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Dr Malcolm Roberts
Chairman
Queensland Competition Authority
GPO Box 2257
BRISBANE QLD 4001

19 December 2014

Dear Malcolm

RESPONSE TO THE QCA'S DRAFT DECISION ON AURIZON NETWORK'S 2014 DRAFT ACCESS UNDERTAKING – MAXIMUM ALLOWABLE REVENUE

Please find enclosed Aurizon Network's submission in response to the Queensland Competition Authority's (QCA's) Maximum Allowable Revenue Draft Decision (MAR Draft Decision) issued on 30 September 2014 concerning Aurizon Network's 2014 Draft Access Undertaking (2014DAU).

Aurizon Network would like to take the opportunity to acknowledge the contribution of the QCA when aiming to balance the interests of all stakeholders when considering Aurizon Network's revenue positions.

In submitting this response, Aurizon Network aims to provide information to address all matters contained within the QCA's MAR Draft Decision. Aurizon Network's response is based upon the information that the QCA has made available to it in respect of the reasons for its MAR Draft Decision.

Aurizon Network seeks to deliver a "world class" Central Queensland Coal Region to sustain current activity levels and accommodate demand growth well into the future. We are dedicated to delivering value to our customer's economic activity and value of the Queensland coal industry and are committed to achieving an outcome that provides the upmost benefit for the supply chain as a whole.

We are committed to working with the QCA and Industry with the objective of achieving a final revenue decision by 30 June 2014.

If you have any questions on this matter please feel free to contact Lana Stockman, Vice President - Regulation.

Yours sincerely

Alex Kummant
Executive Vice President
Aurizon Network Pty Ltd

2014 Draft Access Undertaking

Aurizon Network Response to Queensland Competition Authority's Draft Decision on Maximum Allowable Revenue

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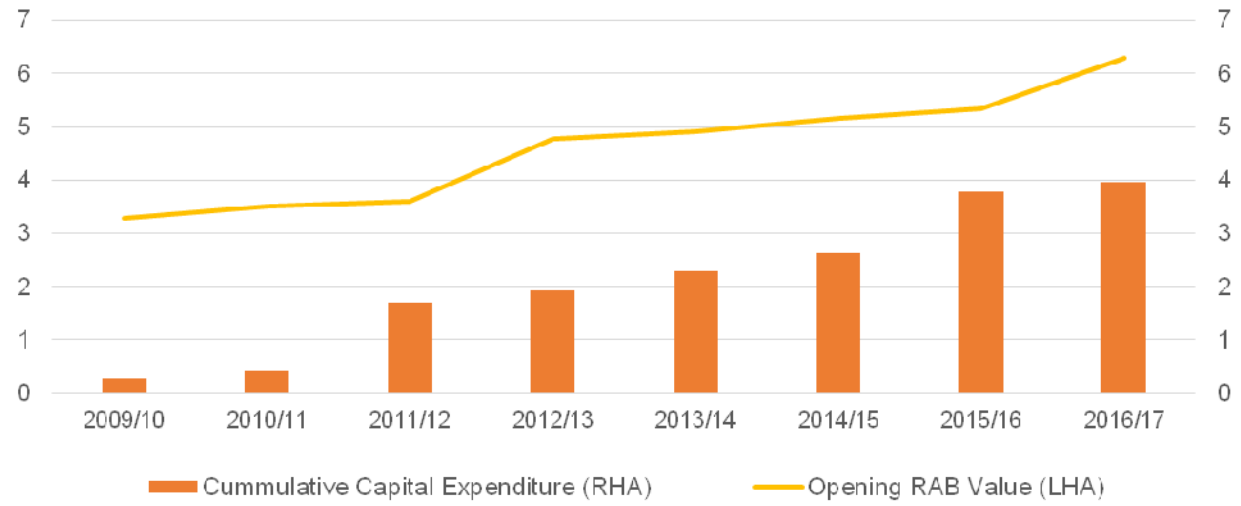
Executive Summary

Chapter 1: Introduction

The Aurizon rail network is a highly sophisticated and complex system that provides vital transport infrastructure over 2700 kilometres linking more than 40 mines to five export coal terminals in the Central Queensland Coal Region (CQCR). Aurizon Network underpins a competitive market for above rail services provided by three operating companies, and dealing with at least 16 coal companies.

While global coal prices have declined in recent years, demand for coal continues to see record tonnages transported on the rail network. The significant strategic investment in the network (represented in the graph below) has ensured Aurizon Network's ability to meet the challenge of these market opportunities, and this Draft Access Undertaking (2014DAU) seeks to maintain that capacity to sustain current activity levels and accommodate demand growth into the future.

Figure 1.1 – Growth in the Regulatory Asset Base (RAB) ($billion nominal)



The decision by the Queensland Competition Authority (QCA) on Aurizon Network's Maximum Allowable Revenue (MAR) will have significant implications for Aurizon Network. It will also have significant implications for the Queensland coal industry, and the economic activity of the State and Nation as a whole. This is because the maintenance and growth of the Aurizon network is essential to the strong performance and the ongoing development of the coal industry, yielding important production, employment and budget revenue outcomes for Queensland and Australia.

The 2014DAU has the potential to deliver a highly resilient coal rail network offering lower real access prices, greater reliability and more efficient utilisation of the Aurizon network, while continuing to meet our contractual obligations to customers demanding greater network access. The investment and expenditure supported by this response to the Draft Decision on MAR is critical to ensure the operational gains Aurizon Network has achieved, are retained and enhanced, to the benefit of our customers, the royalty income of the State, and the Nation's balance of trade.

Conversely, failure of the QCA to confirm Aurizon Network's revised MAR will have significant implications for the reliability of the network and, thus, the performance of the CQCR supply chain and export performance.

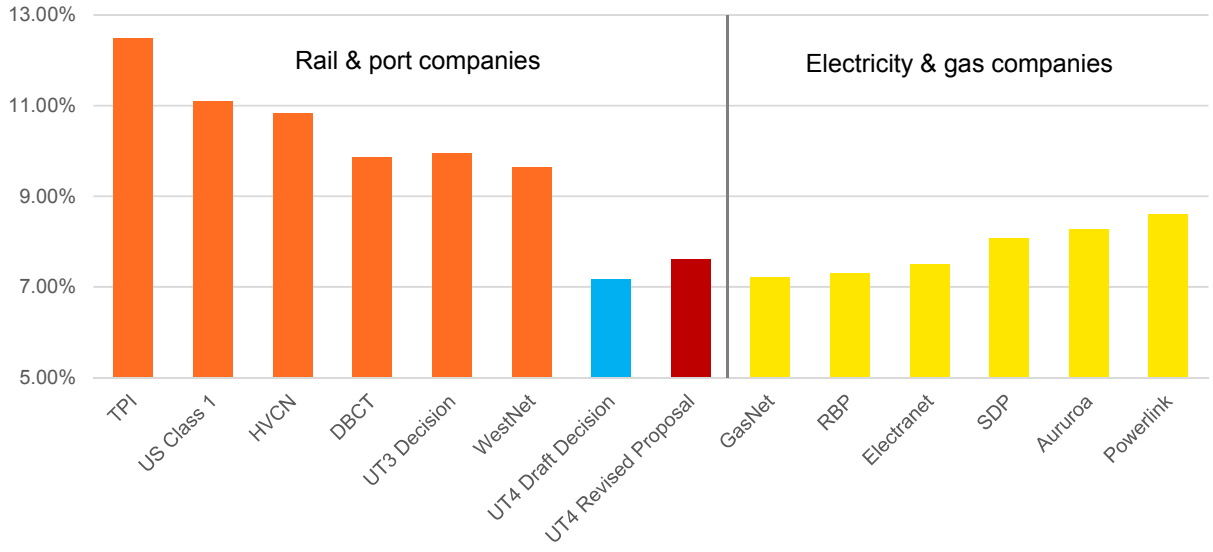
The MAR, and within this the return on capital (WACC) determination, will clearly signal to investors whether the QCA will provide a return on investment commensurate with investors' assessment of the regulatory and commercial risks involved. The QCA's actions will determine whether existing and future investors can have

sufficient assurance to earn an appropriate risk adjusted rate of return over the life of long-term assets – in both existing regulated businesses and, just as importantly, future infrastructure investments.

The WACC determination is especially significant where the regulated assets are held in a publicly listed entity as shareholders will respond negatively if they don't believe the regulated returns are providing an adequate return relative to risk. This could take the form of shareholders refusing to commit investment funds and/or shareholders exiting the stock which, in turn, would undermine the entity's ability to raise capital. Figure 1.2 below indicates Aurizon Network's WACC proposal being conservative compared to rail & port companies.

Considering the broader public interest, if the QCA does not deliver a sustainable WACC rate in this particular undertaking, the appetite of potential investors for supporting either private or public corporations into the future could be fundamentally diminished, jeopardizing the long-term efficient delivery of essential services in this State.

Figure 1.2 – Comparative regulatory WACC outcomes



The operational gains achieved by Aurizon Network would be put at risk if the positions in QCA's MAR Draft Decision are not revised. In particular, the proposed significant reduction in the maintenance and ballast undercutting allowances would fundamentally undermine the capacity of Aurizon Network to maintain and advance its strong performance in network resilience, safety, reliability and efficiency, with consequential risk to the Queensland coal industry and the economic performance of the State.

Where possible, and by adopting a pragmatic and measured approach, Aurizon Network has amended the 2014DAU to take account of the issues raised by the QCA in its Draft Decision on MAR. For example, Aurizon Network has reduced its proposed WACC from 8.18% to 7.62% and the adjusted MAR from $4.78bn to $4.34bn.

Aurizon Network submits that the amendments it has made to the 2014DAU result in a MAR amount that provides for the lowest sustainable and efficient prices while still providing for an efficient level of service. As such, Aurizon Network submits that the amended 2014DAU:

- promotes the Object of Part 5 of the QCA Act;
- has appropriate regard to matters set out in section 138(2) of the QCA Act, including the legitimate business interests of Aurizon Network, the public interest, the interests of persons who may seek access to the service; and
- also has appropriate regard to the pricing principles in section 168A of the QCA Act, including that the proposed MAR should provide for prices that should generate expected revenue for the service that is at least enough to meet the efficient costs of providing access to the service and include a return on investment commensurate with the regulatory and commercial risks involved.

Object of Part 5 of the QCA Act

Part 5 of the QCA Act sets out the provisions concerning Access to Services. The Object of Part 5 is stated in section 69E as follows:

> *The object of this part is to promote the economically efficient operation of, use of and investment in, significant infrastructure by which services are provided, with the effect of promoting effective competition in upstream and downstream markets.*

To have appropriate regard to, and to promote, the object of Part 5, Aurizon Network's 2014DAU should underscore principles of economic efficiency in its build-up of proposed costs in developing, maintaining and operating a highly reliable below rail regulated network.

To demonstrate that the 2014DAU will promote economic efficiency, Aurizon Network has, throughout this and its previous reports to the QCA[1], obtained independent expert advice from industry (economic and financial) advisers, benchmarked against meaningful comparator firms, and applied its own considerable experience in operating the CQCN. As set out in this submission, Aurizon Network has revised its 2014DAU in some key respects (producing a lower MAR) and submits that this amended DAU appropriately promotes the Object of Part 5.

Although the amended DAU delivers a MAR that is closer to the MAR proposed by the Draft Decision, Aurizon Network does not agree with the QCA's Draft Decision and remains of the view that it conflicts with the Object of Part 5 of the QCA Act as it would not *"…promote the economically efficient operation of, use of and investment in…"* the Aurizon Network as significant infrastructure.[2] (The reasons for this are set out in detail in the body of this submission.)

Section 138(2) of the QCA Act

A key concern of Aurizon Network flows from the QCA's proposal to set an excessively low WACC outcome and provide a maintenance allowance that would jeopardise the economic efficiency of the network, including the integrity of ballast supporting the network. These settings in particular threaten the legitimate business interests of Aurizon Network, and compromise its ability to responsibly manage a sustainable commercial business accountable to its shareholders. Aurizon Network submits that the QCA's Draft Decision does not accord appropriate weight to these factors in s.138 (2) of the QCA Act in particular.

Section 168A of the QCA Act

In circumstances where the QCA is confronted in its assessment of Aurizon Network's DAU with return or efficiency uncertainty[3], the QCA should set a price which is certain to achieve the pricing principle (i.e. provide "at least"), rather than to adopt a price where the achievement of that price is uncertain. To do otherwise would be to threaten the legitimate business interests of Aurizon Network, and to undermine a key tenet of section 168A.

Aurizon Network considers that in a number of areas of the QCA's draft decision, the QCA has not had adequate regard to the consequences of potentially setting the MAR too low in the sense that there is a real risk that the prices based on the proposed MAR will not generate expected revenue for the service that is at least enough to meet the efficient costs of providing access.[4]

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[1] Aurizon Network restates and continues to rely on all of the matters raised in its previous submissions and materials provided to the QCA. (As Aurizon Network has amended its DAU over time, those submissions and materials should be seen in their context.)

[2] QCA Act, Part 5, Section 69E

[3] Aurizon Network is confronted with numerous commercial and regulatory risks, as well as possible estimation error in the WACC assessment.

[4] Instead, the QCA has resolved that "consideration of [public and users'] interests leads to a conclusion that Aurizon Network should be permitted to recover no more than efficient costs and return on investment as identified in section 168A(a)": see for example QCA Draft Decision, page 27. This approach does not accord with s.168A (a) nor with s.138 (5), and does not promote the objects of the QCA Act, as it creates an asymmetric truncation effect on returns, leads to a downward bias in price setting, results in access users being subsidised by the owner and causes reduced investment in infrastructure over time: see for example Australian Government Productivity Commission, 2013, Productivity Commission Reports No.66 National Access Regime, p 101. There is also no reference to the words "no more than" in the legislation and no basis for inserting them as a guiding factor to offset the effect of the express words in s.168A (a).

A failure to do this is significant on account of its asymmetric consequences - a point noted by the Productivity Commission in its report on access regulation:

> *For this reason, the Commission considers that the consequences for efficiency from setting access prices too low are, all else equal, likely to be worse than setting access prices too high. This is because deterring infrastructure investment (from setting access prices too low) is likely to be more costly than allowing service providers to retain some monopoly rent (from setting access prices too high) (PC 2008b). The Commission noted in its recent review of electricity regulation that regulators should err on the side of allowing higher returns to regulated businesses to allow for this asymmetry (PC 2013a). There are some arguments that suggest regulators have a tendency to set access prices too low (Hausman 2008; NECG 2001). Given the greater efficiency consequences of setting access prices too low, this bias would increase the expected costs associated with regulatory error."*[5]

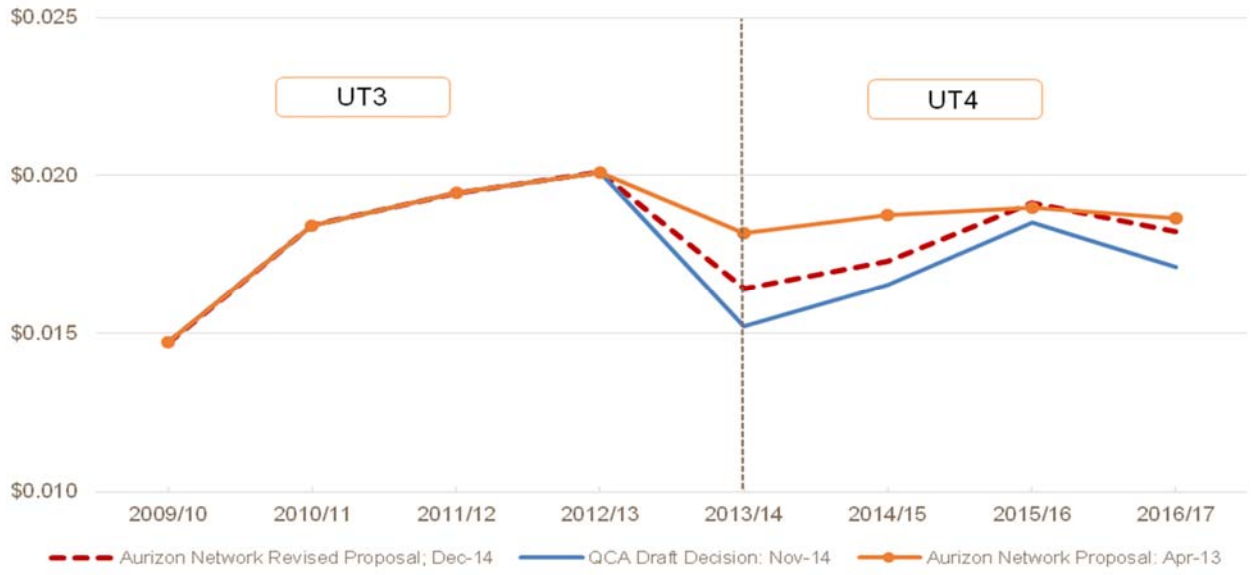
This is particularly so in light of the uncertainty attached to the estimation of some components of the MAR, like the equity beta parameter of the WACC.

> *Asymmetric truncation — access regulation may lead to the expropriation of above-normal returns but not compensate for below-normal returns. This can reduce the expected rate of return of the proposed investment below the required hurdle rate of return and thereby delay or deter investment.*[6]

Aurizon Network therefore further submits that the QCA's Draft Decision is contrary to the matters to which QCA must have regard in assessing an Access Undertaking, identified in Sections 138(2) and 168A of the *QCA Act*[7].

Aurizon Network's response to the QCA MAR Draft Decision proposes economically efficient allowances for WACC, maintenance and operating expenditure which will achieve the continued operation of an efficiently run network while reducing the average unit price of services to its customers in real terms, as shown in Figure 1.3.

Figure 1.3 – Average real price: MAR per Net Tonne Kilometre ($2012/13 per NTK)



Chapter 2: Maximum Allowable Revenue

Aurizon Network considered that its MAR proposal submitted as part of the 2013 Draft Access Undertaking (2013DAU) reflected the efficient costs of developing, maintaining and operating a highly reliable world class rail

[5] Australian Government Productivity Commission, 2013, Productivity Commission Reports No.66 National Access Regime, p. 104.
[6] Ibid, p. 259.
[7] The position is compounded by the fact that Aurizon Network under-recovered in UT3 – a second regulatory period of under-recovery would have lasting adverse impact on the legitimate business interests of Aurizon Network and adversely impact investment decisions. It is also not an efficient outcome, as the long run costs of under-investment exceed any short term "gains" achieved by the outcome.

network with safety as its core value. The costs included in Aurizon Network's MAR proposal were benchmarked against relevant comparator firms and subjected to rigorous review. They have also been thoroughly reviewed by the QCA's consultants.

Furthermore, Aurizon Network considered that its revenue proposal for UT4 was consistent with the pricing principles outlined in section 168A of the *QCA Act*. We therefore disagree with the QCA's position that their proposed MAR is consistent with the relevant provisions of the QCA Act, namely sections 138(2) and 168A.

In responding to the Draft Decision, Aurizon Network has further scrutinized its costs, utilizing the latest available information, and made some adjustments to ensure the accuracy of its MAR estimate.

Table 2.2 – Revised UT4 MAR: Central Queensland Coal Region (CQCR), All Assets ($million, nominal)

Building Blocks	2013/14	2014/15	2015/16	2016/17	Total UT4 Aurizon Network Revised MAR	Total UT4 QCA Proposed MAR
Return on Capital	382.4	399.0	480.4	490.6	**1,752.5**	**1,655.1**
Inflation	(161.7)	(131.0)	(157.7)	(161.1)	**(611.5)**	**(577.2)**
Return of Capital	283.7	306.9	375.8	390.8	**1,357.3**	**1,318.5**
Maintenance Costs	199.4	217.4	217.3	227.1	**861.2**	**737.7**
Operating Costs	200.1	207.2	226.0	234.8	**868.1**	**760.8**
Tax	43.7	55.8	68.8	76.3	**244.6**	**146.5**
Total Revised MAR	**947.6**	**1,055.5**	**1,210.7**	**1,258.5**	4,472.2	4,041.5
UT3 CAPEX carryover	(30.5)	(31.8)	(33.3)	(34.8)	**(130.3)**	**(135.2)**
Total (adjusted) MAR	**917.1**	**1,023.6**	**1,177.4**	**1,223.7**	4,341.9	3,906.2
QCA Proposed MAR	**850.2**	**909.0**	**1,065.4**	**1,081.7**	3,906.2	
Variance to QCA (%)	7.9%	12.6%	10.5%	13.1%	11.2%	

Figure 2.3 – Key drivers of differences in UT4 MAR (Aurizon Network and QCA) ($billion, nominal)

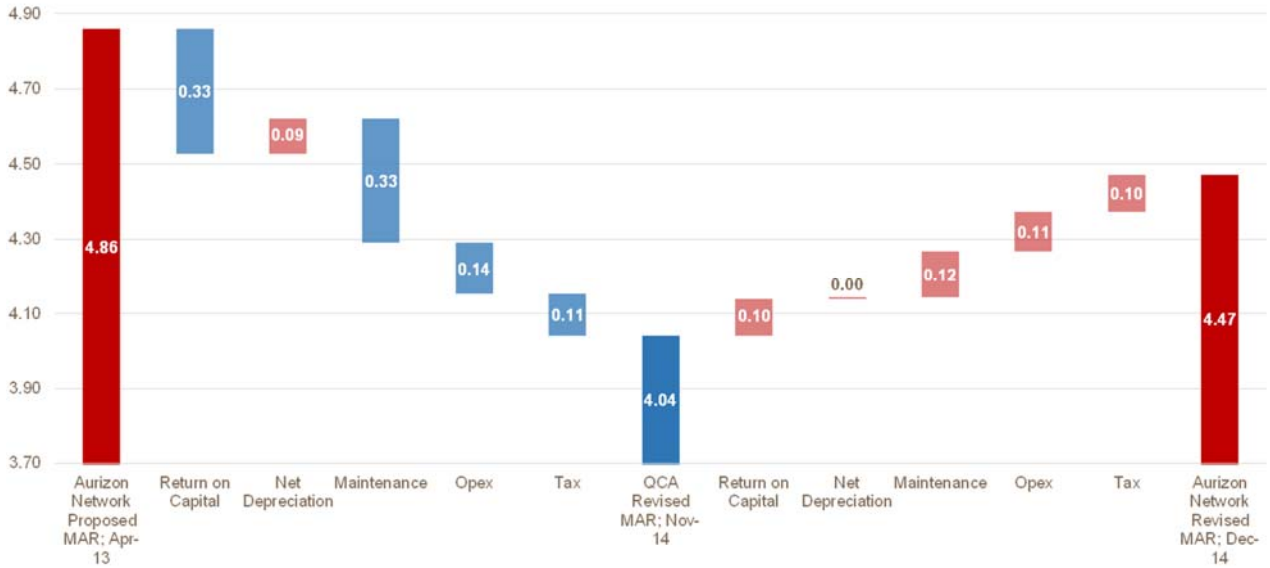
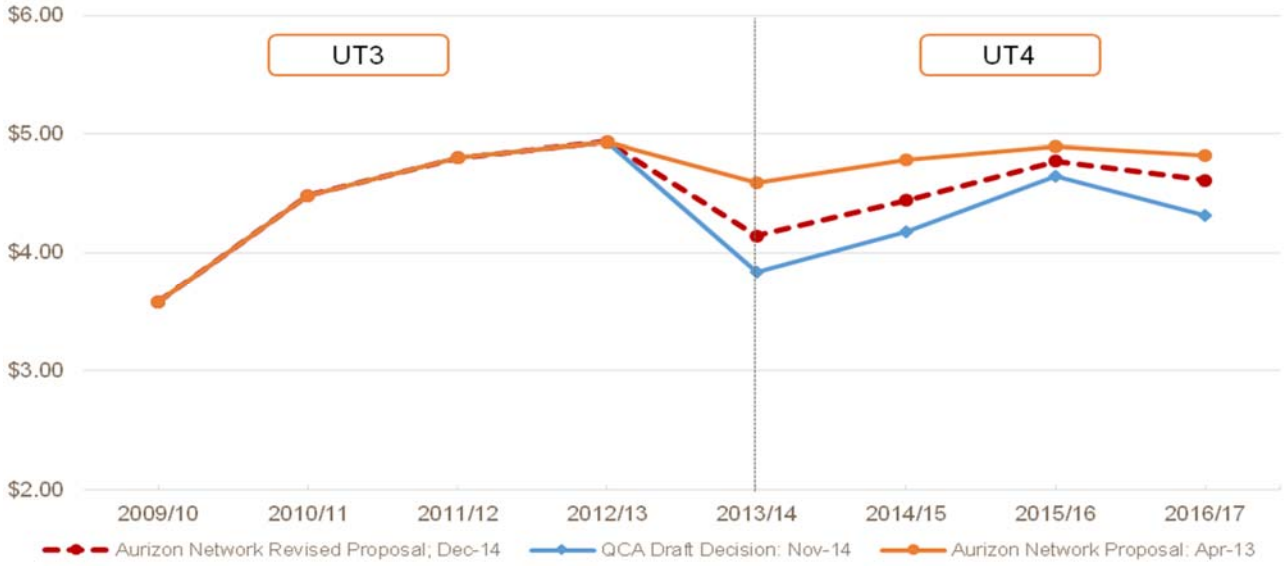


Figure 2.4 – Comparison of total MAR per Net Tonne ($2012/13 per NT, real)



Aurizon Network believes the QCA's proposed MAR will not lead to prices that generate sufficient revenue to at least meet the efficient costs, and return on investment that reflects the regulatory and commercial risks confronted by Aurizon Network.

Aurizon Network would like to discuss with the QCA and industry which of the two options (one off recovery or smoothing across the remainder of UT4) should be adopted for the transitional differences for 2013/14, taking into account feedback from relevant stakeholders and the legitimate business interests of Aurizon Network.

For 2014/15, Aurizon Network proposes that the MAR difference be recovered via an Adjustment Charge, consistent with Schedule F of the 2014DAU and the transitional arrangements for UT3.

Chapter 3: Volume Forecasts

Aurizon Network has clear obligations and incentives to set a volume forecast that is as accurate as possible in order to meet its Rail Safety Act requirements and to minimise cashflow volatility for ourselves and our customers.

The forecast volume for 2014/15, estimated by Energy Economics and adopted by QCA, is currently 205.6 million tonnes, a decrease of 4.1% against actual railings in 2013/14. Aurizon Network considers this forecast to be too low in light of the current performance for 2014/15, which is tracking 7.0% higher than the same period in 2013/14. With the exception of the Goonyella and Newlands system, the 2014/15 volume forecasts outlined below are consistent with those used to calculate transitional tariffs for this year.

Aurizon Network anticipates 2014/15 will be another strong year for coal volumes despite continued subdued prices for thermal and metallurgical coal:

- Coal companies are increasing production to maximise cash flow and reduce unit costs due to low prices.
- Volume growth is also being driven by increasing demand for Australian coal in India as it seeks to dramatically increase its energy and steel production.
- Despite a reduction in overall imports by China Australian coal exports to that market have been resilient.
- An important development that has contributed to this development has been a decision by some US producers to switch shipments from Asia into Europe or cease production altogether.

These positive trends are expected to continue over 2015/16 and 2016/17, particularly as the Wiggins Island Coal Export Terminal (WICET) volumes come on stream.

Aurizon Network proposes that the volume forecast for 2014/15 be updated in accordance with actual performance for the year based on a '9+3' volume forecast to be provided in April 2015.

In its *Coal Medium-Term Market Report 2014*, International Energy Agency (IEA)[8] forecasted that:

- thermal coal supplies in Organisation for Economic Co-operation and Development (OECD) countries will grow by 67mt (+0.8% per year) to 2019, mostly due to increasing production in Australia; and
- met coal supplies in OECD countries will grow by 21mt (+1.2% per year on average) to 305mt in 2019. Virtually all growth in OECD countries comes from Australia.

Table 3.3 – Revised UT4 Volume Forecast (million tonnes - mt)

Financial year to June	2013/14	2014/15	2015/16	2016/17	Total UT4
Blackwater	66.4	60.7	70.5	72.9	**270.4**
Goonyella	111.2	111.2	112.1	116.7	**451.2**
Moura	12.4	13.2	13.5	15.8	**54.9**
Newlands (excl GAPE)	12.0	13.9	13.9	13.9	**53.7**
GAPE	12.5	15.6	17.5	19.4	**65.0**
Total Volume Forecast	**214.5**	**214.6**	**227.4**	**238.7**	**895.2**

Blackwater and Moura figures include volumes associated with Train Services for the new WICET; with the exception of Goonyella and Newlands, 2014/15 represents transitional tariff tonnages.

Chapter 4: Operating Costs

In its 2013DAU, Aurizon Network described the efficient costs of developing, maintaining and operating a highly reliable below rail network that has safety as its core value. Having an appropriate cost allocation applied to Aurizon Network is critical to ensure that it has the capability to meet its obligations to maximise the productivity, reliability and safety of the coal rail network.

A detailed explanation of operating cost categories and the expenses confronted by Aurizon Network is provided in Chapter 4. However, the QCA paid particular attention to the Corporate Overheads category, and the key points of the response to that matter are highlighted below.

Aurizon Network implemented a robust approach to estimating efficient corporate costs for the 2013DAU, including independent benchmarking from Ernst & Young (EY) drawing on a large global database. The EY report concludes that, overall, Aurizon Network's 2013DAU cost estimate for overheads place it within the benchmark range expected for a stand-alone business of a similar size and in a similar industry.

The QCA's proposed cost allowance includes revisions to the costs calculated by its consultant, RSMBC, using the direct cost method, and includes an allowance for corporate overheads related to asset maintenance, resulting in a total allowance of $46.1 million per annum. This is much lower than the $52.3 million which we consider to be a conservative benchmark. Aurizon Network's revised proposal is based on this benchmark, with adjustments for legal and safety obligations as our operations require more focus in these areas than an average company.

Table 4.1 – Total Operating Costs for UT4 period– comparison of Aurizon Network and QCA proposals

Operating Costs	Original submission 2013DAU	QCA Proposed 2014 Draft Decision	Aurizon Network Revised Proposal	AN Revised Proposal vs. QCA Proposed
Train control and operations	133.7	111.0	122.0	**11.0**
Infrastructure management	67.8	62.3	79.0	**16.7**
Business management	48.9	46.1	73.0	**26.9**
Audit & condition based assessment	0.9	1.4	1.6	**0.2**
Subtotal	**251.3**	**220.8**	**275.6**	**54.8**

[8] IEA, 2014b, Coal Medium-Term Market Report 2014, p. 63 and p. 81.

Operating Costs	Original submission 2013DAU	QCA Proposed 2014 Draft Decision	Aurizon Network Revised Proposal	AN Revised Proposal vs. QCA Proposed
Corporate overhead	*279.7*	n/a	n/a	n/a
Maintenance overhead	*56.0*	n/a	n/a	n/a
Total overhead	**335.7**	**194.9**	**246.9**	**52.0**
Traction	306.8	306.8	307.2	**0.4**
Insurance	39.0	38.5	38.5	**0.0**
TOTAL	**932.8**	**761.0**	**868.2**	**107.2**

Chapter 5: Maintenance

Aurizon Network welcomes the QCA's approval of both the scope and cost of its direct maintenance activities (excluding ballast undercutting). Aurizon Network agrees with the QCA that the maintenance allowance should be adjusted for revised volume forecasts. However, Aurizon Network proposes that:

- for 2013/14, actual costs be reflected in the maintenance allowance.
- for 2014/15, the maintenance allowance is adjusted to reflect Aurizon Network's restated cost build-up based on a '9+3' volume forecast to be calculated in April 2015.
- for 2015/16 and 2016/17, the maintenance allowance is adjusted to reflect Aurizon Network's restated cost build-up reflecting the proposed volume forecasts in Chapter 3.

Aurizon Network accepts the QCA's Draft Decision to re-classify re-railing costs as renewals expenditure, subject to a transitional arrangement which delays the re-classification to 2015/16 and adds the 2015/16 and 2016/17 allowances to the UT4 capital indicator. This is a transitional arrangement to avoid a retrospective policy change given the first two years of UT4 are almost complete.

Aurizon Network does not accept a maintenance performance incentive in addition to the existing ex-ante and ex-post arrangements for the funding of, and reporting on, its maintenance activities. Such an incentive is inconsistent with the ex-ante approach by which Aurizon Network's maintenance allowance is established, and may actually promote inefficient outcomes. Aurizon Network is willing to work with the QCA, the Queensland Resources Council (QRC) and other stakeholders to develop an alternative reporting and funding framework to address any concerns.

Aurizon Network continues to believe that a Gross Replacement Value (GRV) approach is the better long-term approach for return on maintenance assets. Aurizon Network is nevertheless prepared to accept the QCA's proposed adjustment to return on assets (including escalation of depreciation) as there is no long term difference between these two approaches, subject to verification of the adjustments summarised in the Draft Decision and the QCA's commitment to the same approach for UT5 to ensure regulatory consistency.

Aurizon Network accepts the QCA's Draft Decision on return on working capital. However, Aurizon Network disagrees with the QCA's Draft Decision on return on inventory on the basis that such a return would be included in the price charged by an arm's length, efficient supplier of maintenance services.

Table 5.2 – Revised proposal for maintenance cost ($nominal million)

($nominal million)	2013/14	2014/15	2015/16	2016/17	Total UT4
Aurizon Network proposed (Apr 2013)	165.0	179.4	191.9	203.3	**739.6**
QCA's Draft Decision	123.7	130.0	132.3	141.9	**527.9**
Aurizon Network proposed adjustments					
• Re-railing costs	16.2	16.4	-	-	**32.6**
• Return on inventory	1.2	1.2	1.2	1.2	**4.8**
• Other adjustments (net)	3.7	3.5	7.6	3.5	**18.4**
Aurizon Network proposal (revised)	**144.8**	**151.2**	**141.1**	**146.6**	**583.7**

Note:A reconciliation of the Apr 2013 proposed maintenance cost and the QCA's Draft Decision is provided in Table 5.1.

Chapter 6: Ballast Undercutting

The QCA has provided a draft decision that substantively impacts Aurizon Network's ability to deliver its ballast undercutting program. The impacts of not delivering an effective ballast undercutting program will be felt throughout the entire supply chain including operators, access holders and end customers.

Having clean ballast is a fundamental requirement for any railway, be it coal or non-coal networks. Fouling, from both natural ballast degradation and coal fines, acts like a sponge trapping moisture and progressively reducing the ballast's ability to drain water and distribute train loads. Over time, the fouling increases and the trapped moisture progressively destabilises the ballast and softens the formation which can result in track failure, and potentially derailments. Ballast undercutting rejuvenates the ballast and improves track reliability.

Aurizon Network wishes to resolve with the QCA the ongoing ballast management issues identified in the earlier Access Undertakings. With this in mind, Aurizon Network accepts the QCA's positions on the treatment of the ballast impairment charges and welcomes its commentary (sourced from the Evan's and Peck report) that the CQCR network is in an appropriate condition. The QCA's engineering consultant, SKM, also concluded that the ballast undercutting scope was appropriate to the needs of the network.

During UT3, Aurizon Network had a ballast undercutting shortfall of $18.73million Present Value (PV) against its approved allowance once a tonnage based adjustment for AT1 revenue is completed. Aurizon Network under-delivered on its planned ballast undercutting scope for UT3, however this was appropriate based upon the tonnages railed within the CQCR over that period.

Aurizon Network has developed its UT4 scope in line with what the Network requires based upon the Ground Penetrating Radar (GPR) results. The latest round of GPR data has confirmed that there is 373km of track within the CQCR with a Percentage Void Contamination (PVC) level greater than 30% and that over the term of UT4, another 185km's will move into this >30%PVC bracket.

Ballast undercutting programs have both fixed costs (labour, depreciation) and variable costs (ballast, fuel freight, etc.). Aurizon Network has an average fixed costs of 44% and incurs these even when the machinery is idle. The QCA's adjustment would only provide sufficient funding for Aurizon Network to complete undercutting for 209km of the revised scope of 538km, with no turnouts being able to be completed due to the funding shortfall.

For the UT4 period, the QCA's pre/post GPR reduction of 33% assumes all undercutting costs are variable. However, once the fixed costs (depreciation and labour) of the ballast undercutting program are removed from the QCA's proposed allowance the implied reduction to variable costs is actually 47%. This effective halving of the variable cost allowance would result in Aurizon Network being unable to complete 331km's of the required undercutting scope. This would introduce unacceptable consequences to the supply chain through increased speed restrictions, increased track access for unplanned maintenance activities and ultimately derailments affecting end customers.

The 2013DAU ballast undercutting program has been further scrutinised and subsequently revised to ensure ongoing efficiency on-top of the reduction due to the reduced forecast tonnages. Aurizon Network's mechanized undercutting costs have consequently been driven below the current comparable competitive market rates.

Aurizon Network is also proposing that all ballast undercutting work completed on bridges be capitalized as the 100% ballast replacement rate, and the associated bridge works, result in a significant extension to the life of the bridge asset.

Table 6.1 – Aurizon Network revised ballast scope and costs for the term of the 2014DAU

	2013/14	2014/15	2015/16	2016/17	Total
Scope – Km's @ 300mm depth	118	140	140	140	538
Scope - Turnouts	68	54	57	57	236
2014DAU Revised Costs ($million nominal)	54.56	66.25	76.24	80.44	277.46
2014DAU Revised Costs ($million FY12)	51.43	60.80	68.26	69.86	250.35

Chapter 7: Opening Asset Value

The Opening Asset Value (OAV) for UT4 outlined in the 2013DAU was based on a forecast value of capital expenditure for the 2011/12 and 2012/13 financial years. Capital expenditure for both financial years has now been approved by the QCA and subsequently added to the RAB as part of the annual roll-forward process.

The OAV includes equity raising costs for GAPE which were deferred from the GAPE 2012 DAAU on the basis that they would be revisited in this UT4 process.

Aurizon Network welcomes QCA's willingness to consider the inclusion of equity raising costs for the UT4 period. Aurizon Network has calculated an indicative allowance for equity raising costs for UT4 period in the revenue model submitted based on the Capital Indicator. The amount will be adjusted at the conclusion of the UT4 period to reflect the actual approved capital expenditure.

Table 7.7 - Total CQCR: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	2013/14
Opening Asset Value	3,283,426	3,520,193	3,604,221	4,767,540	
Capital Expenditure	282,212	119,523	1,303,974	226,419	
Inflation	112,055	139,730	47,979	113,788	
Depreciation	(157,500)	(175,226)	(188,635)	(203,996)	
Closing Asset Value	3,520,193	3,604,221	4,767,540	4,903,750	
UT4 Opening Asset Value: CQCR					**4,903,750**

Chapter 8: Regulatory Asset Base (RAB) and the Capital Indicator

The RAB is a fundamental component of the Access Undertaking, as it represents the value of Aurizon Network's investment in the CQCR against which the return on capital and depreciation (return of capital) are calculated. The RAB is composed of the Opening Asset Value together with the Capital Indicator (representing proposed future investment) with adjustments for inflation and depreciation.

Aurizon Network accepts the QCA's Draft Decision to continue the use of post-tax nominal vanilla WACC for the Capital Indicator, inclusive of Interest During Construction (IDC).

Aurizon Network maintains that its proposal to use a post-tax nominal classic WACC for calculating IDC remains the most viable mechanism for addressing the issue of tax deductibility of interest, especially in light of tax changes that allow the deductibility for capitalised interest to be recognised when incurred. However, in the interest of reducing regulatory complexity, Aurizon Network accepts the QCA's position that the impact of the proposed change to the overall Capital Indicator is immaterial.

Aurizon Network accepts capitalisation of re-railing costs subject to re-railing costs being included as renewals expenditure in the Capital Indicator for 2015/16 and 2016/17 only. This is a transitional arrangement to avoid a retrospective policy change given the first two years of UT4 are almost complete.

A more regular and detailed reporting regime on forecast capital costs, including a reset of the Capital Indicator, as envisaged by the QCA, would impose further regulatory burden and additional costs on Aurizon Network. Given the information already provided, Aurizon Network does not believe the public interest would be advanced by such additional, prescribed processes. However, Aurizon Network is willing to discuss alternative arrangements with the QCA, the QRC and other stakeholders.

With respect to actual costs, Aurizon Network accepts that it should report on its annual renewals activities and agrees with the QCA that it should be undertaken as part of the annual maintenance reporting process. Aurizon Network recommends that this process commences with the 2015/16 year consistent with the arrangements for maintenance cost reporting.

Table 8.1: UT4 Capital Indicator by system ($'000s)

Non Electric Capex	2013/14	2014/15	2015/16	2016/17	Total
Blackwater	80,536	96,799	844,023	77,987	**1,099,345**
GAPE	42,635	26,675	-	-	**69,310**
Goonyella	170,308	62,483	85,465	68,309	**386,565**
Moura	5,423	5,099	55,626	7,660	**73,808**
Newlands	7,235	4,109	7,114	5,189	**23,647**
Total Non-Electric	**306,137**	**195,165**	**992,228**	**159,145**	**1,652,675**
Electric Capex	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**Total**
Blackwater	7,479	137,632	82,831	2,018	**229,961**
Goonyella	53,365	6,618	2,532	2,357	**64,872**
Total Electric	**60,844**	**144,250**	**85,363**	**4,375**	**294,833**
Total Capital	**366,981**	**339,415**	**1,077,592**	**163,520**	**1,947,508**

Note: Excludes return on capital adjustments

Chapter 9: Return of Capital (Net Depreciation)

As approved by the QCA for UT3, Aurizon Network currently applies two different methods to calculate depreciation for pricing purposes, depending on the year in which the asset was accepted for inclusion in the RAB.

Aurizon Network believes that the application of two separate depreciation methods does not result in an efficient pricing outcome because MAR and the Access Charges for new customers will be based on a more aggressive depreciation profile than that for the existing customers.

Furthermore, Aurizon Network considers that the application of a consistent depreciation methodology across all assets has merit as it reduces the level of complexity in calculating the Return of Capital Building Block.

However, Aurizon Network is prepared to accept all three of the QCA's Draft Decisions on Return of Capital. The practical impact is that the "UT3 method" will be used to calculate Return of Capital for the UT4 period – that is, Return of Capital will be calculated with reference to physical lives for assets included in the RAB prior to 1 July 2009, and a rolling 20-year life will be applied to assets included from 1 July 2009.

Aurizon Network intends to re-evaluate the suitability of the weighted average mine life approach in future regulatory periods.

Table 9.1 Aurizon Network's revised depreciation allowance ($million, nominal)

Return of Capital Building Block	2013/14	2014/15	2015/16	2016/17	Total UT4
Aurizon Network proposed (Apr-13)	269.3	291.1	346.5	348.6	**1,255.9**
QCA's Draft Decision (Nov-14 update)	270.7	300.5	372.8	374.6	**1,318.5**
Aurizon Network proposed adjustments[9]	13.1	6.5	3.1	16.1	**38.7**
Aurizon Network proposal (revised)	**283.7**	**306.9**	**375.8**	**390.8**	**1,357.3**
Variance to QCA (%)	4.8%	2.2%	0.8%	4.3%	2.9%

[9] These adjustments include the impact of the revised UT4 Opening Asset Value. As outlined in chapter 7, this reflects the QCA's approved capital expenditure for 2011/12 and 2012/13.

Chapter 10: Return on Capital (WACC)

Providing an appropriate WACC is essential to the QCA meeting its legislative requirements under the QCA Act. Setting an appropriate WACC over the access arrangement period is particularly critical to:

- promoting the primary objective of Part 5 of the Act, namely to promote the economically efficient operation of, and use of, and investment in, significant infrastructure by which services are provided, with the effect of promoting competition in upstream and downstream markets (section 69E);
- having regard to the legitimate business interests of the owner/operator of the service (section 138(2); and
- allowing the entity to generate expected revenue for the relevant service that is at least enough to meet the efficient costs of providing access to the service and include a return on investment commensurate with the regulatory and commercial risks involved (section 168A(a)).

To the extent there is any balance to be struck between the interests of Aurizon Network, users or persons who may seek access, and the public interest, the specific use of the words "at least" in section 168A(a) should encourage the QCA to find in favour of Aurizon Network.

Regrettably the analysis presented in this chapter demonstrates that the analysis and supporting materials that stand behind the QCA's WACC draft determination is, in a number of areas, fundamentally flawed and does not meet regulatory best practice (see Figure 1.2).

Aurizon Network believes transparency, clarity and methodological consistency are essential to achieving the QCA's objective of best practice regulation. Aurizon Network therefore recommends that the inconsistencies outlined in this chapter be addressed by the QCA in finalising its WACC determination.

Aurizon Network further submits that the QCA should make appropriate adjustments to DRP, beta and gamma, resulting in a WACC determination of 7.62%. The adoption of QCA's proposed risk-free rate and MRP is subject to an overall WACC of 7.62% or higher resulting from the application of the various WACC parameters.

Aurizon Network addresses the individual components of the QCA's Draft Decision below:

- Risk-free rate
  - Aurizon Network does not agree with the QCA in matching the term of the risk-free rate to that of the regulatory cycle and continues to submit that a risk-free rate term of 10 years is appropriate.
  - However, adopting a pragmatic approach in responding to the Draft Decision, Aurizon Network has amended the WACC incorporated in the 2013DAU to reflect the value for the risk-free rate set out in the Draft Decision (3.21%).
- Debt-risk premium (DRP)
  - Aurizon Network has, from a pragmatic perspective, adopted the QCA's preferred methodological approach to measuring the DRP.
  - However, Aurizon Network has not incorporated the value for the DRP that the QCA derived from its preferred approach. Aurizon Network has corrected the derivation of the DRP for sample bias, and following that correction has amended the 2013DAU to incorporate a value of 3.00% for the DRP.
  - Aurizon Network agrees with the QCA's draft decision on debt-raising and interest-rate swap costs.
- Market-risk premium (MRP)
  - Due to a combination of methodological, data and transparency issues, Aurizon Network does not agree with the QCA's MRP estimate of 6.5%
  - However, Aurizon Network has adopted a pragmatic approach and amended the WACC to include the MRP set out in the Draft Decision (6.5%).
- Equity and asset beta
  - Aurizon Network does not agree with the QCA's beta estimates due to sample size and replication issues and maintains the beta estimates calculated by SFG Consulting within the 2013DAU are appropriate.
- Gamma
  - Aurizon Network does not agree with the QCA in setting gamma at 0.47 as:
    - the QCA's approach in estimating theta is inconsistent with common theoretical understanding
    - no other Australian regulator has recently determined a distribution rate higher than 0.70
  - Aurizon Network therefore continues to propose a gamma of 0.25.

Comparison of WACC parameters

Table 10.1 – Comparison of WACC parameters

Parameter	Aurizon Network (upper bound)[a] 2013DAU	QCA's Draft Decision[b]	AER's Draft Decision Updated with Aurizon Network's Averaging Period[c]	Aurizon Network's Revised Position[b]
Credit rating	BBB+	BBB+	BBB+	**BBB+**
Risk-free rate	3.15%	3.21%	4.06%	**3.21%**
Market risk premium	7.0%	6.5%	6.5%	**6.5%**
Asset beta	0.6	0.45	-[d]	**0.5**
Debt beta	0.12	0.12	-[d]	**0.12**
Debt to value	55%	55%	60%	**55%**
Equity beta	1.0	0.8	0.7[d]	**0.9**
Gamma	0.25	0.47	0.4	**0.25**
Equity margin	7.0%	5.2%	4.55%	**5.85%**
Cost of equity	10.15%	8.41%	8.61%	**9.06%**
Debt risk premium (raw)	3.28%	2.72%	3.60%[e]	**3.00%**
Debt transaction costs	0.125%	0.108%	0.099%	**0.108%**
Interest rate swap costs	-	0.113%	-	**0.113%**
Debt risk premium (total)	3.405%	2.94%	3.70%	**3.23%**
Cost of debt	6.56%	6.15%	7.76%[e]	**6.44%**
WACC margin	5.03%	3.96%	4.04%	**4.41%**
WACC (post tax nominal)	**8.18%**	**7.17%**	**8.10%**	**7.62%**

Note: a) Aurizon Network (upper bound) is based on 20 business day averaging period to 30 November 2012; b) QCA's Draft Decision and Aurizon Network's Revised Position are based on 20 business day averaging period to 31 October 2013; c) AER's Draft Decision estimates (for risk free rate and debt risk premium only) have been updated using 20 business day averaging period to 31 October 2013. However, methodology is consistent with AER's Draft Decision; d) AER uses a different de-leverage and re-leverage formula; e) AER is moving from on-the-day approach to trailing average approach. The estimate is for the first averaging period, and will be updated annually in a transition to trailing average approach, which is consistent with AER Draft Decision.

The table above shows a comparison that utilises all parameters as allowed in the AER's draft decisions, except for risk free rate and debt risk premium which have been updated using Aurizon Network's averaging period.

While Aurizon Network does not agree with each individual parameter in this comparison, if Aurizon Network was an electricity distributor and regulated by AER, it is likely that the 2013DAU rate of return proposal of 8.18% would have been allowed.

Leaving aside disputes over the individual parameters, the significant difference in the WACC determined by QCA (7.17%) and AER (8.10%) is hard to reconcile with QCA's proposition that Aurizon Network is of similar risk to the energy and water sector[10], and even harder to comprehend when Aurizon Network's arguments in section 10.5 demonstrate that its systematic risk is actually higher than the energy sector.

Standard & Poors and the Brattle Group have provided advice on suitable comparators for Aurizon Network to include rail transport companies such as Brookfield Rail, Canadian Pacific and Canadian National. The exclusion of all rail companies as comparators results in downward bias on the estimate of beta for Aurizon Network.[11]

This analysis reinforces Aurizon Network's position that WACC of 7.17% in QCA's Draft Decision does not provide a reasonable return that is commensurate with the amount of risk, and does not provide appropriate incentive for future investments in the Queensland coal network.

[10] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 252.
[11] Standard & Poors, 2013, Aurizon Network Pty Ltd. and The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC.

Such an outcome would also lead to investors questioning whether the QCA would allow them to earn an appropriate risk adjusted rate of return over the life of long-term assets – in both existing regulated businesses and, just as importantly, future infrastructure investments. This could result in the appetite of potential investors for supporting either private or public corporations into the future being fundamentally diminished, jeopardizing the long-term efficient delivery of essential services in this State and future levels of infrastructure spending by the Government.

Contents

Attachments

Aurizon Network 2014 Draft Access Undertaking Response to QCA's Draft Decision on Maximum Allowable Revenue

1. Introduction

Aurizon Network welcomes the opportunity to respond to the QCA's Draft Decision on Maximum Allowable Revenue (MAR) for Aurizon Network's 2014 Draft Access Undertaking (2014DAU).

This chapter sets the context for the issues discussed throughout this submission. It seeks to highlight:

1. the performance and achievements of the Aurizon Network to date,
2. the importance of ensuring a sustainable revenue outcome which will allow Aurizon Network to maintain these standards for the benefit of its customers, and
3. how the QCA's MAR Draft Decision would put at risk these gains and the capacity of Aurizon Network to continue its strong performance in supporting the continued growth in coal exports from Queensland.

The legitimate business interests of Aurizon Network will be threatened by an excessively low Cost of Capital outcome and/or economically inefficient allowances for asset maintenance, particularly the integrity of ballast supporting the network, and its stewardship role of maintaining a sustainable commercial business which is accountable to its shareholders.

Aurizon Network respectfully disputes the various comments within the QCA's Draft Decision that the CQCR operations are in any way economically inefficient or not cost effective. The estimates presented in the 2013DAU were established on the basis of best available information and have been continually reviewed and scrutinised to incorporate feedback from the QCA and stakeholders in ensuring a satisfactory outcome for all parties.

Aurizon Network's revised MAR submission for UT4 proposes economically efficient allowances for WACC, maintenance and operating expenditure which will achieve the network sustainability while reducing the average unit cost of services to our customers in real terms.

Regulatory process

On 11 August 2014, Aurizon Network resubmitted its 2014DAU to the QCA. The amendments were based upon consultation and feedback from industry stakeholders over the previous 15 months.

As part of the regulatory decision process and in-line with their timetable, the QCA published its Draft Decision on Aurizon Network's MAR on 30 September 2014. The MAR Draft Decision outlines the MAR 'building blocks' for the Central Queensland Coal Region (CQCR). The QCA sought further feedback from interested parties to be submitted by 12 December 2014. Aurizon Network requested and received an extension from the QCA to lodge our response by 19 December 2014.

As we await the QCA's response to the 2014DAU (the policy and pricing draft decision due in January 2015), Aurizon Network presents this formal response to the QCA MAR Draft Decision and seeks to advance the discussion in a genuine effort to achieve a sustainable MAR before a final decision is reached by the QCA.

We would like to take this opportunity to thank the QCA's staff for providing us with the opportunity to comment on the MAR Draft Decision, and the professionalism they have displayed throughout their dealings with Aurizon Network.

To date, the regulatory process employed for the approval of Aurizon Network's 2014DAU has been relatively smooth, however, there are some aspects of the process which have given rise to concern for Aurizon Network. For completeness, and in the interests of openness, these are dealt with in Attachment 8 to this submission.

Aurizon Network remains focussed on commencing the UT4 on 1 July 2015, and emphasises the importance for the QCA to deliver its final decision on the MAR and tariffs by 30 June 2015 to ensure pricing certainty for customers and Aurizon Network as we enter the new financial year.

1.1 Aurizon Network's Contribution to the Coal Sector

The Aurizon rail network is a highly sophisticated and complex system that provides vital transport infrastructure linking more than 44 mines to three ports and five export coal terminals in the Central Queensland Coal Region (CQCR). Aurizon Network underpins a competitive market for above rail services provided by three operating companies, and dealing with at least 16 coal companies, many of which are global corporations with market capitalisations well in excess of that of Aurizon Holdings.

The maintenance and growth of the Aurizon network is essential to the strong performance and ongoing development of the coal industry in Queensland, yielding important production, employment and budget revenue outcomes for Queensland and Australia.

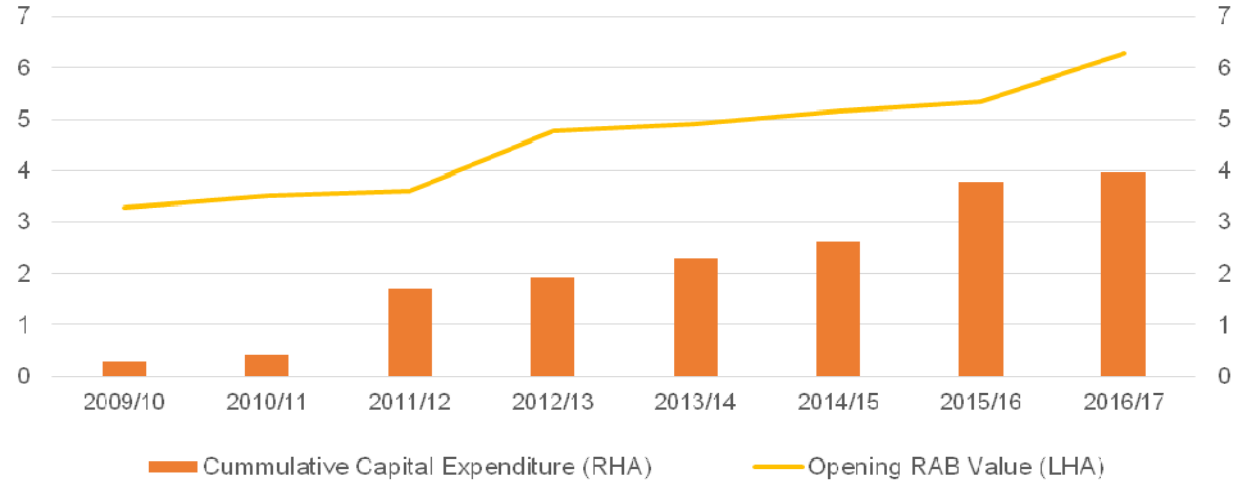
As the QCA has recently pointed out to the Productivity Commission, the continued growth and development of the resources sector will be fundamentally important to the ongoing health of the Queensland economy, and a significant source of future revenue growth for the Queensland Government. Future growth in the coal sector can also be expected to bring significant additional economic benefits to Queensland, in the form of higher economic growth and greater levels of job creation than would otherwise be the case.

While global coal prices have declined in recent years, demand for coal continues to see record tonnages transported on the rail network. The QCA itself has indicated it expects any moderation in coal prices to be offset by increases in volumes, and this is consistent with the experience of Aurizon Network.

With that increase in traffic and tonnages, the effective maintenance and renewal of the network asset is critical to ensure the efficient delivery of coal to export markets continues. Aurizon Network has no incentive to over-maintain the network as we do not obtain any return on the maintenance activities.

While the recent resurgence in coal volumes were unexpected, the significant strategic investment in the network (shown in the graph below) has ensured Aurizon Network's ability to meet the challenge of these market opportunities. This DAU seeks to maintain that capacity and accommodate demand growth into the future.

Figure 1.1 – Growth in the Regulatory Asset Base (RAB)



The performance of Aurizon Network should be judged on its capacity to deliver infrastructure where and when it is required by customers, meeting the transport needs of customers with high levels of reliability, productivity and cost effectiveness, and pursuing operational safety as its highest priority.

It is therefore imperative that QCA's final decision ensures Aurizon Network has the resources needed to continue delivering these important outcomes for its customers, employees, shareholders, local communities and the State. As it stands, the QCA's Draft Decision would jeopardise Aurizon Network's capacity to achieve these outcomes, and thereby act to frustrate not just Aurizon Network from pursuing its legitimate business interests that the QCA needs to have regard to under section 138(2), but also the public interest under section 128(2) (d) of the QCA Act.

1.2 The Regulatory Framework

We agree with the QCA that the regulatory arrangements that govern the provision of the infrastructure facilities which underpin the resource sector's operation will be vital for its future. This particularly includes ensuring sufficient incentives for commercial investment and appropriate maintenance expenditure. Key supply chain constraints on coal export growth would be:

- Insufficient investment in necessary infrastructure caused by inadequate institutional or regulatory structures to allow that investment to proceed; and
- Inadequate maintenance allowances yielding an unreliable rail system which would impede coal companies and above rail operators from responding promptly to their coal market opportunities.

As the sole infrastructure provider servicing multiple customers, Aurizon Network behaves as a responsible supplier of below rail infrastructure services. We believe that economic regulation of our network should facilitate transparency and certainty about the responsible manner in which Aurizon Network builds, maintains and operates its infrastructure assets. Aurizon Network respects the statutory processes that the QCA administers in bringing that regulation to effect.

Aurizon Network engages constructively in the regulatory processes, in order to build a robust and sustainable operational model that meets the needs of our customers and shareholders.

We have already made significant improvements since listing on the Australian Stock Exchange (ASX) in 2010.

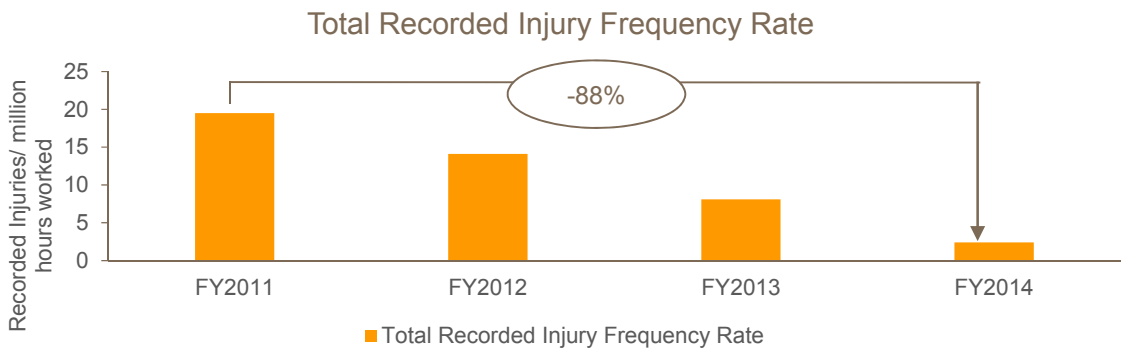
1.3 Continuous Improvement – Delivering Better, Safer Services

The investment, maintenance and operational program of Aurizon Network is carefully designed to achieve continuous improvement in safety, efficiency, productivity and service quality. Over recent years, Aurizon Network has made significant advances in pursuing each of these goals.

1.3.1 Working toward *ZeroHarm*

Safety is Aurizon Network's core value and the commitment to the *ZeroHarm* program has seen a dramatic reduction in the total recorded injury frequency rate over the last 4 years (and a corresponding increase in the productivity of the workforce.)

Figure 1.2 –Safety Performance of Aurizon Network



1.3.2 Record Volumes with Reduced Real Costs and Improved Reliability

Aurizon Network is keeping pace with customer demand - delivering record volumes in 2013/14.

Record daily volume
Of the 15 days of railings above 700,000 tonnes per day, 14 were in 2013/14

Record monthly volume
19.6 million tonnes per month May 2014

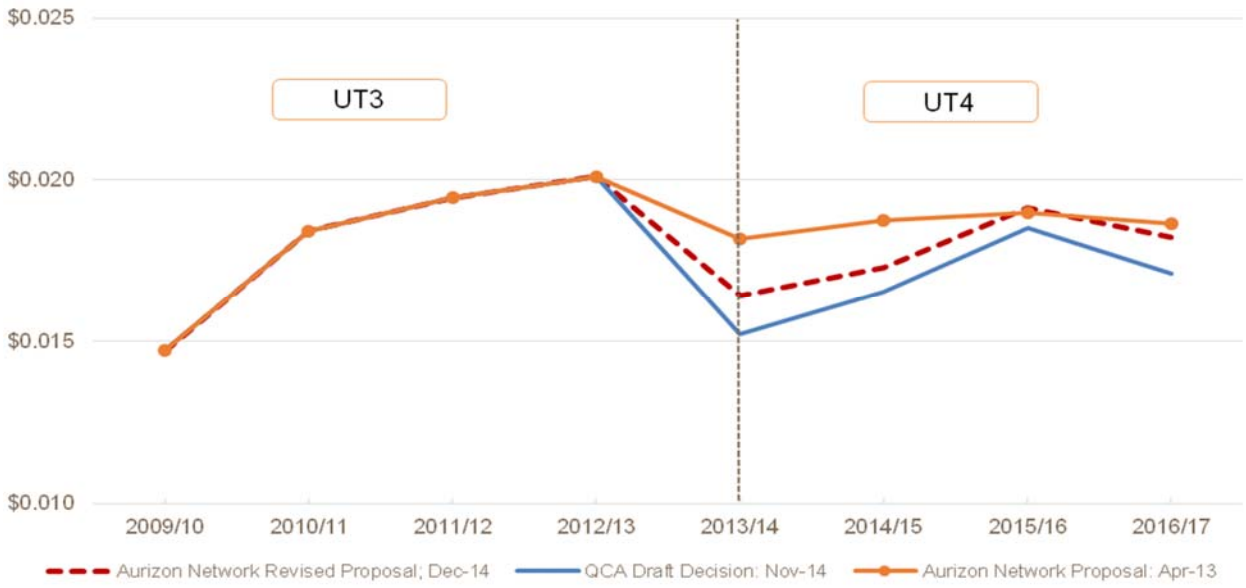
Record annual volume
214.5 million tonnes in 2013/14
15% above previous record in 2009/10
Records for Goonyella, Newlands & Blackwater

This increase in tonnages railed has necessarily meant that the total costs involved in operating the network have increased, and combined with a substantial investment program in new infrastructure, aggregate costs will continue to increase through the remainder of the UT4 period.

Our customers will benefit however as the average unit cost to coal customers under our proposed MAR will actually fall in real terms ($2012/13) - from $ 20.11 per thousand NTK in 2012/13 to $18.20 per thousand NTK in 2016/17 – a real reduction of 9.5% in unit cost. This is illustrated in Figure 1.3 below.

These average costs would fall substantially further if coal companies maximise their utilisation of the contracted capacity of the CQCR over the remainder of the UT4 term.

Figure 1.3 – Average real price: MAR per Net Tonne Kilometre ($2012/13 per NTK)



Note: Figures up to and including 2013/14 are based on actual volumes and approved MAR

Aurizon Network has contributed to the record volumes by achieving dramatic increases in the availability, reliability and efficiency of the Network since 2010/11, with a 44% reduction in delays, low levels of cancellations and an 82% reduction in mainline derailments attributable to below rail as Figures 1.4 and 1.5 illustrate:

Figures 1.4– Below Rail delays on the Aurizon Network

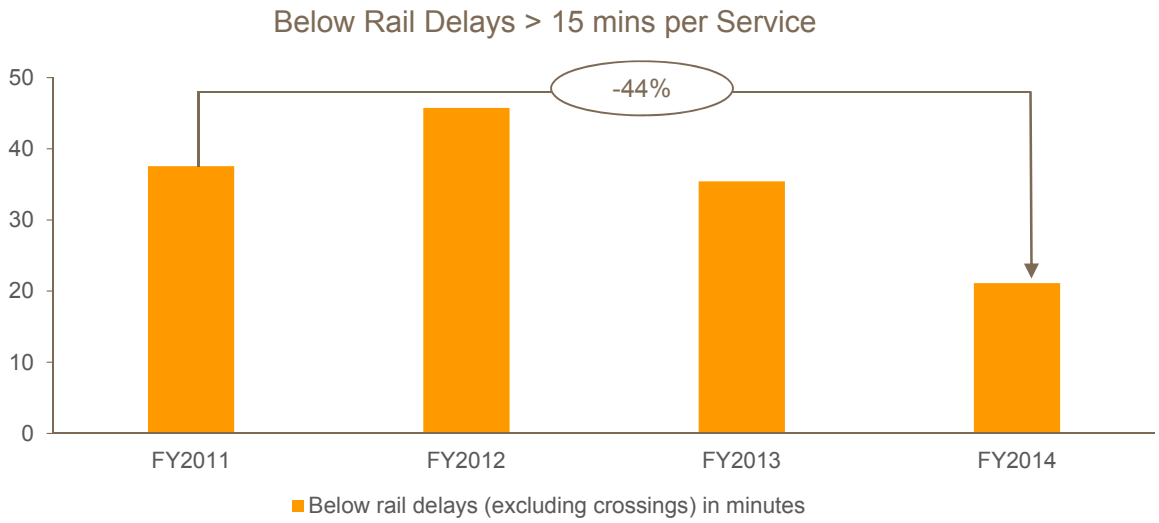
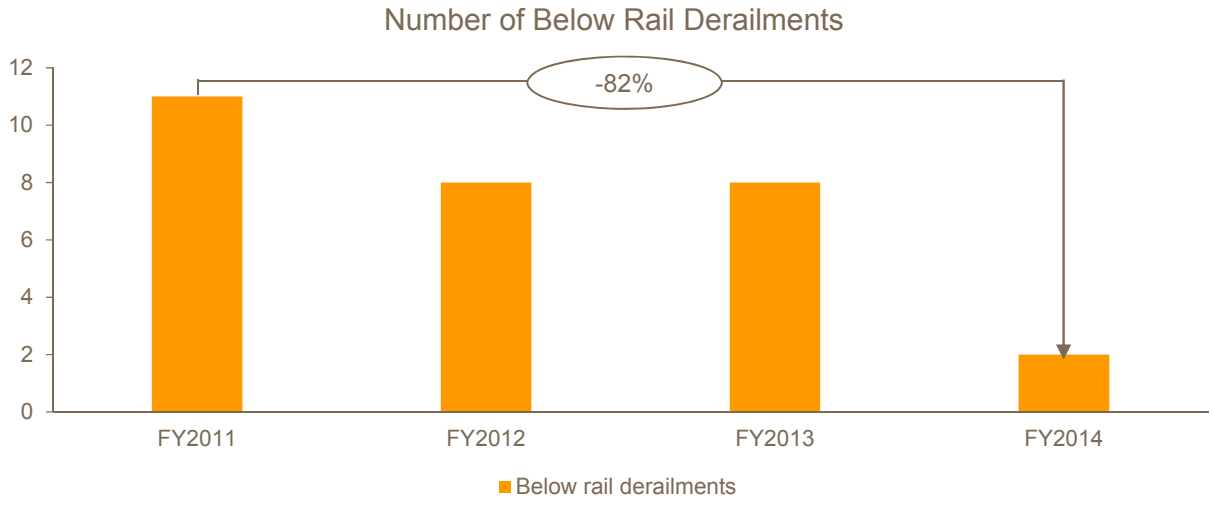


Figure 1.5 – Derailments caused by Below Rail faults on Aurizon Network



The average number of speed restrictions has also been halved in every system by targeting our maintenance effort to the most significant threats to normal train operations.

The UT4 period has the potential to deliver lower real access charges, greater reliability and more efficient utilisation of the network, while continuing to meet our contractual obligations to customers demanding greater volumes. The investment and expenditure that will be supported by our claim for MAR is critical to ensure the operational gains we have achieved are retained and enhanced, to the benefit of the export performance of our customers, the royalty income of the State, and the Nation's balance of trade.

These gains would be put at risk if the positions presented by the QCA in its Draft Decision are not amended. In particular, the proposed significant reduction in the maintenance allowance under the MAR Draft Decision would fundamentally undermine the capacity of Aurizon Network to maintain and advance its strong performance in safety, resilience, reliability and efficiency, with consequential risk to the continued export performance of the Queensland coal industry.

1.3.3 Investments in CQCR Assets

Aurizon Network has invested significantly in below rail infrastructure assets in the CQCR. As depicted in Figures 1.1 and 1.6, our 2016/17 RAB will be almost double that of 2009/10 as acknowledged in the Draft Decision.

Figure 1.6 – Growth in the Regulatory Asset Base

Major Growth Projects	Completion / Estimated Completion	Construction Period (years)	Total Capital ($m)	Capacity Increment (mtpa)	Notes
GAPE	January 2012	2.0	1,100	33	On time, on budget
WIRP	March 2015 / December 2015	4.0	858	27	On track, on budget
Hay Point (second road)[1]	April 2014	1.5	121	11	On track, under budget
Rolleston Electrification[2]	December 2014	1.5	163	N/A[3]	On track, under budget

Capex ($m)	FY2014	FY2015 – FY2017 Expected	Projected
Growth	336	~400	No major projects committed beyond the above at this date
Sustaining	259	~800	~ 250 - 300 p.a.
Total	595	~1,200	~ 250 - 300 p.a.

Note: Excludes Interest During Construction (IDC)

Aurizon invests in its network through the maintenance and infrastructure programs to support demand from its customers. Our coal customers provide the impetus for expansion and growth on the coal networks and manifest their belief in the requirement for this infrastructure through contracts for tonnes that warrant the investment.

Resources markets are highly cyclical and predicting volumes is not a precise 'science'. As a result, from time to time contracts for volume can exceed actual market requirements. These contracts, however, are critical for Aurizon Network to secure long-term funding for the increased investment in the CQCR. Such investment is necessarily lumpy and the funding cost forms a major fixed cost component in obtaining infrastructure services.

The cashflow produced by the relevant contracts must therefore be maintained when the price of coal falls. Equally this cashflow does not increase when the price of coal rises. They cannot be simply adjusted up or down. To arbitrarily manipulate cashflows would fundamentally alter well established infrastructure funding arrangements currently in place in the investment markets. In turn, this would result in a significant increase in the cost of capital for new infrastructure which would flow through to the access fees paid by the coal companies into the future.

Aurizon Network will continue the investment as planned if the returns are commensurate with the risks to which it is exposed. Therefore, for the 'legitimate business interests' of Aurizon Network to be upheld as per section 138(2) of the QCA Act, it is imperative to ensure an appropriate allowance for maintenance and operating expenditure and the return on capital for these investments. Furthermore, the public interests are served with reliably and timely operation and investment in the CQCR.

1.4 Structure of This Submission

This response, including all the attachments, makes up Aurizon Network's response to the MAR Draft Decision.

For ease of reference, this submission mirrors the structure of the QCA's MAR Draft Decision. Aurizon Network, through this response, aims to address each of the QCA's decision points.

Chapter 2 addresses the draft decisions on Maximum Allowable Revenue and Indicative Tariffs.

The response to the Volume Forecasts is in Chapter 3.

Chapter 4 details Aurizon Networks concerns with the calculation of Operating Costs.

The draft decisions on Maintenance Costs are discussed in Chapter 5, while Ballast Undercutting Costs are specifically addressed in Chapter 6.

The Opening Asset Value position is presented in Chapter 7, with discussion of the Regulatory Asset Base (including Capital Expenditure) occurring in Chapter 8.

Chapter 9 provides Aurizon Network's response on the draft decisions on Return of Capital (Net Depreciation).

A detailed discussion on Return on Investment (WACC) is contained in Chapter 10.

2. Maximum Allowable Revenue

In April 2013, Aurizon Network submitted to the QCA its proposed Maximum Allowable Revenue (MAR) and Reference Tariffs for the UT4 regulatory period. The MAR is the total revenue Aurizon Network is able to earn each year by providing regulated access to the Central Queensland Coal Region (CQCR).

MAR is calculated with reference to five core building blocks and the value of Aurizon Network's 'regulatory asset base' (RAB). The building blocks are:

- Return on Capital;
- Return of Capital;
- Maintenance Costs;
- Operating Costs; and
- Tax.

The approved MAR is then translated into Reference Tariffs using operational metrics[12] derived from the approved volume forecasts.

Aurizon Network considered that the MAR proposal submitted as part of the 2013DAU reflected the efficient costs of developing, maintaining and operating a highly reliable world class rail network with safety as its core value. The costs included in Aurizon Network's MAR proposal were benchmarked and subjected to rigorous review through the Aurizon Group's well established corporate governance practices, including engaging industry experts to independently peer review the key allowances.

Furthermore, Aurizon Network considered that its revenue proposal for UT4 was consistent with the pricing principles outlined in section 168A(a) of the QCA Act – that is, that Aurizon Network can charge a price for access that at least provides a return on investment commensurate with the regulatory and commercial risks involved.

Aurizon Network therefore disagrees with the QCA's position that its proposed MAR is consistent with the relevant provisions of the QCA Act particularly sections 138(2) and 168A. We believe the QCA's proposed MAR will not lead to prices that generate sufficient revenue to at least meet the efficient costs, and return on investment that reflects the regulatory and commercial risks confronted by Aurizon Network.

2.1. The QCA's MAR Draft Decision

In September 2014, the QCA released its Draft Decision, refusing to approve Aurizon Network's MAR proposal. The QCA deemed that: *"…the MAR proposed by Aurizon Network is too high."*[13] As outlined in Table 2.1 below, the QCA's Draft Decision on MAR is 18% lower than Aurizon Network's proposal.

Aurizon Network is disappointed with the QCA's Draft Decision, and disputes a number of the methodologies and assumptions used by the QCA in determining their proposed MAR. Aurizon Network nevertheless appreciates the QCA's willingness to consider further information for its final decision.

Table 2.1 – Comparison of Maximum Allowable Revenue proposals

Proposed MAR ($m)	2013/14	2014/15	2015/16	2016/17	Total UT4
Aurizon Network (Apr-13)	1,037.2	1,140.4	1,258.6	1,347.4	4,783.6
QCA's Draft Decision[14]	850.2	909.0	1,065.4	1,081.7	3,906.2
Difference (%) vs Apr-13 MAR	(18.0%)	(20.3%)	(15.4%)	(19.7%)	(18.3%)

[12] Operational metrics include Train Paths, Net Tonnes, Net Tonne Kilometres, Gross Tonne Kilometres and Electric Gross Tonne Kilometres.
[13] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 29.
[14] QCA, 2014b, Aurizon Network 2014DAU – Draft Decision on MAR (Information Update).

The following table outlines Aurizon Network's proposed response to QCA's Draft Decision with respect to MAR:

Draft Decision Reference	Reference	Aurizon Network Response
QCA's proposed (Adjusted) Total MAR for the 2014DAU period.	2.1	Disagree with the conclusion and reasoning behind the MAR proposed by the QCA.
Smooth the difference between actual and allowable revenues for 2013/14 across the remaining years of UT4, i.e. 2014/15 to 2016/17.	2.2	Aurizon Network would like to discuss the two options (one off recovery or smoothing across the remainder of UT4) for the MAR difference.
Seek stakeholder input into the appropriate arrangements for reconciling allowable and actual revenues for 2014/15.	2.3	Aurizon Network proposes that the difference be recovered via an Adjustment Charge.

2.2. Aurizon Network's Response

Aurizon Network's original MAR proposal was submitted to the QCA in April 2013 as part of the 2013DAU. Since that time, Aurizon Network has engaged with numerous stakeholders in order to provide further transparency of its MAR proposal. In addition, many of the inputs used to calculate the MAR proposal were based on forecasts, for example, CPI inflation. To the extent that forecasted values are now known, Aurizon Network has sought to incorporate actual values into its revised MAR.

Aurizon Network's revised MAR is 11% higher than the MAR proposed by the QCA in its Draft Decision, but 9% lower than the MAR proposed by Aurizon Network in April 2013. Figures 2.1 and 2.2 below compare Aurizon Network's revised MAR to its April 2013 submission and the MAR proposed in QCA's Draft Decision.

Figure 2.1 – Comparison of total MAR ($million, nominal)

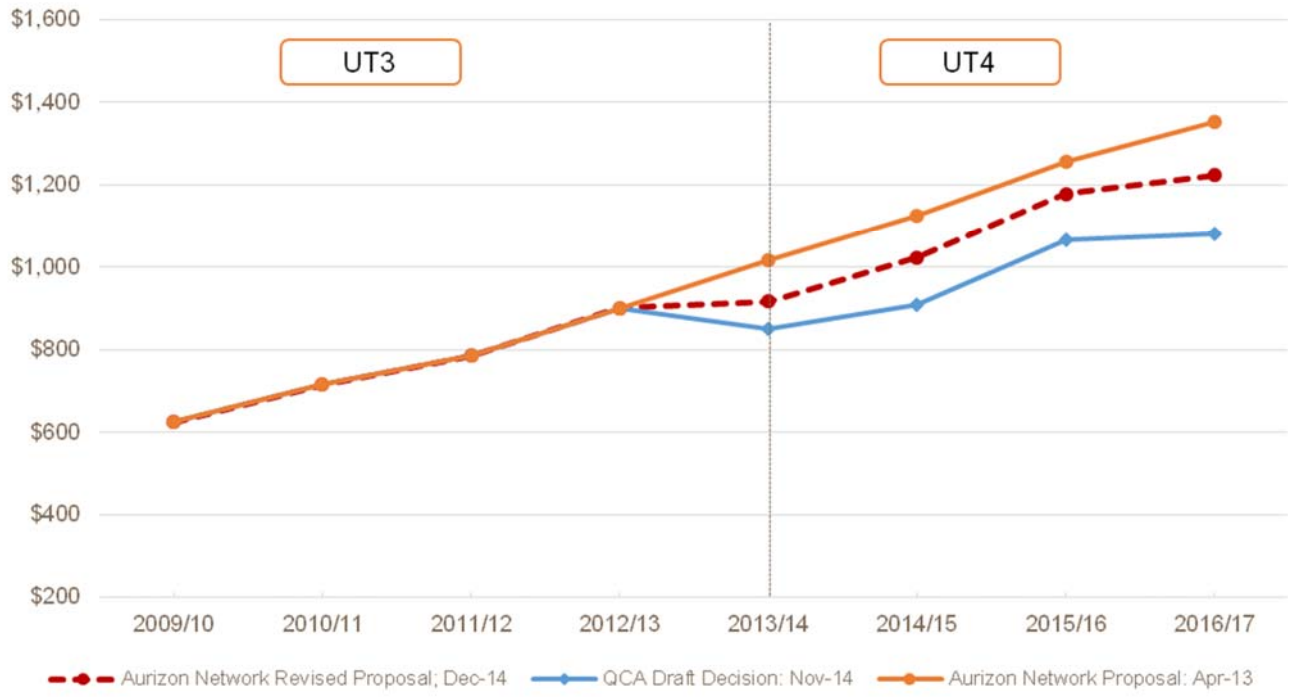
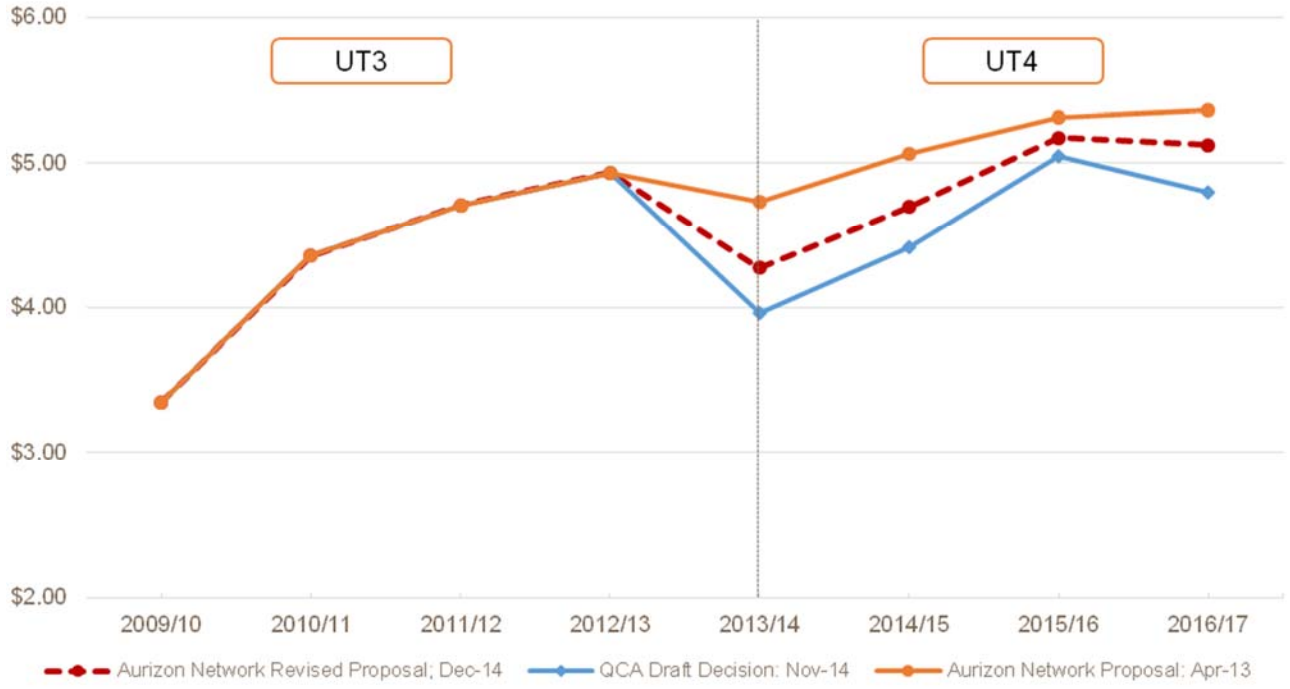


Figure 2.2 – Comparison of total MAR per Net Tonne ($ per NT, nominal)



As shown in Figures 2.3 and 2.4, the variation between the above figures and those in the 2013DAU is primarily driven by:

- a revised WACC of 7.62%;
- adjustments to operating and maintenance expenditure allowances (in the following chapters);
- a revised Capital Indicator forecast which reflects:
  - capitalisation of rail renewal expenditure in 2015/16 and 2016/17; and
  - updated capital expenditure forecasts associated with the Wiggins Island Rail Project (WIRP);
- an updated Opening Asset Value, to reflect the QCA approved capital expenditure for 2011/12 and 2012/13; and
- actual CPI for 2012/13 (1.99%) and 2013/14 (3.22%).

Figure 2.3 – Key drivers of differences in UT4 MAR (Aurizon Network and QCA) ($million, nominal)

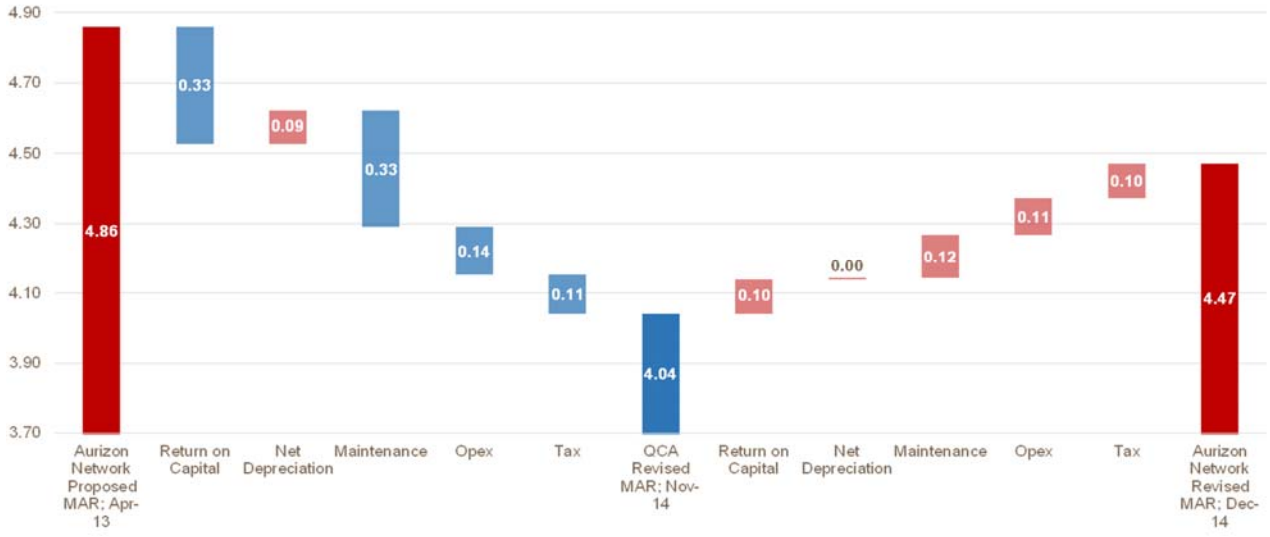
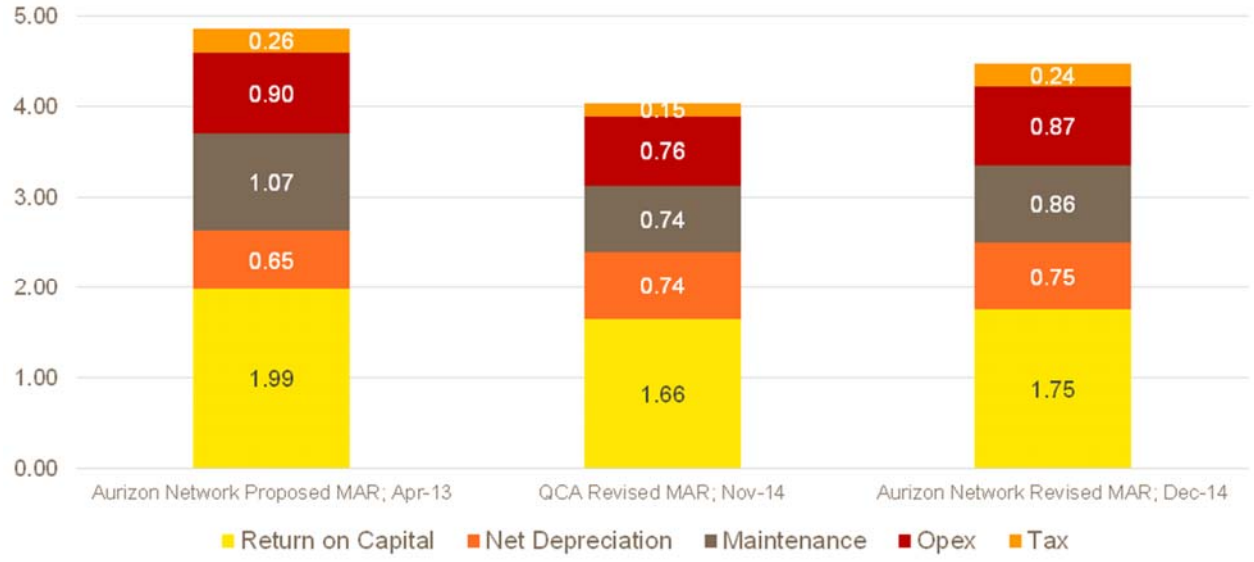


Figure 2.4 – Comparison of UT4 MAR Building Blocks ($billion, nominal)



2.3. Summary of Revised MAR for UT4

Table 2.2 outlines Aurizon Network's revised MAR for the UT4 period.

Table 2.2 – Revised UT4 MAR: CQCR, All Assets ($million, nominal)

Building Blocks	2013/14	2014/15	2015/16	2016/17	Total UT4 Aurizon Network Revised MAR	Total UT4 QCA Proposed MAR
Return on Capital	382.4	399.0	480.4	490.6	**1,752.5**	**1,655.1**
Inflation	(161.7)	(131.0)	(157.7)	(161.1)	**(611.5)**	**(577.2)**
Return of Capital	283.7	306.9	375.8	390.8	**1,357.3**	**1,318.5**
Maintenance Costs	199.4	217.4	217.3	227.1	**861.2**	**737.7**
Operating Costs	200.1	207.2	226.0	234.8	**868.1**	**760.8**
Tax	43.7	55.8	68.8	76.3	**244.6**	**146.5**
Total Revised MAR	**947.6**	**1,055.5**	**1,210.7**	**1,258.5**	**4,472.2**	**4,041.5**
UT3 CAPEX carryover	(30.5)	(31.8)	(33.3)	(34.8)	**(130.3)**	**(135.2)**
Total (adjusted) MAR	**917.1**	**1,023.6**	**1,177.4**	**1,223.7**	**4,341.9**	**3,906.2**
QCA Proposed MAR	**850.2**	**909.0**	**1,065.4**	**1,081.7**	**3,906.2**	
Variance to QCA (%)	7.9%	12.6%	10.5%	13.1%	11.2%	

Aurizon Network's updated MARs for Non-Electric and Electric Assets in UT4 are presented below. Revenues are first presented for the total CQCR, and are then broken down by system.

Table 2.3 – Revised UT4 MAR: CQCR, Non-Electric Assets ($million, nominal)

Non-Electric Assets	2013/14	2014/15	2015/16	2016/17	Total UT4
Return on Capital	338.1	346.0	423.8	437.2	**1,545.1**
Inflation	(142.9)	(113.6)	(139.1)	(143.5)	**(539.2)**
Return of Capital	231.2	245.6	310.4	338.6	**1,125.8**
Maintenance Costs	188.1	206.9	206.6	216.0	**817.6**
Operating Costs	129.7	134.9	144.0	149.3	**557.8**
Tax	32.1	42.3	56.2	68.8	**199.4**
Total Revised MAR	**776.3**	**862.0**	**1,001.9**	**1,066.3**	**3,706.5**
UT3 CAPEX carryover	(19.2)	(20.1)	(21.0)	(21.9)	**(82.2)**
Total (adjusted) MAR	**757.0**	**841.9**	**980.9**	**1,044.4**	**3,624.3**

Table 2.4 – Revised UT4 MAR: CQCR, Electric Assets ($million, nominal)

Electric Assets	2013/14	2014/15	2015/16	2016/17	Total UT4
Return on Capital	44.4	53.0	56.6	53.4	**207.4**
Inflation	(18.8)	(17.4)	(18.6)	(17.5)	**(72.3)**
Return of Capital	52.5	61.4	65.4	52.2	**231.5**
Maintenance Costs	11.3	10.5	10.7	11.1	**43.5**
Operating Costs	70.4	72.4	82.0	85.4	**310.2**
Tax	11.5	13.6	12.6	7.6	**45.3**
Total Revised MAR	**171.3**	**193.4**	**208.8**	**192.1**	**765.7**
UT3 CAPEX carryover	(11.2)	(11.7)	(12.3)	(12.8)	**(48.1)**
Total (adjusted) MAR	**160.1**	**181.7**	**196.5**	**179.3**	**717.6**

2.4. Revised UT4 MAR by System (Non-Electric & Electric)

Table 2.5 – Revised UT4 MAR: CQCR by system, Non-Electric Assets ($million, nominal)

Non-Electric Assets	2013/14	2014/15	2015/16	2016/17	Total UT4
Blackwater					
Return on Capital	111.1	116.2	180.3	181.0	**588.6**
Inflation	(47.0)	(38.1)	(59.2)	(59.4)	**(203.7)**
Return of Capital	73.6	79.9	126.9	134.0	**414.3**
Maintenance Costs	92.4	95.4	94.6	98.8	**381.2**
Operating Costs	42.8	42.9	46.0	48.4	**180.2**
Tax	12.0	15.3	22.5	26.9	**76.7**
Total Revised MAR	**284.9**	**311.5**	**411.1**	**429.8**	**1,437.3**
UT3 CAPEX carryover	(2.4)	(2.5)	(2.7)	(2.8)	**(10.4)**
Total (adjusted) MAR	**282.5**	**308.9**	**408.4**	**427.0**	**1,426.9**

Non-Electric Assets	2013/14	2014/15	2015/16	2016/17	Total UT4
Goonyella to Abbot Point Expansion (GAPE)					
Return on Capital	74.3	74.4	71.7	78.9	**299.3**
Inflation	(31.4)	(24.4)	(23.5)	(25.9)	**(105.3)**
Return of Capital	56.9	59.6	61.1	72.1	**249.8**
Maintenance Costs	10.2	11.5	13.3	14.1	**49.0**
Operating Costs	7.6	9.6	10.9	11.9	**40.0**
Tax	4.4	8.3	9.6	13.0	**35.3**
Total Revised MAR	**122.0**	**139.0**	**143.1**	**164.1**	**568.2**
UT3 CAPEX carryover	(3.1)	(3.2)	(3.3)	(3.5)	**(13.1)**
Total (adjusted) MAR	**119.0**	**135.8**	**139.7**	**160.6**	**555.1**
Goonyella					
Return on Capital	116.5	119.0	122.0	123.5	**481.1**
Inflation	(49.3)	(39.1)	(40.1)	(40.5)	**(168.9)**
Return of Capital	79.4	84.1	89.0	93.5	**346.0**
Maintenance Costs	68.4	80.6	80.2	84.3	**313.5**
Operating Costs	65.3	67.1	70.5	71.9	**274.8**
Tax	10.9	13.1	16.2	18.9	**59.2**
Total Revised MAR	**291.3**	**324.9**	**337.8**	**351.5**	**1,305.5**
UT3 CAPEX carryover	(13.2)	(13.8)	(14.4)	(15.0)	**(56.3)**
Total (adjusted) MAR	**278.1**	**311.1**	**323.5**	**336.5**	**1,249.2**
Moura					
Return on Capital	19.5	19.8	26.0	26.0	**91.3**
Inflation	(8.3)	(6.5)	(8.5)	(8.5)	**(31.8)**
Return of Capital	10.4	10.9	15.6	16.3	**53.2**
Maintenance Costs	9.5	11.6	10.6	11.3	**43.0**
Operating Costs	7.2	7.9	8.4	9.2	**32.7**
Tax	2.3	2.8	3.5	4.1	**12.7**
Total Revised MAR	**40.6**	**46.4**	**55.6**	**58.4**	**201.1**
UT3 CAPEX carryover	(0.8)	(0.9)	(0.9)	(0.9)	**(3.6)**
Total (adjusted) MAR	**39.8**	**45.6**	**54.7**	**57.5**	**197.5**

Non-Electric Assets	2013/14	2014/15	2015/16	2016/17	Total UT4
Newlands					
Return on Capital	16.9	17.0	24.1	28.2	**86.2**
Inflation	(7.2)	(5.6)	(7.9)	(9.2)	**(29.9)**
Return of Capital	11.2	11.2	18.1	22.9	**63.4**
Maintenance Costs	7.6	7.9	7.9	7.5	**30.9**
Operating Costs	6.7	7.3	8.1	8.0	**30.2**
Tax	2.5	2.8	4.4	5.8	**15.5**
Total Revised MAR	**37.8**	**40.6**	**54.8**	**63.0**	**196.2**
UT3 CAPEX carryover	0.3	0.3	0.3	0.3	**1.2**
Total (adjusted) MAR	**38.1**	**40.9**	**55.1**	**63.3**	**197.4**

Table 2.6 – Revised UT4 MAR: CQCR, Electric Assets ($million, nominal)

Electric Assets	2013/14	2014/15	2015/16	2016/17	Total UT4
Blackwater					
Return on Capital	22.2	31.2	36.0	34.0	**123.4**
Inflation	(9.4)	(10.3)	(11.8)	(11.2)	**(42.6)**
Return of Capital	28.7	36.5	39.8	25.8	**130.8**
Maintenance Costs	5.1	3.8	3.9	4.1	**16.9**
Operating Costs	39.2	40.0	42.1	43.1	**164.3**
Tax	6.2	8.0	6.9	2.3	**23.5**
Total Revised MAR	**92.0**	**109.4**	**116.8**	**98.2**	**416.4**
UT3 CAPEX carryover	(7.9)	(8.2)	(8.6)	(9.0)	**(33.7)**
Total (adjusted) MAR	**84.1**	**101.1**	**108.2**	**89.2**	**382.6**
Goonyella					
Return on Capital	21.9	21.5	20.3	19.1	**82.7**
Inflation	(9.2)	(7.0)	(6.7)	(6.3)	**(29.2)**
Return of Capital	23.6	24.6	25.4	26.1	**99.8**
Maintenance Costs	6.2	6.6	6.8	7.0	**26.6**
Operating Costs	31.2	32.4	40.0	42.3	**145.9**
Tax	5.3	5.5	5.7	5.2	**21.8**
Total Revised MAR	**78.9**	**83.6**	**91.5**	**93.5**	**347.5**
UT3 CAPEX carryover	(3.3)	(3.5)	(3.7)	(3.8)	**(14.3)**
Total (adjusted) MAR	**75.6**	**80.1**	**87.8**	**89.7**	**333.2**

Aurizon Network submits that the amendments it has made to the 2014DAU result in a MAR amount that provides for the lowest sustainable and efficient prices while still providing for a reasonable level of service. As such, Aurizon Network submits that the amended 2014DAU:

- promotes the Object of Part 5 of the QCA Act;

- has appropriate regard to matters set out in section 138(2) of the QCA Act, including the legitimate business interests of Aurizon Network, the public interest, the interests of persons who may seek access to the service; and
- also has appropriate regard to the pricing principles in section 168A of the QCA Act, including that the proposed MAR should provide for prices that should generate expected revenue for the service that is at least enough to meet the efficient costs of providing access to the service and include a return on investment commensurate with the regulatory and commercial risks involved.

Object of Part 5 of the QCA Act

Part 5 of the QCA Act sets out the provisions concerning Access to Services. The Object of Part 5 is stated in section 69E as follows:

> *The object of this part is to promote the economically efficient operation of, use of and investment in, significant infrastructure by which services are provided, with the effect of promoting effective competition in upstream and downstream markets.*

To have appropriate regard to, and to promote, the object of Part 5, Aurizon Network's 2014DAU should underscore principles of economic efficiency in its build-up of proposed costs in developing, maintaining and operating a highly reliable below rail regulated network.

To demonstrate that the 2014DAU will promote economic efficiency, Aurizon Network has, throughout this and its previous reports to the QCA[15], obtained independent expert advice from industry (economic and financial) advisers, benchmarked against meaningful comparator firms, and applied its own considerable experience in operating the CQCN. As set out in this submission, Aurizon Network has revised its 2014DAU in some key respects (producing a lower MAR) and submits that this amended DAU appropriately promotes the Object of Part 5.

Although the amended DAU delivers a MAR that is closer to the MAR proposed by the Draft Decision, Aurizon Network does not agree with the QCA's Draft Decision and remains of the view that it conflicts with the Object of Part 5 of the QCA Act as it would not *"…promote the economically efficient operation of, use of and investment in…"* the Aurizon Network as significant infrastructure.[16] (The reasons for this are set out in detail in the body of this submission.)

Section 138(2) of the QCA Act

A key concern of Aurizon Network flows from the QCA's proposal to set an excessively low WACC outcome and provide a maintenance allowance that would jeopardise the economic efficiency of the network, including the integrity of ballast supporting the network. These settings in particular threaten the legitimate business interests of Aurizon Network, and compromise its ability to responsibly manage a sustainable commercial business accountable to its shareholders. Aurizon Network submits that the QCA's Draft Decision does not accord appropriate weight to these factors in s.138 (2) of the QCA Act in particular.

Section 168A of the QCA Act

In circumstances where the QCA is confronted in its assessment of Aurizon Network's Draft Access Undertaking with return or efficiency uncertainty[17], the QCA should set a price which is certain to achieve the pricing principle (i.e. provide "at least"), rather than to adopt a price where the achievement of that price is uncertain. To do otherwise would be to threaten the legitimate business interests of Aurizon Network, and to undermine a key tenet of section 168A.

Aurizon Network considers that in a number of areas of the QCA's draft decision, the QCA has not had adequate regard to the consequences of potentially setting the MAR too low in the sense that there is a real risk that the

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[15] Aurizon Network restates and continues to rely on all of the matters raised in its previous submissions and materials provided to the QCA. (As Aurizon Network has amended its DAU over time, those submissions and materials should of course be seen in their context.)
[16] QCA Act, Part 5, Section 69E
[17] Aurizon Network is confronted with numerous commercial and regulatory risks, as well as possible estimation error in the WACC assessment.

prices based on the proposed MAR will not generate expected revenue for the service that is at least enough to meet the efficient costs of providing access.[18]

A failure to do this is significant on account of its asymmetric consequences - a point noted by the Productivity Commission in its 2014 report on access regulation:

> *For this reason, the Commission considers that the consequences for efficiency from setting access prices too low are, all else equal, likely to be worse than setting access prices too high. This is because deterring infrastructure investment (from setting access prices too low) is likely to be more costly than allowing service providers to retain some monopoly rent (from setting access prices too high) (PC 2008b). The Commission noted in its recent review of electricity regulation that regulators should err on the side of allowing higher returns to regulated businesses to allow for this asymmetry (PC 2013a). There are some arguments that suggest regulators have a tendency to set access prices too low (Hausman 2008; NECG 2001). Given the greater efficiency consequences of setting access prices too low, this bias would increase the expected costs associated with regulatory error."*[19]

This is particularly so in light of the uncertainty attached to the estimation of some components of the MAR, like the equity beta parameter of the WACC.

> *Asymmetric truncation — access regulation may lead to the expropriation of above-normal returns but not compensate for below-normal returns. This can reduce the expected rate of return of the proposed investment below the required hurdle rate of return and thereby delay or deter investment.*[20]

Aurizon Network therefore further submits that the QCA's Draft Decision is contrary to the matters to which QCA must have regard in assessing an Access Undertaking, identified in Sections 138(2) and 168A of the *QCA Act*[21].

2.5. Transitional Matters Relating to UT4 MAR

As this is now the second year of the UT4 period, transitional adjustments will be required to reconcile forecast Access Charges based on estimated 'transitional' Reference Tariffs (RTs), with actual Access Charges determined following the finalisation of those FTs against the ultimate UT4 outcome.

Access Charges for 2013/14 were based on 'transitional' RTs confirmed as 'final' RTs as part of the 2014 Extension Draft Amending Access Undertaking (DAAU), approved by the QCA on 12 June 2014.

Access Charges for 2014/15 are 'transitional' RTs published in the 2014 Extension DAAU.

If a QCA final decision on MAR is provided by 30 June 2015, two adjustments will be required:

- For 2013/14, the difference between the 'final' approved MAR and the transitional MAR (MAR difference)
- For 2014/15, the difference between the final approved RTs and the transitional RTs.

[18] Instead, the QCA has resolved that "consideration of [public and users'] interests leads to a conclusion that Aurizon Network should be permitted to recover no more than efficient costs and return on investment as identified in section 168A(a)": see for example QCA Draft Decision, page 27. This approach does not accord with s.168A (a) nor with s.138 (5), and does not promote the objects of the QCA Act, as it creates an asymmetric truncation effect on returns, leads to a downward bias in price setting, results in access users being subsidised by the owner and causes reduced investment in infrastructure over time: see for example Australian Government Productivity Commission, 2013, Productivity Commission Reports No.66 National Access Regime, p 101. There is also no reference to the words "no more than" in the legislation and no basis for inserting them as a guiding factor to offset the effect of the express words in s.168A (a).

[19] Australian Government Productivity Commission, 2013, Productivity Commission Reports No.66 National Access Regime, p. 104.

[20] Ibid, p. 259.

[21] The position is compounded by the fact that Aurizon Network under-recovered in UT3 – a second regulatory period of under-recovery would have lasting adverse impact on the legitimate business interests of Aurizon Network and adversely impact investment decisions. It is also not an efficient outcome, as the long run costs of under-investment exceed any short term "gains" achieved by the outcome.

2013/14 MAR difference

As noted in the QCA's Draft Decision[22], these amounts will need to be reconciled with actual Access Charges with any difference to be collected from, or returned to, Access Holders via a 'true-up' process. In its submission on the 2014 Extension DAAU, Aurizon Network indicated that a majority of producers preferred to smooth the MAR difference for 2013/14 across the remainder of the UT4 period. Aurizon Network did not comment on this preference other than to note that it was a matter for the finalisation of UT4.

QCA's Draft Decision is to accept[23] this 'proposal' on the basis that the recovery is not dissimilar to the revenue cap process which recovers shortfalls in allowable revenues from, or returns surpluses to, Access Holders two years after the relevant year. However, to be consistent with the revenue cap approach, the 2013/14 difference would need to be recovered or returned only in 2015/16, rather than across the remainder of UT4.

Aurizon Network notes the comments of the new Access Holders who believe that the 2013/14 difference should be addressed via an Adjustment Charge[24], which would occur notwithstanding the QCA's approval of the 2013/14 Adjustment Charge as the 'final' arrangement for this year.

Aurizon Network would like to further discuss with the QCA and industry which of the two options (one off recovery or smoothing across the remainder of UT4) should be adopted for the transitional differences for 2013/14, taking into account feedback from relevant stakeholders and the legitimate business interests of Aurizon Network.

2014/15 MAR difference

For 2014/15, Aurizon Network proposes to recover or return the difference between the transitional allowable revenues and those approved by the QCA via an Adjustment Charge, in accordance with Schedule F of 2014DAU.

Aurizon Network believes that the existing Adjustment Charge framework set out in the 2014DAU (similar to the 2010AU) can be used to recover the 2014/15 adjustments via a single Adjustment Charge to be collected from, or returned to, Access Holders after the end of 2014/15.

To achieve this, the following would need to occur:

- By 30 June 2015, the QCA's final decision on MAR which confirms:
  - The 'final' RTs for 2014/15 will be based on the approved 2014/15 MAR, adjusted for the revised final volume forecast for 2014/15.
  - The final RTs for 2014/15 will be backdated to 1 July 2014.
  - Aurizon Network is to invoice on the basis of the transitional RTs for 2014/15, with the full adjustment to be collected from, or returned to, Access Holders via an Adjustment Charge.
- By 31 August 2015, Aurizon Network submits to the QCA a single Adjustment Charge, equivalent to the difference between approved and transitional RTs for the full year ending 30 June 2015.

Take or Pay and revenue cap arrangements for 2014/15 would continue to operate but based on the revised Gtk Forecasts and System Allowable Revenues approved by the QCA for 2014/15. Take or Pay amounts or Revenue Adjustment Amounts should be immaterial relative to MAR, if the final Gtk Forecasts are based on the proposed 9+3 arrangement in Chapter 3.

This proposal is similar to the process for the finalisation of pricing arrangements for the first year of UT3.

[22] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 35.
[23] Ibid, p. 37.
[24] Ibid, pp. 35-36.

3 Volume Forecasts

3.1 The QCA's MAR Draft Decision

The following table provides a summary of Aurizon Network's proposed response to the QCA's draft decision.

Draft Decision Reference	Reference	Aurizon Network Response
Aurizon Network is to amend its forecast volumes for the 2014DAU consistent with actual results for 2013/14 and forecasts provided by Energy Economics	3.1	Accept with amendment to reflect 2013/14 actual tonnages, updated 2014/15 forecast and additional information from WICET

Key Points from Aurizon Network's Response

Aurizon Network has clear obligations and incentives to set a volume forecast that is as accurate as possible in order to meet its Rail Safety Act requirements and to minimise cashflow volatility for ourselves and our customers.

The forecast volume for 2014/15, estimated by Energy Economics and adopted by QCA, is currently 205.6 million tonnes, a decrease of 4.1% against actual railings in 2013/14. Aurizon Network considers this forecast to be too low in light of the current performance for 2014/15, which is tracking 7.0% higher than the same period in 2013/14. With the exception of the Goonyella and Newlands system, the 2014/15 volume forecasts outlined below are consistent with those used to calculate transitional tariffs for this year.

Aurizon Network anticipates 2014/15 will be another strong year for coal volumes despite continued subdued prices for thermal and metallurgical coal:

- Coal companies are increasing production to maximise cash flow and reduce unit costs due to low prices.
- Volume growth is also being driven by increasing demand for Australian coal in India as it seeks to dramatically increase its energy and steel production.
- Despite a reduction in overall imports by China Australian coal exports to that market have been resilient.
- An important development that has contributed to this development has been a decision by some US producers to switch shipments from Asia into Europe or cease production altogether.

These positive trends are expected to continue over 2015/16 and 2016/17, particularly as the Wiggins Island Coal Export Terminal (WICET) volumes come on stream.

Aurizon Network proposes that the volume forecast for 2014/15 be updated in accordance with actual performance for the year based on a '9+3' volume forecast to be provided in April 2015.

3.2 The Basis of Volume Forecasts

As outlined in Aurizon Network's 2013DAU, volume forecasts for the regulatory period are based on expectations of future railings at a point in time. They take the following factors into account, including:

- the demand outlook for domestic and export coal in the CQCR;
- contracted volumes;
- capacity of the supply chain;
- expected production growth; and
- incremental capacity delivered by expansions and new mines.

According to the International Energy Agency's (IEA) central scenario, Australia's production rate has been estimated to grow by an average 1.6% per annum between 2012 and 2040.[25]

[25] IEA, 2014a, World Energy Outlook 2014.

… 93 coal projects are planned, with total capacity of up to 590 Mt per year, although only 16 of these, with a capacity of some 60 Mt per year, have been committed. [26]

More recently, Bureau of Resources and Energy Economics (BREE) revised its estimate of planned coal projects down to 57 projects representing a potential investment of $71 billion.[27]

In its *Coal Medium-Term Market Report 2014*, IEA[28] forecasted that:

- thermal coal supplies in Organisation for Economic Co-operation and Development (OECD) countries will grow by 67mt (+0.8% per year) to 2019, mostly due to increasing production in Australia; and
- met coal supplies in OECD countries will grow by 21mt (+1.2% per year on average) to 305mt in 2019. Virtually all growth in OECD countries comes from Australia.

Aurizon Network recognizes the difficulties inherent in forecasting volumes across short, medium and long term time horizons. Such difficulties are evident within the original (April 2013) volume forecasts submitted by Aurizon Network and Energy Economics for the 2013/14 financial year. For instance, actual railings for 2013/14 were 12.5% higher than the Energy Economics forecast done in April 2013.[29]

Table 3.1 - Central Queensland coal railing forecast comparison for 2013/14

April 2013 Volume Forecast (million tonnes)	2013/14	Actual vs forecast
Aurizon Network forecast – April 2013	199.6	7.5%
Energy Economics forecast – April 2013	190.6	12.5%
Energy Economics forecast – April 2014	**211.0**	1.7%
Actual Railings	**214.5**	n/a

Aurizon Network would query the QCA's use of the Energy Economics April 2014 forecast as *"…the best available…"*. While the later forecast of Energy Economics for 2013/14 can be seen to be closer to reality than Aurizon Network's April 2013 forecast, it was estimated with the benefit of actual data for a substantial portion of that year being available. Aurizon Network's April 2013 forecast for 2013/14 was closer to the actual result than those of Energy Economics. In addition, Aurizon Network's original UT4 forecasts (April 2013) were developed following two significant flood events, which impacted volumes during the UT3 period.

In its Draft Decision, the QCA makes reference to stakeholder comments which suggest *"…that the undertaking provides incentives for Aurizon Network to under-forecast volumes…"*[30] Aurizon Network strongly rejects this notion. While this incentive may exist under a Price Cap, it is not the case under a revenue cap, where Aurizon Network must return any revenue received in excess of the Allowable Revenue approved by the QCA.

Aurizon Network takes very seriously the accurate estimation of forecast volumes. In maintaining the network, volumes are used to derive the scope of the maintenance effort and the associated maintenance budgets for each year. In order to maintain its Rail Infrastructure Manager and Operations Accreditation and compliance with the Rail Safety Act, Aurizon Network is required to achieve benchmarks for asset management and technical standards, work procedures and operation in and around the infrastructure and governance requirements to ensure the safe operation of the railway.

Volume forecasts are used to convert Aurizon Network's MAR into Reference Tariffs. For instance, when determining AT_3 and AT_4 (both allocative tariffs, where AT_3 is charged on a $ per net tonne kilometre and AT_4 is on a $per net tonne basis), the lower the volumes, the higher the respective tariff components. Evidence of volume movements on tariffs can be illustrated via the Aurizon Network UT4 'Coal System Aggregate' Model.[31]

[26] IEA, World Energy Outlook 2013, p. 166.
[27] Bureau of Resources and Energy Economics, 2014, Resources and Energy Major Projects, p. 21.
[28] IEA, 2014b, Coal Medium-Term Market Report 2014, p. 63 and p. 81.
[29] Energy Economics, 2013, Central Queensland Coal Railings Forecast, p. 4.
[30] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 39.
[31] Aurizon Network, 2014a, Aurizon Network – UT4 Coal System Aggregate Model.

It should be recognised, therefore, that Aurizon Network has clear obligations and incentives to set a volume forecast that is as accurate as possible in order to meet its Rail Safety Act requirements and to minimise cashflow volatility for both ourselves and our customers. As the variable element of the maintenance allowance is linked to these tonnages, there is a clear disadvantage to Aurizon Network if it underestimates the volume forecast, that is, the resulting maintenance allowance may be insufficient to support the additional volumes.

There is also no benefit to Aurizon Network from inflating the forecast. As mentioned above, overestimating forecasts will decrease Reference Tariffs. However, if the volumes do not materialise, Aurizon Network will be left with an under-recovery relative to its Allowable Revenue, which will only be recovered after a 2 year lag via the Revenue Cap adjustment. This creates cashflow volatility for Aurizon Network and its customers.

Aurizon Network strives to rigorously apply this commitment to accuracy and has factored in such considerations for both its original and revised volume forecasts.

As a result, Aurizon Network recommends that the QCA adopt the revised forecast provided below.

3.3 Aurizon Network's Revised Volume Proposal

Factors affecting coal volumes can change considerably within a year. Natural variability in the weather; an unpredictable interaction between coal commodity prices, foreign exchange and physical demand; and coal system productivity can all conspire to upset the most rigorous forecasts.

As mentioned above, 2013/14 saw 214.5 million tonnes railed; a record number for the CQCR. This is despite 5 mine closures over the last 2 years, accounting for a peak capacity of 24.3mtpa, representing some 8% of total contracted capacity.[32]

Aurizon Network anticipates 2014/15 will be another strong year for coal volumes despite continued subdued prices for thermal and metallurgical coal:

- Coal companies are increasing production to maximise cash flow and reduce unit costs due to low prices.
- Volume growth is also being driven by increasing demand for Australian coal in India as it seeks to dramatically increase its energy and steel production.
- Despite a reduction in overall imports by China Australian coal exports to that market have been resilient.
- An important development that has contributed to this development has been a decision by some US producers to switch shipments from Asia into Europe or cease production altogether.

These positive trends are expected to continue over 2015/16 and 2016/17, particularly as the Wiggins Island Coal Export Terminal (WICET) volumes come on stream.

The table below compares actual railings for the first three months of 2014/15 with the same period in 2013/14.

Table 3.2 - Comparison of actual railings in CQCR between July – September[33]

Actual Railings (million tonnes)	Jul – Sep 2013	Jul – Sep 2014	%
Blackwater	15.8	15.7	-0.6%
Goonyella	27.7	29.5	6.4%
Moura	3.1	3.4	8.7%
Newlands	3.2	4.2	30.6%
GAPE	2.9	3.7	26.7%
Total	**52.7**	**56.4**	**7.0%**

[32] Sourced by Market Intelligence Unit of Aurizon from company data and Wood Mackenzie
[33] Aurizon Network, 2014c, Quarterly Performance Report.

The Energy Economics forecast for 2014/15 is currently 205.6 million tonnes. This represents a decrease of 4.1% when compared to actual railings in 2013/14. Aurizon Network considers the Energy Economics forecast to be too low in light of current performance for 2014/15, which is tracking 7.0% higher than the same period in 2013/14.

Aurizon Network has previously noted that one of the reasons for resilient volumes has been fixed take-or-pay contracts, and the QCA acknowledged this possibility in their Draft Decision.[34] The December 2013 edition of BREE Resources and Energy Quarterly report also highlighted this price inelasticity of volumes, stating:

> *Rather than reducing output in response to declining prices, many high cost producers have increased production in order to reduce their unit cost. Some of these producers, largely in Australia, are locked into fixed take-or-pay contracts for infrastructure services and it has been more cost effective to increase production than to close.* [35]

Aurizon Network has now revised the volume forecasts that it originally submitted as part of the 2013DAU.

The process used to construct the revised forecasts is consistent with that undertaken earlier in UT3 and for UT4. In developing these revised forecasts, Aurizon Network has taken the following into consideration:

- actual railings for 2013/14;
- year to date (YTD) railings for 2014/15;
- Energy Economics – April 2014 forecasts, as outlined in the QCA's Draft Decision; and
- revised expectations for the remainder of the UT4 period, e.g. Wiggins Island coming on line (WIRP).

The above factors are used to determine a forecast for each coal system. As noted by Energy Economics within their 2013 report, the system forecasts are then split between each 'Origin / Destination' pair:

> *… with individual projects being allocated a percentage of their contracted railings within the pre-defined envelope of the total system forecast.* [36]

The table below outlines Aurizon Network's revised view across all years of the UT4 period. The 2014/15 estimates are the Transitional Tariff volume and does not necessarily represent Aurizon Network's latest volume forecast.

Table 3.3 – Revised UT4 Volume Forecast (million tonnes - mt)

Financial year to June	2013/14	2014/15	2015/16	2016/17	Total UT4
Blackwater	66.4	60.7	70.5	72.9	**270.4**
Goonyella	111.2	111.2	112.1	116.7	**451.2**
Moura	12.4	13.2	13.5	15.8	**54.9**
Newlands (excl GAPE)	12.0	13.9	13.9	13.9	**53.7**
GAPE	12.5	15.6	17.5	19.4	**65.0**
Total Volume Forecast	**214.5**	**214.6**	**227.4**	**238.7**	**895.2**

Blackwater and Moura figures include volumes associated with Train Services for new WICET; with the exception of Goonyella and Newlands, 2014/15 represents transitional tariff tonnages.

The forecasts for each year reflect the following:

2013/14	• Actual volumes railed for each coal system
2014/15	• Broadly aligned to the volume forecasts proposed in the 2014/15 Extension DAAU (transitional tariffs), but taking YTD actual railings between July - September 2014 into account (refer to table 3.2 above). • Goonyella volumes expected to be strong as existing mines fill the capacity created by HPX3.
2015/16 and 2016/17	• Volume forecasts for Blackwater and Moura incorporate an independent volume forecast for WIRP. • Goonyella volumes expected to be strong as existing mines fill the capacity created by HPX3. • Transfer of some volumes from Newlands to GAPE to reflect the Newlands customer who contracted volumes through a GAPE Access Agreement. As outlined in the GAPE DAAU, all GAPE agreements are considered part of the GAPE system for pricing purposes.

[34] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 40.
[35] Bureau of Resources and Energy Economics, 2013, Resources and Energy Quarterly – December Quarter 2013, p. 16.
[36] Energy Economics, 2013, Central Queensland Coal Railings Forecast, p. 5.

3.4 Additional Considerations

In light of the expected timing of the UT4 Final Decision (July 2015), Aurizon Network proposes that the volume forecast for 2014/15 be updated prior to the Final Decision in accordance with actual YTD performance for the year.

Aurizon Network strongly recommend that the QCA issue its final decision on Aurizon Network's MAR and resulting tariff before 30 June 2015 to ensure pricing certainty for our customers as we enter the new financial year.

Aurizon Network will provide the QCA with an updated "9+3" volume forecast for 2014/15, which would reflect 9 months of actual railings (between July 2014 to March 2015), and a 3 month forecast (between April 2015 to June 2015). This can be provided in early April 2015 and will enable a Final Decision (with respect to 2014/15 volume forecasts) that accurately accounts for any weather related impacts, and minimises variances to the actual railings for the year.

4. Operating Costs

4.1 The QCA's MAR Draft Decision

Aurizon Network has carefully considered the matters raised by the QCA (and its consequent Draft Decision) in relation to operating expenditure for UT4. The following table provides Aurizon Network's proposed responses:

Draft Decision	Reference	Aurizon Network Position
The QCA refuses to approve the system-wide and regional costs (excluding corporate overheads) proposed by Aurizon Network. The QCA considers it appropriate that Aurizon Network amend its proposed system-wide and regional costs (excluding corporate overheads) to reflect the QCA's estimate of efficient costs.	4.1	Disagree The QCA's proposed allowances are insufficient for Aurizon Network to recover its efficient costs.
The QCA approves Aurizon Network's proposal to escalate non-labour costs by CPI.	4.2	Aurizon Network accepts the QCA's Draft Decision on this issue.
The QCA refuses to approve Aurizon Network's proposal to escalate labour costs by the Average Weekly Ordinary Time Earnings (AWOTE). The QCA considers it appropriate that Aurizon Network amend its 2014DAU to remove this escalation by AWOTE.	4.3	Disagree The AWOTE index has the best capacity to take into account any changes in quality or quantity of work performed.
The QCA considers it appropriate that Aurizon Network amend its labour cost escalation rate to reflect escalation in line with the ABS Wage Price Index.	4.4	Aurizon Network disagrees with the Draft Decision and maintains its position. Refer to response in 4.3 above.
The QCA approves Aurizon Network's proposal not to include a CPI-X adjustment factor to be applied for the 2014DAU.	4.5	Aurizon Network accepts the QCA's Draft Decision on this issue.
The QCA refuses to approve Aurizon Network's proposed methodology for estimating its corporate overheads, that is, the use of a blended cost allocator for allocating Aurizon Holdings' corporate overhead costs.	4.6	Aurizon Network disagrees with the Draft Decision, maintains its position and has provided further submissions on this issue for consideration by the QCA. The main reason for this is that the QCA has not demonstrated that Aurizon Network's allocation method is inappropriate.
The QCA considers it appropriate that Aurizon Network amend its 2014DAU in relation to the corporate overhead allowance to reflect the QCA's current estimate of the efficient corporate overhead costs that is associated with all aspects of Aurizon Network's business.	4.7	Aurizon Network disagrees with the Draft Decision, maintains its position and has provided further submissions on this issue for consideration by the QCA. The QCA's proposed corporate cost allowance is insufficient for an efficient stand-alone business.
The QCA accepts the methodology proposed by Aurizon Network for estimating self-insurance costs, but will require Aurizon Network to re-submit its cost escalations to be adjusted for volumes and turnover, consistent with the Draft Decision.	4.8	Aurizon Network accepts the QCA's Draft Decision on this issue.
Aurizon Network is to report on its self-insurance arrangements as part of the annual regulatory accounts including disclosing the number of self-insurance events by type and value each year.	4.9	Aurizon Network accepts the QCA's Draft Decision on this issue, subject to incidents under $50,000 being aggregated for reporting purposes.
The QCA refuses to approve Aurizon Network's proposed insurance premium costs. The QCA would accept Aurizon Network's insurance premium costs if: (a) Insurance premium costs are escalated at 2.5% not at the proposed 4%; and (b) The insurance costs of feeder stations are allocated to the operating costs for electric assets only.	4.10	Aurizon Network accepts the QCA's Draft Decision on this issue.
The QCA accepts the proposed costs for the annual audit	4.11	Aurizon Network accepts the inclusion of

Draft Decision	Reference	Aurizon Network Position
process to be included as part of the system-wide and regional costs, but not subject to an ex-post review.		proposed costs for UT4 into the system-wide and regional cost allowance. Aurizon Network rejects disallowance of recovery of UT3 audit costs.
The QCA accepts audit costs for any audits initiated by the QCA being treated as a cost pass-through item to be reflected in an adjustment to system allowable revenues. This is subject to such costs being efficiently incurred and Aurizon Network providing objective evidence that they cannot be absorbed.	4.12	Aurizon Network accepts the QCA's Draft Decision on this issue.
The QCA accepts the condition-based assessment costs proposed by Aurizon Network, including recovery of the condition-based assessment costs from UT3 of $0.8 million in 2013–14, and including $0.55 million in 2016–17 for a UT4 condition-based assessment.	4.13	Aurizon Network accepts the QCA's Draft Decision on this issue.
The QCA refuses to approve the environmental charges proposed by Aurizon Network. The QCA considers it appropriate that Aurizon Network amend its 2014DAU in relation to operating costs to remove environmental charges from the operating expenditure allowances. These costs are to be included in the electric charge only.	4.14	Aurizon Network accepts the QCA's Draft Decision on this issue.
The QCA to conduct a review of the proposed transmission connection costs for all electrified systems and defer its decision subject to the outcomes of the review.	4.15	Aurizon Network disagrees with the Draft Decision, maintains its position and has provided further submissions on this issue for consideration by the QCA. Aurizon Network is a price taker from Powerlink which is the sole provider of these services.

Key Points from Aurizon Network's Response

In its 2013DAU, Aurizon Network described the efficient costs of developing, maintaining and operating a highly reliable below rail network with safety as its core value. These costs were rigorously benchmarked where possible.

Having an appropriate cost allocation applied to Aurizon Network is critical to ensure that it has the capability to meet its obligations to maximise the productivity, reliability and safety of the coal rail network.

Aurizon Network implemented a robust approach to estimating efficient corporate costs for the 2013DAU, including independent benchmarking from Ernst & Young (EY). The EY report concludes that overall, Aurizon Network's 2013DAU cost estimate for overheads place it within the benchmark range expected for a stand-alone business of a similar size and in a similar industry.

The QCA proposed cost allowance includes reductions to the costs calculated by RSMBC using the direct cost method, and includes an allowance for asset maintenance, resulting in a total allowance of $46.2 million. Whilst this may be broadly consistent with the original cumulative industry benchmark (CIB), it is much lower than $52.3 million (the conservative cumulative benchmark indexed at 2.5% CPI for illustrative purposes).

Table 4.1 – Total Operating Costs for UT4 – comparison of Aurizon Network and QCA proposals ($ million)

Operating Costs	Original Submission					QCA Proposed					Aurizon Network Revised Proposal				
	FY14	FY15	FY16	FY17	Total	FY14	FY15	FY16	FY17	Total	FY14	FY15	FY16	FY17	Total
Train control and operations	31.1	32.7	34.2	35.7	133.7	26.5	27.3	28.1	29.1	111.0	28.4	29.8	31.2	32.6	122.0
Infrastructure management	15.9	16.6	17.3	18.0	67.8	14.9	15.3	15.8	16.3	62.3	18.5	19.3	20.2	21.0	79.0
Business management	10.5	11.0	13.9	13.5	48.9	10.5	10.7	12.8	12.1	46.1	15.6	16.5	20.5	20.4	73.0
Audit and condition based assessment	0.9				0.9	0.8			0.6	1.4	1.1			0.6	1.7
Corporate overhead	*65.9*	*68.6*	*71.3*	*73.9*	*279.7*										
Maintenance overhead	*13.1*	*13.7*	*14.3*	*14.9*	*56.0*										
Total overhead	79.0	82.3	85.6	88.8	335.7	46.2	47.9	49.6	51.2	194.9	58.6	60.7	62.8	64.8	246.9
Traction	68.3	74.4	81.2	82.9	306.8	68.3	74.4	81.2	82.9	306.8	69.7	71.6	81.2	84.7	307.2
Insurance	8.3	9.4	10.3	11.0	39.0	8.3	9.4	10.1	10.7	38.5	8.3	9.4	10.1	10.8	38.5
	214.0	226.4	242.5	249.9	932.8	175.5	185.0	197.6	202.9	761.0	200.1	207.3	226.0	234.8	868.2

In the following sections, reference is made to the reports prepared by the QCA's consultants:

- *Aurizon Network's 2013 Draft Access Undertaking: Financial Assessment of Operating Expenditure* (RSM Bird Cameron, RSMBC)
- *Aurizon Network's 2013 Draft Access Undertaking: Engineering Technical Assessment of Maintenance, Operating and Capital Expenditure Forecast* (Sinclair Knight Merz, SKM)

4.2 System-wide Costs

4.2.1 UT3 Costs

There have been a series of restructures in the Network business during the UT3 period. The comparison below for 2012/13 is the most meaningful to use as a reference point for the UT4 period, as it is more representative of the cost and organizational structures operating through UT4. Costs categorized as corporate overhead for UT4 are excluded from the allowance and actuals below. Corporate overhead is discussed in section 4.3.1.

Table 4.2 - Comparison of system wide operating cost allowance and actuals – 2012/13, $million

	Allowance	Actuals	Difference
Train control, safeworking and operations	25.5	27.4	1.9
Infrastructure management	12.4	18.2	5.8
Business management	7.4	10.6	3.2
Total	**45.3**	**56.2**	**10.9**

4.2.2 UT4 Proposed Costs

The QCA has proposed a $30.9 million reduction in the system wide direct costs proposed by Aurizon Network:

Table 4.3 –UT4 system wide operating cost proposals for QCA and Aurizon Network ($million, nominal)

	Diff	QCA Proposed					Aurizon Network's 2013DAU				
	Total	2013/14	2014/15	2015/16	2016/17	Total	2013/14	2014/15	2015/16	2016/17	Total
Train control, safeworking & operations	**-22.7**	26.5	27.3	28.1	29.1	**111.0**	31.1	32.7	34.2	35.7	**133.7**
Infrastructure management	**-5.5**	14.9	15.3	15.8	16.3	**62.3**	15.9	16.6	17.3	18.0	**67.8**
Business management	**-2.7**	10.5	10.7	12.8	12.1	**46.1**	10.5	10.9	13.9	13.5	**48.8**
Total	**-30.9**	**51.9**	**53.3**	**56.7**	**57.5**	**219.4**	**57.5**	**60.2**	**65.4**	**67.2**	**250.3**

In light of the Draft Decision, and as a result of continued efficiency and cost savings initiatives, Aurizon Network has reassessed its system wide operating costs for UT4 as set out in sections 4.2.4 to 4.2.6 below.

Table 4.4 below summarises Aurizon Network's revised proposal on system wide costs.

Importantly, Aurizon Network does not accept the QCA proposed allowance for reasons set out below.

Table 4.4 – Aurizon Network Revised Proposal for system wide costs ($million, nominal)

	Actuals		UT4 Revised Proposal				
	2012/13	2013/14	2013/14	2014/15	2015/16	2016/17	UT4 Total
Train control, safeworking & operations	*27.4*	*28.4*	28.4	29.8	31.2	32.6	**122.0**
Infrastructure management	*18.2*	*18.5*	18.5	19.3	20.2	21.0	**79.0**
Business management (excl Network Finance)	*10.6*	*10.1*	10.1	10.7	14.4	14.0	**49.2**
Subtotal	***56.2***	***57.0***	**57.0**	**59.8**	**65.8**	**67.6**	**250.2**
Network Finance (from Corporate overhead)	*5.1*	*5.5*	5.5	5.8	6.1	6.4	**23.8**
Restated Total	***61.3***	***62.5***	**62.5**	**65.6**	**71.9**	**74.0**	**274.0**

4.2.3 Cost Escalation

A significant component of Aurizon Network's proposed operating expense flows from the need to make proper allowance for the effect of wage inflation in its labour costs. A key difference between Aurizon Network and the QCA is the appropriate escalator given the legitimate business interests of Aurizon Network and the real world circumstances of operating costs in its market.

In this respect, the input price escalator used in regulation needs to reflect the actual costs that would be prudently incurred by a business operating in a workably competitive market.

The correct measure thus needs to reflect changes in the actual composition of employment rather than an abstract measure of 'underlying' wage inflation which makes no allowance for compositional changes and their ongoing drivers.

In this respect, s168A expressly provides that an access provider must be allowed to "generate expected revenue for the service that is at least enough to meet the efficient costs of providing access and provide a return on investment commensurate with the regulatory and commercial risks involved".

This involves a reasonable expectation of being able to recover actual prudently incurred costs. A major element of the QCA's proposed reduction is its preference to use the Forecast Wage Price Index (WPI) as the labour escalation index, instead of the BIS Shrapnel AWOTE percentages proposed by Aurizon Network.

Aurizon Network proposed the AWOTE index as:

1. AWOTE is more likely to reflect the real labour costs faced by regional railway network providers as it is a more comprehensive measure of wages than WPI and will allow for local labour market conditions
2. AWOTE has the best capacity to take into account any changes in quality or quantity of works performed.
3. AWOTE is a reliable measurement of medium to long term trends, and reflects the labour prices firms actually face.
4. The Forecast Wage Price Index prepared by Deloitte Access Economics is based on the Labour Price Index which has been described as a notional measure of 'underlying' labour prices, and which does not measure sectorial trends within a State.[37] Therefore only those price changes that occur in the markets in which it is operating will be captured by this proposed measure.

BIS Shrapnel has calculated the AWOTE index with a focus on the skill classifications that constitute Aurizon Network's employment base. The index include the following to reflect the respective proportions of the workforce:

- professional, scientific and technical services
- administration and support services
- financial and insurance services
- transport sector.

[37] See Economic Insights, 2011, Review of AER Draft Decisions on Envestra Queensland's and Envestra South Australia's Input Price Escalators and Synergies Economic Consulting, 2013, Powerlink - Real Labour Cost Escalation Review, p. 13.

The efficient, safe and reliable operation of the coal rail network is fundamentally linked to the employment of an appropriately skilled workforce. More than 80% of Aurizon Network's workforce is located within the CQCR and Aurizon Network competes against large mining corporations for many common skills requirements.

These mining corporations have the flexibility to employ staff on short-term inflated conditions. Aurizon Network outlined the effect of this competition in the skilled labour market in its public maintenance costs reports for 2010/11 and 2011/12 where the greatest increase of cost was seen. These wage cost levels have not abated and Aurizon Network continues to be forced to compete with these wage levels to retain skilled labour.

Skilled labour costs are not elastic to reductions in demand. Having achieved higher wage levels, existing employees will expect the retention of those levels, and the absorption of those costs must be achieved through negotiation of productivity trade-offs.

The QCA has proposed escalation rates based on Queensland Treasury's forecasts of annual growth in the Queensland WPI. These figures are not sector sensitive, and so provide an unsatisfactory means of ensuring Aurizon Network has the opportunity to recover at least its efficient labour costs in the future regulatory period.

In its March 2013 Final Decision on APA GasNet Access Arrangements, Australian Energy Regulator decided that the use of APA GasNet's Enterprise Agreement was the best labour cost escalation rate as it most accurately measures the change in the labour price adjusted for labour productivity[38]. This supports the idea of recovering the efficient costs associated with productivity for labour price increases.

As regards the need to deal with compositional changes in the employment mix, the QCA has stated that:

> *'…the skill base of a company's workforce is a business choice for the owners'[39].*

This comment has been taken from the Deloitte Access response to Professor Borland's Labour Cost Escalation Report for Envestra's submissions to the AER. That comment is referable to the compositional change in the utilities sector, does not take account of tight labour market impacts, and assumes a prudent market participant in a workably competitive market has a choice.

This perspective neglects the criticality of an appropriately skilled workforce to the safe and effective performance of the supply chain. A skilled workforce maximizes rail system productivity from the planning stage to the maintenance activity. The efficient planning of activities, efficient use of maintenance windows resulting in the minimum number of train paths being consumed to complete maintenance activities, and the quality of the maintenance activity is not a matter of discretion which can simply be portrayed as an optional business decision.

The composition of the Aurizon Network workforce, and the regional market in which it operates, are therefore influential drivers of labour costs which should be appropriately reflected in the measurement of labour prices to which Aurizon Network is exposed. The simple fact of paying wage levels demanded by respective skill levels does not imply that additional productivity benefits will flow, as the QCA suggests[40]. Rather, these costs need to be incurred to achieve the productivity levels originally planned.

Aurizon Network has clear customer service and regulatory obligations requiring the consistent observation of high operational standards. A skilled workforce is essential to achieving these high standards. The ongoing management of competency through both provision of training and assessment of capability is a statutory requirement of the Rail Safety Regulator. Aurizon Network undertakes this training in line with the national train control training framework, administrated through its Safety, Health and Environment function and resourced through peer controllers in the Train Control, Safeworking and Operations area. This requirement reflects the complexity and safety criticality of the network operations, similar to the environment of air traffic controllers.

It is therefore vital for Aurizon Network's original wage index proposal to be accepted, reflecting efficient labour costs for a skilled workforce to enable safe and effective supply chain performance.

[38] AER, 2013e, Access Arrangement Final Decision – APA GasNet Australia 2013 – 17 Part 3: Appendices, p 7.
[39] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 54.
[40] Ibid, p. 59.

4.2.4 Train Control, Safeworking and Operations

The QCA's approach to deriving the proposed cost allowance for train control, safeworking and operations uses 2012/13 actual costs as a base year, then makes adjustments it deems relevant.

Base year costs for 2012/13, using a 9% non-coal allocation for train control costs, were $26.0 million (and $27.4 million using 2% non-coal allocation). Applying a labour cost escalation rate of 2.75% as proposed by the QCA and including utilities costs of $1.2 million (escalated at 2.5%), Aurizon Network calculates costs for 2013/14 to be $27.9 million. This does not reconcile with the QCA's proposed cost allowance for 2013/14 of $26.5 million. Aurizon Network is unclear what other adjustments have been made to the base year costs to yield a $1.4 million shortfall, as this is not explained in the Draft Decision.

Security Costs

RSMBC recommended a reduction to the UT4 submitted costs (based on 2012/13 forecast) of $0.5 million per year for security costs. As the QCA have sought to calculate UT4 costs using actual 2012/13 costs as a starting point, Aurizon Network highlights that, while budgeted, no security costs were actually incurred within Aurizon Network cost centers in that financial year. It would therefore not be appropriate to adjust the actual costs for 2012/13 for a disallowed budgeted amount which is not included in the actual costs.

Revised Cost Proposal

Aurizon Network acknowledges that the originally submitted UT4 costs are higher than actual costs incurred for 2013/14 and expected to be incurred for 2014/15, and accepts there should be a reduction to the originally proposed costs due to timing of the review of headcount (as explained below) and efficiencies gained in the process. There was no increase in Full Time Equivalents (FTEs) factored into cost estimates for the UT4 period.

In their benchmarking report, RSMBC noted some of the productivity improvements impacting the costs of the train control function [41] summarised as follows:

- capacity to manage an additional 40mt by 2017 (including WIRP) and a 28% increase in contracted volume without the requirement for significant additional train control resources. Given that infrastructure is built in line with contractual requirements, Aurizon Network has structured the organization to be able to manage movement of such tonnes (even if actual or forecast tonnes are lower);
- Aurizon Network is developing an integrated Network Planning, Scheduling and Execution tool, APEX. APEX is expected to decrease the turnaround of the weekly plan by between 24-48 hours freeing up the planning team to improve ad hoc access requests and secure non-invasive maintenance windows.
- electronic interface between maintenance teams and network control, to decrease the time it takes teams to get on track and reduce the access process turnaround time for the controllers.
- use of a train control simulator to improve train control capability, competence and consistency.

We do not accept a reduction that would push the allowance below the costs incurred for 2013/14. We accept the QCA proposal to escalate costs of the base year to derive the UT4 cost allowance. However, we propose the base year for actual costs to be 2013/14 as it is the most recent historical data available.

Based on actuals for 2013/14 and an escalation of those costs for 2014/15 to 2016/17 using the AWOTE index, Aurizon Network proposes the following revised costs for Train control, safeworking and operations:

Table 4.5 – Revised costs for train control, safeworking and operations ($ million)

	Actuals		UT4 Revised Proposal				
	2012/13	2013/14	2013/14	2014/15	2015/16	2016/17	Total
With 2% reduction for non-coal traffic	*27.4*	*28.4*	28.4	29.8	31.2	32.6	**122.0**

The costs of the Train control function are primarily labour and oncost. The train control function had been operating at below optimal staffing levels during UT3 with a number of vacant positions. When preparing the cost

[41] RSM Bird Cameron, 2014a, Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure, p. 137.

estimates for UT4 it was expected that these vacancies would be filled during 2012/13. The increase in actual costs from 2012/13 to 2013/14 reflects labour costs increasing part way through 2012/13, and 2013/14 reflecting a full run rate. As explained in the response to the consultants' report, the train control centre requires staffing 24 hour 7 days a week without overloading the controllers on any boards. Succession planning and costs of driver training school have been incorporated into the costs.

The QCA note in the Draft Decision that they are

> *'…not convinced it is efficient (or necessary) for Aurizon Network to be managing its train control functions in a manner where it has the capacity to deliver contracted tonnes in UT4, particularly given there is no realistic expectation this level of demand will occur over this period.'* [42]

As QCA is aware, Aurizon Network operates on the basis of long term take or pay contracts that oblige Aurizon Network to provide a certain amount of capacity to customers. These contracts give Aurizon Network no relevant discretion to manage its resources in a way that prejudices its ability to honour its capacity promises at levels other than the contracted level. The suggestion that it do so in the face of such commitments in order to satisfy a regulatory "efficiency" hurdle ignores the legal and commercial reality of Aurizon Network's position, and has no regard to its legitimate business interests.

