AURIZON

30 April 2013

2013 Draft Access Undertaking

Volume 3: Maximum Allowable Revenue and Reference Tariffs

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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
CQCN	Central Queensland Coal Network
CQCR	Central Queensland Coal Region
CRIMP	Coal Rail Infrastructure Master Plan
DAAU	Draft Amending Access Undertaking
DORC	Depreciated Optimised Replacement Cost
egtk	electric gross tonne kilometre
gtk	gross tonne kilometre
IAP	Indicative access proposal
MAR	Maximum Allowable Revenue
QCA	Queensland Competition Authority
QCA Act	Queensland Competition Authority Act (Qld) 1997
QR	Queensland Rail Limited
QR Network	the subsidiary of QR which was established in 2008 to own and manage the Queensland rail network, now Aurizon Network
RAB	Regulated Asset Base
SAR	System Allowable Revenue
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

Executive Summary

This volume details Aurizon Network's Maximum Allowable Revenue (MAR) and reference tariffs for UT4.

The MAR is the total revenue that Aurizon Network is able to earn each year for providing regulated access in the Central Queensland Coal Region (CQCR). The MAR is translated into reference tariffs based on QCA approved volume forecasts, with the revenue cap arrangements ensuring Aurizon Network cannot earn more or less revenue than the approved MAR over a regulatory period.

Aurizon Network's revenue proposal reflects the efficient costs of developing, maintaining and operating a highly reliable below rail network that has safety as its core value. These costs, where possible, have been rigorously benchmarked, and are otherwise controlled through the Aurizon Group's well established corporate governance practices.

Further, Aurizon Network's rate of return proposal has been developed with the best expert advice from Professor Stephen Gray and others, is consistent with good regulatory practice, and provides for a commercially reasonable return on capital to Aurizon Network's shareholders, taking into account the prevailing conditions in global financial markets.

In considering Aurizon Network's revenue proposal, the QCA is required to ensure that Aurizon Network's regulated revenue for the UT4 period is consistent with the pricing principles in the QCA Act, most notably s168A(a), which entitles Aurizon Network to charge a price for access 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".

The consistency of the UT4 revenue outcome with s 168A(a) is essential for Aurizon Network to be able to deliver commercially adequate returns to its shareholders and continue to attract private capital to fund future investments in the network, at a time of continued financial market instability and capital rationing.

(a) The context for Aurizon Network's revenue proposal

Aurizon Network understands that the 2013 Undertaking is being proposed in the context of a softness in global demand for Queensland coal exports. It is also understood that many producers are increasingly looking at their cost structures in order to remain competitive.

That noted, Aurizon Network is also a firm believer in strong and sustained growth of Queensland coal exports over the long-term. Further, it is a strong proponent of cooperative, commercial partnerships between itself and its customers to find new, better and more productive ways of maximising the efficiency of the supply chain from pit to port. However, it is also important to recognise that the funding for major new infrastructure is underwritten by long term financial commitments from supply chain participants, which require steady cash flow over their lifetime.

Aurizon Network's revenue and rate of return proposal has been developed in the context of widespread changes in the market for Queensland coal and the changing expectations of its customers, together with major institutional changes in the Aurizon business and the importance of ensuring sustainable access to capital markets to finance new investment, particularly in long term infrastructure assets.

Market and customer developments during the 2010 Undertaking

The market and customer context for the 2013 Undertaking has changed significantly from that in the 2010 Undertaking. More particularly:

- *A positive (yet inherently uncertain) long term demand outlook:* Taking a long term view on volumes (consistent with Aurizon Network's investment horizon) is inherently uncertain in a dynamic global market. Aurizon Network is nevertheless confident in the long-term competitiveness of the Queensland coal industry, and in the opportunities for future growth, irrespective of the current softness.

- *Ongoing cost pressures.* The significant growth in coal demand that emerged in the UT2 period (2005-2009) has had a direct impact on costs, including construction costs, labour and raw materials. It is well documented that all resource sector participants, including Aurizon Network's customers, have been experiencing similar cost pressures. There are also costs that are not driven by demand growth, for example compliance with environmental and safety requirements.

- *Significant expansions in supply chain capacity:* Consistent with the growth outlook, there is significant expansion activity occurring across the CQCR, being driven by a number of major port expansions and developments. Systems have also become increasingly integrated, with the construction of major links such as GAPE and the Surat Basin Railway. For this reason, the value of Aurizon Network Regulated Asset Base will substantially increase over UT4.

- *Continued increases in planning and operational complexity:* The CQCR is comprised of multiple coal supply chains, some of which are linked. This has direct implications for the scope and complexity of Aurizon Network's responsibilities in delivering an efficient and reliable rail network, ranging from planning future capacity requirements through to the management of day of operations.

- *Challenging financial market conditions.* Aurizon Network is facing a WACC reset (the outcome of which will be locked in for the next four years) at a time where future financial market conditions remain highly uncertain. This necessitates a need to prudently manage the issues associated with the influence of abnormal financial market conditions on the estimation of the cost of capital, and to avoid a mechanistic approach to addressing this critical issue.

Changes in the institutional structure of Aurizon Network

In 2010, QR National was separated from Queensland Rail and listed on the Australian Stock Exchange, to be later renamed Aurizon. Since that time, the Aurizon Group, together with its subsidiary Aurizon Network, have pursued a rapid, transformative program of cost containment, precision operations, growth and safety.

These institutional, management and strategic developments have a number of implications for the revenue outcomes that are sought in the 2013 Undertaking:

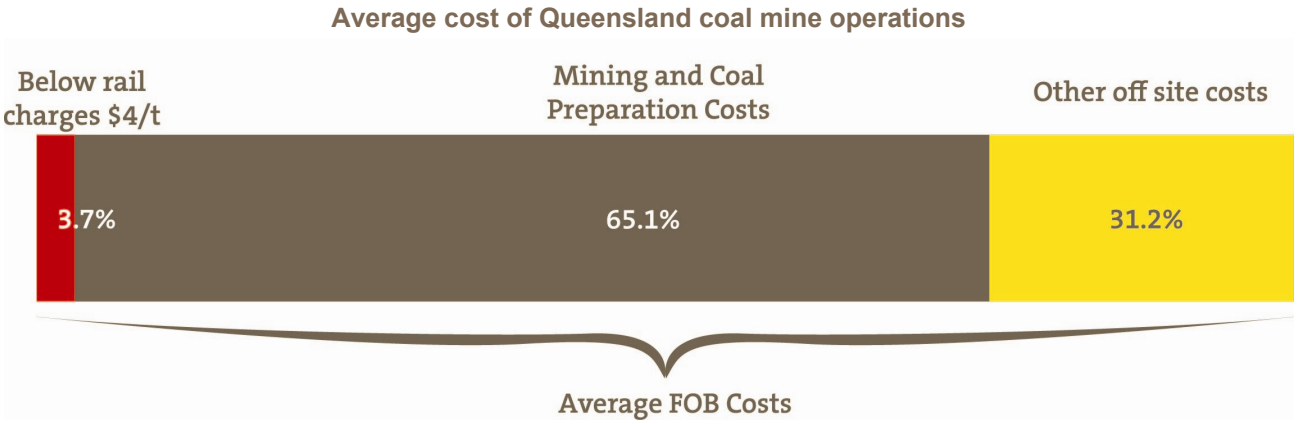
- First, Aurizon Network is now relying on scarce private capital to fund capital expenditure and, in so doing so, needs to be able to demonstrate the extent to which each project will create shareholder value in order to ensure the continued supply of capital for new investment in the CQCN.

- Second, it means that the business is now accountable to its private shareholders and to the market. This imposes a new layer of discipline on management, not only in terms of the scrutiny applied to investment decisions but also performance against budget forecasts and the achievement of efficiency improvements.

(b) Below-rail charges remain a modest contributor to the coal industry's costs

Aurizon Network recognises and understands that the current market conditions have resulted in the Queensland coal industry closely scrutinising its cost structures. It therefore understands, and expects, that it will be required to work constructively with its stakeholders and with the QCA in explaining and justifying its cost structures and requested allowances.

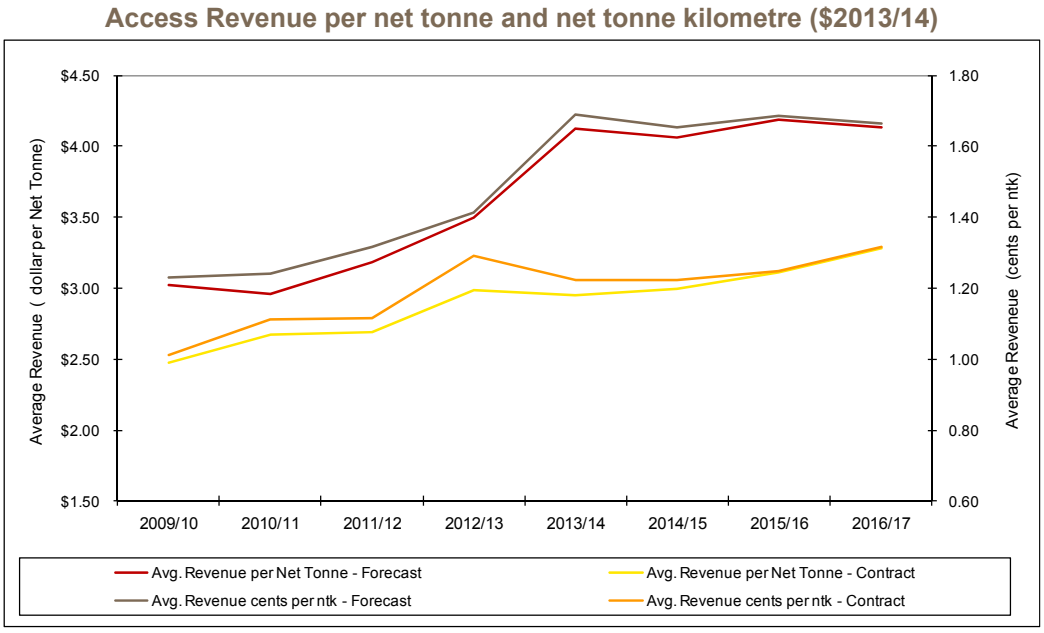
While Aurizon Network recognises and understands these cost pressures, it is also important to note that below-rail infrastructure charges continue to be a modest component in the overall costs of coal extraction and export. This is shown in the following figure, which shows that below rail charges account for only around 4% of total FOB cash costs.



Note: These figures are based on Australian HCC Benchmark of US$210/t and Newcastle thermal benchmark of US$96.7/t. 'Other off-site costs' includes above rail, port and overheads. Below rail cost is sourced from Aurizon FY12 data, while all other costs are Wood Mackenzie CY12.

Source: Wood Mackenzie Cost & Margin Tool, February 2013, Aurizon Network Financial reports, Aurizon analysis

The above figure shows the below rail access revenue per forecast net tonne. The following graph demonstrates that the below rail proportion of those costs would be substantially lower if the network operated closer to contracted below rail capacity. The figure also shows that at utilisation rates closer to contracted levels the proposed UT4 access charges are reasonably commensurate with the final year UT3 tariff in real terms.



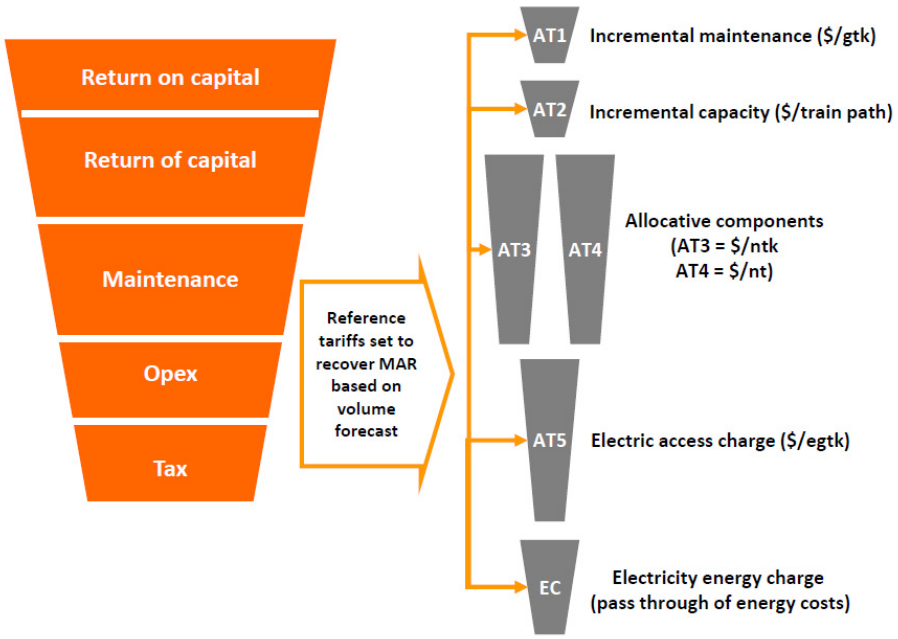
Note: Access Revenue represents non-electric revenue for Blackwater, Goonyella, Moura and Newlands systems

Aurizon Network would also reemphasise that, in addition to being consistent with the requirements of the legislation, compensation for its efficient costs (including its return on capital) will ensure that Aurizon Network can continue to deliver a safe and reliable world-class rail network. This directly contributes to the competitiveness of the Queensland export coal industry in an intensely competitive global market environment. It is also necessary for Aurizon to be able to continue to attract private capital for investment in the rail network, recognising the range of options available to investors in the broader infrastructure asset class (and beyond), both in Australia and abroad.

(c) Proposed 2013 Undertaking tariffs

Aurizon Network's regulated revenues are derived using the 'building blocks' approach, where capital and operating costs are aggregated into a MAR. This revenue is then used to derive tariffs using a QCA approved volume forecast.

Translation of building blocks revenue into reference tariffs



The building blocks approach has been used to calculate Aurizon Network's proposed UT4 MAR for the CQCN, which is:

- $892 million for non-electric assets starting in 2013/14, increasing to $1.121 billion by 2016/17; and
- $165 million for electric assets starting in 2013/14, increasing to $201 million by 2016/17.

Given the volume forecasts (provided below), Aurizon Network's reference tariffs for the UT4 period are as follows.

Proposed UT4 Reference Tariffs ($), FY14

System	AT1	AT2	AT3	AT4	AT5	EC
Blackwater	0.94	5,030	5.84	1.96	2.89	0.68
Goonyella	0.65	2,488	6.35	1.33	2.35	0.68
GAPE	1.46	6,976	1.61	3.48	n/a	n/a
Moura	1.75	612	10.13	1.67	n/a	n/a
Newlands (excl GAPE)	1.82	6,976	3.20	n/a	n/a	n/a

Converted into an average net tonne equivalent, these reference tariffs are as follows for each of the coal systems, from 2014/15 to 2016/17.

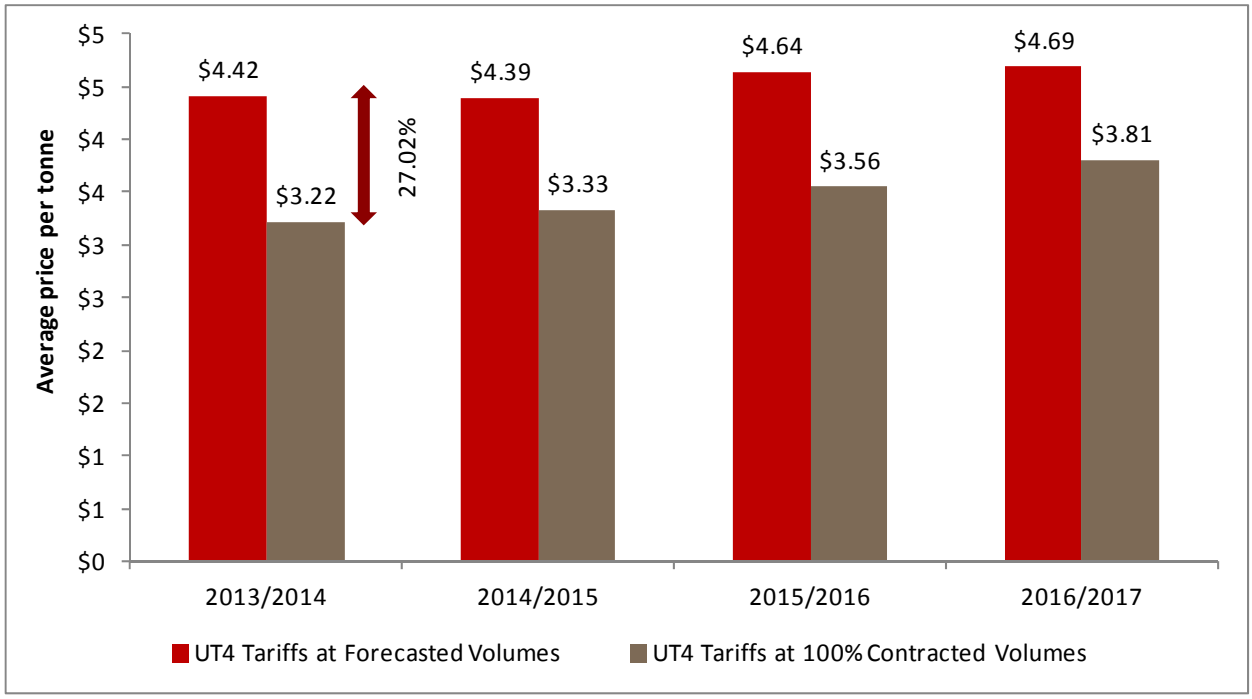
Proposed UT4 tariffs; Average Net Tonne basis

	2012/13	2013/14	2014/15	2015/16	2016/17
(Average revenue per tonne: AT1-AT4)					
Blackwater	4.58	5.71	5.91	6.56	6.76
GAPE	9.63	6.80	5.69	5.50	5.30
Goonyella	2.88	3.46	3.30	3.26	3.26
Moura	3.67	4.01	4.39	4.63	4.37
Newlands	2.34	2.87	3.20	3.18	3.08
Simple Average	**4.62**	**4.57**	**4.50**	**4.63**	**4.55**
Weighted Average	**3.74**	**4.40**	**4.34**	**4.52**	**4.55**
(Average revenue per electric tonne: AT5)					
Blackwater	2.25	1.54	1.63	1.72	1.77
Goonyella	0.83	0.79	0.76	0.77	0.78
Simple Average	**1.54**	**1.16**	**1.20**	**1.25**	**1.27**
Weighted Average	**1.22**	**1.00**	**1.03**	**1.09**	**1.13**

Maximising the utilisation of the CQCN would substantially decrease tariffs

A major driver of the current tariffs is the under-utilisation of the network relative to contract. As noted below, for 2013/14, Aurizon Network forecasts that the CQCN will rail 199.6 million tonnes, and it is on this basis that tariffs have been generated. Were the network to rail at contract (268.0 million tonnes), tariffs (excluding the AT1 and EC components) for the financial year would be, on average, 27% lower.

Potential for tariff reductions over the 2013 Undertaking if volumes improve



NOTE: Proposed revenue equals UT4 $AT_{2\text{-}4}$ and AT_5 System Allowable Revenue (nominal dollars).

(d) The major components and drivers of the UT4 revenue proposal

Volume forecasts are soft across the UT4 period

The volume forecasts underpinning the 2013 revenue proposal are based on actual expected railings and reflect additions to capacity from expansions. They are summarised in the following table.

UT4 volume forecast (million tonnes)

System	2013/14	2014/15	2015/16	2016/17
Blackwater	51.3	51.6	48.5	49.0
Goonyella[1]	100.4	109.4	114.8	119.7
Moura	12.5	11.0	10.4	11.3
Newlands (excl GAPE)	14.8	15.8	17.0	18.7
GAPE	20.6	25.4	27.1	29.0
WIRP Stage 1	--	9.0	18.7	24.3
Total	**199.6**	**222.2**	**236.5**	**252.1**

Note 1: Includes Lake Vermont to RGTanna railings

These forecast volumes are substantially below contracted volumes. As noted above, this has the effect of increasing reference tariffs.

UT4 volume forecast compared to contract (million tonnes)

Forecast vs Contracted Volumes for the UT4 period				
	2013/14	2014/15	2015/16	2016/17
Forecast volumes	199.6	222.2	236.5	252.1
Contracted volumes	268.0[1]	290.4[1]	308.9	310.7
% below contract	-(25.5%)	-(23.5%)	-(23.4%)	-(18.9%)

Note 1: Excludes non-export volumes

The WACC has reduced by around 180 basis points

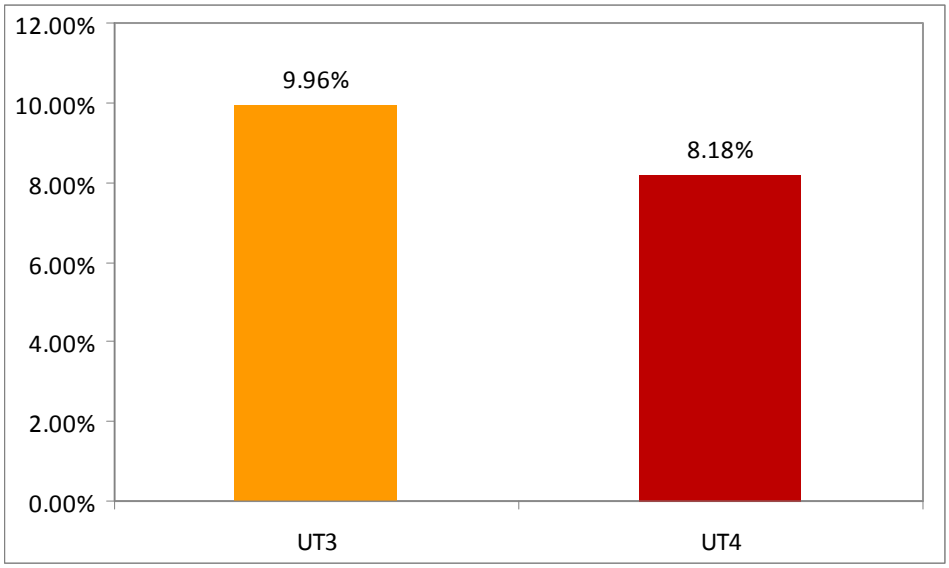
As noted above, s 168A(a) of the QCA Act entitles Aurizon Network to charge a price for access that at least provides a return on investment that is commensurate with the regulatory and commercial risks involved in providing the service. Aurizon Network has identified a number of framework issues that arise in satisfying this provision, including:

- there are commercial risks that are not currently compensated in the WACC, or are not otherwise compensated or mitigated in the regulatory framework;
- Aurizon Network faces material regulatory risk, which is also not addressed by the WACC. Section 168A(a) explicitly requires that regard is given to this risk;
- WACC is particularly vulnerable to estimation error. This increases the risk that the regulated WACC does not 'at least' compensate Aurizon Network for its commercial and regulatory risks; and
- Aurizon Network is facing a WACC reset (the outcome of which will be locked in for the next four years) in highly volatile and uncertain market conditions. This includes a historically low risk free rate, which has particular implications for the cost of equity, which combines a 'spot' risk free rate with long-term average estimates of the market risk premium and beta.

Regardless of the prevailing conditions in the financial markets, Aurizon Network considers it appropriate to specify the values for more uncertain parameters as a range, resulting in a range for WACC. A decision is then made as to where the point estimate for WACC is selected from within that range. This is consistent with the approach adopted by the Independent Pricing and Regulatory Tribunal (IPART).

Based on rates averaged over the twenty days to the end of November 2012, Aurizon Network's indicative WACC range is 7.27% to 8.18%. In order to adequately address the framework issues identified above, for the purpose of estimating the UT4 MAR the WACC has been selected from the upper bound of that range (that is, 8.18%), which is also consistent with the approach taken by IPART in recent decisions. This upper bound estimate is around 180 basis points lower than the WACC for UT3.

Post tax nominal (vanilla) WACC comparisons: UT3 approved and UT4 proposed



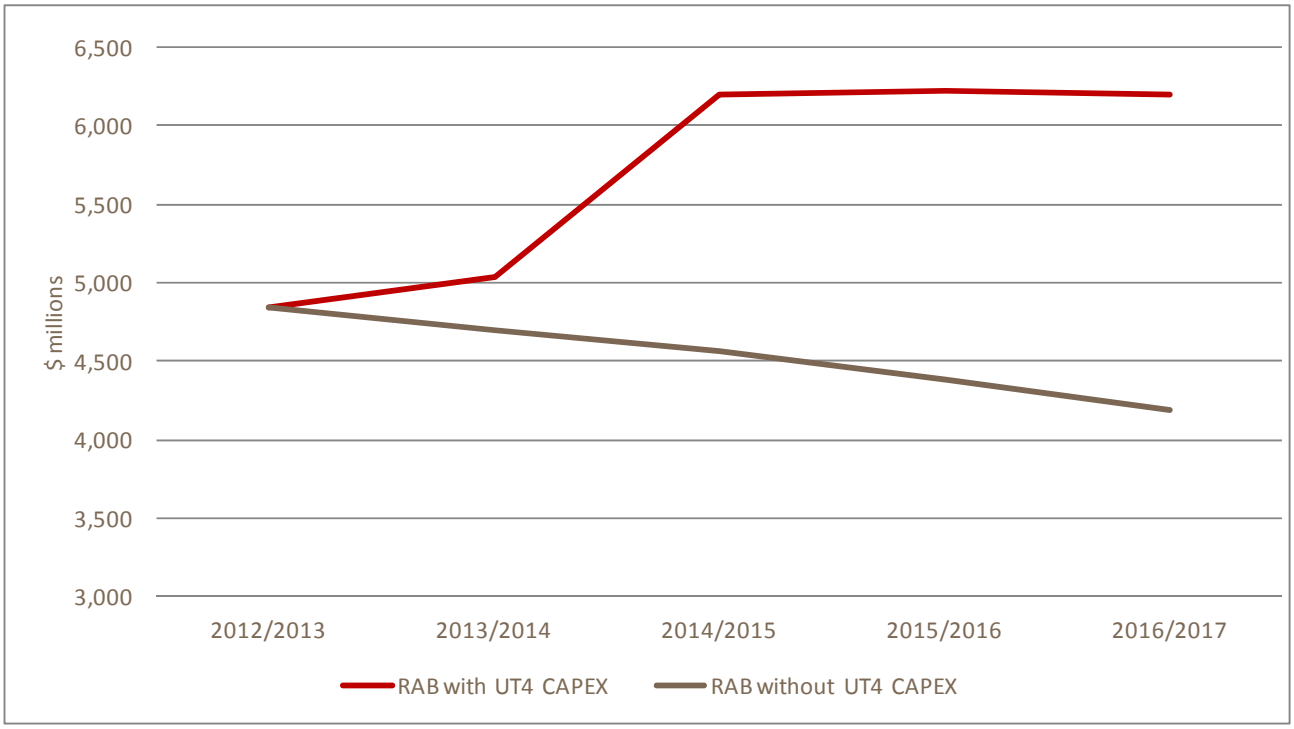
Aurizon Network's proposal is supported by a number of independent expert reports, produced by Professor Stephen Gray, Value Adviser Associates and Synergies Economic Consulting. Of note, Professor Gray has assessed the reasonableness of the cost of equity, having regard to the prevailing conditions in the market for funds (refer Annex A). It shows that at the current time, the mechanistic application of the same approach applied by the QCA in UT3 would result in a cost of equity that is the lowest on record, which is considered neither reasonable nor plausible in the current environment. It concludes that Aurizon Network's proposed cost of equity range is conservative in light of the available evidence.

Overall, Aurizon Network believes that the proposed WACC reduction is a balanced outcome that will help ensure sustainable investment outcomes across the business cycle.

Substantial investment in infrastructure has increased the capital base and will continue during UT4

A significant driver of the increase in regulated revenues is the projected growth in Aurizon Network's regulated asset base over UT4. Consistent with other infrastructure suppliers in the CQCR over the last four years, Aurizon Network has responded to customers and the sustained demand for Queensland coal by investing in increased supply chain capacity. This investment was funded by Aurizon Network and was undertaken on the basis that it had been underwritten by a pronounced increase in contracted tonnes, which have grown from 184.7 mtpa at the commencement of UT3 to a forecast 310 mtpa at the conclusion of UT4. The magnitude of the capital investment is equally reflected in an increase in the size of the regulated asset base, which will grow from $4.9bn to $6.2bn over UT4.

UT4 projected regulated asset base (with and without capex)



The proposed capital expenditure during UT4 includes a number of major growth projects, including Stage 1 of the Wiggins Island Rail Project ($910 million included in the UT4 Capital Indicator), the Goonyella Rail Expansion Project (HPX3)($133 million) and the Rolleston electrification ($200 million).

Further, consistent with Aurizon Network's commitment to world-class operations, continued supply chain efficiency and safety, an increase in renewals capital expenditure has also been proposed. A large number of CQCN assets are reaching the end of their physical lives. Aurizon Network has therefore proposed a major capital renewal program for UT4, in the order of $512m over four years.

This program has been developed consistent with Aurizon Network's Asset Management Plan, and has been benchmarked against world's best practice (including against US Class 1 railroads). It is considered essential to the continued provision of a highly reliable below rail network that will be able to fully, efficiently, and safely meet Aurizon Network's customers' future and current commitments.

Given the above, the proposed UT4 Capital Indicator is shown below.

Proposed UT4 Capital Indicator by System (start of year $'000)

System	2013/14	2014/15	2015/16	2016/17	Total
Blackwater	97,564	1,070,153	96,093	71,418	1,335,229
Goonyella	191,202	109,582	99,974	69,495	470,254
Moura	12,350	61,635	11,301	8,076	93,361
Newlands	10,233	6,649	9,364	6,692	32,937
GAPE	19,805	--	--	--	19,805
TOTAL	331,154	1,248,019	216,732	155,681	1,951,586

Note: Row totals may not sum due to rounding

Aurizon Network recognises that the capital cost of expansion projects will now first fall due at a time of sustained pressure on the profit margins of Queensland coal producers, and that initially, the associated assets will be underutilised relative to the predictions of growth tonnes when the capital was committed. For all members of the supply chain, managing long-term infrastructure investments through market cycles is an ongoing challenge.

However infrastructure capital charges, whether for port or rail, are not by their nature responsive to short-term fluctuations in the demand for, or price of, export coal. In order to obtain capital funding (particularly at the regulated WACC), investment in major, sunk assets must necessarily be underwritten by long-term financial commitments from supply chain participants through take-or-pay contracts. These funding arrangements mean that the cashflows associated with infrastructure projects do not decrease when the price of coal drops; equally they do not increase when the price of coal rises.

A sound and efficient approach to regulatory depreciation

Aurizon Network has proposed to alter the approach to economic depreciation to both simplify the current two-method approach and to provide additional assurances that investment in the regulated asset base will be recovered over time. It is proposed to adopt an approach that is consistent with that accepted by the Australian Competition and Consumer Commission in the Hunter Valley coal network. Aurizon Network therefore proposed to apply an economic depreciation of 25 years to all assets (new and existing), consistent with an analysis of weighted average mine lives in the CQCR.

Mine lives by zone under different weighting methods

Economic Zone	Weighted by Reserves	Weighted by Production	Midpoint
Northern Bowen Basin	32.04	21.27	26.66
Blackwater	29.62	19.80	24.71
Moura	29.37	24.37	26.87

Aurizon Network considers that its new approach to economic depreciation is more efficient and practical, while only having a relatively modest impact on tariffs. It will maximise the certainty that investments in the regulated asset base will be recovered. This is consistent with the regulated return, which does not compensate an investor in the regulated asset for asymmetric risk.

Retaining a different approach for pre- and post-UT3 assets is complex and will lose relevance through time. The effect of this proposal is to decrease capital charges associated with UT3 assets (which are currently depreciated in accordance with a 20 year horizon) but increase it for UT1 and UT2 assets, which are currently depreciated according to their remaining physical or economic lives (where the economic life was capped at 50 years). This approach does not have a material impact on the total depreciation amounts included in the CQCR allowable revenues.

Recovery of operating costs

Aurizon Network's proposed operating expenditure allowance reflects the efficient stand alone costs of operating a below rail coal network, in what is a dynamic and complex operating environment. The total allowance includes:

- system wide and regional costs;
- risk and insurance (which has been developed consistent with the methodology applied in UT3);
- transmission connection costs;
- electricity on selling costs; and
- tax.

System wide and regional costs comprise the costs of operating the network (such as train control, safeworking and asset management), as well an allowance for corporate costs (such as IT, Safety and Finance).

Aurizon Network has implemented a robust approach to estimating corporate costs for UT4, including by commissioning independent benchmarking from Ernst & Young. This benchmarking analysis was based on a number of sources, including the American Productivity and Quality Centre's Open Standards Benchmarking Collaborative Database, the Global Audit Information Network Benchmarking Survey and data from individual organisations approached for the purpose of this study (refer Annex G). The report concludes that overall, Aurizon Network's UT4 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.

Maintaining the infrastructure to deliver a safe and reliable below rail network

Aurizon Network has developed its maintenance expenditure proposal having regard to the goal of ensuring that prices provide efficient and equitable outcomes, based on the following key considerations:

- the challenges in the management and operation of a unique rail infrastructure network. For instance, weather impacts upon network infrastructure requires significant work effort to remedy, and when combined with locality, the cost of providing such maintenance work increases;
- operating within an environment that requires Aurizon Network to balance often conflicting requirements whilst ensuring the ongoing safety and long-term viability of rail infrastructure;
- matching effective and efficient maintenance effort to the Strategic Asset and Safety Management Plans; and
- in the continual drive towards Aurizon Network's core value of "ZEROHarm", recognising that there is a bottom line, non-negotiable cost of maintaining the network safely in terms of time, training, development and implementation of processes, as well the procurement of plant and equipment that ensures legislative compliance.

Aurizon Network's proposed maintenance expenditure for the UT4 period of $914.6m (real dollars, no escalation) is commensurate with the engineering standards contained within the Safety Management Plan, as well as the maintenance requirements of its Strategic Asset Plan.

(e) Other issues covered in this Volume

Reversal of the UT3 impairment for ballast fouling

The QCA's 2010 Draft Decision on pricing included an asset impairment cost relating to forecast ballast undercutting levels. The QCA's view at the time was that Aurizon Network had not done enough to minimise spillage from coal wagons, and the consequent fouling of the network's ballast. The QCA also indicated at the time that it would consider reversing that decision once Aurizon Network had reviewed its practices and provided further information.

Aurizon Network has reviewed the sources and contributing factors associated with current levels of coal fouling of ballast. This analysis indicates that Aurizon Network has limited controls to impose obligations on other parties in the supply chain. As such it is unreasonable to impair assets on the basis of coal fouling without a detailed and robust cost benefit analysis being undertaken, based on the information that was available at the time decisions as regards coal spillage were taken. A paper has been commissioned from Evans & Peck (Annex K) that highlights the complexities associated with undertaking such a study.

Aurizon Network has therefore included a $43 million adjustment to the UT4 allowable revenue to recover the net costs associated with the impairment charges and the ballast undercutting costs incurred over UT3.

Aurizon Network otherwise remains committed to working with all participants in the supply chain to identify and implement commercially effective measures to reduce the impact of coal spillage on rail infrastructure and service quality, while seeking to support a competitive and productive Queensland coal industry operating within the unique characteristics of the CQCR.

A change to the modelling approach, consistent with the AER's Post Tax Revenue Model

Aurizon Network has submitted separate revenue and pricing models to the QCA, with the revenue model based on the key assumptions reflected in the Australian Energy Regulator's Post Tax Revenue Model. This allows for the removal of unnecessary complexity from the modelling framework, facilitating ease of use and understanding of the model and therefore reducing the risk of error. This also avoids the need for the provision of a separate working capital allowance in the operating expenditure proposal.

1 Introduction

This volume presents Aurizon Network's proposed Maximum Allowable Revenue (MAR) and indicative reference tariffs for the UT4 period, given the regulatory framework proposed in Volume 2. It details the methodology, assumptions and calculations underpinning the proposed estimates. The return on capital allowance that is used to calculate the indicative reference tariffs is based on a Weighted Average Cost of Capital estimated as at 30 November 2012. This will be updated prior to the QCA's Final Decision.

As discussed in Chapter 3 of Volume 2, there are a number of major terminal expansions underway in the Central Queensland Coal Region (CQCR) that will require associated rail investments. In terms of rail expansions, the project that is most advanced in development is Stage 1 of the Wiggins Island Rail Project (WIRP 1). These costs are included in the scope of the UT4 MAR and reference tariffs. While the necessary below-rail network expansions to complement the other terminal developments are being investigated, no allowance has been made in UT4 for the costs of these expansions. If required, this will be addressed via a Draft Amending Undertaking during the UT4 period.

This volume is structured as follows:

- Chapter 2 summarises the proposed UT4 MAR and reference tariffs;
- Chapter 3 addresses the Opening Asset Value;
- Chapter 4 addresses the reversal of the ballast fouling impairment made in UT3;
- Chapter 5 discusses other UT3 revenue adjustments;
- Chapter 6 discusses the return of capital;
- Chapter 7 discusses the return on capital;
- Chapter 8 addresses the UT4 capital expenditure forecasts;
- Chapter 9 summarises the UT4 maintenance expenditure forecast; and
- Chapter 10 addresses the UT4 operating expenditure forecast, which includes system wide and regional costs, transmission and electric energy costs, risk and insurance, working capital, tax depreciation and UT3 revenue adjustments.

In this volume:

- references to Aurizon Network are to Aurizon Network Pty Ltd, the provider of access services in accordance with the 2010 Undertaking;
- references to UT1 are to the period covered by the 2001 Undertaking;
- references to UT2 are to the period covered by the 2005 Undertaking;
- references to UT3 are to the period covered by the 2010 Undertaking, including the pricing arrangements effective from 1 July 2009;
- references to UT4 are to the period covered by the 2013 Undertaking; and
- unless otherwise specified, all references to Clauses and defined terms are per the 2010 Undertaking.

2 Maximum Allowable Revenue and Reference Tariffs

Aurizon Network's proposed MAR for the CQCR in UT4 is:

- $892 million for non-electric assets starting in 2013/14, increasing to $1.121 billion by 2016/17; and
- $165 million for electric assets starting in 2013/14, increasing to $201 million by 2016/17.

The increase is primarily driven by increased capital expenditure on growth and renewals projects, a change in the approach to economic depreciation, and operating and maintenance expenditure.

Aurizon Network has proposed an indicative WACC range of 7.27% to 8.18% for the UT4 period and consistent with recent IPART precedent, has selected a WACC of 8.18%, which is at the upper end of the range.

Reference Tariffs have also been revised to incorporate the new approaches to AT1, AT2 and the proposed revenue deferral of AT5 in Blackwater.

The proposed System Reference Tariffs for 2013/14 are as follows:

Proposed UT4 Reference Tariffs ($)

System	AT1	AT2	AT3	AT4	AT5	EC
Blackwater	0.94	5,030	5.84	1.96	2.89	0.68
Goonyella	0.65	2,488	6.35	1.33	2.35	0.68
GAPE	1.46	6,976	1.61	3.48	n/a	n/a
Moura	1.75	612	10.13	1.67	n/a	n/a
Newlands (excl GAPE)	1.82	6,976	3.20	n/a	n/a	n/a

Based on the proposed volume forecasts and allowable revenues the AT1 to AT5 tariffs equate to the following revenue per net tonne.

	2012/13	2013/14	2014/15	2015/16	2016/17
(Average revenue per tonne: AT1-AT4)					
Blackwater	4.58	5.71	5.91	6.56	6.76
GAPE	9.63	6.80	5.69	5.50	5.30
Goonyella	2.88	3.46	3.30	3.26	3.26
Moura	3.67	4.01	4.39	4.63	4.37
Newlands	2.34	2.87	3.20	3.18	3.08
Weighted Average	**3.74**	**4.40**	**4.34**	**4.52**	**4.55**
(Average revenue per tonne: AT5)					
Blackwater	2.25	1.54	1.63	1.72	1.77
Goonyella	0.83	0.79	0.76	0.77	0.78
Weighted Average	1.22	1.00	1.03	1.09	1.13

A major driver of the UT4 tariffs is the underutilisation of the network relative to contracted below rail capacity. In 2013/14 for example, Aurizon Network forecasts that the CQCN will rail 199.6 million tonnes. It is on that basis that tariffs have been determined, if the network railed at expected below rail contract volumes (273.5 million tonnes) the tariffs would be on average 27% lower.

2.1 UT4 volume forecasts

Consistent with the approach taken in UT3, the volume forecasts underpinning Aurizon Network's proposed MAR and reference tariffs for UT4 are based on its current expectations of actual railings. This is based on a number of factors. The starting point is the demand outlook for domestic and export coal in the CQCR, having regard to current contracted volumes and expected production growth.

Regard then needs to be given to the capacity of the relevant supply chains within the context of this demand outlook, the incremental capacity to be delivered by planned expansions and the expected timing of these expansions. The assessment then needs to take account of the practical capacity of the supply chain based on each of its key components (including mine outloading facilities, the below rail network, above rail capacity and terminal capacity), as well as its mode of operation.

Given the inherent difficulties in forecasting volumes over the next four years, a degree of judgment needs to be applied. The annual update of system volume forecasts that now occurs as part of the annual review of reference tariffs substantially mitigates much of the impacts of forecasting error, which introduces a degree of volatility into price outcomes for access holders under a revenue cap form of regulation.

These difficulties in forecasting volumes were demonstrated in UT3, which was impacted by events such as the European debt crisis and various weather-related events, most notably cyclones Oswald (2013), Yasi (2011) and Tasha (2010).

The volume projections for UT4 are reasonably consistent with industry sentiment over the next two years, with current volumes providing a reasonable guide to expected throughput in 2013/14. The Queensland Resources Council's March Quarter edition of the 'State of Sector' cites continued subdued thermal and metallurgical contract coal prices, which points to continued softness in demand[1]. In addition, their CEO employee survey identifies substantial reductions in employment numbers in the sector over first half of 2012/13, with further reductions forecast in 2014. This indicates the sector is not preparing for a significant increase in production over 2013/14 and 2014/15.

Aurizon Network's proposed volume forecast for UT4 are provided overleaf.

As a number of access rights will continue to be provided under UT1 access agreements over the UT4 period, it remains necessary to disaggregate the annual system forecast into monthly forecasts for the purpose of variable take or pay calculations. As only one access holder has access rights under a UT1 access agreement, Aurizon Network has consulted directly with that access holder in the disaggregation of the annual system forecasts which have been included in Schedule F of the 2013 Undertaking.

Table 1 UT4 volume forecast (million tonnes)

System	2013/14	2014/15	2015/16	2016/17
Blackwater	51.3	51.6	48.5	49.0
Goonyella	100.4	109.4	114.8	119.7
Moura	12.5	11.0	10.4	11.3
Newlands (excl GAPE)	14.8	15.8	17.0	18.7
GAPE	20.6	25.4	27.1	29.0
WIRP Stage 1	--	9.0	18.7	24.3
Total	**199.6**	**222.2**	**236.5**	**252.1**

[1] Queensland Resources Council (2013). State of the Sector, Vol.5 Num. 1, March.

2.2 Summary of proposed MAR for UT4

Aurizon Network's proposed MAR for UT4 is presented below. Revenues are first presented for the total CQCR, and are then broken down by system. In terms of major new projects:

- Blackwater and Moura system revenues include the first stage of the Wiggins Island Rail Project (WIRP1) from 2014/15;
- Goonyella system revenues include the upgrade of the Hay Point Coal Terminal to 55 million tonnes per annum (mtpa); and
- Newlands system revenues include the previously deferred cost allocations attributable to access rights provided pursuant to the Newlands to Abbot Point Expansion (NAPE) Deeds from 2013/14.

2.2.1 Proposed UT4 MAR for the CQCR

Table 2 Proposed UT4 MAR: CQCR, Non-electric assets ($'000) (nominal dollars)

Building Block	2013/14	2014/15	2015/16	2016/17
Return on capital	379,831	447,428	451,846	449,068
Return of capital	224,485	244,371	287,533	300,967
Inflation	(116,141)	(136,810)	(138,161)	(137,312)
Maintenance expenditure	222,464	250,842	267,887	283,222
Operating expenditure	137,327	143,611	153,035	158,691
Tax	44,131	46,158	56,256	66,510
Total (Unsmoothed) Revenue	**892,097**	**995,600**	**1,078,396**	**1,121,146**

Table 3 Proposed UT4 MAR: CQCR, Electric assets ($'000) (nominal dollars)

Building Block	2013/14	2014/15	2015/16	2016/17
Return on capital	43,097	69,989	72,423	72,712
Return of capital	45,208	46,750	58,923	47,620
Inflation	(13,178)	(21,401)	(22,145)	(22,233)
Maintenance expenditure	10,231	10,694	11,120	11,571
Operating expenditure	68,344	74,450	81,254	82,944
Tax	11,154	11,292	12,906	8,744
Total (Unsmoothed) Revenue	**164,856**	**191,774**	**214,481**	**201,356**

2.2.2 Proposed UT4 MAR by system

The breakdown of non-electric revenues by system is presented below.

Table 4 Proposed UT4 MAR by system: Non-electric assets ($'000) (nominal dollars)

System and Building Block Components	2013/14	2014/15	2015/16	2016/17
Blackwater				
Return on capital	121,323	180,706	184,417	183,611
Return of capital	77,598	83,161	118,517	124,800
Inflation	(37,097)	(55,254)	(56,389)	(56,143)
Maintenance expenditure	92,387	104,834	117,533	120,584
Operating expenditure	40,708	43,496	48,110	50,895
Tax	18,437	18,252	23,515	28,827
Total (Unsmoothed) Revenue: Blackwater	**313,356**	**375,195**	**435,703**	**452,574**
Goonyella				
Return on capital	128,483	129,515	131,086	130,869
Return of capital	78,650	88,044	91,069	95,327
Inflation	(39,286)	(39,602)	(40,082)	(40,016)
Maintenance expenditure	89,670	99,891	104,058	113,144
Operating expenditure	66,399	68,258	71,808	73,010
Tax	16,279	16,579	19,098	21,662
Total (Unsmoothed) Revenue: Goonyella	**340,195**	**362,685**	**377,037**	**393,996**
Goonyella to Abbot Point Expansion (GAPE)				
Return on capital	91,112	89,706	88,111	86,380
Return of capital	45,066	46,936	48,110	49,313
Inflation	(27,859)	(27,429)	(26,942)	(26,412)
Maintenance expenditure	18,132	22,112	23,249	24,517
Operating expenditure	12,780	14,172	15,506	16,134
Tax	2,532	4,242	5,810	7,297
Total (Unsmoothed) Revenue: GAPE	**141,763**	**149,739**	**153,844**	**157,227**
Moura				
Return on capital	21,482	26,082	26,618	26,657
Return of capital	11,938	12,731	15,727	16,636
Inflation	(6,568)	(7,975)	(8,139)	(8,151)
Maintenance expenditure	13,412	14,677	13,363	14,489
Operating expenditure	8,276	8,471	8,125	8,550
Tax	3,725	3,702	4,046	4,542
Total (Unsmoothed) Revenue: Moura	**52,265**	**57,688**	**59,740**	**62,723**
Newlands				
Return on capital	17,431	21,420	21,617	21,551
Return of capital	11,232	13,498	14,111	14,891
Inflation	(5,330)	(6,549)	(6,610)	(6,590)
Maintenance expenditure	8,863	9,327	9,683	10,489
Operating expenditure	9,163	9,215	9,486	10,102
Tax	3,158	3,383	3,785	4,182
Total (Unsmoothed) Revenue: Newlands	**44,518**	**50,294**	**52,072**	**54,625**

The following table summarises the proposed MAR for electric assets in the Blackwater and Goonyella systems.

Table 5 Proposed UT4 MAR by system: Electric assets ($'000) (nominal dollars)

System and Building Block Components	2013/14	2014/15	2015/16	2016/17
Blackwater				
Return on capital	23,773	47,173	48,160	48,128
Return of capital	24,423	25,159	34,271	20,875
Inflation	(7,269)	(14,424)	(14,726)	(14,716)
Maintenance expenditure	3,721	3,895	4,052	4,218
Operating expenditure	37,843	39,006	40,826	41,801
Tax	5,990	6,323	6,953	2,745
Total (Unsmoothed) Revenue: Blackwater	**88,481**	**107,132**	**119,536**	**103,051**
Goonyella				
Return on capital	19,008	22,498	23,952	24,278
Return of capital	20,713	21,429	24,486	26,575
Inflation	(5,812)	(6,879)	(7,324)	(7,424)
Maintenance expenditure	6,510	6,799	7,068	7,353
Operating expenditure	30,501	35,444	40,428	41,141
Tax	5,162	4,964	5,945	5,989
Total (Unsmoothed) Revenue: Goonyella	**76,082**	**84,255**	**94,555**	**97,912**

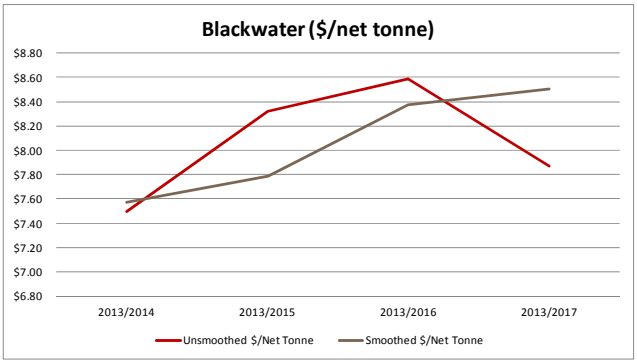
2.3 Summary of reference tariffs

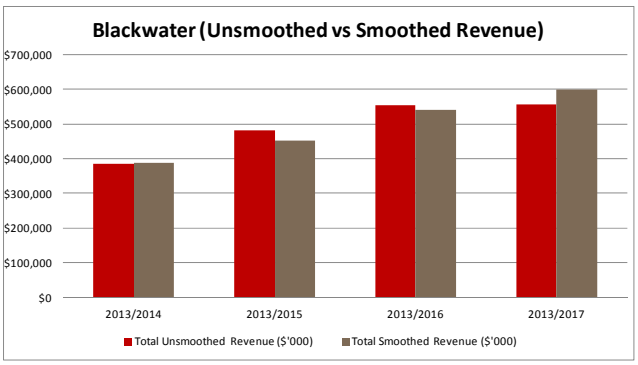
The reference tariffs are derived from the smoothed revenue profile. Aurizon Network has introduced changes to the financial model which allows revenue smoothing to occur to achieve an appropriate balance between the price path prevailing over the UT4 period and the magnitude of the change in the first year, based on the forecast railings. This includes ameliorating the magnitude of the price and revenue shocks that have occurred in previous regulatory resets.

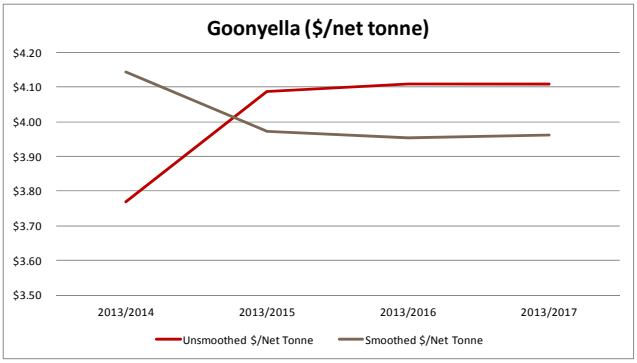
Adjustments have also been made to the unsmoothed revenues to reflect a range of UT3 revenue adjustments, including the Capital Expenditure Carryover Account balance. These are discussed in greater detail in Chapters 4 and 5.

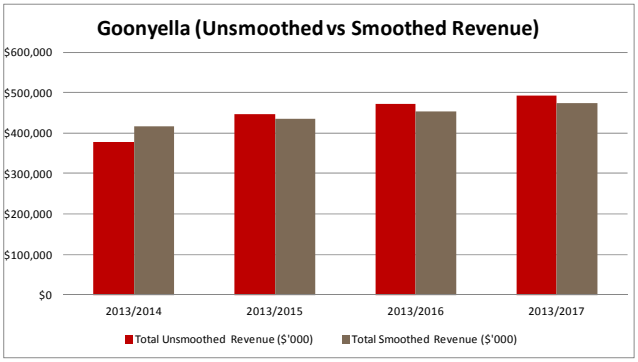
The following graphs show the impact of smoothing on the revenue and tariffs outcomes by system.

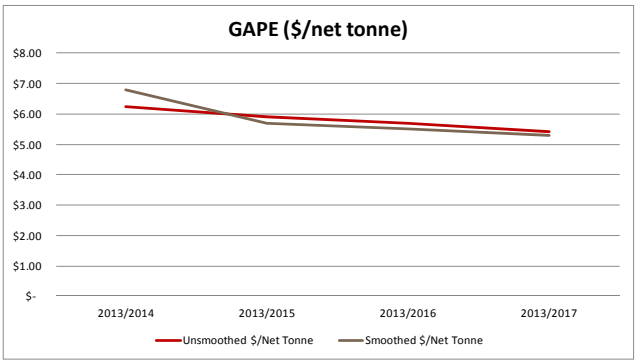
Figure 1 Revenue Smoothing and Tariff Outcomes

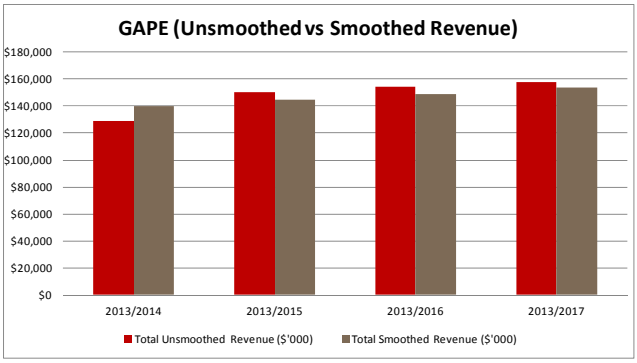


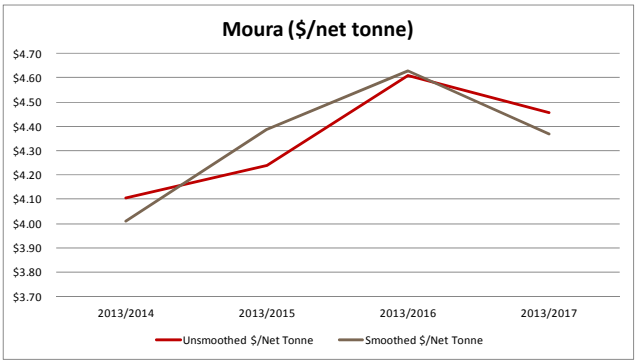


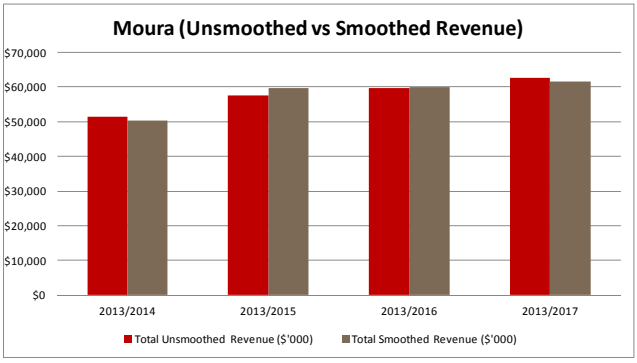

Goonyella ($/net tonne)
$4.20
$4.10
$4.00
$3.90
$3.80
$3.70
$3.60
$3.50
2013/2014
2013/2015
2013/2016
2013/2017
Unsmoothed $/Net Tonne
Smoothed $/Net Tonne

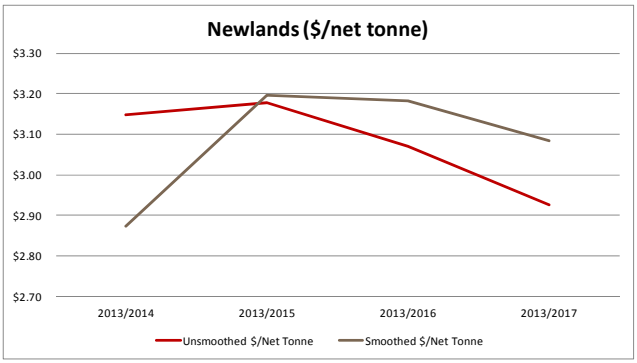

Goonyella (Unsmoothed vs Smoothed Revenue)
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$0
2013/2014
2013/2015
2013/2016
2013/2017
Total Unsmoothed Revenue ($'000)
Total Smoothed Revenue ($'000)

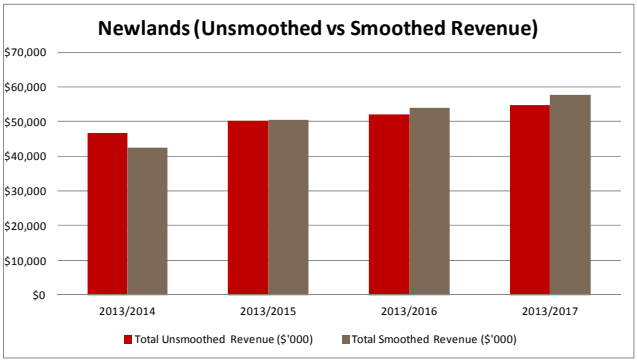

GAPE ($/net tonne)
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$-
2013/2014
2013/2015
2013/2016
2013/2017
Unsmoothed $/Net Tonne
Smoothed $/Net Tonne


GAPE (Unsmoothed vs Smoothed Revenue)
$180,000
$160,000
$140,000
$120,000
$100,000
$80,000
$60,000
$40,000
$20,000
$0
2013/2014
2013/2015
2013/2016
2013/2017
Total Unsmoothed Revenue ($'000)
Total Smoothed Revenue ($'000)


Moura ($/net tonne)
$4.70
$4.60
$4.50
$4.40
$4.30
$4.20
$4.10
$4.00
$3.90
$3.80
$3.70
2013/2014
2013/2015
2013/2016
2013/2017
Unsmoothed $/Net Tonne
Smoothed $/Net Tonne


Moura (Unsmoothed vs Smoothed Revenue)
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
2013/2014
2013/2015
2013/2016
2013/2017
Total Unsmoothed Revenue ($'000)
Total Smoothed Revenue ($'000)


Newlands ($/net tonne)
$3.30
$3.20
$3.10
$3.00
$2.90
$2.80
$2.70
2013/2014
2013/2015
2013/2016
2013/2017
Unsmoothed $/Net Tonne
Smoothed $/Net Tonne


Newlands (Unsmoothed vs Smoothed Revenue)
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
2013/2014
2013/2015
2013/2016
2013/2017
Total Unsmoothed Revenue ($'000)
Total Smoothed Revenue ($'000)

The proposed reference tariffs for each system are provided below.

Table 6 Proposed UT4 system reference tariffs (nominal)

System and reference tariff components	2013/14	2014/15	2015/16	2016/17
Blackwater				
AT1 ($per '000 gross tonne kilometre)	0.94	0.96	0.99	1.01
AT2 ($ per train path)	5,030	5,156	5,285	5,417
AT3 ($ per '000 net tonne kilometre)	5.84	5.81	6.49	6.58
AT4 ($ per net tonne)	1.96	1.97	2.18	2.20
AT5 ($ per '000 egtk)	2.89	2.97	3.04	3.12
EC ($ per '000 egtk)	0.68	0.68	0.68	0.69
Goonyella				
AT1 ($per '000 gross tonne kilometre)	0.65	0.67	0.68	0.70
AT2 ($ per train path)	2,488	2,550	2,614	2,679
AT3 ($ per '000 net tonne kilometre)	6.35	5.95	5.83	5.77
AT4 ($ per net tonne)	1.33	1.25	1.22	1.21
AT5 ($ per '000 egtk)	2.35	2.28	2.30	2.33
EC ($ per '000 egtk)	0.68	0.68	0.68	0.69
Goonyella to Abbot Point Expansion (GAPE)				
AT1 ($ per '000 gross tonne kilometre)	1.46	1.50	1.54	1.58
AT2 ($ per train path)	6,976	7,150	7,329	7,512
AT3 ($ per '000 net tonne kilometre)	1.61	1.42	1.36	1.35
AT4 ($ per net tonne)	3.48	2.41	2.14	1.86
Moura				
AT1 ($ per '000 gross tonne kilometre)	1.75	1.79	1.83	1.88
AT2 ($ per train path)	612	628	643	659
AT3 ($ per '000 net tonne kilometre)	10.13	10.85	11.51	10.64
AT4 ($ per net tonne)	1.67	1.85	1.96	1.81
Newlands				
AT1 ($per '000 gross tonne kilometre)	1.82	1.86	1.91	1.96
AT2 ($ per train path)	6,976	7,150	7,329	7,512
AT3 ($ per '000 net tonne kilometre)	3.20	5.25	4.83	3.63

Note: As described in section 10.4, it is not possibly to reliably forecast the EC rate over the UT4 period. The forecast rate included in the above table escalates the 2013/14 rate by 2.5%.

The proposed Blackwater and Moura system reference tariffs are inclusive of the WIRP Stage 1 project costs. Table 7 shows the Blackwater reference tariff expressed in average dollars per net tonne, with and without the socialisation of the WIRP access rights and project costs with the existing Blackwater access holders. The figures show that the socialisation of the WIRP project costs lowers the average Blackwater access charge.

Table 7 WIRP Socialisation Impacts on Blackwater Average Price ($/NT) (nominal)

	2013/14	2014/15	2015/16	2016/17
Without WIRP I	6.83	8.03	10.58	11.69
With WIRP I	6.83	7.22	8.07	8.30
Variance	--	(0.81)	(2.51)	(3.39)

2.3.1 System Premiums and Discounts

The reference tariffs for some loading points may differ from the relevant system price for one of the following reasons:

- system discounts associated with the proportional use of system infrastructure, such as Stanwell and Colton;
- system discounts associated with the value of capital contributions for single user rail infrastructure; and
- system premiums associated with incremental costs attributable to existing, new or additional access rights relevant to that loading point.

The proposed system discounts and premiums are presented in the table below.

Table 8 Proposed UT4 System Discounts and Premiums (nominal)

2013/14		Discounted Tariffs					
System	**Customer**	**AT1**	**AT2**	**AT2_Diesel**	**AT3**	**AT4**	**AT5**
Goonyella	Carborough Downs	0.65	2,488	2,761	3.91	0.82	1.98
Goonyella	Hail Creek	0.65	2,488	2,761	2.18	0.46	1.28
Goonyella	Isaac Plains	0.65	2,488	2,761	2.66	0.56	1.79
Goonyella	Millennium	0.65	2,488	2,761	3.05	0.64	2.07
Blackwater - Minerva	Minerva	0.94	5,030	5,583	4.26	1.74	--
Newlands	Sonoma	1.82	6,976	6,976	0.99	--	--
Goonyella	South Walker Creek	0.65	2,488	2,761	5.61	1.18	1.91
Goonyella	Moorvale	0.65	2,488	2,761	5.65	1.19	2.19
South West Blackwater	Rolleston	0.94	5,030	5,583	0.68	0.28	--

2014/15		Discounted Tariffs					
System	**Customer**	**AT1**	**AT2**	**AT2_Diesel**	**AT3**	**AT4**	**AT5**
Goonyella	Carborough Downs	0.67	2,550	2,830	3.66	0.77	1.93
Goonyella	Hail Creek	0.67	2,550	2,830	2.01	0.42	1.28
Goonyella	Isaac Plains	0.67	2,550	2,830	2.47	0.52	1.75
Goonyella	Millennium	0.67	2,550	2,830	2.86	0.60	2.01
Blackwater - Minerva	Minerva	0.96	5,156	5,723	4.37	1.78	--
Newlands	Sonoma	1.86	7,150	7,150	2.89	--	--
Goonyella	South Walker Creek	0.67	2,550	2,830	5.25	1.10	1.86
Goonyella	Moorvale	0.67	2,550	2,830	5.29	1.11	2.13
South West Blackwater	Rolleston	0.96	5,156	5,723	1.40	0.58	2.97

2015/16		Discounted Tariffs					
System	**Customer**	**AT1**	**AT2**	**AT2_Diesel**	**AT3**	**AT4**	**AT5**
Goonyella	Carborough Downs	0.68	2,614	2,901	3.62	0.76	1.96
Goonyella	Hail Creek	0.68	2,614	2,901	2.02	0.42	1.33
Goonyella	Isaac Plains	0.68	2,614	2,901	2.46	0.52	1.79
Goonyella	Millennium	0.68	2,614	2,901	2.85	0.60	2.04
Blackwater - Minerva	Minerva	0.99	5,285	5,866	4.90	1.99	--
Newlands	Sonoma	1.91	7,329	7,329	2.35	--	--
Goonyella	South Walker Creek	0.68	2,614	2,901	5.14	1.08	1.89
Goonyella	Moorvale	0.68	2,614	2,901	5.19	1.09	2.15
South West Blackwater	Rolleston	0.99	5,285	5,866	2.22	0.92	3.04

2016/17		Discounted Tariffs					
System	**Customer**	**AT1**	**AT2**	**AT2_Diesel**	**AT3**	**AT4**	**AT5**
Goonyella	Carborough Downs	0.70	2,679	2,974	3.62	0.76	2.00
Goonyella	Hail Creek	0.70	2,679	2,974	2.05	0.43	1.39
Goonyella	Isaac Plains	0.70	2,679	2,974	2.49	0.52	1.83
Goonyella	Millennium	0.70	2,679	2,974	2.88	0.60	2.08
Blackwater - Minerva	Minerva	1.01	5,417	6,013	4.95	2.02	--
Newlands	Sonoma	1.96	7,512	7,512	1.32	--	--
Goonyella	South Walker Creek	0.70	2,679	2,974	5.10	1.07	1.93
Goonyella	Moorvale	0.70	2,679	2,974	5.15	1.08	2.19
South West Blackwater	Rolleston	1.01	5,417	6,013	2.59	1.08	3.12

While the Rolleston mine has historically paid a system premium, this is mainly attributable to the customer specific branchline, with the mine only making the minimum contribution to common costs. As the owner of the Rolleston mine is also a WIRP 1 customer, its contribution to common costs has been determined as:

- $4.44 per thousand net tonne kilometres (ntk) for the access rights unloading at the Barney Point and RG Tanna coal terminals. This rate represents a 5% per annum escalation of the minimum contribution to common costs reflected in the Rolleston reference tariff in 2012/13;
- the proportion of the WIRP 1 project costs attributable to the additional access rights unloading at the Wiggins Island Coal Terminal.

The proposed system discount is the net impact of the increase in the contribution to common costs and the removal of the revenue attributable to the customer specific branchline.

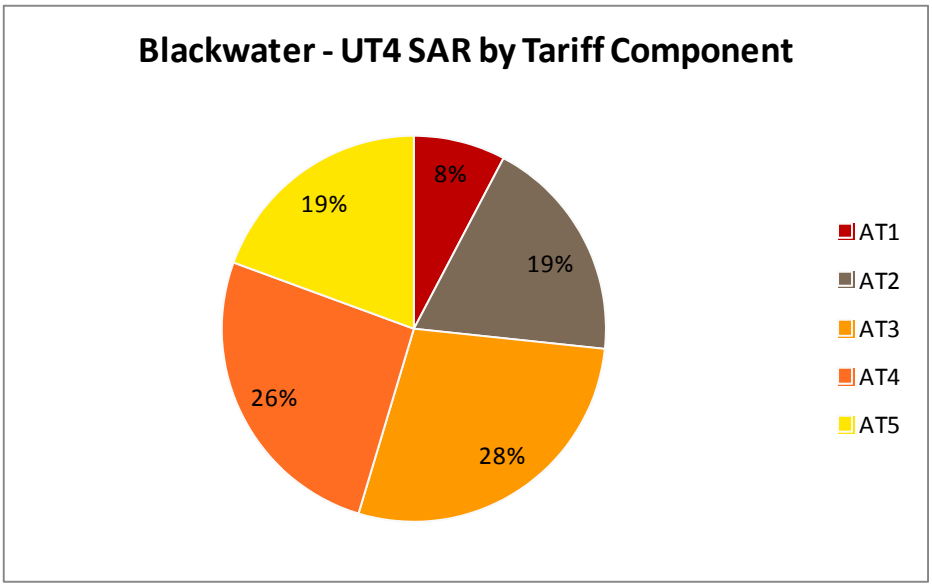
As the Maximum Allowable Revenues are inclusive of contributed assets it is necessary to remove the forecast revenue attributable to system discounts for those assets from the System Allowable Revenue. This results in the following proposed System Allowable Revenues.

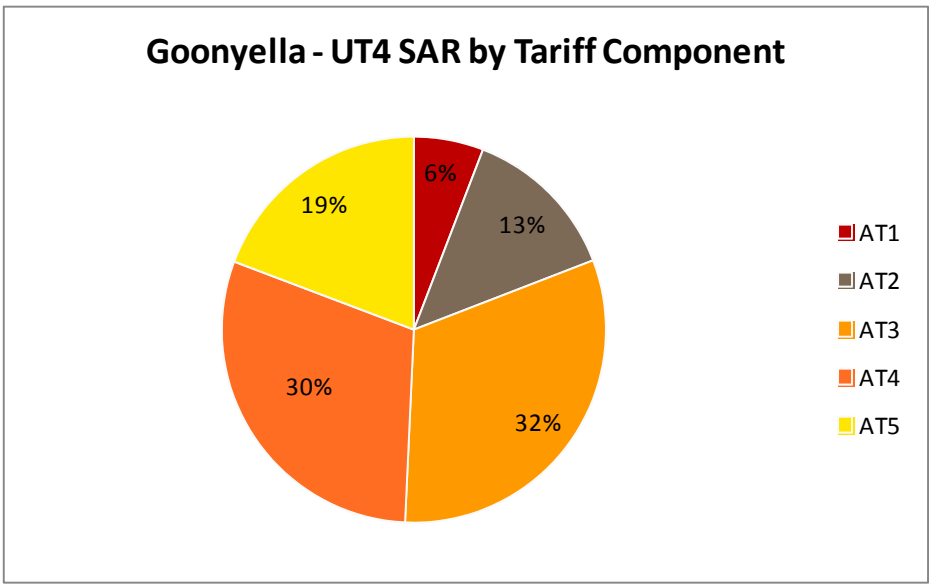
Table 9 Proposed UT4 AT_{2-4} and AT_5 System Allowable Revenues ($'000) (nominal dollars)

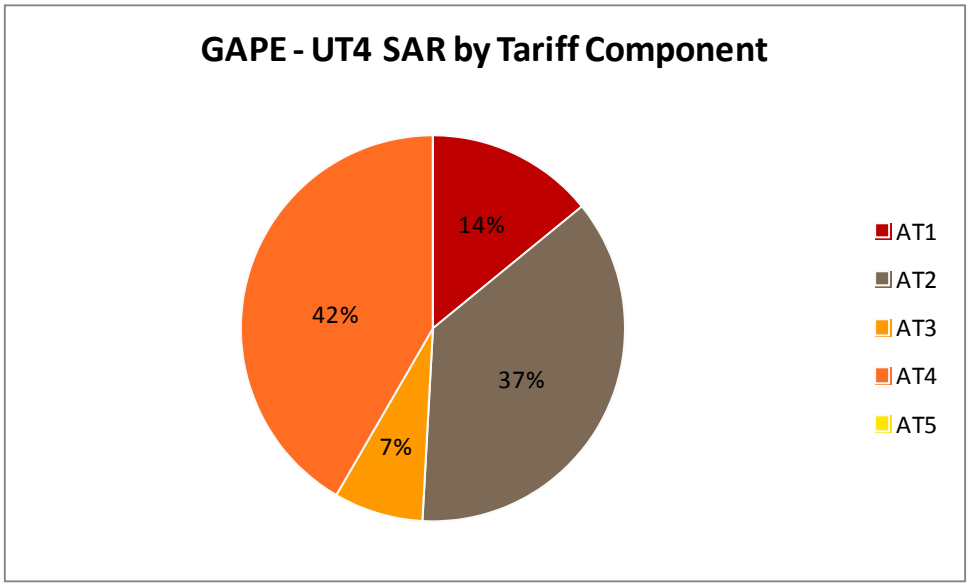
System	2013/14	2014/15	2015/16	2016/17
Blackwater	307,630	370,283	469,207	529,347
Goonyella	370,447	386,008	403,091	421,117
GAPE	123,980	124,578	126,951	129,482
Moura	44,266	52,847	53,310	54,058
Newlands	35,832	43,437	46,304	49,046
Total CQCR	**882,155**	**977,152**	**1,098,863**	**1,183,050**

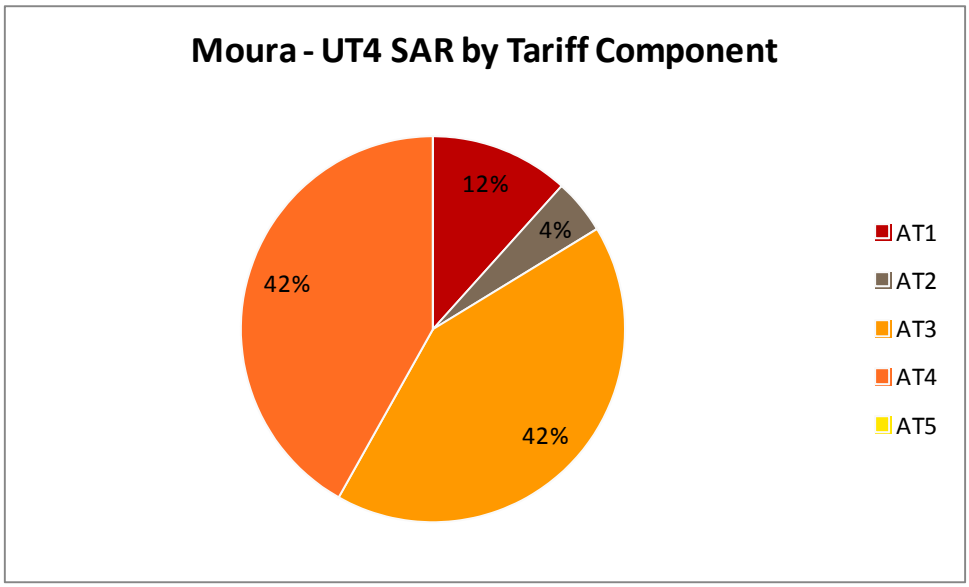
The following figures show the relevant proportion each reference tariff makes to the recovery of System Allowable Revenues (net of single user contributed assets).

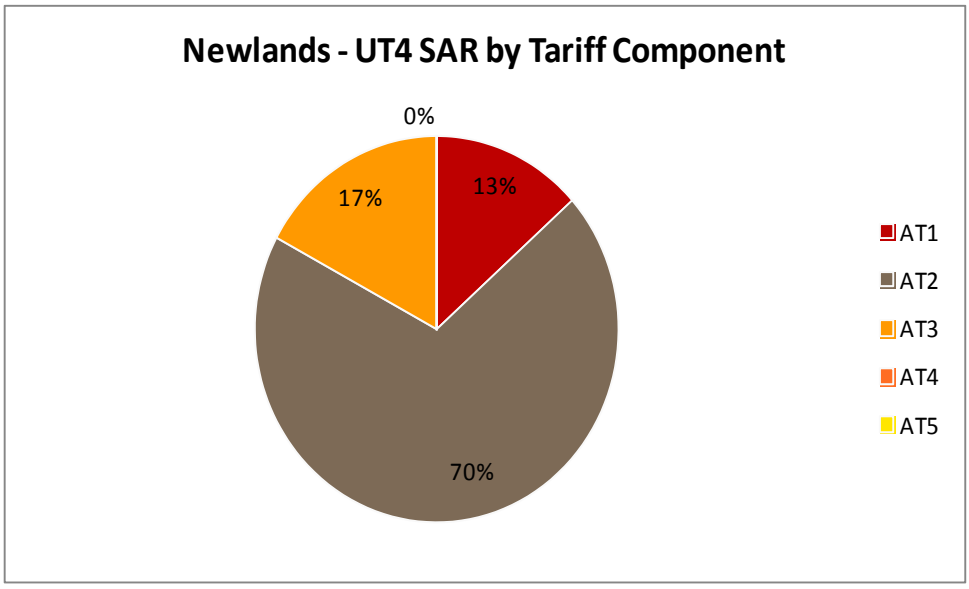
Figure 2 System Allowable Revenue by average tariff component (FY14-FY17)






GAPE - UT4 SAR by Tariff Component
14%
37%
7%
42%
AT1
AT2
AT3
AT4
AT5


Moura - UT4 SAR by Tariff Component
12%
4%
42%
42%
AT1
AT2
AT3
AT4
AT5


Newlands - UT4 SAR by Tariff Component
0%
13%
17%
70%
AT1
AT2
AT3
AT4
AT5

2.4 Key drivers of UT4 tariffs

The following table shows the percentage tariff increase between the last year of UT3 (2012/13) and UT4, based on System Allowable Revenue divided by the relevant system volume forecast (in dollars per net tonne).

Table 10 Annual percentage change in tariffs

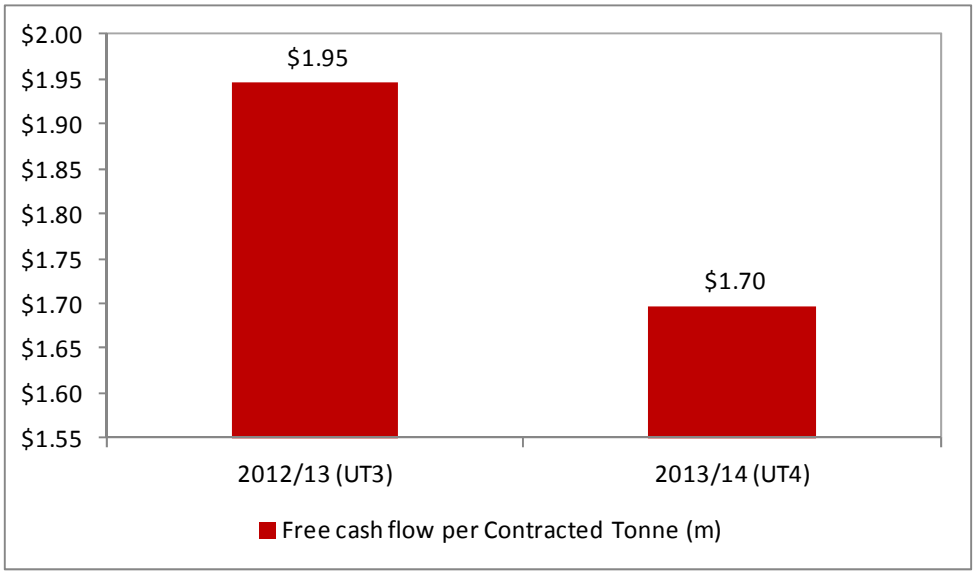
Individual Coal Systems	2013/14	2014/15	2015/16	2016/17
Blackwater (AT2-5)	14.2%	5.8%	12.6%	2.9%
Goonyella (AT2-5)	14.8%	-4.8%	-0.9%	0.0%
Moura (AT2-4)	9.7%	10.0%	5.9%	-6.6%
Newlands (AT2-4)	25.0%	12.9%	-0.6%	-3.9%

Note: 2012/13 SAR excludes revenue cap adjustments and Review Events. Contributed assets have also been included to facilitate comparison.

It may be expected that UT4 reference tariffs would decrease with a reduction in the proposed WACC of 8.18% from the approved UT3 WACC of 9.96%. However, as noted above, the reference tariffs have been particularly influenced by the volume forecasts applied. Additionally, as set out below, the projected increase in the value of the regulated asset base (RAB) – which reflects the inclusion of a number of large projects – is a key driver of the UT4 tariff levels. The implementation of a weighted average mine life approach to depreciation (as discussed in Chapter 6) will have a minimal impact on tariffs. In aggregate the WACC and the depreciation represent the positive free cash flow after tax.

The following figure shows the after tax free cash flow between UT3 and UT4 (expressed in 2012/13 dollars per net tonne). It has been normalised in dollars per contracted net tonne to take into account the change in the assets attributable to the changes in volume.

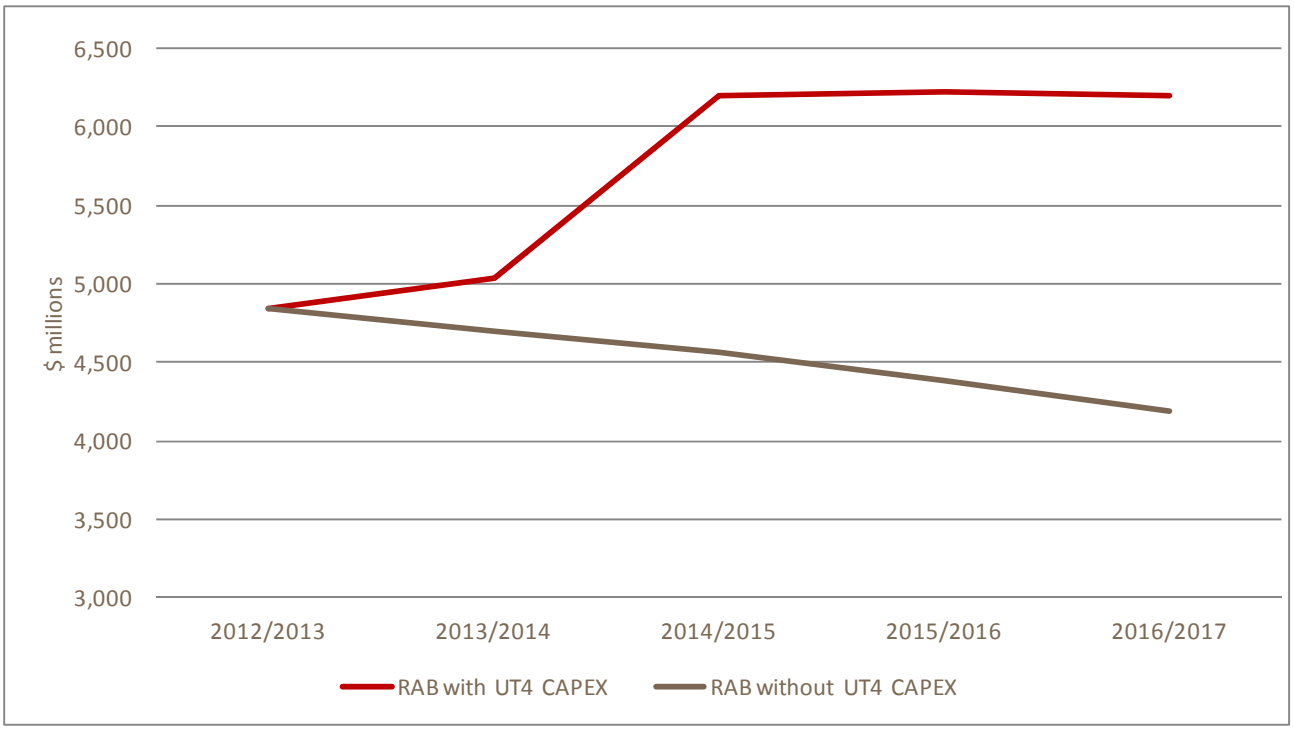
Figure 3 After Tax Free Cash Flow per Contract Tonne (excluding GAPE)



The figure above shows that the capital charges in the proposed UT4 reference tariffs are lower than those reflected in the current approved reference tariffs.

As noted above, one of these drivers is the projected increase in the value of the RAB, which reflects the inclusion of a number of large capital projects. For instance, this includes GAPE, which was completed in UT3 but is still subject to QCA approval. This will be reflected in the CQCR MAR via the return on, and of, capital for those assets.

Figure 4 UT4 projected RAB (with and without CAPEX)



As outlined in Chapter 8, there are a number of growth projects underpinning this increase. Key growth projects, and the amount that has been included in the UT4 Capital Indicator, include:

- WIRP 1 ($910 million);
- the Goonyella Rail Expansion Project, supporting HPX3 ($133 million);
- Rolleston electrification ($200 million).

It is important to note that inclusion in the Capital Indicator does not guarantee that these amounts will be subsequently included in the RAB following commissioning. This will still be subject to the capital expenditure approval process contained in Schedule A of the 2010 Undertaking (and enhanced in the 2013 Undertaking), which also provides for pre-approval of certain aspects of the project (if sought by Aurizon Network) from users or the QCA.

In addition to these preceding building block components, other key drivers of the reference tariff increases are associated with:

- The change in the value of imputations credits (gamma) to 0.25, which results in an increase in the effective corporate tax rate to 22.5% from 15%. The combined effects of the increase in the RAB and the value of the assets in the RAB that are close to or fully depreciated for (regulatory) tax purposes has a substantial impact on the pass through tax allowance.
- The increase in renewals capital expenditure associated with a large number of assets reaching the end of their physical lives. The asset renewals investment is necessary to support existing and proposed volumes. As these costs are not associated with growth tonnes they have the effect of increasing the average price.
- The approach taken for estimating the corporate costs component of operating expenditure. Aurizon Network has implemented a robust approach to estimating these costs for UT4, which have been

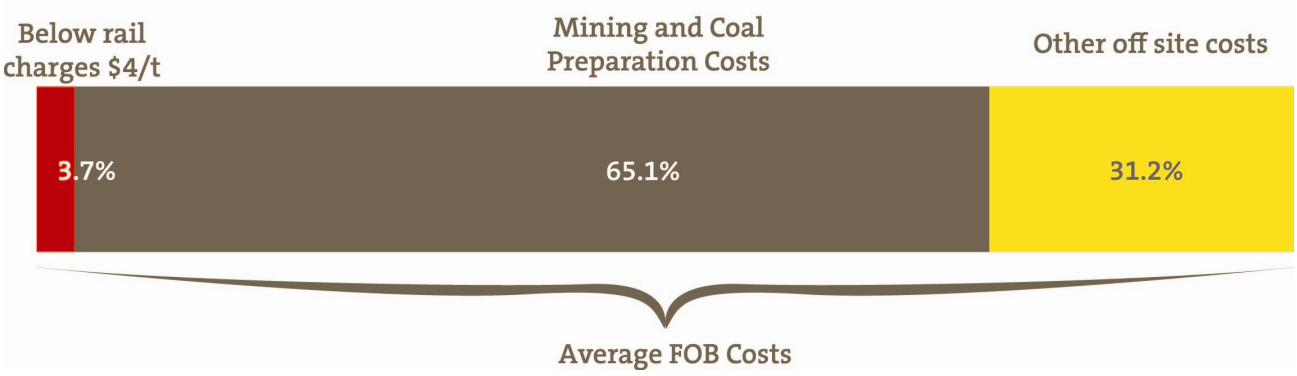
confirmed as reasonable based on an independent benchmarking analysis conducted by Ernst and Young (refer Annex G).

The balance of this Volume explains the details underpinning Aurizon Network's proposed MAR and reference tariffs for UT4.

2.5 Relativity of proposed UT4 tariffs to other industry cost drivers

Recognising the pressures that have been exerted on mine operating margins, and the consequent expectation that below rail pricing will moderate, Aurizon Network considers it important to put its below rail access charges within the context of total mine costs. Analysis has been undertaken using data from Wood McKenzie and Aurizon Network and is represented in the following figure.

Figure 5 Average costs for mines in the CQCN



Note: These figures are based on Australian HCC Benchmark of US$210/t and Newcastle thermal benchmark of US$96.7/t. 'Other off-site costs' includes above rail, port and overheads. Below rail cost is sourced from Aurizon 2011/12 data, while all other costs are sourced from Wood Mackenzie for the calendar year 2012. Source: Wood Mackenzie Cost & Margin Tool, February 2013, Aurizon Network Financial reports, Aurizon analysis

This shows that below rail charges account for only around 4% of total FOB cash costs.

Comparisons can also be made between Aurizon Network's proposed tariffs and terminal access charges. For example, the approved tariff for the uncapped take or pay contract-based pricing for DBCT in 2012/13 was $2.90 per tonne. Aurizon Network notes that this tariff is exclusive of the terminal coal handling charges.

In addition, Aurizon Network understands that the Wiggins Island Coal Terminal is a highly geared terminal with an estimated capital cost of at $2.4 billion. As a pass through model and assuming an average borrowing cost of 6.5% with an assumed life of 20 years this yields an annuity of $217 million and resultant take or pay obligations of approximately $8 a tonne given the 27 million in foundation tonnes.[2] Consistent with DBCT these costs are net of any terminal coal handling charges, which are provided through a separate arrangement with Gladstone Ports Corporation.

The pricing and take or pay arrangements between these two terminals and Aurizon Network are also quite distinct. While the terminals' pricing is based on contract volumes (on the basis that industry have effectively agreed to fund and underwrite underutilisation by other producers), Aurizon Network's tariffs are based on expected volumes, which are below contract volumes[3]. This will make Aurizon Network's tariffs appear comparatively higher on a dollar per tonne basis.

[2] Wiggins Island Coal Export Terminal Pty Ltd (2012). Submission to the Productivity Commission on its Draft Report Titled: Australia's Export Credit Arrangements, March.

[3] For example, the port capacities in the Goonyella system in FY15 are 140 mtpa. In contrast the volume forecast for Goonyella is 107 million tonnes

The other important point to note here is that with the exception of the DBCT, below rail access charges represent the only component of mine operating costs that is regulated. Particularly in an environment where operating margins are under pressure (for example due to variations in commodity prices and exchange rates), the regulatory process presents an opportunity for users to seek cost reductions compared to other input costs that are set by the market. In other words, as one of only two regulated participants in the CQCR, Aurizon Network's access charges are likely to come under the most pressure via the regulatory process, recognising that it is also does not have the freedom to increase prices in more buoyant market conditions when commodity prices are high and demand is strong.

Aurizon Network anticipates that given the predictability of take or pay under contract-based pricing and that coal producers are best placed to forecast their own demand risk, they will be familiar with volume risk and will have implemented measures for managing their exposures to infrastructure charges through options such as:

- hedging;
- sale of underutilised capacity;
- establishing provisions for future liabilities; and
- prepayment of liabilities.

To the extent producers have not implemented measures to manage their risks, it is not reasonable to pursue reductions in the price of a single input cost (being the below rail access charge) through the regulatory framework, where the access provider has been price and revenue constrained in a period of substantial growth and record high commodity prices (noting that the WACC does not compensate the access provider for asymmetric risk).

The following table places the below rail access charges, in 2012/13 dollars, into context with respect to terminal infrastructure charges (net of terminal handling charges) for the both the Goonyella and Blackwater systems. The below rail access charges are based on the average access charge for the UT3 period and what the UT4 access charges would be if determined on the basis of contract volumes (to facilitate more direct comparability with the terminal infrastructure charges). The average charges exclude electric tariffs as these represent a substitutable input cost to the downstream haulage market.

Table 11 Average below rail and port access charges: Blackwater and Goonyella ($2012/13)

System	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	Port charge (TIC)
Blackwater	5.05	5.11	4.97	5.30	4.99	4.93	5.16	5.65	8.00
Goonyella	3.46	3.05	3.00	3.04	2.89	2.91	2.97	3.02	2.97

Source: UT3 data is AT2-AT5 system allowable revenues and volume forecasts approved at 1 October 2010. UT4 data is AT2-AT5 system allowable revenues and contract volume forecasts. Terminal Infrastructure Charges (TICs) are estimated.

The table shows that the UT4 below rail access charges are comparable to those prevailing over the UT3 period and commensurate with terminal infrastructure charges in the respective supply chains.

3 Opening Asset Value

The UT3 RAB has been rolled forward in accordance with section 1.2 of Schedule A of the 2010 Undertaking. This includes approved capital expenditure for the first two years of UT3 that has been approved by the QCA and a forecast of capital expenditure for 2011/12 and 2012/13 (as this is to still be approved by the QCA). This results in an Opening Asset Value for UT4 of $4.9 billion.

3.1 Process

The Opening Asset Value for UT4 is based on the UT3 asset value, which is rolled forward on an annual basis in accordance with section 1.2 of Schedule A of the 2010 Undertaking. This 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.

In accordance with section 9.3.2 of the 2010 Undertaking Aurizon Network submits this annual RAB roll-forward to the QCA for approval following the approval of its capital expenditure for that year. This therefore means that the determination of the Opening Asset Value for UT4 becomes relatively procedural, subject only to the approval of any capital expenditure that is still subject to review and the RAB roll-forward for the relevant years.

3.2 Matters impacting the value of the RAB

3.2.1 Condition based assessment

A new obligation introduced in UT3 requires Aurizon Network to undertake an End of Period Assessment of the condition of the Rail Infrastructure (the process for which is described in section 5 of Schedule A of the 2010 Undertaking). This is used by the QCA to determine whether the condition of that infrastructure has "deteriorated by more than would have been the case had good operating practice and prudent and effective maintenance and asset replacement policies and practices been pursued", which could result in a reduction in the RAB value under section 1.4 of Schedule A.

Aurizon Network is currently undertaking the first End of Period assessment. Given the initial assessment was not conducted at the start of UT3, there is no base case to compare the outcomes of this assessment against (that is, this first End of Period assessment is the base case). Accordingly, the current End of Period assessment should have no implications for the Opening Asset Value for UT4.

A number of significant issues have also been identified with the practical interpretation and application of this obligation, noting that Aurizon Network did not have the opportunity to respond to this in UT3 (as this was a new requirement introduced by the QCA in the Final Decision). Given these practical issues, and some more fundamental questions about the necessity of this obligation, Aurizon Network proposes to remove it for UT4. This is discussed further in section 10.8 of Volume 2.

3.2.2 GAPE equity raising costs

As discussed in section 10.8 of Volume 2, Aurizon Network has proposed an amendment to Schedule A of the 2013 Undertaking to allow for the inclusion of equity raising costs where it has demonstrated that the benchmark firm would be required to raise external equity to fund investments in rail infrastructure (applying the pecking order hypothesis[4] and maintaining the benchmark gearing ratio). The determination of the allowance has been based on the methodology and assumptions applied in seeking approval of equity raising costs for the GAPE project, as described in Aurizon Network's September 2012 Draft Amending Access Undertaking for the GAPE reference tariff (the GAPE DAAU). This in turn has been based on the methodology and assumptions applied by the AER.

The relevant extract from the GAPE DAAU is included in Box 1.

Box 1 Ex post determination of equity raising costs

"The inclusion of financing costs associated with seasoned equity offers is a known and well understood principle. The QCA has also accepted these costs to be legitimate costs to be capitalised into the RAB. For example, the QCA accepted upfront equity raising costs into the RAB for phase 2/3 expansion of the Dalrymple Bay Coal Terminal.

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.

QRNN therefore considers it reasonable and prudent that an ex-post assessment is performed following approval of the 2012/13 capital expenditure amounts to determine an amount for equity raising costs into the RAB.

In contrast with the approach by the Australian Energy Regulator where the amount of equity raising costs is determined at the commencement of the regulatory proceedings, the different approaches to the inclusion of capital expenditure in the regulatory cash flows necessitates a look-back approach to take into account of the actual capital expenditure incurred.

QRNN has included additional requirements in the Schedule A which provides for inclusion in the opening value of the RAB in the next regulatory period an amount for equity raising costs which is determined having regard to:

- the aggregate of the Adjusted System Allowable Revenue for the Central Queensland Coal Region, excluding any Revenue Cap Adjustment Amounts, over the Term;
- the Approved Capital Expenditure amounts over the Term;
- the tax depreciation that should have applied for the Approved Capital Expenditure; and
- the tax payable based on the tax depreciation that should have applied for the Approved Capital Expenditure excluding imputation.

This approach ensures the equity raising amounts are calculated with proper reference to the actual cash flows. As financing is undertaken at a network level, the amount of equity raising costs is relevant to all

[4] That is, the firm will first look to fund investments from retained earnings, then from external borrowings (up to the long term target gearing ratio), and then from equity raisings.

capital expenditure and revenue in the CQCR. Accordingly, the amount of equity raising costs, if any, will be allocated to individual coal systems based on their proportion of actual capital expenditure over the term of UT3.

QRNN also proposes to determine the amount for equity raising using the approach employed by the Australian Energy Regulator (AER) in the Powerlink decision. While the QCA applied a dividend yield approach with DBCT the AER method appears to be internally consistent with the approach to imputation credits.

The only point of difference is that QRNN does not propose to recognise a dividend reinvestment policy. The basis for the exclusion is to ensure consistency with the financial model used to determine reference tariffs in the CQCR. The QCA requires the financial models for both CQCR and DBCT to discount the free cash flows by WACC to recognise the timing of receipts of revenue.

However, in calculating these amounts no correction is made for the timing of dividends. QRNN does not consider it reasonable to incur deductions on its free cash flow, which assumes no mid period dividends but to then assume dividend reinvestment in the equity raising costs. Therefore, QRNN proposes to determine the equity raising costs using the following key parameters:

- Dividend reinvestment of 0%;
- Dividend imputation payout ratio of 70%; and
- Seasoned equity raising cost of 3% of total external equity requirements."

In the GAPE DAAU, which was subsequently withdrawn, Aurizon Network estimated an annual external equity raising requirement over the UT3 period and the associated costs. However, these estimates were based on the approved UT3 Capital Indicator. Having regard to forecast capital expenditure and the consequential impact on tax allowances, the total value of the equity raising costs Aurizon Network is seeking to include in the RAB as at 30 June 2013 is $5.765 million. It is proposed that the NPV of these amounts is included in the Opening Asset Value for UT4.

This amount has been proportionally allocated to the various coal systems based on the proportion of capital expenditure incurred over the UT3 period for that system. The amounts for each individual coal system are shown below.

Table 12 UT3 equity raising cost allocations ($ millions)

Individual Coal Systems	UT3 Capital Expenditure	Equity Raising Cost Allocation
Blackwater	371.5	1.215
GAPE	895.9	2.928
Goonyella	436.5	1.427
Moura	7.0	0.023
Newlands	52.5	0.172
Total	**1,763.4**	**5.765**

3.3 Summary of UT3 roll-forward

3.3.1 CPI indexation

The RAB is rolled-forward each year for actual inflation, which was based on the value of the Brisbane All Groups CPI as at 30 June in each relevant year. The relevant values were:

- 2009/10: 3.2%
- 2010/11: 3.84%
- 2011/12: 0.92%.

For the 2012/13 year, the RAB has been rolled forward assuming forecast inflation of 2.5%, which is the mid-point of the Reserve Bank's target range for inflation and Aurizon Network's proposed inflation forecast for UT4 (refer section 7.9).

This is also consistent with the RBA's most recent forecast of inflation in its February 2013 *Statement of Monetary Policy*, which projects inflation for the calendar years 2013 and 2014 to change by 2.5% in each year. The change in the Brisbane All Groups CPI index between December 2011 and December 2012 was consistent with the national average of 2.25%, with the RBA also expecting inflation in the last half of 2012/13 to increase. It is expecting inflation to fall back to around the middle of its target band by the end of 2013, "as the effects of the introduction of the carbon price largely drop out."[5]

3.3.2 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.

3.3.3 Asset disposals and transfers

There were no asset disposals or transfers from the RAB during UT3. For any future asset disposals and transfers, Aurizon Network has proposed to clarify the value that is deducted from the RAB (which is done pursuant to Schedule A of the Access Undertaking). This is discussed in section 10.8 of Volume 2.

3.3.4 UT3 capital expenditure

The reconciliation of actual UT3 capital expenditure against forecast, which is managed via the Capital Carryover Account, is provided in section 5.2.2.

[5] Reserve Bank of Australia (2013). Statement of Monetary Policy, February 2013, p.66.

3.4 UT4: Opening Asset Values

The RAB roll-forward and Opening Asset Values by system, and for the total CQCR, are presented in the following tables.

Table 13 Blackwater: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	Balance
Opening asset value	1,176,669	1,219,297	1,212,817	1,378,277	
Capital expenditure	63,162	10,218	223,392	65,176	
Inflationary gain	38,674	46,957	12,228	35,267	
Depreciation	(59,208)	(63,655)	(70,160)	(79,079)	
Closing asset value	1,219,297	1,212,817	1,378,277	1,399,641	
UT4 Opening Asset Value: Blackwater					**1,399,641**
Rolleston					
Opening asset value	242,769	238,756	235,676	225,503	
Capital expenditure	--	--	--	9,556	
Inflationary gain	7,772	9,157	2,177	5,757	
Depreciation	(11,785)	(12,237)	(12,350)	(12,901)	
Closing asset value	238,756	235,676	225,503	227,915	
UT4 Opening Asset Value: Rolleston					**227,915**
Minerva					
Opening asset value	74,988	74,338	74,021	71,507	
Capital expenditure	--	--	--	--	
Inflationary gain	2,401	2,851	685	1,788	
Depreciation	(3,051)	(3,168)	(3,197)	(3,277)	
Closing asset value	74,338	74,021	71,507	70,018	
UT4 Opening Asset Value: Minerva*					**70,018**

* Includes non-coal RAB allocation, refer QR Network: revised Minerva DAAU - Letter and Submission (July 09)

Table 14 Goonyella: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	Balance
Opening asset value	1,164,249	1,356,141	1,444,242	1,421,041	
Capital expenditure	212,287	106,664	41,102	58,327	
Inflationary gain	40,644	54,039	13,526	36,251	
Depreciation	(61,039)	(72,602)	(77,829)	(82,065)	
Closing asset value	1,356,141	1,444,242	1,421,041	1,433,554	
UT4 Opening Asset Value: Goonyella					**1,433,554**
Hail Creek					
Opening asset value	114,909	115,105	115,904	113,325	
Capital expenditure	--	--	--	--	
Inflationary gain	3,679	4,415	1,071	2,833	
Depreciation	(3,483)	(3,616)	(3,650)	(3,741)	
Closing asset value	115,105	115,904	113,325	112,417	
UT4 Opening Asset Value: Hail Creek					**112,417**
Vermont					
Opening asset value	54,299	56,935	56,274	53,548	
Capital expenditure	3,812	354	--	13,955	
Inflationary gain	1,780	2,191	519	1,512	
Depreciation	(2,976)	(3,206)	(3,245)	(3,680)	
Closing asset value	56,935	56,274	53,548	65,335	
UT4 Opening Asset Value: Vermont					**65,335**

Table 15 Goonyella to Abbot Point Expansion: UT3 RAB roll-forward and UT4 Opening Asset Value[a] ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	Balance
Opening asset value	--	--	--	804,295	
Capital expenditure	--	--	800,607	22,677	
Inflationary gain	--	--	3,688	20,389	
Depreciation	--	--	--	--	
Closing asset value	--	--	804,295	847,361	
UT4 Opening Asset Value: GAPE					**847,361**

a Excludes deferred Byerwen capital expenditure. Expenditure incurred in the UT3 period has been rolled forward and capitalised into the UT4 Opening Asset Value.

Table 16 Moura: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	Total
Opening asset value	253,911	255,442	256,684	251,548	
Capital expenditure	2,200	687	1,894	2,235	
Inflationary gain	8,164	9,810	2,379	6,317	
Depreciation	(8,833)	(9,255)	(9,409)	(9,733)	
Closing asset value	255,442	256,684	251,548	250,367	
UT4 Opening Asset Value: Moura					**250,367**

Table 17 Newlands: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	Total
Opening asset value	165,277	164,203	164,645	199,898	
Capital expenditure	750	1,600	42,200	7,935	
Inflationary gain	5,302	6,329	1,714	5,096	
Depreciation	(7,126)	(7,487)	(8,661)	(10,140)	
Closing asset value	164,203	164,645	199,898	202,789	
UT4 Opening Asset Value: Newlands					**202,789**

Table 18 Total Central Queensland Coal Region: UT3 RAB roll-forward and UT4 Opening Asset Value ($'000) (nominal)

	2009/10	2010/11	2011/12	2012/13	Total
Opening asset value	3,247,072	3,480,218	3,560,263	4,739,055	
Capital expenditure	282,212	119,523	1,309,366	228,516	
Inflationary gain	108,434	135,748	57,928	138,267	
Depreciation	(157,500)	(175,226)	(188,502)	(204,616)	
Closing asset value	3,480,218	3,560,263	4,739,055	4,901,222	
UT4 Opening Asset Value: CQCR					**4,901,222**

It is important to note that this is a forecast of the Opening Asset Value to apply from 1 July 2013. This asset value will only be able to be confirmed once the QCA has reviewed and approved Aurizon Network's capital expenditure for 2011/12 and 2012/13. Consistent with the approach in UT3, differences between the forecast Opening Asset Value and the actual Opening Asset Value following the approval of the 2011/12 and 2012/13 RAB roll forwards will be reflected through the adjustment to System Allowable Revenue, as provided for in clause 3.1.3 in Part B, Schedule F of the 2010 Undertaking.

4 Ballast Cleaning Impairment Charges

In 2010, Aurizon Network submitted a Coal Dust Management Plan to the Queensland Government on behalf of the Central Queensland Coal supply chains outlining a program of activities to address coal dust on the central Queensland Coal Network. The was in response to an Environmental Evaluation Notice from the Queensland government and represented the first formalised approach to analysing, quantifying and addressing fugitive coal and coal dust, which are a major cause of ballast fouling. Until the Coal Dust plan was agreed, Aurizon Network had no mechanism to manage or prevent this type of ballast fouling.

As a result, a decision to impair assets on the basis of coal fouling seems unreasonable, particularly without a detailed and robust cost benefit analysis that is based on information that was available at the time. Aurizon Network has therefore included a $43.4 million adjustment to the UT4 allowable revenue to recover the net costs associated with the impairment charges and the ballast undercutting

4.1 Introduction

The Central Queensland Coal supply chains have seen substantial levels of growth in coal export volumes over the last decade. This has delivered substantial economic benefits to the participants who depend on those supply chains and the broader Queensland economy. Much of this growth has occurred through improved productivity in those supply chains associated with increased axle loads, train lengths and the payload capacity of coal wagons.

An externality of the benefits of this increased throughput and efficiency has been the fouling of ballast associated with coal spillage from wagons which increases the maintenance costs necessary to provide reliable and safe train operations. The loss of coal from wagons has varying sources and drivers and while assumptions have historically been made on the relative contributions of those sources it is only through recent technical studies in the CQCR and other international railways since 2008 that a sufficient understanding been obtained to progress targeted and cost effective mitigation while preserving the ongoing competitiveness and productivity of a significant Queensland industry.

The majority of this section is focussed on the technical and economic factors which have historically prevailed and are not representations of current technical performance or progressive development of coal loss mitigation now being effectively and successfully implemented in Central Queensland.

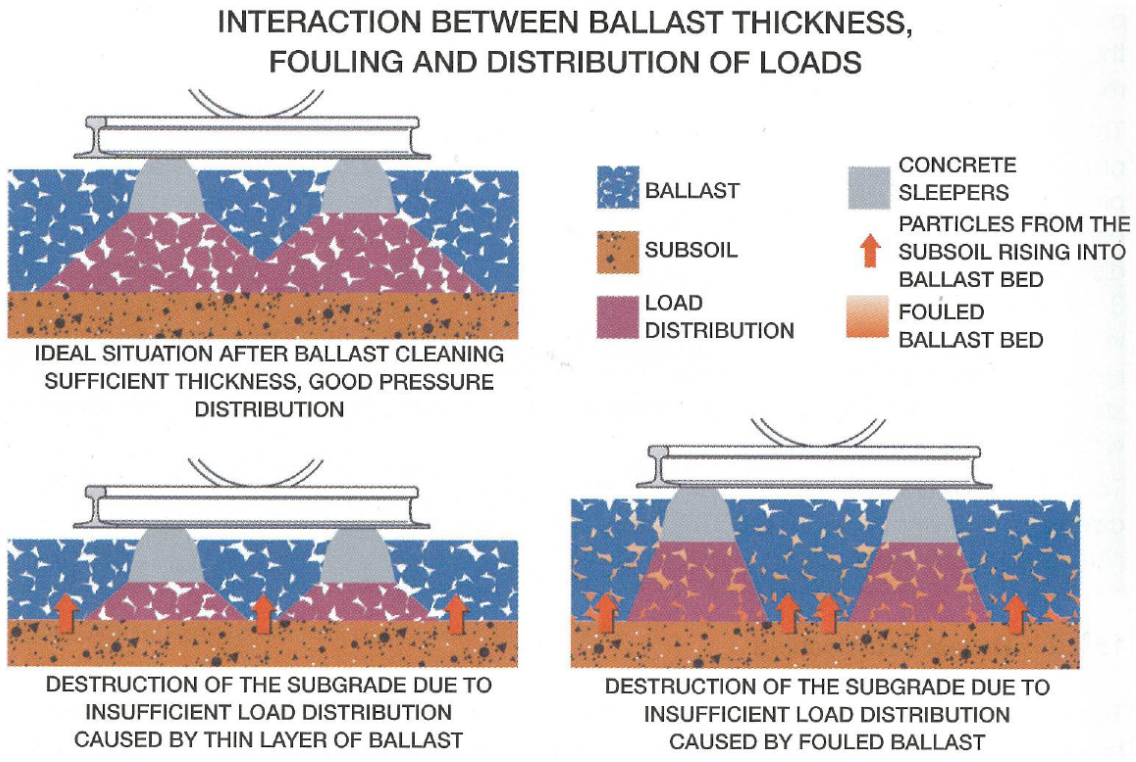
4.2 Background

4.2.1 Overview of ballast fouling and the source of coal loss

Ballast

Ballast is the material that is laid on the rail bed under the sleepers, providing stability and drainage to the track structure. It is an essential structural component of the track as it transfers the loads of the train through the sub-ballast and formation. The interlocking properties of the shape of the ballast rock also provide track stability by reducing the lateral, horizontal and vertical movement of the rail track as shown in the Figure below:

Figure 6 Load Distribution Properties of Ballast



Source: Lichtberger, B. (2011) Track Compendium, Figure 345, p. 506

Ballast is graded stone material where the voids between stones also allow for the drainage of water from the track. It can deteriorate in a number of ways, including crushing by the loads borne by the track infrastructure.

One key source of deterioration is the fouling of the ballast. Fouling occurs from a number of sources including natural attrition of the ballast itself, external contaminants such as dust, sand and dirt either blown or falling into ballast, the infiltration of underlying layers into the ballast and through foreign contaminants such as coal. The retention of fine particles in the ballast can trap water and lubricate it, which can eventually compromise the track stability. This also reduces the service life of the ballast and increases the frequency of maintenance interventions.

The ballast therefore needs to be cleaned to remove these particles in order to restore the elasticity and draining properties of the ballast. Ballast cleaning machines remove the accumulated dirt, coal and broken ballast, before the rail bed is topped up with new ballast. This process is called ballast undercutting.

As will be shown in this Chapter, while the causes of coal fouling are primarily driven by factors that are not within the direct control of the below rail network provider (i.e. through spillage from wagons), it bears most of the costs (i.e. as the entity required to maintain the ballast). The management of this externality is a feature of all coal networks around the world, including by the Class 1 railroads in the United States.

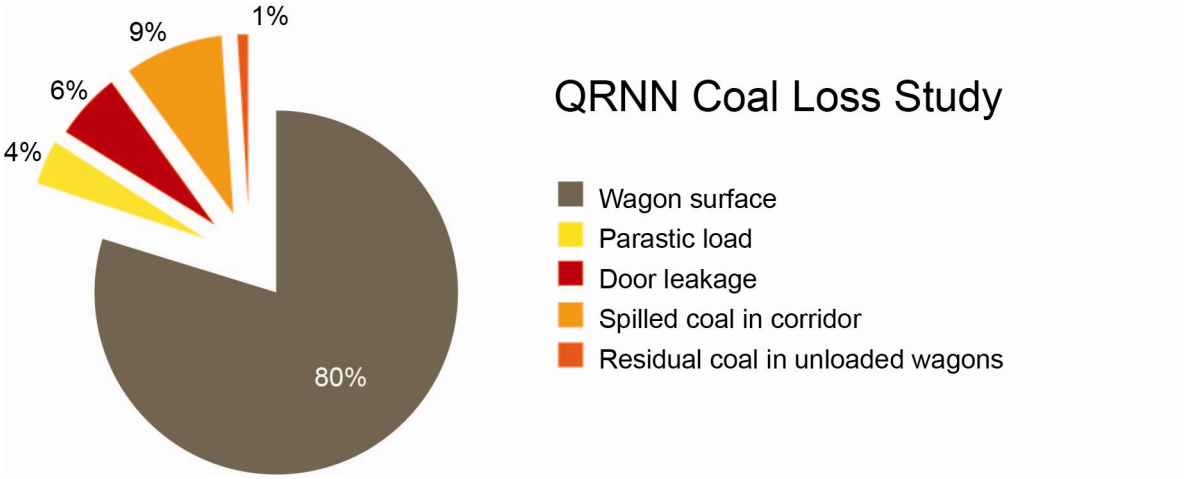
Sources of coal spillage

There are a substantial number of contributing factors to coal spillage, many of which are outside of the direct control of Aurizon Network. In addition to providing an overview of the main causes of coal fouling, this Chapter summarises the nature of the issues and identifies the facts that need to be established in order to

determine the costs and benefits associated with the ballast undercutting requirements, including drawing attention to the substantial economic benefits that have accrued to coal producers from their own practices.

Recent studies of coal emissions in Central Queensland showed that there were five sources of coal loss. The figure below shows the relative proportions of coal spillage within the coal transport network. Approximately 80% of coal spillage came from the surface of the coal wagons. This is a reflection of overloading resulting in coal loads going above the sill of wagons, and uneven loading with coal movement inside the wagons causing wind erosion.

Figure 7 CQCR Estimates of Coal Dust Sources



Source: Final Report Environmental Evaluation of Fugitive Coal Dust Emissions from Coal Trains Goonyella, Blackwater and Moura Coal Rail Systems, Queensland Rail Limited (Connell Hatch, 31 March 2008)

4.2.2 The QCA's 2010 impairment charge for fouled ballast

The QCA's 2010 Draft Decision on pricing included an asset impairment cost relating to forecast ballast undercutting levels. As no subsequent decision in pricing was issued this became the final decision on pricing for UT3. Aurizon Network therefore did not have the opportunity to respond to the impairment decision.

The basis for the QCA's imposition of impairment charges was not whether Aurizon Network has adopted efficient maintenance practices in the management of ballast, as the QCA accepted that the practice of ballast undercutting was an appropriate solution to coal fouled ballast however it did not specify what aspects of Aurizon Network's undercutting practices were inefficient. It was unclear at the time exactly how the QCA proposed that Aurizon Network would reduce the amount of fouling, given that Aurizon Network did not itself have any direct control over the loading practices and rollingstock configuration that had led to coal being lost in transit.

In determining the quantum of the impairment, the efficient benchmark relied upon by the QCA was the Hunter Valley coal network. Assuming that the ballast cleaning rate per gross tonne kilometre (gtk) should be commensurate with those of the Hunter Valley coal network, the QCA decided to reduce the RAB by $107 million, which was derived as:

> "…the difference, in net present value terms, between an efficient level of ballast maintenance and the amount QR Network will need to spend over the next 7 years in order to address concerns with the condition of the ballast in central Queensland.

This reduction in asset value will be written off over 7 years – the term of QR Network's proposed ballast-cleaning program. The Authority has apportioned the amount between systems on the same basis as it used to allocate the ballast costs – that is, by each system's proportion of forecast gross tonne kilometres (gtk's) compared with the aggregate gtk's. On this basis, the resulting reduction in each of the systems' asset values, as at 1 July 2010, is:

(a) Goonyella: $50.6 million;

(b) Blackwater: $44.8 million;

(c) Moura: $5.6 million; and

(d) Newlands: $5.7 million."[6]

The method by which this impairment was implemented was not to remove the value of the assets from the RAB but to apply a negative revenue adjustment commensurate with the capital charges associated with an asset value of $107 million and a remaining economic life of 7 years. The workings of this negative revenue adjustment are detailed in the following table.

Table 19 Derivation of negative revenue adjustment for ballast fouling ($m)

Undercutting Costs	**NPV**	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
QCA Assumed Allowance	213.3	29.0	40.2	48.2	49.2	49.2	49.2	49.2	--
QCA Assumed Hunter Valley Costs	106.6	14.5	20.1	24.1	24.6	24.6	24.6	24.6	--
Difference at 2010-11	106.6	--	36.1	24.1	24.6	24.6	24.6	24.6	--
Asset Roll-forward	**NPV**	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Opening Value		--	106.6	93.7	80.0	65.6	50.4	34.5	17.6
Inflation		--	2.7	2.3	2.0	1.6	1.3	0.8	0.4
Depreciation		--	15.6	16.0	16.4	16.8	17.2	17.7	18.0
Closing		--	93.7	80.0	65.6	50.4	34.5	17.6	0
Impairment Charge	**NPV**	**2009/10**	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**
Net Depreciation			12.9	13.7	14.4	15.2	16.0	16.8	17.7
Return on Asset			10.7	9.3	8.0	6.5	5.0	3.4	1.7
Impairment Charge	**106.6**		**23.6**	**23.0**	**22.4**	**21.7**	**21.0**	**20.2**	**19.4**

[6] Queensland Competition Authority (2010b). Draft Decision on QR Network's 2010 Draft Access Undertaking – Tariffs and Schedule F, pp. 30-31.

The opening value relevant to the calculation of an impairment charge for the UT4 period, commensurate with the UT3 decision, is $65.6 million.

4.3 Overview of Aurizon Network's UT4 approach

The QCA's UT3 decision noted that:

> "The Authority will consider re-including this deduction in the future if QR Network is able to demonstrate that its past approaches to ballast fouling have been cost effective and that it has adopted an efficient approach to maintaining a sound ballast, whether that be through ballast cleaning and/or fouling prevention."[7]

Aurizon Network has been working collaboratively with supply chain participants to invest in technologies and modify operating practices to substantially reduce coal spillage within the rail corridor. The issue of coal spillage and what action Aurizon Network could, or should, have taken to reduce the ballast cleaning requirements to a level commensurate with that which was assumed to occur in the Hunter Valley coal network was not satisfactorily resolved in UT3.

In assessing the issue of coal fouling and the implications for Aurizon Network's treatment of the fouled ballast, Aurizon Network considers that there are three key principles that are fundamental to the assessment of whether an impairment to its RAB could reasonably have been applied:

1. ***In imposing a penalty on the network provider for an action (or perceived failure to act), consideration can only be given to matters that are or were within the direct scope of responsibility of the network provider.*** As will be shown in this Chapter, while Aurizon Network has the ability to directly influence the response to coal fouling, it is not necessarily able to influence practices that can lead to coal fouling in the first place.

2. ***Any assessment of historical management decisions should be based on relevant information and standards that were available at the time the decision was made.*** That is, it is not reasonable to assess past decisions 'with the benefit of hindsight'. To do so exposes the business to an unacceptable level of regulatory risk that could fundamentally alter the dynamics of management decision making. The assessment should also only consider relevant information. This is necessary in order to support reliable valuations (ideally quantitatively justified), and also to ensure irrelevant facts are not improperly considered.

3. ***The consequences of decisions made by the business should have been reasonably foreseeable at the time.*** The service provider must have a clear understanding of the requirements of the decision-maker (including evidence). This includes the consistent application of relevant regulatory precedent.

Aurizon Network does not consider it reasonable that impairment charges are applied until a detailed cost benefit analysis has occurred. That analysis should be directed at ensuring that the maintenance costs associated with removing and managing coal fouling are appropriately attributed to the beneficiaries of the practices leading to spillage, taking into account the costs which have been avoided from that spillage. Aurizon Network is seeking input from stakeholders, as well as guidance from the QCA, as to how this analysis should be undertaken and what matters need to be considered. Any such analysis needs to be undertaken based on application of the principles identified above.

[7] Queensland Competition Authority (2010b). p.78.

In addition, it should recognise that the increase in coal prices, unforeseen in UT1, put significant pressure on existing network capacity. Producers were naturally incentivised to maximise the quantities of coal that could be loaded on each consist, accruing the resulting economic benefits.

Until a full analysis has been undertaken and an appropriate regime is designed for managing fouling that appropriately imposes costs on the parties that cause spillage, Aurizon Network's UT4 proposal is that the impairment charge imposed in UT3 be reversed through an adjustment.

The balance of this chapter addresses:

- the causes and prevention of coal fouling;
- issues associated with the impact of coal fouling;
- the implications of the current situation for Aurizon Network;
- the proposed UT4 adjustments.

4.4 The causes and prevention of coal fouling

In developing the Coal Dust Management Plan, a considerable amount of research and analysis was recently been undertaken to define and understand the sources of fugitive coal and its environmental impact, including the fouling of ballast. The studies led to a number of recommendations for the mitigation of coal dust and these are being implemented under the plan.

While considerably more is now known about the causes (and prevention) of coal fouling, this understanding is still developing in both Australia and the US. The following section considers the main causes of coal fouling and how it is now being prevented.

In Central Queensland, these causes of coal spillage are being mitigated through the activities outlined in the Coal Dust Management Plan, including improved loading practices, profiling loads to a flat "garden bed" shape that minimises the coal surface area subject to lift off, applying a laquer or veneer to the loaded coal that acts as a topper to the coal and improved unloading practices.

4.4.1 Original formation standards and axle loads

4.4.1.1 Causes

As a starting point, it is important to note the specific characteristics of the foundation and soils on the CQCN and their impact on ballast fouling generally. The CQCN is constructed on highly reactive soils. Much of the CQCN's rail infrastructure formation and substructure was designed and constructed to a standard below its current utilisation. For example, for the Blackwater System the formation on sections is failing due to a number of factors such as:

- increased axle loads (from 20 tonnes to 26 tonnes);
- greater impact loads caused by the increased speed of coal trains from 60 km/h to 80 km/h;
- substantial content of highly reactive and erodible clay;
- sub-optimal drainage; and
- high rainfall and intermittent floods

In order to reasonably predict the ballast undercutting requirements arising from a poorly estimated reduction in coal fouling rates, regard must also be given to a significant range of other factors, such as infiltration of underlying granular layers. These other factors may be specific to the railway in question. As will be outlined below, the CQCR is subject to higher levels of saturation. The level of infiltration of the sub ballast layers is therefore likely to be much higher on a railway constructed on poor soil types and operating beyond the original design standard even without coal spillage. Accordingly, regard must be had to the standard of formation in place at the time of the original DORC valuation.

For example, a study by Ebrahimi, Tinjum and Edil of ballast performance under fouling states:

> "A major concern facing the freight rail transportation industry in the US is increasing maintenance costs due to heavier freight loads and substandard track substructure. Surfacing and maintenance expenses of the ballast layer (i.e., the large-size aggregate material of railroad substructure) over the past few years has substantially increased; e.g., Burlington Northern Santa Fe (BNSF) Railway has spent approximately $200 million US annually, about 17% of their capital budget."[8]

Their study also finds:

> "LSCT test results show that increased fouling content and water content increases the accumulation of plastic deformation of ballast. There is a critical limit of fouling in constant water content tests, above which the rate of plastic deformation under cyclic loading increases abruptly."[9]

The laboratory tests are consistent with the assumed ballast cleaning differences between the CQCR and the Hunter Valley coal network, when consideration is given to the harmful combination of poor formation, inundation and load. What is also apparent from a literature review of the impact of coal fines on the performance of the ballast and the resultant maintenance requirements is that this understanding is still evolving, with the need for further investigation to properly inform maintenance intervention over the economic life of the asset. For example, recent GPR studies have indicated the need for a lower frequency of ballast cleaning.

4.4.1.2 Prevention

This issue is only relevant to the existing network infrastructure in place at the time that the original DORC valuation was undertaken at the start of UT1. Since then, the design of any new or replacement network infrastructure will be based on expected network utilisation, performance requirements (in terms of train speeds) and axle loads. However, one option that Aurizon Network could have pursued, not to reduce fouling, but to mitigate the rate of deformation of the substructure layers would have been to reduce axle loads with substantial and material consequences on productivity and throughput.

4.4.2 Rail operations

4.4.2.1 Losses from open top wagons

Causes

Coal lift off from the wagon surface is influenced by a number of key variables, including coal density, surface area, load profile and train speed. This could occur due to wind erosion or and/or load settling and displacement in transit. The Central Queensland studies showed that loss will be influenced by the load

[8] Ebrahimi, A., Tinjum, J. and Edil, T. (2010). Large-Scale, Cyclic Triaxial Testing Of Rail Ballast, AREMA 2010 Annual Conference & Exposition, Orlando, May, p. 4. http://www.arema.org/files/library/2010_Conference_Proceedings/Large-Scale_Cyclic_Triaxial_Testing_of_Rail_Ballast.pdf

[9] Ebrahimi, A., Tinjum, J. and. Edil, T. (2010). p.12.

profile of the wagon, in particular, the extent to which the coal exceeds the wagon height. A higher, uneven load will produce more dust than a flat 'garden bed' shape and profile

The susceptibility to loss will be influenced by the load profile of the wagon, As outlined above, the growth in demand for coal that emerged during the UT2 period created incentives to maximise the amount of coal loaded in each consist (within allowable axle loads). For example, the following pictures show an example of a loading facility that was previously modified to increase the loaded capacity of wagons (within the axle load limitations), but which involved altering the profile of the coal in such a way as potentially change the likelihood of spillage due to slippage in transit.

Figure 8 Example of a Loading facility modified to increase the loaded capacity of wagons

Source: Aurizon Network

The facility pictured here have established a load profile that seeks to maximise the amount of coal that can be loaded in each wagon, as against the volume of transported coal. However, without a sufficiently robust surfactant applied, it is likely that this loading practice will lead to spillage. This is because, during train operations and transport, the load will settle and thereby revert to a more natural angle of repose. This can subsequently lead to coal spillage, as the loading height over the wagon sill will be exceeded.

There are also some fundamental differences between narrow and standard gauge railways in terms of axle loads and capacity that need to be considered here, which is important to the extent that direct comparisons are made between the CQCN and standard gauge networks such as the Hunter Valley (the QCA has previously relied on comparisons against the latter).

Where the wagon envelope is more limited given the intended train speeds, the radius of the curvatures and axle loads, as axle loads increase so too does the potential volumetric capacity. However, where the volumetric capacity of the wagon is constrained by the wagon envelope the additional volumes need to be accommodated through loading above the sill of the wagon.

Coals have different density and coal producers sell by weight, the producers are highly incentivised to maximise the capital efficiency and productivity through maximising the wagon volume by filling wagons above the sill. Coal spillage from the wagon surface, either through erosion or displacement, is influenced by a number of key variables, including coal density, surface area, load profile and train speed.

Aurizon Network understands that the Hunter valley coal has a typical density of 900 kg/m^3. This can be contrasted with the lighter coals typical for Central Queensland, with coal densities in the order of 850 kg/m^3.

The combination of coal density and volumetric capacity of standard gauge provides a constraint against over filling wagons.

For a typical Hunter Valley wagon, any overfilling above the sill would result in a breach of axle load limitations. Aurizon Network also understands that this visual reference is also relied upon by the track manager for enforcement of axle load limits. These loading restrictions also ensure the resultant load profile has a smaller surface area than that expected in Central Queensland and hence less coal spillage.

The following tables show the loading data for standard gauge and narrow gauge wagon with a garden bed profile and 35 degree angle of repose (without adjustment for front and rear load taper). The red shaded area shows density and load profiles that would exceed the maximum axle loads.

Table 20 Indicative Standard gauge loading (30 tonne axle loads)

	Coking Coals							Steaming Coals				
	Total Wagon Gross Mass vs Density											
	Coal Density t/m^3											
Height above sill H (mm)	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1	1.05	1.1
-100.00	80.72	85.98	91.23	96.49	101.75	107.00	112.26	117.52	122.77	128.03	133.29	138.54
-50.00	81.45	86.77	92.10	97.42	102.74	108.06	113.39	118.71	124.03	129.36	134.68	140.00
0.00	82.12	87.51	92.89	98.27	103.66	109.04	114.42	119.81	125.19	130.58	135.96	141.34
50.00	82.73	88.17	93.61	99.05	104.49	109.93	115.37	120.81	126.25	131.69	137.13	142.57
100.00	83.29	88.78	94.27	99.76	105.25	110.74	116.23	121.72	127.21	132.70	138.19	143.68
150.00	83.78	89.32	94.85	100.39	105.92	111.46	116.99	122.53	128.06	133.60	139.13	144.67
200.00	84.22	89.79	95.37	100.94	106.52	112.09	117.67	123.24	128.82	134.39	139.97	145.54

Table 21 Indicative Narrow gauge loading (26 tonne axle load)

	Coking Coals							Steaming Coals				
	Total Wagon Gross Mass vs Density											
	Coal Density t/m^3											
Height above sill H (mm)	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1	1.05	1.1
-100.00	67.89	72.23	76.58	80.92	85.27	89.61	93.95	98.30	102.64	106.99	111.33	115.68
-50.00	68.74	73.16	77.58	82.01	86.43	90.85	95.27	99.69	104.11	108.54	112.96	117.38
0.00	69.54	74.03	78.53	83.02	87.52	92.01	96.51	101.00	105.50	109.99	114.48	118.98
50.00	70.29	74.85	79.41	83.98	88.54	93.10	97.66	102.23	106.79	111.35	115.91	120.48
100.00	70.98	75.61	80.24	84.86	89.49	94.11	98.74	103.37	107.99	112.62	117.24	121.87
150.00	71.63	76.31	81.00	85.68	90.37	95.05	99.74	104.42	109.11	113.79	118.48	123.16
200.00	72.22	76.96	81.70	86.44	91.18	95.92	100.66	105.39	110.13	114.87	119.61	124.35
250.00	72.77	77.55	82.34	87.13	91.92	96.71	101.49	106.28	111.07	115.86	120.64	125.43
300.00	73.26	78.09	82.92	87.75	92.59	97.42	102.25	107.08	111.92	116.75	121.58	126.41
350.00	73.70	78.57	83.44	88.31	93.19	98.06	102.93	107.80	112.68	117.55	122.42	127.29
400.00	74.08	78.99	83.90	88.81	93.72	98.62	103.53	108.44	113.35	118.25	123.16	128.07
450.00	74.42	79.36	84.30	89.24	94.17	99.11	104.05	108.99	113.93	118.87	123.80	128.74
456.00	74.46	79.40	84.34	89.28	94.22	99.17	104.11	109.05	113.99	118.93	123.87	128.82

The standard gauge loading table clearly shows that loading of coals with a density of 0.9 would result in axle load being exceeded where the load height is 50 mm above the sill (given the nominal load of 120 tonnes per wagon). In contrast, a coal with the same density loaded into a narrow gauge wagon would be able to be loaded 200 mm above the sill without exceeding axle loads. Producers with lower density coals are able to load substantially above the wagon sill before exceeding the 26 tonne axle load.