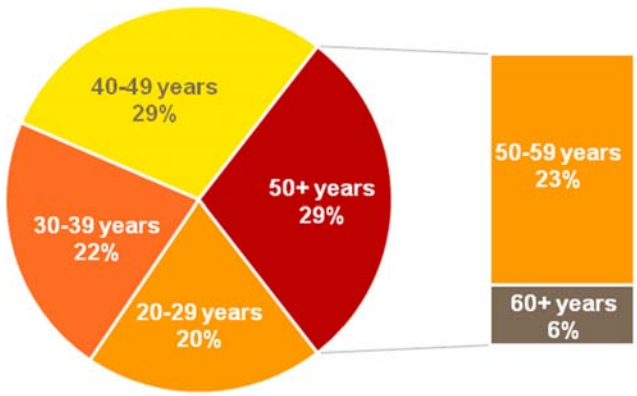
Demand for network capacity is a complex product of many variables, including coal prices (which are set at a regional and global level), operating margins at coal mines and the differing business models of various customers. These have all varied dramatically over the last five years. Aurizon Network is in no position to guess (or gamble) on the future decisions of these entities over a regulatory period that extends well into 2017.

Further, the suggestion that Aurizon Network expose both itself and its customers to contractual third party risk on the basis of unspecified "expectations", and in the face of conflicting contractual obligations, is not reasonable, nor sustainable – particularly given the lead time required to replace skilled operators (as the unfilled vacancies clearly demonstrate). In the circumstances, pursuing this path would not only expose Aurizon Network to legal and commercial risk, but potentially create safety issues in the event that it had to meet surges in capacity without adequate resources.

By its nature succession planning needs to occur before the expected need for the succession as part of a planned program, allowing for the long lead times to recruit and train such specialist skills. Inclusion of such costs is also consistent with the QCA's comments that

> *"in a competitive market, succession planning would represent baseline business activity"*. [43]

The criticality for training of new train controllers for succession purposes is highlighted in the chart below, by the current demographics of staff within the train control center showing 30% of staff are above 50 years old.



Resource levels in the train control centre have historically been at below required levels since the consolidation of the train control function and introduction of the 2 new control boards in 2011. The last trainee controller school

[42] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 61.
[43] Ibid, p. 62.

undertaken has brought the function closer to optimal resource levels. The increased workload from growth in tonnages during UT4 has been budgeted to be delivered without increases in FTEs, and takes into account the expected gains from the APEX software that should assist to reduce workload for train controllers.

RSMBC had noted in their benchmarking that the original UT4 proposed costs were materially consistent with competitors. Refer to the section below on Benchmarking for further comments.

Adjustment for Non-coal Services

The QCA has rejected Aurizon Network's revision to the allocation of costs to non-coal services. This was originally submitted as 9%, but reduced to 2% as part of the response to the RSMBC report. RSMBC noted in the addendum to their report that

> *"based on the information presented to us, (we) consider that the revised reduction is not unreasonable".*[44]

Non-coal traffic predominantly runs on only 120km of the 2,667 km network (being the North Coast Line (NCL) between Parana (near Gladstone) and Rocklands (near Rockhampton).and operates on a regular timetable. That is, the non-coal train movements are effectively 'hard wired' into the master train plan and therefore rarely require alteration from week to week.

The 9% reduction in the 2013DAU submission was obtained using completed train kilometres as explained in our response to the consultant's report. After additional reviews of this data during the consultant's process, this was subsequently determined to be an overstatement of the significance of non-coal traffic on the operation of the network. The 9% reduction does not take account of relevant considerations and gives inappropriate and simplistic weight to a single measure. In particular, it:

- does not take account of the greater complexities associated with the scheduling of coal traffic compared with non-coal traffic which involves only small sections of the CQCR;
- does not take into consideration closures for maintenance and on-track vehicles, a complex task that consumes substantial resources. Its impact is predominantly on the coal network used almost exclusively by coal trains, rather than on the short sections of track traversed by non-coal traffic;
- does not consider the substantial amount of train control activity created by cancellations and rescheduling of coal traffic.

Drawing on analysis by staff from the Rockhampton train control centre, the substance of which is reflected in Tables 4.6 to 4.8, it is clear that an alternative 'averaging' approach is a more accurate method of estimating the call of the respective traffics on the resources dedicated to train control operations. This alternative approach analyses the train controller utilisation on the relevant boards for non-coal traffic and estimates the non-coal percentage reduction to train control costs with reference to the contracted monthly train paths, the number of boards used to control those trains and the number of FTEs assigned to those boards. The approach more accurately aligns costs between coal and non-coal traffics by considering the activities which are actually required to support their operations.

Based on contracted train paths, non-coal traffic accounts for 33% of the traffic on the NCL and 4% on the Western line (West). Non-coal electric services represent 3% of services on the NCL as outlined within Table 9 below:

Table 4.6 – Non-coal train paths as proportion of CQCR trains

	North Coast Line	Western Line
Electric Non-Coal	8	0
Non-Coal	93	7
Coal	190	190
Total Trains Per Week	**283**	**197**

[44] RSM Bird Cameron, 2014b,Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure – Response to Aurizon Network's Submission dated 7 March 2014 – Addendum Report, p. 8 .

	North Coast Line	Western Line
Non-Coal % of Total	33%	4%
Non-Coal electric % of Total	3%	0%

The number of train controllers on each of these lines is as follows:

Table 4.7 – Number of Train Controllers

	North Coast Line	Western Line
Moura Board	5	
South Board	5	
Near West Board		5
West Board		5
Safeworking Supervisor	1	1
Total Board Staff	**11**	**11**
Electric Control Operator Staff South	5	5

An allocation of a FTE for one safeworking supervisor has been included. This allocation is conservative as while there are five FTEs (to cover three shifts per day) they supervise the entire Blackwater and Moura systems.

The equivalent FTEs attributable to non-coal traffics has therefore been determined as follows:

Table 4.8 – Non-coal FTE's

	North Coast Line	Western Line	Total
Control staff as non-coal % of total	3.6	0.4	**4.0**
Electric Control Operator staff as non-coal % of total	0.1	0.0	**0.1**
Total Control Staff			**189**
Control non-coal portion			**2.0%**
Electric Control Operator non-coal portion			**0.1%**

Total Control Staff is the UT4 estimate (based on 2012/13 forecast)

Aurizon Network re-confirms that non-coal services represent a negligible proportion of traffic in the Goonyella and Newlands systems (services predominantly restricted to the short section between Kaili and Durroburra on the NCL). Accordingly, averaging of train control costs between coal and non-coal traffic is not appropriate for these systems.

The analysis above indicates that only four FTEs – out of a total of 189 train control and scheduling staff, are required to support non-coal traffics. The 'remaining' 185 FTEs are represented as follows:

- Train control staff managing coal services in the Blackwater and Moura systems (per above);
- Train control staff managing coal services in the Goonyella and Newlands systems. As indicated above non-coal traffics from a negligible part of activities in these systems;
- Train planning and scheduling staff based in Rockhampton (for Blackwater and Moura) and Mackay (for Goonyella and Newlands). As indicated above non-coal traffics are hard-wired into the master train plan and therefore require little intervention; and
- Train and supply chain performance staff whose activities are based solely on coal traffics.

This 2% reduction across the entire train control function is now considered more appropriate and representative of the costs of that part of the train control function that should reasonably be allocated to non-coal train services, notwithstanding that there are no incremental costs of these services.

We disagree with the QCA's assertion that the simple metric of track kilometres is more likely to be representative of the resources required by Aurizon Network to provide the train control service to non-coal customers, as train control costs are a function of scheduling and time spent on track. The QCA fails to take into consideration the complexities of scheduling, cancellations and rescheduling and closures noted earlier. The analysis above shows the minimal FTEs required to facilitate the non-coal traffic and that it is a marginal cost to the business.

Benchmarking

The QCA have sought to compare the cost per train path of CQCR with that of the Hunter Valley Coal Network (HVCN), and have questioned the higher apparent costs of the CQCR system. Utilizing a comparison that relies on a cost per train path basis is an unreliable and misleading means of comparison. Other benchmarking metrics show Aurizon Network to be at least consistent with, and on corrected calculations more efficient than, HVCN.

For example, RSMBC observed that CQCR's operating costs per track km and forecast gtk are materially consistent with HVCN. In fact, as pointed out in our response to the RSMBC report on Operating Costs, we identified that the track km estimate of 1,336km within their calculations was incorrect. If the analysis was revised to include the correct track distance of 740km, Aurizon Network's operating costs would be $33.46m. Taking the RSMBC estimate of Australian Rail Track Corporation (ARTC) overheads of $16.67m, Aurizon Network is in fact significantly more efficient on a cost per kilometer basis ($46,326/km vs $67,750/km).

The Draft Decision noted that:

> *"RSMBC did not draw strong conclusions on the basis of the operating costs benchmarking. However, its main observation was that there may be opportunities for the Aurizon Network to reduce operating expenditure, particularly in relation to control room operations and yard management."*[45]

This comment was made from a desktop review, with no supporting evidence. However, in any event, actual 2013/14 costs are lower than the UT4 estimated costs, demonstrating that Aurizon Network has already implemented cost savings and efficiencies, some of which were noted under 'Revised cost proposal' earlier in this section. This demonstrates that Aurizon Network constantly reviews and identifies opportunities to drive efficiencies.

HVCN is considerably less complex than the CQCR as accounts for only a quarter of the track distance of CQCR, delivering coal to a single port (albeit with multiple terminals). CQCR also has substantial obligations to service domestic customers, which have critical delivery timeframes to ensure continuity of their operations (such as QAL, Stanwell Power, and NRG). These are relevant matters that need to be factored into any comparison between the two networks, and it is not clear that they have been.

HVCN operates in a different regulatory environment for both economic and safety regulation. This applies different obligations for safeworking as well as commercial/regulatory considerations. It is also non-electric so all the roles and complexity to accommodate track possessions for planned and emergency maintenance of overhead line equipment do not apply. The role of Electrical Control Officers and FCC are undertaken by the Maintenance area of ARTC and unlikely to be included in the Train Operations, Safeworking and Operations benchmark. Furthermore, given coal's lower priority through the Hunter Valley, the role to manage coal train movements would be less complex and attract a lower cost.

Aurizon Network is of the understanding that the Hunter Valley Coal Chain Coordinator (HVCCC) performs some of the planning functions for HVCN and is funded by users of the HVCN infrastructure. Whilst ARTC have in house network control, train planning staff and capacity planning, the existence of HVCCC does smooth out relations across the coal chain and if HVCCC did not exist, it is likely that ARTC would be required either through industry or regulatory pressure to boost their resource levels for capacity planning and day to day planning. In contrast,

[45] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p.54.

Aurizon Network undertakes some of the rail oriented activities provided by HVCCC and as a result, the cost of these activities will be understated when compared with the HVCN's forecast operating costs.

In addition, the number of actual train paths is often an ineffective means of comparing costs between systems. This is because the actual number of train paths run does not take into account the large number of train paths scheduled and subsequently cancelled by customers. A cancelled train path still incurs costs in train control operations. This has significant cost implications in a more complex network like CQCN involving multiple receipt and delivery points Furthermore, cancelled train paths are often re-scheduled, resulting in additional costs as schedules are adjusted to accommodate this unanticipated traffic. An example from 2012/13 is as follows:

> *During 2012/13 a total of 43,292 train paths (out of a total of 52,188 total train paths) were run whilst there were a total of 8,896 cancelled paths or one in every five is cancelled. This may result in a significant increase in workload for the business in managing scheduled train paths.*[46]

The Draft Decision also states that

> *SKM considered Aurizon Network 2012/13 train control costs to be the best estimate of efficient train control costs for UT5, assuming the increase in costs for the 2014DAU period was wholly attributed to succession planning.* [47]

We believe that the reference to UT5 should be UT4. The conclusions actually drawn by SKM were:

> *Despite the increase in total expenditure, the unit rate is declining which indicates that the increase is efficient compared to the growth in train paths. Improvements in Aurizon Network's operating efficiency as the organisation matures are also evident given the unit cost was increasing during the early years of the UT3 period, before trending downwards.*[48]
>
> *…On the basis of the benchmarking exercise, SKM finds that the total forecast cost for train control, safeworking and operations is reasonable for the CQCR, subject to the exclusion of expensed project costs associated with forecast capital projects.*[49]

As RSMBC and SKM essentially found Aurizon Network's total forecast to be reasonable, it is difficult to understand why a substantial discount has been applied to our estimates by the QCA, as it would indicate that Aurizon Network is in fact achieving an 'economically efficient operation' of the train control function.

Aurizon Network presented to the QCA a full critique of benchmarking performed by RSMBC and SKM in *2013 Draft Access Undertaking – Response to QCA Consultants' Cost Reports.*

4.2.5 Infrastructure Management

The QCA's approach to deriving their proposed cost allowance for infrastructure management uses 2012/13 actual costs as a base year, and then makes adjustments deemed relevant.

Base year costs for 2012/13 were $18.2 million excluding the Executive Vice President (EVP) Network. Applying a labour cost escalation rate of 2.75% proposed by the QCA, Aurizon Network calculates costs for 2013/14 to be $18.6 million. This is $3.7 million higher than the QCA's proposed allowance for 2013/14 of $14.9 million. Aurizon Network is unclear on any other adjustments QCA made to the base year costs, as this is not explained in the Draft Decision.

Aurizon Network accepts using a base year and the escalation thereon to derive the cost allowance for UT4, but proposes that 2013/14 actual costs of $18.5 million (net of capitalization) be used as the base year to be escalated each year without any other adjustments. As this is the most recent historical data – and in fact the first year of the UT4 period - it is the most representative of the costs to be incurred for UT4. The revised proposal is outlined below.

Table 4.9 – Infrastructure Management costs net of capitalisation ($million, nominal)

[46] Aurizon Network records
[47] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 53.
[48] SKM, 2014, Aurizon Network 2013 Draft Access Undertaking Engineering Technical Assessment of Maintenance, Operating and Capital Expenditure Forecast, p. 18.
[49] Ibid, p. 24.

	Actuals		UT4 Revised Proposal				
	2012/13	2013/14	2013/14	2014/15	2015/16	2016/17	Total UT4
Infrastructure management costs	*18.2*	*18.5*	18.5	19.3	20.2	21.0	**79.0**

Actual costs for 2013/14 were reasonably consistent with 2012/13 but are higher than the costs originally proposed for UT4. Of the different divisions within Aurizon Network, the costs of Infrastructure management have been the most variable during UT3 due to the restructures, the variable nature of capital projects to which costs may be capitalized and also the rotation of graduate engineers throughout the division.

There has been an increase in FTEs from 2010/11 to 2013/14 reflecting the recovery from loss of economies of scale with Queensland Rail as a result of the Initial Public Offering, realignment of positions within Network under the Group functional model and the further restructure of Network to a stand-alone model in June 2013.

In December 2011 the functional structure for the Aurizon Group was established at the highest (EVP) level but took another 12 months for the design and implementation of this structure to all employee levels. It was during 2012/13 that employee positions were reorganized within the Network function.

As for the Train Control and Operations division, there were a number of vacant positions and positions that were not recruited for straight away to allow time for the bedding down of the structure and determination of efficiencies that could be obtained.

The 2012/13 forecast upon which the UT4 cost estimates was based assumed that not all the positions in the restructured organizational chart would be filled. However some roles were required for compliance, health and safety and business assurance. The number of FTEs has also increased for people working on the Network Asset Management System (NAMS) project, however this is not affecting the labour operating costs as these costs are being capitalized onto the project.

The loss of economies of scale with Queensland Rail was felt in assurance, strategy, commercial and training activities and required transfer or recruitment of FTEs. For example, to meet our legislative requirements and safe working practices, it is necessary to have resources within the business responsible for the training of technical trade maintenance staff working on the signaling, telecommunications and traction power systems. This would also have been shared with passenger and regional freight services when Queensland Rail was part of the Group. In the functional structure, this resource has been transferred from the corporate Safety team to Aurizon Network since it is specific to the operations of Network.

The reorganization of the Network division effective from 1 July 2013 established a stand-alone operating structure for Aurizon Network and saw the Engineering & Project Delivery division move from Aurizon Network to Aurizon Operations. The new organizational structure is consistent with our regulatory obligations as well as creating a transparent and sustainable financial structure.

The current structure of the Infrastructure management team has been designed to support the focus of asset maintenance. The main focus is on proactively managing asset preventative maintenance requirements to minimize infrastructure faults including effectively scheduling track maintenance tasks across the network.

The purpose of this more proactive approach is to anticipate the likely maintenance effort required based on an understanding of the asset's characteristics and the impact of throughput on its performance. The quality of data available for regular asset monitoring and analysis is continually being improved (and will continue to do so with the implementation of the NAMS).

The UT4 cost estimate was prepared using an assumption that 24% of the costs in this division would be capitalized or related to non-regulated activities and not to be included in the allowance. This percentage was derived from a sample of timesheets for the period July – November 2012. This percentage derived from timesheet records was applied to both labour and consumables costs and all cost centers within the division. Actual capital costs during 2012/13 and 2013/14 were lower than estimated using these assumptions.

Given the expectation of fewer growth projects during UT4 than UT3, a more conservative capitalization assumption is more appropriate than the 24% (including non-regulatory services) originally proposed in the UT4 estimates. Year on year the capitalization rate will vary depending on the projects in progress during the year. The costs in Table 4.9 are net of capitalization, based on the 2013/14 actuals.

4.2.6 Business Management

The QCA's approach to deriving their proposed cost allowance for business management uses 2012/13 actual costs as a base year, and then makes adjustments deemed relevant.

Base year costs for 2012/13, were $10.6 million. Applying a labour cost escalation rate of 2.75% as proposed by the QCA, Aurizon Network calculates costs for 2013/14 to be $10.9 million. This does not reconcile with the QCA's proposed cost allowance for 2013/14 of $10.5 million. Aurizon Network is unclear what other adjustments have been made to the base year costs to yield a $0.4 million shortfall, as this is not explained in the Draft Decision.

Included within Business management is the cost of the development of UT5. QCA suggested that the development of UT4 was an inefficient process given the extensive re-write of the 2014DAU.

Aurizon Network disagrees with the QCA and believes the redrafting from the 2013DAU was a necessary part of the regulatory process, as it largely involved incorporating feedback from the extensive industry consultation we conducted. Undoubtedly, there will be knowledge gained from this process (the first as a private entity) that will improve the development of UT5.

QCA has also proposed to reduce 2015/16 and 2016/17 costs by $1.5 million, on the basis of their lower estimate for the costs necessary to prepare UT5 from Aurizon Network's estimate of $4.5 million to $3.0 million. Aurizon Network provided information to RSMBC at the time of their review to support the costs included in the UT4 estimates. These costs excluded implementation costs. RSMBC noted that the estimates are:

> *"…consistent with the costs incurred to date by Aurizon Network for the preparation of UT4 of $4.8 million. On the basis that the preparation of UT5 is anticipated to require a slightly lower level of costs and taking into account inflation, the forecast costs do not appear unreasonable."* [50]

Given RSMBC's comments, Aurizon Network does not understand why QCA reduced the UT5 preparation costs by $1.5m. Therefore we disagree with the QCA's reduction of $1.5m.

Network Finance

In its original submission, Aurizon Network identified that some business support costs in UT3 have been included in corporate overhead for UT4 due to the functional restructure within the Aurizon Holdings Group.

From a functional perspective and for benchmarking purposes, Network Finance was included as part of the costs of Finance in corporate overhead. However, in accordance with the commonly accepted principles for an appropriate cost allocation whereby costs should be directly attributed wherever practicable and following Aurizon's reporting line structure, it is more appropriate to include these costs within Business management.

There is no duplication of activities and costs by including Network Finance within Business management costs and residual finance activities within corporate overhead. Activities performed by Corporate Finance teams are outlined in section 4.4.2 and activities performed by Network Finance are outlined below. Only a portion of both the Corporate Finance and Network Finance team were included in the original proposed cost allowance, and the total costs were within the benchmark range (as analyzed by Ernst & Young). Aurizon Network therefore maintains that this approach was appropriate.

By eliminating perceived duplicated functions from the allocation base and reducing the allocation percentage, the QCA's proposed cost allowance may be below the benchmark range and does not reflect the costs that would be incurred for a stand-alone business.

To mitigate perceived duplication of costs, Aurizon Network proposes that the costs of the Network Finance team be included as part of business support costs in their entirety with additional functions required for a stand-alone business included in the corporate overhead allowance.

The inclusion of Network Finance costs with Business management costs rather than corporate overhead purely reallocates the cost of these activities from overheads to direct costs in line with the reporting structure. Finance,

[50] RSM Bird Cameron, 2014a, Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure, p. 119.

Commercial, Regulation and Network Operations all have direct reporting lines into the CEO Aurizon Network and are directly employed by Aurizon Network.

The Network Finance team are responsible for:

- production of reports and statements using financial and non-financial data and key operational metrics:
  - statutory financial reports
  - below-rail regulatory financial statements
  - review and maintenance of the Costing Manual
  - revenue cap calculations and yearly submission to the QCA
  - internal and external maintenance reporting
  - capital program
- production of performance and other reports for senior managers and Aurizon Network's senior executive and Board as required by a stand-alone legal entity
- development and implementation of management accounting and costing systems to ensure appropriate decisions can be made relating to capital budgeting and planning and repair vs renewal decisions
- review of business cases and Board submissions from across the business in consultation with financial, economic, legal and taxation advisors, senior managers and other relevant stakeholders
- co-ordination of the Network Investment Committee approving such business cases
- coordination of the annual capital, cashflow and operating plans, and Capital Indicator and continuous reforecasting
- detailed profit and cost center budgets, and continuous re-forecasting
- provision of strategic financial support to Aurizon Network projects including development of the Access Undertaking and the associated pricing models
- manage external statutory auditors for half year and year end, and regulatory auditors through regulatory accounts, RAB submission processes and maintenance cost submissions
- completion of monthly general ledger procedures including:
  - monthly invoicing to customers including veneering and adhoc billings
  - take or pay calculations
  - accounting for the application of new tariffs
  - recording of traction expenses
  - accounting for Access Facilitation Deeds
  - lease accounting
  - depreciation calculations including accruals
- development, production & analysis of detailed monthly financial reports & variance analysis for managers
- management of the Aurizon Network Assets under Construction and forecast depreciation models
- provide financial accounting advice and/or liaise with relevant corporate finance teams
- support to credit rating process – debt covenants and security arrangements
- support to significant procurement contract e.g. traction electricity
- monitor customer credit risk and support relationships with key customers
- financial support to transitional tariff setting, tariff resetting, and review event submissions (e.g. floods)
- administer maintenance of systems to provide information on financial performance for capital programs

The Aurizon Network Finance team does not undertake accounts payable, accounts receivable, taxation activities or treasury functions. Please refer to section 4.4.2 for the discussion on Finance costs in corporate overhead.

Including Network Finance into the Business management category of direct costs (as costing allocation principles would suggest is most appropriate), the total proposed allowance for the UT4 period is set out below (with labour costs escalated using AWOTE). The costs are calculated using an escalation of 2013/14 actuals, and adjusted for the inclusion of UT5 development costs in 2015/16 and 2016/17.

Table 4.10 – Aurizon Network proposed Network Finance costs ($million, nominal)

	Actuals		UT4 Revised Proposal				
	2012/13	2013/14	2013/14	2014/15	2015/16	2016/17	Total UT4

Business management (excluding Network Finance)	*10.6*	*10.1*	10.1	10.7	14.4	14.0	**49.2**
Network Finance	*5.1*	*5.5*	5.5	5.8	6.1	6.4	**23.8**
Business management (including Network Finance)	*15.7*	*15.6*	15.6	16.5	20.5	20.4	**73.0**

4.3 Calculation of Corporate Overheads

The QCA has proposed a $145.3 million reduction in corporate overhead costs (including relating to asset maintenance) proposed by Aurizon Network over the UT4 period as follows:

Table 4.11 – Corporate Overheads QCA vs Aurizon Network ($million, nominal)

	2013/14	2014/15	2015/16	2016/17	Total UT4
QCA Proposed	46.2	47.9	49.6	51.2	**194.9**
Aurizon Network 2013DAU	80.1	83.4	86.8	90.0	**340.3**
Aurizon Network Revised Proposal	**64.1**	**66.5**	**68.9**	**71.2**	**270.7**
Less: Network Finance costs transferred to business management	(5.5)	(5.8)	(6.1)	(6.4)	**(23.8)**
Aurizon Network Revised Proposal excluding Network Finance	**58.6**	**60.7**	**62.8**	**64.8**	**246.9**

The original submission for UT4 was based on asset maintenance being a contestable service with its own corporate overhead costs. While the methodology for calculating the corporate overhead was different to that employed for the other parts of the Network business, care was taken to ensure there was no duplication of costs. This was achieved by excluding asset maintenance metrics from the calculation of the allocators.

For simplification and to avoid the perception of duplication, Aurizon Network accepts the QCA's proposal for a consistent approach for corporate overheads for maintenance and operating costs and is willing to work with the QCA to provide any clarification necessary to develop the costing allocation model that incorporates all the relevant and necessary costs for an efficient stand-alone listed company.

In Aurizon Network's view, the QCA's proposed corporate overhead allowance is insufficient and an allocation of at least $52.3 million based on the CIB, as detailed in section 4.3.2 – Table 4.12 (indexed for illustrative purposes at 2.5%) is required for 2013/14, to be escalated each year. Note that this includes Network Finance which is proposed to be included in Business Management.

Aurizon Network's revised proposal is based on this benchmark, with adjustments for legal and safety obligations where Aurizon Network's operations require more focus in these areas than an average company. These functions are discussed in sections 4.4.3 and 4.4.5. The total proposed corporate cost allocation is $58.6 million per year – being the adjusted benchmark of $64.1 million, less direct Network Finance costs (refer to Table 4.12).

In the context of corporate overheads, Aurizon Network reiterates its preference for wage cost forecasts to be based on Average Weekly Ordinary Time Earnings for the relevant industry classifications, as discussed in 4.2.3.

For escalation of labour at a rate higher rate than CPI, Aurizon Network requires the QCA to provide its cost allowance split into labour and consumables components. This is absent in the draft decision. The revised cost proposal in section 4.3.2 has been developed using a weighted average of the AWOTE indices for Professional services, administration and support services, financial and insurance services and CPI for consumables, based on the proportion of costs in these categories in the corporate cost base.

4.3.1 Background

Aurizon Network originally submitted an in-depth and thorough method for allocating corporate overheads from Aurizon Holdings Ltd to the Aurizon Network Pty Ltd business. Section 10.2.2.1 of Volume 3 of Aurizon Network's 2013DAU proposal, suggested that historical cost allowances are not an accurate basis for assessing forward looking efficient costs. This is because Aurizon Network's organisational and structural changes and significant volume growth have fundamentally altered its cost structure.

In particular, the UT3 operating cost allowance:

- materially understated corporate overhead costs;
- was based on cost allocators in the Costing Manual that were not commensurate with the costs of providing coal carrying train services on a stand-alone basis and over allocated costs to the non-coal corridors;
- did not include real labour cost escalation; and
- did not include costs reasonably expected to be incurred by a publicly listed company, as QR Network (as it was at that time) was still part of the Government Owned Corporation.

These points were illustrated in section 10.2.2.1 of Volume 3 of Aurizon Network's 2013DAU proposal. Tables 57 and 58 in that section show how the separation of Queensland Rail from the Group at June 2010 resulted in a loss in economies of scale.

In their report, RSMBC supported Aurizon Network's assertion that the corporate cost allowance for UT3 was understated. While Aurizon Network has absorbed these costs for the duration of UT3, it would not be sustainable to do so into the future. Aurizon Network has not sought to recover the historical shortfall on these costs.

The Below Rail Financial Statements prepared for the year ended 30 June 2013 included an amount of $59.3 million for corporate overhead. This was calculated using the blended allocator and would reduce to approximately $47.2 million if the proportions for direct cost and FTE proposed by the QCA in the Draft Decision were applied.

It is difficult to compare this to the UT3 approved allowance, as corporate charges included in system wide and regional costs when the UT3 was approved were reported as corporate overhead costs for 2012/13 actuals. Aurizon Network estimates the UT3 allowance included approximately $17 million of costs now classified as corporate overheads.

In calculating the Weighted Average Cost of Capital (WACC) the efficient benchmark firm is assumed to be a listed entity and it is appropriate that the costs implied by this status are recovered.

"Bottom up" analysis of overhead

Whilst Aurizon Network is a separate company, it would not be efficient to have an overhead structure separate from the Aurizon Holdings Group. During UT3, Aurizon Holdings moved to a functional structure whereby overhead is incurred centrally, and not within the operating business functions (such as Aurizon Network).

We understand that a "bottom up" analysis was commissioned by the QCA on SunWater. SunWater operates as a stand-alone business and does not sit within a wider corporate group where corporate functions are undertaken centrally and require allocation to that business. Despite this simpler structure, the analysis took several months to complete and involved detailed interviews with representatives from each of the business functions to break down each function into sub-functions, activities and deliverables. The purpose of this was to gather specific information on how employees spend their time and to understand what costs within a function are directed to which activities.

An assessment was then made on whether these activities were core or non-core to the business and then benchmarking was undertaken on the dedicated labour resources against other utilities companies. The benchmarking database was an internal database, as there was no publicly available information for utilities down to a functional level.

The challenges for Aurizon Network in undertaking a similar analysis is that, like the utilities industry, there is no database of publicly available information on the transportation industry at a functional level by which to benchmark Aurizon Network. However, the American Productivity and Quality Centre (APQC) database used in the

benchmarking by Ernst & Young (EY) is publicly available and is at a granular level, attributing costs to activities performed by particular functions. This is discussed further in section 4.3.2 below.

Functions such as Finance, IT and Human Resources are common among all corporate entities, and not industry specific so it is possible to use data from a range of companies for the purpose of benchmarking, though where possible, it has been narrowed to the Transport and Distribution industry.

It is noted that the QCA Act does not define an "efficient cost". Therefore, it is open to interpretation whether an efficient cost is one that Aurizon Network needs to recover under the Pricing Principles or what some hypothetical optimally structured and operating business would need to recover.

4.3.2 Benchmarking of Corporate Costs

Aurizon Network implemented a robust approach to estimating efficient corporate costs for the 2013DAU, including independent benchmarking from Ernst & Young (EY).

The EY benchmarking analysis was based on a number of sources, including:

- the American Productivity and Quality Centre's (APQC) Open Standards Benchmarking Collaborative Database;
- the Global Audit Information Network Benchmarking Survey; and
- data from individual organisations approached for the purpose of the study.

The report concludes that overall, Aurizon Network's 2013DAU cost estimate for overheads place it within the benchmark range expected for a stand-alone business of a similar size and in a similar industry.

The benchmarking analysis completed by EY has been based on the costs that would be incurred by Aurizon Network as a stand-alone below rail network operator. Aurizon Network can confirm that this process did not result in a duplication of costs between Aurizon Network and Aurizon Operations. This was also confirmed by RSMBC in their report.[51]

There is a distinction between the activities reflected in the corporate overhead forecast costs allocated to Aurizon Network and the measurement of the corporate overhead costs. For clarity, the process by which the percentage of corporate costs applicable to Aurizon Network were calculated is as follows:

1. In constructing the Aurizon Network corporate overhead allowance, Aurizon Network identified the activities and functions that would be incurred by a publicly listed, stand alone, rail infrastructure business of commensurate scale in alignment with the functions in the APQC database;
2. The costs of the identified activities and functions were then assessed as a percentage of the Aurizon Group total corporate costs based upon the allocator applied.

Aurizon Network confirms that any savings from economies of scale, benefits from efficiencies and any additional cost savings targets on specific business areas within the Aurizon group have already flowed through to Aurizon Network in the proposed corporate overhead forecasts submitted in the 2013DAU.

The QCA notes that

> "…*they have not had the benefit of a rigorous bottom-up assessment of the corporate overhead costs of an optimally configured stand-alone business".* [52]

The benchmarking analysis compiled by EY involved matching corporate activities for which costing data was available in the APQC database to functions of the Aurizon Network business. This enabled EY to construct a reliable comparison of costs on a like for like basis.

Appendix 4.1 contains an explanation of the data sources and methodology employed by EY.

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[51] RSM Bird Cameron, 2014a, Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure, p. 59.
[52] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, pp. 78-79.

APQC is the largest open standard database of benchmark and performance metric data in the world. It gives organisations standardised definitions for functions, processes, and activities independent of business model or structure thereby allowing for apples-to-apples comparisons. All benchmarking data passes through a rigorous validation process.

Various measures such as 'cost per $1,000 of revenue' or 'cost as a percentage of revenue' were selected as the preferred benchmark types as they allow for easy and meaningful comparison across geography, function and industry. The 'costs as % revenue' metric was chosen for our benchmarking analysis due to its comprehensive data sets built upon significant sample sizes of participant companies for benchmarking purposes. Other metrics were not readily available across all the corporate service categories required for Aurizon Network.

The QCA has commented that

> *"while Aurizon Network did not specifically identify the two government-owned corporations used as benchmarks in the report, our understanding is that one of the government-owned corporations was Energex"*[53]*.*

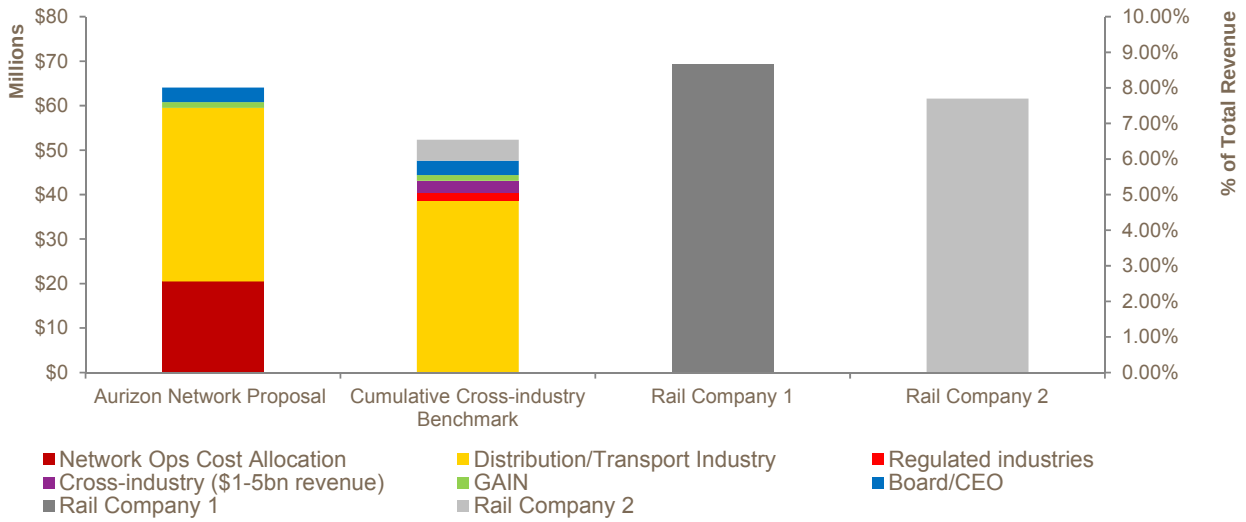
While the names of the companies used in the benchmarking need to remain confidential (as the information was provided to EY on that basis) we can confirm that Energex was not used in this benchmarking exercise and that both companies are in the rail industry, as was noted in the report. The comments made about inefficiency of Energex's costs are therefore not relevant to analysis of Aurizon Network's submission.

The original and revised proposed corporate cost allowance (refer Table 4.12 below) are lower than Rail Company 1 and only slightly more than Rail Company 2 benchmarks. Rail companies 1 and 2 have been included for comparative purposes and the costs of those companies do not form part of the revised Cumulative Industry Benchmark as illustrated below.

- Rail Company 1 was a large State-owned Asia-Pacific Rail company operating network, yards and facilities, freight, passenger, rolling stock and engineering services.
- Rail Company 2 was a large, Government-owned Asia-Pacific Rail non-passenger company specialising in the provision of rail infrastructure and maintenance.

The composition of the cumulative cross-industry benchmark is outlined in Table 4.12 – refer 'Cumulative Industry Benchmark Source' column. Reference should also be made to the EY Benchmarking report.

Figure 4.1 – comparison of corporate overheads against benchmark companies



[53] Ibid, p. 74.

4.3.3 Allocation Methodology

In response to the under-recovery of corporate overheads in UT3 and challenges of a bottom up analysis, Aurizon Network applied an allocation methodology for the 2013DAU consistent with approaches used by other regulated businesses in Australia and accepted by their respective regulatory bodies.

The methodology for the calculation of the corporate overhead allowance is outlined in section 10.2.4, Volume 3 of Aurizon Network's 2013DAU proposal. Aurizon Network has calculated corporate overhead using a cost allocation methodology based on both causal and blended allocation bases. For costs which could not be directly identified to Network, allocators were applied to the forecast Aurizon Holdings Group corporate overhead costs, and comparison made to benchmarks.

In the draft decision, the QCA commented that Aurizon Network prepared the cost estimates using 2011/2012 as the base year and escalated these costs. This is not correct – costs were projected from the 2012/13 year forecast.

We believe that this methodology is aligned with commonly accepted principles for an appropriate cost allocation methodology, being that it should:

- directly attribute costs whenever practicable
- consider the inherent accuracy of each driver's data source
- treat similar types of costs consistently
- make appropriate trade-offs between simplicity and accuracy
- be aligned with other players in the industry.

The analysis by RSMBC did not demonstrate a strong correlation between total direct spend in Aurizon Network and the consumption of corporate overhead in the Aurizon Network business. RSMBC did not substantiate or provide conclusive evidence that Aurizon Network's submitted operating allowances are not efficient.

Research undertaken by EY and presented in their report, indicates that the use of a blended allocator in the absence of a clear causal driver of costs is supported by regulatory precedent, particularly for regulated firms with similar characteristics. Aurizon Network proposed that the blended allocator comprise assets, revenue and FTE's for the following reasons:

- *asset Value* - Aurizon Network's asset base makes up almost 50% of those of the Aurizon Limited group
- *revenue* - Aurizon Network accounts for over 25% of the total Aurizon Limited group earnings before interest and tax
- *FTE* – EY as part of their benchmarking exercise confirmed that FTE was *'…an acceptable component of the blended rate and are commonly used as a causal allocator. Regulatory precedence also supports the use of FTEs as a component in a blended allocator [for example, Energex and Aurora]'*[54]

RSMBC proposed the use of an alternative cost allocation methodology to allocate overheads for cost centres where no clear cost driver can be determined:

> *… may be appropriate based upon:*
>
> - *This is the most commonly adopted methodology in the regulatory environment*
> - *It is the primary methodology adopted by Energex, the company that Aurizon Network has identified as a comparable business.*[55]

RSMBC's response is misleading as the methodology used by Energex is to allocate direct costs between services *within* the regulated business, not between the regulated and non-regulated elements of its business. Aurizon Network understands that Energex uses a three factor (blended) allocator to distribute costs between the non-regulated and regulated segments of their business. Aurizon Network maintains that the approach of Energex is directly comparable to the use of the blended allocator within the Aurizon Group.

[54] Ernst and Young, 2012, Benchmarking of Corporate Overhead Costs for QR Network Pty Ltd , p. 8 and p. 27.
[55] RSM Bird Cameron, 2014a, Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure, section 3.101.

Whilst Aurizon Network recognizes the point made by RSMBC that the scale of the non-regulated activities was a factor in determining the cost allocation methodology to apply, Energex have stated that the blended factor it applied was the

> *"most appropriate when considering simplicity in its application, capable of being replicated by the AER and the most representative cost drivers"*[56]*.*

Energex further states that the blended allocator

> *"better reflects the economic and efficient costs of the services provided. Utilising the three factor method allows consideration to be taken of the materiality, scale and size of the non-regulated activities in comparison to the regulated activities."*[57]

Citipower and Powercor are further examples of where a blended allocator has been used for the allocation of substantial shared costs including system operations, general and administration, health and safety, training, motor vehicle running costs, computer systems, voice communication and salary costs.[58]

In their report, RSMBC have also stated that:

"…we consider:

- *that there is generally a stronger correlation between an entity's direct costs and its corporate overhead costs than the value of an entity's assets and its corporate overhead costs".*[59]

RSMBC did not provide any further context or substantiation in support of this statement.

Aurizon Network disagrees with this view as allocable corporate costs (including Information Technology, Safety, CEO, Finance and Board) do not have a strong causal relationship with the main direct costs of the Aurizon Network business. The costs of the Aurizon Network business used in the direct cost percentage proposed by QCA largely comprise maintenance, train control and infrastructure management, commercial and regulation, insurance and professional services and fees. It is difficult to understand how these costs have a strong correlation with overhead costs.

We note the QCA concerns that by including both revenue and asset values in the blended allocator, it could be too heavily skewed towards asset value (since a significant portion of MAR is a return on assets). This could be resolved by including the direct costs in the three factor blended allocator (along with asset value and FTEs) instead of revenue. This change to the blended allocator was suggested as an alternative in the RSMBC report.

Aurizon Network believes that an allocation of corporate overheads using the direct cost method results in a substantial understatement of costs which would then be imposed on the un-regulated parts of the Aurizon Group. The blended allocator should not be rejected in favour of the proposed direct cost methodology in the absence of more conclusive justification. Indeed, in the addendum to their report, RSMBC acknowledges:

> *"…we are not able to conclusively demonstrate that the blended allocator is not appropriate".* [60]

Aurizon Network maintains the position that the allocation of corporate overhead costs (not subject to specific cost drivers) using the three factor combination of revenue, assets and FTE's (the proposed blended allocator) is reasonable. This methodology has regulatory precedence and results in an allocation of costs within appropriately adjusted comparator benchmarks.

While in our revised cost proposal below in section 4.3.2 we have used the Cumulative Industry Benchmark for the basis of the allowance, we believe our original cost allocation methodology, supported by the use of benchmarks to validate that the methodology results in a reasonable allocation overall is a better approach. It would be logical to

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[56] Energex Limited, 2009, Cost Allocation Method, p. 22.
[57] Ibid.
[58] Ernst and Young, 2012, Benchmarking of Corporate Overhead Costs for QR Network Pty Ltd , p. 27.
[59] RSM Bird Cameron, 2014a, Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure, p. 52.
[60] RSM Bird Cameron, 2014b, Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure – Response to Aurizon Network's Submission dated 7 March 2014 – Addendum Report , p. 5.

apply the same methodology as that for the actual costs to the calculation of the allowance and actual costs can only be reported by way of an allocation methodology.

Calculation of Allocators

The QCA's calculation for the direct cost allocation method includes labour and consumables costs, excluding electricity and fuel. It also excludes capital costs. Aurizon Network believes that replacement of the blended allocator which included asset values with a direct costs allocator which excludes capitalised costs from the calculation results in an unreasonably lower allocation of corporate overhead for many functions and would also lead to an understatement of costs reasonably attributable to Aurizon Network such as:

- procurement for Aurizon Network
- safety (mitigating assets from major incidents and damage- including those assets under construction)
- insurance (arranging cover for CQCR declared assets and other insurance types)
- IT (systems used to monitor assets)
- finance (who provide advice on funding of the assets and maintenance of fixed asset register).

Aurizon Network is an asset intensive business, yet this seems to have been neglected by a failure to include the asset base or capital expenditure into the allocation basis.

If the direct cost percentage calculation is to be used, energy and fuel costs should be excluded as proposed, and track access costs should similarly be excluded. Aurizon Holdings direct costs for 2012/13 included $328.9 million of external track access costs related to above-rail business[61] which we also believe have no correlation with overhead costs incurred in relation to the Network business.

Calculation of Allocable Cost Base

In their review, RSMBC proposed some reductions to the corporate cost base to which the allocators have been applied, with the most significant adjustments being the overall corporate overhead stretch target[62]. It appears these recommendations have been adopted by the QCA.

The reductions included an overall stretch target of [redacted] million in savings from the 2013/14 corporate plan relating to the Enterprise Services which had not been split to a lower sub functional level. RSMBC noted in their report that no consideration was made in the UT4 corporate cost allocation of this particular stretch target[63].

While it was not known at the time in which sub-function these cost savings would be achieved, it is likely that such savings may be achieved from activities initiated by the Procurement division, for example - negotiations with suppliers, but for which the actual cost savings will be achieved in other functional areas in the form of direct costs of goods/services procured. The costs of the Procurement function are restricted to labour and on costs. While this team will be actively pursuing savings opportunities, these are most likely to accrue to other functional areas such as Aurizon Operations. The cost savings attributed to Network are most likely to be savings in capital costs (because the largest part of Network spend relates to capital expenditure) which customers will receive the benefit from in the form of lower RAB values.

Stretch targets had been included across all functions within the 2013/14 corporate plan, and hence by applying the RSMBC proposed reductions to Finance, General Counsel and Company Secretary, Safety, Health and Environment and Enterprise Strategy and Branding, such savings will be taken into account. Further, Aurizon Network notes that for the 2012/13 4+8 forecast from which the UT4 cost estimates were derived, cost saving targets were also included at that point in time.

In the draft decision the QCA notes that reductions have been made to the cost base for costs associated with corporate restructuring and business re-engineering. It is unclear which particular functions or cost centres have been excluded on this basis. We assume this includes Operational Effectiveness, Innovation and parts of Capital

[61] Note: Access charges paid by Aurizon Operations to Aurizon Network are eliminated on consolidation of the Group.
[62] RSM Bird Cameron, 2014a, Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure, p. 108.
[63] Ibid, p. 107.

Excellence. Accordingly, we have excluded these from the revised benchmark calculated in Table 4.12 below. However, we note that incurring these costs has made and continues to make Aurizon Network more responsive and efficient.

4.3.4 Revised Benchmarking Including Asset Maintenance

While the Draft Decision rejects the blended allocation methodology in favour of the direct cost methodology, it appears that there are various reductions that have been made to the allocated costs drawing on this methodology in deriving the total proposed allowance.

Aurizon Network is willing to apply a consistent costing methodology for corporate overhead between the asset maintenance division and other divisions of the Aurizon Network, and has calculated an indicative CIB to include asset maintenance (AM), and exclude the non- benchmarked functions since it appears that QCA is not supportive of many of these costs being included. The previous cumulative benchmark (excluding AM) of $49.7 million ($44.5 million excluding the non-benchmarked functions) thereby increases to $51.1 million also excluding the non-benchmarked functions.

In the original submission, the benchmark data was used to validate the allowance calculated using the cost allocation methodology. However, if it is the preference of the QCA not to use an allocation methodology, then Aurizon Network submits that these benchmarks are appropriate to use as a starting point for the build-up of the allowance.

Note in the table below Network Finance has been included within Finance for benchmarking purposes, but is proposed to be excluded from the corporate cost allowance and included as a direct cost.

Aurizon Network's revised proposal is based on the CIB (including AM). The total proposed corporate cost allocation is $58.6 million – being the adjusted benchmark of $64.1 million, less direct Network Finance costs. The revised proposal utilises the CIB from FY13 (indexed at 3.7% to FY14) for all functions except Legal and Safety (where Aurizon Network’s operations require more focus in these areas than an average company) and Real Estate as explained in section 4.4.5.

Aurizon Network is of the view that it is appropriate for costs of the National Policy, Operational Excellence and Branding functions to be included in the cost allowance. However, Aurizon Network has taken a conservative view, and have not included them in the revised cost proposal below.

Further, Aurizon Network believes that the amounts in the CIB for General Counsel and Corporate Secretary and Safety, health and environment are inadequate due to the specific industry factors as discussed in sections 4.4.3 and 4.4.5 below.

Table 4.12 – Ernst and Young benchmarks for Corporate Overhead cost allocation

		Original Submission		Benchmarks			Revised Submission		
		UT4 Submitted costs (excluding AM) (FY13 base) $FY13	UT4 Submitted costs (including AM) (FY13 base) $FY13	Cumulative Industry (excluding AM) $FY13	Cumulative Industry (including AM) $FY13	Cumulative Industry Benchmark Source	Cost derived from QCA Proposal (including AM) $FY14	Aurizon Network Revised Proposal (including AM) $FY14	Source for Aurizon Network Revised Proposal
		(1)	(2)	(3)	(4)		(5)	(6)	
Board & CEO	Board: Managing Director & CEO	$ 2,114,563	$ 5,436,193	$ 3,157,000	$ 3,157,000	ASX Data		$ 3,273,415	Cumulative Industry Benchmark
Finance (including Network Finance)	Tax; Treasury; Investor Relations; Shared Services; and Capital Excellence	$ 9,004,155	$ 11,409,875	$ 8,490,836	$ 10,141,412	Distribution/Transport industry		$ 10,515,378	Cumulative Industry Benchmark
Enterprise Services	General Counsel and Company Secretary	$ 7,372,462	$ 8,867,956	$ 2,224,552	$ 2,656,994	Cross Industry $1 - 5bn		$ 6,100,174	Allocation Method (direct costs)
	Internal Audit and Enterprise Risk Management	$ 1,972,471	$ 2,053,562	$ 1,253,532	$ 1,253,532	GAIN Median $500m - $1bn		$ 1,299,756	Cumulative Industry Benchmark
	Information Technology	$ 19,755,261	$ 25,280,081	$ 14,931,748	$ 17,834,405	Distribution/Transport industry		$ 18,492,051	Cumulative Industry Benchmark
	Non-benchmarked: National Policy	$ 860,506	$ 519,260	$ 860,506	$ -	$ -		$ -	
Human Resources	Talent and Organisational Development; Resourcing and Services; Remuneration and Support; Employee Relations; and HR External Relations & Communications	$ 3,178,839	$ 5,334,406	$ 6,946,997	$ 8,297,459	Distribution/Transport industry		$ 8,603,429	Cumulative Industry Benchmark
Business Sustainability	Safety, Health and Environment	$ 6,368,988	$ 6,632,113	$ 1,747,862	$ 1,747,862	Regulated industries		$ 6,465,752	Allocation Method (direct costs)
	Enterprise Real Estate	$ 4,979,847	$ 5,734,490	$ 4,599,558	$ 4,599,558	Company 2		$ 7,892,918	Combination of methods
	Enterprise Procurement	$ 2,844,885	$ 2,960,342	$ 1,158,674	$ 1,383,914	Distribution/Transport industry		$ 1,434,946	Cumulative Industry Benchmark
	Non-Benchmarked: Innovation; Operational Excellence, Enterprise Effectivness	$ 3,256,144	$ 3,386,133	$ 3,256,144	$ -			$ -	
Strategy	Strategy, Enterprise Business Development; Branding; Solution Design and Support	$ 1,761,839	$ 2,464,320	$ 1,092,937	$ -	Company 1		$ -	
Other	Uncategorised cost reductions	$ -	$ -	$ -	$ -			$ -	
Total Network Corporate Overhead Cost Allocation		$ 63,469,960	$ 80,078,732	$ 49,720,346	$ 51,072,135		$ 46,240,000	$ 64,077,821	
Network Finance		($ 5,147,347)	($ 5,147,347)					($ 5,499,539)	
Restated Total		$ 58,322,613	$ 74,931,385					$ 58,578,282	

(1) Total cost allocations for 2012/13 used as the base year for costs submitted for UT4 excluding overheads related to Asset Maintenance
(2) Total cost allocations for 2012/13 (excluding Asset Maintenance) plus estimate of Maintenance Service Overheads benchmarked by Deloitte
(3) Cumulative Industry Benchmark – EY Benchmarking of Corporate Overhead Costs for Aurizon Network Operations 22 January 2013
(4) Cumulative Industry Benchmark – based on the EY Benchmarking of Corporate Overhead Costs for Aurizon Network Operations, and adjusted to include Asset Maintenance and exclude non benchmarked functions disallowed in QCA's Draft Decision
(5) Proposed costs from QCA including Asset Maintenance in draft decision allocation by function has not been provided by QCA
(6) Aurizon Network revised costs including Asset Maintenance

In the addendum to their report, RSMBC revised their calculation of the direct cost percentage to exclude energy costs which resulted in an allocation of $39.6 million (prior to revisions) and $36.9 million (after revisions). Since they recommended the QCA make the proposed revisions, they should compare the 'after revisions' costs to the EY benchmark.

However, RSMBC note that

> *"the Direct Cost Allocation Methodology (prior to any revisions) is broadly consistent with EY's Cumulative Industry Benchmark"*[64]

The after-revisions cost of $36.9 million is significantly lower than $50.9 million (the cumulative benchmark excluding asset maintenance indexed at 2.5% CPI for illustrative purposes).

The QCA proposed cost allowance includes further revisions to the costs calculated by RSMBC using the direct cost method, and includes an allowance for asset maintenance, resulting in a total allowance of $46.2 million. Whilst this may be broadly consistent with the original CIB, it is much lower than $52.3 million (the cumulative benchmark indexed at 2.5% CPI for illustrative purposes) which Aurizon Network considers to be a conservative benchmark.

[64] RSM Bird Cameron, 2014b, Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure – Response to Aurizon Network's Submission dated 7 March 2014 – Addendum Report, p. 6.

Under regulatory convention, Aurizon Network should be entitled to recover the operating expenses that would be incurred by a stand-alone business operating efficiently. The benefits of shared services which Aurizon Network is passing on represents a windfall to users that needs to be considered when assessing allowances elsewhere.

4.4 Functions Included in the CIB and Revised Cost Allowance

There is not sufficient detail in the QCA's Draft Decision for Aurizon Network to compare at a functional level its submitted costs or the components of the CIB with the QCA's proposed cost. There is a case for including amounts that can be readily benchmarked in the cost allowance, and the analysis below discusses each of these benchmarks.

Unless otherwise specified, amounts mentioned below are for the 2013/14 year in 2013/14 dollars.

4.4.1 Board & CEO

In preparing their report on maintenance service overheads, Deloitte compiled information from 20 publicly listed mining services companies' annual reports for 2011 and 2012 to use as estimates for CEO's salary and non-executive directors fees. They estimated total cost for the office of CEO and a 5 member Board to be $2.02 million, including very conservative consultants' costs of $0.2 million.

In addition to salary costs, the CEO is also entitled to short-term and long-term incentives. For the 2013/14 year, total remuneration for the CEO of the Aurizon Holdings Group was $5.1million.[65] Remuneration for non-executive Board members is $190,000 including superannuation.[66]

The benchmarking report prepared by Ernst & Young referred to benchmark CEO & Board costs of $3.2 million for ASX listed companies within 50%-200% of Aurizon Network revenue. This comprised:

- CEO Fixed remuneration: $1,078,000
- CEO Short-term incentive: $519,000
- CEO Long-term incentive: $576,000
- Board: $984,000 (based on Chairman fee of $241,000 non-executive director fee of $124,000 and a median number of non-executive directors per company of 6)

CEO & Board costs were obtained for one of the specifically benchmarked rail organisations and were $4.89 million (unadjusted for size of company's revenue).

An amount of approximately $1.4 million would be derived by applying the QCA revised allocation percentage to cost base and Aurizon Network is strongly of the view that such an amount is too low and does not adequately reflect costs that would be incurred for a CEO and Board on a stand-alone basis. It is also noted that an allocation using a blended rate as originally proposed by Aurizon Network would also result in a lower allocated amount than the benchmarked amount. Aurizon Network accepted this lower amount in its original submission because costs for EVP Network were also being recovered in the system-wide and regional cost allowance.

The costs estimated by Ernst & Young and Deloitte are similar when short and long-term incentives are added to the Deloitte costs. Accordingly, we are of the view an allowance of $3.2 million in accord with the Ernst & Young benchmarking is more appropriate for the Aurizon Network company (including maintenance activities) and is the minimum that would enable it to recover its efficient costs of providing access as a private company.

4.4.2 Finance (Excluding Network Finance Function)

In section 4.2.6 it is proposed that Network Finance be included in the business management support costs rather than corporate overhead. This also aligns with the principles of an appropriate cost allocation methodology (set out in section 4.3.3) that costs be directly attributed wherever practicable. Total costs for this team for the 2013/14 year

[65] Aurizon, 2014, FY2013/14 Annual Report, p. 42.
[66] Ibid, p. 48.

were $5.5 million. Services provided by the Network Finance team are outlined in section 4.2.6. Additional services that would be required and are not provided by the Network Finance team are outlined below:

Treasury, Tax & Governance

- establishment of Treasury Policy and credit policies
- develop cash flow forecasts and manage liquidity
- manage and oversee banking relationships (of syndicated facility with multiple banks)
- process and oversee electronic fund transfers between banking facilities
- establish and manage debt facilities
- process and oversee debt and investment transactions, including foreign currency
- manage financial risks – interest rate, liquidity, foreign exchange
- develop and execute hedging transactions, and evaluate and refine hedging positions
- develop tax strategy and plan
- calculate current and deferred income taxes and prepare income tax returns
- monitor tax compliance and address tax inquires
- provide specialist advice to the business on potential and executed transactions

Finance Shared Services – Accounts Receivable, Accounts Payable, Payroll Services

- establish policies and procedures for payroll and vendor payments
- process payments including employee reimbursements, investigate/resolve exceptions and queries
- establish policies and procedures for processing of payroll
- analyse and report paid and unpaid leave and employee utilisation
- maintain and administer employee earnings, superannuation and applicable deductions information
- process payroll and associated payments, including payroll taxes
- produce annual employee tax statements and respond to queries
- file regulatory payroll tax forms
- maintain customer master files, generate and transmit billing data to customers, resolve billing enquiries.
- receive/deposit customer payments
- produce credit/collection reports
- post accounts receivable and accounts payable activities to the general ledger
- maintain/manage electronic commerce

Costs of the activities below performed by the Group Accounting, Planning & Reporting team and not by the Network Finance team are included in the benchmarked costs of Finance.

- Fixed Assets
  - establish fixed assets policies and procedures
  - process fixed asset additions, disposals, transfers and depreciation
  - reconciliations of fixed asset register to general ledger
  - arrange stocktakes of fixed assets
  - provide fixed asset data to support tax, statutory and regulatory reporting
- General Accounting
  - maintenance of financial systems/ general ledger
  - reconciliation of general ledger accounts
- Technical Accounting
  - establishment of accounting policies
  - technical accounting advice on projects and accounting issues

Treasury

It should be noted that the costs of Treasury as defined above are separate from the equity raising costs Aurizon Network has proposed to include in the RAB as part of capital expenditure and debt raising costs included in the calculation of the WACC.

Equity and debt raising costs include interest during construction and upfront financing costs to raise the debt and/or equity capital required to finance the project. These are costs that are paid to financial institutions and do not include any of the internal labour associated with negotiating the establishment of the facilities with the financial institutions or any of the other activities described above as relating to the Treasury function. External costs associated with debt/equity raisings such as fees to investment banks, legal fees and other professional fees are also included as part of debt/equity raising costs and not within operating expenditure.

Investor relations

In the draft decision, the QCA expresses its view that investor relations costs are relevant to the operations of Aurizon Holdings but that it is unclear they would be part of the efficient cost base of a stand-alone business. As a listed company, there are ASIC and ASX requirements that need to be maintained (e.g. continuous disclosure requirements), and it is also imperative to keep investors and analysts informed about the performance of the company to maintain share prices. The Group also has debt capital market disclosures in Australian and Singapore (from the listing of the European Medium Term Note in September 2014).

We can only assume that in the QCA's view, activities performed by the Investor Relations managers could be absorbed by other areas of the business in an efficient stand-alone company. Even if that were the case, there are other incremental costs currently incurred with the Investor Relations cost centre that would need to be incurred by Aurizon Network as a stand-alone company. These costs include results presentation to analysts and debt and equity investor roadshows – domestically and overseas, consultancy costs for research/reports on market and investor sentiment and conditions, and monthly shareholder analysis.

Aurizon Network's proposed costs for Investor Relations were split approximately 40% labour and on-costs and 60% other costs such as travel and technology support. Using the QCA's revised allocator, a cost of approx. $0.4 million would be attributed to the Investor Relations function which we believe is reasonable and takes into account the scale of a Network stand-alone business compared to the Aurizon Holdings listed entity.

Total Finance costs

Applying an allocator to the costs of these functions (excluding Group Accounting, Planning & Reporting) used in the UT4 submission modelling results in a cost of between $2.6 million (direct costs allocator) to $4.2 million (originally submitted blended allocator).

A total cost of Finance (including Network Finance) of $8.14 - $10.4 million compares favourably to the benchmarks obtained by Ernst & Young in their report. The costs of $1.88 million estimated by Deloitte for Finance Services in the estimate of Maintenance Services Overheads covered only 10 staff which is well short of the resources required for the entire Network business, and hence is not comparable. While Network Finance is included in Finance only for benchmarking purposes, it will not be part of corporate overhead as it is proposed to be included in Business Management in line with accepted principles for appropriate costing methodologies. The revised cost proposal includes the EY benchmark cost of $10.5 million.

4.4.3 Enterprise Services

General Counsel and company secretary

Company secretary

Applying the QCA proposed allocator to the cost base proposed by Aurizon Network for 2013/14 and adjusted for the cost savings recommended by RSMBC, a cost allowance of approximately $0.4 million is derived for the company secretarial function, which Aurizon Network believes under-estimates the costs that would be incurred for Aurizon Network as a stand-alone business, submitted as $1.4 million.

Deloitte estimate the following costs on corporate overhead for maintenance activities for a company with $200 million in annual revenue and approximately [redacted] employees:

- ASX fees, share registry charges and associated expenses: $151,000;
- Cost of the annual report (development and distribution): $152,000; and

- Cost of the AGM including cost of a video, mail out of notice of meeting and other professional services relating to the co-ordination and execution of the meeting: $110,000

All of these costs would be required by Aurizon Network as a stand-alone listed company, with almost $1 billion in annual revenue – significantly higher than the company for which Deloitte estimated these costs.

The Annual ASX Listing fee for a company with a value of quoted securities from $1 billion to $10 billion is $73,889 + 0.001232% on excess over $1 billion.[67] Share registry costs vary with the number of shareholders. Costs become incrementally cheaper as the number of holders increases.

Under Aurizon's current contract with Computershare, for the number of holders being between 0 – 40,000 the cost is [redacted] per holder. This equates to a cost of [redacted]. The next bracket is 40,001 – 100,000 at [redacted] per holder. There is a minimum cost of $5,000 per month ([redacted] per year).

There are additional costs for disbursements such as printing and postage of new shareholder packs, printing of personalised stationery and storage costs. Aurizon Holdings also currently incurs management fees for employee share plans, but Aurizon Network accepts that these would not necessarily be required for Aurizon Network as a stand-alone company. The ASX fees, share registry and associated expenses for Aurizon Network as a listed company are estimated to be at least double those in the Deloitte report for the management services company.

The costs originally proposed by Aurizon Network also includes allowance for employee costs for a corporate secretary and support staff member. The company secretary is the prime interface between the Board and Management, and is responsible for ensuring compliance by Aurizon with the statutory obligations specified under the Corporations Act and the governance requirements set out in the ASX Listing Rules. As such, it is an integral function to a listed company and Aurizon Network also submits that employee costs should also be included in the corporate cost allowance

Aurizon Network acknowledges that the original costs submitted for the Company Secretary function are higher than actual costs incurred for 2012/13 and 2013/14 mainly due to differences between expectations and actual number of shareholders. However, we believe that the cost of $0.9 million derived from the application of the QCA allocator to the original cost base is representative of the costs for a stand-alone company like Aurizon Network and has been included in the revised proposal.

General Counsel

The costs originally submitted for General Counsel were $6.2 million – comprising the all costs relating to the distinct Network Legal division (internal and external legal costs) and an allocation of the corporate legal division. The revised proposal includes costs of $5.2 million using the direct cost allocator. Aurizon Network does not consider there is any duplication of costs by including an allocation of the corporate legal division.

The Aurizon Network Legal division are responsible for all Network specific matters (in relation to which a separate team handles ring-fenced matters). Activities performed by the Aurizon Network legal division are outlined below:

- legal preparation, implementation and interpretation of access undertakings and amending access undertakings
- legal preparation, interpretation of projects
- legal preparation, interpretation, amendment and enforcement of access agreements and associated documents
- preparation, negotiation, interpretation, amendment and enforcement of rail infrastructure construction agreements and associated documents
- preparation and negotiation of transfer facility licences
- preparation and negotiation of interface agreements
- advising on access undertaking, and training in relation to compliance
- advising in relation to legal compliance generally

- advising in relation to safety related matters including interpretation and review of safety legislation (rail, work health and safety, electrical) and application, interpretation and review of safety management system
- advising on existing access agreements, force majeure events, capacity transfers and swaps
- advising on complex tenure arrangements such as rail corridor and rail infrastructure leases
- advising on tenure related issues, including rail crossings, way leaves, pipelines, pipeline deeds, telecommunication crossings, volumetric easements
- procurement of external legal advice (e.g. for litigation)
- assisting in relation to unanticipated events such as safety incidents, counterparty issues such as restructure, administration and insolvency
- advising in relation to governance and compliance generally.

In a stand-alone company, the resources currently in the Network Legal team would need to be supplemented with additional resources who currently undertake the following activities from an Aurizon Holdings Group basis:

- commercial contract review including construction, it, procurement
- human resources legal support as required
- transactional support, including banking agreements and offering documents for debt issuances
- project support
- continuous disclosure requirements

Aurizon Network accepts a reduction of the same percentage applied to Commercial Development and Regulation to reflect a portion of work on non-regulatory activities.

The benchmark included in the CIB was across industry as there was insufficient data at this functional level for the Distribution/Transport industry. It was explained in the EY report accompanying the original submission that the costs allocated for Aurizon Network were higher than the cross industry benchmark given the high level of compliance requirements of operating in a regulated environment in the transport industry. This was also evidenced by high costs for Rail Company 2 in the benchmarking analysis.

It is important to note that Aurizon Network is subject not only to complex economic regulation, but also to multi-faceted operational regulation. For example, where most businesses are regulated by one or two safety regulators, Aurizon Network is regulated by Work Health and Safety, Rail Safety, Electrical Safety and Mining Safety regulators.

Aurizon Network is also subject to complex tenure arrangements for both its rail corridor land and rail infrastructure. These include two separate infrastructure leases from two separate lessors, and two rail corridor subleases, one of which is concurrent with another rail operator. As the SUFA project exemplifies, these tenure arrangements, when overlaid with existing access and regulation arrangements, result in relatively complex legal structures and considerations.

Internal Audit and Enterprise Risk Management

Internal audit is an integral function of a listed business. This division provides independent and objective assurance to Management and the Board on the adequacy of governance, risk management and internal control systems and procedures. The team operates under an internal audit charter and also manages the investigations of alleged fraud and corruption. The activities undertaken by this team are not duplicated with Finance. Work performed by Internal audit is utilised by external audit to avoid duplication and reduce costs.

Aurizon Network's proposed cost for Internal audit was $0.9 million, which would reduce to approximately $0.5 million using the QCA proposed allocator.

The QCA's view is unclear on the costs associated with enterprise risk management function of the business, and whether they are included in the category of those costs that are not considered necessary to the same extent as for an efficiently operated stand-alone business of similar size and in a similar industry.

Consequently, Aurizon Network would take this opportunity to reiterate the purpose of the enterprise risk management – which is to provide enterprise-wide services and approach to assess and continuously improve the

effectiveness of risk management, business continuity and compliance processes and controls. A major component of this function is the management of workers compensation and other insurances.

Aurizon Network's proposed cost for enterprise risk management was $1.2 million, which would reduce to approximately $0.7 million using the QCA proposed allocator.

The benchmark of $1.3 million included in the CIB is from the GAIN report as there was insufficient data at this functional level for the Distribution/Transport industry. The GAIN report is for Internal Audit only and is therefore considered conservative. Nevertheless, Aurizon Network is willing to accept an amount of $1.3 million for the combined Internal Audit and Enterprise Risk Management functions in the cost allowance.

Information Technology Costs

Aurizon Network's submitted operating costs includes $25.3 million for Information Technology (including relating to Asset maintenance). Using the QCA proposed direct cost allocator Aurizon Network is willing to accept an allocation of approximately $18.3 million based on the EY CIB which is sourced from the Distribution/Transport industry. It is also in line with the independent benchmarking performed by ITNewcom (refer below).

It is not surprising for Aurizon Network's IT costs to be higher than the median values for cross industry and distribution/transport industry due to the cost intensive telecommunications backbone system not typically found within other industries.

Aurizon Network has developed a telecommunications network for the purpose of linking train control centres to signals and other safe working communications. Over the years the backbone has been expanded in size, complexity and technical sophistication to cater for technical developments in train control and signalling. The core assets of the network include pole routes, optic fibre installations, microwave links, radio networks and associated interface equipment to manage the train control systems in the Network Control Centre.

Aurizon Network engaged ITNewcom to provide a costing for IT services required if Aurizon Network were a stand-alone company, not part of the Aurizon Group. ITNewcom is one of Asia Pacific's leading IT advisory and benchmarking firms as outlined on pages 26-29 of their report. This benchmarking exercise found the costs to be $18.1 million.

The full report from ITNewcom is attached as Appendix 4.3.

Aurizon Network's UT4 submission outlined capital expenditure on an integrated operational planning and scheduling system (known as APEX) to be commissioned during 2015/16. The cost estimate from ITNewcom is annual run cost based on 2013/14 and hence does not include the software maintenance and support services costs for this system of approximately $1.8 million per year. In the revised cost allowance, Aurizon Network has escalated the benchmark cost without adjustment for a step up of costs in the outer years relating to APEX. Hence the benchmark/allowance is considered to be conservative when considering the costs over the entire UT4 period. It is considered that these costs should be added in to the allowance once the project is finalised.

4.4.4 Human Resources (Including External Relations and Communications)

Aurizon Network's originally submitted operating costs included $5.3 million for Human Resources (including relating to Asset maintenance). This compares favourably to the Ernst & Young benchmark for the Distribution/Transport industry and Rail Companies 1 and 2 included in the benchmarking. The costs for Network (excluding asset maintenance) were primarily derived from applying the FTE percentage to the corporate cost base.

Applying the QCA revised FTE allocator and the adjustment recommended by RSMBC, it is estimated that the allocation of Human Resources costs would total $6.1 million. This has been calculated using Aurizon Network's methodology but using direct costs instead of the blended allocator and an increased FTE percentage to include Asset maintenance employees. An adjustment would also need to be made to the Network specific cost centres which had only been included at 21% based on the split of the Network function (as it existed at the time) employees between Operations, Asset maintenance and Engineering & Project Delivery. The costs allocation

would increase by approximately $0.5 million when including Asset maintenance into the allocation of the cost centres identifiable specifically to Network.

Based on comments made in the Draft Decision, it seems likely that costs of External relations and communications (approximating $0.6 million using the updated FTE%) have been omitted from the QCA proposed cost allowance. Aurizon Network rejects such an omission.

External relations and communications are required functions which are not duplicated within the Regulation or Investor Relations teams. It is necessary to keep stakeholders and other interested parties within the community informed about status of projects and activities being undertaken in the CQCR. It should be noted that corporate and community sponsorships were excluded from the submitted costs. The costs include subscriptions paid to various Regional Economic Development Corporations and various publications and consultancy fees paid for government relations strategies.

The Deloitte report on Maintenance Service overheads includes labour costs of $438,000 for a Corporate Affairs function being responsible for: handing inquiries from stakeholders, government departments and Ministerial offices; media relations; management of stakeholders; community relations. The cost was calculated on the assumption of three staff including a communications manager, corporate affairs manager and a communications coordinator with an average salary cost of $146,000 per person as defined in KPMG's corporate cost benchmarking report for LinkWater. On the same basis, Aurizon Network submits that it should receive an allowance of between $0.4 million and $0.6 million for External relations and communications.

Aurizon Network believes the allowance for Human Resources should be at least $6.5 million on the basis of the costs derived from the allocation approach, including External relations and communications and an uplift to identifiable Network costs to include the Asset maintenance portion.

The CIB costs of $8.6 million included in our revised submission for Human Resources are higher than costs derived using the allocation method. Using the cumulative benchmark as a basis for the cost allowance requires the acceptance that for some functions (such as Human Resources) the benchmark may be higher than allocated costs, but for other functions (such as IT) the benchmark is lower than using the allocation methodology.

4.4.5 Business Sustainability

Safety, Health and Environment

Safety is a core value of the Aurizon Group and underpins all activities in all parts of the business. Section 10.2.4.2 of our original submission noted the improvements that had been made in key safety metrics over the last few years. This exceptional performance has continued, as noted in Chapter 1.

Using the revised allocators and correction of deprecation cost duplication, the cost allowance would include approximately $6.5 million for safety, health and environment costs. Aurizon Network's submission included $6.4 million for this function (as part of operating costs). This was based on $4.0 million of directly identifiable labour and consumables costs and $2.4 million of allocated labour and consumables costs. Labour costs were allocated using the FTE percentage and consumables costs using the blended percentage.

The Deloitte report on maintenance services overheads did not include any component of costs for safety, although this would appear to be an oversight rather than an intentional omission. The UT4 Maintenance submission [68] noted that the corporate overhead for maintenance included the function of systems development (particular safety standards), however this was not included as a component of the cost estimate.

Safety underpins all activities of the Aurizon group, including asset maintenance.

This is primarily a legal requirement arising from multiple pieces of legislation which regulate work health and safety, rail safety, electrical safety and mining safety. These legislative requirements in turn require specific internal rules and procedures to ensure compliance with legislative obligations, together with resources to

[68] Aurizon Network, 2013a, UT4 Maintenance Submission, p. 117.

discharge assurance, auditing and investigation obligations imposed by law. Some specific costs of meeting such regulation include:

- compliance costs relating to the federal education regulator, the mine safety regulator, electrical safety regulator, rail safety regulator and environmental protection regulator
- Infrastructure Technical Safety Certificates required for engineering, design and commissioning
- yearly re-licencing of registered engineers.

It is important to note that rail safety regulation differs from other forms of safety regulation in that it requires rail operators to develop specific safety management systems rather than (for example) adopting or complying with pre-existing rules or published codes of practice. These safety management systems necessarily entail many thousands of pages of safety critical standards and procedures in order to demonstrate the discharge of these statutory requirements to the standard required by law. These standards must also be reviewed at regular intervals, and in response to learnings from specific incidents. Rail operators are also subject to ongoing reporting and auditing requirements which are not present in many other industry sectors. Failure to comply with this regime may result in the suspension of operations, significant fines and custodial sentences for individuals involved.

Aurizon Network's accreditation as Rail Infrastructure Manager, and its ability to own and operate the Central Queensland Coal Network is based on the efficacy of its Safety Management System and is the subject of regulation enforced by the Rail Safety Regulator. Aurizon Network's Safety Management System details the prevention/intervention levels and the associated activities required to maintain the network. It also provides direction and guidance on how the maintenance tasks should be managed safely. By law, Aurizon Network must comply with its safety management system at all times.

Aurizon's Safety Management System applies to all those who perform work for, or on behalf of Aurizon businesses where Aurizon has management control over those operations. Aurizon has a comprehensive approach to safety management which includes targeted internal initiatives to support the implementation of our safety and performance driven cultural values by embedding a robust Safety Management System and behaviours across operations and the workforce. Aurizon's Safety Management System sets the safety direction across the enterprise. The Safety Management System requires yearly review and updating to ensure alignment with legislation.

Aurizon's peak governance body for safety management is the Aurizon Board Safety and Environment Committee, supported by the Safety, Health and Environment Board Sub Committee and the Executive Leadership Team. A number of Communities of Competence have been formed at the enterprise level. These Communities draw on expertise from cross functional areas of the business, working collaboratively to ensure that the Safety Management System remains relevant, supports achievement of our goals and targets and is consistent with relevant industry best practice.

As part of the Safety Management System, safety training needs analysis must be performed for each worker. The training needs analysis must be based on a review of work activities and responsibilities; hazard identification and risk assessment; applicable legislation/regulations, codes and standards; and a survey of workers and managers.

A training schedule must be developed which addresses identified training or competency needs. The training schedule will also address future accreditation and reaccreditation needs. Training derived from the training schedule may be classroom, on-line, on the job, coach and mentor based and must be structured and accredited.

Specifically for Network, rules and procedures exist to provide the minimum requirements for trackside protection for anyone who enters the rail corridor, and those performing activities in the danger zone and the safe operation of rail traffic on the rail network. There are also specific standards and requirements relating to civil engineering, electrical engineering, signalling, telecommunications, isolation and lockout and train operations (including speed restrictions, management of signals passed at danger (SPADs), track vehicles, safety in yards and facilities). Other costs specific to the Nework business include:

- medicals for train controllers and infrastructure management workers
- duplication of roles, databases and files required for ring-fencing of investigations, audits and technical safety experts

- interfaces between the Safety, Health & Environment Management System and Vizirail for the reporting of rail faults to the regulators.

Aurizon must also discharge similar obligations in relation to its Work Health and Safety and Electrical Safety duties, and also interacts with Mine Safety regulation.

Directly attributable costs to Network would increase from $4.0 million to $5.5 million when including the asset maintenance business. This is primarily reflecting labour costs for those employees who perform work for the Aurizon Network business. In the original submission the labour costs of those employees who are dedicated resources to the Network function had been apportioned between Network operations, Asset Maintenance and Engineering and Project Delivery based on FTEs in those respective business units of the Network function as it stood at the time of the submission.

The shared costs allocated to Network using the allocation percentages of FTEs and blended rate proposed by Aurizon Network in the original submission are similar to those allocated using FTEs and direct costs proposed by QCA but if the FTE percentage is updated to include asset maintenance employees and revenue used in the blended rate uplifted to include an estimated maintenance revenue component of MAR, the allocated costs would increase to $3.5 million.

The total estimate for Safety, health and environment costs would then be $9.0 million. This is far in excess of all the benchmarks obtained by Ernst & Young. The benchmarking does not take account of the superior world class safety results that we have achieved. Because of all the regulation that Aurizon Network is subject to (as mentioned above) finding an appropriate comparator is difficult. Also Aurizon is only one of five high voltage entities in Queensland.

As identified in RSMBCs report, with the move to the Aurizon Group functional structure, it is becoming difficult to separately distinguish specific Network costs from shared costs of the Aurizon Group. If the direct cost allocator was applied to total forecast costs of the Safety, health and environment function (excluding depreciation duplication) it is estimated the cost allowance would approximate $4.4 million. However, it is considered that the allowance calculated this way would be insufficient for the costs that would be required for a stand-alone company and is insufficient for Aurizon Network. In RSMBC's view this method does not result in the most representative costs for a stand-alone company.

> *Following our initial review of the allocation of safety, health and environmental costs centres, Aurizon Network presented RSMBC with an alternative methodology for the classification these cost centres. In forming the 2014 corporate plan, the majority of safety, health and environment cost centres have been consolidated. Therefore, Aurizon Network has indicated that it no longer has the ability to separately identify cost centres that solely relate to above and below rail activities (other than one minor cost centre which relates to above rail activities). Therefore, the revised allocation applied the blended cost allocator to the majority of Aurizon Network's budgeted safety, health and environmental costs.* [69]
>
> *For the purposes of determining the corporate costs for safety, health and environment for UT4, we consider that the original analysis undertaken by Aurizon Network provides a more accurate representation of the costs that relate to the below rail operations.* [70]

The CIB was drawn from data for companies in regulated industries collected in 2009 as there was insufficient data at this functional level for the Distribution/Transport industry. The report also included data for an APAC resources company with comparable revenue (collected in 2012). On reflection these $3.1 million in costs may have been a more appropriate measure to include in the CIB.

Using the different cost allocation methodologies as discussed above, the costs relating to Safety, health and environment range from $4.4 million to $9.0 million. The costs allocated using the Aurizon Network original proposed methodology but replacing the blended allocator with the direct cost percentage allocator is a mid-point of these at $6.5 million which Aurizon Network believes is reasonable - particularly as it is in line with the costs of Rail

[69] RSM Bird Cameron, 2014a, Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure, para. 3.26.
[70] Ibid, para 3.27.

Company 2 as benchmarked by Ernst & Young. The costs for Company 1 of $1.3 million were noted in the EY report to be costs of labour only and excluding operational roles. [71]

Enterprise Real Estate

The QCA's view on the costs included for Enterprise Real Estate function is unclear as this function has not been specifically mentioned. Aurizon Network's methodology for the calculation of the allowance related to Real Estate is explained below, including the original and now revised cost estimates.

Table 4.13 – Revisions to methodology for Real Estate allowance

	$million	Original Methodology	$million	Revised
Property services, facilities management, acquisitions, disposals	0.5	FTEs% x forecast costs of those corporate cost centres	1.5	Updated % percentage to include Asset maintenance division
Housing	0.1	Properties identified by occupants cost centre. Network % of costs determined as a proportion of market value rent of Network identified properties as a percentage of the Aurizon Group, multiplied by total Group costs.	1.6	Includes housing provided to Asset maintenance staff
Depreciation of property facilities	1.1	Properties identified by cost centre, with the total estimated cost being the aggregate of Network cost centres (excluding Asset maintenance) multiplied by depreciation for 2012/13 and indexed for the UT4 period.	1.4	Includes properties relating to Asset maintenance division (e.g. depots, storage and other facilities)
Brisbane office rental	3.4	Actual rental costs for the Brisbane office at 192 Ann Street converted to a cost / FTE and multiplied by estimated number of employees for the standalone entity.	3.4	
	0.6	For maintenance - current rental price in Brisbane of $577/sqm assuming space is allocated based on 15 sqm per person and 45 employees in corporate office. (Assumed Asset maintenance staff are not office based). Also includes $0.2 million cleaning costs.		
Total	**5.7**		**7.9**	

The calculation for housing in the original submission excluded accommodation provided to workers in the Asset maintenance division. This is where the majority of the costs are for the Network business as workers are required to live in regional/rural locations to service the railway infrastructure of the CQCR. Such costs, however, were not included in the Deloitte report. Using the same methodology as in the original submission, costs would increase to $1.6 million when including the Asset maintenance division.

The property costs for 192 Ann Street, Brisbane were benchmarked by Ernst & Young by applying industry rates for Prime, A Grade and B Grade Brisbane rental costs. The same rule of thumb of 15 sqm per person was used as in the Deloitte cost estimates. It found the market rates for 192 Ann Street to be below those for Prime and A Grade real estate, therefore Aurizon Network believes that the costs submitted are appropriate. Aurizon Network is willing to reduce its submission for Brisbane office rental by $0.6 million to ensure there is no duplication of the corporate office function (since an allowance for corporate functions is included in the $3.4 million).

[71] Ernst and Young, 2012, Benchmarking of Corporate Overhead Costs for QR Network Pty Ltd, p. 20.

The amount included in the CIB for Real Estate was the cost for the Rail Company 2 of $4.6 million. As the Brisbane office rental was separately benchmarked at $3.8 million (A grade), effectively an amount of $0.8 million has been included for depreciation, housing and management which is considered insufficient for those cost categories. Because they were unable to be separately benchmarked and there was such a disparity between Rail Company 1 ($16.7 million) and Rail Company 2 ($4.6 million), Rail Company 2 was included as a conservative view. An average of the two companies is $10.7 million. The costs proposed above of $7.9 million are lower than this average.

Enterprise Procurement

The key function of the Enterprise Procurement team is to deliver best cost commercial outcomes across all Aurizon's supplier expenditures through a sustainable, systematic and disciplined sourcing process and active management of recurring spend categories. The team also maintains the commercial relationships with all suppliers under contract.

The QCA have not expressed any view on the costs associated with the Enterprise Procurement function that are included in the proposed allowance and it is unclear whether the QCA proposed allowance includes an amount derived using the revised allocation percentage (approx. $2.1 million) or one more in line with the benchmarks obtained from APQC through the Ernst & Young benchmarking.

The originally proposed allocation was higher than the median value of the Distribution/Transport industry, and had been derived using a direct cost percentage based on operating and capital costs. We note the QCA's view that the direct cost percentage should only comprise operating costs and not capital costs. The allocation using such a revised percentage is more comparable with an average of Rail Company 1 and 2 and the Cross Industry $1bn – $5bn benchmarks. It is however, still higher than the median value for the Distribution/Transport industry. This may be reflective of other companies in the distribution/transport industry not having as significant infrastructure development costs as Aurizon Network. Procurement plays a significant role in the sourcing of contracts and alliance partners for infrastructure development to ensure we are engaging cost effective suppliers.

Aurizon Network accepts a reduction to its originally proposed costs to the amount included in the CIB of $1.4 million.

4.5 Functions Not Included in the CIBs and Revised Cost Allowance

The following sections reflect areas which were unable to be benchmarked and were excluded by the QCA in its proposed allowance. While Aurizon Network believes that these functions would be required for a stand-alone efficient company, they have not been included in our revised cost proposal (outlined in Table 4.12).

4.5.1 National Policy

The QCA is of the view that including an allocation of the costs of the National Policy team would be a duplication of costs within the business support costs (Regulation). The National policy team is responsible for:

- proposing Aurizon policy positions (pertaining to transport and logistics sectors) to influence industry and public policy formulation and supporting internal alignment to these positions
- providing economic regulatory support to Aurizon functional groups
- positioning Aurizon as a respected voice in industry and public policy
- presenting concerns and requirements to national and state regulators.

The work that is undertaken by the National Policy team on national access regulation, response to legislative change and engagement with government officials would otherwise fall into the ambit of the Regulation team. Aurizon recently made a submission on the Harper Review of competition policy – examining the provision of competition law, the performance and efficiency of regulators administering the law and opportunities for privatisation. This submission was prepared by the National Policy team, but had this function not existed in a hypothetical Network stand-alone company, a submission would have been made by the Regulation team.

Resources in this team would need to be supplemented as a result, and it is estimated an additional 0.5 FTE would be required, at an estimated cost of $100,000.

4.5.2 Operational Excellence

It is unclear from the Draft Decision, but thought likely that the QCA has rejected the inclusion of any costs for the Operational Excellence function in the corporate cost allowance. This team oversees and drives project-specific outcomes for strategic, growth and key operational projects.

The team in Operational Excellence works with Network particularly in the evaluation of capital investments. They have expertise in business improvement, engineering and project management which are utilised by the Group as needed when developing business cases for capital investments. Cost reductions and operating efficiencies can be achieved by collaborating with this team. Working with the Operational Excellence team can achieve benefits and efficiencies for the whole supply chain. The team were involved in major projects like WIRP to ensure the business maximised its return from capital by reducing the total cost of projects by focussing on various levers such as value engineering and procurement.

The cost allocated to this function under the QCA revised cost allocator of direct costs percentage decreases from $1.4 million to $0.9 million ($2013/14) which Aurizon Network believes reasonable.

4.5.3 Branding

We acknowledge the QCA's view that Aurizon Network should not need to undertake vigorous branding and promotional activities that other companies in more competitive non-regulated environments may need to, and hence assume that the QCA's proposed corporate cost allowance does not include any costs that we submitted as Branding.

However the costs within Branding relate to more than just advertising and promotional activities. In 2012/13 these did include one-off costs of rebranding from QR National to Aurizon, including artwork, brochures and signage. Costs incurred within Branding attributable to Network as a stand-alone company include filming of DVDs on expansion projects for stakeholders and the community, printing of posters for specific awareness campaigns such as level crossing safety, and induction material for new staff members. Costs for 2013/14 included the publication of the UT4 submission documents. Financial records for the last 2 years support such costs relating to Network of $0.1 million per year. Aurizon Network maintains that an allocation of at least this amount is necessary to enable it to meet its efficient costs.

4.6 Risk and Insurance

Aurizon Network welcomes the QCA's Draft Decision to accept the methodology for estimating self-insurance costs. Aurizon Network does not however support the adjustment of escalations for the volumes and turnover determined in the Draft Decision as it does not support those proposed amounts. Aurizon Network is willing to submit updated cost estimates for self-insurance once a position on volumes and turnover have been finalized.

Aurizon Network accepts the QCA proposal to report on its self-insurance arrangements as part of the annual regulatory accounts including disclosing the number of self-insurance events by type and value each year. However, we propose that a threshold be applied where incidents under $50,000 are aggregated for reporting purposes.

Aurizon Network welcomes the QCA's approval of the proposed insurance premium costs for the 2013/14 base year. In Aurizon Network's UT4 submission these costs had been escalated using a 4% factor based on the Insurance and Financial Services data obtained from the ABS for the March 2012 quarter. The QCA has rejected the escalation of costs at this rate, instead proposing they be escalated at a rate of 2.5% CPI. Aurizon Network accepts this change.

The industrial special risks premiums had been further adjusted to account for the capital expenditure on specialized track equipment (e.g. ballast undercutting and resurfacing machines) during the period to June 2017. Aurizon Network wishes to ensure that this is maintained and that the 2013/14 base year is not simply escalated only at 2.5% each consecutive year.

The QCA has also proposed that the insurance costs for the feeder stations only be allocated to the operating costs for electric assets. Aurizon Network accepts the QCA proposal.

When we approached Industrial Special Risk insurers for non-binding indications for insurance premiums in 2012, they each estimated a combined figure with no breakdown for each of the assets. To obtain an estimate of a premium for the feeder stations only, Willis (a global insurance broker) provided an allocation for the feeder stations based on a percentage of the overall asset values declared applied to the Industrial Special Risk's total premium (pre the inclusion of Rollingstock in the premium).

Based on this approach a split of the non-binding premium indication for the Feeder stations for the years requested is as follows (indexed at CPI):

2013/14	$734,331
2014/15	$752,689
2015/16	$771,506
2016/17	$790,793

4.7 Audit and Condition-based Assessment

Aurizon Network welcomes the QCA's acceptance of its proposal to include audit costs as part of the system wide and regional costs. The QCA notes that this is

> *Subject to such costs being efficiently incurred and Aurizon Network providing objective evidence that that they cannot be absorbed.*[72]

Aurizon Network is unclear on what objective evidence would be required in order for the cost recovery to be made. Aurizon Network should not be in the position to be required to absorb audit costs relating to additional audits initiated by the QCA that haven't been contemplated or allowed for under the allowance.

The QCA indicated they will not accept a proposed adjustment for the difference between UT3 forecast and actual audit costs. This results in an under-recovery of audit costs of $248,620.

In making its decision, the QCA considered that the audit scope during the UT3 period was limited to the preparation of its regulatory accounts and the maintenance report.[73] This significantly understates the scope of audit plans that were prepared in line with the requirements of clause 10.7 (scope including 3.3.2, 3.7 and 9.7), and were approved each year by the QCA.

Specifically, the QCA approved audit scope for each year of the UT3 term, included the:

- Regulatory Accounts;
- Management of confidential information;
- Decision Making;
- Complaint handling;
- Cost Shifting;
- Discrimination;
- Capacity Allocation; and
- All reports contained within Part 9

The QCA approved scope, resulted in higher costs borne by Aurizon Network than its operating allowance. The QCA's consultant, RSMBC, as part of their review confirmed that Aurizon Network's historical audit costs were reasonable.

Aurizon Network maintains that it should be able to recover the additional audit costs incurred during UT3 arising from additions to scope prescribed by the QCA.

[72] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 86.
[73] Ibid, p. 84.

4.8 Environmental Charges

Aurizon Network accepts the QCA's Draft Decision on environmental charges. As such, we have presented in Table 4.14 below the revised cost build-up for EC, including the environmental charges:

Table 4.14 - Revised Environmental Charges ($ million, nominal)

Environmental Charges	2013/14	2014/15	2015/16	2016/17	Total UT4
Aurizon Network Proposed (2013DAU)-inclusion in Opex	4.57	5.34	6.09	6.58	**22.58**
QCA's Draft Decision – inclusion in EC	4.57	5.34	6.09	6.58	**22.58**
Aurizon Network proposed adjustments*	1.09	0.17	(0.45)	(0.66)	**0.15**
Aurizon Network proposal (revised) – inclusion in EC	**5.66**	**5.51**	**5.64**	**5.92**	**22.73**

** Adjustments include 2013/14 actuals and 2014/15 expected, with 2015/16 and 2016/17 escalated at CPI of 2.5% from 2014/15*

4.9 Operating Costs – Electric Assets

Aurizon Network disagrees with QCA's proposed review of transmission connection costs for the following reasons:

- Existing connection costs have all been approved by the QCA in the past over UT1-3 (refer to Table 4.16 below for approvals for the new connections).
- Connection and Access Agreements (CAA) between Aurizon Network and Powerlink were entered into in 2004 (extended to 2017) and 2009 respectively, long before UT4.
- Aurizon Network notes that "Powerlink does not consent to QRN disclosing the Connection and Access Agreement to the QCA"[74]. The connection services were provided under a commercial arms-length framework agreed between the parties consistent with Powerlink's AER approved Negotiating Framework.

Prescribed and Negotiated Connection Agreements

In the interest of transparency, Aurizon Network provides further information in the section below to demonstrate the prudency of the connection costs to the QCA and stakeholders.

Table 4.15 Terms of Connection Access Agreements for Aurizon Network

Detail	2004 CAA	2009 CAA
Duration	10 years	30 years
Expiry	30 June 2017 (extended on 28 February 2014)	10 September 2039
Number of connections	15	5 + 1 under construction*
Commissioning dates	13 in 1986/87, 2 in 2009/10	2009/10 and post
Transmission service type	Prescribed connection services	Negotiated connection services

** Wotonga connection to be constructed by December 2015*

The prescribed transmission services are subject to regulation by the Australian Energy Regulator (AER) under Part 6A of the NER. As a result, we assume that the QCA's focus was aimed at the negotiated transmission services.

[74] Powerlink, 2012a, Letter dated 20 August 2012, provided to the QCA as part of the 2012-13 Endorsed Variation Event.

Negotiated Connection Agreement

The 2009 CAA was negotiated as a result of changes to the National Electricity Rules (NER) which required all subsequent connections to be 'negotiated', rather than 'prescribed'. The 2009 CAA acts as a master agreement, with subsequent connections being added via "Deeds of Variation". Table 4.16 below summarises the negotiated connections between Aurizon Network and Powerlink:

Table 4.16 - Negotiated connections and QCA approval

Connection	Powerlink Offer to Connect	Negotiated Services Start	QCA Approval Under
DBCT	July 2009	May 2010	UT3 & endorsed variation 2012/13
Raglan	November 2009	November 2011	UT3 & endorsed variation 2012/13
Wycarbah	November 2009	September 2012	UT3 & endorsed variation 2012/13
Bluff	November 2009	September 2012	UT3 & endorsed variation 2012/13
Duaringa	November 2009	September 2012	UT3 & endorsed variation 2012/13
Wotonga	July 2011	September 2015*	Part of 2013DAU, not yet approved

**Current planned month of commissioning*

These feeder stations were all endorsed by end users via the regulatory pre-approval process in the Coal Rail Infrastructure Master Plan (CRIMP) 2006-2010. Comments on connection costs are included in Table 4.17 below:

Table 4.17 - Negotiated connections CRIMP comments

Connection	CRIMP	Comments on Powerlink Connection Charges
DBCT	2006	Power system strengthening for port area completed in 2009
Raglan	2006	$ 2m per annum connection charge payable to Powerlink (annual connection cost is based on the DORC of dedicated 132 kV transmission infrastructure)
Wycarbah Bluff Duaringa	2009[75]	• Included in Tariff as an operational expense (cost is site location specific). Notional cost for 132kv feeder line is $1m/km, with the Powerlink switchgear and other equipment for each site up to $10m ($2008) • Require 4 new feeder stations at Raglan, Wycarbah, Duaringa and Bluff, (including new connections to the Powerlink grid) • Cost estimates for feeder stations excludes Powerlink connection costs
Wotonga	2010[76]	No comments

While some users argue that Aurizon Network didn't provide sufficient information to enable them to test the prudency of the investments, they were fully aware that not voting and not seeking additional information during the CRIMP process constituted implicit acceptance.

The negotiations between Aurizon Network and Powerlink were conducted on an arms lengths basis under the "Powerlink Negotiating Framework for Negotiated Services" (Negotiating Framework)[77]. Under regulation from the AER, Powerlink is required to not discriminate between customers seeking connection services. The parties agreed on a framework to ensure Aurizon was provided connection services in accordance with the NER.

To ensure the technical design for the Powerlink substations is prudent and fit for purpose, Aurizon Network's traction experts conducted technical review of Powerlink's design and selected the option for each substation that provided the best fit with lowest cost[78].

[75] Aurizon Network, 2009a, CRIMP 2009 - Working Paper 4.5: Rationale for Power Systems Upgrade in the Blackwater System; Aurizon Network, 2009b, CRIMP 2009 - Working Paper 4.6: Rationale for Electric Traction System Upgrades in the Central Queensland Coal Network.
[76] Aurizon Network, 2010, CRIMP 2010 – Proposed Rail Infrastructure Enhancements – Goonyella System Expansion 140 Mtpa.
[77] Powerlink, 2012b, Negotiating Framework for Negotiated Transmission Services.
[78] Technical review papers (Confidential paper provided to the QCA).

As a result, the final connection charges for the feeder stations were lower than those indicated in Powerlink's Offer to Connect. Subsequently these reductions were included in the AT5 rates from the endorsed variation in 2012/13. Table 4.18 below shows the reductions due to lower connection costs:

Table 4.18 - 2012/13 Endorsed Variation for AT5 Tariffs

	Blackwater	Goonyella
Original 2012/13 AT5 Price (per '000eGTK)	$5.39	$2.85
Revised 2012/13 AT5 Price (per '000eGTK)	$4.88	$2.80

Wotonga Connection

Based on analysis of funding options, Aurizon Network proposed in the 2013DAU to include the Wotonga connection as a prepayment to Powerlink with an annuity recovery. Given the QCA and stakeholders expressed concerns about this approach, we have decided not to proceed with the proposal and treat Wotonga the same way as all the other negotiated connections with Powerlink.

Revised Connection Charges

Table 4.19 below shows the revised connection charges proposed to be included in the AT5 calculations.

Table 4.19 - Revised Connection Charges ($ million, nominal)

Environmental Charges	2013/14	2014/15	2015/16	2016/17	Total UT4
Aurizon Network Proposed (2013DAU)	68.34	74.45	81.25	82.94	306.98
QCA's Draft Decision – no decision	68.34	74.45	81.25	82.94	306.98
Aurizon Network proposed adjustments*	1.33	(2.82)	(0.02)	1.71	0.21
Aurizon Network proposal (revised)	**69.67**	**71.63**	**81.23**	**84.65**	**307.19**

** Adjustments include 2013/14 actuals and 2014/15 expected, with 2015/16 and 2016/17 escalated at CPI of 2.5% from 2014/15. Actual CPI will be applied to Powerlink connection charges (Brisbane, All Groups)*

Appendix 4.1 – Ernst and Young Benchmarking Methodology

Ernst & Young chose to use the APQC database to conduct the benchmarking. APQC is the largest open standard database of benchmark and performance metric data in the world. APQC's database is constantly validated to ensure logical and statistical validity of all data. Some further detail on APQC:

- Founded in 1977, APQC is a member-based non-profit, serving organizations around the world in all sectors of business, education, and government. APQC serves more than 425 member organisations from 48 countries.
- APQC's Process Classification Framework (PCF) developed in the early 1990s by APQC and a group of members from a number of industries and countries throughout the world. Organizations can use the PCF's common terminology to name, organize, and map their processes.
- The PCF is the world's most widely used process framework. It gives organizations standardized definitions for functions, processes, and activities independent of business model or structure, allowing apples-to-apples comparisons.
- The PCF identifies 12 high-level functional categories and contains over 1,000 process elements. The process elements identified in the PCF are relevant to all organizations regardless of industry, region, or size.
- Various measures are then available for those categories/functions/activities. "Costs per $1,000 of revenue" or "Costs as a percentage of revenue" were selected as the preferred benchmark types as they allowed for easy and meaningful comparison across geography, function and industry.
- All benchmarking data passes through a rigorous validation process wherein each piece of data is scrutinized and validated using both logical and statistical tests.
- APQC is an independent non-profit organization and does not use its benchmarking data to try and sell services, its mission is to enhance your productivity.

Participants in the Transport/Distribution industry are outlined in Appendix 4.2.

The companies contributing to the APQC database include stand-alone and consolidated corporations. For the analysis undertaken, companies were selected from the APQC database Distribution and Transport Industry companies list, which includes over 100 participant companies in its benchmarking list. While a bottom up cost assessment has not been strictly undertaken the approach of applying benchmark costs from a significant sample size to detailed business functions and processes provides a comprehensive comparison for benchmarking purposes of what it would cost to perform the relevant functions for Network as would be required for an equivalent stand-alone business.

For each data set (i.e. Aurizon Network and the comparators) definitions of costing areas/functions were assessed to ensure comparisons between data provided by Aurizon Network and external data were valid. Where necessary, definitions of data provided and/or costing grouping was adjusted and figures recalculated to ensure a valid 'like-for-like' comparison[79].

The costs were built up by attributing benchmarked costs to processes and functions matched from the APQC database to Aurizon Network functions using the PCF framework. The efficient cost is then compared to the allocated costs for each function required for a Network stand-alone business. The Network proposed costs were within a reasonable range of the benchmark. For example, for Aurizon's Human Resources costs, the benchmarking analysis was undertaken at the third level of the PCF and involved a comparison of 9 Functional Areas and 45 Activities. The first three levels of the PCF are outlined below:

[79] Ernst and Young, 2012, Benchmarking of Corporate Overhead Costs for QR Network Pty Ltd, p. 5.

The process applied by Aurizon in developing its corporate cost benchmarking against the specific rail companies involved an in-depth analysis of two comparable Rail Network companies.

Rail Company 1 was a large State-owned Asia-Pacific Rail company operating network, yards and facilities, freight, passenger, rolling stock and engineering services.

Rail Company 2 was a large, Government-owned Asia-Pacific Rail non-passenger company specialising in the provision of rail infrastructure and maintenance.

The process adopted is set out below:

Step 1: Identify and Engage Rail Companies

- Identified suitable comparison organisations from the rail industry (i.e. "Rail Company 1" and "Rail Company 2").
- Engaged with third party rail companies to request participation in benchmarking exercise with Aurizon Network.

Step 2: Design and Issue Data Request

- Confirmed corporate processes and cost categories to be benchmarked (i.e. finance, procurement, IT, etc) and designed format of data request (Excel template).
- Issued data request to participating companies. Data to include breakdown of corporate overheads, FTEs and total revenue for 3 year period up to 2012.

Step 3: Receive and Review Cost Data

- Cost data checked for issues and anomalies, e.g. incomplete data or high/low value outliers.
- Examined stability of costs across three year period to assess suitability of data. Cost data for 2012 was used for benchmarking
- Liaised with third parties to understand and/or resolve discrepancies.

Step 4: Alignment of Cost Buckets

- Aligned costs across the three organizations to ensure meaningful comparison, e.g. combing cost buckets (e.g. HR and training) or identifying areas with limited benchmark data (e.g. "national policy" and "operational excellence").

Step 5: Generate Benchmarks

- Cost data was processed to establish "normalised" benchmarks for each cost category. Benchmarks were expressed as a "cost as % of revenue".
- This activity involved calculating the level of expenditure as a percentage of total revenue for the relevant company.
- The percentages were then applied to Aurizon Network's total revenue figure to derive a $AUD benchmark. This is performed for each category of cost.

Step 6: Collate Allocations & Benchmarks

- Collated the benchmarking data (Rail Company 1 & Rail Company 2 plus other sources) together with output of Network corporate cost allocation exercise and produce results graphs for each category of corporate cost.
- The alignment of allocated costs with benchmark data was evaluated to ensure comparisons were valid.

Step 7: Analyse and Report Findings

- Any material variances between corporate cost allocations and benchmarks were investigated to determine underlying causes, e.g. one-off costs, divergent business models or different approaches to recording costs.
- Results and analysis were summarised into a single report

This approach is more robust than a desktop bottom up analysis. The report that Deloitte prepared for the maintenance services overheads was an exercise that can be completed in a couple of weeks. The number of FTEs considered as required for each function were estimated by looking at statistics for similar sized businesses (primarily in terms of turnover) for public and private sector, sourced from an internal database not publically available information. Both the EY and Deloitte analyses use turnover as a measure for scaling and comparing between companies. The EY costs are derived from a global, publicly available database, whereas the Deloitte analysis utilises an internal database.

The APQC approach to benchmarking is to normalise costs based on revenue. This approach is adopted to ensure a consistent metric for benchmarking across the significant sample size of participants in the APQC database. Other approaches to benchmarking could be applied (including bespoke analysis of direct costs to total costs) however the 'cost as % of revenue' metric from the APQC database was chosen due to its comprehensive data sets built upon significant sample sizes of participant companies for benchmarking purposes. Other metrics were not readily available across all the corporate service categories required for the Aurizon Network company.

Aurizon Network understands that Deloitte were commissioned by the QCA to undertake a "bottom up" analysis for the corporate costs of SunWater in 2011. The purpose of the SunWater work was to assess the prudency and efficiency of SunWater's actual cost base, not to determine a stand-alone efficient cost base for SunWater. In

contrast, the purpose of the work Deloitte performed for Aurizon Network was to estimate corporate overhead costs for a theoretically similar, standalone business to Aurizon's network maintenance operations. For both exercises the assessment was done through the use of benchmarking and Deloitte's experience with similar clients (no names basis), however, the time and cost involved to perform this work was significantly different.

As mentioned earlier, the SunWater work included numerous interviews to understand, in detail, the functions performed by each individual corporate overhead function and the actual FTEs operating within the business and was performed over several months. The SunWater analysis does not result in an externally benchmarked stand-alone efficient cost base.

Aurizon Network also do not believe there is significant benefit in conducting a similar analysis that was done for the maintenance business to the whole Aurizon business given its desktop nature and reliance on information that is not publicly available. However, Aurizon Network is willing to work with the QCA and industry to agree a methodology for future cost build-ups to ensure transparency and efficiency are achieved.

Appendix 4.2 - Participants in the Distribution/ Transportation Industry

- Aerlineas Argentina
- Air Canada
- Air China
- Air France - KLM
- Alaska Air Group
- Alitalia
- ALTERGAZ
- American Airlines
- American Hotel Register Co.
- American Municipal Power
- AMR
- Anhui Electric Power Company
- APL
- ARCOR
- Atlas Energy
- BC Ferries
- Benchmark Logistics
- BNSF Railway
- British Airways
- Buckeye Power
- Carnival Corporation
- CESC
- China Resources Gas Group
- China Southern Airlines Company
- CLP Power Hong Kong
- Club Mediterrane
- Cognizant Tech
- Continental Airlines
- COSCO
- CSX Corporation
- Defense Distribution Depot San Joaquin
- Delta Air Lines
- Deutsche Lufthansa
- Deutsche Post
- Deutsche Post DHL
- E.ON
- Eagle Transport
- East Coast Mainline
- East Japan Railway Company
- EasyJet
- El Paso Corporation
- Electrabel
- Emirates
- ENG
- Epes Transport System
- Expeditors
- ExpressJet Airlines
- FedEx
- Ferrovie Nord
- Future Focus
- Gas Natural SDG
- Gasunie
- Gasverbund Mittelland
- Genencor
- General Dynamics
- GRDF
- Guangshen Railway
- Hainan Airlines
- Hapag-Lloyd
- Hitachi
- INTERTUG
- Japan Airlines
- Key Logistics Solutions
- Khimji Ramdas P&G
- Kinder Morgan
- LAN Argentina
- Lee County Port Authority
- LinkAmerica
- LUL Nominee BCV
- Maersk Group
- Mammoet
- Mar Ter Spedizioni
- McLane Company
- Menlo Worldwide
- Nippon
- NMK Management Services
- O. N. Sunde
- ONEOK
- Pacific Gas and Electric Company
- Panalpina
- Panama Canal Authority
- PKP Intercity
- Plains All American Pipeline
- Port of Amsterdam
- Port of Portland
- Port Of Singapore Authority
- Repsol
- Santa Catalina Island Company
- Satellite Logistics Group
- Shandong Electric Power
- Shanghai Natural Gas Pipeline Network
- Singapore Airlines
- Slovenske elektrarne
- South Mississippi Electric Power Association
- Southwest Airlines
- Southwestern Energy Pipeline
- Spectra Energy
- Stagecoach South Western Trains
- Texas Air Composites
- Texon
- Thomas Cook Group
- TNT Express
- TNT Post
- Toho Gas
- Total Quality Logistics
- Totem Ocean Trailer Express
- Trabajos Marítimos
- UIS Airways Group
- United Air Lines
- United Continental Holdings
- United Space Alliance
- United States Postal Service
- Universal Weather & Aviation
- UPS
- US Airways
- Virgin Atlantic Airways
- Virgin Group
- Vopak
- Westar Energy
- Wilh. Wilhelmsen Holding
- Williams Companies
- World Kitchen
- World Wide Technology
- Yang Ming Marine
- Yobel SCM

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Aurizon Network – IT Services Market Price

8 December 2014

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Section 1

Introduction

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ITNew com

Introduction ▶ Background, Scope and Objectives

Aurizon Network operates the Central Queensland Coal Network. Access to the Central Queensland Coal Network is regulated by the Queensland Competition Authority (QCA). Aurizon Network sources and deploys a range of IT services to meet the needs of the Aurizon Network business. Aurizon Network is required to demonstrate to the QCA that the forecasted UT4 spend for the run IT services is efficient when compared to the Australian market for similar IT services.

Background

- Aurizon Network operates the Central Queensland Coal Network.
- Access to the Central Queensland Coal Network is regulated by the Queensland Competition Authority.
- Aurizon Network sources and deploys a range of IT services to meet the needs of the Aurizon Network business.
- Aurizon Network is required by the regulator to demonstrate that the costs of providing the 'run' IT services is efficient when compared to the Australian market for similar IT services.

Scope

- Prepare a report which estimates the cost of Aurizon Network providing the in-scope run IT services on an efficient and stand-alone basis when compared to the Australian market for similar IT services.
- The report will include a volumetric estimate of the cost of the run IT services (ie. the 'business as usual' costs) based on current practices for all in-scope IT services including Service Desk, End User Computing, Servers, Storage, Network (LAN / WAN), Telecoms (voice and data), Data Centres and in-scope Applications.

Objectives

- The objective is to provide an independent view, validation and explanation of the cost of the run IT services for the in-scope IT services.
- The report will be provided by Aurizon Network to external parties such as the QCA, and be made publicly available to demonstrate the make-up of the IT cost structures and to make transparent the methodology and assumptions used to determine the industry standard cost estimates for the volumetrics and in-scope services.

4

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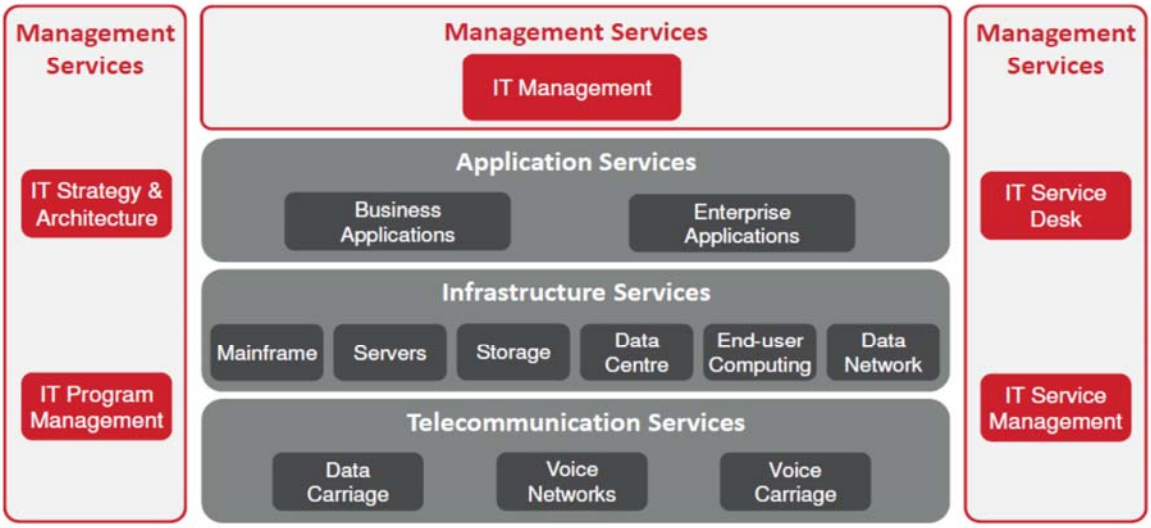
Introduction ▸ The IT Supply Chain - Overview

The IT organisation delivers IT products and services to the business. ITNewcom's IT supply chain groups these IT products into 3 major service delivery groups, ie. application services, infrastructure services and telecommunication services. The service delivery groups are supported by a range of cross-functional management services.



ITNewcom's IT Supply Chain, Release 18.6.2

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Introduction ▸ IT Supply Chain – Key IT Functions

The IT organisation delivers each of these products and cross-functional management services through a standard set of IT services during the IT 'life cycle'. ITNewcom groups these IT services by IT function, product and lifecycle phase to identify key IT functions. The functions highlighted in red below are the in–scope IT services.

	Application Services		Infrastructure Services						Telecom Services			
			Centralised Computing				End-User Computing	Voice & Data Networks		Voice & Data Carriage	
	Business Applications	Enterprise Applications	Mainframe	Servers	Storage	Data Centre		Data Networks	Voice Networks	Data Carriage	Voice Carriage
Plan	IT Strategy and Architecture										
	IT Program Management										
Build	Requirements, Analysis and Design for Applications		Requirements and Solution Design for Computing Platforms					Requirements and Network Design for Voice and Data Networks			
	Develop, Integrate, Test and Deploy Applications		Build Computing Platforms					Build Voice and Data Networks			
Run	**Support and Maintain Applications**		**Support and Maintain Computing Platforms**					**Support and Maintain Voice and Data Networks**			
	IT Service Desk										
	IT Service Management										
	IT Management										

Organisational and Benchmark Scope

IT Services Scope

- All in-scope hardware, software, staff, facilities and carriage services.
- Currently Aurizon Network shares its IT services with other business units of Aurizon Holdings. The analysis has assumed that Aurizon Network is sourcing and deploying its IT services on a stand-alone, insourced and non-shared basis.

Geographic Scope

- All Aurizon Network locations in Australia.

Measurement Period

- FY14

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Section 2

Executive Summary

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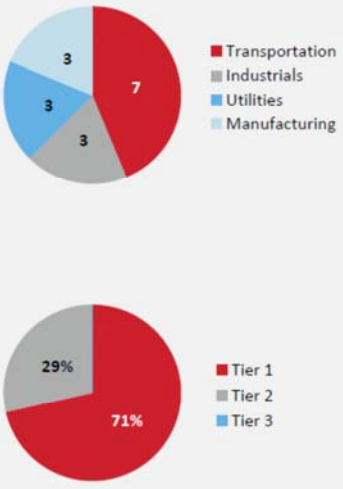
Executive Summary ▸ Benchmarking Peer Group

The composite peer group for this benchmark comprises a total of 16 deals and observations, with at least 6 observations for each IT Service Category.

Peer Group Statistics



Building the Peer Groups, Normalisation and Adjustments

Selecting Peers	▪ When selecting members of the peer group, ITNewcom seeks to include 6-8 IT environments with similar operational characteristics, including: ▪ Scale of IT environment; ▪ Complexity of IT environment; and ▪ Countries of operation.
Normalisation of Peer Group Data	▪ It is accepted that the IT environment of an organisation being benchmarked will never be identical to the IT environments of the peer group and that the benchmarker must consider and normalise for differences between these IT environments. ▪ The normalisation process requires careful comparison of how each difference affects the IT costs of the organisation's environment and the peer group organisations must be normalised to reflect any such differences. ▪ Specific normalisation factors will vary from IT service to IT service, however examples of normalisation factors include differences in: ▪ Volumes; ▪ Scope; ▪ Service Delivery Locations; ▪ Technology; ▪ Service Levels; and ▪ Hardware Refresh Periods.
Market Price	▪ The IT benchmarking industry typically sets '***efficient***' pricing in the market at the average of the peer group. ▪ It is generally accepted IT benchmarking industry practice that a reasonable margin of error for the average of the peer group is plus or minus 5%.

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Executive Summary ► Market Price - By IT Service Category

In order to estimate an efficient price for the Aurizon Network IT function, ITNewcom derived the resource unit volumes for each major IT service group, and then multiplied these resource unit volumes with the market price for the relevant resource unit. A summary of the market price for the run IT services is detailed below.

Annual Market Price for Run IT Services by Service Group

Definitions	
Applications	Application pricing covers the cost of licensing, supporting and maintaining the business, enterprise and desktop application software.
Infrastructure	Infrastructure pricing covers the cost of licensing system software, supporting and maintaining the servers, storage, end-user computing, data network devices and the data centre.
Telecoms	Telecoms pricing covers the cost of supporting and maintaining the voice network devices and providing the data and voice carriage services.
Management	Management pricing covers the cost of providing IT service desk, IT Service Management (ITSM) and IT management services.

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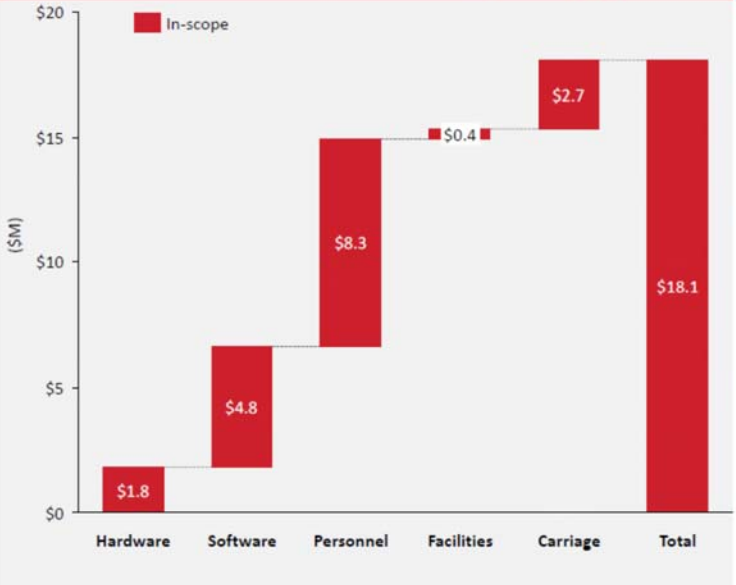
Executive Summary ► Market Price - By IT Cost Category

The table below gives a breakdown of the Market Price by IT Service Category into the major IT cost categories.

Annual Market Price for Run IT Services by Cost Category



Definitions	
Hardware	Hardware costs include the rental of the server, storage and end-user computing devices. This may be in the form of a leasing stream or depreciation. It excludes all costs associated with solution design and build.
Software	Software costs include the licensing of application and system software, including on-going licence support costs. It excludes all costs associated with application design and build.
Personnel	Personnel costs include the support and maintenance of all applications, infrastructure and networks, and providing the IT Service Desk, IT Service Management and IT Management services. It excludes all application, infrastructure and network projects.
Facilities	Facilities costs include the lease and support of the data centre facilities.
Carriage	Carriage costs include all data, voice and mobile carriage services.

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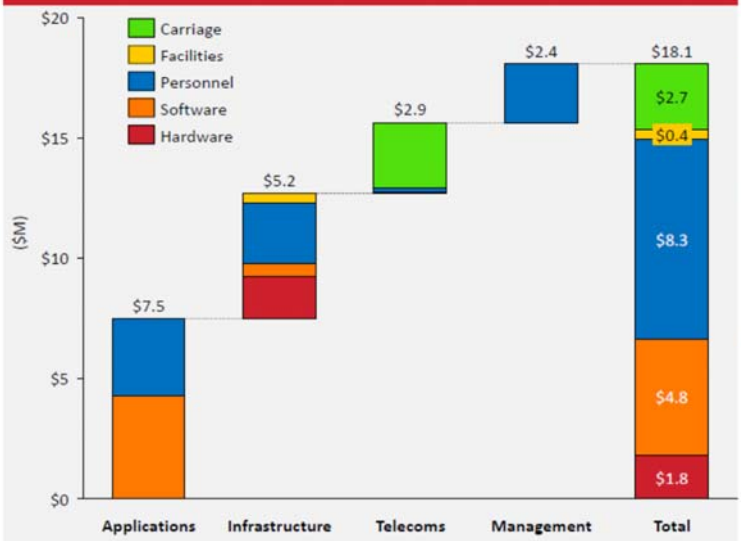
Executive Summary ► Market Price - By IT Service Category and IT Cost Category

The table below gives a breakdown of the Market Price by IT Service Category into the major IT cost categories.

Annual Market Price for Run IT Services by Service Group and Cost Category



Definitions	
Applications	Application pricing covers the cost of supporting and maintaining the business, enterprise and desktop application software
Infrastructure	Infrastructure pricing covers the cost of supporting and maintaining the servers, storage, end-user computing , data network devices and the data centre.
Telecoms	Telecoms pricing covers the cost of supporting and maintaining the voice network devices and providing the data and voice carriage services
Management	Management pricing covers the cost of providing IT service desk, ITSM and IT management services.

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Section 3

Staff

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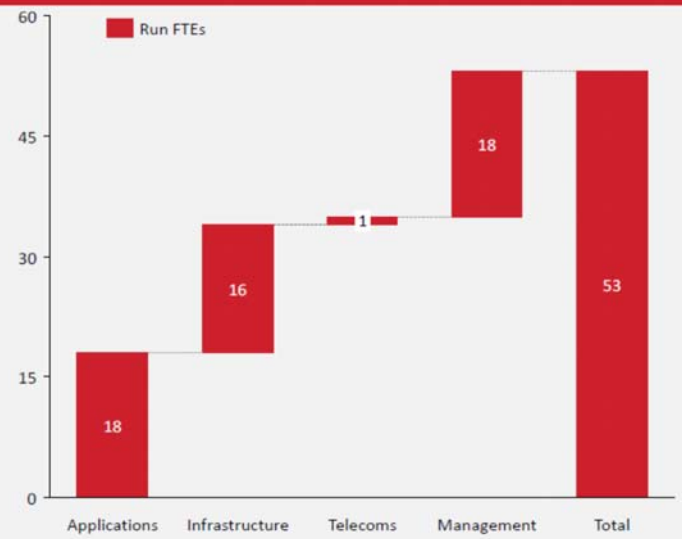
Staff ► Run Services by Service Group

Based upon the profile of the software applications currently supporting Aurizon Network, the enabling infrastructure and telecom services, and the requirement to operate a 24/7 service desk, ITNewcom has found that Aurizon Network will be required to employ or contract a total of 53 FTEs to provide the run IT services.

FTE Breakdown for Run IT Services by Service Group



Definitions	
Applications	Application run staff provide support for business applications and the SAP enterprise resources planning software. Typically they provide bug fix, minor enhancements, software upgrades and application administration for the applications.
Infrastructure	Infrastructure run staff provide support for the servers, storage, end-user computing, data network devices and the data centre. Typically they support the hardware and systems software running on the various devices and provide assistance to end users.
Telecoms	Telecoms run staff provide support for the voice network devices and the data carriage services. Typically they carry out administration of the services and arrange equipment moves.
Management	Management run staff provide the IT service desk services, ITSM and IT management services.

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Staff ► Run Services by Service Category

Staff Category	FTEs	Comments
Applications Services		
Business Applications Support	11	Bug fix, minor enhancements, application administration for over 17 business applications.
SAP Applications Support	7	SAP Functional and Basis support of a SAP v6.0 production environment for 1,043 users.
Infrastructure Services		
Servers	7	VMware ESX support and Windows support for 26 physical servers and 120 logical servers
Personal Computers	5	Support for 350 desktops, 381 laptops and mobile devices at city and high safety regional locations
Storage	2	Support for approximately 175 terabytes of user data on a Storage Area Network (**SAN**) device.
Data Network	1	Support for 66 local area network (**LAN**) and 15 wide area network (**WAN**) devices
Data Centre	1	Support for 10 racks of equipment in 2 data centres.
Telecommunications Services		
Voice Network	1	Support for 731 digital handsets and associated communications equipment.
Management Services		
IT Service Desk	12	Support for a mission critical service desk operating 24x7 (4 shifts, 12 hours each, 4 days on 4 days off).
IT Service Management Support	3	1 FTE each providing service operations, service design and service transition (ITIL processes).
IT Management	3	1 CIO, supported by an applications operations lead and an infrastructure operations lead.
Total 'Run' Staff	**53**	

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Section 4

Key Volumes

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Key Volumes ► Resource Units

Service Category	Volumes	Comments
Infrastructure Services		
Servers		
Total - Unix Physical Servers	0	There are no physical Unix servers.
Total - Unix Logical Servers	7	There are 7 VMware Unix guests. This is based upon the virtualisation ratio of the current environment supported by Fujitsu.
Total - Windows Physical Servers	26	All VMware hosts are Window with x86s architecture. There are no stand-alone Windows servers.
Total - Windows Logical Servers	113	The majority of the VMware guests are Windows servers. The Windows logical servers comprise 65 applications servers and 48 Infrastructure servers.
Storage		
Enterprise SAN Storage		
Installed SAN TBs	219	Based on ITNewcom ratio (# Note).
Allocated SAN TBs	197	Based on ITNewcom ratio (# Note).
Used SAN TBs	175	Based on ITNewcom ratio (# Note)
Data Centre		
Number of Sites	2	Primary and Secondary data centre.
Actual Data Centre space (Sqm)	40	Based upon 4.0 sqm per rack.
Number of Racks	10	To house servers and storage, with spares.

Note

ITNewcom has performed over 1,400 IT benchmarks in the Australian market since 2001 and has built up a detailed set of volumetric ratios for hardware, software and personnel based on organisation size and industry. These ratios have been used to estimate device volumes and sizes.

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Key Volumes ► Resource Units

Service Category	Volumes	Comments
End User Computing		
Personal Computers Infrastructure		
Desktop	350	Based on profile of Aurizon Desktop fleet.
Notebook	381	Based on profile of Aurizon Notebook fleet.
Thin Client Devices	0	
Total - PC Devices Infrastructure	731	
Personal Computer Support		
Desktop	350	Based on profile of Aurizon Desktop fleet.
Notebook	381	Based on profile of Aurizon Notebook fleet.
Thin Client Devices	0	
Total - PC Devices Support	731	
Other EUC Devices Infrastructure		
Monitors	731	Based on ITNewcom ratio for monitors per Desktop and Notebook. (# Note)
B & W Laser Printer	38	Based on estimated volume to print 500 black and white pages per user per month.
Colour Laser Printer	4	Based on estimated volume to print 60 colour pages per user per month.
LAN Switches	66	Based on ITNewcom ratio (# Note).
Data Network		
WAN		
WAN Routers/Switches	6	Based on ITNewcom ratio (# Note).
WAN Appliances	9	Based on ITNewcom ratio (# Note).
WAN Devices Supported	15	Based on ITNewcom ratio (# Note)

Note

ITNewcom has performed over 1,400 IT benchmarks in the Australian market since 2001 and has built up a detailed set of volumetric ratios for hardware, software and personnel based on organisation size and industry. These ratios have been used to estimate device volumes and sizes.

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Key Volumes ► Resource Units

Service Category	Volumes	Comments
Telecommunications Services		
Voice Network		
Analogue Handset Hardware	0	
Digital Handset Hardware	731	Based upon 1 handset per Desktop and Notebook
Supported Analogue and Digital Handsets	731	Based upon 1 handset per Desktop and Notebook
Data Carriage		
Total Bandwidth	1.35 GB	5 x 50Mbps lines between the data centres and regional locations 1 GB link between data centres 2 x 50Mbps links to the Internet
Voice Carriage		
Mobile Voice Plans	268	Based on the mix of plans with 20% over plan spend.
Mobile Handsets	268	Based upon analysis of Aurizon Network call plans

Mobile Monthly Plan	% of usage by fleet
$10	10%
$20	20%
$40	10%
$80	60%

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Key Volumes ► Organisational

Category	Volumes	Comments
Staff		
Total Organisation Staff (Head Count)	1,043	Total for Aurizon Network
Total number of End Users	1,043	Total for Aurizon Network
Total Aurizon Holdings personal computers	4,140	Total for Aurizon Holdings, including Aurizon Network

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Section 5

Software

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Software ► Business and Enterprise Applications

Business and Enterprise Applications

Software Supplier Name	Software Name	Licence Volume	Comment
SAP AG	Enterprise SAP ERP	1,260	Includes all major modules
ESRI	ArcGIS Suite	8	
Google	Google Earth Pro	35	
Mapinfo Corporation	Map Info Professional	3	
Mapinfo Corporation	Map Info Runtime	10	
QR National	Data Warehouse (SQL Server)	76	
Oracle	BRIO / Hyperion	176	
HP	TRIM	247	
Primavera	Primavera	9	
ICG	ViziRail	346	
Innov8	Meridian	41	
RMCon Australia (Rail Management Consultants)	SIMU++	26	
Oracle	Integrated Quality Management Systems (IQMS /OASIS)	76	
AutoDesk	AutoCAD	65	
Figtree Systems	FigTree	8	
Bentley	Microstation	48	
AXIOM	Axiom Productivity Toolkit	1	

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Software ► Desktop Applications

Desktop Applications

Standard Operating Environment (SOE) Software

Software Supplier Name	Software Name	Licence Volume	Comment
Microsoft	Windows Server	113	
Microsoft	Office 365	731	
Microsoft	Project Pro for Office 365	219	30% of Desktops and Notebooks
Microsoft	Visio Pro for Office 365	219	30% of Desktops and Notebooks
WinZip	Winzip 9	731	
Trend Micro	Trend Office Scan 10	731	
UltraEdit	UE/UC Mobile	731	
Mindjet	Mind Manager	731	
Symantec	Symantec Enterprise Vault Client version 8	731	
Adobe	Adobe Acrobat Pro	73	10% of Desktops and Notebooks
Adobe	Adobe CS Suite	73	10% of Desktops and Notebooks

Non-Standard Operating Environment (SOE) Software

Software Supplier Name	Software Name	Licence Volume	Comment
Nuance	Omnipage Professional	73	

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Software ► System Software

System Software			
Infrastructure System Software			
Software Supplier Name	**Software Name**	**Licence Volume**	**Comment**
Oracle	Oracle Database	113	
VMware	VMware	20	
webMethods	Interfaces and Integration (webMethods)	2	
InterDynamics Pty Ltd	Planimate	52	

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Appendix A

Notes and Assumptions

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Notes and Assumptions

Item	Description
Benchmarking Peer Group	• The benchmarking peer group does not include any government organisations. • The transportation organisations within the benchmarking peer group include organisations in the following industries: ○ Air Freight and Logistics, that is organisations providing air freight transportation, courier and logistics services, including package and mail delivery and customs agents; ○ Airlines, that is organisations providing primarily passenger air transportation; ○ Road and Rail, that is organisations providing primarily goods and passenger rail transportation and organisations providing primarily goods and passenger land transportation; and ○ Transportation Infrastructure, that is operators of airports and companies providing related services; owners and operators of roads, tunnels and railtracks; and owners and operators of marine ports and related services.
Data Sources	**In conducting this analysis ITNewcom analysed the following types of documents:** • Data collected in performing the Aurizon Holdings / Fujitsu price benchmark; • Data collected from Aurizon Network regarding the profile and requirements for its environment.
Measurement Period	FY 2014
Currency	AUD
GST	All charges are exclusive of GST.
Rounding	Some of the totals in this report may not equal the sum of the parts. This would be due to a rounding effect.

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ITNewcom ► Introduction to ITNewcom

Unparalleled knowledge of IT costs and suppliers in the Asia Pacific region, combined with a proven track record of results achieved through influencing over $20B of IT spend for the market's largest and most complex clients.

The Facts

- The Leading Australasian IT Spend Optimisation Advisors with unparalleled local market knowledge.
- Advised on over 250 consulting engagements and over 1,400 IT benchmarks since 1997.
- Influenced over $20B of IT spend for over 75 companies and government agencies, delivering optimisations of between 8-20%.
- 30 highly qualified advisors with an average of more than 20 years IT experience across 6 offices throughout the region.

The Differentiators

- Truly vendor independent advisors, we pride ourselves on being held to the highest levels of probity and independence.
- A track record of delivering results above target with support for flexible engagement and commercial models.
- Exclusively focussed on optimising IT spend, supported by advisors with deep technical, commercial and execution experience.
- Dedicated research capability devoted to assisting clients and consultants with latest market trends and targeted research.

The Recognition

- Routinely score more that 4.0 out of 5.0 for all aspects of client satisfaction. Overall ITNewcom averages more than 4.5 for client satisfaction measured for all engagements carried out.
- Business success recognised by BRW in their Fast 100 Survey for three consecutive years.

BRW. fast 100

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ITNewcom ▸ Strong Industry Experience

Demonstrable experience across both industry and government ensuring maximum value for Australasian's largest IT spenders.

Financial Services

IAG, Westpac, Perpetual, QBE, AMP, iB PAY, STATE, ANZ, Commonwealth Bank

Government

Ministry of Education, Ministry of Social Development, CSIRO, TAFE Queensland, ABC, Government of Western Australia Department of Health, Australian Government Medicare Australia, Australian Government Department of Defence, Government of South Australia, Centrelink

Manufacturing, Resources and Utilities

westernpower, Ausgrid, sparq, Yarra Valley Water, WesTrac CAT, Hastings Deering CAT, ActewAGL, BlueScope Steel, WATER Corporation, BMA, BHP Billiton Mitsubishi Alliance, essential energy, bhpbilliton, INPEX

Consumer, Industrials and Transportation

asciano, NSW Transport RailCorp, WorleyParsons resources & energy, coles, NSW Transport Roads & Maritime Services, QANTAS Spirit of Australia, Woolworths, CALTEX Caltex Australia, UnitingCare Queensland, Fonterra, QueenslandRail, AURIZON

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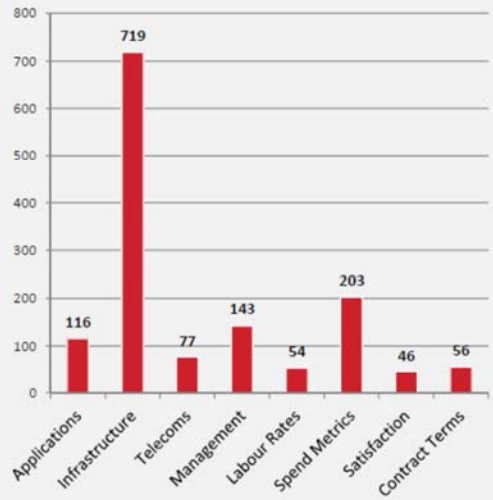
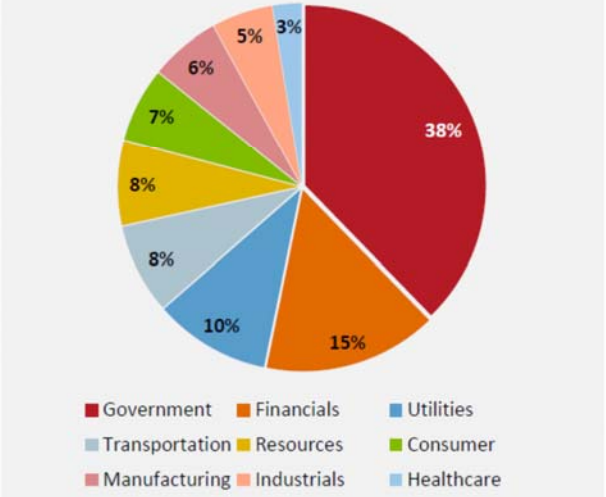
ITNewcom ▸ Unmatched Regional Insights

ITNewcom has performed over 1,400 IT benchmarks within the Asia Pacific region which, in conjunction with consulting and best-in-class market research, have enabled ITNewcom to build the most current and comprehensive benchmarking databases in the market.

IT Benchmarks - by Category



IT Benchmarks - by Industry Sector



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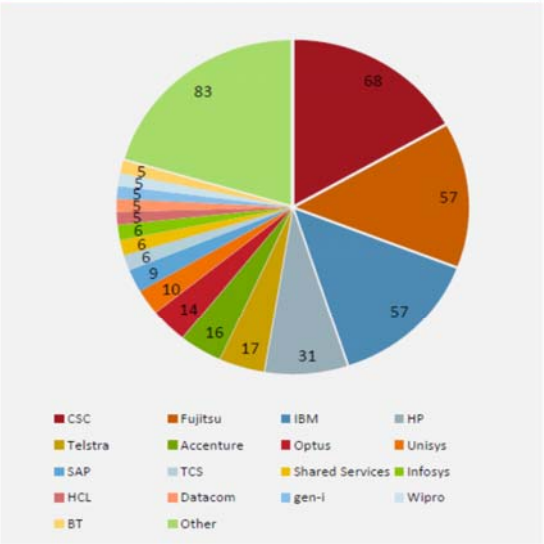
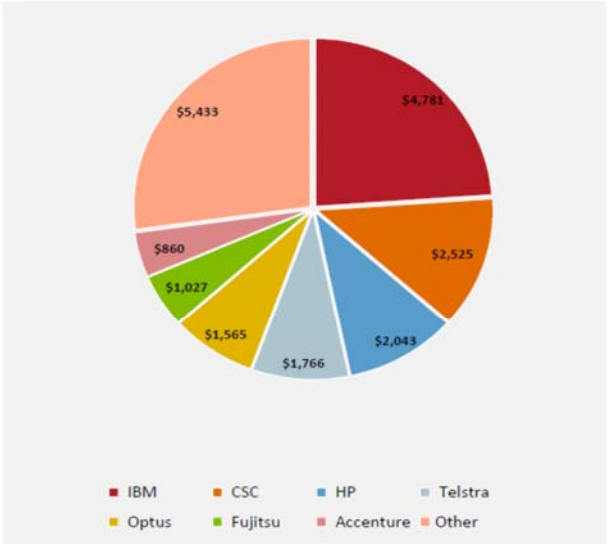
ITNewcom ► Deep Supplier Experience

Extensive experience in driving maximum value from IT suppliers including optimising IT sourcing events, remediating current contracts or enhancing supplier performance through sophisticated analytical tools and benchmarking data.

Number of Negotiations and Price Benchmarks with Major Suppliers



Total Contract Value of Deals Negotiated with Major Suppliers ($M)



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Glossary of IT terms:

WAN (wide-area network)	A communications network that connects computing devices over geographically dispersed locations. While a local-area network (LAN) typically services a single building or location, a WAN covers a much larger area such as a city, state or country. WANs can use either phone lines or dedicated communication lines.
LAN (local-area network)	A geographically limited communication network that connects users within a defined area. A LAN is generally contained within a building or small group of buildings and is managed and owned by a single enterprise. The shorter distances within a building or campus enable faster communications at a lower cost than wide-area networks (WANs). Although an increasing number of LANs use Internet standards and protocols, they are normally protected from the public Internet by firewalls. LANs are generally used to perform the following functions: • Send output to printers attached to the network. • Transfer data or software to or from other systems attached to the network. • Send e-mail to other users on the network. • Access wider-area networks, including the Internet, via a direct connection from the network, for external file transfer, e-mail, facsimile, group collaboration and videoconferencing.
SAN (storage area network)	A SAN consists of two tiers: The first tier — the storage plumbing tier — provides connectivity between nodes in a network and transports device-oriented commands and status. At least one storage node must be connected to this network. The second tier — the software tier — uses software to provide value-added services that operate over the first tier.
IT infrastructure	The system of hardware, software, facilities and service components that support the delivery of business systems and IT-enabled processes.
Data Center	The **data center** is the department in an enterprise that houses and maintains back-end information technology (IT) systems and data stores—its mainframes, servers and databases. In the days of large, centralized IT operations, this department and all the systems resided in one physical place. With today's more distributed computing methods, single data center sites are still common, but are becoming less so. The term continues to be used to refer to the department that has responsibility for these systems, no matter how dispersed they are. Market and industry trends are changing the way enterprises approach their data center strategies. Several factors are driving enterprises to look beyond traditional technology infrastructure silos and transform the way they view their data center environment and business processes. These include aging data center infrastructures that are at risk for not meeting future business requirements, an ongoing cost-consciousness, and the need to be more energy-efficient. Many enterprises are looking to virtualization, fabric-based infrastructure, modular designs and cloud computing as they explore how best to optimize their resources.
Rack	A framework or structure that holds computer servers or networking equipment, usually by means of shelves or mounting plates. The height of computer equipment is expressed in rack units (U), which equal the distance between shelf increments in a standard rack (see rack unit).
Service Desk	A **service desk** is a help desk that is equipped with the resources for resolving service requests and problem calls. It gives the customer service representative or end user the ability to efficiently diagnose, troubleshoot and correct technical-support problems, rather than being a "pass through."
Virtual Machine (VM)	A **virtual machine (VM)** is a software implementation of a hardware-like architecture, which executes predefined instructions in a fashion similar to a physical central processing unit (CPU). A VM can be used to create a cross-platform computing environment that loads and runs on computers independently of their underlying CPUs and operating systems. A notable example is the Java Virtual Machine, the environment created on a host computer to run Java applets. Although VMs have existed longer than Java, Java has made VMs highly visible.
Virtualization	**Virtualization** is the abstraction of IT resources that masks the physical nature and boundaries of those resources from resource users. An IT resource can be a server, a client, storage, networks, applications or OSs. Essentially, any IT building block can potentially be abstracted from resource users.
ITIL	**ITIL**® (formerly known as the Information Technology Infrastructure Library) is an IT service management framework that provides guidance on the full life cycle of defining, developing, managing, delivering and improving IT services. ITIL® is a Registered Trade Mark of AXELOS Limited. It is structured as five core books (Service Strategy, Service Design, Service Transition, Service Operation and Continual Service Improvement) and other supplementary publications.