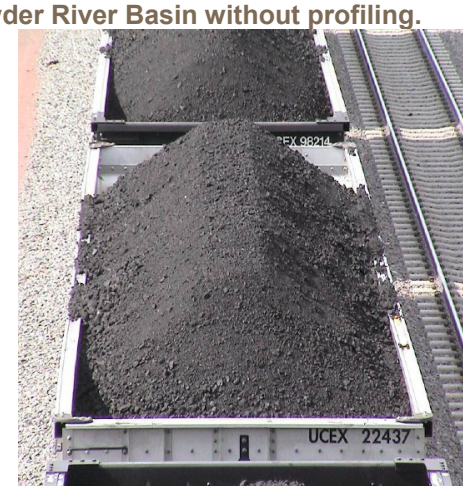
The wagon opening for a narrow gauge wagon design is approximately 20% greater than that of a standard gauge wagon in the Hunter Valley. This indicates that a narrow gauge wagon as used in Central Queensland is likely to have a larger surface area, creating a higher potential source of coal erosion and spillage.

Aurizon Network also notes from observations on the BNSF Joint Line (Powder River Basin) that the wagon design is a rectangular configuration with a large exposed surface area. These are evident in the photos

below. The differences can at least in part be attributable to the higher 32 tonne axle loads, compared to the 30 tonne axle loads in the Hunter Valley.[10]

Figure 9 Loading of a Standard Gauge Railways in the Powder River Basin without profiling.

A) Hunter Valley



B) Powder River Basin

Profiling

The profile of the coal load refers to the shape of the exposed surface of coal above the sill of the wagon. Irregular loads, such as those with multiple peaks, can produce more erosion that a flat garden bed shape. Poorly loaded wagons can also spill coal over the sills onto the ballast and within the corridor.

The irregularly shaped load has a greater erodible surface area and is subject to greater air speeds than the garden bed shape. Wind tunnel modelling, commissioned by Aurizon for the CQCN, shows that irregularly shaped loads exhibit slightly higher velocities and turbulence than the garden bed configuration, which lead to a higher rate of coal erosion from the surface,

Intuitively, adopting a garden bed profile for narrow gauge wagons when applied with a suitable veneering product would limit productivity losses associated with mitigating coal loss. However, both these methods require investment by the owner of the loading facility.

Train Speed

The combination of axle loads and loading heights is then subject to train speed. The above mentioned wind tunnel tests showed an increase in erosion as wind speed (train speed) increased. Aurizon Network understands that loaded coal trains in the Hunter Valley are subject to a maximum train speed of 60 kilometres an hour. In contrast, CQCN operates with maximum loaded train speeds of 80 kilometres an hour. These lower speed limits in the Hunter Valley are not expected to have a significant impact on supply chain throughput due the smaller, geographically constrained system within which they operate, where they would have a significant impact on productivity in the CQCN and Powder River Basin mines.

[10] See Table 4 in Fagan (2010). Open Access for Heavy Haul Railroads: A Questionable Strategy for Social Welfare Gains, p.10 http://www.trforum.org/forum/downloads/2010_167_Access_Heavy_Haul_Railroads.pdf

In contrast, coal spillage in the Powder River Basin appears to be commensurate with that experienced in the CQCR. The main difference between the Hunter Valley coal network and the Powder River Basin, both of which are standard gauge railways, would appear to be wagon loading, surface area and higher train speeds associated with the much longer haulage distances. As consequence of the spillage rates in the Powder River Basin, BNSF notes that:

> "As a result, we are undercutting track on these line segments 2 to 3 three times as frequently as would be required under normal operating conditions."[11]

The ballast cleaning rates in the CQCR are commensurate with those experienced in the Powder River Basin, which provides a more robust comparator of the drivers of coal fouling in the CQCR than the Hunter Valley coal network.

Prevention

Overload detectors are installed on the network to ensure that the maximum axle loads are not exceeded. However, as noted above, with the lower density coals that are typical of the CQCR, wagons can be loaded substantially above the sill height before reaching the maximum axle load.

Preventing losses through wind erosion is now being addressed through the application of a surfactant to a groomed loading profile in a process referred to as veneering that creates a crust on top of the coal and prevents erosion.

This process requires investment and modification to the loading facilities including the veneering station and water supply owned and operated by the relevant coal producer. Many of the mines operating between 2001 and 2008 were established and producing coal (and contributing to network fouling) prior to the commencement of regulation and the establishment of the RAB.

During this period Aurizon Network had no commercial or legal basis with which to compel owners of these facilities to undertake modifications to the loading facility or to install veneering equipment. While the *Transport Infrastructure Act 1994* requires Aurizon Network to seek a license for any new facility wishing to be installed over a railway via a Transfer Facilities Licence (TFL), which it may seek in order to satisfy loading performance standards, it does not empower Aurizon Network to require a TFL for an existing facility.

Similarly, Aurizon Network is not able to seek remedies against the owner of an existing loading facility who subsequently makes modifications to its facility that may exacerbate a fouling problem.

It is not clear what powers or remedies Aurizon Network would possess against the owner of the loading facility, either directly with the owner of the loading facility or indirectly through an operator.

In 2007, the Queensland Government (via the Department of Environment and Resource Management) issued the Chief Executive Officer of QR with an Environmental Evaluation Notice under the *Environmental Protection Act 1994*, which resulted in the production of the Coal Dust Management Plan. It was not until this time that was there sufficient incentive for coal producers to implement coal dust management through the commercial negotiation of TFLs. Notwithstanding this incentive, negotiations with some owners of loading facilities are still continuing, some five years after Department of Environment and Resource Management's acceptance of Aurizon Network's response to the Environmental Evaluation.

[11] Before the Surface Transportation Board, Petition of Arkansas Electric Cooperative Corporation for a Declaratory Order, BNSF Railway Company's Reply Evidence and Argument, STB Docket No. 35305, April 30 2010, p.2.

4.4.2.2 Losses from quick drop doors

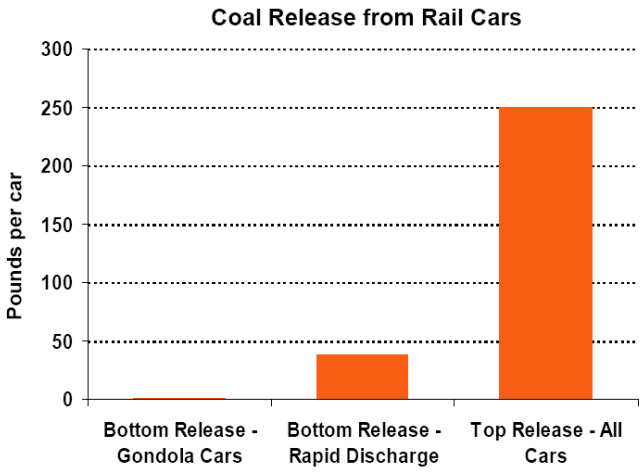
Causes

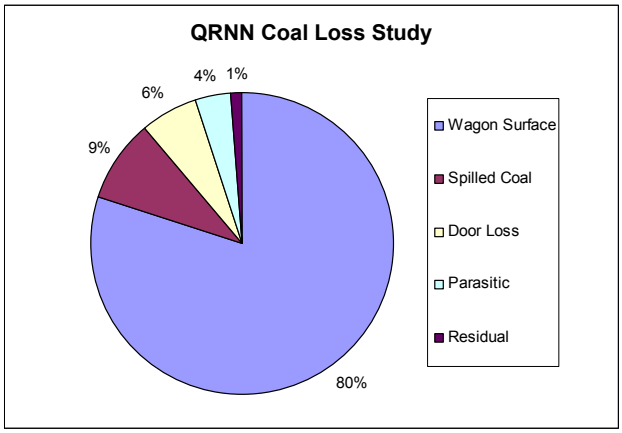
The quick drop door system is a wagon design with a mechanical system for opening and closing doors located at the base of the wagon, enabling the coal to fall into an unloading pit. It requires an appropriate clearance in the doors to ensure their correct, safe and reliable operation.

One of the primary factors factor for door loss is the loading practices. Commencing the load directly over a quick drop door, as opposed to the leading slope, may cause the door to spring out with the possibility of a larger coal particle catching and prying the door open to a gap larger than the nominal clearance.

Recent studies on coal spillage from quick drop doors had been undertaken by both BNSF[12] and Aurizon Network[13] have shown that a small proportion of fouling comes the quick drop door system as shown in the following graphs.

Figure 10 Percentage of coal spillage attributable to quick drop doors: BNSF and QR Network studies





Prevention

Modification of the loading processes is the primary mechanism for reducing the possibility of coal fouling from dust escaping from quick drop doors. This process is now being monitored at the coal loadouts at mines, and is managed in the wagon positioning and speed of the loadout process

4.4.2.3 Wagon Sills, Bogeys and Platforms

Causes

In the process of loading coal some product may become deposited on the sills and ledges of the wagons if sufficient care is not taken in loading. Due to wagon stability and other dynamic forces during transit, a proportion of this coal will fall within the rail corridor.

During the loading process locomotives contain a device called the Train Speed Indicator (TSI), which is the interface between the loading facility and the train driver. It is the responsibility of the driver to operate to the

[12] BNSF Railway Company (2007). Status Report on Coal Dust Suppression.
[13] Aurecom Hatch (2009). Coal Leakage from Kwik-Drop Doors Coal Loss Management Project Queensland Rail Limited, http://www.aurizon.com.au/InfrastructureProjects/Rail%20Network/Coal_Leakage_from_Kwik-Drop_Doors.pdf

indicated speed and the responsibility of the loadout operator to indicate the correct speed. As the access charges are typically levied with respect to a nominal mass (as opposed to a loaded weight or volumetric basis), the loadout operator has strong and clear performance incentives to load as much coal into the wagon as possible and in as short a time as possible.

The TSI also provides the interface between the rail operator and the operator of the unloading facility to ensure the train speed and discharge rate is commensurate with the conveyer and clearance rates of the unloading facility. Rather than upgrade unloading facilities to a higher capacity (including higher speed conveyors), the incentive on the unloading facility is to set the train speed at a rate which 'choke feeds' the discharge chute in order to maximise terminal throughput and align to the handling rates of other parts of the terminal. If the train speed is set higher than the clearance rate then coal may interfere with the train operation and collect on wagon bogeys (that is, 'coal ploughing'). The incentive on the terminal operator to suspend unloading operations in order to remove chute spillover is also likely to be low.

Prevention

These sources of loss can be addressed by ensuring that sufficient care is taken in loading, including avoiding overloading. Upgrades could also be made to the capacity of the unloading facilities.

Similar to the imposition of TFLs on the loadout operations, Aurizon Network is only practically able to influence the performance standards for new facilities. However, it is also the newer and higher performance unloading facilities that will be less susceptible to coal ploughing. In other words, much of the risk is more likely to arise from the existing facilities.

4.4.2.4 Weather

Weather can exacerbate the impact of fouling, which may have occurred due to any of the above causes. This is particularly an issue in the CQCR, which is subject to periods of high rainfall.

Once fouling of ballast occurs, the voids between ballast stones are reduced which impairs the drainage capability of the track. The retention of water on these foulants weakens the load carrying capacity of the ballast, which increases the susceptibility of the track to movement.

Of particular relevance to ballast fouling and resultant cleaning requirements is the deleterious effect of coal on the performance of the ballast and consequential impacts on infiltration of the sub layers. Laboratory trials on the shear strength of ballast with different types and levels of foulant were conducted by Huang, Tutumluer and Dombrow whose test results showed:

> "That when the coal dust fouling percentage increased, the ballast shear strength steadily decreased. Wet fouling was found to exacerbate this trend. Results of ballast samples fouled with clay and mineral filler also showed decreasing trends in strength properties; however, coal dust was by far the worst fouling agent for its impact on track substructure and roadbed.[14]

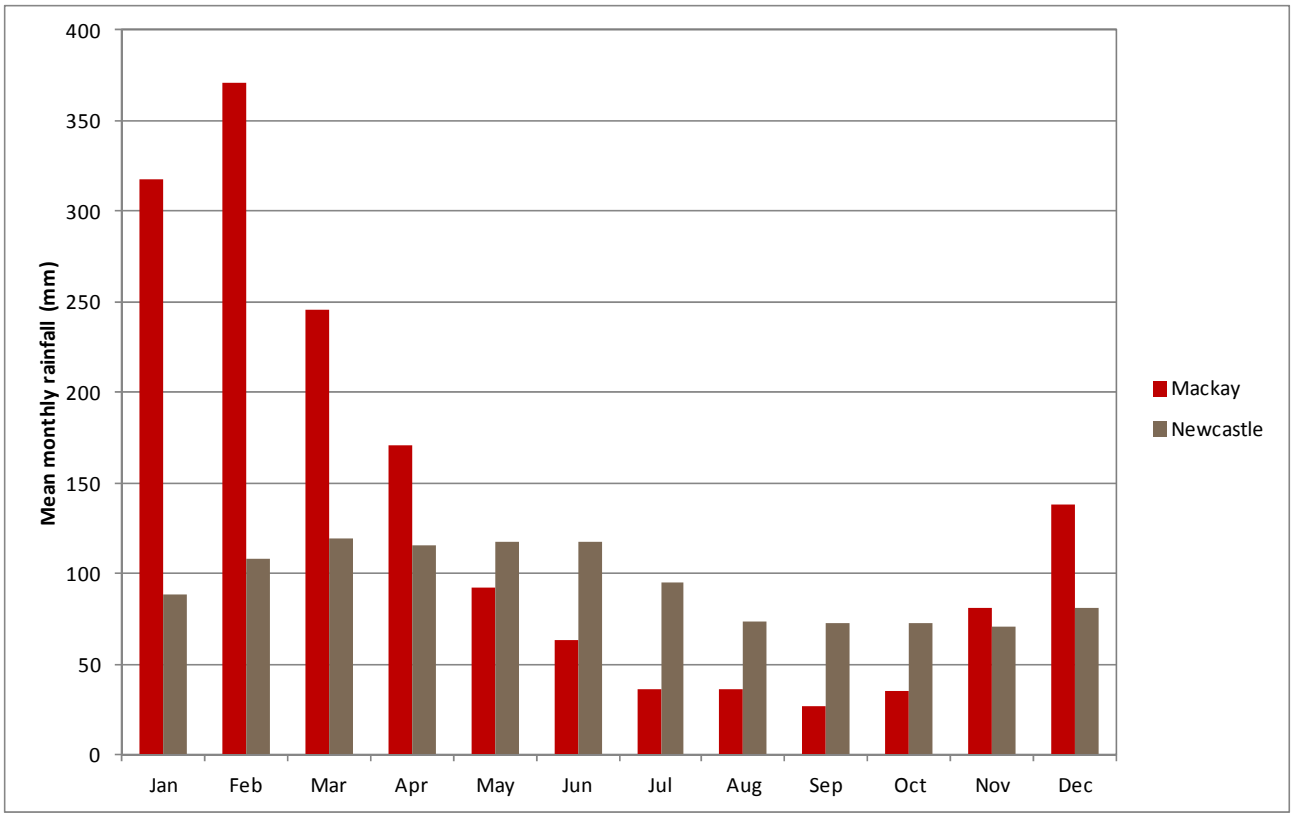
As discussed previously, coal contamination in ballast also has the ability to hold water. Saturated ballast that has been fouled with coal will reduce the ability of the substructure to reduce water content, thus increasing the rate of sub layer infiltration. This is particularly relevant in the context of comparisons with the Hunter Valley. Even if the Hunter Valley experienced similar rates of coal fouling, its network would most

[14] Huang, H., Tutumluer, E., and Dombrow, W. (2009). "Laboratory Characterization of Fouled Railroad Ballast Behavior," Transportation Research Record 2117: Journal of the Transportation Research Board, National Research Council, Washington, D.C., pp. 93-101.

likely be subject to lower levels of fouling and intervention due to the lower levels of ballast inundation and saturation.

A comparative assessment of average monthly rainfall between Mackay and Newcastle is shown below. It is evident from the graphs that Central Queensland experiences a material difference (some two to three times) the rainfall experienced in the Hunter Valley in the monsoonal season.

Figure 11 Average monthly rainfall: Mackay (CQCR) and Newcastle (Hunter Valley)



Source: Bureau of Meteorology, Mean Monthly Rainfall of Mackay (Station Number 33045) vs Newscastle (Station Number 61055), available at www.bom.gov.au

This provides another fundamental point of difference in making any direct comparisons between the CQCR and the Hunter Valley when assessing coal fouling.

Comparative Assessment of Benchmark Railways

The following table summarises the relevant drivers of coal fouling discussed in the previous section against the CQCR, HVCN and Powder River Basins (PRB). The table shows that CQCR displays similar characteristics to the Powder River Basin and that the HVCN is not a reliable comparator or benchmark for ex-post efficiency assessments of the scope of ballast cleaning activities.

Table 22 Comparison of Coal Fouling Drivers and Fouling Levels

Driver of Coal Fouling	CQCR	HVCN	PRB
Gauge	Narrow	Standard	Standard
Axle Load	26	**30**	**32**
Loaded Coal Train Speeds (km/hr)	80	60 (Zone 1)	80+
Formation Saturation	Seasonal high levels of rain intensity and frequency	Low rain fall intensity and frequency	Predominantly from snow thaw
Wagon Opening Area	Approx 30 sqm	Approx 25 sqm	Box style assumed to exceed 30 sqm
Filling Height	Predominantly above sill height	Predominantly at or below sill	Predominantly above sill height
Soil Type	Clay, Blacksoil and reactive	Unknown	Unknown
Historical Fouling Rates	Evidence of fouling	No public information	Evidence of Fouling

4.5 Issues associated with the impact of coal fouling

A cost benefit analysis of the impact of coal fouling also needs to consider issues such as the impact of fouling on network availability (via maintenance possessions required for ballast cleaning) and temporary speed restrictions. These issues are briefly explored below.

4.5.1 Maintenance possessions

Aurizon Network acknowledges that increased levels of ballast cleaning can occur through either:

- an increase in the number of possessions; or
- an increase in the productivity of ballast cleaning; or
- some combination of the two.

However, the resultant capacity losses and ultimately, the additional below rail track infrastructure and rollingstock required to meet the same throughput requirements, will be influenced by the effectiveness of the maintenance planning regime. The capacity losses attributable solely to ballast cleaning are difficult to isolate with the requisite level of precision. In a substantial number of cases, the capacity losses are highly mitigated through the:

- ability to reroute train services on duplicated track;
- coordination of ballast cleaning with other maintenance possessions;
- coordination of ballast cleaning with other capital works closures;
- coordination of the ballast cleaning cycle with other supply chain outages; and
- programming of ballast cleaning, or acceleration of cleaning in periods of low demand for capacity.

Accordingly, any assessment of capacity losses for ballast cleaning needs to consider the extent to which the maintenance possession has a genuine impact on lost throughput.

4.5.2 Temporary Speed Restrictions

In UT3 the QCA noted that Aurizon Network had not factored the impacts of temporary speed restrictions in its previous assessments. This is attributable to the difficulty in:

- identifying and isolating the impact of coal spillage on speed restrictions from other sources of fouling; and
- determining the impact of speed restrictions on system throughput and above rail resources.

In the first instance, determining the effects of coal spillage on speed restrictions requires a detailed engineering and quantitative analysis of all sources of ballast fouling, the effectiveness of the mitigation and the resultant change in the asset behaviour associated with those measures. Predicting the quantum of speed restrictions that would be avoided following an unquantified reduction in ballast coal spillage rates would also be a complex and data intensive exercise. It would require a significant number of ballast sample tests and particle evaluation across a number of speed restrictions to determine the contribution of coal spillage to speed restrictions with any degree of statistical reliability, as opposed to the impact of formation failure and other ballast contaminants.

The direct impact of speed restrictions on below rail capacity is somewhat mitigated by the number of train paths exceeding the port unloading slots. Speed restrictions slow the velocity of the system and potentially require additional above rail services due to an increase in cycle time. In previous studies the Aurizon Network's capacity planning team has simulated speed restriction impacts and noted that a reduction in speed restrictions could increase system throughput by approximately one million tonnes per annum. This modest increase arises due to additional congestion points arising on the network (that is, port queuing) and limitations on crew rostering and strategic crew change locations.

4.5.3 GPR analysis

During the UT3 period Aurizon Network has started to undertake ground penetrating radar (GPR) in order to better understand the extent of ballast fouling and to better target and predict ballast cleaning requirements. As discussed in Volume 4, the extent of ballast fouling is lower than previously assumed.

Prior ballast fouling assumptions were based on Particle Void Contamination (PVC) tests. The historical assumed fouling rates were extrapolated from the change in average PVC measurements between 2003 and 2007. The data being collected through the calibrated GPR testing indicates a number of statistical problems with the conclusions from reliance on PVC, including sample bias where there is tendency for test sites to be selected on an expected of fouling. Aurizon Network is continuing to undertake GPR testing to make further inferences about current levels of ballast fouling. However, without substantial particle testing of PVC samples it should not be inferred that the levels of fouling assumed by either the GPR or PVC testing are solely attributable to coal spillage.

4.6 Implications for Aurizon Network

Aurizon Network can demonstrate that its past approaches to managing ballast fouling were efficient and cost effective and has therefore not included the impairment charges in its revenue proposal for UT4.

Any decision by a statutory authority to impose a material economic impairment on the provider of a regulated service requires a particularly high evidential and procedural standard – including a need for the regulator to exercise their statutory discretion with a particularly high standard of reasonableness.

For example, reference is made to *Re Michael Ex parte Epic Energy (WA) Nominees Pty Ltd (2002) 25 WAR 511*, which related to a draft decision by the WA Independent Gas Pipelines Access Regulator to reduce the Initial Capital Base of the Dampier to Bunbury Gas Pipeline by around $1.2 billion. The Court granted the pipeline's owner, Epic Energy, relief from that draft decision. This decision was later cited by the Australian Competition Tribunal (the Tribunal) in relation to an application by the East Australian Pipeline Limited (EAPL), which also appealed (amongst other things) the determination of the Initial Capital Base:

> "The Independent Gas Pipelines Regulator adopted an ICB of approximately $1.234 billion for the purpose of calculating the Reference Tariff – ie approximately 50 per cent of the actual purchase price. The result was a Reference Tariff which would seriously affect Epic's financial return from its investment. This, in effect, wasted capital in excess of $1.2 billion by a stroke of the pen."[15]

As outlined above, Aurizon Network considers that any assessment that could result in a material impairment of its RAB should have regard to the following principles:

1. In imposing a penalty on the network provider for an action (or perceived failure to act), consideration can only be given to matters that are, or at the relevant time were, within the direct scope of responsibility of the network provider.
2. Any assessment of historical management decisions should be based on the relevant information and standards that were available at the time the decision was made.
3. The consequences of decisions made by the business should have been reasonably foreseeable at the time.

The following considers the QCA's UT3 impairment decision against each of the above principles.

4.6.1 Scope of Aurizon Network's responsibility

4.6.1.1 Aurizon Network's ability to prevent coal fouling is limited

As would be evident from the section 4.4, Aurizon Network has limited ability to directly influence key operating practices and investment decisions that can influence the level of coal fouling.

An implicit assumption in the asset impairment charges is that the forecast ballast cleaning requirements are based on previous train operations and coal fouling. That is, while future train services will contribute to the need for ballast cleaning and replacement, a large proportion of the future maintenance task is attributable to train services which have already operated. In other words, the majority of the ballast that requires corrective cleaning is already fouled. In this regard, coal spillage from wagons and infiltration into rail ballast did not represent non-conformance with an environmental or safety standard.

[15] Application by East Australian Pipeline Limited [2004] ACompT 8, para.20.

In imposing an impairment charge in UT3, the QCA was unable to point to a standard that Aurizon Network management had failed to observe or meet; nor did it provide any clear indication that management should have anticipated at the time the fouling occurred that Aurizon Network would later be penalised by a regulator for failing to observe an unstated, unknown standard.

Rather than pointing to a clear standard, the QCA's UT3 decision instead reasoned that, despite Aurizon Network's management not having control over the causes of fouling, it was nevertheless subject to a 'responsibility' (the source of which was unidentified) to ensure that ballast was not 'excessively' fouled by users of the railway:

> "The Authority accepted that not all of these (and no doubt other) possible approaches to handling the issue are in QR Network's direct control. However, as the owner of the infrastructure, QR Network has a responsibility to ensure that its ballast is not excessively fouled by users."[16]

Aurizon Network disagrees with this reasoning. It submits that its responsibility is for the safe and reliable operation of a railway, which requires that ballast performs its necessary function of providing track stability and drainage. Accordingly, Aurizon Network's responsibility is to undertake the required amount of ballast cleaning in order to ensure that ballast performs that function. It is not however, subject to some other, unspecified responsibility to be accountable for the loading or operating practices of users of the network, particularly given the absence of any legal ability of Aurizon Network to control such factors.

This view is strongly supported by the Federal Railroad Administration, which in hearings by the Surface Transportation Board on the reasonableness of the coal loss performance standards being sought by BNSF stated:

> "First, shippers of virtually every other product of which DOT [Department of Transport] is aware take steps to ensure that their property remains intact in or on rail cars during transport, either because the property has inherent value and/or because it can cause operational, safety, or other consequences if not properly secured. There is no apparent reason why coal should be any different. The fact that the dust that escapes may have little value or that historically it has presented few consequences may explain why shippers and railroads have done nothing about it for a very long time. **But that does not change the responsibility of the owner of the product being shipped to package or load the product so that it remains within the equipment being used for transport, especially if at some point consequences emerge…**
>
> …. But the properties of coal dust and the amounts in which it escapes in the PRB [Powder River Basin] region add an element beyond normal wear and tear **for which the owners of the coal dust are properly responsible**…"[17] [emphasis added]

[16] Queensland Competition Authority (2010b). pp.70-71.

[17] United States Department of Transport (2010). Reply Comments to Arkansas Electric Cooperative Corporation – Petition for Declaratory Order, Filing Number 226919 with Surface Transportation Board, pp. 5-6.

In the same proceeding, BNSF states:

> "Shippers have traditionally been responsible for loading their freight into rail cars and securing their freight so that it does not escape during transit. The fact that the railroad benefits from a shipper's responsible loading practices by avoiding harm to the railroad's property from unsecured freight does not make the railroad responsible for the costs of loading. Loading is the responsibility of the shipper, and the shipper pays the loading costs. There is no reason for special rules governing coal. Coal shippers own their coal, and they are exclusively responsible for and in charge of loading it into rail cars at the mines. Coal shippers, like all other shippers, should bear the cost of responsible loading practices that will ensure that the shipper's freight is properly secured in the rail car."[18]

It should also be noted that a stated preference by the coal shippers is that the railway owner should incur higher maintenance costs, with the Arkansas Electric Cooperative Corporation (AECC) stating:

> "New evidence and other information demonstrate that coal dust presents no greater threat to track stability on the PRB coal lines than do several other ballast foulants, so it can be treated with the same priority as the railroads have established for the other foulants, and not through extraordinary means that add unnecessary incremental costs."[19]

Aurizon Network is not, and has never been, responsible for the loading of coal wagons and supports these views. Aurizon Network's management was not aware of such an expectation of responsibility for loading practices at the QCA. Nor indeed, was management on notice of the prospect of a later impairment being imposed on the business, nor is it clear what, if anything, Aurizon Network could have done to discourage spillage.

4.6.1.2 Price signals

Noting that investment, incentives and behaviours associated with the sources and controls for mitigating coal loss in the past was predominantly attributable to coal producers, it may be argued that Aurizon Network could have provided an incentive for the effective mitigation of coal spillage via price signals.

As discussed in section 9.5 of Volume 2, the pricing principles allow Aurizon Network to price differentiate on the basis of cost or risk. Conceivably, Aurizon Network could have been able to implement tariff surcharges, which provided an incentive to reduce coal spillage or cover the incremental costs of that spillage.

However, as has been shown coal spillage is dependent on a significant number of factors and it is not clear that the surcharge would be equivalent to the cost or risk of an individual train service given losses may vary with:

- loading and unloading performance;
- moisture content of the coal;
- density of the coal; and
- transit route (noting some losses are higher in some parts of the network due to cross winds etc).

[18] BNSF Railway Company (2012). Rebuttal Evidence and Argument – Reasonableness of BNSF Railway Company Coal Dust Mitigation Tariff Provisions, Filing Number 233525 with Surface Transportation Board, p.14.

[19] Arkansas Electric Cooperative Corporation (2012). Rebuttal Evidence and Argument – Reasonableness of BNSF Railway Company Coal Dust Mitigation Tariff Provisions, Filing Number 233519 with Surface Transportation Board, p.3.

Similarly, it would also appear necessary that any surcharge, in terms of net tonne kilometres (ntk), would need to have been reasonably proportional to the cost per tonne of coal spilled. This necessitates an extremely high information burden on the service provider in order for the surcharge to be deemed reasonable. It is not clear that Aurizon Network management would have been able to successfully impose a penalty rate for trains loaded above the wagon sill, or demonstrate that such a penalty rate would promote efficiency, given the substantial uncertainty as to the sources, impacts and means of mitigating coal spillage at that time.

In the three undertaking reviews conducted since 1999, supply chain participants have not sought that Aurizon Network should submit, and the QCA should approve, a surcharge for trains which spill coal into the rail corridor relative to trains which do not. It is possible that such requests were not made as there was perceived to be no material cost advantage in investing in mitigation measures and imposing a tariff surcharge on those that do not make such an investment.

4.6.2 Assessment must be based on relevant information and standards available at the time

4.6.2.1 Understanding of coal fouling is still evolving

Aurizon Network contends that the calculation of impairment charges should be based on cost benefit analysis that considers the costs and benefits to the entire supply chain. Where benefits have accrued to other parties, the analysis should take into consideration any avoided costs to those parties.

However, cost benefit analysis is highly problematic when seeking to be applied retrospectively. As outlined above, an ex post review of decisions made historically should be limited to the information and standards available at the time. Similarly, a cost benefit analysis of a decision made in the past would need to be limited to the technology and costs relevant at that time, including the commercial and legal limitations associated with any relevant options that could have been considered at that time.

Like other rail network operators, Aurizon Network has only recently obtained a more detailed understanding of the sources of coal fouling and the state of fouling of ballast through the CQCN's Coal Dust Management Plan. That knowledge is still evolving as further research and studies are undertaken. As such, the analysis must have regard to the uncertain environment prevailing at the time those decisions were made. Imposing an obligation or performance standard based on partial or incomplete information has the potential to drive investment in wrong areas, which do not achieve the desired reduction in coal spillage in a cost effective way. This view is reinforced in the decision by the Surface Transportation Board:

> "The parties disagree whether and how a cost-benefit analysis should be utilized to determine the reasonableness of BNSF's coal dust provisions.
>
> While we believe that a general presumption that a tariff should employ cost-effective practices that are reasonably commercially available is a valid standard to be applied to the coal dust problem, the cost-benefit analysis suggested by the Shipper Interests does not fit the circumstances of this proceeding and the available evidence.
>
> In addition, as several parties have pointed out in this proceeding, **the science regarding the effects of coal dust dispersion, and its effective control, is still evolving**, and carriers continue to work with shippers on a collaborative basis to develop the methods that will achieve the optimal results in a commercially practicable manner.

> Thus, we cannot conclude that one set method of coal dust emission control—or of mitigating the effects of coal dust dispersion—is the superior method in a cost-benefit analysis, as such a conclusion may effectively lock in use of that method."[20] [emphasis added]

Aurizon Network has invested significant effort to address coal dust since the original Environmental Evaluation that resulted in the CQCN's Coal Dust Management Plan. The timeframes associated with Aurizon Network's response to coal fouling have coincided with similar issues in the Powder River Basin, where the issue of how coal spillage should be addressed is still being disputed through the Surface Transportation Board (Coal Dust II).

The following graphs show the project development by both railways as at July 2010.

Figure 12 Aurizon Network Coal Dust Management Industry Engagements

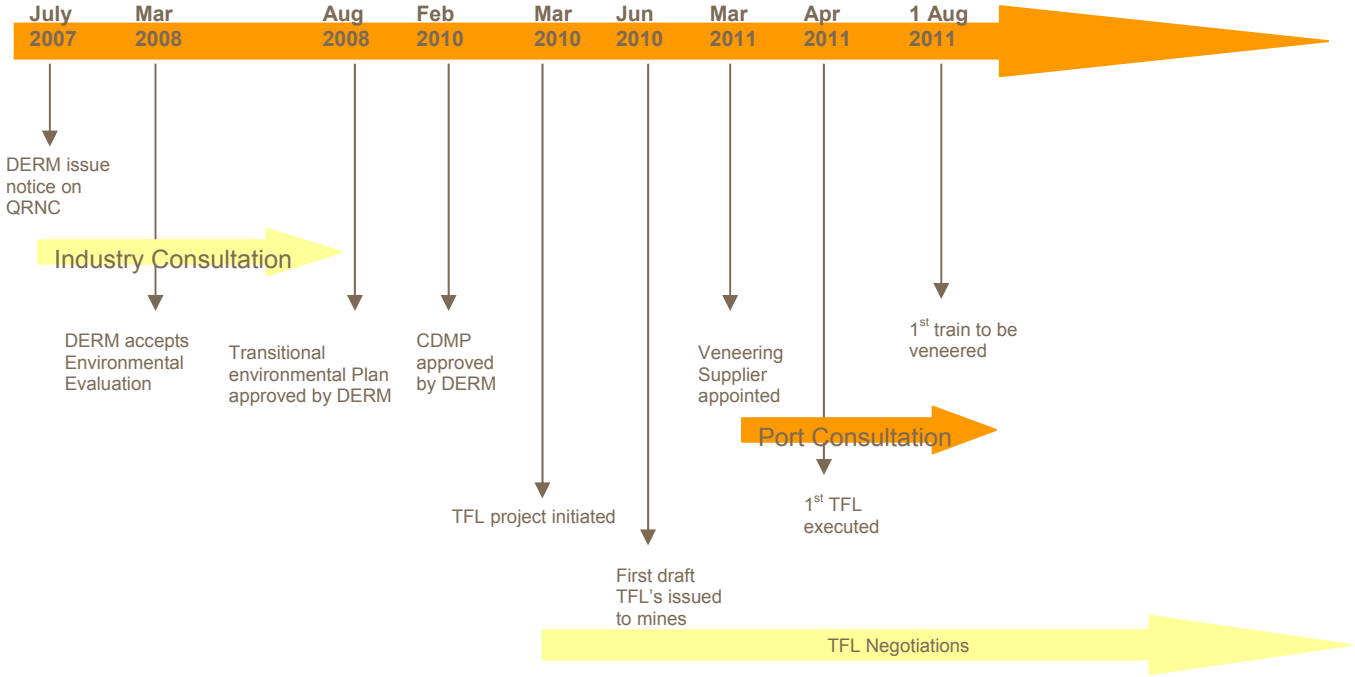
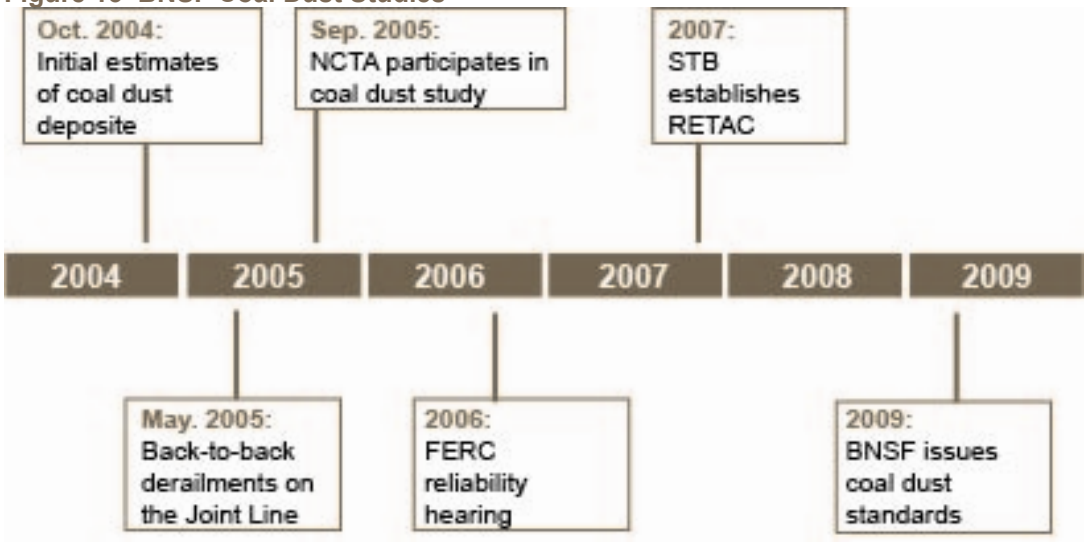


Figure 13 BNSF Coal Dust Studies



Source: BNSF Railway Company (2010). Oral arguments presented to Surface Transportation Board on 29 July 2010, FD 35305. p.14.

[20] Surface Transportation Board, Decision – Arkansas Electric Cooperative Corporation Petition for Declaratory Order, Docket Number FD 35305, March 3 2011, pp.5-6.

It is clear from the schedules that both initiatives to implement measures to mitigate coal spillage are highly dependent on the willingness of supply chain participants to agree the appropriate commercial terms necessary to ensure investment in those measures or implementation of the required operational changes. Accordingly, the evidence that Aurizon Network should be required to produce must be limited to those options that it could reasonably have pursued, while recognising the efforts that have been undertaken to address coal spillage since the Environmental Evaluation.

Aurizon Network could conceivably have sought to impose the following loading restrictions through the specification of the reference train service:

- Load to a bread loaf profile to 100 mm below sill, apply a 60 km/hr loaded speed limit and no application of surfactant.
- Load to a bread loaf profile to 100 mm below sill, apply an 80 km/hr speed limit and apply surfactant.

The difference between the two options is associated with need to reduce erosion, either through a lower train speed or the application of a veneering product. The 'without veneering' option is considered as notwithstanding the demonstrated effectiveness of current veneering products, there are reservations regarding the effectiveness of the veneering products that may have been available at the prior to 2008 and a material difference in their cost of application.

The surfactants currently being applied to coal carrying train services in the CQCR have been developed and tested to meet the rigours of rail operations. Historically, surfactants have been designed for, and applied to, static stockpiles at mines and ports and are not likely to have withstood the vibration and other forces, other than simply wind sheer, that loads would be subject to in a rail application. However, the most significant component of both options in terms of coal spillage mitigation is the effective fill to sill requirement associated with a bread loaf profile up to 100 mm below the sill. As shown in Table 21, this would lead to a reduction in coal per wagon to between 96.5 to 101.0 tonnes. A loss of capital efficiency would need to be offset through additional track and rollingstock.

In addition, Aurizon Network could have imposed an obligation for any non-compliance with this standard to be remedied before the commencement of travel. In this instance, Aurizon Network would have needed to implement monitoring measures such as laser profiling (assuming the technology existed) to identify incorrectly loaded wagons or located a monitor at the exit of each unloader to identify parasitic coal in bogeys. It is also likely that there would be similar operational disruptions to remove parasitic coal before exiting the unloading loop or leaving the loadout (even though the presence of the parasitic coal or coal above the wagon sill does not represent an unsafe condition needing to be rectified to allow the train to operate on the mainline).

4.6.2.2 Coal spillage did not provide an anticompetitive advantage

The QCA's 2010 pricing decision inferred that overfilling has occurred to provide an advantage to Aurizon Network's related above rail operator. Specifically, it noted:

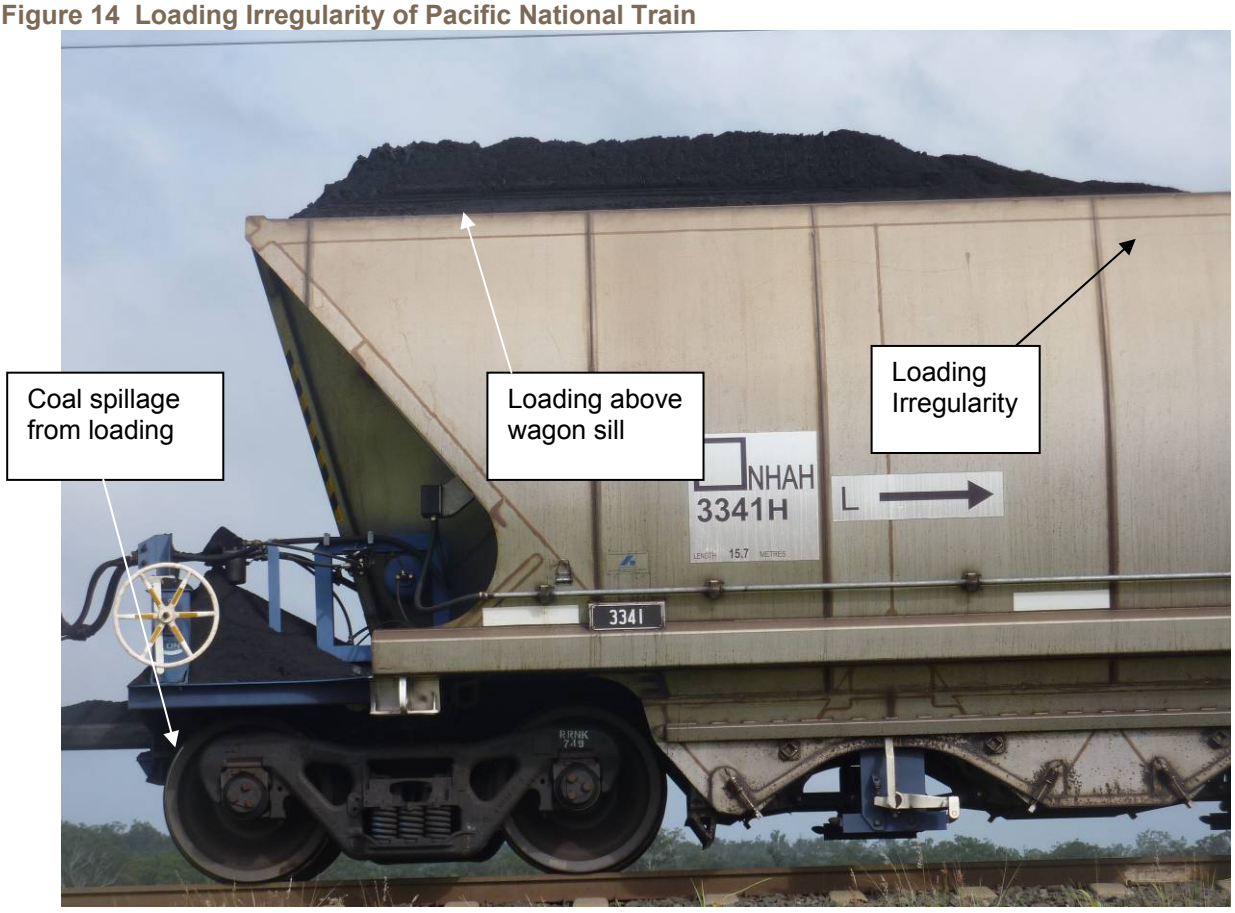
> "Alternatively, it is possible that the above-rail operator allowed its wagons to be over-filled because it did not want to purchase additional rolling-stock to meet its contract commitments. In such circumstances it is questionable why the customers of that network (i.e. the coal mines) should have

to pay for the resultant ballast-cleaning costs if the below-rail network operator allowed this over-filling and ballast fouling to occur to enable it to meet its contractual commitments."[21]

Loading practices are controlled by the coal mine themselves. Accordingly, loading practices and the loading of wagons above sill height are independent of the above rail operator. The coal producers, as purchasers of haulage services in a competitive market, will require their rail operators to maximise the capital productivity of its rolling stock and reduce the unit rate per tonne of coal shipped. It would also appear to be commercially irrational for the owner of a valuable commodity to allow an operator to avoid investment in rollingstock if it would lead to a material loss of saleable coal (with a market value of between $150 and $300 a tonne) through coal spillage in transit.

Moreover, coal spillage is not constrained to a related operator. The photo below clearly shows a Pacific National train that has been poorly loaded with an uneven load distribution and large amount of coal located on the wagon deck. This would tend to confirm that poor loading practices are not exclusive to either Aurizon Network's related operator, or to the related operator's customers, but rather a feature of a supply chain that does not discourage practices contributing to ballast fouling.

Figure 14 Loading Irregularity of Pacific National Train



Source: Aurizon Network

Any inference that Aurizon Network has allowed overfilling to occur to advantage its related operator creates some significant issues in the application of impairment charges. The practical effect is that the impairment charge represents an internalisation of the ballast cleaning costs within the vertically integrated business. As discussed previously, Aurizon Network would be entitled to price differentiate on the basis of cost or risk.

[21] Queensland Competition Authority (2010b). p.77.

The internalisation of impairment charges should therefore require the price differentiation between related and non-related operators for coal spillage.

However, given the inherent limitations in being able to measure the amount of coal lost and the incremental cost attributable to that loss, the only feasible means of differentiation would be to apply a differential performance standard requiring third party operators, and their customers, to demonstrate and achieve a 'no spillage' performance standard in order to obtain access to the declared service (if they make no contribution to the recovery of the costs of coal spilled). As such, it is essential that the QCA declare its future intentions on coal spillage, ballast cleaning and impairment charges so that the appropriate access arrangements can be established in response to those intentions.

4.6.3 The consequences of decisions must be reasonably foreseeable

Aurizon Network contends that in order for the application of asset impairment charges to be reasonably applied to it, it must have been a foreseeable regulatory outcome at the time management made the decision. As outlined above, in applying the impairment the QCA did not show that it should have been evident to QR Network's management that it would have later been penalised for a failure to observe a standard in relation to coal fouling, which in any case, was not known or specified.

The ability of management to predict the consequences of its decisions also requires the consistent application of relevant regulatory precedent. Inconsistent application of precedent creates considerable uncertainty and exposes the business to material regulatory risk.

In response to the 2010 Draft Access Undertaking the Queensland Resources Council (QRC) submitted that:

> "QRC considers that an asset write down is a preferred approach to addressing any deterioration of assets due to past maintenance failures. This write down should, at a minimum, reflect the extent to which future maintenance costs are expected to exceed efficient costs due to past practices."[22]

The QCA considered and accepted this position:

> "However, given the outstanding concerns relating to the efficiency of past ballast cleaning programs, the Authority has deducted $107 million from QR Network's asset base. This is the net present value of the difference between the ballast cleaning allowance provided by the Authority in this decision and the benchmark, ARTC ballast cleaning costs (summed over the seven years of the proposed program).This approach is not dissimilar to the approach the Authority adopted for ballast cleaning in the 2001 undertaking and that proposed by the QRC in response to the 2010 DAU."[23]

Aurizon Network does not consider the circumstances to be similar to the approach adopted by the QCA in 2001 as no past maintenance failure had occurred. The basis of the 2001 decision reflected the acknowledgement by QR that the accelerated ballast cleaning cycle was necessary as:

> "The Goonyella network is 27 years old and has carried approximately 1500 million gross tonnes. The network has not had one full ballast cleaning operation yet. QR's strategy for an annual ballast cleaning program is in its infancy. The delayed start to this programme could be seen as having delayed the maintenance until it was absolutely required."[24]

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22 Queensland Resources Council (2010). Submission in Response to: QR Network's 2010 Draft Access Undertaking – Reference Tariffs, 7 May, p.14.
23 Queensland Competition Authority (2010b). p.78.
24 Queensland Rail (2001). Response to QCA Working Paper 7, Cost Effectiveness of QR's Infrastructure Maintenance, p.11.

Since the decision in 2001 Aurizon Network has undertaken the required amount of ballast cleaning which was commensurate with:

- the condition of the asset as it existed at the time of the original DORC valuation;
- the increased train movements and therefore the reduction in the intervention cycle;
- the rate of coal spillage associated with the loading and unloading practices prevailing over that period; and
- accepted standards for maintenance intervention.

While it is feasible that the original UT1 assessment was not an accurate reflection of the level of the fouling prevailing at the time, and therefore the current asset value is not reflective of the current asset condition, this does not provide a substantiated basis for reducing the value of the RAB 'after the fact' to reflect errors in the original 2001 valuation. Importantly, it is not possible to now quantitatively assess what the actual level of ballast fouling was as at 2001 and therefore determine whether or not an error was indeed made.

The QCA has previously been firm in adopting a 'line in the sand' approach in relation to revaluation of the RAB so as not to subject the business to windfall gains and losses (which is consistent with the approach generally applied by other Australian regulators). For example, it cited this reasoning in rejecting QR's 2005 Draft Access Undertaking proposal to revalue civil and earthworks assets and include initial equity raising costs. Initial equity raising costs were not considered in the original 2001 asset valuation. However, the issue of the legitimacy of those costs only became an accepted regulatory position after that decision had been made. The QCA made this point in responding to QR's 2005 Draft Access Undertaking when it stated:

> "The Authority considered that, if it were to allow initial equity raising costs, it would reopen the entire regulatory asset base, and this would be inconsistent with the line-in-the-sand approach taken in relation to the asset base."[25]

The line in the sand approach was fully incorporated into the regulatory framework in Clause 1.4 of Schedule FB of the 2005 Undertaking, which limits the circumstances under which the QCA can reduce the value of assets contained in the RAB.

The practical effect of asset impairment charges is that they are reopening the DORC valuation of the RAB but only considering the depreciation component of the valuation, as noted in the 2000 Draft Decision:

> "This is the case in the Goonyella system, where fouled ballast has necessitated the acceleration of the ballast cleaning cycle. Consequently, the **depreciation** estimated for this system has been increased to a level commensurate with the net present value of the additional expenditure QR has indicated is required by virtue of the state of the ballast."[26] [emphasis added]

The consideration of only one element of the DORC valuation is inconsistent with the QCA's line in the sand approach. It should only be reviewed in the case of a complete reopening of the RAB for replacement cost, including consideration of other legitimate costs associated with the RAB as at 1 July 2009 (such as initial equity raising costs).

[25] Queensland Competition Authority (2005a). Decision, QR's 2005 Draft Access Undertaking, December, p.51.
[26] Queensland Competition Authority (2000). Draft Decision on QR's Draft Access Undertaking – Volume 3 Reference Tariffs, p. 161.

4.6.4 Conclusions and implications

Conclusions

In Aurizon Network's view, the costs associated with coal spillage should be treated differently. This in turn requires establishing two things. The first is assessing whether the costs of managing and treating that spillage are efficiently incurred (given that the occurrence of spillage has been a consequence of many years of historical practice by users). The second is whether the costs of implementing any performance standard Aurizon Network or the QCA seeks to subsequently impose to avoid or reduce spillage are reasonable. Importantly, any consequence must also arise from something that is within the direct control of Aurizon Network management. The assessment of the reasonableness of asset impairment charges must therefore have proper regard to the information and standards relevant to previous management decisions made in anticipation of, or response to, this issue.

There are a substantial number of options that could have reduced coal spillage, with varying trade-offs as between effectiveness, cost and impact on supply chain efficiency. Many of these have now been agreed with and being implemented within the supply chains following years of study, evaluations and negotiations. In calculating impairment charges Aurizon Network must have a clear understanding of the information required for this purpose, having regard to only the relevant facts. In particular, the analysis should have regard to the information and technology available at the time, and only consider actions that were reasonably within the control and powers of Aurizon Network as the railway manager.

The issue of relevance extends to the application of comparators. Any reliance on the use of comparators for assessing the efficiency of the ballast cleaning requirements needs to consider the material differences and cost drivers between the selected comparators. In this regard, Aurizon Network considers the Hunter Valley coal network to be a highly inappropriate comparator and that Powder River Basin railways are a closer approximation for assessing ballast cleaning requirements.

Implications

Aurizon Network submits that any assessment of historical management decisions should be limited to matters within the scope of its responsibility, be based on relevant information and standards that were available at the time the decision was made and consider the extent to which the consequences of those decisions were reasonably foreseeable at the time.

The key points that have been made in this regard are that:

- It is important to be clear about the scope of Aurizon Network's responsibility in managing coal spillage, relative to other participants in the supply chain. Aurizon Network's primary responsibility is for the safe and reliable operation of a railway, which requires that ballast performs its necessary function of providing track stability and drainage.
- Aurizon Network has limited ability to directly influence key operating practices and investment decisions that can influence the level of coal fouling. It is therefore not acceptable for it to be subject to some other, unspecified responsibility to be accountable for the loading or operating practices of users of the network, particularly given the absence of any legal ability of Aurizon Network to control such factors. Aurizon Network continues to see coal fouling as a whole of supply chain problem and accordingly is committed to continue to work with supply chain participants to address these issues via its Coal Dust Management Plan.

- The QCA's decision to impair the RAB for coal fouling is inconsistent with other decisions that it has made in the past, where it has rejected proposals to re-open the RAB because this was seen as incompatible with its 'line in the sand approach'. Regulatory outcomes must be foreseeable at the time management decisions are made. Inconsistent application of precedent creates considerable uncertainty and exposes the business to material regulatory risk.
- Asset impairment charges are inconsistent with the regulatory commitments included in approved access undertakings since 2005 to not reduce the value of the RAB. As such, Aurizon Network management could not have foreseen that the benefits accruing to coal producers in Central Queensland through loading practices and increased capital efficiency would necessarily lead to asset impairment. Such an outcome significantly increases regulatory risk, which will necessarily lead to higher costs of providing access to the declared service.

4.7 UT4 proposal

Aurizon Network acknowledges its important role in the coal chain to mitigate coal spillage by improving infrastructure and operating practices through commercial agreements and strong relationships. In addition, Aurizon Network is well placed to initiate activities to improve mitigation of coal spillage on the rail corridor. However, its ability to achieve any objectives to mitigate coal spillage requires the voluntary cooperation and investment by all participants in the supply chain. As the principal sources of coal spillage are also sources of coal dust, this cooperative and collaborative supply chain approach to reducing coal spillage into ballast will be achieved through implementation of the Coal Dust Management Plan.[27]

The preceding discussion has summarised only some of the complexity and variability of the factors relevant to the ballast cleaning requirements. Aurizon Network does not consider it reasonable that impairment charges are applied until a detailed cost benefit analysis has occurred, that gives appropriate regard to these factors but is limited to the information that was known at the time.

A cost benefit analysis requires detailed consideration of costs and benefits, not just to Aurizon Network, but to all supply chain participants. The complexity of developing this type of economic model should be readily apparent given that Aurizon Network would require cost inputs regarding the investment and operational changes that would need to occur across the supply chain. Consideration also needs to be given to the impact of fouling on network availability, which is primarily via maintenance possessions required for ballast cleaning and temporary speed restrictions.

As many of the variables would need to be estimated, particularly in relation to ex-post costs, the analysis will incorporate some subjectivity and therefore the potential for disagreement among stakeholders. Indeed, given that ultimately the issue relates the apportionment of liability for ballast cleaning or mitigation between participants in the supply chain, the incentive of users to attempt to game the system to reduce their own individual costs would be high.

Aurizon Network considers that the impairment charges calculated in UT3 are not commensurate with evidential standards, nor consistent with the reasonable exercise of discretion. The decision was made in the absence of an analysis of the relevant costs and benefits within the supply chain of fouling remediation or the incentives and behaviours of all elements of the chain. As such, the impairment charges calculated in UT3 are not consistent with the QCA Act, nor representative of good regulatory practice, and should therefore be revisited in UT4.

[27] QR Network (2010c). Coal Dust Management Plan, http://www.aurizon.com.au/InfrastructureProjects/Rail%20Network/Coal_Dust_Management_Plan.pdf

Given the absence of such analysis in UT3, and the unreasonableness of Aurizon Network bearing an impairment cost without a cost benefit analysis having been undertaken, Aurizon Network has included a $43 million adjustment to the UT4 allowable revenue to recover the net costs associated with the impairment charges and the ballast undercutting costs incurred over UT3.

The workings of these adjustments are detailed in the table below. The actual UT3 undercutting costs are consistent with the QCA's derivation of the undercutting allowance, with a return on plant of 9.96% and a 5.75% margin on direct labour costs.

Table 23 UT4 Impairment Charge Adjustments ($ million)

	2009-10	2010-11	2011-12	2012-13
QCA Approved Undercutting Allowance	29.0	40.2	48.2	49.2
Impairment Charges	--	**23.5**	**23.0**	**22.4**
Net Undercutting Allowance	29.0	16.7	25.2	26.8
UT3 Undercutting Costs	27.5[(a)]	32.2[(a)]	36.8[(a)]	40.5[(f)]
UT4 Adjustment Amounts	(1.5)	15.4	11.6	13.7
UT4 Adjustment Amounts $2012/13	(1.8)	18.7	12.8	13.7
Total UT4 Adjustment (at 30 June 2013)				**43.4**

[(a)] Actual, [(f)] Forecast

The total UT4 adjustment of $43.4 million is the sum of the adjustment amounts in each year, in 2012/13 dollars.

As noted in the above discussion, the calculation of impairment charges based on a 'complete' cost benefit analysis would be information-intensive and need to consider a substantial number of costs and factors. Should stakeholders consider that Aurizon Network has obtained a benefit for which it should make some contribution, or is expected to incur inefficient maintenance costs from not seeking to impose additional costs on the supply chain, then Aurizon Network considers it reasonable that stakeholders should be willing to fund the necessary studies required to undertake that cost benefit analysis.

During the UT3 period, Aurizon Network has sought guidance from the QCA as to the matters and information it considers relevant to conducting the cost benefit analysis. Aurizon Network is willing to engage in dialogue with the QCA and relevant stakeholders during the UT4 period to undertake the analysis the QCA considers necessary.

In order to inform this dialogue, Aurizon Network commissioned Evans and Peck to prepare a summary of the engineering studies, included in Annex K, which would be necessary to establish the following facts:

- Relevant proportion of sources of coal spillage.
- Rate of coal spillage and contributing factors to those sources, including environmental factors.
- Evaluation of the effectiveness of the mitigation measures, including impact on fouling rates.
- Availability and effectiveness of toppers available since 2001.
- Capital and operating costs of veneering stations, including mine water supply costs and integration into loadout.

- Cost of implementing the relevant mitigation, including both capital and operating costs.
- Lost coal sales volumes associated with implementation of mitigation measures and investment lead times.
- Contribution of coal as a foulant relevant to other sources of fouling.
- Capacity losses associated with the relevant mitigation strategy and the additional track and rollingstock infrastructure required to offset volumetric constraints.
- Impact of prevailing train operations since 2001 on the infrastructure standard and condition relevant to the original asset valuation.
- Capacity losses directly attributable to ballast cleaning activities.
- Determine the contribution coal spillage has towards speed restrictions, through both econometric and engineering based approaches.
- Costs and supplementary processing requirements associated with a three inch coal processing size.
- Methods of monitoring compliance with loading performance standards and operational disruptions attributable to the issuance of a notice to remedy.
- The costs of wagon washing facilities and waste disposal at each unload point and any resultant increased rollingstock maintenance requirements arising from corrosion and/or bearing contamination.
- The normalised ballast undercutting requirements, and therefore the net savings to industry, associated with implementation of any relevant mitigation.

The key findings from this report are:

1. the compromising of the ability of a track system to perform its function by various contaminants is a complex interaction involving many considerations;
2. considerable research exists on this and related subjects;
3. the ability to leverage this research is limited due to the site specific and contextual nature of the problem; and
4. an alternative is to use a number of control sites and GPR technology under a well considered program to obtain empirical data.

These findings are consistent with Aurizon Network's concern that in order to derive a reliable and robust conclusion on the efficiency of train services operated in the past, an assessment of the costs and benefits of these operations would be extremely costly and complex. Of particular importance is that to obtain empirical data on both the sources of coal fouling and the success of mitigation measures, it would be necessary to establish control sites that would allow for testing and evaluation. This would presumably also require the operation of train services over the control sites that do not include effective coal spillage mitigation measures. This would need to be done over a sufficiently long timeframe to establish trend data. Importantly, operation of such services would be inconsistent with the objectives of coal dust management. That is, implementing this study would contravene Aurizon Network's environmental commitments under the approved Coal Dust Management Plan.

Otherwise, Aurizon Network remains committed to working with all participants in the supply chain to identify and implement commercially effective measures to reduce the impact of coal spillage on rail infrastructure and service quality, while seeking to support a competitive and productive Queensland coal industry operating within the inherent limitations of a narrow gauge railway, formation standards and regional metrology.

5 Other UT3 Revenue Adjustments

Aurizon Network has made a number of ex post adjustments to UT3 revenues for capital and operating expenditure. These are as follows (all amounts are as at 1 July 2013):

- Finalisation of the UT3 capital expenditure carryover account balance, which is $110.6 million.
- An adjustment for actual audit costs, which were higher than the forecast included in the UT3 operating expenditure allowance. This requires an increase in revenue of $248,280.
- Compensation for the cost of the End of Period assessment that Aurizon Network was required to undertake under Schedule A of the 2010 Undertaking, the costs of which were not included in the UT3 operating expenditure allowance. This amount is $636,000.
- Compensation for Gladstone Area take or pay amounts that Aurizon Network agreed to waive, being $1.744 million.
- An adjustment for the outcome of a take or pay dispute, which meant that Aurizon Network under-recovered revenue in 2010/11 and 2011/12. The NPV of this adjustment is $4.3 million.

5.1 Scope

There are a number of adjustments that need to be made for capital and operating expenditure. These are:

- reconciliation of actual UT3 capital expenditure against forecast;
- reconciliation of actual versus forecast audit costs;
- compensation for the cost of the End of Period Assessment of network condition, which was not included in the UT3 allowance;
- adjustments for Gladstone Area take or pay; and
- adjustments for the outcomes of a take or pay dispute that arose during UT3.

5.2 UT3 capital expenditure

In approving the UT3 reference tariffs the QCA accepted a capital expenditure forecast over the UT3 period of approximately $1.1 billion. These amounts are referred to as the Capital Indicator. Clause 4 of Schedule A of the 2010 Undertaking includes a requirement for Aurizon Network to reconcile the amounts included in the Capital Indicator against those amounts approved by the QCA for inclusion in the RAB.

Clause 4 requires Aurizon Network to record these differences in a Capital Expenditure Carryover Account, with the balance of this account at the end of the regulatory period reflecting the net present value of the difference between:

- revenues 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.

As the final capital expenditure amounts either claimed or to be claimed for the UT3 period are not yet approved by the QCA, the UT4 revenues are adjusted to reflect the forecast balance of the Capital Expenditure Carryover Account. The 2013 Undertaking includes appropriate provisions to allow for adjustment of revenues to reflect the difference between the forecast balance and the final balance approved by the QCA.

In September 2012 Aurizon Network submitted a draft amending access undertaking for the proposed GAPE reference tariff. In developing the proposed GAPE reference tariff Aurizon Network also proposed an increase in the approved UT3 Capital Indicator. As the proposed GAPE reference tariff has not been approved by the QCA, the forecast Capital Expenditure Carryover Account has been determined having regard to the proposed increase in the Capital Indicator.

The section summarises the calculation of the forecast balance of the Capital Expenditure Carryover Account.

5.2.1 Approval process

Aurizon Network submits an annual capital expenditure report to the QCA for approval. The approved amounts are then rolled into the RAB at the commencement of the next regulatory period.

The amounts approved for the first two years of the UT3 period were as follows:

- 2009/10: $282.2 million
- 2010/11: $119.5 million.

Reference is made to the QCA's website for further information regarding the details of the claims and the QCA's assessment.

Aurizon Network lodged its 2011/12 claim for approximately $1.193 billion in November 2012. A majority of this claim relates to GAPE and the Blackwater feeder station project. The QCA has engaged external consultants to review the claim and this assessment is expected to be completed in the period of May to June 2013.

The 2012/13 Capital Expenditure Report will be submitted in the latter part of 2013 as required under clause 9.3.1 of the 2010 Undertaking.

5.2.2 Reconciliation of Capital Carryover Account

The approved Capital Indicator for UT3 is shown below, inclusive of additional amounts proposed for GAPE.

Table 24 Approved Capital Indicator for UT3 ($'000)

System	2009/10	2010/11	2011/12	2012/13	Total
	Forecast	Forecast	Forecast	Forecast	Forecast
Non-Electric					
Blackwater (incl Rolleston & Minerva)	62,700	33,100	28,200	25,300	149,300
Goonyella (incl Hail Creek & Vermont)	289,700	47,500	55,800	21,400	414,400
Moura	1,600	8,600	3,600	1,300	15,100
Newlands	1,300	2,400	42,200	1,500	47,400
GAPE (incl GSE)	0	0	941,990	41,816	983,806
Total Non-Electric	**355,300**	**91,600**	**1,071,790**	**91,316**	**1,610,006**

System	2009/10	2010/11	2011/12	2012/13	Total
Electric					
Blackwater	15,500	80,700	149,300	51,100	296,600
Goonyella	57,200	13,400	24,900	44,400	139,900
Total Electric	**72,700**	**94,100**	**174,200**	**95,500**	**436,500**
Summary					
Total CQCR	**428,000**	**185,700**	**1,245,990**	**186,816**	**2,046,506**

Aurizon Network's capital expenditure for UT3 is expected to be as follows.

Table 25 Capital expenditure for UT3 ($'000)

System	2009/10 Actual Approved	2010/11 Actual Approved	2011/12 Submitted	2012/13 Forecast	Total Forecast
Non-Electric					
Blackwater (incl Rolleston & Minerva)	57,030	9,949	33,075	67,247	167,301
Goonyella (incl Hail Creek & Vermont)	170,312	88,098	37,437	72,060	367,905
Moura	2,200	687	1,894	2,235	7,017
Newlands	750	1,600	42,200	7,935	52,485
GAPE (incl GSE)	--	--	824,540	71,331	895,871
Total Non-Electric	**230,292**	**100,334**	**939,146**	**220,808**	**1,490,579**
Variance	**(125,008)**	**8,734**	**(132,644)**	**129,492**	**(119,426)**
Electric					
Blackwater	6,132	268	190,317	7,485	204,203
Goonyella	45,788	18,922	3,665	223	68,598
Total Electric	**51,920**	**19,190**	**193,982**	**7,708**	**272,800**
Variance	**(20,780)**	**(74,910)**	**19,782**	**(87,792)**	**(163,700)**
Summary					
Total CQCR	**282,212**	**119,523**	**1,133,128**	**228,516**	**1,763,379**
Variance	**(145,788)**	**(66,177)**	**(112,862)**	**41,700**	**(283,126)**

Note: Row totals may not sum due to rounding

As shown in Table 25, Aurizon Network will marginally underspend against the Capital Indicator. The key variations between the Capital Indicator and the UT3 capital expenditure are:

- the QCA's reduction of $24 million in the Jilalan project costs to be included in the RAB; and
- the deferral of capital renewals into UT4. In this regard the UT3 capital renewals estimate was estimated with reference to the original approved volume forecasts. The table below shows the material variance between these volume forecasts and system throughput for the Blackwater and Goonyella systems. Accordingly, it was prudent to defer some renewals expenditure associated with the extension of the useful lives attributable to the lower the expected volumes.

Table 26 UT3 Approved Volume Forecasts and System Throughput (Million tonnes)

System	2009/10	2010/11	2011/12	2012/13	Total
Approved[28]					
Blackwater	58.2	63.1	64.6	64.6	**250.5**
Goonyella	90.0	112.4	124.9	124.9	**452.2**
Actual[29]					
Blackwater	58.1	49.8	52.1	57.7	**217.7**
Goonyella	90.5	88.5	83.0	99.0	**361.0**
Variance					
Blackwater	-0.1	-13.3	-12.5	-6.9	**-32.8**
Goonyella	0.5	-23.9	-41.9	-25.9	**-91.2**
Total	**0.4**	**-37.2**	**-54.4**	**-32.8**	**-124.0**

The Capital Expenditure Carryover Account records the difference between the deprecation and return on assets assumed for the Capital Indicator and the depreciation and return on assets applicable to the actual approved capital expenditure during the UT3 period. The balance recorded in the Capital Expenditure Carryover Account will include:

- a return on capital component, calculated as the difference between the return on capital assumed for the Capital Indicator and the return on capital that should have applied for the approved Capital Expenditure, accrued at the discount rate;
- a depreciation component, calculated as the difference between the depreciation assumed for the Capital Indicator and the depreciation that should have applied for the Approved Capital Expenditure; and
- a tax depreciation component, calculated as the difference between the tax depreciation assumed for the Capital Indicator and the tax depreciation that should have applied for the Approved Capital Expenditure.

The balance will also be calculated using the modelling parameters and assumptions used to determine the reference tariffs.

Based on the difference between the approved Capital Indicator and the actual capital expenditure for UT3, noting that the last two years' actual expenditure are still subject to approval, the forecast balance of the Capital Expenditure Carryover Account as at 1 July 2013 is as follows.

Table 27 Forecast Capital Carryover Account balance as at 1 July 2013 ($'000)

System	$'000
Non-Electric	
Blackwater (incl Rolleston & Minerva)	(9,123)
Goonyella (incl Hail Creek & Vermont)	(45,771)
Moura	(3,060)
Newlands	(232)
GAPE (incl GSE)	(13,212)
Total Non-Electric	**(71,398)**
Electric	
Blackwater	(26,660)
Goonyella	(12,589)
Total Electric	**(39,249)**
Summary	
Total CQCR	**(110,647)**

[28] Queensland Competition Authority (2010b). Draft Decision, QR Network's 2010DAU – Tariffs and Schedule F, p.57. http://www.qca.org.au/files/R-2010DAU-QCA-DraftDecReport-0610.pdf

[29] QR Network, 2009-10 to 2011-12 Operational Data Reports and 2012-13 System Forecasts.

While the UT3 capital expenditure was not materially different from the approved Capital Indicator a contributing factor for the quantum of Capital Expenditure Carryover Account balance is the difference in the timing of the capex. This includes:

- the slippage in the commissioning date of the Coppabella to Ingston duplication from 2009/10 to 2010/11;
- the slippage in the commissioning date of the Wycarbah and Raglan feeder stations; and
- the QCA setting aside of the GAPE early works and subsequent shifting of those costs from the Goonyella system to the Goonyella to Abbott Point system.

The total amount of $110.6 million is an over-recovery of revenue that will be recovered via the UT4 reference tariffs.

5.3 Reconciliation of audit costs

The operating costs submitted by Aurizon Network in September 2008, which also formed the basis of the approved UT3 allowable revenues, were predicated on the regulatory obligations included in the 2008 Draft Access Undertaking.

One of these obligations was the annual regulatory compliance audit. The forecast auditing costs included in the proposed operating expenditure forecast were based on costs previously incurred by Aurizon Network in the performance of its previous obligations. These obligations changed materially in the approved 2010 Undertaking, without a commensurate increase in the operating cost allowances.

The following table shows the actual and forecast cost of regulatory compliance audits for the UT2 and UT3 periods.

Table 28 Regulatory Compliance Audit Costs ($)

Audit Year	2007-08	2008-09	2009-10	2010-11	2011-12
Invoice Year	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**
UT2 Obligations Actual	40,306	77,955	60,750	--	--
CPI Escalated Forecast		59,131	60,609	62,124	63,677
UT3 Obligations Target Cost*	--	--	--	181,683	180,320
Variance	--	--	--	$119,559	$116,643
Total UT4 Adjustment (at 30 June 2013)					**248,280**

* Under the terms of the transition provisions the UT3 regulatory compliance audit obligations did not take effect until 2010-11. Excludes cost overruns associated with audit recommendations of $63,000 and $71,000 for 2011/12 and 2012/ 13 respectively.

The allowable revenue for 2013/14 has been increased by $254,487 ($248,280 plus 2.5% CPI escalation) to reflect the costs variance for 2011/12 and 2012/13.

5.4 UT4 End of Period Assessment costs

The QCA's Final Decision for the 2010 Undertaking required the inclusion of a new obligation on Aurizon Network to undertake periodic condition-based assessments. The optimisation provisions in Clause 1.4 of Schedule A were also amended to allow:

> "…the value of the asset base to be reduced in the event that a condition based assessment identifies that asset values have deteriorated due to QR Network's maintenance, operating or asset renewal policies."

The inclusion of these provisions in the Undertaking was on the expectation that:

> "The condition-based assessment will take place in a timely manner and the cost of the assessments will be paid for by QR Network. QR Network will ultimately recoup the cost of the assessment through the QCA levy."[30]

Following approval of the 2010 Undertaking it was apparent that the Queensland Competition Authority Regulation, which provides for the recovery of the QCA Levy, would not allow for the recovery of costs incurred by Aurizon Network through that pricing mechanism. Accordingly, Aurizon Network has been required to undertake the End of Period Assessment (required six months prior to the terminating date) on an unfunded basis.

The cost associated with the completion of the End of Period Assessment by the Assessor in 2012/13 is $636,000. The present value of this amount has been included in the 2013/14 MAR.

5.5 Gladstone Area take or pay

QR Network submitted the 2011/12 Revenue Cap Adjustment Amounts to the QCA on 30 October 2012.[31] In that submission, QR Network noted that it has billed take or pay differently to the take or pay amounts used to determine the Total Actual Revenue under the revenue cap, to allow for the transfer of Train Service Entitlements (TSEs) between the RG Tanna and Barney Point coal terminals. It stated that it would seek to recover the difference between these two amounts through separate correspondence with the QCA.

5.5.1 Background

Historically, the destination for TSEs for the RG Tanna and Barney Point coal terminals has been defined in access agreements as 'the Gladstone Area'. This largely reflected the single terminal manager model and the common port entitlement, where the port berthing and stockpiling were interchangeable between the two terminals to optimise terminal efficiency.

On 24 December 2009 the Gladstone Ports Corporation Limited and Others formally sought an authorisation from the Australian Competition and Consumer Commission to make contracts, arrangements or understandings between the applications associated with the closure of the Barney Point coal terminal. The application notes in paragraph 1.3:

> "As a consequence of complaints from the residents of Gladstone about noise and coal dust pollution from Barney Point, in 2006, GPC undertook to close Barney Point as a coal terminal".[32]

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30 Queensland Competition Authority (2010d). Final Decision, QR Network's 2010 DAU, September, p.173.
31 QR Network (2012). QR Network Access Undertaking (2010), Revenue Adjustment Amounts (2011/12 Revenue Cap), September.
32 Gladstone Ports Corporation Limited & Others (2009). Submission to the Australian Competition and Consumer Commission in support of application for authorisation [A91208] pursuant to s88 of the Trade Practices Act, December, p.3.

5.5.2 Train Service Entitlements

In light of the potential closure of the Barney Point coal terminal, Aurizon Network discontinued the practice of contracting for new or renewed access rights for the Gladstone Area. Instead, TSEs were defined by reference to a specific destination. If Aurizon Network had continued the practice of grouping Gladstone Area destinations, then following closure of the Barney Point coal terminal the contracted TSEs for the Gladstone Area would exceed the capacity of the RG Tanna coal terminal.

The development of new coal terminals, such as the Wiggins Island Coal Terminal, also necessitated the specification of TSEs on a defined origin to destination basis to provide contractual and scheduling certainty associated with the development of these additional terminals. Contracting below rail TSEs on an origin to destination basis is consistent with the practice in other coal systems and the QCA's direction that the requirements for breach or negligence in the revenue cap adjustment should reflect an obligation on Aurizon Network to provide services on an origin to destination basis.

However, this does create a different take or pay outcome as between access holders whose access agreement specifies the destination as 'the Gladstone Area' and those whose access agreement specifies the destination as an individual coal terminal. This in turn has consequences for revenue cap adjustments.

Where an access holder with TSEs specifying a single port destination schedules train services to a different destination, the practical effect is that the port entitlement has been consumed but the below rail entitlement has not as the service which operated is ad-hoc, on the basis it was not scheduled or operated in accordance with the TSE. In this circumstance, the access holder whose agreement specifies the Gladstone Area as the destination is not subject to take or pay (due to the terminal operator's berthing decision) but the access holder with the destination specified as the individual coal terminal may be liable for take or pay (subject to the system forecast trigger and capping).

Accordingly, Aurizon Network considers that it is reasonable to take measures to redress this different outcome between access holders where end users have fundamentally the same port entitlements.

5.5.3 Revenue Cap Adjustments

The revenue cap provisions do not provide Aurizon Network the commercial discretion to satisfactorily address this issue. In calculating the revenue cap adjustment amounts in section 3.2 of Part B Schedule F of the 2010 Undertaking, clause 3.2.3(b) requires that Total Actual Revenue will comprise:

> "The amount of any Take or Pay amounts … which QR Network is **entitled to be paid** in relation to Access Agreements for coal carrying Train Services on the Individual Coal System Infrastructure calculated on the basis that QR Network is deemed to have contracted on the terms of the relevant Standard Access Agreement…" [emphasis added]

Pursuant to the requirement to calculate take or pay in accordance with the amounts Aurizon Network is *entitled* to earn, the revenue cap adjustment amount for the Blackwater system relevant to the 2011/12 year was calculated on the basis of the TSEs in the relevant access agreements. Where a TSE was specified as either RG Tanna or Barney Point (contracted destination) and the access holder also utilised the other coal terminal in the Gladstone Area, these train services were not offset or credited towards the calculation of the take or pay amounts for the contracted destination. This also means that in determining Total Actual

Revenue for the purpose of revenue cap adjustments, it is assumed that Aurizon Network has collected take or pay on those TSEs that were actually operated to the other terminal in the Gladstone Area.

Aurizon Network considers that a reasonable commercial solution to the problem is to allow access holders whose TSEs are specified as a single origin in the Gladstone Area (either Barney Point or RG Tanna) to offset or credit services that were operated to the other terminal for the purpose of take or pay. This would put these access holders on the same footing as other access holders whose access agreements specify a Gladstone Area TSE, where both sets of access holders have fundamentally the same port entitlements.

If Aurizon Network agrees to waive its entitlement to take or pay for access agreements where the access rights are specified as either Barney Point or RG Tanna (rather than the Gladstone Area) then it will be financially disadvantaged because the revenue cap adjustment amounts will be calculated on a higher Total Actual Revenue than it actually receives (because it will assume that take or pay was actually collected). The amount of this financial disadvantage represents the difference between:

- the take or pay amounts that Aurizon Network was actually entitled to collect based on the current TSE specification in the access agreements; and
- the amounts it would have been entitled to earn had *all* access agreements for the RG Tanna and Barney Point coal terminals been specified as the Gladstone Area.

This has been calculated for the 2011/12 year and is presented in the following table.

Table 29 Reconciliation of Gladstone Area take or pay ($'000)

Blackwater coal system (2011/12)	
Take or Pay Entitlements	6,053
Take or Pay if all RG Tanna and Barney Point Entitlements specified as Gladstone Area	4,309
Difference	**1,744**

Due to the high proportion of UT1 access agreements in the Blackwater system, the take or pay amounts under the relevant UT2 or UT3 agreements are uncapped. As a consequence, no other access holder's take or pay amounts would differ between calculating take or pay on the basis of TSEs and the treatment of the Barney Point and RG Tanna coal terminals as a common destination.

5.5.4 Addressing the financial disadvantage

Aurizon Network has not fully invoiced the take or pay amounts it is entitled to earn for 2011/12 and has agreed to waive the difference of $1.744 million.

Aurizon Network considers the most efficient and fairest means of addressing this financial disadvantage associated with waiving take or pay amounts it is entitled to earn (or a determination by an independent expert which requires take or pay to be calculated under an access agreement on a basis which differs from that used to determine previous revenue cap adjustment amounts), would be to include the net present value of the difference in the revenue it should earn under the relevant agreements and what it did actually earn in the relevant System Allowable Revenues for 2013/14.

This approach also avoids the regulatory uncertainty and complexity of seeking to recalculate the take or pay and revenue cap adjustment amounts for previous periods, particularly for access holders whose access rights are not related to the Gladstone Area.

5.6 Take or pay dispute

During the course of UT3, an access holder disputed the amount of take or pay charged in its 2010/11 invoice. The parties agreed to refer the dispute to an expert for determination. The parties proceeded on the understanding that the determination would also be applied to the calculation of take or pay for the 2011/12 financial year.

The expert determined that take or pay had not been correctly calculated in the relevant year. A copy of the expert's report has been provided to the QCA on a confidential basis.

To comply with the expert's determination, Aurizon Network has amended the access holder's take or pay invoices for the 2010/11 and 2011/12 financial years, and the amount of take or pay Aurizon Network is entitled to earn under the relevant agreement is reduced. This results in a shortfall in the recovery of System Allowable Revenue for the 2010/11 and 2011/12 financial years.

The QCA has already considered and approved revenue cap adjustments for the 2010/11 and 2011/12 financial years. The 2010 Access Undertaking does not contain a mechanism for review of revenue cap adjustments to take into account the reduced take or pay amount to be charged as a result of the dispute.

It is appropriate that Aurizon Network recover the shortfall against System Allowable Revenues for the 2010/11 and 2011/12 financial years. While the resolution of this dispute was protracted, owing to the nature and complexity of the issues in dispute, both parties proceeded in good faith to endeavour to resolve the questions arising, first through negotiation, and then through expert determination. Aurizon Network ought not, as a consequence, be penalised through non-recovery of amounts it would otherwise be entitled to recover if the dispute had been determined within the relevant financial year.

The amount of take or pay Aurizon Network is entitled to earn under the access agreement in question is properly calculated by reference to the methodology as determined by the expert. These are not circumstances where Aurizon Network has failed to collect take or pay to which it is entitled. The agreement, including the dispute resolution provisions under which the expert determination was made, is in the form of the standard UT2 access agreement. The access agreement provides that, in the absence of manifest error, the expert's determination is binding on the parties to the agreement.

As the amounts relate to the revenue cap adjustment amounts which would have been recoverable in the 2012/13 and 2013/14 financial years, Aurizon Network has included NPV adjusted variations to the approved revenue cap adjustment amount, and therefore System Allowable Revenue, applicable to the 2013/14 financial year. The following table sets out the proposed adjustments:

Table 30 Variation to 2013/14 Blackwater Revenue Cap Adjustment Amount ($ millions)

Relevant Year	Disputed Amounts Included in Total Actual Revenue	Amounts Entitled to be Included in Total Actual Revenue	Variance	NPV Adjustment to 2013/14 Revenue Cap Adjustment
2010/11	4,166,170	2,220,711	1,945,459	2,352,401
2011/12	3,936,290*	2,189,722	1,746,568	1,920,570
Total	**8,102,460**	**4,410,433**	**3,692,027**	**4,272,971**

* Excludes $410,722 adjustment for Gladstone Area Take or Pay Amounts included in Table 29.

6 Return of Capital

The UT3 approach to depreciation caps the economic lives of assets included in the RAB after 1 July 2009, but not assets installed prior to this. Aurizon Network does not consider that this results in an efficient pricing outcome, recognising:

- the complexities of maintaining a different treatment for pre- and post-1 July 2009 assets, noting that this distinction will become less relevant through time;
- the increased uncertainty regarding the longer term demand outlook, which could also result in an outcome for Aurizon Network that is NPV negative if it is unable to recover the full return on and of capital invested;
- that the installation of new network capacity now (for example, in response to increased mining extraction rates) has the potential to absorb what would become replacement demand for the existing infrastructure in future years;
- that it is not sustainable to rely on recovering more capital in later years and/or when the probability of asset stranding risk has materially increased (noting that this is not compensated via the WACC), recognising that the industry is likely to be most profitable in its earlier years, given the tendency to extract more economic reserves first.

Aurizon Network has therefore evaluated a number of different approaches to depreciation to address the above. In order to ensure that prices are economically efficient and provide adequate incentives to invest, it is proposing to apply a 25 year life to all assets (pre and post 1 July 2009), which is based on an analysis of weighted average mine lives (consistent with the method applied in the Hunter Valley). The resulting allowance for UT4 is as follows.

Proposed UT4 depreciation allowance ($'000 unsmoothed)

2013/14	2014/15	2015/16	2016/17
269,692	291,121	346,457	348,587

While the changes to the profile of the depreciation charge on existing assets will have a substantial impact on Aurizon Network's asset stranding risk, the resulting impact on reference tariffs will be quite modest, with the impact of the change to a more efficient and workable methodology only increasing the total MAR by less than 1% over the term of UT4.

Aurizon Network considers that the longer term demand outlook remains positive, albeit uncertain. Regardless of the immediate demand outlook, this UT4 proposal will result in an approach that is more compatible with the market environment, and consistent with the objectives of the QCA Act.

6.1 Framework issues

6.1.1 Role of depreciation and legislative requirements

Investors that provide capital for the provision of infrastructure assets expect to recover both the original capital that they have provided and a return on that capital commensurate with the investment risk. This reflects the fundamental regulatory compact underpinning regulation of monopoly infrastructure - that the regulated business can reasonably expect to recover investments that are made to meet the demand of users.

This expectation is reflected in s 168A(a) of the QCA Act which provides 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…"

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.

In previous assessments of QR Network's access undertakings, the QCA has explicitly stated that it considers, as a fundamental regulatory principle, that the net present value of the future cash flows should equal the opening asset value of the assets.[33] That is, that a business should be able to expect to have its investment returned and to earn a reasonable, risk adjusted rate of return on the funds invested.

Similar to many other infrastructure assets, rail infrastructure assets have no alternate use outside their use for the provision of rail access services. Once no longer required for this purpose, the only remaining economic value of the infrastructure assets is the salvage value of the component parts net of the costs of recovery and remediation, the value of which is extremely low compared to the cost of installing the assets. There is, therefore, no realistic prospect of recovering the cost of rail infrastructure assets once they are no longer used for rail access services, either because there is no demand for the services it can provide or because the asset itself deteriorates such that it can no longer provide those services. Hence, the recovery of the initial investment in rail infrastructure assets must occur while the asset is used and useful.

6.1.2 Approaches to assessing depreciation

Depreciation has sometimes been described as the charge for the periodic consumption of the capital services provided by the asset. It is important to distinguish between physical depreciation and economic depreciation. Physical depreciation refers to the physical "wear and tear" of the assets and represents a physical decline in the ability of the assets to produce useful services. Economic depreciation, in contrast, refers to the decline in the ability of an asset to provide a service of value.

While physical depreciation can "explain" economic depreciation, it is possible that economic depreciation can occur without any physical depreciation. For example, a network that services (and only services) a single coal mine could have a minor physical depreciation over time due to network usage; however, if the coal mine closes down, the value of the network will become zero and thus experience very high economic

[33] Queensland Competition Authority (2005b). Draft Decision, QR's 2005 Draft Access Undertaking, July, p. 6.

depreciation. Therefore, when assessing change in the value of assets, the economic aspects of value should be treated as being as important as the physical aspects.

A key implication of this is that the lives ascribed to Aurizon Network's rail infrastructure assets for the purpose of calculating depreciation must reflect the shorter of the physical or the economic lives of the assets, where economic life is determined as the period over which the rail access services continue to be required. Determining depreciation over the shorter of the physical or economic lives of the assets is a longstanding tenet of Aurizon Network's (and its predecessor's) access undertakings, with this principle being reaffirmed by the QCA in UT1[34], UT2[35] and UT3[36].

Beyond this, it is necessary to consider how depreciation charges are incurred over the life of the asset. For some classes of assets, economic depreciation – that is the reduction in the value of the asset on a period by period basis - can be precisely determined. By way of example, the change in the value of a car can be easily and relatively accurately determined by reference to the market value of used cars of particular type, age, condition and mileage. The prices for the use of the services of that car over the relevant period should recover that change in value as economic depreciation. Generally, economic depreciation on assets that are not sunk can be determined in this way.

However, as noted above, rail infrastructure assets are typically sunk and cannot readily be sold once deployed. There is little or no evidence that can be used to observe the period by period decline in economic value of these assets over their lives. While it is possible to form a view on a periodic market price of the assets (being the price that a party should be prepared to pay for the rail infrastructure assets), this value will reflect the future revenue that is expected to be earned from rail access services. This will in turn be driven by the expected regulatory environment and, in particular, the extent to which capital recovery can be included in future prices. Seeking to assess the extent to which economic depreciation should be reflected in access charges by reference to the change in market value of the rail infrastructure, which is in turn based on the expected future access revenue, is therefore circular.

Given the absence of an observable change in the value of Aurizon Network's assets (reflecting both physical and economic aspects of value), the allocation of the depreciation charge over the life of the asset is essentially an arbitrary decision. In a sense, the economic depreciation of the asset is the by-product of the regulatory decision on the future prices that may be charged for the regulated service. The choice of any number of future regulated price paths effectively corresponds to a choice of depreciation profile, any of which will accurately reflect economic depreciation of the asset (given the expected future earnings potential of the asset). In these circumstances, it is better to consider depreciation simply as a charge to repay the initial investment capital and then to determine the most appropriate methodology for allocating that charge over the useful life of the asset. The choice of depreciation profile should therefore be guided by the broader objective of maximising economic efficiency.

The problems associated with assessing a forward looking estimate of economic depreciation have been generally accepted in regulatory frameworks and determinations, with the outcome that the assessment of regulatory depreciation focuses less on seeking an objective measure of the consumption of capital services, but rather on identifying the most efficient allocation of capital costs over the useful lives of the assets. For example, the National Gas Rules[37] provides that the depreciation schedule should be designed so that:

- tariffs vary, over time, in a way that promotes efficient growth in the market for the services;

[34] Queensland Competition Authority (2001). Final Decision, QR's 1999 Draft Access Undertaking, July, p.375.
[35] Queensland Competition Authority (2005c). Final Decision, QR's 2005 Draft Access Undertaking, December, p.61.
[36] Queensland Competition Authority (2010b). pp.63-65.
[37] Clause 89.

- assets are depreciated over their economic life, including allowing for adjustments to reflect changes in that economic life;
- an asset is depreciated only once, that is, does not provide for windfall capital gains to the access provider.

The QCA has itself made a number of decisions regarding the depreciation charge for Aurizon Network's assets reflecting these same fundamental principles, including the decision to defer depreciation on Blackwater electric assets in UT2 in order to achieve the preferred regulated price path, and the decision in UT3 to accelerate depreciation on new investments in order to ensure that Aurizon Network was confident to invest.

While annual straight line depreciation over a fixed estimate of the economic life of the assets is often used as a simple and transparent way to allocate depreciation charges over time, it is important to recognise that this does not equal the period on period change in the economic value of the asset, and there is no intrinsic efficiency benefit from the prices that this profile of depreciation creates. In these circumstances, the critical consideration in depreciation policy should be ensuring a pattern of prices across time that gives rise to the most efficient allocation of resources.

6.1.3 Asset stranding risk

While the principle that assets should be depreciated over the physical or economic lives of the assets is well accepted, in practice, the assessment of the economic life of the rail infrastructure is fundamentally uncertain. From a theoretical perspective, it may be assumed that shareholders in a regulated firm will be indifferent to the chosen profile of depreciation. This is the basis of the "Invariance Proposition" which states that, if a regulated firm is allowed to earn its cost of capital on the depreciated original cost of its investments, and if actual revenues equal allowed revenues, then the NPV of all investments is zero for any method of calculating depreciation, so that shareholders neither make a net loss nor earn extra profits as a result of different depreciation profiles.[38]

However, in reality there is significant uncertainty over a number of critical parameters underpinning the Invariance Proposition, in particular, whether customers' future demand for the service will allow the regulated firm to in fact earn actual revenues equal to the allowed revenues. For example, if the life ascribed to the assets for the purpose of determining the depreciation charge extends beyond the time period where customers in fact require that service to be provided, then the cost of the asset will not have been fully recovered and the remaining value will be stranded. Moreover, it is insufficient for there to simply be demand by customers for the service. If the value of the rail access service to customers declines (e.g. as a result of lower prices for coal or higher costs of extraction) this may also result in asset stranding, if customers are no longer willing to pay access charges that reflect and recover the remaining regulated value.

Asset stranding risk is asymmetric, that is, regulated businesses do not have upside revenue potential. This results in a skewing of the distribution of expected returns, as Aurizon Network faces a downside risk but no commensurate upside exposure to compensate for this due to regulatory pricing constraints. Asymmetric risks are unavoidable and cannot be diversified away by the business. As discussed in section 7.2.3, this risk is not compensated via the WACC.

[38] Schmalensee, R. (1989). "An Expository Note on Depreciation and Profitability under Rate-of-Return Regulation", Journal of Regulatory Economics, Springer, vol.1(e) pp 293-98.

The alternative to providing compensation for the risk is to mitigate the risk. Mitigating against stranding risk essentially means taking action to reduce the likely impact on the business in the event that asset stranding occurs (as the probability of asset stranding is not within the control of the business). The primary means of doing this is through accelerating the depreciation of the asset so the "value at risk" once the demand for the service becomes more uncertain is minimised.

Importantly, the nature of the asset stranding risk means that, by the time the decline in demand becomes imminent, it becomes increasingly difficult to mitigate this risk through accelerating depreciation on the asset. This is because the effect of accelerating depreciation – which will in the short term increase access charges for the service – may well contribute to further declines in demand. As a result, in order to be effective in mitigating against asset stranding risk, it is essential to consider acceleration of depreciation well in advance of a potential decline in demand.

The main driver of asset stranding risk is a material decline in future demand relative to the installed capacity. For example, in Aurizon Network's case, a material decline in demand could be attributable to:

- changes in technology that result in the substitution of the commodity with an alternate in the end manufacturing process, or cessation of the manufacturing process (i.e. energy substitution);
- changes in technology that alter the extraction method with potential resource sterilisation (i.e. coal seam gas extraction);
- increased rates of resource extraction and installation of additional capacity, which replaces what was otherwise assumed as potential replacement demand for existing installed capacity (in other words, additional network capacity must be installed now to facility the accelerated extraction of existing reserves, which could have otherwise been accommodated by existing capacity had the resource extraction rates remained unchanged);
- changes in the competitive market for the supply of the commodity, with lower cost production displacing higher cost extraction. While hard coking coal commands a premium due its quality, lower quality PCI and thermal coals are readily substitutable. While the coal basins in Queensland are reasonably well explored, the prospect of substantial resource discoveries in developing countries is likely to be significant given expected lower levels of exploration. Additionally, shale gas is replacing thermal coal as an energy source in the US, with some of this 'displaced' thermal coal now being sold into Asian markets in direct competition with Australian thermal coal.

Importantly, two of these factors are conflicting drivers but both influence longer term demand risks. Productivity improvements in coal extraction and processing will improve the competitiveness of CQCR producers. This would increase the rate of growth and extraction, which will limit the prospective replacement demand for the installed capacity. On the other hand, any further erosion in the competitiveness of CQCR producers may displace demand for CQCR coal with lower cost producers.

6.1.4 Matters to consider in determining the depreciation charge

As discussed above, given the absence of an observable change in the value of Aurizon Network's assets (reflecting both physical and economic aspects of value), it is best to consider depreciation simply as a charge to repay the initial investment capital and then to determine the most appropriate methodology for allocating that charge over the useful life of the asset.

In this context, it is necessary to consider the depreciation charge not only in relation to s 168A(a) of the QCA Act, which provides that the cost of investment in the assets should be recovered through the access charges, but also against the broader criteria set out in the QCA Act for assessing an Access Undertaking, summarised as:

- reflecting the objects clause, which 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;
- recognising the legitimate business interests of the owner or operator of the service;
- promoting the public interest;
- recognising the rights of access seekers;
- considering the effect of excluding existing assets for pricing purposes; and
- compliance with the pricing principles set out in s 168A.

In short, the objective should be to determine the efficiency-maximising allocation of the depreciation charge over the useful life of the rail infrastructure assets.

The balance of this Chapter will briefly review the approaches taken in previous regulatory periods, before considering the approach for UT4.

6.2 UT1 and UT2 Economic Lives

To date, a robust assessment of economic lives has not been undertaken in relation to rail infrastructure in the CQCR. For the purpose of setting tariffs in the 2001 Undertaking, depreciation was based on physical asset lives. This approach would appear to be reasonable at the time, given the relatively low volumes being extracted and exported from the CQCR, the level of inferred reserves, the highly competitive cost structure of Queensland coal producers and the modest development forecasts at the time (particularly given the slow and steady export growth rates in the preceding 20 years).

As growth in the demand for export coal surged leading into the UT2 period, QR Network sought to apply accelerated depreciation to the Blair Athol branchline. The QCA's 2005 Final Decision rejected this, reaffirming its Draft Decision, which was that:

> "…altering the approved lives of assets to mitigate asset stranding risk should be based on evidence of a material change in risk. Given this, the Authority assessed evidence presented concerning the economic life constraint of Bowen Basin coal reserves in the DBCT Final Decision. The draft decision considered that, on balance, there was sufficient justification for a 50 year economic life constraint."[39]

In Aurizon Network's view, there are a number of material flaws in the conclusions drawn from the economic life assessment undertaken for the DBCT coal terminal and substantial changes in circumstances that invalidate its conclusions. In particular:

- Energy Economics' estimates of an indicative economic life for the Hay Point and DBCT terminals of approximately 38 years is not a relevant basis for the determination of economic life constraints for rail infrastructure outside of the identified catchment area in that report;

[39] Queensland Competition Authority (2005c). p. 61.

- the assumed terminal capacities for the Goonyella system catchments was assumed to be 125 mpta, with DBCT only assumed to operate at 75 to 80 mtpa based on studies undertaken by Prime Infrastructure, and Hay Point expanding to 51 mtpa;
- while the report acknowledges the risk of alternative terminal developments, particularly the increased rates of extraction from the construction of the northern missing link, it does not include the consequential reduction in the indicative lives based on significant expansion of a linked Abbot Point coal terminal or the establishment of Dudgeon Point coal terminal; and
- little consideration was given to supply side economics and substitution effects for thermal coal (particularly the scale of expansions within the Hunter Valley and other global expansions).

Even without consideration of the increased rate of development of export capacity based on the time elapsed since the study and without resource conversion,[40] the projected indicative economic lives would be 24 and 30 years for DBCT and the combined Hay Point terminals respectively.

6.3 UT3 Depreciation Outcome

In UT3, different depreciation treatments were adopted for two different groups of assets:

- For assets included in the RAB prior to the commencement of UT3, assets were depreciated on a straight line basis over the shorter of their remaining physical or economic life, where their economic life was capped at 50 years. This means that those assets that existed at the commencement of UT2 will have a maximum remaining life of 42 years from the due date for commencement of UT4.
- For assets included in the RAB after the commencement of UT3, an accelerated depreciation profile was applied reflecting straight line depreciation over a maximum 20 year life. This 20 year life is not a fixed term, but rather a rolling 20 year life. That is, for the term of the UT3, asset lives were capped at 20 years. In the absence of any evidence of a material increase in asset stranding risk, assets which had their otherwise useful lives capped at 20 years in UT3 would have depreciation calculated in UT4 on the basis of either their remaining physical life or 20 years, whichever is the lesser, in which case the depreciation profile would take a convex shape rather than a straight line.[41]

In approving this approach for UT3, the QCA noted that the accelerated depreciation for investments undertaken in UT3 reflected the extent of the planned investment program that was needed in order to provide increased and more secure capacity for Aurizon Network's customers, and sought to address Aurizon Network's concerns that it would not recover these costs in full.

6.4 Issues for UT4

6.4.1 Impact of new developments on future coal reserves

As discussed above, previous studies of the economic life of Bowen Basin coal in the context of DBCT was constrained to the Goonyella system catchment area and did not consider the impact of future mine and terminal developments. Forecasting resource development and rates of extraction are important in the assessment of depreciation lives as increased rates of extraction can reduce the prospective demand for rail infrastructure once existing mining operations have reached the end of their economic life.

[40] Which requires substantially higher commodity prices to support the higher marginal extraction costs.
[41] Queensland Competition Authority (2009). Draft Decision, QR Network's 2009 Draft Access Undertaking, December, p.36.

Given the expected lives of current operating mines in light of production rates of saleable coal and measured reserves, there is substantial uncertainty as to the quantum and timing of expansions over the next ten to fifteen years. For example, the Bureau of Resources and Energy Economics' Mining Industry Major Projects report (April 2012)[42] identifies potential port developments with a potential combined additional capacity of over 400 million tonnes, which includes T0 and T4 to T9 at Abbot Point, Dudgeon Point, Fitzroy terminal and the 3TL project near Gladstone.

While many of these projects have been deferred due to the current market uncertainties, even if 75% of this capacity is developed within the next ten years this will occur prior to the expiry of the vast majority of current operating mines. Accordingly, it is highly speculative to forecast developable reserves for existing capacity, particularly when there is substantial uncertainty as to future supply chain capacity.

In this regard, Aurizon Network notes Energy Economics' statement that:

> "Barlow Jonker makes the valid point that 'The return on capital from the DBCT assets should not be contingent upon the discovery of resources which are currently unknown or are currently not economically viable as this would require investors in DBCT infrastructure assets to assume exploration and/or resource development risk'." [43]

Establishing the economic life should therefore only consider the marketable reserves of current operating mines as to factor in future resource development, either through mine and terminal development, would be to transfer these development risks to providers of supply chain infrastructure. The assessment should also not include proven reserves of the existing producing mines as the prospect of those reserves becoming measured is subject to a number of large and uncertain factors including future productivity improvements, long term supply and demand dynamics across competing regional producers and commodity price outcomes.

Furthermore, assessing economic life with respect to matters other than the marketable reserves of currently producing mines could render an incremental expansion economically unviable from the perspective of the rail infrastructure owner, to the extent that the owner's investment decision considers the impact of that expansion on future demand for its existing network capacity. As outlined previously, increased resource extraction rates could result in demand for new network capacity, where those reserves could have otherwise been serviced by existing network capacity had their extraction not been accelerated.

That is, even though the incremental expansion may generate sufficient cash flow for the project to be economically viable when assessed in isolation, a proper and robust economic evaluation (which underpins the regulator's zero NPV assumption) requires consideration of the impact of that expansion on the stranding risk of existing network capacity (to the extent that the demand underpinning that expansion displaces replacement demand for existing access rights). Accordingly, each expansion would need to consider what impact that expansion would have on the expected recovery of capital for the existing facility.

[42] Bureau of Resources and Energy Economics (2012). Mining Industry Major Projects, April, p. 27.
[43] Energy Economics (2005). Economic Life of DBCT Assets, A Confidential Report Prepared by Energy Economics for the Queensland Competition Authority, p.5.

This principle was recognised by the ACCC in its Draft Decision for the Hunter Valley Coal Network, where it stated:

> "In relation to the use by ARTC of weighted average assets lives, weighted by the contribution of each mine to total marketable reserves, the ACCC considers this is likely to be appropriate. Although mines with higher reserves and production with shorter lives may dominate and result in a shorter average mine life, this is not necessarily inappropriate as it is likely to result in higher production mines, who benefit the most from the expansion of the network, paying more of the total fixed costs of the network over its life. In addition, a weighted approach will lessen the stranding risk faced by ARTC and should not result in over compensation of ARTC in present value terms under ARTC's proposed loss capitalisation model. As such, the ACCC considers that a weighted approach to estimating mine lives should be consistent with ARTC earning a return commensurate with the regulatory and commercial risk facing its investments and should also result in relatively efficient use and investment in their infrastructure."[44]

Marketable reserves are also highly dependent upon the time they are measured. For example, many of the marketable reserve estimates Aurizon Network has obtained are likely to have been strongly influenced by previously high commodity prices and an expectation of the continuation of those prices. Higher prices allow for the extraction of more marginal deposits, which have higher marginal extraction costs. This is evident from the closure of recent mines such as Gregory and Norwich Park. While the Norwich Park mines has ceased operations on the basis that the mine is not currently economically viable, BHP's 2012 annual financial report includes total marketable reserves of 165 million tonnes.[45]

6.4.2 Global competitiveness of Queensland coal mines

As discussed in Chapter 3 of Volume 2, there has been a significant change in the global competitiveness of Queensland's coal mining sector in recent years.

While long term prospects remain relatively strong, the Queensland coal industry is entering an increasingly complex operating environment characterised by rising operating and capital costs and a significant increase in the level of risk facing new investments. Combined with increasing global competition, these pressures have resulted in a reduction in the cost competitiveness of Queensland coal producers in the global market. These pressures have been further exacerbated by recent falls in world coal prices.

In addition to reducing the profitability of existing operations, these increasing costs and risks could also impact the viability of planned investments in mines and mine-related infrastructure. As a consequence, establishing economic lives based on current published marketable reserves may not sufficiently alleviate Aurizon Network's longer term asset stranding risks.

6.4.3 Matching the depreciation profile to the economic characteristics of extractive industries

The depreciation profile of the rail network assets is a function of the depreciation method (e.g. straight line, declining balance) and deemed asset life. It is possible, through the choice of method and deemed asset life, to construct different depreciation profiles that result in different price profiles over time, but which result in the same return on capital to investors. The social efficiency consequences depend crucially on the impact of the resultant prices on decisions made by the users of the assets in question.

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44 Australian Competition and Consumer Commission (2010). Australian Rail Track Corporation, Hunter Valley Coal Network Access Undertaking, Draft Decision, p. 588.

45 BHP Billiton (2012). Annual Financial Report, p. 77.

Annual straight line depreciation calculated over a fixed asset length does not equal the period on period change in the economic value of the asset, and there is no intrinsic efficiency benefit from the prices that this profile of depreciation creates. In these circumstances, a critical consideration in depreciation policy should be ensuring a pattern of prices across time that gives rise to the most efficient allocation of resources.

Baumol[46] viewed depreciation from the prospective of the peak load problem, which is widely used approach for tariff setting in, for example, electricity markets, whereby fixed costs are allocated predominantly to periods of peak demand. This is a variant of a more general pricing principle that fixed costs (including depreciation of sunk assets) are allocated predominantly to periods where demand is least price elastic, or to customers that are least price elastic. In this context, it is important to consider the economic characteristics of Queensland's coal mining sector and what pattern of prices will maximise the efficient allocation of resources and, ultimately, maximise the development of the sector. This continued development is also in the public interest by maximising the value of the State's mineral resources.

While there are a range of specific factors that have led to the decline in cost competitiveness for Queensland's coal mining sector, a long term trend towards rising costs is predictable given the economic characteristics of the mining industry.

The incremental costs of extraction at a single mine site tend to increase over time due to "stock effect".[47] Firstly, over time it becomes increasingly difficult to physically extract the resources. This reflects a number of factors including:

- the quality of coal (highest quality coal, all things being the same, tends to be extracted first);
- the tendency of mines to extract from shallow seams with low levels of overburden first, leaving deeper seams until later, and to develop thick seams before thin seams; and
- the need to transport overburden for greater distances over the life of the mine.

This position is reflected in the well-known Herfindahl rule, which states that for non-renewable resources, reserves with lowest cost to extract should be used first.[48]

For given prices and supply chain (rail and port) costs, mine development and extraction are elastic with respect to the mine's own costs. The mine will cease to be economically viable (i.e. it will close) when revenues no longer exceed the mine's marginal extraction costs. It follows that, all other things being equal, the economic value of the mine is maximised if depreciation of sunk supply chain assets, including Aurizon Network's rail assets, is inversely related to these incremental extraction costs, that is, as the mine's operating costs increase, the depreciation charge associated with sunk supply chain assets decreases.

The same economic characteristics operate at the level of the overall system or basin. As a general matter, the first mines developed are those which offer the highest returns. The first mines will generally exploit the highest quality and least costly resources characterised by lower overburden, thicker and larger seams. All other things being equal, they will also tend to be closer to ports such that they enjoy low rail haulage costs and are closer to existing main lines to minimise the need for sole user rail infrastructure. As a consequence, the incremental costs of extracting from the coal basins as a whole also increase over time.

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46 QR Network (2005). Submission re Draft Undertaking Draft Decision, Chapter 1, p.29.

47 It has been noted that technological progress often offsets the "stock effect". For example, technological developments in oil and gas have substantially lowered the costs of extraction from highly depleted fields. However, while technology may improve over time, it does not fundamentally change the observation that the decision to close a mine eventually rests on the relativity of prices to marginal extraction costs. If marginal extraction costs are reduced by a lower allocation of rail depreciation charges, this will unambiguously increase mine output.

48 Herfindahl, O. (1967). "Depletion and Economic Theory," in Mason Gaffney, ed., Extractive Resources and Taxation, University of Wisconsin Press, pp.63-90.

It follows that, all other things being equal, the economic value of Queensland's coal resource is maximised if depreciation of sunk supply chain assets, including Aurizon Network's rail assets, is inversely related to these incremental extraction costs from the CQCR as a whole.

In the face of rising marginal extraction costs at the level of the mine and the CQCR in aggregate, straight line depreciation over fixed periods determined by reference to expected mine lives or the expected economic life of shared assets, even if those expectations are correct, reduces the productive potential of those resources and, accordingly, their value to the Queensland economy. Accelerating the depreciation charge applied to all Aurizon Network's assets will increase their value to the Queensland economy by partially offsetting the expected increase in marginal extraction costs over time. This will foster more efficient outcomes by:

- increasing the likelihood of life extension at depleted mines; and
- increasing the likelihood of development of new mines that face higher development and extraction costs.

The implications of this for UT4 are considered further below.

6.4.4 Implications for UT4

6.4.4.1 Uncertainty over economic life

Uncertainty has increased in UT4

The QCA partially assessed the question of the economic life of the central Queensland coal network for both UT1 and UT2.[49]

In its assessment of UT1, the QCA took the view that the Queensland coal industry was expected to continue its expansion well into the twenty-first century, suggesting that the economic life of the coal sector was not a factor that would constrain the physical life of the rail infrastructure assets. This view was based on an assessment of future Queensland coal production by Barlow Jonker, which in turn was based purely on its view on future global demand. Barlow Jonker assumed that, given the extent of Queensland's coal resources, the coal resources will be available and developed, and that the ultimate constraint on railed tonnages will be demand in the marketplace.[50]

In its assessment conducted as part of the UT2 review, the QCA remained confident that, over a 50 year timeframe, it would be economic to develop new coal deposits to replace existing mines at the end of their lives. However, it acknowledged that uncertainty increased significantly beyond this timeframe, both in terms of sources of coal supply as well as demand for coal in international markets. Hence, a 50 year economic life cap was applied for all rail infrastructure assets at that time. This decision reflected its earlier decision on the economic life to be applied to the Dalrymple Bay Coal Terminal.[51] The issues inherent with this analysis and its ongoing relevance were discussed earlier in this chapter.

[49] For UT3, QR Network sought accelerated depreciation only for its major UT3 investment program. As a result, the QCA's consideration of this issue specifically related to stranding risk in the context of new investments, rather than a broader assessment of the economic life of the Bowen Basin coal reserves.

[50] Queensland Competition Authority (2000). Draft Decision on QR's Draft Undertaking, December 2000, Volume 3, p 168.

[51] Queensland Competition Authority (2005a). Final Decision, Dalrymple Bay Coal Terminal Draft Access Undertaking, April, p. 134.

As has been clearly shown above, there are a range of factors that have led to a decline in the international competitiveness of the Queensland coal industry since these previous assessments. In particular, the cost of investing in new mining capacity (either to extend the lives of existing mines or to replace this capacity at the end of a mine's life) has increased rapidly over the last five years. This in turn has increased the uncertainty about the future development of new coal deposits in the central Queensland coal basins. Although Queensland continues to hold large coal reserves, it is no longer possible to say with absolute confidence that it will be economic to invest in the development of these reserves at the end of the lives of the existing mines.

This is not to say that Aurizon Network believes that it will be uneconomic to develop replacement mining capacity at the end of the lives of the existing mines – simply put, this matter is unknown and unknowable. There is a high degree of confidence in the ongoing demand for the rail network for the life of existing mines and those currently under development. Beyond this, the level of certainty attached to the future use of the network diminishes. As new information emerges over time, such as market price changes, technological changes that extend the mine life, or productivity improvements to improve the cost competitiveness of new deposits, then the level of confidence associated with future long term use of the network may well increase.

Applying probabilities in assessing remaining economic lives

The QCA has previously accepted that accelerated depreciation can mitigate stranding risk but has previously required evidence that there has been a material change in risk (from previous assessments of access undertakings) in order to do so.[52] As discussed above, Aurizon Network considers that the uncertainty associated with the assumption that it will continue to be economic to develop replacement coal mines for the next 50 years has increased.

In this context, it is necessary to take a more probability-based approach to assessing remaining economic life. That is, rather than to establish an economic life that assumes uncertain future development, the current estimate of economic life should reflect factors for which there is a reasonably high degree of confidence. If new information emerges over time, such as market price changes, technological changes that extend the mine life, or additions of new mines that can make use of the same network assets, then the economic life estimate can be extended. However, if market conditions do not change, then reflecting only high probability usage in the estimate of economic life will give a reasonable opportunity for Aurizon Network to recover the full cost of the investment over the actual economic life of the asset.

This concept can be illustrated by a simple case study which has two possible demand profiles with equal probability. The first demand profile (Marketable Reserves) is consistent with existing resources progressively depleting without replacement. The second demand profile (Inferred Resources) is commensurate with the demand profile that provides a consistent real price path over the life of the assets and requires the conversion of inferred resources to marketable resources. The demand and real price paths are shown in the following graphs. The price path assumes a capacity to pay cap of 130% of the real price path.

[52] Queensland Competition Authority (2005c). pp.61- 62.

Figure 15 Volume scenarios

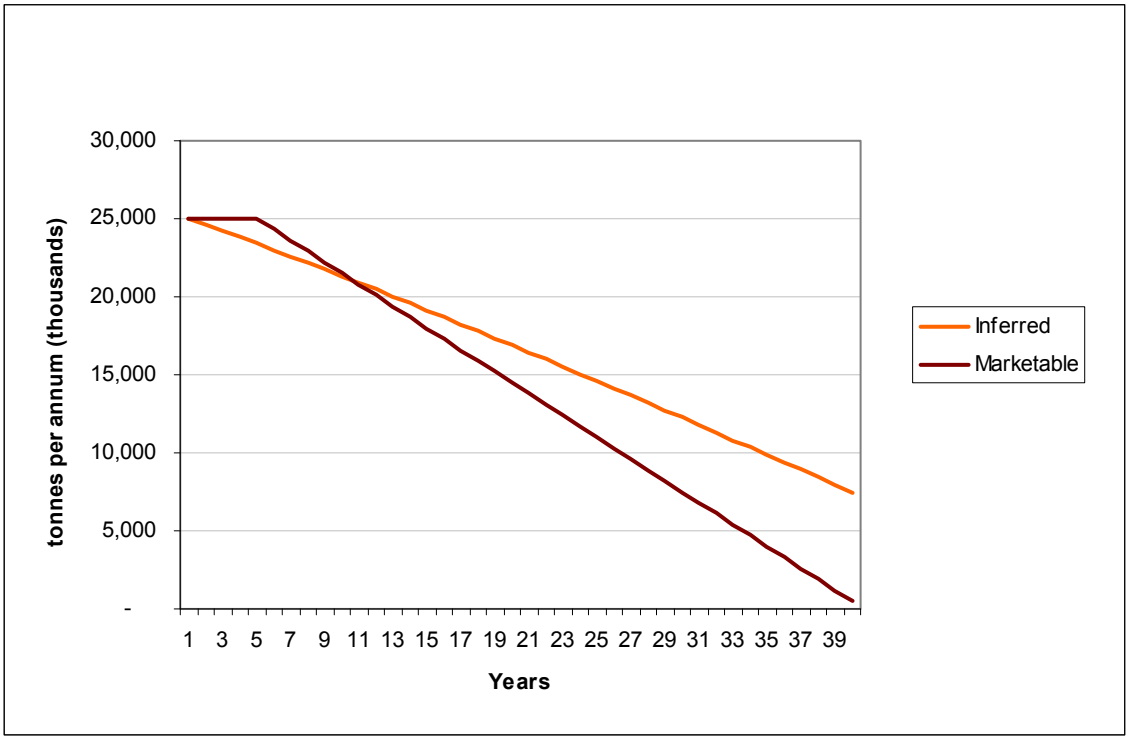
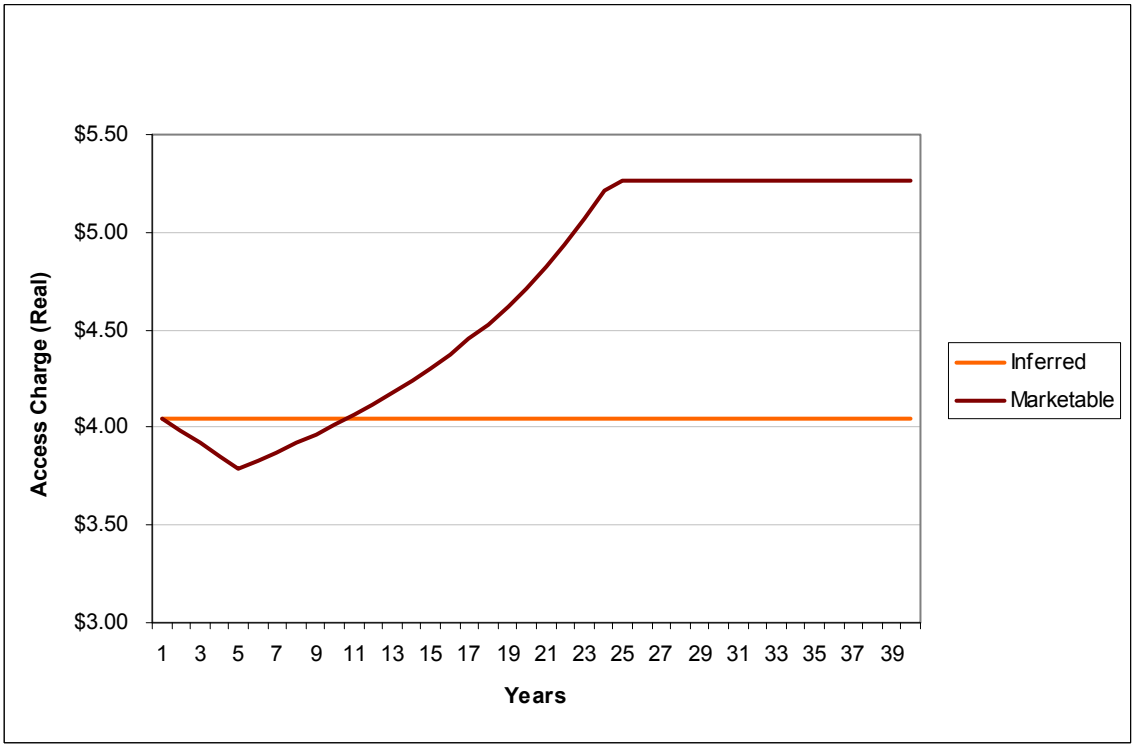


Figure 16 Price scenarios



Assuming a $1 billion opening asset value, the Marketable Reserves scenario yields an NPV of $0. However, due to the inability of the market to pay under the lower volumes in the Inferred Resources scenario, the NPV reduces to $-17 million. As the two scenarios both of equal probability, the expected return on assets at t=0 where prices are determined on solving for NPV equals 0 within a regulatory period is $-8.9 million.

The case study does not include maintenance and operating costs or the costs of asset renewals. As such it is highly conservative with respect to the costs and therefore the free cash flow in the outer years.

The example shows that where the current known marketable reserves are not sufficient to yield a 0 NPV outcome over the life of the assets and there is uncertainty as to the level of conversion of inferred resources to marketable reserves setting prices on unknown demand variables without accelerated depreciation will not provide a return on investment commensurate with the commercial and regulatory risks associated with providing the service.

This example demonstrates that the application of the regulatory financial model typically employed for regulated providers of essential services such as energy and water, to a regulated service provider with large sunk assets and uncertain long term demand dependent on non-renewable resources is economically flawed. Furthermore, it also raises the issue as to whether inflation should be returned to shareholders via dividends in the regulatory period and not capitalised into the RAB (economic depreciation) for recovery from future uncertain demand.

The relationship between expected lives of mines, the degree of certainty attached to that expectation and the economic lives of rail network assets dedicated to the haulage of coal from those mines is well established. By way of example, the value of ARTC's Hunter Valley rail assets was explicitly linked to the remaining life of the dependent mines, taking into account only the marketable coal reserves estimated for each existing mine or mines expected to commence in the next five years.[53] This reflects that, while extensions of these lives are possible, there is significant uncertainty about whether, and to what degree, such extensions will occur. When the next access undertaking is developed, the remaining life of the assets will be reassessed based on the marketable coal reserves estimated at that point in time. Application of this approach has led to maximum remaining economic lives of 22 years from 2010 being accepted in ARTC's recent access undertaking.[54]

6.4.4.2 Ensuring Aurizon Network has confidence to invest

Ensuring that Aurizon Network has confidence that it will be able to recover its capital invested is of upmost importance when the extent of the requirement for further investment in the rail infrastructure assets is considered. While the recent falls in coal prices have created a more subdued investment environment, Aurizon Network is still investing heavily in the rail infrastructure to provide the capacity required for currently committed mine developments, and remains cautiously optimistic in the prospects for future medium term growth in demand, albeit at a slower pace than previously anticipated.

As discussed in Chapter 3 of Volume 2, as part of a publicly listed company Aurizon Network relies on voluntary private investment to finance this growth. This investment will only be forthcoming if these investors are confident that the system of regulation adequately reflects the regulatory compact – that investment that is reasonably made to reflect the demands of users will be recovered in tariffs. If investors are not confident that this regulatory compact will be upheld, they will direct their capital elsewhere. Crucially, investors will not only consider the regulatory arrangements that will apply to ensure confidence in the recovery of future investments, but will also consider how effectively the regulatory compact has applied to past investments. Any concerns regarding failures in the regulatory compact in relation to past investments will fundamentally undermine investors' confidence in their ability to rely on it in making future investments.

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53 Australian Rail Track Corporation. Hunter Valley Coal Network Access Undertaking, 29 June 2011, Clause 4.7(b).

54 Australian Rail Track Corporation (2010). Australian Rail Track Corporation Ltd Hunter Valley Access Undertaking, ARTC Review of the Proposed Hunter Valley Remaining Mine Life to Address ACCC Concerns Expressed in the Draft Decision, Appendix 2, ARTC Revised Remaining Mine Life Estimate.

Creating a regulatory environment that gave Aurizon Network sufficient certainty to invest was a critical issue in the UT3 process. The UT2 regulatory framework had included significant enhancements aimed at providing certainty about how investments would be included in the RAB and recovered in reference tariffs. However, QR Network highlighted at the time that rail infrastructure is a long lived asset, with an investment horizon significantly longer than the mining projects that it is being developed to support. A key concern remained about the long term demand outlook and the risk that the capacity being created may no longer be needed before the investments were fully recovered.[55] The approach endorsed by the QCA for UT3, whereby depreciation on new investments was accelerated based on a rolling 20 year life, was developed in order to address this concern.

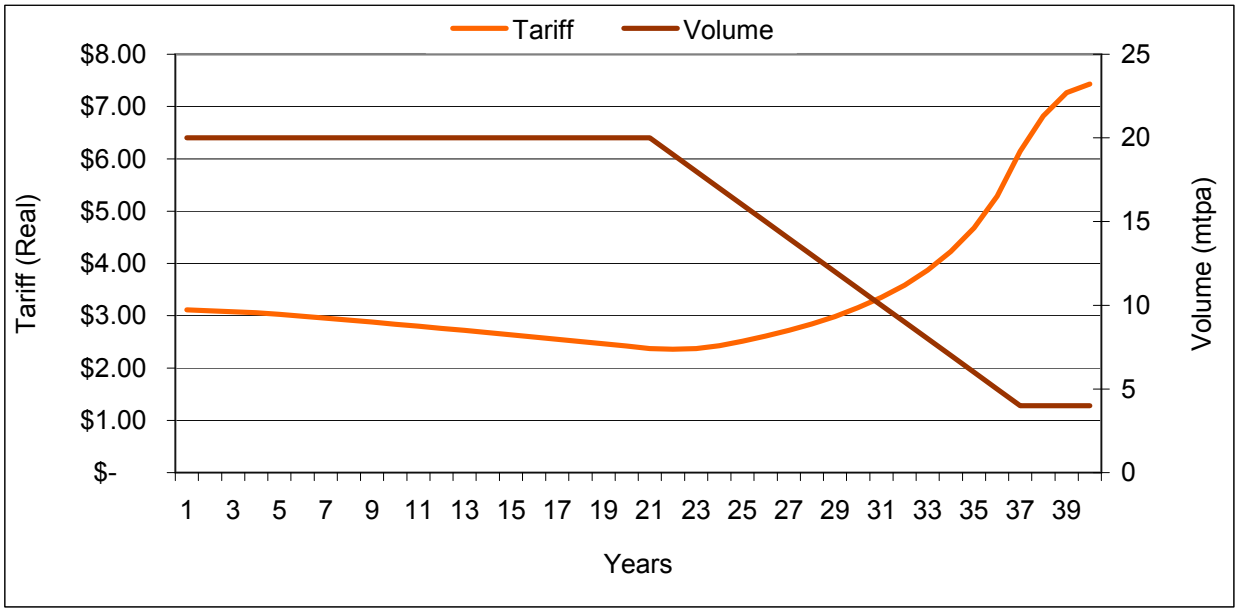
As discussed above, Aurizon Network considers that the risks associated with the long term demand outlook, i.e. the level of demand beyond the life span of existing and committed mining projects, remains a critical issue and has in fact been significantly exacerbated by the decline in the Queensland coal industry's global competitiveness over recent years. Ensuring that Aurizon Network's investors have absolute confidence in the effectiveness of the regulatory compact - that is, that they will receive both a reasonable return on, and ultimately return of, that investment - is critical in engendering sufficient confidence for them to invest further in the rail infrastructure.

6.4.4.3 Establishing the economically efficient price

Aurizon Network remains confident that, over the medium term and with improved financial stability in European markets, commodity prices will remain strong. Accordingly, Aurizon Network considers that economically efficient pricing should consider not only price differentiation between current users of the declared service but temporal differentiation between current and future users of the network based on longer term expectations of capacity to pay.

The following graph shows indicative tariff rates for a 40 year useful life, with an assumption that every four years the increased stock of marketable reserves replaces the depleted stock during the first twenty years. After this first twenty years no additional 'replacement' stock of marketable reserves is established and volumes decline.

Figure 17 Pricing under peak demand



[55] QR Network (2008). QR Network's Access Undertaking (2009), Volume 2 – Central Queensland Coal Reference Tariffs, September.

Aurizon Network also notes that the building block model does not adjust to take account of the misalignment between tax and economic depreciation and the consequential impacts on the tax allowance over the asset life. Tax depreciation amounts decline each year due to a decline in value in real terms and the use of diminishing value on some assets (which makes the tax allowance small early in the asset life but higher later in the asset life).

In summary, where the service is subject to the prospect of peak capacity and servicing a non-renewable commodity, the application of the standard regulatory approach to depreciation increases prices in the period of the asset life at the time when it is more efficient for the prices to be declining. Aurizon Network therefore considers that a review of the regulatory approach to depreciation is needed to produce more efficient pricing outcomes.

6.5 Options analysis

In considering how to address this issue Aurizon Network has considered the following options:

- **Option 1:** Apply a 20 year rolling life assumption to investment made in UT3 and UT4, with the rolled forward UT3 asset value continuing to be constrained by the 50 year life assumption.
- **Option 2:** Apply a periodically reviewed weighted average mine life constraint on all assets, having regard to marketable reserves, the UT4 volume forecast and the expected renewal of contract volumes until resource depletion; and
- **Option 3**: Apply a 20 year rolling life assumption to all assets.

6.5.1 Option 1: 20 Year Life Assumption for Investments made after 1 July 2009

This option extends the UT3 depreciation approach to UT4. Aurizon Network considers that there are a number of issues with the continued application of this model.

The first issue is that a differential rate of depreciation between new and existing assets has the potential to give rise to differential pricing between existing and new users. Aurizon Network is of the view that it is not only unreasonable to potentially require new or expanding producers to bear higher prices relative to other users of common use infrastructure because they entered the market at a time when the cost of expansions is high, but it is unreasonable to also require them to bear the risk of prices increasing further in the future if there is no replacement demand (and these prices also include back-loaded depreciation of existing assets).

To the extent that existing and new access rights utilise the same expanded rail infrastructure, then price differentiation attributable solely to the differences in depreciation rates may adversely affect an access seeker's ability to compete in the relevant downstream market. This favours average cost pricing as existing access holders should be required to contribute to expansion costs given the reciprocal risk that access seekers may be required to make a contribution to the recovery of sunk assets. This issue is discussed in greater detail in section 9.5 of Volume 2.

The second issue is that it does not adequately address the long term replacement demand risk for installed capacity. As discussed earlier in this chapter, given the prospective future capacity expansions that may occur within the next ten years, future prices may not support recovery of pre-2009 investments.

6.5.2 Option 2: Weighted Average Mine Life

The weighted average mine life approach has been a feature of the NSW Rail Access Regime since its inception.[56] The main objective of this approach to determining economic life is to more closely align the recovery of the capital invested in rail infrastructure to the period where it is expected that the service provider has a reasonable prospect of fully recovering this capital.

As part of its 2004 assessment of the remaining mine life in the Hunter Valley, the Independent Pricing and Regulatory Tribunal (IPART) commissioned a report from Booz Allen Hamilton. The basis for establishing the mine life is reasonably well understood and simply requires projecting the production profile and determining the period of time that the known marketable reserves would be depleted. The report prepared by Booz applied a production-weighted average mine life based on the contribution of each mine to actual total production.[57]

ARTC submitted revised remaining mine lives to the ACCC for the Hunter Valley Coal Network with its 2009 voluntary draft access undertaking. This submission was accompanied by a report by Booz Allen Hamilton, which estimated the average mine life weighted by marketable reserves.

The change in approach from weighting by production to weighting by marketable reserves is not explained in the second report prepared by Booz Allen Hamilton. Aurizon Network notes that no particular method is superior to the other and regard should be given to the potential pricing outcomes in determining which approach to apply in order to meet the requirements of the pricing principles in s 168A of the QCA Act.