Source: http://www.gartner.com/it-glossary/

5. Maintenance Costs

5.1 The QCA's MAR Draft Decision

The table below summarises Aurizon Network's proposed response to the draft decisions:

QCA's Draft Decision	Reference	Aurizon Network's Response
Refuse to approve Aurizon Network's forecast direct maintenance costs (excluding for ballast undercutting). Amend the 2013DAU for the following adjustments: • Revise maintenance estimates to reflect revised volume forecasts; and • Reclassify re-railing costs as asset renewals.	5.1	• Accept revision of maintenance estimates for revised volumes, subject to QCA approval of Aurizon Network's actual costs for 2013/14 and its revised maintenance allowance for 2014/15 to 2016/17. • Accept re-classification of re-railing costs, subject to a transitional arrangement which delays implementation until 2015/16.
Consider merits of developing a maintenance performance incentive during the course of the UT4 period.	5.2	Disagree, propose to work with the QCA, the QRC and other stakeholders on an alternative framework for maintenance funding and reporting.
Refuse to approve Aurizon Network's proposed indirect maintenance costs. Amend the 2013DAU for the following adjustments: • calculating return on assets using the QCA's post-tax real WACC (and escalated by CPI) and the historical cost valuation approach; • removing allocations for the return on inventory and working capital; and • removing allocations for corporate costs.	5.3	• Accept return on assets adjustment, subject to Aurizon Network's verification of the QCA's calculations and the QCA's commitment to the historic cost approach for UT5. • Disagree with adjustment to return on inventory, propose re-instatement of the allowance adjusted for escalation by SKM's proposed Consumables sub-index and Aurizon Network's proposed rate of return. • Accept adjustment to return on working capital. • Refer Chapter 4 for discussion on corporate costs.
Refuse to approve Aurizon Network's proposed MCI. Amend the 2013DAU for the following adjustments: • limiting application to direct maintenance costs less depreciation; • escalating labour costs based on equal proportions of the WPI for the national mining and construction industries and Queensland all industries; • escalating fuel costs based on the wholesale price of diesel); and • escalating hire of heavy plant and equipment costs based on the producer price index for non-residential building construction.	5.4	Accept, subject to Aurizon Network's verification of the QCA's application of the MCI and alignment of the forecast and actual MCIs.
Escalate depreciation by the Brisbane CPI (all groups).	5.5	Accept.

5.2 Summary of Aurizon Network's Response

Table 5.1 summarises the differences between QCA's proposed maintenance cost allowance (excluding ballast undercutting) of $527.85m and Aurizon Network's 2013DAU of $739.58m (nominal).

Table 5.1 – Maintenance cost allowance between 2013DAU and QCA's Draft Decision

($nominal million)	QCA's Draft Decision	Aurizon Network's 2013DAU	Difference
Direct Maintenance Costs			
Re-classification of re-railing expenditure	nil	89.11	89.11
Volume adjustment	(15.51)	n/a	15.51
Indirect Maintenance Costs			
Corporate overheads	nil	67.89	67.89
Return on assets	28.62	54.50	25.87
Return on inventory	nil	6.79	6.79
Return on working capital	nil	6.54	6.54
Total			**211.71**

Aurizon Network welcomes the QCA's approval of both the scope and cost of its direct maintenance activities (excluding ballast undercutting). Aurizon Network agrees with the QCA that the maintenance allowance should be adjusted for revised volume forecasts. However, Aurizon Network proposes that:

- for 2013/14, actual costs be reflected in the maintenance allowance.
- for 2014/15, the maintenance allowance is adjusted to reflect Aurizon Network's restated cost build-up based on a '9+3' volume forecast to be calculated in April 2015.
- for 2015/16 and 2016/17, the maintenance allowance is adjusted to reflect Aurizon Network's restated cost build-up reflecting the proposed volume forecasts in Chapter 3.

Aurizon Network accepts the QCA's Draft Decision to re-classify re-railing costs as renewals expenditure, subject to a transitional arrangement which delays the re-classification to 2015/16 and adds the 2015/16 and 2016/17 allowances to the UT4 capital indicator.

Aurizon Network does not accept a maintenance performance incentive in addition to the existing *ex-ante* and *ex-poste* arrangements for the funding of, and reporting on, its maintenance activities. Such an incentive is inconsistent with the *ex-ante* approach by which Aurizon Network's maintenance allowance is established, and may actually promote inefficient outcomes. Aurizon Network is willing to work with the QCA, the QRC and other stakeholders to develop an alternative reporting and funding framework to address concerns.

Aurizon Network continues to believe that a GRV approach is the better long-term approach for return on maintenance assets. Aurizon Network is nevertheless prepared to accept the QCA's proposed adjustment to return on assets (including escalation of depreciation) on the basis there is no long term difference between these two approaches, subject to verification of the adjustments summarised in the Draft Decision and the QCA's commitment to the same approach for UT5.

Aurizon Network accepts the QCA's Draft Decision on return on working capital. However, Aurizon Network disagrees with the QCA's Draft Decision on return on inventory on the basis that such a return would be included in the price charged by an arm's length, efficient supplier of maintenance services.

5.2.1 Direct Maintenance Costs

Aurizon Network welcomes the QCA's approval of both the scope and cost of its direct maintenance activities (excluding ballast undercutting).

The Draft Decision proposes two adjustments:

- alignment with Energy Economics forecasts; and
- re-classification of re-railing costs.

Aurizon Network agrees with the QCA that the maintenance allowance should be adjusted for revised volume forecasts. However, Aurizon Network proposes that:

- for 2013/14, actual costs be reflected in the maintenance allowance. These costs were incurred in good faith and on the basis of expected approval of the scope and costs in the 2013DAU.
- for 2014/15, the maintenance allowance is adjusted to reflect Aurizon Network's restated cost build-up based on a '9+3' volume forecast to be calculated in April 2015. A forecast based on a '3+9' volume forecast (Nov 2014) is provided for illustrative purposes in Table 5.5 below.
- for 2015/16 and 2016/17, the maintenance allowance is adjusted to reflect Aurizon Network's restated cost build-up reflecting the proposed volume forecasts in Chapter 3. A forecast based on these volumes is provided in Table 5.5 below.

Aurizon Network accepts the QCA's proposal to re-classify re-railing costs as renewals, subject to a transitional arrangement which:

- delays the re-classification to 2015/16 (i.e. continues to fund the 2013/14 and 2014/15 allowances recurrently); and
- as a result, adds only the re-railing allowances for 2015/16 and 2016/17 to the UT4 capital indicator (refer Chapter 8).

Aurizon Network's revised proposal for direct maintenance allowance is discussed in detail at section 5.3 below.

5.2.2 Maintenance Performance Regime

Aurizon Network disagrees with a maintenance performance incentive in addition to the existing *ex-ante* and *ex-post* arrangements for the funding of, and reporting on, its maintenance activities. Such an incentive is inconsistent with the ex-ante approach by which Aurizon Network's maintenance allowance is established, and may actually promote inefficient outcomes.

However, subsequent to the QCA's publication of the Draft Decision discussions with the QRC have commenced on an alternative framework for maintenance performance funding and reporting. A proposed set of arrangements have been shared with the QRC and is summarised at section 5.4 below.

Aurizon Network would like to engage further with the QRC and other stakeholders and the QCA to convert these arrangements into workable drafting for UT4.

5.2.3 Indirect Maintenance Costs

Aurizon Network continues to believe that a Gross Replacement Value (GRV) approach is the better long-term approach for return on assets.

Aurizon Network is nevertheless prepared to accept the QCA's proposed adjustment to return on assets (including escalation of depreciation) on the basis there is no long term difference between these two approaches, subject to verification of the adjustments summarised in the Draft Decision and the QCA's commitment to the same approach for UT5.

Aurizon Network rejects the QCA's Draft Decision on return on inventory on the basis that such a return would be included in the price charged by an arm's length, efficient supplier of maintenance services. Aurizon Network proposes that the return on inventory amount be re-instated subject to escalation by SKM's proposed Consumables sub-index (refer section 5.6 below) and Aurizon Network's proposed rate of return (refer Chapter 10).

Aurizon Network accepts the QCA's Draft Decision on return on working capital.

Aurizon Network's revised proposal for indirect maintenance allowance is discussed in detail at section 5.5 below.

Aurizon Network's response to the QCA's Draft Decision on corporate costs for maintenance is provided earlier in Chapter 4.3.

5.2.4 Maintenance Cost Index

Aurizon Network accepts the QCA's proposed MCI subject to verification of the MCI calculations summarised in the Draft Decision and the alignment of indices used to determine forecast and actual MCIs.

Aurizon Network's position is consistent with its March 2014 submission to the QCA on MCI. Aurizon Network stated in the submission that it would be prepared to accept SKM's recommended MCI on the basis that the Australian Bureau of Statistics (ABS) may not be able to prepare alternative sub-indices.

5.2.5 Aurizon Network Revised Proposal for Maintenance Costs

Aurizon Network's revised proposal for maintenance allowance is summarised in Table 5.2 below.

Table 5.2 – Revised proposal for maintenance cost ($nominal million)

($nominal million)	2013/14	2014/15	2015/16	2016/17	Total UT4
Aurizon Network proposed (Apr 2013)	165.00	179.37	191.93	203.30	**739.58**
QCA's Draft Decision	123.70	130.01	132.28	141.88	**527.85**
Aurizon Network proposed adjustments					
• Re-railing costs	16.20	16.41	-	-	**32.61**
• Return on inventory	1.21	1.20	1.20	1.23	**4.84**
• Other adjustments (net)*	3.69	3.54	7.62	3.53	**18.40**
Aurizon Network proposal (revised)	144.80	151.16	141.10	146.64	**583.70**

** 2013/14 equivalent to the difference between the QCA's proposed allowance for direct maintenance costs and 2013/14 actual costs, less re-railing costs and Aurizon Network's proposed return on inventory. 2014/15 to 2016/17 equivalent to the net sum of a) increases to re-instate the QCA volume adjustments b) reductions for Aurizon network's restatement of the maintenance allowance for the revised volume forecasts and c) net differences in MCI escalation between Aurizon Network and QCA approaches.*

5.3 Direct Maintenance Costs (Excluding Ballast Undercutting)

The QCA's Draft Decision 5.1 proposed to amend Aurizon Network's direct maintenance costs (excluding ballast undercutting) in the 2013DAU to:

- revise maintenance estimates to reflect revised volume forecasts; and
- re-classify re-railing costs as asset renewals.

Aurizon Network's response to the Draft Decision is detailed in this section below. Section 5.8 discusses issues relating to direct maintenance costs but not directly related to the Draft Decision:

- location of maintenance works;
- adjustments for non-coal traffics; and
- AT_1 and the Short Run Variable Cost (SRVC).

5.3.1 Revised Volume Forecasts

Aurizon Network accepts the QCA's Draft Decision to revise the maintenance allowance for a revised volume forecast for UT4, subject to the QCA's approval of actual costs for 2013/14 and the revised maintenance allowance prepared by Aurizon Network for 2014/15 to 2016/17.

While there is a summary discussion of the methodology supporting the QCA's proposed adjustments, Aurizon Network has not received a detailed explanation from the QCA. We are therefore unable to verify the link between revised tonnages based on Energy Economics forecast, SKM's methodology and the proposed volume adjustment for maintenance costs.

Aurizon Network is concerned that the SKM methodology may overstate the variability in maintenance costs from changes in volumes, specifically:

- the adjustment may be based on a long run variable cost (i.e. AT_1) rather than the SRVC proposed by Aurizon Network for the annual Reference Tariff variation process in UT4; and
- even if SRVC is used, the adjustment may not reflect the QCA's Draft Decision to capitalize re-railing, as the SRVC should reflect the same re-classification of re-railing from maintenance to renewal.

Aurizon Network's concerns are illustrated by the proposed 'indicative' direct maintenance allowance for 2014/15 and proposed allowances for 2015/16 and 2016/17, for which the Draft Decision appears to show a variability due to volume of up to 5%[80] whereas the discussion below reveals a variability of only up to 1%.

Aurizon Network's further comments on AT_1 and the SRVC are provided at section 5.8.3 below.

In view of the above, Aurizon Network proposes adjustments to the maintenance allowance as follows:

- for 2013/14, actual costs;
- for 2014/15, approach for the 2013DAU[81] aligned with a '9+3' forecast for the Final Decision; and
- for 2015/16 and 2016/17, methodology for the 2013DAU aligned with the forecasts proposed by Aurizon Network and discussed at Chapter 3.

Comments on Aurizon Network's restatement of the maintenance cost allowance for each year of the UT4 period, based on the above approach, are provided below.

2013/14

Aurizon Network recognizes that the revised volume forecast should have an impact on the final maintenance allowance for UT4. However, the Draft Decision was issued after the end of 2013/14. Absent of any UT4 decision, Aurizon Network planned and delivered its maintenance activities on the basis of the scope and cost submitted as part of the 2013DAU for 2013/14.

Therefore, Aurizon Network believes that the maintenance allowance for 2013/14 should reflect actual costs, which in turn are influenced by actual volumes.

Table 5.3 below sets out, on a comparable basis, the QCA's proposed allowance for 2013/14 compared with actual 2013/14 costs.

Table 5.3 demonstrates that the difference between actual direct maintenance costs (excluding ballast undercutting) and the proposed QCA allowance (adjusted for the allowance for re-railing) is not significant and is slightly more than the comparable QCA allowance. The difference:

- reflects higher re-railing costs than the costs proposed by Aurizon Network for UT4 (other than for this increase actual direct costs for 2013/14 are lower than the proposed QCA allowance); and
- would be reduced if Aurizon Network's proposed forecast MCI was used to escalate the QCA's proposed allowance (refer section 5.6.2).

[80] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, Table 48, p. 110.

[81] The approach is based on the Network Strategic Asset Plan (NSAP) developed by Aurizon Network as a tool to assist with the planning of maintenance scope. NSAP uses a tonnage profile that includes the mine location, destination location and the tonnage volumes for the CQCR which is then 'mapped' across a financial model split by line section code. The model also incorporates intervention levels taken from Aurizon Network's Maintenance and Renewal Policy to derive a scope for each line section, which is then aggregated into a system maintenance forecast. Further information on the approach is provided in Aurizon Network's maintenance cost submission for UT4.

Given this difference, Aurizon Network proposes that actual costs, rather than the proposed allowances, be accepted by the QCA for 2013/14.

Table 5.3 Reconciliation of maintenance costs for 2013/14

($nominal million)	QCA's Draft Decision	Actual Costs	Difference
Total cost (including ballast undercutting)	n/a	194.09[82]	
Less ballast undercutting	n/a	(54.56)	
Total cost (excluding ballast undercutting)	119.62	139.53	
Add back re-railing costs	16.20*	n/a	
'Adjusted' proposed QCA allowance	135.82	139.53	3.71 (3%)

** Per Table 48 (p.110), plus escalation consistent with SKM's proposed MCI (refer section 5.6).*

2014/15

Aurizon Network proposes that the maintenance cost allowance for 2014/15 be based on Aurizon Network's methodology applied to a '9+3' forecast to be prepared by Aurizon Network in April 2015. This treatment is consistent with Aurizon Network's proposed finalization of volume forecasts for pricing purposes, as set out in Chapter 3.

This proposal recognizes that neither the 2014/15 transitional volumes for pricing purposes nor actual 2014/15 costs are appropriate bases for restating the maintenance cost adjustment. This is due to:

- the QCA's Draft Decision having been published part-way during 2014/15;
- Aurizon Network having planned, and substantially (but not totally) delivered, its maintenance program for 2014/15; and
- the opportunity to apply ex-ante arrangements for the QCA's approval of cost and scope for 2014/15, whilst recognizing that different forecast volumes between the Draft and Final Decisions will affect scope delivery.

In view of the above, Aurizon Network proposes that the final allowance for 2014/15 be based on Aurizon Network's approach for the 2013DAU and either:

- preferably, Aurizon Network's '9+3' volume forecast, being 9 months actual volumes as disclosed in its public Quarterly Performance Report (once the 2014/15 wet season has passed) and a 3 month forecast (reviewed and endorsed by the QCA); or
- if the QCA is not minded to accept Aurizon Network's forecast, a '9+3' forecast prepared by Energy Economics.

Alignment of the 2014/15 allowance with Aurizon Network's forecast will ensure that the revised allowance can be provided to the QCA and confirmed as part of the Final Decision. Aurizon Network is willing to work with the QCA to confirm the '9+3' forecast for 2014/15 prior to the Final Decision.

For the purposes of this response, a '3+9' forecast (being 3 months actual volumes as disclosed in the Quarterly Performance Report and a 9 month forecast) has been prepared. The forecast is slightly lower than the UT4 submission reflecting the lower volumes proposed by Aurizon Network relative to those proposed for the UT4 submission.

2015/16 and 2016/17

Aurizon Network therefore proposes that for the remaining years of UT4, the QCA accepts Aurizon Network's proposed maintenance allowance (based on Aurizon Network's methodology and volume forecasts) rather than the methodology recommended by SKM and the volume forecasts proposed by Energy Economics.

[82] Total costs for 2013/14 of $194.03m are $2.00m (1%) higher than actual costs per Aurizon Network's October 2014 public maintenance cost report to the QCA.

As per 2014/15, the forecast is slightly lower than the UT4 submission reflecting the lower forecasts proposed by Aurizon Network.

5.3.2 Re-Classifying Rail Renewals Expenditure

Aurizon Network accepts the QCA's Draft Decision to re-classify re-railing costs as renewals expenditure, subject to a transitional arrangement which delays the re-classification to 2015/16 and adds only the 2015/16 and 2016/17 allowances to the UT4 capital indicator.

Table 5.4 below summarises the current differences in the regulatory treatment and funding of re-railing costs:

Table 5.4 - Current differences in re-railing treatment

Re-railing Scenario	Re-railing of life-expired rail	Re-railing as part of upgrades of rail
Regulatory treatment	Recurrent maintenance cost	Capital (renewal) cost
Regulatory funding	Ex-ante basis (i.e. in the year the rail is expected to be replaced) and expensed in the year it is actually replaced	Part of the capital indicator and 'trued up' on an ex-ante basis, capitalized and depreciated over maximum life set by the QCA

Aurizon Network recognizes:

- there is an increasing re-railing requirement over the next 10-20 years, due to increases in the amount of rail becoming life-expired (i.e. reaching wear limits) and requirements for new, harder rail to match increases in axle loads and tonnages;
- that the requirement over the next five to ten years will fluctuate significantly, as evidenced by significantly higher actual costs for 2013/14 relative to the proposed QCA allowance (refer discussion above);
- the QCA's proposal to include the relevant amount in the capital indicator, and that as a result the expected NPV impact of the adjustment should be neutral; and
- there is a short-term negative impact on Aurizon Network's cashflow (relative to the UT4 submission) if the QCA's Draft Decision was backdated to 2013/14.

Aurizon Network agrees with the QCA that these costs would be better classified as asset renewals subject to cost capitalization (i.e. inclusion in the capital indicator, with allowable revenues to cover a return of and return on capital). Aurizon Network therefore accepts the QCA's Draft Decision, subject to a transitional arrangement, on the basis that, over time, its funding requirements can be reviewed and re-aligned with the re-classification. As the first two years of UT4 are already passed or in process, application of the change to these years would have the effect of retrospectivity.

It is not in Aurizon Network's commercial interests for this policy change to have a retrospective effect as investors react negatively to retrospective changes and adversely influences their view of the stability of the Regulatory Regime. Therefore Aurizon Network would support the implementation of this change from 2015/16 as it enables sufficient time to inform all stakeholders and address any concerns.

In view of the above, Aurizon Network proposes an arrangement for UT4 which:

- for 2013/14 and 2014/15, funds the re-railing allowance on a recurrent basis (i.e. included in the maintenance allowance); and
- for 2015/16 and 2016/17, adds the re-railing allowance to the capital indicator.

5.3.3 Restatement of Direct Maintenance Cost Allowance (Excluding Ballast Undercutting)

Aurizon Network's revised proposal for direct maintenance cost is summarised in Table 5.5 below.

Table 5.5 – Direct maintenance cost allowance ($nominal million)

($nominal million)	2013/14	2014/15	2015/16	2016/17	Total UT4

Direct maintenance costs per QCA's Draft Decision[83]	119.62	122.94	126.03	136.59	**505.18**
Add back re-railing costs	16.20	16.41	-	-	**32.61**
'Adjusted' QCA allowance	135.82	139.35	126.03	136.59	**537.79**
Other adjustments (net)*	3.71	3.54	7.61	3.53	**18.39**
Proposed direct maintenance costs (excluding ballast undercutting)	**139.53**	**142.89**	**133.64**	**140.12**	**556.18**

** 2013/14 equivalent to the difference between the QCA's proposed allowance for direct maintenance costs and 2013/14 actual costs, less re-railing costs. 2014/15 to 2016/17 equivalent to the net sum of a) increases to re-instate the QCA volume adjustments b) reductions for Aurizon network's restatement of the QCA forecast for its revised volume forecasts and c) net increases for differences in MCI escalation between Aurizon Network and QCA approaches.*

Aurizon Network is willing to work with the QCA and SKM to confirm its proposed direct maintenance cost allowances.

5.4 Maintenance Performance Regime

The QCA's Draft Decision (5.2) is to consider the merits of developing a maintenance performance incentive during the course of the UT4 period.

Aurizon Network disagrees with a maintenance performance incentive in addition to the existing ex-ante and ex-post arrangements for the funding of and reporting on its maintenance activities.

Since UT1, Aurizon Network has operated under an ex-ante approach to the funding of its maintenance costs. The features of an ex-ante approach are as follows:

- Aurizon Network makes a submission to the QCA on its expected maintenance costs for the coming regulatory period.
- The QCA accepts those costs to the extent it believes them to be efficient.
- Aurizon Network is exposed to the risk associated with any cost over-spends (for over-delivery of scope or delivery at higher-than-approved unit costs) and the opportunities associated with cost under-spends (for under-delivery of scope or delivery at lower-than-approved unit costs).
- Maintenance cost reports and condition based assessments exist to provide transparency for the QCA and stakeholders and to prevent the inefficient under-delivery of scope.

In the Draft Decision the QCA drew attention to the under-delivery during UT3 of certain activities such as rail grinding[84]. However, the QCA has not indicated whether it believes the under-delivery is a result of an efficient delivery (i.e. Aurizon Network has maintained the condition of the network efficiently such that the work has not been required) or an inefficient delivery (i.e. Aurizon Network has allowed the network condition to deteriorate through a reduction in scope delivered).

Under an ex-ante approach, Aurizon Network is entitled to retain any gains associated with the under-delivery of scope provided that network condition is maintained. Any ex-post adjustment, such as a maintenance performance regime, is not necessary. In fact, such a regime may promote inefficient outcomes by incentivizing Aurizon Network to undertake maintenance work which is not required (i.e. to over-maintain the below-rail network) as it will be penalized if the work is not completed.

The implications for end customers of a maintenance performance regime for mechanized maintenance activities for which scope is prescribed (such as rail grinding) might include:

- Train throughput being lost as Aurizon Network seeks track closures to complete work not required;
- Aurizon Network refusing to accommodate requests for track closures to be cancelled or re-scheduled to facilitate mine, port or shipping requirements; and/or

[83] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, Table 57, p. 125.
[84] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 104.

- End customers being required to reimburse Aurizon Network for maintenance performance costs associated with such requests.

In addition, for an efficient maintenance performance incentive to operate, costs associated with the regime must be aligned with the SRVC associated with the relevant product, and the SRVC must be accepted by Aurizon Network.

Aurizon Network is obligated to operate a safe and reliable below rail network. Subject to its legal and contractual obligations, it is then in the supply chain's best interests for Aurizon Network to be allowed to accommodate requests from elsewhere in the supply chain for track closures to be cancelled or re-scheduled without penalty. It is difficult to believe that a maintenance performance regime could be developed which aligns with these objectives. On this basis, Aurizon Network disagrees with the establishment of a maintenance performance incentive.

However, Aurizon Network appreciates the concerns raised by the QCA in its Draft Decision and by the QRC and its members during the consultation process. Aurizon Network also acknowledges the issues raised by the QCA, the QRC in relation to asset renewals costs and in particular the Draft Decision (8.4).

In view of the above, Aurizon Network is willing to work with the QCA, the QRC and other stakeholders to develop an alternative framework for the funding and reporting of maintenance including (but not being limited to) the following arrangements:

- retention of the existing ex-ante approach to the maintenance cost allowance for the regulatory period.
- retention of the existing ex-ante and ex-post arrangements for renewals costs, being inclusion in the capital indicator for the regulatory period, an annual claim via the Capital Expenditure Report and the roll-forward and carry-over of QCA-approved renewals costs via the respective mechanisms.
- commencing as part of the annual Reference Tariff variation for 2016/17, adjustment of the maintenance cost allowance for forecast volumes, either as proposed in the 2013DAU (Short Run Variable Cost) or otherwise supported by the QRC and other stakeholders.
- commencing 2015/16:
    - New quarterly maintenance cost reporting and discussions with the QCA regarding each report, including applications for returns to, or recoveries from, Access Holders for scope and cost adjustments supported by the QRC and other stakeholders.
    - A single, annual maintenance and Asset Replacement and Renewals cost report, aligned with both the quarterly maintenance report and annual Capital Expenditure Report, and published by Aurizon Network following discussions with the QRC and other stakeholders.

In order to implement this process in a timely manner, Aurizon Network proposes that the annual maintenance cost report is either excluded from the list of reports to be accompanied by a Responsibility Statement, or the timeframe for submission of the Responsibility Statement be extended, to allow for the QRC and other stakeholders to be given a reasonable opportunity to review the Maintenance Cost Report and provide comments prior to its finalization and publication by Aurizon Network. Any perceived dis-benefit associated with this change and the regulatory burden associated with the QRC and other stakeholders consultation would be more than offset by the benefit associated with an ongoing, transparent process conducted by Aurizon Network in consultation with the QRC and other stakeholders.

Following the QCA's publication of the Draft Decision, Aurizon Network held preliminary discussions with the QRC on the alternative framework. A draft set of principles reflecting the above has been developed and provided to the QRC for comment. Aurizon Network is willing to engage with the QCA, the QRC and other stakeholders to convert these principles into workable, practical arrangements for UT4.

5.5 Indirect Maintenance Costs

The QCA's Draft Decision (5.3) is to refuse to approve Aurizon Network's forecast indirect maintenance costs and to amend the 2013DAU for the following adjustments:

- calculating return on assets using the QCA's post-tax real WACC (and escalated by CPI) and the historical cost valuation approach;
- removing allocations for the return on inventory and working capital; and
- removing allocations for corporate costs.

Aurizon Network's response to the Draft Decision is provided below.

5.5.1 Return on Assets

Section 5.8 of Aurizon Network's 2013DAU sets out Aurizon Network's proposal for return of, and return on, assets based on a Gross Replacement Value (GRV) approach rather than the historic cost approach utilized since UT1.

The GRV approach is based on the principle that:

- asset values are based on a replacement value of a 'modern equivalent' asset, rather than the historical cost of the asset (or multiples of the assets if the modern equivalent has a greater capability);
- asset lives are based on the lives associated with the modern equivalent assets rather than the remaining accounting life of the existing asset; and
- Maintenance costs are based on the modern equivalent asset (i.e. major refurbishment associated with existing assets are excluded).

Aurizon Network recognized that while the allowable revenue associated with the GRV approach was expected to be higher over UT4, it would be NPV neutral over the longer term.

With respect to SKM's review of this approach, Aurizon Network notes a number of comments[85]:

- that the GRV approach was reasonable;
- that costs associated with major periodic maintenance should be excluded (Aurizon Network confirms that these costs were not included in the cost build-up for UT4 under the GRV approach. Under the approach approved by the QCA for UT3 these costs are treated as assets renewals and therefore added to the historic cost of each asset as the work is completed); and
- that the return on motor vehicle assets had been incorrectly calculated.

Aurizon Network also notes the QCA's concern[86] regarding:

> *"…the absence of transparency about the efficient size of the maintenance asset base. In particular, we are concerned there is limited incentive to remove older or redundant assets from the base when they no longer contribute to the provision of maintenance services."*

Aurizon Network believes that this "limited incentive" is also apparent in the historic cost approach, to the extent that assets continue to retain residual accounting value. In addition, under the GRV approach any redundancy of older assets is accounted for by the fact that the modern equivalent asset sets the benchmark for the delivery of scope. For example, if there are three older rail grinders, then the modern equivalent assets may be one grinder, and therefore the return on assets is calculated on this basis. Aurizon Network is incentivised to scrap an older asset to the extent that the capital and operating costs exceed that of the modern equivalent alternative.

Aurizon Network notes that the QCA's Draft Decision is to reject the GRV approach and to continue with the historic cost approach as the basis for establishing the return on assets. Aurizon Network continues to believe that the GRV approach is the better approach, and will result in lower allowable revenues over subsequent regulatory periods.

In addition, Aurizon Network has not received a detailed explanation from the QCA as to how the adjustment to the return on assets (to align with a historic cost approach) has been calculated.

As either approach is NPV neutral, Aurizon Network has no material concerns with the QCA's rejection of this approach subject to:

- Aurizon Network's verification of the QCA's calculations of the adjustment;
- the QCA's in-principle acceptance that this approach will not be revisited at the end of the UT4 period (i.e. for UT5), as Aurizon Network seeks certainty about its future asset valuation method; and
- Alignment of the rate of return with the QCA's Final Decision.

[85] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 114.
[86] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 117.

For the purposes of this response, Aurizon Network has utilized the return on assets adjustment in the Draft Decision. Aurizon Network is willing to work with the QCA to confirm the adjustment's alignment with Aurizon Network's accounting records on which the historic cost approach should be based consistent with the principles underlying the escalation of the RAB.

5.5.2 Return on Inventory and Working Capital

The 2013DAU sets out adjustment for returns on working capital and inventory on the basis that these costs were not included in the build-up of operating costs.

The QCA's Draft Decision is to reject these adjustments on the basis they are:

> *"…inconsistent with the application of the PTRM's[87] 'end of year' assumption (see Appendix C). We consider the 'end of year' assumption provides Aurizon Network with more than sufficient revenues to operate its business on an annual basis over the course of the 2013DAU period, and this includes any costs associated with working capital and inventory management."*[88]

Aurizon Network is prepared to accept the QCA's Draft Decision with respect to return on working capital. Although on the same basis, Aurizon Network disagrees with the QCA's Draft Decision to reject the return on working capital.

Additional costs associated with the funding of non-cash assets such and plant and equipment - and inventory – are incurred by an efficient maintenance business and, where not allowed within direct costs, should be allowed as an indirect cost.

In addition, the QCA's Draft Decision to allow a return on fixed assets based on the historical cost approach should also be extended to a return on inventory assets and recognizes that like fixed assets, inventory is held for periods in excess of one month due to:

- long lead times for procurement (for example, for traction equipment and turnouts);
- logistical delays associated with delivery of inventory to site (for example, for rail, ballast and sleepers); and
- efficiencies which can be realized with bulk purchases (for example, for ballast).

Costs paid to external suppliers of inventory include a return on the cost of inventory held by those suppliers prior to delivery (or, in the case of larger items such as turnouts, their construction). These costs are included in the direct maintenance cost allowance which the QCA has proposed to accept. Consistent with this principle, it is reasonable to expect that Aurizon Network should also be compensated for the indirect holding cost of these assets.

If the QCA's final decision is to reject a return on inventory amount, Aurizon Network will be incentivised to consolidate all inventory holdings with one or more external suppliers until immediately prior to use. Aurizon Network believes that holding some inventory is a more efficient outcome, not only from a cost perspective but also for the timely delivery of reactive and preventative maintenance.

The calculation of the return on inventory amount is consistent with an average inventory level of around $18 million covering items such as ballast, rail, turnouts and traction equipment. This amount represents less than 0.5% of the average RAB value for UT4.

In view of the above, Aurizon Network disagrees with the QCA's Draft Decision on return on inventory and proposes that the adjustment be re-instated, subject to the restatement of this allowance to align with Aurizon Network's proposed rate of return (refer Chapter 10).

Aurizon Network also proposes the escalation of the return on inventory consistent with the forecast Consumables index recommended by SKM but assuming an alignment of the forecast and actual MCIs (refer section 5.6.2).

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[87] Post-tax revenue model.

[88] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 118.

5.5.3 Corporate Costs

The 2013DAU set out separate allocations for corporate overhead for network ownership/operations and network maintenance, on the basis that maintenance costs are associated with, and should be assessed against a standalone, efficient maintenance business.

Aurizon Network understands the QCA's reasons for consolidating corporate overheads within a single operating cost allowance which is discussed at Chapter 4. Aurizon Network's response to this Draft Decision (which it disagrees with) is also provided at Chapter 4.

5.5.4 Restatement of Indirect Maintenance Cost Allowance

Aurizon Network's proposed maintenance allowance for indirect costs, is summarised in Table 5.6 below.

Table 5.6 – Indirect maintenance cost allowance ($nominal million)

($nominal million)	2013/14	2014/15	2015/16	2016/17	Total UT4
Indirect maintenance costs per QCA's Draft Decision[89] (Table 51)	4.07	7.07	6.25	5.28	22.67
Add back Return on inventory	1.21	1.20	1.20	1.23	4.84
Proposed indirect maintenance costs	5.28	8.27	7.45	6.51	27.51

5.6 Maintenance Cost Index

The QCA's Draft Decision (5.4) is to refuse to approve Aurizon Network's forecast MCI and to amend the 2013DAU for the following adjustments:

- limiting application to direct maintenance costs less depreciation;
- escalating labour costs based on equal proportions of the WPI for the national mining and construction industries and Queensland all industries;
- escalating fuel costs based on the wholesale price of diesel (AIP TGP); and
- escalating hire of heavy plant and equipment costs based on the producer price index (PPI) for non-residential building construction.

Aurizon Network accepts the QCA's proposed MCI subject to verification of the MCI calculations summarised in the Draft Decision and the alignment of the forecast and actual MCIs.

5.6.1 Selection of Weightings and Indices

Aurizon Network's UT4 proposal was for an MCI which, compared with UT3, more closely represented the weighting of actual costs incurred during the UT3 period and also applied sub-indices which were more directly related to the drivers of those actual costs. In this regard, Aurizon Network engaged BIS Shrapnel to recommend an appropriate set of sub-indices including a forecast for the UT4 period.

In respect of the weightings, Aurizon Network notes, and welcomes, SKM's endorsement and the QCA's proposed acceptance of their use in UT4. In respect of the sub-indices, both SKM and the QCA expressed some concern regarding the transparency of the sub-indices proposed by BIS Shrapnel, particularly for Labour and Consumables (representing 75% of maintenance costs).

Aurizon Network's March 2014 submission[90] stated that:

> *"Aurizon Network supports the selection of indices which can be verified by an independent, trustworthy source. In this regard, Aurizon Network contacted the ABS (Australian Bureau of Statistics) which has indicated it is prepared to supply suitable indices under a 'fee for service' arrangement. Aurizon Network is pleased to discuss such an arrangement with the QCA before formally approaching the ABS."*

[89] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 117.
[90] Aurizon Network, 2014e, Supplementary Report to the QCA – Maintenance Cost Index, p. 16.

Aurizon Network held further discussions with the ABS regarding preparation of a set of specific indices best reflective of the drivers of Aurizon Network maintenance costs. As a result, Aurizon Network is no longer satisfied that a specific set of private, but independently verified, sub-indices could be developed by the ABS which would be more representative than the sub-indices recommended by SKM and proposed to be accepted by the QCA.

Aurizon Network has also further reviewed its expenses with respect to fuel and confirms that plant and equipment and motor vehicles are now operating predominantly with diesel engines.

In view of the above, Aurizon Network's response in respect of each of the sub-indices for each cost component is summarised in Table 5.7 below.

Table 5.7 – Summary of AN's position on price indices

Category	Draft Decision	Aurizon Network Response
Accommodation	ABS average room rate per occupied night: • Mackay (50%) • Central Queensland/Fitzroy (50%)	Accept, consistent with Aurizon Network's UT4 proposal.
CPI (Balance of Costs)	ABS CPI all groups Brisbane (100%)	Accept, consistent with Aurizon Network's UT4 proposal.
Consumables	ABS producer price indices: • Fabricated metal (35%) • Transport equipment and parts (20%) • Mining and construction machinery manufacturing (45%)[91]	Accept PPIs based on fabricated metal and transport equipment and parts, consistent with Aurizon Network's UT4 proposal. Accept PPI based on mining and construction machinery manufacturing, Aurizon Network is unable to propose a more appropriate alternative for this sub-index.
Labour	ABS wage price indices: • National construction (33.3%) • National mining (33.3%) • Queensland all industries (33.3%)	Accept, Aurizon Network is unable to propose a more appropriate alternative for this sub-index.
Fuel	AIP terminal gate diesel price, Brisbane (100%)	Accept, Aurizon Network agrees this sub-index better reflects the driver of this cost category.

5.6.2 Application of Forecast MCI

The application of Aurizon Network's proposed MCI for UT4 was based on a three-step process:

1. Establish a set of sub-indices which best reflected the drivers for each cost category;
2. Escalate maintenance costs (expressed in $2011/12) on the basis of an MCI calculated as the forecast associated with those sub-indices applied to the approved weightings for each category; and
3. At the end of the relevant year and as part of the revenue cap process, reconcile the difference between the actual MCI (based on actual sub-indices) and forecast MCI applied to the relevant maintenance cost allowance.

Aurizon Network did not have the opportunity to review the QCA's calculations of the escalation (step 2). However, a high level review of the information contained in the QCA's Draft Decision indicates that the QCA has applied an escalation for forecasting which is different to the sub-indices recommended by SKM (and is partly related to the escalation recommended by BIS Shrapnel).

A comparison of the QCA's forecast and SKM proposed MCI's is provided in Table 5.8 below.

Table 5.8 – Differences in MCI Indices used for forecast and actual

Category	Draft Decision – Forecast MCI	Draft Decision – Actual MCI
Accommodation	ABS average room rate per occupied night:	Same

[91] QCA, 2014b, Aurizon Network 2014DAU – Draft Decision on MAR (Information Update).

Category	Draft Decision – Forecast MCI	Draft Decision – Actual MCI
	• Mackay (50%) • Central Queensland/Fitzroy (50%)	
CPI (Balance of Costs)	ABS CPI all groups Brisbane (100%)	Same
Consumables	ABS producer price indices: • Fabricated metal (35%) • Transport equipment and parts (20%) • Mining and construction machinery manufacturing (45%)	Same
Labour	BIS Shrapnel labour price indices: • Construction, QLD (33.3%) • Mining, QLD (33.3%) • CPI (all groups, Brisbane) (33.3%)	ABS wage price indices: • National construction (33.3%) • National mining (33.3%) • Queensland all industries (33.3%)
Fuel	AIP terminal gate diesel price, Brisbane (100%)	Same

While the outcome of step 3 of the process above is that Aurizon Network is compensated for the escalation associated with the actual MCI, it believes that the forecast escalation should be aligned with the original sub-indices. Aurizon Network is willing to work with the QCA and SKM to confirm the forecast MCI for UT4 and therefore recommends that the QCA:

- requests that SKM prepare a forecast of the relevant sub-indices recommended by it and which Aurizon Network is minded to accept; and
- provides details of the forecasts to Aurizon Network so that the QCA's calculations can be verified.

In addition, it was proposed in Aurizon Network's September 2014 submission on the 2013/14 Revenue Adjustment Amounts that the difference in actual and forecast MCI for 2013/14 would be addressed as part of the finalisation of UT4.

Aurizon Network is willing to work with the QCA and SKM to confirm the actual MCI for 2013/14 prior to the QCA's Final Decision. For clarity, the actual MCI for 2014/15 would be addressed as part of Aurizon Network's submission on the 2014/15 Revenue Adjustment Amounts.

5.7 Escalation of Depreciation

The QCA's Draft Decision (5.5) is to escalate the depreciation on Aurizon Network's maintenance fixed assets by the Brisbane CPI (all groups).

As the GRV approach relied upon restatements of asset values to replacement value, escalation of depreciation was not required.

On the basis that the QCA's Draft Decision in relation to return on assets is accepted (refer section 5.5.1 above), the QCA's Draft Decision to escalate depreciation on the basis of Brisbane All Groups CPI is also accepted on the basis that the principles underlying escalation under the historic cost approach are consistent with the principles underling the escalation of the RAB.

5.8 Other Issues

Aurizon Network wishes to raise a number of other issues which are not directly aligned with the Draft Decisions but are relevant to Aurizon Network's response and the QCA's consideration of a maintenance allowance for UT4.

5.8.1 Locations for Maintenance Works

Section 5.1.1 (p.93) of the Draft Decision refers to a recommendation by SKM that at the beginning of each year Aurizon Network provides locations of its planned preventative maintenance activities, and at the end of the year provide details and locations of actual maintenance spend.

Aurizon Network confirms that the schedule of programmed works is not usually confirmed until 12 months prior to the work being completed (to ensure co-ordination of track closures with the supply chain), Aurizon Network is therefore willing to provide this information as part of the discussions on the maintenance reporting framework referred to at section 5.4 above.

5.8.2 Adjustments for Non-coal Traffics

In Section 5.2.3 (p.110) of the Draft Decision, the QCA indicates that the issue of costs for non-coal traffics should be reconsidered in the QCA's Draft Decision on policy and pricing. Coal industry stakeholders believe that non-coal activities may be cross-subsidized by coal access charges.

Aurizon Network's position is that non-coal activities are not cross-subsidized by coal access charges.

Since UT1, the build-up of Aurizon Network's MAR has been on the following basis:

- the CQCR exists (and is operated) primarily for coal carrying Train Services;
- incremental capability is provided for the benefit of Train Services operated for freight and passenger; and
- consistent with this position, incremental costs associated with freight and passenger services – which form the basis of the price 'floor' under the Part 6 pricing principles - should be built up on an incremental basis across capital, operating and maintenance costs.

The above approach ensures that freight and passenger operators are not 'priced off' the CQCR by Aurizon Network seeking (or being forced to seek) recovery of costs of activities which are primarily for the benefit of coal carrying Train Services.

Non-coal traffics represent around 9% of train kilometers in the CQCR, around 2% of train paths and around 1% of total CQCR revenues. Revenues associated with non-coal traffic on parts of the CQCR shared with coal traffics (i.e. excluding the East End Balloon) are less than 1% of total CQCR revenues.

Aurizon Network notes that the Australian Energy Regulator (AER) recently considered the issue of materiality in setting guidelines for the use of shared assets. In assessing whether the cost shared assets should be allocated between regulated and non-regulated, the AER considered that:

> *"Materiality is defined as a service provider's expected annual unregulated revenue earned with shared assets being at least one per cent of its expected revenue from standard control (or prescribed transmission) services."*[92]

AER also said:

> *"In addition to the above, we note that when unregulated revenues earned with shared assets are lower than the one per cent threshold, potential consumer benefits are very small. Against these benefits we must weigh the administrative costs to service providers (and ourselves) of administering cost reductions."*[93]

In this context, any adjustment for non-coal traffics should be excluded entirely from consideration of Aurizon Network's allowable revenues as revenues for those assets in the CQCR which are shared do not exceed 1%. On this basis, Aurizon Network's revised proposal with respect to operating costs attributable to non-coal traffics, discussed at Chapter 4, appears entirely reasonable.

In addition and as indicated in Chapter 4, non-coal paths are regular timetabled traffics and Aurizon Network is prohibited from assigning these paths to coal traffics as they are 'preserved' under legislation. Incremental operating costs (train planning and network control) are therefore very low as the incremental activity required to facilitate new or amended non-coal services is also very low.

With respect to forecast maintenance costs, Aurizon Network confirms the following principles:

- for scope driven by volumes, volumes (and the scope) exclude non-coal traffics; and

[92] AER, 2013b, AER Explanatory Statement – Shared Asset Guideline, p. 24.
[93] Ibid, p. 25.

- for scope driven by activity, the incremental costs associated with non-coal traffics are negligible (i.e. no extra work is required as a result of non-coal activity).

Aurizon Network recognizes that as a result of this approach, the actual annual maintenance costs reported under clause 9.2.3 of the 2010AU include a small incremental component for non-coal traffic funded through freight access charges (note this is not AT_1 which is the long run incremental cost of maintenance caused by coal) and not through coal access charges. Aurizon Network has never sought to quantify these incremental maintenance costs, as it has been considered immaterial (and potentially negligible) and believes that the benefit associated with a review of maintenance costs would be outweighed by the resourcing and cost required to conduct a formal review process.

The major component of non-coal incremental costs is associated with the parts of the CQCR that are required specifically for non-coal services (such as the East End balloon loop and the Central Line west of Burngrove). These costs are excluded from the MAR and are therefore not funded through Reference Tariffs for coal.

Aurizon Network is willing to discuss this issue further with the QCA.

5.8.3 AT_1 and Short Run Variable Cost

In section 5.3.2 (p.112) of the Draft Decision, the QCA recognizes that any review of a maintenance performance incentive (refer section 5.4 above) would need to occur in conjunction with a full review of the AT_1 Reference Tariff component (variable maintenance tariff).

Aurizon Network agrees with the QCA that AT_1, which is based on the long-run incremental maintenance cost, bears little resemblance to the component developed for UT1. In this regard, since the preparation of the 2013DAU Aurizon Network has undertaken further detailed analysis of AT_1 including:

- the original methodology and its continued relevance (considering the significant increase in both volumes and unit costs);
- the alternative methodologies for AT_1 proposed by SKM;
- the alternative methodology of the SRVC proposed by Aurizon Network for UT4 and reviewed by SKM; and
- a proposed methodology for AT_1 and SRVC based on current volumes and unit costs and reflecting the QCA's Draft Decision on the capitalization of re-railing costs.

Aurizon Network's proposed AT_1 for UT4 represents the AT_1 originally developed for UT1, escalated each year for the Brisbane All Groups CPI. In addition, the SRVC was developed based on re-railing costs being funded as a recurrent cost. Aurizon Network's analysis suggests that the level of AT_1 should increase (but not by as much as suggested by SKM) and that the SRVC should decrease relative to the 2013DAU. The analysis supports Aurizon Network's UT4 proposal to include AT_1 variation in the revenue cap process, as the difference between AT_1 and SRVC (and hence the volume risk associated with AT_1) is a material proportion of Aurizon Network's allowable revenue.

Aurizon Network will present this analysis to the QCA as part of its response to the QCA's Draft Decision on policy and pricing.

6. Ballast Undercutting Costs

6.1 The QCA's MAR Draft Decision

Introduction

The QCA has provided a draft decision that substantively impacts Aurizon Network's ability to deliver its ballast undercutting program. The impacts of not delivering an effective ballast undercutting program will be felt throughout the entire supply chain including operators, access holders and end customers.

Having clean ballast is a fundamental requirement for any railway, be it coal or non-coal networks. Fouling, from both natural ballast degradation and coal fines, acts like a sponge trapping moisture and progressively reducing the ballast's ability to drain water and distribute train loads. Over time, the fouling increases and the trapped moisture progressively destabilises the ballast and softens the formation which can result in track failure, and potentially derailments. Ballast undercutting rejuvenates the ballast to ensure that there is adequate drainage to release any trapped moisture within the infrastructure.

During UT3, Aurizon Network had a ballast undercutting shortfall of $18.73million Present Value (PV) against its approved allowance once a tonnage based adjustment for AT1 revenue is completed. Aurizon Network under-delivered on its planned ballast undercutting scope for UT3, however this was appropriate based upon the tonnages railed within the CQCR over that period.

Aurizon Network has developed its UT4 scope in line with what the Network requires based upon the Ground Penetrating Radar (GPR) results. The latest round of GPR data has confirmed that there is 373km of track within the CQCR with a Percentage Void Contamination (PVC) level greater than 30% and that over the term of UT4, another 185km's will move into this >30%PVC bracket.

The QCA's Draft Decision assumes 100% of the Ballast Undercutting costs are variable. Ballast Undercutting programs have both fixed costs (shift labour, depreciation) and variable costs (ballast, fuel freight, etc.). Aurizon Network has a fixed costs percentage of 44% and incurs these even when the machinery is idle. The QCA's adjustment would only provide sufficient funding for Aurizon Network to complete undercutting for 209km of the revised scope of 538km, with no turnouts being able to be completed due to the funding shortfall.

Aurizon Network response in this Part 6, covers all elements of the Ballast undercutting program including both Mechanised and other as outlined within Table 61 of the QCA's draft decision.

The following summarises Aurizon Network's proposed response to the QCA's draft decisions:

Draft Decision	Reference	Aurizon Network Position
We refuse to approve Aurizon Network's proposed Ballast cleaning costs for the 2014DAU. We consider we would accept a ballast cleaning allowance for the 2014DAU consistent with Table 63	6.1	Aurizon Network proposes to amend the 2013DAU submitted forecast scope and forecast costs as outlined within this response
Our draft decision is to refuse to approve Aurizon Network's proposal that we reverse the ballast impairment charge attributable to the 2010AU period. We consider that the 2014DAU should remove this proposal	6.2	Aurizon Network accepts this position for the term of the 2014DAU.
We propose to approve Aurizon Network's proposal that the ballast impairment charge associated with the 2014DAU period (but not other) be reversed.	6.3	Aurizon Network accepts this position for the term of the 2014DAU

Part 6 of Aurizon Networks response to the QCA's Draft Decision is structure in the following manner:

- Key points from Aurizon Network's response
- Ballast Impairment Charge to address decisions 6.2 and 6.3;

- Development of an undercutting Scope:
    - Calculating an Intervention Rate and Undercutting scope;
    - Aurizon Network's UT3 Ballast undercutting program performance;
    - Development of Aurizon Network 2014DAU Scope;
- Efficient Cost Build-up
    - Ballast Undercutting cost shortfall during UT3
    - Ballast Undercutting efficient costs build up for UT4

Key Points from Aurizon Network's response:

Treatment of the Impairment

Aurizon Network wishes to resolve with the QCA the ongoing ballast management issues identified in the earlier Access Undertakings. With this in mind, Aurizon Network accepts the QCA's positions on the treatment of the ballast impairment charges.

Delivery and Development of Scope

Aurizon Network during the UT3 period, faced challenging operating conditions through an unusually heavy series of wet-seasons that made scope and costs difficult to estimate. In light of these challenges, Aurizon Network delivered the required tonnage-based undercutting scope.

The QCA's consultant, SKM as part of their review, confirmed that the proposed 2013DAU Aurizon Network scope of 537km's (if wagons were in operation) was appropriate during the term[94].

Aurizon Network revised Ballast Undercutting scope within this submission is based upon the results of the GPR. This tells Aurizon Network that there is 373km with greater than 30% PVC ballast contamination within the CQCR. Aurizon Network estimates that an additional 185km's, based upon results of the GPR, will move into the >30% bracket during the term. However, it is important to note, that this number is continuously changing as more fouling occurs over time and undercutting work is completed.

Aurizon Network's ballast undercutting fleet, can complete a maximum of 140km per annum on the assumption that all ballast is at a depth of 300mm.

Aurizon Network is procuring through lease arrangements, additional off-track undercutting resources and an additional mainline undercutter (RM74), which are both required to deliver the undercutting scope. Aurizon Network has also procured the spoil wagons, which are expected to be delivered by end of financial year 2015.

There are no additional procurement costs included in the proposed allowance within this response for the procurement of these spoil wagons.

Delivery and Development of Costs

By completing a tonnages adjustment to AT1 revenue, Aurizon Network incurred a shortfall of $18.73million PV during the UT3 term. The allowance used to calculate the shortfall includes the 'wagon allowance' provided in the QCA UT3 Pricing Draft Decision. However, Aurizon Network has only just procured these wagons, effectively have a time/cost value of money equivalent to $7.4million of the UT3 term.

For the UT4 period, the QCA's pre/post GPR reduction of 33% assumes all undercutting costs are variable. However, once the fixed costs (depreciation and shift labour) of the ballast undercutting program are removed from the QCA's proposed allowance the implied reduction to variable costs is actually 47%. This effective halving of the variable cost allowance would result in Aurizon Network being unable to complete the required undercutting scope and would introduce unacceptable consequences to the supply chain through increased speed restrictions, increased track access for maintenance activities and ultimately derailments affecting end customers.

[94] SKM, 2014, Aurizon Network 2013 Draft Access Undertaking Engineering Technical Assessment of Maintenance, Operating and Capital Expenditure Forecast, Table 3-1.

The 2013DAU Ballast Undercutting program costs have been further scrutinized and subsequently revised to ensure ongoing efficiency on-top of the reduction due to the reduced forecast tonnages. The mechanized undercutting costs have consequently been driven below the current comparable competitive market rates.

Aurizon network will also be more transparent on its ballast undercutting practices and will look to make the existing and forward looking information publically available and remove redactions where appropriate

Aurizon Network is also proposing that all ballast undercutting work completed on bridges be capitalized due to the 100% ballast replacement rate and that these undercutting activities are always part of a larger program of works. The process to complete bridge undercutting is substantially different to normal undercutting activities as it is a large construction process and involves additional elements such as fall protection and significant access constraints.

Subsequently, Aurizon Network has resubmitted the following scope and costs:

Table 6.1 – Aurizon Network revised ballast scope and costs for the term of the 2014DAU

	2013/14	2014/15	2015/16	2016/17	TOTAL
Scope – Km's @ 300mm depth	118	140	140	140	538
Scope - Turnouts	68	54	57	57	236
2014DAU Revised Costs ($million nominal)	54.56	66.25	76.24	80.44	277.46
2014DAU Revised Costs ($million FY12)	51.43	60.80	68.26	69.86	250.35

6.2 Ballast Impairment Charge

As part of the decision on the 2010DAU, the QCA impaired Aurizon Network's regulatory asset base by $107million. The adjustment was effected through a negative revenue charge and not a reduction in the RAB value resulting in Aurizon Network forgoing $43million in lost revenue over the term of UT3. In their 2010 draft pricing decision, the QCA confirmed that:

> *'The authority will reconsider this deduction in the future if QR Network was able to establish that its past and future ballast cleaning programs are efficient'*[95]

During the term of UT3, Evan's and Peck completed a Condition Based Assessment (CBA) as a requirement under Schedule A of the UT3. As part of the prior work completed before the commencement of the assessment, the QCA approved the assessment plan which, amongst other things, contains a methodology for assessing track condition. Overall, Evans's and Pecks assessment concluded that the maintenance practices are appropriate and that the asset was performing in line with its key performance indicators being Overall Track Condition Index and the Below Rail Transit Time. This was supported by the QCA in their draft decision:

> *'…. The track condition for the CQCR was generally good and it did not conclusively suggest that significant remedial work was needed for ballast'*[96].

As part of the QCA's consideration of the 2014DAU, Sinclair Knight Merz (SKM) was engaged to complete an independent assessment, including a review of Aurizon Network's forecast maintenance expenditure. As part of SKM's engagement a high level review of Aurizon Network's Ballast Undercutting costs was completed.

SKM compared Aurizon Network's ballast cleaning costs with ARTC in the Hunter Valley (ARTC) and concluded that based upon size of the CQCR when compared with the Hunter Valley Coal Network, that:

> *'….Aurizon Network's maintenance effort is relatively efficient compared to the ARTC'*[97]

[95] QCA, 2010a, Draft Decision QR Network's 2010 DAU – Tariffs and Schedule F, p. 26.
[96] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 139.
[97] SKM, 2014, Aurizon Network 2013 Draft Access Undertaking Engineering Technical Assessment of Maintenance, Operating and Capital Expenditure Forecast, Attachment A, p. 35.

Aurizon Network has also held confidential discussions with ARTC, who explained that up until recently the majority of their ballast remediation work is completed via shoulder cleaning. Shoulder cleaning is less expensive to undertake than full ballast undercutting. Aurizon Network was to perform shoulder cleaning of ballast during the term of the UT3, however as outlined in section 6.4.2, made the commercial decision not to procure the required machinery to complete the planned scope.

To complete ballast undercutting work similar to Aurizon Network's, ARTC have procured ballast undercutting services through a competitive on-market tender [redacted]. As outlined in section 6.3.7, Aurizon Network's unit costs for its RM900 undercutter (which completes similar activities as the ARTC contract) has been reduced to $388k/km in 2014/15. That is, Aurizon Network's mechanised ballast undercutting costs are less than services procured through a competitive marketplace.

Over the period of UT3, Aurizon Network has further implemented projects and completed activities to further develop its understanding of the impacts of rail operations and environmental factors on the performance of the ballast within the Central Queensland Coal Network. These activities include:

- Ground Penetrating Radar (GPR) leading to greater understanding of fouling levels within the CQCR;
- veneering and profiling by Train Operators and Miners;
- coal dust monitoring programs including air quality monitoring stations;
- improved loading techniques at the mine to reduce parasitic coal on sills and bogeys
- review and correction of faulty quick drop doors by operators; and
- improved unloading practices at the ports.

Aurizon Network has also progressed its ballast management practices during UT3 to further mitigate the effect of coal fouling within the CQCR.

Aurizon Network wishes to move forward with this issue and is therefore accepting of the QCA's Draft Decisions relating to the impairment charge being 'to refuse to approve Aurizon Network's proposal that we reverse the ballast impairment charge attributable to the UT3 period'.

Aurizon Network acknowledges that the lost revenue equivalent to $43million is the cost for the ballast undercutting underperformance in regulatory periods prior to UT3. Aurizon Network has therefore removed this proposal from its 2014DAU.

The Evans and Peck CBA report, along with the improvements to Aurizon Network ballast management practices, strongly validates the QCA's decision 6.3, to reverse the ballast impairment charge during the term of the 2014DAU. Aurizon Network therefore welcomes the QCA's draft decision not to extend the impairment charges into UT4. Aurizon Network reiterates that any further consideration to future impairment charges must be based upon a detailed costs benefit analysis.[98]

6.3 Calculating an Intervention Rate and Undercutting Scope

Aurizon Network has provided the QCA with its ballast management practices in a previous submission - *"Management of Ballast Fouling in the Central Queensland Coal Network"*[99] (The Ballast Submission). As part of the Ballast Submission, Aurizon Network outlined that:

[98] Aurizon Network outline the proposed items that must be addressed as part of the costs benefit analysis on pp. 67-68 of the 2013DAU Volume 3: Maximum Allowable Revenue and Reference Tariffs and the accompanying report by Evan's and Peck included within Annex A of that submission.

[98] Aurizon Network, 2014d, Management of Ballast Fouling in the Central Queensland Coal Network – A review of Ballast Management 2010-2017.

- A non-coal railway will typically use an intervention rate of 1000mnt[100] to develop a strategic ballast undercutting scope,
- Coal railways have an accelerated ballast fouling rate due to coal spillage and coal dust from wagons, parasitic coal on wagon sills, bogies and loss through quick-drop doors[101],
- Ballast fouling makes its way to the formation and then builds up from there towards the base of the sleeper. As fouling gets closer to the base of the sleeper, both track stability and drainage problems start to occur. Ultimately this can lead to an increase in Below Rail Transit Times, adverse Overall Track Condition Index and progressing unchecked, derailments.

To manage the build-up of ballast fouling, Railway Managers must develop a program of ballast undercutting with applicable intervention rates to manage the onset of any track instability.

6.3.1 Aurizon Network Intervention Rate

As explained in the Ballast Submission[102], Aurizon Network applies a volume-based Percent Void Contamination (PVC) metric to quantify ballast fouling (which includes coal fouling) within the CQCR. Using data gathered through the use of GPR and in-ground testing and validation, Aurizon Network has been able to demonstrate that coal accelerates the rate of ballast fouling resulting in a required CQCR-averaged ballast undercutting threshold of 600mnt[103].

Aurizon Network confirms that the 2013DAU submission including both the scope and the costs was based upon an intervention rate of 600mnt.

Aurizon Network commenced using GPR in 2010 and has completed four runs covering 2024km of the CQCR, the remaining approx. 600km are areas having low tonnage throughput, and low line speed and the Northern Link (developed as part of GAPE). Highly trafficked and critical areas of the 2024km have been covered up to three (of the four) times.

The GPR machine obtains over 600 measurements per kilometre, it has the ability to identify concentrated areas of ballast fouling within the network, some of which could be as short as 5 metres. Under previous manual methods (approximately two measurements per kilometre) it is highly likely that these 'spot' fouled locations may never have been identified or quantified.

In the QCA's Draft Decision, it was stated:

> *'…..Aurizon Network has provided us with a range of material on how the ballast cleaning scope for the 2014DAU was determined. This includes references to a number of different methodologies, some of which seem inconsistent[104]'*

Aurizon Network understands that the QCA in developing its draft decision had regard to the Evan's and Peck report - *'CQCR Independent Forecast of Asset maintenance and Renewal Costs (2013)'.* This report was not created for the purposes of UT4. This report applied a ballast undercutting threshold of 400mnt (which was a past intervention rate) which was appropriate at the time when the information was requested, however is inconsistent with Aurizon Network's current approach to ballast undercutting and does not reflect the assumptions used throughout the development of the 2014DAU scope.

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[100] Aurizon Network, 2014d, Management of Ballast Fouling in the Central Queensland Coal Network – A review of Ballast Management 2010-2017, p.9, here was an incorrect reference on ballast life, where the number 100million net tonnes was indicated. This should have be in-fact 1000 million net tonnes.
[101] Evans and Peck, 2013a, Ballast contamination scoping study, p. 10.
[102] Aurizon Network, 2014d, Management of Ballast Fouling in the Central Queensland Coal Network – A review of Ballast Management 2010-2017, p. 9.
[103] Ibid, p. 36.
[104] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 140.

This report provided various tonnage based scenarios and the impact that these tonnages would have on Aurizon Network's future maintenance costs. The forecast ballast costs within this report are built up using a range of assumptions and the forecast costs that were only developed for mainline undercutting and not the more difficult and expensive turnouts[105]. The mainline undercutting program is completed by the efficient RM900 ballast undercutter which has a lower unit cost. The RM900 is the most-efficient ballast undercutting machine used by Aurizon. Turnout undercutting can only be completing using an off-track undercutting solution and also requires full ballast renewal (i.e. zero return rate); as a result this solution is more expensive than the mainline undercutting program. Both mainline and turnout undercutting is within Aurizon Networks proposed scope and costings.

All 2014DAU ballast submissions that the QCA has published reference the 600mnt intervention rate. This rate is borne through interrogation of successive GPR data points and assessed against tonnage throughput which provided an average rate of fouling increase of 5% per 100mnt. At an intervention rate of 30% PVC, this equates to an intervention frequency of 600mnt[106]. It is important to note that this is a CQCR-averaged value.

The GPR data has the additional benefit of allowing Aurizon Network to review its intervention rate more frequently, and amend it accordingly as appropriate. If the GPR data indicates that a change in intervention rate is required, this data and change will be communicated to both the QCA and stakeholders.

For these reasons, we recommend that the QCA accept Aurizon Network's proposed scope and costs that were built up using an intervention rate of 600mnt and GPR data and not have regard to the Evan's and Peck - *CQCR Independent Forecast of Asset maintenance and Renewal Costs (2013)* report in assessing the ballast undercutting costs.

6.3.2 Development of a Ballast Undercutting Scope

Strategic Scope

For the 2013DAU proposal, Aurizon Network used both a forecast tonnage throughput (i.e. million net tonnes) and the GPR-derived CQCR-averaged fouling rate (i.e. 30% PVC for every 600mnt throughput) to develop its Strategic, Scope.

This response, proposes using a scope developed using GPR derived PVC data to provide a forecast ballast cleaning requirement, refer Section 6.4.3. This involves clear identification of areas within the network that require ballast cleaning as they are above the 30% PVC level and calculating how many kilometres will move into this category over the term.

The Strategic scope provides the foundation for the Access Undertaking scope for the regulatory period. In the development of the Strategic Scope, there is no ability to factor in the impact of weather related variables that are outside of Aurizon Network's control.

Annual Scope

The annual scope is dependent upon the output of the strategic scope, as it details the number of units (kilometres or turnouts) that are required to be undercut during the year.

Previously, manual methods of testing involving manual based excavations of ballast and laboratory based testing occurred to support the development of annual scope.

Granular GPR data is used in conjunction with track geometry data and field engineering input in order to identify and nominate specific sections for undercutting to be incorporated into an Annual Scope.

Using the Aurizon Network PVC rate, the GPR will direct the maintenance activities to network areas that exceed the 30% PVC threshold rate. Detailed planning must occur in consideration of location, access availability, rainfall events, and impact to revenue traffic and rostering of labour resources.

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[105] Evans and Peck, 2013b, CQCN Independent Forecast of Assets Maintenance and Renewal Costs, FY2018-2033, p. 25.
[106] Aurizon Network, 2014d, Management of Ballast Fouling in the Central Queensland Coal Network – A review of Ballast Management 2010-2017, p. 36.

The GPR data allows for efficient and targeted planning of ballast undercutting work based upon geographical location. Once the data is analysed and the areas of ballast fouling are determined, the following operational review practices are completed:

Figure 6.1 – Operational Annual Scope inputs

6.3.3 Scope and Execution Are Not Linear

When creating an undercutting scope using GPR data, it is important to remember that the relationship between the scope based upon tonnages and GPR and the execution of that scope are non-linear. An example of this is outlined below:

Example 6.1

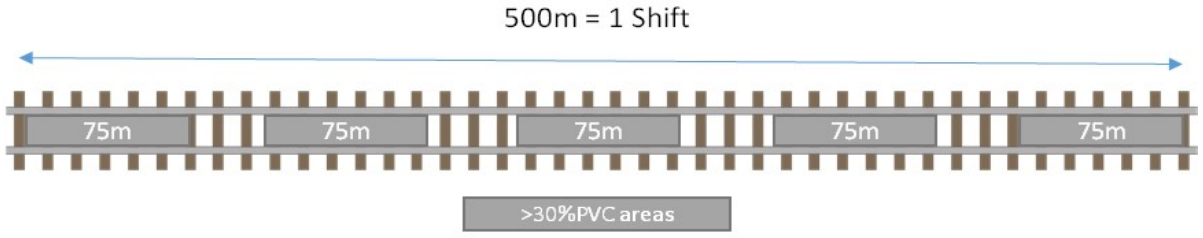
A Railway network is 200km long, there are no turnouts and services 1 mine and 1 port. The network's undercutting program is executed by a mainline undercutter with a capacity to complete 50km per annum with the ability to do 500m per shift.

The undercutting scope development calculation outlines that an undercutting program must be complete 50km of undercutting per year. The GPR data concludes that there is 50km of fouled ballast spread throughout the network greater than the networks 30% PVC rate. The fouling is in locations that range in lengths between 1meter and 2kilometers long.

To complete the 50km of undercutting on only the fouled ballast above the 30% PVC rate would be highly inefficient given the contrasting distances. Undercutting on only the >30%PVC fouled ballast would be highly inefficient and the ballast undercutting program would include completing work on those areas of ballast with fouling <30% PVC. As part of any shift, the undercutter will clean ballast with fouling of both greater and less than 30%.

As shown in Figure 6.2 below, of the 500m being undercut, 375m would be >30%PVC and 125m would be less than <30%PVC. It is more efficient to complete the full 500m than the individual 75m amounts.

Figure 6.2 – Example of the non-linear relationship



From the above example, this will result in a residual amount of fouled ballast from the original 50km identified remaining at the end of the regulatory period. The Railway Manager will have appropriate controls to manage any residual fouling through the monitoring of key performance indicators.

A Railway operator could calculate a 'gross-up' multiplier that could factor in the greater than/less than split, however this would require substantial levels of data which require a full cost/benefit analysis to determine if this practice would be efficient.

The above example does not take into account any track access related issues.

This concept extends across the CQCR and aims to both improve ballast return rates and production efficiency as well as progressively move towards a greater majority of undercutting being a preventative intervention measure. GPR is the only practice that allows for this degree of granularity.

6.4 Aurizon Network's Revised Ballast Cleaning Scope and Costs

In the Draft Decision, the QCA have outlined that it is:

> *'…appropriate for Aurizon Network to amend its 2014DAU to reduce its proposed undercutting costs to a level the QCA consider is more consistent with the efficient scope and cost of ballast cleaning for the 2014DAU period'*[107]*:*

The QCA has proposed to reduce Aurizon Network's Ballast Undercutting allowance by $95.3million ($FY12), excluding the tonnage adjustment. This adjustment is based upon the QCA's process outlined within Appendix E, utilising a pre and post GPR adjustment methodology.

Overall the QCA have used the following assessment criteria to make their Draft Decision:

Table 6.2 – QCA assessment criteria for ballast maintenance allowance

No.	Assessment Criterion	Rationale
1	Establish a baseline assessment of the condition of the ballast	Provide a position from which to assess Aurizon Network's scope and cost proposal for the 2014DAU. The QCA have considered that the Evan's and Peck Condition Based Assessment was a useful guide
2	Is the proposed scope efficient for the 2014DAU Period?	The QCA considers the efficient costs comprise of: • The requisite level of baseline ballast undercutting, subject to no incremental ballast undercutting to account for identified legacy issues associated with historic rates of ballast undercutting; • Identification of any incremental corrective ballast undercutting considered appropriate, the extent to which its existence was within management control and the actions taken to mitigate it
3	Are the forecast costs efficient for the 2014DAU?	The QCA considers the efficient costs comprise of: • an allowance for all efficient costs associated with the requisite level of baseline ballast undercutting for the 2014DAU period, subject to no incremental corrective ballast undercutting to account for legacy issues associated with the historic rates of ballast undercutting; • an allowance for all efficient costs that it is appropriate for Aurizon Network's customers base to bear with respect to any incremental corrective ballast undercutting considered appropriate; • an appropriate escalation factor to take into account changes in costs outside of Aurizon Network's control.
4	If there is corrective maintenance necessary, is there a case for the costs to be borne by access holders?	The QCA consider that it would only be efficient for access holders to meet the costs of corrective maintenance, if: • It was clear the corrective maintenance had arisen due to factors outside of the control of Aurizon Network; and • It was clear that Aurizon Network had not already received payment for the maintenance tasks in a prior period.

Source: *QCA's Draft Decision, Aurizon Network Maximum Allowable Revenue, September 2014, Table 60, page, 132.*

Aurizon Network seeks to address each of these points in the following sections.

[107] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 139.

6.4.1 Baseline Assessment of the Condition of the Ballast

No.	Assessment Criterion	Rationale
1	Establish a baseline assessment of the condition of the ballast	Provide a position from which to assess Aurizon Network's scope and cost proposal for the 2014DAU. The QCA have considered that the Evan's and Peck Condition Based Assessment was a useful guide
4	If there is corrective maintenance necessary, is there a case for the costs to be borne by access holders	The QCA consider that it would only be efficient for access holders to meet the costs of corrective maintenance, if: • It was clear the corrective maintenance had arisen due to factors outside of the control of Aurizon Network; and • It was clear that Aurizon Network had not already received payment for the maintenance tasks in a prior period.

The Evan's and Peck Condition Based Assessment (CBA) concluded that there was not corrective maintenance required within the CQCR, therefore there has been no requirement for Access Holders to bear any additional costs. Aurizon Network agrees that the CBA was a useful guide and provides an indication of the condition of the ballast within the CQCR.

Overall, the CBA did not conclusively confirm that significant remedial work was needed within the CQCR. Aurizon Network has outlined in section 6.3.5 that it has already been under-compensated in previous regulatory terms for its ballast undercutting programs. Aurizon Networks analysis shows that during the term of the UT3, it had an allowance shortfall of $18 million through the reduced AT1 revenues.

6.4.2 Aurizon Network's UT3 Ballast Undercutting Performance

No.	Assessment Criterion	Rationale
2	Is the proposed scope efficient for the 2014DAU Period?	The QCA considers the efficient costs comprise of: • The requisite level of baseline ballast undercutting, subject to no incremental ballast undercutting to account for identified legacy issues associated with historic rates of ballast undercutting; • Identification of any incremental corrective ballast undercutting considered appropriate, the extent to which its existence was within management control and the actions taken to mitigate it

As part of this response to the QCA's Draft Decision, Aurizon Network aims to demonstrate that in the previous regulatory periods, the development of the undercutting scope based upon tonnes has proven to be efficient.

Historical performance against Scope

In the QCA's Draft Decision figure 26 outlines an under-delivery of scope during the UT3 term. The following table outlines Aurizon Network's performance against the approved UT3 Ballast Undercutting scope when measured against actual tonnages.

Table 6.3 – Performance against approved UT3 Ballast Undercutting scope

Ballast Cleaning UT3	2009/10	2010/11	2011/12	2012/13	Total
Approved Undercutting Scope (km)	108	130	150	150	538
Delivered Scope (km)	111	124	111	99	445
Variance					-17%
Forecast Tonnages	184	209	224	224	841
Actual Tonnages	186	164	166	177	693
Variance					-18%

On a tonnage adjusted basis, the required undercutting UT3 scope was delivered.

Historical Performance Against Scope – Variations To Resource Allocation Assumptions

When developing the proposed UT3 scope, Aurizon Network made assumptions for the upcoming regulatory term that related to investment in new equipment and allocation of resources to particular undercutting tasks. Some of these assumption have, in hindsight, proven to be inaccurate for reasons not wholly within Aurizon Networks control. These UT3 assumptions included:

- completion of ballast cleaning via shoulder cleaning for a total of 25km's per year throughout the UT3 term;
- procurement of an additional 44 spoil wagons (up from 6 original wagons) during the UT3 period to allow for increased productivity of ballast cleaning activities when return rates are low or fouled ballast cannot be used to improve corridor access or corridor drainage.

The below table outlines those resource allocation assumptions:

Table 6.4 – Resource allocation assumptions associated with the UT3 Ballast Undercutting program

Assumption	2009/10	2010/11	2011/12	2012/13
UT3 proposed number of spoil wagons available	6	30	50	50
Actual number of spoil wagons during UT3	6	6	6	6
Shoulder cleaning KM's	25	25	25	25
Actual shoulder cleaning delivered	0	0	0	0

Aurizon Network decided during the UT3 term not to procure the additional spoil wagons nor complete the proposed shoulder cleaning. Both of these decisions were based upon similar reasons:

- This machinery requires long procurement lead times of up to 24 months. The time taken to obtain an approved 2010 Access Undertaking, created regulatory revenue uncertainty which effectively precluded the ability to procure the spoil wagons within the original investment timetable that was proposed in Aurizon Network original UT3 submission. The time taken to complete the UT3 regulatory decision escalated the regulatory and revenue risk associated with the project, subsequently impacting Aurizon Network ability to approve the project and procure the wagons within the required timeframes;
- The QCA methodology for the impairment charge through a negative revenue charge materially reduced the ability to fund the UT3 ballast cleaning scope let alone the procurement of any additional machinery;
- Significant reductions in coal volumes following the Global Financial Crisis, which had a direct impact on the required ballast cleaning scope. The reduction in coal volumes effectively negated the requirement for additional ballast undercutting capability; and
- Reduced tonnages against forecast for the UT3 term reduced the actual AT1 revenue by 14%, resulting in a position where Aurizon Network was capital constrained.

If the capital program was executed, the procurement of the additional spoil wagons coupled with shoulder cleaning capability would have resulted in the ability to deliver the approved undercutting scope during the term of the UT3. However, the factors outlined above meant that it was not considered an efficient nor prudent investment to procure the wagons or undertake the shoulder cleaning in the relevant period. This was particularly as Aurizon Network was actually able to deliver the scope on a tonnage adjusted basis, and ensure ongoing integrity of the network, without undertaking this investment.

The QCA in their 2010 Draft Pricing Decision provided an additional 'wagon allowance' of $53million (nominal) within the maintenance allowance[108]. This allowance covered the depreciation and return on these additional wagons and storage facilities that would need to be recovered over their economic useful life. There would, therefore, be a corresponding allowance required in future undertakings, including UT4. Aurizon Network did not commence the procurement of the MFS wagons until the end of the UT3 period. Using the approved Weighted Average Cost of

[108] QCA, 2010a, Draft Decision QR Network 2010 DAU – Tariffs and Schedule F, Table 2.10, p. 79.

Capital and actual MCI, the impact cost from 2010 to the procurement would result in a time value of money cost of $7.4m (nominal).

The procurement project of the spoil wagons has subsequently been re-scoped based upon markets conditions and tonnages and has resulted in the total number of wagons being procured being reduced to 24. These wagons can manage ballast at twice the rate of the original's projects wagons. The procurement of only 24 wagons does not account for the full QCA wagon allowance. Therefore, based on the re-scoping exercise and based upon market conditions, Aurizon Network has prudently directed this capital into other ballast undercutting capital projects including RM900 system upgrades, ballast storage facilities and refurbishment of the existing spoil wagons. The decision to complete these alternative investments is prudent given the current market conditions whilst ensuring the capital is spent efficiently.

Aurizon Network confirms that neither its original 2013DAU nor its revised 2014DAU allowance for Ballast Undercutting includes any capital funding for the spoil wagons. Aurizon Network reiterates that these wagons have been procured and are expected to be delivered during the 2nd half of FY15. Aurizon Network is able to provide evidence of the procurement of these wagons.

Historical Performance Against Scope – Variables Outside of Aurizon Network's Control

The build-up of the UT3 Ballast Undercutting scope requires assumptions for elements that are outside of Aurizon Network's control. The majority of these assumptions are heavily impacted by weather and at the time when Aurizon Network was developing the UT3 scope, most of the CQCR was in drought.

As part of the development of the scope, Aurizon Network assumed that at least 70% of ballast will be screened and return to track. However during the UT3 term, the Central Queensland Region experienced extended wet seasons in 2011, 2012 and 2013 which adversely impacted the ballast return rates. Wet weather affects the ability to screen the ballast as it is generally heavily fouled with coal and clay which blocks the screening capability of ballast undercutter consists. As a result of this, in 2011/12 and 2012/13 return rates were at the extremely low levels of 51% and 52% respectively. These are return rates outside of events covered through the 'Review Event' process outlined within Schedule F of UT3.

The wet coal and clay fouled ballast also slows the shift productivity as the screening process takes longer to complete. Fouled ballast fills the spoil wagons quicker, resulting in greater periods of production down-time to unload the wagons of their fouled ballast and return to normal operations. Operationally, if 100% of the ballast is classed as spoil, the current RM900 consist will be able to travel 60m or 1 hours production before it is forced to cease to unload the spoil wagons. The unload process takes approximately 1.5 hours to complete.

Adverse weather also affects the ability to get access to track, isolates machinery and in some cases does not allow maintenance windows to be realised. In periods of wet weather, the site of ballast undercutting consists become inaccessible for machine operators. This effectively isolates the machinery until the surrounding areas are dry enough to allow access. Lost maintenance windows due to wet weather are generally never rescheduled at the request of the supply chain as they seek to recover lost Train Service Entitlements.

During the UT3 term, as reported in the Annual Maintenance Cost reports, Aurizon Network completed ballast undercutting in areas where ballast depth was up to 600mm, this above the standard depth of 300mm. This effectively reduces the productivity of the ballast undercutting machinery as it takes longer to deal with greater ballast volumes.

When these variables and impacts are factored into an assessment against scope, it can be seen that although a simple indicator of productivity, a simple linear kilometre assessment both fails to account for the intricacies and complexities of the CQCR and is considered a misleading and ineffective base of detailed comparison.

Scope Comparison with ARTC

Aurizon Network's ballast undercutting program is continually compared with the ARTC program. However, there is one important difference between the two undercutting programs - that being undercutting depth. Railway maintenance programs include the practice of placing new ballast on-top of existing ballast to provide a remediation to an underlying track or formation issue. Sometimes this solution is the most efficient and increases

the service life of the track, however in some circumstances this practice needs to be repeated and over time this will build up the ballast depth.

Aurizon Network completes its ballast undercutting down to the formation level which can be up to 600mm, whereas ARTC complete ballast undercutting down to 300mm only even though their ballast may in fact be deeper.

Aurizon Network undercuts down to formation for three primary reasons:

1) It protects the formation from further deterioration due to moisture creeping in from fouled ballast. Once the formation becomes soft, formation repair or replacement are the only options. Formation repair starts at approximately $1million per km and formation replacement can be up to $3million per km. In addition, formation repairs are highly intrusive and require the track to be closed to all traffic for periods up to 6 days to complete the necessary formation work;
2) It removes all of the fouling and extends the period of time between the next intervention activity; and
3) If the ballast level is above 300mm, the ballast undercutter will restore the ballast down to the standard depth of 300mm.

Aurizon Network confirms that this is a more efficient practice as it effectively extends the period between ballast undercutting, minimising disruptions to the Coal chain through efficient maintenance activities and maximising the availability to the Network to the supply chain. The QCA recognised this in its Draft Decision indicating that

> *'SKM noted that the additional effort undertaken by Aurizon Network means its cleaning effort is more expensive, but should last between eight and ten years before needing to be renewed. This compares to ARTC's 4 year cycle time.'*[109]

6.4.3 Aurizon Network's 2014DAU Strategic Scope

Aurizon Network continuously reviews its ballast management practices as it better understands how its ballast asset performs under the unique conditions prevalent in the CQCR. The QCA in their Draft Decision have concluded that:

> *'….Aurizon Network has provided us with a range of material on how the ballast cleaning scope for the 2014DAU was determined. This includes references to a number of different methodologies, some of which seem inconsistent.'*[110]

Aurizon Network acknowledges this in some respect. Some of these inconsistencies are a result of timings which explains the Evan's and Peck Independent Forecast report.

In 2012, Aurizon Network confirmed that 600mnt was the appropriate intervention rate based upon data at that time from the Ground Penetrating Radar which also validated an average fouling rate of 5% per 100mnt, endorsing the 30% PVC. Historical manual ballast testing methods would not have allowed for this confirmation as the data was not sufficiently granular to understand what level of ballast undercutting the network requires to remain at a 'steady state'.

As part of its consideration of the 2013DAU, the QCA appointed Sinclair Knight Merz (SKM) to complete an assessment of Aurizon Network proposed maintenance scope and costs. In its findings on the forecast ballast undercutting program, SKM concluded that:

> *'SKM found that Aurizon Network's proposed ballast undercutting scope and costs are reasonable in the context of historical ballast fouling and the impact of new volumes. However, recommendations were made to limit the scope of the ballast undercutting task until Aurizon Network acquires the additional ballast wagons proposed in the UT4 Maintenance Submission'*[111]

The QCA's decision does not align to SKM's findings.

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[109] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 137.
[110] Ibid, p. 140.
[111] SKM, 2014, Aurizon Network 2013 Draft Access Undertaking Engineering Technical Assessment of Maintenance, Operating and Capital Expenditure Forecast, Table 3-1.

6.4.4 GPR Results at Latest Run of July 2014

Since 2010, Aurizon Network has completed 4 GPR runs through the CQCR, covering 2024km. Over the course of these four runs, heavily trafficked (and therefore critical) sections may have been measured over three of the four runs.

The data at the latest round of GPR testing provided Aurizon Network with even further information to understand the condition of the ballast within the CQCR. This run was completed in July of 2014, 14 months after the original 2013DAU submission. The results of this confirmed the following:

Table 6.5 – Levels and Kilometres of fouling within the CQCR

Level of Fouling	Kilometers
>30% PVC	373 km
20-30% PVC	418 km
<20% PVC	1241 km

The remaining approx. 600km of the CQCR not within the above numbers is either within areas with very low tonnages, low line speed or the Northern Link (developed for GAPE).

The 373km of track that has a PVC >30%, is mostly made up of a mix of mainline track in the Blackwater, Goonyella, Newlands and Moura System (in order of decreasing KM's greater than 30% PVC).

Aurizon Network has provided a full breakdown of these kilometres within the Appendix 6.1. Please note that these numbers continuously move as fouling occurs through loss from train operators and ballast undercutting maintenance work is carried out.

6.4.5 Aurizon Network Undercutting Capacity

A critical consideration in developing the scope of an undercutting program is the capacity of the available resources. Aurizon Network has completed this analysis and has concluded that its capacity with the resources that will be utilised/deployed during the UT4 term, being the RM900, RM74, Off-track undercutting solution, spoil wagons and efficient labour force planning. The capacity of these resources is 130-140km per annum at a ballast depth of 300mm.

The RM900 is approaching the end of its useful life and is planned to be retired in FY17. Aurizon Network is already planning for this and has subsequently procured the next generation in hi-production ballast undercutters. The hi-production undercutter benefits from screening higher volumes of ballast and is therefore able to have higher production rates.

6.4.6 2014DAU Submitted Scope

When developing the 2013DAU Maintenance submission, the ballast undercutting scope was developed for each year using relevant forecast tonnages and a 600mnt intervention rate.

Aurizon Network's original UT4 ballast strategic scope submitted in April 2013, is outlined below:

Table 6.6 – Original UT4 ballast strategic scope (70% at 300mm depth and 30% at 500mm depth)

	2013/14*	2014/15	2015/16	2016/17	Total
Original Tonnages	196.6	218.3	231.5	246.5	**892.9**
Scope – Volume (m3)	358,203	387,372	406,302	426,430	**1,578,307**
Scope - Linear Distance (km)	122	137	143	150	**552**
Turnouts (unit)	60	80	82	82	**304**

Source – 2013DAU Maintenance submission – Volume 4

**Due to 2013/14 having already been completed, the scope for this year has not been adjusted from the 2013DAU submission.*

2014DAU Revised Scope

Based upon new tonnage forecasts, including the latest round of GPR results, Aurizon Network has reviewed its 2013DAU ballast undercutting strategic scope and has concluded that the network requires 558km of ballast undercutting during the term. This is based upon totalling the 373km plus (using an average fouling rate of 5% per 100MNT), an additional 185km's from the less than 30%PVC categories that will move into the >30%PVC category.

Table 6.7 – Calculated Ballast undercutting scope (at 300mm depth)

	2013/14*	2014/15	2015/16	2016/17	Total
Revised Tonnages	214.5	214.6	227.4	238.7	**895.2**
Scope - Linear Distance (km)	122	145	145	146	**558**
Scope – Linear Volume (m3)	305,000	362,500	362,500	365,000	**1,395,000**
Turnouts (unit)	68	54	57	58	**237**

**Due to 2013/14 having already been completed, the scope for this year has not been adjusted from the 2013DAU submission.*

However this is excess of Aurizon Networks current capabilities based upon resources available and would require greater track possession to complete, using more of the off-track undercutting solution to deliver the scope. Therefore Aurizon Network confirms that its revised scope for the term of UT4 is as follows:

Table 6.8 – Deliverable Ballast undercutting scope by Aurizon Network (at 300mm depth)

	2013/14*	2014/15	2015/16	2016/17	Total
Revised Tonnages	214.5	214.6	227.4	238.7	**895.2**
Scope - Linear Distance (km)	118	140	140	140	**538**
Scope – Linear Volume (m3)	354,011	350,000	350,000	350,000	**1,404,011**
Turnouts (unit)	68	54	57	58	**237**

This results in Aurizon Network proposing a scope that is 20km's less over the term of UT4, than what the GPR data is telling us. Aurizon Network will manage the asset in line with its standard practices which includes monitoring Overall Track Condition Index, Below Rail Transit Times, Sectional Run times and operational inspections. The Ballast Undercutting plan takes into account the location, tonnage throughput, section speed and maintenance activities that will assist with the management of any locations with fouled ballast. This plan will be considerate of the 20km outlined above.

The above scope is built up upon the assumption that Aurizon Network does not forgo any track possession at the request of Operators or Access Holders or from inclement weather. If track possession is lost as a result of these two elements, historical evidence has shown that these are near impossible to reclaim.

Importantly, as outlined within section 6.3.3, there is a non-linear relationship between the scope and its execution as it is simply not efficient to target only those >30%PVC areas. The RM900 ballast undercutter requires at least 300m of undercutting to make a single production shift efficient, any less than this would have the effect of reducing productivity and increasing unit rates.

It should never be expected that there will be 0km's of >30%PVC ballast fouling at the end of the regulatory term. The delivery of this 'ideal', would require vast amounts of resources and continuous GPR runs to continually monitor the CQCR and identify areas approaching the intervention limit; these are not required. Aurizon Network has provided a sample of GPR data within the Appendix 6.2, that shown the non-linear relationship of ballast fouling within the CQCR.

Those areas contained in the 600km that has not been reviewed by the GPR machine, are excluded from the strategic scope and if required, will have ballast undercutting completed through the normal maintenance process, or 'ballast undercutting – other'.

To assist with the delivery of the 2014DAU scope, Aurizon Network confirms that the following operational activities will be completed during the term:

Effective Identification and Planning

Additional GPR runs are planned during the 2014DAU period to support the identification of ballast fouling within the CQCR. Aurizon Network confirms that 80% of infrastructure for which Aurizon Network is the Railway Infrastructure Manager (RIM) has been assessed using the GPR and in some cases, a second and third run of the most heavily trafficked sections of track.

As Aurizon has progressed the use of GPR within the CQCR, location accuracy has improved to the point where in 2014, Aurizon have been able to provide sub-1 metre accuracy. The objective of the additional proposed runs is to understand the rate of increase of ballast fouling and to isolate and quantify zones within the CQCR that are subject to high, medium and low fouling rates. All of this information sourced from the GPR is used by the Ballast Undercutting production team to provide more efficient planning of the undercutting activities.

The effect of these abovementioned operational activities allows for the delivery of the scope to smooth out during the term of the 2014DAU as tonnages progressively increase. It will also result in the delivery of the required scope as the forecasted tonnages increase during the term of the Undertaking. Figure 6.3 below shows the methodology to create and execute the scope completed by Aurizon Network is correct as the historical data shows a clear relationship between tonnages and scope delivery.

Procurement of the Spoil Wagons

The additional 24 spoil wagons will be put into operation progressively during the next six months (second half of 2014/15). The procurement of these assets will assist when ballast return rates are low by allowing greater volumes of spoiled ballast to be held between periods of unloading. It will also help when there is difficult access, as the spoil wagon will allow for extended operation prior to having to temporarily cease production to enable to the spoil wagons to detached and unloaded.

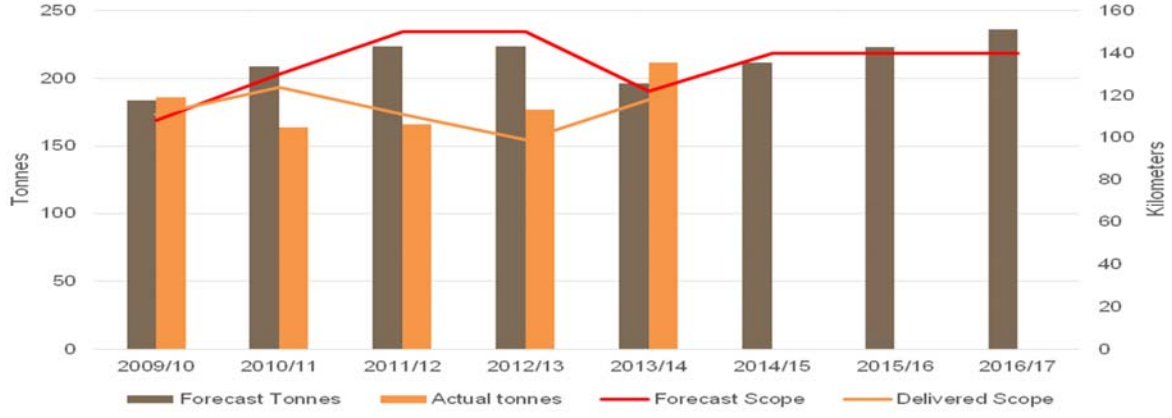
Additional Machinery

Additional machinery is to be acquired through the leasing of a RM74 ballast undercutter to support the existing RM900. The RM74 is well suited to locations where track access is limited and provides a faster and more controlled undercutting solution than the alternative of an excavator undercutter. The option to lease this machinery offers Aurizon Network some flexibility with its purchasing requirements.

In addition to the RM74, Aurizon Network will be leasing additional off-track ballast undercutting machinery to complete difficult areas such as turnouts and localised areas exhibiting accelerated ballast degradation. This dedicated machinery will further support the delivery of the proposed scope.

The above operational activities will assist in delivering a scope that aligns with the tonnage forecast. As outlined in the section dealing with the delivery of the UT3 scope, Aurizon Network ballast undercutting performance was in line with the actual tonnages delivered. Therefore, Aurizon Network's UT4 delivery through the use of GPR data to develop the scope, should be consistent and the following graph outlines this relationship:

Figure 6.3 – Undercutting scope versus Tonnages



As confirmed by Evans and Peck's CBA report, there is no corrective maintenance required within the CQCR resulting in no additional funding being required from Access Holders. The SKM report supported Aurizon Network's 2014DAU proposed ballast undercutting scope.

Aurizon Network as part of this response has outlined that the undercutting scope is heavily dependent on the tonnes railed and historical evidence supports this. The increased forecast tonnes have a direct relationship on the required scope during the UT4 term and this is the driver behind the increase in the required scope.

Turnout Undercutting

The original April 2013DAU submission provided a proposed undercutting scope for turnouts. Based on the revised tonnages within Chapter 3 of this response, Aurizon Network has revised the turnout undercutting scope.

Table 6.9 – Adjustments to Turnout estimates for 2014DAU

Period	Unit	2013/14	2014/15	2015/16	2016/17	Total
2013DAU Tonnage	MNT	197	218	231	247	**893**
2013DAU Turnouts	T/O	60	80	86	88	**314**
Revised Tonnage	MNT	215	215	227	239	**895**
Revised Turnouts	T/O	55	54	57	58	**224**
Tonnage Variance	MNT	18	(6)	(8)	(11)	**-7**
Turnout Variance	T/O	(5)	(26)	(29)	(30)	**-90**

During the recasting of the turnout scope based upon revised tonnages, Aurizon Network identified an error in the original forecasting model that provided the 2013DAU turnout scope. This error was limited to the scope of undercutting of turnouts within the Goonyella system only. This error was due to the model not appropriately breaking down turnouts for duplicated track in the Goonyella system. This resulted in an overstatement of the tonnages (effectively fully loaded trains on both up & down roads) used to create the turnout scope. This error has been corrected in the above revised scope. The other systems models were subsequently reviewed with no errors identified.

6.4.7 Reporting Proposals

Both of the proposed reporting arrangements outlined below, will be responded to formally within Aurizon Network's response to the QCA's Draft Decision on Policy related matters.

Aurizon Network will look to remove unnecessary confidentiality claims on previously published information, including the - *Management of Ballast Fouling in the Central Queensland Coal Network*[112]

GPR reporting

Aurizon Network is proposing to report its GPR figures over the remaining years of the UT4 term One of the key metrics that it will report is Aurizon Networks performance against the 373km of track that has a >30%PVC. However, this reporting is only available and relevant if more frequent GPR runs are completed, which Aurizon Network has proposed in its costing below. Aurizon Network will align its reporting of the GPR data with the level of approved funding for GPR runs over the remaining years of the term.

Aurizon Network will look to provide stakeholders with GPR data that is appropriate. The raw data is extensive and covers millions of points within the CQCR. Therefore Aurizon Network will look at appropriate solutions that accurately summarises this information. If the QCA wishes to review the granular data, Aurizon Network is open to considering this.

[112] Aurizon Network, 2014d, Management of Ballast Fouling in the Central Queensland Coal Network – A review of Ballast Management 2010-2017.

Volumetric Conversions

Over time and under traffic, railway track alignment progressively deteriorates. To correct and reset track alignment, an activity known as resurfacing occurs. Railway maintenance programs include the practice of resurfacing. Resurfacing typically includes the placement of additional ballast on-top of existing ballast and raising the track height a nominal amount. Resurfacing is typically the most efficient solution and provides for sustained track performance, however this practice needs to be repeated overtime which eventuates in a progressive increase in ballast depth.

To account for this when establishing the 2014DAU Ballast undercutting scope, Aurizon Network outlined a volumetric conversion at a standard depth of 300mm, for the amount of ballast that the mechanised undercutting activities requires using a variable ballast profile. This has a large impact on productivity and costs during each year of the regulatory term.

Volume is a critical measure, as the ballast undercutter is a machine that manages ballast volumes, the linear distance is an outcome of undercutting. The Central Queensland Coal Region has an irregular ballast profile with Aurizon Network engineering standard allowing up to 600mm as a result of resurfacing. A variance in ballast height is a feature of all railways and is not unique to the CQCR.

A volumetric conversion is required as ballast is one of the largest variable costs of the undercutting activity. Variability in volume is seen through both the ballast depth and the return rates. The return rate measures the amount of existing clean ballast that can be returned to the track.

The return rate is influenced by many factors including moisture content, which when evident, has the effect of reducing productivity through longer maintenance time required to effectively clean the fouled ballast or move to spoil.

Aurizon Network proposes to use a volumetric measure for both new ballast and returned ballast for all future reporting requirements when discussing the ballast undercutting maintenance program. In addition, Aurizon Network will define clear Key Performance Indicators for Ballast Undercutting and report on these periodically throughout the UT4 term.

6.5 Are the Forecast Costs Efficient for the 2014DAU?

No.	Assessment Criterion	Rationale
3	Are the forecast costs efficient for the 2014DAU	The QCA considers the efficient costs comprise of: • an allowance for all efficient costs associated with the requisite level of baseline ballast undercutting for the 2014DAU period, subject to no incremental corrective ballast undercutting to account for legacy issues associated with the historic rates of ballast undercutting; • an allowance for all efficient costs that it is appropriate for Aurizon Network's customers base to bear with respect to any incremental corrective ballast undercutting considered appropriate; • an appropriate escalation factor to take into account changes in costs outside of Aurizon Network's control.

The QCA have concluded that an efficient allowance for Aurizon Network Ballast undercutting program is:

Table 6.10 – QCA's Draft Decision on ballast undercutting costs for UT4

	2013/14	2014/15	2015/16	2016/17	Total
Total Ballast undercutting costs (Mechanized costs + other)	50.70	48.12	55.49	55.62	209.93

Source: Table 66, QCA's Draft Decision, 2014DAU Ballast Undercutting Costs ($million, nominal)

This allowance is inadequate to meet Aurizon Network's efficient costs, and fails to have regard to its legitimate business interests. This includes Aurizon Network's legitimate business interest to maintain a safe, efficient and operational network, with minimal disruption to the supply chain as the result of infrastructure failure or unplanned maintenance.

The QCA's proposed allowance has been based on an erroneous adjustment to reflect a supposed reduction in intervention rates without a corresponding reduction in costs. Aurizon Network's concerns with the QCA' approach to determining a ballast undercutting allowance are summarised in the following section.

Aurizon Network UT3 Costs

To understand the build-up of Aurizon Network costs, it is important to consider the historical basis of Aurizon Network's undercutting program. The approval of the UT3 ballast undercutting program saw an increase in costs during the period.

The QCA's Draft Decision, specifically Figure 26, outlined that Aurizon Network spent the full allowance, however it did not complete the approved scope. As outlined previously, Aurizon Network delivered an undercutting outcome that was appropriate for the tonnes during the term. The costs outlined within the QCA's Draft Decision, specifically figure 26, indicate that Aurizon Network received the full ballast undercutting allowance for the term of the UT3.

However, Aurizon Network analysis of the ballast undercutting for the term of the UT3, indicates a funding shortfall for its ballast undercutting program.

Table 6.11 – Adjusted UT3 ballast allowance ($million)*

	2009/10	2010/11	2011/12	2012/13	Total	PV**
UT3 approve maintenance costs ($2007/08)	134.97	147.63	156.50	156.90		
UT3 approve maintenance costs ($Nominal)	144.06	161.84	174.61	179.45		
Ballast proportion of total UT3 maintenance costs	20%	19%	18%	18%		
UT3 net ballast undercutting allowance ($07/08)	27.02	36.91	43.09	42.40		
Ballast undercutting allowance (Nominal)	28.84	40.46	48.07	48.49	**165.87**	
UT3 forecast AT1 revenue	52.70	59.69	64.06	65.94		
UT3 actual AT1 revenue	54.68	48.51	51.37	53.93		
Volume related adjustments to maintenance allowance	1.98	(11.18)	(12.69)	(12.02)		
Ballast proportion of volume related adjustments	20%	19%	18%	18%		
Volume adjustment to ballast allowance (Nominal)	0.39	(2.10)	(2.30)	(2.15)		
Adjusted ballast allowance (Nominal)	29.23	38.36	45.77	46.34	**159.70**	**190.77**
Actual ballast undercutting costs incurred	36.77	40.96	46.79	49.92	**174.43**	**209.50**
Volume adjusted net ballast undercutting allowance						**(18.73)**

**Actual MCI used in calculation.*
***Based on the approved UT3 Vanilla WACC of 9.96% (Pre-tax 10.76%)*

Aurizon Network had a ballast undercutting allowance shortfall during UT3. This funding shortfall is equivalent to a present value of $18.73million. This was the required spend to be able to complete the ballast undercutting that was appropriate for the tonnages run across the CQCR. The above allowance includes the additional wagon allowance provided for during UT3. In addition, there has been no adjustment for the negative revenue adjustment charge associated with the impairment during UT3.

The completion of the UT3 ballast undercutting program was required to keep the ballast in a constant state during the term. If Aurizon Network did not deliver on this scope and resulting in the requirement of spend these costs in turn incur these costs, then the flow on effects to the supply chain through speed restrictions and potential derailments would be substantial.

In terms of UT3 actual costs, Aurizon Network saw a large uplift in variable costs during the UT3 term resulting in Aurizon Network having to incur costs above the volume adjusted net ballast allowance. During the term of UT3, Aurizon Network ballast undercutting program incurred the following costs:

Labour Increases

Labour costs per employee increased during both 2011/12 and 2012/13 by 10% and 14% respectively. This increase was a direct result of roles having to be re-evaluated due to the wage pressure being placed upon the Central Queensland job market.

As part of the re-evaluation, the remuneration ranges of these roles are assessed against external remuneration surveys including Hay, Mercer and McDonalds Engineering & Construction. These surveys take into account the immediate influences of similar sized companies in similar industry sectors on the job market. The surveys confirmed that the immediate Central Queensland job market experienced accelerating wage growth for skilled staff. This resulted in renegotiated wages for skilled staff operating the ballast cleaning machinery. The importance of having an adequately skilled staff is outlined in Chapter 4 – Operating Costs, of this response.

Safeworking Practices

During the UT3 period, working with the Rail Safety Regulator, restrictive safe working practices came into effect that limited the distance to turnouts and signalling equipment upon which the RM900 machine can complete ballast undercutting works. This distance is measured from the front of the ballast undercutting consist. The ballast undercutter consist is made up of the 6 ballast spoil wagons at the front, followed by the Undercutter. These new safe working practices have resulted in the RM900 machine having to cease undercutting further away from turnouts and signals than under previous operating rules. The remainder of this work will have to be completed by the less efficient off-track ballast undercutting solution.

Freight Costs

The requirement for additional new ballast volume was greater than the original assumptions due to the weather impacts (excluding 'review events' related to flooding) during UT3 and required more ballast to be freighted within the Network. This resulted in increased costs to complete the ballast undercutting works.

Ballast

The price of ballast has increased significantly during the UT3 period, with $9.48 per cubic metre on-top of the base price or up to 29% added to the price of ballast from some quarries. This is due to the limitation to be only able to purchase ballast from a small number of quarries within the region. Where possible this is done through a competitive tender process, however there is a risk as not all quarries in the region supply ballast that meets the engineering standard for use on railways. With this, some of the identified quarries only supply ballast to Aurizon Network and subsequently only remain open to service our requirements. Upon review, sourcing ballast from other quarries is not viable as the location and effectively a lower quality make any alternatives an uneconomic option.

In addition, the volume of ballast required during the term increased due to the impact of weather on the recovery rates of the ballast and the severity of fouling uncovered. Also the depth of ballast within the Network was greater than forecasted.

Accommodation

Due to the expanse of the network into remote areas of Queensland, Aurizon consumes a large amount of accommodation costs for our operators to deliver the necessary scope. Where possible block bookings are made with key providers.

The cost of accommodation around the CQCR increased during the UT3 period, attributable to the demand for accommodation from the remainder of the supply chain and its contractors. This increase was not in-line with the assumptions Aurizon Network put into its forecast costs build up for the UT3.

6.5.1 Development of 2014DAU Ballast Undercutting Costs

To develop the ballast undercutting costs for the 2014DAU, Aurizon Network operations and finance departments work collaboratively to complete a cost build up and further challenge the variable costs within the overall allowance. The development of the ballast undercutting allowance is displayed in Figure 6.4 below:

Figure 6.4 – High-level development of ballast undercutting allowance

When developing the allowance, the fixed costs are applied first. These are costs that Aurizon Network incur even when the ballast undercutting machinery is not in operation or stranded by weather events within an inaccessible location of the network. Aurizon Network accounts for Labour as a fixed costs due to it being treated under Enterprise Agreement arrangement. This reduces the flexibility and therefore variability associated with labour costs.

The variable costs are develop based upon actuals and contracted prices at the time of the allowance development. An important step in the variable costs process is the internal challenge sessions for each individual variable cost. As part of this challenge process, an important step is to ensure that all external costs incurred are procured through a competitive tender process and that the forecast volumes applied to these variable costs are appropriate based on Aurizon Network's assumptions.

The fixed versus variable split during the 2014DAU term is as follows:

Table 6.12 - 2014DAU fixed vs variable split percentage

	2013/14	2014/15	2015/16	2016/17	2014DAU
Fixed	44%	44%	44%	43%	**44%**
Variable	56%	56%	56%	57%	**56%**
2014DAU fixed amount $million	27.65	32.22	32.81	33.11	**125.79**

The QCA's pre/post GPR adjustment implies that the QCA believe that 100% of Aurizon Network ballast undercutting costs are variable and scalable with output and that the allowance can be amended in-line with the adjustment. The QCA's adjustment amount can only be subtracted from the variable component of the undercutting allowance, which would make the delivery of the proposed scope impossible due to the funding requirements of the undercutting fixed costs.

This substantially increases the impact of the QCA adjustment as once the fixed costs of the ballast undercutting

program are removed from the QCA's proposed allowance the implied reduction to variable costs is actually 47%. This effective halving of the variable cost allowance would result in Aurizon Network being unable to complete the required tonnage-based undercutting scope and would therefore undermine its legitimate business interests.

Table 6.13 – QCA impact of ballast undercutting delivery ($2011/12 million)

	2013/14	2014/15	2015/16	2016/17	2014DAU
QCA proposed allowance	50.70	48.12	55.49	55.62	**209.93**
Minus Fixed Costs	(27.65)	(32.22)	(32.81)	(33.11)	**(125.79)**
Remaining Allowance	23.05	15.9	22.68	22.51	**84.14**
Funded Mainline Undercutting (km)*	61	39	53	54	**207**

*Using 2014DAU unit rates sourced from Figure 6.6 below**

The 'funded mainline undercutting' row in the above table, aims to demonstrate that with the QCA's adjusted allowance from the Draft Decision, minus Aurizon Network's fixed costs and then applying the 2014DAU revised mechanised unit rate, Aurizon Network will be unable to fund the proposed 2014DAU undercutting scope of 538km.

Based upon Aurizon Network's revised scope from Table 6.8 above, this effectively results in an under-delivery of 331km's during the 2014DAU term, with no turnouts being undercut during that time. This definitively would not allow Aurizon Network to meet its legitimate business as completing this amount of undercutting would not provide a safe and reliable network to its coal customers.

Developing an Efficient 2014DAU Ballast Undercutting Allowance

The 2013DAU was submitted in April 2013 with the primary cost drivers for Maintenance Cost, including the Ballast Undercutting program, being sourced from actuals from Financial Year 2012. In that submission the increase in total Maintenance Costs, particularly mechanised Ballast Undercutting was due to labour, ballast volumes, freight and worksite protection cost.

Since the April 2013 submission, Aurizon Network has continued to challenge its costs to find improvements and cost reductions to deliver an efficient ballast undercutting program. This includes a review of the following variable costs:

1. Scope Delivery Options:

In the original submission, the scope required for Ballast Undercutting is more than the production capacity of the RM900 ballast undercutting machine. In order to bridge the production capability gap, Aurizon Network had planned the purchase of smaller off track equipment that can deliver the increased scope. The cost of this solution to deliver the scope was estimated as $14M per annum ($2011/12).

Since the original submission, alternative options have been explored which includes hiring the relevant equipment versus the purchase of a specific excavator with a modified undercutter bar with greater levels of production. Overall, this alternative solution has led to a reduction of $4M per annum of our ballast undercutting allowance.

The off-track undercutting solution is about two and half times more expensive per kilometre than the high production RM900. However, it is the most efficient method to undercut for the parts of the network where the RM900 cannot operate.

2. Freight:

In delivering the Ballast Undercutting scope, Aurizon Network is expected to incur freight charges for both the movement of the Ballast Undercutting Machine as well as the movement of the ballast itself. The April 2013 submission assumed that all of the additional spoil wagons would be used for all RM900 ballast undercutting activities in the final years of the UT3 term. In reviewing the operational delivery of the scope, it has been identified that the additional wagons can be targeted so that only the wagons required will be deployed to site. This has significantly reduced the planned freight costs.

This revised planning is expected to save $10 million over the 2014DAU period.

3. Ballast:

The allowance for ballast in this response is built up using the assumption that return rates will be at 70% during each year of the regulatory term and that the depth of ballast is at 300mm.

For 2013/14, a reduction in ballast costs of $8m eventuated due to the drier weather and subsequent higher screening and return rates from the RM900 operation. Actual Ballast return rates for 2013/14 were 74%.

It is expected that the final two financial years in 2014DAU term will not see any variation to the cost of ballast to what was previously submitted. However, this is subject to any variation in the actual ballast return rates during the term which as outlined previously, and this is a variable cost that Aurizon Network confirms is outside of its control.

Importantly, there is no provisions within the proposed allowance to manage any changes to the way in which Aurizon Network is able to dispose of its unusable ballast. There is always a risk that during an undertaking either environmental legislation or operational constraints may impact this disposal. Aurizon Network is continuously monitoring this and if this risk begins to materialise, will communicate the impact to stakeholders.

Additional Costs from the 2013DAU Submission

Additional GPR Runs

As part of the review of the ballast undercutting program, Aurizon Network has identified the need for an additional two GPR runs during the term of the 2014DAU, bringing the total to four. The GPR runs completed since 2010 have primarily focussed upon mainlines with the objective to identify specific areas of fouled ballast.

The forward looking agenda for GPR, is to focus on the development of fouling zones, specifically turnouts, curves, balloon loops and port loops and subsequently develop a detailed undercutting plan. This undercutting plan aims to identify zones with fouled ballast and their applicable fouling rate.

In order to develop this plan, Aurizon Network needs to attain accurate data. To date, the abovementioned zones have only had one GPR run over them, resulting in only one data point which is inadequate to develop a forward looking plan with confidence. The 2014DAU GPR runs will result in an additional 3 data points which when collated, will provide specific rates of fouling in those areas.

The benefit of this data and subsequent plan will allow Aurizon Network to have a conclusive undercutting intervention rate (or rates) for the development of the next version of the Access Undertaking (UT5). The previous GPR scope of 2 runs would have only allowed this 'zonal' approach to be operational at the end of the next Access Undertaking period (approx. 2020).

The GPR Runs have also increased in costs during the term of the 2014DAU. The more kilometres that are covered with each GPR run, comes at a higher cost primarily through the additional data processing required to analyse the results of each run. For this reason, the cost of the GPR runs are now at $1.2million per annum.

It is expected that in UT5, the number of GPR runs will be reduced as by that time, Aurizon Network would have all the required information on fouling locations and rates.

Ballast Undercutting on Bridges

The proposed 2014DAU scope contained a kilometre amount for bridges, however the proposed allowance did not. Ballast undercutting on bridges is a complex task that requires detailed planning to limit the disruption to the network. Because of this, the work would be included into a larger project incorporating a full maintenance regime for the applicable bridge.

In addition to completing it as part of a larger scope of works, ballast cleaning on bridges requires a 100% rate of ballast replacement i.e. No ballast is screened and returned to the track. Because of this rate of return, Aurizon Network is proposing to capitalise ballast replacement on bridges and proposes the following amounts through-out the term of the 2014DAU:

Table 6.14 – Proposed capital amounts for ballast replacement on bridges ($2011/12)

Bridge Undercutting	2013/14	2014/15	2015/16	2016/17	Total
$ (2011/12)	1,525,520	3,051,041	3,813,801	3,813,801	12,204,163

The current capital indicator proposed in Chapter 8 of this document, does not contain provision for capitalisation of ballast on bridges.

6.5.2 - 2014DAU Revised Costs

The 2014DAU revised costs have be built up using the following scope inputs:

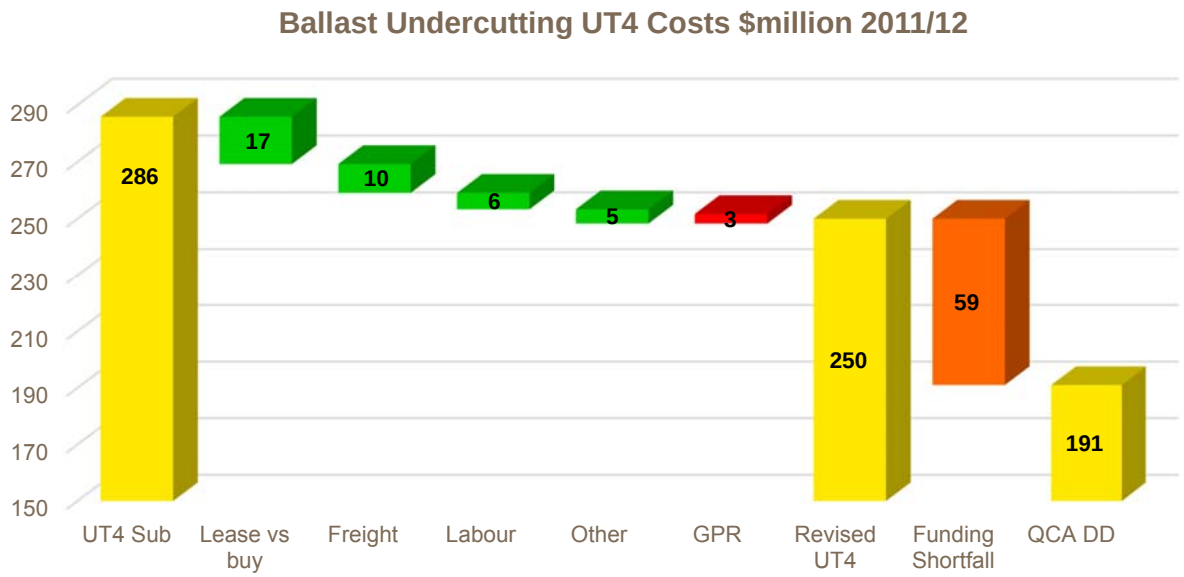
Table 6.15 – Scope inputs into cost build up

	2013/14	2014/15	2015/16	2016/17	Total
Scope – Km's @ 300mm depth	118	140	140	140	538
Scope - Turnouts	68	54	57	57	236

Importantly, the cost build up within this section of the response does not include any consideration to additional 20km's that is beyond Aurizon Network's capacity.

Overall, the forecast costs for the Ballast undercutting program has been reduced from the original 2013DAU submission. The ballast undercutting forecast allowance over the term of the 2014DAU has been reduced by $36miilion ($FY12) with the reductions outlined within Figure 6.5 below:

Figure 6.5 – Reconciliation of savings to ballast undercutting costs



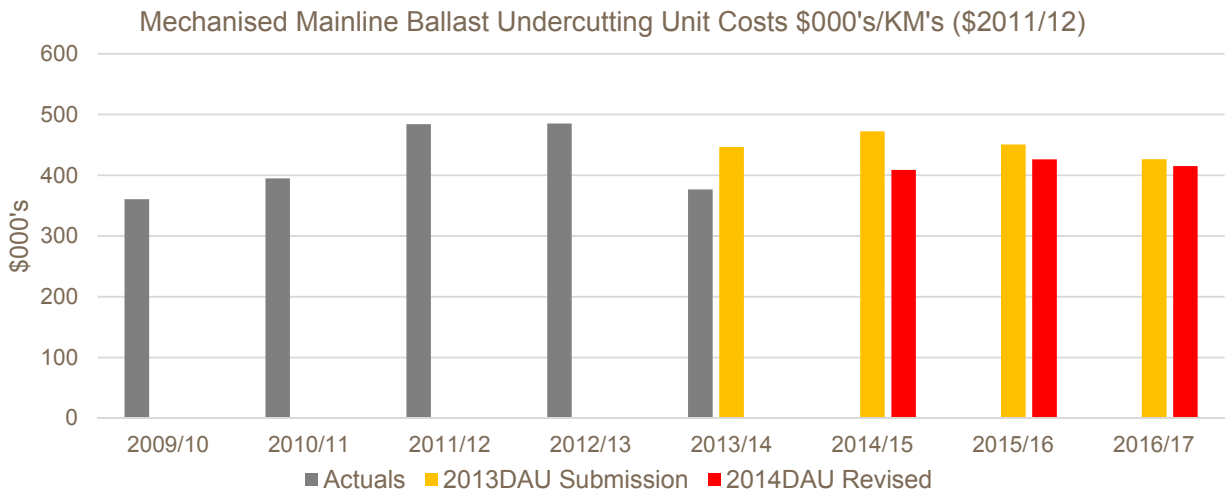
This reduction, reduces the unit rates for the ballast undercutting to the following levels, which are a reduction from the 2012 ballast undercutting unit rates:

As explained above, this proposed allowance was based on considerations and assumptions that were either not correct or omitted reference to key relevant matters identified above. Once the QCA takes into account these considerations, the proposed allowance will need to be reconsidered.

In this regard, Aurizon Network seeks an additional $59m from the QCA allowance. This additional $59million is required to meet the efficient costs of ballast management for Aurizon Network and to achieve its legitimate business interest of operating a safe, efficient, well-maintained network. Aurizon Network's business interests extend further than simple financial returns to areas of safe operation of train services, maintenance of applicable accreditations and the overall responsibility to the supply chain.

Failure to achieve this increase in the Ballast undercutting allowance will inevitably lead to an adverse impact on the reliability and performance of the network with adverse impact on customers.

Figure 6.6 – Ballast Undercutting mainline unit rates



Application of Maintenance Cost Index

The application of Maintenance Costs index is outlined with Aurizon Network's response in Part 5. Aurizon Network therefore proposes the following revised Ballast Undercutting costs for the term of the 2014DAU.

Table 6.16 – Aurizon Network revised ballast costs for the term of the 2014DAU ($2011/12)

Costs $M	2013/14 Actual	2014/15	2015/16	2016/17	Total
2014DAU Revised Costs	51.430	60.800	68.260	69.858	250.348

6.6 Treatment of Ballast Undercutting As Renewals

The QCA in their draft decision has outlined that it will consider the treatment of ballast undercutting as either maintenance or renewals as part of its consideration of UT5. Aurizon Network would welcome involvement in these discussion to progress this matter and would propose to work with the QCA to develop potential transitional approaches to implement any outcomes.

Apart from the capitalization of ballast undercutting on bridges outlined in section 6.5.1 above, Aurizon Network welcomes this consideration and is willing to work with interested stakeholders to further develop this.

6.7 Conclusion

The following table summarises Aurizon Network responses to the QCA assessment criteria:

No.	QCA Assessment Criterion	Aurizon Network's response
1	Establish a baseline assessment of the condition of the ballast	The Evan's and Peck Condition Based Assessment provided an appropriate independent analysis of the condition of the Network.
2	Is the proposed scope efficient for the 2014DAU Period?	During UT3, Aurizon Network was subjected to a range of variable conditions outside of its control which included the impacts of adverse weather. Aurizon Network UT3 ballast undercutting delivered the appropriate level of undercutting for the actual tonnages that were railed across the network. Like the UT3 scope, the UT4 scope has been developed using a PVC intervention rate that has been validated by the GPR data. The UT4 ballast undercutting scope, based upon tonnages, will be delivered

No.	QCA Assessment Criterion	Aurizon Network's response
		through the new machinery supplementing the existing ballast undercutting machines. The UT4 ballast undercutting scope has been confirmed as appropriate by the QCA independent engineers, SKM.
3	Are the forecast costs efficient for the 2014DAU?	During the UT3 term, Aurizon Network undercutting allowance was substantially inadequate for it to execute its ballast undercutting program. This was a result of the allowance being reduced through the negative revenue charge and the reduced AT1 revenue received. As a result, Aurizon Network was required to spend $18.73million dollar more than the allowance provided for to maintain the network for the benefit of the supply chain. This is unsustainable. The QCA costs adjustment is unreasonable as it again will not provide an adequate allowance for Aurizon Network to meet its legitimate business needs. The 2013DAU proposed allowance has been subsequently reviewed and revised based upon more prudent investment decision on the appropriate funding of the Ballast Undercutting program. This results in Aurizon Network requesting consideration to an addition $61million from the QCA proposal.
4	If there is corrective maintenance necessary, is there a case for the costs to be borne by access holders?	The Evan's and Peck Condition based Assessment concluded that there was not corrective maintenance required within the Central Queensland Coal Network, therefore there has been no requirement for Access Holder to bear any additional costs.

Appendix 6.1 – Kms of Fouled Ballast

GROUND PENETRATING RADAR - as at JULY 2014

LOCATION				PVC				
SYSTEM	LINE	TRACK	TrackID	>30	30>20	20>15	15>	TOTAL
Blackwater	Callemondah	No5Arrival	BlackwaterCallemondahNo5Arrival	0.6 km	0.0 km	0.4 km	1.2 km	2.2 km
Blackwater	Central	CurraghBalloonLoop	BlackwaterCentralCurraghBalloonLoop	1.3 km	0.2 km	2.0 km	10.5 km	14.0 km
Blackwater	Central	Down	BlackwaterCentralDown	21.4 km	27.9 km	28.9 km	84.4 km	162.6 km
Blackwater	Central	SINGLE	BlackwaterCentralSINGLE	43.1 km	20.4 km	13.2 km	37.8 km	114.5 km
Blackwater	Central	StanwellPowerStationBalloonL	BlackwaterCentralStanwellPowerStationBalloonLoop	0.4 km	0.4 km	0.6 km	3.5 km	4.9 km
Blackwater	Central	UP	BlackwaterCentralUP	12.7 km	16.7 km	15.3 km	105.9 km	150.6 km
Blackwater	Clinton spur	No1BalloonLoop	BlackwaterClinton spurNo1BalloonLoop	3.1 km	1.3 km	0.8 km	0.7 km	5.9 km
Blackwater	Gregory	GordonstoneBalloonLoop	BlackwaterGregoryGordonstoneBalloonLoop	4.5 km	2.9 km	1.8 km	4.0 km	13.2 km
Blackwater	Gregory	PassingLoop	BlackwaterGregoryPassingLoop	3.5 km	1.5 km	1.1 km	0.3 km	6.4 km
Blackwater	Gregory	SINGLE	BlackwaterGregorySINGLE	15.6 km	30.9 km	19.6 km	11.1 km	77.2 km
Blackwater	GregoryToOakyCreek	Single	BlackwaterGregoryToOakyCreekSingle	7.2 km	4.9 km	0.7 km	0.3 km	13.1 km
Blackwater	Koorilgah	Koorilgah Balloon Loop	BlackwaterKoorilgahKoorilgah Balloon Loop	5.8 km	0.1 km	0.0 km	0.0 km	5.9 km
Blackwater	Koorilgah	Single	BlackwaterKoorilgahSingle	10.5 km	1.4 km	0.6 km	0.3 km	12.8 km
Blackwater	Koorilgah	TPR	BlackwaterKoorilgahTPR	0.6 km	0.0 km	0.0 km	0.0 km	0.6 km
Blackwater	NCL	Down	BlackwaterNCLDown	7.9 km	13.5 km	16.8 km	59.5 km	97.7 km
Blackwater	NCL	UP	BlackwaterNCLUP	8.0 km	11.9 km	11.6 km	61.5 km	93.0 km
Blackwater	Power house loop	PowerhouseNo1	BlackwaterPower house loopPowerhouseNo1	0.8 km	0.2 km	0.4 km	3.2 km	4.6 km
Blackwater	Springsure	MinervaBalloonLoop	BlackwaterSpringsureMinervaBalloonLoop	0.9 km	0.5 km	0.5 km	1.1 km	3.0 km
Blackwater	Springsure	Single	BlackwaterSpringsureSingle	21.7 km	10.8 km	6.5 km	3.3 km	42.3 km
Goonyella	Blair Athol	PassingLoop	GoonyellaBlair AtholPassingLoop	5.9 km	3.0 km	1.5 km	4.0 km	14.4 km
Goonyella	Blair Athol	SINGLE	GoonyellaBlair AtholSINGLE	4.4 km	11.5 km	23.5 km	65.0 km	104.4 km
Goonyella	Caval Ridge balloon loop	BalloonLoop	GoonyellaCaval Ridge balloon loopBalloonLoop	1.0 km	3.3 km	1.9 km	0.2 km	6.4 km
Goonyella	Caval Ridge balloon loop	HoldingRoad2	GoonyellaCaval Ridge balloon loopHoldingRoad2	0.5 km	1.8 km	0.4 km	0.0 km	2.7 km
Goonyella	Caval Ridge balloon loop	Single	GoonyellaCaval Ridge balloon loopSingle	0.2 km	0.9 km	1.5 km	0.4 km	3.0 km
Goonyella	Dalrymple Bay	Arrival2	GoonyellaDalrymple BayArrival2	1.2 km	0.7 km	1.2 km	2.2 km	5.3 km
Goonyella	Dalrymple Bay	Departure2	GoonyellaDalrymple BayDeparture2	2.7 km	0.4 km	0.3 km	0.7 km	4.1 km
Goonyella	Hail Creek	Single	GoonyellaHail CreekSingle	13.9 km	21.2 km	4.8 km	0.9 km	40.8 km
Goonyella	Hay Point	Arrival1	GoonyellaHay PointArrival1	0.4 km	0.1 km	0.0 km	4.5 km	5.0 km
Goonyella	Hay Point	Arrival2	GoonyellaHay PointArrival2	1.9 km	0.9 km	0.6 km	4.3 km	7.7 km
Goonyella	Hay Point	Departure2	GoonyellaHay PointDeparture2	0.7 km	0.2 km	0.4 km	2.2 km	3.5 km
Goonyella	Main	DOWN	GoonyellaMainDOWN	34.6 km	36.5 km	35.9 km	62.7 km	169.7 km
Goonyella	Main	Hay Pt.	GoonyellaMainHay Pt.	1.6 km	2.0 km	1.1 km	2.0 km	6.7 km
Goonyella	Main	McArthurLoop	GoonyellaMainMcArthurLoop	0.2 km	0.7 km	1.9 km	1.9 km	4.7 km
Goonyella	Main	Single	GoonyellaMainSingle	6.7 km	9.0 km	6.8 km	14.1 km	36.6 km
Goonyella	Main	SouthWalkerBalloonLoop	GoonyellaMainSouthWalkerBalloonLoop	0.9 km	1.5 km	1.7 km	6.9 km	11.0 km
Goonyella	Main	UP	GoonyellaMainUP	24.6 km	44.9 km	33.4 km	66.3 km	169.2 km
Goonyella	Oaky	DOWN	GoonyellaOakyDOWN	2.2 km	3.1 km	3.3 km	4.0 km	12.6 km
Goonyella	Oaky	PassingLoop	GoonyellaOakyPassingLoop	15.2 km	20.3 km	6.6 km	3.5 km	45.6 km
Goonyella	Oaky	SINGLE	GoonyellaOakySINGLE	31.6 km	77.0 km	28.3 km	10.9 km	147.8 km
Moura	Callide	Single	MouraCallideSingle	0.2 km	0.3 km	0.6 km	13.9 km	15.0 km
Moura	Dakenba	Single	MouraDakenbaSingle	1.4 km	2.3 km	1.5 km	9.2 km	14.4 km
Moura	Main	SINGLE	MouraMainSINGLE	5.7 km	9.6 km	15.7 km	147.2 km	178.2 km
Moura	Main	PassingLoop	MouraMainPassingLoop	4.9 km	1.1 km	0.4 km	1.9 km	8.3 km
Newlands	Abbot Point	Single	NewlandsAbbot PointSingle	2.6 km	1.3 km	0.6 km	10.8 km	15.3 km
Newlands	Main	DOWN	NewlandsMainDOWN	13.4 km	0.3 km	0.0 km	0.0 km	13.7 km
Newlands	Main	SINGLE	NewlandsMainSINGLE	13.4 km	9.4 km	10.0 km	107.3 km	140.1 km
Newlands	Main	Up	NewlandsMainUp	12.0 km	1.2 km	0.0 km	0.1 km	13.3 km

SYSTEM	SYSTEM	>30	30>20	20>15	15>	TOTAL
All Systems	All Systems	373.6 km	410.0 km	304.7 km	935.7 km	2024.0 km
Goonyella	Goonyella	150.4 km	239.0 km	155.1 km	256.7 km	801.2 km
Blackwater	Blackwater	169.6 km	145.5 km	120.8 km	388.6 km	824.5 km
Newlands	Newlands	41.4 km	12.2 km	10.6 km	118.2 km	182.4 km
Moura	Moura	12.2 km	13.3 km	18.2 km	172.2 km	215.9 km

Appendix 6.2 – GPR Data

7. Opening Asset Value

7.1 The QCA's MAR Draft Decision

The following table provides a summary of Aurizon Network's proposed response to the QCA's draft decisions.

Draft Decision	Reference	Aurizon Network Position
Approve Aurizon Network's opening asset base as set out in Table 67 for the 2014DAU, based on the 2012-13 RAB roll-forward	7.1	Accept with Amendment reflecting more recent decisions
Refuse to approve inclusion of $5.77 million in equity-raising costs in respect of UT3 in the regulatory asset base as at 30 June 2013.	7.2	Disagree – legitimate equity raising costs were incurred for the GAPE during UT3 and postponed for inclusion by agreement.

Key Points from Aurizon Network's Response:

The Opening Asset Value for UT4 outlined in the 2013DAU was based on a forecast value of capital expenditure for the 2011/12 and 2012/13 financial years. Capital expenditure for both financial years has now been approved by the QCA and subsequently added to the RAB as part of the annual roll-forward process (see Table 7.1).

The OAV includes equity raising costs for GAPE which were deferred from the GAPE 2012 DAAU on the basis that they would be revisited in this UT4 process.

Aurizon Network welcomes QCA's willingness to consider the inclusion of equity raising costs for the UT4 period.

Aurizon Network has calculated an indicative allowance for equity raising costs for UT4 period in the revenue model submitted based on the Capital Indicator. The amount will be adjusted at the conclusion of the UT4 period to reflect the actual approved capital expenditure.

7.2 UT4 Opening Asset Value As Per the QCA's Draft Decision

Table 7.1 UT4 Opening asset value from the QCA's RAB roll-forward draft decision in Sept 2014

UT3 roll-forward – closing RAB value					Opening value 2014DAU
Non-electric	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
Blackwater	1,078,532	1,083,433	1,082,823	1,103,347	1,103,347
Rolleston	238,756	235,676	225,503	225,339	225,339
Minerva	74,338	74,021	71,507	69,669	69,669
Goonyella	1,234,808	1,313,681	1,300,032	1,315,228	1,315,228
Vermont	48,132	47,627	45,320	43,421	43,421
GAPE	–	–	900,346	984,848	984,848
Moura	255,373	256,614	251,472	251,089	251,089
Newlands	164,217	164,659	312,586	341,261	341,261
Total Non-Electric Assets	**3,094,157**	**3,175,711**	**4,189,589**	**4,334,202**	**4,334,202**
Electric	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**
Blackwater	140,713	129,332	291,605	284,040	284,040
Goonyella	236,545	246,573	233,754	227,084	227,084
Vermont	8,803	8,646	8,228	7,883	7,883
GAPE Electric	–	–	–	4,421	4,421
Total Electric Assets	**386,061**	**384,552**	**533,587**	**523,428**	**523,428**

The UT3 RAB has been rolled forward in accordance with section 1.2 of Schedule A of the 2010AU. This includes capital expenditure for the entire UT3 period, which has now been approved by the QCA. This results in an Opening Asset Value for UT4 of $4.86 billion.

7.3 Process

As outlined in the 2013DAU, the Opening Asset Value (OAV) for UT4 is based on the UT3 asset value, which is rolled forward on an annual basis. The roll-forward reflects:

- indexation for inflation using the CPI (All Groups – Brisbane);
- depreciation, applying the asset lives and depreciation profile approved by the QCA;
- adjustments for disposals and transfers of assets in the RAB; and
- the inclusion of UT3 capital expenditure that has been approved by the QCA, based on the final balance of the Capital Expenditure Carryover Account.

The OAV for UT4 outlined in the 2013DAU was based on a forecast value of capital expenditure for the 2011/12 and 2012/13 financial years. Capital expenditure for both financial years has now been approved by the QCA and subsequently added to the RAB as part of the annual roll-forward process.

In accordance with section 9.3.2 of the 2010AU, Aurizon Network submits the annual RAB roll-forward to the QCA following their approval of capital expenditure up to 2012/13.

The following sections outline the updated OAV for the UT4 period and the key differences between these values and those reported in Volume 3 of the 2013DAU.

7.4 Summary of Changes to UT3 Roll-forward

7.4.1 CPI Indexation

The RAB is rolled forward each year for actual inflation, which is based on the value of the 'Brisbane All Groups' CPI index as at 30 June in the relevant year. In the 2013DAU, a forecast inflation rate of 2.5% was applied to the 2012/13 year as the actual rate of inflation had not been published.

The CPI index has since been updated to include 30 June 2013. The actual rate of inflation has now been applied to the RAB roll-forward for the 2012/13 year. The final CPI values applicable to the UT3 period are:

2009/10:	3.20%
2010/11:	3.84%
2011/12:	0.92%
2012/13:	1.99%

7.4.2 Depreciation

Depreciation on capital expenditure prior to the UT3 period has been calculated on a straight-line basis, assuming the QCA-endorsed asset lives. For capital expenditure incurred during the UT3 period, depreciation has been calculated using the 20 year rolling life methodology approved by the QCA at the start of UT3.

For clarity, the 'weighted average mine life' methodology that Aurizon Network proposed for UT4 depreciation (discussed in Chapter 9) will not be applied retrospectively to affect the UT4 OAV.

7.4.3 Asset Disposals and Transfers

Aurizon Network reconfirms that there are no asset disposals or transfers from the RAB during UT3, other than assets scrapped for nil value as part of asset replacement and renewal activities.

7.4.4 Goonyella to Abbot Point Expansion (GAPE) Early Works Capex

Aurizon Network's 2008/09 Capital Expenditure (capex) Submission included a claim for early works associated with the GAPE project. The GAPE Early Works received customer endorsement as part of the 2007 Coal Rail Infrastructure Master Plan (CRIMP) process.[113]

In its final decision on the 2008/09 capex claim, the QCA approved GAPE Early Works capex of $34.9m on the basis that it would initially be excluded from the Regulatory Asset Base (RAB). This was reinforced in the UT3 Draft Decision which stated that this capex would be excluded:

> "*…until such time that the arrangements associated with the pricing of the GAPE project has been approved by the Authority. Until that time, the [GAPE Early Works capex] will be rolled-forward at the approved WACC rate.*"[114]

While the WACC adjustments were made appropriately in the early years, due to an administrative oversight the value of this GAPE Early Works capex was not reported as part of the GAPE RAB as it should have been from the time QCA approved the GAPE pricing arrangements. That is, the roll-forward value of this capex was omitted from the RAB Roll-Forward reports for 2011/12 and 2012/13. As a result, the Opening Asset Value reported for GAPE in Volume 3, page 39, of the 2013DAU was understated.

For clarity, the GAPE Early Works capex was correctly accounted for when setting Allowable Revenue and Reference Tariffs for 2011/12 and 2012/13 as part of the GAPE Draft Amending Access Undertaking (GAPE DAAU), which established a Capital Indicator for the GAPE system.

In summary, GAPE Early Works capex had been rolled-forward at the regulatory WACC rate applicable to the UT2 (for 2008/09) and UT3 (for 2009/10 and 2010/11) period. As part of the revised OAV, and consistent with the QCA's final decision on the 2008/09 Capital Expenditure Submission and the UT3 Draft Decision, this capex has been inserted into the GAPE RAB from 2011/12 onwards and rolled-forward at CPI in the same way as the remainder of the GAPE capex (post-early works).

7.5 UT3 Capital Expenditure

The OAV for UT4 outlined in the 2013DAU was based on a forecast value of capital expenditure for the 2011/12 and 2012/13 financial years. The capital expenditure and RAB roll-forward for both years has now been approved by the QCA.

The reconciliation of actual UT3 capital expenditure against forecast, which is managed via the Capital Carryover Account, is provided in Chapter 8.

7.6 Updated UT4: Opening Asset Values

The RAB roll-forward and revised Opening Asset Values by system, and for the total CQCR, are presented in the following tables. The tables include both Electric and Non-Electric assets.

Table 7.2 - Blackwater System: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

[113] Aurizon Network, 2009c, QR Network's 2008/09 Capital Expenditure Submission, pp. 20 – 21.
[114] QCA, 2009, Draft Decision QR Network 2009 Draft Access Undertaking, p. 7.

	2009/10	2010/11	2011/12	2012/13	2013/14
Blackwater					
Opening Asset Value	1,176,669	1,219,297	1,212,817	1,374,427	
Capital Expenditure	63,162	10,218	219,513	63,618	
Inflation	38,673	46,958	12,210	27,982	
Depreciation	(59,208)	(63,655)	(70,113)	(78,640)	
Closing Asset Value	1,219,297	1,212,817	1,374,427	1,387,387	
UT4 Opening Asset Value: Blackwater					**1,387,387**
Rolleston					
Opening Asset Value	242,769	238,756	235,676	225,503	
Capital Expenditure	--	--	--	8,068	
Inflation	7,772	9,157	2,176	4,567	
Depreciation	(11,785)	(12,237)	(12,350)	(12,799)	
Closing Asset Value	238,756	235,676	225,503	225,339	
UT4 Opening Asset Value: Rolleston					**225,339**
Minerva					
Opening Asset Value	74,988	74,338	74,021	71,507	
Capital Expenditure	--	--	--	--	
Inflation	2,401	2,851	684	1,423	
Depreciation	(3,051)	(3,168)	(3,197)	(3,261)	
Closing Asset Value	74,338	74,021	71,507	69,669	
UT4 Opening Asset Value: Minerva					**69,669**

Table 7.3 Goonyella System: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	2013/14
Goonyella					
Opening Asset Value	1,164,249	1,356,141	1,444,242	1,420,462	
Capital Expenditure	212,287	106,664	40,649	63,061	
Inflation	40,644	54,038	13,524	28,892	
Depreciation	(61,039)	(72,602)	(77,953)	(81,960)	
Closing Asset Value	1,356,141	1,444,242	1,420,462	1,430,455	
UT4 Opening Asset Value: Goonyella					**1,430,455**
Hail Creek					
Opening Asset Value	114,909	115,105	115,904	113,325	
Capital Expenditure	--	--	--	--	
Inflation	3,679	4,415	1,070	2,255	
Depreciation	(3,483)	(3,616)	(3,650)	(3,722)	
Closing Asset Value	115,105	115,904	113,325	111,858	
UT4 Opening Asset Value: Hail Creek					**111,858**
Vermont					
Opening Asset Value	54,299	56,935	56,274	53,548	
Capital Expenditure	3,812	354	--	--	
Inflation	1,799	2,190	520	1,066	
Depreciation	(2,976)	(3,206)	(3,245)	(3,310)	
Closing Asset Value	56,935	56,274	53,548	51,304	
UT4 Opening Asset Value: Vermont					**51,304**

Table 7.4 - Goonyella to Abbot Point Expansion (GAPE) System: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	2013/14
GAPE					
Opening Asset Value	--	--	--	944,710	
Capital Expenditure	--	--	892,279[115]	63,556	
Inflation	--	--	8,474	27,020	
Depreciation	--	--	--	--	
Closing Asset Value	--	--	944,710	1,035,286	
UT4 Opening Asset Value: GAPE					**1,035,286**

[115] See discussion on GAPE Early Works Capex in section 7.10

Table 7.5 - Moura System: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	2013/14
Moura					
Opening Asset Value	253,911	255,442	256,684	251,472	
Capital Expenditure	2,200	687	1,810	4,295	
Inflation	8,164	9,810	2,379	5,047	
Depreciation	(8,833)	(9,255)	(9,400)	(9,726)	
Closing Asset Value	255,442	256,684	251,472	251,089	
UT4 Opening Asset Value: Moura					**251,089**

Table 7.6 - Newlands System: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	2013/14
Newlands					
Opening Asset Value	165,277	164,203	164,645	312,586	
Capital Expenditure	750	1,600	149,724	23,821	
Inflation	5,303	6,328	6,944	15,536	
Depreciation	(7,126)	(7,487)	(8,726)	(10,579)	
Closing Asset Value	164,203	164,645	312,586	341,364	
UT4 Opening Asset Value: Newlands					**341,364**

Table 7.7 - Total Central Queenland Coal Region: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	2013/14
Total CQCR					
Opening Asset Value	3,283,426	3,520,193	3,604,221	4,767,540	
Capital Expenditure	282,212	119,523	1,303,974	226,419	
Inflation	112,055	139,730	47,979	113,788	
Depreciation	(157,500)	(175,226)	(188,635)	(203,996)	
Closing Asset Value	3,520,193	3,604,221	4,767,540	4,903,750	
UT4 Opening Asset Value: CQCR					**4,903,750**

7.7 Equity Raising Costs

7.7.1 Legitimacy of Equity Raising Costs

Equity raising costs are incurred when project owners source external equity financing to support project development. It is an essential element of the capital expenditure program for any corporation. Accordingly, Aurizon Network seeks an allowance for equity raising costs to be incorporated into the RAB Opening Asset Value.