The main issue with both approaches can be illustrated through a simple example of three mines:

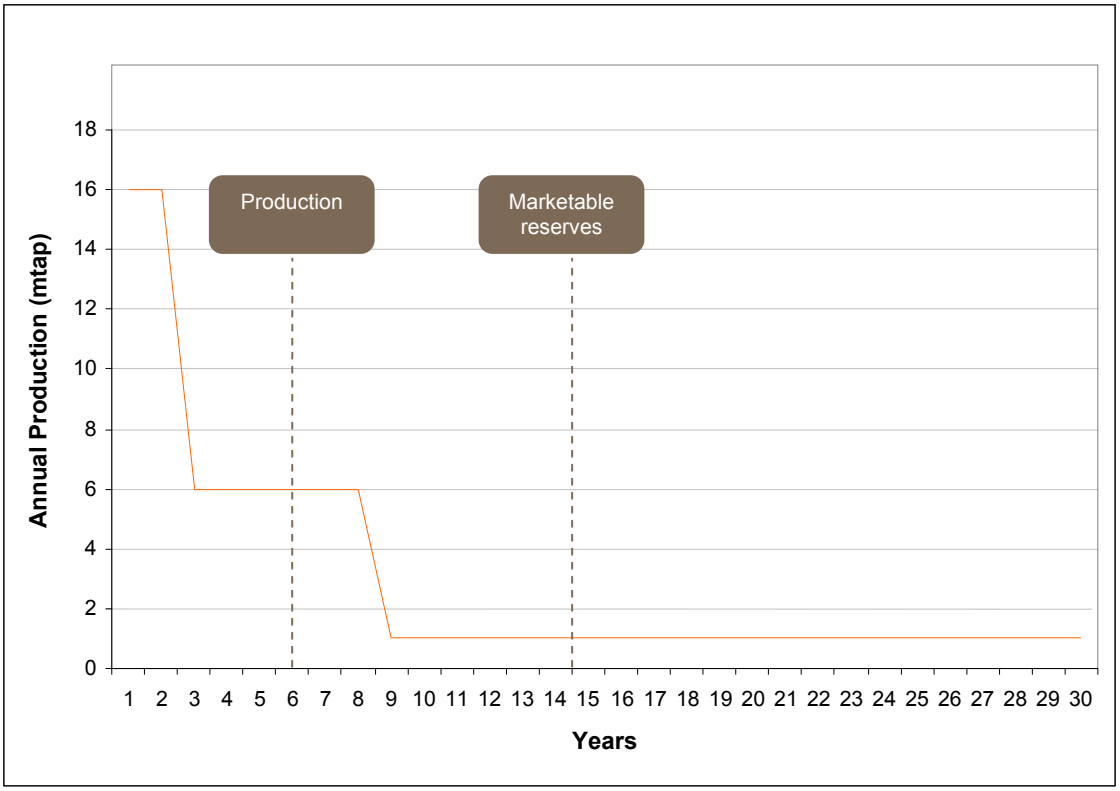
- Mine A has reserves of 30 million tonnes and a production rate of 1 mtpa;
- Mine B has reserves of 40 million tonnes and a production rate of 5 mtpa; and
- Mine C has reserves of 20 million tonnes and production rate of 10 mtpa.

In this example the weighted average mine life based on production is 5.6 years and the weighted average mine life based on marketable reserves is 14 years. The following graph shows the annual production over this time horizon.

[56] See Section 3.2(c) (iv) of Schedule 3 of the NSW Rail Access Undertaking

[57] Independent Pricing and Regulatory Tribunal (2005). Final Report on the Determination of the Remaining Mine Life and Rate of Return – From 1 July 2004, p. 6.

Figure 18 Example average mine lives under different weighting methods



Setting the life constraint based on marketable reserves would not provide for the full recovery of capital, as the annual production forecast beyond year 9 is not sufficient to recover the balance of the RAB prevailing at that time. In contrast, setting the life constraint at 5.6 years may lead to excessively high prices early, relative to the prices that would be expected to prevail later in the period where the economic life constraint is subject to a periodic reset (that is, a rolling cap as is currently applied to investments made from the start of UT3 onwards). In this particular example, setting the economic life at the mid point would not avoid the peak pricing problem identified illustrated in Figure 17 above.

Aurizon Network has undertaken its own analysis of average mine lives in the CQCR, based on the following assumptions:

- marketable reserves as at 1 July 2013 provided by Wood Mackenzie;
- over the UT4 period, the marketable reserves as at 1 July 2013 are extrapolated based on Aurizon Network's UT4 volume forecasts; and
- from 1 July 2017, assumed annual production rates are equivalent to 90% of below rail contracted access rights until depletion of marketable reserves.

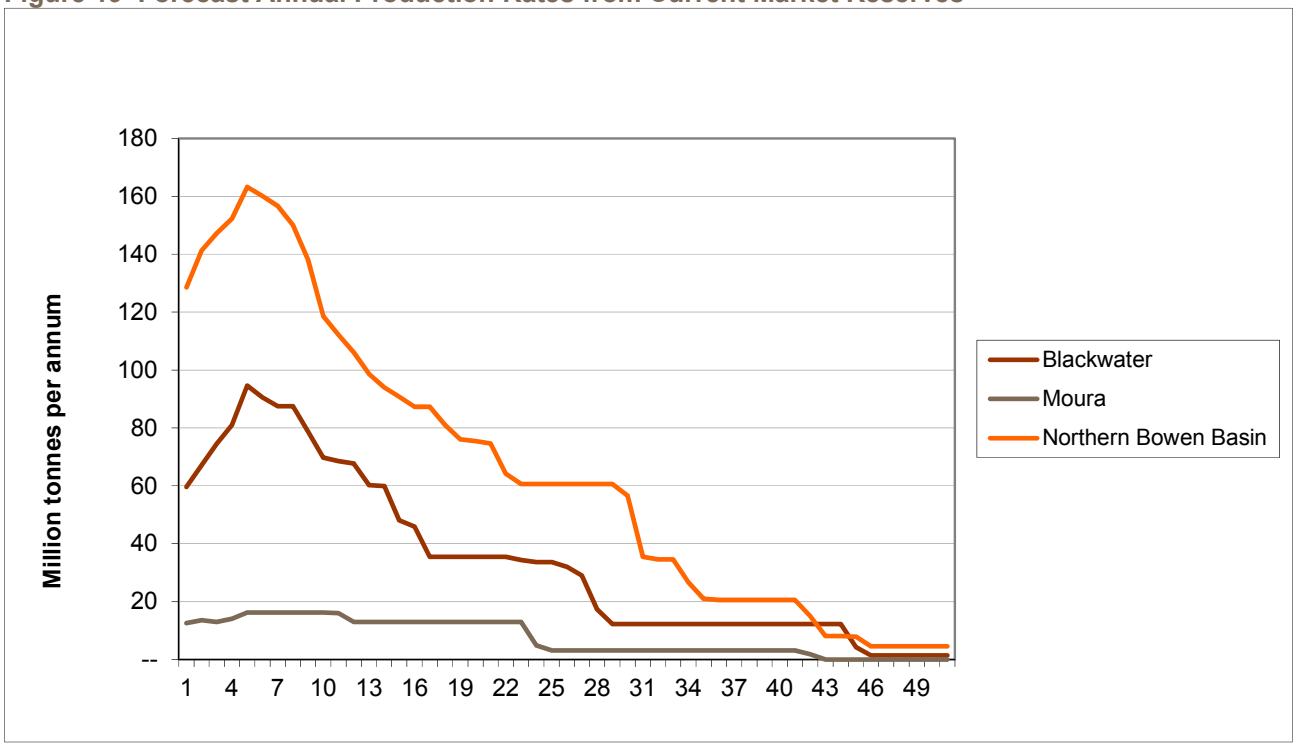
The assumption of using 90% of below rail contracted access rights as the basis for annual production rates is considered reasonable because coal producers have executed take or pay contracts and are not expected to contract for capacity materially in excess of their production estimates (with the 10% buffer allowing for under railing relative to contract). In addition, given the right to renew for the term of the mine life it is expected that the mine will continue to produce at that level.

These mines have then been grouped into the following three economic zones:

- Northern Bowen Basin (inclusive of Goonyella, Newlands and GAPE);
- Blackwater; and
- Moura.

The Northern Bowen grouping reflects that the relevant rail corridors are viable substitutes available to these mines. Assumed marketable reserves for forecast mines is provided in Appendix C. On the basis of this analysis, Aurizon Network has determined production forecasts from known marketable reserves. These are presented for each economic zone in the graph below.

Figure 19 Forecast Annual Production Rates from Current Market Reserves



The average mine life as at 1 July 2016 has been weighted on both marketable reserves (as at 1 July 2016) and production rates (in the year 2016/17). The weighted mine life as at 1 July 2013 has been derived by adding three years to the relevant weighted average mine life at 1 July 2016. These are summarised below.

Table 31 Mine lives by zone under different weighting methods (Years)

Economic Zone	Weighted by Reserves	Weighted by Production	Midpoint
Northern Bowen Basin	32.04	21.27	26.66
Blackwater	29.62	19.80	24.71
Moura	29.37	24.37	26.87

Aurizon Network does not consider that weighting the mine life by marketable reserves is consistent with providing a return on assets commensurate with the commercial and regulatory risks of providing the service for the following reasons:

- As the supply chains may reasonably be expected to remain capacity constrained over the next decade, it is anticipated that new mining developments, or expansion to existing mining developments, will require new infrastructure prior to the closure of existing mines. This reduces the probability that replacement demand will be available for existing installed capacity (the curves in Figure 19 in relation to existing installed capacity may not shift to the right).
- Additional supply chain capacity is likely to be taken up through a combination of new mine developments (additional marketable reserves) and increased rates of extraction from existing marketable reserves (the curves in relation to the existing installed capacity may shift to the left).
- There is uncertainty as to whether the marketable reserves for current and planned mine operations in UT4 will increase over time or new marketable reserves will be established given the potential emergence of competing suppliers, particularly in relation to thermal coal. This point was noted in the Queensland Government's Coal Plan 2030, which stated:

  > "Wood Mackenzie forecast strong supply and import demand cases for Queensland coal in the 2010-2020 period. Their forecast considered emerging uncertainty over the 2020 to 2030 period as some existing mine reserves are exhausted, and as some emerging supply markets begin to challenge Australian exports in the market on a cost-competitive basis."[58]

- The rate in the decline of production from current and planned mine operations in UT4 may not support sustainable pricing in the years beyond the production-weighted average mine life. The indicative example in Figure 15 and 16 showed that in order to maintain tariffs reasonably constant in real terms, this requires a reasonably uniform utilisation rate over the assumed life for pricing purposes, as would be expected to occur in energy networks.

While Aurizon Network expects demand for Central Queensland coal to be relatively robust up to 2030 and that new deposits will be developed for continued operations well beyond that period, it is not appropriate to include these prospective developments in the determination of the life to be applied for depreciation and therefore pricing purposes in UT4. As demonstrated in the simple example provided above, doing so would not provide an expected return on assets commensurate with the regulatory and commercial risks of providing the services. Consistent with this view, the ACCC Draft Decision on the proposed Hunter Valley Coal Network stated:

> "In relation to new mines that are not yet in production and are highly uncertain, it does not seem inappropriate to exclude these mines from the mine life calculation as there is no guarantee these will ever come into production. To the extent these do come on line in future years, these could be considered in future mine life estimates."[59]

[58] Queensland Government (2012). Coal Plan 2030: Laying the foundations of a future, p. 22.
[59] Australian Competition and Consumer Commission (2010). Draft Decision – Hunter Valley Coal Network Voluntary Access Undertaking, p. 588.

6.5.3 Option 3: 20 Year Rolling Life Assumption for all Assets

The 20 year rolling life assumption operates as follows. The expected economic life of each existing network asset is determined at the start of each regulatory period (i.e. at the commencement of UT4), or for new assets at the time of their commissioning. Assets whose expected physical life is less than 20 years will be depreciated on a straight line basis over an asset life equal to that remaining useful life. Assets whose expected economic life is 20 or more years will be deemed to have a 20 year remaining life.

This can be illustrated with a simple example. A rail line may have been in operation for say, ten years of its physical 50 year life. The line was commissioned prior to UT3 and has therefore been depreciated to date on a straight line basis over a 50 year life. On that basis, the rail line's value at the start of UT4 is 80% of its initial value. If at the start of UT4, the mines served by the line are expected to have 25 more years of expected profitable production, the line will be deemed to have a 20 year life and will be depreciated during UT4 on a straight line basis over 20 years. That is, annual depreciation will be charged equal to 5% of the rail line's asset value at the start of UT4.

The consequences of this mode of depreciation have to be assessed in the context of the future four year revisions to the access undertakings, the inherent uncertainty of the markets that are served by the network assets, and the flow of new information that resolves that uncertainty over time. Extending the foregoing example:

- if after the commencement of UT4 the 25 year expected economic life of the mines is extended by an additional ten years (as might happen if there is a sustained increase in coal market prices), then its economic life at the next undertaking review (UT5) will be extended to a further 20 years from that date; or alternatively
- if after the commencement of UT4 the 25 year expected economic life of the mines is reduced by ten years (as might happen if there is a sustained decrease in coal market prices), then its economic life at the next undertaking review (UT5) will be reduced to ten years.

This approach would apply in the same manner to a periodically reviewed weighted average mine life and avoids the prospect that the asset could continue to be used by coal carrying train services after the invested capital has been fully recovered. That is, the life assumption would continue to be extended at each regulatory reset to reflect those circumstances.

6.5.4 Evaluation of options

Based on the preceding analysis, Aurizon Network does not consider that extension of the UT3 depreciation approach (Option 1) results in prices that are efficient and consistent with the requirements of s 168A of QCA Act.

As demonstrated above, the application of a 20 year rolling life assumption (Option 3) is consistent with the weighting of average mine lives by production. However, Aurizon Network recognises that while the impact on tariffs of a change in the rate of depreciation to an approximate life of 20 years would be offset to a large extent by the reduction in the WACC (based on the current proposed estimate), the proposed UT4 MAR also includes a step change increase in operating expenditure.

Accordingly, Aurizon Network proposes to use a remaining mine life assumption for depreciation purposes of 25 years across all systems (Option 2). This represents the effective midpoint of the two different approaches to weighting (by marketable reserves and production) that were discussed above.

6.5.5 Consistency with QCA Act criteria

As established at the beginning of this chapter, the choice of depreciation profile is essentially an arbitrary one, as the economic depreciation of the assets is in fact driven by the expectation of the regulated price path. In this context, it is necessary to consider the depreciation charge against the broader criteria set out in the QCA Act for assessing an Access Undertaking.

Aurizon Network considers that the periodic review of the proposed 25 year life approach to determining depreciation charges is most consistent with the QCA Act criteria, as it will:

- *Promote efficient use of the rail infrastructure:*
    - Maximises the contribution to sunk infrastructure costs at times of high and certain demand – as evidenced by the existence of capacity constraints and the need to invest further in new capacity to meet demand.
    - As demand becomes more uncertain, reduces the need for mines to contribute to sunk infrastructure costs. This is likely to stimulate demand as mines' marginal extraction costs increase over time, for example by:
        - increasing the likelihood of life-extension at depleted mines; and
        - increasing the likelihood of development of new mines that face higher development and extraction costs.
- *Promote efficient investment in the rail infrastructure:*
    - Ensures that Aurizon National's investors are confident that the regulatory compact will be upheld in the face of uncertainty over long term demand.
    - Recognises the chilling effect on investment that would occur in event that:
        - sunk assets were excluded for pricing purposes;
        - asset lives for existing assets were kept at the length assumed at the time of the initial investment, even in the face of changing circumstances, thereby preventing Aurizon Network from mitigating stranding risk.
    - superiority over insurance premium given uncertainty (assuming risk was able to be insured in the market or by self-insurance).
- *Consistency with the Pricing Principles:*
    - The assessment of an efficient depreciation profile should exclude uncertain demand in order for prices to be at least sufficient to provide an expected return on investment, commensurate with the commercial and regulatory risk of providing the service.
    - There is no price differentiation between customers within a regulatory period and therefore no impacts on effective competition in downstream or upstream markets.
    - There is no dynamic efficiency impacts associated with higher rates of asset recovery early in the asset life than the lower rates which may prevail later in the asset lives. However, those lower rates of financial capital depreciation are likely to be offset by higher rates of physical capital maintenances, which will place upward pressure on future prices (in other

words, if depreciation is back ended it has a compounding effect on prices given physical capital maintenance demands are also increasing).

- *Promote the public interest:*
    - Accelerating the depreciation charge applied to all Aurizon Network's assets will increase their value to the Queensland economy by partially offsetting the expected increase in marginal extraction costs over time. This will foster more efficient outcomes by:
        - increasing the likelihood of life-extension at depleted mines; and
        - increasing the likelihood of development of new mines that face higher development and extraction costs.

6.6 UT4 proposal

Aurizon Network has therefore amended the approach to determining the depreciation charge for its assets so that depreciation of all assets in the UT4 period is calculated using the 25 year weighted average mine life. This follows the approach approved by the QCA for the depreciation of capital expenditure that was incurred during the UT3 period, and extends this to all assets including those that were commissioned prior to the start of UT3.

This revision has been adopted because, in the light of characteristics of the markets to which these assets are dedicated:

- it better reflects the economic and risk characteristics of the relevant network assets; and
- it better meets the objectives of the QCA Act, as shown above.

As a result, from the commencement of UT4, depreciation of all assets has been determined on a straight line basis over the remaining QCA endorsed physical life of the asset, except where the remaining physical life of the asset exceeds 25 years, in which case the remaining life of that asset has been capped at 25 years. The physical lives of the assets remain as endorsed by the QCA for UT3.

The resulting depreciation charge to be used for the purpose of determining UT4 reference tariffs is as follows.

Table 32 UT4 proposed depreciation charge ($'000) (nominal)

2013/14	2014/15	2015/16	2016/17
269,692	291,121	346,457	348,587

While the changes to the profile of the depreciation charge on existing assets will have a substantial impact on Aurizon Network's asset stranding risk, the resulting impact on reference tariffs will be quite modest, with the impact of the change in methodology only increasing the total MAR by less than 1% over the term of UT4.

7 Return on capital

Under the QCA Act (s 168A(a)), Aurizon Network is entitled to charge a price for access that at least provides a return on investment that is commensurate with the regulatory and commercial risks involved in providing the service. Aurizon Network has identified a number of framework issues that arise in satisfying this provision, including:

- There are commercial risks that are not currently compensated in the WACC and not otherwise compensated or mitigated in the regulatory framework;
- Aurizon Network faces material regulatory risk, which is also not addressed by the WACC. Section 168A(a) explicitly requires that regard is given to this risk;
- WACC is particularly vulnerable to estimation error. This increases the risk that the regulated WACC does not 'at least' compensate Aurizon Network for its commercial and regulatory risks; and
- Aurizon Network is facing a WACC reset (the outcome of which will be locked in for the next four years) in highly volatile and uncertain market conditions. This includes an historically low risk-free rate, which has particular implications for the QCA's estimate of the cost of equity (which combines a 'spot' risk-free rate with long-term average estimates of the market risk premium and beta).

Regardless of the prevailing conditions in the financial markets, Aurizon Network considers it appropriate to specify the values for more uncertain parameters as a range, resulting in a range for WACC. A decision is then made as to where the point estimate for WACC is selected from within that range. This is consistent with the approach adopted by the Independent Pricing and Regulatory Tribunal (IPART).

Based on rates averaged over the twenty days to the end of November 2012, Aurizon Network's indicative post tax nominal vanilla WACC range is 7.27% to 8.18%. For the reasons outlined above, for the purpose of estimating the UT4 MAR the WACC has been selected from the top end of that range (that is, 8.18%), which is also consistent with the approach taken by IPART in recent water decisions. This is still around 180 basis points lower than the approved WACC for UT3.

Aurizon Network's proposal is supported by a number of independent expert reports, produced by SFG Consulting, Value Adviser Associates and Synergies Economic Consulting. One of the reports produced by SFG Consulting assesses the reasonableness of the cost of equity, having regard to the prevailing conditions in the market for funds [refer Annex A]. It shows that at the current time, the mechanistic application of the same approach applied by the QCA in UT3 would result in a cost of equity that is the lowest on record, which is considered neither reasonable nor plausible in the current environment. It concludes that Aurizon Network's proposed cost of equity range is conservative in light of the available evidence.

7.1 Overview

The return on capital is one of the most significant of the building blocks that make up Aurizon Network's MAR. It is based on a post-tax nominal (vanilla[60]) Weighted Average Cost of Capital (WACC).

Aurizon Network has developed its proposed WACC having regard to relevant regulatory precedent, prevailing financial market conditions, finance theory and commercial practice. As will be outlined below, domestic and global financial markets are currently faced with considerable uncertainty. Amongst other things, the implications of this for the WACC that is set for the four years of the UT4 period needs to be carefully considered. If the regulated WACC is below the expected returns that lenders and shareholders require given the risk profile of the below-rail network business, it will adversely affect investment in the network.

There are a number of framework issues that provide important context for the assessment of Aurizon Network's rate of return. These issues are examined first. One of the key concerns that will be raised is the problems that can arise in applying a mechanistic 'parameter by parameter' approach to estimating WACC, without reviewing the reasonableness of the overall outcome having regard to the relevant requirements of the legislation within the context of the current market environment. While Aurizon Network has considered each parameter in isolation, it therefore also considers the implications of the overall outcome and whether it is likely to satisfy the pricing principles in the QCA Act.

The chapter concludes with Aurizon Network's proposed WACC range for UT4. This chapter also addresses the inflation estimate.

7.2 Framework issues

This section identifies and assesses those issues that Aurizon Network considers are important in assessing the rate of return within the context of the pricing principles in the QCA Act. These issues are:

- the legislative requirements;
- the investor's perspective;
- Aurizon Network's commercial and regulatory risks;
- the QCA's application of 'NPV equals zero';
- estimation error; and
- the financial market environment.

The section concludes with Aurizon Network's proposed way of dealing with the above issues.

7.2.1 Legislative requirements

Section 168A(a) the QCA Act states 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..."

[60] Also referred to as the "Officer 3" version.

This reflects the provisions of the *Competition Principles Agreement*.

There are two important aspects to s 168A(a). The first is that revenue should *at least* be sufficient to cover the efficient costs of providing the service, including a return on capital. This is particularly important in this case given the asymmetric consequences of error, which is discussed further below.

The second aspect is the scope of the provision. The rate of return must be "commensurate with the regulatory and commercial risks involved". Historically, the focus of the review of the return on capital to apply to the Central Queensland coal network has been on estimating each of the parameters in the WACC. This provides for an expected return on debt that is seen to be based on the prevailing benchmark cost of comparable borrowings in the market and an expected return on equity that is derived using the Capital Asset Pricing Model (CAPM). The CAPM-derived cost of equity only provides compensation for systematic or non-diversifiable risks.

None of the previous reviews, including the initial development of Aurizon Network's first undertaking (UT1), have had regard to the requirement of s 168A(a) of the QCA Act in setting the rate of return or whether the QCA's proposed estimates meet that requirement. As the WACC is comprised of an expected return on debt based on the prevailing benchmark cost of comparable borrowings in the market and the expected return on equity compensates equity holders for systematic risks, the question is whether this is (at least) commensurate with the commercial and regulatory risks borne by Aurizon Network and if not, how should these risks be appropriately compensated (but only to the extent that those risks are not compensated elsewhere).

7.2.1.1 Legislative requirements: conclusion

Aurizon Network's proposal must be assessed with reference to the requirements of the QCA Act, in particular, s 168A(a).

7.2.2 The relevant perspective is the investor's perspective

Of fundamental importance here is the fact that the question of whether or not the return is seen as commensurate (or 'at least' commensurate) with the relevant risks can only be answered by investors, who are not participants in the review process. Aurizon Network must make decisions on behalf of its shareholders in order to create value for the business. This includes making investment decisions that will deliver an appropriate rate of return to investors. The return expectations of investors are formed with reference to the alternative opportunities available to them in the current market. If that rate of return is perceived to be too low relative to these alternatives, those investors, acting rationally, will allocate their capital to the higher yielding alternative.

It is therefore necessary to attempt to incorporate this perspective into this review. In essence, to the extent that the regulator's assessment is seeking to balance the interests of the regulated business and the users of the service, in assessing the rate of return the key issue is the extent to which the proposed return will deliver an adequate return to shareholders and enable the business to raise additional capital to fund new investments. Without this support from financial markets, Aurizon Network will not be able to raise capital for new investments.

This requires understanding the alternatives that investors are evaluating alongside Aurizon Network's below-rail network business. Analysts' reports for Aurizon Holdings Limited show that investors are assessing the business more broadly within the context of the infrastructure asset class. UBS has defined this asset class as encompassing transportation assets (such as rail, toll roads, airports, tunnels, bridges and ports), utility and energy assets (water, energy and fuel storage), communications infrastructure (transmission towers) and social infrastructure (education, recreation, waste management and healthcare).[61]

A narrower definition of Aurizon Network's possible asset class could at least be expected to comprise other transportation infrastructure, including Class 1 railroads but also other types of transport. A broader definition sees investors comparing Aurizon Network against energy, water, communications and even social infrastructure. Some of these assets will be regulated. At the current time, there is no evidence to suggest that regulated infrastructure comprises its own asset class.

Reference can also be made to infrastructure indices that track the performance of infrastructure investments and whose metrics are often referenced by analysts in assessing value. The composition of these indices parallels the treatment of this sector as an asset class. At the broadest level it comprises all of the key infrastructure sectors. There are also indices for specific sectors, such as transportation and energy. There is (currently) no regulated infrastructure index.

Key examples include:[62]

- Dow Jones Global Infrastructure Index: A global index of companies with at least 70% of cash flows derived from infrastructure lines of business.
- S&P Global Infrastructure Index: Comprises 75 companies. The index has balanced weights across three distinct infrastructure clusters, being utilities, transportation, and energy.
- MSCI Infrastructure Indices: Indices comprised of the listed infrastructure companies based on the Global Industry Classification System (GICS). MSCI further aggregates the GICS sub-industries into the following infrastructure sectors: telecommunication services, utilities, energy, transportation and social infrastructure.[63]
- Dow Jones Transportation Average: A price-weighted average of 20 US transportation stocks. It was formerly known as the Dow Jones Railroad Average.
- FTSE 350 Electricity Index: Measures the performance of the electricity sector of the FTSE 350.

[61] UBS. An Introduction to Infrastructure as an Asset Class. http://www.static-ubs.com/global/en/asset_management/infrastructure-and-private-equity/additional_materials/_jcr_content/par/linklist/link_0.327697562.file/bGluay9wYXRoPS9jb250ZW50L2RhbS91YnMvZ2xvYmFsL2Fzc2V0X21hbmFnZW1lbnQvaW5mcmFzdHJ1Y3R1cmUvSW50cm9kdWN0aW9uIHRvIGluZnJhc3RydWN0dXJlIHNjcmVlbi5wZGY=/Introduction%2520to%2520infrastructure%2520screen.pdf. Accessed 21 November 2012.

[62] Definitions sourced from Bloomberg.

[63] MSCI. MSCI Infrastructure Indices. http://www.msci.com/products/indices/thematic/infrastructure/. Accessed 21 November 2012.

The need for a broader perspective was highlighted in a submission made by the Financial Investors Group (FIG)[64] to the Australian Energy Regulator's (AER's) 2009 review of the WACC guidelines to apply to regulated electricity network businesses.[65] The FIG commented on the need for regulators to be ultimately guided by commercial and practical considerations "as this is the perspective that investors will take when making subsequent investment decisions."[66] It also submitted:

> "Australian regulated energy network infrastructure competes for capital with a wide range of infrastructure investment opportunities domestically and offshore, including non-regulated infrastructure. It is a small part of that broader infrastructure market… If the prospective returns from investing in regulated energy network infrastructure are insufficient, capital – which has become scarce in the aftermath of the global financial crisis – will be shifted into investments of comparable risk which offer more attractive returns."[67]

As part of the current Victorian Gas Access Arrangements review, Envestra procured a report from Ernst and Young on current market evidence on the cost of equity.[68] Ernst and Young's analysis was based on an examination of 889 independent expert reports (e.g., for mergers or takeover bids) produced between 1 January 2008 and 10 October 2012. This analysis concluded that, for the average firm in the market, the AER's implied cost of equity, which is based on a similar methodology and parameter inputs to those used by the QCA, is on average, around 2.2% lower than the prevailing market cost of equity implied by the independent expert reports. This excludes the impact of differences in the value assigned to imputation credits. Ernst and Young observed that while these reports often use the CAPM to estimate the cost of equity, they typically:

> "a. exercise discretion in the application of the CAPM and the interpretation of data (e.g., they may vary how they may derive parameter estimates) in recognition of the limitations of the model; and
>
> b. assess the valuation results obtained from the application of the CAPM with the values obtained from other methods (or vice versa, depending on the respective quality of the relevant information). These other methods typically include capitalising earnings or (near term) perspective earnings using observed trading and/or transaction multiples, or estimating discount rates using the Dividend Growth Model."[69]

As will be discussed in section 7.7, in setting Aurizon Network's beta in UT3 the QCA exclusively relied on electricity network businesses and continued to dismiss the relevance of US Class 1 railroads. There is no evidence to suggest that an investor would take such a narrow focus. Indeed, there is currently no evidence to suggest that the characteristics of regulated infrastructure are considered sufficiently unique (or specific) to warrant a separate class for these assets. To the extent that a below-rail coal network is being compared against an energy network business it would be in the context of the broader infrastructure asset class. At a more specific level, Aurizon Network is more likely to be compared against other firms in the transportation sector, including Class 1 railways.

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64 The Financial Investors Group comprised: AMP Capital/ Macquarie (as joint managers of the DUET group), APA Group, Babcock and Brown Infrastructure, Cheung Kong Infrastructure Holdings Limited, Hastings Fund Management, Hongkong Electric Holdings Ltd, Singapore Power and Spark Infrastructure.
65 Financial Investors Group (2009). Submission to the AER's WACC Parameter Review, The Investor Perspective.
66 Financial Investors Group (2009). p.10.
67 Financial Investors Group (2009). pp.5-6.
68 Ernst and Young (2012). Market Evidence on the Cost of Equity, Victorian Gas Access Arrangement Review , 8 November.
69 Ernst and Young (2012). Para.46.

Aurizon Network is also competing for capital with other firms in the broader infrastructure investment class. It is widely recognised that institutional investors will invest in portfolios which are reasonably diversified. These portfolio diversification decisions will also necessitate an allocative approach across various asset classifications with a limit on the total amount of funds invested in those asset classifications. Accordingly, Aurizon Network is competing with the broader pool of global infrastructure assets for capital.

7.2.2.1 The investor's perspective: conclusion

In order to satisfy the requirements of s 168A(a), it is essential to have regard to the returns investors are likely to actually require in the context of prevailing market conditions and alternative opportunities available to them in the market.

7.2.3 Aurizon Network's commercial and regulatory risks

Section 168A(a) entitles Aurizon Network to a return that is commensurate with its commercial and regulatory risks. It is therefore important to identify and assess these risks and consider whether they are compensated via the WACC.

7.2.3.1 Risk assessment

Synergies Economic Consulting (Synergies) has examined Aurizon Network's commercial and regulatory risks, including a comparison against other regulatory regimes (refer Annex F). It also considers whether the risks are systematic (and therefore potentially compensated via the CAPM-derived equity beta) or non-systematic (in which case they should be dealt with elsewhere in the regulatory process).

The regulatory regimes that were referenced in the comparative analysis were ARTC, the WA rail access regime (focussing on The Pilbara Infrastructure (TPI) given this is most relevant to Aurizon Network) and the National Electricity Rules (given the QCA's previous reference to energy network businesses in setting beta). Consideration was given to sources of revenue risk, inflation exposure, financing risk and stranding risk. The key differences between Aurizon Network's regime and the other regimes were that:

- The ACCC has not imposed an X factor on the Australian Rail Track Corporation (ARTC). In UT3, the QCA has applied an X factor to Aurizon Network that is based on a Western Australian study that is of questionable relevance to the Central Queensland coal network. X factors have also been applied by the ERA (TPI) and the AER.
- Aurizon Network is the only business that bears inflation risk on its revenues during the course of the regulatory period, being exposed to the difference between actual and forecast inflation for the purpose of calculating the return on, and of, capital allowances.
- It is difficult to draw any definitive conclusions regarding each regulator's upfront review of forecast capital, operating and maintenance expenditure. However, the reviews by the QCA and AER would appear to be far more detailed (and intrusive) than the other regimes. Two key differences between the NER and the other regimes are that:
    - the NER places more constraints around the regulator's discretion; and
    - regulated businesses have access to merits review, which by no means eliminates regulatory risk, but serves as an important mitigant.

- Aurizon Network's capital expenditure is subject to a detailed ex post review by the QCA (unless pre-approved under the mechanisms in Schedule A of the 2010 Undertaking, which currently primarily addresses scope). The ACCC will not undertake an ex post assessment of ARTC's capital expenditure if that expenditure has been approved by the relevant customers. In the case of electricity network businesses, while a detailed review of the prudence and efficiency of the expenditure is done upfront as part of the approval of the forecast, the AER does not revisit this ex post (adjustments are still made for the difference between forecast and actual expenditure as part of the RAB roll-forward).

- Aurizon Network and ARTC are both in the process of developing service quality incentive regimes. Electricity network businesses are also subject to a service quality regime. In WA, the inclusion of a KPI regime (and whether there are any rewards or penalties under the regime) is left to negotiation between TPI and access seekers.

- Aurizon Network is exposed to a maximum 10% loss in annual revenue for failing to make the network available due to its own breach or negligence. ARTC will also bear this risk, although there is no cap on this liability. However, ARTC's True Up Test is broader, being applied at a pricing zone level, while Aurizon Network's is applied to each origin-destination pair. No such exposure would appear to exist under the other regimes.

- Aurizon Network is the only service provider that has a commitment to fund investment (under the 2010 Undertaking). The other businesses reviewed do not have such an obligation, consistent with the terms of their legislation (which also reflects the Competition Principles Agreement).

- TPI's WACC is reviewed annually for changes in the risk-free rate, inflation and debt margin. This assists in mitigating the interest rate risks on new borrowings undertaken during the regulatory period. The other regimes do not provide for mid-period reviews. Under the 2010 Undertaking, Aurizon Network can apply a Varied WACC for a different risk-free rate and debt margin but only for investments over $300 million (and this also must be approved by the QCA).

- Aurizon Network is exposed to the risk of optimisation for a material reduction in demand, the possibility of actual bypass and a deterioration in asset condition. Neither the ARTC or TPI regimes allow for this. Electricity transmission assets may be removed from the RAB if no longer used (under certain conditions). The asset condition provision is considered unique and is a significant source of regulatory risk to Aurizon Network.

On balance, it is therefore evident that Aurizon Network is exposed to greater commercial and regulatory risks than these other businesses. Consideration is now given as to what risks are not reflected in the WACC.

7.2.3.2 The WACC framework does not address non-systematic risks

As described above, the CAPM-derived cost of equity only provides compensation for systematic or non-diversifiable risks. These are risks specific to the firm or industry and are not correlated with the domestic economy. Some of these risks may be mitigated or compensated (for example, through insurance) and others are not.

7.2.3.3 The WACC framework does not address asymmetric risks

The QCA has previously acknowledged that "the CAPM does not compensate the firm for asymmetric risk."[70] Asset stranding is an example of this risk. The sources of stranding risk identified in the report prepared by Synergies include[71]:

- a material and sustained reduction in demand;
- change in the preferred traction choice (specifically, the stranding of its electric network assets);
- the QCA does not accept the full amount of capital expenditure; and
- the RAB is optimised for a deterioration in network condition.

The first source may have a systematic component, to the extent that there is a correlation between a reduction in the demand for access (which is directly derived from the demand for coal) and domestic economic activity. As submitted by QR Network in previous regulatory reviews, it is reasonable to expect that there is some relationship between the demand for coal and domestic economic activity given the importance of the export coal industry to domestic economic performance.[72]

It is also noted that the QCA has previously relied upon regulated electricity network businesses in setting Aurizon Network's beta. These businesses provide an essential service and accordingly are exposed to little if any stranding risk.

There is a regulatory dimension to all of the above risks, which is discussed below.

7.2.3.4 The WACC framework does not address regulatory risks

Sources of regulatory risk

Aurizon Network considers that its regulatory risk has three potential sources:

1. The QCA's regulatory process imposes some risks on the business that would not otherwise exist (many of which are not faced by other businesses). Key examples of this were highlighted in section 7.2.3 above.
2. There is a risk of future changes to the regulatory framework, which could result in the business being worse off. For example, the inclusion of the ability for the QCA to optimise the RAB for deterioration in network condition was introduced in UT3. Such an outcome could have a material adverse impact on the business (as it would effectively strand assets).
3. There is a risk that a parameter may be underestimated or some other error is made in the application of the regulatory process. For example, the QCA may optimise the RAB for deterioration in network condition based on an assessment that has erroneously or unreasonably concluded that the condition of the network has deteriorated and/or this is wrongly attributed to a failure of Aurizon Network's maintenance or asset replacement practices.

The second and third sources of risk have also been previously recognised by the Productivity Commission (who referred to them as 'regulatory risk' and 'regulatory error' respectively).[73]

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70 Queensland Competition Authority (2010). Draft Decision, Aurizon Network's 2010 DAU – Tariffs and Schedule F, June p.48.
71 Synergies Economic Consulting (2013). Aurizon Network's Commercial and Regulatory Risks.
72 For example, refer: Professor R.G. Bowman (2005). Queensland Rail – Determination of Regulated WACC, Response to Reports Prepared by the Allen Consulting Group, August.
73 Productivity Commission (2004). Review of the Gas Access Regime, Productivity Commission Inquiry Report.

Consequences of regulatory risk

The Productivity Commission has previously recognised that regulatory error has asymmetric consequences.[74] That is, setting the rate of return too low has worse economic and societal consequences than setting it too high, as it could deter investment in essential infrastructure.

This has also been recognised by the QCA:

> "The difficulties outlined above merely serve to highlight that the calculation of WACC, using CAPM to estimate the return on equity, involves some degree of imprecision and requires judgement to be exercised. In exercising this judgement, the Authority considers that regard must be had to the fact that considerably more social harm could be caused by selecting too low a rate of return (leading to no investment in the network) than one that is at the upper bound of a reasonable range."[75]

For the reasons presented in this chapter, this risk is high in relation to WACC. Given the inherent uncertainty in estimating key parameters such as beta, the MRP and gamma, there is likely to be a range of reasonable estimates rather than a precise value. In practice, however, regulators seek to ascribe an unreasonable degree of precision to the estimates, which often then become entrenched in precedent. This has been previously recognised by the Australian Competition Tribunal (the Tribunal):

> "…there is no single correct figure involved in determining the values of the parameters to be applied in developing an applicable Reference Tariff. The application of the Reference Tariff Principles involves issues of judgement and degree. Different minds, acting reasonably, can be expected to make different choices within a range of possible choices which nonetheless remain consistent with the Reference Tariff Principles."[76]

This has very important implications for the assessment of WACC, particularly if appropriate regard is given to s 168A(a) of the QCA Act and the need for prices to at least compensate the business for the commercial and regulatory risks borne.

Implications of regulatory risk

Even though regulatory risk is explicitly recognised in s 168A(a), it has never been considered by the QCA.

Regulatory risk is generally not systematic, although there could be a systematic element if, for example, the regulator is more likely to underestimate the WACC when risk free rates are unusually low. Further, as postulated by Ergas et al, regulatory risk is arguably also not diversifiable because no other firms will clearly gain when the regulated firm loses.[77] They show why this risk asymmetric and that:

> "…even if there is no bias in the regulator's estimation (so that the expected value of each parameter estimate is equal to the true parameter), the consequences of such errors are asymmetric, to the detriment of the firm's income."[78]

Aurizon Network considers that it is of fundamental importance that the QCA gives specific regard to the first source of risk listed above, given that:

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74 Productivity Commission (2001). Review of the National Access Regime, Report no. 17, AusInfo, Canberra, p.83.
75 Queensland Competition Authority (2000). Draft Decision on QR's Draft Undertaking, Volume 3 – Reference Tariffs, p.216.
76 Australian Competition Tribunal (2003). para 29.
77 Ergas, H., Hornby,J., Little, I. and Small, J. (2001). Regulatory Risk. Paper prepared for the ACCC Investment and Regulation Conference.
78 Ergas, H., Hornby,J., ,Little, I. and Small, J. (2001). p.11.

- these risks are not faced by unregulated businesses, which could include other firms that Aurizon Network is competing with for scarce capital; and
- some of these risks are not faced by other regulated businesses, including the electricity network businesses that the QCA has previously relied upon as comparators for beta.

The other two sources of regulatory risk identified above, including the risk of error, are also important, particularly as the QCA Act prescribes that the return on capital should at least provide compensation for commercial and regulatory risks. Unless the values of parameters can be estimated with complete certainty, Aurizon Network risks an 'NPV negative' outcome, which violates the principle that it is at least compensated for its commercial and regulatory risks.

There are some important points to note regarding risks that are not compensated in the WACC. The first is the question of whether the risks are compensated elsewhere in the cash flows. It will also be important to consider the extent to which these risks are mitigated elsewhere in the regulatory framework and what is the residual risk after these strategies are taken into account (as mitigation does not necessarily mean that there is no case for compensation for the residual risks borne). For example, if the QCA accepts Aurizon Network's depreciation proposal as set out in Chapter 6, Aurizon Network accepts that this would mitigate – but not completely eliminate - the market-driven source of stranding risk. However, it does not address the other sources of stranding risk identified above, which are all regulatory risks.

The second point is that these risks can also be very difficult to reliably measure in practice, particularly given the high 'burden of proof' that is typically imposed by the regulator. For example, the QCA has recognised the possible compensation of 'additional risks' under the access conditions framework introduced in UT3. To the extent that compensation is sought via adjustments to cash flows, Aurizon Network must provide:

> "…evidence that there are risks not mitigated by the other Access Conditions being sought, and the adjustments are reflective of the possible outcomes and probabilities of the outcomes as a consequence of such risks…"[79]

The value of risk is a function of its probability and impact. Often while the impact of the risk on the business can be measured under different scenarios, it is the probabilities of these scenarios occurring that cannot be readily measured. For example, it is difficult to reliably assess the probability of asset stranding in the more bullish market conditions, which as recent experience has shown, can substantially alter within an extremely short time frame (as evidenced by the mining industry's relatively quick and decisive action on project deferrals). Risk events can also be correlated so it is necessary to be able to understand and quantify these relationships, which can also be difficult.

However, these measurement challenges do not mean that these risks do not exist (noting that the relevant horizon for assessing the risk of stranding long-life below-rail network assets tends to be longer than the horizon of a coal producer). Indeed as outlined above, if they are ignored, there is a risk that the business is unable to earn a fair return, let alone a return that at least compensates it for its commercial and regulatory risks.

[79] Clause 6.5.4(vii)(A)

To the extent that the risks have a systematic element, they can be considered as part of the beta assessment, especially when making comparisons against publicly listed businesses that are not exposed to these risks. Otherwise, recognising the measurement issues, Aurizon Network submits that these risks should be addressed via the specification of a range for WACC and the decision as to where to select the WACC from within that range. This is discussed in section 7.2.7 below.

7.2.3.5 Aurizon Network's commercial and regulatory risks: conclusion

Section 168A(a) entitles Aurizon Network to a rate of return that at least compensates it for its commercial and regulatory risks. A number of these risks are not reflected in the WACC. However, if the requirements of s 168A(a) are to be satisfied, it is essential to consider how these risks should be addressed in the regulatory framework. This includes giving appropriate consideration to regulatory risk, which has asymmetric consequences.

7.2.4 The 'NPV equals zero' argument

More recently the QCA has used 'NPV equals zero' as an argument underpinning its approach to setting the cost of capital, and in particular, its decision to align the term to maturity for the risk-free rate and the debt margin with the length of the regulatory period. Assuming that the term of the regulatory period is less than ten years, it considers that applying a ten year term to maturity (which is most common in practice) means that the NPV of revenues cannot be equal to zero over the term of the regulatory period. This is based on the work of one of the QCA's main WACC consultants, Associate Professor Martin Lally.

The way in which the QCA has applied this principle has no specific legislative foundation. What the QCA Act does require is that Aurizon Network's prices are set so that it can at least earn a return on investment that compensates it for its commercial and regulatory risks. As stated previously, in order to satisfy this requirement, the QCA must consider the type of capital that investors are most likely to provide and the return they will expect on that capital in the current market environment, having regard to the commercial and regulatory settings and the risks this presents.

Indeed, the QCA's application of the 'NPV equals zero' principle constrains its ability to satisfy this requirement. Given the risk of uncertain future outcomes and regulatory error, it could be more likely that the regulated business will earn a negative NPV. This would directly contradict the requirement under s 168A(a) of the QCA Act.

In its 2004 Review of the Gas Access Regime, the Productivity Commission recognised that while economic profits are constrained to zero under that regime, the presence of risk can mean that actual economic profit is not zero.[80] It stated that economic profit may be consistent with competitive behaviour, where the firm seeks to earn a higher return in the good years, to make up for lower returns in the bad years. However, regulators are more likely to misconstrue this as evidence of monopolistic behaviour, leading to what it called "asymmetric truncation" (because only high profits are curtailed).[81]

In any case, even if the question of whether the QCA's application of NPV equals zero is appropriate is put aside, a key assumption underpinning its application is not valid. Specifically, as described in the independent report procured from SFG Consulting (SFG) (refer Annex C), Associate Professor Lally's NPV equals zero argument requires forward interest rates to equal expected future spot rates. As SFG highlights, this has been shown to be invalid.

[80] Productivity Commission (2004). p.103.
[81] For example, refer: Productivity Commission (2004).

Instead, SFG shows that the QCA's practice of aligning the term to maturity for the risk-free rate and debt margin with the length of the regulatory period is *unnecessary* in order for NPV equals zero to hold. SFG shows that the implications of the QCA's approach are that:

- given yield curves are normally upward sloping, under the QCA's assumption regulated prices could be lowered without any value loss to the firm by shortening the length of the regulatory period (and the shorter the length of the regulatory period the better if the goal is to reduce prices);
- the estimate of the Market Risk Premium (MRP) must also be changed, because it is not contingent upon the length of the regulatory period (noting that historical averages of the MRP assume a ten year term to maturity for the risk-free rate); and
- the regulator would be no longer be estimating the price that would prevail in a competitive market, because the administrative decision as to the length of the regulatory period is of no relevance in this context.

Aurizon Network also notes that the AER, which applies a ten year term to maturity in setting the WACC to apply to regulated energy network businesses (who generally have regulatory periods of five years), considers that this is consistent with the 'present value principle':

> "Conceptually, the adoption of a 10 year forward looking risk free rate and a 10 year forward looking MRP, based on prevailing conditions in the market for funds at the commencement of the access arrangement period:
>
> - is consistent with the present value principle—this principle states that the present value of a regulated business's revenue stream should match the present value of its expenditure stream (plus or minus any efficiency rewards or penalties). As Lally explains, this is a fundamental principle of economic regulation. Satisfying this principle both promotes efficient investment and avoids the excess profits that regulation seeks to prevent.
> - is consistent with the building block model
> - is consistent with the Sharpe-Lintner CAPM
> - is internally consistent, and
> - promotes regulatory certainty and consistency."[82]

The QCA's assumption that the term of the risk-free rate and debt margin must match the length of the regulatory period also leads to perverse outcomes, as it makes the allowed rate of return dependent on the length of the regulatory period (the choice of which is largely an administrative consideration). Assuming a normal yield curve, it incentivises the regulated business to set the regulatory period for as long as possible in order to maximise the WACC outcome. On the other hand, it would incentivise users to seek the shortest possible regulatory period. Either of these approaches could have other more significant implications for the business and the users of rail infrastructure.

This approach has also not been consistently applied. For example, in 2010 the QCA approved the 'rolled forward WACC' that DBCT Management agreed with industry, which was based on a ten year term to maturity (the implications of materially different regulated WACC outcomes in the same supply chain are considered further below).

[82] Australian Energy Regulator (2013). Access Arrangement Final Decision, Envestra Ltd, 2013-17, Part 2: Attachments, March, p.118.

The other key assumption that the QCA is making is that investors are limiting their investment decision (and their return expectations) to the length of the regulatory period. Investors in the infrastructure asset class generally view these investments as long term. While revenues are being periodically reset over time, their investment decision will be based on an assessment of the long-term cash flows that could be generated by these assets, discounted using a long-term rate. This is a key example of assumptions being made on behalf of investors based on a theory that has been developed and applied independent of the realities of the commercial and financial market environment. If these realities are ignored, the outcome cannot be expected to satisfy the requirements of the QCA Act.

7.2.4.1 The NPV equals zero argument: conclusion

The overarching principle that needs to be satisfied is articulated in s 168A(a) of the QCA Act. The QCA's application of Associate Professor Lally's NPV equals zero principle risks constraining it from satisfying this requirement. Aurizon Network considers that the most appropriate assumption to apply in setting a rate of return that at least compensates it for its commercial and regulatory risks is a ten year term to maturity.

7.2.5 Estimation error

The estimation of WACC is inherently imprecise yet as noted above, the return on capital allowance is one of the most significant components of Aurizon Network's MAR. Even for those risks that WACC is intended to compensate, the risk of estimation error is high. This risk has a number of possible sources, which are discussed below.

7.2.5.1 Model error

The QCA applies the CAPM to determine the cost of equity. While its deficiencies are well known[83] and have been broadly acknowledged by regulators, it remains the only method that is considered by the QCA. Its shortcomings were recently acknowledged by the Australian Energy Market Commission (AEMC) in its recent draft rule change determination for gas and electricity network businesses, where it noted some of those limitations to be:

- "it is based on unrealistic assumptions;
- it is difficult to test the validity of the CAPM; and
- the Beta estimate does not remain stable over time."[84]

To the extent that none of the alternatives are clearly superior (including the CAPM) and each approach has its strengths and weaknesses, a sensible alternative to reduce the risk of error would be to reference more than one model in estimating the WACC. For example, the Surface Transportation Board in the US now uses a 'blend' of both CAPM and a multi-stage Discounted Cash Flow (or Dividend Growth Model) approach.

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[83] A key criticism is that it is a single period model that cannot be readily applied in a multi-period setting. Further, almost all of the assumptions on which it is based can be questioned. For example: (1) not all investors can borrow and lend at the risk-free rate; (2) short-selling of physical assets is generally not permitted (with the exception of derivative instruments); (3) many investors will consider the implications of taxes and transaction costs when making investment decisions; and (4) investors tend not to have homogeneous expectations regarding risk and return. On the contrary, much trading activity, and price volatility is driven by differences in expectations (and 'decision models' used by investors to form these expectations), particularly between buyers and sellers.

[84] Australian Energy Market Commission (2012). Draft Rule Determinations, Draft National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012; Draft National Gas Amendment (Price and Revenue Regulation of Gas Services) Rule 2012, p.47.

An alternative is to use these other models as a cross-check against the CAPM-derived estimate, which would also require the development of a clear set of principles or decision rules that would be applied if the results of the cross-check were materially above (or below) the CAPM estimate.

The approach of examining a range of relevant evidence has also been endorsed by the AEMC in its recent draft rule change determination, where it acknowledged:

> "Given that there are other financial models and methods for estimating the cost of equity capital that vary in their acceptance academically and consequent usage by market practitioners, restricting consideration to the CAPM alone would preclude consideration of other relevant estimation methods.
>
> The Commission is of the view that estimates are more robust and reliable if they are based on a range of estimation methods, financial models, market data and other evidence."[85]

Aurizon Network is not proposing a change of model in its UT4 proposal. However, it considers that the risk of model error is a relevant and important consideration in this review, consistent with the approach endorsed by the AEMC. It also highlights the importance of not applying the CAPM in a mechanistic way. Aurizon Network therefore submits that it is appropriate for the QCA to consider whether the outcomes produced are commercially reasonable given prevailing market conditions and the relevant risks. It is also submitted that this is necessary in order to ensure that the outcome satisfies the requirements of the QCA Act.

7.2.5.2 Measurement error

As the expected rate of return is forward-looking, a number of the parameters cannot be readily observed in practice. Reference is often made to historical data as a guide. However, this is not always reliable, especially in the current environment where there is considerable uncertainty and historically low risk-free rates. The next source of error is therefore measurement error, which is the risk that the estimated value for any one parameter differs from the 'true' expected value of that parameter.

The risk of estimation error is particularly high for the cost of equity, including beta and MRP. For example, the standard practice for estimating beta typically involves identifying a sample of relevant listed firms and estimating the betas of these firms over an appropriate measurement period. Estimation error could arise in a number of ways:

- there are no suitable comparator firms, or the sample of comparator firms is too small to be statistically reliable;
- the sample of comparator firms is not appropriate (for example, in UT3 the QCA relied on electricity network businesses as comparators for Aurizon Network);
- there are no adjustments made for any material differences in risk between the comparators and the target firm;
- the estimated betas do not reflect the 'true' beta of the firm due to some form of statistical error, for example, the shares of a firm are not actively traded or there is 'noise' in the data (such as unrelated information or events that are affecting the firm's share price, such as a change in management or takeover rumours). This risk is exacerbated if the sample size is small;

[85] Australian Energy Market Commission (2012). p.48.

- inappropriate adjustments are made to the beta in arriving at the estimate for the target firm (for example, making adjustments for risk that are not systematic), noting that these adjustments are typically arbitrary;
- the process of de-levering and re-levering betas is also subject to estimation error, including that the assumptions underpinning the chosen formula (which in the QCA's case, is the Conine approach) do not reflect the market realities. For example, Aurizon Network (and others) has historically expressed concerns with the valuation of the debt beta (refer section 7.7.2.1).

These issues are highlighted by the different beta estimates that can emerge from the same dataset using different estimation techniques and time periods.

In the case of the MRP, the historical MRP can be readily observed by measuring the difference between actual returns on the domestic share market index and the risk-free rate (noting that it is highly volatile in the short term but more stable in the long run). Particularly in difficult and uncertain market conditions, the historical MRP may not reflect the expected MRP. This is discussed in more detail below.

The other issue with the QCA's current approach is that it has not adjusted its MRP estimate to reflect the use of a five year term to maturity for the risk-free rate and debt margin. It has seen any such adjustment as unnecessary because the difference is well within the standard error of its estimate and there is sufficient "headroom" allowed between its 6% MRP and the estimates it has relied upon.[86]

SFG Consulting (refer Annex C) contends that the QCA's argument is not a correct application of the notion of estimation error.[87] The QCA's conclusion implies that the means of the cost of equity capital under a five and ten year term to maturity assumption are not statistically different from each other, which justifies the retention of a 6% MRP. However, the QCA has changed (lowered) its assessment of the most appropriate cost of equity capital simply due to the assumption of a five year term to maturity. Accordingly, its estimate of the MRP should also be changed. This is also consistent with the Tribunal's 2003 decision in relation to GasNet, where it overturned the ACCC's decision to apply a five year term to maturity for the risk-free rate:

> "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 so that the choice was either a five year bond rate or a ten year bond rate in both situations."[88]

The QCA has assumed that no adjustment needs to be made to the MRP with the use of the shorter term as the long-run difference between the five and ten year risk free rate (or slope of the yield curve) is only 20 basis points and, therefore, is not statistically significant. However, the QCA does not apply a long run estimate of the risk free rate. In applying a spot rate for the risk free rate the assessment should have regard to the quantum of the statistical error relevant to the spot rate. The difference between the five and ten year yields in the UT3 market averaging period was 58 basis points and the difference over the averaging period used to produce Aurizon Network's indicative WACC (over the twenty days to 30 November 2012) was 41 basis points. These differences are both materially above the QCA's 20 basis point 'headroom'.

[86] Queensland Competition Authority (2012). Draft Decision, Aurizon Network's 2010 DAU – Tariffs and Schedule F, June, p.40.
[87] SFG Consulting (2012a). Term to Maturity of the Risk Free Rate Estimate in the Regulated Return, 29 August, p.4.
[88] Australian Competition Tribunal (2003). Application by GasNet Australia (Operations) Pty Ltd [2003] ACompT 6, para.46.

Aurizon Network remains of the view that it is unacceptable to entrench a known inconsistency, particularly given so many of the WACC parameters, including the MRP, are vulnerable to estimation error. As will be outlined in section 7.6, it is also possible that the QCA's preferred MRP of 6% is materially below the premium that investors are likely to require under current financial market conditions.

7.2.5.3 Estimation error: conclusion

WACC estimation is inherently imprecise, making it vulnerable to error. The existence of estimation error means that NPV equals zero cannot be assured unless there is complete certainty that the expected values of the estimated parameters will equal their true value. It is impossible to obtain this certainty. It is therefore essential to have regard to the risks and consequences of error in estimating individual parameters, and determining the overall WACC.

7.2.6 Financial market environment

7.2.6.1 Relevance to this review

Conditions in financial markets have a significant impact on Aurizon Network's MAR and reference tariffs via the WACC. While parameters such as the market risk premium and beta tend to be based on long-term averages, the risk-free rate (which affects the cost of debt and equity) and the debt margin are typically set over a twenty day averaging period prior to the Final Decision and will remain locked in for the duration of the regulatory period. This means that Aurizon Network's WACC, though set for a four year period, may reflect in part the short run conditions (whether typical or atypical) in financial markets as at the date of reset.

In relation to achieving the principle contained in s 168A(a) of the QCA Act, this is subject to two main risks, each influenced by the prevailing conditions in financial markets at the time of the reset. The first is that actual rates of return differ from the assumptions used in the regulated WACC over the course of the regulatory period. It is certain that this will occur. What is unknown is whether rates will move higher or lower and by how much.

The second risk is that the regulated rate of return does not reflect the returns that investors require in the current market environment. At the current time, the key issue is the mechanistic approach that has been historically applied, which involves combining a spot estimate of the risk-free rate with a long run average MRP. While this has not necessarily been an issue in more stable market conditions, it can cause issues in a more difficult market environment, as is presently the case.

As will be outlined below, the application of this mechanistic approach, without regard to the overall reasonableness of the outcomes it produces, results in a historically low estimate of the cost of equity that is neither reasonable nor plausible in the environment that has prevailed following the commencement of the GFC. These concerns have been expressed by the AEMC, who has observed:

> "…the provisions create the potential for the regulator and/ or appeal body to interpret that the best way to estimate the allowed rate of return is by using a relatively formulaic approach. This may result in it not considering the relevance of a broad range of evidence, and may lead to an undue focus on individual parameter values rather than the overall rate of return estimate."[89]

The issues presented by the global financial environment for UT4 are considered below.

[89] Australian Energy Market Commission (2012). Rule Determination, National Electricity Amendment (Economic Regulation of Network Service Providers) Rule 2012, National Gas Amendment (Price and Revenue Regulation of Gas Services), Rule 2012, November, p.40.

7.2.6.2 Current global financial market conditions

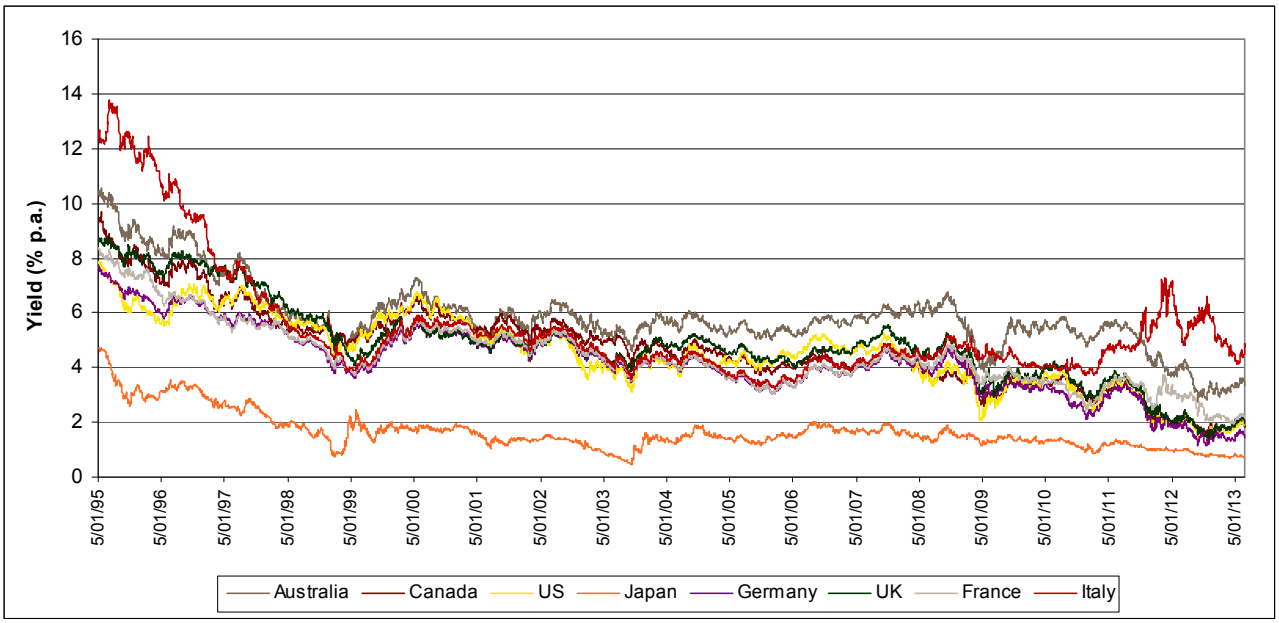
The Australian economy and financial market has always been impacted by conditions in the global market, as acknowledged by the Deputy Governor of the Reserve Bank, Philip Lowe.[90] In an address made in October 2012, Mr Lowe indicated that while these influences "have long had a profound impact… and no doubt, they will continue to do so", the "unusual nature of recent developments is changing the way in which global outcomes affect Australia."[91] Currently, there are some positive influences, being strong growth in emerging market economies, including Asia. However, there continues to be a pervasive negative influence as a consequence of the recessed advanced economies, which is itself driven by fiscal, household balance sheet and banking problems. The result is a costly adjustment phase that could take some time to complete.

Mr Lowe continues to outline how the problems in the advanced economies are affecting economies such as Australia in a number of ways. One of the impacts is uncertainty, which in recent times has been dominated by concerns regarding Europe and the US. Recognising that there are some domestic drivers to this (such as lower employment and consumption growth), he observes:

> "This uncertainty stemming from problems in the advanced economies is having an impact here in Australia. It has adversely affected confidence and has led to the deferral of some decisions and more cautious behaviour…This gradual realisation that the future is likely to be different from the past is an important factor weighing on sentiment in Australia."[92]

The other key impact is the accommodative monetary policy stance in the large industrialised countries, with official interest rates at or close to 'lower bound'. Mr Lowe states that while this response is hardly surprising, "from another perspective, what we are seeing is highly unusual". The implications of this are seen as not yet fully understood. One of the clear impacts of this is historically low sovereign bond yields (including in Australia), as shown in the following chart.

Figure 20 Ten year sovereign Government bond yields in eight major economies: Jan 1995 to 28 February 2013



Source: Bloomberg

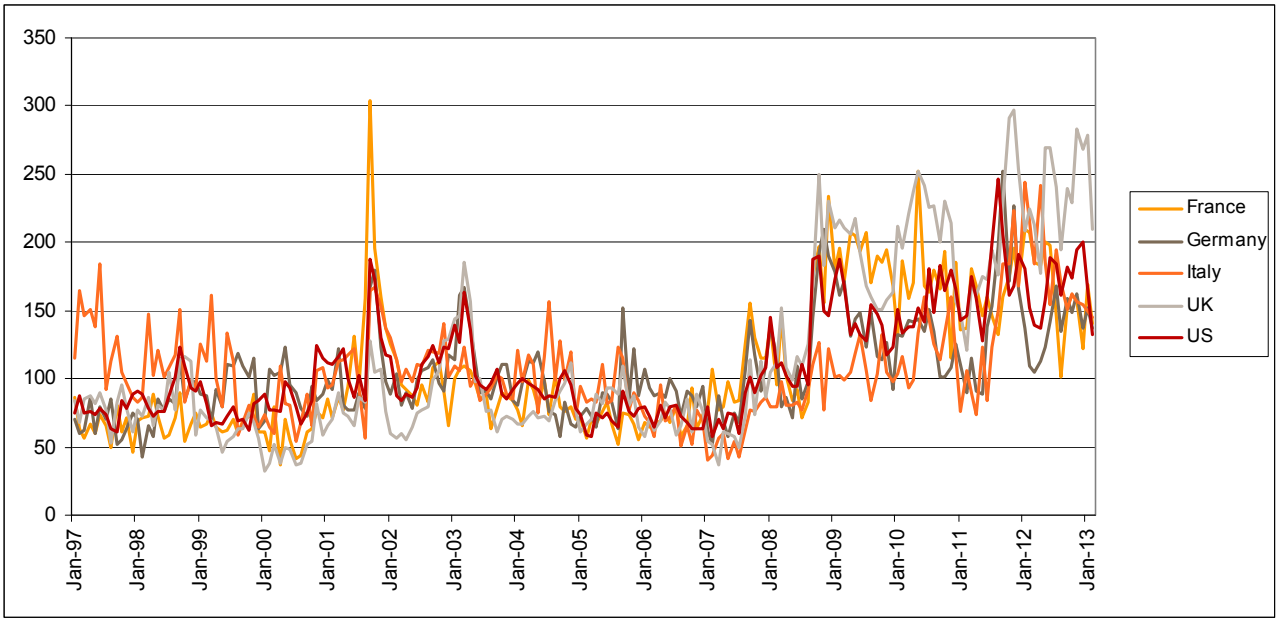
[90] Lowe, P. (2012). "Australia and the World", Address to the Commonwealth Bank Australasian Fixed Income Conference Dinner, 30 October. Available at: http://www.rba.gov.au/speeches/2012/sp-dg-301012.html. Accessed 20 November 2012.
[91] Lowe, P. (2012).
[92] Lowe, P. (2012).

Similar themes emerged in a paper by the International Monetary Fund (IMF) delivered to the November 2012 G-20 meetings in Mexico city.[93] It was observed that while there has been some stabilisation in financial markets and global growth:

> "Unconventional monetary policy has been at the heart of the policy response in advanced economies…"[94]

The recovery will be impacted by uncertainty about the future policy direction in key G-20 economies, with this uncertainty affecting confidence, financial markets and baseline growth. This is highlighted by the Economic Policy Uncertainty Index, which tracks policy uncertainty in the major world economies.

Figure 21 Economic Policy Uncertainty Index: France, Germany, Italy, UK and US (Jan 1997 to Feb 2013)



Source: Scott Baker, Nicholas Bloom and Steven J. Davis (2012). www.PolicyUncertainty.com. Accessed 14 March 2013.

The Economic Policy Uncertainty Index is constructed from three underlying components, being:

- newspaper coverage of policy-related economic uncertainty;
- the number of federal tax code provisions due to expire in future years; and
- disagreement among economic forecasters.[95]

This shows the significant increase in uncertainty since the start of the Global Financial Crisis.

[93] International Monetary Fund (2012). Global Prospects and Policy Challenges, Meetings of G-20 Finance Ministers and Central Bank Governors, November 4-5 2012.
[94] International Monetary Fund (2012). p.3.
[95] Economic Policy Uncertainty. http://www.policyuncertainty.com/methodology.html.

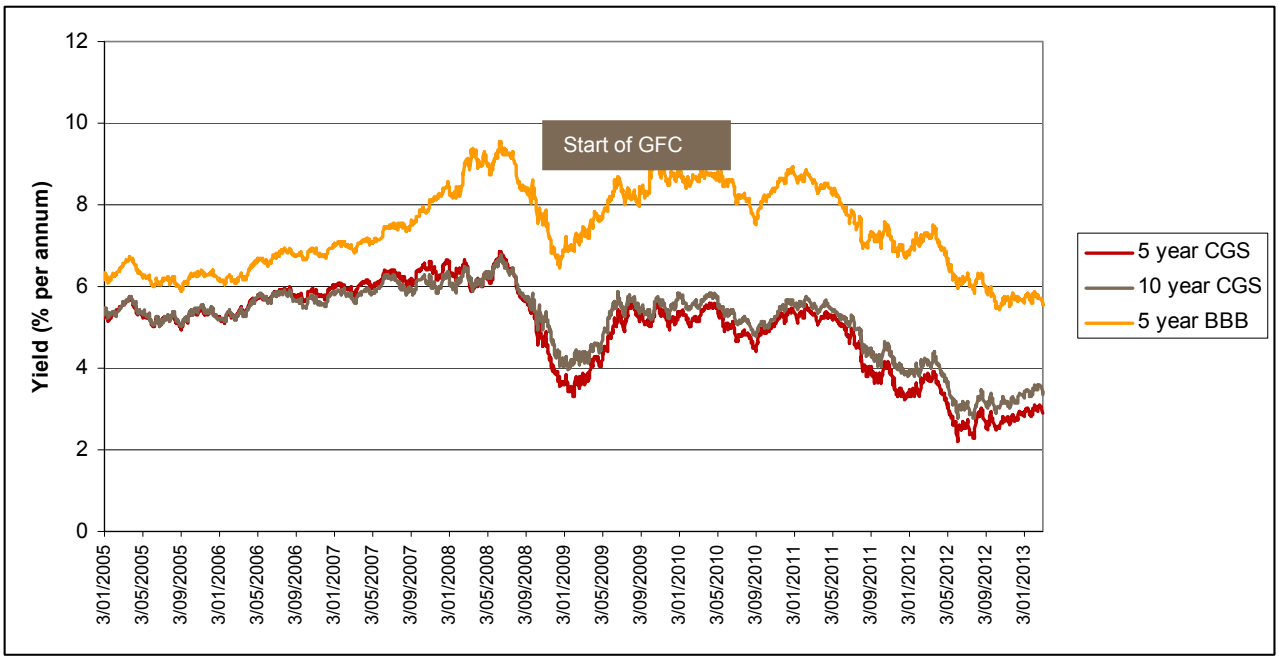
The subsequent February 2013 G-20 meeting in Moscow noted a material improvement in conditions as a consequence of more decisive policy action in Europe and the US.[96] While this was seen as containing the most immediate threats to global recovery, real activity is only expected to recover gradually. Significant downside risks were seen to remain, although there is also the possibility of upside. It considers that the policy imperatives for the major economies remain broadly unchanged, including the maintenance of accommodative monetary policies.

7.2.6.3 Issues for UT4

Aurizon Network's WACC combines market-sensitive (or time varying) parameters that reflect current spot rates, with parameters that have been based on longer term averages of historical data as they are assumed to be more stable through time. The two main market sensitive parameters, being the risk-free rate and debt margin (which comprise the cost of debt), will be set over a twenty day period prior to the Final Decision. The cost of equity is also based on the current risk-free rate, plus the equity risk premium, which reflects longer term historical averages. It is assumed that the equity risk premium (based on the beta and MRP) is more stable through time and accordingly are less likely to be varied between regulatory periods.

The following chart shows yields on five and ten year Commonwealth Government bonds and five year BBB bond yields since the commencement of 2005. This also shows that the spread between the five year BBB bond yields and the risk-free rate (or the debt margin) widened following the commencement of the GFC and has not materially contracted since then.

Figure 22 5 and 10 year Cth Government bond yields and 5 year BBB fair value yields: 3 Jan 2005 to 28 February 2013



Source: Bloomberg

[96] Group of Twenty (2013). Global Prospects and Policy Challenges, Meetings of G-20 Finance Ministers and Central Bank Governors,, February 15-16, Moscow.

A further possibility is that the market has undergone permanent structural change following the GFC. As above, the Deputy Reserve Bank Governor recently commented on a "gradual realisation that the future is likely to be very different from the past".[97] This could also mean that investors have permanently changed the way they assess and price risk and return. However, it could take some time to build an adequate dataset to be able to robustly test as to whether or not this has occurred, and what that impact might be.

It is not known when the final UT4 reset period will be and even if this was known, it is not possible to predict where interest rates will be at that time. Unless market conditions materially improve or stabilise, Aurizon Network is facing a WACC reset at one of the most difficult periods in financial markets that have been experienced for some time, and certainly since its first access undertaking was approved in 2001.

As noted in the independent expert report prepared by Professor Bob Officer and Dr Steven Bishop of Value Adviser Associates (VAA), which is provided in Annex E, the practice of combining spot rates with longer term averages has not been a problem historically when market conditions are more stable. However, it is proving an issue in the current environment. They note that there tends to be an inverse relationship between the risk-free rate and MRP. They also observe that this negative correlation is stronger in a falling market than a rising one. This means that the current compression in the risk-free rate (driven by the flight to quality) is accompanied by a higher expected premium for bearing risk (the MRP). To the extent that this relationship holds it will not be reflected in the regulated outcome because the risk-free rate varies with prevailing market conditions whereas the MRP is effectively static.

Aurizon Network also commissioned a report from SFG Consulting for the purpose of testing the reasonableness of the return on equity if the UT3 parameters and methods were applied, and only updated for the current five year risk-free rate (refer Annex A). As concluded by SFG Consulting, this would result in a historically low cost of equity this is neither reasonable nor plausible in the current environment. This analysis is considered further in section 7.10.

7.2.6.4 The implications for potentially competing investments

Low rates of return may also promote excessive demand for higher cost augmentation of an existing facility rather than efficient investment that could compete with the declared service. However, this increased demand may not be met if the provider of the declared service does not consider the risk/reward relationship for that investment to be appropriately balanced.

For example, one of the key criteria that are used to assess if infrastructure should be declared for third party access is whether that infrastructure is economic to duplicate, based on the 'private profitability' test. In applying this test it will always be more profitable to expand another party's facility than to develop competing infrastructure. This could deny a more efficient outcome that regulation is not able to replicate. For example, while the Standard User Funding Agreement might be considered an effective means of facilitating efficient economic bypass of the regulated network, if the expected rate of return is not seen as commensurate with the risk/reward outcome then it will not attract the necessary capital.

[97] Lowe, P. (2012).

This point was also noted in a submission by Professor Allan Fels to the Productivity Commission on the costs of access regulation:

> "Last but not least, as well as undermining access providers' investment decisions, an access regime may also distort access seekers' incentive to invest, especially where regulated access offers a low-cost, low-risk alternative. If access seekers can benefit from the access provider's investment, the gain from making their own investments in substitute facilities is diminished. The lower the cost to the access seeker of using the access provider's facility, the less the gain from undertaking their own investments. When those costs are low enough, entrants will have incentives to invoke the compulsory access provisions, rather than bearing the difficulties and risks entailed in organising to meet their own needs. Mandatory access may thus discourage otherwise efficient by-pass."[98]

7.2.6.5 The implications of rates of return set in other parts of the supply chain

DBCT Management operates in the same export coal supply chain as Aurizon Network and is also regulated by the QCA. As infrastructure providers in that supply chain, investment decisions made by Aurizon Network and DBCT Management will have a significant impact on supply chain efficiency. A decision to invest – or not invest – in one part of the supply chain will have direct consequences for the supply chain as a whole.

In its last regulatory review, DBCT Management agreed a 'rolled forward' WACC with industry (with the market sensitive parameters updated for the then prevailing market conditions). This was approved by the QCA and the final outcome was a post-tax nominal vanilla WACC of 9.86%. Aurizon Network fully supports the principle that the regulator should not intervene where a commercial decision has been agreed between the service provider and its customers (unless this was somehow clearly contrary to some relevant requirement under the governing legislation). However, the practical implications of this outcome are that if the QCA determines a WACC for Aurizon Network that is consistent with the same parameters and methods used by it in UT3 (and only updated for current market rates), it could result in an outcome that is not only around 3% lower than Aurizon Network's UT3 WACC, but also DBCT Management's WACC.

Aurizon Network recognises the need to set its WACC independent of the DBCT WACC. However, the practical consequence of such a material difference in the regulated rate of return – for two businesses that will be competing in the same market for capital to fund expansions in the same supply chain – is that the pressure to invest will be biased towards Aurizon Network (recognising that rail capacity can substitute for port capacity, particularly where the latter has limited stockpile capacity). This is because the WACC that is used to set the return on capital component of the access charge will be materially lower.

The supply chain expansion path needs to be driven by what would be the most efficient investment in capacity in the right part of the supply chain at the right time, having regard to the service provider's legitimate business interests. An artificially low WACC on the rail network relative to the commercial returns inherent in the terminal investments may promote cost transfer and inefficient overinvestment in the rail system. Not only would materially disparate WACC outcomes have the potential to compromise this, but it is also critically flawed to assume that at this return, Aurizon Network would be readily able to raise capital to fund new investments, especially when compared to other potential investments that are not only in the same industry, but are in the same supply chain.

[98] Fels, A. (2013). Submission to the Productivity Commission Inquiry into the National Access Regime. Available at www.pc.gov.au.

7.2.6.6 Financial market conditions: conclusions

The preceding analysis shows that the world economy and financial markets are currently in a highly uncertain state. As acknowledged by the Deputy Governor of the Reserve Bank, these influences have had, and will to continue to have, a "profound" impact on Australia. Indeed, both the Deputy Governor and the IMF have suggested that we are at a very unusual point in history, with the former suggesting that this could be "changing the way in which global outcomes affect Australia."[99] This could also mean that it is not appropriate to assume that Australia's comparative resilience to the GFC can be expected to occur again if the world plunges into another major downturn. As Mr Lowe observes, there is a gradual realisation that "the future is likely to be different from the past" and this is impacting sentiment in Australia.

At the current time, the advanced economies would appear to be on a recovery path with some stabilisation in the financial markets and gradual improvements in growth. However, this story is underpinned by considerable downside risk and uncertainty. The main risk for Aurizon Network is that the application of a mechanistic approach to setting WACC could result in a historically low cost of equity, which is not reflective of investors' actual return expectations. Further, this outcome will be locked in for the next four years.

Overall, the AEMC has concluded that there should be more flexibility in the approach that is applied in assessing the rate of return, which will be done on a determination by determination basis:

> "A robust and effective rate of return framework must be capable of responding to changes in market conditions. If the allowed rate of return is not determined with regard to the prevailing market conditions, it will either be above or below the return that is required by capital market investors at the time of the determination. Neither of these outcomes are efficient and neither is it in the long term interest of energy consumers."[100]

The need to appropriately take account of prevailing market conditions was similarly endorsed by Financial Investor Group in its 2009 submission to the AER's WACC review.[101] FIG was critical of the AER's "forensic" approach to assessing the WACC and its "mechanical" application of the CAPM, which will not result in an estimate that would reflect the prevailing conditions in the market for funds (noting that this "mechanical" approach is similarly applied by the QCA and other Australian regulators). It also commented that:

> "Moreover, the evidence suggests that regulated businesses are not insulated from financial market risks by virtue of the design of the regulatory regime. If anything the regulatory regime adds an additional layer of risk which needs to be managed."[102]

The AEMC also highlighted the importance of ensuring accountability for both the regulator and service provider in estimating an appropriate rate of return.

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99 Lowe, P. (2012).

100 Australian Energy Market Commission (2012). p.49. While the AEMC's review has been done within the context of the National Gas and Electricity Rules, these findings are just as relevant to Aurizon Network given the QCA has historically applied a rigid and formulaic approach to the assessment of its rate of return, consistent with the approach that has also been applied by the AER.

101 Financial Investor Group (2012).

102 Financial Investor Group (2012). p.12.

Specific solutions

One way to address this issue is to align the measurement period for the risk-free rate and MRP. As noted above, the MRP is inherently volatile and the estimation of the forward-looking MRP is a difficult task (which partly explains the reliance on historical data). Adopting a long-term average for the risk-free rate would be a one way of achieving this consistency. However, it may also not fully address the problem. That is, it remains possible that the cost of equity is too low if investor expectations of the MRP have materially altered – either simply due to current market conditions or because of a permanent structural change in the market post-GFC.

This problem has been acknowledged by IPART in recent decisions in the water industry. IPART's standard approach is to estimate a range for WACC (reflecting ranges for some of the more uncertain parameters) and then select a point estimate from within that range. For example, in its 2011 decision for the Sydney Desalination Plant, IPART stated:

> "The risk free rate and debt margin have been affected by market volatility and the prolonged weak market following the credit crisis of 2008. The change in these factors has potentially created a disparity between these parameters (for which we use short term average data) and the market risk premium (for which we use long term average data)."[103]

IPART's response was to select the WACC from the upper end of its range. This in turn was informed by an analysis of what the WACC might be if all parameters were based on long-term averages (that is, this was used as a reasonableness check). It is noted that IPART has continued to do this in other recent decisions in the water industry, including Sydney Water Corporation[104] and the Sydney Catchment Authority[105].

In response to these issues, IPART is currently reviewing its approach more generally. In a Discussion Paper released in December 2012[106], it considers that while the approach it has used historically has worked well (noting that this has involved the estimation of a range for WACC and then the selection of a point estimate from within that range), it is not necessarily appropriate in the unstable and volatile market conditions experienced since the GFC. It states:

> "In recent determinations, we have expressed concerns that in current market conditions our current methodology for determining the WACC may result in values that are too low. Our key concern was that the very low interest rates on Government bonds, which are an important part of our approach to estimating the WACC, had driven the estimated WACC to levels below their historical norms. This would not be a problem if it reflected revised expectations for returns on investments in utilities and similar industries. However, we were concerned that it may not. We responded to this by setting the WACC above the midpoint of the estimated range."[107]

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[103] Independent Pricing and Regulatory Tribunal (2011). Review of Water Prices to Apply to Sydney Desalination Plant Pty Limited, From 1 July 2012 to 30 June 2017, December, p.80.

[104] Independent Pricing and Regulatory Tribunal (2012a). Review of Prices for Sydney Water Corporation's Water, Sewerage, Stormwater Drainage and Other Services, From 1 July 2012 to 30 June 2016, Final Report, June.

[105] Independent Pricing and Regulatory Tribunal (2012b). Review of Prices for the Sydney Catchment Authority, From 1 July 2012 to 30 June 2016, June.

[106] Independent Pricing and Regulatory Tribunal (2012c). Review of Method for Determining the WACC, Dealing with Uncertainty and Changing Market Conditions, Other Industries – Discussion Paper.

[107] Independent Pricing and Regulatory Tribunal (2012c). p.9.

While it is satisfied that the approach that it has used in its recent water decisions has resulted in an appropriate cost of capital, it remains concerned about combining short-term average rates with long-term averages data, particularly in relation to the cost of equity. It also notes the AEMC's concerns about placing reliance on a single model (i.e. CAPM).

Another approach is to adjust the MRP. This could also be achieved by selecting the WACC from the upper bound of the range.

An alternative approach is to annually update the risk-free rate and debt margin. This is done by the Economic Regulation Authority and in the UK. One advantage of this approach is that it could allow the regulated business to better align the costs of new borrowings undertaken during the regulatory period with the regulated cost of debt. However, this approach may not be preferred by stakeholders because it will introduce another source of yearly tariff variations. It also does not address the problem if the equity margin (in particular, the MRP) is too low.

Another way to address this issue – which Aurizon Network contends should be done regardless of the current market environment – is to cross check the reasonableness of the estimate against alternative models and/or market evidence. This is an important way of addressing model error, especially in estimating the cost of equity (which is currently solely reliant on the CAPM-derived outcome). As outlined in section 7.2.5.1, the AEMC has endorsed the use of alternative models in setting the cost of debt and equity for energy network businesses. SFG Consulting has considered the use of other models and evidence in assessing the reasonableness of the current cost of equity estimate if the QCA's existing parameters and methods were applied (refer Annex A), the outcomes of which are summarised in section 7.10.

The question that then arises is what to do if these reasonableness checks suggest that the rate of return is too high or too low. One solution would be to adjust the WACC (as determined using the regulator's preferred parameter estimates and approaches) for the difference between that WACC and the average estimate produced using the other approaches (especially if those alternative estimates are clustered within a certain range).

IPART's recent approach has been to select the WACC from a different point in the range. The 'reasonableness check' that IPART has applied here is a comparison of the estimated WACC against long-term averages of the market-sensitive parameters. This has resulted in it selecting the WACC from the top end of the range in its more recent decisions. Aurizon Network's proposed response to this is described below.

7.2.7 Review of the framework: implications

A number of framework issues have been identified and discussed above.

In summary, recognising that regulated prices should at least compensate Aurizon Network for its regulatory and commercial risks, in order to satisfy the requirements of s 168A(a) in the QCA Act it is therefore necessary for the QCA to:

- address commercial risks that are not currently compensated in the WACC, or are not otherwise compensated or mitigated in the regulatory framework;
- address regulatory risk, which has not been previously addressed;
- give appropriate regard to estimation error (including model error and measurement error), which is a significant issue in the context of WACC; and

- have regard to prevailing market conditions, with the uncertain market environment currently exacerbating the risk of estimation error.

In addressing the first three issues, the preferred approach would be to include an allowance for these other risks in the cash flows based on a value at risk methodology that quantifies risks based on their impact and probability (consistent with the concept of a 'self insurance' premium).[108] As previously stated, while the impacts of risks could be estimated, the probabilities would be extremely difficult to determine, as there will be little, if any, historical data to inform the assessment.

In the absence of a robust basis for quantification, an alternative is to specify a range for WACC based on ranges for the underlying parameters and select the estimate from above the mid-point of the range. For example, the New Zealand Commerce Commission has selected the WACC from the 75th percentile (or mid-point of the upper bound) in recognition of the asymmetric consequences of error. Historically, IPART has also previously selected ARTC's WACC from above the mid-point of the range. At least one of the reasons for this was to ensure adequate investment. In 2005 the quantum of the adjustment was agreed in a workshop between industry participants and ARTC. In 2009 it applied the equivalent uplift (60 basis points) in recognition of the risks of underinvestment.[109]

Consideration also needs to be given as to how to address the fourth issue, being the prevailing financial market conditions. More recently, IPART has addressed this by selecting the WACC estimate from the upper end of the range, which it has also seen as more consistent with the long-term average values of parameters. Aurizon Network is of the view that IPART's approach is a reasonable and pragmatic way of acknowledging and addressing the risk of error.

There are two key aspects to this approach. The first is to acknowledge the inherent uncertainty in estimating a number of the WACC parameters by establishing a range rather than a point estimate for those parameters. A range for WACC is then calculated.

The second aspect to the approach is deciding where to select the point estimate from within that range. Aurizon Network argues that in order to give appropriate regard to the risk of error, and the asymmetric consequences of that error, the starting point should be the 75th percentile. A further adjustment is required for the uncertain global financial environment. Aurizon Network considers that this warrants selection of the point estimate from the top end of the range.

In UT3 Aurizon Network also proposed a WACC range and a point estimate from the 75th percentile of that range. The QCA did not specifically comment on the proposal to establish a range for WACC or select the WACC from the 75th percentile because:

> "…Aurizon Network had generally proposed parameter ranges where the lower end of those ranges was at the high end of ranges that the Authority considered to be reasonable. The effect of this was compounded when Aurizon Network proposed a WACC that sat at the 75th percentile of a distribution based on already high parameter ranges."[110]

Aurizon Network has procured expert evidence to show why its proposed parameter ranges are reasonable. Aurizon Network's proposals for the relevant WACC parameters are set out below.

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[108] Officer and Bishop also draw parallels with banks' prudential supervision requirements. While this is a very different application, the amount of capital retained is also based on a value at risk framework.

[109] Independent Pricing and Regulatory Tribunal (2009). New South Wales Rail Access Undertaking – Review of Rate of Return and Remaining Mine Life from1 July 2009, Rail Access – Draft Report and Draft Decision, May.

[110] Queensland Competition Authority (2010). p.32.

7.3 Risk-free rate

7.3.1 UT3 outcome

There were two main issues in UT3, being the term to maturity assumption and the impact of the GFC on the risk-free rate.

Aurizon Network proposed a ten year term to maturity. The QCA adopted five years, for the reasons discussed in section 7.2.4. It also provided an additional allowance for refinancing risk in the cost of debt.

In UT3 Aurizon Network also proposed an adjustment to the risk-free rate to reflect concerns regarding the appropriateness of relying upon Commonwealth Government bond yields during times of crisis as a proxy for the CAPM risk-free rate. It proposed to adjust the risk-free rate by a 'convenience yield' measure, which seeks to estimate the impact of the flight to quality on yields. This approach was rejected by the QCA.

7.3.2 Issues for UT4

The issues that were present in UT3 remain in UT4, being:

- the QCA's practice of aligning the term to maturity of the risk-free rate to the length of the regulatory period; and
- setting the risk-free rate in the current market environment, where Commonwealth Government bond yields have reached historical lows.

7.3.2.1 Term to maturity

The QCA's practice of aligning the term to maturity with the length of the regulatory period was discussed in section 7.2.4. For the reasons outlined in that section and addressed in detail in the report by SFG contained in Annex C, Aurizon Network continues to fundamentally disagree with this practice and has proposed a ten year term to maturity.

7.3.2.2 Current market conditions

As discussed above, one of the options for addressing the low level of the risk-free rate is to use a long-term average. The question that then arises is the time-frame over which the estimates are calculated. One option is to commence from the point in time when the Reserve Bank commenced inflation targeting, which is generally accepted to be mid-1993.[111] Given it could take some time for the market to adjust to this new regime, Aurizon Network has selected a commencement date of 1 January 1995. The alternative is to set the 'long-term' horizon at ten years, which allows for a much longer adjustment period to inflation targeting. It is still long-term (at least from the perspective of fixed interest markets in Australia) but gives more weight to recent data.

Two long term estimates of the ten year Commonwealth Government bond yield have therefore been produced, up to and including the 30th of November 2012 (consistent with the end date of the averaging period for the risk-free rate). The estimates are:

[111] Reserve Bank of Australia (1999). "Six Years of Inflation Targeting", Reserve Bank of Australia Bulletin, May. http://www.rba.gov.au/publications/bulletin/1999/may/pdf/bu-0599-2.pdf

Table 33 Long-term averages of the ten year Commonwealth Government bond yield

Averaging Period	Estimate
1 January 1995 to 30 November 2012	5.91%
1 December 2002 to 30 November 2012	5.27%

This compares to a current estimate of 3.15% to 30 November 2012. This is nearly half of the long-term average since 1995, and over 2% lower than the ten year long-term average.

7.3.3 UT4 proposal

Aurizon Network does not currently propose to use the long-term average to set its proposed WACC range for UT4. However, it will use this data as a reasonableness check.

For the purpose of its indicative WACC estimate Aurizon Network has estimated the ten year risk-free rate over the twenty days ending 30 November 2012, which was 3.15%.

7.4 Gearing

7.4.1 UT3 outcome

In UT3 the QCA maintained the UT2 gearing level of 55% (debt to total capital) and a notional credit rating of BBB+.

7.4.2 Issues for UT4

While any future deterioration in market conditions could make it more difficult for firms to raise capital, Aurizon Network has not identified any issues that warrant a change to its current benchmark gearing level of 55% or notional credit rating of BBB+.

7.4.3 UT4 proposal

Aurizon Network has continued to assume benchmark gearing of 55%, compatible with a notional credit rating of BBB+.

7.5 Debt margin

7.5.1 Overview of previous approach used by QCA

Consistent with the term to maturity assumption for the risk-free rate, the debt margin was set based on the difference between Bloomberg's five year BBB 'fair value' corporate bond yields and the risk-free rate, averaged over the same twenty day period.

A refinancing allowance was included in recognition of the likelihood that Aurizon Network (or the efficient benchmark firm) will borrow for terms longer than five years. This is seen as compensating the business for the costs of swapping ten year BBB debt into five year BBB debt, based on advice provided by Lally.[112] The two components of the refinancing allowance are:

[112] Lally, M. (2010). The Appropriate Term for the Risk-free Rate and the Debt Margin, 27 April.

- the 'credit default swap proxy'[113], which reflects the costs of converting the ten year debt margin to a five year margin; and
- the interest rate swap allowance, which reflects the costs of converting the ten year 'risk free element' of the cost of debt into a five year exposure.

In the absence of data from the credit default swap market, the QCA estimated the 'credit default swap proxy' based on the difference between the five and ten year margins for BBB debt. This in turn requires an estimate of the cost of ten year BBB debt.

The key question here was how to estimate a ten year BBB cost of debt because Bloomberg has not published ten year BBB fair value yields for some time given the lack of liquidity in this market. This issue has proven extremely contentious in other regulatory jurisdictions, including energy, where the debt margin is set based on a ten year term to maturity.

In UT3 Aurizon Network proposed the use of the AER's approach to estimate the ten year cost of debt, which has been to extrapolate the longest BBB fair value yield published by Bloomberg (seven years), based on the difference between seven and ten year AAA corporate bond yields (as for some time, these were the longest corporate bond yields published). The QCA accepted this approach.

Bloomberg ceased publishing these longer term AAA yields in June 2010. It is noted that the QCA has continued to apply this approach in practice, with some slight modifications to replicate changes in the AER's approach (discussed further below). The interest rate swap allowance was determined based on the QCA's own empirical analysis. Aurizon Network notes that in more recent decisions for the water industry, it has relied on a 2010 report by Evans and Peck which estimates the allowance based on an 'internal bank pricing model'. It is not possible to replicate this analysis.

7.5.2 Issues for UT4

The most significant issue for UT4 is the term to maturity assumption. As discussed above, Aurizon Network is proposing to apply a ten year term to maturity. The key issue that needs to be addressed is the estimation of a ten year BBB yield, which as noted above, has also been required to estimate the QCA's refinancing allowance.

7.5.2.1 Choice of data source

Aurizon Network considers that the BBB cost of debt should continue to be based on Bloomberg's fair value estimates. It notes that other Australian regulators, such as IPART, have proposed to put less weight on these fair value estimates in favour of estimating a yield from their own sample of BBB bonds. Aurizon Network has significant concerns with such an approach. Bloomberg is an independent and reputable provider of financial market data with a significant resource base and analytical capability. It is therefore considered much better placed to construct a representative yield curve from the limited financial market data available, especially given the lack of liquidity in the market.

[113] It is called this because it was assumed that a business would use credit default swaps to manage this risk. The QCA intended to refer to the credit default swap market for this data however lack of liquidity has precluded this.

Liquidity is fundamental importance to price discovery. To the extent that some of the bonds that have been issued are not actively trading (as acknowledged by APT Allgas regarding its own ten year bond issue that had previously been relied upon by the AER[114]), the published yield will not necessarily reflect current market information. While the detailed methodology used by Bloomberg to construct its fair value yield curves is not known, it is understood that certain criteria must be met before a bond is included in its sample, including that the bond is "well priced".[115] IPART's method does not have any regard to issues such as liquidity or how the price estimate may have been informed – instead it simply accepts the published yield on face value. Aurizon Network considers that if a bond was 'well priced', it is more likely to have been included in Bloomberg's fair value sample, obviating the need for IPART to construct its own portfolio.

Aurizon Network therefore considers that it is important to continue to rely on Bloomberg's fair value yields. If the QCA were to consider an alternative approach that involved the development and interpretation of its own sample of market data, this could introduce another significant source of regulatory risk.

7.5.2.2 Estimating a ten year BBB yield

The longest fair value yield currently published by Bloomberg remains seven years. The main question that needs to be considered is how to extrapolate the seven year yield to produce a ten year yield. Aurizon Network has given consideration to two methods.

AAA extrapolation method

This is the method that was proposed by Aurizon Network (and accepted by the QCA) in UT3. The QCA has also continued to apply this method based on the recommendation of Lally.[116] In its most recent decision on the cost of debt made for SunWater made in May 2012, it adopted the 'AER approach' based on the advice of its consultant, NERA.[117] This in turn was based on the approach that the AER used for a short period of time, which was to average the extrapolated ten year yield with the yield on the Australian Pipeline Trust's (APT's) ten year BBB bond issue, which was one of the first ten year BBB issues to come into the market for some time and was regarded by the AER as reflecting the 'efficient benchmark' energy network business.

As noted above, even APT Allgas questioned the validity of relying on the yield on its own bond issue given it knows that this bond is not actively traded in the market. It therefore appealed the AER's decision with the Australian Competition Tribunal (the Tribunal). In January 2012 the Tribunal overturned the AER's decision to reference the APT bond yield.[118] The AER subsequently reverted to solely relying on the extrapolated ten year yield using the AAA data, for example, in its Final Decisions for Powerlink[119] and the Roma to Brisbane gas pipeline made in 2012.[120] In its more recent Final Decisions for Victorian gas distribution businesses[121] it accepted the use of the matched pairs approach submitted by those businesses, which is discussed further below.

Bloomberg ceased publishing its seven and ten year AAA corporate bond yields on 22 June 2010. This data is now over two years old. This results in the current seven year BBB bond yield being extrapolated using older data. However, it remains the most recent source of corporate bond market data based on Bloomberg's fair value curves.

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114 APA Group (2011). APT Allgas Energy Pty Limited, Access Arrangement, Response to AER Draft Decision, 1 July 2011 – 30 June 2016, 23 March.
115 Lee, M. (2007). Bloomberg Fair Value Market Curves, Presentation to International Bond Market Conference 2007, Taipei.
116 For example, refer: Lally, M. (2011). The Estimated WACC for the SEQ Interim Price Monitoring, 5 January.
117 Queensland Competition Authority (2012). Final Report, SunWater, Irrigation Prices Review: 2012-17, Volume 1, May.
118 Application by APT Allgas Energy Limited (No 2) [2012] ACompT 5 (11 January 2012).
119 Australian Energy Regulator (2012). Final Decision, Powerlink Transmission Determination, 2012-13 to 2016-17, April.
120 Australian Energy Regulator (2012). APT Petroleum Pipeline Pty Ltd, Access Arrangement Final Decision, Roma to Brisbane Pipeline, 2012-13 to 2016-17, August.
121 For example, refer: Australian Energy Regulator (2013). Access Arrangement Final Decision, Envestra Ltd, 2013-17, March.

Extrapolation based on matched pairs

VAA has examined the estimation of the debt margin in their report to Aurizon Network (refer Annex E). The approach that it recommends to extrapolate the seven year BBB yield is based on 'matched pairs'. This is an approach that identifies bonds issued by the same issuer but with different maturities (based on the spread differential at seven and ten years). As noted above, the AER has recently accepted this approach in Draft Decisions for the Victorian gas distribution businesses.

Given there are no long-dated bonds in the Bloomberg BBB fair value curve, the pairs need to be sourced from:

- additional bond pricing data, for example based on rate sheets from UBS;
- bonds of other rating classes;
- bonds issued by Australian entities but denominated in USD.

This is more likely to appropriately capture the current term structure of interest rates (or the slope of the yield curve), at least for those issuers. However, because of the lack of long-term corporate bond issues in Australia, the data may have to be sourced from the US market. VAA reference USD bond issues from three Australian companies, estimating a margin (between the seven and ten year yield) of 0.24% as at 30 November 2012.[122]

This method is more data intensive. Other issues identified by Officer and Bishop include:

- there can be considerable variation depending on the matched pairs included in the analysis; and
- the outcome can be more vulnerable to the idiosyncratic features of the individual issuers.

The second issue is a particular concern given the small sample sizes. The other concern is that while the issuers are Australian companies, to the extent that the margin is based on issues in the US market it will reflect conditions in that market, which are quite different to the conditions in the Australian corporate bond market.

VAA also examines extrapolating the seven year BBB yield based on the observed differential in Credit Default Swap (CDS) spreads between seven and ten year maturities. To make the CDS spread equivalent to the difference between the BBB corporate bond yield and the risk-free rate, the interest rate swap margin also needs to be added. VAA has concerns with the reliability of this approach[123] and therefore does not recommend it.

The above options are summarised in the table below, including the resulting debt margin. The seven year BBB yield is estimated over the twenty days to 30 November 2012.

[122] USD denominated bonds often have call provisions (that is, the issuer can buy the bond back). This will mean that these bonds tend to trade at higher yields. VAA considers this yield impact to be minimal.

[123] Their main concerns are that the 'match' between the CDS and the bond are not exact because: (1) the CDS is denominated in USD; (2) the CDS assumes a 40% recovery rate as defined in the contract, which could vary materially from the recovery rate implied in bond yields; and (3) concerns regarding the reliability of the swap rates to derive a spread over the risk-free rate, including whether the average swap spreads reflect actual counterparty risks.

Table 34 Different methods that can be used to estimate a ten year BBB yield (by extrapolating seven year BBB yield[a])

Extrapolation method	Estimated margin: 7 to 10 yrs	Estimated total debt margin (over risk-free rate)	Pros	Cons
AAA extrapolation method	0.58%[a]	3.28%	Simple and transparent.	AAA data over two years old. Inconsistency in adding this data to a current estimate of the seven year BBB yield.
Matched pairs	0.24%[c]	2.94%	Uses current market data to extrapolate current seven year yield. More likely to reflect actual term structure of interest rates.	More data intensive and not readily able to be replicated. Utilises US market data. Outcomes can vary considerably between different issuers and can reflect idiosyncratic features.

a Seven year BBB yield averaged over the 20 days to 30 November 2012
b Averaged over the 20 days to 22 June 2010
c Estimated by VAA as at 30 November 2012
Source: Bloomberg, VAA

7.5.3 UT4 proposal

Aurizon Network proposes to estimate the debt margin based on a ten year cost of debt. In terms of the extrapolation method used to estimate a ten year BBB cost of debt, the key options available at the current time both have advantages but also have shortcomings. Aurizon Network considers that the most appropriate response is to estimate a range for the debt margin based on the two methods described above. This gives appropriate regard to uncertainty and the risk of error. This is also consistent with its overall approach, which is to estimate a WACC range that will reflect ranges for the more uncertain parameters.

For the purpose of estimating its indicative WACC for the UT4 proposal, Aurizon Network has estimated a range for the debt margin over the 20 days ending 30 November 2012 of 2.94% to 3.28%.

This margin is exclusive of debt raising costs. Consistent with QCA precedent, Aurizon Network has assumed a margin of 0.125% per annum for debt raising costs. Aurizon Network notes that this has not been contentious in the past.

7.6 Market risk premium

7.6.1 Overview of previous approach used by the QCA

In UT3 the QCA rejected Aurizon Network's proposed range for the MRP of 6% to 7% in favour of its precedent value of 6%. The QCA's estimate was based on a number of different methods, including the use of surveys. The QCA also made reference to the AER's (then recent) decision to increase the MRP from 6% to 6.5%, which was in recognition of the impact of the GFC. The QCA stated that:

> "…any adjustments made for short term fluctuations in market conditions are inherently highly subjective, both in the scale of the adjustment and the period over which they would need to be subsequently reversed…"[124]

[124] Queensland Competition Authority (2010). p.40.

The QCA also considered the inconsistency that arises from assuming a five year term to maturity for the risk-free rate while informing the MRP based on analysis that assumes a ten year term to maturity. As noted previously, it rejected making any adjustment for this.

7.6.2 Issues for UT4

7.6.2.1 Estimating the MRP in the current environment

Aurizon Network remains of the view that the QCA's preferred MRP of 6% is at the lower bound of a reasonable range of estimates for the long-term MRP, even putting aside the current difficult financial market conditions. However, when regard is given to the prevailing market conditions, which is the perspective that will be taken by potential investors, the forward-looking MRP is likely to be materially above the long-run MRP.

Aurizon Network engaged Value Adviser Associates (VAA) to review the most appropriate estimate (or range of estimates) to apply for the MRP for the next regulatory period, and its report is contained in Annex E. This analysis shows that the historical MRP has generally fallen within the range of 6% to 7% and recommends 7% as being best reflective of the historical MRP.

As noted previously, VAA also notes that combining the spot risk-free rate with a long-term MRP can prove an issue in unstable market conditions, with the inverse correlation between the two tending to be stronger in a falling market than a rising one. This issue has been recognised by IPART in its more recent decisions in the water industry, where it has selected the WACC from the upper bound of its range.

In addition to reviewing the historical MRP, VAA considers the circumstances prevailing in the capital market, given:

> "This is the market where capital is raised to finance asset investment and the market that assesses the value of businesses."[125]

In assessing these prevailing market conditions, VAA has regard to stock market volatility and yields on traded financial instruments. In summary:

- implied stock market volatility remains above the long run historical average (which VAA assesses is 14%); and
- the persistent high spreads on corporate debt show that investors continue to require a return above pre-GFC levels. There is no reason why equity investors would accept a narrower spread or risk premium than lenders following the GFC. VAA also refutes the argument that the persistent high debt spreads can be attributed to non-systematic default risk and show why any increase in idiosyncratic default risk would only explain a negligible proportion of the increase in the DRP.

These metrics suggest that equity investors are likely to expect a MRP above the long-term historical average, at least over the horizon of the next regulatory period.

Given the above, VAA examines a number of methods to estimate the forward MRP based on these prevailing market conditions, using:

- information from forward markets;
- information on debt spreads;

[125] Value Adviser Associates (2012). Review of Debt Risk Premium and Market Risk Premium, September, p.20.

- dividend growth models.

These methods support a value well above 6%, with information from forward markets suggesting a value in excess of 8%. VAA concludes:

> "In our view the best estimate of the historical average MRP is 7% and the current forward view is above this."[126]

While not asked to recommend an appropriate value for the MRP, SFG also considered the implications of current market conditions for the cost of equity, including equity risk premiums (refer Annex A), reaching similar conclusions to the VAA report. SFG observes that the QCA's preferred value of 6% is largely informed by historical evidence, as well as survey evidence. This 6% value is consistent with the value applied by the QCA (and most Australian regulators) prior to the GFC. As noted above, the QCA did not make any adjustment for the GFC, categorising it as a 'short term fluctuation'. It has applied a MRP of 6% in all of its decisions.

At the current time, there is a range of evidence to suggest that market conditions are currently fundamentally different to the conditions prior to the GFC. Consistent with VAA, one of the pieces of evidence SFG relies upon is the persistently high credit spreads. It shows that it is neither reasonable nor plausible to assume that return on equity required by investors is currently at a historical low, which is the outcome that would result if the QCA's preferred parameters and methods (including a 6% MRP) are applied.

SFG also examines the use of survey evidence. It notes the Australian Competition Tribunal's comments on the three conditions that must be met for survey responses to be given any material consideration, which are:

- The survey must be timely – there must have been no change in the prevailing conditions in the market for funds since the survey was administered;
- There must be clarity about precisely what respondents were asked so that there is no ambiguity about how to interpret their responses; and
- The survey must reflect the views of the market and not a sample that is small, unresponsive, or without sufficient expertise.[127]

It concludes that none of these conditions have been met in the survey evidence that the QCA has relied upon.

7.6.2.2 Inconsistency with the term to maturity for the risk-free rate

As discussed in section 7.2.5.2, if the QCA continues to apply a five year term to maturity, Aurizon Network reiterates its view that it is inappropriate to entrench a known and transparent inconsistency by continuing to estimate the MRP based on evidence that has assumed a ten year risk-free rate. Aurizon Network does not accept that it is appropriate to assume that this is within the 'headroom' of its current estimates. This is not compatible with the requirements of the QCA Act, which entitles Aurizon Network to earn a return that is "at least" commensurate with its commercial and regulatory risks. It is also inconsistent with the Tribunal's conclusions in relation to GasNet, as cited previously.

[126] Value Adviser Associates (2012). p.33.
[127] SFG Consulting (2013). Testing the Reasonableness of the Regulatory Allowance for the Return on Equity, Report for Aurizon Network, March.

7.6.3 UT4 proposal

Aurizon Network maintains its UT3 view that the MRP should be specified as a range rather than a point estimate, as this recognises the uncertainty in estimating a 'precise' value for the MRP, particularly in the current environment. This environment continues to be characterised by the volatility and uncertainty that prevailed following the commencement of the GFC during the last UT3 review, which the QCA at the time categorised as a "short term fluctuation." Aurizon Network is concerned about the QCA's mechanistic application of the CAPM, particularly in the current environment, without having regard to the reasonableness of the cost of equity this produces. In Aurizon Network's view, this mechanistic approach could result in an outcome that is inconsistent with the requirements of the QCA Act.

Aurizon Network also remains of the view that 6% is at the lower bound of a reasonable range of values for the MRP. The upper bound of that range is 7% in 'normal' or stable market conditions. At the current time, there is evidence to suggest that the forward looking value is well above 7%, at least for the horizon of the next regulatory period, as outlined in the VAA report.

Aurizon Network has proposed a range of 6% to 7% for the MRP and this is supported by a range of estimation methods as summarised in the VAA report. This proposal is considered conservative as the upper bound is likely to be well below the current forward looking value for the MRP. However, Aurizon Network also notes the QCA's comments in UT3 that suggested a need for longer term stability:

> "…in its previous decisions, the Authority did not lower the market risk premium when market conditions at the time led some stakeholders to seek a reduction – therefore increasing the premium now would be inconsistent with its past practice that sets the MRP at a level to encourage investment over the medium term and not in response to short term market fluctuations."[128]

Aurizon Network considers that this is best addressed by establishing a reasonable range for the MRP of between 6% and 7%, and then adjusting for specific issues such as unique market conditions in the selection of the point estimate from within the resulting WACC range.

Indeed, Aurizon Network considers that this proposal is extremely conservative in the current circumstances. For example:

- the QCA's most recent update of the forward looking estimate of the MRP based on the dividend growth model (the Cornell method) is 8.7%[129], compared to a value of 5.68% cited in its UT3 decision for QR Network[130] (and as this is the discount rate that is applied to cash flows in perpetuity, this is not a short term measure);
- as shown in the SFG report, the cost of equity determined in recent IPART decisions can either be achieved by adopting:
    - a long run average risk free rate of 5.2% to 5.4%; or
    - a contemporaneous MRP estimate of 7.5% to 7.8%[131].

In the context of this and other evidence presented above, maintaining a value of 6% will not satisfy the requirements of the QCA Act in the current market environment.

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[128] Queensland Competition Authority (2010). p.40.
[129] Queensland Competition Authority (2013). Discussion Paper, The Risk Free Rate and the Market Risk Premium, November.
[130] Queensland Competition Authority (2010). p.40.
[131] SFG Consulting (2013). p.5.

7.7 Equity beta

7.7.1 Overview of previous approach used by QCA

In UT3, Aurizon Network proposed an asset beta range of 0.5 to 0.6, which was primarily informed by the betas of listed US class 1 railroads, US coal firms and Westshore Terminals (a listed Canadian coal export port). In assessing Aurizon Network's beta, the QCA's consultant, the Allen Consulting Group (ACG) examined a similar sample of firms and concluded that regulated energy network businesses were most relevant to Aurizon Network:

> "In particular, ACG observed that businesses in this sector have several characteristics that make their business risk profile similar to Aurizon Network, including relatively uncorrelated demand, revenue caps, and/or take-or-pay contracts over significant volumes."[132]

The QCA accepted this view. It also referred to Professor Olan Henry's beta analysis for the AER (produced as part of the 2009 review of the WACC guidelines that are applied to regulated energy network businesses). It has consistently rejected reference to the US Class 1 railroads in estimating Aurizon Network's beta.

The QCA rejected Aurizon Network's proposed asset beta range and determined an asset beta of 0.45. As the QCA increased Aurizon Network's asset beta from 0.45 to 0.5 in UT2, this decision was seen as 'reversing' that UT2 uplift, which it stated was provided to "encourage the timely provision of new rail infrastructure".[133]

7.7.2 Issues for UT4

7.7.2.1 Debt beta

As the QCA continues to use the Conine formula to convert between asset betas and equity betas, assessing the equity beta requires consideration of the debt beta and asset beta. While Aurizon Network continues to be of the view that the most appropriate value of the debt beta is zero (given the absence of any robust accepted method to estimate it), it has no new evidence to submit on this in UT4. It has therefore applied the UT3 value of 0.12.

7.7.2.2 Overall concerns with the QCA's UT3 assessment

Overall, Aurizon Network continues to have fundamental concerns with the QCA's UT3 assessment of beta.

The first issue, as outlined previously, is the QCA's decision to align Aurizon Network's beta with energy network businesses. The QCA has continued to reject firms in the transportation sector, including US Class 1 railroads, as relevant comparators. These firms are consistently referred to by market analysts as a peer group of Aurizon Holdings Limited. While Aurizon Holdings Limited and the US Class 1 railroads are vertically integrated, if Aurizon Network was a stand-alone coal network business it would most certainly remain in this peer group. The QCA is assuming that in assessing its required rate of return for Aurizon Network (as a stand-alone business), an investor will only be doing this with reference to regulated energy network businesses (in other words, these businesses are the investor's main alternative in deciding where to put its capital). As discussed above, in practice, investors will have regard to a wider infrastructure peer group, which will include firms that operate in the same or a similar market as Aurizon Network.

[132] Queensland Competition Authority (2010). p.44.
[133] Queensland Competition Authority (2010). p.47.

The second issue is the need to give more appropriate regard to estimation error. Beta estimation is particularly imprecise and there are a number of potential sources of error, including relying on inappropriate or irrelevant comparators, as well as statistical errors in the beta estimates themselves (that is, the measure of the firm's beta does not accurately reflect that firm's 'true' beta). It is therefore considered important to specify beta in terms of a range rather than a point estimate.

In addressing these issues for UT4 Aurizon Network has procured two independent expert reports. This includes:

- An assessment of Aurizon Network's commercial and regulatory risks (Synergies, Annex F). This report, the outcomes of which were summarised in section 7.2.3, extends beyond the scope of beta as these risks are systematic and non-systematic.
- An empirical analysis of Aurizon Network's systematic risk (SFG, Annex B).

Aurizon Network has also procured a report from SFG on the reasonableness of the return on equity if the QCA's preferred parameters and approaches were applied in the current environment (Annex A). This is discussed in section 7.10.

7.7.2.3 Empirical analysis

SFG has undertaken a detailed statistical analysis of Aurizon Network's systematic risk. A summary of the process SFG has applied is provided below. Reference is made to the report in Annex B for more detail.

Reference to a larger and wider sample of relevant firms

The SFG analysis assesses beta with reference to a wider sample of relevant firms, which includes Australian listed industrial transportation firms (including Aurizon Holdings Limited), US Class 1 railroads and Australian listed energy network businesses. It noted that reliance on energy network businesses "has the obvious limitation of having a different product and customer base to a rail network."[134] In addition to using information from a broader sample of relevant firms in assessing Aurizon Network's beta, a larger sample size mitigates against firm-specific estimation error.

Techniques to address estimation error

In addition to referencing a larger sample size, SFG addresses estimation error by using a number of different estimation techniques. This includes having regard to firm characteristics "which empirical evidence and theory implies are associated with equity returns."[135] These characteristics include firm size (market capitalisation), book to market ratios and debt equity ratios. It therefore applies three main techniques, being:

- Ordinary Least Squares (OLS) regression, using different starting points for four weekly returns;
- incorporating firm characteristics directly into the beta estimates (firm size and book to market equity ratios);
- fitting regression-based beta estimates according to firm characteristics (that is, the dependent variable is the regression-based beta estimate and the independent variables are firm size, book-to-market ratios and debt-equity ratios).

[134] SFG Consulting (2012c). Systematic Risk of Aurizon Network, p.5.
[135] SFG Consulting (2012c). p.12.

Results

SFG report results for each of the samples, as well as summary results applying different weights to:

- the OLS estimation technique; and
- energy network businesses,

both of which have been previously (solely) relied upon by the QCA in informing Aurizon Network's beta.

The panel of resulting asset beta estimates is provided below.

Table 35 Summary of SFG's asset beta estimates

Weight on energy networks (%)	Weight on OLS estimates (%)										
	0	10	20	30	40	50	60	70	80	90	100
0	0.71	0.71	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
10	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69
20	0.67	0.67	0.67	0.66	0.66	0.66	0.66	0.66	0.65	0.65	0.65
30	0.65	0.65	0.64	0.64	0.64	0.63	0.63	0.62	0.62	0.62	0.61
40	0.63	0.62	0.62	0.61	0.61	0.60	0.60	0.59	0.59	0.58	0.58
50	0.61	0.60	0.59	0.59	0.58	0.57	0.57	0.56	0.55	0.55	0.54
60	0.59	0.58	0.57	0.56	0.55	0.54	0.54	0.53	0.52	0.51	0.50
70	0.57	0.56	0.55	0.54	0.53	0.52	0.50	0.49	0.48	0.47	0.46
80	0.55	0.53	0.52	0.51	0.50	0.49	0.47	0.46	**0.45**	0.44	0.43
90	0.53	0.51	0.50	0.48	0.47	0.46	0.44	0.43	0.42	0.40	0.39
100	0.50	0.49	0.47	0.46	0.44	0.43	0.41	0.40	0.38	0.37	0.35

Source: SFG Consulting (2010). Systematic Risk of Aurizon Network, p.5.

What this shows is that the QCA's UT3 asset beta of 0.45 (highlighted) can only be sustained in the bottom right-hand corner of the table. That is, the current QCA estimate can only be sustained on the basis of OLS estimates of energy distribution companies. If any material weight is applied to other rail comparables or to other estimation methods, the resulting beta estimate is higher:

- if 100% weight is placed on the OLS technique, 50% weight is placed on the sample of Australian-listed energy network firms and the remaining 50% weight is allocated equally to Australian-listed Industrial Transportation firms and US-listed railroads, the asset beta is 0.54; and
- if 50% weight is placed on the OLS estimation technique, 50% weight is placed on the sample of Australian-listed energy network firms and the remaining 50% weight is allocated equally to Australian-listed Industrial Transportation firms and US-listed railroads, the asset beta is 0.57.

SFG also observes that when regard is given to firm characteristics "the OLS beta estimates for Australian-listed energy networks are unusual, in comparison to their characteristics."[136] SFG's analysis shows why firm characteristics are relevant. If they had no role in informing systematic risk, then the coefficients on those variables would be zero.

[136] SFG Consulting (2012c). p.3.

While Aurizon Network does not accept the QCA's reliance on energy network businesses in assessing its beta, even if *some* weight is given to these businesses the asset beta is materially higher than the value determined in UT3, and also well within the range Aurizon Network proposed in UT3. Indeed, SFG's analysis confirms that Aurizon Network's proposed UT3 range is reasonable, coinciding with the middle of the ranges of the above panel estimates rather than the upper bound.

SFG acknowledges issues in the direct comparability of each of these samples to a 'pure play' below rail network. It also acknowledges the sensitivity of the beta estimates to the estimation method and the time period. Accordingly:

> "All of this information, from different samples and estimation techniques, is informative about the appropriate beta estimate for Aurizon Network." [137]

SFG concludes that 0.55 is an appropriate asset beta estimate for Aurizon Network, which coincides with the mid-point of its proposed UT3 range.

7.7.2.4 Risk comparisons

Section 7.2.3 summarised comparisons between Aurizon Network and other regulated businesses, including electricity network business, which are represented in the above sample. Some of the potential differences between Aurizon Network and these businesses are considered below. Aurizon Network also compares the systematic risk characteristics of its below-rail network to the US Class 1 railroads, based on a first principles analysis.

Electricity network firms

As previously discussed, one of the fundamental differences between Aurizon Network and regulated electricity network businesses is the nature of the service provided and the underlying customer base. At the broadest level, Aurizon Network and electricity network businesses both form part of the infrastructure asset class. If this was narrowed, for example by using a tool such as the Global Industry Classification Standard (GICS), the businesses would be in completely different sectors. Aurizon Network would fall into the Transportation Section (industry grouping 2020) and electricity network providers would fall under the Utilities category (industry grouping 5510). This categorisation is based on the principal business activity, and also considers earnings and market perception.[138]

Apart from the risk of estimation error in relying on this more limited sample of firms, the QCA's extremely narrow approach ignores how an investor might assess Aurizon Network's expected return relative to its risk profile. As outlined in section 7.2.2, it is this perspective that is relevant in assessing whether or not the proposed rate of return meets the requirements of s 168A(a) of the QCA Act. Investors will be making this assessment with reference to other comparable investment opportunities. This may (or may not) make reference to electricity network businesses. It will include regulated and unregulated businesses. It is also likely to include reference to other rail transport providers, including US Class 1 railways.

The fact that Aurizon Network and the electricity network businesses are regulated is only one of a number of features that inform a comparative risk analysis. However, the QCA is putting the most weight on this one feature. In any case, the analysis summarised in section 7.2.3 identified a number of differences in the regulatory frameworks governing Aurizon Network and electricity network providers, including:

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[137] SFG Consulting (2012c). p.5.

[138] MSCI (2012). Global Industry Classification Standard, http://www.msci.com/resources/factsheets/MSCI_Global_Industry_Classification_Standard.pdf.

- Aurizon Network is exposed to inflation risk on the return on and of capital components of its allowable revenues;
- in addition to having an allowance approved upfront, all of Aurizon Network's capital expenditure is subject to an ex post review;
- Aurizon Network is exposed to a maximum 10% loss in annual revenue for failing to make the network available due to its own breach or negligence;
- Aurizon Network is exposed to the risk of optimisation for a material reduction in demand, the possibility of actual bypass and a deterioration in asset condition; and
- Aurizon Network does not have access to merits review, which mitigates exposure to regulatory risk.

It is recognised that most of these risks are non-systematic asymmetric and/or regulatory risks. The main systematic risk difference is the inflation exposure. This in turn is a potentially significant risk because the return on and of capital are the two dominant components of Aurizon Network's building blocks revenue allowance.

Aurizon Network is still entitled to compensation for its commercial and regulatory risks under s 168A(a). To the extent that risks are not reflected in the beta because they are not systematic, unless they are clearly otherwise compensated elsewhere in the cash flows, this does not mean that these risks should therefore be ignored. If investors are having regard to features of the regulatory regime in comparing different investment opportunities, these factors will be taken into account in their decisions as to where to allocate their capital.

First Principles analysis of US Class 1 Railroads

A qualitative review of Aurizon Network's systematic risks compared to the US Class 1 railroads was also undertaken, given Aurizon Network supports the inclusion of these businesses in its comparator beta sample (while the QCA has not). A first principles analysis is a qualitative assessment of a number of key factors that are seen to influence systematic risk, including: nature of the product or service, nature of the customer, pricing structure, duration of contracts, market power, nature of regulation, growth options and operating leverage[139]. Each of these factors is assessed below.

Nature of the product or service/nature of the customer

For the purpose of beta, the objective of understanding the underlying market for the relevant product is to identify the key drivers of demand and the extent to which these drivers have a relationship with domestic economic activity. Systematic risk measures the sensitivity of the firm's returns to changes in economic activity. Demand only explains part of this, being revenues (albeit a very important part). The sensitivity of returns will also be influenced by the relationship between demand and costs. This is considered separately under the factor 'operating leverage'.

Overall, this is considered to be one of the most important factors in the first principles analysis because this is a fundamental driver of the firm's returns.

The performance of the Queensland economy is currently highly dependent on the export coal industry, contributing nearly 50% of Queensland's exports of merchandise goods in 2010-11.[140] This provides a direct link between Aurizon Network's returns and domestic economic activity.

[139] Lally, M. (2004). The Cost of Capital for Regulated Entities. Report prepared for the Queensland Competition Authority.
[140] Queensland Government (2010). Railing Queensland's Coal: A New Era for Queensland's Coal Export Industry. p.7.

Coal is the single most important commodity hauled by the Class 1 railroads, servicing both domestic and export customers. Its contribution to total revenues is summarised below.

Table 36 US Class 1 Railways: contribution of coal traffic to total revenue 2011

Railroad	% of revenue
Burlington Northern Sante Fe	25.9
Canadian National Railway	6.9
Canadian Pacific Railway	10.7
CSX Corporation	31.6
Genesee & Wyoming	9.3
Kansas City Southern	13.4
Norfolk Southern	31.0
Rail America	6.3
Union Pacific[a]	not available

a 22% of Union Pacific's revenues in 2011 was from energy products, which includes coal, petroleum and coke transportation. Coal is the largest segment of Union Pacific's energy transportation business.

Source: Bloomberg

The key differences between Aurizon Network and the US Class 1 railroads is that the latter are considerably larger and more diversified. Demand for some of the commodities carried will be correlated with domestic economic activity while others will be less sensitive.

The more diversified nature of the US Class 1 railways means that depending on the composition of each carrier's traffic, it may be able to protect its returns in the event of a contraction in domestic economic activity given its diversified revenue base. While Aurizon Network is also in the rail transport business it is a single commodity railway that primarily services export markets. As outlined above, given the importance of the export coal industry to the Queensland economy this provides an important link between the performance of that industry and domestic economic activity.

While this highlights some differences between Aurizon Network and US Class 1 railroads in terms of how their returns might covary with the return on the market, of the three groups of comparator firms examined in the beta analysis, the US Class 1 railroads provide the most similar type of service to Aurizon Network. The firms in the industrial transportation sector is the next most relevant sector (based on type of service offering), although not all of these firms are rail transport providers. Electricity network providers provide a fundamentally different service.

Pricing structure

Pricing structure refers to the extent that the firm's pricing arrangements either mitigate or increase its exposure to systematic risk. It is difficult to make any direct comparisons between Aurizon Network and US Class 1 railroads as the pricing structures employed by the latter are not known, and are likely to vary across the different service offerings. As they are only subject to light-handed regulation, the US Class 1 railroads have more flexibility in relation to the pricing of services, depending on the elasticity of demand for the particular traffic.

Duration of contracts

Lally states that the duration of contracts with suppliers and customers can impact systematic risk in two ways:[141]

[141] Lally, M. (2004). p.82.

- if a firm's prices are fixed under long-term contracts and there is a (positive) demand shock, it may be unable to increase its prices, which will reduce its beta;
- if a firm's prices are fixed under long-term contracts and there is a (negative) cost shock, it may similarly be unable to increase its prices, which will increase its beta.

It is therefore difficult to clearly assess the impact of the duration of contracts on systematic risk.

Aurizon Network typically enters into long-term contracts for access to its below-rail network. However, these are typically only ten years and relinquishment fees are capped at 50%. It is understood that US Class 1 railroads do enter into long-term contracts although the specific duration of these contracts is not known. In contrast, majority coal infrastructure agreements are rolling 10 years, until notified, with full take or pay liability.

Market power

The existence of market power is often seen as having a mitigating effect on systematic risk (although Lally indicates that it offers mixed results, as long as firms seek to maximise their cash flows[142]). This assumes that the firm possesses market power and is able to exercise that power to its advantage.

In the coal markets, both Aurizon Network and US Class 1 railroads have market power. In the case of Aurizon Network, the existence of prescriptive regulation (compared to light-handed regulation) and countervailing buyer power constrains its ability to use that power. In the case of the Class 1 railroads, the threat of a return to more intrusive regulation could also service as a constraint on the exercise of market power.

Nature of regulation

In theory, the US Class 1 railroads are exposed to more systematic volume risk than Aurizon Network because they are only subject to light-handed regulation. The assumption here is that regulation reduces rather than increases risk: heavy-handed regulation could increase risk because it significantly reduces the firm's commercial flexibility, including its ability to raise its prices in response to changes in market circumstances.

Growth options

Both Aurizon Network and a number of the US Class 1 railroads have growth options arising from expansion plans, as well as replacement of existing network infrastructure. Given the scale of the expansions contemplated in the Central Queensland coal region relative to Aurizon Network's existing asset base, Aurizon Network's growth options could be more sensitive to changes in economic conditions compared to the Class 1 railroads. However, Aurizon Network also has less discretion in undertaking investments, which materially increases its commercial and regulatory risk (but not necessarily systematic risk).

Operating leverage

Operating leverage is a measure of the sensitivity of a firm's returns to output changes, which is driven by the proportion of the firm's operating costs that are fixed. All other things being equal, high operating leverage is associated with higher systematic risk, as these fixed costs will still be incurred irrespective of actual volumes.

Typical of a rail infrastructure provider, Aurizon Network has high operating leverage. This has previously been acknowledged by the QCA.[143]

[142] Lally, M. (2004).

It is not possible to directly estimate operating leverage for the US Class 1 railroads. However, it can be proxied by estimating the change in operating income relative to changes in sales.[144] If a firm has high operating leverage, operating income should change more than proportionately than the change in sales. The average operating leverage for the Class 1 railways has been estimated using financial statement data for the years 2002 to 2011.

Table 37 US Class 1 Railways: average operating leverage 2002-2011

Railroad	Average operating income to sales
Burlington Northern Sante Fe	110%
Canadian National Railway	114%
Canadian Pacific Railway[a]	86%
CSX Corporation	462%
Genesee & Wyoming	120%
Kansas City Southern	269%
Norfolk Southern	173%
Rail America	139%
Union Pacific	102%

a Excludes one outlier, where the ratio in a year was greater than 10,000%.

Source: Bloomberg

Overall, this shows that on average, operating income has changed more than proportionately than sales, suggesting that the firms do have high operating leverage. The exception is one firm, which had one outlier excluded. Caution needs to be exercised in relying on this data because it is only a proxy measure.

There was also considerable year-on-year volatility.

Conclusions

The above analysis shows that Aurizon Network's below-rail business is similar to the US Class 1 railways on a number of systematic risk dimensions. The key difference is that the US Class 1s are more diversified and are also not subject to regulation, although the threat of intrusive regulation would impose some constraints on behaviours. This supports inclusion of these firms in a comparator beta sample, noting that Aurizon Network is not looking to restrict this sample to these firms.

7.7.3 UT4 proposal

Aurizon Network considers that in order to satisfy the requirements of s 168A(a) the QCA Act (which entitles it at least to a return that is commensurate with its commercial and regulatory risks), it is necessary to take a prudent and robust approach to estimating beta, which is highly prone to estimation error. A number of the risks that have been identified are not systematic and hence will not be reflected in the beta estimate. However, Aurizon Network considers that these other uncompensated risks should be addressed as part of the decision regarding the selection of the point estimate from within the WACC range, as discussed previously.

Limiting the scope of beta estimation to systematic risk, Aurizon Network has had regard to a number of key principles that are considered necessary to ensure that s 168A(a) is satisfied.

143 Queensland Competition Authority (2005b). Decision, QR's 2005 Draft Access Undertaking.
144 Damadoran, A. Estimating Risk Parameters. https://archive.nyu.edu/bitstream/2451/26906/2/wpa99019.pdf

First, it remains important to specify beta as a range rather than a single point estimate, given the uncertainty associated with its estimation and the risk of error.

Second, recognising that as there are no 'pure play' listed stand-alone below-rail coal networks, Aurizon Network considers it important to have regard to a broader sample of relevant firms. This sample should include firms in the rail and transportation sector that are currently members of Aurizon Holdings Limited's peer group, which are no less relevant even if the business was not vertically integrated. It also includes firms that are not regulated.

Third, it is imperative to address the risk of estimation error. This means using a number of valid estimation techniques and measurement periods. It also includes having regard to firm characteristics that have been shown to have an impact on the firm's systematic risk.