It is common for Australian regulators to provide allowance for equity raising costs associated with capital expenditure. In the Powerlink decision, the Australian Energy Regulator (AER) approved an allowance for equity raising costs by applying the 'pecking order' methodology and maintaining a benchmark gearing ratio. The AER recognised the efficient benchmark firm may incur additional transaction costs if it needed to raise new equity to fund projects. These costs are not reflected in the rate of return. The same approach has previously been applied in the other AER regulatory determinations.[116]

In its Rate of Return Guidelines, the Economic Regulation Authority (ERA) also supports an allowance for equity raising costs:[117]

> *The Authority also considers that an allowance for the transaction costs of raising equity is justified where an adjustment is required to maintain the debt to equity ratio …*

The QCA has previously accepted equity raising costs to be legitimate costs to be capitalised into a RAB. For example, the QCA accepted upfront equity raising costs into RAB for phase 2/3 expansion of the Dalrymple Bay Coal Terminal (DBCT).[118]

Aurizon Network welcomes QCA's willingness to consider the inclusion of equity raising costs for the UT4 period, in the context of assessment of Schedule E, 2014DAU. To allow for transparency among stakeholders, Aurizon Network has calculated an indicative allowance for equity raising costs for UT4 period in the revenue model submitted based on the Capital Indicator. However, to be consistent with Schedule E, 2014DAU, the amount will be adjusted at the conclusion of the UT4 period to reflect the actual approved capital expenditure.

Aurizon Network proposes to use the approach employed by the AER for Powerlink to determine an allowance for equity raising costs. While the QCA applied a dividend yield approach with DBCT, the AER approach appears to be internally consistent with the approach to imputation credits, which assumes a constant dividend payout ratio.

The key parameters assumed in determining the equity raising costs for UT4 are as follows[119]:

- dividend reinvestment of 30%;
- dividend reinvestment plan cost of 1% of the total dividends reinvested;
- dividend imputation payout ratio of 70%; and
- seasoned equity raising cost of 3% of total external equity requirement.

These parameters are consistent with the AER approach.

7.7.2 Equity Raising Costs for UT3

In its Draft Decision, the QCA refused to approve the inclusion of equity raising costs for UT3 period in Opening Asset Value. QCA considers this to be a retrospective review of the capital expenditure costs for UT3, and outlines two reasons:

- *QR Network, as it was at the time, did not include a proposal for equity raising costs in its UT3 submission.*
- *Access holders have made commercial decisions, including in respect of projects such as GAPE, without anticipating additional equity-raising costs.*

Absence of Equity Raising Costs in the UT3 Submission

As directed by the QCA in its UT3 decision, the UT3 Capital Indicator excluded all capital expenditure associated with the Goonyella to Abbot Point Expansion (GAPE).

QCA's Draft Decision for Aurizon Network (previously QR Network) 2009 DAU stated:[120]

> *With regards to concerns about works for the GAPE project being included in the capital expenditure forecasts, the Authority notes that no decision on the treatment of GAPE assets has been made at this*

[116] AER, 2010, Final decision, Queensland distribution determination 2010-11 to 2014-15, pp. 199-202.
[117] ERA, 2013. Rate of Return Guidelines, p.28.
[118] QCA, 2010b. Final Decision – DBCT Capacity Expansion Phase 2/3 Actual Costs DAAU, p. 40.
[119] See Schedule E, 2014DAU
[120] QCA, 2009, Draft Decision QR Network 2009 Draft Access Undertaking, p. 31.

time. Therefore, the Authority proposes to exclude GAPE related forecast capital expenditure from the capital indicator.

…Nevertheless, the Authority argued that it was not reasonable to include GAPE-related capital expenditure in the capital indicator at a time when the pricing arrangements for that project remained highly uncertain.

If GAPE capital expenditure was included in UT3 Capital Indicator, Aurizon Network would have proposed an allowance for equity raising costs. Consequently, it is not logically reasonable nor it is fair for QCA to reject the inclusion of UT3 equity raising costs in OAV, based on the moot point that Aurizon Network did not propose such costs in its UT3 submission.

In early September 2012, Aurizon Network submitted a Draft Amending Access Undertaking (DAAU) to the QCA, seeking approval to add GAPE to the UT3 Capital Indicator, and to establish a new Reference Tariff for coal carrying train services utilising GAPE infrastructure.

The original GAPE DAAU submitted by Aurizon Network included a claim for Equity Raising Costs. However, upon further discussion with QCA, it became apparent that retaining the claim for Equity Raising Costs in the GAPE DAAU would inadvertently delay the approval of a GAPE Reference Tariff. As a result, Aurizon Network resubmitted the GAPE DAAU without the claim for equity raising costs, while stating an intention to include it as part of the UT4 submission.[121] This approach has also been endorsed by QCA:

Given these matters are far from being resolved, these will have to be considered as part of the 2013DAU approval process. While this is not an approach that should be adopted as a matter of course, the Authority sees merit in adopting this approach in this instance.

We would note there was a typographical error in Aurizon Network's 2012 GAPE DAAU and subsequently 2013DAU regarding equity raising costs. In those documents we stated:[122]

The approved allowable revenues for the UT3 period based on the quantum of the capital indicator did not include provision for upfront debt or equity raising costs. This is because the regulatory cash flows generated sufficient retained earnings to finance the capital expenditure assumed in the capital expenditure forecasts. However, these cash flows and the capital indicator ***included*** *the GAPE project costs.*

The correct phrase should be,

… However, these cash flows and the capital indicator ***excluded*** *the GAPE project costs.*

Aurizon Network does not seek any change to the approved capital expenditure. Rather we seek an addition of equity raising costs to the RAB. Aurizon Network considers it more reasonable and prudent to determine equity raising costs on an ex-post basis.

If equity raising costs are determined using forecasted capital expenditure, regulated firms will have a perverse incentive to inflate the Capital Indicator. To avoid such a problem, an ex-post determination is necessary. Moreover, compared to the approach by the AER where the amount of equity raising costs is determined at the commencement of the regulatory proceedings, the different approaches to inclusion of capital expenditure in the regulatory cash flows necessitates a retrospective approach to take into account the actual capital expenditure.

Impacts on Access Holders' Commercial Decisions

As mentioned above, the equity raising costs were not proposed due to the exclusion of GAPE capital expenditure from the Capital Indicator. Access holders are part of the discussion and consultation process. Consequently, industry participants should reasonably have expected that the equity raising costs associated with capital expenditure would have been recovered at the time the GAPE expenditures were included, and made their commercial decisions accordingly.

[121] Aurizon Network, 2013c, Draft Amending Access Undertaking Reference Tariff for the GAPE System, Attachment C, p. 4.
[122] Aurizon Network, 2013b, 2013 Draft Access Undertaking – Volume 3: Maximum Allowable Revenue and Reference Tariffs, p. 35.

Aurizon Network also does not believe access holders' commercial decisions will be significantly affected the relatively small amount of equity raising costs. The total updated equity raising costs Aurizon Network is seeking to include in the OAV is $8.27m ($5.77m in 2013DAU). Compared to total capital expenditure approved during the UT3 period of $1,776.5m, equity raising costs only represent 0.47% of total costs. It is extremely unlikely that equity raising costs would have affected access holders' commercial decisions.

In the current regulatory environment, access holders are already making commercial decisions using imperfect forecasts. As a result, the magnitude of equity raising costs suggest that access holder's commercial decisions would not have been materially affected.

7.7.3 Updated Equity Raising Costs for UT3

The $5.77m of equity raising costs proposed in 2013DAU was the deferred proposal from 2012 GAPE DAAU. Consequently, it was based on the approved UT3 Capital Expenditure for 2009/10 and 2010/11, and forecasts for 2011/12 and 2012/13. Moreover, the dividend reinvestment rate was assumed to be 0%. Given QCA has now approved capital expenditure for the entire UT3 period, and to be consistent with equity raising costs assumptions set out in Schedule E, 2014DAU, the calculation for equity raising costs has been updated to reflect the final approved amounts for 2011/12 and 2012/13, together with a change in the dividend reinvestment rate assumption to be 30%.

Consistent with the assumptions listed earlier, the total value of equity raising costs Aurizon Network is seeking to include in OAV, as at 30 June 2013 is $8.27m.

As the allowance for equity raising costs has been calculated using capital expenditure across different systems, this amount is proportionately allocated to the various coal systems based on the proportion of capital expenditure incurred during the UT3 period for that system. The amounts for each coal system are summarised below.

Table 7.8 UT3 Equity Raising Cost Allocation ($000)

System	UT3 Approved Capital Expenditure	Equity Raising Cost Allocation
Moura	8,993	41.9
Newlands	66,049	307.5
Blackwater	364,578	1,697.5
Goonyella	426,828	1,987.3
GAPE^	910,095	4,237.4
Total	1,776,543	8,271.6

^ excludes portion of GAPE related capex deferred until UT4. This treatment is consistent with the GAPE DAAU.

8. Regulatory Asset Base

8.1 The QCA's MAR Draft Decision

The Regulatory Asset Base is a fundamental component of the Access Undertaking, as it represents the value of Aurizon Network's investment in the CQCR against which the return on capital and depreciation (return of capital) are calculated. The RAB is composed of the Opening Asset Value together with the Capital Indicator (representing proposed future investment) with adjustments for inflation and depreciation.

Draft Decision	Reference	Aurizon Network Position
Refuses to approve Aurizon Network's proposal to change methodology to calculate interest during construction ("IDC") to a post-tax nominal classic WACC	8.1	Accept, to reduce regulatory complexity
Refuses to approve capital indicator. QCA considers it appropriate to continue to reflect the IDC using the post-tax nominal WACC	8.2	Accept, as above
Proposes to treat re-railing maintenance costs as renewals expenditure	8.3	Accept subject to QCA approval of implementation from 2015/16
(1) Aurizon Network to provide an annual forecast of asset renewals costs and scope to the QCA prior to the commencement of the financial year with (2) renewals activities to be included as part of the reporting for the annual maintenance report	8.4	(1) Disagree, given information already provided. However, willing to discuss alternatives with QCA (2) Accept subject to commencing arrangement in 2015/16
Proposes to smooth the return of over-recovery of the UT3 capital indicator across the 2014DAU period	8.5	Accept

Key Points from Aurizon Network's Response

Aurizon Network accepts the QCA's Draft Decision to continue the use of post-tax nominal vanilla WACC for the Capital Indicator, inclusive of Interest During Construction.

Aurizon Network maintains that its proposal to use a post-tax nominal classic WACC for calculating IDC remains the most viable mechanism for addressing the issue of tax deductibility of interest, especially in light of tax changes that allow the deductibility for capitalized interest to be recognized when incurred.

However, in the interest of reducing regulatory complexity, Aurizon Network accepts the QCA's position that the impact of the proposed change to the overall Capital Indicator is immaterial.

Aurizon Network accepts Draft Decision 8.3 subject to re-railing costs being included as renewals expenditure in the Capital Indicator for 2015/16 and 2016/17 only.

A more regular and detailed reporting regime on forecast capital costs, including a reset of the Capital Indicator, as envisaged by the QCA, would impose further regulatory burden and additional costs on Aurizon Network. Given the information already provided, Aurizon Network does not believe the public interest would be advanced by such additional, prescribed processes. Aurizon Network is willing to discuss alternative arrangements with the QCA, the QRC and other stakeholders.

With respect to actual costs, Aurizon Network accepts that it should report on its annual renewals activities and agrees with the QCA that it should be undertaken as part of the annual maintenance reporting process.

Aurizon Network recommends that this process commences with the 2015/16 year consistent with the arrangements for maintenance cost reporting.

The Aurizon Network Capital Carryover Account balance as at 1 July 2013 is presented in Table 8.4.

8.2 Interest During Construction (IDC)

Aurizon Network accepts the QCA's Draft Decision to continue the use of post-tax nominal vanilla WACC for the Capital Indicator, inclusive of IDC.

Aurizon Network maintains that its proposal to use a post-tax nominal classic WACC for calculating IDC remains the most viable mechanism for addressing the issue of tax deductibility of interest, especially in light of tax changes that allow the deductibility for capitalized interest to be recognized when incurred.

The use of the post-tax nominal vanilla WACC requires the tax deductibility of interest to be reflected in the cash flows in circumstances where it may not be readily ascertained. In contrast, the use of the post-tax nominal classic WACC avoids this challenge by assuming projects are financed at the benchmark gearing level and adjusting the WACC accordingly.

However, Aurizon Network accepts the QCA's position that the impact of the proposed change to the overall Capital Indicator is immaterial and, therefore, in the interest of reducing regulatory complexity that the use of two different WACCs may cause, will revert to the use of a post-tax nominal vanilla WACC for determining the IDC and Capital Indicator.

8.3 Capital Indicator

Consistent with Aurizon Network's response to Draft Decision 8.1, Aurizon Network's accepts Draft Decision 8.2 and will amend the 2014DAU Capital Indicator to include IDC calculated using the post-tax nominal vanilla WACC. In amending the 2014DAU Capital Indicator, Aurizon Network has also updated it for the expected final costs for the Wiggins Island Rail Project Stage 1 (WIRP) resulting in a reduction in the Blackwater system.

For clarity, other than for WIRP, Aurizon Network has not updated the Capital Indicator for the Capital Expenditure Report for 2013/14 (capital claim) submitted to the QCA in October 2014 for the following reasons:

- the QCA is yet to approve the capital claim; and
- the difference between the 2014DAU Capital Indicator and the capital claim would not have a material impact on UT4 pricing.

Accordingly, Aurizon Network proposes to defer the variation to the UT4 capital carryover mechanism.

The updated Capital Indicator incorporating the changes as a result of Draft Decisions 8.1, 8.2 and 8.3 (discussed in "Section 8.4 Treatment of Re-Railing costs" below) is outlined in Table 8.1 below.

Table 8.1: UT4 Capital Indicator by system ($'000s)

Non Electric Capex	2013/14	2014/15	2015/16	2016/17	Total
Blackwater	80,536	96,799	844,023	77,987	**1,099,345**
GAPE	42,635	26,675	-	-	**69,310**
Goonyella	170,308	62,483	85,465	68,309	**386,565**
Moura	5,423	5,099	55,626	7,660	**73,808**
Newlands	7,235	4,109	7,114	5,189	**23,647**
Total Non-Electric	**306,137**	**195,165**	**992,228**	**159,145**	**1,652,675**
Electric Capex	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**Total**
Blackwater	7,479	137,632	82,831	2,018	**229,961**
Goonyella	53,365	6,618	2,532	2,357	**64,872**
Total Electric	**60,844**	**144,250**	**85,363**	**4,375**	**294,833**
Total Capital	**366,981**	**339,415**	**1,077,592**	**163,520**	**1,947,508**

Note: Excludes return on capital adjustments

8.4 Treatment of Re-Railing Costs

Aurizon Network accepts Draft Decision 8.3 subject to re-railing costs being included as renewals expenditure in the Capital Indicator for 2015/16 and 2016/17 only. The revised Capital Indicator above reflects this proposed treatment of re-railing costs.

Aurizon Network's detailed response to the QCA's Draft Decision on the treatment of re-railing costs is addressed in Chapter 5.

8.5 Asset Renewals Costs

Draft Decision 8.4 proposes to impose obligations on Aurizon Network which are addressed separately below.

8.5.1 Provision of Forecast Asset Renewals Costs and Scope

Asset renewals include the replacement of network infrastructure assets such as track, sleepers, culverts, bridges, overhead and signaling equipment[123].

Asset renewal costs are currently subject to *ex-post* and *ex-ante* arrangements whereby forecast costs are incorporated in the Capital Indicator for the regulatory period, an annual claim of actual costs is made via the annual Capital Expenditure Report and the roll-forward and carry-over of QCA-approved costs is then implemented. As part of this arrangement, detailed information is provided to the QCA and its consultants on forecast costs (*ex-ante*) and actual costs (*ex-post*).

A more regular and detailed reporting regime on forecast capital costs, including a reset of the Capital Indicator, as envisaged by the QCA, would impose further regulatory burden and costs on Aurizon Network by way of increased preparation and management review time as well as additional review and audit time. Given the information already provided, Aurizon Network does not believe the public interest would be advanced by such additional, prescribed processes.

Aurizon Network is willing to discuss alternative arrangements with the QCA, the QRC and other stakeholders, which in the event that forecast renewals costs are different to the Capital Indicator (subject to a materiality threshold[124]), might include:

- an Endorsed Variation Event; or
- concurrent with the annual Reference Tariff variation.

In the absence of a workable, agreed mechanism, Aurizon Network disagrees with the proposal to provide annual forecast of asset renewals costs and scope to the QCA prior to the commencement of the relevant financial year. Aurizon Network accepts that in the absence of such approval the UT4 capital indicator will still be subject to a full ex-ante review of the reasonableness of the Capital Indicator and a full ex-post review of the prudency of actual capital expenditure, as is currently the case.

8.5.2 Renewals Activities to be Included in the Annual Maintenance Reporting

With respect to actual costs, Aurizon Network accepts that it should report on its annual renewals activities and agrees with the QCA that it should be undertaken as part of the annual maintenance reporting process. Unlike the annual revision of forecast costs, the annual reporting of actual costs would not be an onerous additional

[123] For clarity, ballast replacement as part of a track upgrade is currently included in the Capital Indicator, and from UT4 Aurizon Network proposes to treat all ballast replacement relating to bridges within asset renewals.
[124] For example, by reference to the impact of the renewal costs 'difference' on the relevant System Allowable Revenue.

requirement provided it aligns with the annual Capital Expenditure Report which is prepared concurrently with the annual maintenance cost report. This means that:

- "Renewals costs" would be aligned with the proposed definition of Asset Replacement and Renewal Expenditure in the 2014DAU; and
- The expenditure reported would align with the Capital Expenditure Report, subject to a reconciliation of those costs which have either been incurred in the relevant year but excluded from the capital claim, or incurred in a different year but included in the capital claim.

Aurizon Network recommends that this process commences with the 2015/16 year consistent with the arrangements for maintenance cost reporting. Aurizon Network's detailed discussion on, and proposal for, an alternative reporting framework for maintenance and renewals is provided at Chapter 5.

8.6 Capital Carryover Account

Clause 4 of Schedule A of the 2010 Undertaking requires Aurizon Network to maintain a capital carryover account to reflect the net present value of the difference between:

- Revenue Aurizon Network was entitled to earn from the capital expenditure forecast; and
- What those revenue entitlements would have been had they been based on the actual capital expenditure incurred.

Since the submission of 2013DAU, capital expenditure for 2011/12 and 2012/13 has been approved by QCA. The amounts of capital expenditure approved for UT3 period were as follows:

- 2009/10: $282.2m
- 2010/11: $119.5m
- 2011/12: $1,152.7m
- 2012/13: $222.2m

Tables 8.2 and 8.3 provide further detailed breakdowns on a system basis, along with reconciliations between approved capital expenditure and Capital Indicator for UT3.

Table 8.2 Approved Capital Expenditure for UT3 ('$000)

System	2009/10	2010/11	2011/12	2012/13	Total
Non-Electric					
Blackwater (incl Rolleston & Minerva)	57,030	9,949	37,504	57,960	162,444
Goonyella (incl Hail Creek & Vermont)	170,311	88,097	36,664	54,692	349,765
Moura	2,200	687	1,810	4,295	8,993
Newlands	750	1,600	42,200	21,499	66,049
GAPE (incl GSE)	--	--	848,481	61,614	910,095
Total Non-Electric	**230,292**	**100,334**	**966,659**	**200,061**	**1,497,345**
Electric					--
Blackwater	6,132	268	182,008	13,726	202,134
Goonyella	45,788	18,921	3,985	8,369	77,064
Total Electric	**51,920**	**19,190**	**185,994**	**22,094**	**279,198**
Total CQCR	**282,212**	**119,523**	**1,152,653**	**222,155**	**1,776,543**

Table 8.3 Variance between Approved Capital Expenditure and Capital Indicator for UT3 ('$000)

System	2009/10	2010/11	2011/12	2012/13	Total
Non-Electric					
Total Approved CAPEX	230,292	100,334	966,659	200,061	1,497,345
Total Capital Indicator	355,300	91,600	1,071,790	91,316	1,610,006
Variance	(125,008)	8,734	(105,130)	108,745	(112,660)
Electric					
Total Approved CAPEX	51,920	19,190	185,994	22,094	279,198
Total Capital Indicator	72,700	94,100	174,200	95,500	436,500
Variance	(20,780)	(74,910)	11,794	(73,406)	(157,302)
Total CQCR Variance	**(145,788)**	**(66,177)**	**(93,337)**	**35,339**	**(269,962)**

As shown in Table 8.3, Aurizon Network has underspent against the UT3 Capital Indicator by $270m. Based on the difference between the approved Capital Indicator and the actual capital expenditure for UT3, the updated Capital Expenditure Carryover Account as at 1 July 2013 is shown in Table 8.4. Notably, there is a small variance from QCA's Draft Decision figures. The variance is attributed to the final approval of 2012/13 capital expenditure and, as discussed in section 7.4.4, the deferral of GAPE early works capital expenditure.

Table 8.4 Aurizon Network Capital Carryover Account balance as at 1 July 2013 ($'000)

System	QCA DD	Updated
Non-Electric		
Blackwater (incl Rolleston & Minerva)	(8,926)	(8,673)
Goonyella (incl Hail Creek & Vermont)	(46,680)	(46,851)
Moura	(2,982)	(2,957)
Newlands	1,049	977
GAPE (incl GSE)	(16,303)	(10,902)
Total Non-Electric	**(73,842)**	**(68,405)**
Electric		
Blackwater	(27,980)	(28,073)
Goonyella	(11,830)	(11,899)
Total Electric	**(39,783)**	**(39,972)**
Summary		
Total CQCR	**(113,625)**	**(108,377)**

9. Return of Capital

9.1 The QCA's MAR Draft Decision

The following table provides a summary of Aurizon Network's proposed response to the QCA's draft decisions. Each of the draft decisions will be addressed specifically in the chapter below:

Draft Decision	Reference	Aurizon Network Position
The QCA refuses to approve Aurizon Network's proposal to change to a Weighted Average Mine Life approach for the depreciation of assets.	9.1	Accept, subject to re-evaluation in future regulatory periods.
The QCA refuses to approve Aurizon Network's proposal to amend the existing depreciation approach for the 2014DAU.	9.2	Accept
The QCA refuses to approve Aurizon Network's proposal to commence regulatory depreciation the year after an asset is commissioned.	9.3	Accept

Key Points from Aurizon Network's Response

Aurizon Network currently applies two different methods to calculate depreciation for pricing purposes. The methodology applied is dependent on the year in which the asset was accepted for inclusion in the Regulatory Asset Base (RAB).

Aurizon Network believes that the application of two separate depreciation methods does not result in an efficient pricing outcome because MAR and the consequent Access Charges for new customers will be calculated on the basis of a more aggressive depreciation profile than that which applies to existing customers.

Furthermore, Aurizon Network considers that the application of a consistent depreciation methodology across all assets has merit as it reduces the level of complexity in calculating the Return of Capital Building Block.

However, Aurizon Network is prepared to accept all three of the QCA's Draft Decision's with respect to Return of Capital. The practical impact of this is that the "UT3 method" will be used to calculate Return of Capital for the UT4 period – that is, Return of Capital will be calculated with reference to physical lives for assets included in the RAB prior to 1 July 2009, and a rolling 20-year life will be applied to assets included from 1 July 2009.

Aurizon Network intends to re-evaluate the suitability of the weighted average life approach in future regulatory periods.

9.2 Depreciation Methodology

Section 168A (a) of the QCA Act provides that the price of access to a service should:

> *"… generate expected revenue for the service that is at least enough to meet the efficient costs of providing access to the service and include a return on investment commensurate with the regulatory and commercial risks involved…"*

As stated in the 2013DAU[125]:

> *"… the capital cost of installing rail infrastructure assets is a major element of the efficient costs of providing rail access services. The recovery of these costs via the depreciation charge is therefore an important component of the building blocks."*

[125] Aurizon Network, 2013b, 2013 Draft Access Undertaking – Volume 3: Maximum Allowable Revenue and Reference Tariffs, section 6.1.1.

As rail infrastructure assets have limited alternate uses, the recovery of the initial investment in these assets must therefore occur while the asset is used and useful. The return of capital (depreciation) building block is therefore an important component that accounts for approximately 25% of Aurizon Network's MAR for the UT4 period.

Aurizon Network currently applies two different methods to calculate depreciation for pricing purposes. The methodology applied is dependent on the year in which the asset was accepted for inclusion in the Regulatory Asset Base (RAB).

- Assets included in the RAB prior to 1 July 2009 are depreciated on a straight line basis in accordance with the remaining 'physical' asset lives[126]; whereas
- Assets included on or after 1 July 2009 are subject to an accelerated depreciation profile, which reflects straight line depreciation over a 20 year 'rolling life'.

In practice, the term 'rolling life' means that the remaining physical life of each asset is re-assessed against the 20 year life at the commencement of each subsequent regulatory period.

The QCA's Draft Decisions with respect to depreciation are to retain the above approach for the UT4 period. The QCA rejected Aurizon Network's proposal to calculate depreciation on the basis of an assessment of the weighted average life of mines expected to either operate or commence operations during the UT4 period.

Aurizon Network is prepared to accept the QCA's Draft Decisions, although it reserves its position that the application of two separate depreciation methods does not result in an efficient pricing outcome because MAR (and subsequently) Access Charges for new customers will be calculated on the basis of a more aggressive depreciation profile than that which applies to existing customers.

Aurizon Network considers that applying a cap which reflects a periodically reviewed weighted average mine life is an effective way of achieving this without a significant increase in revenue associated with the Return of Capital Building Block (on average, 0.7% per annum).

As part of its assessment of the UT4 Capital Indicator, the QCA expressed a desire for consistency in methodology:

> *"As a general guide, our preference is not to have multiple WACC values being used to estimate the overall cost build up. Our view is the case for adding this level of complexity to the regulatory process would need to be strong…" [127]*

Aurizon Network considers that this preference for consistency should be applied more broadly, as there should be a general commitment to transparency, ease of communication and a reduced opportunity for error. However, the QCA's Draft Decision with respect to the weighted average mine life appears contrary to this approach.

The application of a consistent depreciation methodology across all assets has merit as it reduces the level of complexity in calculating the Return of Capital Building Block.

9.3 Commencement of Regulatory Depreciation

Aurizon Network accepts the QCA's Draft Decision that regulatory depreciation is to commence in the year of commissioning.

In accepting this recommendation, it should not be assumed that Aurizon Network has acceded to the QCA's claim that Aurizon Network's proposal is biased in the interests of the access provider. As outlined in the 2014DAU[128], MAR is measured such that the net present value (NPV) of Aurizon Network's cashflows is zero. There is no scope to earn an extra return when calculating MAR. Nevertheless, the QCA approach can be readily applied.

[126] Physical asset lives were capped at 50 years in the QCA's 2005 Final Decision.
[127] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 166.
[128] Aurizon Network: 2014 Draft Access Undertaking, Clause 6.3.3 c).

9.4 Summary

Aurizon Network has considered and accepts the QCA's Draft Decision with respect to Return of Capital. However, Aurizon Network still believes there is merit in applying a consistent methodology across all assets when calculating regulatory depreciation and will reconsider this treatment in future regulatory periods

The table below compares the Return of Capital Building Block under the QCA's Draft Decision, to Aurizon Network's revised proposal. Aurizon Network's proposed adjustments relative to the QCA's Draft Decision are limited to differences in forecast RAB values.

Table 9.1 Aurizon Network's revised depreciation allowance ($million, nominal)

Return of Capital Building Block	2013/14	2014/15	2015/16	2016/17	Total UT4
Aurizon Network proposed (Apr-13)	269.3	291.1	346.5	348.6	**1,255.9**
QCA's Draft Decision (Nov-14 update)	270.7	300.5	372.8	374.6	**1,318.5**
Aurizon Network proposed adjustments[129]	13.1	6.5	3.1	16.1	**38.7**
Aurizon Network proposal (revised)	**283.7**	**306.9**	**375.8**	**390.8**	**1,357.3**
Variance to QCA (%)	4.8%	2.2%	0.8%	4.3%	**2.9%**

[129] These adjustments include the impact of the revised UT4 Opening Asset Value. As outlined in chapter [7], this reflects the QCA's approved capital expenditure for 2011/12 and 2012/13.

10. Return on Capital

10.1 Summary of Response to Return on Capital

Aurizon Network Proposed WACC Of 7.62% Satisfies Requirements of the QCA Act

The return on capital is one of the most significant building blocks that make up Aurizon Network's MAR.

Providing a return on investment that is commensurate with the regulatory and commercial risks involved provides an assurance to investors that they will be able to earn an appropriate risk-adjusted rate of return over the life of long-term assets.

The return on capital determination is especially significant where the regulated assets are held in a publicly listed entity as shareholders will respond negatively if the regulated returns are not seen as providing an adequate return relative to risk. This could take the form of shareholders refusing to commit investment funds and/or shareholders exiting the stock which, in turn, would undermine the entity's ability to raise capital.

The maintenance and growth of the Aurizon Network is essential to the strong performance and the ongoing development of the coal industry in Queensland, yielding important production, employment and budget revenue outcomes for Queensland and Australia.

Considering the broader public interest, if the QCA does not deliver a sustainable WACC rate in this particular undertaking, the appetite of potential investors for supporting either private or public corporations into the future could be fundamentally diminished, jeopardizing the long-term efficient delivery of essential services in this State.

Providing an appropriate WACC is essential to the QCA meeting its legislative requirements under the QCA Act. Setting an appropriate WACC over the access arrangement period is particularly critical to:

- promoting the primary objective of Part 5 of the Act, namely to promote the economically efficient operation of, and use of, and investment in, significant infrastructure by which services are provided, with the effect of promoting competition in upstream and downstream markets (section 69E);
- having regard to the legitimate business interests of the owner/operator of the service (section 138(2); and,
- allowing the entity to generate expected revenue for the relevant service that is **at least** enough to meet the efficient costs of providing access to the service and include a return on investment commensurate with the regulatory and commercial risks involved (section 168A(a)).

To the extent there is any balance to be struck between the interests of Aurizon Network, users or persons who may seek access, and the public interest, it is submitted that the specific use of the words "at least" in section 168A(a) should encourage the QCA, when exercising its functions and powers in respect of the WACC, particularly where there is uncertainty, to take a conservative approach. This is because section 168A (a) recognizes that:

- asymmetric risks arise where networks are not properly funded - that is, the risks that arise where a network is underfunded as greater than the risks that arise where networks are overfunded
- regulated business that are provided with an opportunity to recover at least efficient costs are provided with an incentive to become more efficient over time.

Regrettably the analysis presented in this chapter demonstrates that the analysis and supporting materials that stand behind the QCA's WACC draft determination is, in a number of areas, fundamentally flawed and falls well short of regulatory best practice.

Aurizon Network further submits that in making any final decision, or in preparing and approving its own amendments, the QCA should make appropriate adjustments to its methodology and results, providing a WACC of at least 7.62%.

The Australian Competition Tribunal has held in the context of the telecommunications access regime that "legitimate business interests" includes being able to achieve a normal return on invested capital.

> *…those legitimate business interests require that Telstra be allowed to recover its costs of supplying the LSS [Line Sharing Service] and achieve a normal return on its invested capital. The expression "legitimate business interests" is a general expression and is somewhat open-textured. What is "legitimate" conduct or a "legitimate" interest in business may be open to a number of differing interpretations. We consider that a carrier's "legitimate business interests" is a reference to what is regarded as allowable and appropriate in commercial or business terms…the expression connotes something which is allowable and appropriate when negotiating access to the carrier's infrastructure. When looked at through the prism of a charge term and condition of access and its relationship to a carrier's cost structure, it is a reference to the interest of a carrier in recovering the costs of its infrastructure and its operating costs and obtaining a normal return on its capital."*[130]

Aurizon Network outlined in its previous submissions its return on capital requirements for UT4 and explained how those requirements had appropriate regard to the relevant matters set out in section 138, of the QCA Act. In part, this was detailed within Aurizon Network's submission *2013 Draft Access Undertaking Return on Capital Response – Summary Paper,*[131] and during the December 2013 QCA WACC Forum.

Hence, Aurizon Network firmly believes that the submitted *2013DAU* WACC of 8.18% provides for a return on investment commensurate with the regulatory and commercial risks involved, and, as such, provides a reasonable and fair incentive to investors to continue to invest in the asset so as to ensure the needs of the Queensland coal industry are met into the future.

However, in light of the QCA's Draft Decision, and taking a pragmatic approach to the determination of the WACC, Aurizon Network has amended the WACC in the 2014DAU.

Aurizon Network's response to QCA's draft determination on WACC is summarised in the following table:

Draft Decision	Reference	Aurizon Network Position
We refuse to approve the indicative estimate of the 10-year risk free rate proposed by Aurizon Network of 3.15%.	10.1	Aurizon Network agrees that the risk-free rate should be measured by reference to Commonwealth Government nominal bond yields as a proxy for the risk-free rate and that a 20-day averaging period of 20 business days to 31 October 2013 be used. Aurizon Network does not agree to use a term for measuring the risk-free rate that is consistent with the regulatory cycle, and maintains that a 10 year term should be adopted.
We propose to estimate the risk-free rate as: a) Commonwealth Government nominal bond yields as the proxy for the risk-free rate b) A 20-day averaging period of 20 business days to 31 October 2013 c) A term to maturity consistent with the regulatory cycle (i.e. four years)	10.2	
We consider it appropriate that Aurizon Network amend its draft access undertaking based on Aurizon Network's averaging period, to reflect our estimate of the risk-free rate of 3.21%	10.3	However, adopting a pragmatic approach, Aurizon Network has amended the WACC incorporated in the 2014DAU to adopt the value for the risk-free rate set out in the Draft Decision.
We approve Aurizon Network's proposals for a benchmarked: a) Capital structure of 55% debt and 45% equity b) BBB+ credit rating	10.4	The QCA's position is consistent with the position of Aurizon Network and no amendment has been made to the 2014DAU in relation to gearing or credit rating.
We refuse to approve Aurizon Networks indicative proposed debt risk premium estimate of 3.28%. We consider it appropriate that Aurizon Network amend its draft access undertaking to apply a debt risk premium of 2.72%	10.5 & 10.6	Aurizon Network has amended the 2014DAU to adopt the QCA's preferred methodology for measuring the debt-risk premium (without agreeing that this methodology is to be preferred). However, Aurizon Network has addressed various issues with the application of the methodology to determine a value for the debt-risk premium of 3.0% in order to correct for a biased sample.
We refuse to approve Aurizon Network's proposed debt-	10.7	Aurizon Network has amended the 2014DAU to

[130] ACT, 2006, Telstra Corporation Limited [2006] ACompT4, at [89].
[131] Aurizon Network, 2014f, 2013 Draft Access Undertaking Return on Capital Response – Summary Paper, p. 6.

Draft Decision	Reference	Aurizon Network Position
raising transaction costs of 12.5 basis points per annum We consider it appropriate that Aurizon Network amend its draft access undertaking to set debt-raising transaction costs of 10.8 basis points per annum	10.8	incorporate debt-raising transaction costs of 10.8 basis points per annum QCA's decision on debt-raising cost.
We consider it appropriate that Aurizon Network amend its draft access undertaking to set the interest rate swap costs at 11.3 basis points	10.9	Aurizon Network accepts the QCA's decision on interest-rate swap costs.
In summary, we consider it appropriate that Aurizon Network amend its draft access undertaking to set the cost of debt at 6.15%, comprised of: a) 3.21% for the four-year risk-free rate b) 2.72% for the debt risk premium for a 10-year term of debt c) 0.108% for debt-raising transaction costs d) 0.113% for interest rate swap costs.	10.10	As per 10.3 to 10.9 above: • Aurizon Network accepts the risk-free rate in adopting a pragmatic approach. • Aurizon Network does not agree with the QCA's draft decision on the DRP and instead suggest the QCA adopts a value of 3.0% in order to correct for a biased sample. • Aurizon Network accepts QCA's decision on debt-raising costs. • Aurizon Network accepts the QCA's decision on interest-rate swap costs.
We consider it appropriate that Aurizon Network amend its draft access undertaking to set the market risk premium at 6.5%.	10.11	Aurizon Network does not agree with the QCA's MRP estimate of 6.50% due to a combination of methodological, data and transparency issues. However, adopting a pragmatic approach, Aurizon Network has amended the WACC incorporated in the 2014DAU to adopt the value for the MRP set out in the Draft Decision.
We approve Aurizon Network's proposed debt beta of 0.12	10.12	Aurizon Network has not made an amendment to the 2014DAU with respect to the debt beta and maintains a value of 0.12 for this parameter.
We refuse to accept Aurizon Network's proposed equity beta range of 0.9 to 1.0. We consider it appropriate that Aurizon Network amend its draft access undertaking to reflect our estimate of an equity beta of 0.8	10.13 & 10.14	• Aurizon Network disagrees with the QCA on comparators and highlights issues with Incenta's beta analysis. • Aurizon Network recommends inclusion of transport (including rail) companies as comparators and reiterates the proposed equity beta of 0.9 to 1.0
We refuse to approve Aurizon Network's proposed gamma between 0.0 and 0.25. We consider it appropriate for Aurizon Network to amend its draft access undertaking to set a gamma of 0.47.	10.15 & 10.16	Aurizon Network disagrees with the QCA on gamma due to theoretical inconsistency for theta and regulatory precedence for the distribution rate. Aurizon Network recommends a gamma of 0.25.

Key Points from Aurizon Network's Response

Aurizon Network addresses the individual components of the QCA's Draft Decision below:

- Risk-free rate (refer 10.2)
  - Aurizon Network does not agree with the QCA in matching the term of the risk-free rate to that of the regulatory cycle and continues to submit that a risk-free rate term of 10 years is appropriate.
  - However, adopting a pragmatic approach in responding to the Draft Decision, Aurizon Network has amended the WACC incorporated in the 2013DAU to reflect the value for the risk-free rate set out in the Draft Decision (3.21%).
- Debt-risk premium (DRP) (refer 10.3)
  - Aurizon Network has, from a pragmatic perspective, adopted the QCA's preferred methodological approach to measuring the DRP.

- However, Aurizon Network has not incorporated the value for the DRP that the QCA derived from its preferred approach. Aurizon Network has corrected the derivation of the DRP for sample bias, and following that correction has amended the 2013DAU to incorporate a value of 3.00% for the DRP.
- Aurizon Network agrees with the QCA's draft decision on debt-raising and interest-rate swap costs.

- Market-risk premium (MRP) (refer 10.4)
  - Due to a combination of methodological, data and transparency issues, Aurizon Network does not agree with the QCA's MRP estimate of 6.5%
  - However, Aurizon Network has adopted a pragmatic approach and amended the WACC to include the MRP set out in the Draft Decision (6.5%).
- Equity and asset beta (refer 10.5)
  - Aurizon Network does not agree with the QCA's beta estimates due to sample size and replication issues and maintains the beta estimates calculated by SFG Consulting within the 2013DAU are appropriate.
- Gamma (refer 10.6)
  - Aurizon Network does not agree with the QCA in setting gamma at 0.47 as:
    - the QCA's approach in estimating theta is inconsistent with common theoretical understanding
    - no other Australian regulator has recently determined a distribution rate higher than 0.70
  - Aurizon Network therefore continues to propose a gamma of 0.25.

Inconsistency in WACC Parameters

Aurizon Network seeks to highlight a range of inconsistencies within the views of the QCA and Associate Professor Lally (Lally), including:

- Despite proposing to apply different tenors to the risk-free rate terms of the CAPM model, the QCA has relied on a 10-year risk-free rate in assessing the merits of the different sample periods for the Ibbotson and Siegel historical averaging methods. The QCA also references Lally's work on the Siegel method using the average real yields on 10-year government bonds and 10-year inflation forecasts.
- On the incorporation of survey results, the QCA discounted the AER survey results on the 10-year term to maturity[132]. When some submissions argued that 99% of survey respondents do not use the Siegel method to inform estimates, the QCA suggested these arguments to be irrelevant[133]. However, the QCA subsequently sought to retain the evidence from surveys as one of its methods in its MRP averaging methodology[134], and also referred to the KPMG survey to support its position on the utilisation rate[135].

Aurizon Network believes transparency, clarity and methodological consistency are essential to achieving the QCA's objective of best practice regulation. Aurizon Network therefore recommends that the inconsistencies outlined above be addressed.

Aurizon Network's Revised Position on WACC

Aurizon Network considers that its original WACC proposal of 8.18% represents a return on investment commensurate with the regulatory and commercial risks involved. However, in making amendments to the 2014DAU, Aurizon Network has taken a pragmatic approach to the calculation of the WACC. Aurizon Network has, insofar as possible, and while not necessarily agreeing with a number of the QCA's positions, incorporated the QCA's preferred approach to a number of parameters.

The amendments Aurizon Network has made result in an overall WACC of 7.62% and Aurizon Network submits that a WACC value of 7.62% or higher should apply in UT4.

In its amendments to the 2014DAU, Aurizon Network has proposed a revised set of parameters with only the following being different from the QCA's Draft Decision:

- Debt Risk Premium of 3.00% after correction of sample bias

[132] QCA, 2014c, Cost of Capital Markets Parameters – Final Decision, p. 50.
[133] Ibid, p. 61.
[134] Ibid, p. 64.
[135] Ibid, p. 100.

- Asset/equity betas at the lower end (lower MAR) of the 2013DAU range, reflecting higher risk allowance for risk free rate being for a 4-year term
- Gamma to be 0.25, same as 2013DAU proposal.

Table 10.1 compares Aurizon Network's revised position on WACC with the 2013DAU, the QCA's Draft Decision and the AER's draft decision recently published[136].

Table 10.1 – Comparison of WACC parameters

Parameter	Aurizon Network (upper bound)[a] 2013DAU	QCA's Draft Decision[b]	AER's Draft Decision Updated with Aurizon Network's Averaging Period[c]	Aurizon Network's Revised Position[b]
Credit rating	BBB+	BBB+	BBB+	**BBB+**
Risk-free rate	3.15%	3.21%	4.06%	**3.21%**
Market risk premium	7.0%	6.5%	6.5%	**6.5%**
Asset beta	0.6	0.45	-[d]	**0.5**
Debt beta	0.12	0.12	-[d]	**0.12**
Debt to value	55%	55%	60%	**55%**
Equity beta	1.0	0.8	0.7[d]	**0.9**
Gamma	0.25	0.47	0.4	**0.25**
Equity margin	7.0%	5.2%	4.55%	**5.85%**
Cost of equity	10.15%	8.41%	8.61%	**9.06%**
Debt risk premium (raw)	3.28%	2.72%	3.60%[e]	**3.00%**
Debt transaction costs	0.125%	0.108%	0.099%	**0.108%**
Interest rate swap costs	-	0.113%	-	**0.113%**
Debt risk premium (total)	3.405%	2.94%	3.70%	**3.23%**
Cost of debt	6.56%	6.15%	7.76%[e]	**6.44%**
WACC margin	5.03%	3.96%	4.04%	**4.41%**
WACC (post tax nominal)	**8.18%**	**7.17%**	**8.10%**	**7.62%**

Note: a) Aurizon Network (upper bound) is based on 20 business day averaging period to 30 November 2012; b) QCA's Draft Decision and Aurizon Network's Revised Position are based on 20 business day averaging period to 31 October 2013; c) AER's Draft Decision estimates (for risk free rate and debt risk premium only) have been updated using 20 business day averaging period to 31 October 2013. However, methodology is consistent with AER's Draft Decision; d) AER uses a different de-leverage and re-leverage formula; e) AER is moving from on-the-day approach to trailing average approach. The estimate is for the first averaging period, and will be updated annually in a transition to trailing average approach, which is consistent with AER Draft Decision.

The table above shows a comparison that utilises all parameters as allowed in the AER's draft decisions, except for risk free rate and debt risk premium which have been updated using Aurizon Network's averaging period.

While Aurizon Network does not agree with each individual parameter in this comparison, if Aurizon Network was an electricity distributor and regulated by AER, it is likely that the 2013DAU rate of return proposal of 8.18% would have been allowed.

Leaving aside disputes over the individual parameters, the significant difference in the WACC determined by QCA (7.17%) and AER (8.10%) is hard to reconcile with QCA's proposition that Aurizon Network is of similar risk to the energy and water sector[137], and even harder to comprehend when Aurizon Network's arguments in section 10.5 demonstrate that its systematic risk is actually higher than the energy sector.

[136] On 27 November 2014, the Australian Energy Regulator (AER) issued draft decisions on ACT and NSW energy businesses, including ActewAGL, Ausgrid, Jemena Gas Networks and TransGrid, available at www.aer.gov.au

[137] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 252.

Standard & Poors and the Brattle Group have provided advice on suitable comparators for Aurizon Network to include rail transport companies such as Brookfield Rail, Canadian Pacific and Canadian National. The exclusion of all rail companies as comparators results in downward bias on the estimate of beta for Aurizon Network.[138]

This analysis reinforces Aurizon Network's position that WACC of 7.17% in QCA's Draft Decision does not provide a reasonable return that is commensurate with the amount of risk, and does not provide appropriate incentive for future investments in the Queensland coal network.

Such an outcome would also lead to investors questioning whether the QCA would allow them to earn an appropriate risk adjusted rate of return over the life of long-term assets – in both existing regulated businesses and, just as importantly, future infrastructure investments. This could result in the appetite of potential investors for supporting either private or public corporations into the future being fundamentally diminished, jeopardizing the long-term efficient delivery of essential services in this State and future levels of infrastructure spending by the Government.

10.2 Risk-free Rate

10.2.1 - Summary

Aurizon Network does not agree with the QCA in matching the term of the risk-free rate to that of the regulatory cycle and continues to submit that a risk-free rate term of 10 years is appropriate. However, adopting a pragmatic approach in responding to the Draft Decision, Aurizon Network has amended the WACC incorporated in the 2014DAU to adopt the value for the risk-free rate set out in the Draft Decision (3.21%). The adoption of this rate is subject to an overall WACC of 7.62% or higher resulting from the application of the various WACC parameters.

Aurizon Network believes that matching the term of the risk free rate to the regulatory period undermines the integrity of the CAPM approach, as the CAPM requires a consistent risk-free term across application of the model.

Aurizon Network also believes matching the 4-year regulatory period is an inefficient practice, with a real risk of QCA inadvertently penalising a regulated business for implementing an efficient practice.

Therefore, Aurizon Network continues to present its case that aligning the risk-free rate with the regulatory term:

- is not efficient; (see 10.2.4)
- is not consistent with regulatory practice for a regulated firm; (see 10.2.3)
- is a view that is not commonly shared by other regulators; (see Table 10.1)
- has not correctly applied s.138 (2), taking into account the legitimate business interests of Aurizon Network (10.2.4 and Table 10.3).

10.2.2 - Proposed QCA Approach

The QCA proposes an approach that involves three factors which:

- utilises Commonwealth Government Securities (CGS) as proxies for the risk-free rate;
- calculates a proxy risk-free rate that is averaged across 20 days immediately preceding, or as close as practically possible to the start of the regulatory cycle; and
- aligns the term of the risk-free rate to the term of the regulatory cycle.[139]

For the first two factors, Aurizon Network acknowledges that the QCA approach is generally consistent with regulatory precedent (refer Table 10.2).

[138] Standard & Poors, 2013, Aurizon Network Pty Ltd. and The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC.
[139] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 203.

Table 10.2 - Risk-free rate considerations

Regulator	Proxy	RFR Averaging Period	RFR Term
QCA*	Australian CGS	20 business days	4 year
AER[140]	Australian CGS	20 business days	10 year
ACCC	Australian CGS	20 business days	10 year
ERA[141]	Australian CGS	20 business days	10 year
ESC[142]	Australian CGS	40 business days	10 year
IPART[143]	Australian CGS	20 business days	10 year

** Note: Draft Determination*

As Table 10.2 demonstrates, however, the same consistency does not exist on the QCA's stance to match the term of the risk-free rate to that of the regulatory cycle, as it is the only regulator who currently proposes the 4 year term for a railway company.

10.2.3 - Consistency of the Risk-free Rate across the CAPM

Regulatory Precedents Support 10 Year Term

The QCA noted that the Economic Regulatory Authority of Western Australia (ERAWA or ERA) has applied a term matching approach in some of their decisions and in the ERA's *Rate of Return Guidelines – Meeting the requirements of the National Gas Rules*[144]. However the ERA has not applied the term matching approach to the rail industry. When deciding on the risk-free rate for the rail industry, the ERA has utilised a risk-free rate term of 10 years from as far back as 2008.

In its June 2014 Draft Determination on its *Review of the method for estimating the Weighted Average Cost of Capital* for the Freight and Urban Railway Networks, the ERA states:

> [254] *…., the Authority will base its estimation of the nominal risk free rate on the observed yield of 10 year CGS bonds.* [145]

Therefore if the QCA relies on the practice from the ERA, then Aurizon Network believes that the rail industry determination of 10 years is a more appropriate precedence to follow.

ACT Decisions Highlight Term Inconsistency to Be Incorrect In Principle

SFG summarised the requirement for consistency by pointing to the first "GasNet" case heard by the ACT:

[140] AER, 2013c, Rate of Return Guidelines – Better Regulation.
[141] ERA, 2014a, Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks – Draft Determination; ERA, 2013a, Determination on the 2013 Weighted Average Cost of Capital for Freight and Urban Railway Networks; ERAWA, 2008, 2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Railway Networks – Final Determination.
[142] ESC, 2014, Goulburn-Murray Water Price Review 2016 – Guideline on Price Submission.
[143] IPART, 2013, Review of WACC Methodology – Final Report.
[144] ERA, 2013b, Rate of Return Guidelines – Meeting the requirements of the National Gas Rules.
[145] ERA, 2013a, Determination on the 2013 Weighted Average Cost of Capital for Freight and Urban Railway Networks.

> *…the practice of the QCA in using the 10-year yield to estimate the risk-free rate in one part of the CAPM formula, and the 5-year yield to estimate the risk-free rate in another part of the same CAPM formula is inconsistent with the Tribunal's GasNet ruling.* [146]

In response to Aurizon Network's reference to the ACT "GasNet" case, the QCA commented:

> *…a more recent decision of the Tribunal makes it clear that the selection of a five year term for the risk-free rate in alignment with the term of the regulatory cycle can be appropriate. Prior to that, the Tribunal had suggested that it could be open to the possibility of moving away from a 10 year term for the risk-free rate if material were provided to support such an outcome.* [147] [148]

However, in an even more recent decision (than the one that the QCA has referred to above), the ACT reinforced the importance of consistency in the application of the risk-free rate with its use in the calculation of the Market Risk Premium (MRP). Specifically, the ACT judgement on APA GasNet Australia (Operations) Pty Limited (No 2) [2013] ACompT 8[149] discussed the inconsistency between the two risk-free (Rf) elements:

> [261] *APA GasNet submitted that Professor Gregory had observed that this approach involved a very common error which had been discussed in recent UK regulatory appeals.*
>
> [262] *The potential error of using two inconsistent risk-free rates was also identified by other APA GasNet experts including Professor Wright and NERA, and by the AER's expert CEPA.*
>
> [264] *The Tribunal agrees with all the submissions and reports made about the importance of using internally consistent values of the risk-free rate in estimating the cost of equity under the CAPM. Under different circumstances which do not apply in this matter, it noted in Re GasNet Australia (Operations) Pty Ltd [2003] ACompT 6 at [46]-[47], that*
>
> > *While it is no doubt true that the CAPM permits some flexibility in the choice of the inputs required by the model, it nevertheless requires that one remain true to the mathematical logic underlying the CAPM formula. In the present case, that requires a consistent use of the value of rf in both parts of the CAPM equation where it occurs...*

Aurizon Network therefore maintains that the inconsistency in the term of risk-free rate is fundamentally incorrect. If the maturity of the two risk-free rates differs, there will be a systematic bias in the estimated cost of equity. [150]

Lally's Incorrect Assumption on Term Matching

Officer & Bishop (2008) commented on the term of the risk-free rate, especially on the arguments of Lally (2002)[151]:

> *To use a rate with a time span equal to the regulatory period requires showing the assets of the company are not at risk, they will be totally protected or "insured" by the regulator. Moreover, this five year rate is inconsistent with the MRP and therefore inconsistent with the CAPM. Although the difference in the market risk premium estimated using five year rates relative to ten year rates would not have a profound influence on the ultimate value, it misses the point. The rate used has to be consistent with the assets' cost of capital and because the assets are long lived the ten year rate is likely to be more consistent with the cost of capital than a five year rate. Also, the longer term investment will show a greater premium because of the normal shape of the yield curve than a shorter term investment.* [152]

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[146] SFG, 2014d, The term of the risk-free rate –Report for Aurizon Network, p. 18.
[147] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 205.
[148] ACT, 2012, Application by DBNGP (WA) Transmission Pty Ltd (No 3) [2012] ACompT 14.
[149] ACT, 2013, Application by APA GasNet Australia (Operations) Pty Ltd (No 2) [2013] ACompT 8.
[150] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, pp. 10-11.
[151] Lally, M., 2002, Determining the risk-free rate for regulated companies.
[152] Officer, B. & Bishop, S., 2008, Term of the Risk-free Rate – Commentary.

The Brattle Group also points out the NPV 0 proposition over a 4-year horizon is only truly feasible if there is no risk of stranded assets or substantial asset revaluation.[153] The same view is also shared by SFG, which believes the assumption behind NPV 0 proposition is not realistic as it requires the asset value at the end of the regulatory period to be known with certainty right from the start.[154]

In relation to Lally's assumptions, Aurizon Network would reiterate that its assets are *not totally protected*, are *not insured* by the regulation and are therefore *not free of risk, particularly on a timeline beyond the regulatory period*. While the regulated WACC is greater than the risk-free rate and does make allowances for commercial and business risks, the regulated WACC does not compensate for asset stranding risk. This was recently affirmed by the QCA:

> *…the QCA considers that the regulatory WACC does not compensate Aurizon Network for asset stranding risk.* [155]

If the term matching is not corrected, then there needs to be an uplift to the market risk premium to correct the downward bias of a shorter term risk free rate. [156]

In summary, on rail industry entities, except for the QCA, regulatory authorities in Australia have aligned their approaches and determined that the risk-free rate term should equal that of the 10 year Australian CGS.

10.2.4 - Efficient Financing Practice

The efficiency of regulated entities is also a consistent theme within Australian regulatory practice.

The QCA has stated:

> *We also must consider what is efficient for regulated entities to do. We are aware that regulated entities typically match their exposure to the risk-free rate to the regulatory period. In this respect, we do not consider our approach to setting the risk-free rate is necessarily inconsistent with the practice of a regulated firm.* [157]

Aurizon Network fully recognizes that in setting the total return on capital, the QCA must determine what is efficient in practice. The *Queensland Competition Authority Act 1997 (QCA Act)*, *s.168A* states that:

> *The pricing principles in relation to the price of access to a service are that the price should generate expected revenue for the service that is at least enough to meet the efficient costs of providing access to the service and include a return on investment commensurate with the regulatory and commercial risks involved…* [158]

In determining its efficient financing practice, Aurizon Network must consider its requirement for funding the long term expansion and growth of the CQCR. In order to ensure the efficient funding of the capital intensive projects, Aurizon Network has followed conventional market practice by entering into the debt capital markets, both domestically and abroad, and securing funding with maturities beyond the length of the regulatory period.

Aurizon Network was able to achieve this by demonstrating its long-term stable revenues, strong balance sheet and financial flexibility, and consistent operational improvements since privatisation. Failure to engage in long-term debt funding increases the financial risk of projects that extend beyond the current regulatory period, therefore contributes to an inefficient financing practice, and potentially reduces the ability to attract any funding at all during periods of market stress.

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[153] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, p. 12.
[154] SFG, 2014d, The term of the risk-free rate –Report for Aurizon Network, p. 13.
[155] QCA, 2013, Draft Decision: Aurizon Network 2013 Blackwater Electric Traction Pricing Draft Amending Access Undertaking, p. 48.
[156] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, pp. 14-15.
[157] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 206.
[158] QCA, 2012, Queensland Competition Authority Act 1997, p. 140.

In financing its ability to maintain and operate the CQCR, Aurizon Network strongly believes that two elements within the QCA Act are of particular prominence:

- *the legitimate business interests of the owner or operator of the service (section 138(2)); and*
- *the pricing principles specified in section 168(A).*

Recent Aurizon Financing Practice Favours Longer Debt Maturity

With legitimacy and the objective of the Pricing Principles in mind, Aurizon Network would highlight two recent real-world examples of how it goes about its debt financing.

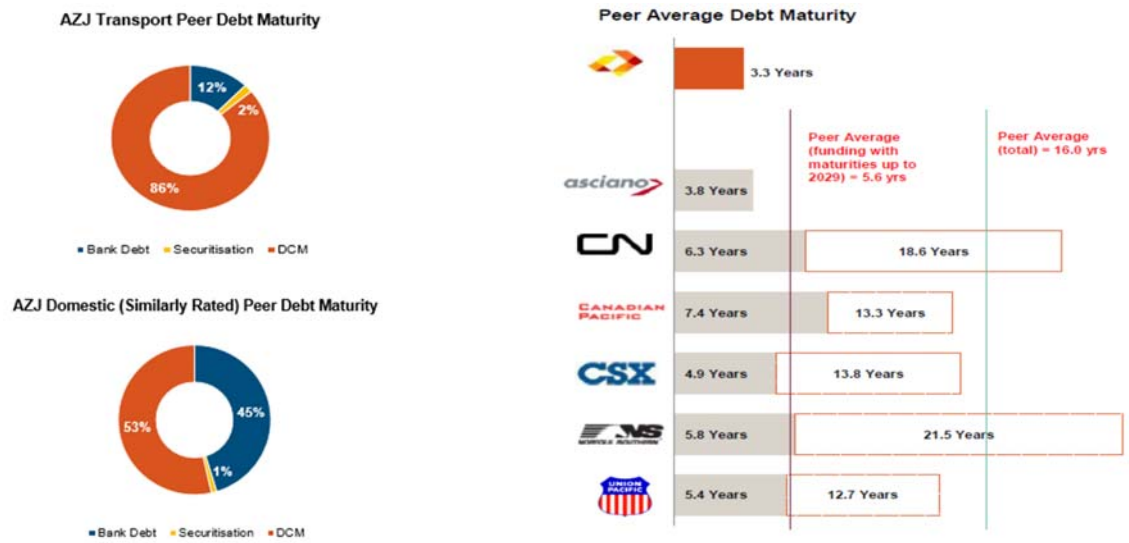
As at June 2014, Aurizon (AZJ) has a maturity profile shorter than its peers (4 year average maturity) and has a large reliance on bank debt (>65%) compared to transport and similarly rated domestic peers (see Figure 10.1). This short term debt profile was due to the financing structure the company was required to adopt at the time of the Initial Public Offering.

Over the past 12 months, the overall financial structuring objective of Aurizon Network has been to replace a material component of existing bank debt with debt capital markets issuances to provide diversity and longer tenor to mitigate refinancing risk.

In October 2013 Aurizon Network completed a seven-year BBB+/Baa1 rated, fixed rate Australian dollar bond transaction. Due to limited domestic capital market depth and investor appetite at the time of execution, Aurizon Network did not attempt to seek longer tenors than seven-years. The issuance represented Aurizon Network's first Australian bond deal and the largest AUD denominated seven-year raising within the "BBB" rating band, raising ~A$525m without offering any protective financial covenants.

Due to greater maturity and depth of overseas capital markets, Aurizon Network further diversified its funding sources in September 2014, pricing ~€500m within the European bond market by issuing ten-year, BBB+/Baa1 rated, fixed rate Euro Medium Term Notes (EMTNs). Proceeds from the issuance were swapped to Australian Dollars (AUDs) then utilised to repay existing AUD denominated bank debt with tenors up to 2016.

Figure 10.1 – Comparative debt maturity profiles (as at 2013/14)

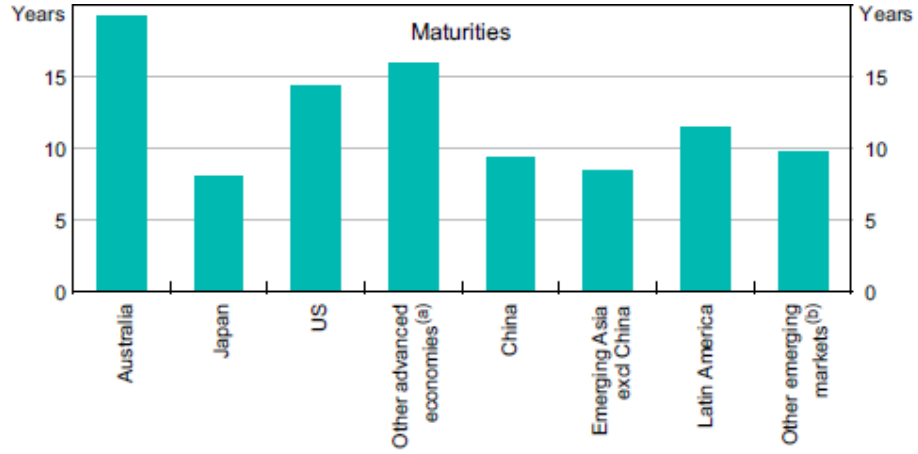


Global infrastructure financing practice highlights longer maturities

Aurizon Network's management of debt is consistent with global trends toward longer tenors in debt issuance illustrated in Figure 10.2 below. As the development of global markets for infrastructure bonds has increased substantially since 2000, even since the global financial crisis, many advanced economies have posted record

bond issuances.[159] Since 2009 average Australian infrastructure bond maturities are above 15 years, but just as importantly, no region exhibits average infrastructure bond maturities of less than 7 years.

Figure 10.2 – Average Maturities of Infrastructure Bonds



Value-weighted averages (2009-2013)[160]

Clearly Aurizon Network is not alone in using bonds of longer maturities to raise funds as many Australian entities have undertaken similar initiatives to do the same. For a more precise exposition of actual financing practice within Australia, Aurizon has extracted Australian corporate bond data from Bloomberg. The results are shown in Table 10.3 below, after removing issuances with no 'issue date' and no 'S&P rating':

Table 10.3 - Australian Bond Issues since 1996[161]

S&P Rating Category	Number of Bonds	Average Term to Maturity
All ratings	162	9.67 years
BBB rating band	90	9.78 years
BBB+	22	8.92 years
Regulated infrastructure bonds*	40	10.94 years

** 35 of the 40 bonds are within the "BBB" rating band*

Impacts of Inefficient Financing Practice

Aurizon Network highlights that if it did utilise tenors of bonds matching the shorter regulatory period as proposed by the QCA, the costs of funding Aurizon Network would potentially increase, directly affecting its legitimate business interests. Aurizon Network lengthened and smoothed its maturity profile so as to reduce refinancing risk and minimise the cost of undertaking large refinancing activities annually. In practice, Aurizon Network would ideally seek to refinance part of its debt portfolio approximately every other year (a similar regular refinancing stance is also assumed by the AER).[162]

Prudent and efficient financing practices consider qualitative as well as quantitative aspects. For instance, reducing the debt to maturity profile of Aurizon Network's financing would potentially:

[159] RBA, 2014a, Infrastructure and Corporate Bond Markets in Asia.
[160] Ibid, p. 85.
[161] Bloomberg, 2014, Australian bond issuance data – all credit ratings (since 1996).
[162] AER, 2013d, Better Regulation – Explanatory Statement – Rate of Return Guideline.

- increase financial risk by heightening the mismatch between debt tenure and long term cash outflows required for investments in the asset;
- limit the ability of Aurizon Network to diversity its funding sources, as the bank debt market rather than the debt capital markets is typically used to fund short term maturities;
- expose Aurizon Network to increased refinancing risk and contribute towards an inefficient debt maturity profile forcing Aurizon Network to re-enter the capital market above optimum frequency; and
- be out of step with other similarly rated Australian and overseas corporates.

This perspective appears to be shared by Incenta Economic Consulting (2013), who stated:

> *From a first principles perspective we would expect that a regulated infrastructure business like Aurizon Network would issue debt for a longer period than its own regulatory period (4 years). Prudence would suggest that the re-financing task should be kept to relatively stable and manageable levels each year. That is, the maturity profile of the debt portfolio would be expected to be staggered, with a manageable amount of re-financing falling due each year, on average."* [163]

As the intent of the QCA Act is to encourage efficient operations, Aurizon Network believes that it should be exposed to incentives to adopt efficient (best practice) financing arrangements, and just as importantly, should not be penalised for doing so.

Stakeholder Comments on Efficient Financing Practices Consistent with Aurizon Practice

The Queensland Treasury Corporations (QTC's) stated in its response to PricewaterhouseCoopers' report *"A cost of debt estimation methodology for business regulated by the Queensland Competition Authority"*, that, one of the fundamental objectives of:

> *…economic regulation is to provide compensation for the efficient financing costs of the benchmark firm...*[with]*…efficient debt financing costs to be the costs that would be expected to be incurred by a firm that prudently structures and manages its borrowings and interest rate risk exposures, taking into account market-based constraints such as the availability of very long term debt. These costs can be viewed as the outcome from adopting and maintaining efficient debt financing and risk management strategies.*[164]

QTC further comments that efficient debt financing and risk management strategies would result:

> *…in a firm's equity providers being exposed to an acceptable level of refinancing and interest rate risk, taking into account the firm's size, average asset life, capital structure, and the characteristics of their cash flows.*[165]

The concept of efficient financing practice is not exclusive to the Queensland regulatory environment. The AER stated that in relation to efficient financing practices:

> *We consider that in efficient capital markets, all firms operate on the capital frontier. All firms should be priced efficiently and able to access capital at the cost associated with the risks they face that are priced by investors (e.g. under CAPM this would be the systematic risk as measured by the CAPM beta associated with their business operations). Outperformance or underperformance relative to the frontier is reflective of firm specific factors which are not of concern to the regulator as these are not priced in capital markets and do not require ex-ante investor compensation. We note that we compensate transaction costs according to the size of the firm so as not to bias firms towards larger firm structures due to economies of scale that may be associated with raising capital.* [166]

[163] Incenta Economic Consulting, 2013, Aurizon Network: Review of benchmark credit rating and cost of debt, p. 7.
[164] QTC, 2014, Cost of Debt Discussion Paper, p. 4.
[165] Ibid, p. 4.
[166] AER, 2013d, Better Regulation – Explanatory Statement – Rate of Return Guideline.

10.2.5 – Conclusion - Risk Free Rate

In summary, Aurizon Network is concerned that the QCA appears to be advocating setting the allowed return below the return that investors would require in a commercial setting. Therefore Aurizon Network re-highlights the question raised by our expert adviser, SFG Consulting, as to how such a position could be seen to be promoting economic efficiency.[167]

Aurizon Network believes matching the 4-year regulatory period is an inefficient practice, with a real risk of QCA inadvertently penalising a regulated business for implementing an efficient practice, which would contradict the objectives of Part 5 of the *QCA Act*.

Therefore, Aurizon Network maintains that aligning the risk-free rate with the regulatory term:

- is not efficient;
- is not consistent with regulatory practice for a regulated firm;
- is a view that is not commonly shared by other regulators;
- has not correctly applied s.138(2), taking into account the legitimate business interests of Aurizon Network.

However, as noted above Aurizon Network has adopted a pragmatic approach in responding to the Draft Decision and has amended the WACC incorporated in the 2014DAU to adopt the value for the risk-free rate set out in the Draft Decision (3.21%). The adoption of this rate is subject to an overall WACC of 7.62% or higher resulting from the application of the various WACC parameters.

10.3 Cost of Debt - Debt-risk Premium (DRP)

10.3.1 - QCA's Draft Decision on DRP

In making its Draft Decision on the DRP the QCA had regard to two papers:

- *A cost of debt estimation methodology for businesses regulated by the Queensland Competition Authority*[168] from PricewaterhouseCoopers which Incenta applied to on the estimation of the DRP; and,
- *Aurizon Network: Review of benchmark credit rating and cost of debt*[169].

The QCA relied on Incenta's application of the simple portfolio approach to estimate Aurizon Network's DRP at 2.72%, and cross checked the estimation with the Bloomberg's BVAL data (paired-bond extrapolation approach, 2.51%) as well as the RBA's BBB non-financial corporate bond data (3.38%).

Aurizon Network has, from a pragmatic perspective, adopted the QCA's preferred methodological approach to measuring the debt-risk premium. However, Aurizon Network has not incorporated the value for the debt-risk premium the QCA derives from its preferred approach. Aurizon Network has corrected the derivation of the debt-risk premium for sample bias, which gives a value for the debt-risk premium of 3.00.

In the following section, Aurizon Network addresses what it considers to be a number of errors in Incenta's application of the PwC methodology, and the errors in the cross-check reference points. After correcting for these errors, Aurizon Network has incorporated an amended value for the DRP of 3.00% in the 2014DAU.

10.3.2 - Bond Sample Employed by Incenta

Incenta compiled a sample of bonds applicable to the averaging period in the *2013DAU* submission[170]. These bonds were filtered in an attempt to provide a sample indicative of a benchmark cost of debt.[171] Aurizon Network agrees that one method for estimating the DRP is through the use of econometric methods but this should only be

[167] SFG, 2014d, The term of the risk-free rate – Report for Aurizon Network, p. 1.
[168] PricewaterhouseCoopers, 2013, A Cost of Debt Estimation Methodology for Business Regulated by the Queensland Competition Authority.
[169] Incenta Economic Consulting, 2013, Aurizon Network: Review of benchmark credit rating and cost of debt.
[170] The 20-business days to 31st October 2013
[171] Incenta Economic Consulting, 2013, Aurizon Network: Review of benchmark credit rating and cost of debt, p. 24.

done after the sample of bonds is thoroughly tested for distortion or bias. Aurizon Network believes it is a fundamental error to perform an econometric estimate without first confirming whether the chosen data is fit for purpose.

Aurizon Network has the following issues with Incenta's application of the PwC "Simple Portfolio" methodology:

- The weighted-average method of testing whether the DRP estimate is associated with a BBB+ credit rating is simplistic and failed to identify sample bias within this specific dataset.
- The sample of bonds was regressed with indicator variables to assess the relative impact of bonds with different credit ratings on the overall sample. This test revealed that there was no statistically significant difference between the DRPs of BBB and BBB+ bonds. However there was a statistically significant and economically material difference between the DRPs of A- and BBB+ bonds.
- The weighted-average credit rating calculation was repeated with the assignment of correct weights to each credit rating, based on the regression results above. The analysis showed a systematic under-estimation of Aurizon Network's DRP as the weighted average fell half-way between BBB+ and A-.
- Aurizon Network has recalculated the DRP using the same principles as the "Simple Portfolio" with additional methods applied to account for bias evident in the sample collected by Incenta.

An overview of Incenta's bond sample is presented in Table 10.4 below[172], sorted by Standard & Poor's ratings.

Table 10.4 – Incenta Bond Sample Overview

Time to Maturity	A-rated		BBB+rated		BBB rated	
Years	No.	Mean Yield	No.	Mean Yield	No.	Mean Yield
0-2	15	4.17%	3	5.33%	14	4.7%
3-4	10	4.75%	6	5.07%	7	5.17%
5-6	8	5.21%	5	5.99%	9	5.86%
7-8	1	5.84%	3	6.26%	2	7.38%
9-10	0	N/A	0	N/A	0	N/A
10+	0	N/A	1	7.8%	0	N/A
Total	34	4.64%	18	5.72%	32	5.3%

The table shows that the mean yields for the BBB+ category are always above those for the corresponding A- bonds. However, this is not always true when comparing BBB+ to BBB bonds – with the latter lower than the former for the 0-2 and 5-6 years subsamples. This is consistent with a conclusion that BBB yields are not materially higher than BBB+ yields while A- yields are materially lower than BBB+ yields.

This raises questions about the validity of the calculation of the DRP from pooled regression performed by Incenta – where it is assumed that the inclusion of BBB and A- yields effectively 'cancel out' each other in the regression allowing the regression parameters to be interpreted as BBB+ parameters.

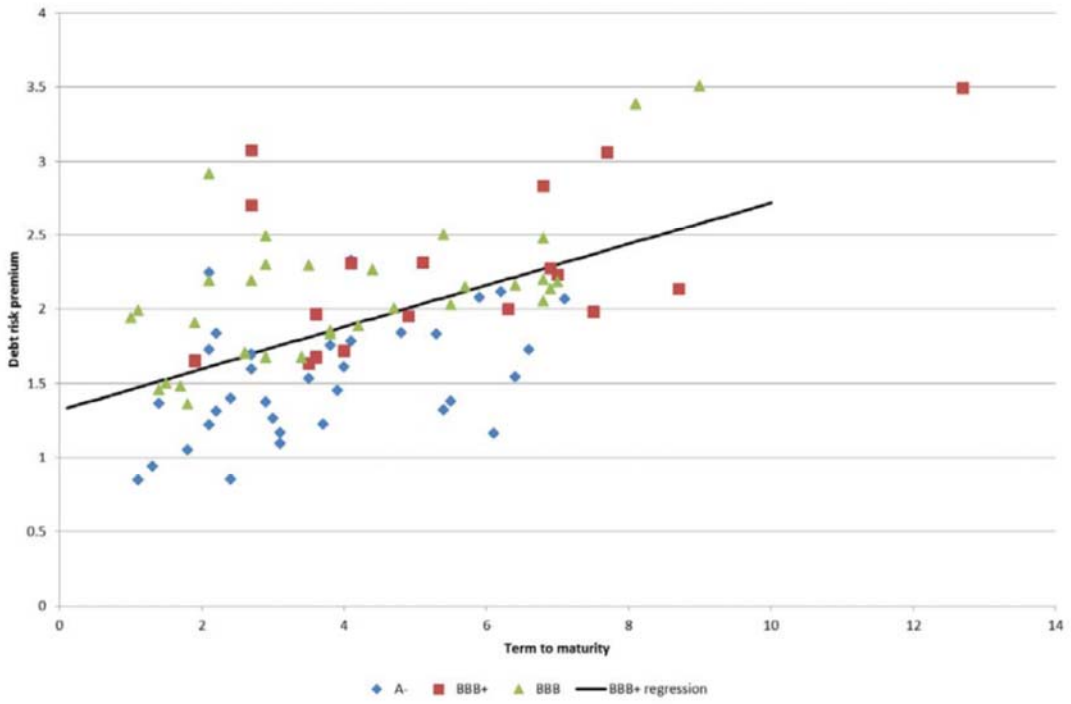
The problem that concerns Aurizon can be seen visually in figure 4.2 from the Incenta report – reproduced below.[173]

Approximately half of the BBB observations are below the regression line which Incenta treats as representative of BBB+ DRPs. By contrast, almost all of the A- observations are below the regression line. Visual inspection shows that the spread of BBB observations is very similar to that of BBB+ observations, suggesting that:

- the inclusion of BBB bonds may not raise the regression estimate above that of BBB+ bonds; but
- the inclusion of A- bonds tends to pull down the regression estimate below that of BBB+ bonds.

[172] The bond sample as supplied by Incenta is provided in Appendix 10.1 for information purposes.
[173] Incenta Economic Consulting, 2013, Aurizon Network: Review of benchmark credit rating and cost of debt, p. 29.

Figure 10.3 – Debt risk premium – simple domestic portfolio (pooled data) approach (20 days to 31 October, 2013)



Source: Bloomberg and UBS

Statistical tests presented below demonstrate that this is the case and that Incenta's regression is materially biased downwards by the presence of A- bonds in the sample – an effect that is not offset by the presence of BBB bonds.

In describing Figure 10.3, Incenta make the following incorrect statement:

> *... the debt risk premiums of the vast majority of the BBB bonds are found to lie above the regression line, while the debt risk premiums of the majority of A- bonds are found to lie below the regression line…*[174]

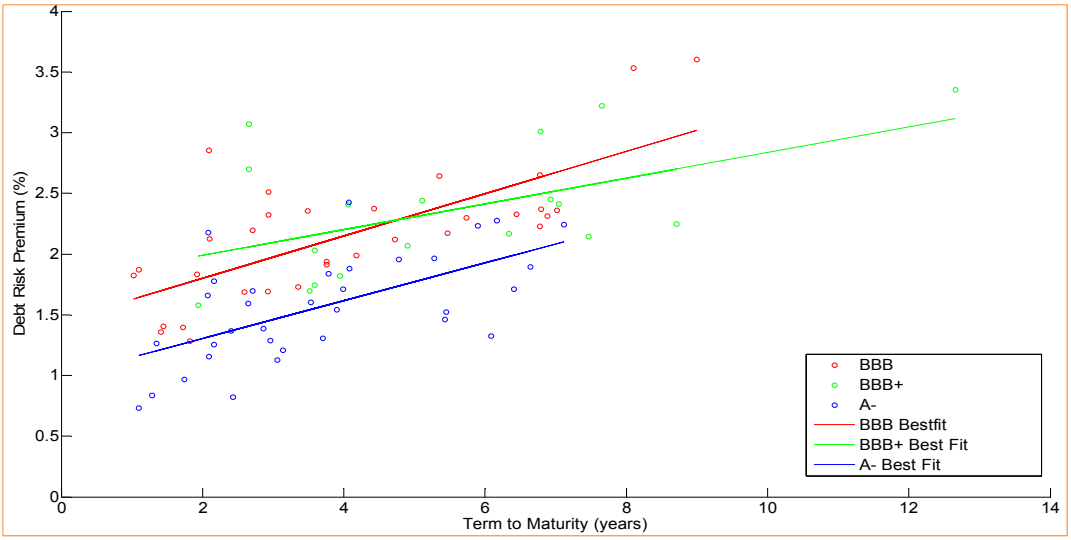
This is simply not correct. Under no reasonable interpretation can only around half of the observations be regarded as a vast majority. This failure by Incenta to properly describe their data provides a potential reason why Incenta does not test more carefully its characterisation of its regression line in Figure 10.3 as a "BBB+ regression".

Figure 10.4 below shows the Incenta bond sample for each credit rating separately. It is clear that the A- rating sample fits the concept with most bonds, exhibiting DRPs that are lower than their counterparts in the lower credit ratings. However, there is no clear delineation between the trends of the BBB+ and BBB ratings.

Aurizon Network believes one possible reason why the samples could exhibit this behaviour is that, within the current sample of Australian bonds, investors may not place much weight on the relative position of the bond within the BBB range, irrespective of the plus sign after BBB.

[174] Ibid, p.28

Figure 10.4 - Time to Maturity versus DRP



10.3.3 - Indifference between BBB and BBB+ DRP

Figure 10.4 suggests there is minimal difference between the DRPs of BBB and BBB+ bonds. In this section, we use a number of ways to test this hypothesis.

As there is a pooled sample of data across different credit ratings, the most common approach is to test this hypothesis via the use of a regression that includes indicator variables[175]. In this case, the use of indicator variables would be controlling for the different credit ratings that exist in the pooled sample, where the regression to estimate the relationship between DRP and time to maturity (TTM) would be:

$$\widehat{DRP} = \beta_0 + \beta_1 TTM$$

This formula would therefore serve to estimate the DRP and the effect on the TTM for the entire pooled sample, regardless of how the sample was constituted.

If the above formula was adjusted to include indicator variables to allow for the differences between credit ratings, the formula would appear as follows:

$$\widehat{DRP} = \beta_0 + \beta_1 TTM + \delta_1 A^{-}\ Indicator + \delta_2\ BBB\ Indicator$$

The indicator variables in this instance would work by flagging which bonds belong to the A- and BBB credit rating. As a result the estimated coefficient for the TTM would give us an accurate assessment of the additional DRP required for each additional year towards maturity for the required BBB+ credit rating. In turn, the coefficients for the two indicator variables will show the scale to which the BBB+ estimate would need to be adjusted to arrive at an estimate for the BBB and A- credit rating.

By utilising Matlab – a statistical reporting/analytical package – and using Incenta's bond sample as input data, the output of this regression is shown below.

As exhibited by the R-squared value of 0.573, the regression achieves a strong fit to the data. This is materially higher than the adjusted R squared in the Incenta regression (0.3) – suggesting a materially better fit to the data. An overview of the output variables is shown below[176]:

1. TTM estimates the increase in DRP for each additional YTM that the bond exhibits. Given the t-statistic of 10.9, this is a statistically significant value.

[175] Carter Hill R., Griffiths W.E. and Lim G.L., 2011, Principles of Econometrics, p. 261.
[176] The critical t-statistic for this test at the 95% level is 1.96 (or -1.96 for negative coefficients), any t-statistics in the regression output that exhibit a value outside these bounds are concluded to be statistically significant.

2. DummyA_1 estimates the deviance from the expected regression line if the bond being estimated has the credit rating of A-. Given the t-statistic of 7.1, this variable is also strongly significant.
3. DummyB_1 estimates the deviance from the expected regression line if the bond being estimated has the credit rating of BBB. Given the t-statistic of 0.1, this variable is not statistically different from zero.

Figure 10.5 - Pooled Regression with dummy variables for A- and BBB rated bonds

```
Linear regression model:
    DRP ~ 1 + TTM + dummyA + dummyB

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    _________    _______    __________

    (Intercept)       1.566      0.1436      10.906     1.708e-17
    TTM             0.14319    0.020037      7.1465    3.7064e-10
    dummyA_1        -0.52586     0.11897     -4.4201    3.0712e-05
    dummyB_1        0.012149     0.11777     0.10316       0.91809


Number of observations: 84, Error degrees of freedom: 80
Root Mean Squared Error: 0.387
R-squared: 0.588,  Adjusted R-Squared 0.573
F-statistic vs. constant model: 38.1, p-value = 2.17e-15
```

The clear conclusion of this statistical test is that the difference between the DRP on a BBB+ and a BBB bond is statistically imperceptible.

Critically, the bias in the bond sample is a potential error that neither Incenta, nor the QCA have accounted for in their estimation of Aurizon Network's cost of debt and debt risk premium.

To illustrate how this error effects Aurizon Network, if we assumed that the dummy variable for BBB rated bonds was significant, then the following DRPs can be predicted for 10 year bonds on each of the credit ratings:

Table 10.5 – Predicted 10-year bond DRP

Credit Rating	Predicted DRP on 10-year bond assuming dummy variable significant
A-	2.472%
BBB+	2.998%
BBB	3.010%

This indicates a DRP differential of only 1 basis point between BBB and BBB+ bonds. Therefore, if Incenta assumes their sample of bonds (when averaged) are indicative of a sample of BBB+ bonds, then there will be systematic downward bias on the calculated DRP. This is further addressed below.

10.3.4 - Comparison of Weighted Average Credit Rating

In order to test the representativeness of the sample of pooled data for a regression, PwC advised that a weighted average approach should be utilised. Incenta adopted this method to test its combined sample. However, there is an implicit assumption in Incenta's weighting that causes a significant error making this test ineffective.

As indicated in the table below, Incenta weighted the bond credit ratings by the number of bonds. [177]

[177] Incenta Economic Consulting, 2013, Aurizon Network: Review of benchmark credit rating and cost of debt, p. 26.

Table 10.6 – Incenta's weighting on credit ratings

Credit rating	No. of Bonds	Weighting – (Credit rating score)	Weighted Sum
BBB	32	3	96
BBB+	18	2	36
A-	34	1	34
Total	84		166
		Average weighting	1.98

However, for this weighting to be meaningful it must be that BBB bonds have DRPs that are equally above those of BBB+ bonds as A- bonds DRPs are below those of BBB+ bonds. That is, the cardinal values assigned to the credit ratings (3=BBB, 2=BBB+ and 1=A-) can only be assumed to be meaningful if the difference in DRP between BBB and BBB+ bonds is of the same absolute magnitude as the difference between BBB+ and A- bonds. However, it is well understood that credit ratings are ordinal rankings and not cardinal measures of differences in risk:

> *… rating agencies insist that their ratings should be interpreted as ordinal rankings of default risk…valid at all points in time rather than absolute measures of default probability that are constant through time*[178]

Put simply, all you can presume about credit ratings is their relative rank. You cannot assume that risk increases proportionally as you move each notch of the credit rating system.

The illusion of symmetry arises simply because the number of observations for BBB and A- are roughly the same. Under the assumption of proportion risk increase with credit rating, the average weighting would always yield an outcome close to the score of the middle observed category.

To illustrate this point, the arbitrary cardinal credit rating score within Table 10.6 (adopted without justification) can instead be interpreted as the DRP on the bonds in each credit rating. This would mean that BBB bonds would exhibit a 3% DRP, BBB+ bonds a 2% DRP and the A- bonds a 1% DRP. This assumption fits in with the general assumption explored earlier as to the DRP decreasing as the credit rating rises higher. If viewed in this way, the weighted averages of the bond sample would derive a DRP of 1.98%, essentially the same as the desired number of 2% for the BBB+ credit rating being estimated. This is the symmetry that is required for the Incenta weighted average credit rating to be correct – but we do not observe this symmetry in the data.

In light of the above material, Aurizon submits that Incenta have made a significant error in relying on this test of representativeness of the sample.

To highlight this issue, if the bonds are weighted in a way that represents their actual difference to the target credit rating of BBB+, a different conclusion is reached.

In Table 10.7, the DRP on the target credit rating (BBB+) is assumed as 1%, and the DRP on the other bonds are calculated using the indicator coefficients observed earlier. Re-calculation of the weighted average should result in an average of 1.00 if the sample reflected a sample with an average weighting of BBB+.

Table 10.7 – Recalculated weighting on the Incenta data

Credit Rating	No. of Bonds	Weighting - indicator coefficients*	Weighted Sum
BBB	32	1.012149	32.3887
BBB+	18	1.000000	18
A-	34	0.47414	16.12076
Total	84		66.50946
		Average weighting	0.792

**1+coefficients from Figure 10.4 for dummyA_1 and dummyB_1*

[178] Amato, J. and Furfine, C., 2004, Are Credit Ratings Procyclical?.

On this analysis, when the weights applied to the sample test are realistic, a significant amount of sample bias is revealed within the Incenta regression. The value of 0.792 in Table 10.7 indicates that Incenta's sample represents bonds with a credit rating that is higher than BBB+ (with a lower weighted average implying a higher credit rating). This indicates that Incenta have under-estimated the DRP and in turn, the cost of debt to be adopted in respect of the averaging period.

10.3.5 - Estimation of DRP Correcting for Errors

Aurizon Network submits that two corrections to the errors made by Incenta are required if this method is to be adopted in the estimation of the DRP for UT4. These estimates are based on the same principles as the "simple portfolio" method, but contain statistical corrections to the methodology to reflect the biased sample used. The corrections are:

1. Regression of observed DRP's with A- dummy variable
2. Regression of observed DRP's excluding A- bonds

10.3.5.1 Estimate of DRP with A- Dummy Variable

Given the analysis in section 10.3.3, the DRPs on BBB and BBB+ bonds are statistically indistinguishable. Consequently, we estimate DRP using only the A- dummy variable.

Figure 10.6 shows the pooled regression with dummy variables for A- rated bonds only.

From this regression an estimate of the DRP can be readily calculated:

DRP_{BBB+} = Intercept + 10 years * TTM

DRP_{BBB+} = 1.5761 + 10 * 0.14269

DRP_{BBB+} = 3.00%

Notably, this is the same result if the (insignificant) dummy variable for BBB rated bond is included, as shown in section 10.3.3.

Figure 10.6 - Pooled regression with dummy variables for A- rated bonds only

```
Linear regression model:
    DRP ~ 1 + TTM + dummyA

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    _______    __________

    (Intercept)      1.5761     0.10428     15.114    2.7244e-25
    TTM             0.14269    0.019304     7.3914     1.173e-10
    dummyA_1        -0.53412    0.087513    -6.1033    3.4017e-08


Number of observations: 84, Error degrees of freedom: 81
Root Mean Squared Error: 0.385
R-squared: 0.588,  Adjusted R-Squared 0.578
F-statistic vs. constant model: 57.8, p-value = 2.52e-16
```

10.3.5.2 Estimation of DRP Excluding A- Bonds from Sample

Alternatively, the DRP can be calculated by excluding the A- bonds from the sample, as there is statistically no difference between the BBB and BBB+ rated bonds. Excluding the A- bonds leaves a sample size of 50 bonds, which is still large enough to perform a regression and obtain a robust result.

The output of the regression that includes only the BBB and BBB+ bonds is provided below.

Figure 10.7 - Pooled regression excluding A- rated bonds

```
Linear regression model:
    DRP ~ 1 + TTM

Estimated Coefficients:
                   Estimate       SE        tStat       pValue
                   ________    ________    ______    __________

    (Intercept)     1.5896      0.12264    12.962    2.7153e-17
    TTM            0.13977     0.023491    5.9499    2.9896e-07


Number of observations: 50, Error degrees of freedom: 48
Root Mean Squared Error: 0.408
R-squared: 0.424,  Adjusted R-Squared 0.412
F-statistic vs. constant model: 35.4, p-value = 2.99e-07
```

DRP_{BBB+} = Intercept + 10 years * TTM

DRP_{BBB+} = 1.5896 + 10 * 0.13977

DRP_{BBB+} = 2.99%

This method provides an unbiased estimate of the DRP of 2.99%, in line with the estimate using dummy variables.

10.3.5.3 Overview of Calculated DRPs

Using the method from PwC and Incenta, Aurizon Network has provided two estimates of the DRP that adjust for statistical biases in the original derivations. Aurizon Network believes that these estimates of the DRP are within the QCA's parameters of the DRP as outlined in the Final Decision of the Cost of Debt Estimation Methodology:

> *Given the limited use of the PwC econometric approach in previous regulatory reviews, the QCA proposes that reference be made to extrapolations of the Bloomberg BVAL series and RBA estimates as a 'cross-check' on estimates from the PwC econometric approach.* [179]

Aurizon Network agrees with the QCA in that the econometric method should be 'cross-checked' against the Bloomberg and the RBA estimation.

The 3.38% spread shown in table 10.8, and also relied upon by QCA[180], is the simple average of the RBA BBB non-financial corporate bond spread between end of September 2013 and end of October 2013. It does not reflect the true risk premium for a 10-year debt as the average effective term is only 8.68 years.[181] To adjust the term to

[179] QCA, 2014d, Final Decision: Cost of Debt Estimation Methodology, p. 10.
[180] Ibid.
[181] RBA, 2014, F3: Aggregate Measure of Australian Corporate Bond Spreads and Yields.

10 years, Aurizon Network applied AER's proposed method[182] outlined in its recent Draft Decision on ACT and NSW energy businesses. The result is an estimate of 3.91% for the10-year DRP.[183]

In its Draft Decision, AER also used a new method to extrapolate the Bloomberg fair value curve based on RBA BBB non-financial corporate bond yield. Aurizon Network has applied AER's new method and extrapolated the Bloomberg BVAL curve to 10 years.[184] The 10-year DRP under this approach is 3.28%.

Aurizon Network recommends that the QCA adopt the RBA extrapolation method proposed by AER given its transparency and simplicity relative to the paired bond approach, if the QCA wishes to use the Bloomberg BVAL curve as a cross-check. As discussed in section 10.3.6 below, there is a discrepancy in Incenta's paired bond approach– the existence of which further supports adopting the AER's methodology for extrapolation.

The AER adopted the mid-point of the adjusted RBA and extrapolated Bloomberg BVAL estimates as the point estimate of cost of debt. Under this approach, the appropriate DRP for Aurizon Network would be the average of 3.91% (adjusted RBA estimate) and 3.28% (extrapolated Bloomberg BVAL estimate), which is 3.60%.

Table 10.8 – Summary of DRP Estimates

Methodology	Estimate	Delta to Incenta SP
Estimates based on Simple Portfolio Method		
Incenta (2013) – Simple Portfolio Method	2.72%	N/A
Aurizon Network – Simple Portfolio with A- Dummy Variable	3.00%	0.28%
Aurizon Network – Simple Portfolio Excluding A- Bonds	2.99%	0.27%
Bloomberg and RBA based estimates		
Incenta (2013) – Paired Bonds Extrapolation of Bloomberg	2.51%	N/A
AER (2014) – RBA Extrapolation of Bloomberg	3.28%	0.56%
QCA (2014) – RBA BBB Non-financial Corporate Bond Yield[185]	3.38%	0.66%
AER (2014) – Adjusted RBA BBB Non-financial Corporate Bond Yield	3.91%	1.19%
AER (2014) – Combined Estimation	3.60%	0.88%

After correction of sample bias, the revised DRP estimate of 3.00% proposed by Aurizon Network, although higher than the original Incenta estimate of 2.72%, is still very conservative when compared to the adjusted RBA estimate (3.91%), the Bloomberg BVAL estimate using RBA extrapolation method (3.28%) and the point estimate that the AER's methodology would produce (3.60%). By contrast, the Incenta estimate appears to be an outlier.

10.3.6 Paired Bonds Method by Incenta

As discussed in the QCA's Final Decision of the Cost of Debt Estimation Methodology[186], Bloomberg BVAL series extrapolation will be used as one of the cross references to examine the reasonableness of the simple portfolio estimation. In light of this, Incenta also implemented the paired bond method to extrapolate the Bloomberg fair value curve, and concluded a 10-year DRP of 2.51%.

The paired bond approach essentially extrapolates the Bloomberg 7-year DRP using the spread differential from bonds with different maturities (preferably 7-year and 10-year) issued by the same issuer. As such, a sample of paired bonds need to be determined first. They are drawn from Table 4.4 of the Incenta report.[187]

[182] AER, 2014a. AER Draft Decision: Ausgrid distribution determination 2015-16 to 2018-19, Attachment 3: Rate of return, p.320.
[183] This estimate involves an extrapolation of the DRP measured relative to CGS. Aurizon notes that the AER's method extrapolates the DRP measured as a spread to swap. However, given that the QCA reports DRP in spread to CGS we have used the former approach.
[184] AER, 2014a. AER Draft Decision: Ausgrid distribution determination 2015-16 to 2018-19, Attachment 3: Rate of return, p.318.
[185] QCA, 2014d, Final Decision: Cost of Debt Estimation Methodology, p. 10.
[186] QCA, 2014d, Final Decision: Cost of Debt Estimation Methodology.
[187] Incenta Economic Consulting, 2013, Aurizon Network: Review of benchmark credit rating and cost of debt, p. 30.

Table 10.9 – Paired bonds from the Incenta report

Bond issues	Term of short bond (years)	Term of long bond (years)	DRP of short bond (bp)	DRP of long bond (bp)	Basis points per annum
CBA Property Fund	6.15	9.16	211	227	5
GPT	5.27	8.83	183	205	6
SP AusNet	7.46	8.70	198	214	13
Sydney Airport	8.09	8.98	339	351	14
Basis points per annum average					**9.4**
3 times bppa					28.2
Bloomberg BBB 7 year DRP					223
'Paired bonds' extrapolated DRP					**251**

Even if this data was accurate, Aurizon considers that four bond pairs with such disparate term relationships (of between less than one and three years) provides an unreliable basis for extrapolation. Aurizon is also concerned about the quality of the data presented.

The paired bonds should be part of the wider sample[188] used in the econometric analysis. However, the statistics shown in the table appear to be inconsistent with the wider sample. Specifically:

- two bonds from CBA Property Fund in the wider sample mature in 2016 and 2019, with approximately 3 and 6 years to maturity, compared to the 6.15 and 9.16 years shown in the table above
- two GPT bonds included in the wider sample have approximately 4 and 5 years to maturity, compared to 5.27 and 8.83 years reported in the table above.

Alternatively, if the CBA Property Fund and GPT paired bonds are excluded, the extrapolated DRP will be 2.64%.

Given the unexplained discrepancy in the paired bond sample, if the QCA considers that the extrapolation method proposed by Incenta should be adopted, Aurizon Network submits the QCA must further investigate the Incenta estimates prior to doing so, or at least, place much less weight on it as a cross-reference.

10.3.7 Summary of Debt Risk Premium Position

One method of estimating the DRP is through the use of econometric methods but this should only be done after the sample of bonds is thoroughly tested for distortion or bias. Aurizon Network believes it is a fundamental error to perform an econometric test without first confirming whether the chosen data is fit for purpose. The issues that Aurizon Network has outlined with the PwC "Simple Portfolio" methodology and Incenta's DRP estimation are summarised as follows.

- The weighted-average method of testing for bias in the sample of bonds is simplistic and prone to error and this has been demonstrated visually and statistically.
- The sample of bonds was regressed with indicator variables to assess the relative impact of bonds with different credit ratings on the overall sample. This test revealed that there was no statistical difference between the DRPs on the BBB and the BBB+ bonds but there was a statistically significant difference between BBB+ and A- bonds.
- In this context, the best estimate of the BBB+ DRP at 10 years is derived using a dummy variable for A- bonds and this results in a DRP estimate of 3.00%.

In conclusion, Aurizon Network has, from a pragmatic perspective, adopted the QCA's preferred methodological approach to measuring the debt-risk premium. However, Aurizon Network has not incorporated the value for the debt-risk premium the QCA derives from its preferred approach.

[188] A full list of bonds analysed in the simple portfolio approach, provided by Incenta, is included in Appendix 10.3.1.

Aurizon Network has corrected the derivation of the debt-risk premium for sample bias, and following that correction has amended the 2014DAU to incorporate a value for the debt-risk premium of 3.00% (being the DRP estimated using a regression with dummy variable for credit ratings).

10.3.7.1 Debt-Raising Costs

Aurizon Network has amended the 2014DAU to incorporate the QCA's decision on debt raising costs and has adjusted the debt-raising costs to 10.8 basis points per annum.

10.3.7.2 Swap Cost Allowances

Aurizon Network has amended the 2014DAU to incorporate interest-rate swap costs on the basis that a term for the risk-free rate of less than 10 years is adopted. This provides an allowance to swap the base interest rate portion of the cost of debt to match the length of the regulatory period. However, this should not be taken as Aurizon Network accepting the term on risk free rate and cost of debt to be aligned to the regulatory period. If QCA accepts 10-year term on risk free rate and cost of debt, then no swap cost allowance is required.

10.3.8 Conclusion

In conclusion, Aurizon Network has not amended the 2014DAU with respect to the DRP to reflect all elements of the QCA's Draft Decision 10.10 but, taking a pragmatic approach, has made a number of amendments in light of the draft decision.

Aurizon Network provides the responses to the subsection of the decision as follows:

- Aurizon Network amended the 2014DAU to incorporate a risk-free rate of 3.21% in calculating an overall WACC of 7.62%.
- Aurizon Network adopted the QCA's preferred methodology in calculating DRP and corrected it for a biased sample, therefore has incorporated a value for the DRP of 3.00%.
- Aurizon Network amended the 2014DAU to incorporate the Draft Decision's debt-raising allowance.
- Aurizon Network amended the 2014DAU to incorporate the Draft Decision's interest-rate swap allowance.

Appendix 10.3.1 - Comparable Debt Issuances in Australia

Name	Date of maturity	Credit Rating	Yield
ADLAIRPORT	15/09/2015	BBB	4.63532
ADLAIRPORT	20/09/2016	BBB	5.471319
APT Pipelines Ltd	22/07/2020	BBB	6.199081
Aurizon	28/10/2020	BBB+	5.996975
Australia Pacific Airports Melbourne Pty Ltd	14/12/2015	A-	4.09872
Australia Pacific Airports Melbourne Pty Ltd	25/08/2016	A-	4.335128
Australia Pacific Airports Melbourne Pty Ltd	4/06/2020	A-	5.420923
BRISAIR	1/07/2016	BBB	5.118993
Brisbane Airport	21/10/2020	BBB	5.942276
Brisbane Airport Corp Pty Ltd	9/07/2019	BBB	5.688209
Caltex Australia Ltd	23/11/2018	BBB+	5.731121
CEUAU	2/09/2020	BBB	5.875065
CLPAUST	16/11/2015	BBB	5.68358
Coca-Cola Amatil Ltd	13/11/2019	A-	4.763894
Commonwealth Property Office Fund	11/03/2016	A-	4.245154
Commonwealth Property Office Fund	13/12/2019	A-	5.729634
Crown Group Finance Ltd	18/07/2017	BBB	5.023227
DBCT Finance Pty Ltd	9/06/2016	BBB+	5.988064
DEXUS Finance Pty Ltd	21/04/2017	BBB+	4.747409
DEXUS Finance Pty Ltd	10/09/2018	BBB+	5.331161
ETSA	9/10/2017	A-	4.830341
ETSA Utilities Finance Pty Ltd	29/09/2016	A-	4.252712
ETSA Utilities Finance Pty Ltd	7/09/2017	A-	4.64988
General Property Trust	24/01/2019	A-	5.280572
Goodman Australia Industrial Fund Bond Issuer Pty Ltd	19/05/2016	BBB	4.594875
Goodman Australia Industrial Fund Bond Issuer Pty Ltd	20/03/2018	BBB	5.560677
GPT Wholesale Shopping Centre Fund	13/11/2017	A-	5.016048
Holcim Finance Australia Pty Ltd	27/03/2015	BBB	4.13572
Holcim Finance Australia Pty Ltd	18/07/2017	BBB	4.996402
Holcim Finance Australia Pty Ltd	4/04/2019	BBB	5.516775
HYUCAP	16/05/2017	BBB+	4.802705
HYUCAP	16/05/2017	BBB+	5.089982
Incitec Pivot Ltd	21/02/2019	BBB	5.970128
Investa Office Fund	7/11/2017	BBB+	5.541202
Mirvac	18/09/2020	BBB+	6.021489
Mirvac Group Finance Ltd	16/09/2016	BBB	4.651495
Mirvac Group Finance Ltd	18/12/2017	BBB	5.136595
Mirvac Group Funding Ltd	15/03/2015	BBB	4.087058
MLBAIRPORT	14/12/2015	A-	4.618563
New Terminal Financing Co Pty Ltd	20/09/2016	BBB	5.280076
Perth Airport Pty Ltd	23/07/2020	BBB	5.773814
POWERCOR	16/11/2015	A-	3.984539
POWERCOR	15/11/2015	A-	5.008004

Name	Date of maturity	Credit Rating	Yield
Powercor Australia LLC	27/04/2017	A-	4.654962
PRAECO W	28/07/2020	BBB+	6.557303
QIC Finance Shopping Center Fund Pty Ltd	27/07/2017	A-	4.9259
QIC Finance Shopping Center Fund Pty Ltd	25/07/2018	A-	5.19622
QPH Finance Co Pty Ltd	29/07/2020	BBB	5.918185
Santos Finance Ltd	23/09/2015	BBB+	4.385448
SPI Australia Assets Pty Ltd	12/08/2015	BBB	4.072691
SPI Australia Assets Pty Ltd	21/02/2017	BBB	4.754827
SPI Electricity & Gas Australia Holdings Pty Ltd	25/09/2017	BBB+	4.933753
SPI Electricity & Gas Australia Holdings Pty Ltd	14/02/2020	BBB+	5.644371
SPI Electricity & Gas Australia Holdings Pty Ltd	1/04/2021	BBB+	5.795593
SPI Electricity & Gas Australia Holdings Pty Ltd	28/06/2022	BBB+	6.087303
SPIAA	25/03/2020	BBB	5.822868
STOCKLAND	6/09/2019	A-	5.644527
Stockland Trust	18/02/2015	A-	3.980192
Stockland Trust	1/07/2016	A-	4.621317
Stockland Trust	25/11/2020	A-	5.839648
SYDAIRPORT	20/11/2014	BBB	4.551953
SYDAIRPORT	20/11/2015	BBB	4.958843
SYDAIRPORT	20/11/2021	BBB	7.279716
SYDAIRPORT	11/10/2022	BBB	7.48964
Sydney Airport Finance Co Pty Ltd	6/07/2015	BBB	4.172355
Sydney Airport Finance Co Pty Ltd	6/07/2018	BBB	5.352493
TRANSB (W)	10/11/2015	A-	4.484976
TRANSB (W)	10/11/2017	A-	5.559709
Transurban Finance Co Pty Ltd	8/06/2016	A-	4.507719
UNITE EN W	23/10/2014	BBB	4.491997
UNITED ENERGY DISTRIBUTI	11/04/2017	BBB	5.398815
Volkswagen Financial Services Australia Pty Ltd	21/11/2014	A-	3.409861
Volkswagen Financial Services Australia Pty Ltd	28/01/2015	A-	3.541557
Volkswagen Financial Services Australia Pty Ltd	14/07/2015	A-	3.743717
Volkswagen Financial Services Australia Pty Ltd	5/12/2016	A-	4.197775
Volkswagen Financial Services Australia Pty Ltd	27/06/2017	A-	4.380707
Wesfarmers Ltd	4/11/2016	A-	4.103579
Wesfarmers Ltd	28/03/2019	A-	4.868243
Wesfarmers Ltd	12/03/2020	A-	5.20303
Woolworths Ltd	22/03/2016	A-	3.704716
Woolworths Ltd	21/03/2019	A-	4.802876
BBIDBCTFIN	9/06/2016	BBB+	5.616682
BBIDBCTFIN	9/06/2021	BBB+	6.902997
BBIDBCTFIN	9/06/2026	BBB+	7.799442

10.4 - Market Risk Premium

In past decisions, the QCA calculated the MRP using a combination of two historical empirical analyses and two forward looking approaches. The QCA then applied 25% weight to the outputs of each approach, rounding the weighted result to the nearest whole percentage. Since UT1, this has resulted in Aurizon Network receiving an MRP of 6.0%.[189]

On the other hand, the *Draft Decision* applied the proposal to set aside the whole number rounding approach outlined in the *2014 Cost of Capital Market Parameters* paper[190].

Aurizon Network welcomes this development, as SFG previously demonstrated that it should lead to more accurate estimates of the MRP.[191] The removal of the whole number rounding resulted in an MRP estimate of 6.5% for UT4.

However the derivation of the 6.5% MRP is less transparent than previous decisions. While still referencing the four approaches, the QCA has introduced an additional factor of 'Current conditions/Conditional information', including:

> *… volatility measures, corporate debt premiums, and liquidity premiums on government bonds. The QCA also considered the relationship between the risk-free rate and the market risk premium.* [192]

Unlike previous decisions the QCA did not provide the weights afforded to each of the five factors, nor how these were determined. Instead the QCA stated that:

> *Appropriate weights will be difficult to specify and some information will be qualitative. The QCA will consider a range of evidence and will apply judgement in arriving at an estimate of the market risk premium.* [193]

Table 10.10 below shows a comparison of MRP estimates using the different approaches.

Table 10.10 – MRP approach comparison

Method	UT4 Draft Decision Estimate	UT1-UT3 Approach		UT4 Approach	
		Weight	Weighted Estimate	Weight	Weighted Estimate
Ibbotson method	6.5%	25%	1.63%	Unknown	Unknown
Siegel method	5.5%	25%	1.38%	Unknown	Unknown
Survey evidence	6.8%	25%	1.70%	Unknown	Unknown
Cornell DGM	7.1%	25%	1.78%	Unknown	Unknown
Current conditions	N/A	N/A	N/A	Unknown	Unknown
MRP (rounding)	6.50%?		6.00%		6.50%?
MRP (no rounding)	6.50%?		6.48%		6.50%?

Aurizon Network recognizes that due to the largely qualitative nature of 'Current conditions/Conditional information' factor, it could be difficult to provide consistent weights across regulatory periods. Such is the nature of a factor that focusses on conditions current to the undertaking period of the time.

In determining a 6.5% MRP, the QCA would nevertheless have had to calculate weights of some quantum or magnitude. Therefore, Aurizon Network does not agree that the revised approach prohibits the QCA from specifying weights across the methods and outlining how such weights were determined.

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[189] As commented by SFG in various reports (e.g., SFG, 2014f, Estimating the market risk premium: Response to the UT4 Draft Decision – Report for Aurizon Network, p. 2.)
[190] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 237.
[191] SFG, 2014b, An appropriate regulatory estimate of the market risk premium.
[192] QCA, 2014c, Cost of Capital Markets Parameters – Final Decision, p. 23.
[193] Ibid, p. 23.

An MRP of 6.48% can be calculated if the UT1-UT3 approach was applied to the four methods in the *Draft Decision*. This notional analysis seems to indicate that the QCA has assigned little to no weight to the additional qualitative factor, then rounded the weighted result to the half percentage point, rather than a whole. As summarised by SFG:

> [42] *That is, it appears that the equally-weighted mean (over the four approaches) has not been adjusted in accordance with the additional information, but has simply been rounded to the nearest 0.5%....These adjustments are consistent with the QCA rounding to the nearest 0.5%, but they are not consistent with the QCA having regard to the additional information.* [194]

The QCA also indicates the range it has developed for the MRP is between 5.0% and 7.5%:

> *…we have used a number of valid methods and current information to form a range and then applied our best judgement to determine a final point estimate, based on a boarder consideration of the evidence at hand. On this basis, we consider a reasonable estimate of the market risk premium for the 2013DAU period is 6.5%.* [195]

Aurizon Network is unable to identify the method that the QCA utilised in its analysis to arrive at the particular estimates for its lower and upper bounds.

10.4.1 Siegel Method

The Siegel method is not used by any other Australian regulator, nor Siegel himself. This is most likely due to the fact that the data required to implement the Siegel approach is not readily available, and the assumption that the high real returns of 1980 government bonds were expected to continue into the future.[196] The Brattle Group also shares the same concern with the Siegel procedure as implemented by the QCA, and believes the inclusion of this specific methodology needs additional explanation and empirical support.[197]

In response to previous submissions[198] by SFG on this point, the QCA stated that:

> *… the QCA simply notes that these arguments are not relevant, as the QCA's practice is to assess proposed methods on their merits — the QCA's view is that the Siegel method has merit.* [199]

Aurizon Network challenges why the QCA continues applying weights to the Siegel method where every other regulator has afforded the method a zero weight. Its use is considered by Aurizon Network as contrary to the QCA's stated objective of best-practice regulation.

The range of Siegel estimates for the MRP is 4.1% to 6.4%. For the period 1958-2013, which the QCA believes to be the longest period of high quality data, the MRP estimate was 5.5%.[200] However, the QCA has stated that the lower bound of the MRP range to be 5.0%, 50 basis points below its preferred Siegel estimate of 5.5%.

Aurizon Network does not endorse the use of the Siegel method. However, if the QCA continues to decide to apply the Siegel method, Aurizon Network recommends that the Siegel method be applied consistently and therefore, that the lower bound of the MRP be set to equal the Siegel estimate of 5.5%.

10.4.2 Cornell Dividend Growth Model (DGM)

The standard application of the Cornell DGM first derives a required market return. A single discount rate is essential to equate forecast dividends to a current share price.

However, the QCA uses a hybrid Cornell DGM,[201] which differs from the standard application in two ways:

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[194] SFG, 2014f, Estimating the market risk premium: Response to the UT4 Draft Decision – Report for Aurizon Network, p. 9.
[195] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 236.
[196] SFG, 2014f, Estimating the market risk premium: Response to the UT4 Draft Decision – Report for Aurizon Network, p. 15.
[197] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, pp. 16-17.
[198] SFG, 2014b, An appropriate regulatory estimate of the market risk premium.
[199] QCA, 2014c, Cost of Capital Markets Parameters – Final Decision, p. 62.
[200] Ibid.
[201] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 233.

- It makes a downward adjustment to long-term growth forecasts - the GDP discount adjustment.
- It assumes that investors have two different required return periods, one over the next 10 years, and another for the subsequent period – the dual rate adjustment.

As per the attached SFG report, *Application of the dividend discount model for estimating the market return by the Queensland Competition Authority,* Aurizon Network recommends that neither adjustment should be made.[202]

The Brattle Group also points out that, the Cornell DGM does not take into account the distribution of cash by share repurchase which creates a downward bias in the estimation of market risk premium. As a result, it is not logical to correct for a potential upward bias by new equity issuances while ignoring the downward bias created by alternative ways of distributing cash.[203]

The QCA's dual rate adjustment is another departure from the ACT "GasNet" consistency principle.

A further inconsistency is encountered in estimating the MRP itself once the required market return is derived. In producing an estimate of the MRP the QCA used the 10 year CGS bond yield (4.06%) in one part of the CAPM equation, and a 4 year CGS bond yield in another (3.21%).

Table 10.11 below shows the different Cornell DGM estimates, with the QCA approach producing the lowest MRP.

Table 10.11 – Cornell DGM estimates under different assumptions[204]

Estimation approach	Required Market Return	MRP Estimate	
		10-year Rf of 4.06%	4-year Rf of 3.21%
New QCA approach	11.2%	7.1%	8.0%
No dual rate adjustment	11.5%	7.4%	8.3%
No GDP discount adjustment	12.6%	8.5%	9.4%
Neither adjustment	12.1%	8.0%	8.9%

Therefore, in using the same risk-free rate as the *Draft Decision* with no downward adjustment, Aurizon Network recommends that the QCA adopt a Cornell DGM estimate of 8.9% in estimating a UT4 MRP if the QCA does not use 10-year risk free rate.

10.4.3 MRP Range

While the QCA indicated that it has developed a range in deciding on the MRP, Aurizon Network is unclear as to how the QCA applied its 'best judgement' in deriving the MRP range, or how it leads to an estimated MRP of 6.5%.

Aurizon Network notes that the QCA has applied asymmetric adjustments to the lower and upper bounds of the MRP range, but is unclear why such asymmetry exists.

Aurizon Network therefore seeks transparency on this issue.

10.4.4 Wright Approach

The QCA supported the Wright approach in its Draft Decision, stating:

> *"…the QCA will have regard to the Wright estimates in forming a view on an appropriate estimate of the market risk premium.* "[205]

[202] SFG, 2014h, Application of the dividend discount model for estimating the market return by the Queensland Competition Authority – Report for Aurizon Network.
[203] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, p.18.
[204] SFG, 2014f, Estimating the market risk premium: Response to the UT4 Draft Decision – Report for Aurizon Network, p. 30.
[205] QCA, 2014c, Cost of Capital Markets Parameters – Final Decision, p. 80.

Yet in estimating the Draft Decision MRP, no reference seems to have been made by the QCA to the Wright method.

The Wright approach effectively assumes that the real required return on the market is constant.[206] Against this background, and so as to estimate an MRP that exhibits a greater degree of stability, both Aurizon Network and SFG have supported the inclusion of the Wright approach into the current estimation procedure. The QCA's consultant, Associate Professor Lally, has also previously supported the inclusion of the approach.[207]

Based upon the same period of high quality data used to estimate the MRP within the Siegel method, the Wright approach produces an MRP estimate of 7.4%, with a range between 6.0% and 8.4% upon taking into account the NERA adjustment.[208] When further factoring QCA's risk-free rate of 3.21% from the *Draft Decision*, as well as the QCA estimate of the expected return on the market portfolio, a MRP of 8.5% (11.7% - 3.2%) is estimated.[209]

Yet in estimation of the *Draft Decision* MRP, no reference seems to have been made to the Wright method despite the QCA stating it supports having regard to the approach.

Aurizon Network therefore seeks clarity on what regard and subsequent impact the QCA has given to the Wright estimates.

10.4.5 Correction of Estimates

Based upon the approaches discussed within the *Draft Decision*, SFG has performed its own estimates of the MRP. In doing so, SFG has adopted (although does not impliedly endorse) QCA's estimates of both gamma (0.47) and the risk-free rate (3.21%)[210]. SFG has also corrected for the inconsistency of converting between with-imputation and ex-imputation returns as adopted by the QCA.[211]

The results of the SFG analysis is outlined below, with differences between SFG's and QCA's estimates outlined in the far right hand column.

Table 10.12 – MRP Estimation methods (QCA and SFG estimates)

Method	QCA Estimate	SFG Estimate	Difference
Ibbotson	6.5%	6.6%	0.1%
Siegel	5.5%	5.6%	0.1%
Surveys	6.0%	7.9%	1.9%
Expert exports	6.4%	8.3%	1.9%
Cornell	7.1%	8.9%	1.8%
Wright	7.4%	8.6%	1.2%
Mean (excluding Wright)	6.3%	7.5%	1.2%
Median (excluding Wright)	6.4%	7.9%	1.5%
Mean (including Wright)	6.5%	7.7%	1.2%
Median (including Wright)	6.5%	8.1%	1.2%

Aurizon Network therefore proposes that the QCA address these discrepancies and update its MRP estimate, especially where the same data and same approaches are utilised.

[206] SFG, 2014b, An appropriate regulatory estimate of the MRP, p. 22.
[207] Lally, 2013b, Response to submissions on the risk-free rate and the MRP – Report to the QCA.
[208] QCA, 2014c, Cost of Capital Markets Parameters – Final Decision, p. 88.
[209] SFG, 2014f, Estimating the market risk premium: Response to the UT4 Draft Decision –Report for Aurizon Network, p. 28.
[210] Except for Ibboston and Siegel approach, which still use 10-year risk free rate.
[211] SFG, 2014g, Converting between ex-imputation and with-imputation required returns – Report for Aurizon Network.

Aurizon Network also highlights that an MRP estimate of less than 7.5% (with imputation) can only be justified by a combination of the following methodological selections as outlined by SFG[212].

Specifically:

- *Applying material weight to the Siegel approach, which virtually no one else uses for any purpose, and for which the required data is unavailable;* [and/or]
- *Using two different values for the same risk-free rate in the same CAPM equation; [and/or]*
- *Adjusting the survey and independent expert report estimates for the value of imputation credits in a manner that is inconsistent with the QCA's regulatory model; [and/or]*
- *Compiling the Cornell estimate in an entirely unique manner that is inconsistent with the Cornell paper on which it is based. This approach requires two different estimates of the required return on the market; and [or]*
- *Disregarding the Wright estimate which has been recommended in work commissioned by the QCA.*

The Brattle Group also highlights the need to adjust the market risk premium for the difference between the 10-year and the 4-year government bond yield, if the QCA insists to use 4-year risk free rate based on the unrealistic assumptions behind NPV 0 principle. As outlined in Table 1 of The Brattle Group report, the consistent market risk premium should be 7.05%, even if the QCA's estimates were retained.[213]

Aurizon Network submits that the QCA's methodological selections are not appropriate and do not meet regulatory best practice. However, in adopting a pragmatic approach in responding to the Draft Decision, Aurizon Network has amended the WACC incorporated in the 2014DAU to adopt the value for the market-risk premium set out in the Draft Decision (6.5%). The adoption of this rate is subject to an overall WACC of 7.62% or higher resulting from the application of the various WACC parameters.

10.5 - Equity Beta

10.5.1 - Overview of QCA's Draft Decision

In the *Draft Decision*, the QCA has initially determined an asset and equity beta of 0.45 and 0.80 respectively.

The QCA has relied on the report provided by Incenta, *Review of Regulatory Capital Structure and Asset/Equity Beta for Aurizon Network: Report to the Queensland Competition Authority*.[214] The QCA believes Incenta has:

> *…correctly identified a large sample of international energy and water businesses as appropriate comparators for Aurizon network.*[215]

Moreover, the QCA believes that Incenta has:

> *… correctly identified a reasonable range for the asset beta of Aurizon Network as falling between:*
>
> *a) a lower bound of 0.35 (DBCT), and*
> *b) an upper bound of 0.49 (toll-roads).*
>
> *...[that] this mid-point is the same as the point estimate asset beta it estimated for international and Australian regulated energy and water businesses is a coincidence. That is, the 0.42 estimate is based on analysis of a large sample of business identified as comparators.* [216]

The QCA has concluded that the proposed value for the asset beta, and the equity beta to be:

- *"…consistent with observed betas for relevant comparator group of energy businesses*

[212] SFG, 2014f, Estimating the market risk premium: Response to the UT4 Draft Decision –Report for Aurizon Network, p. 33.
[213] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, pp. 14-15.
[214] Incenta Economic Consulting, 2014, Review of Regulatory Capital Structure and Asset/Equity Beta for Aurizon Network and response to stakeholder comments – Report to the Queensland Competition Authority.
[215] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 252.
[216] Ibid.

- *reflected the limited exposure of Aurizon Network to risks related to short-term coal demand shocks…*
- *would provide an environment conducive to investment in new infrastructure…, and*
- *represented an appropriate reduction to the asset and equity betas approved in UT2."*[217]

In estimating the beta for Aurizon Network, the QCA has applied no weight to any comparator in the rail sector and in the broader transportation sector. Aurizon Network maintains that the QCA's proposed approach on this issue is not appropriate.

In addition, Aurizon Network raises concerns with the underlying analysis upon which the QCA has relied in determining both the asset and equity beta's across UT4. Upon thorough review of the Incenta report and associated data, Aurizon Network has identified a narrow reliance on one methodology for estimating beta, and the incorrect application of that methodology, with Aurizon Network's analysis of the same data yielding a higher beta rate.

10.5.2 - Aurizon Network's 2013 Submission on Beta

Aurizon Network's *2013DAU* proposed an asset beta range of 0.5 to 0.6 for UT4. Based on SFG's beta analysis[218] and a 55% gearing level, the resulting equity beta range was 0.9 to 1.0.

Aurizon Network's *2013DAU* raised two main concerns over QCA's previous (UT3) equity beta decision:

- Aurizon Network remains concerned with the QCA's ongoing rejection of transportation firms – including US Class 1 railroads – as relevant comparators. Instead, the QCA has solely relied on energy network businesses to determine Aurizon Network's beta; and
- Aurizon Network is concerned with the potential errors in estimating beta, including statistical errors as well as potential reliance on inappropriate or irrelevant comparators.

The second point is especially important if only one methodology of beta estimation is applied, as the QCA has done in its *Draft Decision* by relying solely on the analysis of Incenta.

To address each of these two concerns, Aurizon Network commissioned two independent expert reports:

- Synergies Economic Consulting: Based on Synergies' risk comparison analysis, Aurizon Network believes that a sole comparison with electricity network businesses is not appropriate.[219] The retail nature of the service and the abundant and perpetually captive customer base of an electricity business are significantly different from that of Aurizon Network. The regulatory frameworks governing Aurizon Network and electricity network providers are different, with Aurizon Network exposed to more risks, including stranded asset risk.[220]
- SFG Consulting: SFG performed a first principle analysis on the comparability of US Class 1 railways. Key factors considered were the nature of the product or service, the nature of the customer, pricing structure, and duration of contracts, market power, and the nature of regulation, growth options and operating leverage. Based on this work, Aurizon Network concluded that the two businesses are similar on systematic risk dimensions, although US Class 1 railways are more diversified and not subject to the same degree of regulation.

Based on these works and similar to that of other regulated rail businesses, such as Brookfield Rail in WA, Aurizon Network proposed to give some weight to the transportation sector given the similarity in some aspects of risk exposure, thereby not solely relying on energy network businesses when estimating beta.

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[217] Ibid, pp. 252-253.
[218] SFG, 2014c, Commentary on the Systematic Risk Analysis of Aurizon Network by the Queensland Competition Authority – Report for Aurizon Network.
[219] Synergies Economic Consulting, 2013a, Aurizon Network's Commercial and Regulatory Risk.
[220] Aurizon Network, 2014b, A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks.

10.5.3 - SFG's Beta Estimation Report

SFG maintains its conclusion that an appropriate estimation of equity beta for Aurizon Network is 1.0.

As beta is not directly observable in the market, estimations must be constructed. There is significant risk of error in relying on one methodology. To minimise the risk of estimation error, SFG used three different beta estimation techniques including Ordinary Least Square (OLS), and other approaches incorporating firm characteristics.[221]

Both Aurizon Network and SFG believe that weights should be assigned to more than one industry when analysing the outputs of beta empirical estimates. On the comparability of firms to Aurizon Network, SFG concluded:

> *Some firms will be more comparable in one dimension (industry), other firms will be more compatible in other dimensions (form of regulation) and still other firms will be more comparable in other dimensions. Our approach is to apply weight depending on how comparable each firm might be across the range of relevant dimensions.*[222]

The Brattle Group also shares the same view as Aurizon Network and SFG. Specifically, The Brattle Group believes that a sample of comparable railroads should be drawn from overseas while companies in the same regulatory environment could be drawn from a set of Australian energy companies, to estimate equity beta for Aurizon Network. Moreover, The Brattle Group considers the regulatory regime of Canadian railroads is similar to Aurizon Network, as Canadian Transportation Agency also sets the allowed return on equity for a single raw material.[223] As a result, Aurizon Network submits that appropriate weights should be given to the railroads.

In contrast, the QCA and Incenta appear to consider that the main driving force of systematic risk and beta is the distinction between the degrees of regulation. However as Aurizon Network has no direct comparators on systematic risk, there is a need to compare Aurizon Network to more than one industry in order to accumulate the risk effects of different industries.

In line with Aurizon Network's own risk analysis, SFG utilised a larger and wider sample of relevant firms, including Australian transportation firms, US Class 1 railroads and Australian energy network businesses. By carefully examining different weights given to different estimation techniques and different samples, SFG concluded that 0.55 was an appropriate asset beta estimate for Aurizon Network.[224]

Aurizon Network therefore proposed an asset beta range of 0.5 to 0.6 for UT4, translating into an equity beta range of 0.9 to 1.0 when using a 55% gearing level.

10.5.4 - Previous Regulatory Decision's on Beta for Australian Rail Companies

The inclusion of other Australian transportation firms and international railroads has precedent in, Western Australia, the other State jurisdiction which regulates railways.

The Economic Regulatory Authority of Western Australia (ERAWA) regulates three rail networks:

- The Public Transport Authority (PTA) operating the passenger rail network for the Perth metropolitan area;
- Brookfield Rail (Brookfield) freight services (previously known as WestNet Rail); and
- The Pilbara Infrastructure (TPI).

As part of its 2008 Weighted Average Cost of Capital Review[225], the ERAWA commissioned a paper by Allen Consulting Group (ACG). The ACG report outlined a methodology to determine WACC for firms regulated under the *Railways (Access) Code 2000 (WA)*. The paper is still used by ERAWA for deciding an appropriate equity beta.

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[221] SFG, 2012a, Systematic risk of Aurizon Network.
[222] SFG, 2014c, Commentary on the Systematic Risk Analysis of Aurizon Network by the Queensland Competition Authority – Report for Aurizon Network.
[223] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, pp. 8-9.
[224] SFG, 2012a, Systematic risk of Aurizon Network.
[225] The Allen Consulting Group, 2007, Railways (Access) Code 2000: Weighted Average Cost of Capital: 2008 WACC Determinations.

The ACG analysis on the equity beta directly contradicts the Incenta analysis currently adopted by the QCA.

PTA's Beta

As with most regulatory precedent in the estimation of beta, the ACG report outlined how a sample of comparator firms were selected, with a beta derived by analysing the firm's excess returns against the excess returns of the market of a given time period. ACG estimated the PTA's beta on the basis that:

> *No directly comparable listed rail companies have been identified. In the absence of directly comparable entities, it is considered that appropriate comparable businesses are mature toll-road companies.*[226]

The global toll-road comparator firms selected by ACG were as follows:

- Vinci SA (France);
- Albertis Infraestructuras SA (Spain);
- Atlantia SPA;
- Brisa Auto-Estradas-Priv SHR (Portugal);
- Macquarie Infrastructure Group (Australia); and,
- Transurban Group (Australia).

This is the same group of comparator firms that the QCA used for Aurizon Network. However the QCA proposed the ACG-derived beta estimate to be the upper-bound of Aurizon Network's beta, even though the limited risk profile of a state-owned passenger railway network should exhibit a lower beta than Aurizon Network.

Brookfield Rail's Beta

Brookfield Rail is a private rail infrastructure company with significant similarities to Aurizon Network. It holds a long term lease over 5,500 kilometres of rail infrastructure in the southern half of Western Australia, with bulk resource and agricultural commodities representing around 80% of its traffic. For Brookfield Rail, ACG proposed the comparators for freight rail (including bulk minerals transport, refer Table 10.13 below) as the following:

> *Comparable listed businesses are considered to comprise:*
>
> 1. *Listed rail infrastructure businesses in the United States and Canada; and,*
> 2. *Listed transport infrastructure and service firms in Australia and New Zealand.*[227]

Table 10.13 – ACG Report Comparator Firms

Comparator Name	Country	Industry
Kansas City Southern	US	Rail
Union Pacific Corporation	US	Rail
RailAmerica Inc	US	Rail
CSX Corporation	US	Rail
Burlington Northern Santa FE	US	Rail
Canadian Pacific Railway Ltd	Canada	Rail
Adsteam Marine Limited	Australia	Transport
Macquarie Infrastructure Group	Australia	Transport
Patrick Corporation Ltd	Australia	Transport
Toll Holdings Ltd	Australia	Transport
Auckland International Airport Ltd	New Zealand	Transport

[226] Ibid, p. 30.
[227] The Allen Consulting Group, 2007, Railways (Access) Code 2000: Weighted Average Cost of Capital: 2008 WACC Determinations, p. 18.

Comparator Name	Country	Industry
Infratil Ltd	New Zealand	Transport
Port of Tauranga	New Zealand	Transport
Toll NZ Ltd	New Zealand	Transport

The ACG Report specifically addresses the differences between the betas of the WA bulk freight network and that of the Class 1 railroads in the United States:

> *… Beta values in these ranges may, however, overstate beta values for the freight rail system in Western Australia for reasons that the comparator businesses considered for this study would have a greater proportion of revenues derived from intermodal (container) traffic, which would generally be expected to have higher levels of non-diversifiable risk (and higher beta values) than the freight rail system in Western Australia, which has a greater proportion of revenues from bulk transport of grain and mineral products. Lower beta values of perhaps in the range of 0.5 to 0.6 (corresponding to equity beta values 0.77 to 0.92) may be more appropriately determined for the freight rail system in Western Australia, and would be consistent with recent regulatory precedent. An exercise of judgement to adopt such lower values would necessarily be subjective. Taking these matters into account, an asset beta value of 0.6 is recommended for the freight rail system, corresponding to an equity beta value of 0.92 at a gearing of 35 per cent.*[228]

Aurizon Network finds the conclusions of ACG, and their adoption by the ERAWA, to be more balanced in the determination of a beta estimate for bulk railway access by not dismissing the relevance of Class 1's outright.

Comparatively, the QCA has instead adopted a beta estimated from an unrelated industry (in this case electricity). Aurizon Network has responded to each of the arguments made by the QCA on explicitly rejecting the comparability of the US Class 1 railroads in Appendix 10.5.1.

The Brattle Group has pointed out the similarity in regulatory regime in Canadian railroads.[229] Aurizon Network submits that the QCA should place weight on the comparator groups used by other regulators in the benchmarking of equity beta in the rail sector.

10.5.5 - Errors Identified in Incenta's Beta Report

Aurizon Network supports the use of econometric and statistical techniques in the estimation of beta, and believes in the need for robust methodology and application of derived techniques. This is especially required in the estimation of beta as there is considerable potential for estimation error as outlined in both Aurizon Network's *2013DAU* and the QCA's *Draft Decision*.

Aurizon Network highlights various errors in Incenta's estimation of beta in *Review of Regulatory Capital Structure and Asset/Equity Beta for Aurizon Network: Report to the Queensland Competition Authority*[230].

This section demonstrates clear flaws in the outputs of the simulated month beta estimation by Incenta, errors in the categorisation of the sample data, and the de-leveraging analysis applied.

10.5.5.1 Empirical Estimation of Beta – Simulated Month Methodology

Incenta prepared a simulated monthly analysis in order to ensure that the choice of day of month between which returns are calculated does not bias the estimate of beta. This is an appropriate filter to apply and it was also undertaken by SFG in their analysis of Aurizon Network's beta, albeit with a different approach. The methodology is explained in greater detail within Appendix 10.5.2.

Output of Estimation

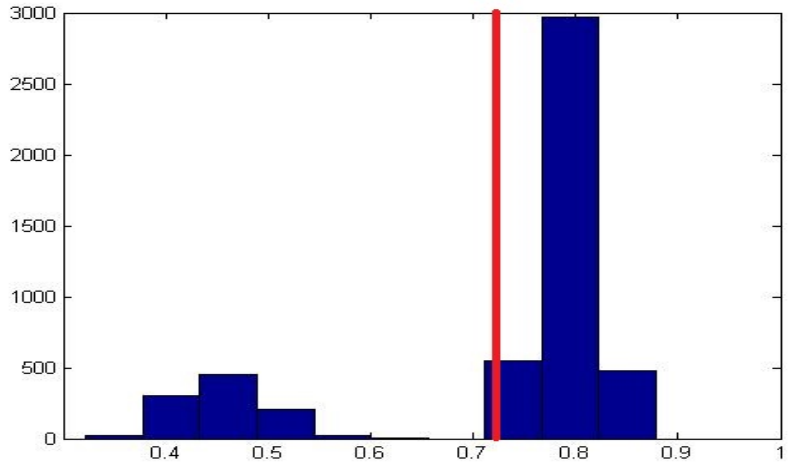
[228] Ibid, p. 31.
[229] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, p. 9.
[230] Incenta Economic Consulting, 2014, Review of Regulatory Capital Structure and Asset/Equity Beta for Aurizon Network and response to stakeholder comments – Report to the Queensland Competition Authority.

Aurizon Network replicated the Incenta simulated month method for all energy and toll road firms within their example. Appendix 10.5.3 contains an excerpt of 8 of the firms from the sample of 70 energy firms, the histogram of the Incenta data, as well as a histogram of the Aurizon Network replication of the data. It is clear from the outputs that there is significant error in the 'simulated months' simulation conducted by Incenta.

Further analysis reveals the systematic nature of these errors throughout all of the simulated betas. In just under half of the outputs for the comparator firm sample, results are not from a normal distribution. Of these firms, most have a distinct and separate cluster of results, whereas others exhibit a separate cluster close to that of the mode of results.

This is illustrated below in Figure 10.8, the histogram for US-listed regulated energy company Xcel Energy, where there are two distinct clusters, both displaying some elements of normality. In the left smaller cluster there are 999 observations, or exactly 20% of the observations.

Figure 10.8 - Histogram for US-listed regulated energy company Xcel Energy



Of the 70 energy firms in the Incenta analysis, 49% show this trend. All of these 49% have an outlying cluster of 999 ± 1%, similar to the one shown above in Figure 10.8. These observations indicate that there is a systematic error in the Incenta results which skews the outcomes of the beta analysis.

The two most likely drivers of this systematic error of data are as follows:

- There is a general error in the code that causes 20% of regressions to exhibit behaviour outside the normal output. This could be a general code error that allows the regression to over/under-state the OLS estimates.
- There is a data/data-manipulation error.

Given that the mean of this sample of estimates is then used to calculate the mean beta of the firm, Aurizon Network considers that a material error has been introduced into the estimates. The red line on the above graph represents the mean of the data for Xcel Energy. As it falls within a bar on the histogram representing around 10% of the observed betas in the estimation, it is not representative of the simulated data.

10.5.5.2 Other Issues with Incenta's Report

As highlighted in the last section, there appears to be statistical issues with Incenta's beta analysis. Given these issues, in an attempt to verify Table 5.3 of the Incenta report[231], Aurizon Network replicated some of the key outputs in Incenta's report, using data provided by Incenta.

[231] Incenta Economic Consulting, 2014, Review of Regulatory Capital Structure and Asset/Equity Beta for Aurizon Network and response to stakeholder comments – Report to the Queensland Competition Authority, p. 65.

Sample Issues with Incenta's Data

The first step to verify Incenta's results was to examine the sample composition. The Incenta's report indicated that there are 7 toll-road and 70 energy firms within the sample. However, if the sample composition from Incenta's data is analysed (using industry classifications provided in the dataset), a different number of firms within each industry group is identified to those reported.

As a result, Aurizon Network undertook further research and identified that Incenta has:

- misclassified Societa Iniziative Autostradali e Servizi SpA, an Italian toll-road company, as a business in the airport industry; and
- CONSOL Energy, a US coal mining business, as a business in the energy sector.

Although these oversights may not have materially affected the final results, it raises some concerns as to how carefully the analysis has been conducted.

De-leveraging Process

As in section 10.5.5.1, the simulation outputs from Incenta's data appears to be problematic - especially for the energy sector on which QCA places most of the weight in determining Aurizon Network's beta. Even leaving aside this issue, the de-leveraging process utilised by Incenta cannot be replicated using the data provided.

After correcting the industry classification for the two firms identified above, Aurizon Network has further analysed the de-leveraging process performed by Incenta for toll-road and energy sectors. The dataset provided by Incenta contains the simulation outputs, with the equity beta and associated gearing ratio (D/V). However, tax rates for each country are not provided. In order to replicate the de-leveraging process, Aurizon Network utilised the average tax rates for the relevant countries over the sample period. To be consistent with the QCA and Incenta, the tax rates in Table 10.14 have been adjusted for dividend imputation where applicable, using a gamma of 0.47.

Table 10.14 - Average Tax Rates used for De-leveraging[232]

Country	Average Tax Rate
Australia*	15.9%
Canada	31.2%
France	33.3%
Italy	32.9%
New Zealand*	15.9%
Portugal	25.3%
Spain	30.9%
UK	27.4%
US	40%

** Adjusted for imputation credits*

Also consistent with the QCA and Incenta, Aurizon Network used the Conine formula for de-leveraging. As shown in Table 10.15, by applying the relevant tax rates for each country, the asset betas vary compared to Incenta's report.

Table 10.15 - Replication of De-leveraging Process

Industry	Asset Beta (Incenta Report)	Asset Beta (tax rates per Table 10.10)

[232] KPMG, 2014, Corporate tax rates table, available at http://www.kpmg.com/global/en/services/tax/tax-tools-and-resources/pages/corporate-tax-rates-table.aspx.

	Mean	Median	Mean	Median
Toll-road	0.49	0.49	0.53	0.54
Energy	0.41	0.42	0.55	0.51

To investigate if the discrepancies could be caused by different tax rates used by Incenta, Aurizon Network re-performed the de-leveraging process by using alternative tax rates. The sensitivity analysis investigates tax rates within +/-5% range in Table 10.14. Generally, the asset beta is not sensitive to small changes in tax rates used, where the asset betas for the toll-road and energy samples always much higher than those reported. Aurizon Network's comparative analysis on the same data set raises some material concerns as to how Incenta determined the figures reported in their Table 5.3.

In an attempt to reconcile the discrepancies, Aurizon Network requested from the QCA the relevant codes for the simulation and data used for estimating beta. However as of lodgement of this submission, no data was provided in response.

In summary, Aurizon Network is concerned that Incenta may not have conducted the underlying data analysis with a sufficient degree of care and diligence. Consequently, Aurizon Network believes that sole reliance on the report prepared by Incenta directly undermines the robustness of the conclusions in the QCA's *Draft Decision* on beta and WACC. Aurizon Network therefore submits that the QCA should carefully review of the Incenta report before placing any reliance on it by analysing it objectively in the context of the critique above, as well as those reports prepared by SFG Consulting and Aurizon Network's *2013DAU*.

Conclusion on Errors found in Incenta Report

Aurizon Network is wary of the empirical results supplied to the QCA by Incenta Economic Consulting as a consequence of the identification of errors in the outputs of the Incenta model. If we assume the Incenta's calculations on the simulated month betas had been performed correctly, then the mean estimations for the betas of the energy and toll road industries would be higher than stated.

The errors identified in Incenta's report reinforces the veracity of Aurizon Network's warning of the potential for error with respect to beta, as flagged in its *2013DAU*. Aurizon Network therefore retains no confidence in the estimates of equity and asset beta provided by Incenta given the errors made in the empirical estimates of both beta and the debt risk premium, as explored in Section 10.2.

Given this conclusion on the errors in the Incenta report, together with the matters raised above as to the use of appropriate comparators to estimate the equity beta, Aurizon Network ultimately believes that the best empirical estimate of Aurizon Network's beta has been provided by SFG Consulting as discussed in 10.5.3.

10.5.6 CAPM for Low Beta Stock

As pointed out by The Brattle Group, vast empirical evidences show that Sharp-Linter CAPM tends to underestimate (overestimate) the return for low (high) beta stock.[233] One way to correct for the empirical observation of underestimation is using the Black CAPM:

$$r_i = r_f + \alpha + \beta_i * (MRP - \alpha)$$

where α is the adjustment of the risk-return line.

Essentially, Black CAPM estimates a flatter slope while higher intercept than Sharp-Linter CAPM. As a result, Black CAPM estimates higher returns for stocks with betas less than one than Sharp-Linter CAPM. The main difference between these two versions of CAPM is the assumption behind investors' borrowing and lending activities. Sharp-Linter CAPM assumes investors are able to borrow and lend at risk free rate unlimitedly, which does not hold in reality. In contrast, Black CAPM relaxes this assumption and instead assumes unlimited short selling of stocks with the proceeds available for investment.

[233] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, p. 18-19.

The AER has decided to apply the Black CAPM to assist in the selection of higher equity beta point estimate from the empirical range. The approach adopted by the AER is to back out the equity beta in Sharp-Linter CAPM that would predict same return as Black CAPM, given certain values of zero beta premium (alpha).[234] Essentially, the AER uses Black CAPM to guide the upward adjustment to equity beta used in Sharp-Linter CAPM for low beta stocks.