The thorough and robust analysis undertaken by SFG shows that an asset beta range of 0.5 to 0.6 remains reasonable. Importantly, this holds even if some weight is given to electricity network businesses. The QCA's UT3 analysis puts full weight on one sample of firms (that are not considered directly relevant to Aurizon Network) and one estimation technique. This materially exposes Aurizon Network to the risk of error. The direct consequence of this error is that the regulated WACC is below the rate of return required by investors, recognising that these investors are assessing this in direct comparison to alternative investment opportunities that they consider relevant.

Aurizon Network therefore proposes an asset beta range of 0.5 to 0.6 for UT4. Assuming 55% gearing and a debt beta of 0.12, this results in an equity beta range of 0.9 to 1.0.

7.8 Gamma

7.8.1 Overview of previous approach used by QCA

Aurizon Network proposed a range for gamma of zero to 0.5 in UT3. The QCA maintained its long-term precedent value of 0.5, although noted that "this decision does not preclude its future considerations of the arguments for a change in the gamma estimate based on the evidence available at that time."[145]

7.8.2 Issues with current approach

Historically, the most commonly applied value of gamma by Australian regulators (including the QCA) was 0.5. In 2009, it was subject to a detailed review by the AER as part of its review of the WACC guidelines to apply to regulated electricity network businesses. In that decision, the AER adopted a value of 0.65, which was based on a distribution rate of 100% and a value of franking credits (theta) of 0.65.[146]

While the AER's decision in relation to its WACC guidelines could not be appealed, regulatory determinations made for individual network businesses are subject to merits review. The AER applied its preferred value of 0.65 in determinations made for the Queensland and South Australian electricity distribution businesses in 2010 and these decisions were subsequently appealed.

The Tribunal reached its decision on this appeal in April 2011. Before the hearing was conducted the AER recognised that it had made an error in making its determination in relation to the distribution rate, acknowledging that there was no data supporting a value higher than 70% (which is the most commonly applied value in practice).

[145] Queensland Competition Authority (2010). p.55.
[146] Gamma is the product of these two inputs.

The focus of the Tribunal's review was therefore on the value of theta. One of the most commonly used methods to estimate the value of theta is a dividend drop-off study, which ascribes a value to theta based on the change in share price following the payment of a franked dividend by a company.

There was much contention about the dividend drop-off evidence relied upon by the AER. As part of its deliberations the Tribunal requested a new 'state of the art' dividend drop-off study, the terms of reference of which had to be agreed between the parties to the appeal (with intervention by the Tribunal). This study was undertaken by SFG and arrived at a value of theta of 0.35. The Tribunal concluded:

> "The Tribunal is satisfied that SFG's March 2011 report is the best dividend drop-off study currently available for the purpose of estimating gamma in terms of the Rules. Its estimate of a value of 0.35 for theta should be accepted as the best estimate using this approach." [147]

The resulting value of gamma was 0.25, based on a distribution rate of 0.7 and a theta of 0.35. This value has subsequently been applied by the AER in its decisions.[148]

Aurizon Network has procured a report from SFG on the value of gamma, which is presented in Annex D. Relying on the same analysis that was relied upon by the Tribunal, SFG recommends a range for gamma from 0 to 0.25. This in turn is based on a:

- best available estimate for the distribution rate of 70%; and
- best available estimate for theta of 0 to 0.35, with 0.35 based on the analysis from its 'state of the art' dividend drop-off study commissioned by the Tribunal.

It presents evidence to support the lower bound of zero based on:

- the observed market practice of valuation experts, corporations, credit rating agencies and government owned corporations (where the rate of return guidelines applied to the latter are intended to replicate the commercial incentives and behaviour of non-government owned businesses);
- the results of a study published by Cannavan, Finn and Gray (2004), which examined the simultaneous prices of shares and futures prices (and therefore does not suffer from the problems inherent in dividend drop-off studies); and
- the dividend drop off estimate when the value of cash dividends is set at 100 cents in the dollar, consistent with the CAPM.

None of the above evidence relies on assumptions regarding the identity of the price setting investor. Accordingly, the QCA's previous assertion that a gamma of zero is incompatible with the domestic CAPM is of no relevance here, noting that if the QCA's 'closed economy' assumption was applied to all of the parameters, they would need to be re-estimated to exclude the impact of foreign investors in the Australian capital market (if that were possible).

SFG highlight this inconsistency, noting that the AER's estimate of theta recognises the practical influence of foreign investors in the Australian market. It also notes that the origin of the QCA's view was work performed by Lally, who suggested that if all foreign investors are excluded from consideration, the most appropriate estimate for theta is one. SFG states:

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147 Australian Competition Tribunal, Application by Energex Limited (Gamma)(No 5)[2011] ACompT 9, para. 29.

148 Except in electricity transmission, as no departure from the value contained in the National Electricity Rules, which is still 0.65, is permitted.

> "Another way of looking at this issue is that the theoretical assumption approach involves estimating theta not as it *is*, but as it *would be* if there were no foreign investors. But if we estimate theta on this basis, consistency demands that we should do the same for *all* WACC parameters. For example, the risk-free rate would presumably be higher if no foreign investment were allowed, as there would be less demand for Australian government bonds." [149]

It is also commented that:

> "…we note that the Authority has maintained the same values of the distribution rate and theta since its first WACC decision, even though a considerable volume of new evidence (including published empirical estimates) have become available. Consequently, it is not clear what new evidence would be required in order for the Authority to change its estimate of gamma."[150]

Given the regulated businesses would seem to bear the burden of proof for this evidence in order to alter the regulator's preferred view, if the QCA again rejects this new evidence Aurizon Network similarly questions what standard of evidence it would need to produce to satisfy its requirements and an explanation of why the standard of evidence required by the QCA is higher than that required by the Tribunal.

7.8.3 UT4 proposal

Aurizon Network is therefore proposing a value of gamma of 0.25, consistent with the value endorsed by the Australian Competition Tribunal.[151]

7.9 Inflation

In UT2 and UT3, the QCA approved an inflation estimate of 2.5%, being the mid-point of the Reserve Bank's target range. As there was no specific discussion of this in the QCA's decisions, Aurizon Network is assuming that this estimate has not been contentious. Aurizon Network has therefore proposed an inflation estimate of 2.5% for UT4. It is considered a robust forecast of long term inflation given the credibility and effectiveness of the Reserve Bank's monetary policy activities. It is also independent.

As noted in section 7.2.3, unlike other regulatory regimes (specifically, ARTC, WA rail and energy networks), Aurizon Network is exposed to inflation risk on its return on and return of capital allowances. That is, it is exposed to the difference between actual inflation and that forecast that is used to roll-forward the RAB for the purpose of setting these allowances. All other things being equal, this exposes Aurizon Network to higher systematic risk than these other regimes.

[149] SFG Consulting (2012d). Estimating Gamma, p.22.
[150] SFG Consulting (2012d). p.23.
[151] For the purpose of estimating its proposed WACC range, 0.25 is set at the lower bound because this is the estimate that would result in a lower (overall) rate of return for Aurizon Network.

7.10 Assessing the reasonableness of the proposed estimates

7.10.1 SFG analysis

The QCA's WACC review process has typically focussed on each parameter in isolation, without having regard to the overall reasonableness of the resulting estimate. Given the need to satisfy the requirements of s 168A(a) of the QCA Act and the risk and consequences of estimation error, Aurizon Network considers this to be extremely important. This is especially the case at the current time, when a mechanistic application of the QCA's approach would result in a cost of equity that is the lowest on record, which is considered neither reasonable nor plausible in the current environment.

As the cost of debt is more readily observable the main focus is the on cost of equity (recognising that observed debt margins can also be used to assess the reasonableness of the proposed cost of equity). The relevant question is whether investors would view the proposed return as adequate given the relevant risks and the prevailing conditions in the market for funds.

Aurizon Network has procured a report from SFG on the reasonableness of the allowed return on equity, having regard to the parameters and methods that have been previously applied by the QCA (refer Annex A). Applying the current approach of combining the current estimate of the risk-free rate (based on current spot rates) with the MRP (which is based on a long run average), the implication is that the return on equity required by investors is currently at its lowest level on record. However, there is no evidence to support this being the case.

Instead, the evidence suggests that the prevailing conditions in the market for funds are not commensurate with the conditions prior to the GFC. This includes the materially higher debt risk premiums (three to four-fold higher since the start of the GFC), dividend growth models, dividend yields and price-earnings ratios. This evidence is contrary to a conclusion that required returns are currently at historical lows. The application of the current QCA approach in the current market conditions also implies that a firm could significantly reduce its cost of capital by employing 100% equity financing, which is a direct contradiction to well accepted finance theory.

As also highlighted by VAA, SFG argues that the long-run average MRP does not necessarily provide an estimate that is commensurate with conditions in the current market, noting that the mean of historical excess returns tends to move in the opposite direction to the expected risk premium:

> "When risk premiums rise, stock prices fall and the historical mean falls, and when risk premiums fall, stock prices rise and the historical mean rises. Consequently, the mean of historical excess returns does not provide an estimate of the MRP that is commensurate with the prevailing conditions in the market for funds, but rather one that is commensurate with the average conditions in the market over the historical period."[152]

SFG compares the return on equity estimate that would result from a mechanical update of the QCA's UT3 parameters (7.46%) with Aurizon Network's proposed cost of equity range (8.55% to 10.15%). It also notes the approach that has been taken by IPART in responding to the prevailing market conditions, which has involved allowing a return on equity that is closer to its long-run historical average. This in turn could be obtained by applying a long-term average for the risk-free rate (which would be above 5%) or a current estimate of the MRP (of 7.5% to 7.8%). It concludes:

[152] SFG Consulting (2012b).

"In our view, QRN's proposed range for the allowed return on equity, of 8.56% to 10.16%[153], is conservative in light of the evidence set out above…In our view, an allowed return on equity below the range submitted by QRN cannot be considered to be commensurate with the prevailing conditions and would not provide QRN's shareholders with a return that is commensurate with the risks involved."[154]

7.10.2 Comparison against long-term averages

Consistent with the approach recently taken by IPART, and in recognition of the issues identified by both VAA and SFG, a comparison can be made against a 'long-term average' WACC estimate based on long-term averages. Given the key issue is the reasonableness of the cost of equity (and the combination of a spot estimate for the risk-free rate with a long run average MRP), the analysis is limited to the risk-free rate in the cost of equity.

Two long-term average estimates of the ten year risk-free rate were provided in section 7.3.2.2. The first, taken from 1 January 1995, was 5.91%. The second, taken from 1 December 2002 (a ten year average) was 5.27%. Cost of equity estimates have been produced using these two estimates based on the QCA's approved UT3 parameter estimates (MRP of 6% and an equity beta of 0.8) and Aurizon Network's proposed ranges (6% to 7% for the MRP and 0.9 to 1.0 for the equity beta). The results are shown in the following table.

Table 38 Cost of equity estimates applying long-term average risk-free rate

Horizon for long term average	UT3	Aurizon Network lower bound	Aurizon Network upper bound
From 1 January 1995	10.71%	11.31%	12.91%
From 1 October 2002	10.07%	10.67%	12.27%

This compares to a cost of equity of 7.54% if the QCA's UT3 parameters and approaches were applied, including an updated five year risk-free rate over the 20 days to 30 November 2012. This is nearly 2.5% lower than the UT3 approved cost of equity. As argued by SFG, it is neither reasonable nor plausible to assume that investors have materially lowered their return expectations in the current market environment.

7.11 Summary: proposed return on capital

Aurizon Network's proposed WACC range for UT4 is summarised in the table below. Estimates of the risk-free rate and debt margin have been averaged over the twenty days ending 30 November 2012.

Aurizon Network intends to seek confidential approval of its proposed UT4 averaging period with the QCA. Providing confidential advance notice of the intended averaging period is common practice in Australia (including in energy), as it allows the regulated business to implement its necessary hedging strategies without notifying the market.

[153] SFG's analysis was based on estimates of Aurizon Network's cost of equity range applying a twenty day average of the risk-free rate as at the end of September 2012. Aurizon Network's proposal is based on the 20 day average as at the end of November 2012. There is only one basis point difference between the resulting cost of equity outcomes over those different averaging periods, which is considered immaterial.

[154] SFG Consulting (2013). p.40.

Table 39 Aurizon Network's proposed WACC range (as at 30 November 2012)

Parameter	Lower bound	Upper bound
Risk free rate	3.15%	3.15%
Debt margin	2.94%	3.28%
Debt raising costs	0.125%	0.125%
Refinancing allowance	n/a	n/a
Debt to value	55%	55%
MRP	6%	7%
Gamma	0.25	0.25
Corporate tax rate	30%	30%
Debt beta	0.12	0.12
Asset beta	0.5	0.6
Equity beta	0.9	1.0
Cost of debt	6.22%	6.56%
Cost of equity	8.55%	10.15%
Post-tax nominal (vanilla) WACC	**7.27%**	**8.18%**

The upper bound of the proposed WACC range is materially below Aurizon Network's approved UT3 WACC of 9.96%.

Aurizon Network has undertaken a more detailed review of the framework within which the WACC is estimated based on the requirements of the QCA Act, specifically, the requirement to set prices that at least provide a return on investment that is commensurate with the regulatory and commercial risks involved in providing the service. In order to satisfy this requirement, it is essential to have regard to the way in which investors will make this assessment, as they are ultimately the ones who will determine whether or not the rate of return is adequate having regard to alternative opportunities available to them in the market.

One of the more contentious framework issues in the UT3 review was the QCA's decision to base the risk-free rate and debt margin on a five year term to maturity (except for the purpose of estimating the MRP). For the reasons set out in section 7.2.4 and as supported by the independent report by SFG, Aurizon Network does not consider it appropriate to assume a five year term to maturity for the risk free rate and debt margin and accordingly has assumed a ten year term to maturity.

As outlined in section 7.2.7, Aurizon Network proposes to deal with a number of the framework issues identified at the beginning of this chapter, including the difficulties presented by the current market conditions, via the selection of the point estimate from within the WACC range.

The principal framework issues that need to be addressed are:

- commercial risks that are not currently compensated in the WACC, or are not otherwise compensated or mitigated in the regulatory framework;
- regulatory risk; and
- estimation error (including model error and measurement error), which is a significant issue in the context of WACC.

This justifies selection of the WACC from at least the 75th percentile of the range, having regard to the asymmetric consequences of error.

This makes no adjustment for current market conditions. Aurizon Network proposes to address this consistent with the approach recently adopted by IPART, which is to select the WACC from the top end of the range. This results in a cost of equity that is close to the estimate of 10.07% that would result after applying the UT3 approved parameters and a ten year long-term average risk-free rate (noting that Aurizon Network does not agree with the QCA's asset beta estimate of 0.45 and considers a 6% MRP to be at the lower bound of the reasonable range). Aurizon Network therefore considers this upper bound to be conservative, consistent with the observations made by SFG.

Aurizon Network has therefore applied a post-tax nominal WACC of 8.18% in developing its indicative UT4 MAR and reference tariffs.

8 Capital expenditure

Aurizon Network proposes a Capital Indicator of $1.95 billion over the four years of UT4. This reflects Aurizon Network's best estimate of the amount and timing of expected capital expenditure with a view to minimising the need for tariff adjustments at the end of UT4.

The expenditure includes:

- a number of major growth projects, including expenditure relating to WIRP 1, the Goonyella Rail Expansion Project (HPX3) and the Rolleston electrification.
- a significant increase in renewals expenditure, that smooths this expenditure to better align with depreciation, having regard to the current age profile of the assets. Such an approach, which has been adopted by the US Class 1 railroads, should improve track quality, increase network capacity and be more cost effective in the long run.

The proposed UT4 Capital Indicator is shown in the tables below.

UT4 Capital Indicator by System ($'000)

System	2013/14	2014/15	2015/16	2016/17	Total
Blackwater	97,564	1,070,153	96,093	71,418	1,335,228
Goonyella	191,203	109,582	99,975	69,495	470,254
Moura	12,350	61,635	11,301	8,076	93,361
Newlands	10,233	6,649	9,364	6,692	32,937
GAPE	19,805	--	--	--	19,805
TOTAL	**331,154**	**1,248,019**	**216,732**	**155,681**	**1,951,586**

UT4 Capital Indicator by Electric/Non-electric ($'000)

System	2013/14	2014/15	2015/16	2016/17	Total
Electric	320,745	887,077	161,605	115,376	1,484,803
Non-electric	10,409	360,942	55,127	40,305	466,783
TOTAL	**331,154**	**1,248,019**	**216,732**	**155,681**	**1,951,586**

Aurizon Network also proposes to change the approach used to calculate interest during construction (IDC) for capital expenditure projects (which allows capitalisation of financing costs into the value that is included in the RAB). This involves using a post tax nominal classic WACC for the purpose of calculating IDC, as this allows for the recognition of the tax deductibility of interest in the WACC rather than the cash flows (which the post tax nominal vanilla WACC assumes). This avoids additional complexity and facilitates user funding.

8.1 Introduction

Aurizon Network is committed to expanding the capacity of the CQCR to support the next stage in the development of the Queensland coal industry. The opportunity cost that would be incurred by way of foregone volumes in the event capacity was not available when the demand for coal increases is a frequent concern expressed by industry. In that respect, Aurizon Network appreciates that certain expenditure needs to be committed now to ensure that when additional port capacity is constructed, it will be complemented by below-rail capacity. Aurizon Network also needs to ensure appropriate investment continues to be made in renewals in order to maintain track quality and achieve a high level of reliability, given the high level of throughput and the unique technical challenges posed by sustaining throughput on the CQCR.

Aurizon Network has taken the same approach as UT3 in deriving the Capital Indicator over the regulatory period, with the Capital Expenditure Capital Carryover Account maintained to reflect differences between the Capital Indicator and actual approved capital expenditure (based on the return on capital, depreciation and tax). Aurizon Network acknowledges that acceptance of the Capital Indicator does not imply final acceptance of that expenditure, with actual expenditure subject to the acceptance process contained in Schedule A based on the standard, scope and cost of works.

The Capital Indicator has been developed in line with the forecast capital expenditure activity in each system for each year. Aurizon Network has considered all projects that are to be commissioned within the UT4 period that have current Board approval, as well as costs relating to projects commissioned during the UT3 period (which may still be subject to final approval by the QCA) that have further expenditure required in UT4.

The identification and assessment of all investments is undertaken in accordance with Aurizon Holdings Limited's Board approved Capital Management Policy. All investment proposals must be evaluated in accordance with the Investment Framework Manual as part of the mandated governance requirements under its Enterprise Risk Management Framework. This robust framework is designed to ensure that all projects receive appropriate assessment against prudent commercial standards. In this respect, as described in Chapter 7 of Volume 2, Aurizon Network's investment process has five stage gates, being:

- Concept (which includes the development of the business case)
- Prefeasibility
- Feasibility
- Execution
- Operation.

The approval process is based on the organisation's financial delegation. The stage gate process must be applied regardless of the size of the investment. The project may also need to be subject to an independent peer review.

8.2 Scope

Aurizon Network's capital expenditure forecast for UT4 identifies those projects that will be completed during that period for capital works in the CQCR. In addition to works that contribute towards the delivery of the current expansion path in each system, the estimates include the following types of capital projects:

- customer specific projects for which the scope of works has or will be agreed between the customer and Aurizon Network;

- projects that are ongoing from UT3 (and have received approved funding in the past);
- projects undertaken or planned for asset replacement or renewal;
- projects undertaken or planned for maintaining the safe and reliable operation of the network.

The forecasts reflect the current expected cost of each project, based on the year of expected commissioning. Works on commissioned projects may continue after the date of commissioning (or the date at which they become operational), until they reach a point where there is no further expected expenditure. As a result the majority of claims will occur in the year of commissioning but there may be subsequent claims for close-out works in following years.

As part of the development of new projects, Aurizon Network will often need to invest in feasibility studies which examine the feasibility of the proposal (or alternative proposals) from a number of perspectives, including engineering (design, construction and operations), commercial and development. The commitment to undertake these studies must be made well before the decision is made as to whether the project will proceed. The regulatory framework accepts that the prudent management of the network necessitates that these costs be incurred, and recovered by way of reference tariffs, even where it is uncertain as to whether the project will proceed. This recognition has been retained in UT4.

Further, in recognition of the risks borne by Aurizon Network in relation to feasibility study costs, in UT3 the QCA approved the ability for Aurizon Network to require access seekers to fund these costs. Clause 7.5.2 of the 2010 Undertaking contains provisions for the funding of pre-feasibility and feasibility studies.

8.3 Details of major growth projects

This section describes the major growth projects that are included in the UT4 forecast. Investment in renewals is discussed in the following section.

8.3.1 Wiggins Island Rail Project Stage 1

The Wiggins Island Rail Project (WIRP) will create a vital link between the new Wiggins Island Coal Terminal (WICET) and mines in the southern Bowen and Surat Basins. This project will deliver a 30% increase in coal tonnage transported from the Southern Bowen Basin by 2015. The rail infrastructure will be delivered in accordance with the meeting commercially agreed project milestones.

WIRP Stage 1 will see Aurizon Network deliver a series of rail infrastructure projects that will feed WICET's initial 27 mtpa capacity. It will provide new infrastructure to connect the existing rail network to the new terminal and capacity increasing upgrades across the Blackwater and Moura Systems.

The scope of works required is very sensitive to changes in tonnages. As actual tonnage profiles were only confirmed late in the project, a number of studies were investigated based on indicative tonnage profiles. As the profiles firmed some studies were pushed into future stages and other newly identified studies commenced.

Development of the optimal infrastructure solutions to deliver the required capacity involved extensive whole of system modelling of the Blackwater and Moura systems. This involved using a combination of static and dynamic modelling to explore different combinations of above and below rail solutions under different operating paradigms. The solutions were evaluated against a number of criteria, including satisfying stakeholder requirements in relation to capacity and below rail transit time targets. Aurizon Network also developed a set of operating principles, which include the relevant system operating parameters as well as

maintenance and construction requirements, which were submitted to the relevant stakeholders (coal producers and above rail operators) for review. A copy of the Blackwater supply chain operating parameters which reflected the proposed WIRP project were provided to the QCA in 2011.

There are also a number of key interdependencies that impact the timing and scope of the project. The most significant one is the construction of the port, which is being managed via constant consultation with the WICET project, including participation in project steering committees. There are also a number of network connections required for new mines that will be participating in WIRP Stage 1.

The project has been endorsed by the eight proposed end users of Stage 1. As different parts of the project are required to satisfy discrete sets of end users, the project has been separated into five segments, each of which will be executed and managed separately. This includes the selection of the most appropriate procurement method for each work package based on complexity and risk.

An overview of each segment is provided below.

8.3.1.1 Moura system upgrade

Upgrades are required to the Moura system to improve the existing track structure to accommodate the additional tonnages going to WICET. The basis of the work is formation strengthening and deviations, with the options analysis examining different online possession regimes and the addition of a siding at the Yalkara Quarry (for the purpose of providing ballast material for rail construction, which was eventually deemed unnecessary).

The preferred solution includes upgrading the earthworks underneath the railway track in four locations on the Moura Short Line. Approximately three kilometres of earthworks will be upgraded, with the majority of work occurring within the rail corridor between the Burnett Highway and Prospect Creek Road in the Greycliffe area.

Construction commenced in March 2012.

8.3.1.2 Wiggins Island balloon loop

Initial investigations of this solution commenced back in 2007, with an options study for the locations of a rail yard at Aldoga and an unloading facility. Following the investigations conducted as part of this study, this was removed from the scope of works in 2010. The Moura Link connection to the Wiggins Island balloon loop was also removed when it became clear that Surat Basin tonnes would not be part of WICET Stage 1.

Following the detailed analysis of options and the confirmation of Stage 1 volumes, the preferred solution is the construction of a new 13 kilometre balloon loop from the North Coast Line near Yarwun to enable the unloading of coal for the new port facility via a conveyor. Works at the balloon loop project site include earthworks and drainage, track infrastructure, overhead electrical equipment, power systems, signals and telecommunications.

Once operational, coal trains will travel from mines in the southern Bowen Basin along Aurizon Network's rail network to the balloon loop where they will be unloaded onto WICET's conveyor and carried to the port for export. Up to five Blackwater length trains can be held on the balloon loop at one time - three on the arrival side waiting to be unloaded, one at the unloader unloading coal, and one on the departure side heading back to the mines.

Given the substantial operational benefits of electrification of the Wiggins Island balloon loop the UT4 Capital Indicator includes an estimate of the works necessary to facilitate the operation of electric train services to WICET. Construction of the balloon loop commenced in May 2012.

8.3.1.3 Blackwater duplications

Duplication of the Blackwater system began in 2004/05. After the commissioning of the Grantleigh tunnel duplication in September 2009, only seven single line sections remain on the Blackwater main line. Duplication of these seven sections was endorsed through the Coal Rail Infrastructure Master Plan (CRIMP) in 2008. These seven duplications have been consolidated under two duplication projects, being Rocklands to Stanwell and Dingo to Bluff. As noted in prior submissions to the QCA in the context of the Electric Traction Draft Amending Access Undertaking (DAAU), once the duplications are complete, the inferior performance of diesel locomotives on certain ruling grades will become the primary constraint on capacity and capital efficiency in Blackwater, as against the current constraint posed by through running trains on the North Coast Line.[155]

Rocklands to Stanwell duplication

WIRP Stage 1 includes duplicating 18 kilometres of track between Rocklands and Stanwell on the Blackwater System. Works between Rocklands and Stanwell include earthworks and drainage, track infrastructure, overhead electrical equipment, power systems, signals and telecommunications. Three rail bridges will also be constructed at the Burnett Highway, Four Mile Creek and Neerkol Creek. The duplications will be designed to carry coal trains that are 1.7km in length along the Blackwater System to the balloon loop near Gladstone for unloading.

Construction of the Rocklands to Stanwell duplication commenced in July 2012.

Dingo to Bluff duplication

This requires the duplication of 23.9 kilometres of track between Dingo and Bluff. Construction is due to commence in May 2013.

8.3.1.4 North Coast line Aldoga triplication

It will be necessary to increase the capacity of the North Coast line adjacent to WICET. This will involve the construction of ten kilometres of additional track between Aldoga and the balloon loop and six bridges (three over waterways, two over roads and one over rail). It will require heavy earthworks in hilly terrain.

The scope of works has been agreed with customers in order to satisfy capacity and congestion (i.e. minimum below rail transit time) requirements. Recent studies undertaken by Aurizon Network have identified opportunities that might enable a lower cost solution, such as alternative track alignments, however they need to be fully investigated. The proposed options are being investigated and stakeholders have been involved during this process.

The commissioning date of this segment of the project is required later than the balance of the WIRP projects. The final project budget will reflect the cost of the preferred option (which is expected to be lower than the current estimate). As such, the proposed capital indicator aligns to the commercially agreed project scope.

[155] QR National Network (2012). Submission to QCA, Electric Access Draft Amending Access Undertaking, September.

8.3.1.5 Bauhinia north branch upgrade

This will involve an upgrade from Rangal to (but not including) the Bandanna spur connection in the north to provide improved rail on the Bauhinia branch line access (through the development of easements from public roads into the corridor). A number of options were evaluated based on the construction of a passing loop at Kenmare, with alternative solutions considered as to the position of the passing loop, access roads, and signalling.

This project is currently in the feasibility stage and construction is expected to be commenced in April 2013.

8.3.1.6 WIRP Stage 1 forecast UT4 expenditure

The total amount included in the UT4 capital expenditure forecast for WIRP Stage 1 is $910 million. This includes the costs for all five segments, including contingencies (no contingency has been included for the North Coast Line Aldoga triplication).

8.3.2 Goonyella to Abbot Point Expansion (GAPE) finalisation

The 69 kilometre 'northern missing link' between the Goonyella and Newlands systems was completed ahead of schedule, with first railings in January 2012. This enables the delivery of 50 mpta of coal through to the Abbot Point Coal Terminal (APCT).

The remaining works required to finalise this project in the UT4 period involves the expansion and upgrade of track in the Newlands system. This is expected to be substantially completed in 2012/13, with the final costs of completion expected to be incurred in 2013/14. The forecast expenditure for 2013/14 is $0.598 million.

8.3.3 GAPE-related Goonyella System Works (the Teviot Brook Passing Loop)

The Teviot Brook Passing Loop project is necessary to ensure the success of the GAPE project (capacity increase from 17mtpa to 50mtpa). It involves the construction of a 2.4 kilometre electrified passing loop between Wotonga and Moranbah North that is suitable for Goonyella length trains.

The tonnages for GAPE will place additional demands on Goonyella system capacity. The Teviot Brook Passing Loop is required to support initial tonnage growth of 10.7 mpta to APCT. The passing loop will increase flexibility and assist in the management of traffic travelling between the Goonyella System and APCT. Specifically, it will enable loaded trains travelling in the "up" direction and loaded trains from the North Goonyella branch to the Hay Point and Dalrymple Bay coal terminals to be held in the passing loop.

A number of different options were investigated. Modelling showed that operational improvements alone would not be sufficient to meet the capacity required to deliver 50 mpta to APCT. The construction of additional below rail infrastructure is therefore the only way to deliver the required capacity. A number of below rail alternatives were considered, with the passing loop assessed as the preferred option compared to the following:

- Do nothing: this was not considered feasible.
- Duplicate track between Wotonga and Moranbah North: This is considerably more expensive than the passing loop. While duplication may eventually be required depending on demand, Aurizon Network's capacity analysis confirmed that the passing loop could support increased tonnages to both GAPE and the ports of Hay Point and Dalrymple Bay before this occurs.

- Half duplication from Wotonga to the end of the passing loop: Aurizon Network's capacity analysis showed that this would provide no additional benefit above and beyond the loop alone.

The Teviot Brook Loop will therefore alleviate the demands on Goonyella system capacity while allowing more intensive capital works to be delayed (which will also depend on future tonnage growth). It will also allow for greater operational flexibility on the North Goonyella branch line.

The project was included in the 2010 CRIMP (and endorsed by the QCA in May 2011). It is currently still in the planning stage. Construction is expected to commence in mid 2013/14 and completed in 2014/15. The forecast expenditure included in the UT4 forecast is $20 million.

8.3.4 Goonyella Rail Expansion Project (HPX3)

The 924km Goonyella rail system services 30 coal mines in the northern Bowen Basin. Coal is railed to the Port of Hay Point, south of Mackay, where it is exported through the Hay Point Services Coal Terminal (HPSCT), operated by the BHP Billiton Mitsubishi Alliance (BMA), and the Dalrymple Bay Coal Terminal (DBCT), operated by DBCT Management. HPSCT is undertaking an 11 mtpa expansion of its existing terminal, which will take Goonyella system capacity from 129 mtpa to 140 mtpa.

Aurizon Network has identified and evaluated six below rail projects to support the increase in Goonyella rail system capacity to 140 mpta. Consideration was also given as to whether operational improvements could alleviate the pressure on capacity between Jilalan Yard and the port terminals, however this will not address the problem. There is also no opportunity to increase capacity via additional rollingstock. The final below rail projects that will be progressed are:

- the duplication of track south of Hay Point; and
- the Wotonga Feeder Station.

The above projects were endorsed by the QCA in May 2011 as part of the 2010 CRIMP.

Recognising the interdependencies between these projects and the expansion at HPSCT, Aurizon Network is managing the delivery and timing of these projects to ensure alignment in the ultimate delivery of the expanded capacity in the coal chain. An overview of the relevant projects is provided below.

8.3.4.1 Track duplication south of Hay Point

This project involves a seven kilometre track duplication parallel to the existing main line south of the DBCT and HPSCT balloon loops. This will increase the ability to hold loaded trains prior to entering the HPSCT unloading facility without blocking empty trains leaving the facility (it will be able to hold two trains if needed).

Consideration was also given to the need for a holding road to provide additional capacity for empty trains required to travel back to Jilalan, however the more recent analysis indicates that this may not be necessary. Initial pre-concept studies for the Dudgeon Point coal terminal have also indicated that the original proposed alignment and location of this holding road would require its removal if the Dudgeon Point coal terminal proceeds. Detail optimisation and capacity modelling undertaken during the feasibility phase have indicated that the need for the holding road can be avoided through operational changes. This change in scope has been communicated to the relevant access holder.

Benefits of the duplication include streamlined operations, additional train holding capacity for trains waiting to enter and leave the port unloaders and safer train movements.

Earthworks and construction of the track duplication has commenced. Commissioning is expected in the first half of the 2014 financial year.

8.3.4.2 Wotonga Feeder Station

The existing electrical infrastructure at Wotonga will not adequately support the projected haulage load increase with a reliable power supply. This project will replace the existing Track Sectioning Cabin (TSC) at Wotonga near Moranbah with a new 132kV/50kV feeder station, and construct new TSCs in Carborough Downs and Grosvenor. In the event of a delay of a 132kV connection the feeder station shall be configured to temporally operate as a TSC providing more reliable supply if problems occur at the Coppabella or Moranbah feeder stations.

The benefits of this project include greater power system reliability, improved operational efficiency on the northern and western Goonyella lines and improved operations of Coppabella and Moranbah feeder stations and the North Goonyella mine. It is noted that Aurizon Network has substantially documented and modelled the superior efficiency of a fully-electric system like Goonyella, as against a hybrid system like Blackwater.

The TCO model prepared as part of the Electric Traction DAAU, and made available to the QCA in that context,[156] is a compelling empirical case underlying the endorsement of the Wotonga Feeder Station by the Goonyella user group. Aurizon Network reiterates its offer to the QCA to make the TCO model available to it, subject to appropriate controls over confidential information of the Related Operator that is used in the model, should it aid in the QCA's consideration of the Wotonga Feeder Station project. The Wotonga Feeder Station is scheduled for commissioning in mid-2015, which aligns with the Powerlink connection.

8.3.4.3 HPX3 forecast UT4 expenditure

The aggregate amount included in the amount included in the UT4 Capital Indicator for the HPX3 project is $132.791 million.

8.3.5 Rolleston electrification

In electrification of the Bauhinia rail spur that services the Rolleston mine, the utilisation of electric trains has identified efficiencies that will generate both operational and cost benefits. For instance, electric trains are able to deliver increased power-to-weight ratios due to power being drawn directly from overhead electrical infrastructure. As a consequence, decreased section running times on ruling grades are typically achievable for electric consists when compared to the running times of equivalent diesel consists.

An allowance of $199.589 million has been included in the UT4 Capital Indicator for electrification of the 110km Bauhinia rail spur, with this amount equally assigned in the 2015/16 capital expenditure and subsequent return on capital values. Based upon this estimated allowance, a WACC of 8.18% and an expected commencement date of December 2014, return on capital of the Bauhinia spur in 2015/16 equates to $15.926m. Combined with return on assets, maintenance costs, operating costs and inflation adjustments, these values form the building blocks of MAR for the system. Hence, the electrification capital expenditure of $199.589m is rolled into the RAB, continuing to earn a rate of return as determined by the WACC.

In the year prior to the electrification project, it is forecast that volumes of approximately 20.961 million electric gross tonne kilometres (egtks) are to be railed across the Blackwater system. This is based upon a total combined Blackwater electric building block value of $107.132 million.

[156] For example, refer: Aurizon Network (2012). Response to Draft Decision – Electric Traction Services Pricing, 25 September, p.18.

Following electrification of the Bauhinia spur in 2014/15, this value grows to $119.536 million, representing an uplift of $12.404 million. However, volumes are augmented by a further 40% (approximately 8.716 million egtks) in 2015/16, growing to approximately 10.144 million egtks in 2016/17, indicating significant economies of scale. With Xstrata's recent announcement to proceed with the expansion of the Rolleston coal mine, which expands output from 9.4 million tonnes per year to 14.6 million tonnes per year (with provisions to increase to 20 million tonnes per year), these forecast volumes are expected to be achieved.

Assuming long run system railings of 85% of contract, and based upon a total electric MAR of $19.954 million for 2015/16, an incremental price of $2.69 per egtk is forecast. In contrast, the proposed price within the Blackwater system is forecast to be $2.97 per egtk. As a consequence, electric train services from the Rolleston branch line will make a positive contribution (i.e. $0.28 per egtk) to common system costs.

Table 40 - Rolleston Electrification Incremental and Contribution to Common Costs

Incremental Costs ($'000)	2015/16	2016/17	2017/18
Return on Capital	15,926	15,780	15,617
Less Inflation	-4,870	-4,826	-4,775
Return of Asset (Depreciation)	6,655	6,822	6,992
Maintenance Costs	167	174	178
Operating Costs	2,076	2,128	2,181
Gamma Adjusted Tax	-	-	-
Total Costs	**19,954**	**20,078**	**20,193**
Cash Flows	**2015/16**	**2016/17**	**2017/18**
Contracted Volumes	8,715,809	10,143,750	10,143,750
85% of Contracted Volume	7,408,437	8,622,187	8,622,187
Incremental Cost per '000 egtk	$2.69	$2.33	$2.34
Blackwater AT5	$2.97	$3.04	$3.12
Contribution to Common Cost	$0.28	$0.71	$0.78

8.3.6 Lilyvale passing loop

The Lilyvale passing loop will support the expansion of the RG Tanna coal terminal to 81 mtpa (based on infrastructure improvements and the closure of the Barney Point coal terminal). Based on Aurizon Network's capacity analysis, it will be required by the end of 2013.

This project involves the design, procurement and construction of a 2.4km electrified passing loop between 62.6km and 65.0km on the Gregory Branch of the Goonyella Line. Construction is due to commence in April 2013, for completion in December 2013.

An allowance of $18.075 million has been included for the Lilyvale passing loop in the UT4 Capital Indicator.

8.4 Upgrades and renewals

8.4.1 Asset renewals

8.4.1.1 Introduction

The railway network business is by its nature capital intensive. Although the full range of below rail assets may have lives in a range from five to 100 years, railway networks can function sustainably for many years without significant investment. This is because most of the high value assets in a railway network have relatively long lives.

Initial capital investment aside, for such a business (particularly where high tonnages are carried), as the asset matures a higher proportion of the business cash flow will tend to be spent on investment in sustaining the operation through asset renewals. The requirements for sustaining capital investment can be very non-homogeneous (i.e. “lumpy”) due to a number of factors including common installation dates for large asset quantities with similar anticipated life and service. Renewing assets in an operating environment is more costly and time consuming than in a ‘greenfield’ situation. As the asset matures larger investments are necessary. At this point in the lifecycle there are two significant issues that need careful consideration, that is, financing activities for the capital investment required and the physical ability to carry out large renewal programs in the operating railway without impacting operational capacity.

Determining the most appropriate balance between investment in asset renewals and maintenance is critical to effective asset management. Maintenance can be used to maximise the life of the asset and defer the need for upgrades or replacement. On the other hand, timely asset replacement can reduce the need for maintenance through time and reduce whole of life-cycle costs.

The most efficient asset management strategy involves optimising the timing of renewals in order to minimise expensive corrective maintenance and/or avoid the consequences of early failure. This is essentially a risk management exercise. There are a range of factors that can impact asset performance (a number of which are related) and the timing and impact of these factors cannot be predicted with certainty. Reference is made to historical data however this does not always inform how an asset might respond as network volumes continue to grow. For example, the more frequent and severe weather events that have recently been experienced in the CQCR could not have been predicted and this has had a significant impact on the condition of the asset.

Aurizon Network has proposed a significant increase in renewals expenditure for UT4. The main driver of this approach is a change in strategy. Aurizon Network has reviewed its approach to renewals within the context of its asset management strategy and is proposing to implement a new strategy for renewals based on a more constant or smoother expenditure profile, consistent with the practice employed by the US Class 1 railroads. At the same time:

- the current age profile of the assets (including track renewal work installed in the 1980s and 1990s) means that many of the assets are nearing end of life, necessitating an increase in renewal investment;
- gross tonne kilometres remain the predominant driver of renewal and maintenance activities, with rail wear generally proportional to volumes. Predicted increases in corridor tonnages will require more renewal and maintenance activities to be delivered in the same or fewer closure periods.

A material increase in renewals activity in UT4 relative to previous regulatory periods is not unexpected in the context of the original asset valuation and remaining asset lives. The original asset valuation in 2000 reflected a total track length of 1918 kilometres. These same track quantities have also seen a material increase in tonnages since the original asset valuation and substantially more than was envisaged when the remaining asset lives were initially determined. The following table shows the assumed remaining asset lives at the time of the original valuation and the remaining life in the RAB as at 1 July 2012, for selected assets in the Blackwater and Goonyella systems only.

Table 41 Asset Lives for Selected Asset Categories Installed at January 2000: Blackwater and Goonyella

Asset Class	Assumed Asset Life at Valuation	Useful Remaining Life at Valuation	RAB Remaining Life at July 2012	UT3 Adjusted Asset Lives[a]	Effective RAB Life Remaining at July 2012
Goonyella					
Track	40	24	12	35	7
Signals	30	19	7	30	7
Electrical System Equipment	25	16	4	35	14
Power Distribution	40	16	4	35	0
Blackwater					
Track	40	21	9	35	4
Signals	30	20	8	30	8
Electrical System Equipment	25	18	5	35	15
Power Distribution	40	18	5	35	0

a Factors in volume changes compared to the volumes underpinning the asset lives at valuation (that is, the impact of higher asset utilisation rates).
Source: Gutteridge, Haskins and Davey Pty Ltd (2000). Valuation of Queensland Rail's Below Rail Assets for the Coal Network; UT3 Regulatory Model.

The following table shows the submitted asset replacement amounts included in capital expenditure submissions since 2005/06. These replacement amounts are also shown as a proportion of the CPI escalated total gross replacement value assumed for the original valuation date for the asset classes listed in Table 41 ('renewals rate') and civil structures. These GRV estimates are also conservative as replacement costs have substantially exceeded CPI. In addition, brownfield replacement costs would also be substantially higher than assumed with the relativity of a Greenfield GRV estimate.

Table 42 Asset Replacement Expenditure (CQCR)

Year	Asset Renewal Expenditure ($ million)[a]	Brisbane (All Groups) CPI	GRV CPI Escalated ($ million)[b]	Renewals Rate
2005/06	22.1	84.5	$2,372.8	0.9%
2006/07	8.3	86.7	$2,434.6	0.3%
2007/08	16.1	91.1	$2,558.2	0.6%
2008/09	14.4	92.9	$2,608.7	0.6%
2009/10	17.5	95.9	$2,693.0	0.6%
2010/11	19.0	99.6	$2,796.9	0.7%
2011/12	91.8	100.5	$2,822.1	3.3%
2012/13 (f)	121.8	103.0	$2,892.7	4.2%

a Excludes $14.9 million in investment in telecommunications renewals between 2005/06 and 2011/12
b Includes only track, power system, signalling and structures based on Gross MEERA values in 1999 Working Paper 5 – Valuation of Queensland Rail's Below Rail Assets for the Coal Network

Where an existing asset base at its original valuation is assumed to be comprised of a uniform distribution of assets of various ages, the capital replenishment rate would normally be expected to be in the order of 3% of gross replacement value per annum (for a 30 to 35 year physical asset life).

The renewals rates in Table 42 and the remaining asset life in Table 41 are commensurate with a large proportion of the RAB being installed within a reasonably narrow period of time, that is, the asset cannot be assumed to have been in a 'steady state' and undergoing periodic renewal at the time of valuation.

Accordingly, it is reasonable to expect that renewals expenditure will need to substantially increase as a large pool of assets approach the end of their original design lives. It is also likely that the renewals expenditure may substantially exceed a steady state capital replenishment rate where a large pool of the RAB approaches life expiry within the same narrow window those assets were installed.

The renewals requirement for the UT4 period is commensurate with this distribution of asset lives and is explained in more detail below.

8.4.1.2 Renewals and asset management

This section briefly reviews the theory underpinning investment in renewals expenditure as part of an asset management strategy before examining Aurizon Network's approach.

Proactive versus reactive renewals

As described above, renewals investment is not assessed in isolation but within the context of the overall asset management strategy, including maintenance expenditure. In the submission accompanying its Draft 2009 Undertaking, QR Network highlighted the following tradeoffs between capital and maintenance expenditure.

Table 43 Trade off between renewals and maintenance expenditure

High maintenance and deferred renewals	High renewals and lower maintenance
Advantages	
Deferred renewals expenditure keeps access charges lower in the short term (although this will be offset by higher maintenance costs in the medium to long term).	Limits the amount of on-track time required for future maintenance.
	More likely to ensure the safety and integrity of the asset. This is still dependent on an appropriate maintenance regime however the asset should require less maintenance to perform at the required standard.
	Reduces the vulnerability of the delivery of the maintenance program to labour shortages (and/or spikes in labour costs).
	Reduces technological obsolescence as spare parts should always be readily available for new equipment.
Disadvantages	
Deferring renewals expenditure could lead to unsupported systems being relied upon due to technological obsolescence. This can also have a detrimental impact on network performance if delays are experienced because spare parts aren't available.	A more significant renewals program will increase access charges for users in the short term, however this should be offset by lower maintenance costs.
A more intensive maintenance regime will be difficult to implement in a capacity constrained environment. An increase in the number and/or duration of maintenance possessions will reduce network availability and supply chain performance.	
An increased requirement for maintenance in an environment where skilled labour is already scarce may adversely impact the ability to achieve the maintenance plan.	

As noted in the table above, while higher renewals expenditure can lead to higher access charges in the short run, this should be offset by longer term savings in maintenance costs. The costs of the early failure of an asset can be significant, particularly if this results in lost throughput opportunities for producers in periods of high demand. It can also present material safety risks, which could have far more catastrophic consequences.

It is important to note that increased renewals expenditure will not necessarily translate to a 'compensating' reduction in maintenance costs in the short run. In other words, the proposed maintenance allowance has been prepared on the assumption of achieving 'steady state' asset depreciation. Underinvestment in renewals would necessitate higher levels of maintenance than estimated for UT4. Ensuring ongoing adequate investment in maintenance is imperative to maintaining asset quality. However, appropriate investment in renewals should lead to savings in the whole of life cycle costs of investing in and maintaining the assets, including avoiding the costs of unanticipated early asset failure.

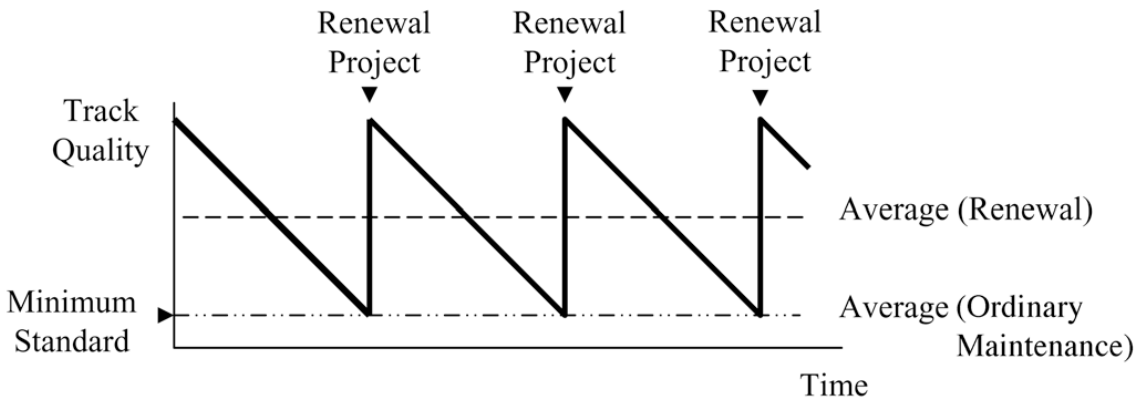
Recognising the trade-offs between the two does not imply that renewals is better than ordinary maintenance or vice versa. Both form an essential part of the asset management strategy. The key objective is to achieve an appropriate balance between the two, recognising that these decisions need to be made and planned in advance in the face of considerable uncertainty.

A 2006 study by Grimes and Barkan examined the cost effectiveness of renewals strategies in US Class 1 railways.[157] The authors observed that over the last twenty years, the US Class 1 railways have increased their expenditure on renewals relative to maintenance. Grimes and Barkan noted that the fundamental difference between maintenance and renewals from an engineering management perspective is that:

[157] Grimes, G. and Barkan, C. (2006). "Cost Effectiveness of Railway Infrastructure Renewal Maintenance". Journal of Transportation Engineering, August.

- renewals-based maintenance results in better average asset condition over the life of the asset but greater variation in asset quality (assuming lumpy renewals investment), as shown in the figure below; while
- selective ordinary maintenance is generally used to maintain the track at a consistent minimum standard.[158]

Figure 23 Relationship between maintenance, renewals and track quality



Source: G. Grimes & C. Barkan (2006). "Cost Effectiveness of Railway Infrastructure Renewal Maintenance". Journal of Transportation Engineering, August, p.602.

This study concluded that renewals-based maintenance was more cost effective. One of the reasons for this is that renewals is more productive, based on the use of large mechanised production gangs in limited track possession time, which can be predicted and planned for upfront. Noting that renewals expenditure had comprised the largest proportion of the US Class 1's capital spending:

> "…if railroads unduly constrain renewal maintenance in an effort to conserve capital resources, they will find that ordinary maintenance expenses will rise disproportionately in relation to the reductions in capital expenditures. Making such tradeoffs may improve free cash flow temporarily, but the effect will only be short lived as overall maintenance cost eventually increases."[159]

That is, while ordinary maintenance will continue to be an important part of the asset management regime, this analysis shows that under-investing in renewals could have more adverse consequences for maintenance costs in the long-run through higher asset failure rates and less productive maintenance interventions. This is particularly relevant with a large, geographically diverse railway network with substantial maintenance response times due to transit. In a recent submission made in response to the Productivity Commission's review of the National Access Regime, ARTC commented that:

> "The fear of competition and the sometimes constrained return that the asset owner is able to achieve inhibits asset renewal to an extent that could produce market failure. Regulatory practice to date has focused more-so on delivering efficient service (and lower end user cost) rather than on investment for sustainability and future growth capacity. Significant gains have been achieved for the industry and now the focus needs to be re-balanced towards the need and incentives for infrastructure owners to renew assets and invest for capacity enhancement. This needs to be recognised in the regulatory framework."[160]

[158] Grimes, G. and Barkan, C. (2006). p.602.
[159] Grimes, G. and Barkan, C. (2006). p.607.
[160] Australian Rail Track Corporation (2013). National Access Regime, ARTC Submission to the Productivity Commission Issues Paper, 8 February, p.10.

The importance of capital investment in railways is also highlighted in a railway reform toolkit prepared by the World Bank. It states:

> "Railways can function for years without investment because railway assets have long life spans. Without regular investment, the trains can continue to run, but costs rise for materials and maintenance, and service quality and asset values decline. A railway that is not regularly investing, however, is "eating" its assets. Over the longer term, the railway becomes unsustainable. This is acceptable in markets the railway is planning to exit."[161]

It highlights that as railways are capital intensive businesses a high proportion of its cash flow should be spent on investment. It also demonstrates that physical capital maintenance is as essential as financial capital maintenance in maintaining the value of the RAB.

Implementation within Aurizon Network

As outlined in Volume 4*,* Aurizon Network has an approved Asset Maintenance and Renewal Policy, which is based on the engineering standards of the Safety Management System. This documents the asset life of each asset, which enables it to develop an age profile of the asset base and the strategy for managing the assets, which involves maintenance and renewals.

Aurizon Network has developed guidelines for the management approach applied to the assets and how this will be measured (refer Volume 4). This includes specified triggers for maintenance and renewals work. These triggers are consistent with strategies employed by the US Class 1 railroads, for example:

- triggers for ballast renewals are consistent;
- rail life compares favourably;
- sleeper life compares favourably;
- signalling systems throughout the world are similar.

Aurizon Network's strategy has been informed by significant improvements in recognising when an asset is likely to reach the end of its life, as well as a greater understanding of failure modes and what is most likely to drive an asset to fail in its operating environment. The strategy is continually improved and updated based on experience (including dealing with the unique conditions posed by the CQCR) and contemporary asset management practices.

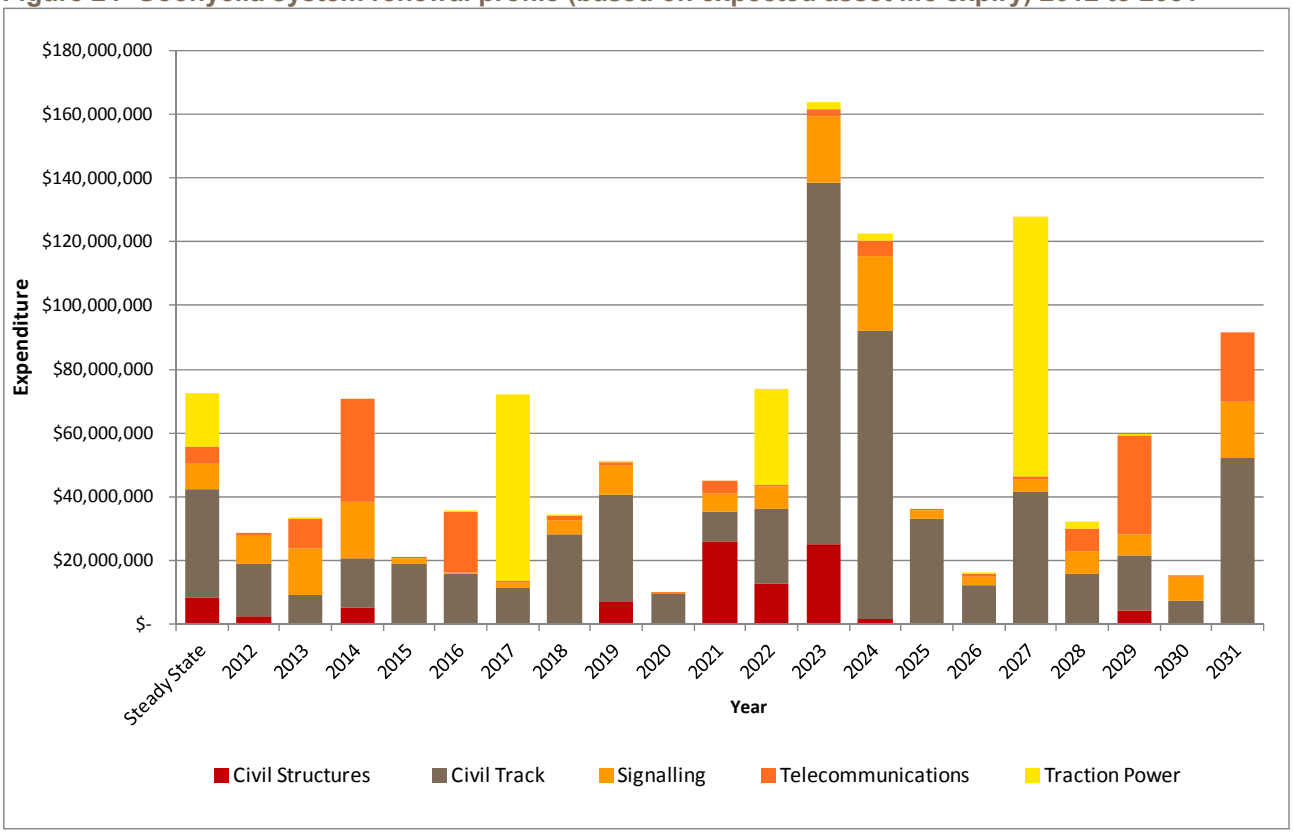
The Asset Maintenance and Renewal Policy provides a robust and consistent framework for asset management decision making. However, given the inherent uncertainty underpinning this type of decision-making, a considerable degree of judgment still needs to be applied, informed by practical experience.

Change to renewals investment profile

As represented in simplified form in Figure 23, if the renewals investment profile is aligned with the expected life expiry of the assets, it will result in a lumpy capital expenditure profile. For example, the following figure shows the profile for the Goonyella system as at 2012.

[161] The International Bank for Reconstruction and Development/The World Bank (2011). Railway Reform: Toolkit for Improving Rail Sector Performance, p.55.

Figure 24 Goonyella system renewal profile (based on expected asset life expiry) 2012 to 2031



Under this type of investment, the optimal timing for investment is assumed to coincide with the expected life expiry of the asset (or a 'just in time' approach). There are a number of problems with this approach.

First, it will mean that a significant amount of capital works for renewals will be concentrated into discrete periods in time. Because asset installation tends to be project based, large quantities of assets will tend to reach their end of life at the same time. Compounding this, brownfields renewals cannot be achieved as quickly as greenfields construction. It is also extremely difficult to access the track for extended periods, with the opportunity cost of track closures continuing to increase as volumes grow.

The other practical issue is that where a large amount of renewals activity is required, it may be necessary to procure externally sourced service providers to support the delivery of that work program. Where the external market for renewals construction is relatively small, particularly for those with a capability in narrow gauge assets, it may also be difficult to procure those services at reasonable rates. These cost pressures are further compounded by the tight construction and labour markets. Some asset renewals also have long lead times for deliveries (for example, two years for transformers), which reduces the ability to quickly respond in the event of early failure or if an asset is pushed beyond its useful life.

The other issue with this approach is that it does not address the risk of early failure. The early failure of an asset can be extremely difficult to predict and can have significant adverse consequences for network availability, reliability and importantly, safety.

The alternative renewals strategy is to invest based on the average profile, which will smooth expenditure across time. This will also mitigate the risk of early failure and proactively manages safety risks.

Investment based on the average renewals profile is the approach that has been employed by the North American Class 1 railroads. As noted above, these businesses have materially ramped up their capital expenditure on renewals in recent decades and now spend a relatively consistent amount over time that is more in line with depreciation. This strategy is considered to be delivering improved track quality and increased capacity in the US Class 1 networks. The paper by Grimes and Barkan cited above has also demonstrated that this strategy is more cost effective in the long term.

Summary

Consistent with its vision of achieving and maintaining world class performance, and its core value of Zero Harm (refer section 10.2), Aurizon Network's asset management strategy will now also be based on the approach outlined above. The key benefits of this are as follows.

1. Improved operational safety

Renewing assets before end of life failures contributes towards the reduction in safety risks, including:

- improving train control systems;
- improving train monitoring systems
- improving road/rail interface safety.

2. Enable reliable train services

Feedback from users of the network indicates that reliability is the highest priority. More consistent expenditure on asset renewals should deliver more sustainable and optimal outcomes for the supply chain in terms of maintaining reliability and increasing asset resilience (including to wet weather events). Importantly, it also better enables the planning and management of track possessions, including a more flexible and controlled response if windows for increased track access become available due to short term changes in demand conditions. It also reduces the need for unanticipated delays or track closures due to faults or early asset failure. It enables redundancy to be built into key systems.

3. Enable reduced cycle times

Increased network velocity (or cycle times) results in better utilisation of the existing network infrastructure, which can also defer the need for expansions to network capacity. Optimal investment in renewals can achieve this by:

- reducing the number and duration of speed restrictions;
- supporting efficient train control services, disciplined service delivery and on-time running.

4. Improved cost effectiveness

More constant investment in renewals should achieve more cost effective outcomes in the long run, the benefits of which will accrue to users. One of the fundamental reasons for this is that the cost of rectifying unanticipated early failure can be significantly higher than more proactive asset replacement, even before other consequences are considered, such as compromises to safety or lost throughput.

The other key driver here is that it facilitates long term supply contracts (based on a more constant and predictable work program). This would be an important benefit in what is a small and specialised market of service providers. This should also result in a reduction in the unit rate for consumables by smoothing resource requirements and increasing economies of scale. It will also enable improvements in the utilisation of plant. Another important economic benefit is the ability to maximise the efficiency and effectiveness of the planned network closures.

It will also result in a more stable and predictable capital expenditure profile, including reducing the number of budget variations that arise due to the rectification of early failures.

5. Leverage proven technology

A more constant renewals profile improves the ability to implement new technologies that can improve network performance and asset reliability. Examples of this include:

- remote monitoring technologies;
- improved inspection and predictive technologies;
- the automation of manual processes.

The following section expands on where renewals investments might be required in the CQCR for the key asset categories and how these needs are identified.

8.4.1.3 Renewals investment requirements in the CQCR

The Central Queensland coal systems have been in operation for over 25 years and are currently railing tonnages and train densities well above original design criteria. Given this ageing asset and the significant increase in the traffic task over this period, particularly in more recent years, the requirement for the renewal of assets has increased from historical levels. As the original assets were designed and installed to support tonnages and consist sizes less than the newer assets, some assets are wearing faster than their design specification.

The Central Queensland coal network comprises some 2,600 kilometres of track. Parts of the asset are in remote areas and in areas that experience extremes of weather, which can have a significant impact. This presents a number of challenges to renewing the assets and identifying areas of advanced asset wear.

Specific asset classes have specific needs and expertise requirements. Aurizon Network's asset management strategy has been set up to align with the following asset categories:

- Track and Civil Assets
- Signalling and Track Side Systems
- Telecommunications Assets
- Power Systems and Distribution Assets
- Corridor Assets.

It also includes the renewal and establishment of control and asset management systems.

This following provides an overview of the typical asset renewal activities carried out within each of these asset disciplines.

Track and Civil Assets

The track and civil assets category covers all infrastructure related to the track structure and civil surrounds, which includes approximately 2,600 kilometres of track including main line, passing loops and yards controlled by Aurizon Network. The Track and Civil Assets category is grouped into the following asset classes.

Table 44 Track and Civil Assets: asset classes

Asset Class	Description
Structures	Bridges, culverts, drainage
Formation / Ballast	Sub formation, capping layer, ballast, ballast cleaning, stone blowing
Sleepers	Sleepers, fasteners
Rail	Rail, catch rail, cures, cant, top and line
Turnouts	Turnouts, turnout components

A description of each is provided below.

Structures

Given the location of the coal systems across the channel country to the west of the Great Dividing Range and on the coastal plains to the east, significant amounts of drainage is required to allow for the flow of water under the rail corridor. This flow is facilitated by a combination of pipes, box culverts and bridge structures.

For culverts, given the increase in tonnages and the weight and density of train consists some original drainage structures are showing accelerated wear. Further, the acidic soils near the coast and the black soils evident in some areas are affecting the continuity of some drainage structures. The effect of damaged or failed drainages structure is a loss of formation continuity, leading to top and line issues which in turn can result in the imposition of speed restrictions over aged drainage structures. The risks related to drainage failure include:

- sudden formation shift and increased derailment risk; and
- the inability for water to flow due to reduced drainage capacity, leading to increased flood risk and associated scour and water impacts.

Typical asset renewal projects include:

- drainage replacements;.
- drainage rectification;
- scour protection and remediation;
- culvert upgrades.

All bridges within the CQCR are steel and/or concrete construction, other than some timber structures past Burngrove that are used by Minerva. As a result, limited renewal works are required for bridge structures. Some possible asset renewal projects would include pylon replacement and cathodic protection (mostly on coastal bridges in salt water).

Formation and ballast

The formation in the Blackwater system existed prior to the commencement of coal haulage in this system. This was also the case for sections of the Moura and Goonyella systems. Given this age of formation and the fact that it was designed for lower tonnages and fewer trains, the formation continues to show signs of deterioration. This effect can be seen via the development of mud holes and the loss of top and line and formation failure, with the risks being quite similar to the risks related to culvert failure.

Formation and ballast condition is treated via a number of capital project activities, including:

- Formation strengthening – via formation removal and replacement or lime slurry injection to sure up the sub grade and formation, often prevalent in areas of black soils or clay soils.
- Formation renewal – the track structure is broken and ballast removed, formation re-built, track and ballast returned. This activity completely replaces the pre-existing formations.
- Ballast cleaning/ undercutting – ballast is removed from track and screened, cleaned and replaced as required.
- Ballast replacement – ballast that has lost its edges and therefore bonding capabilities no longer provides the structural support to the rails to hold alignment.

Sleepers

Sleeper type, axle load rating and fastening have all evolved with system growth. The current standard sleeper installed in new track sections is a 26.5 tonne axle load (tal) full depth reinforced concrete sleeper with E-clip fasteners. The rigidity of the sleeper, its ability to hold firm and clamp to the rail and the spacing between sleepers are pre-conditions to good track alignment. Failure of clips or fastenings, below axle load rating and damage to sleepers as a result of dragging equipment will result in the loss of track alignment, loss of track gauge or loss of track cant. The risk of derailment also increases with increased rail creep due to failed sleepers or fastenings.

Sleeper issues are addressed via a number of asset renewal activities:

- Sleeper replacement - currently there are significant sections of “fist clip” 20 tal sleepers that require programmed replacement across the Goonyella and Blackwater systems.
- Upgrade of clips to galvanised E-clips, of particular concern in coastal areas.
- Upgrade of sidings, including replacements of aged or damaged sleepers with the current sleeper standard or like for like replacements due to the age of pre-existing sleepers.

Rail

The wheel-rail interface is critical to smooth rollingstock operations. Issues with rail have the negative effect of wheel wear for above rail operators and conversely under standard wheel sets can greatly effect the wear rate and quality of the below rail assets. Rail weights and design have increased with system growth. Current track standard calls for 60 kilogram head-hardened full carbon rail on main line sections. Lighter rail is utilised in maintenance and bad order sidings[162] as well as in rail yards that operate at lower train speeds.

[162] That is, sidings used to house defective rollingstock.