As summarised in The Brattle Group's report, the academic literature has estimated an alpha range between 1% and 7%.[235] To adjust for the underestimation of return on equity for Aurizon Network, The Brattle Group further shows that even a conservative alpha value of 3%, the equity beta of 0.80 in the Sharp-Linter CAPM need to be adjusted to be 0.89, to generate same return as predicted by Black CAPM. Aurizon Network submits that the QCA should give appropriate consideration to Black CAPM when determining the equity beta, and thus cost of equity for Aurizon Network.

10.5.7 Conclusion of Asset/Equity Beta

Aurizon Network submits that the inclusion of other industry comparators is paramount in the estimation of beta. In addition, in the *2013DAU*, Aurizon Network made specific reference to the large risk of estimation error when estimating empirical CAPM beta. Aurizon Network believes that the large amount of estimation risk evident in the outputs of Incenta's empirical estimates of equity/asset bets is a prime example of this risk.

As such, Aurizon Network submits that there is a need for any estimation work to be carefully performed, as well as for an appropriate comparator sample to be developed. To include the estimates of more than one comparator industry would allow for a benchmarked amount of systematic risk that is commensurate with more than just one characteristic of Aurizon Network, that it is regulated under a revenue cap scheme.

Aurizon Network maintains that, at a minimum, the appropriate range for the equity beta is 0.9 - 1.0, and maintains a value for the equity beta of 0.9 in the 2014DAU. Taken together with the other parameters in the 2014DAU, this provides an overall WACC of 7.62%.

[234] AER, 2013d, Better Regulation – Explanatory Statement – Rate of Return Guideline, pp. 69-71.
[235] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, p. 20.

Appendix 10.5.1: Comment on Incenta's Analysis of Class 1 railroads

In arriving at its draft decision the QCA relied on Incenta's analysis on the comparability of Aurizon Network to US and Canadian Class 1 railroads. As per its January 2014 paper, *A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks,* Aurizon Network seeks to address a number of issues within the Incenta analysis.

Aurizon Network reasserts that it does not believe it faces the same level of systematic risk as a Class 1 railroad. However, Aurizon Network believes it prudent to consider US Class 1 railroads when deriving the asset beta. Since 2008 the Economic Regulation Authority Western Australia (ERAWA) has taken the systematic risk of Class 1 railroads into account when determining the beta of Brookfield Rail.

Pricing Structure

The QCA summarised Incenta's first-principles comparability analysis of pricing structures as follows:

> *US class 1 railroads are subject to regulatory oversight of their rates, with the regulator normally assessing rate challenges from customers based on 'constrained market pricing' principles. These principles limit the pricing flexibility of US class 1 railroads, typically through application of a stand- alone-cost test[236].*

That is, even though the US Class 1 railroads have greater flexibility in their pricing, they are still somewhat bound by regulatory pressure on prices, using a stand-alone cost test in a similar way that Aurizon Network's pricing is set. To illustrate this point, Christensen (2008) studied the prevalence of competition in US Class 1 markets stating:

> *We may expect railroads to exercise local market power where possible, though our expectations are tempered somewhat by the prospect that rates in this limiting case may be moderated by regulatory attention if not direct intervention. That is, railroads may effectively cede some market power to avoid regulatory intervention, or otherwise may be subject to implicit or explicit regulatory constraints.[237]*

In the empirical analysis, Christensen (2008) also found that there was limited increase in the prices charged to customers that only had the choice of rail at their specific origin. Further quantified by econometric analysis, results indicated that where the Class 1's were able to exercise monopoly power in the coal transport market, such increases were only marginal (<5%)[238]. A result that was similar across all industry groups in the sample.

From the comparisons above, Aurizon Network submits that while US Class 1 railroads have greater pricing flexibility than Aurizon Network, this is tempered by regulatory oversight and the price elasticity of demand.

Aurizon Network therefore reiterates its original position that it is difficult to compare the pricing structure due to lack of information. However, given that both Aurizon Network and US Class 1s have some limits on the pricing they can charge, there is some room for comparison with the difference between the two relying on relative flexibility of pricing structures. That is, US Class 1 railroads have more risk but not by a significant margin, given their regulation.

Nature of Product/Service & Nature of Customer

The QCA summarised Incenta's first-principles comparability analysis of nature of service/product as follows:

> *US class 1 railroads have much more diversified customers and commodity traffic than Aurizon Network. Aurizon Network's regulatory arrangements, characterised by a revenue cap with periodic cost reviews, mean variations in demand from its customers does not translate into variations in economic returns.*

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[236] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, Table 89, p. 247.
[237] Christensen Associates, Inc, 2008, A Study of Competition in the U.S. Freight Railroad Industry and Analysis of Proposals that Might Enhance Competition, Volume 2: Analysis of Competition, Capacity and Service Quality, Section 11, p. 18.
[238] Ibid, Table 11-5.

> *Aurizon Network's demand does not co-vary with movements in the Australian economy, suggesting these factors are not important indicators of systematic risk* [239]

Aurizon Network does not agree with the QCA's position. The revenue cap regulation does not guarantee that the revenue is not fluctuating with demands.

As shown in The Brattle Group report, the variation in revenue for Aurizon Network is even higher than the US Class I railroads.[240] Moreover, the systematic risk measures the relationship between market return and stock return. Returns are a function of cash flows and the discount rate that is applied to them. When there are shocks or changes in discount rates, there will be changes in stock returns even if the expected cash flows are completely unchanged.

As a result, by focusing exclusively on the form of regulation, Incenta have focused only on the cash flow component of beta.

Duration of Contracts

The QCA summarised Incenta's first principles comparability analysis of contract duration as follows:

> *Aurizon Network has a significant proportion (around 70%) of contracted capacity covered by long-term take-or-pay contracts, with terms typically of 10-15 years. US class 1 railroads typically have contracts for one to three years, with coal traffic contracts for up to five years.*[241]

Incenta's assertions are based on:

> *...our discussions with North American investment analysts covering US and Canadian Class 1 railroad stocks indicated that the contract term is typically 1 to 3 years, with up to 5 years in the case of coal*[242]*.*

Aurizon Network believes that evidence which cannot be substantiated or alternatively, based on unattributed anecdotal conversations with investment analysts, does not constitute evidence that should be taken into account by the QCA in making its decision.

Such undocumented evidence does not provide Aurizon Network with the ability to understand and to verify the material relied upon by Incenta and, in turn, by the QCA. In such circumstances, Aurizon Network submits that it is inappropriate for the QCA to rely on such anecdotal assertions without reference and/or documentation.

Market Power

The QCA summarised Incenta's first principles comparability analysis of market power as follows:

> *Aurizon Network has significantly more market power than US class 1 railroads. This is because Aurizon Network operates a natural monopoly rail network that is not subject to road competition for coal, whereas US class 1 railroads face competition from road haulage for many commodities on shorter routes, and parallel rail lines operated by competitors.*[243]

However, analysing the key sectors serviced by US Class 1 railroads, Aurizon Network points out the majority share of traffic held by the three largest hauliers of coal in the United States has been remarkably stable over time[244]:

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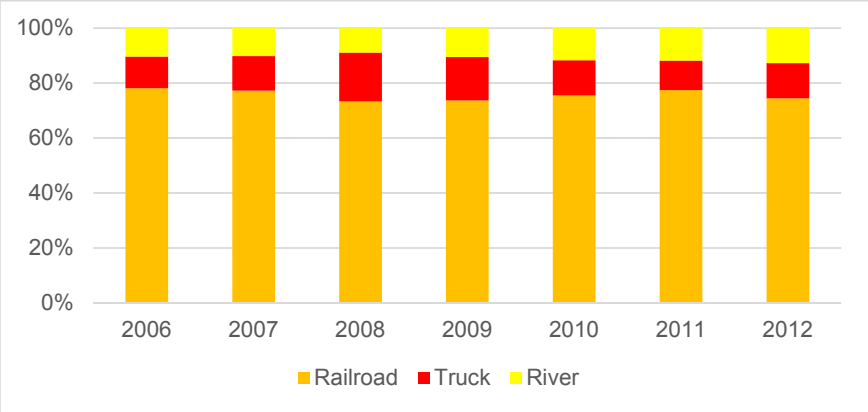
[239] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, Table 89, p. 247.
[240] The Brattle Group, 2014, Aurizon Network 2014 Draft Access Undertaking, comments on Aspects of the WACC, p. 6.
[241] Ibid.
[242] Incenta Economic Consulting, 2014, Review of Regulatory Capital Structure and Asset/Equity Beta for Aurizon Network and response to stakeholder comments – Report to the Queensland Competition Authority.
[243] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, Table 89, p. 247.
[244] US Energy Information Administration, 2006 – 2012, Annual Coal Distribution Reports.

Figure 10.9 – Modal Market Share



The stable hold on rail's market share for coal shipments in the US indicates rail has not confronted challenging competition from other modes of transport for some time.

Aurizon Network has previously addressed this point in considerable detail in its January 2014 submission, *A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks*. In that paper, Aurizon Network replicated the Surface Transport Board Commodity Revenue Stratification Report, which outlines the revenues of Class 1 railroads by product hauled and competition prevalent for each industry.

This data is replicated in Table 10.16 below and updated with the most recent 2012 data[245].

Table 10.16 – Revenues of Class 1 railroads by product and competition

US$million	Price Sensitive	Effective Competition	Captive Shipping
Coal Products	$1,293,664	$6,329,018	$7,240,126
Intermodal	$2,030,538	$4,809,077	$1,867,831
Food	$515,648	$3,805,890	$1,211,247
Chemical Products	$393,170	$3,473,430	$5,306,444
Farm Products	$336,498	$2,918,782	$1,813,315
Transportation Equipment	$629,413	$3,633,558	$1,196,896
Pulp & Paper Products	$301,174	$1,664,405	$292,568
Metal Products	$184,685	$1,647,924	$799,376
Non-metallic Minerals	$112,156	$1,338,061	$1,352,913
Petroleum or Coal Products	$50,717	$1,109,817	$1,172,747
Other	$1,101,204	$5,441,395	$3,241,932
Total	$6,948,866	$36,171,358	$25,495,395
Percentage	10%	53%	37%

At the time of submission, Aurizon Network noted that:

> *The presence of market power with significant price flexibility across a diverse traffic mix would suggest that US Class 1 railroads have the ability to partially insulate their free cash flow from changes in demand. Additionally, the ability to Ramsey price across a diverse range of services and markets could allow replication of cash flows normally associated with price regulation of a single commodity.*[246]

[245] Surface Transport Board, 2012, Surface Transport Board Commodity Revenue Stratification Report 2012.
[246] Aurizon Network, 2014b, A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks, p. 22.

Aurizon Network highlights that the analysis it submitted in January 2014 does not seem to be addressed by either Incenta or the QCA in their Draft Decision.

Relationship between Market Power and Systematic Risk

Incenta is correct in stating that some empirical studies have found there to be an ambiguous relationship between the market power of a firm and the systematic risk which it faces as a consequence.

Peyser (1994) reviewed all literature previously published on the matter[247] and observed that of the eleven papers on the subject, three found a negative relationship between beta and market power, and eight concluded that there was an ambiguous relationship between the two characteristics. Peyser (1994) concluded:

> *...those authors who have modelled the theoretical relationship between various CAPM measures and market power have uniformly concluded that they ought to be negatively related ... all but [one] cite the empirical study by Sullivan as confirming the validity of their formal models. Yet, a close reading of Sullivan does not support these assertions.* [248]

Peyser (1994), then went on to derive a more parsimonious model of the effects of market power on the CAPM beta without the restrictions on models that had been included by previous researchers. He concluded:

> *As might be expected, without these restrictions... Rather than the relationship's being monotone negative, it is shown to depend on the relative degree of price and wage uncertainty*[249]

This fits in with Sullivan's empirical observations on the relationship:

> *Sullivan, on the other hand, finds that cash flow systematic risk plays almost no role in producing the negative relationship between beta and market power that he observes because uncertain operating expense completely offsets uncertain revenue*[250]

Therefore, based on the above, the relationship between beta and market power is influenced by the relative uncertainty of input prices. As such, the conclusion by Incenta that Aurizon Network should have a lower beta by the sole reason that it exhibits more market power than the US Class 1 railroads is less than robust.

In light of the above, Aurizon Network does not agree with Incenta's analysis on market power.

Nature of Regulation

The QCA summarised Incenta's first principles comparability analysis of the nature of regulation as follows:

> *Aurizon Network's regulatory arrangements do not increase risk by constraining its flexibility to respond to changes in market circumstances. Aurizon Network does not require a high degree of commercial (i.e. pricing) flexibility as it is subject to revenue-cap regulation with regular reviews, and is thereby largely shielded from changes in finance costs. In addition, it is subject to several cost pass-through mechanisms, and application of the MCI to maintenance costs.*[251]

In its assessment, Incenta stated:

> *…empirical evidence suggests that regulation tends to reduce systematic risk by buffering cash flows (this is known as the 'Peltzman buffering hypothesis').*[252]

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[247] Peyser, P.S., 1994, Beta, Market Power and Wage Rate Uncertainty.
[248] Ibid.
[249] Ibid.
[250] Ibid.
[251] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, Table 89, p. 247.
[252] Incenta Economic Consulting, 2014, Review of Regulatory Capital Structure and Asset/Equity Beta for Aurizon Network and response to stakeholder comments – Report to the Queensland Competition Authority, p. 6.

However, Peltzman (1976) conducted empirical tests on the theory and derived estimates that are not statistically significant, providing no evidence of his own hypothesis holding true[253].

There have also been numerous empirical studies into the effect and validity of the Peltzman Buffering Hypothesis[254], reproduced in Table 10.17 below.

Incenta's justification by the Peltzman Buffering Hypothesis does not hold, as of the twenty surveyed studies, only nine are consistent with the hypothesis. The other eleven show results with either no, or no significant, change or a positive change in the beta of firms that experienced changes to the regulatory level.

Incenta also stated that Aurizon Network had failed to take into account other beta-determining characteristics such as operating leverage or growth options. These will be responded to separately in the next two sections.

Table 10.17 – Comparison of empirical studies into Peltzman Buffering Hypothesis

Outcome of Empirical Study	Studies	No. of Studies
Regulation caused a decrease in beta	Peltzman (1973)[255], Fartuch (1978)[256], Clarke (1980)[257], Hogan, Sharpe & Volker (1980)[258], Chen & Sanger (1983)[259], Norton (1985)[260], Mitchell & Mulherin (1988)[261], Davidson, Mathur, Rangan & Rosenstein (1990)[262], and Fraser & Kannan (1990)[263]	9
There was no discernible trend in beta due to regulation	Davidson, Chandy, and Walker (1984a, 1985)[264], Chen and Merville (1986)[265], Sankaranarayanan (1986)[266], Alien and Wilhelm (1988)[267], Fraser and Kolari (1990)[268], Ifflander, Kretovich, and Moeller (1991)[269], and Lamdin (1991)[270]	8
Regulation caused an increase in beta	Kretovich and Kutner (1987)[271], Davidson, Rangan, and Sundaran (1990)[272], and Lenway, Rehbein, and Starks (1990)[273]	3

[253] Peltzman, S., 1973, The Benefits and Costs of New Drug Regulation in Regulating New Drugs.
[254] Binder, J.J. and Norton, S.W., 1999, Regulation, Profit Variability and Beta.
[255] Peltzman, Sam. 1973. 'The Benefits and Costs of New Drug Regulation." in Regulating New Drugs (New York: MacMillan).
[256] Fartuch, Nikolai. 1978. "Empirical Tests of the Political Wealth Maximizing Theory of Regulation Using Financial Data." Working paper (March).
[257] Clarke, Roger G. 1980. "The Effect of Fuel Adjustment Clauses on the Systematic Risk and Market Values of Electric Utilities." Journal of Finance 35: 347-358.
[258] Hogan, W. P., I. G. Sharpe, and P. A. Volker. 1980. "Risk and Regulation: An Empirical Test of the Relationship." Economics Letters 6: 373-379.
[259] Chen, Andrew H., and Gary Sanger. 1985. "An Analysis of the Impacts of Regulatory Change: The Case of Natural Gas Deregulation." Financial Review 20: 36-54.
[260] Norton, Seth W. 1985. "Regulation and Systematic Risk: The Case of Electric Utilities." Journal of Law and Economics 28: 671-686.
[261] Mitchell, Mark L., and J. Harold Mulherin. 1988. "Finessing the Political System: The Cigarette Advertising Ban." Southern Economic Journal 54: 855-862.
[262] Davidson, Wallace N., Ike Mathur, Nanda Rangan, and Stuart Rosenstein. 1990. "Regulation and Systematic Risk in the Electric Utility Industry: A Test of the Buffering Hypothesis." Working paper (September).
263 Fraser, Donald R., and Srinivasan Kannan. 1990. "Deregulation and Risk: Evidence from Earnings Forecasts and Stock Prices." Financial Management 19: 68-76.
[264] Davidson, Wallace N., P. R. Chandy, and Mike Walker. 1984a. "The Stock Market Effects of Airline Deregulation." Journal of Business and Economics 23: 31-45.; and, Davidson, Wallace N., P. R. Chandy, and Mike Walker. 1985. "The Stock Market Effects of Trucking Deregulation." Akron Business and Economic Review 16: 44-50.
[265] Chen, Andrew H., and Larry J. Merville. 1986. "An Analysis of Divestiture Effects Resulting from Deregulation." Journal of Finance 41: 997-1010.
[266] Sankaranarayanan, S. 1986. "An Analysis of the Effects of Government Regulation on Business: Evidence from the Capital Markets." Working paper (March).
[267] Allen, Paul R., and William J. Wilhelm. 1988. 'The Impact of the 1980 Depository Institutions Deregulation and Monetary Control Act on Market Value and Risk: Evidence from the Capital Markets." Journal of Money, Credit and Banking 20: 364-380.
[268] Fraser, Donald R., and James Kolari. 1990. "The 1982 Depository Institutions Act and Security Returns in the Savings and Loan Industry." Journal of Financial Research 13: 339-347.
[269] Ifflander, James, Duncan J. Kretovich, and Susan E. Moeller. 1991. "Deregulation, Oil Prices, and Risk: An Empirical Study of the Railroad Industry." Working paper (April).
[270] Lamdin, Douglas J. 1991. "Empirical Tests of the Buffering Hypothesis: A Re-examination of the Cigarette Advertising Ban." Working paper, University of Maryland Baltimore County, Department of Economics.
[271] Kretovich, Duncan J., and George Kutner. 1987. "Risk and Deregulation in the Motor Carrier Industry." Working paper (January).
[272] Davidson, Wallace N., Nanda Rangan, and Sridhar Sundaran. 1990. "The Market Valuation Effects of the Financial Institutions Reform, Recovery and Enforcement Act of 1989." Working paper (October).
[273] Lenway, Stefanie, Kathleen Rehbein, and Laura Starks. 1990. "The Impact of Protectionism on Firm Wealth: The Experience of the Steel Industry." Southern Economic Journal 56: 1079-1093.

Growth Options

The QCA summarised Incenta's first-principles comparability analysis of growth options as follows:

> *Compared to US class 1 railroads, the returns from Aurizon Network's growth options are constrained by regulation, as are its risks (by regulation and contracting). Hence, the same growth options will have much less influence on Aurizon Network's beta. If uncertainty of revenue recovery is minimal, there is no justification to compensate for the value of growth options.*[274]

This conclusion by the QCA was based on the following conclusion by Incenta:

> *Expansions by the US Class 1 railways are not protected by long term take-or-pay contracting and face much greater competition and stranded asset risk. It is therefore of little consequence that during the last decade (and particularly since the global financial crisis) the growth of US Class 1 railroads has been significantly lower than that of Aurizon Network. On this factor the US Class 1 railroads should have higher systematic risk.* [275]

Aurizon Network does not believe that the investment behaviour of a firm on the tail-end of a recession - while growth in the economy is still depressed - is a valid way of assessing the future investment behaviour of a given firm.

The future investment required by Class 1 firms to satisfy demand had been well reported in the past few years (as discussed below). The national strategic significance of this investment will ensure that US Governments will play at least some role in funding that investment. The funding risk is not as great as would be expected for a private company, and at least in this context Aurizon Network has a greater risk profile than the US Class 1 railroads, as Aurizon no longer has a call on government funding.

The main contribution to this field was Cambridge Systematics' (CS) 2007 Report: *National Rail Freight Infrastructure Capacity and Investment Study.* The basis of the CS forecasting is as follows:

> *The CS study assumes that future rail volumes are demand driven—with no supply-side constraints—and estimates the railroad infrastructure investment required through 2035 "to keep pace with economic growth and meet the U.S. DOT's forecast demand."*[276]

Therefore the investment in the Class 1 networks in this report is not driven by speculative investment forecasts provided by the Class 1 firms themselves. If the investment outlined by CS is not carried out, then the proportion of Class 1 network near, at or over capacity would reach 55% by 2035[277].

The required investment to meet the capacity upgrades is shown below in Table 10.18.[278]

Table 10.18– US Class 1 railroads: required investment by infrastructure category (US$million, 2007)

Infrastructure Category	Class 1 Required Investment $m
Line Haul Expansion	$94,750
Major Bridge, Tunnels and Clearance	$19,400
Branch Line Upgrades	$2,390
Intermodal Terminal Expansion	$9,320
Carload Terminal Expansion	$6,620
Service Facilities	$2,550
Total	**$135,030**

[274] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, Table 89, p. 247.
[275] Incenta Economic Consulting, 2014, Review of Regulatory Capital Structure and Asset/Equity Beta for Aurizon Network and response to stakeholder comments – Report to the Queensland Competition Authority, p. 6.
[276] Cambridge Systematics, 2007, National Rail Freight Infrastructure Capacity and Investment Study, prepared for the Association of American Railroads, p. ES-1.
[277] Ibid, Table 5.1, p. 5-6.
[278] Ibid, p. 7-2.

At the time of the report, Class 1 railroads stated they would be able to fund around 50% of this need:

> *If rail revenues grow proportionally to rail tonnage, currently forecast to increase by 88 percent by 2035, and if the railroads maintain their current level of effort for expansion, then the Class I railroads will invest cumulatively about $70 billion over the 28-year period.*[279]

As US Class 1 railroads have flagged they will be unable to collectively meet the funding needs of the required investment, it follows that the money they do invest in expansions of their networks will make a guaranteed return. In the instance that they cannot fund their own expansions, there are two options:

(1) they could not invest the money and have congested networks or,
(2) the federal government could subsidise the investment in new network extensions.

Either of the two situations would provide some stability in the returns on investment expected by the railroads.

Where they do not invest the money and are left with networks where 55% of the track is either near, at or over capacity, CS concluded that:

> *...the resulting level of congestion would affect nearly every region of the country and would likely shut down the national rail network*[280]

This leaves the government co-investment in the Class 1 railroads as the only viable option. Given this, the growth options available to the Class 1 railways would have a much lower risk than their current assets given the fact that the government is likely required to bankroll investment[281].

Given these observations on the future investment of Class 1 railroads, in contrast to the Incenta's anecdotes of investment since the GFC, it could again be concluded that on the issue of growth options, the risk profile of Aurizon Network is greater than the US Class 1 railroads, as Aurizon no longer has a call on government funding.

Operating Leverage

The QCA summarised Incenta's first principles comparability analysis of operating leverage as follows:

> *Incenta demonstrated that, on several measures calculated, Aurizon Network has lower operating leverage than US class 1 railroads. In any case, the cash-flow buffering provided to Aurizon Network by the revenue cap form of regulation is likely to neutralise any impact of operating leverage on systematic risk.*[282]

Aurizon Network has dealt with this issue in its paper *A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks.* As that paper has not been directly addressed by either Incenta or the QCA, these arguments have been repeated below.

Aurizon Network agrees with the findings that its operating leverage would be lower than the US Class 1 railroads. This is due to the vertical integration of Class 1 railroads, which have higher operating costs for train operations.

While we agree with the derivation of the opex/assets ratio for Aurizon Network in Table 3.4 of the Incenta report, we are more uncertain on the other reported metrics, as they are most likely derived from regulatory cash flows and not real cash flows or earnings. The effect of using theoretical earnings (regulatory) and actual earnings on derived operating leverage (DOL) is demonstrated in Table 10.19, using data from audited below rail financial statements.

The average DOL of 5.71 is much greater than Incenta's estimate of 1.01.

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[279] Ibid, pp. 7-5 and ES-2.
[280] Cambridge Systematics, 2007, National Rail Freight Infrastructure Capacity and Investment Study, prepared for the Association of American Railroads, pp. 5-6.
[281] Wibowo, A., 2006, CAPM-Based Valuation of Financial Government Supports to Infeasible and Risky Private Infrastructure Projects.
[282] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, Table 89, p. 247.

Table 10.19 – Derived Operating Leverage

Measure	2007/08	2008/09	2009/10	2010/11	2011/12
EBIT ($000s)	149,921	191,628	279,669	241,717	283,037
Change in EBIT		28%	46%	-14%	17%
Sales (net tonnes)	158,485,564	163,848,393	186,402,072	163,978,271	166,737,641
Change in Sales		3.4%	13.8%	-12.0%	1.7%
DOL		8.22	3.34	1.13	10.16

Appendix D of the Incenta report noted:

> *"If a business has high fixed costs and low variable costs, the impact of variable revenue will be accentuated, as revenue rises and falls."* [283]

As a consequence, using opex-to-assets as a measure of operating leverage for US Class 1 railways is unreliable unless the operating costs predominantly comprised of fixed costs. However, it is directly comparable to regulated transmission utilities with an average opex-to-asset ratio of 3.1, as fixed costs component is similar.[284] This is less than 50% of Aurizon Network's opex-to-asset ratio of 8.4 as calculated by Incenta.

In addition, the other DOL proxy estimates for the US class 1 Railroads are also likely to be substantially overstated, as they do not take into account the large proportion of variable costs (i.e. fuel for train operations). This is evident in the relative stability of the contribution to common costs changes in Table 6 from the paper *A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks*.[285] Accordingly we would not expect EBIT to change in the same order of magnitude as changes in sales, which suggests the DOL for US class 1 Railroads is likely to be overstated.

Taking these factors into account, Aurizon Network considers that while its operating leverage is unlikely to equate that of a vertically integrated railway, the analysis presented above does support higher operating leverage than energy utilities and can justify the proposed asset beta relative to US Class 1 Railroads.

Conclusion of US Class 1 railroad comparison

Aurizon Network does not pretend that it faces the same level of systematic risk as a Class 1 railroad. However, Aurizon Network does believe it prudent to consider US Class 1 railroads when deriving the asset beta, consistent with the regulatory model applied in Western Australia for Brookfield Rail over the last 6 years.

[283] Incenta Economic Consulting, 2014, Review of Regulatory Capital Structure and Asset/Equity Beta for Aurizon Network and response to stakeholder comments – Report to the Queensland Competition Authority, p. 81.
[284] AER, 2013a, Transmission Network Service Provider Performance Report 2010-11, Table 2.3, p. 16.
[285] Aurizon Network, 2014b, A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks, p. 23.

Appendix 10.5.2 – Critique of Incenta Application of Simulated Monthly Estimation of Beta

Incenta produced 4,995 OLS beta estimates for each firm by creating 10 years of returns split into pseudo-months by randomly choosing the starting date of the data in the first month and then randomly sampling a month length (in business days) for each of the remaining months. Each of the 4995 observations were processed as follows:

1. Draw an integer from 1 to 23 to establish the first day of the first pseudo-month where July 21st 2003 is the first day (these days exclude weekends).
2. Draw from a distribution based on Table B.2 to determine which day is the last day of the pseudo-month interval (PMI).
3. Repeat step 2 for each successive PMI until all the daily data has been exhausted.

Table B.2 is reproduced in Table 10.20 below and provides the distribution that the month lengths were drawn from.

Table 10.20 – Number of Trading Days in International Data

Appendix Table B.2: Number of Trading Days in International Data.

Trading Days	%	Cum %
19	0.85	0.85
20	17.80	18.64
21	27.97	46.61
22	37.29	83.90
23	16.10	100.00

After each of the 4995 regressions were run using the simulated data, the mean of the beta estimates were taken provided on a firm by firm basis.

This process is a simple process of Monte Carlo simulation. Through this sampling methodology many samples of data are created to test the properties of the estimators of a regression model. In order to fully analyse Incenta's output from its repeated sampling process above it is necessary to outline the nature of an econometric regression and the assumptions that are made about its estimation.

Assumptions of the Simple Linear Regression Model [286]

Beta is usually derived through the estimation of the following equation, as cited by Incenta:

$$(r_a - r_f) = \beta_1 + \beta_2(r_m - r_f)$$

This is an example of a Simple Linear Regression Model (SLRM), estimated in the form of:

$$\hat{y} = \widehat{\beta_1} + \widehat{\beta_2}x$$

Given this is a SLRM, the assumptions around the data and its outputs are as follows:

1. The value of *y*, for each value of *x*, is $y = \beta_1 + \beta_2 x + e$
2. The expected value of the random error *e* is $E(e) = 0$
   Which is equivalent to assuming that $E(y) = \beta_1 + \beta_2 x$
   The variance of the random error *e* is $var(e) = \sigma^2 = var(y)$
3. The random variables *y* and *e* have the same variance because they differ only by a constant.

[286] This section and the following sections; *Normality of OLS Estimators, The Objectives of Monte Carlo Analysis* are based on econometric theory as contained in Chapter 2 of the undergraduate econometrics textbook *Principles of Econometrics* by R. Carter Hill et al, John Wiley and Sons Publishing.

4. The covariance between any pair of random errors e_i and e_j is
$$cov(e_i, e_j) = cov(y_i, y_j) = 0$$
The stronger version of this assumption is that the random errors are statistically independent, in which case the values of the dependent variable y are also statistically independent.
5. The variable *x* is not random and must take at least two different values.
6. (Optional) The values of *e* are normally distributed about their mean
$$e \sim N(0, \sigma^2)$$
if the values of *y* are normally distributed, and vice versa.

The first five of these assumptions, if satisfied when a regression is performed, make up the Gauss-Markov theorem. This theorem states that under the assumptions one to five, the estimators b_1 and b_2 have the smallest variance of all linear and unbiased estimators of β_1 and β_2. They are the 'Best Linear Unbiased Estimators (BLUE)' of β_1 and β_2.

Normality of OLS Estimators

Special consideration should be given to assumption 6 when interpreting the Incenta outputs. The decision that assumption 6 is "optional" is based on the Central Limit Theorem (CLT):

> *If assumptions one through five hold, and if sample size N is sufficiently large, then the least squares estimators have a distribution that approximates the normal distribution as shown below[287]:*
> $\widehat{\beta_1} \sim N\left(\beta_1, \frac{\sigma^2 \sum x_i^2}{N \sum (x_i - \overline{x})^2}\right)$, $\widehat{\beta_2} \sim N\left(\beta_2, \frac{\sigma^2}{\sum (x_i - \overline{x})^2}\right)$

The normality assumption arises for two reasons:

- Based on assumption one above, if the error term e_i is normally distributed then it holds that y_i, should also be normally distributed.
- Given that the OLS estimators are linear, the sums of normally distributed random variables should be normally distributed due to the fact that β_2 can be expressed in term of the weighted averages of the y_i values.

The main consideration, for the CLT, is to ensure that the sample size is *sufficiently* large. The current sample of 114 month observations is considered sufficiently large for the CLT[288].

The Objective of the Monte Carlo Analysis

The objective of the Monte Carlo analysis conducted in the Incenta paper was to avoid the "turn-of-the-month effect" in which there are differences in the monthly betas when an arbitrary day of the month is uniformly selected.

The method seeks to make a different sample for each iteration that randomly selects the start date and length of the month. By repeating this sampling technique and running each regression, a sample of OLS estimators will be obtained, in this case 4995 estimates of the estimators. This sample of estimators are used to confirm the following:

1. Given assumptions one through five, that the OLS estimators are unbiased. The estimator is assumed to be unbiased if the expected value of the OLS estimator as per the Monte Carlo simulation is equal to the OLS estimate. That is:
   1. $E(b_2) = \beta_2$

   where $E(b_2)$ is the mean outcome of the Monte Carlo simulated OLS estimators.

[287] Carter Hill, R., Griffiths, W.E. & Lim, G.C. (2011), Principles of Econometrics, 4th Ed, John Wiley and Sons, Hoboken, NJ.
[288] There are many calculus intensive methodologies for the computation of bounds for the CLT, however as a rule of thumb, 30 observations is sufficient.

2. Given assumption one through five, that the OLS estimators have sampling variances given by:

$$var(b_1) = \left[\frac{\sum x_i^2}{N\sum(x_i - \bar{x})^2}\right]$$

$$cov(b_1, b_2) = \left[\frac{-\bar{x}}{\sum(x_i - \bar{x})^2}\right]$$

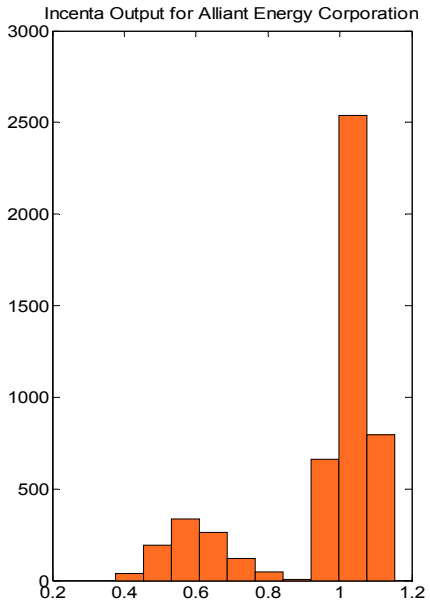
   The sampling variation of the estimates in the Monte Carlo simulation can be measured by their sample variance. The standard deviation in the Monte Carlo analysis should be similar to that of the OLS.
3. The estimator of the error variance is an unbiased estimator of σ^2.
4. Assumption six of normal distribution has been adopted given the large sample sizes of the Incenta data.

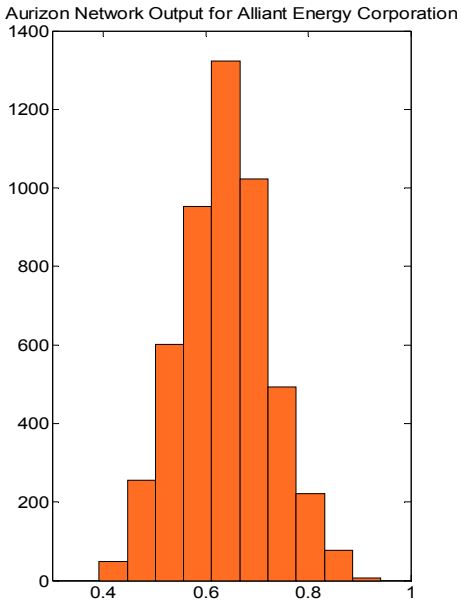
With these assumptions in mind, we can evaluate the Incenta Monte Carlo outputs against these assumptions and conclude on the methodology they employed to estimate the betas in Appendix 10.5.3.

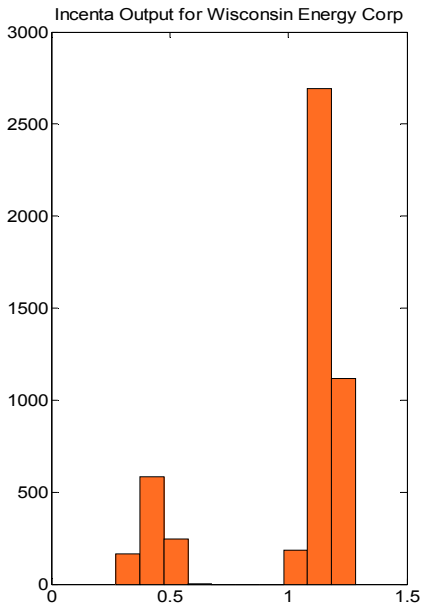
Appendix 10.5.3: Sample of Incenta Simulation Outputs

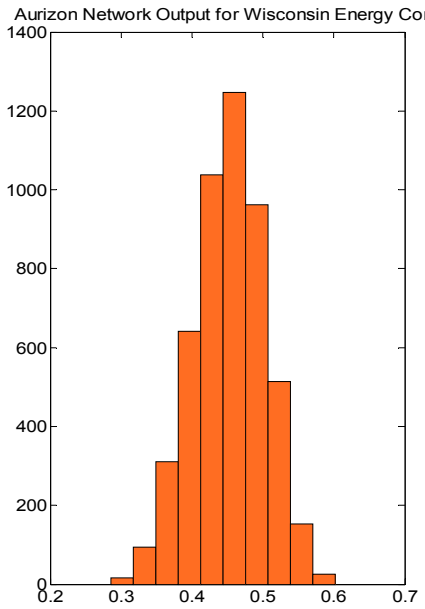
The graphs below compare, for a sample of 8 individual firms, the results of Incenta's simulation with the results derived by Aurizon Network's replication of the simulation after adjusting for the methodological errors described in Appendix 10.5.2.

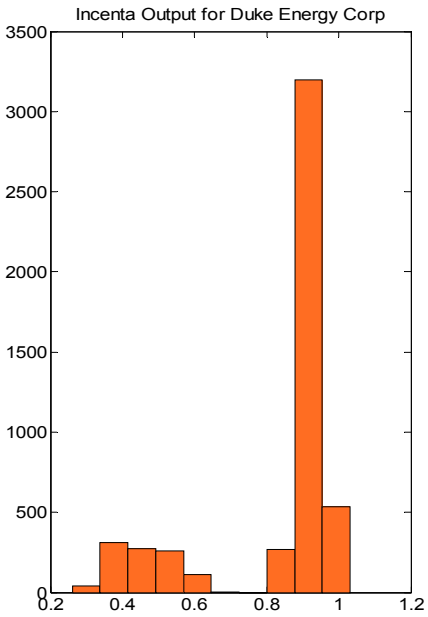
It is clear from the outputs below that there is significant error contained in the outputs of the simulated months simulation as conducted by Incenta.

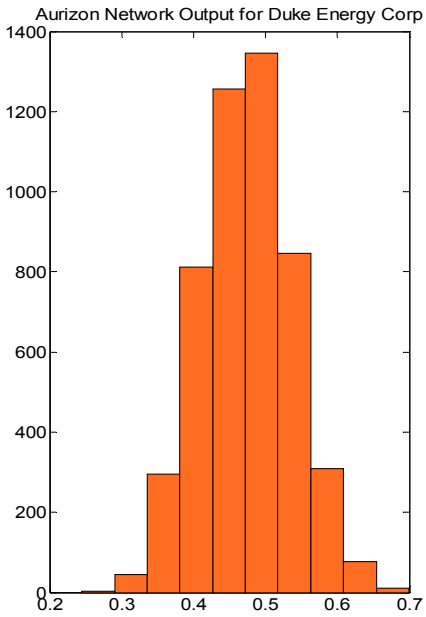


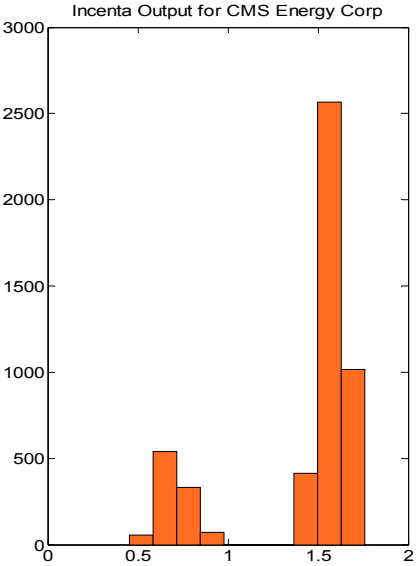


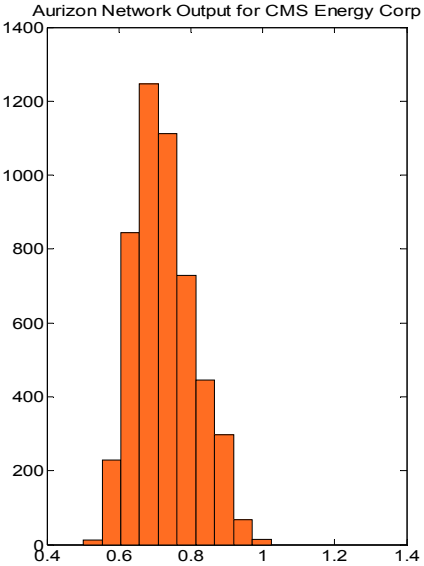


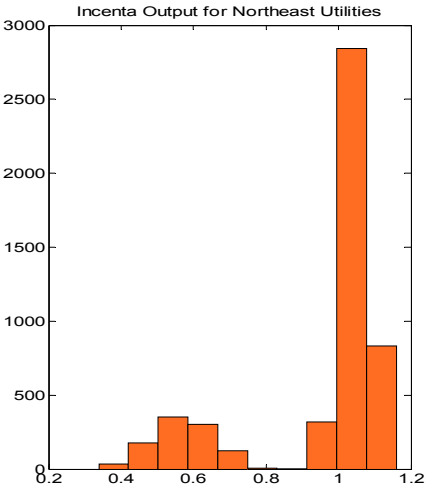


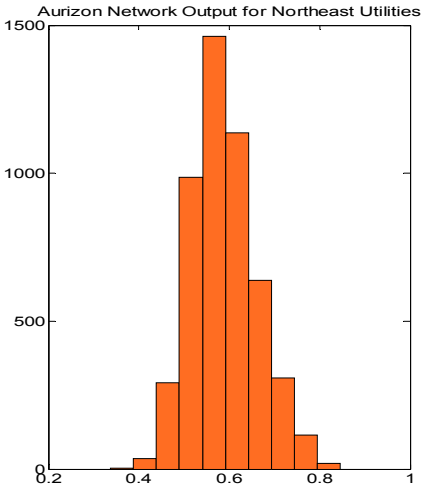

Incenta Output for Duke Energy Corp
3500
3000
2500
2000
1500
1000
500
0
0.2
0.4
0.6
0.8
1
1.2

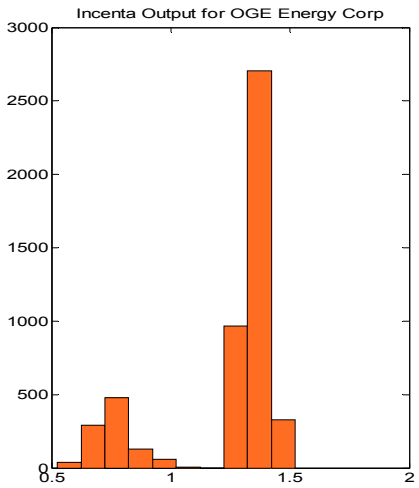

Aurizon Network Output for Duke Energy Corp
1400
1200
1000
800
600
400
200
0
0.2
0.3
0.4
0.5
0.6
0.7

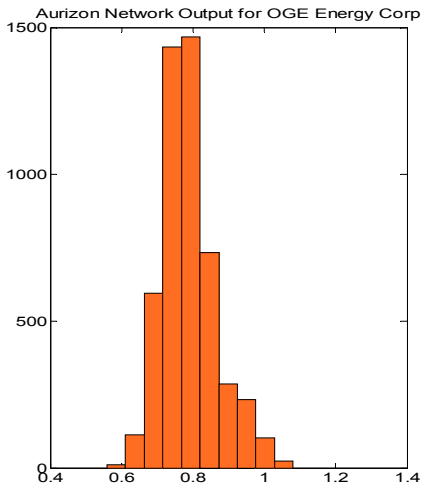

Incenta Output for CMS Energy Corp
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5
2

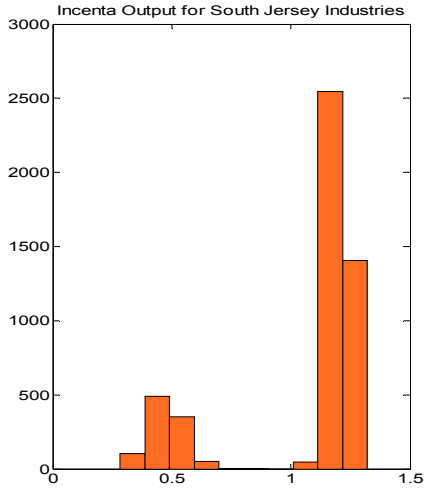

Aurizon Network Output for CMS Energy Corp
1400
1200
1000
800
600
400
200
0
0.4
0.6
0.8
1
1.2
1.4

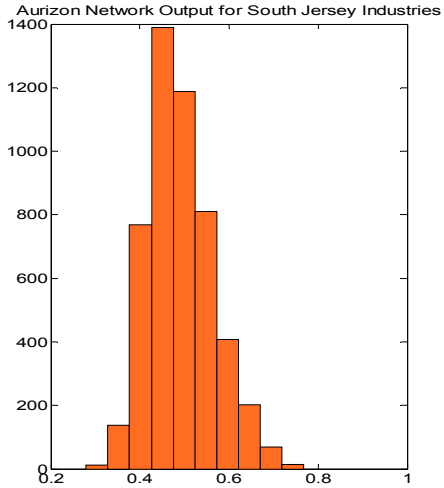

Incenta Output for Northeast Utilities
3000
2500
2000
1500
1000
500
0
0.2
0.4
0.6
0.8
1
1.2

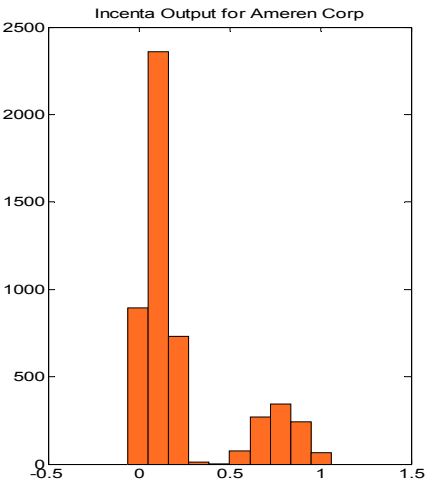

Aurizon Network Output for Northeast Utilities
1500
1000
500
0
0.2
0.4
0.6
0.8
1

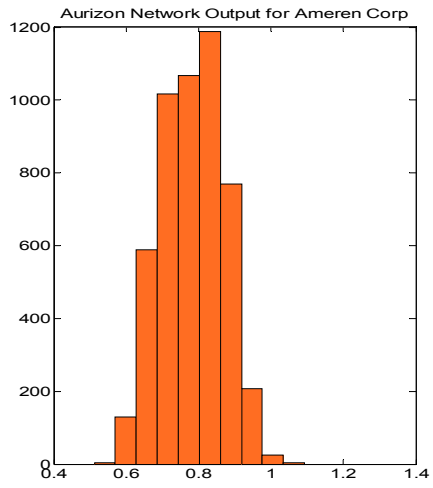

Incenta Output for OGE Energy Corp
3000
2500
2000
1500
1000
500
0
0.5
1
1.5
2


Aurizon Network Output for OGE Energy Corp
1500
1000
500
0
0.4
0.6
0.8
1
1.2
1.4


Incenta Output for South Jersey Industries
3000
2500
2000
1500
1000
500
0
0
0.5
1
1.5


Aurizon Network Output for South Jersey Industries
1400
1200
1000
800
600
400
200
0
0.2
0.4
0.6
0.8
1


Incenta Output for Ameren Corp
2500
2000
1500
1000
500
0
-0.5
0
0.5
1
1.5


Aurizon Network Output for Ameren Corp
1200
1000
800
600
400
200
0
0.4
0.6
0.8
1
1.2
1.4

Appendix 10.5.4: Overview of Outlying Clusters in Energy Firms

Firm Name	Code	Non-normal	No. of Obs in Outlying Cluster	% in Outlying Cluster
ACO: Atco Ltd : Canada : Energy	ACO	Y	999	20%
AEE: Ameren Corp : United States : Energy	AEE	Y	998	20%
AEP: American Electric Power Co : United States : Energy	AEP	N	0	0%
ALE: ALLETE Inc : United States : Energy	ALE	N	0	0%
APA: APA Group : Australia : Energy	APA	N	0	0%
ATO: Atmos Energy Corp : United States : Energy	ATO	N	0	0%
'AVA: Avista Corp : United States : Energy	'AVA	N	0	0%
'CMS: CMS Energy Corp : United States : Energy	'CMS	Y	999	20%
'CNA: Centrica : United Kingdom : Energy	'CNA	N	0	0%
'CNL: Cleco Corp : United States : Energy	'CNL	Y	999	20%
'CNP: CenterPoint Energy : United States : Energy	'CNP	Y	1004	20%
'CPK: Chesapeake Utilities Corp : United States : Energy	'CPK	Y	997	20%
'CU: Canadian Utilities : Canada : Energy	'CU	Y	999	20%
'D: Dominion Resources Inc : United States : Energy	'D	Y	999	20%
'DTE: DTE Energy Co : United States : Energy	'DTE	N	0	0%
'DUE: DUET Group : Australia : Energy	'DUE	N	0	0%
'DUK: Duke Energy Corp : United States : Energy	'DUK	Y	999	20%
'ED: Consolidated Energy Inc : United States : Energy	'ED	N	0	0%
'EDE: Empire District Electric Co : United States : Energy	'EDE	Y	994	20%
'EE: El Paso Electric Co : United States : Energy	'EE	Y	999	20%
'EIX: Edison International : United States : Energy	'EIX	Y	999	20%
'EMA: Emera Inc : Canada : Energy	'EMA	Y	999	20%
'ENV: Envestra : Australia : Energy	'ENV	Y	998	20%
'ETR: Entergy Corp : United States : Energy	'ETR	N	0	0%
'FE: FirstEnergy Corp : United States : Energy	'FE	N	0	0%
'FTS: Fortis Inc : Canada : Energy	'FTS	Y	999	20%
'GAS: AGL Resources Inc : United States : Energy	'GAS	N	0	0%
'GXP: Great Plains Energy Inc : United States : Energy	'GXP	Y	999	20%
'IDA: IDACORP Inc : United States : Energy	'IDA	N	0	0%
'ITC: ITC Holdings Corp : United States : Energy	'ITC	N	0	0%
'LG: Laclede Group : United States : Energy	'LG	N	0	0%
'LNT: Alliant Energy : United States : Energy	'LNT	Y	999	20%
'MGEE: MGE Energy : United States : Energy	'MGEE	Y	1010	20%
'NEE: NextEra Energy : United States : Energy	'NEE	Y	999	20%
'NFG: National Fuel Gas : United States : Energy	'NFG	N	0	0%
'NG: National Grid : United Kingdom : Energy	'NG	Y	1009	20%
'NI: NiSource Inc : United States : Energy	'NI	N	0	0%
'NJR: New Jersey Resources Corp : United States : Energy	'NJR	Y	934	19%
'NU: Northeast Utilities : United States : Energy	'NU	Y	999	20%
'NVE: NV Energy Inc : United States : Energy	'NVE	Y	999	20%
'NWE: Northwestern Corp : United States : Energy	'NWE	N	0	0%
'NWN: Northwest Natural Gas : United States : Energy	'NWN	N	0	0%
'OGE: OGE Energy Corp : United States : Energy	'OGE	Y	999	20%

Firm Name	Code	Non-normal	No. of Obs in Outlying Cluster	% in Outlying Cluster
'PCG: PG&E Corp : United States : Energy	'PCG	Y	977	20%
'PEG: Public Service Enterprise Group : United States : Energy	'PEG	N	0	0%
'PNW: Pinnacle West Capital Corp : United States : Energy	'PNW	N	0	0%
'PNY: Piedmont Natural Gas : United States : Energy	'PNY	Y	982	20%
'POM: Pepco Holdings Inc : United States : Energy	'POM	N	0	0%
'POR: Portland General Electric : United States : Energy	'POR	N	0	0%
'PPL: PPL Corp : United States : Energy	'PPL	N	0	0%
'SCG: SCANA Corp : United States : Energy	'SCG	N	0	0%
'SJI: South Jersey Industries Inc : United States : Energy	'SJI	Y	999	20%
'SKI: Spark : Australia : Energy	'SKI	N	0	0%
'SO: Southern Co : United States : Energy	'SO	Y	1005	20%
'SPN: SP AusNet : Australia : Energy	'SPN	N	0	0%
'SRE: Sempra Energy : United States : Energy	'SRE	Y	996	20%
'SWX: Southwest Gas Corp : United States : Energy	'SWX	Y	1017	20%
'TCP: TC Pipelines LP : United States : Energy	'TCP	N	0	0%
'TE: TECO Energy Inc : United States : Energy	'TE	N	0	0%
'TEG: Integrys Energy Group : United States : Energy	'TEG	N	0	0%
'TRP: TransCanada Corp : Canada : Energy	'TRP	Y	996	20%
'UIL: UIL Holdings Corp : United States : Energy	'UIL	N	0	0%
'UNS: UNS Energy Corp : United States : Energy	'UNS	Y	998	20%
'UU: United Utilities : United Kingdom : Energy	'UU	N	0	0%
'VCT: Vector : New Zealand : Energy	'VCT	N	0	0%
'VVC: Vectren Corp : United States : Energy	'VVC	N	0	0%
'WEC: Wisconsin Energy Corp : United States : Energy	'WEC	Y	999	20%
'WGL: WGL Holdings Inc : United States : Energy	'WGL	N	0	0%
'WR: Westar Energy Inc : United States : Energy	'WR	N	0	0%
'XEL: Xcel Energy Inc : United States : Energy	'XEL	Y	999	20%
	No. of Yes	**34**	**% of Yes**	**49%**

10.6 - Gamma

Gamma, the product of two elements being the distribution rate (F) and the value of distributed credits (also referred to as the utilisation rate or theta (Θ)), represents the value that shareholders assign to imputation credits.[289]

Within its *2013DAU*, Aurizon Network submitted a gamma of 0.25, where F equalled 0.7 and theta equalled 0.35.

The QCA's *Draft Decision* indicated it had:

> *…considered a range of information, including the:*
>
> *a) stakeholder submissions and supporting research provided in our review of UT4 and views expressed at the Cost of Capital Forum held at the QCA on 13 December 2013*
>
> *b) evidence and arguments presented by the AER in its Rate of Return Guideline*
>
> *c) views expressed by the Tribunal and supporting evidence in its recent decisions on gamma*
>
> *d) papers prepared by Lally.* [290]

QCA's Draft Decision	Ref	Aurizon Network Response
We refuse to approve Aurizon Network's proposed gamma between 0.0 and 0.25.	10.15	Disagree with the QCA and instead reiterate the original submission of 0.25
We consider it appropriate for Aurizon Network to amend its draft access undertaking to set a gamma of 0.47.	10.16	Disagree with the QCA and demonstrate error in Lally's approach on distribution and utilisation rates

10.6.1 - Distribution rate

Aurizon Network believes there is a robust empirical basis for the *2013DAU* submission of a 0.70 distribution rate. The QCA's alternative suffers from the following issues:

- In rejecting the standard regulatory approach of using Australian Taxation Office (ATO) statistics, the QCA may have misinterpreted the analysis of NERA Consulting (2013b) and Hathaway (2013).
- Lally's methodology was considered but not adopted by the QCA in past decisions, and does not feature in the QCA's *2014 Cost of Capital Market Parameters* paper.
- The Australian Energy Regulator (AER) proposed in their *2013 Rate of Return Guidelines* a distribution rate consistent with Aurizon Network's submission, as has the Australian Competition Tribunal (ACT).

Two methods to estimate the distribution rate are:[291]

a) *ATO Tax Statistics* approach. Most Australian regulators adopt this approach, which use statistical data collected by the ATO to estimate the ratio of total credits redeemed to total credits distributed. This was undertaken by Hathaway and Officer in 1999, reaffirmed in 2004, and by Hathaway in 2010.[292]

b) ASX *Annual Report* approach. The alternative method involves analysing annual report data of a sample of Australia's largest listed companies from within the ASX200.

[289] Imputation credits are generated when Australian companies pay Australian corporate tax on distributed income, with credits later distributed to shareholders via company dividend payments so as to erase the effects of double taxation.
[290] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 255.
[291] Aurizon Network notes there are more than two methods to calculate distribution rates, however the *ATO Tax Statistics* approach and the *ASX Annual Report* approach remain the most prevalent and widely used.
[292] Hathaway, N.J. and Officer, R.R., 2004, The value of imputation tax credits – updated 2004.

QCA's Draft Decision on Distribution Rate

In consideration of an appropriate distribution rate, the QCA stated:

> *We are not persuaded by Aurizon Network's 0.70 distribution rate estimate, as it is based on studies relying on ATO data, which contain major unresolved discrepancies that are likely to be the result of double-counting and aggregation problems. The ATO data allows for two approaches to estimating the distribution rate — if the data is correct and is processed correctly by the ATO, then the two approaches should give the same result. However, they do not — NERA has demonstrated that there are significant variations in results that arise from these approaches when using the ATO data. NERA also identifies other specific deficiencies in the relevant data. Further, other researchers have expressed concern with the ATO data.*
>
> *Given the problems identified with the ATO data, we do not prefer the estimate of 0.70 submitted by stakeholders. The basis of these submissions are the ATO data, and if that data is wrong, then studies utilising that data will produce an estimate (of 0.70) that is consistently wrong.* [293]

Misinterpretation of NERA

NERA (2013b) actually concluded that the dividend payout ratio should be no more than 0.70, despite their concerns about the *ATO Tax Statistics* data:

> *…that the cumulative payout ratio and the two measures of the annual payout ratio estimated from the latest published ATO taxation statistics support a dividend payout ratio of no more than 0.70.*
>
> *The authors of this Report, Mr. Brendan Quach and Dr. Simon Wheatley have made all the inquiries that each of them believes are desirable and appropriate and that no matters of significance that each of them regards as relevant have, to each of their knowledge, been withheld.* [294]

Precedents for 0.70 Distribution Rate

The 0.70 distribution rate is commonly accepted within regulatory practice (refer to Table 10.21). McKenzie and Partington, consultants to the Queensland Resources Council in the UT4 process, have also consistently recommended a distribution rate of 0.70 since 2010.[295] As recently as 2013, McKenzie and Partington stated that:

> *There is less debate about the magnitude of the access fraction as this can be measured reasonably well from taxation statistics and a value of 70% is widely accepted ...* [296]

Table 10.21 – Regulatory determinations on gamma's distribution rate

Regulator	When	Distribution Rate
QCA*	2014	0.84
AER[297]	2013	0.70
ERA*[298]	2014	0.70
ERA[299]	2013	0.70
ERA[300]	2013	0.70
IPART[301]	2012	0.70
IPART[302]	2011	0.70

** Note: Draft Determination*

[293] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 256.
[294] NERA, 2013, The Payout Ratio – A report for the Energy Network Association, p. 13.
[295] McKenzie, M. and Partington, G., 2010, Report to AER – Evidence and Submissions on Gamma.
[296] McKenzie, M. and Partington, G., 2013, Report to Queensland Resources Council.
[297] AER, 2013c, Rate of Return Guidelines – Better Regulation.
[298] ERA, 2014b, Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution System – Public Version.
[299] ERA, 2013b, Rate of Return Guidelines – Meeting the requirements of the National Gas Rules.
[300] ERA, 2013a, Determination on the 2013 Weighted Average Cost of Capital for Freight and Urban Railway Networks.
[301] IPART, 2012, Review of imputation credits (gamma), Research – Final Decision.
[302] IPART, 2013, Review of WACC Methodology – Final Report, December 2013.

Misinterpretation of Hathaway

The 'other researchers' the QCA referred to is Neville Hathaway. The 2013 Hathaway report outlined unexplained discrepancies within the ATO data for both distribution rates (what Hathaway referred to as 'access fractions') and utilisation rates. Hathaway identified an inconsistency for net credit distributions from the ATO Franking Account Balance (FAB) data compared to that from the ATO company dividend data.[303] However, Hathaway (2013) believed that reasonable estimates for the distribution rate can be made by using the ATO data on FAB.

Further, Hathaway's concern is limited to the use of ATO company dividend data for utilisation not distribution rates:

> *Unfortunately, there are too many unreconciled problems with the ATO data for reliable estimates to be made about the utilisation of franking credits. The utilisation rate of franking credits is based on dividend data (from the tax office) and I have demonstrated that this data is questionable. The only reasonably reliable estimate I can obtain from the taxation statistics is the access fraction, which is obtained from the FAB data.* [304]

Hathaway's analysis of ATO FAB data produced a distribution rate of 0.71, consistent with the 2013DAU.[305]

Summary for 0.7 Distribution Rate

In summary, Aurizon Network believes there is a robust empirical basis for the QCA to support the 2013DAU Submission of a 0.70 distribution rate as:

- NERA (2013b) concluded a distribution rate of no more than 0.70 using the ATO data;
- Hathaway (2013) indicated that a reliable estimate of distribution rates can be obtained from taxation statistics which are further confirmed by ATO FAB data; and
- all other regulatory decisions since 2011 have used a distribution rate of 0.70.

Consistent Rejection of Lally's ASX Annual Report Approach

On Lally's *ASX Annual Report* approach, there has been an extended history of QCA rejection of this methodology in past decisions, and in the QCA's 2014 paper on *Cost of Capital Market Parameters*.

The QCA did not take the Lally approach into consideration within its Final Decision in UT1. Instead, it relied on a report by Hathaway and Officer (1999) on the distribution rate of Australian firm's until 1995[306]. The distribution rate estimate concluded in that report and adopted by the QCA was 0.8. However, the QCA acknowledged the potential for the distribution rate to fall in future:

> *… The New Tax System (NTS) reverses some of the incentives for high dividend payout ratios that emerged from dividend imputation. This is because, under the NTS, capital gains attract a relatively low effective tax rate in a low inflation environment.* [307]

Since Hathaway and Officer (1999) flagged this impending change, every regulatory decision has adopted a lower distribution rate. Despite this consistent position across the nation, in 2004 Lally estimated the distribution rate for eight listed companies, recommending the distribution rate be set to 1.00, and made the same recommendation in 2010 for UT3. On both occasions the QCA did not accept Lally's recommendation.[308]

Despite the QCA's disclaimer about future decisions, and despite the fact that they concluded that all evidence pointed to a distribution rate of 1.0, the QCA decided not to adopt that value within its UT3 decision.

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[303] Hathaway, N, 2013, Imputation Credit Redemption – ATO data 1988-2011 – Where have all the credits gone?.
[304] Ibid, p. 39.
[305] Ibid, p. 38.
[306] Hathaway, N. and Officer, R., 1999, The Value of Imputation Tax Credits. The study covers the period until 1995.
[307] QCA, 2001, Draft Decision: QR Network's 2001DAU – Tariffs and Schedules F, p. 224.
[308] QCA, 2005, Draft Decision: QR Network's 2005DAU – Tariffs and Schedules F, p. 30; QCA, 2010a, Draft Decision: QR Network's 2010DAU – Tariffs and Schedules F, p. 55.

The consistent rejection of the 1.0 distribution rate was confirmed in the 2010 'Gamma Case'[309]. The AER conceded that the distribution rate of 1.0 was an error due to a misinterpretation of a study by Hathaway and Officer.[310]

QCA's Acceptance of Lally's ASX Annual Report Approach in the Draft Decision

In considering the current *2013DAU*, the QCA adopted the Lally methodology which was marginally revised to increase the sample size from eight to ten firms, resulting in a decrease in the estimated distribution rate to 85%.[311] Lally further expanded the number of firms to include an additional 10 companies, bringing the total sample to 20;[312]

> *…raising the share of ASX200 market capitalisation from 50% to 62%... The aggregate distribution rate has fallen only marginally, to 84%… In addition, the most significant characteristic of the companies with the unusual (low) distribution rates is not size but that they are involved in natural resource extraction. All of this reinforces the conclusion that the estimate from the ATO data is too low, and that the appropriate rate for the market is about 85%.* [313]

Apart from marginal movements in the distribution rate no new evidence has been presented in Lally's approach. Even though rejecting Lally's approach since UT1, the QCA has now indicated a preference for the approach, by highlighting four main advantages of the approach:

> [1] *The 20 firms account for 62% of the value of the ASX200 and obviously relate to listed companies.* [2] *As the distribution rate is estimated as a market-wide parameter, the significant feature of this sample is its aggregate weight in the relevant market.* [3] *The proportion of company taxes paid to the ATO that come from these firms will be highly related to their market weight.* [4] *In addition, Lally's estimate is based on data sourced from firm's financial statements, and these have three important advantages relative to the ATO's tax statistics' data.* [314]

Arguments against Lally's approach

Apart from one paragraph within the *Draft Decision*, the QCA has not examined arguments against the Lally method.

Aurizon Network questions how Lally can assume that the *"…proportion of company taxes paid to the ATO…will be highly related to their market weight"*. This would imply assumptions on company profits and also future market capitalisations. These assumptions are simply assertions with little analysis provided to support such claims.

A fundamental issue exists with Lally's work, as the approach is inconsistent with the QCA's definition[315] below:

	QCA's definition	Lally's definition
Distribution rate	$\frac{Distributed\ credits}{Corporate\ tax\ paid}$	$\frac{Distributed\ credits}{Created\ credits}$

If firms pay taxes outside Australia, the distribution rate is raised as taxes paid to ATO are reduced. SFG demonstrated that, to be consistent with the QCA definition, Lally's approach needs to be adjusted[316] by:

$\frac{Created\ credits}{Corporate\ tax\ paid}$ If the QCA relies on the Lally approach, the appropriate distribution rate would be 50% as in Table 10.22.

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[309] ACT, 2010, Application by Energex Limited (No 2) [2010] ACompT 7 (13 October 2010).
[310] Ibid, paragraph 52.
[311] Lally, M., 2013a, Estimating Gamma.
[312] Lally, M., 2014, Review of submissions to the QCA on the MRP, Risk-free rate and Gamma.
[313] Ibid, p. 30.
[314] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 256.
[315] SFG, 2014e, *Estimating gamma – Response to UT4 Draft Decision – Report for Aurizon Network.*
[316] SFG, 2014e, *Estimating gamma – Response to UT4 Draft Decision – Report for Aurizon Network*, p. 9.

In its *Draft Decision*, the QCA stated

> *…These foreign-sourced profits would reduce tax payments to the ATO and therefore raise their distribution rates. However, … Lally doubles his sample size from 10 to 20 firms by market capitalisation. The distribution rate fell only marginally from his previous estimate of 0.85 to 0.84.* [317]

Implicitly the QCA considers foreign-sourced profits to be trivial for Lally's 20 firms, and the 0.84 distribution rate does not need to be adjusted. However evidence would show otherwise, even evidence from Lally:

> *The ANZ discloses the tax payments made to the ATO … the proportion is 70%...*[318]

Table 10.22 shows total taxes paid from annual cash flow statements of Lally's 20 sample firms across the same period. The differences between ATO tax and Total Tax are attributed to foreign taxes. Across Lally's 20 firms, average taxes paid to ATO only account for around 59% of total taxes paid. The average adjusted distribution rate of 0.50 is well below the 0.84 proposed by Lally.

Table 10.22 – Adjustments to Lally's Distribution Rate

Company	DIST	ATO Tax	Total Tax	Lally "DIST Rate"	ATO Tax as % of Total tax (adj)	DIST Rate
CBA (Parent)	15,212	15,504	23,361	0.98	66%	0.65
BHP (Group)	20,054	31,362	58,009	0.64	54%	0.35
Westpac (Parent)	14,984	15,974	20,831	0.94	77%	0.72
ANZ (Group)	12,750	13,015	19,517	0.98	67%	0.65
NAB (Group)	13,410	14,445	23,621	0.93	61%	0.57
Telstra (Group)	19,395	19,321	21,776	1.00	89%	0.89
Woolworths (Group)	4,980	6,506	7,501	0.77	87%	0.67
Wesfarmers (Group)	5,400	5,643	5,481	0.96	103%	0.99
CSL (Group)	161	161	1,959	1.00	8%	0.08
Woodside (Group)	3,443	6,530	6,762	0.53	97%	0.51
Rio Tinto (Group)	1,880	5,219	38,475	0.36	14%	0.05
Westfield (Group)	407	437	1,190	0.93	37%	0.34
MacQuarie (Group)	821	985	1,983	0.83	50%	0.41
Origin Energy (Group)	1,384	1,384	1,337	1.00	104%	1.04
Suncorp (Group)	2,957	3,372	3,632	0.88	93%	0.82
QBE Ins (Group)	657	748	2,311	0.88	32%	0.28
Brambles (Group)	1,263	1,153	2,898	1.10	40%	0.44
Santos (Group)	1,321	1,954	2,697	0.68	72%	0.49
AMP (Group)	1,821	1,932	3,085	0.94	63%	0.59
Amcor (Group)	634	634	1,240	1.00	51%	0.51
Total (or mean)	**122,934**	**146,279**	**246,335**	**0.84**	**59%**	**0.50**

If firms pay all taxes in Australia, the distribution rate should be close to the dividend (fully franked) payout ratio over the long run. However as shown in Table 10.23, most firms in Lally's sample (from 2000 to 2013) have a

[317] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 257.
[318] Lally, M., Estimating Gamma, p. 44.

dividend payout ratio well below the distribution rate estimated by Lally.[319] This further reinforces the significance of foreign taxes for Lally's sample firms.

Table 10.23 – Lally's Distribution Rate and Dividend Payout Ratio

Company	Lally DIST Rate	Div Payout Ratio
CBA (Parent)	0.98	0.77
BHP (Group)	0.64	0.38
Westpac (Parent)	0.94	0.73
ANZ (Group)	0.98	0.68
NAB (Group)	0.93	0.70
Telstra (Group)	1.00	0.92
Woolworths (Group)	0.77	0.67
Wesfarmers (Group)	0.96	0.95
CSL (Group)	1.00	0.45
Woodside (Group)	0.53	0.56
Rio Tinto (Group)	0.36	0.34
Westfield (Group)	0.93	0.94
MacQuarie (Group)	0.83	0.67
Origin Energy (Group)	1.00	0.57
Suncorp (Group)	0.88	0.98
QBE Ins (Group)	0.88	0.74
Brambles (Group)	1.10	0.76
Santos (Group)	0.68	0.65
AMP (Group)	0.94	0.80
Amcor (Group)	1.00	0.92

Although Lally's 20 firms represent 62% of the market capitalisation, there is still 38% of the market unaccounted for. Among these firms (including Aurizon), the distribution rate is likely to be much lower than Lally's sample firms. The smaller firms tend to have lower dividend payout ratios than more mature firms in Lally's sample[320], and are more likely to have lower foreign-sourced profits.

Aurizon Network believes that the market-wide distribution rate needs to include both Lally's sample and the rest of the market. This is likely to result in a distribution rate lower than Lally's 0.84 estimate, and the adjusted 0.50 estimate.

Regulatory Precedence Points to 0.7 Distribution Rate

The QCA stated that it has been regulatory practice to set a value for the distribution rate parameter within a range between 0.70 – 1.0.[321] While this statement was based on the AER's *2013 Consultation Paper – Rate of Return*

[319] The other possibility that the distribution rate could be higher than the dividend payout ratio is when the firm has a tax loss carrying forward. However, this possibility cannot exist across all the firms and over time, as shown in the table 10.23.
[320] For example, according to BCG Consulting, the average dividend payout ratio is around 60% for ASX 200 firms in the past ten years, compared to 71% for Lally's top 20 firms. Source: BCG Consulting, 2014, The Challenge of Growth, p.12.
[321] QCA, 2014c, Cost of Capital Market Parameters – Final Decision, p. 91.

Guidelines, that document was superseded by the more recent AER *2013 Rate of Return Guidelines – Better Regulation* document, which states that the distribution rate (i.e. payout ratio):

> *…would be estimated using the cumulative payout ratio approach. This approach uses ATO tax statistics to calculate... This approach leads to an estimate of 0.7 for the payout ratio.* [322]

This position is supported by the recent judgement by the Australian Competition Tribunal (ACT), that:

> *The AER accepts that on the material presently before the Tribunal, there is no empirical data that is capable of supporting an estimated distribution ratio higher than 0.7…*[where]*…the Tribunal concludes that the distribution ratio is 0.7 for the calculation of gamma.* [323]

Summary on distribution rate

In summary, up until this point in time, the QCA has not had regard to Lally's *ASX Annual Report* method when calculating the distribution rate, and Aurizon Network is not aware of any other regulatory decisions in Australian that have applied Lally's methodology in determining the distribution rate.

Aurizon Network appreciates that the QCA need to consider the merits of alternative methods within the literature. However after adjusting for inconsistent definition and enlarging sample size, Lally's approach is likely to produce a distribution rate much lower than the 0.84 estimate that the QCA relied on.

An objective assessment of the available literature and recent regulatory decisions can only conclude that a distribution rate of 0.7 is the appropriate estimate.

10.6.2 - Utilisation Rate (Theta)

The main argument around theta is the definition, between the value of imputation credits in the hands of equity holders and the proportion of imputation credit that is redeemed. Under the value interpretation, market value studies such as dividend drop-off analysis can provide an estimate for theta. On the other hand, the redemption rate can be estimated using ATO tax data and equity ownership. In this section, Aurizon Network will discuss

- the distinction between these two interpretations
- the validity of SFG's dividend drop-off analysis
- the weights applied to each of the estimation approaches
- the overestimation of utilisation rate from ATO tax and equity ownership approaches

Redemption Rate vs Value of Credits

Aurizon Network notes that the QCA is seeking to abandon its previous approach in estimating the value of imputation credits, by defining theta as a measure of the redemption rate of imputation credits, a simple function of the proportion of equity ownership held by Australian taxpayers. As a result, the QCA estimated a theta of 0.56.

Given the relatively high level at which the regulatory framework is stated in the QCA Act, it is unsurprising that there is no specification or definition given of "gamma" within Queensland legislation. However, Aurizon Network submits that in approaching the interpretation of gamma, the broader framework indicates that what is properly measured by the theta component of gamma is the value that equity holders place on imputation credits.

This is apparent in light of the purpose for determining the WACC. The WACC measures the estimated return demanded by debt and equity holders investing in a particular entity. What is relevant to them is the value of the returns they receive. If equity holders value imputation credits at less than face value, a gamma that is based on face value will result in equity holders being under-compensated.

The adoption of a "proportion redeemed" approach to the theta component of gamma is inconsistent with section 168A of the QCA Act, in particular that the price of access to a service should generate expected revenue for the service that is at least enough to meet the efficient costs of providing access to the service and include a return on

[322] AER, 2013c, Rate of Return Guidelines – Better Regulation, p. 23.
[323] ACT, 2010, Application by Energex Limited (Distribution Ratio (Gamma)) (No 3) [2010] ACompT 9.

investment commensurate with the regulatory and commercial risks involved. This is because prices will have been calculated on a basis that under-compensates equity holders.

It is also inconsistent with the object of Part 5 of the QCA Act, which includes to promote economically efficient investment in infrastructure by which services are provided. This is because under-compensating shareholders (or the regulated entity having to reduce any deemed efficient but discretionary spending in order to properly compensate shareholders) will not promote economically efficient investment.

Approaching theta as the value that shareholders place on imputation credits is consistent with the regulatory frameworks in the National Gas Rules (NGR) and National Electricity Rules (NER) and the definition given to gamma in those frameworks. Both the NGR and the NERdefine gamma to be the value of imputation credits.[324]

There are material differences between the 'redemption rate' and the 'value of credits to shareholders',[325] as surmised by SFG:

> *In general, the two specifications (value and proportion redeemed) will differ. Suppose that in reality the shareholder values every credit created at 25% of face value, but the regulator sets gamma to 0.47. For every credit created by the firm, the regulator would reduce the allowed return by 47 cents, in relation to a credit that was worth only 25 cents to the shareholder. The result is that the shareholder is under-compensated. In the regulatory setting, gamma must be set on the basis of the value of imputation credits – otherwise shareholders cannot be properly compensated.*[326]

The approach undertaken by the QCA to estimate theta is contrary to the common theoretical understanding of gamma itself, specifically the value of imputation credits:

- Handley, an academic that both the QCA and Lally have consistently referred to, advised the AER in 2008 that a redemption rate estimate of theta will not produce an appropriate estimate of gamma, although it may be interpreted as a reasonable upper bound on the value of gamma.[327]
- The ACT highlighted in 2010 the difference between two such approaches, stating that redemption rates cannot be used to estimate the value of credits.[328]

To be consistent with the definition of theta, the value of imputation credits, one should empirically estimate theta through market value studies such as dividend drop-off analysis. In contrast, ATO tax data and the equity ownership approaches are estimating the redemption rate, rather than the value.

Validity of SFG's Dividend Drop-off Study

While there is a common theoretical understanding of gamma, due to the availability of various methodologies, there is a level of uncertainty for theta estimation. Based on the SFG dividend drop-off study originally commissioned by the Australian Competition Tribunal (the Tribunal), Aurizon Network proposed a theta of 0.35 across UT4.[329]

The QCA attempted to undertake an extensive analysis of the approaches to estimating theta[330], including SFG:

> *… we considered that the decision by the Tribunal depended on the information that it had before it at the time and that the Tribunal recognised that there was scope for further conceptual and empirical work to clarify the interpretation of gamma and provide better estimates of gamma. This view is…adopted by the AER ...*

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[324] AEMC, 2014a, National Gas Rules – Version 22, retrieved 30th October 2014; AEMC, 2014b, *National Electricity Rules – Version 65,* retrieved 30th October 2014.
[325] SFG, 2014e, Estimating gamma – Response to UT4 Draft Decision – Report for Aurizon Network, Section 100.
[326] SFG, 2014e, Estimating gamma – Response to UT4 Draft Decision – Report for Aurizon Network, p.18.
[327] Handley, J., 2008, A note on the value of imputation credits – Report to the AER.
[328] ACT, 2010, Application by Energex Limited (Distribution Ratio (Gamma)) (No 2) [2010] ACompT 7.
[329] SFG, 2012, Estimating gamma – Report for QR National (Submitted as Annex D within the 2013DAU).
[330] QCA, 2014c, Cost of Capital Market Parameters – Final Decision, pp. 92-101; QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, pp. 257-261.

> *…the Tribunal's view does not require us to give overriding weight to dividend drop-off studies ...*
>
> *In our Market Parameters Decision, we concluded that dividend drop-off studies do not produce robust statistical results. They suffer from a number of well-documented methodological and econometric problems. … we concluded that dividend drop-off estimates of the utilisation rate are of limited relevance. We rather considered that the value of the utilisation rate should be informed by assessing the merits of other evidence on the basis of their congruency with the relevant concept.* [331]

To support this statement, the QCA states in the *Cost of Capital Market Parameters* paper that:

> *The QCA engaged Dr Lally to review the SFG Consulting (2011) study, and Dr Lally raised both conceptual and empirical concerns with it (Lally 2012c, 2013d). Handley (2008) has also raised a number of similar concerns about the reliability and interpretation of dividend drop-off studies. The AER has also raised similar concerns (AER, 2013e: 166–177).*[24] [332]

In response, SFG contested the validity of the perceived 'econometric problems' within their January 2014 paper, *An appropriate regulatory estimate of gamma.* For example, the Cannavan, Finn and Gray (2004) study made conclusions on the basis of pre-2000 data. SFG employed the same methodology with more recent data (2000-2012) and demonstrated that the value of imputation credits was much lower than concluded by the earlier study.[333]

However it seems the QCA did not make any detailed reference to SFG's rebuttal of the criticisms about their model. Aurizon Network recommends that the QCA assess the merits of arguments for and against the dividend drop-off studies, including SFG's responses to criticisms from Lally's and others.

SFG have further addressed the perceived issues around the dividend drop-off estimates within their most recent paper on gamma. Aurizon Network highlights the importance of this paper in resolving any such concerns.[334]

Weights applied to approaches for utilisation rate

The QCA indicated that it has analysed each of the approaches and based on that analysis, applied weights accordingly. However the QCA does not indicate in either its *Cost of Capital Market Parameters* paper or the *Draft Decision*, how these weights were determined and ultimately, what these weights are. Aurizon Network recommends the QCA provide transparency on the weights applied.

The QCA did state the reason why equity ownership should receive the most weight:

> *…[it] is based on the correct conceptual concept, a weighted average of utilisation rates across investors with weights reflecting ownership shares in Australian listed companies. It is also transparent, based on reliable data and relatively easy to estimate. We consider the equity ownership approach provides the best available estimate of the utilisation rate and represents a conservative estimate.*[335]

The equity ownership approach calculates the utilisation rate for both domestic and foreign ownership, assigning weights of 1.0 and 0.0 respectively. For a utilisation rate of 0.56 for listed domestic market equities, the approach assumes a 44% estimate of foreign share ownership. However this estimate of foreign ownership directly contradicts the assumptions within Lally's approach for calculating the distribution rate, and not consistent with the definition of theta.

Lally expressed concerns on the equity ownership approach for utilisation rate estimation. Lally indicated that the equity ownership approach suffers from a significant drawback, where the estimate produced by the method:

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[331] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 258.
[332] QCA, 2014c, Cost of Capital Market Parameters – Final Decision, p. 27.
[333] SFG, 2014a, An appropriate regulatory estimate for gamma, p. 47.
[334] SFG, 2014e, Estimating gamma – Response to UT4 Draft Decision –Report for Aurizon Network, Chapter 5, Section 189-200.
[335] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 261.

> *…is inconsistent with the use of a CAPM that assumes complete segmentation of risky asset markets... The problem arises from combining a CAPM that assumes complete segmentation of equity markets with an estimate of U[tilisation] that reflects the actual degree of integration.* [336]

As the QCA indicated it has weighted the various approaches for the utilisation rate, Aurizon Network highlights the issues within Lally's theoretical approach, or Lally's 'Conceptual test'.[337] As summarised previously by SFG:

- *The QCA has previously rejected the Lally proposal to assume an extreme value for theta based on theoretical reasoning. The QCA has noted that such an approach would be inconsistent with the regulatory model used by the QCA;*
- *No other Australian regulator adopts a value for theta based on the theoretical Lally approach;*
- *It is the standard regulatory practice to estimate all WACC parameters on the basis of empirical evidence;*
- *If theta is to be estimated not as it is, but as it would be in the absence of any foreign investment, then all WACC parameters should be estimated on the same basis;*
- *The convoluted "test" that Lally (2012, 2013) proposes to demonstrate the superiority of his theoretical value requires point estimates of what CAPM parameters would be in theoretical perfect segmentation and perfect integration worlds, it ignores estimation error, and it rests on the assumption that Australian government bonds would have the same yield whether or not foreign investors were allowed to invest in them – which defies logic. Relaxing this last assumption alone would result in the empirical estimate of the value of imputation credits passing the Lally test. In any event, no other Australian regulator has set the value of any WACC parameter based on the assumption that Australian government bonds would have the same yield whether or not foreign investors were allowed to invest in them.* [338]

Consequently, Aurizon Network submits that the QCA should apply no weight towards Lally's conceptual test. This 'goalposts' approach is also explicitly rejected by AER in its recent draft decision on ACT and NSW energy businesses.[339]

Overestimation of Utilisation Rate from ATO Tax and Equity Ownership Approach

As discussed above, Aurizon Network believes value of theta should be estimated through market value studies such as dividend drop-off analysis, to be consistent with the definition of theta. However, even if we leave aside this fundamental issue, the QCA has over estimated theta under both the ATO tax (referred to as the redemption approach in Draft Decision) and equity ownership approaches.

ATO Tax Approach

The QCA estimated a value of 0.53 for utilisation rate under the ATO tax approach, which is based on Hathaway (2013)'s report for the ENA. The two redemption rates provided in the reports are 0.62 and 0.44 for the period 2004-2011. The estimate of 0.62 is estimated from the franked dividend data, while 0.44 is based on the taxation data and the change in the aggregate franking account balance.

Hathaway explicitly considered the estimate from the tax statistics is more reliable:

> *As was explained in section 3, I have more faith in the [franking account balance] data than in the dividend data. The dividend data appears to be missing about $87.5 billion and the ATO has had substantial problems with dividend data in the past.*[340]

Moreover, the associated distribution rate from the franked dividend data is 0.47, which is far lower than the 0.84 distribution rate proposed by the QCA in the Draft Decision. As a matter of logic, if the QCA does not believe the

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[336] Lally, M., 2013, Estimating Gamma, p. 15.
[337] QCA, 2014a, Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, p. 260.
[338] SFG, 2014a, An appropriate regulatory estimate for gamma, p. 7.
[339] AER, 2014b. AER Draft Decision: Ausgrid distribution determination 2015-16 to 2018-19, Attachment 4: Value of imputation credits, p. 71.
[340] Hathaway, 2013, Imputation credit redemption ATO data 1988-2011: Where have all the credits gone?, para. 99.

distribution rate from the franked dividend data (0.47) is within its reasonable bound, it should also place no weight on the utilisation rate from the same data. This view is also supported by AER in its recent draft decision:

> *We place less reliance upon: …Hathaway's estimate of 0.61, because this corresponds to an estimate of the distribution rate of around 0.5 whereas we adopt an estimate of the distribution rate over all equity of 0.7.*[341]

Instead, AER based its estimate on the franking account balance data, and adopted a value of 0.43 in its recent draft decisions.

In light of the data reliability issue, Aurizon Network believes the utilisation rate from the franked dividend data (0.62) should be disregarded.

Equity Ownership Approach

The QCA estimated around 44% of foreign ownership for listed equity during the period 2009-2013 using the National Accounts data from Australian Bureau of Statistics (ABS). The QCA then assumed domestic resident investors have a utilisation rate of one while zero for foreign investors. As a result, the redemption rate under the ownership approach is 0.56.

However, as pointed out in AER's recent draft decisions for ACT and NSW energy businesses, the approach can be refined further to focus on the types of equity that are deemed to be most relevant to the benchmark entity, and the specific classes of investors.

More specifically, the AER:

- *exclude from the calculation equity in entities that are wholly owned by the public sector*
- *calculate the equity held by those classes of investors that are eligible to utilise imputation credits as a share of the equity held by all classes of investor that either utilise or waste credits*[342]

The refined foreign listed equity ownership is shown in the graph below, reproduced from AER's draft decision on Ausgrid.[343]

Figure 10.10 – AER graph on refined domestic ownership share of listed Australian equity

Source: Australian National Accounts: Financial Accounts (ABS cat 5232.0) table 32

[341] AER, 2014b. AER Draft Decision: Ausgrid distribution determination 2015-16 to 2018-19, Attachment 4: Value of imputation credits, p. 58.
[342] Ibid, p. 54.
[343] AER, 2014b. AER Draft Decision: Ausgrid distribution determination 2015-16 to 2018-19, Attachment 4: Value of imputation credits, p. 55.

For the period 2009-2013, the domestic ownership of equity varies between 0.38 and 0.46, which is consistent with the redemption rate from franking account balance data (0.43), and much lower than the 0.56 estimate in the Draft Decision.

Bibliography

Allen, PR., and WJ. Wilhelm. 1988. *The Impact of the 1980 Depository Institutions Deregulation and Monetary Control Act on Market Value and Risk: Evidence from the Capital Markets*, Journal of Money, Credit and Banking, Vol.20, No.3, pp. 364-380.

Amato, J. and Furfine, C., 2004, *Are Credit Ratings Procyclical?*, Journal of Banking and Finance, vol.28, No.11, pp. 2641- 2677.

Aurizon, 2014, *2013/14 Annual Report*, available at www.aurizon.com.au.

Aurizon Network, 2009a, *CRIMP 2009 - Working Paper 4.5: Rationale for Power Systems Upgrade in the Blackwater System*, March 2009.

Aurizon Network, 2009b, *CRIMP 2009 - Working Paper 4.6: Rationale for Electric Traction System Upgrades in the Central Queensland Coal Network,* October 2009.

Aurizon Network, 2009c, *QR Network's 2008/09 Capital Expenditure Submission*, October 2009, available at www.qca.org.au.

Aurizon Network, 2010, *CRIMP 2010 – Proposed Rail Infrastructure Enhancements – Goonyella System Expansion 140 Mtpa,* December 2010.

Aurizon Network, 2013a, *UT4 Maintenance Submission*, 30th April 2013, available at www.qca.org.au.

Aurizon Network, 2013b, *2013 Draft Access Undertaking – Volume 3: Maximum Allowable Revenue and Reference Tariffs*, 30th April 2013, available at www.qca.org.au.

Aurizon Network, 2013c, *Draft Amending Access Undertaking Reference Tariff for the GAPE System*, 15th April 2013, available at www.qca.org.au.

Aurizon Network, 2014a, *Aurizon Network – UT4 Coal System Aggregate Model,* available at www.qca.org.au.

Aurizon Network, 2014b, *A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks,* 20 January 2014, available at www.qca.org.au.

Aurizon Network, 2014c, *Quarterly Performance Report*, available at http://www.aurizon.com.au/network/reports-and-qca.

Aurizon Network, 2014d, *Management of Ballast Fouling in the Central Queensland Coal Network – A review of Ballast Management 2010-2017*, 11th March 2014, available at www.qca.org.au.

Aurizon Network, 2014e, *Supplementary Report to the QCA – Maintenance Cost Index*, March 2014, available at www.qca.org.au.

Aurizon Network, 2014f, *2013 Draft Access Undertaking Return on Capital Response – Summary Paper*, 20th January 2014, available at www.qca.org.au.

Australian Government Productivity Commission, 2013, *Productivity Commission Reports No.66 National Access Regime,* 25th October 2013, available at www.pc.gov.au.

Australian Competition Tribunal, 2006, *Telstra Corporation Limited* [2006] ACompT4, at [89], available at www.competitiontribunal.gov.au.

Australian Competition Tribunal, 2010, *Application by Energex Limited (Distribution Ratio (Gamma)) (No 3) [2010] ACompT 9,* 24th December 2010, available at www.competitiontribunal.gov.au.

Australian Competition Tribunal, 2012, *Application by DBNGP (WA) Transmission Pty Ltd (No 3) [2012] ACompT 14*, 26th July 2012, available at www.competitiontribunal.gov.au.

Australian Competition Tribunal, 2013, *Application by APA GasNet Australia (Operations) Pty Ltd (No 2) [2013] ACompT 8*, 18th September 2013, available at www.competitiontribunal.gov.au.

Australian Energy Market Commission, 2014a, *National Gas Rules – Version 22,* retrieved 30th October 2014, available at www.aemc.gov.au.

Australian Energy Market Commission, 2014b, *National Electricity Rules – Version 65,* retrieved 30th October 2014, available at www.aemc.gov.au.

Australian Energy Regulator, 2010. Final decision, Queensland distribution determination 2010-11 to 2014-15, May 2010, available at www.aer.gov.au.

Australian Energy Regulator, 2013a, *Transmission Network Service Provider Performance Report 2010-11*, July 2013, available at www.aer.gov.au.

Australian Energy Regulator, 2013b, *AER Explanatory Statement – Shared Asset Guideline,* November 2013, available at www.aer.gov.au.

Australian Energy Regulator, 2013c, *Rate of Return Guidelines – Better Regulation,* December 2013, available at www.aer.gov.au.

Australian Energy Regulator, 2013d, *Better Regulation – Explanatory Statement – Rate of Return Guideline,* 16th December 2013, available at www.aer.gov.au.

Australian Energy Regulator, 2013e, *Access Arrangement Final Decision – APA GasNet Australia 2013 – 17 Part 3: Appendices*, March 2013, available at www.aer.gov.au.

Australian Energy Regulator, 2014a, *AER Draft Decision: Ausgrid distribution determination 2015-16 to 2018-19, Attachment 3: Rate of return,* November 2014, available at www.aer.gov.au.

Australian Energy Regulator, 2014b, *AER Draft Decision: Ausgrid distribution determination 2015-16 to 2018-19, Attachment 4: Value of imputation credits,* November 2014, available at www.aer.gov.au.

Australian Government Productivity Commission, 2013, *Productivity Commission Reports No.66 National Access Regime, 25th October 2013*, available at www.aph.com.au.

BCG Consulting, 2014, *The Challenge of Growth*, available at www.bostonconsulting.com.au.

Binder, J.J. and Norton, S.W., 1999, *Regulation, Profit Variability and Beta*, Journal of Regulatory Economics, Vol.15, No.3, pp. 249-266.

Bureau of Resources and Energy Economics, 2013, *Resources and Energy Quarterly – December Quarter 2013,* available at www.bree.gov.au.

Bureau of Resources and Energy Economics, 2014, *Resources and Energy Major Projects*, October 2014, available at www.bree.gov.au.

Cambridge Systematics, 2007, *National Rail Freight Infrastructure Capacity and Investment Study, prepared for the Association of American Railroads*, September 2007.

Carter Hill R., Griffiths W.E. and Lim G.L., 2011, *Principles of Econometrics*, 4th Ed, Hoboken, NJ.

Chen, AH., and G. Sanger, 1985, *An Analysis of the Impacts of Regulatory Change: The Case of Natural Gas Deregulation*, Financial Review, Vol.20, No.1, pp. 36-54.

Chen, AH., and LJ. Merville, 1986, *An Analysis of Divestiture Effects Resulting from Deregulation*, Journal of Finance, Vol.41, No.5, pp. 997-1010.

Christensen Associates Inc., 2008, *A Study of Competition in the U.S. Freight Railroad Industry and Analysis of Proposals that Might Enhance Competition*, *Volume 2: Analysis of Competition, Capacity and Service Quality,* available at www.stb.dot.gov.

Clarke, RG., 1980, *The Effect of Fuel Adjustment Clauses on the Systematic Risk and Market Values of Electric Utilities*, Journal of Finance, Vol.35, No.2, pp. 347-358.

Davidson, WN., PR. Chandy, and M. Walker, 1984, *The Stock Market Effects of Airline Deregulation*, Journal of Business and Economics, Vol.23, No.4, pp. 31-45.

Davidson, WN., PR. Chandy, and M. Walker, 1985, *The Stock Market Effects of Trucking Deregulation*, Akron Business and Economic Review, Vol.16, pp. 44-50.

Davidson, WN., I. Mathur, N. Rangan, and S. Rosenstein, 1990, *Regulation and Systematic Risk in the Electric Utility Industry: A Test of the Buffering Hypothesis*, Working paper (September).

Davidson, WN., N. Rangan, and S. Sundaran, 1990, *The Market Valuation Effects of the Financial Institutions Reform, Recovery and Enforcement Act of 1989*, Working paper (October).

Economic Insights, 2011, *Review of AER Draft Decisions on Envestra Queensland's and Envestra South Australia's Input Price Escalators*, 22 March 2011.

Economic Regulation Authority Western Australia, 2008, *2008 Weighted Average Cost of Capital for the Freight (WestNet Rail) and Urban (Public Transport Authority) Railway Networks – Final Determination,* June 2008, available at www.erawa.com.au.

Economic Regulation Authority Western Australia, 2013a, *Determination on the 2013 Weighted Average Cost of Capital for Freight and Urban Railway Networks,* 9th July 2013, available at www.erawa.com.au.

Economic Regulation Authority Western Australia, 2013b, *Rate of Return Guidelines – Meeting the requirements of the National Gas Rules,* 16th December 2013, available at www.erawa.com.au.

Economic Regulation Authority Western Australia, 2014a, *Review of the method for estimating the Weighted Average Cost of Capital for the Freight and Urban Railway Networks – Draft Determination,* 5th June 2014, available at www.erawa.com.au.

Economic Regulation Authority Western Australia, 2014b, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution System – Public Version,* 14th October 2014, available at www.erawa.com.au.

Energex Limited, 2009, *Cost Allocation Method*, February 2009, available at www.energex.com.au.

Energy Economics, 2013, *Central Queensland Coal Railings Forecast*, 31st July 2013, available at www.qca.org.au.

Ernst and Young, 2012, *Benchmarking of Corporate Overhead Costs for QR Network Pty Ltd*, July 2012, available at www.qca.org.au.

Essential Services Commission, 2014, *Goulburn-Murray Water Price Review 2016 – Guideline on Price Submission,* August 2014, available at www.esc.gov.au.

Evans and Peck, 2013a, *Ballast contamination scoping study*, March 2013, available at www.qca.org.au.

Evans and Peck, 2013b, *CQCN Independent Forecast of Assets Maintenance and Renewal Costs, FY2018-2033*, December 2013.

Fartuch, N., 1978, *Empirical Tests of the Political Wealth Maximizing Theory of Regulation Using Financial Data*, Working paper (March).

Fraser, DR., and S. Kannan, 1990, *Deregulation and Risk: Evidence from Earnings Forecasts and Stock Prices*, Financial Management, Vol.19, No.4, pp. 68-76.

Fraser, DR., and J. Kolari., 1990, *The 1982 Depository Institutions Act and Security Returns in the Savings and Loan Industry*, Journal of Financial Research, Vol.13, No.4, pp. 339-347.

Handley, J., 2008, *A note on the value of imputation credits – Report to the AER,* 12th November 2008, available at www.aer.gov.au.

Hathaway, N. and Officer, R., 1999, *The Value of Imputation Tax Credits*, Finance Research Group, Melbourne School of Business.

Hathaway, N.J. and Officer, R.R., 2004, *The value of imputation tax credits – updated 2004*, November 2004, available at www.aer.gov.au.

Hathaway, 2013, *Imputation credit redemption ATO data 1988-2011: Where have all the credits gone?*, September 2013, available at www.aer.gov.au.

Hogan, WP., IG. Sharpe, and PA. Volker, 1980, *Risk and Regulation: An Empirical Test of the Relationship*, Economics Letters, Vol.6, No.4, pp. 373-379.

Ifflander, J., DJ. Kretovich, and SE. Moeller, 1991, *Deregulation, Oil Prices, and Risk: An Empirical Study of the Railroad Industry*, Working paper (April).

Incenta Economic Consulting, 2013, *Aurizon Network: Review of benchmark credit rating and cost of debt,* November 2013, available at www.qca.org.au.

Incenta Economic Consulting, 2014, *Review of Regulatory Capital Structure and Asset/Equity Beta for Aurizon Network and response to stakeholder comments – Report to the Queensland Competition Authority,* 2nd April 2014, available at www.qca.org.au.

Independent Pricing and Regulatory Tribunal, 2012, *Review of imputation credits (gamma), Research – Final Decision,* 15th March 2012, available at www.ipart.nsw.gov.au.

Independent Pricing and Regulatory Tribunal, 2013, *Review of WACC Methodology – Final Report,* December 2013, available at www.ipart.nsw.gov.au.

International Energy Agency, 2013, *World Energy Outlook 2013,* November 2013, available at www.iea.org.

International Energy Agency, 2014a, *World Energy Outlook 2014,* November 2014, available at www.iea.org.

International Energy Agency, 2014b, *Coal Medium-Term Market Report 2014*, 16 December 2014, available at www.iea.org.

KPMG, 2014, *Corporate tax rates table*, available at http://www.kpmg.com/global/en/services/tax/tax-tools-and-resources/pages/corporate-tax-rates-table.aspx.

Kretovich, DJ., and G. Kutner, 1987, *Risk and Deregulation in the Motor Carrier Industry*, Working paper (January).

Lally, M., 2002, *Determining the risk-free rate for regulated companies,* 23rd August 2008, available at www.aer.gov.au.

Lally, M., 2013a, *Estimating Gamma,* 25th November 2013, available at www.qca.org.au.

Lally, M., 2013b, *Response to submissions on the risk-free rate and the MRP – Report to the QCA,* 22nd October 2013, available at www.qca.org.au.

Lally, M., 2014, *Review of submissions to the QCA on the MRP, Risk-free rate and Gamma,* 12th March 2014, available at www.qca.org.au.

Lamdin, DJ., 1991, *Empirical Tests of the Buffering Hypothesis: A Re-examination of the Cigarette Advertising Ban*, Working paper, University of Maryland Baltimore County, Department of Economics.

Lenway, S., K. Rehbein, and L. Starks, 1990, *The Impact of Protectionism on Firm Wealth: The Experience of the Steel Industry*, Southern Economic Journal, Vol.56, No.4, pp. 1079-1093.

McKenzie, M. and Partington, G., 2010, *Report to AER – Evidence and Submissions on Gamma*, 25th March 2010, available at www.aer.gov.au.

McKenzie, M. and Partington, G., 2013, *Report to Queensland Resources Council*, 5th October 2013, available at www.qca.org.au.

Mitchell, ML., and J. Mulherin, 1988, *Finessing the Political System: The Cigarette Advertising Ban*, Southern Economic Journal, Vol.54, No.4, pp. 855-862.

NERA, 2013, *The Payout Ratio – A report for the Energy Network Association*, June 2013, available at www.aer.gov.au.

Norton, SW., 1985, *Regulation and Systematic Risk: The Case of Electric Utilities*, Journal of Law and Economics, Vol.28, No.3, pp. 671-686.

Officer, B. and Bishop, S., 2008, *Term of the Risk-free Rate – Commentary*, 11th September 2008, available at www.aer.gov.au.

Peltzman, S., 1973, *The Benefits and Costs of New Drug Regulation in Regulating New Drugs,* New York: MacMillan.

Peltzman, S., 1976, *Toward a More General Theory of Regulation,* Journal of Law and Economics, Vol.19, No.2, pp. 211-240.

Peyser, P.S., 1994, *Beta, Market Power and Wage Rate Uncertainty*, The Journal of Industrial Economics, Vol.42, No.2, pp. 217 -226.

Powerlink, 2012a, Letter dated 20 August 2012, provided to the QCA as part of the 2012-13 Endorsed Variation Event.

Powerlink, 2012b, *Negotiating Framework for Negotiated Transmission Services*, April 2012, available at http://www.powerlink.com.au/Network/Documents/Negotiating_Framework_for_Negotiated_Transmission_Services.aspx.

PricewaterhouseCoopers, 2013, *A Cost of Debt Estimation Methodology for Business Regulated by the Queensland Competition Authority*, June 2013, available at www.qca.org.au.

Queensland Competition Authority, 2001*, Draft Decision: QR Network's 2001DAU – Tariffs and Schedules F,* December 2000, available at www.qca.org.au.

Queensland Competition Authority, 2005, *Draft Decision: QR Network's 2005DAU – Tariffs and Schedules F,* July 2005, available at www.qca.org.au.

Queensland Competition Authority, 2009, *Draft Decision QR Network 2009 Draft Access Undertaking,* available at www.qca.org.au.

Queensland Competition Authority, 2010a, *Draft Decision QR Network 2010 DAU – Tariffs and Schedule F,* available at www.qca.org.au.

Queensland Competition Authority, 2010b, *Final Decision – DBCT Capacity Expansion Phase 2/3 Actual Costs DAAU*, available at www.qca.org.au.

Queensland Competition Authority, 2012, *Queensland Competition Authority Act 1997*, 21st September 2012, available at www.qca.org.au.

Queensland Competition Authority, 2013, *Draft Decision: Aurizon Network 2013 Blackwater Electric Traction Pricing Draft Amending Access Undertaking,* 21st November 2013, available at www.qca.org.au.

Queensland Competition Authority, 2014a, *Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue*, September 2014, available at www.qca.org.au.

Queensland Competition Authority, 2014b, *Aurizon Network 2014DAU – Draft Decision on MAR (Information Update)*, 21 November 2014, available at www.qca.org.au.

Queensland Competition Authority, 2014c, *Cost of Capital Markets Parameters – Final Decision*, 29th August 2014, available at www.qca.org.au.

Queensland Competition Authority, 2014d, *Final Decision: Cost of Debt Estimation Methodology*, 29th August 2014, available at www.qca.org.au.

Queensland Treasury Corporation, 2014, Cost of Debt Discussion Paper, 20th January 2014, available at www.qca.org.au.

Reserve Bank of Australia, 2014a, *Infrastructure and Corporate Bond Markets in Asia,* 25th July 2014, available at www.rba.gov.au.

Reserve Bank of Australia, 2014b, *F3: Aggregate Measure of Australian Corporate Bond Spreads and Yields,* accessed November 2014, available at www.rba.gov.au.

RSM Bird Cameron, 2014a, *Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure,* January 2014, available at www.qca.org.au.

RSM Bird Cameron, 2014b, *Aurizon Network 2013 Draft Access Undertaking Financial Assessment of Operating Expenditure – Response to Aurizon Network's Submission dated 7 March 2014 – Addendum Report,* April 2014, available at www.qca.org.au.

Sankaranarayanan, S., 1986. *An Analysis of the Effects of Government Regulation on Business: Evidence from the Capital Markets*, Working paper (March).

SFG Consulting, 2012a, *Systematic risk of Aurizon Network,* 31st August 2012, available at www.qca.org.au.

SFG Consulting, 2012b, *Estimating gamma – Report for QR National (Submitted as Annex D within the 2013DAU),* 25th January 2012, available at www.qca.org.au.

SFG Consulting, 2014a, *An appropriate regulatory estimate for gamma,* 16th January 2014, available at www.qca.org.au.

SFG Consulting, 2014b, *An appropriate regulatory estimate of the market risk premium*, 16th January 2014, available at www.qca.org.au.

SFG Consulting, 2014c, Commentary on the Systematic Risk Analysis of Aurizon Network by the Queensland Competition Authority – Report for Aurizon Network, 21st November 2014, available at www.qca.org.au.

SFG Consulting, 2014d, *The term of the risk-free rate – Report for Aurizon Network,* 23rd November 2014, available at www.qca.org.au.

SFG Consulting, 2014e, *Estimating gamma – Response to UT4 Draft Decision –Report for Aurizon Network,* 15th December 2014, available at www.qca.org.au.

SFG Consulting, 2014f, *Estimating the market risk premium: Response to the UT4 Draft Decision – Report for Aurizon Network*, 21st November 2014, available at www.qca.org.au.

SFG Consulting, 2014g, *Converting between ex-imputation and with-imputation required returns – Report for Aurizon Network*, 25th November 2014, available at www.qca.org.au.

SFG Consulting, 2014h, *Application of the dividend discount model for estimating the market return by the Queensland Competition Authority – Report for Aurizon Network*, 26th November 2014, available at www.qca.org.au.

Sinclair Knight Merz (SKM), 2014, *Aurizon Network 2013 Draft Access Undertaking Engineering Technical Assessment of Maintenance, Operating and Capital Expenditure Forecast,* 21st January 2014, available at www.qca.org.au.

Standard & Poors, 2013, *Aurizon Network Pty Ltd.*, 15th May 2013, available at www.standardandpoors.com/ratingsdirect.

Surface Transport Board, 2012, *Surface Transport Board Commodity Revenue Stratification Report 2012,* available at www.stb.dot.gov.

Synergies Economic Consulting, 2013a, *Aurizon Network's Commercial and Regulatory Risk,* April 2013, available at www.qca.org.au.

Synergies Economic Consulting, 2013b, *Powerlink - Real Labour Cost Escalation Review*.

The Allen Consulting Group, 2007, *Railways (Access) Code 2000: Weighted Average Cost of Capital: 2008 WACC Determinations*, available at www.erawa.com.au.

The Brattle Group, 2014, *Aurizon Network 2014 Draft Access Undertaking: comments on Aspects of the WACC,* December 2014, available at www.qca.org.au.

US Energy Information Administration, 2006-2012, *Annual Coal Distribution Reports*, available at http://www.eia.gov/coal/distribution/annual/.

Wibowo, A., 2006, *CAPM-Based Valuation of Financial Government Supports to Infeasible and Risky Private Infrastructure Projects*, Journal of Construction Engineering and Management, Vol.132, No.3, pp. 239–248.

Glossary

2010 Undertaking	Aurizon Network's current Access Undertaking, approved by the QCA on 1 October 2010, together with any subsequent changes approved by the QCA
2013 Undertaking	Aurizon Network's Draft Access Undertaking due to commence on 1 July 2013
2013DAU	2013 Draft Access Undertaking
2014DAU	2014 Draft Access Undertaking
ABS	Australian Bureau of Statistics
ACT	Australian Competition Tribunal
ACCC	Australian Competition and Consumer Commission
Access Holder	A person or organisation that holds access rights to the Central Queensland Coal Network
AER	Australian Energy Regulator
AIP	Australian Institute of Petroleum
AM	Asset Maintenance
APCT	Abbot Point Coal Terminal
APEX	Integrated Network Planning, Scheduling and Execution tool which is currently in development for Aurizon Network
APQC	American Productivity and Quality Centre
ARTC	Australian Rail Track Corporation
ASIC	Australian Securities and Investment Commission
ASX	Australian Stock Exchange
ATO	Australian Tax Office
Aurizon Group	The Group of Companies held by Aurizon Holdings Limited, which includes Aurizon Network Pty Ltd
Aurizon Holdings	Aurizon Holdings Limited
Aurizon Network	Aurizon Network Pty Ltd, the provider of access services in accordance with the 2010 Undertaking
AWOTE	Average Weekly Ordinary Times Earning
AZJ	Aurizon Holding Limited
Ballast	Ballast is the material that is laid on the rail bed under the sleepers, providing stability and drainage to the track structure.
bn	billion
BREE	Bureau of Resource and Energy Economics
BRTT	Below Rail Transit Time
BVAL	Bloomberg Valuation Service
CAA	Connection Access Agreement
CAPM	Capital Asset Pricing Model
CAPEX	Capital Expenditure

CBA	Condition Based Assessment -An obligation introduced within the 2010 Access Undertaking requiring Aurizon Network to undertake an end of term assessment of the condition of the Rail Infrastructure.
CEO	Chief Executive Officer
CEPA	Centre for Efficiency and Productivity Analysis
CGS	Commonwealth Government Securities
CIB	Cumulative industry benchmark
CPI	Consumer Price Index
CQCN	Central Queensland Coal Network
CQCR	Central Queensland Coal Region
CRIMP	Coal Rail Infrastructure Master Plan
DAU	Draft Access Undertaking
DAAU	Draft Amending Access Undertaking
DBCC	Dalrymple Bay Coal Chain
DBCT	Dalrymple Bay Coal Terminal
DGM	Dividend Growth Model
DORC	Depreciated Optimised Replacement Cost
DRP	Debt Risk Premium
ERA	Economic Regulation Authority
ESC	Essential Services Commission
EY	Ernst & Young
eGTK	Electric gross tonne kilometres
ERAWA	Economic Regulatory Authority of Western Australia
EVP	Executive Vice President
FCC	Fault Control Centre
FTE	Full Time Equivalents
FY	Financial year
GAPE	Goonyella to Abbot Point Expansion
GOC	Government Owned Corporation
GPR	Ground Penetrating Radar - A non-destructive subsurface inspection technology that is used to measure the condition of Aurizon's Assets, in particular ballast.
GRV	Gross Replacement Value
GTK	Gross tonne kilometres
HPCT	Hay Point Services Coal Terminal
HVCCC	Hunter Valley Coal Chain Coordinator
HVCN	Hunter Valley Coal Network
IDC	Interest During Construction
IEA	International Energy Agency
IPART	Independent Pricing and Regulatory Tribunal

IPO	Initial Public Offering
Kwik Drop Doors	Kwik Drop Doors are the coal wagon doors with an automatic release mechanism to allow quick unloading of the coal wagon as they pass through the coal unloader. The doors are operated by an opening and closing lever mechanism on the wagon which engages with trackside cams.
MAR	Maximum Allowable Revenue
MCI	Maintenance Cost Index
mt	Million tonnes
MNT	Million net tonnes
MRP	Market Risk Premium
mtpa	Million tonnes per annum
NAMS	Network Asset Management System
NCL	North Coast Line
NER	National Electricity Rules
NGL	National Gas Rules
NML	Northern Missing Link – the section of track connecting the Goonyella coal system with the Newlands Coal System between North Goonyella Junction to Newlands junction
NPV	Net Present Value
NSAP	Network Strategic Asset Plan
nt	Net tonnes
ntk	Net tonne kilometres
OAV	Opening Asset Value
OECD	Organisation for Economic Co-Operation and Development
OPEX	Operational Expenditure
ORC	Optimised Replacement Cost
OTCI	Overall Track Condition Index - A measure of the quality of the geometry of the track calculated from track geometry recording vehicle outputs
PCF	Process Classification Framework
PTRM	Post-tax revenue model
PV	Present Value
PVC	Percent Void Contamination - Calculated by dividing the volume of contaminates by the volume of voids within the ballast profile. PVC is determined in a compacted state to simulate actual track conditions
QCA	Queensland Competition Authority
QCA Act	Queensland Competition Authority Act (Qld) 1997
QR	Queensland Rail Limited
QRC	Queensland Resources Council
QR Network	The subsidiary of QR which was established in 2008 to own and manage the Queensland rail network, now Aurizon Network
QTC	Queensland Treasury Corporations

RAB	Regulatory Asset Base
RBA	Reserve Bank of Australia
RIM	Rail Infrastructure Manager
RM74	Mainline Ballast Undercutter Machine
RM900	Mainline Ballast Undercutter Machine
RSMBC	RSM Bird Cameron
RT	Reference Tariffs
S&P	Standard and Poor's
SAC	Stand Alone Cost
SAR	System Allowable Revenue
SFG	Strategic Finance Group
SKM	Jacobs, formally known as Sinclair Knight Merz,
SPAD	Signal Passed At Danger
SUFA	Standard User Funding Agreement
TAR	Total Access Revenue
Turnout	A section of railway track-work that allows trains to pass from one track on to a diverging path
TNSP	Transmission Network Services Provider
US	United States of America
UT1	The period from 2001 to 2006, being the term of QR's first access undertaking
UT2	The period from 2006 to 2010, being the term of QR's second access undertaking covering the CQCR
UT3	The period from 2010 to 2013, being the term of the 2010 Undertaking, being the third access undertaking covering the CQCR
UT4	The four year period commencing 1 July 2013, being the proposed term of the 2013 Undertaking, which will be the fourth access undertaking covering the CQCR
WA	Western Australia
WACC	Weighted Average Cost of Capital
IICET	Wiggins Island Coal Export Terminal
WIRP	Wiggins Island Rail Project
WPI	Wage Price Index

The term of the risk-free rate

Report for Aurizon Network

23 November 2014

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Contents

1. Background and conclusions

Overview and instructions

1. SFG Consulting (**SFG**) has been retained by Aurizon Network (**Aurizon**) to provide our views on issues relating to the term of the risk-free rate proxy for use in the Capital Asset Pricing Model (**CAPM**) within the regulatory setting. In particular, we have been asked to respond to the Market Parameters Decision and the Aurizon UT4 Draft Decision of the Queensland Competition Authority (**QCA**) insofar as they relate to the term of the risk-free rate.

Summary of conclusions

2. Our main conclusions are set out below.

Required returns in a commercial setting

3. When estimating required returns in a commercial setting, the overwhelming market practice is to use the yield on 10-year government bonds as the proxy for the risk-free rate.

4. The QCA argues that its role is not to set the allowed return to mirror the return that would be required by investors in a commercial setting. Rather, the QCA argues that its role is to promote the economically efficient investment in infrastructure and that this requires it to set the allowed return below the return that investors would require in a commercial setting.

5. In our view, setting the allowed return on regulated assets below the return that investors expect to receive on comparable assets in a commercial setting has clear implications for allocative efficiency. Suppose a regulator believes that its regulatory process de-risks an investment such that the required return should be commensurately low. If investors do not share the regulator's views about the extent to which the regulatory process de-risks the asset, the lower allowed return will act as a disincentive for investment and allocative inefficiency.

6. **Recommendation: For clarity, in its Final Decision the QCA should explain:**

   a) **Whether it believes it is required to set the allowed return below the return that investors would require in a commercial setting;**

   b) **Whether it *has* set the allowed return below the return that investors would require in a commercial setting; and**

   c) **How setting the allowed return below the return that investors would require in a commercial setting promotes economic efficiency.**

The NPV=0 principle

7. The QCA presents a mathematical derivation of what it calls "the NPV=0 principle," which is the principle that the value of an asset is equal to the present value of the expected cash flows produced by that asset. The idea behind the QCA's application of this principle is that the regulatory process results in the end-of-period asset value being known for sure right from the beginning of the regulatory period. Under this view, investors in the regulated asset will value the asset as the present value of the cash flows during the regulatory period plus the present value of the known end-of-period asset value. That is, they will value the asset like a bond, because the terminal value is known with certainty from the outset. Since the cash flows to be discounted do not extend beyond the regulatory period, the term of the discount rate is set to the term of the regulatory period.

8. In a commercial setting, investors will discount cash flows over the life of the project using a long-term discount rate. This is because investors do not know for sure what the value of the asset might be at any future point in time. That is, rather than knowing what the market value of the asset will be in Year 5, they will need to estimate that value as the present value of all subsequent expected cash flows.

9. In our view, there is general agreement that:

    a) If investors know with certainty what the value of the asset will be X years from now, it is appropriate to use the X-year discount rate; and

    b) If investors do not know with certainty what the value of the asset will be at any future point in time, it is appropriate to use a long-term discount rate, as is the custom in the commercial sector.

10. That is, the NPV=0 principle requires the term of the discount rate to reflect the period over which there is cash flow uncertainty:

    a) If the cash flow uncertainty lasts for only five years (because the Year 5 terminal asset value is known with certainty from the outset) a 5-year discount rate would be consistent with the NPV=0 principle; and

    b) If the cash flow uncertainty lasts for the life of the asset (because investors do not know with certainty what the value of the asset will be at any future point in time) a long-term discount rate (as used in commercial practice) would be consistent with the NPV=0 principle.

11. The QCA presents a mathematical derivation to support its contention that a discount rate aligned to the length of the regulatory period is consistent with the NPV=0 principle. That derivation requires that the end-of-period asset value must be known with 100% certainty right from the start of the period. Aligning the discount rate to the length of the regulatory period is only consistent with the NPV=0 principle if the end-of-period asset value is known with certainty from the outset.

12. **Recommendation: In its Final Decision, the QCA should state whether it agrees with the following propositions, or if it does not agree with them, the QCA should explain why:**

    a) If the value of the asset at the end of the regulatory period is known with certainty right from the start of the regulatory period, the NPV=0 principle requires that the term of the risk-free rate must be set equal to the term of the regulatory period – because the asset can be valued without any reference to cash flows beyond the regulatory period; and

    b) **If the value of the asset at the end of the regulatory period is *not* known with certainty right from the start of the regulatory period, the NPV=0 principle requires that a long-term risk-free rate must be used – because the asset can only be valued with reference to long-term cash flows.**

Regulatory justification for a short-term discount rate

13. Any suggestion that aligning the discount rate to the length of the regulatory period is consistent with the NPV=0 principle even where the end-of-period asset value is not known with 100% certainty from the outset, would be a demonstrable error. The QCA derivation clearly demonstrates that the

end-of-period asset value must be known with certainty to support the use of a short-term discount rate.

14. In light of the previous point, a regulator could only align the discount rate to the length of the regulatory period if they considered that the end-of-period asset value actually *was* known with 100% certainty. Otherwise, the NPV=0 principle would require that the standard commercial practice of adopting a long-term discount rate should be used.

15. Consequently, it would be incumbent upon a regulator who proposed to align the discount rate to the length of the regulatory period to explain why it is that the end-of-period asset value is known with 100% certainty. The regulator could then document the guaranteed end-of-period market value of the asset in its determinations.

16. **Recommendation: For clarity, in its Final Decision the QCA should explain:**

    a) **Whether it considers its application of the NPV=0 principle to rely on the end-of-period market value being known with certainty from the outset; and**

        i) **If not, the QCA should present a revised proof that does not rely on such certainty; and**

        ii) **If so, the QCA should state what it guarantees the end-of-period market value of Aurizon Network will be; and**

    b) **Whether it considers that real-world investors would perceive less risk and require lower returns if the length of the regulatory period was reduced.**

Consistency between risk-free rate and MRP

17. In its UT4 Draft Decision, the QCA determines that the required return for the average firm is 10.56%. The QCA then sets the allowed return for Aurizon as though the required return for the average firm is 9.71%.

18. This anomaly arises because the QCA uses two different values in the two places where the risk-free rate appears in the CAPM equation. This practice runs counter to the GasNet decision of the Australian Competition Tribunal, which "requires a consistent use of the value of r_f in both parts of the CAPM equation where it occurs so that the choice was either a five year bond rate or a ten year bond rate in both situations."[1]

19. **Recommendation: In its Final Decision, the QCA should explain:**

    a) **Why it considers it reasonable to determine an estimate of the required return on the market, and then set the allowed return for Aurizon on the basis of a lower estimate; and**

    b) **What regard it has had to the GasNet decision.**

Consistency with regulatory practice

20. The AER and IPART both estimate the risk-free rate using the yield on 10-year government bonds.

[1] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6, Paragraph 46.

21. In explaining its position, the AER cites:

    a) The GasNet decision;

    b) Evidence of commercial practice; and

    c) Submissions from Incenta (2013) relating to the fact that the use of a shorter term would only be justified if the end-of-period asset value was guaranteed from the outset.

22. IPART has recently lengthened the term of its risk-free rate from five years to ten on the basis of the same evidence considered by the AER.

23. Although the weight of regulatory practice supports a 10-year term, the ERA has recently adopted a five-year risk-free rate in its extraordinary ATCO Gas Draft Decision.

24. **Recommendation: In its Final Decision, the QCA should address each of the Incenta submissions to the AER, explaining why it disagrees with the AER's acceptance of them.**

2. Commercial practice and the role of the QCA

Commercial practice is to use a long-term discount rate

25. There is broad agreement that the dominant practice of market practitioners and valuation professionals is to set the term of the risk-free rate to 10 years on the basis that this is the longest observable term for Australian government bonds. For example, SFG (2013 IER) note that the overwhelming majority (94%) of expert assessments in their 2012/13 sample group employed a term assumption for the risk-free rate of ten years. Several reports indicated that the use of a 10-year term assumption was standard practice amongst independent experts in Australia. For example, in its report to ING Real Estate Community Living Group, Deloitte stated that:

> The 10-year bond rate is a widely used and accepted benchmark for the risk free rate in Australia.[2]

26. In its report for Hastings Diversified Utilities Fund (a firm with regulated infrastructure investments), Grant Samuel noted that:

> The ten year bond rate is a widely used and accepted benchmark for the risk free rate. Where the forecast period exceeds ten years, an issue arises as to the appropriate bond to use. While longer term bond rates are available, the ten year bond market is the deepest long term bond market in Australia and is a widely used and recognised benchmark. There is a limited market for bonds of more than ten years. In the United States, there are deeper markets for longer term bonds. The 30 year bond rate is a widely used benchmark. However, long term rates accentuate the distortions of the yield curve on cash flows in early years. In any event, a single long term bond rate matching the term of the cash flows is no more theoretically correct than using a ten year rate. More importantly, the ten year rate is the standard benchmark used in practice.[3]

27. In summary, the independent expert evidence supports the use of a 10-year term to maturity when estimating the risk-free rate:

    a) 94% of the relevant reports adopted a 10-year term assumption; and

    b) The few reports that did not use a 10-year term assumption explained that the reason for not doing so was that they were adopting a term assumption that matched the lives of the assets being valued.

28. Incenta (2013) also conclude that the dominant commercial practice is to use a 10-year term for the risk-free rate:

> In conclusion, we recommend using a 10 year risk free rate for estimating the cost of equity, and for this rate to be applied consistently to estimate the market risk premium…our view is based on achieving consistency with the practice of valuation professionals for whom the use of a 10 year term for the risk free rate is widespread, and consistency with our observations of how investors actually value regulated infrastructure assets. [4]

[2] Deloitte (2012), ING Real Estate Community Living Group – Independent expert's report and Financial Services Guide, 24 April 2012, p.93.
[3] Grant Samuel (2012), Hastings Diversified Utilities Fund – Independent Expert's report, 3 August 2012, p.4.
[4] Incenta (2013), p. 13.

The role of the QCA

Focus on economic efficiency

29. The QCA has stated that its objective is *not* to replicate competitive market outcomes, but rather to achieve economic efficiency.[5] The QCA does not disagree with the general notion that benchmarking to a competitive market outcome has some validity, but highlights that its overriding objective is economic efficiency (our emphasis added below):

> For purposes of determining rates, the QCA Act does not require the QCA 'to estimate the price that would prevail in a competitive market'. Section 168A of the Act does require, inter alia, revenue adequacy. Benchmarking a competitive market outcome is valid in the sense that unregulated firms in competitive markets charge a price to just cover their efficient costs, including the cost of capital, and regulation should do the same with respect to costs. However, unregulated firms face advantages and disadvantages that cannot be readily replicated in a regulated environment.
>
> The Act also requires the QCA to 'promote the **economically efficient** operation of, use of and investment in, significant infrastructure by which services are provided, with the effect of promoting effective competition in upstream and downstream markets' (s.69E). Section 168A(b) specifically allows for multipart pricing and price discrimination when they aid efficiency. Price discrimination is generally not a feature of highly competitive markets.
>
> More generally, regulation involves choosing a form of regulation and ancillary mechanisms, for example cost pass-throughs, review triggers, and the frequency of resets, to achieve e**conomic efficiency** and meet specific statutory objectives. The package of regulatory arrangements affects risk and the cost of capital and is designed to compensate the firm to support **efficient investment**.[6]

30. The QCA has emphasised that, in achieving its objective of economic efficiency, it conducts regulation to satisfy its NPV = 0 principle, and this has led the QCA to align the term of the risk-free rate with the length of the regulatory period.

31. However, as set out in more detail below, it is important to note that the NPV=0 principle only implies that the term of the discount rate should match the length of the regulatory period if the end-of-period asset value is known with 100% certainty from the beginning of the period. Otherwise, the NPV=0 principle implies that a long-term discount rate should be adopted, consistent with the standard commercial practice.

32. That is, the NPV=0 principle does not require that the term of the risk-free rate must be aligned to the term of the regulatory period in *all* cases – only in the special case where the end-of-period asset value is known with 100% certainty from the beginning of the period.

Implications for allocative efficiency

33. We now consider the case where a regulator aligns the term of the risk-free rate with the term of the regulatory period on the basis of the regulator's belief that the end-of-period market value of the asset *is* known with 100% certainty – but where investors do not believe that the market value of the asset is guaranteed, but is uncertain. In this case, investors will assess their required return using a

[5] QCA Market Parameters Decision, Appendix B, p. 49, Paragraph 1.
[6] QCA Market Parameters Decision, Appendix B, pp. 48-49.

long-term risk-free rates (consistent with their standard commercial practice) whereas the regulator will set the allowed return on the basis of the (lower) shorter-term risk-free rate.

34. In our view, setting the allowed return on regulated assets below the return that investors expect to receive on comparable assets in a commercial setting has clear examples for allocative efficiency. Setting the allowed return below the investor's required return will act as a disincentive for investment and allocative inefficiency.

35. Consequently, the consideration that is relevant to the question of economic efficiency includes whether investors do consider the end-of-period market value of the asset to be guaranteed, such that a short-term risk-free rate would be appropriate. However, we note that there is no evidence to support the notion that investors consider the end-of-period asset value to be guaranteed. Rather, for example, the practice of independent experts and equity research analysts is to use a long-term risk-free rate when valuing regulated assets. Also, consider the investors that are now preparing to bid on the regulated assets to be offered for sale by the Queensland and NSW governments. The suggestion that those bidders would use materially lower discount rates if the term of the regulatory period were shortened is fanciful. One of their main concerns is regulatory due diligence, and it is certainly not the case that they consider more frequent involvement of regulators as something that would decrease risk and their required return.

36. In our view, setting the allowed return on regulated assets below the return that investors expect to receive on comparable assets in a commercial setting has clear implications for allocative efficiency. Suppose a regulator believes that its regulatory process de-risks an investment such that the required return should be commensurately low. If investors do not share the regulator's views about the extent to which the regulatory process de-risks the asset, the lower allowed return will act as a disincentive for investment and allocative inefficiency.

3. The term to maturity of the risk-free rate

What does NPV=0 mean?

37. In its Market Parameters Decision, the QCA concludes that when estimating the risk free rate component of the regulated rate of return, it will:

> align the term of the risk-free rate with the term of the regulatory cycle.[7]

38. The basis for the position of the QCA is that aligning the term of the risk-free rate with the term of the regulatory period means that the net present value of expected cash flows to a regulated entity is equal to the regulated asset base. In QCA reports this is termed the NPV = 0 principle. We agree that it is appropriate to estimate prices such that the present value of expected cash flows is equal to the asset value. However, we agree with Incenta (2013) in that:

> In this context, the NPV=0 principle says nothing more than that the discount rate should be the correct one for the cash flows being considered.[8]

39. That is, the NPV=0 principle does not say that the term of the risk-free rate must be equal to the length of the regulatory period. Rather, the NPV=0 principle says that the term of the risk-free rate should be appropriate for the cash flows that are being considered by investors.

40. The QCA says that investors need only consider the cash flows through to the end of the regulatory period because the end-of-period market value of the regulated asset is known with 100% certainty from the outset – thus, there is no need to consider any subsequent cash flows. However, we consider that the end of period market value of the assets is not certain, and that investors will consider all cash flows that the asset might generate over its life (as is the case with all other assets).

Key assumptions and their implications

41. In its Market Parameters Decision and its UT4 Draft Decision, the QCA sets out its view that the only way in which the NPV = 0 principle is satisfied is if the term to maturity of the risk-free rate proxy is set equal to the term of the regulatory period. We have previously made the submission that the QCA approach makes an implicit assumption that the interest rates expectations hypothesis holds.[9] The expectations hypothesis is the theory that the difference between yields on bonds of different terms to maturity reflects *only* market expectations of future interest rate changes. So, for example, if the yield on 10-year bonds is higher than the yield on five-year bonds, the expectations hypothesis implies that the differential can be explained *entirely* by the expectation that, in five years' time, there will be higher yields on five-year bonds. In other words, investors expect the same return from (a) investing in a 10-year bond today, and (b) investing in a five-year bond today and then rolling that investment into another five-year bond when the first one matures.

42. The QCA disagrees with our view that its NPV=0 principle relies on the foundational assumption that the expectations hypothesis holds. This disagreement is best explained with reference to the QCA's Market Parameters Decision, *Example 2: The NPV = 0 principle and the expectations hypothesis.*[10]

[7] QCA Market Parameters Decision, Sub-section 3.5, p. 14, Paragraph 2.
[8] Incenta (2013), p. 6.
[9] SFG (2013 RF).
[10] QCA Market Parameters Decision, Appendix B, pp. 45-46.

43. In this example, the QCA documents the setting of a regulated return on assets in which it makes no explicit assumption about expectations for interest rates after the regulatory period. For ease of explanation there are two one-year regulatory periods in the example. There is an assumption about the interest rate in the first regulatory period (5.0%). But the QCA shows that, regardless of whether the interest rate in the second year is 4.0% or 6.0% there is no impact on the allowed return in the first year. On this basis the QCA says that it makes no assumption about whether the expectations hypothesis is true or not.[11]

44. For ease of explanation we refer to this as the *interest rate irrelevance hypothesis*. This hypothesis means that interest rate movements after the regulatory period are irrelevant for setting the regulated rate of return because any movement in future interest rates is reflected in the corresponding movement in the future regulated rate of return.

45. The difference between the view of the QCA and our view can be summarised as follows. We consider that there *is* uncertainty over the market value of the asset at the end of the first regulatory period. In our view, the market value of the asset at the end of the first year will be the present value of the expected cash flows to be received after the first regulatory period. That is, at the end of the first year, investors will estimate the future cash flows they expect the asset to produce and they will discount those expected cash flows back to a present value using a discount rate that reflects the prevailing conditions in the market at that time. This is how the market value of the asset at the end of the first year will be determined.

46. That is, if at the end of the first period, investors were forecasting higher cash flows and if market conditions were such that a lower discount rate was appropriate, the market value of the asset would be higher. Conversely, if investors were forecasting lower cash flows and if market conditions were such that a higher discount rate was appropriate, the market value of the asset would be lower.

47. By contrast, the view of the QCA is that there is no uncertainty over the market value of the asset at the end of the first regulatory period. The assumption that the value of the asset at the end of the regulatory period is already known with 100% certainty at the beginning of the regulatory period is the basis for the QCA's derivation of the NPV=0 principle as it applies to the regulatory setting. If the value of the asset at the end of the regulatory period is not known with certainty, setting the term of the risk-free rate equal to the length of the regulatory period is no longer consistent with the NPV=0 principle.

48. The second last paragraph of the QCA example makes this clear (our emphasis added):

> The correct analytical process (i.e. underlying equations 5-7 above) recognises that the revenues to be received at the end of the second year **will be known** at the end of the first year, and therefore will have a value at the end of the first year of $.20m – **regardless of what the one-year risk free rate is in one year.** So, the discount rate to be applied now to this $.20m value arising in one year **with certainty** is the current one-year risk-free rate of 5.0%.[12]

49. Thus, the key point has been crystallised:

[11] The example of the QCA characterises the debate that has existed over seven years since before the publication of papers by Hall (2007) and Lally (2007a, 2007b). The authors of those two papers continue to hold opposing views as to what is implicitly assumed under the term matching approach of the QCA.
[12] QCA Market Parameters Decision, pp. 45-46.

a) If the value of the asset at the end of the regulatory period is known with certainty right from the start of the regulatory period, setting the term of the risk-free rate equal to the term of the regulatory period will be consistent with the NPV=0 principle; and

b) If the value of the asset at the end of the regulatory period is *not* known with certainty right from the start of the regulatory period, setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle.

The NPV=0 principle and the end-of-period market value

50. The Queensland Treasury Corporation (2014) has submitted that the QCA approach is analogous to assuming that the asset can be sold at the end of the regulatory period for an amount equal to the regulatory asset base. The QCA disagreed with that point on the basis that it "makes no assumption about assets being sold."[13] However, this response misses the point entirely. The QCA implies that the key issue is about whether or not the asset will be sold at the end of the regulatory period – but this is irrelevant. The issue is about the value of the asset at the end of the period – whether the asset is sold or not.

51. That is, QTC make the point that the foundation of the QCA argument is that the market value of the asset at the end of the regulatory period is known with 100% certainty right from the beginning of the regulatory period. The asset has the same value whether or not the owner chooses to sell it. The issue is not about whether the owner might chose to sell, but about whether the value of the asset is known with 100% certainty right from the beginning of the period.

52. We note in Section 5 below that it is not just ourselves and QTC who have submitted that setting the term of the risk-free rate to the length of the regulatory period is only consistent with the NPV=0 principle if the end-of-period market value of the asset is 100% certain from the outset. The same submission has been made by:

a) Incenta (2013); and

b) Officer and Bishop (2008)

and has been accepted by the AER and IPART.

53. For example, Incenta (2013) state that the argument is that the regulatory cash flows have:

> …similar characteristics to a 5 year bond, in that an investment exists at the start of the period, delivers coupons during the period and **delivers a certain residual value** (equivalent to a return of principal from a bond) at the end of the period.[14]

The Lally certainty assumption

54. The QCA's approach to the term of the risk-free rate (and the overall return) and to the NPV=0 principle is based on the work of Lally.[15] In a recent contribution on this issue, Lally (2012 QCA) is very clear about the assumption that serves as the foundation for all of his derivations. He assumes that the regulatory process is such that the market value of the regulated assets at the end of each regulatory period is not subject to any risk:

[13] QCA Market Parameters Decision, Appendix B, p.47.
[14] Incenta (2013), p. 6, emphasis added.
[15] ERA Rate of Return Guideline Explanatory Statement, Appendix 2.

> the output price will be reset to ensure that the value at that time of the subsequent payoffs on the regulatory assets equals the regulatory asset book value prevailing at that time[16]

such that the:

> payoffs at time 4 [the end of the regulatory period in his example] are certain.[17]

55. Lally (2013 QCA) is even more explicit about the fact that the present value principle only requires the term of the return to be set to the length of the regulatory period if the end-of period market value of the asset is known with certainty from the outset. Lally sets out a two-period example in which the regulated asset has a two year life, the initial RAB is \$100, depreciation is \$50 in each period, and the allowed return in the first period is 5%. Consequently, investors will receive cash flows of:

    a) In period 1: \$50 depreciation plus a return on capital of \$100×5%; and

    b) In period 2: \$50 depreciation plus a return on capital of \$50×R_{12}, where R_{12} is the allowed return for the second period, set by the regulator at the end of the first period.

56. Lally then assumes that the market value of the asset at the end of the first period is known for sure right from the beginning of the first period. At the beginning of the first period no one knows what market conditions will prevail at the end of the first period. Consequently no one knows what return investors will require over the second period or what the regulator might allow over the second period. But Lally assumes that the regulator will set the allowed return precisely equal to whatever it is that investors require. This ensures that the market value of the regulated asset at the end of the first period is known for sure right from the outset. Lally (2013, Eq 1) states that:

$$V_1 = \frac{50 + 50\tilde{R}_{12}}{1 + \tilde{R}_{12}} = 50$$

where the R_{12} in the numerator is the regulator's allowed return and the R_{12} in the denominator is the investor's required return.

57. Given that the market value of the asset at the end of the first regulatory period is guaranteed from the outset, the current market value of the asset can be found by discounting the first period regulatory cash flows, plus the known end-of-period market value back over the first regulatory period. Lally (2013) explains that:

> At the end of the first year, the regulated business will therefore receive $V1$ = \$50m plus revenues to cover regulatory depreciation of \$50m and the cost of capital for the first year of \$100m(.05). **Since this sum is known at the beginning of the first year** it can be valued using the prevailing risk-free rate, which is 5%. So the value now of $V1$, plus the revenues received at the end of the first year, is \$100m as follows:[18]

[16] Lally (2012 QCA), p. 14.
[17] Lally (2012 QCA), p. 10.
[18] Lally (2013 QCA), p. 47, emphasis added.

$$V_0 = \frac{(50 + 100 \times 0.05) + 50}{1.05} = 100$$

where the term in brackets is the regulatory allowed cash flow for the first period and the end-of-period market value is known for sure, $V_1 = 50$.

58. In summary, the assumption that the value of the asset at the end of the regulatory period is already known with 100% certainty at the beginning of the regulatory period is the basis for the derivation of the conclusion that the NPV=0 principle requires the term of the risk-free rate (and the overall return) to be set to the length of the regulatory period. If the market value of the asset at the end of the regulatory period is *not* known with certainty, setting the term of the risk-free rate equal to the length of the regulatory period is no longer consistent with the NPV=0 principle.

59. Thus, the key point has been crystallised:

    a) If the value of the asset at the end of the regulatory period *is* known with certainty right from the start of the regulatory period, setting the term of the return equal to the term of the regulatory period will be consistent with the NPV=0 principle – because the asset can be valued with reference to cash flows over the regulatory period only; and

    b) If the value of the asset at the end of the regulatory period is *not* known with certainty right from the start of the regulatory period, setting the term of the return equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle – because the asset would be valued with reference to cash flows extending beyond the end of the regulatory period. If the cash flows that would be considered when valuing the asset extend beyond the five-year period, they would be discounted back to present value using a rate that is longer than the five-year rate. Thus, the present value of the cash flows will not be consistent with the use of a five-year discount rate.

60. Finally, we note that in all of the derivations above, the whole point is to show that the end-of-period market value of the regulated asset was certain from the outset. The RAB was, by definition, certain to be $50 at time 1 – no other value was even possible. What Lally shows is that if the time 1 *market value* of the firm is known for sure, then there is no need to consider subsequent cash flows when estimating the market value of the firm.

61. Indeed, the RAB is not a *value* at all. It is one of a number of inputs that the regulator inserts into a formula to determine what prices the firm is allowed to charge. It is the present value of the future cash flows that will determine the value of the firm.

What if the end-of-period market value is not certain?

62. If the market value of the regulated asset at the end of the first period (V_1) is *not* known with certainty from the outset, the opening market value of the firm would be computed in the standard manner by discounting the expected cash flows over the life of the asset using a discount rate that is appropriate for those cash flows (in terms of risk and duration). The standard valuation calculation in this case is:

$$V_0 = \frac{CF_1}{(1 + R_{02})^1} + \frac{CF_2}{(1 + R_{02})^2}$$

where R_{02} is the investor's required return for a two-period horizon beginning at time 0.[19]

63. That is, if the market value of the regulated asset at the end of the first period (V_1) is *not* known with certainty from the outset, investors would value the asset by discounting the expected cash flows over the two-period life of the asset using the two-period discount rate. In this case, the "present value principle" would require the regulator to set allowed returns based on the two-period rate, not the (usually lower) one-period rate.

The end-of-period market value is either certain or it is not

64. What we have established so far is that:

    a) If the value of the asset at the end of the regulatory period is known with certainty right from the start of the regulatory period, setting the term of the risk-free rate equal to the term of the regulatory period will be consistent with the NPV=0 principle; and

    b) If the value of the asset at the end of the regulatory period is *not* known with certainty right from the start of the regulatory period, setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle.

65. Indeed, the QCA's derivation of the NPV=0 principle relies on the end-of-period asset value being certain from the outset. The reasons why the end-of-period asset value might not be known with certainty are irrelevant – if it is *not* known with certainty right from the start of the regulatory period, the QCA's derivation does not hold and setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle.

66. In particular, the QCA notes that it seeks to properly compensate firms for all relevant systematic and non-systematic risks through its regulatory process. However, the only point that is relevant to the current issue is whether the QCA's regulatory process can guarantee the market value of the asset at the end of the regulatory period. If it cannot, then setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle.

67. For example, the QCA states that:

> The QCA does not consider that the presence of perceived systematic or non-systematic risk applying to recovery of the RAB should suggest the term chosen for measuring the risk-free rate.
>
> Investors might perceive that recovery of the RAB could entail some residual regulatory risk. However, to the extent such risk is systematic, it will be compensated through an appropriate estimate of the regulated firm's asset beta. The QCA's view is that providing a firm with a longer term risk-free rate as some kind of compensation for this perceived risk would be double-counting. If such risks are nonsystematic, they must relate to the expectation of a loss from uncompensated risks implicit in the regulatory contract. Such risks can be dealt with through other mechanisms.[20]

[19] Note that it is also theoretically appropriate to discount the first cash flow at the one-period zero-coupon discount rate and the second cash flow at the two-period zero-coupon discount rate. But this is equivalent (by construction) to discounting both cash flows at the two-period coupon rate R_{02} as above. Using a single rate for all cash flows over the life of the asset is also consistent with the uniform market practice.

[20] QCA Market Parameters Decision, Appendix B, p. 47, Paragraphs 5-6.

68. That is, the QCA makes the point here that if the end-of-period asset value is not 100% certain it may vary. This variation will either be related to market movements (i.e., systematic) or it will be independent of market movements (i.e., nonsystematic). This point is obviously true, but it is also irrelevant.

69. It does not matter whether the variation in the end-of-period asset value is systematic or non-systematic. If there is any variation in the end-of-period asset value, setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle.

70. The QCA's discussion about compensation for systematic risk is a red herring. The QCA provides compensation for systematic risk via the equity beta, which it estimates with reference to comparable commercial firms.[21] That is, the regulated firm receives the same compensation for systematic risk as do comparable commercial firms. Indeed the only thing that might separate the regulated firm from the comparable commercial firms is the possibility that the regulated firm might have a known market value at the end of the regulatory period whereas a commercial firm does not. If the end-of-period market value of the regulated firm *is* known with certainty from the outset, there is an argument for aligning the term of the risk-free rate to the length of the regulatory period. If the end-of-period market value is *not* guaranteed, the regulated firm is not materially different from the commercial firm and the regulated firm should use the same long-term risk-free rate that is used by the comparable commercial firms.

71. In summary, the QCA may well seek to provide proper compensation for all sorts of risks. But after all of that the end-of-period market value of the asset is either known with 100% certainty or it is not. If not, there is no basis for setting the term of the risk-free rate to the term of the regulatory period.

72. Our point is that it is not appropriate to assume that the asset base has a certain value at the end of the regulatory period. Because there is risk associated with the market value at the end of the regulatory period, the cost of capital reflects expectations for all future cash flows. And once the asset is valued using all future cash flows a long-term risk-free rate must be used.

Potential regulatory responses

73. The foregoing discussion can be summarised as follows:

    a) If the value of the asset at the end of the regulatory period is known with certainty right from the start of the regulatory period, setting the term of the risk-free rate equal to the term of the regulatory period will be consistent with the NPV=0 principle; and

    b) If the value of the asset at the end of the regulatory period is *not* known with certainty right from the start of the regulatory period, *for whatever reason*, setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle.

74. If a regulator argues that the derivation of the NPV=0 principle does not require that the end-of-period asset value must be known with 100% certainty right from the beginning of the period, they would be demonstrably wrong. A mathematical proof establishes this point.

75. Consequently, we assume that the regulator accepts that the NPV=0 principle requires that the end-of-period asset value must be known with 100% certainty, as the AER and IPART have done. In this case, the NPV=0 principle would only be relevant if the regulator considered that the end-of-

[21] Or at least with reference to commercial firms that the QCA considers to be comparable.

period asset market value *was* known with 100% certainty. This would be the case, for example, if the regulator considered that its regulatory process was such that it could guarantee that at every regulatory determination it would set allowed revenues such as to *exactly* compensate investors for every one of the building block components.

76. If a regulator really did believe that its regulatory process guaranteed the end-of-period market value of the asset with 100% certainty, that certain value should be set out in the regulatory determination for the benefit of all stakeholders.

Conclusion

77. For the reasons set out above, our view is that:

    a) The market value of the regulated asset at the end of the regulatory period is not certain right from the beginning of the regulatory period;

    b) Consequently, setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle; and

    c) A long-term risk-free rate should be used, which is consistent with:

        i) The long-term (uncertain) cash flows that determine the value of the asset; and

        ii) Commercial practice.

4. Consistency between the risk-free rate and the market risk premium

The current practice of the QCA

78. In the CAPM, the market risk premium represents the extent to which the expected return on the market portfolio exceeds the risk-free rate:

$$r_e = r_f + \beta(r_m - r_f).$$

79. The QCA has adopted an estimate of the market risk premium of 6.5% in its Market Parameters Decision and in its UT4 Draft Decision. This estimate is formed on the basis of historical market returns, figures reported in survey evidence and independent expert reports, an estimate formed from applying the dividend discount model to analyst dividend expectations, and other market-based information.[22]

80. The QCA makes it clear that its analysis of the market risk premium is made with reference to the yield on 10-year bonds.[23] The 10-year government bond yields adopted in the Market Parameters Decision and the UT4 Draft Decision, and the associated estimates of the required return on the market portfolio, are set out in Table 1 below.

Table 1. QCA MRP estimates

QCA Decision	Estimation Date	10-year Government Bond Yield	MRP	Required Market Return
Market Parameters	Sep-13	4.29%	6.50%	10.79%
UT4 Draft	Oct-13	4.06%	6.50%	10.56%

Source: QCA Market Parameters Decision and UT4 Draft Decision.

81. In its UT4 Draft Decision, the QCA then implements the CAPM using a fixed 6.5% MRP and an estimate of the four-year risk-free rate of 3.21%.[24] This implies an estimate of the required return for the average firm of:

$$\begin{aligned} r_e &= r_f + \beta(r_m - r_f) \\ &= 3.21\% + 1 \times 6.5\% = 9.71\%. \end{aligned}$$

82. That is, having determined that the required return for the average firm is 10.56%, the QCA then sets the allowed return for Aurizon as though the required return for the average firm is 9.71%.

83. Similarly, in its Market Parameters Decision, the QCA relied upon bond yields from December 2013 to reach its conclusions. The 10-year bond yield from December 2013, used by the QCA, was 4.29%.[25] The corresponding yield to maturity on Commonwealth government bonds with maturity of two, three and five years to maturity was 2.73%, 2.98% and 3.49%. This means that if the QCA

[22] QCA Market Parameters Decision, Sub-section 4.3.4, p. 23, Paragraph 3.
[23] QCA Market Parameters Decision, Sub-section 4.3.1, p. 20, Footnote 18; and Appendix C, p. 52, Paragraph 4.
[24] QCA UT4 Draft Decision, p. 211.
[25] QCA Market Parameters Decision, Sub-section 4.3.1, p. 20, Footnote 18; and Appendix C, p. 52, Paragraph 4. We have verified that the average annualised yield to maturity on 10-year Commonwealth Government bonds, as reported by the Reserve Bank of Australia (**RBA**), for the 20 trading days ending 31 December 2013, was 4.29%. We computed the corresponding average annualised yield over the same time period for bonds with maturity of two, three and five years.

was to regulate an entity using a five-year regulatory cycle it would do so as if the required market return was 9.99%.[26] But the QCA's own analysis is that its estimate of the required market return is 10.79%.[27]

GasNet inconsistency

84. In explaining its reasons for adopting a 10-year term for the risk-free rate, the AER recently had regard to the *GasNet* decision of the Australian Competition Tribunal:

> The Australian Competition Tribunal (the Tribunal) decided in its 2003 GasNet decision that 10 years is the appropriate term of the risk free rate in the CAPM. The Tribunal came to this view on the basis of two reasons:
>
> • as the MRP was estimated using a 10 year risk free rate, consistency demands that a 10 year risk free rate be used in the CAPM, and
>
> • it is a convention of economists and regulators to use a relatively long-term risk free rate where the life of the assets is relatively long.[28]

85. In its GasNet decision, the Tribunal stated that:

> The position of the ACCC was that it was required to make an evaluative judgment for the purposes of s 8.30 as to what the appropriate Rate of Return should be. Its position was that although consistency was desirable, best estimates have to be used when perfect information is not available, and that at various stages of the CAPM, approximations and estimates are required. The ACCC contends that such a use of estimates and approximations does not invalidate the use of the CAPM. While it is no doubt true that the CAPM permits some flexibility in the choice of the inputs required by the model, it nevertheless requires that one remain true to the mathematical logic underlying the CAPM formula. In the present case, **that requires a consistent use of the value of r_f in both parts of the CAPM equation where it occurs** so that the choice was either a five year bond rate or a ten year bond rate in both situations.[29]

86. The Tribunal went on to conclude that:

> The ACCC erred in concluding that it was open to it to apply the CAPM in other than the conventional way to produce an outcome which it believed better achieved the objectives of s 8.1. In truth and reality, **the use of different values for a risk free rate in the working out of a Rate of Return by the CAPM formula is neither true to the formula nor a conventional use of the CAPM**. It is the use of another model based on the CAPM with adjustments made on a pragmatic basis to achieve an outcome which reflects an attempt to modify the model to one which operates by reference to the regulatory period of five years. The CAPM is not a model which is intended to operate in this way. **The timescales are dictated by the relevant underlying facts in each**

[26] Expected market return = risk free rate estimated with a five year term to maturity + market risk premium = 3.49% + 6.50% = 9.99%.
[27] Expected market return = risk free rate estimated with a ten year term to maturity + market risk premium = 4.29% + 6.50% = 10.79%.
[28] AER Draft Rate of Return Guideline Explanatory Statement, p. 182.
[29] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6, Paragraph 46, emphasis added.

> **case and for present purposes those include the life of the assets and the term of the investment**. [30]

87. In summary, the practice of the QCA in using the 10-year yield to estimate the risk-free rate in one part of the CAPM formula, and the 5-year yield to estimate the risk-free rate in another part of the same CAPM formula is inconsistent with the Tribunal's *GasNet* ruling.

The internal inconsistency in the QCA approach

88. In response to submissions that this represents an inconsistency the QCA has reached the following conclusion:

> [T]he QCA has considered the arguments presented for applying a five-year rate for consistency with the first term in the CAPM and re-estimated the market risk premium using a five-year rate. The results of this analysis reinforce the QCA's conclusion that a market risk premium of 6.5% is reasonable.[31]

89. The QCA has determined that a market risk premium of 6.5% is reasonable, regardless of whether the market risk premium is applied to a risk-free rate with a term to maturity of one year, five years or ten years. The basis for this conclusion is the QCA's analysis of the historical yields on bonds with different maturities. The QCA does not report exactly what is the basis for its conclusion, but our inference is that the QCA considers the difference between the yields on bonds of different maturities to be small.[32] In particular, the QCA appears to mechanistically round its MRP estimate to the nearest 0.5%. If this rounding involved an upward adjustment that was of the same order of magnitude as the difference between the 10-year and five-year government bond yields, that would explain the QCA's conclusion above.[33]

90. For example, we computed the average yield to maturity on bonds of two, three, five and ten years to maturity from 3 January 1995 to 2 October 2014. These average figures are 5.20%, 5.32%, 5.51% and 5.78%. That is, on average there has been an upward-sloping yield curve over the last 20 years. Investors require a premium to encourage them to invest in bonds with a longer term to maturity. The average yields on Commonwealth Government bonds with different terms to maturity are presented in Figure 1.

91. The difference between the average yield to maturity on 10-year bonds and bonds with a shorter term to maturity is 0.59% in comparison to the two-year bond, 0.47% in comparison to the three-year bond and 0.27% in comparison to the five-year bond. The QCA may well have an opinion that these differences in average yields are small. This might then lead the QCA to conclude that the inaccuracy in having inconsistent estimates of the risk-free rate in the same CAPM equation is likely to be relatively small, on average. However, there are two problems with this conclusion:

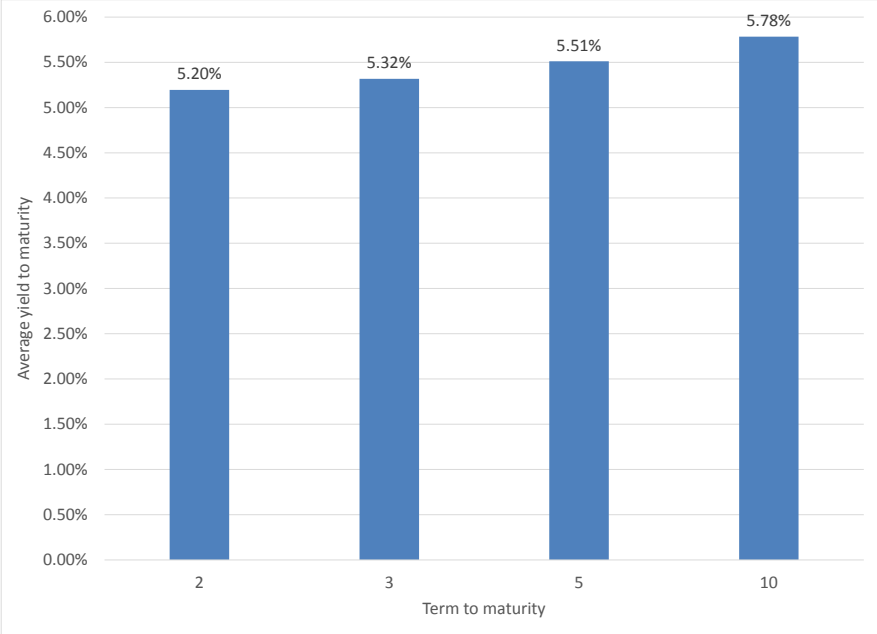
    a) There is no need to have any inaccuracy at all. The QCA could still estimate the MRP in exactly the same way as it currently does. It would then add the contemporaneous 10-year

[30] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6, Paragraph 46, emphasis added.
[31] QCA Market Parameters Decision, p. 52.
[32] From reading the QCA Market Parameters Decision, this was the only inference we were able to draw. If our inference is not correct, and there is a different basis for the QCA conclusion, we welcome any information from the QCA to support a different inference and can revise our report.
[33] However, this would leave the QCA in the position of having to explain (a) whether this leaves any room at all for the QCA to have regard to any evidence other than its four usual approaches for estimating MRP, and (b) why the same conclusion would apply to the UT4 Draft Decision where there was no rounding of the mean MRP estimate.

government bond yield to produce an estimate of the required return on the market portfolio. That estimate would then be inserted into the CAPM equation as r_m. The QCA would then insert whatever value it believes is appropriate for the risk-free rate – but would insert the same value in both places. This is no more complex and involves no additional cost relative to the QCA's current approach. It does, however, have the benefit of being internally consistent; and

b) Even if the difference between the 5-year and 10-year government bond yields are small *on average*, they can be very large at the time of a particular determination.

Figure 1. Average yield to maturity on Commonwealth government bonds 1995 to 2014



Source: RBA.

92. Even if the QCA reaches the conclusion that the differences in average yields across bonds of different maturities is small, the differences in yields that prevail at particular points in time are much larger. In Figure 2 we present the difference between the 20 day average of 10-year bond yields and yields on bonds with five, three and two years to maturity. Over the last 20 years the figures show the following ranges for the difference between yields on 10-year bonds and bonds with different terms to maturity. All figures reported below are based upon 20 day averages, consistent with the QCA approach.

    a) The difference between 10-year bond yields and two-year bond yields ranges from –0.67% to +1.75%.

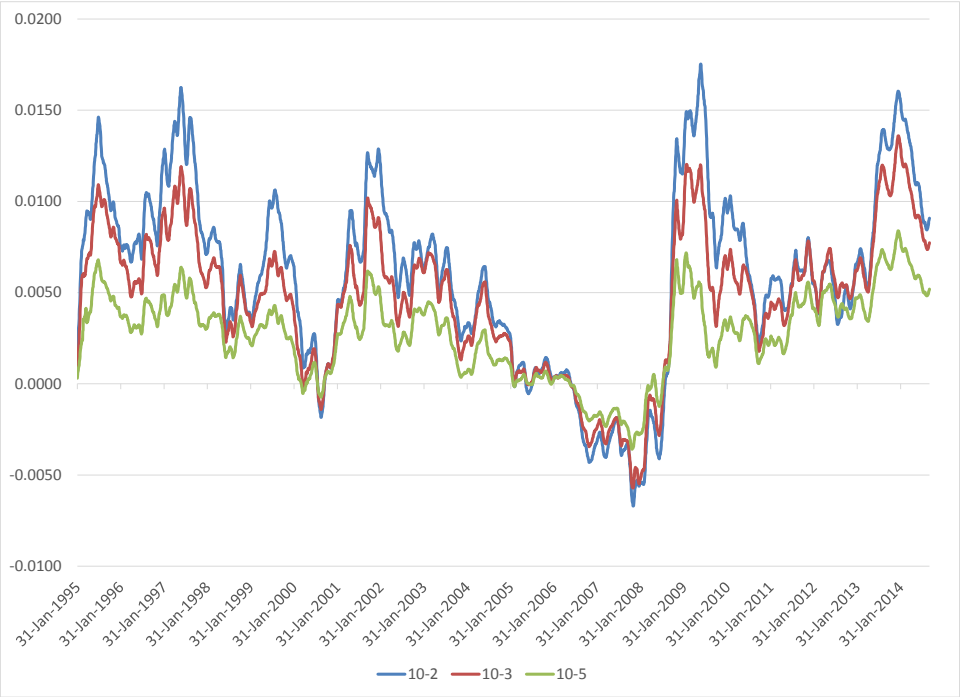
    b) The difference between 10-year bond yields and three-year bond yields ranges from –0.57% to +1.36%.; and

    c) The difference between 10-year bond yields and five-year bond yields ranges from –0.36% to +0.84%.

93. Figure 2 illustrates that the difference between 10-year bond yields and five-year bond yields fluctuates substantially over time. The section of the graph above zero on the horizontal axis

represents periods in which the yield curve is upward-sloping, which is the majority of the time. In particular, 10-year bond yields exceeded 5-year bond yields 88% of the time. So if the QCA makes its best estimate of the market risk premium with reference to 10-year bond yields, and applies that premium to a five-year bond yield for an entity with a five-year regulatory period, there is a 5-in-6 chance the QCA will under-estimate the market return.

Figure 2. Difference between 20 day average of 10 year yields and 5, 3 and 2 year yields



Source: RBA.

94. The UT4 Draft Decision provides an ideal illustration of the effect of the QCA's internal inconsistency, as it coincides with a steep upward-sloping yield curve. The ten- and four-year bond yields that prevailed for the UT4 Draft Decision were 4.06% and 3.21%, respectively, estimated as 20-day averages. Every estimate of the market risk premium compiled by the QCA was made with reference to the reference to the 10-year bond yield. The analysis has the clear implication that the QCA's best estimate of the required market return was the 10-year bond yield plus 6.50%, or 4.06% + 6.50% = 10.56%. Yet, as set out above, it is equally clear that the QCA has set the allowed return as for Aurizon as though the required market return was 9.71%. That is, having determined that the required return for the average firm is 10.56%, the QCA then sets the allowed return for Aurizon as though the required return for the average firm is 9.71%.

5. Consistency with regulatory practice

Leading regulatory practice is to adopt a 10-year term

95. The current Australian regulatory practice is to use a ten-year term to maturity when estimating the risk-free rate. For example, in its recent draft Rate of Return Guideline, the AER concluded that:

> On balance, we are more persuaded by the arguments for a 10 year term, than the arguments for a five year term.[34]

96. The AER also notes that the Australian Competition Tribunal advocates the use of a 10-year term, as set out above.

97. IPART, which has previously adopted a 5-year term to maturity, has recently announced that it will now adopt a 10-year term:

> We agree with stakeholder views that increasing the TTM [term to maturity] from 5 years to 10 years for all industries is more consistent with our objective for setting a WACC that reflects the efficient financing costs of a benchmark entity operating in a competitive market.[35]

Regulatory practice is to adopt a 10-year term because the end-of-period market value of the asset is not guaranteed.

98. As set out above, the AER has rejected the QCA approach of setting the term of the risk-free rate equal to the term of the regulatory period. The AER recognises that aligning the term of the risk-free rate to the term of the regulatory period is only justified in the case where the end-of-period market value of the asset is known with certainty from the outset:

> In Lally (2012), the argument for a five year term relies on the 'present value principle'—the principle that the net present value (NPV) of cash flows should equal the purchase price of the investment.
>
> Lally stated that the present value principle is approximately satisfied only if the term of equity matches the regulatory control period. Lally illustrated this point using a numerical example in which there is no risk, so the return on equity equals the risk free rate. The example sets allowed revenues at the beginning of the regulatory control period using the yield to maturity on a five year risk free bond. Lally showed that in this example, the 'present value principle' is approximately satisfied: the NPV of the cash flows is approximately equal to the book value of the assets.
>
> The reason why the principle is satisfied is that the structure of the bond payments and the structure of the regulatory payments are similar…The core intuition behind the argument for a five year term is that the cash flows from the building block model have a similar structure to the cash flows from a five year bond. Put simply, the argument is that an equity investment in a regulated business is—at least in respect of its term—like an investment in a five year bond.

[34] AER Draft Rate of Return Guideline Explanatory Statement, p. 181.
[35] See IPART (2013), Review of WACC Methodology, December, p. 12.

> The central issue in the debate about the term of equity, therefore, is the extent to which the cash flows from an equity investment in a regulated business are like the cash flows from a five year bond.[36]

99. However, the AER goes on to note that the cash flows from an equity investment in a regulated business are *not* like the cash flows from a five year bond in a very important respect – whereas a bondholder receives a known payment at maturity, the infrastructure equity owner does not. Rather, infrastructure equity (like all equity) is risky and the value of shares five years into the future cannot possibly be known with certainty. Using the same Lally derivation on which the QCA now relies, the AER notes that this necessary precondition does not hold in practice, but only under certain theoretical assumptions:

> In Lally's calculation above, the cash flow in each year is the allowed revenue net of opex and capex, except in the final year, where the closing value of the regulatory asset base (RAB) is included in the cash flow. That is, the assumption is that the investor receives a cash payment equal to the RAB in the final year of the regulatory control period. While under certain assumptions, the market value of equity is equal to the residual value of the RAB, these assumptions may not hold in reality.[37]

100. The AER then cites a report by Incenta (2013) which explains that:

a) The argument that the term of the risk-free rate should be set equal to the length of the regulatory period relies on the end-of-period market value of the asset being known with certainty from the outset; and

b) Since this necessary precondition does not hold, the term of the risk-free rate should *not* be set to the length of the regulatory period:

> …investors are unlikely to evaluate regulated assets with reference to a 5 year bond because – unlike the case of the bond – the residual value at the end of each 5 year period is inherently risky. This is because the residual value is not returned in cash, but rather comprises a 'value' whose recovery remains at risk from future regulatory decisions and changes in the market (both technological changes and changes to customer preferences).[38]

101. The AER also notes that the same point has been made by Officer and Bishop (2008):

> Officer and Bishop said that the argument for a five year term would be correct only if after five years, in the event that 'they [the owners of the regulated business] choose to walk away from the asset, they would be fully compensated'. Officer and Bishop propose, however, that the owners are not, in reality, guaranteed of such compensation—the problem is that there is no guarantee that the secondary market will deliver a price equal to the value of the equity component of the RAB. [39]

102. The AER concludes that the term of the risk-free rate should be set to 10 years and not to the length of the regulatory period.

[36] AER Draft Rate of Return Guideline Explanatory Statement, p. 183.
[37] AER Draft Rate of Return Guideline Explanatory Statement, p. 183.
[38] AER Draft Rate of Return Guideline Explanatory Statement, p. 183.
[39] AER Draft Rate of Return Guideline Explanatory Statement, p. 183.

Other issues raised by Incenta

103. In concluding that the term of the risk-free rate should be set to 10 years, the AER also cites two other points raised by Incenta. Incenta provided evidence (consistent with that set out above) that the commercial practice is to set the term of the risk-free rate to 10 years:

> First, Incenta presented the results of a survey of market practitioners which asks them whether they use a 10 year or a five year rate for valuing regulated equity. In this survey, 12 practitioners and two independent experts were asked specifically about 'the term of the risk free rate in a CAPM valuation of regulated infrastructure assets with a five year regulatory cycle'. All of those surveyed stated they used a 10 year rate. [40]

104. Incenta also advise that if the term of the risk-free rate was set to 10 years, the MRP would need to be re-estimated on a consistent basis:

> Second, Incenta observed that a move to a five year term for equity would have implications for our estimates of the MRP. For example, the evidence relating to historical estimates of the MRP have been calculated using a 10 year risk free rate. If we were to move to a five year term, this historical average may need to be recalculated (or approximated) using a five year risk free rate. The data we currently use to calculate historical averages of the MRP covers a significantly longer period than the data available for the five year risk free rate (which only extends back to the 1970s). [41]

105. The AER concludes that these "additional considerations support not adopting a five year term." The AER then confirms that it will maintain its use of a 10 year term. [42]

[40] AER Draft Rate of Return Guideline Explanatory Statement, p. 184.
[41] AER Draft Rate of Return Guideline Explanatory Statement, p. 184.
[42] AER Draft Rate of Return Guideline Explanatory Statement, p. 184.

6. References

Australian Competition Tribunal, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6.

Australian Energy Regulator, 2013, *Better regulation: Explanatory statement to the draft rate of return guideline,* August.

Deloitte, 2012, *ING Real Estate Community Living Group – Independent expert's report and Financial Services Guide,* 24 April 2012.

Economic Regulation Authority, 2013, *Appendices to the Explanatory Statement for the Rate of Return Guideline,* 16 December.

Economic Regulation Authority, 2013, *Explanatory Statement for the Rate of Return Guideline,* 16 December.

Grant Samuel, 2012, *Hastings Diversified Utilities Fund – Independent Expert's report,* 3 August 2012.

Hall, 2007, "Comment on Regulation and the term of the risk rate: Implications of corporate debt," *Accounting Research Journal,* 20, 81–86.

Incenta, 2013, Term of the risk-free rate for the cost of equity, June, http://www.aer.gov.au/sites/default/files/Report%2014%20-%20Term%20of%20the%20Risk%20Free%20Rate%20%28Final%29%20-%2028%20June.pdf.

Independent Pricing and Regulatory Tribunal, 2013, *Review of WACC methodology: Research – Final report,* December.

Lally, M., 2007a, "Regulation and the term of the risk free rate: Implications of corporate debt," *Accounting Research Journal,* 20, 73–80.

Lally, M., 2007b, "Regulation and the term of the risk free rate: Implications of corporate debt – A rejoinder," *Accounting Research Journal,* 20, 87–88.

Lally, M., 2012 QCA, *The risk free rate and the market risk premium,* Report for the Queensland Competition Authority, 23 August.

Lally, M., 2013 QCA, *Response to submissions on the risk-free rate and the MRP,* Report for the Queensland Competition Authority, 22 October.

Officer R. and S. Bishop, 2008, "Term of the Risk-Free Rate – Commentary," *Value Advisor Associates*, September.

Queensland Competition Authority, 2014, *Cost of capital: Market parameters – Final decision*, August.

Queensland Competition Authority, 2014, Aurizon Network 2014 Draft Access Undertaking – Maximum allowable revenue, September.

Queensland Treasury Corporation, 2014, *The risk-free rate and the market risk premium,* 20 January.

SFG Consulting, 2013 IER, *Evidence on the required return on equity from independent expert reports,* Report for the Energy Networks Association, June.

SFG Consulting, 2013 RF, *Response to the QCA approach to setting the risk-free rate,* 25 March.

Commentary on the systematic risk analysis of Aurizon Network by the Queensland Competition Authority

Report for Aurizon Network

21 November 2014

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Contents

1. Background and conclusions

Overview and instructions

1. SFG Consulting has been retained by Aurizon Network Pty Ltd (**Aurizon**) to comment on the regulated rate of return set by the Queensland Competition Authority (**QCA**) in its UT4 Draft Decision.[1] The specific aspect of the QCA's determination that we address in the current report is the estimate of equity beta (β_e). The equity beta estimate is a component of the Capital Asset Pricing Model (**CAPM**) which is used by the QCA to estimate the allowed return to equity holders, also termed the cost of equity capital.

2. The QCA has adopted an estimate of the equity beta for Aurizon of 0.8.[2] This means that the QCA estimates that Aurizon shareholders bear systematic risk which is 80% of the systematic risk exposure of the market portfolio of all risky assets, despite Aurizon having almost twice the leverage of the average firm.[3]

3. In this report we review the analysis conducted by the QCA set out in its UT4 Draft Decision.

Summary of conclusions

4. Our primary conclusion is that an equity beta estimate of 1.0 is appropriate for Aurizon.[4] As explained in our earlier submissions on this issue, our approach is to compute beta estimates for a set of comparable firms and weight them appropriately. Our view is that a number of factors or dimensions are relevant when selecting comparable firms. Some firms will be more comparable in one dimension (industry), other firms will be more comparable in other dimensions (form of regulation), and still other firms will be more comparable in other relevant dimensions. Our approach is to apply weights depending on how comparable each firm might be across the range of relevant dimensions.

5. By contrast, the QCA relies entirely upon quantitative evidence from businesses associated with ports, energy, water, and toll roads. But not a single piece of accounting or market data relating to any rail or transport business has any impact whatsoever on the allowed return on equity for Aurizon Network.

6. If *any* material weight at all is assigned to any railroad or transportation firms, the result would be a higher equity beta estimate. That is, the only way the QCA can maintain an equity beta estimate as low as 0.8 is by using some sort of multi-stage assessment method that entirely eliminates all railroad and transport firms from receiving any consideration. In our view, there is no reasonable basis for such an approach.

[1] QCA (2014).
[2] QCA (2014), Sub-section 10.8.2, p. 254.
[3] Systematic risk, also termed market risk, economic risk, or non-diversifiable risk, reflects the risk associate with overall economic conditions. This can be contrasted with non-systematic risk, also termed company-specific risk, or diversifiable risk.
[4] SFG Consulting (2014b), Section 4, p. 15.

2. Analysis of the QCA estimate of equity beta for Aurizon Network

Proposed approach and estimate

7. In its UT4 Draft Decision, the QCA's estimate of an equity beta of 0.8 is based on the following input assumptions, **an estimate of asset beta (β_a) of 0.45**, a corporate tax rate (τ) of 30%, an estimated value for imputation credits (γ, or gamma) of 0.47, leverage (Debt/Value, or D/V) of 55%, and a debt beta (β_d) of 0.12.[5] This leads to a computation of the equity beta of 0.79, as shown below, which the QCA rounds to 0.80.

$$\begin{aligned}\beta_e &= \beta_a \times \left\{1 + \frac{D}{E} \times [1 - \tau \times (1 - \gamma)]\right\} - \beta_d \times \frac{D}{E} \times [1 - \tau \times (1 - \gamma)] \\ &= 0.45 \times \left\{1 + \frac{0.55}{0.45} \times [1 - 0.30 \times (1 - 0.47)]\right\} - 0.12 \times \frac{0.55}{0.45} \times [1 - 0.30 \times (1 - 0.47)] \\ &= 0.45 \times 2.03 - 0.12 \times 1.03 \\ &= 0.91 - 0.12 \\ &= 0.79.\end{aligned}$$

8. This equation shows that the conclusion of the QCA of an equity beta estimate of 0.8 is underpinned by its assessment of the asset beta, estimated at 0.45. The asset beta represents the systematic risk the shareholders would be exposed to in the absence of any debt finance. The increase in the asset beta of 0.45 to the equity beta of 0.8 is due to the increased risk borne by equity holders as a result of the firm issuing debt that ranks ahead of equity. Borrowing increases the volatility of returns to equity holders, and hence their required return, and the increase in systematic risk is measured by the QCA using the re-levering equation above.

The basis of the QCA beta estimate

9. The QCA's estimate of asset beta is based upon analysis provided by Incenta Economic Consulting in two reports.[6] There are three relevant asset/equity beta estimates that are considered:

   a) A lower bound asset beta estimate of 0.35[7], which corresponds to an equity beta estimate of **0.59**. The basis for this lower bound is that this is the estimated asset beta of the Dalrymple Bay Coal Terminal (DBCT) compiled in an independent expert report by Grant Samuel;

   b) An asset beta estimate of 0.42,[8] which corresponds to an equity beta estimate of **0.73**. The basis for this asset beta estimate is that it is the median asset beta estimate for a sample of 77 regulated energy and water business listed in Australia and in other markets; and

   c) An asset beta estimate of 0.49[9], which corresponds to an equity beta estimate of **0.87**, for a sample of seven toll road businesses listed in Australia and other markets.

10. The three asset/equity beta estimates reported above form a range of estimates for the asset beta of 0.35 to 0.49, and a corresponding range for equity beta estimates of **0.59 to 0.87**.

[5] QCA (2014), Sub-section 10.8.2, p. 254, and Sub-section 10.8.1, p. 240.
[6] Incenta Economic Consulting (2013, 2014).
[7] QCA (2014), Sub-section 10.8.2, p. 252; Incenta Economic Consulting (2013, 2014), Sub-section 1.1, p. 6;
[8] QCA (2014), Sub-section 10.8.2, p. 252; Incenta Economic Consulting (2013, 2014), Sub-section 1.5, p. 19.
[9] QCA (2014), Sub-section 10.8.2, p. 252; Incenta Economic Consulting (2013, 2014), Sub-section 1.5, p. 19.

11. In its UT4 Draft Decision, the QCA states that its preferred set of comparator firms for benchmarking is regulated energy and water utilities.[10] The QCA concluded that an equity beta of 0.8 was appropriate, on the basis of imprecision in beta estimation, regulatory certainty, and investment incentives.[11]

Relevant evidence not considered by the QCA

12. In its UT4 Draft Decision, the QCA specifically excluded consideration of beta estimates from the following firms:[12]

    a) U.S.-listed railroads:

        i) According to the regression-based estimates we compiled for nine U.S.-listed railroads the median asset beta estimate is 0.74[13] and the corresponding equity beta estimate at 55% leverage is **1.38**; and

        ii) According to analysis on seven railroads listed in Australia and overseas compiled by Incenta, the median asset beta estimate is 0.89[14] and the corresponding equity beta estimate at 55% leverage is **1.68**;

    b) Australian-listed industrial transportation firms:

        i) According to the regression-based estimates we compiled for 29 Australian-listed industrial transportation firms, the median asset beta estimate for these firms is 0.55[15] and the corresponding equity beta estimate at 55% leverage is **1.00**; and

        ii) According to analysis of six airports listed in Australia and overseas compiled by Incenta, the median asset beta estimate is 0.63[16] and the corresponding equity beta estimate at 55% leverage is **1.15**.

13. The key point we have made throughout our submissions to the QCA on this issue is that, if *any* material consideration is assigned to beta estimates from railroads or transportation firms, then the implied asset beta will be considerably greater than 0.45, and the corresponding equity beta will be close to, or above, one.

14. That is, the QCA equity beta estimate of 0.8 can only be supported if no material weight is applied to any other railroad or transportation firm. In its UT4 Draft Decision, the QCA estimates the equity beta for Aurizon's Central Queensland rail network with reference to electricity distributors and water businesses, placing zero weight on rail or transport companies.

[10] QCA (2014), Sub-section 10.8.2, p. 252.
[11] QCA (2014), Sub-section 10.8.2, p. 253.
[12] QCA (2014), Sub-section 10.8.2, p. 252.
[13] See SFG Consulting (2012), Sub-section 4.3.3, Table 11, p. 20 for a table of equity beta estimates and debt/equity figures. The equity beta estimates can be unlevered to the QCA approach described in this paper, and then re-levered assuming a debt/value assumption of 55%.
[14] Incenta Economic Consulting (2013, 2014), Sub-section 1.5, p. 19.
[15] See SFG Consulting (2012), Sub-section 4.2.3, Table 8, p. 17 for a table of equity beta estimates and debt/equity figures. The equity beta estimates can be unlevered to the QCA approach described in this paper, and then re-levered assuming a debt/value assumption of 55%.
[16] Incenta Economic Consulting (2013, 2014), Sub-section 1.5, p. 19.

Inconsistencies in the QCA's reasoning

15. The basis for our report of January 2014[17] is that the QCA has proposed inconsistent reasons for including and excluding particular comparable firms from its analysis. There are two primary issues discussed in that report, both of which are relevant in light of the approach proposed in the QCA's UT4 Draft Decision.

Inconsistent selection of data from the Grant Samuel report

16. First, the lower bound asset beta estimate of 0.35 is justified on the basis that it is from an independent expert "that was arrived at by an informed market participant that was used to inform a transaction, and so it qualifies in our view as an indirect source of market evidence."[18] We noted that *the same independent expert*, in *the same report*[19], made an estimate of the equity beta for WestNet Rail (now Brookfield Rail) and arrived at an equity beta estimate of 1.0 to 1.1, assuming gearing of only 20 to 25%.[20] We repeated this observation in our report of June 2014, but it has not yet been addressed by the QCA.

17. WestNet Rail is excluded entirely from consideration in the advice from Incenta on the basis that the information on WestNet Rail relates to a regulatory decision rather than a financial transaction. However, the *same informed market participant* that estimated the risk of DBCT (which the QCA relied upon) also made an estimate of risk for WestNet Rail, which the expert classified as "regulated by the [ERA with] revenue based upon revenue floors and ceilings for line segments" and with a revenue stream that is "largely stable, underpinned by long term access agreements with its customer base."[21] That is, the same expert report that the QCA relies upon for other purposes set out a list of characteristics for WestNet Rail that shares many similarities with Aurizon Network.

18. This means that:

    a) The lower bound of the QCA's estimated asset beta range of 0.35 to 0.49 is informed solely by the estimated risk of a single coal terminal in Queensland based on an a single independent expert report; even though

    b) An estimate of the risk of a regulated rail network from the *same expert* in the *same report* carries zero weight in reaching a conclusion on beta. The implied asset beta from the expert report is within the range of 0.81 to 0.93, and the corresponding equity beta estimates at 55% leverage are **1.51 to 1.76**.

19. **We also noted in our report of June 2014 that Standard and Poor's relies upon the same WA rail network in its analysis of the Central Queensland Coal Network, and also considers other transportation businesses, but does not consider energy networks.**

20. Our view is that there is no reasonable basis for including the independent expert's assessment of risk for the DBCT as a reference point for beta, while at the same time excluding the independent expert's assessment of risk for WestNet Rail. We do not suggest that WestNet Rail (or any other firm) is a perfect comparator for Aurizon Network, but we do suggest that it has *some* relevance. This is particularly the case where the QCA relies on an independent expert estimate of the equity beta of

[17] SFG Consulting (2014a)
[18] Incenta Economic Consulting (2013, 2014), Sub-section 1.6, p. 23.
[19] Grant Samuel (2010).
[20] SFG Consulting (2014a), Sub-section 2.3.
[21] SFG Consulting (2014a), Sub-section 2.3, pp. 9 to 10.

the DBCT port (which it *does* consider to be a relevant comparator) and that *same* independent expert report contains an analysis of the equity beta for WestNet Rail.

21. The further implication of this view is that either:

    a) Both estimates should be included, in which case the QCA's equity beta range would be 0.59 to 1.76 (with the lower bound based on DBCT and the upper bound based on WestNet); or

    b) Both estimates should be excluded, in which case the QCA's equity beta range would be 0.73 to 0.87 (where the lower bound is based on electricity and water utilities and the upper bound is based on transport companies).

22. By contrast, the QCA selects one beta estimate from the Grant Samuel report and ignores the other. The one it selects is for a port and the one it omits is for a regulated rail network with stable revenues and long-term contracts with its customers. Moreover, the data that the QCA has extracted from the Grant Samuel report has the effect of minimising the resulting estimate of beta. If the QCA had included both beta estimates, excluded both beta estimates, or included only the WestNet beta estimate, its final estimate of the Aurizon beta would have been higher.

The sequential framework produces a biased result

23. The second important issue discussed in our report of January 2014 is that the sequential framework adopted by the QCA and by Incenta for assessing information necessarily leads to retained information being given too much weight relative to relevant information that was excluded in the first stage. The reason for this disproportionate weighting is explained below.

24. At the outset it is important to establish the following fact. There is no single piece of quantitative evidence, relied upon by the QCA in estimating beta, that relates in any way to any rail business. The QCA relies entirely upon quantitative evidence from businesses associated with ports, energy, water, and toll roads. But not a single piece of accounting or market data relating to a rail business has any impact whatsoever on the allowed return on equity for Aurizon Network.

25. The reason this occurs is entirely due to the arbitrary sequential manner in which the QCA considers information. All rail businesses are excluded from the analysis at the first hurdle because the QCA considers that no rail company anywhere in the world is comparable to the Aurizon Network. The QCA does not simply conclude that some other (non-rail, non-transport businesses) are *more* comparable to Aurizon and should receive more weight – the QCA concludes that every other rail business in the world is so materially different from Aurizon that none should receive even any minor amount of weight.

26. By contrast, according to the QCA, water, energy, ports and toll roads businesses are sufficiently comparable to be retained in the dataset at the first hurdle and are therefore eligible to receive some weight. This conclusion is based almost entirely on the form of regulation of these businesses. Water, energy, ports and toll roads businesses have materially different customers and cost structures to a rail network. But these characteristics are apparently not fatal to these businesses' inclusion in the QCA's comparable firm analysis.

27. The use of the form of regulation as a single threshold for inclusion or exclusion of comparable firms continues, despite the lack of any empirical evidence showing any reliable association between equity beta estimates and the form of regulation.[22] The key point is that listed railroads are excluded because their regulation is not sufficiently comparable to the regulation of Aurizon, a view that is purely based

[22] SFG Consulting (2014a), Sub-section 2.2.

upon conjecture as to just how comparable the form of regulation needs to be. According to Incenta, "[t]he only North American railroad traffic that appears to be subject to explicit revenue cap regulation is the Canadian grain traffic, which is regulated by the CTA."[23] The remaining railroads are subject to regulatory oversight of their rates and assess challenges from customers based upon constrained market pricing principles.[24]

28. In short, the relatively less onerous regulation of overseas-listed railroads is a criteria used to exclude this set of firms for comparison at the first hurdle – entirely and irrevocably. Other transportation firms are also excluded at the first hurdle. So what remains is a set of firms that pass the regulation test, but which are materially less comparable on the basis of all other dimensions. The QCA's analysis then needs to live with the industry-based limitations of this remaining set of comparable firms.

29. Had the sequence been performed in the opposite direction, by first considering industry characteristics rather than regulation, railroads would have been retained as the most comparable firms, and all other industries excluded. The analysis would then need to live with the perceived regulation-based limitations of this remaining set of comparable firms.

30. This means that, because Incenta considers that regulation is the "dominating effect" (a term used several times in its report), and regulation is the first criteria used to exclude firms (completely and irrevocably) from consideration, the limitations of industry differences have no bearing – because otherwise there would be no firms left.

31. The point we have made consistently is that Aurizon Network bears some characteristics of many different types of firms that could be considered comparable. We proposed that the best estimate of Aurizon Network's systematic risk comes from consideration of a broader set of evidence, *all* of which points to asset and equity beta estimates above those adopted by the QCA. If the comparator set is increased in any way, the result would be a higher equity beta. The 0.8 equity beta can only be maintained by excluding all rail and transport companies and limiting the comparator set to electricity and water businesses. In its own submissions Aurizon has explained in detail the characteristics that differentiate it from electricity businesses and water business, but Incenta and the QCA appear to be of the view that none of this material needs to be considered because "regulation is the dominating effect."

32. In its UT4 Draft Decision, on a variety of matters, the QCA states that it has had regard to a set of factors and that its estimate "weights them appropriately." Our approach to estimating beta is entirely consistent with that approach. We consider it appropriate to write down a set of beta estimates from the set of comparable firms and weight them appropriately. Our view is that a number of factors or dimensions are relevant when selecting comparable firms. Some firms will be more comparable in one dimension (industry), other firms will be more comparable in other dimensions (form of regulation), and still other firms will be more comparable in other relevant dimensions. Our approach is to apply weight depending on how comparable each firm might be across the range of relevant dimensions.

33. Yet our approach is criticised by Incenta on the following basis.

> SFG's assignment of weights to each comparator industry is arbitrary and, by assigning weight to non-comparable firms, expected to result in an inaccurate estimate. Our view is

[23] Incenta (2013, 2014), Sub-section 3.4.4, p. 43.
[24] Incenta (2013, 2014), Sub-section 3.4.4, p. 43; QCA (2014), Sub-section 10.8.2, p. 247.

> that no weight should be allocated to firms or industries that are not appropriate comparators to Aurizon Network (i.e. do not exhibit similar systematic risk characteristics).[25]

34. The difference between our approach and that of Incenta and the QCA is as follows. We consider that listed railroads are not perfectly comparable to Aurizon Network, so the weight assigned to their beta estimates should be less than one. Remaining weight should be assigned to beta estimates for other firms. In contrast, Incenta and the QCA consider that listed railroads are not comparable to Aurizon Network, so the weight assigned to their beta estimates should be zero. Remaining weight should be assigned to beta estimates of other firms – before any consideration at all of whether those remaining firms are in any way comparable to Aurizon Network on any other relevant dimension.

35. As set out above, and in our previous reports, if *any* material weight at all is assigned to any railroad or transportation firms, the result would be a higher equity beta estimate. That is, the only way the QCA can maintain an equity beta estimate as low as 0.8 is by using some sort of multi-stage assessment method that entirely eliminates all railroad and transport firms from receiving any consideration. In our view, there is no reasonable basis for such an approach.

[25] Incenta Economic Consulting (2013, 2014), Sub-section 6.6.3, p. 91.

3. References

Grant Samuel, 2010. Independent Expert's Report on the Proposal from Brookfield Infrastructure Partners L.P., Annexure A to the scheme of arrangement materials prepared by Brookfield Infrastructure Group Corporation and Prime Infrastructure Group.

Incenta Economic Consulting, 2013 (December) and 2014 (April). "Review of Regulatory Capital Structure and Asset / Equity Beta for Aurizon Network and response to stakeholder comments."

Queensland Competition Authority, 2014. "Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue," Draft decision, September.

SFG Consulting, 2012. "Systematic risk of QR Network," August.

SFG Consulting, 2014a. "Systematic risk of Aurizon Network: Response to reports and submissions to the Queensland Competition Authority," January.

SFG Consulting, 2014b. "Justification for cost of equity parameters," June.

Estimating the market risk premium: Response to UT4 Draft Decision

Report for Aurizon Network

21 November 2014

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Contents

1. Background and conclusions

Overview and instructions

1. SFG Consulting (**SFG**) has been retained by Aurizon Network (**Aurizon**) to provide our views on issues relating to the estimation of the market risk premium (**MRP**) for use in the Capital Asset Pricing Model (**CAPM**) within the regulatory setting. In particular, we have been asked to respond to the Market Parameters Decision and the Aurizon UT4 Draft Decision insofar as they relate to MRP.

Summary of conclusions

2. Our main conclusions are set out below.

The QCA's revised approach

3. The QCA's previous approach to estimating the MRP has been to take the equally-weighted mean of four approaches (Ibbotson, Siegel, surveys and Cornell) and then to round to the nearest full percentage point. This approach resulted in the QCA adopting a fixed 6% estimate in every one of its decisions to date.

4. The QCA's revised approach appears to be to take the equally-weighted mean of the same four approaches and to round to the nearest 0.5%.

5. This mechanistic rounding of the mean to the nearest 0.5% is the only way to reconcile the QCA's Market Parameters Decision with its UT4 Draft Decision. Between those two decisions, the QCA corrected a material error in its survey estimate[1] and updated its Cornell estimate.[2] Although two of the four estimates changed between the two decisions, the QCA adopted a final MRP estimate of 6.5% in both cases. This is consistent with the mean estimate being rounded to the nearest 0.5%. It is inconsistent with any other explanation – in the absence of rounding, a change in the evidence would lead to a change in the estimate.

6. **Recommendation: If the QCA has not simply rounded the mean to the nearest 0.5%, it should explain in its Final Decision how it arrived at the same 6.5% estimate in its Market Parameters and UT4 decisions, even though the evidence differed across these two cases.**

The role of the range

7. In its UT4 Draft Decision, the QCA sets out a range for the current MRP of 5.0% to 7.5%. However, the Draft Decision contains no information about how the range was determined, why it is asymmetric[3] or how it is used – other than to note that the range is "based on our analysis."[4]

8. **Recommendation: If a range is to be computed, the QCA should explain how that range has been determined, what role it plays in the estimation process, and how it has been used.**

[1] The QCA had forgotten to include one of the variables in its own equation for determining the value of imputation credits, and had accidentally interpreted the (incorrect) 18% result as though it was 0.18%.
[2] This reflects a timing difference only.
[3] The bottom of the range is 50 basis points below the minimum of the QCA's four estimates and 40 basis points above the maximum of the QCA's four estimates.
[4] QCA UT4 Draft Decision, p. 237.

The selection of a point estimate

9. The QCA explains its selection of a 6.5% MRP by listing its estimates from each of its four traditional approaches, and then noting that the QCA has "applied [its] best judgment to determine a final point estimate." [5] There is no explanation at all of how the QCA has applied its judgment or how that judgment led to an estimate of 6.5%. There is also no explanation of how the QCA's judgment led it to adopt the same estimate of 6.5% in the Market Parameters and UT4 decisions, even though the set of evidence to which it had regard differed in those two cases.

10. **Recommendation: The Final Decision should contain some explanation of how the QCA's judgment has been applied. For example:**

    a) **Did the QCA's judgment lead it to assign more weight to the estimates from some approaches than others? How much? Why?;**

    b) **Did the QCA's consideration of "conditional information" have any impact on its final point estimate? How much? Why?;**

    c) **How was the range determined? What role does the range have in determining the point estimate? Why was a range determined in the UT4 Draft Decision, but not in the Market Parameters Decision?**

The QCA approach implies that the required return on equity is lower than ever before

11. The QCA's previous approach of adding a fixed 6% MRP to the contemporaneous government bond yield implies that, since the onset of the GFC, the required return on equity has been lower than at any time since World War II. This is because government bond yields have been at historical lows since the onset of the GFC. In our view, the suggestion that the GFC and European debt crises served to *lower* the required return on equity capital is not one that can be treated seriously.

12. The QCA's revised approach also implies that, since the onset of the GFC, the required return on equity has been lower than at any time since World War II. Whereas the previous approach took the contemporaneous government bond yield and added a fixed 6% MRP, the revised approach adds an MRP with some minor variation around 6%.

13. **Recommendation: The Final Decision should:**

    a) **Acknowledge that if the QCA's proposed approach had been applied in every year since World War II, it would never have produced estimates of the required return on equity that are as low as the present estimates;[6] and**

    b) **Explain why the QCA considers that the current required return on equity actually is lower than at any time since World War II, such that its current estimate is appropriate.**

The Siegel approach

14. In our view, the Siegel approach should receive no material weight for three reasons:

[5] QCA UT4 Draft Decision, p. 237.
[6] Alternatively, the QCA could provide an example of where its proposed approach would have produced an allowed return on equity that is lower than the value set out in its Market Parameters Decision.

a) It is not used by other regulators, practitioners, or academics.

b) The data required to implement the Siegel approach is not available, requiring strong assumptions to be made; and

c) The Siegel paper is based on the notion that the high real government bond returns in the 1980s are expected to continue in the future. However, precisely the reverse has occurred.

15. **Recommendation: The Siegel approach should receive no weight. It should certainly not receive the same weight as the Ibbotson and Cornell estimates.**

Independent expert valuation reports

16. The independent expert reports considered by the QCA do *not* support the notion that an ex-imputation required return of 6% can be paired with the contemporaneous five-year government bond yield, as the QCA suggests. That approach produces estimates of the ex-imputation required return on equity that are lower than every single expert estimate considered by the QCA.

17. The use of a median estimate is also statistically misleading in a setting where there are no observations below the median and 41% of the observations above it. In our view, the mean estimate of 6.4% is a more appropriate summary statistic in this case.

18. Even an ex-imputation MRP of 6.4% produces required return on equity estimates that are below those adopted by independent experts – if it is paired with the contemporaneous yield on five-year government bonds. This is because independent experts generally use the 10-year bond when estimating the risk-free rate, and because they include other uplift factors when estimating the required return on equity.

19. **Recommendation: The independent expert reports that were considered by the QCA support an ex-imputation MRP of *at least* 6.4%.**

Wright approach

20. The QCA and AER have both indicated that they will have regard to the Wright approach, and Lally (2013) recommends that the Wright approach should be added to the list of approaches that the QCA considers. However, the MRP estimate in the UT4 Draft Decision appears to be entirely independent of any Wright estimate.

21. The UT4 Draft Decision indicates that the QCA appears to consider the Wright and Siegel approaches to be alternative methods for adjusting for the same thing. However, these two approaches make adjustments for entirely different things (inflation declining vs. inflation differing from expectations) where those adjustments move the estimate in opposite directions.

22. **Recommendation:**

a) The QCA should have proper regard to the Wright approach;

b) The Final Decision should explain how the QCA has had regard to the Wright approach – including an explanation of how the QCA's consideration of the Wright approach affected its estimate of MRP;

c) **The current estimate of MRP from the Wright approach is 8.5% based on the QCA's figures, which is close to our own estimate of 8.6%.**

Cornell dividend discount model

23. In our view:

    a) If the QCA version of the dividend discount model is to be used, it should be used without either of the adjustments that the QCA now proposes to apply; and

    b) The MRP should be estimated with reference to the same risk-free rate that is used elsewhere in the same CAPM formula.

24. **Recommendation: The QCA-Cornell estimate of the MRP should be set to 8.9%.**[7]

Internal inconsistency

25. The risk-free rate is required in two places in the CAPM equation:

$$r_e = r_f + \beta(r_m - r_f).$$

26. The QCA uses an estimate of 3.21% (4-year yield) for the first instance of the risk-free rate and an estimate of 4.06% (10-year yield) for the second.

27. In our report on the term of the risk-free rate[8] we noted that the QCA's approach in using different risk-free rates in two places in the same CAPM equation is inconsistent with the consistency principle laid out by the Tribunal in its *GasNet* decision.

28. In our view, such an obvious internal consistency is a clear error that must be corrected.

Current estimates

29. For the reasons set out in the body of the report, it is our view that an estimate of the with-imputation MRP less than 7.5% could only be justified by some combination of the following methodological choices:

    a) Applying material weight to the Siegel approach, which virtually no one else uses for any purpose, and for which the required data is unavailable;

    b) Using two different values for the same risk-free rate in the same CAPM equation;

    c) Adjusting the survey and independent expert report estimates for the value of imputation credits in a manner that is inconsistent with the QCA's regulatory model;

    d) Compiling the Cornell estimate in an entirely unique manner that is inconsistent with the Cornell paper on which it is based. This approach requires two different estimates of the required return on the market in the same estimation process; and

    e) Disregarding the Wright estimate which has been recommended in work commissioned by the QCA.

[7] We consider dividend discount models in more detail in our companion report, SFG (2014 DDM).
[8] SFG (2014 Term).

The adjustment for imputation credits

30. In the regulatory framework the ex-imputation required return on equity is estimated and prices are set to allow the firm to provide that return to its shareholders. There are two ways to estimate the ex-imputation required return on equity:

    a) Insert the ex-imputation MRP into the CAPM (or other asset pricing model); or

    b) Estimate the with-imputation MRP into the CAPM to obtain an estimate of the with-imputation required return on equity, which is then inserted into the regulatory model, which removes the assumed value of imputation credits.

31. If consistently applied, both approaches will produce the same estimate of the ex-imputation required return on equity. However, the estimates and procedures set out in the UT4 Draft Decision result in materially different estimates from the two approaches.

32. **Recommendation: The Final Decision should clearly set out the QCA's with-imputation and ex-imputation estimates of MRP and the required return on equity, and it should either demonstrate the internal consistency between these estimates, or explain why internal consistency between parameter estimates is not required.**[9]

Hierarchy of approaches

33. In our view, the best and most appropriate approach for estimating MRP is to estimate an ex-imputation MRP based on a 10-year risk-free rate.

34. Estimating an ex-imputation MRP avoids debate about the methods that should be adopted to gross-up the estimate of MRP to include the assumed value of imputation credits. It also avoids any possibility of inconsistencies in the way that different estimates of MRP are grossed-up to reflect the benefit of imputation credits. This issue is addressed in detail in our companion report *Converting between ex-imputation and with-imputation required returns*.

35. Using a 10-year risk-free rate in both places in the CAPM equation is consistent with commercial practice and it is also internally consistent as per the GasNet principle. We address this issue in detail in our companion report *The term of the risk free rate*. If, however, a four-year risk-free rate is to be used in one place in the CAPM formula, consistency requires that it should also be used in the other place where it appears in the CAPM formula. That is, our view is that the best approach is to use a 10-year risk-free rate in both places in the CAPM formula, the second best approach is to use a 4-year risk-free rate in both places, and that an unacceptable approach is to use inconsistent risk-free rates in the two places that parameter appears in the CAPM formula.

36. Throughout this report, we maintain our view that the best and most appropriate approach for estimating MRP is to estimate an ex-imputation MRP based on a 10-year risk-free rate. We do, however, recognise the reality that the QCA proposes a different approach on both of these aspects of estimating the MRP. Consequently, in a number of places we comment on how one might estimate a with-imputation MRP and how MRP might be estimated relative to the four-year risk-free rate. We do this in the interest of completeness – our preferred approach is to estimate an ex-imputation MRP based on a 10-year risk-free rate.

[9] We consider the adjustment for imputation credits in more detail in our companion report, SFG (2014 Gross-up).

37. **Recommendation: The Final Decision should estimate an ex-imputation MRP based on a 10-year risk-free rate.**

2. No basis for the QCA point estimate

The QCA's previous approach

38. The QCA's previous approach to estimating the MRP has been to take the equally-weighted mean of four approaches and then to round to the nearest full percentage point. The four approaches adopted by the QCA have been:

    a) Ibbotson (historical excess returns);

    b) Siegel (historical excess returns reduced to reflect the extent to which actual real returns on government bonds may have been lower than expectations);

    c) Surveys; and

    d) Cornell (dividend discount model).

39. This approach resulted in the QCA adopting a fixed 6% estimate in every one of its decisions to date.

The revised QCA approach

40. In its Market Parameters Decision and UT4 Draft Decision, the QCA has indicated that it proposes to change from its traditional approach to estimating MRP. The QCA has stated that it will consider a wider range of evidence and apply its judgment when distilling that range of evidence into a single point estimate. In its Market Parameters Decision, the QCA stated that:

> the QCA considers it is no longer appropriate to base the market risk premium on an average of equally weighted estimates produced by various methods. Appropriate weights will be difficult to specify and some information will be qualitative. The QCA will consider a range of evidence and will apply judgement in arriving at an estimate of the market risk premium. This approach will be more flexible and allow greater consideration to be given to current market conditions than in previous reviews. Accordingly, this approach will give the flexibility to move the allowed market risk premium in the cost of equity above or below its long-run average of 6.0% on a periodic basis based on current market conditions.[10]

41. Similarly, in its UT4 Draft Decision the QCA stated that:

> As discussed and explained in detail in the Market Parameters Decision, we consider it is no longer appropriate to base estimates of the market risk premium on a mechanically rounded average of equally weighted estimates produced by the various methods we have considered in our assessment. Instead, we have used a number of valid methods and current information to form a range and then applied our best judgement to determine a final point estimate, based on a broader consideration of the evidence at hand.[11]

42. However, it seems that the QCA has actually adopted precisely the same mechanistic approach as it has previously adopted, except that it now rounds to the nearest half percent rather than the nearest full percent. For example:

[10] QCA Market Parameters Decision, pp. 23-23.
[11] QCA UT4 Draft Decision, p. 237.

a) The QCA again reports estimates for four approaches – the same four approaches that it has always used; [12]

b) The QCA reports the equally-weighted mean of the four approaches – as per its previous approach; [13] and

c) Even though the QCA reports different mean values in its Market Parameters Decision and its UT4 Draft Decision, it rounds both to the same 6.5%. [14]

43. Table 1 below summarises the QCA's two recent decisions in relation to MRP. In both cases, the QCA sets out its favoured estimates for the same four approaches it has always used and then specifies a final point estimate, rounded to the nearest 0.5%.

Table 1. QCA estimates of MRP

	Market Parameters Decision	UT4 Draft Decision
Ibbotson	6.5	6.5
Siegel	5.5	5.5
Surveys/Experts	6.2	6.8
Cornell	6.9	7.1
Mean	**6.3**	**6.5**
Median	6.4	6.7
Other evidence/Rounding	+0.2	0.0
Final Estimate	**6.5**	**6.5**

44. In its Market Parameters Decision, the QCA reports the equally-weighted mean over its four approaches of 6.3% and then selects a final point estimate of 6.5%:

> An estimate of 6.5% is marginally above the 'mechanical' average of 6.3% from applying the previous approach. The QCA's view is that the information provided by expanding the range of information to include current conditions does not provide support for a number higher than 6.5%. [15]

45. For its UT4 Draft Decision, the equally-weighted mean is 6.5% (which differs from the previous decision due to the correction of errors and different timing). Again, the QCA selects a final point estimate of 6.5%. The QCA states that they have:

> applied our best judgement to determine a final point estimate, based on a broader consideration of the evidence at hand. On this basis, we consider a reasonable estimate of the market risk premium for the 2014 DAU period is 6.5%. [16]

46. In both decisions, the QCA refers to additional evidence including volatility estimates, debt risk premiums and the Wright approach. However, it seems that none of this additional information has

[12] QCA UT4 Draft Decision, p. 234; QCA Market Parameters Decision, p. 23.
[13] QCA UT4 Draft Decision, p. 234; QCA Market Parameters Decision, p. 23.
[14] QCA UT4 Draft Decision, p. 234; QCA Market Parameters Decision, p. 23.
[15] QCA Market Parameters Decision, p. 23.
[16] QCA UT4 Draft Decision, p. 237.

received any real weight. That is, although the QCA has discussed this additional information and has concluded that it is relevant, it appears to have had no impact at all on the final estimate.

47. That is, it appears that the equally-weighted mean (over the four approaches) has not been adjusted in accordance with the additional information, but has simply been rounded to the nearest 0.5%. In the Market Parameters Decision, the QCA adjusts its standard mean estimate upwards by 0.2%. In the UT4 Draft Decision, the QCA makes no adjustment at all to its mean estimate. These adjustments are consistent with the QCA rounding to the nearest 0.5%, but they are not consistent with the QCA having regard to the additional information. If it was the additional information that had caused the QCA to adjust its mean estimate by 0.2% in the Market Parameters Decision, the same additional information would have resulted in an uplift to the mean estimate in the UT4 Draft Decision – but it did not.

48. By contrast, the QCA indicates that it has not applied a mechanistic averaging and rounding procedure:

> The broader range of evidence does not readily lend itself to an averaging and rounding procedure. As a result, the QCA will assess the information at hand and exercise its judgment to reach a final view on the appropriate estimate of the market risk premium.[17]

49. However, this statement appears to be difficult to reconcile with the evidence set out above. If the QCA has not simply rounded the mean to the nearest 0.5%, it should explain in its Final Decision how it arrived at the same 6.5% estimate in its Market Parameters and UT4 decisions, even though the evidence differed across these two cases. That is, even though the evidence changed, the QCA's point estimate did not.

50. In our view, it is not enough for a decision maker to list the evidence that has been considered and to then select a point estimate based on its "judgment." Good regulatory process requires some explanation of how the judgment was applied, including explanation of the relative weights applied to each piece of evidence.

The QCA's range and point estimate

51. In its UT4 Draft Decision, the QCA sets out what it considers to be a reasonable range for MRP as follows:

> we consider it is prudent to consider a range of estimates from a number of different methods before determining a final point estimate. We considered this issue in detail in our Market Parameters Decision.
>
> Based on our analysis, we have developed a range of 5.0% to 7.5% for the market risk premium at this time:
>
> • the lower bound of 5.0% is based on the Siegel estimates—the lower bound is 50 basis points below 5.5%, which is the estimate from the time series of 1958-2013, the longest series of high quality data
>
> • the upper bound is based on the Cornell estimate—the upper bound of 7.5% is 40 basis points above the median estimate of 7.1%.[18]

[17] QCA Market Parameters Decision, p. 15.
[18] QCA UT4 Draft Decision, p. 237.

52. However, the QCA provides no explanation whatsoever for:

    a) Why it is appropriate to set the lower bound of the range 50 basis points below the QCA's preferred Siegel estimate;

    b) Why it is appropriate to set the upper bound of the range 40 basis points above the QCA's preferred Cornell estimate. In particular, why the upper bound is set to 7.5%, when three of the six Cornell estimates produced by the QCA are at or above 7.5%;

    c) Why there is an asymmetry in the sense that the lower and upper bounds are determined by applying adjustments of 50 and 40 basis points respectively. The upper and lower bounds also appear to have been rounded to the nearest 0.5%;

    d) What role the range has in the process of arriving at the final point estimate.

53. If a range is to be computed, the QCA should explain how that range has been determined and how it has been used. In our view, it is not enough to say no more than that the range is "based on our analysis." [19]

54. In selecting a point estimate from within the range, the QCA states that:

> Based on this range, we consider that the most appropriate estimate of the market risk premium at this time is 6.5%, based on our analysis of:
>
> • Ibbotson estimates—the Ibbotson estimates provide a range of 5.8%–6.6% over all sample periods, with an estimate of 6.5% for the period 1958–2013
>
> • Siegel estimates—the range for the Siegel estimates is 4.1%–6.4%, with an estimate of 5.5% for the period 1958–2013
>
> • survey evidence / independent expert report estimates—survey data and independent experts' reports support an estimate of 6.0% (excluding imputation credits) and 6.8% (including imputation credits)
>
> • Cornell dividend growth estimates—the Cornell range is 5.6%–8.3%, with a median estimate of 7.1%
>
> • conditional information—additional sources of information include volatility measures and corporate debt premiums. We also considered the relationship between the risk-free rate and the market risk premium.
>
> As discussed and explained in detail in the Market Parameters Decision, we consider it is no longer appropriate to base estimates of the market risk premium on a mechanically rounded average of equally weighted estimates produced by the various methods we have considered in our assessment. Instead, we have used a number of valid methods and current information to form a range and then applied our best judgement to determine a final point estimate, based on a broader consideration of the evidence at hand. On this basis, we consider a reasonable estimate of the market risk premium for the 2014 DAU period is 6.5%.[20]

[19] QCA UT4 Draft Decision, p. 237.
[20] QCA UT4 Draft Decision, p. 237.

55. That is, the QCA explains its selection of a 6.5% MRP by listing its estimates from each of its four traditional approaches, and then noting that they have "applied our best judgment to determine a final point estimate." [21] There is no explanation at all of how the QCA has applied its judgment or how that judgment led to an estimate of 6.5%. There is also no explanation of how the QCA's judgment led it to adopt the same estimate of 6.5% in the Market Parameters and UT4 decisions, even though the set of evidence differed in those two cases.

56. In our view, the Final Decision should contain some explanation of how the QCA's judgment has been applied. For example:

    a) Did the QCA's judgment lead it to assign more weight to the estimates from some approaches than others? How much? Why?;

    b) Did the QCA's consideration of "conditional information" have any impact on its final point estimate? How much? Why?;

    c) How was the range determined? What role does the range have in determining the point estimate? Why was a range determined in the UT4 Draft Decision, but not in the Market Parameters Decision?

57. If the MRP point estimate was computed by taking the mean of the estimates from the QCA's four usual approaches and rounding to the nearest 0.5%, the Final Decision should simply state that.

[21] QCA UT4 Draft Decision, p. 237.

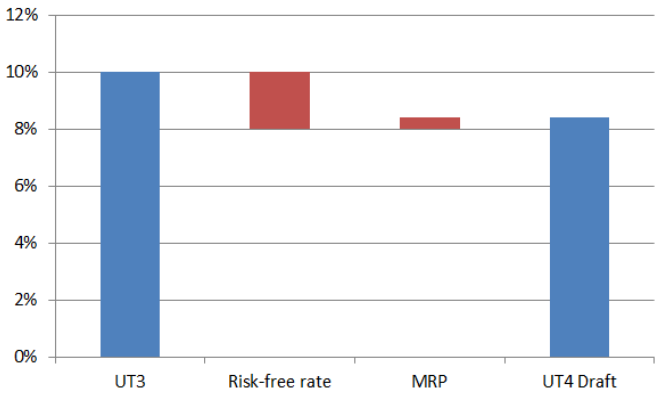
3. The QCA estimates suggest that the required return on equity capital is at historical lows

The evolution of the allowed return on equity

58. In its UT3 Decision, the QCA set the allowed return on equity to 10.0%. The UT4 Draft Decision proposes an allowed return on equity of 8.4%, which represents a 16% discount to allowed return on equity in the previous regulatory period. That is, the QCA has estimated that equity investors in Aurizon Network now require a 16% lower return on equity than they did four years ago.

59. The 160 basis point reduction in the allowed return on equity is the net effect of a reduction in the QCA's estimate of the risk-free rate and an increase in the QCA's estimate of the market risk premium, as shown in Figure 1 below. The 200 basis point reduction due to the new estimate of the risk-free[22] rate is partially offset by a 40 basis point increase due to the new estimate of the MRP.[23] That is, the QCA's new approach for estimating the MRP serves to offset one fifth of the reduction due to the lower estimate of the risk-free rate.

Figure 1
Evolution of QCA allowed return on equity



Source: QCA UT4 Draft Decision, p. 262.

The changes to the QCA approach

60. As set out above, the QCA's previous approach to estimating the MRP has been to take the equally-weighted mean of four approaches (Ibbotson, Siegel, surveys and Cornell) and then to round to the nearest full percentage point. This approach resulted in the QCA adopting a fixed 6% estimate in every one of its decisions to date. As we noted in our previous report to the QCA,[24] the practice of estimating the required return on equity by adding a fixed risk margin to the contemporaneous government bond yield implies that since the onset of the GFC the required return on equity has been lower than at any time since World War II. This is because government bond yields have been at historical lows since the onset of the GFC. In our view, the suggestion that the GFC and European debt crises served to *lower* the required return on equity capital is not one that can be treated seriously.

[22] Between the UT3 Decision and the UT4 Draft Decision, the QCA's estimate of the risk-free rate has fallen from 5.2% to 3.2%.
[23] Between the UT3 Decision and the UT4 Draft Decision, the QCA's estimate of the MRP has risen by 0.5%. Multiplying this increase by a beta of 0.8 produces the 0.4% figure.
[24] SFG (2014 MRP).

61. In summary, the QCA's previous mechanistic approach of adding a fixed margin to the contemporaneous government bond yield results in estimates that suggest that:

    a) The required return on equity is low during financial crises and recessions; and

    b) The required return on equity is high during bull markets and economic expansions.

62. In its recent decisions, the QCA has recognised that its previous mechanistic approach of simply fixing the MRP to 6% in every decision has become untenable since the onset of the GFC. That approach does not produce sensible outcomes in market conditions, such as those that have existed since the onset of the GFC.

63. This has led the QCA to revise its approach for estimating MRP. As explained below, the main changes to the QCA approach for estimating MRP appear to be:

    a) The QCA now makes a downward adjustment to long-term growth forecasts when implementing its Cornell dividend discount model. This results in Cornell estimates that are uniformly lower than those that would have been obtained under its previous approach;

    b) When implementing the Cornell approach, the QCA now assumes that investors have two different required returns, one for cash flows over the next ten years and then a different required return for all subsequent cash flows;

    c) The QCA now includes an adjustment for the assumed value of imputation credits in its survey estimates. In particular, the (with-imputation) survey estimate has been increased from 6% to 6.8%; and

    d) Whereas the QCA's previous approach was to take the mean of the four approaches and then round to the nearest full percentage point, the current approach appears to be to take the mean of the four approaches and to round to the nearest 0.5%.

Estimates from the proposed approach remain at historical lows

64. The QCA's revised approach continues to imply that since the onset of the GFC the required return on equity has been lower than at any time since World War II. The only difference is that the estimates of the required return on equity are slightly higher than they would have been if the MRP had been fixed at 6%. Nevertheless, the QCA's current approach continues to imply that since the onset of the GFC, shareholders have required lower returns on their equity investments than at any time since WWII.

65. By way of analogy, consider a climate model that predicts that the average maximum temperature in Brisbane over the month of January will be 15°C. Because this model produces output that defies basic common sense, it might be revised. Suppose that the revised model produces an estimate of 16°C. Although the second model will fail the basic reasonableness test by less than the first model, it will still fail. Importantly, the second model must be subjected to the reasonableness test. It is not logical to conclude that the second model must be adequate, simply because the first one has been revised.

66. For the reasons set out in our previous submission to the QCA, our view is that it is unreasonable to suggest that the GFC and European debt crises served to *lower* the required return on equity capital to levels never before seen in the post-war period. In our view, the QCA's Final Decision should:

a) Acknowledge that if the QCA's proposed approach had been applied in every year since World War II, it would never have produced estimates of the required return on equity that are as low as the present estimates;[25] and

b) Explain why the QCA considers that the current required return on equity actually is lower than at any time since World War II, such that its current estimate is appropriate.

67. In this regard, the QCA has stated that:

> our view is that it is far from clear that current market conditions are sufficiently different from previous market conditions to warrant significant alteration to the approach we use to estimate the WACC and its parameters.[26]

68. But this is precisely the point – if current market conditions are not "sufficiently different from previous market conditions," why is it appropriate to set the allowed return on equity materially lower than ever before?

[25] Alternatively, the QCA could provide an example of where its proposed approach would have produced an allowed return on equity that is lower than the value set out in its Market Parameters Decision.
[26] QCA UT4 Draft Decision, p. 199.

4. The Siegel approach

Overview

69. In our view, the Siegel approach should receive no material weight for three reasons:

    a) It is not used by other regulators, practitioners, or academics.

    b) The data required to implement the Siegel approach is not available, requiring strong assumptions to be made; and

    c) The Siegel paper is based on the notion that the high real government bond returns in the 1980s are expected to continue in the future. However, precisely the reverse has occurred.

The Siegel approach is not used by others

70. The QCA notes that the Siegel method:

> is not used by other regulators[27]

and that:

> over 99% of survey respondents have said they do not use it to inform their market risk premium estimates. [28]

71. However, the QCA is not concerned about the fact that it is essentially unique in its use of the Siegel method:

> in response to these arguments, the QCA simply notes that these arguments are not relevant, as the QCA's practice is to assess proposed methods on their merits — the QCA's view is that the Siegel method has merit.[29]

72. That is, the QCA's response to the evidence that virtually everyone else ignores the Siegel approach is that virtually everyone else is wrong.

73. Every other regulator in the country has assessed the Siegel approach on its merits and concluded that it should receive zero weight. Moreover, 99.5% of survey respondents have assessed the Siegel approach on its merits and also concluded that it should receive no weight. Elsewhere the QCA considers that the survey respondents (who overwhelmingly reject the Siegel approach) should be considered to be well informed in that the:

> participants can be considered sophisticated investors and/or market observers (including academics).[30]

[27] QCA UT4 Draft Decision, p. 230.
[28] QCA UT4 Draft Decision, p. 230.
[29] QCA Market Parameters Decision, p. 62.
[30] QCA UT4 Draft Decision, p. 232.

74. Moreover, for other aspects of MRP estimation, the QCA does have material regard to the approach adopted by other Australian regulators.[31]

75. If surveys and other regulatory decisions are relevant evidence for some aspects of MRP estimation, they should also be relevant to the issue of how much weight should be afforded to the Siegel estimate when estimating MRP.

76. In summary, the fact that almost everyone who considers the Siegel approach decides to give it no weight is a relevant consideration in determining how much weight it should be afforded when estimating MRP.

The data is not available to implement the Siegel approach

77. The QCA's preferred historical data period now begins in 1958.[32] Consequently, implementation of the Siegel approach requires estimates of:

    a) The actual real government bond yield every year since 1958; and

    b) The expected real government bond yield every year since 1958.

78. For the expected real government bond yield every year, the QCA uses the Commonwealth government inflation-indexed bond yield. However, these bonds only began trading in 1987, so no estimates are available for the first 30 or so years of the required sample period. This leads the QCA to *assume* that the mean of the expected real yield from 1958-1987 would be the same as the mean from 1987-2013. This would be a reasonable assumption if real yields were stable over time, but they are not – in the 1987-2013 period the real yield on indexed bonds varied between 0.79% and 5.83%.[33]

79. In our view, the fact that the data required to implement the Siegel approach is not available should go to the weight that is applied to it. However, the UT4 Draft Decision does not explicitly address the fact that implementation of the Siegel approach requires the QCA to *assume* that the (highly variable) indexed bond yield would have the same mean over the 30 years of missing data as for the 25 years of available data.

The basis for the Siegel papers has not eventuated

80. The Siegel papers are based on the notion that the high real government bond returns in the 1980s are expected to continue in the future. For example, Siegel (1992) states that:

> The last 10 years represent only about 5 per cent of the total time examined in this study, but the period since 1980 contains the highest real long-term bond returns during any consecutive 10-year period since 1884 and the highest real short-term bond returns since the 19th century (excepting the sharp deflationary periods of the Depression). It is not unreasonable to assume that the current higher real rates will turn out to be more characteristic of future returns than the unusually low real rates of the earlier part of this century.[34]

and Siegel (1999) states that:

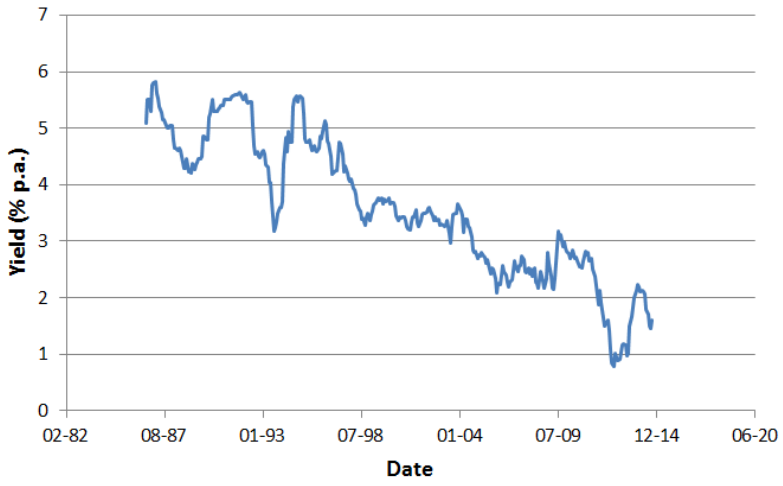
[31] QCA UT4 Draft Decision, pp. 236-237.
[32] QCA Market Parameters Decision, p. 20.
[33] Source: RBA, Table F2.
[34] Siegel (1982), p. 37.

> The real return on fixed income assets is likely to be significantly higher than that estimated on earlier data. This is confirmed by the yields available on Treasury inflation-linked securities, which currently exceed 4%.[35]

81. That is, when the Siegel papers were written real returns on government bonds were materially higher than their long-run average. The basis of the Siegel papers was that the then high real government bond returns would continue to remain high into the future – that future real returns on government bonds would be higher than their historical average. However, since the Siegel papers were written, real government bond returns have fallen materially. In particular, inflation-indexed government bond yields have been at historical *lows* for some years now.

82. Figure 2 below shows that the yield on Australian inflation-indexed government bonds was above 4% during the 1980s and early 1990s – around the time the Siegel papers were being prepared. Contrary to the basis of the Siegel papers, real yields have *not* stayed at that level, but have reduced steadily. They have been below 3% for almost all of the last 10 years and below 2% for almost all of the last three years.

Figure 2
Yield on Commonwealth government inflation-indexed bonds



Source: RBA

Relative weighting of Ibbotson and Siegel approaches

83. The QCA considers two approaches for analysing the historical excess returns data – the Ibbotson and Siegel approaches. Under its proposed approach, it appears that the QCA intends to apply equal weight to the Ibbotson and Siegel approaches. In particular, in its Market Parameters Decision, the QCA concluded that the long-term average MRP is 6%:

> The QCA considers that a reasonable estimate of the long-term average market risk premium remains at 6.0%.[36]

84. The QCA has also indicated that its Ibbotson and Siegel approaches provide estimates of the long-term average MRP, whereas the QCA considers its survey and Cornell estimates to be forward-

[35] Siegel (1999), p. 15.
[36] QCA Market Parameters Decision, p. 15.

looking and more reflective of contemporaneous market conditions. Indeed, the QCA refers to the former as being "historical averaging" methods and the latter as being "forward-looking methods."[37] Thus, the QCA considers the Ibbotson and Siegel methods to contain information about the long-run average MRP and the survey and Cornell estimates to contain information about the contemporaneous MRP.

85. The QCA's preferred estimates from the Ibbotson and Siegel approaches are 6.5% and 5.5%, respectively.[38] Thus, the long-run average estimate appears to be an equally-weighted average of the two estimates.

Summary and conclusions

86. In our view, the Ibbotson and Siegel approaches should not receive the same weight. Rather, the Siegel approach should receive no weight at all and historical excess returns should be analysed using the Ibbotson approach.[39] The reasons for this conclusion are:

    a) The Siegel approach is not used by other regulators, practitioners, or academics.

    b) The data required to implement the Siegel approach is not available, requiring strong assumptions to be made; and

    c) The Siegel paper is based on the notion that the high real government bond returns in the 1980s are expected to continue in the future. However, precisely the reverse has occurred.

[37] QCA Market Parameters Decision, p. 16.
[38] QCA Market Parameters Decision, p. 23.
[39] We also recommend that weight be given to the Wright approach, in which the market return is estimated as the average real return from historical data, adjusted for a current estimate of inflation.

5. Independent expert valuation reports

The QCA's misinterpretation of independent expert reports

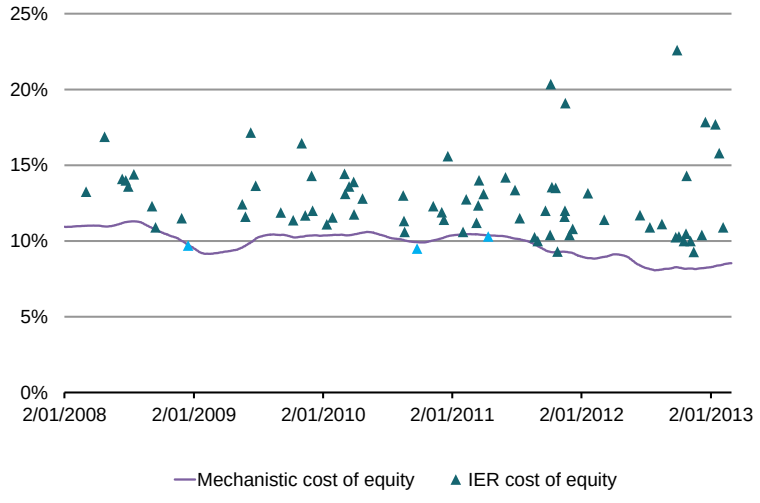
87. The QCA's approach is to estimate the required return on equity for the average firm by adding its estimate of the MRP to the contemporaneous five-year government bond yield. The UT4 Draft Decision concludes that independent expert valuation reports support an (ex-imputation) MRP of 6%.[40] Thus, the suggestion is that the independent expert valuation reports are consistent with an approach whereby the (ex-imputation) required return on equity for the average firm can be estimated by adding 6% to the five-year government bond yield. However, nothing could be further from the truth. In no sense do the independent expert reports provide any support whatsoever for the contention that the required return on equity can be estimated by adding 6% to the five-year government bond yield. We explained this point in our previous submission to the QCA,[41] as summarised below.

88. Our previous submission to the QCA noted that SFG (2013 IER) examine all of the independent expert valuation reports from January 2008 to April 2013 that set out a cost of capital calculation. Figure 3 below shows a comparison between:

    a) Mechanistic estimates of the required return on the market (10-year government bond yield plus 6%); and

    b) Independent expert estimates of the final required return on equity for firms for which the independent expert adopted an equity beta estimate between 0.75 and 1.25. The sample of firms was restricted to those with an equity beta estimate close to 1.0 to ensure a reasonable basis of comparison with an estimate of the required return on the market (which also has a beta of 1.0).

Figure 3
Expert report cost of equity estimates (for beta estimates between 0.75 and 1.25) compared to mechanistic market cost of equity (for beta of 1.0)



Source: SFG (2013), p. 29.

89. The striking feature of this graph is that, with three exceptions, every one of the independent expert estimates of the required return on equity is higher than the mechanistic estimate. The three exceptions all have equity beta estimates between 0.75 and 0.80 – below the market beta of 1.0 – and

[40] QCA UT4 Draft Decision, p. 232.
[41] SFG (2014 MRP).

all have cost of equity estimates that are only marginally below the mechanistic estimate of the market cost of equity.

90. SFG (2013 IER) also determine, for each report in their sample, the overall cost of equity capital estimated by the independent expert. The average cost of equity capital calculated for the entire sample (2008-2013) is 14.4%, within a range of 9.3% to 35%.

91. They then compare:

    a) The independent expert's estimate of the required return on equity for each firm; with

    b) An estimate formed by inserting the following values into the Sharpe-Lintner CAPM:

        i) Contemporaneous 10-year government bond yield for risk-free rate;

        ii) 6% for market risk premium; and

        iii) The equity beta estimate adopted by the independent expert.

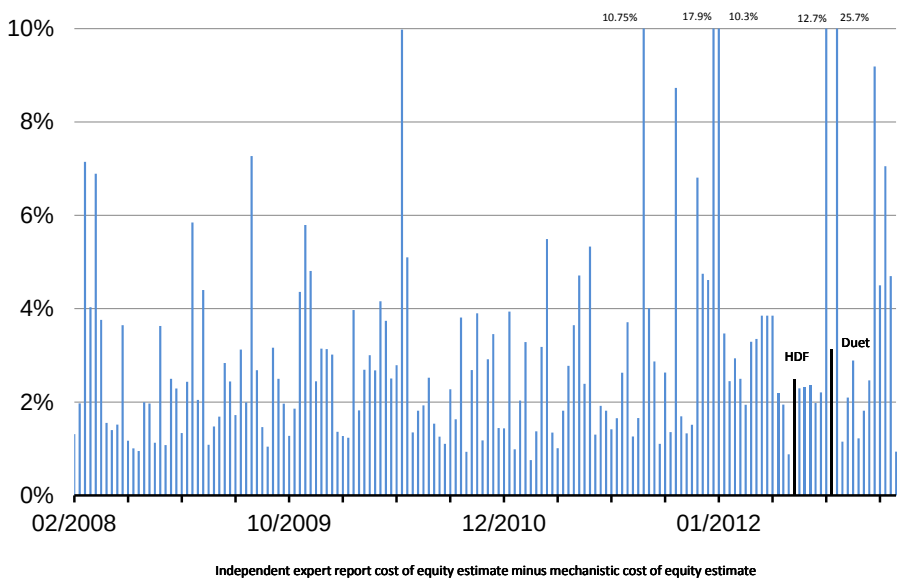
92. The average estimate of the required return on equity from the former approach is 14.4%, and the average from the latter approach is 11.1%.

93. The pair-wise comparisons of the two estimates for each asset are set out in Figure 4 below, which shows that in every case the mechanistic estimate is below the figure that is adopted in the independent expert report. In that figure, the vertical scale is capped at 10% to show sufficient detail, but in a number of cases the difference is even greater than that. In almost every case, the difference is greater than 1% and the difference is greater than 2% in many cases.

94. The results for the 2012-13 period are particularly striking. In almost every case the difference between the two estimates exceeds 2% and the average differential of 4.1% is substantially higher than for the earlier period.

95. Highlighted in the graph are the differences between the expert estimate and the mechanistic estimate for the only two utilities companies in the data (Hastings Diversified Fund and the Duet Group) in the recent period sub-sample. Both show that the market-based assessment of the cost of equity is materially higher than the mechanistic approach would suggest. That is, the approach that the independent experts have taken in the Hastings and Duet cases has resulted in estimates of the required return on equity that are materially greater than the mechanistic approach would suggest – in line with all of the other expert reports in the sample.

Figure 4
Difference between expert report and adjusted mechanistic estimates of cost of equity



Source: SFG (2013 IER), p. 30.

96. In summary, our previous submission to the QCA showed that independent experts clearly do *not* estimate the (ex-imputation) required return on equity by adding 6% to the risk-free rate.

97. We also noted in our previous submission to the QCA that independent expert reports adopted a range of approaches for increasing the estimate of the required return on equity for the current market conditions. These approaches included:

    a) Increasing the estimate of MRP (The mean MRP estimate over the sample of reports was 6.4%. Many of the reports adopted estimates above 6% and none adopted estimates below 6%);

    b) Using a value of the risk-free rate that exceeded the spot government bond yield (On average, the sample of reports adopted a risk-free rate 0.5% above the contemporaneous 10-year government bond yield); and/or

    c) Adding an uplift margin to the CAPM estimate of the required return on equity.

98. That is, independent experts do not use the CAPM the same way that the QCA uses it. It would be misleading to adopt a 6% MRP[42] on the basis of these independent expert reports, but to ignore all of the uplifts to the required return on equity that were contained in those same reports.

The misleading use of the median estimate

99. In its analysis of independent expert reports, the QCA adopts a median (ex-imputation) MRP estimate of 6%. The QCA explains the basis for its use of the median estimate as follows:

> On request, SFG Consulting provided us with copies of 29 independent expert reports considered relevant. Our assessment of these reports suggests they support a base mean

[42] The QCA's estimate of the ex-imputation MRP from independent expert reports.

> market risk premium of 6.4% (as contended by SFG Consulting) and a median estimate of 6.0% (excluding imputation credits). However, we consider that the more appropriate statistic is the median, to eliminate the influence of outliers in this small sample.[43]

100. However, in the sample of independent expert reports, there are no outlier estimates of the ex-imputation MRP. In fact, the distribution of estimates is as set out in Table 2 below. As well as being the median estimate, 6% is also the *minimum* estimate. None of the reports that were evaluated by the QCA adopts an estimate below 6%, but 41% of them adopt an estimate above 6%. We also note that there are no outliers in the sense that the maximum estimate (6-8%) is adopted by 24% of the reports.

Table 2. Independent expert estimates of ex-imputation MRP

Estimate	Frequency
6%	59%
7%	14%
6-7%	3%
6-8%	24%

Source: Independent expert reports

101. In our view, the median estimate of 6% does not appropriately characterise the estimates set out above. None of the reports contains an estimate below 6%, whereas 41% of them contain estimates above 6%. The range of estimates adopted in the reports is from 6% to 8%. Our view is that the estimates adopted in the expert reports are much better characterised by the mean estimate of 6.4%.

102. Moreover, even the 6.4% mean is understated in that a number of reports set out a range, but then indicate their preference for an estimate above the mid-point. For example:

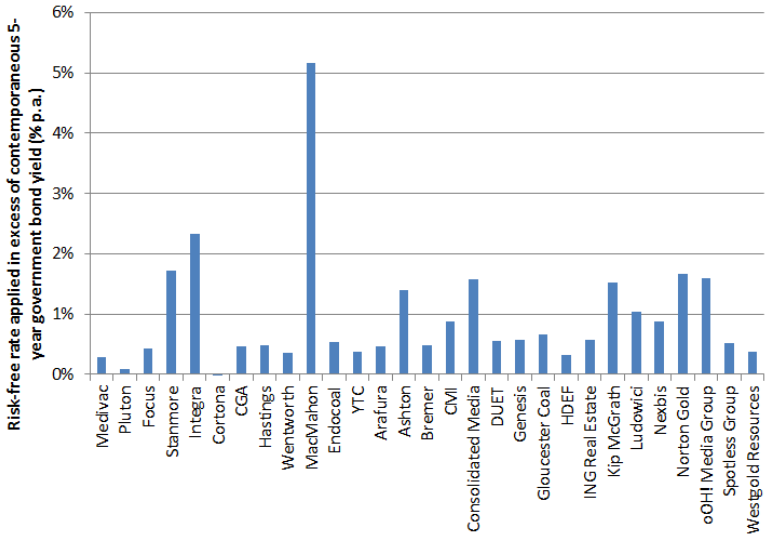
> We have noted that the current market risk premium is 8%. This has been sourced from Bloomberg. The market risk premium is derived on the basis of capital weighted average return of all members of the S&P 200 Index minus the risk free rate is dependent on the ten year government bond rates. For the purpose of our report we have adopted a market risk premium of 6 to 8 percent.[44]

The risk-free rate adopted in the QCA sample

103. The QCA approach is to pair its estimate of MRP with the contemporaneous five-year government bond yield. However, the independent expert reports that the QCA considers do *not* pair their estimates of MRP with the contemporaneous five-year government bond yield. By contrast, the independent expert reports adopt a risk-free rate that is, on average, 0.93% higher than the contemporaneous five-year government bond yield, as set out in Figure 5 below.

[43] QCA UT4 Draft Decision, p. 232.
[44] BDO Corporate Finance (WA) Pty Ltd, Pluton Resources Limited - Independent Expert's Report, 17 October 2012. P. 37.

Figure 5
Difference between expert report risk-free rate and contemporaneous five-year government bond yield



Source: Independent expert reports, SFG analysis.

104. Thus it would be misleading to suggest that independent expert reports support the practice of pairing a 6% (ex-imputation) MRP with the contemporaneous five-year government bond yield. *None* of the independent expert reports considered by the QCA have done that.

105. There are two primary reasons why independent experts adopt a risk-free rate that is higher than the QCA estimate:

a) Independent experts use the ten-year government bond rate, whereas the QCA uses the five-year rate. For example:

> In Australia, the 10-year Commonwealth Government bond yield is used as a proxy for the risk-free rate…We have adopted a risk free rate, based on the yield as at the valuation date of Australian Commonwealth Government 10 year debt.[45]

b) Some independent experts adopt a risk-free rate above the contemporaneous government bond yield as a means of increasing the standard CAPM estimate to better reflect required returns in the current market conditions. For example:

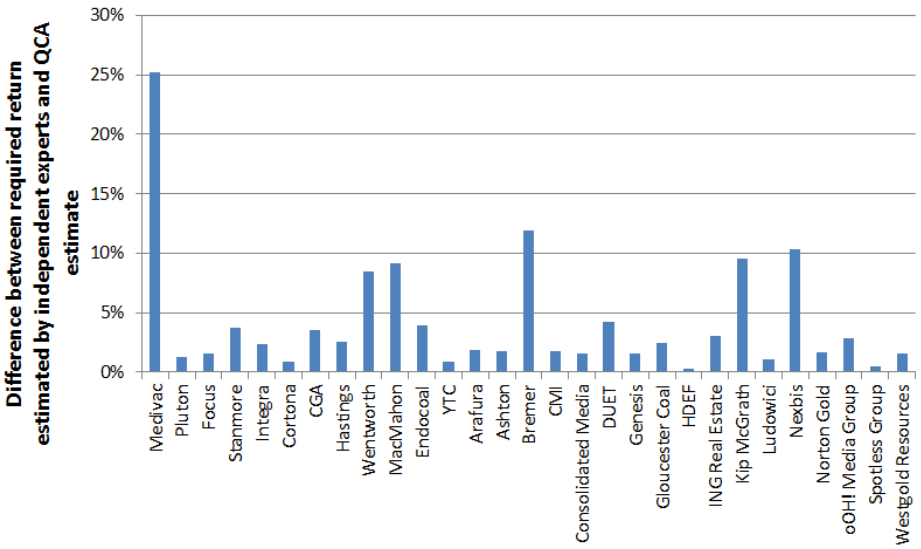
> Based on a historical analysis of the risk free rate using the 10 year Australian Government bond rate, a long term range of 5.2% to 5.4% appears appropriate. On this basis, in determining an appropriate risk free rate we have considered the 10 year Australian Government bond yield as at 31 August 2012 of 3.11% and add a further 2.00%. These inputs combined result in a risk free rate of 5.11%.[46]

[45] RSM Bird Cameron Corporate Pty Ltd (2012), Medivac Limited Financial Services Guide and Independent Experts Report 12 October, p. 56 - in Medivac Limited, Notice of Annual General Meeting & Explanatory Statement.
[46] Ernst & Young (2012), Independent Expert's Report and Financial Services Guide Integra Mining Limited Proposed acquisition by Silver Lake Resources Limited, 7 November, p. 84 - in Scheme Booklet – A recommended merger by scheme of arrangement between Integra Mining Limited and Silver Lake Resources Limited.

The required return adopted in the QCA sample

106. The QCA interprets the independent expert reports as supporting an ex-imputation MRP of 6%. Under the QCA approach, this implies that the ex-imputation required return can be estimated as the contemporaneous five-year government bond yield plus equity beta times 6%. This QCA estimate of the ex-imputation required return on equity can then be compared with the corresponding independent expert estimate, as in Figure 6 below.[47]

Figure 6
Difference between independent expert report (ex-imputation) required return and QCA estimate



Source: Independent expert reports, SFG analysis.

107. The independent expert report estimates of the ex-imputation required return on equity are uniformly higher than the QCA estimates of the same thing. That is, the independent expert reports do not support the use of an (ex-imputation) 6% MRP being used in the QCA's WACC estimation process.

Summary and conclusions

108. The independent expert reports considered by the QCA do *not* support the notion that an ex-imputation required return of 6% can be paired with the contemporaneous five-year government bond yield, as the QCA suggests. That approach produces estimates of the ex-imputation required return on equity that are lower than every single expert estimate considered by the QCA.

109. The use of a median estimate is also statistically misleading in a setting where there are no observations below the median and 41% of the observations above it. In our view, the mean estimate of 6.4% is a more appropriate summary statistic in this case.

110. Even an ex-imputation MRP of 6.4% produces required return on equity estimates that are below those adopted by independent experts – if it is paired with the contemporaneous yield on five-year government bonds. This is because independent experts generally use the 10-year bond when

[47] The independent expert estimates of the ex-imputation required return on equity is computed by taking the mid-point estimates of the risk-free rate, beta and MRP. The QCA estimate is computed using the contemporaneous five-year government bond yield, MRP of 6.5% and the same beta estimate as adopted by the respective independent expert reports.

estimating the risk-free rate, and because they include other uplift factors when estimating the required return on equity. Consequently, it is our view that the independent expert reports that were considered by the QCA support an ex-imputation MRP of *at least* 6.4%.

6. The Wright approach

QCA assessment of the Wright approach

111. The Lally (2013) report commissioned by the QCA recommends that the Wright approach *should* be given material weight:

> I consider that the set of methodologies considered by the QCA should be augmented by one involving estimating the expected real market cost of equity from the historical average actual real return and then…converting the estimate of the expected real market cost of capital to its nominal counterpart.[48]

112. That is, the consultant commissioned by the QCA recommends that the QCA should add the Wright approach to the four approaches it has traditionally considered. In recommending that the Wright approach should be used, Lally (2013) recognises that the two approaches set out above are the end points of a spectrum. The first assumes that the MRP is constant so that the required return on the market varies one-for-one with the risk-free rate. The second assumes that the (real) expected return on the market is constant so that the MRP varies one-for-one with the risk-free rate. Lally (2013) concludes that the evidence on which end of the spectrum should be preferred is "not decisive"[49] and consequently recommends that both approaches should be given some weight.

113. In its recent Guideline,[50] the AER has stated that it too will have regard to the Wright approach when determining the allowed return on equity. In setting out its reasons for having regard to the Wright approach, the AER noted that the Wright approach is likely to produce allowed returns on equity that are more stable over time than those produced by its previous mechanistic implementation of the Sharpe-Lintner CAPM:

> …the Wright approach for implementing the Sharpe–Lintner CAPM will result in estimates of the return on equity that may be relatively stable over time. The informative use of these implementations of the Sharpe–Lintner CAPM, in addition to other information, is expected to lead to more stable estimates of the return on equity than under our previous approach.[51]

114. The AER also noted that more stability in the allowed return on equity was favoured by a broad cross section of stakeholders and is more likely to properly reflect the efficient financing costs of a benchmark efficient entity.[52]

115. The AER also considers the Wright approach to have the attractive features of transparency and replicability – relative to its previous mechanistic implementation of the CAPM:

> …we consider that implementing the Wright approach is more transparent and replicable than our standard implementation of the Sharpe–Lintner CAPM.[53]

[48] Lally (2013), p. 3.
[49] Lally (2013), p. 6.
[50] AER (2013), Draft rate of return guideline, p. 7, affirmed in the AER's Final Guideline.
[51] AER (2013), Draft rate of return guideline: Explanatory statement, p. 13.
[52] AER (2013), Draft rate of return guideline: Explanatory statement, p. 69.
[53] AER (2013), Draft rate of return guideline: Explanatory statement, p. 186.

116. Moreover, Siegel (1999) also concludes that real stock returns have "displayed remarkable long-term stability" which is entirely consistent with the use of the Wright approach:

> The real return on stocks, as I have emphasised [1998] has displayed a remarkable long-term stability…The relative stability of long-term real equity returns is in marked contrast to the unstable real returns on fixed income assets.[54]

117. The QCA concludes that:

> the QCA will have regard to the Wright estimates in forming a view on an appropriate estimate of the market risk premium. This position is consistent with the position of the AER in its Rate of Return Guideline.[55]

118. However, this conclusion is difficult to reconcile with the fact that the QCA has not even presented an estimate for the Wright approach in its UT4 Draft Decision. It is not clear how the QCA will "have regard to the Wright estimates" if they are never even computed.

Wright vs. Siegel

119. The Wright approach is designed to adjust for the possibility that average inflation over some historical period might be higher than *current* expected inflation. By contrast, the Siegel approach is designed to adjust for the possibility that average inflation over some historical period might have been higher than what the market was expecting *at that time*. That is:

    a) The Wright approach would be adopted if one expects that future inflation will differ from past inflation; and

    b) The Siegel approach would be adopted if one thought that past inflation might have turned out to be systematically higher than what investors were expecting at the time.

120. The Wright approach requires an estimate of current expected inflation. By contrast, the Siegel approach requires an estimate of what investors were expecting inflation to be each year since 1958.

121. However, the QCA appears to consider the Wright and Siegel approaches to be alternative methods for adjusting for the same thing:

> the QCA considers that the adjustment for unexpected inflation incorporated in the Siegel method is valid and relevant when estimating an expected as opposed to an actual return. For this reason, the QCA considers that the Siegel method better addresses the unexpected inflation issue relative to the Wright method.[56]

122. As set out above, these two approaches make adjustments for entirely different things (inflation declining vs. inflation differing from expectations). They are clearly not two alternative methods for addressing the same "unexpected inflation issue."

[54] Siegel (1999), p. 12.
[55] QCA UT4 Draft Decision, p. 236.
[56] Market Parameters Decision, p. 21.

Current estimates of the Wright approach

123. The Market Parameters Decision does contain estimates of MRP for the Wright approach. In particular, the QCA reports an estimate of 7.4% for its preferred historical period of 1958-2013.[57]

124. Under the Wright approach, one first estimates the expected return on the market portfolio and then subtracts the contemporaneous risk-free rate from it. The risk-free rate used in the QCA's calculation is the 10-year government bond yield of 4.29% at the end of 2013. This implies an estimate of the expected return on the market of 11.7%, which is close to our own estimate of 11.8%. Both of these estimates include the QCA adjustment for imputation credits that it uses to estimate MRP.[58]

125. In its UT4 Draft Decision, the QCA adopts a risk-free rate of 3.21%.[59] This implies a (with-imputation) Wright MRP estimate of 8.5%, based on the QCA's figures. That is, in the first step of the Wright approach, the QCA has estimated that the expected return on the market portfolio to be 11.7%, which is close to our own estimate of 11.8%. When this figure is inserted into the CAPM, the risk-free rate is subtracted from it and the difference is referred to as the MRP:

$$r_e = r_f + \beta\left(r_m - r_f\right).$$

126. That is, the difference between the QCA's estimate of $r_m = 11.7\%$ and the QCA's estimate of $r_f = 3.2\%$ implies a QCA estimate of $\left(r_m - r_f\right) = \left(11.7 - 3.2\right) = 8.5\%.$

Summary and conclusion

127. In our view:

a) The QCA should have proper regard to the Wright approach;

b) The Final Decision should explain how the QCA has had regard to the Wright approach – including an explanation of how the QCA's consideration of the Wright approach affected its estimate of MRP;

c) The current estimate of MRP from the Wright approach is 8.5% based on the QCA's figures, which is close to our own estimate of 8.6%.

128. By contrast, the MRP estimate in the UT4 Draft Decision appears to be entirely independent of any Wright estimate.

[57] QCA Market Parameters Decision, Table 5, p. 88.
[58] For clarity, this differs from the QCA adjustment for imputation credits that is incorporated into its regulatory model to estimate cash flows.
[59] QCA UT4 Draft Decision, p. 262.

7. Dividend discount model

The QCA approach

129. In its recent decisions, the QCA has altered its approach to estimating MRP from the Cornell dividend discount model in two ways:

    a) The QCA now makes a downward adjustment to long-term growth forecasts when implementing its Cornell dividend discount model. This results in Cornell estimates that are uniformly lower than those that would have been obtained under its previous approach. We show in our companion report on dividend discount models[60] that the QCA's downward adjustment is based on dated US empirical data that has reversed since the mid-1990s; and

    b) When implementing the Cornell approach, the QCA now assumes that investors have two different required returns, one for cash flows over the next ten years and then a different required return for all subsequent cash flows. This adjustment also has the effect of reducing the estimate of the MRP.

130. In our companion report on dividend discount models,[61] we consider both of these adjustments in some detail and conclude that neither adjustment should be made. We also note that:

    a) The AER also proposes to make some downward adjustment to long-term growth forecasts, however such downward adjustments are not made by commercial data providers such as Bloomberg; and

    b) We are unaware of anyone else ever having estimated two different MRPs – one MRP for the short to medium term and a different MRP for the longer term. This is another feature of the UT4 Draft Decision that is entirely unique.

Dividend discount estimates without the QCA downward adjustments

131. In this section, we consider what the QCA's dividend discount estimate of MRP would have been if the QCA procedure had been followed exactly, but for the downward adjustments set out above. In particular, we adopt all of the QCA's parameter estimates and we follow the QCA approach of selecting the median estimate.

132. Our conclusions are that:

    a) The standard implementation of dividend discount models is to estimate the discount rate that equates the forecasted dividends to the current share price. The QCA approach is unique in that the QCA estimates two different discount rates – one for the first 10 years and one for the subsequent period. If the QCA had estimated a single discount rate (and made no other changes to its process or parameter values) the estimate of the required return on the market portfolio would be 11.5%;

    b) If the QCA had set its estimate of long-run dividend growth equal to long-run GDP growth, rather than applying three different discounts (and made no other changes to its process or parameter values) the estimate of the required return on the market portfolio would be 12.6%; and

[60] SFG (2014 DDM).
[61] SFG (2014 DDM).

c) If the QCA had applied neither of the above adjustments that it has recently introduced (and made no other changes to its process or parameter values) the estimate of the required return on the market portfolio would be 12.1%.

133. Table 3 below summarises the Cornell dividend discount model estimates of the required return on the market. In all cases, we adopt the parameter estimates set out in the UT4 Draft Decision and the QCA version of the DDM. We estimate the required return on the market with and without the downward adjustments that the QCA has applied in its recently revised approach. We also note that the QCA adopts two different values for the risk-free rate in its UT4 Draft Decision, so we report the MRP estimate corresponding to each.

Table 3. Cornell dividend discount estimates under different assumptions

		MRP estimate	
Estimation approach	**Required market return**	**Risk-free rate of 4.06%**[62]	**Risk-free rate of 3.21%**[63]
New QCA approach	11.2%	7.1%	8.0%
No dual rate adjustment	11.5%	7.4%	8.3%
No GDP discount adjustment	12.6%	8.5%	9.4%
Neither adjustment	12.1%	8.0%	8.9%

Source: QCA Cornell approach, SFG calculations.

134. In our view:

a) If the QCA version of the dividend discount model is to be used, it should be used without either of the adjustments that the QCA now proposes to apply; and

b) The MRP should be estimated with reference to the same risk-free rate that is used elsewhere in the same CAPM formula – 3.21%.

135. Consequently, our preferred QCA-Cornell estimate of the MRP is 8.9%.

The GasNet inconsistency in relation to the QCA's dividend discount estimates of MRP

136. The risk-free rate is required in two places in the CAPM equation, as set out below:

$$r_e = r_f + \beta\left(r_m - r_f\right).$$

137. The QCA's recent decisions:

a) Set the first instance of the risk-free rate equal to the yield on government bonds with maturity equal to the length of the regulatory period; and

b) Set the second instance of the risk-free rate equal to the yield on government bonds with maturity of ten years.

[62] QCA UT4 Draft Decision, p. 233.
[63] QCA UT4 Draft Decision, p. 211.

138. In our report on the term of the risk-free rate[64] we noted that the QCA's approach in using different risk-free rates in two places in the same CAPM equation is inconsistent with the consistency principle laid out by the Tribunal in its *GasNet* decision.

139. The inconsistency is particularly egregious in relation to the QCA's implementation of the Cornell dividend discount model. The Cornell model produces an estimate of the required return on the market portfolio, r_m. In its UT4 Draft Decision, the QCA concludes that the Cornell approach produces an estimate of the required return on the market of $r_m = 11.16\%$.[65,66] The QCA then produces an estimate of the MRP by subtracting the ten-year government bond yield of 4.06% whereas it uses a four-year government bond yield of 3.21% elsewhere in the *same* CAPM equation.

140. That is, the QCA's interpretation of the Cornell model is that the required return on equity can be estimated as:

$$\begin{aligned} r_e &= r_f + \beta\left(r_m - r_f\right) \\ &= 3.21\% + \beta(11.16\% - 4.06\%). \end{aligned}$$

141. This implies that the required return on the market portfolio (which has a beta of 1.0, by definition) is:

$$\begin{aligned} r_e &= r_f + \beta\left(r_m - r_f\right) \\ &= 3.21\% + 1.0(11.16\% - 4.06\%) = 10.31\%. \end{aligned}$$

142. That is, having estimated that the required return on the market is 11.16%, the QCA then uses an internally inconsistent version of the CAPM formula which estimates the required return on the market to be 10.31%. In our view, such an obvious internal consistency is a clear error that must be corrected.

Summary and conclusions

143. In our view:

a) If the QCA version of the dividend discount model is to be used, it should be used without either of the adjustments that the QCA now proposes to apply; and

b) The MRP should be estimated with reference to the same risk-free rate that is used elsewhere in the same CAPM formula – 3.21%.

144. Consequently, our preferred QCA-Cornell estimate of the MRP is 8.9%.

[64] SFG (2014 Term).
[65] QCA, UT4 Draft Decision, p. 233.
[66] As set out above, this figure is contentious for a number of reasons, however we set aside those issues for the moment.

8. Relative weighting of evidence

145. We have computed what we consider to be the best and most appropriate estimate of the (with-imputation) MRP from each of the approaches discussed in the UT4 Draft Decision. In each case, we adopt the QCA's estimate of theta (0.56) and the QCA's estimate of the risk-free rate (3.21%). That is, we set out below our estimates for each of the approaches considered by the QCA, adopting all other relevant parameter values from the UT4 Draft Decision.

146. Our estimates are as follows:

a) **Ibbotson: 6.6%.** This estimate is computed in the same way as the QCA estimates it, using data from 1958-2013. Our data suggests an estimate of 6.6%, 10 basis points above the QCA estimate.

b) **Siegel: 5.6%.** This estimate is computed in the same way as the QCA estimates it, using data from 1958-2013. Our data suggests an estimate of 5.6%, 10 basis points above the QCA estimate.

c) **Surveys: 7.9%.** We take the QCA ex-imputation estimate of 6.0% and apply the Officer (1994) adjustment, as used by IPART and by the QCA in its regulatory model[67], to convert it into a with-imputation estimate of 7.9%.

d) **Independent expert reports: 8.3%.** We take the mean estimate of 6.4% from the QCA sample and apply the Officer (1994) adjustment, as used by IPART and the QCA in its regulatory model, to convert it into a with-imputation estimate of 8.3%.

e) **Cornell: 8.9%.** We do not apply the QCA's adjustment to long-run growth and we estimate a single required return (rather than two different returns for pre- and post-10-year cash flows). Otherwise we follow the QCA approach exactly.

f) **Wright: 8.6%.** Our estimate differs from the estimate set out in the Market Parameters Decision in that we have adopted the 3.21% risk-free rate from the UT4 Draft Decision.

147. Some relevant summary statistics are as follows:

a) The equally-weighted mean is 7.6% and the median is 8.1%;

b) The mean remains at 7.6% if the survey and independent expert estimates are combined into a single estimate;

c) Our view is that the Siegel approach should be afforded no weight. In the absence of the Siegel approach, the mean estimate is 8.1%; and

[67] In our corresponding paper on imputation credits (SFG, 2014 Gross-up) we make the point that the QCA treats imputation credits differently in estimating the market risk premium from historical data and in estimating cash flows from its regulatory model. With reference to our use of the Officer (1994) adjustment to estimate the market risk premium, the QCA has stated that our approach is incorrect because it relies upon a zero growth assumption. While this issue is discussed in our other paper (SFG, 2014 Gross-up) at this point we emphasise that it is not *our* adjustment – it is the adjustment the QCA applies to estimate cash flows, and we are applying the same adjustment to estimate the market risk premium. If this QCA supports the use of a different adjustment for imputation credits to estimate the market risk premium, it should use that same adjustment to estimate cash flows. All we do here is estimate the market risk premium in a manner consistent with the QCA's approach to estimating cash flows.

d) If the Wright estimate is given no weight (which we believe to be inappropriate) the mean estimate is 7.5%.

148. An estimate of the with-imputation MRP less than 7.5% could only be justified by some combination of the following methodological choices:

a) Applying material weight to the Siegel approach, which virtually no one else uses for any purpose, and for which the required data is unavailable;

b) Using two different values for the same risk-free rate in the same CAPM equation;

c) Adjusting the survey and independent expert report estimates for the value of imputation credits in a manner that is inconsistent with the QCA's regulatory model;

d) Compiling the Cornell estimate in an entirely unique manner that is inconsistent with the Cornell paper on which it is based. This approach requires two different estimates of the required return on the market; and

e) Disregarding the Wright estimate which has been recommended in work commissioned by the QCA.

149. In our view, none of these methodological choices can be justified. However:

a) Some combination of *several* of these choices would have to be made to support an MRP estimate below 7.5%; and

b) *All* of them would have to be made to support an MRP estimate as low as 6.5%.

9. The adjustment for imputation credits

Overview

150. The standard Australian regulatory model takes, as an input, a with-imputation estimate of the required return on equity. The model itself then subtracts the assumed value of imputation credits and produces an ex-imputation estimate of the required return on equity. Prices are then set to allow the firm to provide this ex-imputation return to its shareholders.

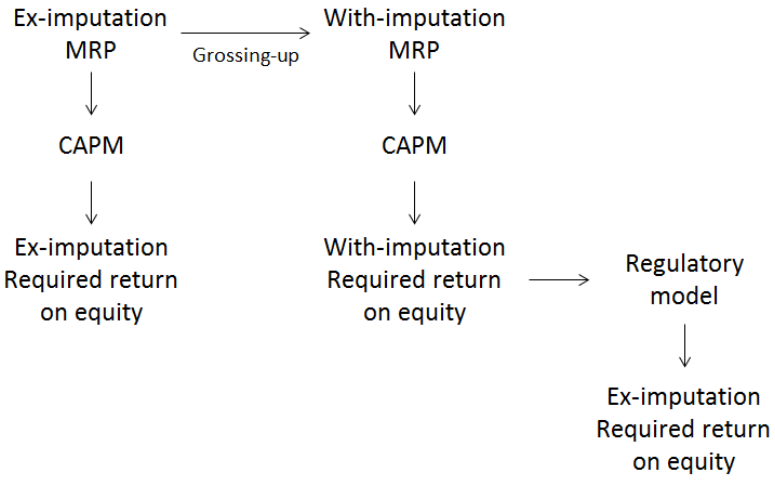
151. Consequently, the estimates of MRP must be grossed-up to incorporate the value of imputation credits – because a with-imputation estimate of the required return on equity is required as an input to the regulatory model. There is some controversy about how this grossing-up should be performed and we consider that issue in detail in our companion report.[68] In this report, we make the simple points that:

a) The QCA begins with a number of ex-imputation estimates of MRP; and

b) The ultimate goal is to estimate the ex-imputation required return on equity,

152. Figure 7 below shows that there are two ways of estimating the ex-imputation required return on equity, which forms the basis for regulated prices. Both approaches begin with an estimate of the ex-imputation MRP. In the first case, the ex-imputation MRP is inserted into the CAPM to produce a direct estimate of the ex-imputation required return on equity. In the second case, the ex-imputation MRP is grossed-up to become an estimate of the with-imputation MRP, which is inserted into the CAPM to produce an estimate of the with-imputation required return on equity. That estimate is inserted into the regulatory model which strips out the assumed value of imputation credits, producing an estimate of the ex-imputation required return on equity.

Figure 7
Methods for estimating the ex-imputation required return on equity



153. Our point here is simply that the two estimates of the ex-imputation required return on equity in Figure 7 should be compared with each other to ensure that the regulator's calculations are all internally consistent.

[68] SFG (2014 Gross-up).

Ex-imputation estimates of the MRP

154. The UT4 Draft Decision sets out the QCA's estimates of the with-imputation MRP, together with some description of how the original ex-imputation figures have been grossed-up for imputation. In Table 4 below we summarise the QCA's with-imputation MRP estimates and we compare them with the QCA's corresponding ex-imputation estimates. That is, the table below does not set out our preferred estimates of the ex-imputation MRP, but rather the QCA's estimates drawn from the UT4 Draft Decision. We have computed the QCA estimates of the ex-imputation MRP as follows:

    a) Ibbotson: Dividend yields have not been grossed-up to reflect a utilisation rate of 0.56;

    b) Siegel: Dividend yields have not been grossed-up to reflect a utilisation rate of 0.56;

    c) Surveys/Independent expert reports: The UT4 Draft Decision reports that the QCA's ex-imputation estimate is 6%;

    d) Cornell: Dividend yields have not been grossed-up to reflect a utilisation rate of 0.56 and the long-run required return on equity has been set to 11.0% rather than 11.8%, consistent with the 0.8% adjustment for imputation credits set out in the UT4 Draft Decision. The median value of the six Cornell estimates is adopted, again consistent with the UT4 Draft Decision.

Table 4. QCA estimates of ex-imputation MRP

	QCA estimate	
	Ex-imputation	**With-imputation**
Ibbotson	6.2%	6.5%
Siegel	5.2%	5.5%
Surveys	6.0%	6.8%
Cornell	5.7%	7.1%
Mean	5.8%	6.5%
Point estimate	5.8%	6.5%
Risk-free rate	3.2%	3.2%
Beta	0.8	0.8
Required return on equity	7.8%	8.4%
Regulatory model adjustment factor		0.83[69]
Ex-imputation required return on equity		7.0%

Source: UT4 Draft Decision, SFG calculations.

155. Table 4 shows that the mean ex-imputation MRP estimate is 5.8%. When inserted into the CAPM,[70] this figure produces a direct estimate of the ex-imputation required return on equity of 7.8%.

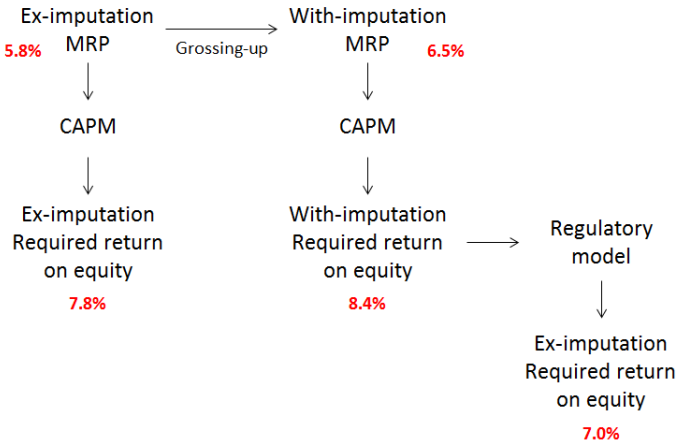
156. Table 4 also shows that the mean with-imputation MRP estimate is 6.5%. When inserted into the CAPM, this figure produces an estimate of the with-imputation required return on equity of 8.4%. When that figure is inserted into the regulatory model, together with the QCA's 0.47 estimate of

[69] Computed as $\frac{1-T}{1-T(1-\gamma)} = \frac{1-0.3}{1-0.3(1-0.47)} = 0.83$.

[70] We also adopt the QCA parameter values for beta and risk-free rate. We note that we disagree with both of these figures, but the point of this section is to demonstrate the internal inconsistency of the QCA's figures.

gamma, it is adjusted to an ex-imputation allowed return of 7.0%. The sequence of calculations is summarised in Figure 8 below.

Figure 8
Estimates of the ex-imputation required return on equity



157. That is, the two methods for estimating the ex-imputation required return on equity produce different estimates. The reason for this is that the QCA approach for grossing-up the MRP is inconsistent with the approach embedded with the regulatory model.

158. The Final Decision should clearly set out the QCA's with-imputation and ex-imputation estimates of MRP and the required return on equity, and it should either demonstrate the internal consistency between these estimates, or explain why internal consistency between parameter estimates is not required.

References

Australian Energy Regulator, 2013, *Draft rate of return guideline – Explanatory Statement*, August.

Brailsford, T., J. Handley and K. Maheswaren, 2008, "Re-examination of the Historical Equity Risk Premium in Australia," *Accounting and Finance*, 48, pp. 73-97.

IPART, 2013, *Review of WACC Methodology: Final Report*, December.

Lally, M., 2013, *Response to submissions on the risk-free rate and the MRP*, Report for the QCA, 22 October.

Lally, M., 2012, *The risk-free rate and the market risk premium*, Report for the Queensland Competition Authority, 23 August.

Officer, R. R., 1994, "The cost of capital of a company under an imputation system," *Accounting and Finance*, 34, 1, 1-17.

QCA, 2014, Market Parameters Decision, *Cost of capital: market parameters*, August.

QCA, 2014, UT4 Draft decision, Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, September.

Siegel, J., 1992, "The equity premium: Stock and bond returns since 1802," *Financial Analysts Journal*, 48, 1, 28-38.

Siegel, J., 1999, "The shrinking equity premium: Historical facts and future forecasts," *Journal of Portfolio Management*, 26, 1, 10-17.

SFG, 2013 IER, *Evidence on the required return on equity from independent expert reports*, Report for the Energy Networks Association, June.

SFG, 2014 DDM, *Dividend discount estimates of the market risk premium*, November.

SFG, 2014 Gross-up, *Converting between ex-imputation and with-imputation required returns,* November.

SFG, 2014 MRP, *An appropriate regulatory estimate of the market risk premium*, January.

SFG, 2014 Term, Setting the risk-free rate and market return parameters in regulated returns, November.

Wright, S., 2012, *Review of Risk Free Rate and Cost of Equity Estimates*: *A Comparison of UK Approaches with the AER*, www.aer.gov.au.

Application of the dividend discount model for estimating the market return by the Queensland Competition Authority

Report for Aurizon Network

26 November 2014

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Contents

1. Introduction

1.1 Overview

1. SFG Consulting has been retained by Aurizon Network Pty Ltd (**Aurizon**) to provide our views on the use of the dividend discount model[1] for estimating the expected market return, as applied by the Queensland Competition Authority (**the QCA**). In recent work relating to cost of capital estimates the QCA has stated that it will rely upon the dividend discount model as one approach to estimating the expected return on the market.[2] The QCA then applied this approach in its UT4 Draft Decision for Aurizon Network.[3]

2. At the outset we document what the QCA's estimates of the market return and market risk premium (**MRP**) are when using the dividend discount model. We then introduce the specific analysis that is presented in our report.

1.2 QCA estimates of the market risk premium and market return

3. In the QCA analysis on cost of capital estimates, the QCA provided four estimates of the market risk premium based upon its dividend discount model analysis. The reason there are four estimates is that the QCA makes two alternative assumptions regarding the expected long-term growth in dividends, and two alternative assumptions regarding the length of the period over which near-term growth in dividends is expected to revert to long-term growth in dividends. This period is referred to by the QCA as the *convergence period*. The two long-term growth assumptions are 4.0% and 5.1% per year in nominal terms[4], and the two convergence periods are 10 years and 20 years.[5]

4. In its UT4 Draft Decision the QCA reported the following four estimates of the market risk premium from dividend discount model analysis: 5.6% (4.0% growth, 10 year convergence), 7.0% (4.0% growth, 20 year convergence), 7.3% (5.1% growth, 10 year convergence), and 8.3% (5.1% growth, 20 year convergence).[6] This means that the range of market risk premium estimates compiled by the QCA is 5.6% to 8.3%, and the median of the four market risk premium estimates is 7.1%.

5. The QCA notes that the above MRP estimates are all relative to the yield on 10 year government bonds of 4.06%.[7] This means that, according to the dividend discount model analysis of the QCA, its estimates of the market return from four different sets of assumptions are 9.7% (4.0% growth, 10 year convergence), 11.1% (4.0% growth, 20 year convergence), 11.4% (5.1% growth, 10 year convergence), and 12.4% (5.1% growth, 20 year convergence). This means that the range of the market return estimates compiled by the QCA is 9.7% to 12.4% and the median of the four market return estimates is 11.2%.

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[1] The term *dividend growth model* is used by the QCA, while we use the tem *dividend discount model*. In practice, the term dividend growth model is often interpreted as a specific form of the dividend discount model, in which dividends grow at a constant rate in perpetuity from the first forecast year. In order to mitigate the risk of this misinterpretation, we use the term dividend discount model throughout. The QCA adopts a constant growth assumption from either the 10th or the 20th forecast year.

[2] QCA (2014a), Sub-section 4.2.2, p. 18 under *Cornell dividend growth model*, and Appendix C, pp. 67 to 73 under *Cornell dividend growth model*.

[3] QCA (2014b, Sub-section 10.7, p. 233 under *Dividend growth models*.

[4] The QCA assumes that long-term growth in gross domestic product (GDP) will be 3.0% per year in real terms, and that inflation will be 2.5% per year. This implies a long-term nominal GDP growth expectation of 5.6%, computed as $1.030 \times 1.025 - 1 = 0.056$. The QCA assumes that for firms currently listed, the real growth expectation will be either 0.5% or 1.5% per year below real GDP growth. So the upper nominal growth expectation of 5.1% per year is computed as $1.025 \times 1.025 - 1 = 0.051$, and the upper nominal growth expectation of 4.0% per year is computed as $1.015 \times 1.025 - 1 = 0.040$.

[5] A 10 year convergence period means that expected dividend growth in forecast year two converges to long-term growth over the next eight years. A 20 year convergence period means that dividend growth in forecast year two converges to long-term growth over the next 18 years.

[6] QCA (2014b), Sub-section 10.7, pp. 233 to 234.

[7] QCA (2014b), Sub-section 10.7, p. 233.

6. The QCA's Cornell dividend discount model produces an estimate of the contemporaneous required return on the market. The QCA then subtracts the yield on 10-year government bonds to obtain its estimate of the MRP.

7. In its UT4 Draft Decision the risk-free rate used by the QCA for estimating Aurizon Network's cost of capital is 3.21% per year.[8] So if we were to consistently compare the QCA's estimates of the required market return to the QCA's estimate of the risk-free rate, we would have the following four estimates of the market risk premium: 6.5% (4.0% growth, 10 year convergence), 7.9% (4.0% growth, 20 year convergence), 8.1% (5.1% growth, 10 year convergence), and 9.2% (5.1% growth, 20 year convergence). This means that the range of market risk premium estimates, comparing the QCA's estimate of the required market return to the QCA's estimate of the risk-free rate, is 6.5% to 9.2% and the median of the four market risk premium estimates is 8.0%.

8. In several submissions to the QCA we have made the point that, if the QCA is to estimate the risk-free rate with reference to government bonds with a term to maturity equal to the regulatory period, it should use the same consistent approach when estimating the market risk premium. The QCA's estimates of the MRP (whether using the dividend discount model or otherwise) rely exclusively on analysis of the difference between expected market returns and 10-year bond yields. In its Market Parameters Decision and its UT4 Draft Decision the QCA states in several places that it has considered the historical difference between yields on five-year (or four-year, or one-year) and ten-year government bonds and that "this analysis reinforced the conclusion … that a reasonable estimate of the market risk premium at this time is 6.5%."[9]

9. It is unclear why the QCA has reached the conclusion that the same market risk premium can be applied, regardless of whether the QCA elects to measure the risk-free rate with reference to one-year, four-year, five-year or 10-year government bonds. From reading the two QCA reports we can only conclude that the difference between historical average bond yields with different terms to maturity is, in the view of the QCA, too small to warrant the trouble of preparing internally consistent estimates of the MRP. We disagree on this materiality aspect because there is zero cost to using the QCA's best estimate of the required market return consistently throughout its computations.

10. However, even if there was zero difference in the historical average difference between short- and long-term government bond yields, the important issue is the difference in bond yields at the time the QCA makes a decision. With reference to the UT4 Draft Decision, the difference between four-year and ten-year bond yields as compiled by the QCA is 0.85%.

11. This means that, with respect to its dividend discount model analysis, the QCA's own analysis implies a best estimate of the required market return of 11.2%,[10] and a best estimate of the market risk premium within the range of 6.5% to 9.2% with a median of 8.0%. Yet in application the QCA relies upon estimates of the market with premium within the range of 5.6% to 8.3% with a median of 7.1%.

12. These comments apply equally to all of the QCA's approaches to estimating the market risk premium, because all approaches adopted by the QCA have been based upon the difference between the expected market return and the 10-year government bond rate. So the implication is that if the QCA's best estimate of the market risk premium is 6.5%,[11] and its best estimate of the 10-year government bond yield is 4.06%, then its best estimate of the required market return is 10.6%. In turn, this implies that the QCA's best estimate of the market risk premium is 7.4%.

[8] QCA (2014b), Sub-section 10.4, p. 211.

[9] QCA (2014b), Sub-section 10.3.4, p. 193; QCA (2014b), Sub-section 10.3.6, p. 200; QCA (2014b), Sub-section 10.4, p. 206; QCA (2014b), Sub-section 10.7, p. 238; QCA (2014a), Section 3, p. 10; QCA (2014a), Sub-section 3.4, p. 13; QCA (2014a), Sub-section 4.3.3, p. 23; QCA (2014a), Appendix B, p. 49; and QCA (2014a), Appendix C, p. 52.

[10] This is the median estimate from within the range of 9.7% to 12.4%.

[11] QCA (2014b), Sub-section 10.7, p. 239.

1.3 Assumptions and implications

13. The QCA makes a set of assumptions that underpin its dividend discount model analysis that directly impact upon its estimates of the expected market return and market risk premium. In the current sub-section we briefly outline those assumptions and their implications, and briefly explain our reasons where we disagree with the assumptions made by the QCA. In subsequent sections we comment in more detail on the implications of different assumptions.

14. **Long-term growth.** The QCA's estimates of nominal long-term growth in dividends per share are either 4.0% or 5.1%. In turn, these assumptions are based upon assumed inflation of 2.5%, real GDP growth of 3.0%, and the assumption that real growth in dividends per share will be either 0.5% or 1.5% below real GDP growth. We refer to this real, long-term growth assumption as *GDP minus 0.5% to 1.5%.*

15. The empirical basis for the assumed difference in real GDP growth and real dividend growth is research findings relating to the historical relationship between GDP and dividend growth.[12] We analysed data from Australia and the United States (**U.S.**), and document that this result (which underpins the downward adjustment applied by the QCA) is confined to the period prior to the substantial reductions in inflation that occurred over the last 20 to 30 years in Australia and the U.S. when central banks began to focus on maintaining moderate inflation. Since this change in inflation and central bank policy, real growth in earnings per share has matched or *exceeded* real growth in GDP.

16. Over the same time period, price/earnings ratios rose substantially. So in applying the *GDP minus 0.5% to 1.5%* approach, the QCA incorporates a growth assumption from the period *prior* to inflation/central bank regime change, and applies that growth assumption to high price/earnings stocks *post* the inflation/central bank regime change. Our point is that price/earnings ratios in recent decades have likely increased because the cost of capital is lower in nominal terms *and* growth estimates are higher. Under the QCA growth assumption, the increase in price/earnings ratios is attributed to reductions in the discount rate.

17. If the market cost of equity was to be estimated using a fixed input for long-term growth that is independent of share prices, there is no reason to think that earnings per share growth will lag behind GDP growth. We maintain the position that the most appropriate manner for estimating long-term growth is to use a technique that is not anchored to GDP, but rather incorporates reinvestment and returns on investment. In addition, even if long-term growth was anchored to GDP growth there is no basis for the downward adjustment of 0.5% to 1.5% used by the QCA, because the empirical evidence supporting this adjustment is entirely confined to the period prior to the current inflation/central bank policy regime.

18. **Term structure of the expected market return.** The QCA makes an assumption that, after a 10-year period, the expected market return will be equal to 11.8%, which is the sum of an average risk-free rate of 5.8% and a long-run market risk premium of 6.0%.[13] In conjunction with the QCA's 2.5% inflation estimate, the QCA's post 10-year market return assumption implies a real equity market return of 9.1%.[14] In conjunction with the QCA's long-term nominal growth estimates of 4.0% and 5.1%, the QCA's post 10-year market return assumption implies a dividend yield of 6.7% to 7.8%.[15] Further, the QCA is also assuming that the real 10-year bond yield will increase from the current QCA estimate of 1.5%[16] to a long-term figure of 3.2%.[17]

[12] QCA (2014a), Appendix C, p. 72, referring to Bernstein and Arnott (2003).
[13] QCA (2014a), Appendix C, p. 71; and QCA (2014b), Sub-section 10.7, p. 233.
[14] (1 + 0.118) ÷ (1 + 0.025) – 1 = 0.091.
[15] Dividend yield = total return – capital gains = 0.118 – 0.040 (or 0.051) = 0.078 (or 0.067).
[16] (1 + 0.0406) ÷ (1 + 0.025) – 1 = 1.5%.
[17] (1 + 0.0580) ÷ (1 + 0.025) – 1 = 3.2%.

19. The first thing to note is that the QCA's conclusions are predicated on a view that dividend yields of firms currently listed will rise substantially over the next 10 years. The trailing dividend yield assumed in the QCA analysis is 4.48%.[18] So dividend yields must increase by 2.2% to 3.3% over the convergence period. However, for even the longest listed firms amongst companies with analyst following, dividend yields remain below the range assumed by the QCA. The nine companies in our dataset with the longest trading histories currently have dividend yields within the range of 2.8% to 5.9%.[19] The QCA assumptions are consistent with the notion that the current set of relatively high growth/low dividend yield companies (the initial two year growth rate assumed by the QCA is 7.49% per year)[20] mature over the next 10 or 20 years to become relatively low growth/high dividend yield companies (with long-term growth rates of 4.0% or 5.1%). Yet the listed companies with the longest time to mature still have dividend yields below the QCA long-term dividend yield assumption.

20. In contrast, our perspective is that the long-term expected growth rate of listed companies is approximately the same as nominal GDP growth. We did not estimate growth on the basis of GDP growth, but our method and assumptions ultimately led to growth rates that approximate nominal GDP growth.

21. The second thing to note about the term structure assumption is that it leads to substantial time-series variation in the estimated market return. This occurs because, by imposing an assumption for the discount rate from year 11 onwards, the QCA must effectively solve for the discount rate over a very short period of time. In the current report we show that the time series variation in the market return estimate is substantially reduced simply by estimating a single discount rate for all future periods.

22. **Dividend imputation.** In prior work we have compiled estimates of the expected market return on two bases – both including and excluding the impact of imputation credits. We used a particular equation to estimate the higher market return that includes the impact of imputation credits. That equation states that the higher return that includes imputation benefits = the lower return that excludes imputation benefits ÷ {[1 – corporate tax rate] ÷ [1 – corporate tax rate × (1 – imputation credit value)]}, or $[1 - \tau] \div [1 - \tau \times (1 - \gamma)]$. At a corporate tax rate of 30% and an assumption for gamma of 0.47[21] this means that the higher return that includes imputation benefits = the lower return that excludes imputation benefits × 1.23.[22]

23. The QCA has reached the conclusion that "[t]he SFG Consulting adjustment is in error because it is only appropriate under very unrealistic circumstances. In particular, it assumes there is no inflation and that firms distribute all net cash flows as dividends rather than retaining such cash flows."[23] We only briefly comment upon the QCA conclusion in the current report because this subject forms the basis for a separate report that covers the issue in detail.

24. The first point to make is that we adopted the imputation adjustment described above because it is exactly the imputation adjustment that the QCA makes in projecting cash flows in its post-tax revenue model. We do not advocate that the adjustment is based upon realistic assumptions. We agree that it is based upon the assumption that all cash flows are distributed as dividends and that this does not occur. But we used the adjustment for the sole reason that it is adopted by the QCA in its post-tax revenue model. The QCA uses a weighted average cost of capital that does not include the impact of imputation credits. But in estimating the tax benefit of imputation credits, the equations it uses lead to exactly the

[18] QCA (2014b), Sub-section 10.7, p. 233.
[19] The specific firms are BHP (listed 117 years, dividend yield = 4.1%), Santos (listed 48 years, dividend yield = 2.8%), Origin (listed 41 years; dividend yield = 3.5%), Rio Tinto (listed 40 years, 3.8%), ANZ (listed 33 years, dividend yield = 5.1%), Westpac (listed 32 years, dividend yield = 5.2%), Woodside (listed 31 years, dividend yield = 5.9%), QBE (listed 29 years, dividend yield = 3.2%) and National Australia Bank (listed 28 years, dividend yield = 5.6%).
[20] QCA (2014b), Sub-section 10.7, p. 233.
[21] QCA (2014b), Sub-section 10.9, p. 261.
[22] $1 \div \{[1 - 0.30] \div [1 - 0.30 \times (1 - 0.47)]\} = 1 \div \{0.70 \div 0.86\} = 1 \div 0.81 = 1.23$.
[23] QCA (2014b), Sub-section 10.7, p. 232.

same result. In short, the imputation adjustment is not *the SFG Consulting adjustment*. Rather, it is *the QCA adjustment* that is implemented in the QCA's post-tax revenue model computations.

25. The second point to make is that the QCA uses one equation for estimating imputation credits in determining the expected market return, and a different equation for estimating imputation benefits in estimating revenue in its post-tax revenue model. According to the QCA, if the market risk premium was estimated at 6.0% without the benefit of imputation credits, the corresponding estimate of the market risk premium that includes the benefit of imputation credits is 6.8%.[24] So for a market risk premium estimate of 6.8%, there is approximately 0.8% benefit from imputation credits. In contrast, were the QCA to incorporate assumptions in its post-tax revenue model of a risk-free rate of 3.21%, market risk premium of 6.8%, and an equity beta of 1, the allowed return to equity holders would be 8.16%.[25] This is 1.85% below the 10.01% equity return that includes the benefit of imputation credits. We repeat our previously-made point that, in estimating the market risk premium, the QCA assumes that imputation credits have low value but in estimating cash flows for a regulated entity the QCA assumes that imputation credits have high value. Our submission is that the QCA adopt a consistent treatment of imputation credits in estimating the expected market return and in estimating cash flows for a regulated entity.

1.4 Outline

26. In Section 2 of the report we devote our attention to individual assumptions made by the QCA in compiling its dividend discount model estimates. We document the impact that these assumptions have on the level and time series variation of estimates of the expected market return and market risk premium over time.

27. In Section 3 we focus entirely on issues relating to long-term growth, paying particular attention to the merits of the *GDP minus 0.5% or 1.5%* assumption. We discuss the impact of share repurchases and new share issues on growth in earnings per share and dividends per share, and then consider historical evidence on growth in GDP, earnings per share and dividends per share. We reach conclusions in Section 4.

[24] QCA (2014b), Sub-section 10.7, p. 232.
[25] 3.21% + 1.0 × 0.068 = 10.01%. 10.01% × 0.81 = 8.16%.

2. What would the QCA approach have produced in the past?

2.1 Assumptions and extended analysis

28. We began our analysis by replicating the QCA's computations of the expected market return and market risk premium, under the following assumptions:

a) initial trailing dividend yield of 4.48% per year;

b) 10-year government bond yield of 4.06% per year;

c) four-year government bond yield of 3.21% per year;

d) initial two year dividend growth of 7.49% per year;

e) market return after ten years of 11.8% per year;

f) ten-year government bond yield after ten years of 5.8% per year;

g) market risk premium after ten years of 6.0% per year;

h) imputation adjustment factor for dividends of 1.18 [that is, \$1.00 of cash dividends is worth \$1.18 to the investor computed as 1 + corporate tax rate ÷ (1 – corporate tax rate) × percentage of dividends franked × value of a distributed imputation credit = 1 + 0.30 ÷ (1 – 0.30) × 0.75 × 0.56]; and

i) dividends are paid every half year.

29. We were able to verify the market risk premium and market return estimates compiled by the QCA using these inputs, as summarised in Paragraphs 4 and 5 above.

30. Having verified the QCA computations, we applied the QCA approach to compile estimates of the expected market return and market risk premium at the end of every month from July 2002 to December 2013. The dataset we use to estimate trailing dividend yields and the initial two-year dividend growth rate is our aggregation of individual analyst earnings and dividend forecasts for all Australian-listed stocks. For each listed company we match the release of an analyst's earnings and dividend forecast with the stock price on the day the analyst forecast is released. This ensures there is alignment in time between market expectations impounded into the stock price and the earnings and dividend expectations of the analyst. This is a useful way to compile the dataset because when consensus analyst forecasts are used (that is, the average of analyst forecasts prevailing at one time), the consensus forecasts contain some stale data (i.e., some of the analyst forecasts were formed when prices were different). Our estimate of the risk free rate is the 20-day trailing average of the 10-year government bond yield, consistent with the approach adopted by the QCA when estimating MRP.

31. Our computations are illustrated in Figure 1. Panel A presents the time series of market return estimates and Panel B presents the time series of market risk premium estimates, after subtracting the yield on 10-year government bonds. We present estimates under the two convergence periods, and two long-term growth assumptions made by the QCA. In the chart, the label H10 refers to the high growth assumption and a 10 year convergence period, the label H20 refers to the high growth assumption and a 20 year convergence period, the label L10 refers to the low growth assumption and a 10 year convergence period and the label L20 refers to the low growth assumption and a 20 year convergence period.

2.2 The term structure assumption and the sensitivity to the growth assumption

32. The first thing to note is the substantial volatility of the market return and market risk premium estimates over time. This point is discussed in the following sub-section in which we make the point that the substantial time-series variation in market return estimates is the direct result of the QCA assumption that the market return is constant at 11.8% after year ten. The key point is that if the QCA continues to assume a term structure for the cost of equity, in a subsequent period in which dividend

yields could be high or low, we will observe extreme estimates of the expected market return and market risk premium.

33. The impact of the QCA long-term growth assumption can be seen in the median market return and market risk premium estimates over time. Assuming 5.1% long-term growth, the median market return estimates are 12.6% assuming ten year convergence and 14.1% assuming 20 year convergence (corresponding to median market risk premiums of 7.4% and 9.3%); assuming 4.0% long-term growth, the median market return estimates are 10.9% and 12.8% (corresponding to median market risk premium estimates of 5.7% and 8.0%). If we were to take a median of the four market return and market risk premium estimates each month, and then take a median over each month in the period, the market return over the period would be estimated at 12.6% and the market risk premium would be estimated at 7.7%.

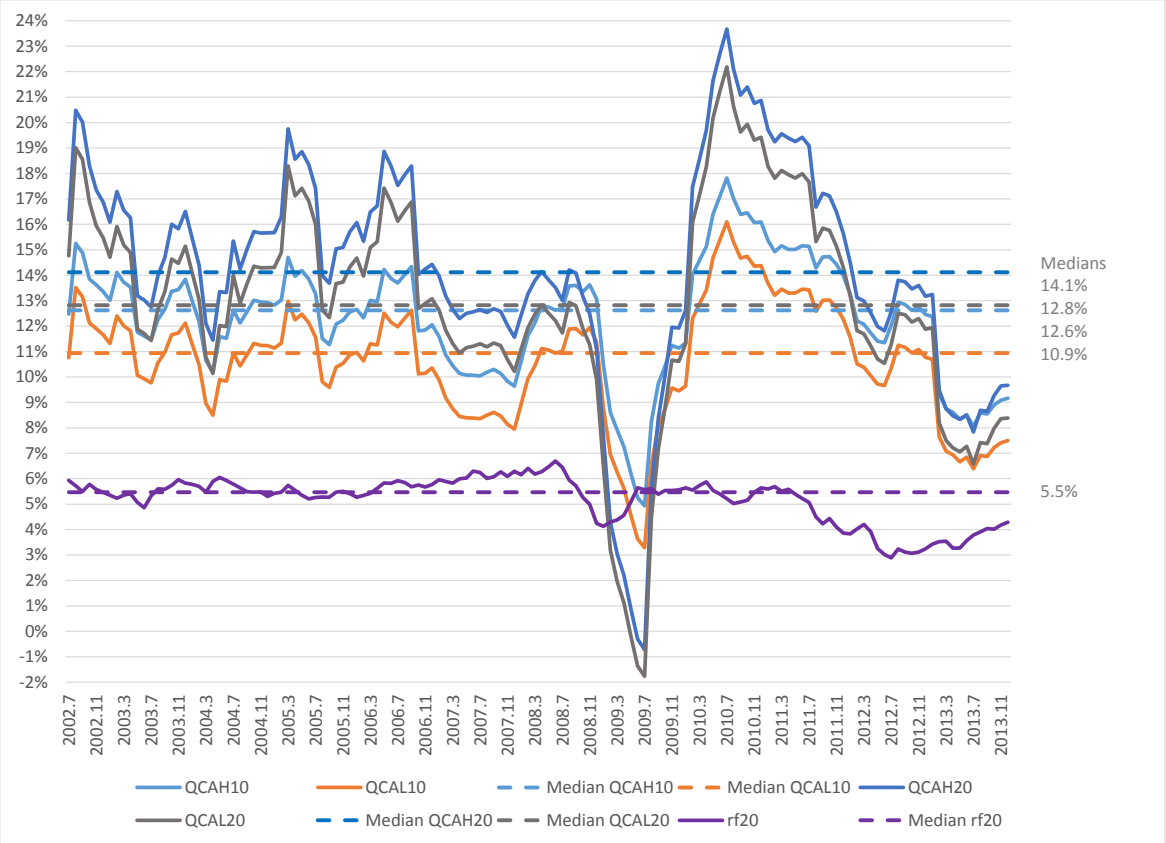
34. So the QCA's long-term growth assumption is important in estimating the market cost of equity and market risk premium, and this importance is exacerbated by the QCA's term structure assumption. In the dividend discount model, if the convergence period is zero, then the cost of equity is just the sum of the dividend yield and the growth rate. If the cost of equity is held constant (that is, no term structure) as the convergence period lengthens, the near-term growth expectations become more important and the long-term growth expectations become less important. So the change in the cost of equity under different growth assumptions will be less than the change in the long-term growth estimate. This means that, with a 20 year convergence period, the debate over what is the "right" long-term growth assumption would be mitigated because the level of long-term growth has less impact.

35. However, because of the term structure assumption, we have more impact of the long-term growth assumption. Consider the median cost of equity estimates shown in Figure 1. At a 10 year convergence period the median cost of equity estimate is 10.9% assuming low growth and 12.6% assuming high growth. So a difference in the long-term growth estimate of 1.1% corresponds to a difference in the cost of equity of 1.7%. As the convergence period lengthens to 20 years, the median cost of equity estimates are 12.8% and 14.1% under low and high growth. So a 1.1% difference in the long-term growth assumption corresponds to a difference in the cost of equity of 1.3%.

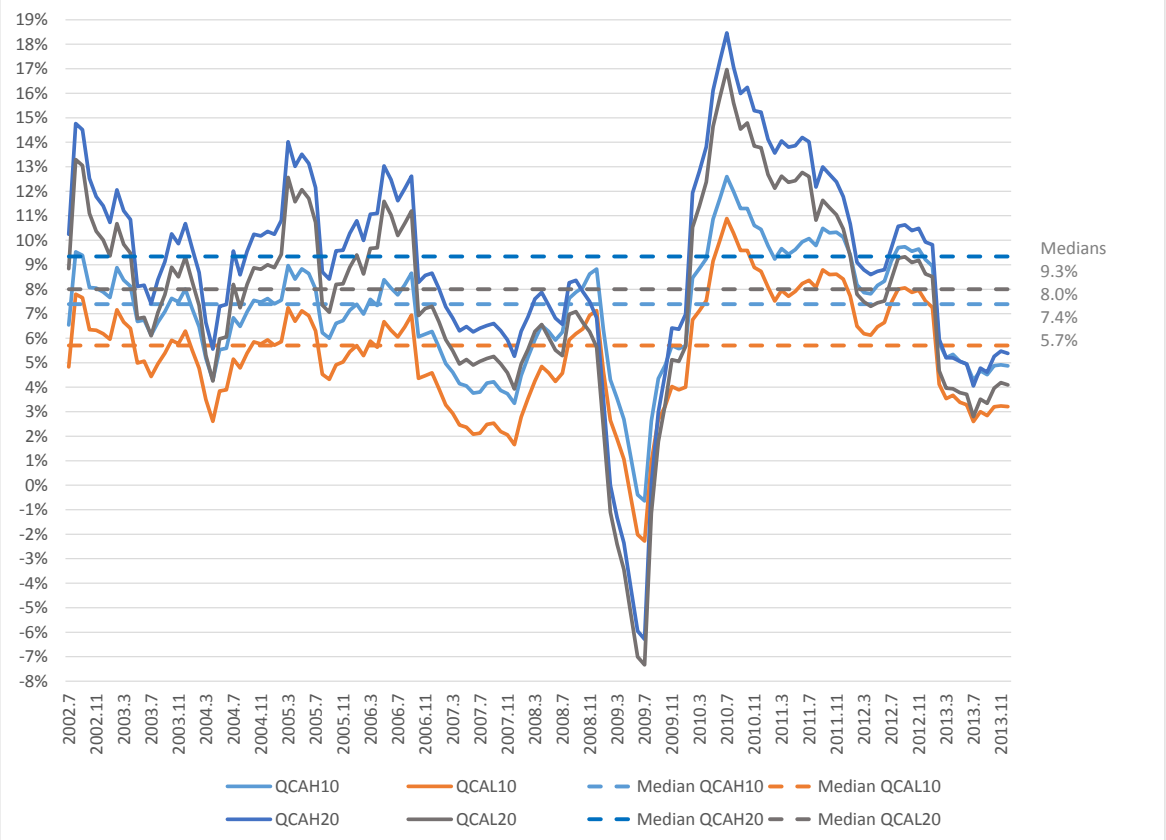
36. In sum, we agree with the QCA's use of a convergence period, but disagree with the use of a term structure assumption for estimating the cost of equity. The term structure assumption increases the sensitivity of the cost of equity estimate to the long term growth assumption, and there is no reliable basis for making the assumption that the cost of equity is expected to converge to a different figure at the end of year 10 or 20.

Figure 1. Market return and market risk premium estimates implied by the QCA method and long-term assumptions

Panel A: Market return and risk free rate



Panel B: Market risk premium



2.3 The term structure assumption and time series variation in estimates

37. The QCA adopts an assumption about the term structure of the cost of equity. The basis for this approach is that the cost of equity in the short term might be different to the cost of equity in the long term. This is analogous to the term structure for bond yields, in which the yield to maturity on a 10-year bond will be different to the yield to maturity on a 30-year bond. Our view is that a better approach is to adopt one cost of equity over all forecast years into perpetuity.

38. To incorporate a term structure into the estimate of the cost of equity means there needs to be an assumption of the long term expected market return, for which the QCA assumption is 11.8% per year. This necessarily embeds an assumption that current equity prices have no relevance at all to the cost of equity for cash flows received after the convergence period.

39. Incorporating a term structure assumption means we confront the following problem. We do not really have useful information about whether there is a term structure for equity. We are attempting to estimate the cost of equity from share prices to obtain a timely estimate of required returns. It might be the case that the cost of equity from year 10 onwards is different to the cost of equity for years 1 to 10, and it might be the case that the cost of equity is the same for all years.

40. What is clear, however, is that if we assume a *high figure* for the long term cost of equity, the estimate for the cost of equity over the first 10 years will come *down*; and if we assume a *low figure* for the long term cost of equity, the estimate for the cost of equity over the first 10 years will come *up*. This will increase the variation in the estimated cost of equity over time. We quantify this time series variation below by comparing the cost of equity and market risk premium over time, incorporating a long term cost of equity versus not incorporating a long term cost of equity.

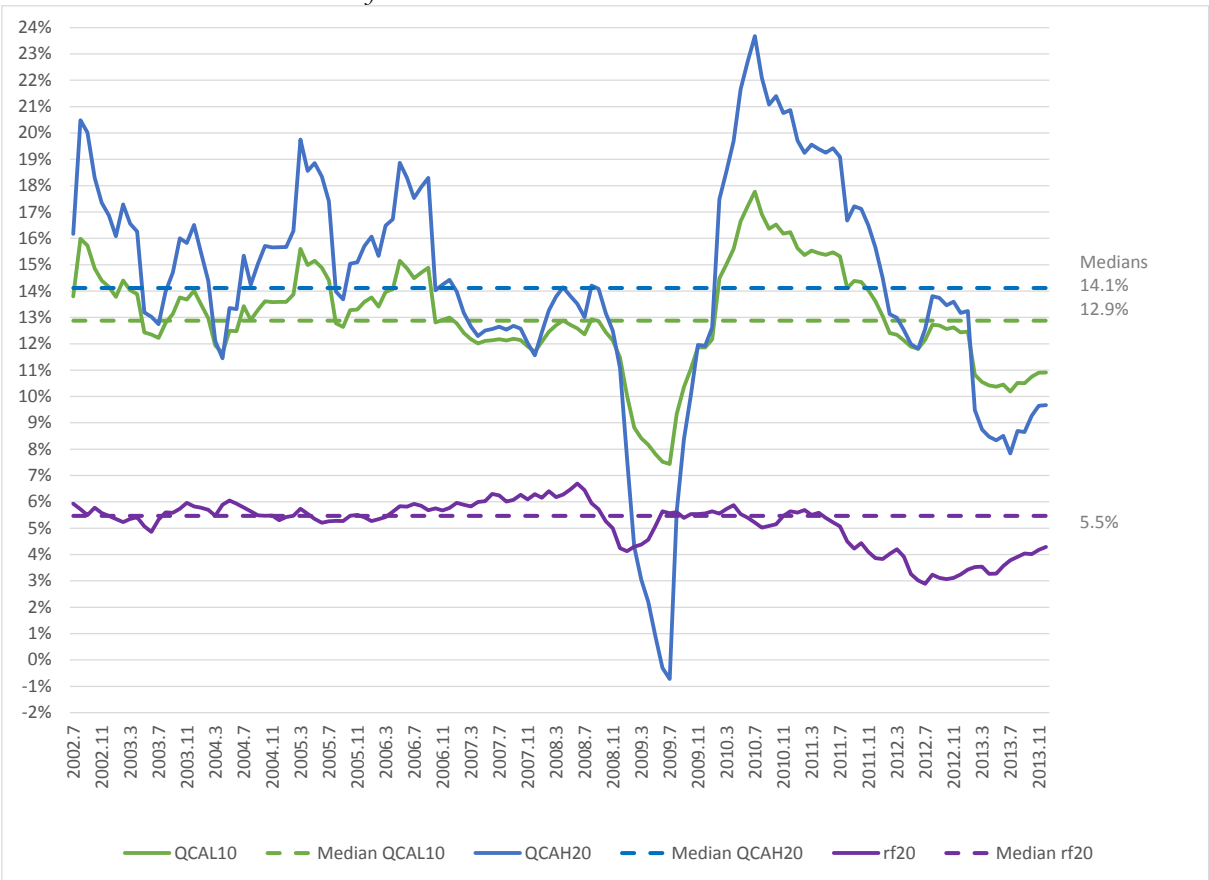
41. Turning to Figure 2, we observe that the cost of equity and market risk premium estimates are considerably more volatile once a term structure is incorporated. This figure presents the market return and market risk premium estimates under the 5.1% long term growth/20 year convergence assumption.

42. The median market return estimates over time are 14.1% if a term structure assumption is adopted and 12.9% if no term structure is adopted, thereby allowing the market return to be constant for all future years. This corresponds to median estimates of the market risk premium of 9.3% and 7.8%, respectively. This means there is no reason to think that if the term structure assumption was removed that it would in any way bias the market return and market risk premium estimates.

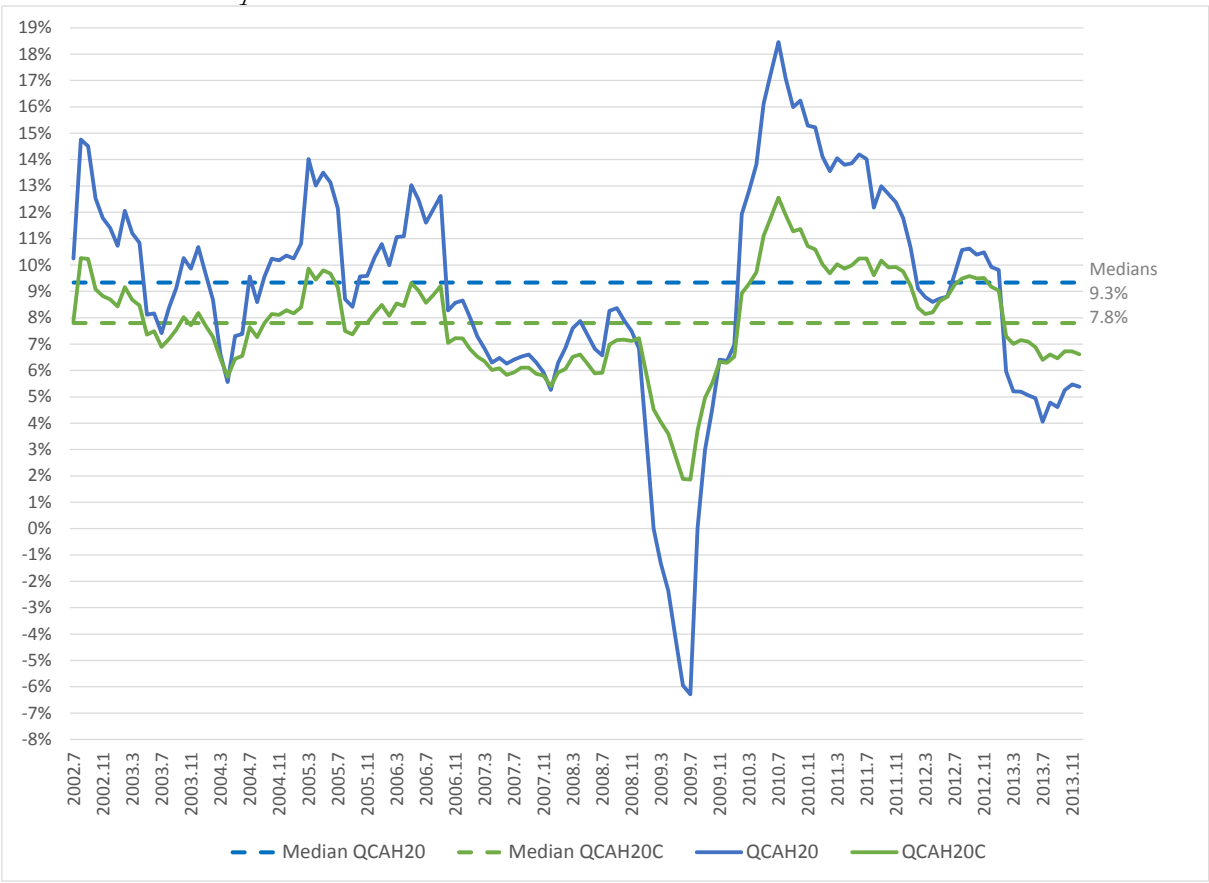
43. In sum, the benefit of removing the term structure assumption is that it would substantially mitigate the time-series variation in the market return and market risk premium estimates. We maintain the view that an estimate of long term growth should be made with consideration of reinvestment and returns. But even if a long term growth rate was simply assumed, unnecessary time series variation in the estimate of the market return and market risk premium can be avoided simply by removing the term structure assumption. This is not at all a violation of any important theoretical or empirical assumption because there is no reliable basis for assuming that stocks are priced under the assumption that the cost of equity after year 10 or 20 differs from the cost of equity over year one.

Figure 2. Market cost of equity estimate incorporating a term structure assumption

Panel A: Market return and risk-free rate



Panel B: Market risk premium



3. Estimation of long-term growth

3.1 Introduction

44. In this section we discuss the QCA's assumption relating to long-term growth. Our view is that the long-term growth assumption should not be *imposed* on the analysis, but rather should be *estimated* using relevant observable data such as share prices, earnings and dividends. But in this report we do not repeat our earlier analysis and document our estimation procedure for market returns and the market risk premium. We focus on just two issues.

45. First, in relation to the theoretical rationale of the QCA, we make the point that the growth in earnings per share and dividends per share does not need to be anchored to GDP growth. Growth in listed company earnings per share is contingent upon investment and returns, not imposed by the growth rate in the aggregate economy. It is not reasonable to simply say that if one company grows at a rate faster than GDP it will eventually be larger than the economy and that cannot hold. What matters for valuation purposes is the growth in earnings per share over one century, not the technical case of "forever" and we could easily just compute the present value of expected dividends per share over the next century to estimate the market return. The imposing of the GDP growth rate as a ceiling on the market growth in earnings per share simply ignores the relationship between investment and returns in determining earnings per share growth.

46. Second, in relation to the empirical evidence relied upon by the QCA, we document that for the entire period since central banks in Australia and the United States adopted policies to target inflation that growth in earnings per share has approximated GDP growth. The empirical evidence relied upon by the QCA that GDP growth outstrips earnings per share growth is entirely driven by the earlier time period of relatively high inflation.

47. This earlier high inflation period is characterised by relatively low price-earnings ratios, and the more recent low inflation period is characterised by relatively high price-earnings ratios. In estimating the market return using the dividend discount model, the QCA is attempting to determine the discount rate that justifies the relatively high price-earnings ratios in the more recent period. But in making this assessment the QCA relies upon an assumption about growth that is driven by the earlier period of low price-earnings ratios. This means that the QCA long-term growth assumption of *GDP growth minus 0.5% or 1.5%* is likely to be an understatement of expected growth, leading to an understatement of the expected market return. We reiterate that what is important is the market's expectation for long-term growth, and suggest that the low inflation, high price-earnings ratio period is characterised by an assumption that growth in earnings per share approximates GDP growth.

3.2 Growth, reinvestment, buybacks and dividend reinvestment plans

48. The QCA's analysis of the market cost of equity using the dividend discount model relies upon an assumption that long-term growth is 4.0% or 5.1%. The basis for this estimate is that real long-term growth of listed firms will be 0.5% or 1.5% below real long-term GDP growth of 3.0%, and that inflation will be 2.5%. In this sub-section we discuss the basis for this conclusion, and whether it appears reasonable.

49. The first issue to consider is the relevance of GDP growth for the growth in earnings per share of listed companies at a point in time. Our concern over this reference point is that it has nothing to do reinvestment rates for listed companies. The basic argument relied upon by the QCA is that it makes no difference what reinvestment rates are, listed companies cannot grow faster than GDP, because eventually the earnings of listed companies would be larger than the whole economy.

50. The troubling extension to this argument is that it simply does not allow expectations for growth to vary across firms according to reinvestment rates, or over time in response to economic or policy changes that encourage dividends versus share buybacks at different points in time. Linking earnings per share growth in listed companies to GDP growth is a blunt instrument. It is likely that more reliable

estimates of the cost of equity, at the market and industry level, would result from consideration of reinvestment rates and returns on investment. This includes investments in new projects, as well as share repurchases (which is just one particular type of investment – the purchase of a company's own shares), and new share issues (which has the opposite impact of reinvestment).

51. As an example, suppose that a firm has just generated earnings per share of $1.00, the cost of equity is 10%, the firm reinvests $0.35 in new projects, pays a dividend of $0.65, and dividends and earnings are expected to grow in perpetuity at 4.6%. There are 100 million shares on issue. Prior to the dividend payment the value of the share is $13.24, computed as shown below, and the total equity value is $1324 million.

$$\begin{aligned} Equity\ value\ per\ share_0 &= DPS_0 + \frac{DPS_0 \times (1+g)}{r_e - g} \\ &= \$0.65 + \frac{\$0.65 \times 1.046}{0.100 - 0.046} \\ &= \$0.65 + \frac{\$0.68}{0.054} \\ &= \$0.65 + \$12.59 \\ &= \$13.24 \end{aligned}$$

52. After the dividend is paid, the share price will fall to $12.59 and the market capitalisation will be $1259 million. This is the present value of expected dividends after the first dividend is paid. We can see in this instance that, after the ex-dividend date, the dividend yield will be 5.4% ($0.68 ÷ $12.59 = 5.4%), the growth rate is 5.4%, which sum to the cost of equity of 10.0%.

53. In this example the firm decided to invest $35 million in new projects and return $65 million to shareholders via dividend payments. Now suppose that the firm decides that the way it returns cash to shareholders will change. Rather than pay dividends of $65 million it will use $65 million to repurchase shares.[26] What happens? The post-buyback value of the equity will still be $1,259 million because there has been no change to the firm's investment prospects, nor to its cost of capital. Prior to the payment of any dividend or repurchase of shares the market value of the equity will still be $1,324 million. But the market will recognise that there will be fewer shares on issue after the buyback. This will alter the mix of return from dividends versus capital gains.

54. Now suppose that the company offers shareholders $13.24 per share in a buyback. If the shareholders accept the offer they will not be entitled to the dividend. With $27 million of cash available for the repurchase of shares, this means that 2.04 million shares will be repurchased (that is, $27 million ÷ $13.24 per share = 2.04 million shares). The remaining shareholders will split the dividend of $38 million amongst 97.96 million shares, so each shareholder will receive a dividend of $0.39 (that is, $38 million ÷ 97.96 million shares = $0.39 per share). The share price after the buy-back and the dividend payment will be $12.85 per share (that is, $1,259 million ÷ 97.96 million shares = $12.85 per share).

55. In sum, shareholders who participated in the buyback receive cash for their shares of $13.24. Shareholders who did not participate in the buyback receive a cash dividend of $0.39, and hold a share worth $12.85, so their total wealth per share is also $13.24. In the all dividend case, shareholders

[26] For the purposes of the example, we assume that the buyback announcement itself does not signal anything to the market about undervaluation of the company's real assets, and that there are no tax benefits associated with a buyback versus a dividend.

received a cash dividend of $0.65 and were left with a share worth $12.59, so their wealth is $13.24 per share.[27]

56. If this process is repeated each year, with the same proportion of total earnings being used to pay dividends and repurchase shares, we see a trade-off between dividend yield and growth in how shareholders receive their total return of 10.00%. In the all-dividend case, the dividend yield is 5.40% and capital gains are 4.60%. Capital gains exactly match the growth in earnings per share and dividends per share. In the buy-back case, the dividend yield is 3.22% and capital gains are 6.78%.

57. This outcome is presented in Table 1, which shows financial information over the five forecast years. In Panel A we present the situation in which there are only dividends paid, and in Panel B we present the situation in which there are dividends and share repurchases. The implications are the same, regardless of the number of years presented. One distribution policy leads to high dividends and low growth, another distribution policy leads to low dividends and high growth.

58. This example highlights the limitation of anchoring growth expectations to GDP growth, which takes no account of reinvestment rates. In the example, the investment in new projects is the same. But the manner in which benefits are returned to shareholders is altered. The buyback means that the firm *is* making more investments. It just happens to be making investments in its own stock. This leads to higher growth in earnings per share, dividends per share, and share price.

59. The example can be extended to dividend reinvestment plans, and the implication is the same, that growth is altered by reinvestment policy with no change in real investments. A dividend reinvestment plan is a share repurchase plan in reverse. The company pays a dividend, shareholders with a preference for shares rather than cash elect to reinvest their dividend in shares of the company. If the company wants to use the cash for new projects, or to repay debt, it will issue new shares in exchange for cash. If the company decides it has no need for additional cash, or to repay debt, it will repurchase shares on the market on behalf of the shareholders who want to reinvest their dividends. The latter situation is basically the company providing some convenience for shareholders who want to avoid the transaction costs and time involved in buying additional shares themselves on the market.

60. The example just provided can be extended to the dividend reinvestment plan situation. Suppose that the company decides to return all $100 million of earnings to shareholders as a dividend, but just prior to the payment of the dividend raises $35 million in new equity.[28] All shareholders are entitled to participate at the fair price of $13.24 per share.[29] The reinvestment of $35 million means that the company issues 2.64 million new shares (that is, $35 million ÷ $13.24 per share = 2.64 million shares). A shareholder who elects not to participate in the capital raising will receive a dividend of $0.97, and be left with a share worth $12.27. A shareholder who does participate in the capital raising now owns 1.0264 shares, so has dividends worth $1.00 ($0.97 per share × 1.0264 shares = $1.00), shares worth $12.59 ($12.27 per share × 1.0264 shares = $12.59), but paid out $0.35. So the total wealth of the shareholder who participated in the capital raising is $1.00 + $12.59 – $0.35 = $13.24.

61. If this situation continues we will have a dividend yield of 8.09% and capital gains of 1.91% per year. This is depicted in Table 1, Panel C. There is a payout ratio of 100% of earnings, but there is still

[27] The reason buybacks are useful is that some shareholders have a preference to receive cash and some shareholders have a preference for capital gains. So the buyback allows shareholders with a preference for cash to exercise their preference and shareholders with a preference for capital gains to exercise their preference. Often these preferences are motivated by different taxes applicable to classes of shareholders, and different taxes applicable to the return of capital, dividends and capital gains. For the purposes of this discussion the reason why buybacks exist is not important. What matters is how buybacks alter the mix of expected returns amongst dividend yield and growth.

[28] This approach might be adopted by companies with shareholders who have a preference for dividends, rather than capital gains.

[29] Some dividend reinvestment plans offer shares at a small discount to the market price. In situations in which the company has a need for new equity for investment or repayment of debt, the discount will typically be larger to encourage participation in the plan. In situations in which the dividend reinvestment plan is not needed for new capital, the discount will generally be lower and will often be zero.

positive growth in earnings per share because capital for investment is raised via the dividend reinvestment plan.

62. So in this extended example we have a dividend only case, a buyback case, and a reinvestment case, in which the total returns to shareholders are identical, but the growth rates vary from 1.91% in the reinvestment case, 4.60% in the dividend case, and 6.78% in the buyback case. There has been no change in the aggregate earnings growth of the company, which has been 4.60% throughout. The key point is that growth in earnings per share should not be anchored to GDP growth without consideration of how reinvestment impacts upon earnings per share growth.

Table 1. Example of dividends versus share repurchase

Panel A: Dividends only

Year	0	1	2	3	4	5
NPAT	100.00	104.60	109.41	114.44	119.71	125.22
Investment in new projects	35.00	36.61	38.29	40.06	41.90	43.83
Cash used for buyback	0.00	0.00	0.00	0.00	0.00	0.00
Dividends	65.00	67.99	71.12	74.39	77.81	81.39
Cash used for buyback and dividends	65.00	67.99	71.12	74.39	77.81	81.39
% of earnings invested in new projects	35%	35%	35%	35%	35%	35%
% of earnings used to repurchase shares	0%	0%	0%	0%	0%	0%
% of earnings paid as dividends	65%	65%	65%	65%	65%	65%
Shares pre buyback	100.00	100.00	100.00	100.00	100.00	100.00
Buyback price	13.24	13.85	14.49	15.15	15.85	16.58
Shares repurchased	0.00	0.00	0.00	0.00	0.00	0.00
Shares post-buyback	100.00	100.00	100.00	100.00	100.00	100.00
Earnings per share	1.00	1.05	1.09	1.14	1.20	1.25
Dividends per share	0.65	0.68	0.71	0.74	0.78	0.81
Earnings per share growth		4.60%	4.60%	4.60%	4.60%	4.60%
Dividends per share growth		4.60%	4.60%	4.60%	4.60%	4.60%
Equity value per share prior to dividend	13.24	13.85	14.49	15.15	15.85	17.32
Equity value per share after dividend	12.59	13.17	13.78	14.41	15.07	16.51
Market cap prior to dividend and buyback	1324.07	1384.98	1448.69	1515.33	1585.04	1657.95
Market cap after dividend and buyback	1259.07	1316.99	1377.57	1440.94	1507.22	1576.56
Dividend yield		5.40%	5.40%	5.40%	5.40%	5.40%
Capital gains		4.60%	4.60%	4.60%	4.60%	9.51%
Total return to equity holders		10.00%	10.00%	10.00%	10.00%	14.91%
Growth in NPAT	4.60%					
Long-term growth in dividends per share	4.60%					
Cost of equity	10.00%					

Panel B: Dividends and share repurchase

Year	0	1	2	3	4	5
NPAT	100.00	104.60	109.41	114.44	119.71	125.22
Investment in new projects	35.00	36.61	38.29	40.06	41.90	43.83
Cash used for buyback	27.00	28.24	29.54	30.90	32.32	33.81
Dividends	38.00	39.75	41.58	43.49	45.49	47.58
Cash used for buyback and dividends	65.00	67.99	71.12	74.39	77.81	81.39
% of earnings invested in new projects	35%	35%	35%	35%	35%	35%
% of earnings used to repurchase shares	27%	27%	27%	27%	27%	27%
% of earnings paid as dividends	38%	38%	38%	38%	38%	38%
Shares pre buyback	100.00	97.96	95.96	94.01	92.09	90.21
Buyback price	13.24	14.14	15.10	16.12	17.21	18.38
Shares repurchased	2.04	2.00	1.96	1.92	1.88	1.84
Shares post-buyback	97.96	95.96	94.01	92.09	90.21	88.37
Earnings per share	1.00	1.07	1.14	1.22	1.30	1.39
Dividends per share	0.39	0.41	0.44	0.47	0.50	0.54
Earnings per share growth		6.78%	6.78%	6.78%	6.78%	6.78%
Dividends per share growth		6.78%	6.78%	6.78%	6.78%	6.78%
Equity value per share prior to dividend	13.24	14.14	15.10	16.12	17.21	18.87
Equity value per share after dividend	12.85	13.72	14.65	15.65	16.71	18.33
Market cap prior to dividend and buyback	1324.07	1384.98	1448.69	1515.33	1585.04	1657.95
Market cap after dividend and buyback	1259.07	1316.99	1377.57	1440.94	1507.22	1576.56
Dividend yield		3.22%	3.22%	3.22%	3.22%	3.22%
Capital gains		6.78%	6.78%	6.78%	6.78%	9.71%
Total return to equity holders		10.00%	10.00%	10.00%	10.00%	12.93%
Growth in NPAT	4.60%					
Long-term growth in dividends per share	6.78%					
Cost of equity	10.00%					

Panel C: Dividends and dividend reinvestment plan

Year	0	1	2	3	4	5
NPAT	100.00	104.60	109.41	114.44	119.71	125.22
Investment in new projects	35.00	36.61	38.29	40.06	41.90	43.83
Cash used for buyback (DRP)	-35.00	-36.61	-38.29	-40.06	-41.90	-43.83
Dividends	100.00	104.60	109.41	114.44	119.71	125.22
Cash used for buyback (DRP) and dividends	65.00	67.99	71.12	74.39	77.81	81.39
% of earnings invested in new projects	35%	35%	35%	35%	35%	35%
% of earnings used to repurchase shares (i.e., DRP)	-35%	-35%	-35%	-35%	-35%	-35%
% of earnings paid as dividends	100%	100%	100%	100%	100%	100%
Shares pre buyback (DRP)	100.00	102.64	105.36	108.14	111.00	113.93
Buyback (DRP) price	13.24	13.49	13.75	14.01	14.28	14.55
Shares repurchased	-2.64	-2.71	-2.78	-2.86	-2.93	-3.01
Shares post-buyback (DRP)	102.64	105.36	108.14	111.00	113.93	116.95
Earnings per share	1.00	1.02	1.04	1.06	1.08	1.10
Dividends per share	0.97	0.99	1.01	1.03	1.05	1.07
Earnings per share growth		1.91%	1.91%	1.91%	1.91%	1.91%
Dividends per share growth		1.91%	1.91%	1.91%	1.91%	1.91%
Equity value per share prior to dividend	13.24	13.49	13.75	14.01	14.28	15.53
Equity value per share after dividend	12.27	12.50	12.74	12.98	13.23	14.45
Market cap prior to dividend and buyback (DRP)	1324.07	1384.98	1448.69	1515.33	1585.04	1657.95
Market cap after dividend and buyback (DRP)	1259.07	1316.99	1377.57	1440.94	1507.22	1576.56
Dividend yield		8.09%	8.09%	8.09%	8.09%	8.09%
Capital gains		1.91%	1.91%	1.91%	1.91%	9.26%
Total return to equity holders		10.00%	10.00%	10.00%	10.00%	17.36%
Growth in NPAT	4.60%					
Long-term growth in dividends per share	1.91%					
Cost of equity	10.00%					

3.3 Historical GDP growth and earnings per share growth

63. In the prior section we made the point that, if the assumed earnings per share growth is anchored to GDP growth, without consideration of reinvestment, the assumed growth rate could be very far from the correct growth rate. Even if dollar earnings grow at the same rate as GDP (or GDP ± an assumed percentage) the growth in earnings per share could be very different once reinvestment is accounted for.

64. In this section we consider the historical relationship between GDP growth and growth in both earnings per share and dividends per share for stocks listed in Australia and the U.S. While our task is to estimate the cost of equity for Australian-listed stocks, we refer to U.S. data to mitigate the risk that our conclusions are affected by unexpected events in Australia. We also refer to U.S. data because the research that supports the position of the QCA is two studies which examine data from a number of countries.

65. The purpose of this section is to address three reasons why the QCA assumes real earnings and dividend growth to be 0.5% to 1.5% below the QCA's estimate of long-term GDP growth. These three reasons are summarised below, and we consider each of these reasons in turn.

a) Mathematically, the dollar earnings of the market cannot grow faster than GDP forever. Eventually, corporate earnings of listed firms would exceed the entire output from the economy.

b) Even if aggregate corporate earnings grow at the same rate as GDP, some of those corporate earnings come from new companies. If current listed companies grow at the rate of GDP, and there are some additional earnings from new companies, in aggregate growth in corporate earnings will be more than GDP growth. So, again, aggregate earnings of listed companies would eventually be larger than the economy.

c) Historical data shows dividend and earnings growth in developed markets which is less than historical GDP growth.

Earnings would eventually exceed economic output if earnings growth exceeds GDP growth

66. It is correct to say that, if the earnings of listed companies grow at a faster rate than GDP, eventually those corporate earnings would exceed GDP. Mathematically, that would occur. According to the Australian Bureau of Statistics (ABS), over the calendar year 2013, nominal GDP was estimated at $1,556 billion.[30] The ABS also reports an estimate of company profits before tax, which stands at $180 billion for 2013.[31] So pre-tax corporate profits are estimated at 11.6% of GDP. If GDP grows at 5.6% for 50 years, and pre-tax corporate profits grow faster, at (for example) 6.1% for 50 years, then pre-tax profits will reach 14.7% of GDP. If this continues for 100 years the ratio will be 18.6%. Of course, these ratios would be even lower if we were to consider after-tax corporate profits.

67. For valuation purposes, there has been general agreement that it is useful to factor in a long-term growth rate at some point in the estimation. In the QCA analysis, this point is reached in ten or 20 years. But the argument that the growth rate assumption cannot mathematically exceed an estimate of GDP growth is a very long term argument. For valuation purposes, we are really talking about the rate of growth over the next 100 years. The perpetual growth assumption is made for convenience. For example, if a cash flow of $100 today is expected to grow at 5.6% per year forever, and the discount rate is 10.0%, the present value of expected cash flows is $2,400.[32] The present value of expected cash flows over 50 years is $2,088, which is 87% of the total present value, and the present value of expected cash flows over 100 years is $2,356, which is 98% of the total.

68. This means that, if we were to write the present value equation as the present value of each individual cash flows over 100 years, rather than a perpetuity, it is much more realistic to consider the situation in which earnings per share growth matches or exceeds GDP growth. The question is whether we could see growth approximate GDP growth over the next 100 years from listed companies, not the case in which we consider the actual perpetuity situation. In other words, it is not appropriate to exclude the possibility that the growth in corporate earnings from listed companies approximates GDP growth over 100 years, because this cannot happen *forever*.

Overview of the historical growth in earnings per share and GDP

69. Addressing the second point – contribution from new companies – the rationale here is that total growth in GDP comes from existing businesses and new businesses, so we cannot attribute all of the GDP growth to businesses in existence today. This ties in to the third point, which is the historical relationship between GDP growth, dividend growth and earnings growth in developed markets. The empirical observation is that dividend growth and earnings growth have been less than GDP growth. So in the discussion below, we examine the historical information.

70. We first draw our attention to analysis presented by Bernstein and Arnott (2013). They report that over 100 years from 1900 to 2000, Australia had real GDP growth of 3.3% per year and real dividend growth of 0.9% per year. The difference of –2.4% between real GDP growth and dividend growth is referred to as *dilution in dividend growth (vis-à-vis GDP growth).*[33]

71. For the United States, the researchers report real GDP growth of 3.3% per year and real dividend growth of 0.6% per year, which leaves dilution in dividend growth of –2.7% per year. Across the full sample of 16 countries the average real GDP growth is 2.8% per year, the average real dividend growth is –0.5% per year (that is, on average, dividends are reported to have declined in real terms), which leaves average dilution of –3.3% per year. For countries with growth not unduly affected by war, the

[30] ABS Table 5206.0, Series ID A2302467A, Gross domestic product: Current prices.
[31] ABS Table 5676.0, Series ID, A3531604T, Profit before Income Tax; Total (State); Total (Industry); Current Price; CORP.
[32] Value = $100 × 1.056 ÷ (0.100 – 0.056) = $105.6 ÷ 0.044 = $2400.
[33] Bernstein and Arnott (2013), Table 1, p. 51.

average real GDP growth is 3.0% per year and the average real dividend growth is 0.7% per year, which leaves average dilution of –2.3%.

72. The title of the paper is *Earnings growth: The two percent dilution*. The two percent referred to in the title is an aggregate estimate of the difference between real GDP growth and real dividend growth. The QCA, correctly, recognises that one reason for the low dividend growth is that the payout ratio has declined over time for listed companies. Earnings growth has not declined as much as dividend growth. So on a forward-looking basis the QCA assumes dilution of 1% rather than 2%.

73. The second set of historical data is presented by MSCI Barra (2010). This paper relies upon 40 years of data from 1969 to 2009. The researchers report that, over this period, Australia had real GDP growth of 3.1% per year and real earnings per share growth of 0.5% per year.[34] The difference between the growth rates is 2.7%.

74. For the United States, the estimates from MSCI Barra (2010) are real GDP growth of 2.8% per year and real earnings per share growth of 0.0% per year. Across 16 developed markets the average real GDP growth is 2.4% per year and the average real earnings per share growth is 0.1% per year.

75. The reason both sets of researchers (Bernstein and Arnott, 2013, and MSCI Barra, 2010) reach the conclusion that real dividend or earnings growth falls below real GDP growth is that this is an average result over either 100 or 40 years' worth of data. In analysis presented in detail below, the dilution can be entirely attributed to the early part of the sample periods. For the time period since central banks in Australia and the U.S. began using monetary policy to constrain inflation, real earnings per share growth has matched or exceeded real GDP growth. We discuss the results in more detail below, but the most important results are as follows.

76. In Australia, annual inflation fell from 6.9% in 1990 to 1.5% in 1991. The RBA began referring to its target inflation range of 2% to 3% in mid-1993, but its monetary policy statements show that inflation considerations were influencing official interest rates prior to this point (the bank just did not refer to the target range until 1993). Over the 23 years from the end of 1990 to the end of 2013, trend GDP growth was 3.3% per year, while trend earning per share growth was 4.9% per year.[35] In contrast, the 21 years from 1969 to 1990 saw trend GDP growth of 3.0% per year, compared to trend earnings per share growth of 1.8% per year. So the dilution in earnings per share growth vis-à-vis GDP growth is a feature of the high inflation period of 1969 to 1990, and not the low inflation period of 1990 to 2013. Even if we extend the break-point to 1987, we observe real earnings per share growth (3.2% per year) keeping pace with real GDP growth (3.3% per year). From 1969 to 1987, real earnings per share growth was 1.6% per year versus 2.9% per year for real GDP growth.

77. In the U.S., annual inflation fell from 8.9% in 1981 to 3.8% in 1982. This followed the actions of the U.S. Federal Reserve to constrain inflation since Paul Volcker was installed as Chairman on the 6th of August 1979.[36] Over the 32 years from the end of 1981 to the end of 2013, trend growth in real GDP was 3.2% per year, while trend growth in real earnings per share was 2.8% per year. In contrast, over the 52 years from 1929 to 1981, GDP growth of 4.2% per year exceeded earnings per share growth of 2.8% per year.

78. This difference in growth rate estimates over time is important because the objective is to make an estimate of what growth expectations are embedded in market prices. Furthermore, the reason there is debate about the growth assumption is that price-earnings multiples are higher today than in the past.

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[34] MSCI Barra (2010), Exhibit 3, p. 4.

[35] As discussed in the following sub-section, we measure trend growth in real GDP and real earnings per share, which is the linear change in the natural logarithm of real GDP and real earnings per share in dollar terms. This can be contrasted with the computations performed by Bernstein and Arnott (2003) and MSCI Barra (2010) who measured annual growth with reference to real GDP growth as geometric means, and which results in the growth estimates being entirely dependent on the level of real GDP and real earnings per share in the first and last years of their samples.

[36] Paul A. Volcker became chairman of the Board of Governors of the Federal Reserve System on August 6, 1979. He was reappointed for a second term on August 6, 1983, and served until August 11, 1987.

79. So the question is, "Are price-earnings multiples higher than previously observed because the cost of equity is lower than in the past, because growth expectations are higher than in the past, or are both assumptions important?' The assumption that *growth = GDP minus 1%* would hold if the market priced stocks according to the entire history of GDP and earnings per share growth. And the result would be a cost of equity estimate that is much lower today than in the past. Alternatively, the market could have formed a growth expectation according to more recent information about firm prospects, and the cost of equity would not have fallen as far.

80. The key point is that it is not appropriate to attribute a low growth estimate to market expectations (on the basis of low growth observed decades ago), and then derive the cost of equity on the basis of current prices and earnings prospects. If a growth estimate is adopted that is consistent with the evidence from recent decades, there is no reason to think that earnings per share growth will be less than GDP growth.

Detailed analysis of the historical growth in earnings per share and GDP growth

81. There are two research papers that present data implying that GDP growth outstrips growth in earnings per share or dividends per share (Bernstein and Arnott, 2033; and MSCI Barra, 2010). Our first step was to attempt to verify the conclusions reached by Bernstein and Arnott (2003) and MSCI Barra (2010) using the data available to us. While the percentage figures we report are not identical to those reported in prior papers, we agree that over the corresponding time periods GDP growth has outstripped earnings per share growth.

82. The first thing to note is that the reported aggregate growth in earnings per share, dividends per share and GDP from those papers is computed as a geometric mean. So the reported growth rates are highly dependent on the start point and end point of the series.

83. In the first paper by Bernstein and Arnott (2003) the researchers report *dividend per share growth* from 1900 to 2000 of 0.9% per year for Australia and 0.6% per year for the U.S. Our corresponding estimates of dividend growth, based upon the start and end points in the series and computed over the same time periods, are 1.3% per year for Australia, and 1.1% per year for the U.S.[37] So, while our dividend growth estimates are higher than those previously reported, the overall implication is the same, that dividend growth was relatively low over this 100 year time period. As will be shown later, however, this low growth rate is not relevant for estimating the market's view on subsequent growth in dividends per share and earnings per share.

84. In the second paper by MSCI Barra (2010) the researchers report *earnings per share growth* from 1969 to 2009. For Australia, the estimated earnings per share growth rate is 0.5% per year and in the U.S. the estimated earnings per share growth rate is 0.0% per year. Over the corresponding 40-year period, and based upon the start and end points in the series, we estimate earnings per share growth for Australian-listed stocks of 1.8% per year and –1.8% per year for U.S.-listed stocks. The growth rate estimates vary materially, depending upon sample selection (time and datasets) for the following reason. Earnings per share growth is volatile over time, and computing the growth rate as a geometric mean relies entirely on the start and end values for earnings per share. For example, had we started the Australian computation one year later, at the end of 1970, we would have computed earnings per share growth of 1.4% per year, instead of 1.8% per year; and had we ended the U.S. computation one year earlier, we would have computed earnings per share growth of 0.8% per year, rather than –1.8% per year.

85. This means we need to compile growth rate estimates that are not contingent entirely on the first and last year of the series. This can be done by compiling trend growth estimates. Simply take the natural logarithm of each value, and estimate the linear change in log values over time. Expressed as an equation, we estimate the beta coefficient in the following regression (which is also used for GDP

[37] For dividend data on Australian-listed stocks we analysed dividend yields and closing values for the All Ordinaries Index compiled by Global Financial Data. For dividend data on U.S.-listed stocks we analysed dividend yields and closing values for the S&P500 compiled by Professor Robert Shiller (http://www.econ.yale.edu/~shiller/).

growth and dividends per share growth). To express the growth rate in discrete time we then compute $e^{\beta} - 1$.[38]

$$\ln EPS_t = \propto + \beta \times \ln EPS_{t-1}$$

86. This analysis is illustrated in Figure 3, which shows real GDP and real earnings per share for Australian-listed stocks from 1969 to 2013. With trend growth estimated over the entire 44 year time period, real earnings per share growth is estimated at 1.5% per year,[39] and real GDP growth is estimated at 3.2% per year. The trend growth estimate is considerably less sensitive to the start and end points. For example, had the first year been excluded, trend growth in earnings per share would still have been 1.5%. In contrast, if we had computed growth as a geometric average, we would have reported annualised earnings per share growth of 1.4% if the first year was included, and 1.1% if the first year was excluded.

87. We performed computations of earnings per share growth, dividend per share growth, and GDP growth on this basis for a number of time periods. Using Australian data, we separately analysed two periods: (1) the 21-year period from 1969 to 1990; and (2) the 23-year period from 1990 to 2013.[40] The year 1990 signals a change from a high inflation environment to a low inflation environment. Trend inflation from 1969 to 1990 was 9.1%, compared to 2.6% from 1990 to 2013. The four years ending in 1992 were particularly poor for listed company earnings. In aggregate, real earnings per share fell by 81% from 1988 to 1992. So we examine whether this time period unduly impacts upon our results. We present alternative sets of results that extend the first sub-period by three years to the end of 1993, and back three years to the end of 1987.

88. Using U.S. data, we separately analysed three periods: (1) the 69-year period from 1990 to 1969; (2) the 12-year period from 1969 to 1981; and (3) the 32-year period from 1981 to 2013. Inflation in the U.S. substantially declined in 1982 and for the last 32 years trend inflation has been 2.8% per year, compared to 7.7% per year for the 1969 to 1981 period.[41] U.S.-listed firms also experienced a period of poor earnings performance around the transition from high to low inflation. Over four years from 1979 to 1983, earnings per share fell by an aggregate 32%. So, as with the analysis of Australian data, we examine whether changes in the selection of different time periods impact on the results.

89. The primary results are presented in Table 9, Panel A. In Australia, for the most recent 23 years we have observed annual growth in real earnings per share of 5.0%, compared to real GDP growth of 3.4%. In contrast, during the 21 years from 1969 to 1990, real earnings per share grew at an annual rate of 1.8%, compared to real GDP growth of 3.0%.

[38] Note that if analysis was conducted which measured the relationship between two economic variables over time, as opposed to trend growth, than the more appropriate analysis would be to estimate changes in log growth over time for the two variables. The reason for this is that economic variables generally drift upwards over time, so analysis between two variables can suggest causality when two variables are both drifting upwards without any causal relationship. In this instance we are simply measuring the drift itself. In other words, we are simply asking, "What has been the trend in GDP and earnings per share over time?"

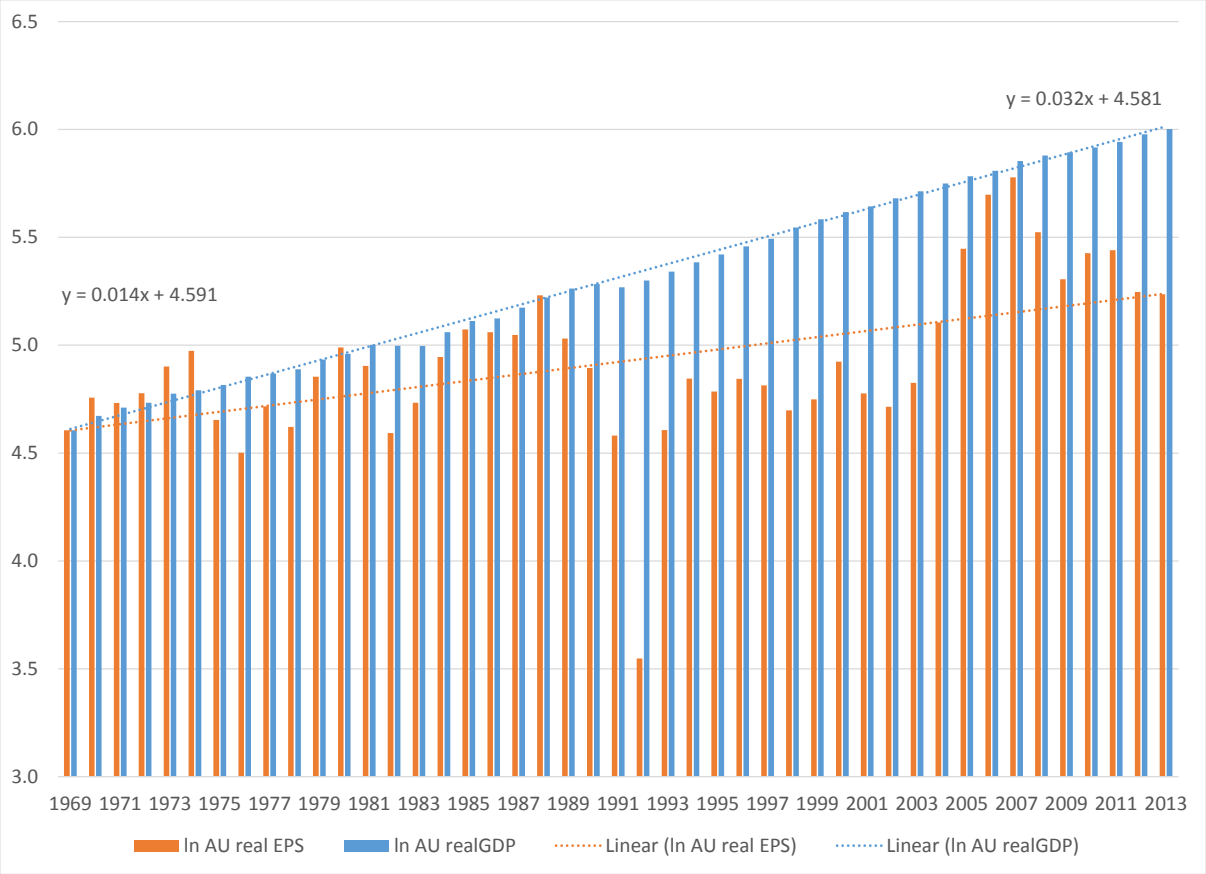
[39] Expressed as logarithmic growth, the rate is 1.442% per year, which corresponds to the figure of 0.014 shown in the chart. Expressed as a discrete annual rate, this is $e^{0.01442} - 1 = 1.453\%$. Similar computations apply throughout the paper.

[40] There is no overlap in these time periods. For instance, there are 22 data points for earnings per share from 1969 to 1990, so we are measuring how earnings per share changed over the 21 years from the end of 1969 to the end of 1990. There are 24 data points for earnings per share from 1990 to 2013, so we are measuring how earnings per share changed over the 23 years from the end of 1990 to 2013. So the first period ends at the end of 1990, and the second period begins at the end of 1990.

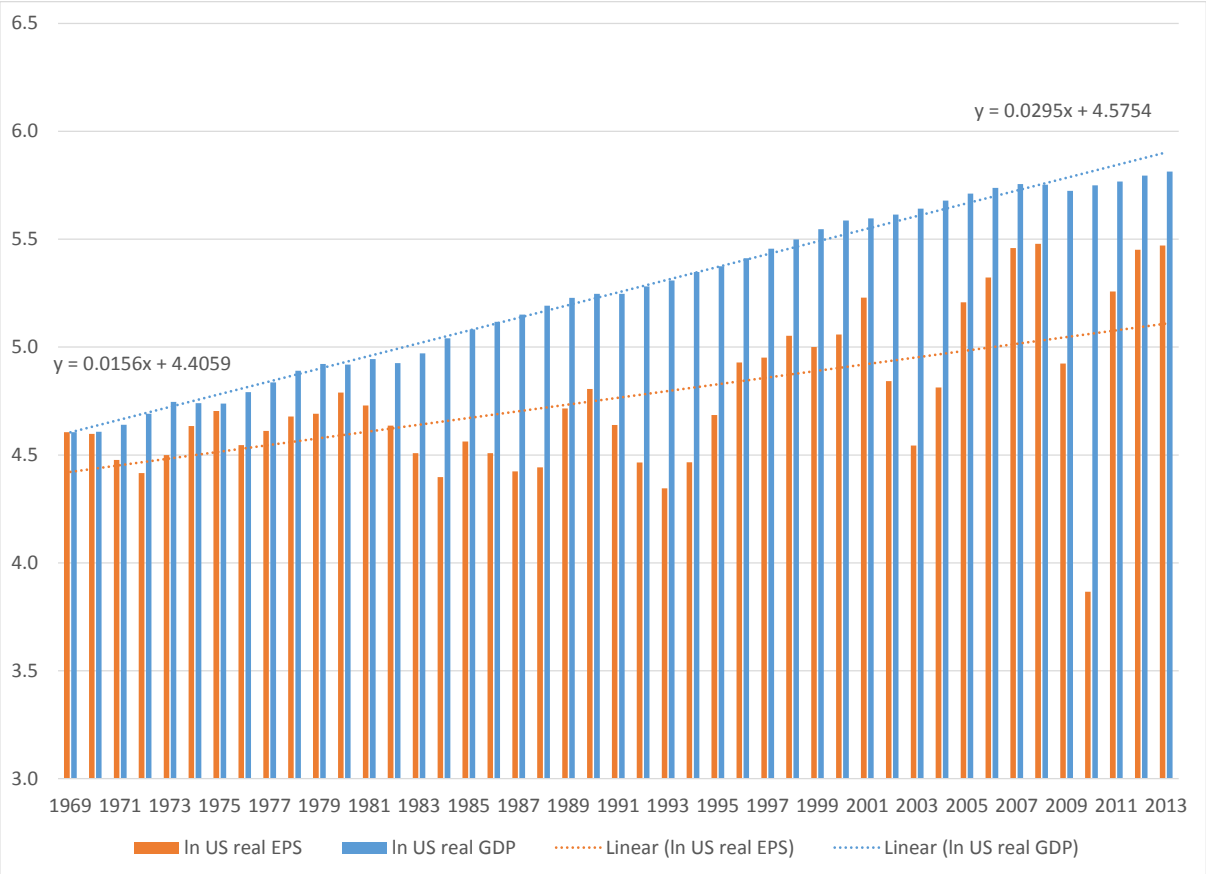
[41] The start year of 1969 for period two in the U.S. is to align the analysis with that presented by MSCI Barra (2010). We do not have earnings per share information for Australian-listed companies prior to 1969, only dividends per share.

Figure 3. Real GDP and real earnings per share growth in from 1969 to 2013

Panel A: Australia



Panel B: United States of America



90. The growth rates over different time periods is reflected in share prices over this time. In Figure 4, Panel A, we present the real price alongside real earnings per share for the Australian equity market. We also present seven year average values for both series, computed at the mid-point of the seven year period (for example, the seven year average from 2007 to 2013 is presented above year 2010). For the most part, prices move in the same direction as corporate earnings, with a handful of exceptions (from 1969 to 1974 prices fell while earnings rose, and from 1988 to 1992 earnings fell while prices rose).

91. Price growth has somewhat outstripped earnings growth, leading to an increase in price-earnings ratios. The median price compared to the previous 12 months earnings was 11.5 from 1969 to 1990, and 19.1 from 1991 to 2013. If we consider real price compared to real 10-year trailing earnings, the median was 12.2 from 1978 to 1990 and 19.8 from 1991 to 2013. This is presented in Figure 4, Panel B.

92. The issue at hand is what is likely to have caused the relatively higher price-earnings ratios that prevail in the latter part of the sample period. Our view is that the higher price-earnings ratios are attributed both to higher growth expectations *and* a lower cost of capital. In the early part of the sample period, GDP growth outstripped earnings per share growth, but this was reversed in the latter part of the sample period. A value-based investor might argue that the peak of the equity market observed in 2007 resulted from investors having high growth expectations that could not be matched by actual corporate performance. But that does not mean we should estimate the cost of equity on the basis of the growth assumptions those investors *should* have adopted. This would attribute a low cost of equity to the market on the basis of a lower long-term growth assumption. If we were to use a lower, long-term growth assumption we would also need to estimate the cost of equity at lower prices which also incorporate that long-term growth assumption.

93. If we consider Table 2, Panel B, we observe that our conclusion – that in recent decades earnings per share growth has at least matched GDP growth – is not sensitive to the selection of the break-point between the high and low inflation periods. If the latter period is extended back to 1987, spanning 26 years, we observe that earnings per share growth has kept pace with GDP growth (3.4% per year for GDP versus 3.3% per year for earnings per share). If we only consider the most recent 20 years, earnings per share growth has outstripped GDP growth by 1.2% per year, while for the prior 24 years earnings per share growth was slightly negative.

94. Considering the U.S. equity market, the implication is the same – subsequent to the increased focus of the U.S. Federal Reserve on maintaining low, stable inflation, there is no material difference in the growth of real GDP and earnings per share of listed companies. The first year in which there was a substantial reduction in inflation is 1982, so we consider the periods 1969 to 1981, and 1981 to 2013.

95. Referring to Table 2, Panel A, we see that since 1981 growth in real earnings per share has kept pace with growth in real GDP (real GDP growth of 2.9% per year compared to real earnings per share growth of 2.8% per year). In contrast, it is during the earlier years of 1969 to 1981 in which real GDP growth outstripped real earnings per share growth. In this earlier time period there is a 1.1% per year difference in real GDP growth and real earnings per share growth. It is only if we begin to include years prior to 1981 in the latter time period that we begin to see growth rates diverge. If we consider any time period from the last 20 years to the last 32 years we observe real earnings per share growth approximate real GDP growth.

96. In Figure 5, Panel A, we present real prices and real earnings per share for U.S. equities, presented in natural log terms, along with seven-year averages. During the 1970's and 1980's, earnings per share was flat. But from the mid- to late-1980's earnings per share growth began to accelerate and matched GDP growth. Share prices began to grow strongly from a low point at the end of 1981. Prices and earnings per share were impacted by the economic downturn that began in 2008, but have since recovered to pre-recession levels.

Table 2. Growth in real GDP, earnings per share and dividends per share (%)

Panel A: Variation in growth rates according to monetary policy regime

Country	Years	GDP	EPS	DPS	Inflation
Australia	1900 to 1969	5.1		2.1	2.7
	1969 to 1990	3.0	1.8	–2.2	9.6
	1990 to 2013	3.4	5.0	3.4	2.7
USA	1900 to 1969	3.5	1.1	0.9	2.1
	1969 to 1981	3.1	2.0	–1.0	8.0
	1981 to 2013	2.9	2.8	1.9	2.9

Panel B: Sensitivity of growth rates to changes in break points

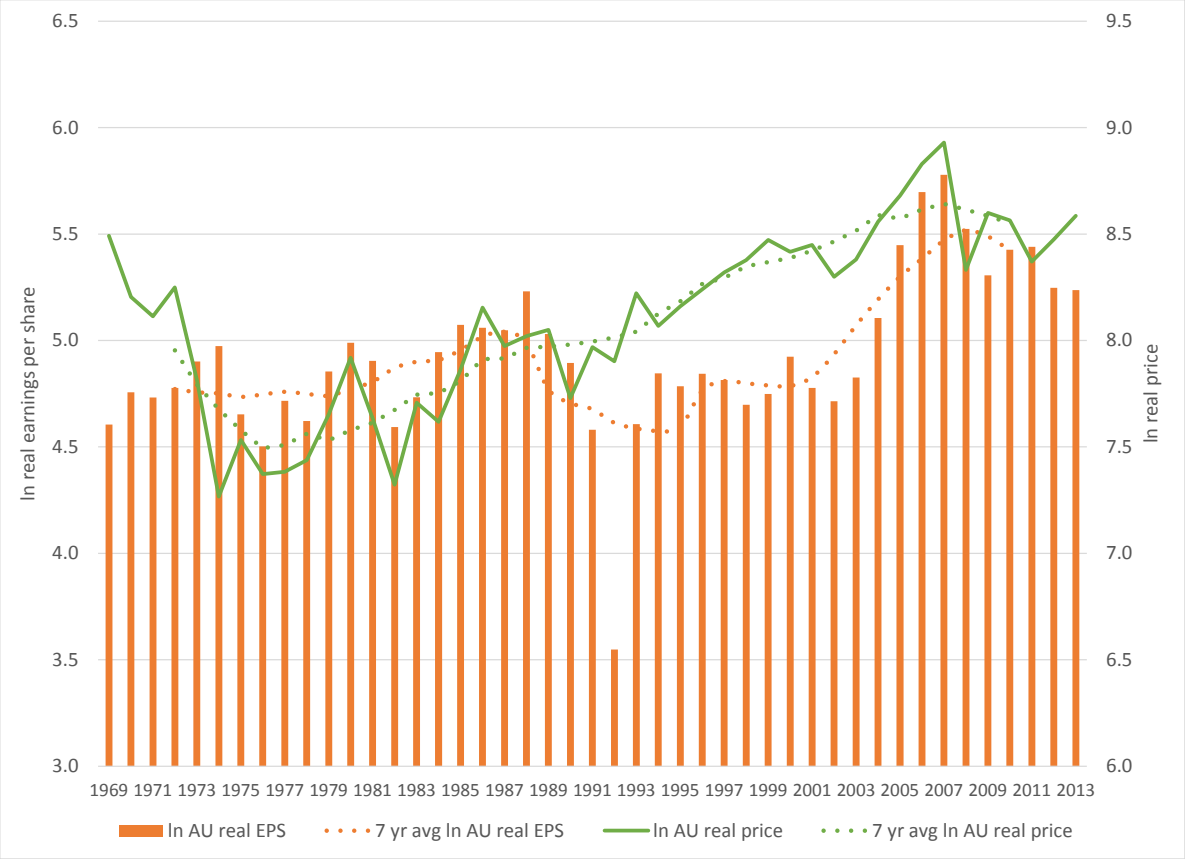
Country	Years	GDP	EPS	DPS	Inflation
Australia	1969 to 1987	2.9	1.6	−4.2	10.0
	1987 to 2013	3.4	3.3	2.6	2.8
	1969 to 1988	3.0	2.0	−3.4	9.8
	1988 to 2013	3.4	3.7	2.7	2.7
	1969 to 1989	3.0	2.0	−2.7	9.7
	1989 to 2013	3.4	4.4	3.0	2.7
	1969 to 1990	3.0	1.8	−2.2	9.6
	1990 to 2013	3.4	5.0	3.4	2.7
	1969 to 1991	3.0	1.3	−2.2	9.4
	1991 to 2013	3.4	5.6	3.8	2.7
	1969 to 1992	3.0	−0.2	−2.3	9.1
	1992 to 2013	3.4	5.9	3.8	2.7
	1969 to 1993	3.0	−0.3	−2.2	8.9
	1993 to 2013	3.4	4.6	3.6	2.8
USA	1969 to 1978	3.1	2.1	−1.7	6.9
	1978 to 2013	2.9	2.3	1.7	3.1
	1969 to 1979	3.2	2.5	−1.3	7.3
	1979 to 2013	2.9	2.4	1.8	3.0
	1969 to 1980	3.2	2.4	−1.1	7.7
	1980 to 2013	2.9	2.6	1.8	2.9
	1969 to 1981	3.1	2.0	−1.0	8.0
	1981 to 2013	2.9	2.8	1.9	2.9
	1969 to 1982	2.9	1.3	−1.0	8.0
	1982 to 2013	2.9	2.9	1.9	2.8
	1969 to 1983	2.8	0.5	−0.9	8.0
	1983 to 2013	2.8	3.0	1.9	2.8
	1969 to 1984	2.9	0.3	−0.8	7.8
	1984 to 2013	2.8	3.0	1.9	2.8

97. The aggregate impact of fluctuations in earnings and share prices has been a substantial increase in price-earnings ratios in recent years. In Figure 5, Panel B, we illustrate the real share price compared to 10-year trailing average real earnings per share. The median price-earnings ratio was 8.9 for the four years ending in 1981, and 21.1 for the 32 years ending in 2013. If we consider the two periods analysed with respect to the Australian data, the median price-earnings ratios are 9.8 for the 13 years ending in 1990 and 24.9 for the 23 years ending in 2013.[42]

[42] Recall that the corresponding median price-earnings ratios were 12.2 and 19.8 for Australian-listed equities.

Figure 4. Real earnings per share and prices for the Australian equity market from 1969 to 2013

Panel A: Real prices and earnings per share



Panel B: Real price relative to 10-year trailing real earnings per share

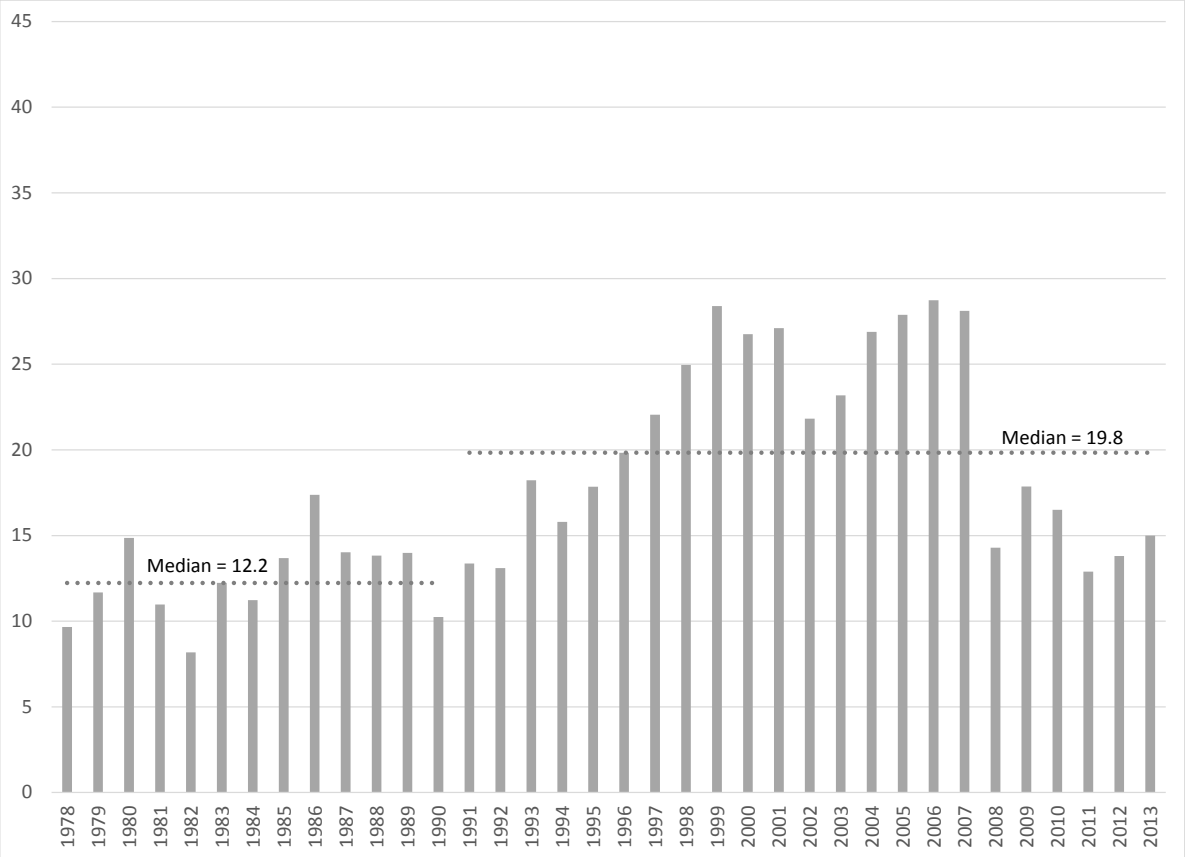
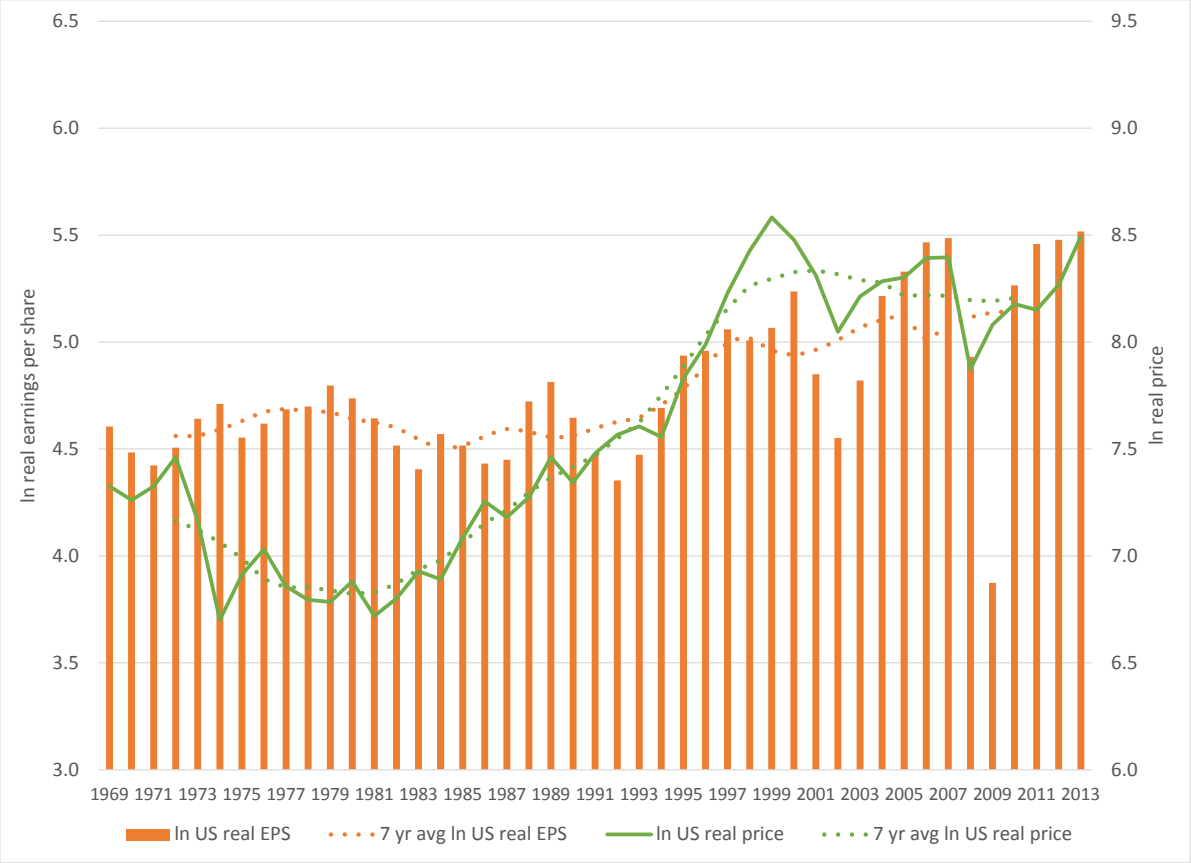
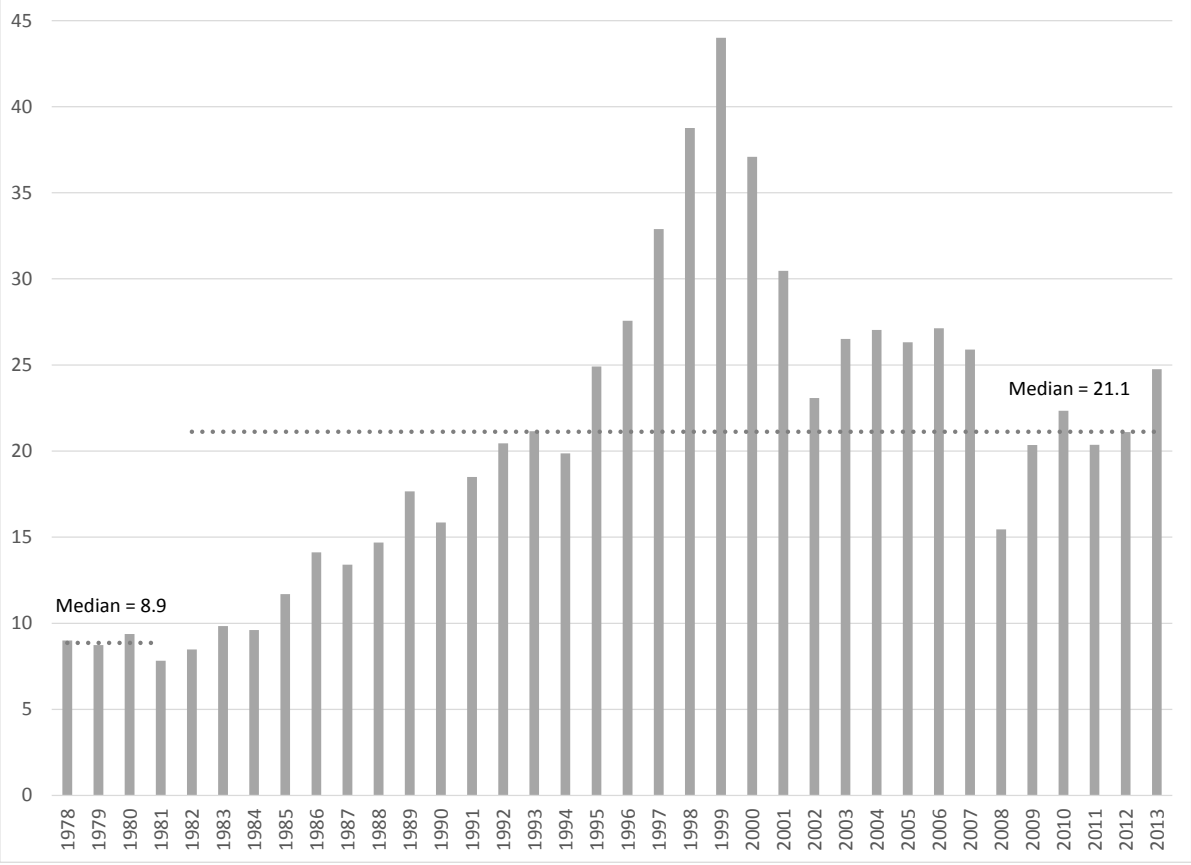


Figure 5. Real earnings per share and prices for the U.S. equity market from 1969 to 2013

Panel A: Real earnings and prices per share



Panel B: Real price relative to 10-year trailing real earnings per share



98. At the end of 2013 the price relative to 10-year trailing earnings is 24.8 for U.S.-listed equities, so is close to what we have observed for the last two to three decades. In estimating the cost of equity prevailing today, the question is whether we should consider growth rates that have been observed over the last two to three decades, or whether we should consider growth rates that prevailed over a longer time period. As with the Australian data, it would not be appropriate to assume that stocks are priced on the basis of growth over 44 years, or 113 years, and therefore assume that the increase in price-earnings ratios reflects only reductions in the discount rate. The increase in price-earnings ratios is likely to reflect both higher growth expectations (which he have observed for two to three decades) *and* reductions in the discount rate.

3.4 Implication

99. The implication of the analysis in this section is that, *if* a long-term growth assumption is to be adopted which is independent of short-term share price movements, the growth assumption should at least reflect earnings per share growth rates that reflect a more recent view of the historical data. For more than two decades in Australia, and three decades in the U.S., earnings per share growth has matched or exceeded GDP growth. Price-earnings ratios have also increased over these time periods, which align with material reductions in inflation in both countries, and central banks' diligence in maintaining inflation at low levels. In adopting a long-term growth assumption based upon 40 to 100 years of historical data, the QCA combines a *low* growth assumption (from all available data) with *low* dividend yields (from recent data).

100. The implication of the QCA's approach to the growth rate is that price-earnings ratios have increased because the cost of equity has fallen. In our view, it is more likely that price-earnings ratios have increased because the nominal cost of equity has fallen *and* expectations for growth have increased.

4. Conclusion

101. In this report we make two important and distinct points.

102. The first point relates to the QCA's assumption about a term structure for the cost of equity. The QCA assumes that, after 10 or 20 years, the expected market return is equal to 11.8%, based upon a long-term risk-free rate of 5.8% and a long-term market risk premium of 6.8%. The QCA also assumes that long-term inflation is 2.5%, and long-term dividend growth is either 4.0% or 5.1%. These assumptions necessarily imply the following assumptions.

a) The long-term real market return is expected to be 9.1%.

b) The long-term dividend yield is expected to be either 6.7% or 7.8% (the long-term market return of 11.8% minus growth of either 4.1% or 5.1%).

c) The 10 year bond yield will increase from a current figure of 4.1% to a long-term figure of 5.80%.

d) The real 10 year bond yield will increase from a current figure of 1.5% to a long-term figure of 3.2%.

103. This term structure assumption leads to unnecessary time-series variation in the estimated market return and market risk premium, and unnecessary sensitivity to the long-term growth assumption. There is no reliable basis for making the assumption that the cost of equity later will be different to the cost of equity today. If this assumption was removed it has an unbiased impact on the estimates of the market return and market risk premium. In some periods the estimated market return would be higher, and in some periods the estimated market return would be lower. But on average there would be no difference in the estimated market return. It simply means that the extreme estimates of the market return and market risk premium would be avoided.

104. The second point is that the QCA's long term growth assumption is inappropriate. The QCA makes an assumption the real long-term growth in earnings per share must be 0.5% or 1.5% less than real GDP growth. But the empirical basis for this assumption does not apply in recent decades, either in Australia or the U.S., when inflation has been substantially reduced. The historical analysis of earnings per share growth implies the following.

a) There is an earlier time period of relatively high inflation, and relatively low price/earnings ratios. During this period real earnings per share growth was less than real GDP growth.

b) There is a latter time period of relatively low inflation, and relatively high price/earnings ratios. During this time period real earnings per share growth was equal to or exceeded real GDP growth.

c) The QCA is trying to estimate the expected market return today, which is part of the period of relatively low inflation and relatively high price/earnings ratios. It uses an estimate for real GDP growth in earnings per share which is less than the growth in real GDP. This assumption is supported by data from the period of relatively high inflation and relatively low price/earnings ratios.

d) So the QCA uses a low real growth assumption which is consistent with high inflation and low price/earnings ratios to estimate the cost of equity implied by low inflation and high price/earnings ratios.

e) An appropriate assumption for the QCA to use would be to assume that real earnings per share growth equals real GDP growth (in the absence of our preferred position which is to consider reinvestment and returns).

5. References

Bernstein, W.J., and R.D. Arnott, 2003. "Earnings growth: The two percent dilution," *Financial Analysts Journal,* 59, 47–55.

MSCI Barra, 2010. "Is there a link between GDP growth and equity returns?" *Research Bulletin,* May.

Queensland Competition Authority, 2014a. "Cost of capital: Market parameters," Final decision, August.

Queensland Competition Authority, 2014b. "Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue," Draft decision, September.

Converting between ex-imputation and with-imputation required returns

Report for Aurizon Network

25 November 2014

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Contents

1. Background and conclusions

Overview and instructions

1. SFG Consulting (**SFG**) has been retained by Aurizon Network (**Aurizon**) to provide our views on the conversion between estimates of the ex-imputation and with-imputation required return on equity. These are estimates of the required return on equity that respectively include, and exclude, the estimated benefits of imputation credits. In particular, we have been asked to respond to the QCA's Market Parameters Decision and the QCA's Aurizon UT4 Draft Decision insofar as they involve conversions between ex-imputation and with-imputation required returns.

Summary of conclusions

2. Our main conclusions are set out below.

The regulatory framework and post-tax revenue model

3. The Australian regulatory framework ultimately requires an estimate of the ex-imputation required return on equity. Regulated prices are set so that the firm has sufficient after-tax profits to provide the required ex-imputation return to its shareholders.

4. One way of estimating the ex-imputation required return on equity is to insert the ex-imputation market risk premium (**MRP**) directly into the Capital Asset Pricing Model (**CAPM**).

5. An alternative method for estimating the ex-imputation required return on equity is to convert the ex-imputation MRP into a with-imputation MRP, which can be inserted into the CAPM to obtain an estimate of the *with-imputation* required return on equity. This with-imputation required return on equity is then inserted into the Post-tax Revenue Model (**PTRM**)[1] where it is converted into an ex-imputation required return on equity using the Officer (1994) formula:

$$r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)}.$$

6. In our view, the better approach is to estimate the ex-imputation required return on equity directly by simply inserting the ex-imputation MRP directly into the CAPM. This approach avoids the need to make two adjustments and hence avoids the risk of there being an inconsistency between those two adjustments.

7. If, however, the two-adjustment approach is to be made, the same adjustment formula must be used in both places $r_{ex} \rightarrow r_{with}$ and $r_{with} \rightarrow r_{ex}$. If an adjustment of:

$$r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)}$$

is to be used for one adjustment, it should also be used for the other.

[1] The PTRM was first developed by the Australian Energy Regulator. We understand that a version of the PTRM that is similar to the AER version in all relevant respects is being used in the UT4 determination.

8. There is Australian regulatory precedent for making such consistent adjustments. For example, in its recent WACC review, IPART (2013) noted its intention to use the Officer (1994) adjustment to convert estimates of the ex-imputation required return on equity to with-imputation estimates.

The Officer adjustment formula that is embedded within the PTRM

9. The PTRM is currently structured to convert an estimate of the with-imputation required return on equity into an ex-imputation required return on equity using the following adjustment formula:[2]

$$r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)}.$$

The error in the QCA's Market Parameters Decision

10. In its Market Parameters Decision, the QCA sets out its approach for converting between estimates of the ex-imputation and with-imputation required return. There are two problems with that conversion approach:

    a) The QCA has inadvertently forgotten to include one of the terms it meant to have in its conversion formula; and

    b) The QCA has inadvertently interpreted the resulting estimate of 18% as though it was 0.18%.

11. In its UT4 Draft Decision, the QCA recognises that the approach set out in its Market Parameters Decision was in error. It now proposes an adjustment that is four times as large. In spite of this, the QCA concludes that no change needs to be made to the estimate of the with-imputation MRP set out in its earlier decision.

The approach proposed in the UT4 Draft Decision

12. In its UT4 Draft Decision, the QCA sets out its revised approach for converting $r_{ex} \rightarrow r_{with}$. This results in:

    a) The QCA adopting an adjustment factor of 1.09 when converting $r_{ex} \rightarrow r_{with}$; and

    b) An adjustment factor of 1.20 when converting $r_{with} \rightarrow r_{ex}$.

Primary conclusion and recommendation

13. Regulated prices are set so that the firm has sufficient after-tax profits to provide the required ex-imputation return to its shareholders. There are two ways of estimating the ex-imputation required return:

    a) Insert the ex-imputation MRP directly into the CAPM; or

    b) Convert the ex-imputation MRP into a with-imputation MRP, which can be inserted into the CAPM to obtain an estimate of the *with-imputation* required return on equity. This with-imputation required return on equity is then inserted into the PTRM where it is converted into an ex-imputation required return on equity using the Officer (1994) formula.

[2] See Appendix 1 for a detailed explanation.

14. In our view, the better approach is to estimate the ex-imputation required return on equity directly by simply inserting the ex-imputation MRP directly into the CAPM. This approach avoids the need to make two adjustments and hence avoids the risk of there being an inconsistency between those two adjustments.

15. If the latter approach is to be adopted, the former approach should also be estimated to check that the multi-step approach has been performed in an internally consistent manner.

2. The need for a conversion method

The Australian regulatory framework

16. Under the Australian regulatory framework, the annual revenue requirement (**ARR**) for each regulated asset is computed using a building block approach. In particular, the ARR is set as the sum of:

    a) Return on equity (determined as the with-imputation return on capital less the estimated value of imputation credits);

    b) Return on debt;

    c) Return of capital;

    d) Operating costs; and

    e) Taxes.

17. The Australian Energy Regulator (**AER**) has developed an integrated spreadsheet model that uses the building block approach to compute the ARR, given the necessary inputs. This is known as the Post-tax Revenue Model (**PTRM**). Aurizon has proposed to use the AER's PTRM (with some minor modifications, none of which are related to the valuation of imputation credits) to derive its annual revenue requirement and the QCA has accepted the use of that model:

> Our Draft Decision reflects our acceptance of Aurizon Network's proposed adoption of a PTRM as a structural framework for its 2014 DAU inputs and revenue models.[3]

18. The AER has made its version of the PTRM publicly available whereas the QCA-Aurizon version is not publicly available. Consequently, all references to the PTRM in this report relate to the publicly available AER version. We understand that, in all respects that are relevant to this report, the QCA-Aurizon PTRM is the same as the AER version.

19. The PTRM requires, as an input, an estimate of the with-imputation required return on equity. This is an estimate of the required return on equity *including* the benefits of imputation credits. The QCA proposes to estimate this by inserting a with-imputation estimate of the market risk premium (**MRP**) into the Capital Asset Pricing Model (**CAPM**).

20. For example, in the AER's PTRM, the regulator's estimate of the with-imputation required return on equity is required in Cell **D17** on the **Analysis** sheet. To show how this works, consider a firm that has $700 of equity in its RAB where the regulator estimates the with-imputation required return on equity to be 10%. In this case, the return to shareholders – including the regulator's estimate of the benefits of imputation credits – must be $70. This with-imputation required return on equity appears across **Row 17** of the **Analysis** sheet.

21. The PTRM then converts the with-imputation required return on equity into an ex-imputation required return on equity. This is an estimate of the required return on equity *excluding* the benefits of imputation credits. Regulated prices are set so that the firm has sufficient after-tax profits to provide this ex-imputation return to its shareholders. In the PTRM, the conversion is performed according to the following formula from Officer (1994):

[3] QCA UT4 Draft Decision, p. 283.

$$r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)}.$$

22. Suppose, for example, that the regulator sets the corporate tax rate to 30% and gamma to 0.25. In that case, we have:

$$r_{ex} = 10\% \frac{1-0.3}{1-0.3(1-0.25)} = 9.032\%.$$

23. Thus, in the example above, the ex-imputation required return from after-tax profits is $63.23 (i.e., a return of 9.032% on the $700 of equity capital). In this case, the regulator's estimate of the value of imputation credits is $6.77, in which case the with-imputation return is $70, as above. That is, the ex-imputation and with-imputation required returns differ by the regulator's estimate of the value of imputation credits.

24. The ex-imputation required return on equity ($63.23 in the example above) is then included as a component of the annual revenue requirement in **Row 27** of the **Analysis** sheet.

25. In summary, the PTRM begins with the regulator's estimate of the with-imputation required return on equity, converts this into an estimate of the ex-imputation required return on equity as $r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)}$, and then includes the ex-imputation required return on equity in the annual revenue requirement.

26. A detailed description of the calculations that are required under the Australian regulatory framework are set out in Appendix 1 to this report.

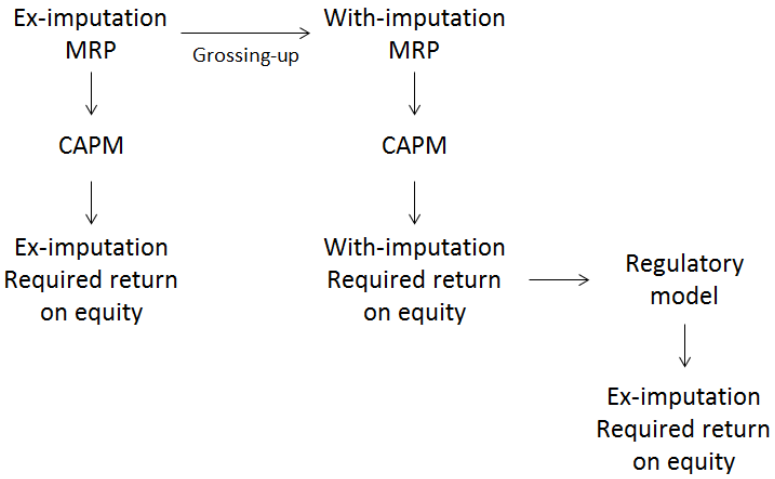
The conversions required for the PTRM

27. In its UT4 Draft Decision, the QCA has set out a range of estimates of MRP. In each case, the QCA begins with an ex-imputation estimate, which it then "grosses-up" to create a with-imputation estimate. It then inserts the with-imputation estimate of the MRP into the CAPM to produce an estimate of the with-imputation required return on equity. The with-imputation required return on equity is then inserted into the PTRM, where it is converted into an ex-imputation required return on equity via the adjustment factor that is set out above:

$$r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)}.$$

28. An alternative method of estimating the ex-imputation required return on equity (and the regulated price that is based on it) is to insert the original ex-imputation MRP directly into the CAPM. The two approaches for estimating the ex-imputation required return on equity are summarised in Figure 1 below.

Figure 1
Methods for estimating the ex-imputation required return on equity



29. Consider, for example, the way the QCA adjusts its survey/independent expert estimate of MRP in the UT4 Draft Decision. The QCA suggests that the ex-imputation MRP from that source is 6%, and that this corresponds to a with-imputation MRP of 6.8%. The QCA also adopts a risk-free rate of 3.21% and an equity beta of 0.8. The QCA then needs to estimate the ex-imputation required return on equity, and regulated prices will be set to allow the firm to provide that return to their shareholders (see Appendix 1 for more details).

30. One way of estimating the ex-imputation required return on equity is to insert the ex-imputation MRP into the CAPM:

$$\begin{aligned} r_{ex} &= r_f + \beta \times MRP_{ex} \\ &= 3.21\% + 0.8 \times 6\% = 8.01\%. \end{aligned}$$

31. An alternative method for estimating the ex-imputation required return on equity is to begin by inserting the *with-imputation* MRP into the CAPM to obtain an estimate of the *with-imputation* required return on equity:

$$\begin{aligned} r_{with} &= r_f + \beta \times MRP_{with} \\ &= 3.21\% + 0.8 \times 6.8\% = 8.65\%. \end{aligned}$$

32. This with-imputation required return on equity can then be inserted into the regulatory PTRM, which will strip out the assumed value of imputation credits to produce an estimate of the ex-imputation required return on equity. For the QCA's gamma estimate of 0.47, the PTRM will produce:[4]

$$\begin{aligned} r_{ex} &= r_{with} \frac{1-T}{1-T(1-\gamma)} \\ &= 8.65\% \frac{1-0.3}{1-0.3(1-0.47)} = 7.2\%. \end{aligned}$$

[4] Again, see Appendix 1 for more details about this procedure and the operation of the PTRM.

33. The QCA's approach (of converting the ex-imputation MRP of 6% into a with-imputation MRP of 6.8%, and then inserting the resulting estimate of the with-imputation required return on equity into the PTRM) produces an estimate of the final ex-imputation required return on equity (which forms the basis of the regulated price) of 7.2%.

34. However, inserting the QCA's own estimate of the ex-imputation MRP directly into the same CAPM produces an estimate of the ex-imputation required return on equity of 8.01%.

35. This inconsistency arises because the QCA uses one approach (its own) to convert $r_{ex} \rightarrow r_{with}$ and a different approach (the Officer (1994) approach, embedded within the PTRM as explained in Appendix 1) to convert $r_{with} \rightarrow r_{ex}$.

A better approach

36. The approach proposed in the UT4 Draft Decision involves two adjustments – an upward adjustment from $r_{ex} \rightarrow r_{with}$ (when estimating MRP) and a downward adjustment from $r_{with} \rightarrow r_{ex}$ (within the PTRM). The resulting estimate of the ex-imputation required return is then one of the components of the annual revenue requirement.

37. A better approach would be to estimate the ex-imputation required return on equity directly by simply inserting the ex-imputation MRP directly into the CAPM. This approach avoids the need to make two adjustments and hence avoids the risk of there being an inconsistency between those two adjustments.

Previous SFG submission

38. As set out above, the Australian regulatory framework and PTRMs convert between with-imputation required returns and ex-imputation required returns using the formula from Officer (1994):

$$r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)}.$$

39. In our previous submission to the QCA[5] we proposed that this same formula should be used to convert between with-imputation and ex-imputation required returns. The QCA has rejected the use of this conversion formula, concluding that:

> the adjustment recommended by SFG Consulting is, in general, not correct. It will, in almost all cases, materially overstate the correct adjustment. This is because SFG Consulting's adjustment formula assumes that expected returns to equity holders only take the form of dividends and imputation credits (i.e. it assumes there are no capital gains), and this assumption is completely unrealistic and also inconsistent with the empirical evidence (see Appendix C, Technical Annex). The correct adjustment should be 0.18%.[6]

40. The first point to note here is that it is inaccurate to refer to the above adjustment formula as "SFG Consulting's adjustment formula." This formula was not developed by us, but by Officer (1994) and then used by Australian regulators. We adopted that formula because that is the formula that is embedded within the Australian regulatory model.

[5] SFG, 2013, *An appropriate regulatory estimate of the market risk premium*, 16 January.
[6] QCA Market Parameters Decision, p. 66.

41. The simple point we have raised is that if two adjustments are to be made in relation to imputation credits, the same adjustment formula should be used in both places $r_{ex} \to r_{with}$ and $r_{with} \to r_{ex}$. This point is agnostic about which adjustment formula should be used – the point is simply that the same formula should be used consistently. By way of analogy, it would be wrong to use a conversion factor of 100 when converting from centimetres to metres, but then use a factor of 75 when converting back from metres to centimetres.

42. Having made this point, we consider the derivation of this Officer (1994) adjustment formula in some detail below, concluding that the QCA's criticism of it is misplaced.[7]

Summary

43. The regulator ultimately requires an estimate of the ex-imputation required return on equity.[8] This is one component of the firm's annual revenue requirement.

44. One way of estimating the ex-imputation required return on equity is to insert the ex-imputation MRP into the CAPM.

45. An alternative method for estimating the ex-imputation required return on equity is to convert the ex-imputation MRP into a with-imputation MRP, which can be inserted into the CAPM to obtain an estimate of the *with-imputation* required return on equity. This with-imputation required return on equity is then inserted into the PTRM where it is converted into an ex-imputation required return on equity using the Officer (1994) formula:

$$r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)}.$$

46. In our view, the better approach is to estimate the ex-imputation required return on equity directly by simply inserting the ex-imputation MRP directly into the CAPM. This approach avoids the need to make two adjustments and hence avoids the risk of there being an inconsistency between those two adjustments.

47. If, however, the two-adjustment approach is to be made, the same adjustment formula must be used in both places $r_{ex} \to r_{with}$ and $r_{with} \to r_{ex}$. If an adjustment of:

$$r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)}$$

is to be used for the $r_{with} \to r_{ex}$ adjustment, it should also be used for the $r_{ex} \to r_{with}$ adjustment.

48. We note that there is Australian regulatory precedent for making such consistent adjustments. For example, in its recent WACC review, IPART noted its intention to use the Officer (1994) adjustment to convert estimates of the ex-imputation required return on equity to with-imputation estimates:

[7] Indeed, it is the QCA's adjustment formula and 0.18% adjustment amount that is fundamentally flawed – a point which the QCA has accepted.
[8] See appendix 1 for a detailed explanation.

This approach uses the following equation, which shows the relationship between the return on equity including and excluding the benefits of imputation credits given our assumed tax rate (T) and gamma (γ):

$$Return\,incl.\ imp\ benefits = Return\,excl.\ imp\ benefits \div \frac{1-T}{1-T(1-\gamma)}.$$[9]

[9] IPART WACC Review (2013), p. 17.

3. The QCA conversion approach

The approach proposed in the Market Parameters Decision

49. In its Market Parameters Decision, the QCA explains the basis for its proposed adjustment as follows:

> As shown in the technical section, this estimate is the product of the utilisation rate, the maximum attachment rate [$T_c/(1-T_c)$] and the proportion of dividends fully franked. The QCA's preferred utilisation rate is 0.56, the statutory corporate tax rate (T_c) is 0.30, and the proportion of dividends fully franked is 0.75 (Brailsford et al., 2008: 85). Therefore, the imputation adjustment is (.56)(.3/.7)(.75) = .18. [10]

50. The QCA further explains that under its approach an ex-imputation MRP estimate of 6% would be converted into a with-imputation MRP estimate of 6.2%:

> Applying the adjustment of .18% (based on the correct formula) increases the median estimate from 6.0% to 6.2% (rounded from 6.18%).[11]

51. The QCA also states that the standard Officer (1994) adjustment (which is embedded into the PTRM that the QCA has adopted) is wrong and that its own unique adjustment is correct:

> the adjustment recommended by SFG Consulting [the standard Officer adjustment, as implemented by IPART] is, in general, not correct. It will, in almost all cases, materially overstate the correct adjustment…The correct adjustment should be 0.18%.[12]

The QCA's apparent error

52. There are two problems with the conversion approach set out in the QCA's Market Parameters Decision:

    a) The QCA has inadvertently forgotten to include one of the terms it meant to have in its conversion formula; and

    b) The QCA has inadvertently interpreted the resulting estimate of 18% as though it was 0.18%.

53. The QCA sets out its proposed approach for converting estimates of ex-imputation required returns to with-imputation estimates as:[13]

$$r_{with} = r_{ex} + U\frac{T}{1-T}Z \qquad (1)$$

where U represents the QCA's estimate of the utilisation rate (0.56) and Z represents the QCA's estimate of the proportion of dividends that are fully franked (0.75).

[10] QCA Market Parameters Decision, p. 66.
[11] QCA Market Parameters Decision, p. 67.
[12] QCA Market Parameters Decision, p. 66.
[13] QCA Market Parameters Decision, p. 66.

54. Thus, the QCA has determined that an estimate of the ex-dividend required return (or MRP) can be converted into an estimate of the with-dividend required return (or MRP) by adding 18 basis points, computed as follows:

$$U\frac{T}{1-T}Z = 0.56\frac{0.3}{1-0.3}0.75 = 0.18 = 18\%. \quad (2)$$

55. This adjustment formula is unique to the QCA and has never been used in any paper, report or submission ever before (because, as set out below, it is demonstrably wrong).

56. The first, and most obvious problem with the QCA's unique approach is that it does *not* produce an outcome of 18 basis points as the QCA suggests. The QCA has acknowledged this estimation error.

57. The second problem is that the QCA has apparently forgotten to include a variable in its conversion formula. Specifically, the QCA has apparently forgotten to include the dividend yield, r_{divs}, in its conversion formula. For example, when performing the conversion in relation to its Cornell estimate of MRP, in the same Market Parameters Decision, the QCA uses the following adjustment factor:

$$U\frac{T}{1-T}Z \times r_{divs} = 0.56\frac{0.3}{1-0.3}0.75 \times 4.6\% = 0.83\%. \quad (3)$$

58. In its UT4 Draft Decision, the QCA acknowledges the error in its Market Parameters Decision:

> we note that SFG Consulting recently identified an error in our Market Parameters Decision, where the estimate with imputation credits was stated as 6.2%. That estimate should have been presented as 6.8%. We have made this correction in this Draft Decision.[14]

59. The UT4 Draft Decision does not address the internal inconsistency issue that is the focus of this report. Whereas the UT4 Draft Decision includes the variable that was inadvertently left out of the Market Parameters Decision, it remains the case that the QCA uses two different approaches for converting $r_{ex} \to r_{with}$ and $r_{with} \to r_{ex}$. That is, it continues to divide by 100 when converting centimetres to metres, and then multiply by 75 when converting metres back to centimetres.

[14] QCA UT4 Draft Decision, p. 232.

4. The QCA derivation

A logical analysis of the QCA's conclusions

60. In rejecting the use of the Officer (1994) adjustment factor, the QCA sets out an algebraic derivation at pp. 83-84 of its Market Parameters Decision. The culmination of that derivation is the following general formula:

$$r_{with} = r_{ex} + \Omega UZ \frac{T}{1-T} r_{ex} \tag{4}$$

where Z represents the proportion of dividends that are fully franked and Ω represents the proportion of ex-imputation returns that comes in the form of dividends. That is:

$$\Omega = \frac{r_{divs}}{r_{ex}} = \frac{r_{divs}}{r_{divs} + r_{cap\ gains}}. \tag{5}$$

61. The QCA correctly notes[15] that this adjustment is equivalent to:

$$r_{with} = r_{ex}\left[\frac{1-T\left(1-\Omega UZ\right)}{1-T}\right] \tag{6}$$

62. The QCA also correctly notes[16] that the Officer (1994) adjustment that is embedded into the regulatory PTRM can be written as:

$$r_{with} = r_{ex}\left[\frac{1-T\left(1-Ud\right)}{1-T}\right] \tag{7}$$

where gamma is the product of what the QCA calls the "utilisation rate" and "the distribution rate for imputation credits," so $\gamma = Ud$.[17]

63. It is not, as the Market Parameters Decision suggests, a question of one of these adjustment formulas being correct and the other being wrong. It is also not a question of the QCA justifying its selection of one or the other of these formulas. Rather, the QCA *already uses both formulas*. The QCA uses Equation (6) when converting $r_{ex} \rightarrow r_{with}$ (when grossing-up ex-imputation return estimates) and Equation (7) when converting $r_{with} \rightarrow r_{ex}$ (within the PTRM).

64. The adjustment that is embedded into the regulatory PTRM is based on the assumption that all dividends are franked. If unfranked dividends are considered to be a possibility, the PTRM adjustment would be:

$$r_{with} = r_{ex}\left[\frac{1-T\left(1-UdZ'\right)}{1-T}\right] \tag{8}$$

[15] QCA Market Parameters Decision, Equation 29, p. 84.
[16] QCA Market Parameters Decision, Equation 30, p. 84.
[17] The notation that has been more commonly used in the Australian regulation setting is to use F to represent the distribution rate and θ to represent the other parameter, whether it is referred to as the value of distributed credits or the utilisation rate. Of course, what symbol is used or what the variable is called makes no difference to the mathematical derivations here.

where Z' is the proportion of dividends that are franked. That is, the regulated firm is assumed to be domestic, in which case $Z'=1$.

65. Obviously, Equations (6) and (8) are identical whenever $\Omega Z = dZ'$. The QCA notes that one circumstance where this equality holds is when $\Omega = d = 1$ and when all dividends are fully franked, so $Z = Z' = 1$. In this case, the firm distributes 100% of its after-tax profits as dividends and there are no capital gains (because there is no reinvestment). The QCA states that this scenario is "very unrealistic" and inconsistent with the empirical evidence that the imputation credit distribution rate is 70%, not 100%.[18]

66. This leads the QCA to reject the Officer (1994) adjustment in Equation (8). However, there is a logical problem with the QCA's conclusion on this point. The QCA is seeking to determine whether $\Omega = d$ (given that the same estimate of the proportion of franked dividends should be used in each place, so $Z = Z'$). The QCA identifies one possible case where $\Omega = d$, and concludes that that case is unrealistic. It does not logically follow that every *other* case where $\Omega = d$ is also unrealistic. Having observed one black swan, we cannot logically conclude that all swans are black. For example, if the firm has a constant dividend payout ratio and if all reinvested earnings earn exactly the required return, it will also be the case that $\Omega = d$ even though the firm does not distribute 100% of its earnings as dividends. As illustrated in Appendix 2 to this report, the Officer (1994) adjustment does not require a 100% payout ratio.

67. Ultimately, the QCA must determine whether the Officer (1994) adjustment factor is correct and appropriate or whether it is not. If the QCA decides that it is correct, it should be used as the adjustment factor consistently throughout the determination. If the QCA decides that it is not correct, the Officer (1994) adjustment factor should not be used anywhere in the determination. The only requirement is that the regulator must use the same adjustment process when converting $r_{ex} \rightarrow r_{with}$ as when converting $r_{with} \rightarrow r_{ex}$.

68. It the UT4 Draft Decision:

    a) In its $r_{ex} \rightarrow r_{with}$ adjustment using Equation (6) above, the QCA has set:

        i) $\Omega = 0.5$ based on an estimate of the dividend yield of the average firm; and

        ii) $Z = 0.75$ based on Brailsford, Handley and Maheswaran (2008); whereas

    b) In its $r_{with} \rightarrow r_{ex}$ adjustment using Equation (8) above, the QCA has set:

        i) $d = 0.84$ based on the Lally estimate of the distribution rate of created credits; and

        ii) $Z' = 1$ based on the implicit assumption that is embedded within the PTRM.

69. This results in the QCA adopting an adjustment factor of:

$$\left[\frac{1-T\left(1-\Omega UZ\right)}{1-T}\right]=\left[\frac{1-0.3\left(1-0.5\times 0.56\times 0.75\right)}{1-0.3}\right]=1.09$$

[18] QCA Market Parameters Decision, p. 85.

when converting $r_{ex} \rightarrow r_{with}$ and an adjustment factor of:

$$\left[\frac{1-T(1-Ud)}{1-T}\right]=\left[\frac{1-0.3(1-0.56\times 0.84)}{1-0.3}\right]=1.20$$

when converting $r_{with} \rightarrow r_{ex}$. That is, the QCA uses one adjustment factor when converting centimetres into metres and a materially different adjustment factor when converting metres back into centimetres.

70. In our view, the better approach is to estimate the ex-imputation required return on equity directly by simply inserting the ex-imputation MRP directly into the CAPM. This approach avoids the need to make two adjustments and hence avoids the risk of there being an inconsistency between those two adjustments.

References

Brailsford, T., J. Handley and K. Maheswaren, 2008, "Re-examination of the Historical Equity Risk Premium in Australia," *Accounting and Finance*, 48, pp. 73-97.

IPART, 2013, *Review of WACC Methodology: Final Report*, December.

Officer, R. R., 1994, "The cost of capital of a company under an imputation system," *Accounting and Finance*, 34, 1, 1-17.

QCA, 2014, Market Parameters Decision, *Cost of capital: market parameters*, August.

QCA, 2014, UT4 Draft decision, Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue, September.

SFG, 2013, *An appropriate regulatory estimate of the market risk premium*, 16 January.

Appendix 1: The role of gamma in the Australian regulatory setting

Non-imputation setting

71. Consider a firm with $700 of equity in its RAB and an allowed return on equity of 10%. In the absence of dividend imputation, such a firm would require an after-tax profit of $70 to distribute to its shareholders. This would require a pre-tax profit of $100, as set out in the table below.

Profit before tax	100
Less corporate tax	30
After-tax profit available for distribution to shareholders	70

72. In general, in the absence of dividend imputation, a pre-tax profit of $X will generate an after-tax profit (available for distribution to shareholders) of $X(1-T) where T is the corporate tax rate. In this case, the required pre-tax profit can be determined by solving:

$$X(1-0.3)=70,$$

where X is $100 in this case.

73. That is, the regulator would allow the firm to charge prices so that the expected pre-tax profit is $100, in order that there would be $70 of after-tax profits available to shareholders, as required.

74. Note that the $70 benefit that the shareholders receive from the after-tax profit is independent of the firm's payout policy under the QCA's NPV=0 criterion. For example, suppose the firm distributes a dividend of $50 and retains $20 to fund future investment. If the invested funds earn a normal return (i.e., if those investments satisfy NPV=0) the value of those investments will be $20. That is, whatever is not distributed as a dividend increases the value of the firm by an equivalent amount.

Imputation setting

75. Now consider the case *with* imputation. We consider the same firm as above with $700 of equity capital and an allowed return on equity of 10%. In the regulatory setting, the allowed return on equity includes the value of imputation credits – it represents the total return required by shareholders, a portion of which is assumed to come in the form of imputation credits.

76. By way of example, suppose gamma is set to 0.25. In that case, a $100 pre-tax profit produces the same $70 after-tax profit for distribution to shareholders. It also produces imputation credits with a face value of $30 (equal to the amount of corporate tax paid). For gamma set to 0.25, the value of those imputation credits is $0.25\times 30=7.5$. Thus, the total return to shareholders is the sum of the $70 after-tax profit and the $7.5 of value from imputation credits, as set out in the table below.

Profit before tax	100
Less corporate tax	30
After-tax profit available for distribution to shareholders	70
Value of imputation credits	7.5
Total return to shareholders	77.5

77. In general, a pre-tax profit of $X will generate an after-tax profit for shareholders of $X(1-T) plus imputation credits valued at γTX. In this case, a pre-tax profit of $100 produces an after-tax profit for distribution to shareholders of:

$$X(1-T)=100(1-0.3)=70.$$

and imputation credits with a value of:

$$\gamma TX = 0.25\times 0.3\times 100 = 7.5.$$

78. In summary, a pre-tax profit of $X produces a return to shareholders of:

$$X(1-T)+\gamma TX$$

which can also be written as:

$$X(1-T(1-\gamma)).$$

79. In the example above, a pre-tax profit of $100 produces a total return to shareholders of:

$$100(1-0.3(1-0.25))=77.5.$$

80. This is more than the $70 return that is required by shareholders of a firm with $700 of equity capital and an allowed return on equity (including imputation credits) of 10%. In this case, the correct pre-tax profit is determined by solving:

$$X(1-0.3(1-0.25))=70 \qquad (9)$$

such that the required pre-tax profit is X=$90.32. This produces an after-tax profit for shareholders of $63.23 and imputation credits with a value of $6.77 – a total of $70, as set out in the table below.

Profit before tax	90.32
Less corporate tax (30%)	27.10
After-tax profit available for distribution to shareholders	63.23
Value of imputation credits (0.25 times corporate tax paid)	6.77
Total return to shareholders	70.00

81. In summary, the regulated price must be set such that the firm has an after-tax profit of $63.23 that it can distribute to shareholders. This amounts to an (ex-imputation) return of 9.032% on the $700 of equity capital, where the ex-imputation return is computed as:

$$r_{ex} = r_{with}\frac{1-T}{1-T(1-\gamma)} = 10\%\frac{1-0.3}{1-0.3(1-0.25)} = 9.032\%.$$

82. That is, the PTRM converts the with-imputation required return on equity to the ex-imputation required return on equity using the Officer conversion formula:

$$r_{ex} = r_{with}\frac{1-T}{1-T(1-\gamma)}..$$

The tax building block

83. Another way of thinking about the calculations set out above is that the shareholders require an (ex-imputation) after-tax return on capital of $63.23 plus compensation for corporate tax of $27.10 – which gives a pre-tax profit requirement of $90.32. That is, the regulated price must be set so that the pre-tax profit is $90.32. The firm then pays 30% of this ($27.10) as corporate tax, leaving $63.23 to pay to the shareholders as their ex-imputation return.

84. For example, the National Electricity Rules (on which the AER's PTRM is based) define the Estimated Tax Cost (**ETC**)[19] as:

$$ETC = (Tax\ Payable)(1-\gamma) = (ETI \times r_t)(1-\gamma).$$

where ETI is the estimated taxable income ($90.32 in the above example) and r_t is used to represent the corporate tax rate (30% in the above example). That is, the expected tax cost in the above example is:

$$ETC = (90.32 \times 0.3)(1-0.25) = 20.32. \quad (10)$$

85. This calculation recognises that the firm pays corporate tax of $27.10, which is offset by the value that shareholders receive from imputation credits, which is $6.77 in this example (i.e., 27.10 - 6.77 = 20.32, with rounding).

86. Precisely the same calculation is set out in Table 95 of the UT4 Draft Decision – one of the building block costs is:

$$ETC = (Tax\ Payable)(1-\gamma).$$

87. In the AER and QCA-Aurizon versions of the PTRM, tax payable is estimated as:

$$Tax\ Payable = \left(\begin{array}{c} Ex-imputation \\ required\ return\ on\ equity \end{array} + \begin{array}{c} Value\ of \\ imputation\ credits \end{array}\right) \times \frac{T}{1-T(1-\gamma)} \quad (11)$$

88. For the example above, we have:

$$Tax\ Payable = (63.23 + 6.77) \times \frac{0.3}{1-0.3(1-0.25)} = 27.10.$$

89. This calculation is set out in **Row 44** of the **Analysis** sheet of the AER's PTRM and in Table 95 of the UT4 Draft Decision.

90. The PTRM then computes the value of imputation credits by multiplying the corporate tax payment by gamma at **Row 43** of the **Analysis** sheet of the PTRM. In the example above, this is:

[19] NER Clause 6.5.3.

$$27.10 \times 0.25 = 6.77.$$

91. The required pre-tax profit is then determined as:

$$\begin{aligned} Pre-tax\ profit &= Ex-imputation\ required\ return\ on\ equity + ETC \\ &= 63.23 + 27.10 = 90.32, \end{aligned} \tag{12}$$

exactly as set out above. This calculation is performed at **Row 27** of the **Analysis** sheet of the PTRM and also appears in Table 95 of the UT4 Draft Decision.

Returns with and without imputation credits

92. In the above example, shareholders require a total return (including imputation credits) of 10%, which amounts to $70 for equity capital of $700. The $70 return is paid in two components:

    a) Imputation credits comprise an estimated $6.77 of the $70 total. This amounts to 9.68% of the total; and

    b) The firm is allowed to charge prices that enable it to achieve an after-tax profit for the shareholders of $63.23, which amounts to 90.32% of the total.

93. Officer (1994) has previously shown that the proportion of the total return that comes from after tax profits (i.e., not including the value of imputation credits) is:

$$\frac{1-T}{1-T(1-\gamma)},$$

which, in the above example is:

$$\frac{1-0.3}{1-0.3(1-0.25)} = 90.32\%.$$

94. Similarly, Officer (1994) has also previously shown that the relationship between the with-imputation return and the ex-imputation return is given by:

$$r_{ex} = r_{with}\frac{1-T}{1-T(1-\gamma)}.$$

95. In the above example, we have:

$$r_{ex} = 10\%\frac{1-0.3}{1-0.3(1-0.25)} = 9.032\%.$$

96. Note that the return from after-tax profits is $63.23, which amounts to a return of 9.032% on the $700 of equity capital.

Calculations in the Australian regulatory framework

97. The Australian regulatory framework, and the PTRM in particular, begin with an estimate of the total (with-imputation) required return on equity (10% in the above example).

98. Embedded within the PTRM is the calculation of the ex-imputation required return on equity as:

$$r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)},$$

which is 9.032% in the example above.

99. The PTRM then allows the regulated firm to charge prices such that they will be able to provide that ex-imputation required return to shareholders. In the example above, the firm is allowed to charge prices so that they are able to pay an after-tax return of $63.23 to shareholders. This is sufficient to provide them with a 9.032% (ex-imputation) return on their $700 of equity capital.

100. As set out above, converting between ex-imputation and with-imputation required returns is straightforward, as shown by Officer (1994):

$$r_{ex} = r_{with} \frac{1-T}{1-T(1-\gamma)}. \quad (13)$$

101. For example, IPART uses a number of versions of the dividend discount model to inform its estimate of the required return on equity. The dividend discount approach takes no account of imputation credits at all, and consequently produces an estimate of the ex-imputation required return on equity. IPART use the Officer formula set out above to convert the ex-imputation estimate into a with-imputation estimate, for use in the regulatory model.

102. In summary, IPART and the PTRM both convert between the with-imputation and ex-imputation required return on equity using the Officer (1994) formula in Equation (13) above.

Appendix 2: The derivation of the Officer adjustment factor

103. In a dividend imputation system, the total required return on equity is composed of dividends, capital gains and imputation credits:

$$r_e = r_{divs} + r_{cap\ gains} + r_{IC} \tag{14}$$

104. It is common to define the *ex-imputation* return as:

$$r_{ex} = r_{divs} + r_{cap\ gains} \tag{15}$$

and the *with-imputation* return to be:

$$r_{with} = r_{divs} + r_{cap\ gains} + r_{IC} \tag{16}$$

105. We follow the standard notation in defining F to be the proportion of created credits that are distributed to shareholders and θ to be the equilibrium value of distributed credits.[20] We also follow the standard approach of defining gamma to be the product of these two parameters:

$$\gamma = F \times \theta. \tag{17}$$

106. Now, note that for every F dollars of dividends, there are $1-F$ dollars of capital gains if those reinvested funds earn a fair return so that NPV=0. That is, for every $1 of after-tax profits, the firm pays a dividend of $\$F$ and re-invests the remaining $\$(1-F)$.

107. The Officer (1994) adjustment requires that all reinvested funds earn exactly their required return, such that every new investment is NPV=0. This is obviously at odds with the empirical reality that reinvested funds tend to have positive NPVs (indeed this is the whole point of NPV analysis). However, if all reinvested funds do earn exactly their required return such that they have NPV=0, the $\$(1-F)$ that is reinvested will have a value of $\$(1-F)$. This implies that for every dollar of dividends there are $\frac{1-F}{F}$ dollars of capital gains, in which case:

$$r_{cap\ gains} = \frac{1-F}{F} r_{divs}.$$

108. Also note that there are $\frac{T}{1-T}$ imputation credits attached to every dollar of dividends, each of which has an equilibrium value of θ. This implies that for every dollar of dividends there are imputation credits worth $\frac{\theta T}{1-T}$, in which case:

$$r_{IC} = \frac{\theta T}{1-T} r_{divs}.$$

109. Substituting these results into Equation (16) yields:

[20] Note that replacing the symbol θ with the symbol U, or calling it "utilisation" instead of "value" makes no difference to the subsequent mathematical derivation.

$$
\begin{aligned}
r_e &= r_{divs} + \frac{1-F}{F} r_{divs} + \frac{\theta T}{1-T} r_{divs} \\
&= \left(1 + \frac{1-F}{F} + \frac{\theta T}{1-T}\right) r_{divs} \\
&= \left(\frac{1-T+F\theta T}{F(1-T)}\right) r_{divs} \\
&= \left(\frac{1-T(1-\gamma)}{F(1-T)}\right) r_{divs}.
\end{aligned}
$$

110. That is, each year the proportion of the return that is due to dividends is:

$$\frac{r_{divs}}{r_e} = \frac{F(1-T)}{1-T(1-\gamma)}.$$

111. It follows that the proportion of the return that is due to capital gains is:

$$\frac{r_{cap\,gains}}{r_e} = \frac{1-F}{F}\left(\frac{F(1-T)}{1-T(1-\gamma)}\right) = \frac{(1-F)(1-T)}{1-T(1-\gamma)},$$

in which case the proportion of the return that is due to dividends and capital gains collectively is:

$$\frac{r_{divs} + r_{cap\,gains}}{r_e} = \frac{(1-T)}{1-T(1-\gamma)}.$$

112. This is precisely the Officer (1994) adjustment equation that is embedded into the Australian regulatory model. In terms of our previous notation:

$$\frac{r_{ex}}{r_{with}} = \frac{(1-T)}{1-T(1-\gamma)}.$$

113. Note that this derivation does not require that the firm must have a 100% dividend payout rate – it allows for reinvestment and share price growth/capital gains. The only assumption required about this is that the reinvested funds earn exactly their required return such that NPV=0.

Estimating gamma: Response to UT4 Draft Decision

Report for Aurizon Network

15 December 2014

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Contents

1. Background and conclusions

Overview and instructions

1. SFG Consulting (**SFG**) has been retained by Aurizon Network (**Aurizon**) to provide our views on issues relating to the estimation of the gamma parameter. In particular, we have been asked to respond to the Aurizon UT4 Draft Decision insofar as it relates to gamma.

Summary of conclusions

2. Our main conclusions are set out below.

Distribution rate

3. The QCA has adopted a unique estimate of 84% for the distribution rate:

   a) Every other Australian regulator has used an estimate of 70% in every one of their decisions;[1]

   b) All stakeholders (including Aurizon and the Queensland Resources Council) proposed an estimate of 70%.

4. The issues that the QCA has raised in relation to the ATO data on which the standard 70% estimate is based are minor and completely at odds with the conclusion of the Australian Energy Regulator (**AER**) that:

> We consider this is a reasonable approach to estimate the payout ratio. In particular, we consider it is simple, fit for purpose, transparent, replicable and based on reliable and publicly accessible data sets.[2]

5. The QCA defines[3] the distribution rate to be $\frac{Distributed\ credits}{Corporate\ tax\ paid}$, consistent with the standard regulatory framework. However, the Lally approach (on which the QCA relies) estimates something quite different. His approach estimates $\frac{Distributed\ credits}{Created\ credits}$.

6. In summary:

   a) The QCA defines the distribution rate to be $\frac{Distributed\ credits}{Corporate\ tax\ paid}$;[4]

   b) The post-tax revenue model (**PTRM**) also requires an estimate of $\frac{Distributed\ credits}{Corporate\ tax\ paid}$;[5]

   c) Lally examines 20 firms and produces an estimate of $\frac{Distributed\ credits}{Created\ credits}$; and

[1] In 2009, the AER suggested that it might adopt a higher distribution rate, but quickly abandoned that idea and reverted to a 70% distribution rate in every one of its decisions to date.
[2] AER Draft Rate of Return Guideline – Explanatory Statement, p. 236.
[3] QCA Market Parameters Decision, at Equation (1); at p. 25; at Equation (34); and at p. 89.
[4] QCA Market Parameters Decision, at Equation (1); at p. 25; at Equation (34); and at p. 89.
[5] See Appendix 1 to this report.

d) For the Lally sample of firms, $\frac{Distributed\ credits}{Corporate\ tax\ paid} = 50\%$.

7. That is, if the Lally sample is to be used to estimate the distribution rate as the QCA defines it, the appropriate estimate would be 50%.

8. In relation to the distribution rate, the QCA has not had regard to a number of submissions made to it, including:

   a) In our previous submission to the QCA[6] we noted that Lally has been proposing the same technique for estimating the distribution rate to the QCA for over 10 years. Until now, the QCA has consistently rejected that technique. In his recent submissions, Lally provides no new analysis and no new reasons to support the use of his technique. The QCA has not explained why they consider that it was reasonable for them to have consistently rejected the Lally estimation approach for over 10 years, yet it is now reasonable for them to place 100% weight on that approach and to entirely reject all other estimation approaches – including that adopted by every other Australian regulator; and

   b) In our previous submission to the QCA,[7] we also noted that two days after his report to the QCA, Lally advised the AER that a 70% distribution rate was within the reasonable range. The AER interpreted Lally's advice to them as supporting its 70% estimate.[8]

9. **Recommendation: The QCA should adopt the standard 70% distribution rate that every other regulator uses, consistent with the submissions of all stakeholders.**

Value or redemption rate

10. The QCA distinguishes between:

    a) Estimating the proportion of corporate tax paid that will end up being redeemed by shareholders via imputation credits (the *redemption rate*); and

    b) Estimating the *value* that shareholders obtain from their redemption of imputation credits.

11. The ***redemption rate*** can be estimated using *ATO tax data* or the *equity ownership approach*. The ***value of credits*** can be estimated empirically from financial market data via *market value studies* such as dividend drop-off analysis.

12. The QCA has determined that gamma should be based on the *redemption rate* of credits and not based on the *value* of credits. Consequently, the QCA estimate is based on methods that estimate the redemption rate and the QCA places no weight on methods that estimate the extent to which shareholders value those credits.

13. There is a material difference between the redemption rate (the proportion of credits that are redeemed) and the value of credits to shareholders. The Australian Competition Tribunal has held that redemption rates cannot be used to estimate the value of credits. Moreover, redemption rate studies and market value studies consistently produce materially different estimates – because they seek to estimate materially different things.

[6] SFG (2014 Gamma), p. 16.
[7] SFG (2014 Gamma), pp. 16-17.
[8] AER (2013), Rate of Return Guideline – Explanatory Statement, p. 165.

14. In our view, gamma should properly be based on the *value* of imputation credits for the following reasons:

    a) The Australian regulatory framework reduces the allowed return to shareholders by $\$\gamma$ for every \$1 of imputation credits created.[9] If shareholders do not *value* the \$1 imputation credit at $\$\gamma$, they will not receive an appropriate return. Even the QCA recognises that "the credits represent a component of the total return on investment";[10]

    b) The National Gas Rules and National Electricity Rules specifically define that gamma "is the *value* of imputation credits";[11]

    c) Any reasonable analysis of the relevant literature leads to the conclusion that gamma is intended to be a measure of the value of imputation credits. Even McKenzie and Partington (2013), in a submission for the QRC, state that:

    > Theta (θ) [one of the components of gamma] is the value to the investor of the imputation credits distributed, expressed as a fraction of face value,[12]

    and:

    > The standard practice has been to measure the market value of theta.[13]

    and:

    > The question then is how to measure the market value of the imputation credits.[14]

    d) Lally (2013) makes it clear that what he calls the *utilisation rate* (U) is the extent to which distributed imputation credits (IC) are capitalised into the stock price – the extent to which the stock price reflects the *value* of distributed imputation credits;[15]

$$S_0 = \frac{Y_1 - TAX_1 + IC_1U + S_1}{1 + R_f + \phi\beta_e}$$

    e) The QCA justifies its use of the redemption rate on theoretical models developed by Lally and others. However, the Lally model only applies to the special case in which Australia is assumed to be completely segmented from world capital markets, in which case there is zero foreign investment.[16] By contrast, the QCA seeks to use the Lally model to justify its use of a redemption rate that reflects the extent to which Australian equities are owned by foreign investors. Lally has advised the QCA that his model does not apply in such a setting – there is no market clearing condition and one cannot solve for any equilibrium pricing results. The QCA has either misunderstood or ignored the advice that it has received from Lally (and

[9] The regulatory framework actually reduces the allowed return by $\$\gamma$ for every \$1 of corporate tax paid, but corporate tax paid equals imputation credits created for a domestic firm, such as regulated businesses.
[10] QCA Market Parameters Decision, p. 89.
[11] NER cls. 6.5.3, 6A.6.4 (current since version 53); NGR r. 87A(1) (current since version 14), emphasis added.
[12] McKenzie and Partington (2013), p. 31.
[13] McKenzie and Partington (2013), p. 32.
[14] McKenzie and Partington (2013), p. 33.
[15] Lally (2013), p. 10, Equation (3).
[16] Lally recommends that the QCA should assume complete segmentation. The model also applies in the case of perfect integration (which would lead to gamma being set close to zero), but this case is not recommended to the QCA.

others) on this point. There is no theoretical framework that supports the QCA's proposed approach.

15. **Recommendation: Gamma should be defined as the *value* of imputation credits, and should be estimated accordingly.**

The Lally "conceptual test"

16. The QCA considers a "conceptual test" developed by Lally, which suggests that the utilisation rate must be one or close to one.[17] However, the QCA then adopts a utilisation rate that is materially different from one (0.56).

17. As a matter of decision-making logic:

    a) If the QCA considers that the test does provide reliable bounds, they must reject (as unreasonable) any estimate from outside of those bounds; and

    b) If the QCA considers that the test does not provide reliable bounds, it should not be given any weight in its decision-making process.

18. As a matter of logic, it is not possible to rationalise the QCA's conclusions that the test has merit and should be afforded some weight, with the QCA's selection of an estimate that fails the test by a large margin.

19. In our view, the Lally conceptual test does not establish a reasonable range for the utilisation rate and it should be afforded no weight at all. The reasons for this conclusion are:

    a) To our knowledge, no regulator or commercial valuation professional anywhere in the world at any time has ever adopted an estimate of the utilisation rate from within the range established by the Lally test of "one or close to one"; [18]

    b) The test relies upon estimates of CAPM parameters as they would be in perfectly segmented and perfectly integrated worlds. The estimation of CAPM parameters in the real world (where substantial data is available to assist) is already difficult and contentious. It is simply impossible to estimate what these parameters might be in the theoretical worlds considered in the Lally test;

    c) The Lally test is based upon the assumption that the market risk premium in every country is equal to the same multiple of stock market variance. However, the QCA cites Lally himself as concluding that "the statistical precision of the method is very low,"[19] and the QCA concludes that this approach "does not warrant material weight at this time."[20] That is, the whole basis of the Lally "test" is an approach that the QCA itself considers to provide no useful information. That is, the test is based on the notion that an approach that the QCA considers to be so difficult to reliably apply in the real world (where data is available to guide the estimation) that no material weight should be applied to it, is somehow able to produce perfectly reliable output for Lally's hypothetical worlds (where no data is available because those worlds do not exist); and

[17] QCA Market Parameters Decision, p. 99.
[18] QCA Market Parameters Decision, p. 99.
[19] QCA Market Parameters Decision, p. 74.
[20] QCA Market Parameters Decision, p. 74.

d) The first version of the Lally test relied upon government bonds having the same yield whether or not foreign investors are allowed to buy them, which is clearly unsupportable. The second version of the test simply treats the obvious difference in government bond yields in the two cases as being an irrelevant consideration – on the basis that the market for government bonds is globally integrated at the same time as the market for risky assets is perfectly segmented. In our view, no reliable information can be obtained by any analysis that has such an implausible foundation.

20. **Recommendation: The QCA should apply no weight to the Lally "conceptual test".**

Dividend drop-off analysis: Econometric issues

21. The QCA's recent determinations re-list the range of econometric issues that were set out in the reports of Lally (2013a) and Lally (2013b).[21] SFG has addressed those issues in two submissions to the QCA – Section 5 of this report sets out where each of these issues has already been addressed.

22. The QCA's determinations appear to have no regard to the fact that our earlier submissions address every one of the econometric issues that have been raised. If the QCA maintains its view that these econometric issues affect the reliability of dividend drop-off estimates, they should state why they consider our existing responses on each issue to be inadequate.

23. The QCA draws a particular comparison between the SFG dividend drop-off analysis and that of Vo, Gellard, and Mero (2013) (the ERA study). Where that study applies the standard approach of using market-adjusted prices it corroborates the results of the SFG studies. The only inconsistency between the two studies occurs when the ERA study uses raw prices and returns, contrary to the accepted practice in the literature.

24. The QCA has no regard to any submissions about the relative merits of the ERA and SFG studies. Rather, the QCA treats them as equals and concludes that dividend drop-off studies are generally unreliable because some of the ERA results are implausible and because some of the ERA results differ from those reported by SFG.[22] A better approach would be to give weight to different studies according to the quality of each. In the case at hand, the SFG study has been assessed by the Tribunal for its fitness for use in the regulatory setting. The Tribunal concluded that it has confidence in the SFG estimate[23] and that "No other dividend drop-off study estimate has any claims to be given weight vis-à-vis the SFG report value"[24] and that "the careful scrutiny to which SFG's report has been subjected, and SFG's comprehensive response, gives the Tribunal confidence in those conclusions."[25]

25. **Recommendation: The best available dividend drop-off estimate of the value of distributed imputation credits is 0.35 – consistent with the SFG study (and with the ERA study when the standard approach of using market-adjusted prices is used).[26]**

Market practice

[21] QCA Market Parameters Decision, pp. 94-96.
[22] QCA Market Parameters Decision, p. 95.
[23] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 38.
[24] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 38.
[25] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 22.
[26] Our view is that the appropriate value of gamma is even lower, once studies on derivative prices and stock prices are considered, in addition to dividend drop-off studies. But consideration of studies on derivative prices is outside the scope of the current report.

26. SFG (2014 Gamma) provided submissions to the QCA about market practice in relation to gamma. In particular, the dominant practice of independent expert valuation professionals, corporate practitioners, and government agencies is to make no adjustment at all in relation to imputation credits. The QCA has not yet had regard to these submissions.

27. Rather, the QCA presents pieces of anecdotal evidence about the existence of dividend washing schemes and imputation funds. To the extent that this anecdotal evidence is worthy of receiving any weight, it actually operates against the QCA's arguments. If gamma was equal to one, these schemes would not exist because the full face value of imputation credits would already be factored into share prices – there would be nothing to gain by buying shares to capture imputation credits. The only thing that can be concluded from the existence of these schemes is that gamma must be less than one. The further gamma was below one, the more demand there would be for such schemes.

28. **Recommendation: The QCA should properly address the submissions that have been made to it in relation to market practice.**

The evolution of the QCA's approach to estimating gamma

29. At the time of its last WACC review in 2004, the QCA practice was to set the utilisation rate to 0.625 and gamma to 0.5. At that time, the QCA used empirical market data and estimation techniques that were designed to estimate the *market value* of imputation credits, consistent with the approach of all other Australian regulators at the time.

30. Setting the market value of distributed credits to 0.625 has become untenable since the *Gamma Case*, where the Tribunal ruled that there is no support for such a high market value estimate and that the best available market value estimate for distributed credits is 0.35.

31. That is, the basis for the QCA's previous gamma estimate of 0.5 is inconsistent with the Tribunal's ruling. This has led the QCA to re-evaluate its approach to estimating gamma. The result of this re-evaluation is a fundamental change to the very definition of gamma itself. The QCA has now concluded that it was wrong to have been trying to estimate the value of imputation credits over the last 10 years, because gamma does not in fact represent "the value of imputation credits" at all, but rather represents something quite different. This in turn has led the QCA to now reject all of the empirical market data that it has previously relied upon and to estimate gamma using different methods that are more consistent with the QCA's revised definition of what gamma means.

32. The result of these fundamental changes in the very definition of gamma, and in all of the methods used to estimate it, is that the QCA's final estimate has changed from 0.50 to 0.47.

33. **Recommendation: The QCA should estimate gamma as the market value of imputation credits.**

2. The distribution rate

QCA estimate is inconsistent with all submissions and with universal practice

34. In our previous submission to the QCA we noted that, but for Lally (2013) and the QCA, there is universal endorsement of 0.7 as an appropriate estimate of the distribution rate:[27]

    a) The Australian Competition Tribunal uses 0.7;

    b) The AER uses 0.7;

    c) The ERA uses 0.7;

    d) IPART uses 0.7;

    e) McKenzie and Partington submitted 0.7;

    f) The Queensland Resources Council submitted 0.7; and

    g) Aurizon Network submitted 0.7.

35. The QCA claims that:

> Regulatory practice in Australia to date has been to set a value for this parameter within the range, 0.70–1.0.[28]

36. However, we are unaware of any regulator other than the QCA ever using any estimate other than 0.7 in any regulatory decision. In its 2009 WACC Review, the AER proposed to set the distribution rate to 1.0 on the basis of theoretical assumption rather than empirical evidence. At the first opportunity, this proposal was appealed by several businesses. Prior to the first hearing for these appeals, the AER abandoned the proposed 1.0 estimate in favour of the standard 0.7 estimate that it had previously used. The AER continues to use a 70% distribution rate.

The reliability of the 0.7 estimate

37. The QCA questions the reliability of the Australian Tax Office data that forms the basis of the standard 0.7 estimate of the distribution rate. Specifically, the QCA cites two places in the NERA (2013) report, which the AER currently uses as the basis for its 0.7 estimate. There are three issues identified in those sections:

    a) The empirical estimate of 0.7 may be somewhat overstated because:

        i) The data set effectively assumes that the franking account balances of companies that become bankrupt during the year are distributed, when they are not; and

        ii) Credits that flow from one company to another via a trust are effectively double counted;[29]

[27] SFG (2014 Gamma), Section 4.
[28] QCA Market Parameters Decision, p. 91.
[29] NERA (2013), pp. 5-6.

b) It is possible that the estimate in a given year might be affected by firms failing to report their franking account balances, but only to the extent that the non-reporting firms happened to have systematic increases or decreases in their franking account balances in that year;

c) There is a material change in the distribution rate for the last year of the NERA sample because that estimate is a preliminary one that has not yet been finalised by the ATO.[30]

38. In our view, none of these data issues are particularly concerning:

a) The first issue is immaterial and results in a conservative *upward* bias in the distribution rate in any event;

b) The second issue is also immaterial in any given year (since non-reporting firms tend to be very small) and will certainly have no material effect on the cumulative distribution rate computed over many years; and

c) To the extent that there are any concerns about the preliminary data in the final year of the sample, that year can be omitted. The inclusion or removal of that year from the sample has no material effect on the cumulative estimate of 0.7.

39. As noted above, the AER has recently relied upon the NERA (2013) study in affirming its use of the standard 0.7 estimate. In relation to the quality of the data and the estimation techniques applied to it, the AER has concluded that:

> We consider this is a reasonable approach to estimate the payout ratio. In particular, we consider it is simple, fit for purpose, transparent, replicable and based on reliable and publicly accessible data sets.[31]

40. By contrast, the QCA has rejected this evidence in favour of Lally's calculations for a sample of 20 companies.

Use of market-wide estimate

41. The QCA clearly states that it considers gamma to be a market-wide parameter such that the same value would be used for every firm and every industry:

> As gamma is an overall Australian market parameter, and not specific to any particular market or firm, the analysis and results of this review will inform estimates of gamma in forthcoming reviews for all entities regulated by the QCA.[32]

42. The QCA also notes that:

> The use of a market-wide average for gamma and its components has been largely undisputed in submissions.[33]

43. This is all consistent with the standard regulatory practice of using market-wide data to estimate both components of the gamma parameter, and we adopt that framework throughout this report.

[30] NERA (2013), pp. 8-9.
[31] AER Draft Rate of Return Guideline – Explanatory Statement, p. 236.
[32] QCA Market Parameters Decision, p. 29.
[33] QCA Market Parameters Decision, p. 91.

The Lally/QCA approach

44. The QCA has rejected the standard 70% distribution rate that has been adopted by every other Australian regulator. Instead, the QCA adopts the Lally (2013, 2014) estimates of the mean distribution rate for 10, and subsequently 20, large listed firms. However, Lally has not estimated the distribution rate as defined by the QCA – he has estimated something quite different.

45. To see this, note that the QCA defines the distribution rate (in its Market Parameters Decision at Equation (1); at p. 25; at Equation (34); and at p. 89) to be:

$$\frac{Distributed\ credits}{Corporate\ tax\ paid}.$$

46. By contrast, Lally has estimated:

$$\frac{Distributed\ credits}{Created\ credits}.$$

47. These two different quantities are linked as follows:

$$\frac{Distributed\ credits}{Corporate\ tax\ paid} = \frac{Created\ credits}{Corporate\ tax\ paid} \times \frac{Distributed\ credits}{Created\ credits}$$

48. That this, the two quantities will only be equal if:

$$Created\ credits = Corporate\ tax\ paid.$$

49. This equality does not hold for the firms in the Lally samples. By contrast, Lally has selected a sample of firms that almost guarantees the biggest possible *difference* between created credits and corporate tax paid. This is because his sample consists of the largest multinational companies who pay material amounts of tax to foreign governments – tax payments that do not create imputation credits.

50. By way of analogy, it is as though the QCA needs an estimate of temperature and they have instead inserted a Lally estimate of humidity. This "estimate of the wrong thing" issue is developed more fully in the following sub-sections.

How do some of the Lally firms distribute most of the credits they create?

51. We begin by considering a domestic firm that earns all of its profits and pays all of its tax within Australia. Suppose that our firm (on average) pays out 70% of its profits as dividends and reinvests 30% back into the firm.[34] This firm will mechanically distribute 70% of the imputation credits that it creates each year, as set out in Table 1 below.

52. Table 1 shows that the firm generates an after-tax profit of $70. It distributes 70% of this, which amounts to a $49 dividend. The maximum amount of imputation credits that can be attached to that dividend is $49 \times \frac{0.3}{1-0.3} = 21$. Consequently, the firm has distributed 70% of the imputation credits that it created.

[34] This 70% dividend payout rate is close to the average payout rate for Australian listed firms over the last 10 years and it is close to the 71% dividend payout rate for the Lally sample. Source: Morningstar.

Table 1. Distribution of imputation credits – Domestic firm

Company profit	100
Corporate tax paid (30%)	30
Imputation credits created	30
After-tax profit	70
Dividend paid (70%)	49
Imputation credits distributed	21
Proportion of credits distributed	70%

53. Now consider a firm that earns some profits that have not been taxed in Australia at the standard 30% corporate tax rate. This could be profits that have been generated (and taxed) offshore and/or Australian profits that are the subject of some sort of corporate tax exemption. Suppose, for example, that the firm above has $70 of domestic profits that are taxed in Australia and $30 of offshore profits that are taxed at 30% in the offshore jurisdiction. If the firm distributes the standard 70% of its $70 after-tax profit, the dividend will be $49. A maximum of $21 of imputation credits can be attached to that dividend since $49 \times \frac{0.3}{1-0.3} = 21$. In this case, fully franking the dividend results in 100% of the imputation credits being distributed. The distribution of all of the created credits required the firm to have material foreign sourced profits. The relevant calculations are set out in Table 2 below.

Table 2. Distribution of imputation credits – Multinational firm

	Domestic	**Foreign**	**Total**
Company profit	70	30	100
Corporate tax paid	21	9	30
Imputation credits created	21	0	21
After-tax profit	49	21	70
Dividend paid			49
Imputation credits distributed			21
Proportion of credits distributed			100%

54. In our examples above, we have adopted a dividend payout rate of 70%. This is because:

    a) The average Australian listed firm has a dividend payout rate of approximately 70%;[35] and

    b) The average firm in the Lally sample also has a dividend payout rate of approximately 70%.[36]

55. In summary:

    a) The average listed firm in Australia distributes 70% of its after-tax profits as dividends;

    b) If a firm with exclusively domestic operations has a dividend payout rate of 70%, its maximum imputation credit distribution rate is 70%;[37] and

[35] Source: Morningstar.
[36] Source: Morningstar.
[37] Such a firm will only be able to achieve an imputation credit distribution rate of 70% if 100% of its profits are taxed at the full 30% rate.

c) The only way that a firm with a dividend payout rate of 70% can distribute more than 70% of its imputation credits is if it has (foreign sourced) income that has not been taxed in Australia. But in this case, created credits will not equal corporate tax paid and the Lally estimate will be inconsistent with the QCA definition of the distribution rate.

Operation of the regulatory model

56. The AER has developed an integrated spreadsheet model that uses the building block approach to compute the annual revenue requirement, given the necessary inputs. This is known as the Post-tax Revenue Model (**PTRM**). Aurizon has proposed to use the AER's PTRM (with some minor modifications, none of which are related to the valuation of imputation credits) to derive its annual revenue requirement and the QCA has accepted the use of that model:

> Our Draft Decision reflects our acceptance of Aurizon Network's proposed adoption of a PTRM as a structural framework for its 2014 DAU inputs and revenue models.[38]

57. The AER has made its version of the PTRM publicly available whereas the QCA-Aurizon version is not publicly available. Consequently, all references to the PTRM in this report relate to the publicly available AER version which implements the building block approach set out in the National Gas Rules (**NGR**) and National Electricity Rules (**NER**). We understand that, in all respects that are relevant to this report, the QCA-Aurizon PTRM is the same as the AER version.

58. The effect of the regulatory rules is to assume that shareholders receive a benefit that has a value to them given by the product of gamma and the firm's total tax payment. A detailed explanation is set out in Appendix 1 to this report. In this section, we summarise the key issues.

59. We begin by considering a regulated firm that has $700 of equity capital and an allowed return on equity of 10%. Obviously, this firm needs to distribute a return of $70 to its shareholders. Assume for this example that gamma is set to 0.25, based on a distribution rate of 70% and theta of 0.35 – the values set by the Tribunal. The regulatory Rules state that the pre-tax profit that the firm must generate is determined by solving:

$$X\left(1-T\left(1-\gamma\right)\right)=X\left(1-0.3\left(1-0.25\right)\right)=70 \qquad (1)$$

60. In this case, the required pre-tax profit is $90.32. This produces an after-tax profit for shareholders of $63.23 and imputation credits with a value of $6.77 – a total of $70, as set out in Table 3 below.

Table 3. Regulatory implementation of imputation credits

Profit before tax	90.32
Less corporate tax (30%)	27.10
After-tax profit available for distribution to shareholders	63.23
Value of imputation credits (0.25 times corporate tax paid)	6.77
Total return to shareholders	70.00

61. Appendix 1 explains all of the calculations from Table 3 in detail, referencing them back to the provisions in the regulatory Rules, and showing precisely where they are implemented in the PTRM.

[38] QCA UT4 Draft Decision, p. 283.

62. The regulatory model set out in the Rules and implemented in the PTRM assumes that all tax payments generate imputation credits. This is equivalent to assuming that *imputation credits created* equals *corporate tax paid* for regulated firms. The reason these two quantities are considered to be identical is because regulated assets are domestic, with all profits being taxed in Australia. However, these two quantities are *not* equal in the Lally samples of 10 or 20 firms – due to the existence of material foreign profits that are taxed offshore. Indeed, by selecting a small number of the largest firms, Lally has effectively maximised the difference between imputation credits created and corporate tax paid for his sample. That is, across the whole economy the amount of imputation credits created is likely to be close to the amount of corporate tax paid, with the difference between these two quantities being concentrated in the sorts of very large multinational firms that make up most of the Lally samples.

63. In particular, we have compiled data on total tax payments and imputation credits created for the Lally sample from Morningstar. For the Lally sample, $\frac{Created\ credits}{Corporate\ tax\ paid} = 59\%$. That is, for the Lally firms, approximately 41% of total tax payments do not create imputation credits.

64. As set out above, the QCA definition and the standard regulatory model require an estimate of $\frac{Distributed\ credits}{Corporate\ tax\ paid}$. By contrast, the Lally approach produces an estimate of $\frac{Distributed\ credits}{Created\ credits}$. This causes problems because created credits are materially different from corporate tax paid for the Lally sample of firms.

65. If the Lally sample is to be used to estimate the distribution rate, it should be used to estimate the QCA's definition of the distribution rate, as used in the PTRM, $\frac{Distributed\ credits}{Corporate\ tax\ paid}$. For the Lally sample, this quantity is 50%. That is, for the Lally firms, the ratio of imputation credits distributed to corporate tax paid is 50%.[39]

66. In summary:

    a) The QCA defines the distribution rate to be $\frac{Distributed\ credits}{Corporate\ tax\ paid}$;[40]

    b) The PTRM also requires an estimate of $\frac{Distributed\ credits}{Corporate\ tax\ paid}$;[41]

    c) Lally examines 20 firms and produces an estimate of $\frac{Distributed\ credits}{Created\ credits}$;

    d) For the Lally sample of firms, $\frac{Distributed\ credits}{Corporate\ tax\ paid} = 50\%$.

67. That is, if the Lally sample is to be used to estimate the distribution rate as the QCA defines it, the appropriate estimate would be 50%.

Unaddressed submissions on the distribution rate

68. In our previous submission to the QCA[42] we noted that Dr Lally has been proposing the same technique for estimating the distribution rate to the QCA for over 10 years. Until now, the QCA has

[39] Source: Morningstar.
[40] QCA Market Parameters Decision, at Equation (1); at p. 25; at Equation (34); and at p. 89.
[41] See Appendix 1 to this report.
[42] SFG (2014 Gamma), p. 16.

consistently rejected that technique. In his recent submissions, Lally provides no new analysis and no new reasons to support the use of his technique. The QCA has not explained why they consider that it was reasonable for them to have consistently rejected the Lally estimation approach for over 10 years, yet it is now reasonable for them to place 100% weight on that approach and to entirely reject all other estimation approaches – including that adopted by every other Australian regulator.

69. In our previous submission to the QCA,[43] we also noted that two days after his report to the QCA, Dr Lally advised the AER that a 70% distribution rate was within the reasonable range. The AER interpreted Lally's advice to them as supporting its 70% estimate.[44] The QCA has not yet had regard to this submission.

[43] SFG (2014 Gamma), pp. 16-17.
[44] AER (2013), Rate of Return Guideline – Explanatory Statement, p. 165.

3. The conceptual definition of theta (or U)

The QCA approach

70. The standard regulatory approach has been to define gamma to be the product of two components:

$$\gamma = F \times \theta$$

where F is the distribution ratio (the proportion of created imputation credits that are distributed to shareholders) and θ (**theta**) is the value of a distributed credit that is reflected in share prices.

71. The QCA defines gamma to be the product of the following two components:[45]

$$\gamma = \frac{IC}{Tax} \times U$$

.

72. The QCA defines the distribution rate (first parameter) to be the ratio of imputation credits distributed to total corporate tax paid. This is consistent with the regulatory rules and the operation of regulatory building block models, as discussed in Section 2 above.

73. The QCA defines the second parameter to be the utilisation rate, which is specified to be:

> the rate at which shareholders actually use the credits (the utilisation rate) when they file their taxes. [46]

74. In summary, there is broad agreement about the fact that gamma should be estimated as the product of two components. There is also broad agreement about the fact that the first parameter is the distribution rate – although the QCA has a unique view about how this parameter should be estimated,[47] there is general agreement about what it represents. Thus, the key conceptual issue here is the definition of the second parameter. It doesn't matter what symbol is used to represent that second parameter, the key issue is whether that second parameter represents:

    a) The value of a distributed imputation credit that is reflected in the share price; or

    b) The proportion of distributed credits that are redeemed.

75. The QCA defines the second parameter to be the proportion of distributed credits that are redeemed. This proportion is commonly called the *redemption rate* or *redemption ratio*. That is, the QCA has decided that the appropriate task is not to estimate the *value* of distributed credits at all, but that the appropriate task is to estimate the proportion of distributed credits that investors are able to redeem – the redemption rate.

76. The QCA considers two methods for estimating the redemption rate: the equity ownership approach and tax statistics studies. The equity ownership approach estimates the proportion of Australian shares that are owned by resident investors, and then assumes that all imputation credits distributed to those resident investors will be redeemed. The tax statistic studies use ATO data to estimate the

[45] QCA Market Parameters Decision, p. 25.
[46] QCA Market Parameters Decision, p. 24.
[47] Every other Australian regulator has used an estimate of 70% in every one of their decisions. In 2009, the AER suggested that it might adopt a higher distribution rate, but quickly abandoned that idea and reverted to a 70% distribution rate in every one of its decisions to date.

ratio of (a) the quantity of imputation credits redeemed in a given year, to (b) the quantity of imputation credits distributed in that year. Both of these methods are designed to estimate the redemption rate. The QCA concludes that the evidence from these two approaches supports a redemption rate of 56% – that 56% of the credits that are distributed end up being redeemed by resident investors.[48]

There is a material difference between the *redemption rate* and the *value* of imputation credits

77. There is a material difference between the redemption rate (the proportion of credits that are redeemed) and the value of credits to shareholders. Redemption rate studies and market value studies consistently produce materially different estimates – because they seek to estimate materially different things.

78. The Australian Competition Tribunal has held that redemption rates cannot be used to estimate the value of credits. In particular, the Tribunal held that redemption rates provide no more than an upper bound check on estimates of the value of imputation credits obtained from the analysis of market prices, and that the AER was wrong to have interpreted such an estimate as a point estimate rather than as an upper bound:

> The AER accepted that utilisation rates derived from tax statistics provide an upper bound on possible values of theta. Setting aside the manner in which the AER derived a value from the tax statistics study, it correctly considered that information from a tax statistics study was relevant. However, its relevance could only be related to the fact that it was an upper bound. No estimate that exceeded a genuine upper bound could be correct. Thus the appropriate way to use the tax statistics figure was as a check.[49]

79. That is, if it is correct to interpret gamma in terms of the value of imputation credits (which it is, for the reasons set out below) the QCA's approach of relying on redemption rates would be in error – because redemption rates do not measure value.

Value or redemption rates?

The definition of gamma under the National Gas and Electricity Rules

80. Whereas the relevant Queensland legislation does not specifically define gamma, we note that the National Gas Rules and National Electricity Rules clearly define gamma to be the *value* of imputation credits:

> γ is the value of imputation credits.[50]

Gamma determines the allowed return to shareholders

81. The Australian regulatory framework reduces the allowed return to shareholders by $\$\gamma$ for every \$1 of imputation credits created.[51] If shareholders do not *value* the \$1 imputation credit at $\$\gamma$, they will not receive an appropriate return.

[48] AER Rate of Return Guideline, Explanatory Statement, p. 160.
[49] Application by Energex Limited (No 2) [2010] ACompT 7 (13 October 2010), Paragraph 91.
[50] NER cls. 6.5.3, 6A.6.4 (current since version 53); NGR r. 87A(1) (current since version 14).
[51] The regulatory framework actually reduces the allowed return by $\$\gamma$ for every \$1 of corporate tax paid, but corporate tax paid equals imputation credits created for a domestic firm, such as regulated businesses.

82. Specifically, under the Australian regulatory framework, the gamma parameter plays the role of determining:

    a) What proportion of the total return to equity must come from allowed revenues; and

    b) What proportion of the total return to equity is assumed to come from dividend imputation tax credits.

83. This is consistent with the QCA view that:

> the credits represent a component of the total return on investment.[52]

84. In particular, under the Australian regulatory framework the proportion of the total return that is assumed to come from allowed revenues is:

$$\frac{1-T}{1-T(1-\gamma)}$$

where T is the corporate tax rate, the balance being assumed to come from the value of imputation credits.

85. By way of example, the QCA proposes that $\gamma = 0.47$, which (together with a corporate tax rate of 30%) implies that 83%[53] of the total return to equity comes from allowed revenues and 17% is assumed to come from imputation credits. For example, suppose that the total required return on equity is 10%. The parameter estimates adopted by the QCA imply that the allowed revenue should be set so that the firm is able to provide a return of 8.3% to its shareholders, the other 1.7% being assumed to come from the value of imputation credits.

86. That is, every dollar of value that is ascribed to imputation credits reduces the regulatory allowed return to equity by a dollar. For example, consider a regulated firm with $100 of equity capital in its regulatory asset base (RAB) and an allowed return on equity of 10%. This implies that equity holders require a return of $10. If the regulator determines that the imputation credits received by shareholders are valued at $1.70 (consistent with the parameter estimates proposed by the QCA), the regulator will allow the firm to charge prices that enable it to pay a return of $8.30 to shareholders.

87. In this case, shareholders lose $1.70 of value from the return provided by the firm, but are assumed to gain $1.70 of value from the imputation credits that they receive. That is, shareholders are assumed to be indifferent between:

    a) Receiving a return of $10 from the firm; or

    b) Receiving $8.30 from the firm and imputation credits that they value at $1.70.

88. In summary, the role of gamma in the regulatory process is to determine the *value* of imputation credits, such that this value can be deducted from the return that the regulated firm is able to pay to its shareholders.

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[52] QCA Market Parameters Decision, p. 89.

[53] $\frac{1-T}{1-T(1-\gamma)} = \frac{1-0.3}{1-0.3(1-0.47)} = 0.83$.

89. By way of analogy, a casual fruit shop employee may be indifferent between receiving a $100 wage or a $90 wage and fruit that is worth $10 to them. They are unlikely to be indifferent between a $90 wage and 10 *grams* of fruit, or 10 *slices* of fruit, or even a fruit basket that has a marked price of $10 but which is not worth $10 to *them*. If their pay is being reduced by $10, they will need as compensation something that has equivalent monetary *value* to them.

90. The same applies in the regulatory setting. The estimate of gamma determines the amount of reduction in the monetary return that is paid to shareholders. It should be set to equate the monetary *value* of imputation credits with the monetary reduction in the allowed return that is paid to shareholders. Thus, the regulatory task is to determine the monetary value of imputation credits and to then reduce the allowed return on equity by that same monetary value.[54]

91. In our view, the relevant task in the regulatory setting is to:

    a) Determine the required return on equity having regard to all relevant evidence and the prevailing conditions in the market for equity funds; and to then

    b) Determine how much of that required return can be obtained from imputation credits, having regard to all relevant evidence and the prevailing conditions in the market for equity funds; and to then

    c) Set allowed prices so that the firm will be able to pay to its shareholders a return that is equal to the difference between (a) and (b) above.

92. In other words, gamma determines the *price* that shareholders would be prepared to pay to buy imputation credits. In the example above, shareholders are assumed to be willing to pay $1.70 (by receiving a return that is $1.70 lower than it would otherwise be) for the imputation credits that they receive. The regulator needs to determine the dollar value that shareholders would ascribe to imputation credits, and then reduce the return that they receive from the regulated firm by that amount. If the regulator reduces the allowed return by more than the true value of the credits, shareholders will end up being under-compensated. Conversely, if the regulator reduces the allowed return by less than the true value of the credits, shareholders will end up being over-compensated. Neither of these outcomes is appropriate.

93. In our view, it is clear that gamma represents the value (or worth or price) that shareholders ascribe to imputation credits. The only question then is how to best estimate that value.

The QCA approach

94. The QCA estimates its utilisation rate as the proportion of Australian shares owned by Australian residents. Nowhere does the QCA suggest that this approach provides an estimate of the *value* of imputation credits. Rather, the QCA defines gamma in terms of the proportion of credits that are redeemed, and concludes that the value of those credits to shareholders is irrelevant.

Summary

95. The regulatory framework requires an estimate of the value of imputation credits – the price that the relevant shareholder would pay for the imputation credits that they receive. By contrast, the QCA proposes to define gamma in terms of the proportion of imputation credits that are redeemed. In general, the two specifications (value and proportion redeemed) will differ. Suppose that in reality

[54] A submission by the ENA (2013) to the AER contains a detailed explanation of this issue, including a fully-worked numerical example. See ENA (2013), *Response to the Draft Rate of Return Guideline of the Australian Energy Regulator*, 11 October, pp. 137-140.

the shareholder values every credit created at 25% of face value, but the regulator sets gamma to 0.47. For every credit created by the firm, the regulator would reduce the allowed return by 47 cents, in relation to a credit that was worth only 25 cents to the shareholder. The result is that the shareholder is under-compensated. In the regulatory setting, gamma must be set on the basis of the value of imputation credits – otherwise shareholders cannot be properly compensated.

96. Importantly, the QCA does not suggest that the proportion of credits that are redeemed is an estimate of the *value* (as in price or worth) of those credits. Rather, the QCA proposes that the value of credits to shareholders is irrelevant.

Unaddressed submission from our previous report

97. In our previous submission to the QCA, we noted that the equations set out in Lally (2013) make it clear that his "utilisation rate" reflects that part of the value of the stock price that is due to the value of imputation credits. Since this submission has not yet been addressed by the QCA, we repeat it below.

98. The difference between the redemption rate and the value of imputation credits is made clear in Equation (3) from Lally (2013):[55]

$$S_0 = \frac{Y_1 - TAX_1 + IC_1U + S_1}{1 + R_f + \phi\beta_e}$$

99. This equation clearly shows that what Lally calls the *utilisation rate* (*U*) is the extent to which distributed imputation credits (*IC*) are capitalised into the stock price – the extent to which the stock price reflects the *value* of distributed imputation credits.

100. That is, the equation above clearly shows that imputation credits are relevant to the extent that investors are willing to pay for them in the stock price. It shows that what we need to estimate is the extent to which investors will be prepared to increase the stock price for the imputation credits they will receive. The stock price will not reflect the *number* of credits received or redeemed, it will reflect how much investors are willing to pay for them. What is relevant here is the *value* of imputation credits.

The difference between the redemption rate and the value of distributed credits

101. There are a number of reasons why the value of distributed imputation credits that is reflected in share prices may be less than the face value of those credits, including:

    a) Some of the credits that are distributed to shareholders are never redeemed. There are, in turn, a number of reasons why a distributed credit might not be redeemed, including:

        i) Credits distributed to non-resident investors cannot be redeemed under the dividend imputation legislation;

        ii) Credits distributed to resident investors who sell the shares within 45 days of their purchase cannot be redeemed;[56] and

[55] Lally (2013), p. 10.

[56] The so-called "45 day Rule" took effect in July 1997. It prevents resident investors from redeeming imputation credits unless they own the shares for 45 days around the payment of the relevant dividend.

iii) Some credits distributed to resident investors are not redeemed because some investors fail to keep the required records and simply do not claim them. For example, Handley and Maheswaran (2008) report that, on average 8% of the credits distributed to resident individuals are never redeemed.[57]

b) There is a time delay in obtaining any benefit from imputation credits. Whereas dividends are available to the investor as soon as they are paid, the imputation credits that are attached to that dividend only have value after the investor's end-of-year tax return is filed and processed. This time delay can be up to two years for a credit that is distributed directly from a company to an individual shareholder. The time delay can be even greater when credits are distributed through other companies or trusts;

c) There are administrative costs involved in the redemption of imputation credits. The investor must maintain records of all credits that are received and redeem them by preparing the necessary schedules for the investor's tax return. This involves time and expenses such as accountant fees. By contrast, when an investor buys shares, they provide bank account details and all dividends are automatically transferred into that account without any action required of the investor. That is, it is more costly to convert imputation credits into value;

d) Imputation credits are taxed as income in the same way that dividends are taxed. When an investor receives a franked dividend, their taxable income is increased by the amount of the dividend plus the face value of the credit. Both components are then taxed at the investor's marginal tax rate; and

e) If dividend imputation leads resident investors to hold more domestic dividend-paying shares than they otherwise would (because they are attracted by the possibility of receiving imputation credits) their portfolios will become more concentrated and the resulting loss of diversification comes at a cost. A rational investor would continue to increase the concentration of their portfolio until the marginal benefit of the last imputation credit equalled the marginal cost of losing diversification. That is, the last imputation credit would be of no net benefit.[58]

102. This last point about portfolio diversification is particularly important and has been recognised by Lally (2013) and other regulators:

> The ERA (2013, page 5) goes even further and asserts that even domestic investors would value franking credits less than their face value because they must incur risk, pay transaction costs, and sacrifice international diversification opportunities by purchasing Australian stocks with imputation credits.[59]

103. To explore the portfolio diversification point in more detail, first consider Figure 1 below in a market with no dividend imputation. That figure shows the utility[60] of a particular investor as a function of the proportion of their wealth that is invested in domestic dividend-paying shares (as opposed to domestic shares that do not pay dividends, international shares, or other assets such as real property,

[57] This figure includes credits that are not redeemed due to the 45-day Rule and, for the pre-2000 period, credits that are not redeemed because the shareholder has taxable income below the tax-free threshold. The latter is likely to be immaterial as it is unlikely that a material proportion of shares are owned by residents whose income is below the tax-free threshold.

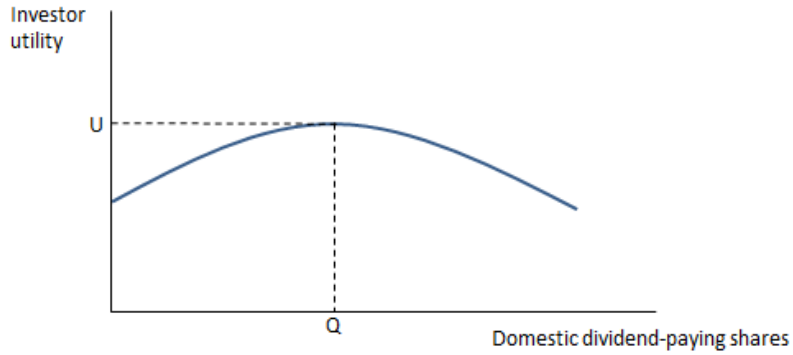
[58] This effect is explained in more detail in Paul Lajbcygier and Simon Wheatley (2012), "Imputation credits and equity returns," *The Economic Record*, 88, 283, 476-494.

[59] Lally (2013), p. 16. The reference to ERA (2013) appears to be a reference to Vo, Gellard and Mero (2013).

[60] Utility is the economic concept of well-being or satisfaction. The basis of most economic models is the notion that individuals will act to maximise their utility.

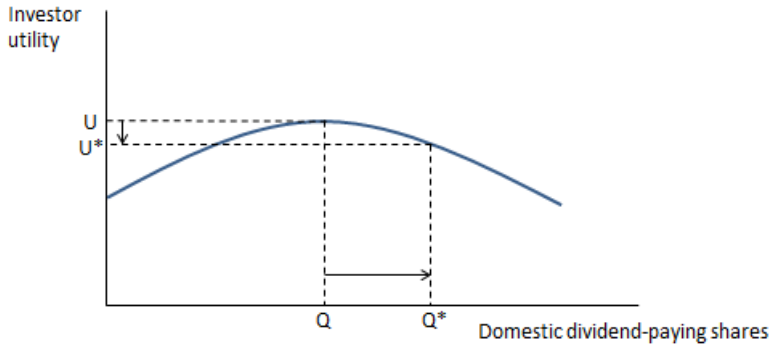
term deposits, bank balances and so on). Figure 1 shows that the optimal investment in domestic dividend-paying shares is at Q, because this maximises the investor's utility at U.

Figure 1
Optimal portfolio holding of domestic dividend-paying shares



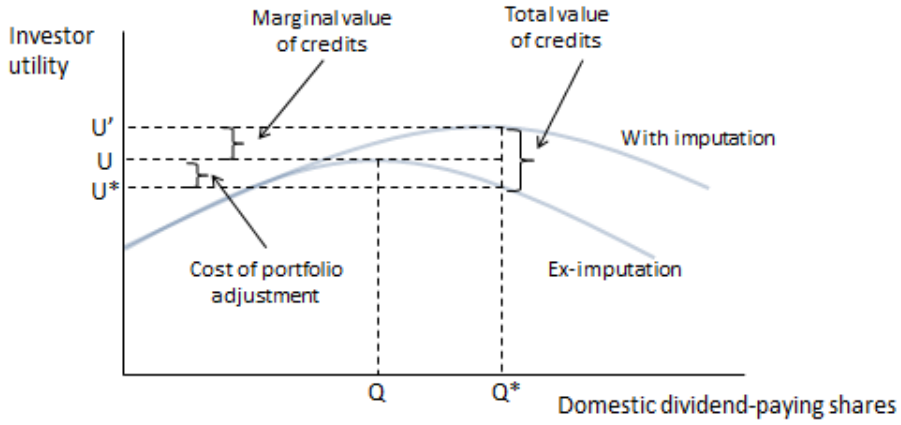
104. If the investor moved away from their optimal investment in domestic dividend-paying shares (Point Q), the result would be a loss of utility, in which case the investor would be worse off. This is illustrated in Figure 2 below, which shows that an over-investment in domestic dividend-paying shares (at Q*) leads to a reduction in utility (U*).

Figure 2
Sub-optimal portfolio holding of domestic dividend-paying shares



105. Now suppose that imputation is introduced into this market, as illustrated in Figure 3 below. The domestic investor is likely to alter their portfolio by increasing their investment in domestic dividend-paying shares. This causes the investor to move away from their optimal portfolio, which comes at a cost – reducing utility from U to U*. However, that cost is more than compensated by the value that the investor receives from imputation credits. When the value of imputation credits is included, the curve shifts and the optimal investment in domestic dividend-paying shares is at Q*, producing utility of U'. This optimum occurs at the point where the marginal benefit of the next imputation credit is exactly offset by the marginal cost of further concentration of the investor's portfolio. That is, the last dollar of imputation credits that the investor receives has a negligible marginal benefit.

Figure 3
Australian government bond yields and the proportion of domestic ownership



106. Figure 3 also shows clearly that the net benefit that this investor receives from imputation credits is to increase utility from U to U'. This net benefit is obtained by subtracting the cost of portfolio adjustment from the total value of the credits. In summary, the value that the investor obtains from imputation credits comes at a cost – the cost of concentrating the investor's portfolio into domestic dividend-paying shares.

Other regulatory submissions on value vs. redemption rates

McKenzie and Partington (2011)

107. The AER's Guideline materials refer to advice from McKenzie and Partington (2011) as supporting the redemption rate interpretation of theta. In its Guideline materials, the AER states that the McKenzie and Partington report that it commissioned during the *Gamma* case "raised fundamental questions over the framework."[61]

108. In that report, McKenzie and Partington (2011) state that there are two possible interpretations of theta:

> the market value of franking credits distributed[62]

and:

> the franking credits redeemed as a percentage of franking credits distributed…known as the utilisation ratio.[63]

109. That is, McKenzie and Partington (2011) are clear about the fact that one must choose between a *value* interpretation and a *utilisation* interpretation. In our view, it is this exact distinction that the AEMC sought to clarify in its recent Rule change which specifies that gamma "is the value of imputation credits." The standard regulatory practice has always been to estimate the *value* of imputation credits and this remains the practice of all regulators other than the AER. The Rule change clarifies that the *value* interpretation that has always been used is the correct one.

[61] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 149.
[62] McKenzie and Partington (2011), p. 2.
[63] McKenzie and Partington (2011), p. 2.

110. McKenzie and Partington (2011) are also clear about the fact that:

    a) Empirical studies such as dividend drop-off analysis provide an estimate of the *value* of imputation credits; whereas

    b) Redemption rates provide an estimate of the *utilisation* of credits.[64]

111. Nowhere in their report do McKenzie and Partington (2011) state their view about which of the value or utilisation interpretations is the appropriate one in the regulatory/valuation setting, although they do note that the general consensus is that the value interpretation should be used:

> The literature subsequent to Officer has tended to view both gamma and theta as market values.[65]

112. In their more recent submission to the QCA, McKenzie and Partington (2013) clarify their view as follows:

> Theta (θ) is the value to the investor of the imputation credits distributed, expressed as a fraction of face value,[66]

and:

> The standard practice has been to measure the market value of theta.[67]

113. McKenzie and Partington (2013) then state that:

> The question then is how to measure the market value of the imputation credits[68]

and the balance of their report considers various empirical estimates of the value of imputation credits, without any further discussion of utilisation/redemption rates.

114. In summary, the advice from McKenzie and Partington does not recommend that the redemption rate interpretation of theta should be adopted. Rather, McKenzie and Partington simply state that if a regulator decides to define gamma in terms of redemption rates, then gamma should be estimated in terms of redemption rates. Certainly McKenzie and Partington never suggest that redemption rates should be used to the exclusion of market value estimates, or even in preference to market value estimates.

115. In our view, the advice from McKenzie and Partington (2011, 2013) does not support the sole reliance on redemption rates when estimating gamma. By contrast, McKenzie and Partington (2011, 2013) consider empirical estimates of the *value* of imputation credits at some length.

[64] McKenzie and Partington (2011), p. 2.
[65] McKenzie and Partington (2011), p. 3.
[66] McKenzie and Partington (2013), p. 31.
[67] McKenzie and Partington (2013), p. 32.
[68] McKenzie and Partington (2013), p. 33.

Handley (2008)

116. During its 2009 WACC Review, Handley (2008) provided the same advice in a report commissioned by the AER. One issue that was addressed in the Handley report was the appropriate interpretation of the redemption rate estimates reported by Handley and Maheswaran (2006). Handley (2008) advised the AER that the Handley and Maheswaran study estimated redemption rates, rather than the value of distributed credits. Handley further advised that it would be inappropriate to use a redemption rate interpretation of theta for the purposes of estimating gamma. He advised the AER that a redemption rate estimate of theta will not produce an appropriate estimate of gamma – at best, it will produce an upper bound for gamma.

117. In particular, Handley (2008) advised the AER that an estimate of gamma based on the redemption rate interpretation:

> may be interpreted as a reasonable upper bound on the value of gamma.[69]

118. At the Roundtable convened by the AER in October 2008, Handley further addressed the concept of an estimate of gamma that was based on a redemption rate (rather than on a market value estimate of theta). He again stated clearly that the redemption rate interpretation does not provide an appropriate estimate of gamma:

> Well, that's not our estimate of gamma therefore we haven't said that's our estimate of gamma. In some ways, what you could do is you could certainly say that is perhaps an upper bound for what gamma is.[70]

119. In summary, the author of the main redemption rate study that the AER relied upon at its last WACC Review has advised the AER that the study estimates the redemption rate and not theta, and that redemption rates cannot be used to provide an appropriate estimate of gamma. Handley's point is that his redemption rate study provides a reasonable estimate of the utilisation of imputation credits, but that the utilisation of credits cannot be used to produce an appropriate estimate of gamma.

120. In our view, the advice from Handley (2008) does not support the sole reliance on redemption rates when estimating gamma. A more appropriate interpretation of Handley (2008) suggests that redemption rates can only be used as an upper bound.

Officer (1994)

121. In its Guideline materials, the AER points out that Officer (1994) defines gamma to be both:

a) The value of a dollar of tax credit to the shareholder; and

b) The proportion of company tax that is rebated against personal tax.[71]

122. In their report for the AER, McKenzie and Partington (2011) also note this apparent inconsistency, describing it as "a potential source of confusion" [72] and "ambiguity."[73]

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[69] Handley (2008), p.8.
[70] AER Roundtable transcript, 10 October 2008, p. 18.
[71] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 138. The QCA also notes this apparent inconsistency at p. 93.
[72] McKenzie and Partington (2011), p.2.

123. Logically, there are two paths through the confusion and ambiguity caused by the drafting of the text in Officer (1994):

    a) Conclude that Officer means gamma to have a *value* interpretation and that words suggesting a *utilisation* interpretation were poorly drafted (i.e., the reference to utilisation should be read as simply identifying the source of value); or

    b) Conclude that Officer means gamma to have a *utilisation* interpretation and that words suggesting a *value* interpretation were poorly drafted.

124. In our view, the first interpretation is plausible and the second is not. To see this, first consider the following passage from Officer (1994):

> Where there is a market for tax credits one could use the market price to estimate the value of γ for the marginal shareholder, i.e. the shareholder who implicitly sets the price of the shares and the price of γ and the company's cost of capital at the margin, but where there is only a covert market, estimates can only be made through dividend drop-off rates.[74]

125. In our view, it is inconceivable that anyone who so clearly refers to the "market price" and "value" and who specifically references dividend drop-off analysis could possibly be of the view that the value interpretation was the one that was incorrect. Such explicit statements are unlikely to have been made by accident. It is far more likely that the references to "the proportion of tax collected from the company which gives rise to the tax credit associated"[75] have simply been poorly drafted.

126. Second, one can bypass the ambiguous language in Officer (1994) altogether and go directly to the mathematical equations and numerical examples to see precisely how gamma *is* interpreted in his paper. For example, consider the calculations in Officer's worked example. In particular, consider the calculations relating to the vanilla definition of WACC labelled "III" on p. 17 of Officer (1994). That example adopts the parameters set out in Table 4 below.

Table 4
Parameters for Officer (1994) worked example

Parameter	Symbol	Estimate
Corporate tax rate	T	39%
Gamma	γ	0.5
Cost of equity	r_e	17.70%
Cost of debt	r_d	14.32%

Source: Officer (1994)

127. The cash flows and imputation credits from that example are summarised in Table 5 below.

[73] McKenzie and Partington (2011), p.3.
[74] Officer (1994), p. 5.
[75] Officer (1994), p. 5.

Table 5
Cash flows and imputation credits for Officer (1994) worked example

	Symbol	$ (millions)
Pre-tax profit	X_O	39.96
Interest	X_D	5.14
Taxable income	X_O-X_D	34.82
Corporate tax	TAX	13.58
Face value of imputation credits	IC	13.58

Source: Officer (1994)

128. In general, the annual cash flow to equity is:

$$\begin{matrix}\textit{Cash Flow}\\ \textit{to Equity}\end{matrix} = \begin{matrix}\textit{Pre-tax}\\ \textit{Profit}\end{matrix} - \textit{Interest} - \begin{matrix}\textit{Corporate}\\ \textit{Tax}\end{matrix} + \begin{matrix}\textit{Value of}\\ \textit{Imputation Credits}\end{matrix}$$

which can be expressed as:

$$CF(Equity) = X_O - X_D - TAX + \gamma \times IC.$$

129. Consequently, the annual cash flow to equity in this case is:[76]

$$\begin{aligned} CF(Equity) &= X_O - X_D - TAX + \gamma \times IC \\ &= 39.96 - 5.14 - 13.58 + 0.5 \times 13.58 \\ &= 28.03. \end{aligned}$$

130. Since, in this example, all cash flows are perpetuities the value of equity is given by: [77]

$$E = \frac{X_O - X_D - TAX + \gamma \times IC}{r_e} = \frac{39.96 - 5.14 - 13.58 + 0.5 \times 13.5}{0.177} = 158.362\,.$$

131. This expression unambiguously shows that gamma represents the extent to which imputation credits are capitalised into the stock price. Gamma shows the effect that imputation credits have on the *value* of the shares. In the absence of imputation credits, the value of the firm's equity would be:

$$E_{ex-IC} = \frac{X_O - X_D - TAX}{r_e}.$$

132. Gamma then represents the increase in the *value* of equity due to imputation credits, expressed as a proportion of the present value of all future imputation credits:[78]

[76] Since, in this example, all of the profits after interest and tax are paid as a dividend to the shareholders, we can also write $CF(Equity) = Dividend + \gamma \times IC = 21.24 + 0.5 \times 13.58 = 28.03$.

[77] Similarly the value of debt is given by $D = \frac{5.14}{0.14316} = 35.903$ in which case the value of the firm is $V = E + D = 194.265$ as set out in Officer (1994, p. 17).

[78] Where $PV(IC) = IC / r_e$ in the case of perpetual cash flows.

$$\gamma = \frac{E_{with-IC} - E_{ex-IC}}{PV(IC)}.$$

133. This shows, unambiguously, that gamma has a *value* interpretation.

134. Finally, we note that McKenzie and Partington (2011) have advised the AER that:

> The literature subsequent to Officer has tended to view both gamma and theta as market values.[79]

135. We suggest that the foregoing discussion explains why it is that the standard practice is to view gamma and theta as market values. We also suggest that the literature subsequent to Officer has *uniformly* viewed gamma and theta as market values. Even the authors of redemption rate studies view gamma and theta as market values, such that redemption rates can only provide an upper bound.

136. In our view, Officer (1994), properly and holistically interpreted, does not support the sole reliance on redemption rates when estimating gamma. That is, the QCA's proposed approach is inconsistent with Officer (1994).

Hathaway and Officer (2004)

137. The AER's Guideline materials present a quote from Hathaway and Officer (2004) that is claimed to be "supporting the cash flow interpretation of the value of imputation credits."[80] However, the Guideline materials have misconstrued the point that Hathaway and Officer are making. The point being made is simply that estimates of the value of distributed credits are not estimates of gamma, but of theta. They need to be multiplied by the distribution rate (F) to obtain an estimate of gamma.

138. Indeed the Guideline materials quote only the first half of the relevant paragraph. In the second half of that same paragraph, Hathaway and Officer (2004) state that:

> Gamma is not the *value* of distributed credits alone. It is the compounding of two factors – the fraction of tax distributed as credits multiplied by the *value* of distributed credits. In this sense it is the *value* of all possible credits, that is, the *value* of all tax payments giving rise to the creation of credits.[81]

139. Moreover, the primary purpose of the Hathaway and Officer (2004) study was to present the results of a dividend drop-off analysis, which is clearly relevant only to the standard *value* interpretation of theta. Hathaway and Officer also present some statistics relating to redemption rates, but that analysis has been retracted by Hathaway who has since stated that it should not be relied upon.[82]

140. In our view, Hathaway and Officer (2004) does not support the sole reliance on redemption rates when estimating gamma. In particular, the fact that Hathaway and Officer (2004) is primarily a dividend drop-off analysis would suggest that they would not support exclusive reliance on redemption rates when estimating gamma and that they do not consider a market value interpretation to be irrelevant.

[79] McKenzie and Partington (2011), p. 3.
[80] AER, Rate of Return Guideline, Explanatory Statement, Appendix H, p. 143, emphasis added.
[81] Hathaway and Officer (2004), p. 7.
[82] Hathaway (2013), Paragraph 12.

Theoretical justification for the redemption rate interpretation

Overview

141. The QCA relies heavily on theoretical support for its new interpretation of gamma, stating that:

> the definition applied by the QCA is also consistent with the formal definition derived in the models of Monkhouse (1993) and Lally and van Zijl (2003), [83]

and:

> The equity ownership approach is based on the correct conceptual concept — a weighted average of utilisation rates across investors with weights reflecting ownership shares in Australian listed companies. [84]

142. However, the QCA's definition of gamma in terms of the proportion of credits that are redeemed is not consistent with *any* theoretical model. The theoretical models considered by Lally (2013) only apply to the special case where Australia is assumed to be completely segmented from world capital markets, in which case there is zero foreign investment.[85] By contrast, the QCA seeks to use the Lally model to justify its use of a redemption rate that reflects the extent to which Australian equities are owned by foreign investors. Lally has advised the QCA that his model does not apply in such a setting – there is no market clearing condition and one cannot solve for any equilibrium pricing results. The QCA has either misunderstood or ignored the advice that it has received from Lally (and others) on this point. As explained in detail below, there is no theoretical framework that supports the QCA's proposed approach.

A closed system is required

143. Lally (2012, 2013) notes that there is a special case in which the proportion of imputation credits that are redeemed would be an appropriate estimate of the value of imputation credits that is reflected in the share price. He considers a class of models that includes Monkhouse (1993) and Lally and van Zijl (2003). These models all consider a setting in which there is a single market in which the m investors jointly own all of the n assets. In these models there is a closed system – there are no assets outside the market that are available to the m investors inside the market and there are no investors outside the market who can buy any of the n assets inside the market. That is, these models only apply in a closed system where the m investors collectively own all of the n assets and nothing else.

144. The models then derive an equilibrium by solving a market clearing condition. This involves noting that:

    a) All of the m investors must invest all of their wealth across the n assets and nothing else; and

    b) All of the n assets must be owned entirely by the m investors and no one else.

145. Each of the m investors will hold a different amount of each of the n assets according to their wealth, their risk aversion and their tax status. Other things equal, wealthy investors will hold more of each asset than poor investors, highly risk averse investors will tend to hold safer portfolios, and investors

[83] QCA Market Parameters Decision, p. 93.
[84] QCA Market Parameters Decision, p. 100.
[85] Lally recommends that the QCA should assume complete segmentation. The models also apply in the case of perfect integration (which would lead to gamma being set close to zero), but this case is not recommended to the QCA.

who are eligible to redeem imputation credits will hold relatively more of the stocks that distribute larger amounts of those credits.

146. Because there is a closed system in which the *m* investors collectively own all of the *n* assets and nothing else, it is possible to derive the relative amount of each asset that each investor will want to hold. This will be a function of the investor's relative wealth, risk aversion and tax status. The relative demand for each asset will determine its equilibrium price and the equilibrium return that investors will require for holding it. Again, it is very important to emphasise that none of these equilibrium calculations can be performed unless the system is closed such that the *m* investors collectively own all of the *n* assets and nothing else.

147. These models also make the assumption that a dollar of redeemed credits has the same value as a dollar of cash dividends. We discuss the reasonableness of this assumption in the next sub-section of this report.

148. A by-product of these equilibrium calculations is an estimate of the equilibrium value of the imputation credits that are distributed by each firm. This is a derived figure for the extent to which imputation credits will be capitalised into the equilibrium stock price. In these models, the equilibrium value of imputation credits (capitalised into the stock price) turns out to be a weighted-average of the extent to which each investor is able to redeem imputation credits, weighted by wealth and risk aversion. That is, under the assumptions of these models (including the assumption that a dollar of redeemed credit is equal in value to a dollar of cash dividends) the market value of imputation credits (i.e., the extent to which the credits are capitalised into stock prices) will be equal to the weighted-average redemption rate. Under the assumptions of these models, the market value of imputation credits can be estimated as the weighted-average of the utilisation rates of the *m* investors.

149. That is, in an economy where the prerequisite conditions hold (i.e., there is a closed system in which the *m* investors collectively own all of the *n* assets and nothing else) and where all of the assumptions of the model hold (including the assumption that redeemed credits and cash dividends are equally valued), it must be the case that the market value of imputation credits is equal to the weighted-average utilisation rate. In this case, there is equality between:

    a) The extent to which imputation credits are capitalised into stock prices; and

    b) The weighted-average redemption rate.

    That is, there are two equivalent ways of determining the value of imputation credits, but only if the pre-requisite conditions and assumptions of the model hold.

Specific cases of a closed system

150. Lally (2013a) considers an extreme case where:

    a) There are *m* investors who collectively own all of the *n* assets and nothing else;

    b) All of the *m* investors value a dollar of redeemed credits equal to a dollar of cash dividends, and

    c) All of the *m* investors can redeem 100% of the imputation credits that are distributed to them (i.e., there are no foreign investors).

151. He notes that (a) and (b) above establish the pre-conditions that are required for theta to be equal to the weighted-average utilisation rate. He also notes that from (c) above the weighted-average utilisation rate will be 100%. In this special case, 100% of the face value of the distributed credits will be capitalised into the stock price and theta will be equal to 1. Lally (2013a) recommends that the QCA should adopt the assumptions set out above and set theta to 1.

152. Of course, if theta is to be estimated not as it actually *is* in the market for equity funds, but as it *would be* in a world with no foreign investors, consistency requires that all WACC parameters must be estimated on the same basis. Lally (2013a) presents some calculations to show how one might go about estimating beta and MRP as they *would be* in such a world.

153. Lally (2013a) also considers the case of perfectly integrated capital markets where:

    a) The *m* investors consist of all global investors; and

    b) The *n* assets consist of all global equities.

154. This is also a closed system in which the *m* investors collectively own all of the *n* assets and nothing else. Consequently, an equilibrium exists in which the value of imputation credits capitalised into the stock price is equal to the weighted-average of the utilisation rates over the *m* investors. In this case, only a small proportion of the *m* investors are eligible to redeem imputation credits (commensurate with the small proportion of Australian investors in the global market), in which case theta will be negligibly small.

155. By contrast, the QCA appears to consider a setting in which:

    a) The *m* investors consist of all Australian investors and those foreign investors who own some Australian shares; and

    b) The *n* assets consist of all Australian equities.

156. This is not a closed system because it is not the case that the *m* investors collectively own all of the *n* assets and nothing else. Consequently, no market clearing equilibrium can be derived and it will not be the case that an equilibrium exists in which the value of imputation credits capitalised into the stock price is equal to the weighted-average of the utilisation rates over the *m* investors.

157. In the context of these equilibrium models, if foreign investors are included, foreign assets must also be included. Alternatively, if foreign assets are not included, then foreign investors must be assumed away. If neither of these assumptions is made, no equilibrium model will apply and the weighted-average utilisation rate cannot be used as an estimate of theta.

Lally's specific rejection of the QCA approach

158. In his advice to the QCA, Lally (Nov 2013) notes that one:

> …possible approach to estimating *U* arises from the definition of *U* as a value weighted average over the utilisation rates of individual investors, but without imposing the restriction that investors must be Australian residents. Consequently *U* would be a value weighted average over the utilisation rates of locals and foreigners. Since foreigners

> cannot benefit from the credits (except through tax arbitrage), then *U* would be the proportion of Australian shares held by Australians.[86]

159. It is this very approach of using an average utilisation rate that the QCA has adopted. In fact, the QCA places 100% weight on this single approach and zero weight on all other approaches. Lally (Nov 2013) goes on to advise that:

> The drawback with this approach is that the estimate is inconsistent with the use of a CAPM that assumes complete segmentation of risky asset markets. Handley (2008, section 2.2) appears to believe that there is no inconsistency and believes that all CAPMs start by defining the "market", from which the "relevant" set of investors follows. Thus, if the market is Australian equities, then the relevant set of investors includes foreigners to the extent they invest in Australian equities. I do not agree. Every CAPM starts instead with a set of assumptions about investor behaviour and institutional features rather than a "market", and the particular assumptions imply which market portfolio and set of investors are relevant.

160. We agree entirely with Lally on this point. There is no version of the CAPM, and indeed no version of any equilibrium asset pricing model, that supports the taking of an average utilisation rate across Australian investors and "foreigners to the extent that they invest in Australian entities." As set out above, such an approach violates the most basic market clearing condition of equilibrium asset pricing models.

161. Lally goes on to advise the QCA that a weighted average utilisation rate is only relevant where:

    a) All of the *m* investors must invest all of their wealth across the *n* assets and nothing else; and

    b) All of the *n* assets must be owned entirely by the *m* investors and no one else.

162. He notes that there are only two settings in which this condition holds. This first is the complete segmentation case in which:

> the relevant investors are Australian residents and the relevant market portfolio is all Australian risky assets[87]

and the second is the complete integration case in which:

> the relevant investors are those throughout the world and the relevant market portfolio would be all risky assets throughout the world.[88]

163. By contrast, under the QCA's setting in which:

    a) The *m* investors consist of all Australian investors and those foreign investors who own some Australian shares; and

    b) The *n* assets consist of all Australian equities

[86] Lally November 2013, p. 13.
[87] Lally November 2013, p. 14.
[88] Lally November 2013, p. 14.

the proportion of credits that are redeemed has nothing to do with the value of those credits to shareholders. That is, there is no theoretical framework that supports the QCA's proposed approach.

164. Lally (2013) also notes that the use of redemption rates based on the proportion of foreign investors

> has the perverse consequence that as national equity markets become increasingly integrated, foreign ownership of Australian equities will rise, the resulting estimate of *U* will fall, and therefore the cost of equity capital estimated using the Officer model will rise. However, as markets become more integrated, investors will be holding more well diversified portfolios and therefore the cost of equity capital should fall.[89]

The evolution of the QCA's approach to estimating gamma

165. At the time of its last WACC review in 2004, the QCA practice was to set the utilisation rate to 0.625 and gamma to 0.5. At that time, the QCA used empirical market data and estimation techniques that were designed to estimate the market value of imputation credits, consistent with the approach of all other Australian regulators. In its conclusions to the 2004 WACC review, the QCA noted that:

> Lally reviews several different approaches to estimating the value of the utilisation rate. The first approach uses empirical estimates from examining either ex-dividend day returns or the proportion of imputation credits attached to dividends that are redeemed against investor tax liabilities. Lally notes that the typical estimate drawn from these studies is about 0.60.[90]

166. That is, the QCA's (market value) estimate of 0.625 was based on:

    a) Redemption rate studies; and

    b) Dividend drop-off studies,

    which the QCA considered to produce estimates of "about 0.60."

167. This approach to estimating the utilisation rate has become untenable since the *Gamma Case*, where:

    a) The Tribunal ruled that redemption rates cannot be used to estimate the value of imputation credits; and

    b) The Tribunal also ruled that:

        i) The dividend drop-off study that supports an estimate of about 0.60 was unreliable and should not have been used; and

        ii) The SFG "state-of-the-art" estimate of 0.35 should be adopted instead.

168. That is, the whole basis for the QCA's previous gamma estimate of 0.5 is inconsistent with the Tribunal's ruling. This has led the QCA to re-evaluate its approach to estimating gamma. The result of this re-evaluation is a fundamental change to the very definition of gamma itself. The QCA has

[89] Lally (2013), p. 14.

[90] DBCT Draft Decision (2004), p. 229. Note that the empirical estimates of theta will reflect *all* reasons why investors do not value imputation credits at their face value, so the QCA's use of the term "utilisation rate" in this context is somewhat misleading. In actual fact, the QCA concluded that the empirical evidence that was available at that time supported a theta estimate in the order of 0.6.

now concluded that it was wrong to have been trying to estimate the value of imputation credits over the last 10 years, because gamma does not in fact represent "the value of imputation credits"[91] at all, but rather represents something quite different. This in turn has led the QCA to now reject all of the empirical market data that it has previously relied upon and to estimate gamma using different methods that are more consistent with the QCA's revised definition of what gamma means.

169. The result of these fundamental changes in the very definition of gamma, and in the methods used to estimate it, is that the QCA's final estimate has changed from 0.50 to 0.47.

The AER's Draft Decisions

170. In relation to the conceptual definition of theta, we finally note that the AER has recently issued a number of draft decisions that restate the AER's view that gamma should be interpreted in terms of the proportion of imputation credits that are redeemed rather than as the value of those credits. Since the QCA has followed the AER in this conceptual redefinition of gamma (and specifically theta) we have already addressed the "redemption rate" interpretation of theta above. However, we make two points that arise in the AER's draft determinations that we have not previously dealt with, as follows:

a) We have made the point in this report that Associate Professor Lally is clearly on the record as stating that the use of a weighted-average representative investor (the basis of the equity ownership and redemption rate estimates of theta) is inappropriate other than in the context of perfect segmentation (where all investors can utilise imputation credits) or perfect integration (where a negligible number of investors can utilise imputation credits). Lally has previously provided the same advice to the AER. For its recent draft decisions, the AER has replaced Lally as its advisor on gamma withy Associate Professor Handley. Handley advises the AER that Lally is incorrect on this point and that a representative agent can be derived in the absence of a standard market clearing condition as set out in Paragraphs 141 to 164 above.[92] In our view, Handley is quite wrong about this – it is simply impossible to obtain a representative agent in the absence of a standard market clearing condition. The QCA should at least provide an opportunity for Associate Professor Lally to comment on this important issue; and

b) The AER considers some of the derivations in Officer (1994) in some detail. In particular, the AER sets out the following equation,[93] which clearly demonstrates that gamma represents the proportion if imputation credits (IC) that are reflected in the market value of equity – precisely the definition that we propose in this report:

$$E_{with-IC} = \frac{X_O - X_D - TAX + \gamma IC}{r_e}$$

As set out above, another way to see this is to note that the Officer (1994) equations can be rearranged to show that gamma is the difference between the market value of equity with

[91] Notwithstanding the fact that gamma is defined in exactly that way in the National Gas Rules and National Electricity Rules.
[92] Handley (2014), p. 23.
[93] See, for example, the AER's Jemena Draft Decision, Appendix 4, p. 41.

imputation credits and the market value of equity without imputation credits expressed as a proportion of the present value of all future imputation credits:[94]

$$\gamma = \frac{E_{with-IC} - E_{ex-IC}}{PV(IC)}.$$

[94] In its draft decisions, the AER notes that in our submission to them we simply used *IC* in the denominator of this expression. The denominator should be the present value of all future imputation credits, where $PV(IC) = IC / r_e$ in the case of perpetual cash flows.

4. The Lally conceptual test

Decision-making logic

171. Lally (2013) develops a "conceptual test" that is designed to provide some bounds around a reasonable estimate of the utilisation rate. The QCA notes that the test is only satisfied by setting the utilisation rate close to one:

> a utilisation rate of one (or close to one) in conjunction with the common approach of Australian regulators is reasonable (i.e. it produces a result that satisfies the test).[95]

172. Before considering the merits of the test itself, we address the decision-making logic of the QCA's use of this "test." As part of its decision-making process, the QCA must decide whether the Lally test does bound the reasonable values for the utilisation rate or whether it does not. That is the QCA must decide whether:

    a) The test provides reliable bounds such that all reasonable values of the utilisation rate must fall within those bounds; or

    b) The test does not provide reliable bounds such that reasonable values for the utilisation rate may be taken from outside the bounds established by the test.

173. It is important to note that the "test" is not designed to inform a point estimate for the utilisation rate. Rather, it examines Lally's modelling of two extreme end-points.

174. Logically:

    a) If the QCA considers that the test does provide reliable bounds, they must reject (as unreasonable) any estimate from outside of those bounds; and

    b) If the QCA considers that the test does not provide reliable bounds, it should not be given any weight in its decision-making process.

175. The QCA has adopted a utilisation rate that falls well outside of the bounds established by the Lally test. That is, the utilisation rate adopted by the QCA fails the Lally test by a material amount. However, the QCA concludes that:

> The Lally conceptual test is relevant but given the uncertainty about the bounds of the test, it is given less weight in establishing a final estimate of the utilisation rate.[96]

176. The QCA has not explained how it is that it has:

    a) Given some weight to the Lally conceptual test; and then

    b) Adopted a utilisation rate that fails the test by a large margin.

177. The QCA should explain how its estimate of the utilisation rate has been affected by the weight it has applied to the Lally conceptual test – how different would the QCA's estimate have been if it had not applied weight to the Lally test?

[95] QCA Market Parameters Decision, p. 99.
[96] QCA Market Parameters Decision, p.100.

The merits of the conceptual test

Overview

178. In our view, the Lally conceptual test does not establish a reasonable range for the utilisation rate and it should be afforded no weight at all. The reasons for this conclusion are:

a) To our knowledge, no person or entity anywhere in the world at any time has ever adopted an estimate of the utilisation rate from within the range established by the Lally test;

b) The test relies upon estimates of CAPM parameters as they would be in perfectly segmented and perfectly integrated worlds. The estimation of CAPM parameters in the real world (where substantial data is available to assist) is already difficult and contentious. It is simply impossible to estimate what these parameters might be in the theoretical worlds considered in the Lally test;

c) The Lally test is based upon the assumption that the market risk premium in every country is equal to the same multiple of stock market variance. However, the QCA cites Lally himself as concluding that "the statistical precision of the method is very low," [97] and the QCA concludes that this approach "does not warrant material weight at this time." [98] That is, the whole basis of the Lally "test" is an approach that the QCA itself considers to provide no useful information. That is, the test is based on the notion that an approach that the QCA considers to be so difficult to reliably apply in the real world (where data is available to guide the estimation) that no material weight should be applied to it, is somehow able to produce perfectly reliable output for Lally's hypothetical worlds (where no data is available because those worlds do not exist); and

d) The first version of the test relied upon government bonds having the same yield whether or not foreign investors are allowed to buy them, which is clearly unsupportable. The second version of the test simply treats the obvious difference in government bond yields in the two cases as being an irrelevant consideration.

Parameter estimation

179. In our previous submission to the QCA, we explained that it is simply impossible to estimate CAPM parameters as they would be in the theoretical worlds that form the basis of the Lally test. It is already difficult to estimate the expected return on the market in the real world. Estimating (with any degree of precision) what it might be in two different theoretical worlds is impossible. By way analogy, it is difficult to predict the winner of Melbourne Cup, but we can make reasonable forecasts based on the form of horses over previous races – for which some data is available. But it is impossible to make an estimate with any precision about which horse might win if the race were held on ice, or if the horses had to run backwards – because there is no data about these theoretical worlds to inform any estimate. We made this point in our previous submission as follows:

> Associate Professor Lally undertakes the estimation task by starting with estimates of WACC parameters from the real world and making adjustments to determine what those parameter values would be if markets were perfectly segmented and what they would be if markets were perfectly integrated. In our view, this is an impossible task. Estimating beta and MRP in the real world (reflecting the actual impact that foreign investors have on asset prices) is extremely difficult and a matter of great controversy, thousands of

[97] QCA Market Parameters Decision, p. 74.
[98] QCA Market Parameters Decision, p. 74.

> pages of expert submissions, and almost continual litigation. The task of estimating what beta and MRP *would be* if there no foreign investment was allowed, and what they would be if markets were perfectly integrated is an impossibility.
>
> Even if was possible to derive point estimates of beta and MRP as they would be in these theoretical scenarios, the reasonable ranges (or confidence intervals) around the point estimates would be very wide indeed – reflecting not just statistical estimation error, but also the extent to which the theoretical adjustments to convert estimates from their real world values to their theoretical world values were not perfectly accurate. Indeed properly constituted ranges would likely be so wide as to be of no use whatsoever.
>
> However, Lally (2012, 2013) produces point estimates of the required return on equity to three decimal places and uses these point estimates to rule out all estimates of theta (or *U*) other than his own theoretically reasoned value of 1. He does not consider the possibility of *any* estimation error or of *any* model error in converting real-world estimates to their theoretical world values.[99]

180. The QCA appears to have had no regard to this submission when determining its estimate of the utilisation rate. If the QCA intends to persist with its reliance on the Lally conceptual test, it should have regard to, and address, the above submission.

Estimates are based on a framework that has been rejected by Lally and the QCA

181. The technique that Lally uses to estimate the MRP in his theoretical worlds is materially different to the techniques that the QCA uses to estimate MRP in the real world. Lally proposes to estimate MRP as a fixed multiple of the variance of the market return in each of his theoretical worlds. However, the QCA has rejected that approach for estimating MRP in the real world.

182. In its Market Parameters Decision, the QCA specifically considers what it calls "the Merton (1980) approach" [100] of estimating MRP as a multiple of stock market variance. The QCA notes that:

> Lally has examined the general approach of Merton (1980) and concluded that the statistical precision of the method is very low.[101]

183. This leads the QCA to conclude that the approach that forms the whole basis of the Lally conceptual "test":

> …does not warrant material weight.[102]

184. If the QCA intends to persist with its reliance on the Lally conceptual test, it should explain why it considers that the multiple-of-variance approach is a suitable method for estimating MRP in Lally's theoretical worlds when it considers that same method to be unsuitable for use in the real world.

Treatment of risk-free rates

185. The first version of the Lally conceptual test relied upon government bonds having the same yield whether or not foreign investors are allowed to buy them. This is clearly unsupportable.

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[99] Lally (2012, 2013) does consider different values for certain parameters that are used to convert from the real world to the theoretical worlds, but he assumes that his approach for converting between worlds is perfectly accurate.
[100] QCA Market Parameters Decision, p. 74.
[101] QCA Market Parameters Decision, p. 74.
[102] QCA Market Parameters Decision, p. 74.

186. The second version of the test simply treats the obvious difference in government bond yields in the two cases as being an irrelevant consideration that has no impact at all on the conclusions. The basis for this treatment is that the:

> CAPM only assumes that the market for *risky* assets is completely segmented. No assumption is made in this model about the market for the risk-free asset.[103]

187. That is, the new version of the Lally test is based on a scenario in which the market for government bonds is completely integrated and the market for all other assets is completely segmented. Such an inherently contradictory framework should not be used to determine the bounds for reasonable estimates of the utilisation rate. Indeed such a framework is not fit for any purpose at all. In our view, it would be an error to place any weight whatsoever on any analysis that is based on such a nonsensical foundation.

188. If the QCA intends to persist with its reliance on the Lally conceptual test, it should explain why it considers it reasonable to set regulated prices (in part) on the basis of an assumption that the market for government bonds is completely integrated and the market for all other assets is completely segmented.

[103] Lally (2014), p. 29.

5. Dividend drop-off analysis

QCA determination

189. The QCA has determined that no weight at all should be applied to dividend drop-off estimates. Two reasons have been proposed:

a) Dividend drop-off studies seek to estimate the value of imputation credits, whereas the utilisation rate is the proportion of credits that are redeemed and not the extent to which they are valued by investors;

b) Dividend drop-off studies are affected by econometric issues to such an extent that no reliance should be placed on them.

190. The first issue is a conceptual one that is dealt with in Section 3 above. Our view is that gamma represents the value of imputation credits, not the number of credits that are redeemed. If, however, gamma actually has nothing to do with the value of imputation credits, then dividend drop-off analyses would indeed be irrelevant. In the remainder of this section we address the econometric issues that relate to dividend drop-off analysis, should they be considered to provide relevant evidence.

Econometric issues

191. The QCA's recent determinations re-list the range of econometric issues that were set out in the reports of Lally (2013a) and Lally (2013b).[104]

Issues already addressed

192. We have made two previous submissions to the QCA that deal, in part, with dividend drop-off analysis. Those submissions address, in some detail, all of the issues that have been re-listed in the QCA's recent determinations. In particular:

a) We address issues relating to trading volumes around ex-dividend dates at SFG (2014 Gamma, pp. 35-37);

b) We address the use of a constant term in the regression specifications at SFG (2014 Gamma, pp. 37-38);

c) We address the interaction between the value of the cash dividend and the value of the imputation credit at SFG (2014 Gamma, pp. 38-39);

d) We address the elimination of micro-cap companies at SFG (2014 Gamma, pp. 39);

e) We address the stability and reliability of our estimates in SFG (2014 ERA);

f) We address the comparison between the ERA and SFG studies in SFG (2014 ERA);

g) We address the potential impact of increases in trading volume around ex-dividend dates at SFG (2014 Gamma, pp. 61-62);

[104] QCA Market Parameters Decision, pp. 94-96.

h) We address clientele effects and the potential effects of short-term trading at SFG (2014 Gamma, pp. 62-64).

193. The QCA's determinations appear to have no regard to the fact that our earlier submissions address every one of the econometric issues that have been raised. If the QCA considers that we have not adequately addressed one or more of the econometric issues they should state why they have reached that conclusion. To date, the QCA simply lists the issues that have been raised by Lally and makes no mention of our responses to each of those issues. If the QCA maintains its view that these econometric issues affect the reliability of dividend drop-off estimates, they should state why they consider our existing responses on each issue to be inadequate.

Comparison with the ERA study

194. The QCA draws a particular comparison between the SFG dividend drop-off analysis and that of Vo, Gellard, and Mero (2013) (the ERA study).

195. The QCA begins by suggesting that the two studies produce different results, which goes to the reliability of the dividend drop-off method. The SFG study uses market-adjusted returns, as is standard in dividend drop-off analyses around the world. This adjustment implies that, but for the dividend, the stock would have moved in accordance with the broad market. Paragraphs 221 to 225 of our previous report explain why the standard market adjustment should be applied. The ERA study presents results with the standard market-adjusted returns and concludes that when the standard market adjustment is applied the best estimate of theta is 0.34, which corroborates the SFG (2011) and SFG (2013) estimates of 0.35.

196. The ERA study also presents results without the standard market adjustment. This approach implies that (but for the dividend) the stock price would have been unchanged over the day – whether the broad market was up 5% or down 5%. As explained in our previous report, this approach is not used in dividend drop-off studies because it introduces unnecessary error. The conclusions of the ERA study differ from those of the SFG studies only to the extent that the ERA study places some reliance on the non-standard approach of assuming that stocks in their sample are uncorrelated with the broad market.

197. In summary, when the ERA study uses the accepted and correct methodology, it confirms the SFG estimate. When the ERA study uses a non-standard and faulty methodology, it produces somewhat different conclusions.

198. The QCA also focuses on the robustness of the results to the removal of a small number of observations. This specific issue was addressed at some length in our SFG (2014) submission to the QCA (Paragraphs 45-77). That previous submission explains in detail why the SFG stability analysis produces reliable evidence and why the ERA analysis does not. In brief:

a) The ERA only performs stability analysis for the non-standard error-inducing approach of assuming that stocks in their sample are uncorrelated with the broad market;

b) The ERA focus their stability analysis on their "OLS" model, which they themselves had previously concluded to be "not appropriate." It would generally not be surprising that an inappropriate model would produce unstable results; and

c) Regardless of the above issues, the ERA's conclusions are inconsistent with their own results.

199. The QCA has no regard to any submissions about the relative merits of the ERA and SFG studies. Rather, the QCA treats them as equals and concludes that dividend drop-off studies are generally unreliable because some of the ERA results differ from those reported by SFG.[105] However, it is not logical to conclude that dividend drop-off studies are generally unreliable on the basis that some results from a low-quality study differ from the results of a careful and thorough high-quality study. On this basis, any piece of reliable evidence could be voided by someone creating a low-quality study that produced a different estimate. In our view, a more reasonable approach would be to give weight to different studies according to the quality of each.

200. In the case at hand, the SFG study has been assessed by the Tribunal for its fitness for use in the regulatory setting. The Tribunal concluded that it has confidence in the SFG estimate[106] and that "No other dividend drop-off study estimate has any claims to be given weight vis-à-vis the SFG report value"[107] and that "the careful scrutiny to which SFG's report has been subjected, and SFG's comprehensive response, gives the Tribunal confidence in those conclusions."[108]

[105] QCA Market Parameters Decision, p. 95.
[106] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 38.
[107] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 38.
[108] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 22.

6. Other unaddressed submissions

Lally's primary recommendation

201. Lally's primary recommendation to the QCA is that it should set gamma to 1.0 on the basis of his theoretical reasoning whereby foreign investors are "omitted from consideration." The QCA has not yet explained why it has rejected this primary submission.

Market practice

202. In our previous report, we noted that:

a) The great majority of independent expert valuation reports make no adjustment at all to either cash flows or discount rates to reflect any assumed value of franking credits (Lonergan, 2001[109]; KPMG, 2005[110]; SFG 2013[111]);

b) The great majority of CFOs of major Australian companies (who between them account for more than 85% of the equity capital of listed Australian firms) make no adjustment at all to either cash flows or discount rates to reflect any assumed value of franking credits (Truong, Partington and Peat, 2008[112]);

c) Published Queensland Government Treasury valuation principles require government entities to make no adjustment at all to either cash flows or discount rates to reflect any assumed value of franking credits (OGOC, 2006[113]); and

d) Credit rating agencies make no adjustments in relation to franking credits to any quantitative metric that they compute when developing credit ratings for Australian firms.

203. The QCA has not yet opined on the relevance of these submissions.

Anecdotal evidence

204. In our previous report, we made submissions on the anecdotal evidence about the existence of dividend washing schemes and imputation funds. To the extent that this anecdotal evidence is worthy of receiving any weight, it actually operates against the QCA's arguments. If gamma was equal to one, these schemes would not exist because the full face value of imputation credits would already be factored into share prices – there would be nothing to gain by buying shares to capture imputation credits. The only thing that can be concluded from the existence of these schemes is that gamma must be less than one. The further gamma was below one, the more demand there would be for such schemes. The QCA has not yet opined on the relevance of these submissions.

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[109] Lonergan, W., 2001. "The Disappearing Returns: Why Imputation Has Not Reduced the Cost of Capital," *JASSA*, Autumn 1, 1–17.

[110] KPMG, 2005. "The Victorian Electricity Distribution Businesses Cost of Capital - Market practice in relation to imputation credits Victorian Electricity Distribution Price Review 2006 – 10."

[111] http://www.aer.gov.au/sites/default/files/Report%204%20-%20Use%20of%20Independent%20Expert%20Reports%20%28Final%29%20-%2026%20June.pdf.

[112] Truong, G., G. Partington, and M. Peat, 2008. "Cost of Capital Estimation and Capital Budgeting Practice in Australia," *Australian Journal of Management,* 33, 95 – 121.

[113] Queensland Government Treasury, 2006, "Government owned corporations – Cost of capital guidelines," www.ogoc.qld.gov.au.

References

Australian Competition Tribunal, 2010, Application by Energex Limited (No 2) [2010] ACompT 7, 13 October.

Australian Competition Tribunal, 2010, Application by Energex Limited (Distribution Ratio (Gamma)) (No 3) [2010] ACompT 9, 24 December.

Australian Competition Tribunal, 2011, Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9, 12 May.

Australian Energy Regulator, 2014, *Jemena Gas Networks Draft Decision*, November.

Australian Energy Regulator, 2013, *Rate of return guideline – Explanatory Statement*, December.

Energy Networks Association, 2013, *Response to the draft rate of return guideline of the Australian Energy Regulator*, submission to the AER, October.

Handley, J., 2014, "Advice on the value of imputation credits," report for the AER, 29 September.

Handley, J., 2008, "A note on the value of imputation credits," report for the AER, December, www.aer.gov.au/content/ index.phtml/itemId/722190.

Handley, J.C., and K. Maheswaran, 2008. "A measure of the efficacy of the Australian imputation tax system," *The Economic Record,* 84 (264), 82 – 94.

Hathaway, N., 2013, *Imputation credit redemption ATO data 1988-2011: Where have all the credits gone?* Capital Research, September.

Hathaway, N. and R. R. Officer, 2004, *The value of imputation tax credits*, Capital Research.

Independent Pricing and Regulatory Tribunal, 2013, Review of WACC Methodology: Final Report, December.

KPMG, 2005, "The Victorian Electricity Distribution Businesses Cost of Capital - Market practice in relation to imputation credits Victorian Electricity Distribution Price Review 2006 – 10."

KPMG, 2013, Valuation Practices Survey 2013, www.kpmg.com.au.

Lajbcygier, P. and S. Wheatley, 2012, Imputation credits and equity returns, *The Economic Record*, 88, 283, 476-494.

Lally, M., 2013, *Estimating Gamma*, Report for the QCA, 25 November.

Lally, M., 2014 QCA, *Review of submissions to the QCA on the MRP, risk-free rate and gamma*, Report for the QCA, 12 March.

Lally, M. and T. van Zijl, 2003, "Capital Gains Tax and the Capital Asset Pricing Model," *Accounting and Finance*, 43, pp. 187-210.

Lonergan, W., 2001. "The Disappearing Returns: Why Imputation Has Not Reduced the Cost of Capital," *JASSA*, Autumn 1, 1–17.

McKenzie, M. and G. Partington, 2011, Response to questions related to the estimation and theory of theta, Report for the AER, 7 March.

McKenzie, M. and G. Partington, 2013, *Review of Aurizon Network's draft access undertaking*, Report for the Queensland Resources Council, 5 October.

NERA, 2013, *The payout ratio,* Report for the Energy Networks Association, June.

Officer, R.R., 1994, "The cost of capital of a company under an imputation tax system," *Accounting and Finance,* 34, 1–17.

Queensland Competition Authority, 2014, *Cost of capital: Market parameters – Final decision*, August.

Queensland Government Treasury, 2006, "Government owned corporations – Cost of capital guidelines," www.ogoc.qld.gov.au.

SFG Consulting, 2011, *Dividend drop-off estimate of theta*, Report prepared for the Australian Competition Tribunal.

SFG Consulting, 2013, *Updated dividend drop-off estimate of theta*, Report prepared for the Energy Networks Association, 7 June.

SFG, 2014 ERA, *Estimating the required return on equity*, submission to the ERA, March.

SFG Consulting, 2014 Gamma, *An appropriate regulatory estimate of gamma*, submission to the AER, January.

Truong, G., G. Partington, and M. Peat, 2008, "Cost of Capital Estimation and Capital Budgeting Practice in Australia," *Australian Journal of Management,* 33, 95 – 121.

Vo, D., B. Gellard and S. Mero, 2013, *Estimating the market value of franking credits: Empirical evidence from Australia*, Working paper.

Appendix 1: The role of gamma in the Australian regulatory setting

Non-imputation setting

205. Consider a firm with $700 of equity in its RAB and an allowed return on equity of 10%. In the absence of dividend imputation, such a firm would require an after-tax profit of $70 to distribute to its shareholders. This would require a pre-tax profit of $100, as set out in the table below.

Profit before tax	100
Less corporate tax	30
After-tax profit available for distribution to shareholders	70

206. In general, in the absence of dividend imputation, a pre-tax profit of $X will generate an after-tax profit (available for distribution to shareholders) of $X(1-T) where T is the corporate tax rate. In this case, the required pre-tax profit can be determined by solving:

$$X(1-0.3)=70,$$

where X is $100 and T is 30% in this case.

207. That is, the regulator would allow the firm to charge prices so that the expected pre-tax profit is $100, in order that there would be $70 of after-tax profits available to shareholders, as required.

208. Note that the $70 benefit that the shareholders receive from the after-tax profit is independent of the firm's payout policy. For example, suppose the firm distributes a dividend of $50 and retains $20 to fund future investment. If the invested funds earn a normal return, the value of those investments will be $20. That is, whatever is not distributed as a dividend increases the value of the firm by an equivalent amount.

Imputation setting

209. Now consider the case *with* imputation. We consider the same firm as above with $700 of equity capital and an allowed return of 10%. In the regulatory setting, the allowed return on equity includes the value of imputation credits – it represents the total return required by shareholders, a portion of which is assumed to come in the form of imputation credits.

210. By way of example, suppose gamma is set to 0.25. In that case, a $100 pre-tax profit produces the same $70 after-tax profit for distribution to shareholders. It also produces imputation credits with a face value of $30 (equal to the amount of corporate tax paid). For gamma set to 0.25, the value of those imputation credits is $0.25\times 30=7.5$. Thus, the total return to shareholders is the sum of the $70 after-tax profit and the $7.5 of value from imputation credits, as set out in the table below.

Profit before tax	100
Less corporate tax	30
After-tax profit available for distribution to shareholders	70
Value of imputation credits	7.5
Total return to shareholders	77.5

211. In general, a pre-tax profit of $X will generate an after-tax profit for shareholders of $X(1-T) plus imputation credits valued at γTX. In this case, a pre-tax profit of $100 produces an after-tax profit for distribution to shareholders of:

$$100(1-0.3)=70.$$

and imputation credits with a value of:

$$\gamma TX = 0.25\times 0.3\times 100 = 7.5.$$

212. In summary, a pre-tax profit of $X produces a return to shareholders of:

$$X(1-T)+\gamma TX$$

which can also be written as:

$$X(1-T(1-\gamma)).$$

213. In the example above, a pre-tax profit of $100 produces a total return to shareholders of:

$$100(1-0.3(1-0.25))=77.5.$$

214. This is more than the $70 return that is required by shareholders of a firm with $700 of equity capital and an allowed return on equity (including imputation credits) of 10%. In this case, the correct pre-tax profit is determined by solving:

$$X(1-0.3(1-0.25))=70 \qquad (2)$$

215. In this case, the required pre-tax profit is $90.32. This produces an after-tax profit for shareholders of $63.23 and imputation credits with a value of $6.77 – a total of $70, as set out in the table below.

Profit before tax	90.32
Less corporate tax (30%)	27.10
After-tax profit available for distribution to shareholders	63.23
Value of imputation credits (0.25 times corporate tax paid)	6.77
Total return to shareholders	70.00

Estimated tax cost

216. The Rules define the Estimated Tax Cost (ETC)[114] as:

$$ETC=(ETI\times r_t)(1-\gamma).$$

where ETI is the estimated taxable income (90.32 in the above example) and r_t is used to represent the corporate tax rate (30% in the above example). That is, the expected tax cost in the above example is:

$$ETC=(90.32\times 0.3)(1-0.25)=20.32. \qquad (3)$$

[114] NER Clause 6.5.3.

217. This calculation recognises that the firm pays corporate tax of 27.10, which is offset by the value that shareholders receive from imputation credits, 6.77 (i.e., 27.10 - 6.77 = 20.32, with rounding).

218. In its PTRM, the AER combines Equations (2) and (3) above. This enables the calculation of the expected tax cost as:

$$ETC = \frac{Required\ return\ on\ equity}{ex-imputation\ credits} \times \frac{T}{1-T(1-\gamma)} \quad (4)$$

219. In the above example, we have:

$$ETC = 70 \times \frac{0.3}{1-0.3(1-0.25)} = 27.10$$

as set out in Row 44 of the Analysis sheet of the PTRM.

220. The PTRM then computes the value of imputation credits by multiplying the corporate tax payment gamma at Row 43 of the Analysis sheet of the PTRM. In the example above, this is:

$$27.10 \times 0.25 = 6.77.$$

221. The required pre-tax profit is then determined as:

$$\begin{aligned} Pre-tax\ profit &= After-tax\ profit + ETC - \gamma \times ETC \\ &= 70 + 27.10 - 6.77 = 90.32, \end{aligned} \quad (5)$$

exactly as set out above. This calculation is performed at Row 27 of the Analysis sheet of the PTRM.

Returns with and without imputation credits

222. In the above example, shareholders require a total return (including imputation credits) of 10%, which amounts to $70 for equity capital of $700. The $70 return is paid in two components:

a) Imputation credits comprise $6.77 of the $70 total. This amounts to 9.68% of the total; and

b) The firm is allowed to charge prices that enable it to achieve an after-tax profit for the shareholders of $63.23, which amounts to 90.32% of the total.

223. Officer (1994) has previously shown that the proportion of the total return that comes from after tax profits (i.e., not including the value of imputation credits) is:

$$\frac{1-T}{1-T(1-\gamma)},$$

which, in the above example is:

$$\frac{1-0.3}{1-0.3(1-0.25)} = 90.32\%.$$

224. Similarly, Officer (1994) has also previously shown that the relationship between the with-imputation return and the ex-imputation return is given by:

$$r_{ex} = r_{with}\frac{1-T}{1-T(1-\gamma)}.$$

225. In the above example, we have:

$$r_{ex} = 10\%\frac{1-0.3}{1-0.3(1-0.25)} = 9.032\%.$$

226. Note that the return from after-tax profits is \$63.23, which amounts to a return of 9.032% on the \$700 of equity capital.

Calculations in the Australian regulatory framework

227. The Australian regulatory framework, and the AER's PTRM in particular, begin with an estimate of the total (with-imputation) required return on equity (10% in the above example). From this, the PTRM computes the total required return to equity (\$70 in the above example).

228. The PTRM then computes the pre-tax profit that would be required to produce the required return to equity by solving:

$$X(1-T(1-\gamma)) = \begin{matrix}\textit{Total required}\\ \textit{return to equity}\end{matrix}.$$

229. In the example above, a pre-tax profit of \$90.32 produced an after-tax profit for shareholders of \$63.23 and imputation credits with a value of \$6.77 – making up the \$70 total required return.

230. The regulator then sets prices to produce the required pre-tax profit (\$90.32 in the above example).

231. The starting point for these calculations is an estimate of the with-imputation required return on equity. Consequently, any approach that produces an estimate of the ex-imputation required return on equity must first be converted to a with-imputation required return on equity for use in the Australian regulatory framework (and the AER's PTRM in particular). As set out above, converting between ex-imputation and with-imputation required returns is straightforward, as shown by Officer (1994):

$$r_{ex} = r_{with}\frac{1-T}{1-T(1-\gamma)}. \qquad (6)$$

232. For example, IPART (2013) uses a number of versions of the dividend discount model to inform its estimate of the required return on equity. The dividend discount approach takes no account of imputation credits at all, and consequently produces an estimate of the ex-imputation required return on equity. IPART use the Officer formula set out above to convert the ex-imputation estimate into a with-imputation estimate, for use in the regulatory model.

233. In summary, IPART and the PTRM both convert between the with-imputation and ex-imputation required return on equity using the Officer (1994) formula in Equation (6) above.

Aurizon Network 2014 Draft Access Undertaking

Comments on Aspects of the WACC

PREPARED FOR

Aurizon Network for submission to the Queensland Competition Authority

PREPARED BY

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17 December 2014

THE Brattle GROUP

This report has been prepared for Aurizon Network Pty Limited (**Aurizon** or **the Company**).

All results and any errors are the responsibility of the authors and do not necessarily represent the opinion of The Brattle Group, Inc. or its clients.

Unless otherwise defined in this report, capitalized terms used in this report have the meaning given in the Queensland Competition Authority "Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue", September 2014 (**Draft Decision**).

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Table of Contents

I. Introduction and Background

In September 2014 the Queensland Competition Authority (QCA) issued a Draft Decision in relation to Aurizon Network's Maximum Allowable Revenue.[1] The Draft Decision set forth the parameters proposed by the QCA to determine Aurizon's Weighted Average Cost of Capital (WACC). The WACC is a critical input to the calculation of Aurizon's Maximum Allowable Revenue in the next undertaking period (expected to commence on 1 July 2013), described in the Draft Decision as UT4).

The Brattle Group has been engaged to comment on certain parameters that concern the determination of the WACC, as set out in the Draft Decision. This report is focused on the determination of the parameters that enter the Capital Asset Pricing Model (CAPM) (a component of WACC), namely:

- the equity beta;
- the risk-free rate; and
- the Market Risk Premium (MRP).

Moreover, this report will examine the empirical evidence underlying the application of the CAPM to low-beta (less than one) stock.

This report is limited to providing a discussion of the academic evidence presented in the Draft Decision as well as comment on practitioner and regulatory practice in relation to WACC; it does not provide a quantification of the parameters and it is focused only on key elements rather than all aspects. Accordingly, this report explores the following areas:

- Comparators used to determine the relevant equity beta (systematic risk).
- Horizon of the risk-free rate.

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[1] Queensland Competition Authority, "Draft Decision: Aurizon Network 2014 Draft Access Undertaking – Maximum Allowable Revenue," September 2014 (QCA Draft Decision).

- Determination of the MRP:
    - Implementing the estimation of the historical (Ibbotson) MRP.
    - Use of the Siegel method to estimate the MRP by reference to historic data.
    - Use of the Cornell or other methods to estimate the MRP.
- Empirical evidence regarding modifications to CAPM for low-beta stocks.

For Australian companies to attract capital, they must demonstrate capacity to earn a return that is comparable to that presently available to other businesses with a similar risk profile. In respect of Aurizon, investors necessarily look to the Maximum Allowable Revenue and Aurizon's ability to earn the allowed WACC rather than individual parameters in the WACC calculation. In so doing, prudent investors will compare Aurizon to other entities which exhibit a similar risk profile.

II. Equity Beta

The cost of capital is the rate of return investors require based on the risk-return alternatives available in competitive capital markets. The cost of capital is a type of opportunity cost: it represents the rate of return that investors could expect to earn elsewhere without bearing more risk. The definition of the cost of capital recognizes a tradeoff between risk and return that can be represented by the "security market risk-return line"[2]. This line is depicted in Figure 1, below. As illustrated, the higher the risk, the higher the cost of capital required.

[2] Also known as the "security Market Line".

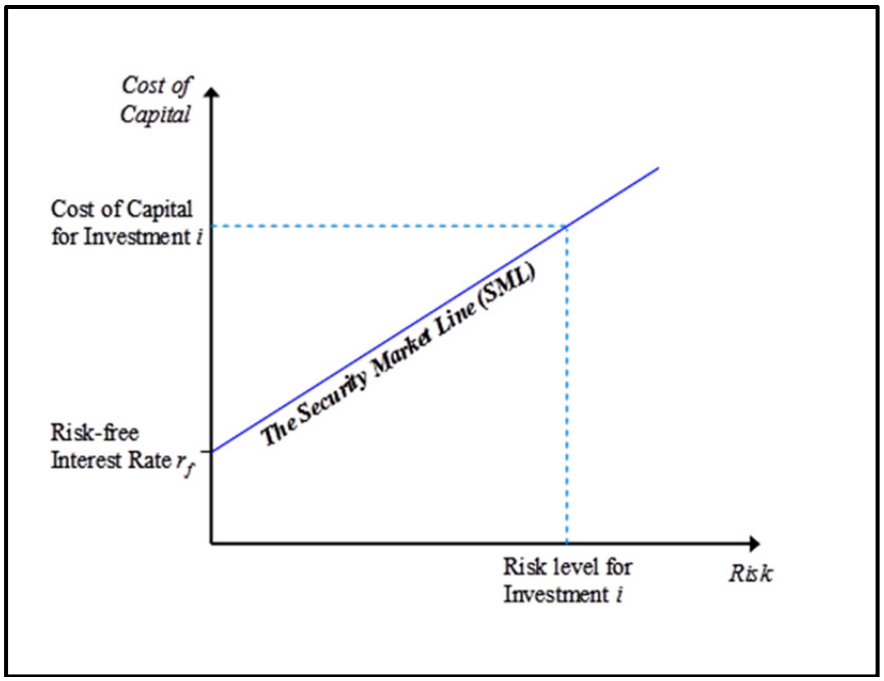

Figure 1: The Security Market Line

The cost of capital for a company depends on the risk of the lines of business in which it is engaged. Because investors consider the risk-return tradeoff and look to comparable companies to assess whether to invest in Aurizon, it is imperative that Aurizon's systematic risk is compared to that of other businesses that face risks similar to Aurizon. As the QCA measures the systematic risk by beta, it is vital that the beta measure is derived from a set of companies that operate businesses that are comparable to that of Aurizon. Further, as financial markets have become more globalized, that comparison is likely to be global rather than being limited to Queensland or Australia.

A common theme in the academic literature is that beta varies with operating leverage, so that the larger the fixed costs are relative to variable costs, the higher the beta. Professors Berk and DeMarzo of Stanford University comment on the effect of increasing fixed costs to variable costs:

> Another factor that can affect the market risk of a project is its degree of operating leverage, which is the relative proportion of fixed versus variable cost.[3]

[3] Jonathan Berk and Peter DeMarzo, "*Corporate Finance: The Core*," 3rd edition, 2014, p. 420.

Similarly, Professors Ross, Westerfield, and Jaffe, state:

> Operating leverage magnifies the effect of the cyclicality of a firm's revenues on beta. That is, a firm with a given sales cyclicality will increase its beta if fixed costs replace variable cost in its production process.[4]

Thus, firms with higher operating leverage (more invested capital) have higher betas. As railroad companies are capital intensive companies relative to most industries, they are expected to have betas that are higher than those of less capital intensive firms.

Along the comparability dimension and especially the use of capital, we note that operating cash flow to capital expenditure and operating cash flow to operating costs for the toll road, Transurban Group, which is included in Incenta's group of toll roads, appears to be an outlier with a very low beta.[5] Specifically, Transurban Group has an unusual profile with Bloomberg data showing Cash Flow to Capital Expenditures at 7.9 and operating cash flow to operating expenses in excess of .80, whereas Aurizon Networks had cash flow to capital expenditure of 0.7 and operating cash flow to operating expenses .68.[6] Thus, measured on the relationship between cash flow and capital expenditures. Aurizon only has 1/10 of the cash available for capital expenditures as does Transurban and cash flow relative to operating costs is low for Aurizon relative to Transurban. Therefore at least one toll road is an outlier relative to Aurizon. At the same time, Bloomberg estimates Transurban Group's beta at .65, while the average beta for the toll roads with available data is 1.04.[7] Without Transurban, the average beta for the toll roads increases by a non-trivial amount; using data for those with a beta estimate available from Bloomberg, the beta increases from .94 to 1.27 when Transurban is eliminated.[8] We also note

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4 Stephen A. Ross, Randolph W. Westerfield, and Jeffrey Jaffe, "*Corporate Finance*," 10th edition, 2013, p. 410.

5 Incenta Economic Consulting, "Review of Regulatory Capital Structure and Asset / Equity Beta for Aurizon Network," p. 72.

6 Transurban Group has a very high asset to revenue measure, but a low beta which is also unusual.

7 Bloomberg data as of December 9, 2014. Bloomberg shows beta estimates for Albertis (1.51), Atlantia (1.04), Gruppo (.57), and Transurban Group (.65).

8 See Figure A-4 attached to this report for details.

that Brisa has an unusually high cash flow to capital expenditure measure, but Bloomberg does not provide a beta estimate for that company, so we cannot assess the impact on the beta estimate for the toll roads. However, the group of toll roads, which are used as an upper bound for Aurizon, includes companies that are not comparable to Aurizon and at least one of the toll roads appears to downward bias the beta estimate.

Another distinguishing factor for railroad businesses relative to, for example, electric, natural gas, or water utilities businesses is that while the electric, natural gas, and water utilities predominantly serve residential customers, freight railroads such as Aurizon serve industrial / commercial customers, whose demand for service is much more variable than that of a larger number of residential customers. North American freight railroads obtain in excess of 92% of their revenues from freight transportation for industrial customers,[9] while electric utilities have in recent years sold 40-41% of their total electricity sales to residential customers[10] and the publicly traded water utilities have an even larger share of residential customers at 50-90%.[11] Aurizon is also an industrial load carrier. Thus, the railroads face a less diversified and more demand varying group of customers than electric or water utilities.

We note that the draft decision cites Incenta's advise that

> Aurizon Network's regulatory arrangements, characterised by a revenue cap with periodic cost reviews, mean variations in demand from its customers does not translate into variations in economic returns. [12]

However, there is no discussion of how this impacts the cash flow for Aurizon. Looking at the U.S. Class 1 railroads, Canadian railroads and data on regulated Aurizon revenue shows that

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9 Bloomberg data.

10 Data from Energy Information Administration at http://www.eia.gov/electricity/annual/html/epa_02_02.html

11 American Water 2013 10-K p. 9; Aqua America 2013 10-K p. 6; California Water 17 January 2014 Value Line Sheet; American States Water Annual Report p. 12; SJW Corp. 2013 Annual Report p. 25.

12 QCA Draft Decision, p. 247.

Aurizon Network's regulatory cash flow has varied **more** than that of the U.S. Class 1 railroads and the Canadian railroads. Aurizon Network's as well as the U.S. Class 1 and the Canadian railroads revenues are shown below in Figure 2 (normalized to 100 for 2007 for comparability).[13] As is evident from the chart, the variability (*e.g.*, Standard Deviation) in Aurizon Network's revenue is substantially higher than that of both the U.S. railroads and the Canadian railroads. Thus, the revenue cap does not imply that the regulatory cash flow is stable – in fact, Aurizon Network's regulatory cash flow has a higher standard deviation than the revenues of the Canadian or U.S. Class 1 railroads. Investors ultimately are interested in expected cash flow and revenue is the top line hereof, so this measure is important and shows that the revenue cap does not translate into lower revenue variability than what is common among US Class 1 railroads..[14,15] Put differently, the railroads provide insights into Aurizon's risk characteristics and should be considered.

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[13] Data for the U.S. Class 1 railroads was obtained from Bloomberg, while data for Aurizon Network was read from Figure 16 in Aurizon, "A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks," 20 January 2014.

[14] We also note that the cash flow from operations of Aurizon Holdings is more variable than that of the US Class 1 railroads. This is illustrated in Figure A-5 attached to this report.

[15] The QCA Draft Decision, Chapter 10 discusses the characteristics of the U.S. Class I railroads, but not the Canadian or railroads other than the US Class 1 railroads.

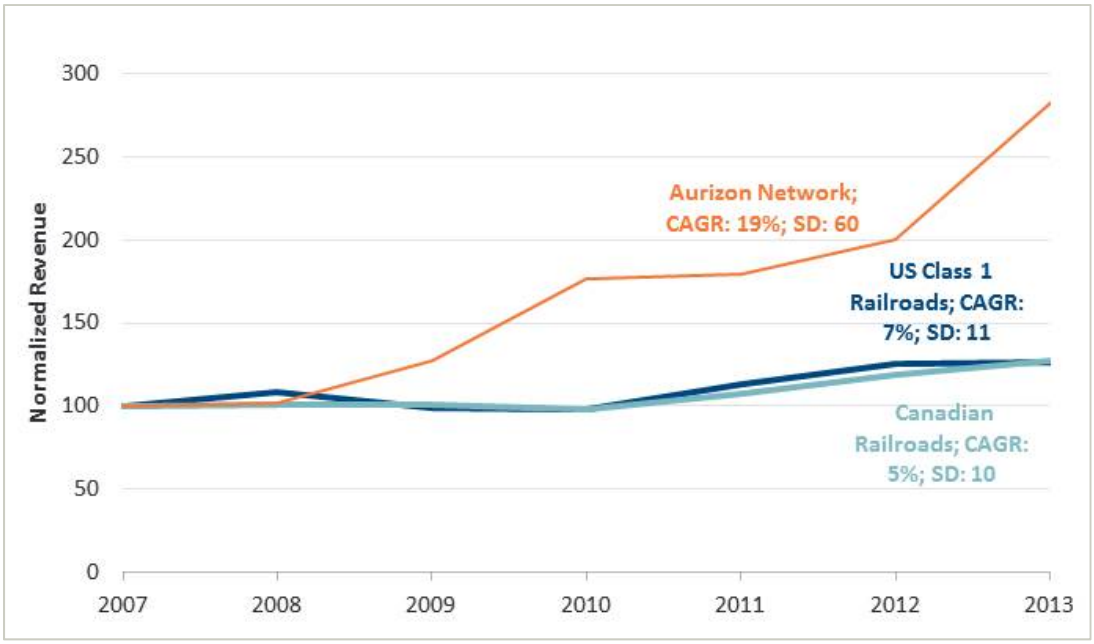

Figure 2: Cash Flow / Revenue for Aurizon Network U.S. Class 1 Railroads and Canadian Railroads

The Australian energy businesses, Electranet, Gasnet, and Aurora Energy, are not market comparables as Electranet is a privately owned company, Gasnet is part of APA Group and therefore has no separately traded stock, and Aurora Energy is a state-owned entity with no public traded stock.[16] Thus, the beta that is cited in the QCA's Draft Decision is based on an indirect estimation rather than market data.[17] Further, I note that Electranet and Gasnet primarily serve regulated entities and not industrials while Aurora Energy is a retail energy provider that serves primarily residential customers. In addition, it appears that these entities expect a relatively low growth in regulated assets going forward whereas Aurizon expect substantial growth in regulated assets.[18] It is therefore not clear that these entities are the *only*

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16 http://www.electranet.com.au/corporate/governance/; http://apa.com.au/about-apa.aspx; and http://www.auroraenergy.com.au/about/about-aurora.

17 See, QCA Draft Decision p. 243.

18 Aurizon, "A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks," 20 January 2014, p. 75. The Brattle Group has not independently calculated the regulatory asset value.

comparable entities that are relevant for forming an upper bound on beta as suggested by parties such as the QRC.

The use of betas from a regulatory decision to estimate the betas for another regulatory proceeding is quite circular. While the evidence that the regulator relied upon when determining the beta for the Electranet, Gasnet, or Aurora may be relevant, the reliance on the outcome from a decision rather than the empirical evidences may cause important assumptions, facts or the context to be lost. Put differently, it is difficult to assess the applicability of a decided parameter to another proceeding and a different industry.

While electric and gas utilities' comparability is discussed, there is limited discussion of the decisions for railroads regulated by the Economic Regulatory Authority (ERA). In both 2013 and 2014, the ERA found an equity beta of 1.43 for Pilbara infrastructure and an equity beta of 1 for Brookfield Rail.[19] Neither is there a discussion of the findings of the Canadian Transportation Agency, which like QCA determines the cost of equity for Canadian National and Canadian Pacific as it pertains to the transportation of a single bulky raw material.[20]

The QCA's Draft Decision acknowledges the determination of the beta estimates "necessarily involves identifying comparator firms with similar risk profiles to Aurizon Network"[21]. Because no such comparator firms exist in Australia, a sample of comparable railroads will necessarily have to be drawn from overseas. At the same time, companies in the same regulatory environment could be drawn from a set of Australian energy companies. The ultimate placement of Aurizon's beta would be based on a fundamental analysis of these risk components; including lines of business, capital intensity, growth opportunities, and customer composition

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19 See Figure A-2 attached to this report for details.

20 The Canadian Transportation Agency (CTA) determines the cost of capital for rail transportation of western grain and then potentially applies this figure for other purposes. See CTA Decision No. 525-R-2011, paragraphs 10-11.

21 QCA Draft Decision p. 188.

(demand and supply risk). The QCA's Draft Decision has focused on the differences between the U.S. Class 1 railroads and Aurizon, but has not looked at whether the Canadian freight railroads (Canadian National and Canadian Pacific) or companies such as Genesee & Wyoming, which is a U.S. railroad but not a Class 1 railroad, are comparable. The beta for these railroads could then be considered in the evaluation of Aurizon's beta.

Looking to the Canadian Railroads, their regulated services consist of western grain and interswitching with the regulated cost of capital being determined for western grain. Thus, the regulatory regime is similar in that the CTA sets the allowed return on equity for a single raw material. Further, the Canadian railroads (as well as the U.S. Class 1 railroads) have grown substantially in recent years, as has Aurizon.[22] Looking to the raw beta estimates for the Canadian railroads, we found Bloomberg values of 1.01 for Canadian National and 1.30 for Canadian Pacific. This results in asset betas of .89 and 1.10, respectively.[23] It is noteworthy that the lower asset beta is also consistent with that of the lowest estimates for U.S. railroads. Because the business model and customer composition of Aurizon is more comparable to that of the railroad industry than to other comparable companies, some weight should be placed on the beta estimates obtained for railroads. We note that the Canadian Transportation Agency uses the beta estimate for the Canadian railroads to determine the cost of capital for Western grain and interswitching (and a few other purposes).[24]

The lower bound of .35 that the QCA Draft Decision[25] proposes is based on a 2010 indirect estimate for the Dalrymple Bay Coal Terminal (DBCT). I.e., it is not a current estimate based on market data. Because the estimate is not based on current market data and is an indirect

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22 Using Bloomberg data as well as annual reports from Aurizon, we found that since 2010, the annual growth for Aurizon, the Canadian railroads and U.S. Class 1 railroads was 14%, 27%, and 13%, respectively.

23 See Figure A-1 attached to this report for details.

24 CTA Decision No. 525-R-2011.

25 QCA Draft Decision p. 252.

estimate, it is difficult to assess the accuracy of the estimate or how well it measures current market conditions.

In addition to looking directly to the estimates obtained from railroads in North America, we note that railroads in other parts of Australia have larger equity margins than those proposed in the QCA's Draft Decision.[26] As discussed in this report, investors will look to comparable companies to assess whether to invest in Aurizon, it is crucial to assess what aspects of Aurizon's risk are such that it merits a lower return than other regulated railroads in Australia. Figure A-2 (attached to this report) shows the equity margin for a number of decisions as well as for the proposed margin in the QCA's Draft Decision. It is evident from the table that the equity margin proposed in the draft decision is below that afforded other regulated railroads. With an equity margin of 5.2%, the margin is more than 100 basis points below the lowest in Figure A-2 (Canadian National). In making this comparison, it is important to recognize that while the QCA regulates Aurizon's coal transportation, the Canadian Transportation Agency determines the cost of capital for the transportation of western grain.[27] I.e., both regulatory regimes are setting the allowed cost of capital for a specific raw material. As investors will necessarily look the return available on other investments that share characteristics similar to that of Aurizon, an explanation as to why no railroad companies were considered is needed.

III. Risk-Free Rate

The CAPM can be estimated using a short-term or long-term version of the risk-free rate **and** a comparable term of the MRP. However, it has become common for practitioners and regulators to use the long-term version. The reasons for this include:

(i) the long-term version tend to be more stable; and

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[26] Data from Attachment B to Aurizon, "A Comparator Analysis of Aurizon Network's Commercial and Regulatory Risks."

[27] Canadian Transportation Agency, Decision No. 525-R-2011, paragraphs 10-11.

(ii) regulated assets are long-lived.

Because monetary policy influences short-term government bonds more than long-term bonds, the shorter bonds tend to fluctuate more and thus reliance on them lead to less stable regulatory outcomes.

Regardless of which version is implemented (a longer or shorter term) it is imperative that the risk-free rate used in the CAPM calculation and that used in the determination of the MRP are consistent. If the maturity of these two risk-free rates differs, there will be a systematic bias in the estimated cost of equity. Such a bias will result in an inaccurate decision, which may impact the regulated entity's return and plausibly its ability to attract capital.

The following example illustrates this point using a beta of one for simplicity and also assumes the current spread and the historical spread between 4-year and 10-year government bonds is the same.

Example:

Assumptions:	4-year risk–free rate:	3.25%	
	10-year risk-free rate:	4.07%	
	MPR over 10-year bonds:	6.50%	
	MRP over 4-year bonds:	7.32%	
	Beta:	1.00	(for simplicity)

RFR / MRP horizon	RFR	Beta	MRP	Estimated COE
4 / 4	3.25%	1	7.32%	**10.57%**
4 / 10	3.25%	1	6.50%	9.75%
10 / 4	4.07%	1	7.32%	11.39%
10 / 10	4.07%	1	6.50%	**10.57%**

As the example shows, if the 4-year risk-free rate is used with a 10-year MRP, the estimated cost of equity is downward biased and if the 10-year risk-free rate is used with a 4-year MRP, then the estimated cost of equity is upward biased.

As the historical MRP is often reported over 10 or 20-year government bonds or over 30 or 90-day government bills, it has become customary, in many regulatory jurisdictions, to implement the CAPM using a *comparable* risk-free rate[28], although some regulators adjust the commercially reported MRP to allow for the use of a shorter (e.g., 4-5 year government bond as the risk-free rate).[29]

The QCA's Draft Decision as well some of the expert evidence note that an investor in a regulated asset should expect to earn zero economic profit - this is captured in the NPV-0 proposition set out in the Draft Decision. This proposition was originally developed by Marshall et al. 1981,[30] who showed investors would expect zero economic profit *over the life of the project*.

Clearly, the expected life of Aurizon's network is longer than four years. Schmalense 1989[31] extended the proposition to hold for shorter periods when the firm faces *no cash flow risk, asset value risk and if it is financed 100% by equity*. However, any long-lived company will face cash flow and asset value risk, so Schmalense's extension is of little practical assistance.

The QCA's Draft Decision notes Lally's work on including additional risk sources such as operating cost and demand risk and further notes that his work show that asset revaluations can be dealt with through risk allowances. The results require an annual reset of the regulated price.[32] We note two problems with these results. First, it requires that any asset revaluation (or

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28 The Australian Energy Regulatory has recently relied on the 10-year risk-free rate (See, AER, "Explanatory Statement: Rate of Return Guidelines," December 2013, p. 73). The U.S. Surface Transportation Board uses a 20-year risk-free rate to match Ibbotson's reported long-term historical MRP (see Surface Transportation Board, "Decision Docket No. EP-558 (Sub-No. 17)," issued July 31, 2014, p. 7).

29 Harris, et al. "Calculating the Equity Risk Premium and the Risk-free Rate, prepared for NMa, OPTA" November 2012.

30 Marshall, W, Yawitz, J & Greenberg, E 1981, "Optimal Regulation Under Uncertainty", *Journal of Finance*, vol. 36, pp. 909-921.

31 Schmalensee, R 1989, "An Expository Note on Depreciation and Profitability Under Rate-of-Return Regulation", *Journal of Regulatory Economics*, pp. 293-298.

32 QCA Draft Decision p. 195.

stranded asset risk) is handled through risk allowances, which is a difficult requirement. *Ex ante* the current regulatory entity, the QCA and its members, cannot bind future regulators to grant risk allowances should an asset become stranded or need substantial revaluation. Second, the result requires the regulated price to be reset annually, which plausibly will be obtainable in the current regulatory environment but may not be in the future. Therefore, it seems that the NPV-0 proposition over a 4-year horizon only is truly feasible if there is no risk of stranded assets or substantial asset revaluations.

In summary, the NPV-0 proposition is appropriate for the life of the regulated asset but because of the strong (unrealistic) assumptions used to derive results for the regulatory period, it is of little to no assistance in determining the horizon of the risk-free rate.

As discussed above, (a) the NPV-0 proposition does not help us determine the horizon of the risk-free rate, (b) data on the MRP are commonly calculated over a 10-year (or 20-year in North America) government bond (or over a 90-day bill), (c) practitioners and regulators often use a 10-year government bond, and longer term government bonds are less susceptible to monetary policy than short-term bonds. Therefore, there are multiple benefits to use a long-term government bonds and we do not see the NPV-0 proposition as an argument. We find that a straightforward way to avoid biasing the estimated cost of equity through an inconsistent use of the risk-free rate in the CAPM calculation and in the MRP determination is to rely on the 10-year government bond.

We also note that other Australian regulators such as the AER, ERA (rail) and IPART use the 10-year risk-free rate. Many overseas regulators also use a long-term government bond as the risk-free rate[33]. Because a mismatch of the risk-free rate and the term relied upon in the MRP determination can have a material impact on the cost of equity estimate, it is important to ensure

[33] For example, the U.S. Surface Transportation Board uses a 20-year government bond (consistent with the MRP relied upon by the regulator).

there is no discrepancy between the maturity of the term of the risk-free rate and the term of the MRP.[34]

The author further notes that the QCA has determined to use a 10-year bond to determine the cost of debt, so using a similar horizon for the risk-free rate in the CAPM would be consistent.[35]

IV. Market Risk Premium

As discussed above, the MRP relied upon is estimated over long-term government bonds and that median of the estimates exceeds the QCA's recommended MRP as contained in the QCA's Draft Decision. Table 1 below shows the Draft Decision's point estimate and range for the MRP, which for all methods are measured over the 10-year risk-free rate. The table also shows the implied MRP over a 4-year government bond.[36]

Table 1: QCA Draft Decision Benchmark MRPs[37]

	QCA's MRP Estimate	MRP Range	Implied MRP over 4-Year Bond
Ibbotson	6.50%	5.8 - 6.6%	6.82%
Siegel	5.50%	4.1 – 6.4%	5.82%
Surveys	6.80%	N/A	7.62%
Dividend Growth	7.10%	5.6% - 8.3%	7.92%
Median	6.65%		7.22%
Midpoint	6.30%		6.87%
Average	6.50%		7.05%

[34] Ibbotson as well as the Credit Suisse data calculates the historical MRP over long term bonds and the survey data are consistent with being over a long-term bond. See, for example, Pablo Fernandez, Javier Aguirreamalloa & Pablo Linares, *Market Risk Premium and Risk Free Rate used for 51 countries in 2013: A Survey with 6,237 Answers* (revised June 27, 2013.

http://papers.ssrn.com/sol3/papers.cfm?abstract_id=914160

[35] We recognize that the QCA Draft Decision (see p. 218) attempted to use a 4-year debt rate, but was unable to find credit default swaps that could convert the efficient 10-year rate to a 4-year rate.

[36] The implied MRP is calculated as the QCA's MRP estimate plus the difference between the 10-year and the 4-year risk free rate. For the Ibbotson and Siegel method, I relied on as long a period as I have available (2000-2013), whereas the survey and dividend growth method use the difference over the last 20 days in October 2013 to be contemporaneous and consistent with the risk-free rate estimate.

[37] QCA Draft Decision pp. 230-234.

As shown in Table 1 above, if the QCA uses the 4-year government bond in its CAPM estimation, the MRP needs to be adjusted for the difference between the 10-year and the 4-year government bond yield.

The remainder of this section addresses the determination of the historical MRP (the Ibbotson method) and the use of the Siegel method.

A. HISTORICAL MRP

The historical MRP is commonly determined as the arithmetic difference between the return on a stock index such as the Australian ASX and a risk-free rate over a long period. Ibbotson notes that for the purpose of determining the MRP, it is preferable to apply the longest period for which reliable data are available.[38] Specifically, the authors argue that:

> "some analysts estimate the expected equity risk premium using a shorter, more recent time period on the basis that recent events are more likely to be repeated in the near future; furthermore, they believe that the 1920s, 1930s, and 1940s contain too many unusual events. This view is suspect because all periods contain "unusual" events. Some of the most unusual events of the last hundred years took place quite recently, including the inflation of the late 1970s and early 1980s, the October 1987 stock market crash, the collapse of the high-yield bond market, the major contraction and consolidation of the thrift industry, the collapse of the Soviet Union, the development of the European Economic Community, the attacks of September 11, 2001 and the more recent liquidity crisis of 2008 and 2009."[39]

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38 Morningstar, "*Ibbotson SBBI 2013 Valuation Yearbook*," p. 59.

39 Morningstar, "*Ibbotson SBBI 2013 Valuation Yearbook*," p. 59.

The QCA's Draft Decision appears to agree with this proposition by its application of a period from 1958 to 2013[40] although the QCA's Draft Decision does not explain why the alternative source from Credit Suisse is not reliable.

In the alternative Credit Suisse source, the authors use data from 1900 to current and find the historical arithmetic MRP for Australia to be 7.6%.[41] Similarly, Professors Ross, Westerfield and Jaffe find that an estimate based on the historical arithmetic average over as long a period as data are available is reasonable and use the Credit Suisse data as their source.[42] As noted above, Credit Suisse reports a historical arithmetic MRP of 7.6% for 1900 to 2013 for Australia.

B. SIEGEL

The Siegel procedure adjusts the Ibbotson estimated MRP by adding the real bond return back and subtracting the expected real bond return. Thus, it attempts to adjust for unexpected inflation.

There are three issues with the Siegel procedure as implemented by the QCA. First, the QCA's Draft Decision prefers to use data from 1958-2013 for the determination of the Ibbotson MRP,[43] but only has data on the expected real bond return from July 1986 to October 2012[44] or approximately half of the relied upon period for determination of the Ibbotson MRP. Second, the research underlying the implementation of the method relied on

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40 QCA Draft Decision p. 230.

41 E. Dimson, P. Marsh, and M. Staunton, "*Credit Suisse Global Investment Returns Sourcebook 2014*," Table 10. The text also provides an alternative measure that makes adjustments for the price-dividend ratio. Using that measure, the Australian MRP is measured at 7.27% (Table 11 in the text). These measures do not take the impact of imputation credits into account, which would increase the measured MRP.

42 Ross, Westerfield and Jaffe 2013, p. 326 discuss the methodology. "*Credit Suisse Global Investment Return Sourcebook 2014*," Table 10 of that text provides the long-term arithmetic MRP referenced above and Table 9 of the text provides the short-term MRP – currently 7.5%.

43 QCA Draft Decision p. 231.

44 Martin Lally, "Response to Submissions on the Risk-Free Rate and the MRP," 22 October 2013, p. 12.

data from 1940 to 1990,[45] which included high inflationary periods. As there has been no follow up on studies, it is not clear what the impact is today. Third, the Siegel procedure is not widely used among practitioners or regulatory settings.

The first two issues are interlinked. While it is always problematic to extrapolate data from a period to a longer period, it is especially troublesome when the period to which it is extrapolated may differ from the period for which data is available. In this case, the Australian inflation rate has varied quite dramatically over the period used to estimate the MRP.[46] Thus, it is not clear that the extrapolation of data provides an accurate implementation of the Siegel procedure. Further, the QCA's Draft Decision cites a study on the inflation from 1940 to 1990 as evidence that inflation forecasts were too low during the high inflation sub-period.[47] However, this does not necessarily mean that the average inflation forecasts were too low for the full period. *I.e.*, there is no evidence that the result is valid for the full period relied upon, 1958-2013.

Specifically, according to data from the RBA, inflation in Australia was 6.37% in the period from 1940-1990, which is higher than the average inflation of 4.96% recorded over the period 1958-2013 and even higher still than the average inflation rate of 4.19% from 1923-2014. In the past 26 years from 1986 – 2012, average inflation has been lower still at 3.50%, suggesting the Siegel method might yield a bias estimate that does not reflect current conditions.[48]

Lastly, as acknowledged in the QCA's Draft Decision, the Siegel procedure is not widely used. Because there are many other MRP estimation methods that are much more widely used than the Siegel procedure, the inclusion of this specific methodology needs additional explanation and empirical support.

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45 QCA Draft Decision p. 230.

46 Figure A-3 (attached to this report) shows the historical inflation as well as the average inflation over selected periods.

47 QCA Draft Report p. 230.

48 Reserve Bank of Australia historical inflation data as of 12/7/2014.

C. Alternative Methods

As noted above, there are methods or data other than those relied upon by the QCA to estimate the MRP. The Draft Decision discusses the use of the Cornell (dividend growth) method, which (i) allows the forecasted dividend growth to converge towards the long-run economy growth over a 10-20 year period, (ii) deduct 0.5 – 1.5% for the creation of new companies and new equity issuance, (iii) incorporate a term structure for the return on equity, and (iv) recognize dividend payments every six months.

We agree that the dividend growth rate long-term plausibly will converge to that of the economy as a whole and that a recognition of the actual periodicity of dividend payments is important. However, the QCA did not cite evidence for the magnitude of the reduction of 0.5% to 1.5% for the creation of new equity. The reduction is particularly worrisome because the model as implemented does not take into account the fact that companies distribute cash to shareholders by other means than dividend distributions. For example, many corporations, including Aurizon and North American railroads are engaged in share buybacks, which is an alternative way to distribute cash to shareholders.[49] Therefore, the model as implemented takes into account a potential upward bias caused by new equity issuances, but does not take the de facto cash distribution though share buybacks into account. This downward biases the estimated MRP. Consistency would require a consideration of all factors that impact the MRP; either though an explicit modeling of such factors or through a demonstration that they are offsetting.

V. Evidence on the CAPM for Low-Beta Stock

One of the challenges to the CAPM has been the empirical observation that low beta stocks have higher average returns than predicted by the CAPM. The empirical estimates seem to require that the security market line in Figure 1 pivot around beta = 1. I.e., the intercept needs to increase while the slope declines. This would lead to higher expected returns for low beta stock

[49] See, for example, Value Line Investment Surveys for the U.S. railroads and Business Spectator, "Aurizon Announces Share Buyback Scheme," 11 November 2014.

and lower returns for high beta stock. There have been many studies on this topic with early papers by Black, Jensen and Scholes (1972) and Fama and MacBeth (1972).[50] Although the realized market returns demonstrated a remarkable linearity in the CAPM beta, as predicted by CAPM, the empirical version of the Security Market Line was pivoted around beta = 1.0. I.e., the intercept was higher and the slope less steep than predicted by theory. Several subsequent studies confirmed the robustness of this result and proposed explanations revolving around market frictions, such as different borrowing and lending rates, and the role of taxes. [51] Nevertheless, the empirical evidence suggested significant movement in the Security Market Line, often flattening, to the point that Fama and French (1992) found a zero slope in the empirical Security Market Line.[52] Fama and French suggested that factors other than the risk relative to the market, such as size and book-to-market value ratios (among others) were significant in explaining the Security Market Line. A string of papers followed the initial work that has culminated in the model now known as the Fama-French model. Although this empirical challenge has motivated important and interesting work, alternatives to using the CAPM remain hotly debated by many.

The Empirical CAPM (**ECAPM**) or the Black CAPM is one way of correcting for the empirical flattening of the Security Market Line. Specifically, the ECAPM directly adjusts the CAPM Security Market Line by a parameter, alpha, that can be controlled for sensitivities, etc. Formally, the ECAPM relation is given by:

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50 F. Black, M.C. Jensen, and M. Scholes, "The Capital Asset Pricing Model: Some Empirical Tests," *Studies in the Theory of Capital Markets*, Praeger Publishers, 1972, pp. 79-121 and E.F. Fama and J.D. MacBeth, "Risk, Returns and Equilibrium: Empirical Tests," *Journal of Political Economy* 81 (3), 1972, pp. 607-636.

51 Figure A-6 attached to the report contains a list of additional articles documenting this result.

52 E.F. Fama and K.R. French, "The Cross-Section of Expected Returns," *Journal of Finance* 47, 1992, pp. 427-465.

$$r_S = r_f + \alpha + \beta_S \times (MRP - \alpha)$$

where α is the "alpha" adjustment of the risk-return line, a constant, and the other symbols are as defined above. The alpha adjustment has the effect of increasing the intercept while reducing the slope of the Security Market Line, resulting in a Security Market Line that more closely matches the results of empirical tests. The model is illustrated in Figure 3 below.

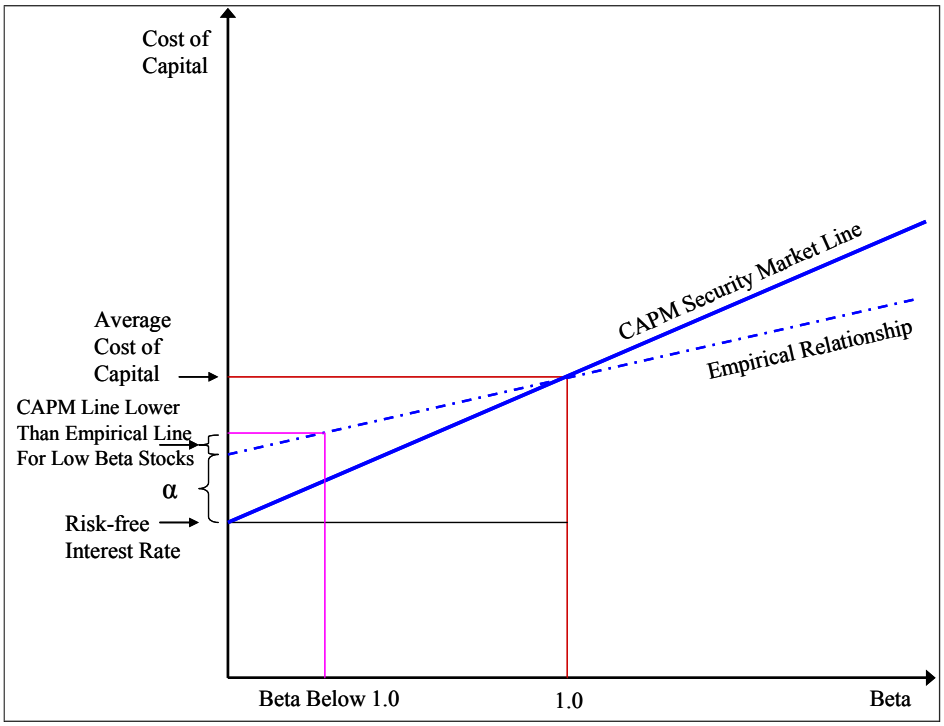


Figure 3: The Empirical Relationship Between Beta and Return

The academic literature has estimated a fairly wide range of alpha parameters, ranging from 1 percent to as much as 7 percent when using short-term government bonds.[53] Thus, while there is no consensus about the magnitude of the needed pivot, the finding that one is needed has been consistent. As a result the AER concluded that "using the Black CAPM theory to inform our

[53] The academic literature that estimates alpha dates back to the 1980s or earlier. Figure A-6 attached to this report lists the relevant academic research and also provides the alpha parameters the research estimated. Recent research in this area has focused on Fama-French multifactor models rather than an adjustment to CAPM.

equity beta estimate may mitigate possible low beta bias."[54] The AER went on to use an alpha parameter of 1.5% and 3.0% to assess the best point estimate for the beta estimate.[55]

The following example illustrates the magnitude using the data from the QCA's Draft Decision.

Example:

Based on the data cited in the QCA's Draft Report for the equity beta, risk-free rate, and MRP along with an alpha parameter of 1.5% or 3.0% as proposed by the AER, we show the impact on the estimated ROE in Table 2 below.

	Alpha	Risk-Free Rate	Beta	MRP	Estimated ROE	Implied Beta
QCA	0.00	3.21	0.8	6.5	8.41	0.80
QCA, alpha = 1.5%	1.50	3.21	0.8	6.5	8.71	0.85
QCA, alpha = 3.0%	3.00	3.21	0.8	6.5	9.01	0.89

Table 2: Impact of Using the ECAPM

Thus, using an alpha of 1.5% to 3.0% as suggested by the AER, the estimated cost of equity increases by 30 – 60 basis points or viewed alternatively, the relied upon beta increases from .8 to 0.85 – 0.89. We note that these alpha estimates are conservative as the academic literature find an impact of one to seven percent.

[54] AER, "Explanatory Statement: Rate of Return Guidelines (Appendices)," p. 16.

[55] *Ibid.*, p. 106.

APPENDIX: Supporting Figures and Tables

Figure A-1: Details of U.S. and Canadian Betas

Company	Capital Structure Precentages: 2009 - Present Average Percent Debt	2009 - Present Average Percent Equity	2009 - Present Average Percent Preferred Equity	Equity Beta	Tax Rate (Value Line)	Debt +Preferred Beta	Asset Beta	Relevered Beta Equity at 0.45
Union Pacific	13.77%	86.23%	0%	1.00	38%	0.00	0.91	1.56
CSX Corp.	26.66%	73.34%	0%	1.13	36%	0.00	0.92	1.57
Norfolk Southern	25.99%	74.01%	0%	1.18	36%	0.00	0.96	1.65
Kansas City South'n	17.21%	82.73%	0%	1.48	35%	0.00	1.30	2.23
Can. Pacific Railway	20.28%	79.72%	0%	1.30	27%	0.00	1.10	1.88
Can. National Railway	15.08%	84.92%	0%	1.01	27%	0.00	0.89	1.53
Genesee & Wyoming	23.86%	75.45%	1%	1.53	11%	0.00	1.18	2.03
							Average	1.78

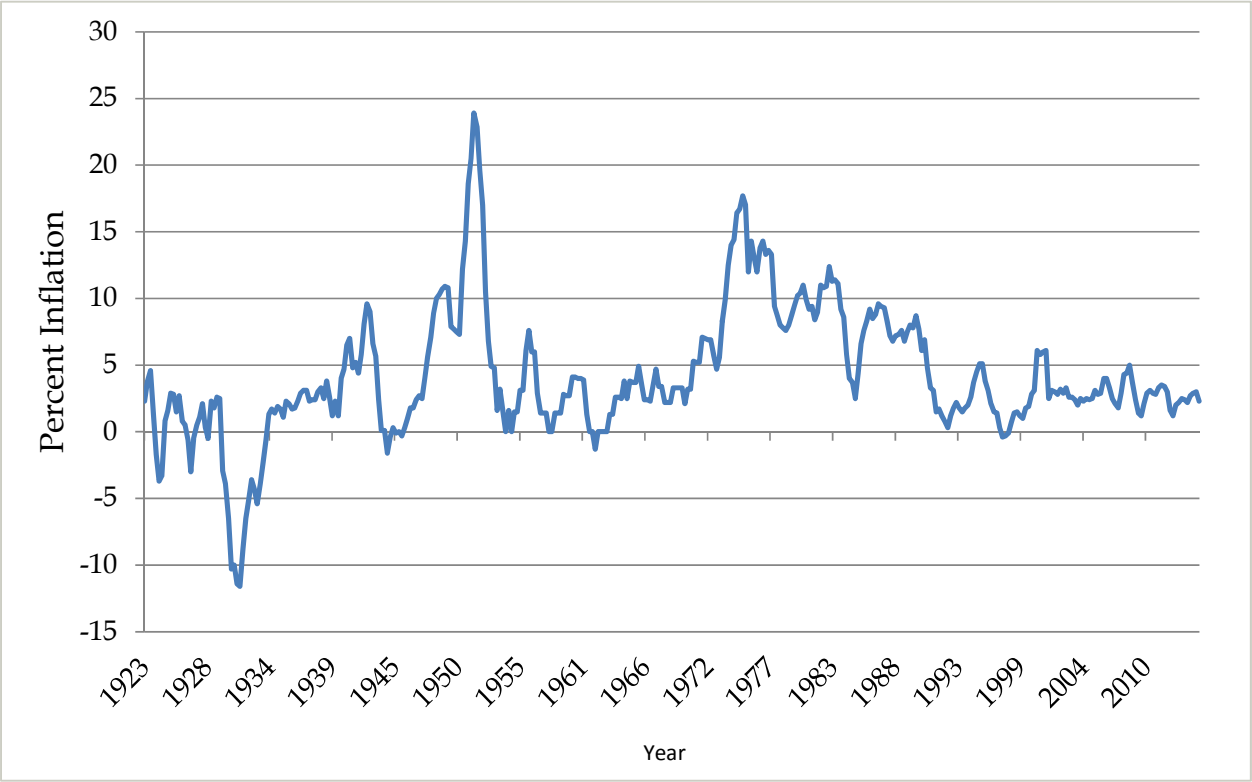
Figure A-2: Regulatory Equity Margins for Railroads

		10 Year Risk Free Rate [a]	Allowed ROE [b]	Equity Margin [c]	Beta [d]	Reference [e]
US Class 1 Railroads - 2012	[1]	1.88	11.12	9.24	1.15	US STB 2012
US Class 1 Railroads - 2013	[2]	1.76	11.32	9.56	1.35	US STB 2013
USA	[3]	**1.82**	**11.22**	**9.40**	**1.25**	Average
Canadian Pacific Railway - 2012	[4]	1.79	10.18	8.39	NA	CTA 2012
Canadian Pacific Railway - 2013	[5]	1.80	11.02	9.22	NA	CTA 2013
Canadian National Railway - 2012	[6]	1.79	8.50	6.71	NA	CTA 2012
Canadian National Railway - 2013	[7]	1.80	9.36	7.56	NA	CTA 2013
Canada	[8]	**1.80**	**9.77**	**7.97**	**NA**	Average
The Pilbara Infrastructure - 2013	[9]	3.27	15.31	12.04	1.43	ERA 2013
The Pilbara Infrastructure - 2014	[10]	4.24	15.91	11.68	1.43	ERA 2013
Brookfield Rail - 2013	[11]	3.27	11.98	8.71	1.00	ERA 2014
Brookfield Rail - 2014	[12]	4.24	12.58	8.35	1.00	ERA 2014
Australia	[13]	**3.75**	**13.95**	**10.19**	**1.22**	Average

Sources and notes:

[a]:	Bloomberg as of 12.10.2014
[1], [b], [d]:	Surface Transportation Board, Railroad Cost of Capital - 2012, Decided August 30, 2013, Docket No. EP 558 (Sub-No. 17)
[2], [b], [d]:	Surface Transportation Board, Railroad Cost of Capital - 2013, Decided July 30, 2014, Docket No. EP 558 (Sub-No. 17)
[3]:	([1] + [2])/2
[4] - [7], [b], [d]:	Canadian Transportatioon Agency, "Agency-approved cost of capital rates for other regulatory purposes", available from: https://www.otc-cta.gc.ca/eng/agency-approved-cost-capital-rates-other
[8], [b], [d]:	([4] + [5] + [6] + [7])/4
[9], [b], [d]:	ERA, Determination on the 2013 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, July 9, 2013. Nominal Allowed ROE and Risk-Free Rate were used.
[10], [b], [d]:	ERA, Determination on the 2014 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, October 24, 2014. Nominal Allowed ROE and Risk-Free Rate were used.
[11], [b], [d]:	ERA, Determination on the 2013 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, July 9, 2013. Nominal Allowed ROE and Risk-Free Rate were used.
[12], [b], [d]:	ERA, Determination on the 2014 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, October 24, 2014. Nominal Allowed ROE and Risk-Free Rate were used.
[13], [b], [d]:	([9] + [10] + [11] + [12])/4
[c]:	[a] - [b]

Figure A-3: Australian Inflation 1923 to 2014



Average Inflation in Australia

Jan-1958 - Dec-2013	4.96
Jan-1940 - Dec-1990	6.37
Jul-1986 - Oct-2012	3.50
Jun-1923 - Sep-2014	4.19

Sources and notes:

RBA Inflation data as of 12/7/2014

Figure A-4:

	Operations Cash Flow/Total Capital Expenditures	Operations Cash Flow/Total Operating Expenditures	Bloomberg Unadjusted Betas
ABERTIS	1.69	0.68	1.51
Atlantia	1.89	0.56	1.04
Gruppe	NA	0.55	0.57
Transurban Group	7.92	0.80	0.65
Toll roads	**5.20**	**0.61**	**0.94**
Toll roads similar to Aurizon	**1.79**	**0.62**	**1.27**
Aurizon	**0.70**	**0.68**	**TBD**

Sources and notes: Bloomberg as of 12.10.2014; Aurizon Financial Report for year ending 6.30.2014.

Figure A-5: Operating Cash Flow for Aurizon Holdings and US Class 1 Railroads

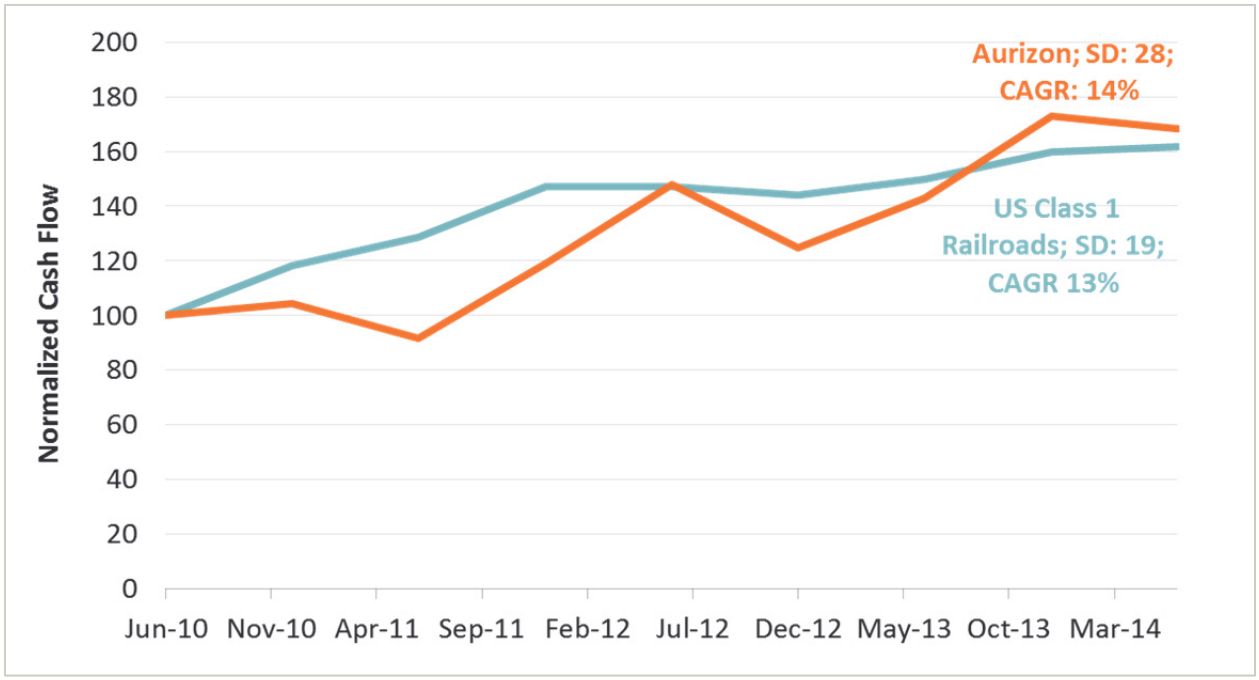


Figure A-6: Empirical Evidence on the Alpha Factor in ECAPM

EMPIRICAL EVIDENCE ON THE ALPHA FACTOR IN ECAPM*

AUTHOR	RANGE OF ALPHA	PERIOD RELIED UPON
Black (1993)[1]	1% for betas 0 to 0.80	1931-1991
Black, Jensen and Scholes (1972)[2]	4.31%	1931-1965
Fama and McBeth (1972)	5.76%	1935-1968
Fama and French (1992)[3]	7.32%	1941-1990
Fama and French (2004)[4]	N/A	
Litzenberger and Ramaswamy (1979)[5]	5.32%	1936-1977
Litzenberger, Ramaswamy and Sosin (1980)	1.63% to 3.91%	1926-1978
Pettengill, Sundaram and Mathur (1995)[6]	4.6%	1936-1990

*The figures reported in this table are for the longest estimation period available and, when applicable, use the authors' recommended estimation technique. Many of the articles cited also estimate alpha for sub-periods and those alphas may vary.

[1]Black estimates alpha in a one-step procedure rather than in an un-biased two-step procedure.

[2]Estimate a negative alpha for the subperiod 1931-39 which contain the depression years 1931-33 and 1937-39.

[3]Calculated using Ibbotson's data for the 30-day treasury yield.

[4]The article does not provide a specific estimate of alpha; however, it supports the general finding that the CAPM underestimates returns for low-beta stocks and overestimates returns for high-beta stocks.

[5]Relies on Lizenberger and Ramaswamy's before-tax estimation results. Comparable after-tax alpha estimate is 4.4%.

[6]Pettengill, Sundaram and Mathur rely on total returns for the period 1936 through 1990 and use 90-day treasuries. The 4.6% figure is calculated using auction averages 90-day treasuries back to 1941 as no other series were found this far back.

Sources:

Black, Fischer. 1993. Beta and Return. *The Journal of Portfolio Management* 20 (Fall): 8-18.

Black, F., Michael C. Jensen, and Myron Scholes. 1972. The Capital Asset Pricing Model: Some Empirical Tests, from Studies in the theory of Capital Markets. In *Studies in the Theory of Capital Markets*, edited by Michael C. Jensen, 79-121. New York: Praeger.

Fama, Eugene F. and James D. MacBeth. 1972. Risk, Returns and Equilibrium: Empirical Tests. *Journal of Political Economy* 81 (3): 607-636.

Fama, Eugene F. and Kenneth R. French. 1992. The Cross-Section of Expected Stock Returns. *Journal of Finance* 47 (June): 427-465.

Fama, Eugene F. and Kenneth R. French. 2004. The Capital Asset Pricing Model: Theory and Evidence. *Journal of Economic Perspectives* 18 (3): 25-46.

Litzenberger, Robert H. and Krishna Ramaswamy. 1979. The Effect of Personal Taxes and Dividends on Capital Asset Prices, Theory and Empirical Evidence. *Journal of Financial Economics* XX (June): 163-195.

Litzenberger, Robert H. and Krishna Ramaswamy and Howard Sosin. 1980. On the CAPM Approach to Estimation of a Public Utility's Cost of Equity Capital. *The Journal of Finance* 35 (2): 369-387.

Pettengill, Glenn N., Sridhar Sundaram and Ike Mathur. 1995. The Conditional Relation between Beta and Returns. *Journal of Financial and Quantitative Analysis* 30 (1): 101-116.

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Attachment 8

The 2014 DAU Regulatory Process:

As indicated in the main body of the submission we would like to express our gratitude to the QCA's staff for providing us with an opportunity to comment on the Draft Decision, and for the professionalism that they have displayed in their dealings with Aurizon Network.

In particular, we would like to recognise the efforts made by QCA staff to meet with us and work through our issues and queries in respect of the Draft Decision and its impact on the 2014 DAU. While we did not always receive the answers we were after, the QCA staff responded to our queries promptly and as fulsomely as they believed appropriate and/or possible.

The regulatory process employed for the approval of Aurizon Network's 2014 DAU was relatively smooth. However, there were some aspects which give rise to concern for Aurizon– in particular:

- the decision by the QCA to publish a draft decision in two separate components – MAR and the remaining matters (pricing & policy) – in order to achieve a July 2015 Final Decision date; and
- the withholding of reasons (ie information underlying its decision) and/or calculations by the QCA on the grounds of concerns by the authority that disclosure of that information would involve breaches of natural justice and/or confidentiality obligations.

Aurizon Network understands the QCA's rationale for each of these aspects, but for completeness and in the interest of openness, notes the following matters in relation to their effect on Aurizon Network in this process.

Splitting the Draft Decision

The Draft Decision relates only to the permitted MAR referable to Aurizon Network. It does not address the other matters relevant to the 2014 DAU (policy and pricing) which the QCA say are matters that will be dealt with under a subsequent draft decision.

The QCA has indicated that its final decision will consolidate these two draft decisions in light of the submissions it receives. In doing so, we note that the QCA have referred in the Draft Decision to their "*high degree of flexibility in the manner in which* [they] *conduct an investigation*".[1]

Aurizon Network acknowledges this flexibility and respects the QCA's power to determine – in each case - what particular form of process will be followed. Aurizon Network also understands the timing issues which resulted in the QCA's decision to adopt this particular form of process. However, it remains the case that the optimum regulatory outcome will only be achieved by providing stakeholders with a fair and fully informed opportunity to make submissions on the draft access undertaking as whole.

Further, it is well understood that an access undertaking - like the 2014 DAU - is a fully integrated economic and commercial instrument – where adjustments to one part will generally impact commercial, regulatory or legal positions taken on other parts.

For these reasons, it is not possible for Aurizon Network to make fully informed and final submissions on MAR until it is able to assess the position that the QCA takes on the remaining matters in the DAU.

It follows that Aurizon Network reserves the right – where necessary – to make supplementary submissions on MAR issues at the time that it responds to the second part of the Draft Decision.

Approach to confidentiality

We note that the QCA, in producing its Draft Decision, has intentionally omitted or made opaque its methodology and reasoning (*Information*) for its decisions in certain sections.

Through our ongoing communications with the QCA during the current consultation period we understand that Information was omitted for the following reasons:

[1] Draft Decision, page vi

- QCA considers that natural justice requires that if it disclosed the Information to Aurizon Network, it must also disclose it publically;
- however, as the Information replicated and/or applied information which had previously been identified by the provider (often Aurizon Network) to be "Confidential Information" (as per s.187 of the *Queensland Competition Authority Act*), the QCA was not prepared to disclose the Information without prior consent
- by reason of the above, the QCA's chosen path was not to disclose the Information to anyone, including Aurizon Network.

Aurizon Network understands the rationale for the QCA's chosen path on this issue.

However, the net result of the above is that Aurizon Network has not been provided with the level of information necessary to fully understand the QCA's decision on specific elements of MAR.

As a result, Aurizon Network has requested that the QCA provide further information to assist it in understand the decision and to enable it to meaningfully respond to the QCA's determination. In almost all instances, the QCA has maintained its position and rejected the request on the grounds of confidentiality and natural justice.

Wherever possible, Aurizon Network has sought to replicate the outcome using the information provided in the Draft Decison and its knowledge of the confidential inputs. But there are a number of areas where this has not been possible and so Aurizon Network is not certain that it has been able to accurately respond to the relevant decision.

Aurizon Network considers this approach to be sub-optimal – mainly because principles of natural justice do not require that *everyone* involved in the process have access to *all* of the information. In a world where the owner has access to large amounts of confidential data – shared only with the regulator – there will always be information asymmetry and so the issue must be approached from a position of pragmatism. In Aurizon Network's view that means disclosure of reasoning must take precedence.

An inability to understand QCA's reasons, or the relevant components of its decision (such as the case of CEO in the Opex Chapter where it is not possible to identify the approved level remuneration of the CEO in the QCA's decision), places Aurizon at a significant disadvantage. If it is unable to replicate the decision or the reasons behind it, it has been left to speculate as to whether there are errors of fact, calculation or something else that lies behind the decision and/or our ability to back-solve it. This leads to inefficiency in process, additional resources being employed to deal with the "unknown" issues and a general uncertainty on key elements of the MAR decision.

In the circumstances, Aurizon Network reserves the right to press for the release of additional information (as per the attached schedule), and make further submissions once additional information comes to light.