Rail wear limits are identified in the Civil Engineering Track Standards. Rail wears at differing rates depending on its location. For example, rail on the inside of a tight radius curve wears significantly faster than rail of the same standard in a straight track section. Rail-related renewal projects include:

- Rail upgrade / replacement – replacing aged or worn rail with the modern day equivalent 60 tal head-hardened full carbon rail with E-clip fasteners.
- Rail replacement in curves.
- Replacement of check and guard rails.
- Cant and curve adjustments / reductions.
- Upgrade of sidings, including replacements of aged or damaged rail with the current rail standard or like for like replacements due to the age of pre-existing rail.

Turnouts

There are currently over 800 turnouts (also known as points) across the coal systems. These vary in size, type, mechanics and frequency of use. The failure of a turnout can impact the flexibility of the track in that area. Failure of a turnout while a train is in transit can lead to derailment and significant infrastructure damage.

As a guide, turnouts have an engineering life of 25 years. To avoid replacing all turnouts in the CQCR in year 25, they would need to be upgraded on a periodic basis at a rate of 32 per year. However, this is neither possible nor practical in the current environment given the amount of turnouts and the cost and the availability of track possessions. The Asset Manager therefore prioritises the turnouts for replacement based on criticality of the turnout, the frequency of use and the design of the turnout.

Turnout related capital renewal projects include:

- full turnout replacement – replacing aged and worn turnouts or increasing the size of a turnout;
- upgrade of manual turnouts to electrified turnouts – for coordination into the UTC system and automated operation;
- renewal of turnout components – to prolong the life of a turnout.

Telecommunications Assets

The telecommunication assets provide all of the communication links from the network to Network Control, which are necessary to facilitate train movements, safety systems, coordination of works and the delivery of projects. The telecommunications system is a combination of optic fibre, microwave radio, computer links and satellite communications. This system also includes business communications to all Aurizon Network offices, depots and work gangs.

Like the track and civil assets, the telecommunications assets have been in service for over 25 years. While many augmentations to the system have been undertaken in that period, parts of the system are well beyond their design life. The periodic upgrade of this asset class has been triggered through the need for greater capacity on the network and the redundancy of technologies. One of the challenges of this system is the connection of new assets to the aged network. For example, attaching new fibre optic cable to the existing system is becoming problematic given the age of the existing optic fibre. The impact of failure of these systems is that train operations are disrupted due to the inability to communicate train movements within the systems.

The Telecommunications Assets category is grouped into the following asset classes.

Table 45 Telecommunications Assets: asset classes

Asset Class	Description
Radio	Microwave and digital train radio systems
Telecoms Backbone	Fibre optic cable renewals and upgrades, PABS telephone systems, LAN and data transfer systems
Transmission Services	Internet and bandwidth systems, IT solutions and systems development
Asset Systems	Asset monitoring systems, Disaster Recovery systems

Radio systems

Aurizon Network uses radio communications between work groups, train operators and network control as a point to point voice communications tool. It is a condition of all access contracts that above rail operators have radio able to integrate with the Aurizon Network radio system. Areas of the coal system have no mobile phone coverage requiring the maintenance of the radio system. Radio renewal projects include:

- renewal of radio tower infrastructure;
- upgrade of radio coverage systems;
- strengthening radio coverage and system robustness.

Telecoms backbone

The telecoms backbone is the name given to the telecommunication network owned by Aurizon Network. This backbone consists of optic fibre cabling, microwave radio systems and mobile telecommunications. The backbone is one of the largest stand-alone networks in Queensland covering all coal systems. The backbone carries all data communications to field signals, level crossing protection systems, asset protection systems, automation of point movement, flood and weather monitoring and other business critical data. Failure of, or interruption to, these assets has an adverse effect on train movements and system capacity.

Typical projects related to the backbone include:

- sections of optic fibre replacement;
- upgrades to the optic fibre transmission systems;
- upgrades and augmentations to existing systems;

The telecommunications asset class also includes related IT systems utilised by Aurizon Network to manage the train control systems in the Network Control Centre.

Electrical and Traction Assets

The Blackwater and Goonyella systems both operate as electrified rail systems. The electric and traction assets provide the linkage between the high voltage electricity network and the electric rollingstock. This asset class includes the supply feeder stations, which take electrical load from the Powerlink network and convert it down to the 25kv operating voltage, and the overhead electrical line (also referred to as the distribution network).

Both the Goonyella and Blackwater systems were electrified in the mid 1980s with the majority of original installed assets now 28 years old. While electrical assets have few moving parts or physical impacts other than the flow of electricity, these assets have been operating at higher than their designed level for a number of years. Failures of the electrical and traction assets can result in losses of electrical sections, translating to a loss of train paths and reductions in system capacity for the duration of the fault.

The Electrical and Traction Assets category is grouped into the following asset classes.

Table 46 Electrical and Traction Assets: asset classes

Asset Class	Overview
Distribution network	The pole and wires (or the electric overhead infrastructure)
Power systems	Feeder stations, track sections cabins and supply transformers
Supervisory systems	SCADA and electrical safety systems

Distribution Network

Aurizon Network's distribution network is the second largest privately owned and utilised electrical network in Queensland. It stretches across the Blackwater and Goonyella systems for approximately 2100 kilometres. The distribution network includes all electrical infrastructure related to accommodating electricity between trains and the feeder points within the electrified systems. This includes, but is not limited to, cantenary wire, earth ground wire, support masts, earthing systems and track bonds, insulators, motorised insulators and electrical neutral sections.

Distribution network renewal projects include:

- renewal of section insulators;
- renewal of electrical neutral sections (the break in the distribution network between supply points);
- motorised isolator renewals;
- mast tie foundations renewals (to retain alignment of support structures);
- replacement of overhead line equipment such as dropper wires, insulators etc.

Power systems

Power systems assets are assets related to the feed of electricity into the distribution network, for example, electrical feeder stations that take the Powerlink load at either 137kv or 220kv and convert it down to 50kv. This asset group also includes auto transformers that boost power into the system at various locations and track section cabins that act as the extremities to an electrical section serviced by a feeder station.

Aurizon Network is currently investigating renewal of power system assets across the original 17 feeder stations and related track section cabins. This includes renewal of supply transformer, harmonic filters, static var compensators and switch rooms. Aurizon Network is required to meet certain power quality conditions under its connections to the Powerlink electrical network that are driving the requirements to renew some of these assets.

Supervisory systems

The electrical systems are managed in Network Control by Electrical Control Officers (ECOs). The ECO utilises the SCADA (Supervisory Control and Data Acquisition) to manage electrical load and safety within electrical systems. The SCADA systems are renewed and updated with the commissioning of additional electrified track.

Signalling and Trackside Systems

This asset class is split between signalling and signalling systems, operational systems communicating to field equipment and asset protection systems. The Signalling and Trackside Assets category is grouped into the following asset classes.

Table 47 Signalling and Trackside Systems: asset classes

Asset Class	Overview
Signalling Equipment	Signals, signal interlocking, electrical points and motors
Operational Systems	Electrical points and motors, train detection
Asset Protection Systems	Identifying issues during operations

Signalling equipment

Aurizon Network utilises a number of signalling systems across its networks, including direct train control (DTC), Universal Train control (UTC) and Remote Control Signalling (RCS). The signalling system also encompasses active level crossing protection systems such as activation for flashing lights and boom gates. Signalling equipment also includes the signal interlocking systems, which are the train protection systems that govern the separation of trains on the network through the use of the signals.

Operational systems

The operational systems related to signalling are those systems that identify train movements within the Universal Train Control (UTC). This includes track circuits and axle counters and the related telemetry systems. Operational systems also include points machines and motors that switch rail between tracks. Given the linear nature of the Aurizon network, remote monitoring of points has been introduced to allow the condition of points and points motors to be reviewed to identify wear trends prior to failure. This will allow Aurizon Network to better manage its maintenance and renewal programs given the real time data available and the trend analysis. Typical renewal projects include:

- telemetry upgrades;
- renewal of track circuits;
- installation of axle counters;
- installation of points condition monitoring.

Asset protection systems

Retaining operation of the network is a key business driver of the Aurizon Network business. Numerous asset protection systems are therefore installed to provide real time alarms to Network control via the telecommunications systems to ensure that incidents that have the potential to cause significant infrastructure damage or system disruption are addressed as they occur. For example, train overload detectors are used to alert Aurizon Network if trains are overloaded. Overloaded trains can result in advanced wear of the infrastructure and therefore additional need for either maintenance or the advancement of renewal activities.

The asset protection systems utilised include:

- dragging equipment detectors;
- hot wheel bearing detectors;
- train overload detectors;
- open wagon door sensors.

As train operations increase additional sites for this equipment are installed to ensure coverage. Other renewal activities include replacing aged equipment with the modern day equivalent systems.

Corridor Assets

Corridor assets include all infrastructure within the rail corridor including fencing, access roads, level crossings and environmental monitoring assets. The Corridor Assets category is grouped into the following asset classes.

Table 48 Corridor Assets: asset classes

Asset Class	Description
Level Crossings	Road/rail interfaces and protection systems
Fencing and corridor security	Providing separation of people and livestock from the rail corridor
Corridor Access	Providing access to the rail corridor and crew change facility
Corridor Monitoring	Track monuments, noise management, environmental infrastructure

Level Crossings

There are currently over 740 public and private level crossings within the Aurizon Network rail systems. These road/rail interfaces are a high safety risk for Aurizon Network as incidents at level crossings can pose risks to human life, and can also impact system capacity via infrastructure damage. A significant level of renewal and new works are therefore conducted around level crossing safety and protection systems.

Aurizon Network is currently working with public and private road managers to identify the condition and evident risks at all level crossings and to develop capital renewal activities that are assigned to either the rail manager or road manager. This rail manager scope forms the forward program for asset renewals at level crossings. Typical renewal and upgrade activities include renewal of advance warning signage and installation of active protection measures such as boom gates and flashing lights.

Fencing and Corridor Security

Aurizon Network fences the rail corridor to retain the separation of the public and livestock from train operations. In built up areas fencing can consist of security fencing or solid wall fencing. In rural areas cattle fencing is installed. Many areas within the network have fences over 30 years old and require upgrades to retain this physical barrier to the rail corridor.

Corridor Access

Aurizon Network needs to retain access to the rail corridor to assist in maintenance and response to incidents. In some areas of the network the access to the corridor is limited and affected in wet weather. The safety of these access roads and access points is also a consideration in the renewal program of these roads.

Aurizon Network has an access agreement condition that it must provide adequate crew change facilities for above rail operators within the rail network. Traditionally these have been rolled ballast pads or earthen pads, both of which resulted in uneven surfaces and the potential for trip and fall injuries. Aurizon Network is currently installing the innovative solution of high impact plastic crew change pads that are highly visible and low slip. These new generation crew change pads have been well received by all above rail operators. Additional sites are being installed as part of the asset renewal program.

Corridor Monitoring

Corridor monitoring includes infrastructure used to identify the conditions within the corridor including levels of noise, dust and pollutants, water levels and rail heat. This class also includes the monitoring devices related to the management of coal dust through veneering at mine load outs and noise mitigation infrastructure such as natural or fixed noise barriers.

Asset Control and Management Systems

Aurizon Network also manages the establishment or renewal of asset management systems utilised in driving efficiencies around track possession in order to maximise works carried out within possessions and to forward plan to manage works within similar areas. Projects related to automated track condition monitoring and data analysis also fall into this asset class.

8.4.1.4 Asset renewals: UT4 proposal

Aurizon Network's proposed renewal expenditure for UT4 reflects a move by the business to a more constant renewals profile that smoothes the expenditure through time and proactively managing the risks of early failure. This is more consistent with investing in accordance with depreciation.

This approach has now been applied for some years by the US Class 1 railroads and has been shown to have been successful in improving track quality and increasing network capacity. It should also be more cost effective over the long term, compared to a more reactive maintenance strategy, which can involve more costly fixes to assets that have been subject to early failure. This is before consideration of the more significant costs or externalities that could arise from early failure, such as safety issues or lost throughput.

The fundamental benefits of this approach are to safety, reliability and cycle times, maximising the availability of network capacity. Smoothing expenditure also smoothes the tariff impacts for users, compared to a lumpier 'just in time' expenditure profile, as illustrated for Goonyella in Figure 24.

As discussed above, while Aurizon Network's asset management strategy provides a robust framework for planning and decision-making, the inherent uncertainty associated with these decisions means that it is not possible to forecast the precise nature, amount and timing of renewals expenditure across the four years of the regulatory period. A degree of judgment will still need to be applied in prioritising and planning renewal activities, which can be impacted by changes in tonnages and asset condition, as well as significant weather events. The timing of works will also be assessed to maximise delivery efficiencies.

Every individual asset renewal project will be subject to the requirements of Aurizon Network's Capital Allocation Funding Framework, including the stage gate process. Proposed investments will require completion of a business case, which may be subject to independent peer review. The business case is designed to address the prudency tests for capital expenditure approval contained in Schedule A of Access Undertaking. Aurizon Network can also seek pre-approval of this expenditure (including from relevant network users) under Schedule A.

Aurizon Network has determined its proposed allowance by benchmarking against the US Class 1 railways, having regard to the CQCR's size and traffic task and the likely renewal requirements in each asset class. The average renewals spend across the US Class 1 railways in the financial years from 2009 to 2011 was $2.60 per thousand ntk. In the 2011-12 financial year, total throughput in the CQCR was approximately 46 million ntk. This rate of renewals expenditure would equate to a total investment of around $120 million in that year. Consistent with the Class 1s, this amount is also more aligned with depreciation.

Having regard to expected volumes for the UT4 period, the forecast renewals expenditure that has been included in the Capital Indicator is as follows.

Table 49 UT4 forecast renewals expenditure ('$m) (nominal dollars)

Asset Category	2013/14	2014/15	2015/16	2016/17
Asset Renewals	150.3	84.2	91.5	120.0
Telecoms	0.02	0.02	0.02	-
Network Control Systems	31.20	15.9	18.9	-

The total forecast across the UT4 period is $512 million, equating to an average annual spend of $128 million. This represents 2.7% of the opening RAB and is comparable to the average annual depreciation of $311 million for the UT4 period. Given the average life of network assets is 25 years, based on this level of expenditure the assets will be renewed every 25 years. Aurizon Network considers that this level of investment is appropriate given the unique demands of the CQCR on asset condition and the importance of maximising network availability and reliability to the performance of the Queensland export coal industry.

8.4.2 Investment in an integrated operational planning and scheduling system

8.4.2.1 Introduction

The complex nature of the operations in the CQCR, coupled with the demands posed by operating at full capacity (including managing possessions for maintenance and capital works), requires sophisticated planning, scheduling and train control tools. The size and complexity of the network infrastructure, combined with additional flexibility in access holder contracts, will only continue to increase. This presents even more challenges in optimising network capacity and resolving day of operations conflicts that inevitably arise between train services and network constraints.

One of the key tools used is ViziRail, which is an integrated scheduling and operations management platform. Aurizon Network also uses the Network Operations Pathing Planner Tool to plan operational network capacity based on train orders. This tool is used to 'test for fit', with the outcomes of this analysis fed into the ViziRail for scheduling and monitoring.

Tools like ViziRail were developed in a very different operating paradigm, where mines tended to run to only one port and demand was relatively subdued. Today, many mines have more than one choice of port and more than one operator can be moving to the same load-out (and going in different directions).

The integrated nature of the CQCR and the complex interdependencies between the different supply chain components means that individual decisions can impact the entire network. The current toolsets do not allow planners or controllers to quickly assess these impacts. For example, given the range of factors that can influence the ability of a train to run to schedule, day of operations conflicts invariably arise. These conflicts currently need to be resolved manually by the train controller.

The current situation is not sustainable. Accordingly, Aurizon Network is investing in a new integrated operational planning, scheduling and execution tool that will directly assist in delivering optimal operational performance and improved service to network users and an allowance for this has been included in the Capital Indicator for UT4. An overview of this proposed investment and Aurizon Network's development process is provided below.

8.4.2.2 Overview of the proposed investment

The proposed solution, APEX, will integrate operational planning, scheduling and real-time traffic management. The horizon it will encompass will be from two years out to the day of operations. This therefore does not include longer term planning and capacity analysis.

There are two main products that will form the integrated solution, both of which will be customised to the requirements of the CQCR, including Aurizon Network's obligations under the Access Undertaking. SolveIt Software has been engaged to develop the network planning and optimisation capability, which integrates the generation of the operational plan and train schedules. It will have improved forecasting accuracy and enable scenario analysis, which is critical functionality in what is an inherently uncertain and changing operating environment. One of SolveIt Software's core capabilities is the development of planning and logistics tools for the mining industry and it is already used by a number of the participants in the CQCR.

GE will be developing the real-time traffic management capability. This will provide decision-support systems and automated decision-making processes based on embedded business rules. It enables the real-time integration of scheduling and execution. Other key areas of functionality will include:

- real-time train movement, including interactive electronic time-distance graphs;
- conflict detection and resolution (replacing the current manual process);
- performance dashboards, comparing actual outcomes against the plan; and
- real-time plan optimisation.

Overall, it will allow for consistent, reliable and repeatable execution of day of operations activities. It will replace the functionality currently provided by ViziRail, which will be decommissioned.

This investment will deliver significant benefits to network users and the entire supply chain. This includes:

1. Efficiency:

- faster times to produce the plan;
- quicker recovery to plan;
- improved cycle time performance;
- reduced day of operations losses;
- improved network utilisation;
- opportunity for improved operational performance to defer more costly rail infrastructure investment
- enables predictive modelling based on real-time information.

2. Process visibility:

- improved transparency through to the network decision-making process;
- visibility of network constraints;
- real time performance feedback.

3. Consistency:

- automation of Aurizon Network's scheduling and execution rules;
- improved decision quality and consistency across planning and scheduling horizons;
- improved capability to execute and recover to plan.

8.4.2.3 Stakeholder engagement

The project scoping and tender process was conducted in 2012. Aurizon Network engaged with supply chain stakeholders as part of this process and will continue to do so during the development and implementation phases. This includes key supply chain coordination forums including:

- Aurizon Network's Network Development and Planning forum;
- the Integrated Logistics Company;
- the Service Provider Leadership (comprising Aurizon Holdings Limited (above and below rail), DBCT and Pacific National);
- the DBCT Stakeholder Operational monthly meetings; and
- the Abbot Point User Group.

Aurizon Network has also held a number of one on one meetings with supply chain participants (infrastructure providers and producers). A key objective of these meetings was to obtain input on the types of capabilities that participants would like the solution to be able to deliver.

8.4.2.4 Process

Aurizon Network has applied its Investment Approval framework, including the stage gating process, to identify and select the preferred solution. A comprehensive market scan was conducted globally, with the stage gate approach resulting in a systematic evaluation and short listing of 14 potential solutions. Key criteria included the availability of a proven operating platform, expertise and value for money. For example, the GE solution is being used in the US Class 1 railways. Aurizon Network will be working with one of its current users, Norfolk Southern, as part of the implementation phase and will leverage off their experience and expertise to ensure an effective delivery approach.

Aurizon Network is planning a phased delivery timetable so that the benefits of the solution can be delivered as early as possible. The three phases and the capabilities that will be delivered in each phase are summarised in the table below.

Table 50 Project schedule

Phase	Benefits Realised	Target completion
1. Network plan and schedule optimisation	Precise schedule Network plan and schedule optimisation Improved forecast accuracy Scenario modelling/ 'what if' analysis	December 2013
2. Day of operations optimisation	Electronic time-distance graphs Improved schedule attainment Decision support for recovery and management of variations Real time integration of scheduling and execution Optimising green light running of trains	August 2014
3. Day of operations automation	Automated conflict resolution/ problem solving Improved decision support capability and responsiveness Consistent, reliable and repeatable execution	December 2016

8.4.2.5 Forecast project cost

The forecast project cost that has been included in the Capital Indicator for UT4 is $37.983 million. As outlined above, the cost of the customised solution has been based on a competitive tender process.

8.4.3 Renewal of power systems in Goonyella and Blackwater

Switch rooms and harmonic filters are an integral part of the electrical infrastructure required for the traction power systems. The loss of either type of unit may result in a reduction in the number of trains that can operate on the electrified network. Continual degradation in the condition of these assets will lead to an increase in both the quantity and duration of unplanned electrical outages, which will have a significant adverse impact on network haulage capacity.

Failures in the switchgear (circuit breakers and associated circuitry) cause interruptions to services. Electric locomotives introduce harmonic distortions to the power system at the Feeder Station connections, which the harmonic filters reduce to the limits specified within the connection agreements.

It has been identified that the AIS switch rooms and ancillary equipment, including harmonic filters, installed in the Goonyella and Blackwater systems are at risk of failure due to operational degradation of the AIS switchgear and ancillary items. This need was originally identified in the 2010 CRIMP. An upgrade of the harmonic filters may also be required to ensure compliance with the National Electricity Regulations (NER).This will need to be completed prior to the termination of the existing agreements, which is in March 2014. The requirements will be assessed at each site based on an analysis of compliance with the NER.

This project is for the renewal of AIS switch rooms and ancillary equipment including harmonic filters at feeder stations and Track Sectioning Cabins located within the Goonyella and Blackwater coal systems. The project is currently in pre-feasibility stage and various options for the upgrade are being investigated in order to determine the optimal solution at each site. These options include:

- replacement of the old switch room sites with new installations complete with current technology switchgear, harmonic filters, protection equipment and secondary systems;
- replace all of the old switch rooms with new installations complete with current technology switchgear;
- refurbish or replace the harmonic filters;
- replace the protection relays in the existing building or with stand alone air conditioned relay rooms adjacent to the switch room;
- replace the existing AIS CBs with new AIS CB units;
- refurbish the existing AIS CBs;
- combination of the above items;
- do nothing.

Solutions will be prioritised and then managed to minimise impacts on network operations. For example, the replacement switch room and harmonic filter can be built as ‘green field’ sites adjacent to the existing feeder station or Track Sectioning Cabin, which can then be cut-over to the electrical network with minimal system outage and traffic disruption. This also reduces safety risks.

The project is estimated for completion in late 2015/16. The final cost will depend on the solutions required to appropriately address the level of degradation at each site. The amount that has been included in the UT4 capital expenditure forecast is $87.152 million.

8.4.4 Transformer refurbishments

This project is for the refurbishment of power transformers on the Blackwater system. This process is already being undertaken within the Goonyella system.

It has been identified that the power transformers and autotransformers presently installed and operating are at risk of failure due to operational degradation, which will lead to the reduction of traction power system availability and unpredictable equipment failure. This could adversely impact the operation of trains within the network in the longer term. The ageing traction power equipment is being addressed by a number of asset renewal projects identified in the 2010 CRIMP, including the overhaul of traction power transformers and a number of the autotransformers.

This project is targeted for completion in 2014/15. An amount of $8.144 million is included in the UT4 Capital Indicator.

8.4.5 Replacement of life expired electrical components

The project involves the replacement of structure earth wire clamps that are ineffective. A failure to do so could result in earthwire fractures and failures on both the Blackwater and Goonyella systems. This project is estimated for completion during 2014/15 and an estimated cost of $1.032 million has been included in the UT4 Capital Indicator.

8.4.6 Upgrades to mainline connections

A number of upgrades are required to network connections, which are owned and managed by Aurizon Network. This includes the following projects:

- Kestrel North angle; and
- Bauhinia South upgrade.

These projects are under development. An estimate of $45.52 million has been included in the UT4 Capital Indicator.

8.5 Projects not included in the Capital Indicator

Aurizon Network has a number of other significant projects in the pipeline that will create assets to be included in the RAB. At this stage no costs, including feasibility costs, have been included in the UT4 Capital Indicator as there is uncertainty as to the timing of commitment and commissioning dates. Some of these projects are required to meet customer needs identified in the Request for Proposals process commenced in December 2011. This includes the following:

- *WIRP Stage 2:* This project is for the expansion of rail network to support a 30mtpa expansion of WICET. Financial close of this project has been deferred until at least late 2014.
- *WIRP Stage 3:* This project is to support the second expansion of 30mtpa of WICET.
- *Central Queensland Integrated Rail Project (CQIRP):* Aurizon Network is investigating the potential to develop an integrated rail network from the Galilee Basin to Central Queensland ports, in particular Abbot Point. The proposed CQIRP would service the growing needs of the central and south Galilee Basin, opening up access for the Basin's mines to the Central Queensland coal chain and multiple port destinations. In addition to the Galilee Basin, the project will also enhance access to Abbot Point for the expanding and new mines of the Bowen Basin. Aurizon Network's proposal will seek to optimise existing rail infrastructure through upgrades to the Newlands coal system, and thereby minimise the extent of new or 'greenfield' railway that must be constructed to link the central and south Galilee Basin to the export terminals.
- *Northern Port (Bowen Basin Expansion):* Aurizon Network was advised by Dudgeon Point Project Management Pty Ltd in March 2012 of the total 68 mtpa development to be carried out in two stages of 34 mtpa each. The responses from the Request for Proposal process for Dudgeon Point will determine the timeframe and sequence of rail infrastructure requirements. This project has recently been deferred.

- *Abbot Point Coal Terminal (APCT) expansion:* APCT expansion projects cater for the new terminals T0 and T2 at the Port of Abbot Point and also the potential expansion of the existing T1 terminal. In total Aurizon Network is looking to support a 50 mtpa to 135 mtpa tonnage growth. Potential projects include a bypass around Collinsville, new loops at APCT, duplications and other works to cater for Goonyella length trains.

Should these projects be advanced and expected to be commissioned within the UT4 period Aurizon Network will submit a Review Event or Draft Amending Access Undertaking as necessary to establish a new reference tariff or increase the relevant system allowable revenue.

8.6 Interest During Construction

The period of construction of many capital expenditure projects may exceed one year. During this timeframe, Aurizon Network may incur financing costs. However, it is not able to recover a return on that investment until the asset has been commissioned and included in the RAB (presuming approval by the QCA). Due to these timing issues, and the need to ensure that Aurizon Network is compensated for its efficient costs (in order to at least achieve a NPV of zero), interest during construction costs (IDC) are accrued up to the date of the asset's inclusion in the RAB at the approved WACC.

Prior to UT3, the QCA accepted a simplified approach, which assumed that the typical 'S-curve' profile for capital expenditure projects resulted in construction interest commensurate with accumulated interest for invoiced amounts. This approach is represented by the following formula:

$$IDC = \left(Capex * WACC/2\right) \times Months/12 \qquad \text{Equation (1)}$$

Where:
Capex = total project capex
Months = total months in construction period

However, this approach may overstate the construction interest if projects have longer implementation timeframes, where the majority of the project expenditure is incurred later in the project period. As a consequence, during the review of the 2007/08 capital expenditure claim Aurizon Network and the QCA agreed that IDC should be calculated on the basis of accumulated interest on actual monthly capital expenditure up to the month of the asset's inclusion in the RAB. This is represented by the following formula:

$$IDC = \sum [Capex_m * (1 + ((1 + WACC^{1/12}) - 1))^{remainingmonths}] \qquad \text{Equation (2)}$$

Where:
$Capex_m$ = capex for the month
Remaining months = months remaining prior to date asset written into the RAB

Aurizon Network has identified a complexity associated with the use of a post tax nominal vanilla WACC for this purpose. The post tax nominal vanilla WACC in Equation 3 requires the tax deductibility of interest to be reflected in the cash flows. As such the WACC is the weighted average of the pre-tax cost of debt and the post tax cost of equity:

$$WACC_3 = k_d \times L + k_e \times (1 - L) \qquad \text{Equation (3)}$$

Where:
k_d = cost of debt
k_e = cost of equity
L = leverage (debt to total value), based on benchmark gearing

The complexity arises with the recognition of the tax deductibility of capitalised interest. Recent tax changes allow the tax deductions for capitalised interest to be recognised when incurred. The recognition of this tax deductibility may be difficult where:

- the capitalised interest relates to a project that will have a separately identified allowable revenue and tariff components. As such this would require the carry forward of tax losses for periods prior to its inclusion in the RAB; and
- as Aurizon Network noted in its Draft Amending Access Undertaking for the Standard User Funding Agreement, as the Unit Trust does not procure financing in its own right, Aurizon Network does not have the information relevant to the tax deductibility of any financing costs incurred by the User Funder. As such the User Funder may obtain a tax advantage relative to Aurizon Network if it were to fund the same investment.

Aurizon Network considers this issue can be easily addressed, including maintaining competitive neutrality for user funding, through recognising the tax deductibility of IDC in the WACC applied to the calculation of the IDC amounts, assuming the project is financed at the benchmark gearing level. This would require the post tax nominal WACC formula used to calculate IDC to be comprised of the weighted average of the post tax cost of debt and the post tax cost of equity as represented by Equation 4:

$$WACC = k_d(1 - T_c(1-\delta)) \times L + k_e \times (1 - L) \qquad \text{Equation (4)}$$

Where:

T_c = corporate tax rate

δ = gamma

The WACC formulation in Equation 4 is also referred to as the post tax nominal classic WACC. Aurizon Network has estimated IDC amounts for inclusion in the Capital Indicator using this approach. Capital expenditure reports submitted to the QCA during UT4 for approval will also have IDC calculated in this way.

8.7 Summary

Aurizon Network proposes a Capital Indicator of approximately $1.95 billion over the four years of UT4. This reflects Aurizon Network's best estimate of the amount and timing of expected capital expenditure with a view to minimising the need for tariff adjustments at the end of UT4.

The proposed UT4 Capital Indicator is shown in the tables below.

Table 51 UT4 Capital Indicator by System ($'000) (nominal)

System	2013/14	2014/15	2015/16	2016/17	Total
Blackwater	97,564	1,070,153	96,093	71,418	1,335,228
Goonyella	191,203	109,582	99,975	69,495	470,254
Moura	12,350	61,635	11,301	8,076	93,361
Newlands	10,233	6,649	9,364	6,692	32,937
GAPE	19,805	--	--	--	19,805
TOTAL	**331,154**	**1,248,019**	**216,732**	**155,681**	**1,951,586**

Table 52 UT4 Capital Indicator by Electric/Non-electric ($'000) (nominal)

System	2013/14	2014/15	2015/16	2016/17	Total
Electric	320,745	887,076	161,606	115,376	1,484,803
Non-electric	10,409	360,942	55,127	40,305	466,783
TOTAL	**331,154**	**1,248,019**	**216,732**	**155,681**	**1,951,586**

9 Maintenance expenditure

Aurizon Network's proposed maintenance expenditure for the UT4 period of $914.67m (real dollars, no escalation) is commensurate with the engineering standards contained within the Safety Management Plan, as well as the maintenance requirements as per the Strategic Asset Plan.

Initially referencing the actual cost of the maintenance scope completed during 2011/12, maintenance costs were rigorously reviewed at product level, resulting in Aurizon Network having a very clear understanding of the cost drivers for the UT4 period. In comprising the maintenance expenditure:

- maintenance costs were allocated across various disciplines or groupings, including: mechanised, general track, structures, signalling, traction and telecommunications;
- each of the above disciplines warranted individual and detailed costing as maintenance objectives:
    - across each grouping differed; and
    - across each system within the network varied due to geography, age, climate and railings.
- costs within each of the above disciplines needed to reflect the availability of skilled staff and specialised machines, the market price of consumables, the ability to access track to undertake work and the location of the maintenance effort itself; and
- as costs are directly linked to scope, changes in tonnages directly affect maintenance effort and overall costs (defined by the short-run fixed/variable cost split as described in section 10.4 of Volume 2).

The proposed UT4 maintenance expenditure allowance is shown below.

Proposed UT4 maintenance expenditure ($'000)

	2013/14	2014/15	2015/16	2016/17	Total
Total (real - no escalation)	212,374	229,115	234,853	238,329	914,672
Total (nominal - with escalation)	232,696	261,536	279,007	294,793	1,068,032
Total System Net Tonne Kilometres (million NTK)	49.40	55.35	59.26	63.29	227.29
Total Maintenance Allowance per million NTK*	2.42	2.25	2.18	2.09	2.22

(1) Total Maintenance Allowance per million NTK are based upon real, direct maintenance costs excluding Mechanised Ballast Undercutting, Traction Power and Telecommunications.

Aurizon Network's proposed maintenance expenditure allowance for UT4 is detailed in Volume 4. For completeness, a summary of the methodology and forecast is provided below.

9.1 Scope

The scope of the maintenance activities adopted for the 2013 Undertaking is based upon the forecast tonnage profile and the requirements of the engineering standards contained within Aurizon Network's Safety Management System. The maintenance price has been based on the actual costs incurred during 2011/12 for the product-based maintenance activities carried out on the network in accordance with the Network Strategic Asset Plan.

9.2 Methodology and assumptions

9.2.1 Approach

Aurizon Network's Safety Management System details the prevention/intervention levels and the associated activities required to maintain the network. These requirements have been formulated in the context of the legislative and regulatory frameworks that affect Aurizon Network's operations and constitute an inviolable baseline for determination of the maintenance scope.

In considering the approach to scope, three primary maintenance modes need to be considered: time-based, usage-based and repair-on-failure. The scope for time-based activities is based on the requirements of the Safety Management System, while the intervention levels for usage-based activities have been set on the forecast tonnages derived from contracted train paths. Repair-on-failure maintenance is treated as a purely reactive activity.

The maintenance price was developed by:

- identifying all cost inputs in the scope of works completed in 2011/12, ensuring capital and external works are excluded;
- uplifting those inputs to reflect the resources required to complete the higher maintenance task, including the acquisition of new plant (and associated productivity improvements), together with the engagement/hire of additional external resources, both labour and plant;
- identifying the asset base used in the maintenance function, resulting in a return on assets and inventory being calculated and included in the price;
- identifying the applicable corporate overhead allowance; and
- applying escalation across the four year period, based on the Maintenance Cost Index (MCI).

9.2.2 Key assumptions

The following assumptions underpin the maintenance scope and maintenance price:

- the scope in part is based on forecast tonnes expected to be railed over the regulatory period. In most circumstances the pricing and costing volume forecasts will align, the exception being GAPE and WIRP where pricing is based on contracted volumes for take or pay purposes on rail infrastructure installed for the benefit of those customers;
- the time-based and usage-based maintenance activities are as specified in the Safety Management System;

- the possession regime will require fewer planned system closures, however these will be of a longer duration;
- the mechanised maintenance involved a mix of leased and owned equipment;
- the price provides for the procurement of additional external resources to meet the scope;
- the forecast includes a return on plant and assets that is commensurate with an efficient cost and consistent with regulatory asset valuation methods; and
- corporate overheads have been based on an industry benchmark of 5% of direct costs.

9.2.3 Efficiency gains

Aurizon Network will undertake a number of improvement initiatives across the asset management, infrastructure technology and maintenance planning and delivery functions. These improvements are designed to:

- improve the performance and reliability of assets;
- enable more effective and timely planning for maintenance tasks; and
- enable more efficient utilisation of maintenance resources within a constrained maintenance environment.

The efficiency gains expected from these initiatives, particularly FTE reductions, have been built into the UT4 price as detailed in Volume 4. Restructuring activities across the Aurizon Holdings Limited Group during 2012/13 are expected to deliver cost efficiencies across a range of corporate overheads and services.

9.2.4 Use of external expertise

In the development of the maintenance expenditure proposal, Aurizon Network has utilised a number of expert external resources, including:

- Deloitte for financial modelling, corporate overhead benchmarking and general advice on associated regulatory matters;
- Evans & Peck for research, analysis and benchmarking on maintenance activities, cost and pricing, including an International survey on maintenance activities, costs and prices;
- BIS Shrapnel for the MCI; and
- Aurora Marketing for the development and analysis of the 2012 Stakeholder Survey.

9.2.5 Maintenance Cost Index

A consideration in the build-up of the price for the UT4 maintenance forecast has been the downstream cost impacts caused by the increase in mining activities in the CQCR. With this in mind, Aurizon Network has reviewed the applicability and effectiveness of the components and weightings of the MCI utilised in UT3 and has determined that the components were not appropriate for the CQCR. Accordingly, a modified suite of indices and weightings for the new submission has been developed in conjunction with BIS Shrapnel.

9.3 UT4 proposal

Aurizon Network has developed its maintenance expenditure proposal having regard to the goal of ensuring that prices provide efficient and equitable outcomes, having regard to the following key considerations:

- the challenges in the management and operation of a unique rail infrastructure network. For instance, weather impacts upon network infrastructure requires significant work effort to remedy, and when combined with locality, the cost of providing such maintenance work increases;
- operating within an environment that fosters co-operative relationships and meeting industry needs (as identified via executive level engagements and industry forums), requiring Aurizon Network to balance conflicting requirements whilst ensuring the ongoing safety and long-term viability of rail infrastructure;
- matching a maintenance effort that is both effective and efficient to the Strategic Asset and Safety Management Plans; and
- in the continual drive towards Aurizon Network's core value of "ZEROHarm", recognising that there is a bottom line, non-negotiable cost of maintaining the network safely in terms of time, training, development and implementation of processes, as well the procurement of plant and equipment that ensures legislative compliance.

Table 53 Proposed UT4 maintenance expenditure ($'000)

Maintenance Discipline	2013/14	2014/15	2015/16	2016/17	Total
Mechanised Maintenance					
Ballast undercutting	55,271	64,859	65,883	66,361	252,373
Resurfacing	18,979	19,015	20,867	20,927	79,787
Rail Grinding	12,513	13,516	13,958	14,435	54,422
General Track Maintenance	47,319	50,472	52,004	53,581	203,376
Re-railing	15,267	15,061	15,722	16,144	62,194
Structures	2,650	2,769	2,841	2,935	11,195
Signalling	22,591	23,457	23,944	24,417	94,408
Traction Power	9,556	9,598	9,598	9,597	38,348
Telecommunications	5,365	5,514	5,516	5,518	21,914
Direct Costs	189,510	204,260	210,332	213,915	818,017
Indirect Costs	22,864	24,855	24,521	24,415	96,655
Total (real - no escalation)	**212,374**	**229,115**	**234,853**	**238,329**	**914,672**
Total (nominal - with escalation)	232,696	261,536	279,007	294,793	1,068,032
Total System Net Tonne Kilometres (million NTK)	49.40	55.35	59.26	63.29	227.29
Total Maintenance Allowance per million NTK(1)	2.42	2.25	2.18	2.09	2.22

Note: Direct and total costs may not sum due to rounding
(1) Total Maintenance Allowance per million NTK are based upon real, direct maintenance costs excluding Mechanised Ballast Undercutting, Traction Power and Telecommunications.

10 Operating expenditure

Aurizon Network's operating expenditure proposal for UT4 comprises the following key components: System wide and regional costs, Transmission and electricity energy costs, Risk and insurance and Working capital.

System wide and regional costs

These comprise the costs of operating the network, including train control, safeworking, and asset management, together with an allowance for corporate costs, including IT, Safety and Finance. The UT4 proposal for these costs is as follows.

Proposed UT4 System Wide and Regional Costs ($'000)

	2013/14	2014/15	2015/16	2016/17
Total	123,552	128,848	136,688	141,085
Cost per net tonne	$0.62	$0.58	$0.58	$0.56
Cost per net tonne km	$0.24	$0.23	$0.22	$0.22

The approach to the development of the system wide and regional cost allowance has evolved considerably since UT1. This has been largely driven by a number of progressive changes in the operations and organisational structure of the below-rail network business, with consequential impacts on the size of the network managed and the costs necessarily incurred.

One of the most important implications of these operational and structural changes for operating costs has been the loss of economies of scale. Aurizon Network is now responsible for a smaller network while still having to incur similar operating expenses that were previously spread across the Queensland Rail network.

Additionally there has been a significant increase in volumes over this same period. This has created increasing complexity in the CQCR as new ports are developed, each of which is part of a supply chain. The coal systems have also become increasingly integrated. Further, producers now have greater expectations on Aurizon Network to commit more resources and time to the coordination of scheduling and planning in increasingly complex and integrated supply chains.

As a result, the operational model applying now – and through UT4 - is fundamentally different than the operational models considered in previous assessments of the benchmark efficient below rail costs. Thus, the below rail network system wide and regional costs prior to the separation and listing of the business in the second half of 2010 are not considered to be an appropriate benchmark for UT4 Operating Expenses. Aurizon Network submits that there was a significant understatement of corporate overheads in UT3. Aurizon Network has absorbed this understatement for the duration of UT3, but this is not sustainable.

The allowance for corporate costs under UT4 has been assessed against an independent benchmarking analysis conducted by Ernst and Young. This analysis was based on a number of sources, including the American Productivity and Quality Centre's Open Standards Benchmarking Collaborative Database, the Global Audit Information Network Benchmarking Survey and data from individual organisations approached for the purpose of this study. This independent analysis shows that overall, Aurizon Network's UT4 cost estimates for corporate overhead place it within the benchmark range expected of a stand alone business of a similar size and in a similar industry.

Transmission and electric energy costs

Transmission use of system charges are managed directly through the connection agreements between Aurizon Network and the Transmission Network Service Provider (Powerlink). The total forecast connection costs for UT4 are summarised below.

Proposed UT4 Connection Costs ($'000)(excluding proposed Rolleston connection)

	2013/14	2014/15	2015/16	2016/17
Blackwater	37,843	37,993	38,749	39,673
Goonyella	30,501	35,444	40,428	41,141

Electricity on-selling costs

The electricity which Aurizon Network supplies to an access holder is procured through a supply agreement entered into with a registered electricity retailer. The EC rate is intended to allow Aurizon Network to recover the costs associated with providing this ancillary service to access holders.

While the costs associated with procuring electricity are certain for the 2013/14 period, it is difficult to forecast with any degree of certainty the electricity supply costs associated with a range of different variables. These variables include: the impacts of future carbon pricing; the costs associated with compliance with mandated renewable energy targets; regional loss factors; and the impact of regenerative braking.

As a consequence of the forecasting risk associated with these factors Aurizon Network has not prepared electric retail cost forecasts beyond 2013/14. While the supply costs are known for this year, the regional loss factors and environmental charges applicable to 2013/14 are not available and the EC tariff will be revised once these parameters become known. Otherwise, Aurizon Network intends to publish the updated EC rate for each financial year by the end of May (prior to the start of that relevant year).

Risk and insurance

The claim for UT4 reflects:

- A premium for relevant specifically insured risks under the Industrial and Special Risks policy. Of the below-rail assets, only selected bridges, tunnels and feeder stations are covered and there is no cover for rail track infrastructure.
- A premium for the following corporate insurances which have been costed on the basis of Aurizon Network being a stand-alone entity: General liability (Third Party Liability); Directors & Officers Liability; Professional Indemnity and Excess; Employment Practices Liability; and Corporate travel.
- A premium based on the costs of insuring key below-rail risks such as derailments, dewirements, weather events and below-deductible liability losses.

The assessment is supported by expert reports from Willis (the costs of corporate insurance and Industrial and Special Risks) and Finity (self-insurance).

The proposed UT4 risk and insurance premium in nominal dollars is summarised in the table below.

Proposed UT4 Risk and Insurance Allowance ($million) (nominal)

	2013/14	2014/15	2015/16	2016/17
Industrial and Special Risks	3.33	3.77	4.00	4.14
Self insurance	4.97	5.65	6.25	6.88
Total	**8.30**	**9.42**	**10.25**	**11.02**

For insurable risks, it is not relevant to make any direct comparisons with the UT3 estimates (which were produced at the start of that period) because premiums will be influenced by a number of factors including the prevailing conditions in the insurance market). Self-insurance costs have increased since UT3 because of:

- the significant increase in the per kilometre track cost of weather events, based on the severe weather events that impacted the CQCN in recent years;
- the ongoing growth in network activity, noting that derailment costs is one of the main drivers of self-insurance costs.

Working capital

Aurizon Network has submitted separate revenue and pricing models to the QCA, with the revenue model based on the key assumptions reflected in the AER's Post Tax Revenue Model. This allows for the removal of unnecessary complexity from the modelling framework, facilitating the ease of use and understanding of the model and therefore reducing the risk of error. This also avoids the need for the provision of a separate working capital allowance in the operating expenditure proposal.

10.1 Scope

This chapter summarises Aurizon Network's operating expenditure proposal for UT4. This encompasses:

- system wide and regional costs;
- transmission and electric energy costs;
- risk and insurance;
- working capital; and
- tax depreciation.

10.2 System wide and regional costs

10.2.1 Introduction

Section 168 A(a) of the QCA Act entitles Aurizon Network to charge an access price that will generate expected revenue for the service that is at least sufficient to recover its efficient costs (including a return on investment that is commensurate with its commercial and regulatory risks). 'Efficient Cost' is defined in the 2010 Undertaking as those that:

> "…would be reasonably expected to be incurred by a Railway Manager adopting efficient work practices in the provision of the Rail Infrastructure to the required service standard, having regard to any matters particular to the environment in which Aurizon Network operates, and including any transitional arrangements agreed between Aurizon Network and the QCA to reflect the transition for Aurizon Network's actual cost to the efficient cost."

The section details the methodology, data and assumptions used to determine Aurizon Network's system wide and regional cost estimates for UT4. In addition, it describes the key functions associated with the below-rail business and the relevant costs.

It will also briefly review some of the history to the development of the system wide and regional cost allowance. This is particularly important as it demonstrates that the approach taken in UT3 (and in the earlier Undertakings) does not provide an appropriate benchmark for assessing the UT4 Operating Expenses.

The approach to the development of the system wide and regional cost allowance has evolved considerably since UT1 was first approved by the QCA. This has been largely driven by a number of progressive changes in organisational structure for the below-rail network business, with consequential impacts on the size of the network managed and the costs incurred.

One of the most important implications of these operational and structural changes for operating costs has been the loss of economies of scale, with Aurizon Network now being responsible for a smaller network while still having to incur similar operating expenses.

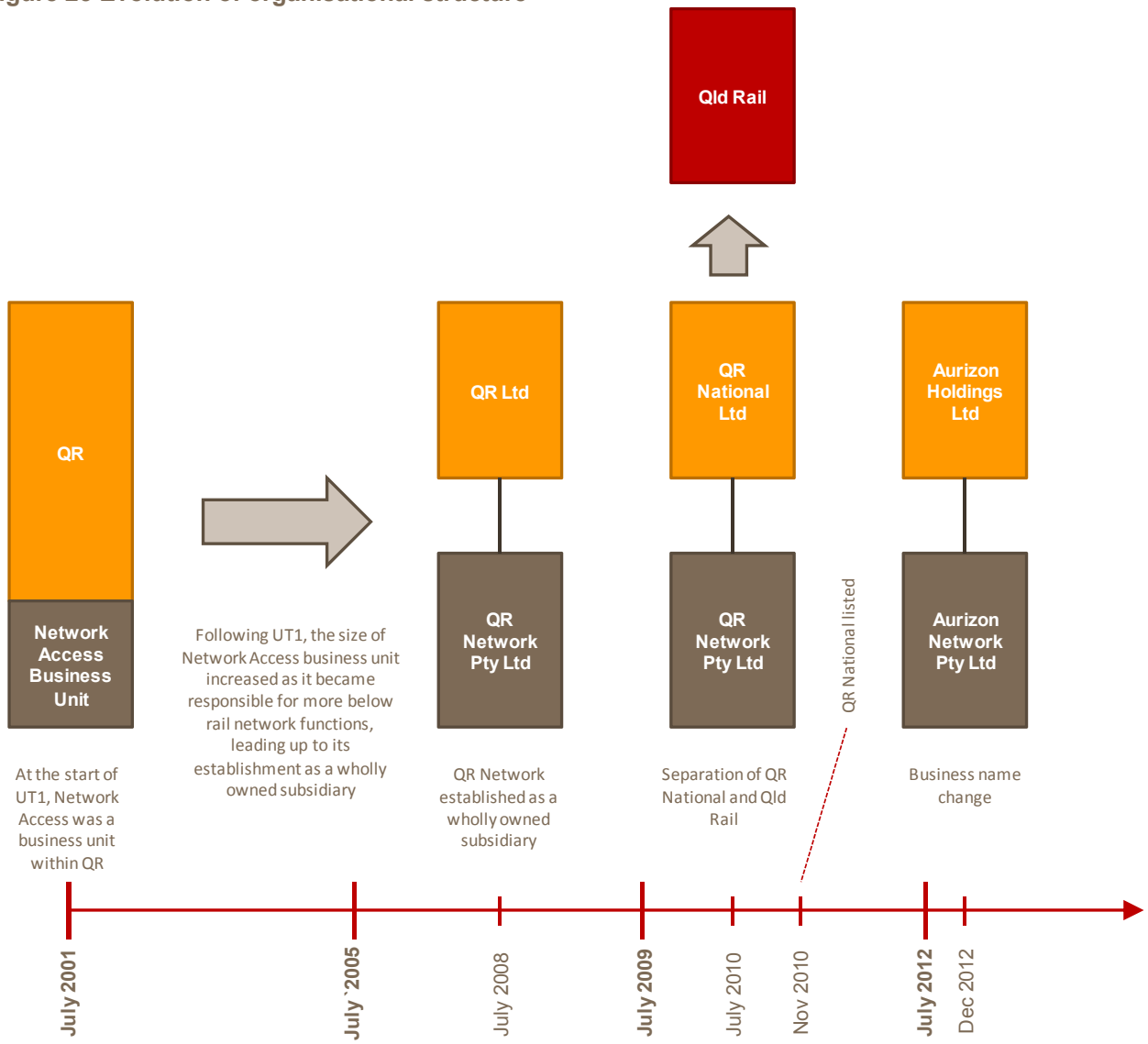
Additionally there has been a significant increase in volumes over this same period. This has created increasing complexity in the CQCR as new ports are developed, each of which is part of a supply chain. The coal systems have also become increasingly integrated, so that many mines have (or will have) more than one choice of port. Further, producers now have greater expectations on Aurizon Network to commit more resources and time to the coordination of scheduling and planning in increasingly complex and integrated supply chains.

As a result, the operational model applying now – and through UT4 - is fundamentally different than the operational models considered in previous assessments of the benchmark efficient below rail costs. Thus, the below rail network system wide and regional costs prior to the separation and listing of the business in the second half of 2010 are not considered to be an appropriate benchmark for UT4 Operating Expenses.

10.2.1.1 History of approach to estimating operating costs of the below rail network business

One of the most significant factors that has influenced the methodology used to estimate the operating costs of the below rail network business has been the structural changes that have occurred since UT1. This is summarised (in simplified form) in the following figure.

Figure 25 Evolution of organisational structure



The implications of this for the estimation of the system wide and regional costs for the below rail network business since UT1 are summarised below. The implications of this for the estimation of the system wide and regional costs for the below rail network business since UT1 are summarised below. As noted in Figure 25, the various organisational changes, culminating in the establishment of a wholly owned subsidiary of a publicly listed company, have resulted in the size of the Network business unit increasing as it became responsible for more of the below rail network functions, with consequential increases in costs attributable to the business unit. As a result, the Operating Expenses under UT1, UT2 and UT3 cannot be properly compared with the UT4 Operating Expenses

UT1

The first below-rail network access undertaking was submitted by Queensland Rail (QR) in 1999 and approved by the QCA in 2001. At the time, QR's below-rail network business was highly integrated across regions, traffic types (that is, coal and non-coal) and key activities. The Network Access business unit had been formed, though was still both new and also very small. Many of its core functions were therefore still performed by other parts of the business.

The integrated nature of the business meant that the system wide and regional cost estimate for UT1 could not be based on an assessment of the actual costs of below rail coal activities. Instead, it was based on a theoretical assessment of the costs of operating a stand-alone below rail coal network. Where possible, activities that were specific to the below rail coal network were isolated and costed (although these activities were reasonably broad). Otherwise, more reliance had to be based on the application of cost allocators, requiring the allocation of costs between:

- above and below-rail;
- below-rail access and infrastructure services;
- coal and non-coal; and
- CQCR and non-CQCR.

These allocators were subsequently incorporated into the Costing Manual.

UT2

By the time of the UT2 review Network Access was well established as a separate business unit within QR. It had also been progressively given direct responsibility for below rail functions that had previously been conducted in other parts of the business.

However, in developing the system wide and regional cost forecast significant reliance still needed to be placed on the allocation of costs based on the Costing Manual. QR submitted that the UT1 allowance materially understated its system wide and regional costs and proposed that its actual costs for 2002-03 be used as the basis for the UT2 forecast. This was rejected by the QCA in favour of a cost forecast based on the hypothetical stand-alone benchmarks that were utilised in UT1, adjusted for volumes. The approved allowance ended up materially understating the business's actual costs in the UT2 period, which was partly because the nature and extent of the coal boom that emerged during that period, including the implications of this for activities and costs, was not anticipated.

UT3

On 1 July 2008 QR Network Pty Ltd was established as a separate subsidiary of QR Ltd. By this stage, the below-rail network business had evolved to the point where it operated as a stand-alone network business and most of its relevant costs and activities were reflected in its own financial structure (with the exception of some infrastructure maintenance and corporate overhead).

In its UT3 submission, QR Network expressed concerns with the hypothetical stand-alone costing approach that the QCA had applied in UT2. It argued that the approach that had been previously applied was no longer appropriate given the network business now effectively operated as a stand-alone subsidiary. However, reliance still needed to be placed on cost allocators given QR Network remained responsible for the entire Queensland below-rail network, including allocating costs between:

- coal and non-coal; and
- CQCR and non-CQCR.

It proposed that its actual costs formed a more appropriate basis for establishing the efficient stand-alone cost of a below rail coal network business. It was also necessary to appropriately capture the costs

associated with the significant demand growth that had occurred during the course of UT2, including the associated pressures on input costs (such as labour).

The QCA accepted QR Network's proposed regional costs and the known system wide costs related to the CQCR. However, it also accepted the recommendation of its consultant, GHD, to:

- reduce the allocated system wide cost by the same amount that regional costs had increased; and
- remove $1.88 million per annum relating to a claim for dangerous goods and safeworking/yard control operations.

It also adjusted the estimates for updated volumes. This resulted in an allowance for system wide and regional costs that was 11% lower than QR Network's original claim submitted in 2008.

UT4

Since UT3, the business has undergone the most significant organisational and structural change since the start of UT1. On 1 July 2010, the core public passenger business and assets, the metropolitan rail networks, and the regional non-coal freight networks were transferred to Queensland Rail, which remains a government owned entity. QR National Limited was incorporated in September 2010 and become the non-operating holding company of QR Limited and its controlled entities. QR National Limited was subsequently listed on the Australian Securities Exchange in November 2010.

A further functional restructure of QR National Limited was implemented on 1 December 2010, resulting in the centralisation of functions such as finance, safety and facilities (and accordingly, the reallocation of certain costs). On 1 December 2012, QR National Limited's business name was changed to Aurizon.

The above changes have significant implications for Aurizon Network's system wide and regional costs. The most important is that Aurizon Network is now primarily responsible for managing the below rail coal network in the CQCR. While it still has to provide access to non-coal services that traverse the Central Queensland Coal Network (noting that these volumes are not material in the context of coal volumes), it is no longer necessary to allocate costs between the CQCR and other regions. Additionally, as a listed entity there are a number of costs that are now incurred that were not previously relevant to a government owned corporation.

10.2.1.2 Implications of organisational and structural changes for UT4

This most recent stage in the evolution of the below rail network business marks a transition from a more integrated business at the start of UT1 to what is now effectively a stand-alone below-rail coal network business. This has culminated in the complete separation of the below rail coal network and non-coal networks (including the Western System). This has meant that some functions that are relevant to the below rail business that were previously shared with Queensland Rail have had to be replicated in Aurizon Network.

Ie, one of the most significant consequences of this set of operational and structural changes for operating costs has been the loss of economies of scale, with Aurizon Network now being responsible for a smaller network while still having to incur similar operating expenses.

As a result, the below rail network system wide and regional costs prior to the separation and listing of the business in the second half of 2010 are not considered to be an appropriate benchmark for UT4 Operating Expenses. This is discussed further in section 10.2.2.1 below.

10.2.1.3 Implications of volume growth

In parallel with the evolution of the network business into a stand alone below rail coal network business, there has also been a significant increase in volumes. This has also seen increasing complexity in the CQCR as new ports are developed, each of which is part of a supply chain. The coal systems have also become increasingly integrated so that many mines have (or will have) more than one choice of port. In addition, producers now have greater expectations on Aurizon Network to commit more resources and time to the coordination of scheduling and planning in increasingly complex and integrated supply chains.

As a result, the operational model applying now – and through UT4 - is fundamentally different than the operational models considered in previous assessments of the benchmark efficient below rail costs.

Although operating costs do not have a direct relationship with incremental changes in volume, the impact of these increased volumes will still affect costs. For example, the growth of the CQCR has resulted in a significant increase in complexity which affects all key activities, ranging from planning and development right through to day-to-day network operations. The CQCR environment also remains capacity constrained where every endeavour to meet customer requirements and facilitate railings of customers' coal tonnages is made. It is also in a competitive market for skilled labour due to demand from mining companies and other industries in the CQCR. The limited depth in the labour market for these skills generally means that key personnel risk is high in many areas, particularly in operational and asset management roles. Additionally, many of the skills within the railway industry take considerable time to develop. As a result, any shortages of skilled staff and consequential labour cost pressures cannot be addressed rapidly.

The demand for access to the network requires sufficient resourcing to be able to respond to customer requirements in a timely manner, while at the same time ensuring any analysis undertaken is reliable and robust. This requires the maintenance of a highly skilled workforce. In relation to direct costs, growth in costs continues to be observed in areas such as:

- network capacity planning and analysis;
- responding to access requests (which are subject to detailed and complex procedural requirements), negotiating new access agreements and dealing with access-related matters;
- retention of sufficient depth in the train control function to ensure continuity in train control activity;
- greater interaction with customers and other industry stakeholders on a range of matters, including network enhancements;
- responding to the need for increasingly sophisticated capacity planning;
- analysing new major projects;
- developing network business plans; and
- managing an increasingly complex and prescriptive regulatory framework.

The implications of this for key activities in the network business are considered further below.

The remainder of this section describes:

- the methodology used to estimate the UT4 system wide and regional cost allowance;
- an assessment of the direct and indirect costs; and

- the corporate overhead allocation methodology, which is supported by a benchmarking analysis of comparable businesses.

10.2.2 Methodology

10.2.2.1 The relevance of historic cost allowances to the UT4 proposal

In previous determinations the QCA has placed weight on the system wide and regional cost allowance approved for the previous regulatory period as a benchmark when assessing forward looking efficient costs. Historical costs may provide such a benchmark for the assessment of costs that are directly and solely attributable to the provision of coal carrying train services in the CQCR, provided that direct and valid comparisons can be made. That is, it is necessary that these historical cost 'benchmarks' are also directly and solely attributable to the provision of the relevant services, as well as fully capturing the costs of operating a below rail network business.

In this regard the UT3 operating cost proposal submitted by QR Network in 2008 identified those costs that were specific to the CQCR and those that represented an allocated cost. The separation of regional and allocated costs in the UT3 operating costs proposal is shown in the table below.

Table 54 QR Network UT3 system wide and regional cost proposal (2008$'000)

	2009/10	2010/11	2011/12	2012/13
Regional	21,705	22,951	24,124	25,317
Allocated	32,788	32,785	36,871	37,323
Total	**54,493**	**55,736**	**60,994**	**62,640**

The allocated costs are not fully representative of the efficient costs associated with the provision of a stand alone below rail network servicing the CQCR railway. As described above, the Aurizon Network business has been subject to significant organisational change since these cost estimates were compiled in 2008, the most significant being the separation of Queensland Rail from QR National and the latter's subsequent public listing.

As a result, cost structures are now more closely aligned to that of a dedicated stand alone network manager than in previous regulatory periods where costs were still largely based on an allocation methodology in the approved Costing Manual.

Accordingly, the proposed UT3 system wide and regional costs are not an appropriate benchmark for assessing the efficiency and reasonableness of the forward looking costs of providing below rail services in the CQCR on a stand alone basis. In summary the UT3 system wide and regional cost proposal:

- 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
- because QR Network was still part of a GOC, did not include costs reasonably expected to be incurred by a publicly listed company.

In order to demonstrate the implications of the first three of these deficiencies, the following sections provide an indicative estimate of the amounts that may have been proposed and submitted in UT3 if adjustments are

made to the original UT3 costings to be more representative of the current network structure and ownership model. These workings are provided for illustrative purposes only to demonstrate the order of magnitude that these deficiencies can produce. However it is noted that this order of magnitude could be as high as 2:1.

The starting point for these workings is the UT3 costings as shown in Table 55.

Table 55 UT3 system wide and regional cost proposal by activities (2008$'000)

Cost Component	2009/10	2010/11	2011/12	2012/13
Operations	23,757	24,799	26,599	27,852
Infrastructure Management	11,905	12,105	13,472	13,587
Access Management	7,182	7,182	8,075	8,085
Business Support and Finance	6,617	6,617	7,431	7,664
Return on Corporate Asset	1,197	1,197	1,197	1,197
Corporate Overhead	2,835	2,835	3,220	3,255
Expensed Studies	1,000	1,000	1,000	1,000
Total	**54,493**	**55,736**	**60,994**	**62,640**

Illustrative adjustment to UT3 allowance to include realistic corporate overhead

The UT3 proposed operating costs included a nominal corporate overhead allowance of around $3 million per annum. This low amount was not queried by the QCA or its consultant in the approval of UT3. This is materially lower than what the actual corporate overhead costs for the CQCR and the rest of the network were at the time. In this respect, the 2008/09 QR Network below rail financial statements reported these costs to be $28.1 million. Similarly, it is also substantially below the corporate overhead costs included in both the QR Network and Queensland Rail 2011/12 below rail financial statements of $18.8 million and $44.9 million respectively.[163]

Illustrating the effect of such a low number on the total UT3 proposal can be done by deflating the 2008/09 corporate overhead costs using the escalator described later in this section. This calculation suggests a revised corporate overhead cost of $27.1 million in 2007/08 dollars as better reflecting actual cost in the UT3 period. Table 56 adjusts QR Network's proposed system wide and regional costs for UT3 for this corporate overhead amount.

Table 56 UT3 system wide and regional cost proposal adjusted for reported corporate overhead (2008$'000)

	2009/10	2010/11	2011/12	2012/13
Original UT3 Proposal	54,493	55,736	60,994	62,640
Corporate Overhead Adjusted UT3 Proposal	**62,639**	**63,881**	**70,246**	**71,992**

Illustrative adjustment to UT3 cost allocations

The allocator used primarily for the allocation of indirect costs in previous regulatory periods was standard allocator 'C'. This allocator was used to allocate the proportion of the network indirect costs to the CQCR. For the purpose of UT3 the standard allocator increased from 40.50% to 46.50% with the inclusion of GAPE traffic.

The misalignment between standard allocator C and cost relativity is evident in the changes to the costs of both Queensland Rail and Aurizon Network since separation in 2010. The table below shows the allocation

[163] The 2011/12 statements are a more reliable cost benchmark than the 2010/11 year as they represent the first full year without adjustments associated with the separation and privatisation processes. The implementation of the functional model will see a substantial increase in corporate overhead and commensurate reduction in other operating expenses for the network business unit as various support functions are corporatised to leverage economies of scale and scope.

of the joint and common other operating expenses between the CQCR and the rest of the narrow gauge network in 2009/10 and the other operating expenses[164] as reported in Queensland Rail's and Aurizon Network's 2011/12 below rail financial statements. As can be seen, allocator C had over-allocated costs to what is now Queensland Rail's network, and under-allocated them to the CQCR.

Table 57 Operating costs in below rail financial statements ($'000)

Cost Category	QR Network 2009/10 Below Rail Financial Statements			2011/12 Below Rail Financial Statements	
	CQCR	Rest of Network	Total Below Rail	QR	Aurizon Network
Train Operations Management	18,247	36,189	54,436	47,356	29,572
Other operating expenses	79,967	152,612	232,579	78,045	157,018
Corporate Overhead	12,086	16,021	28,107	44,937	18,808

Again, in order to demonstrate how the loss of economies of scale and scope in the network business unit impact on the total cost impact of horizontal separation, the proposed UT3 operating cost allowances are recalculated with the allocation of system wide costs based on 80%. This is a conservative estimate of the potential functional and system duplication associated with horizontal separation given that the cost base excludes all costs that could be specifically allocated to non-coal, such as capacity planning and modelling. The impact of the revised allocations is detailed in Table 58.

Table 58 UT3 proposed system wide and regional costs adjusted for standard allocator C ($'000)

	2009/10	2010/11	2011/12	2012/13
Original UT3 proposal	54,493	55,736	60,994	62,640
Allocator C at 80%	**97,933**	**99,172**	**101,214**	**102,692**

Illustrative adjustment to UT3 to include real labour cost escalation

The UT3 system wide and regional cost proposal was based on a 2007/08 cost base, which would be escalated by CPI to determine a nominal operating cost base. As part of this proposal QR Network did not apply real labour cost escalators.

[164] Excludes depreciation, insurance and accreditation, and train operations management.

In calculating nominal operating casts for recasting the UT3 system wide and regional cost proposal, Aurizon Network has employed the conservative assumption of a labour cost proportion of 75% and applied the national all sectors Labour Price Index (which excludes bonuses and other retention payments necessary in regional areas with skill shortages and excess labour demand). When combined with the Brisbane All Groups CPI this yields the following weighted average cost changes.

Table 59 Nominal cost escalators (weighted annual price change)

2007/08	2008/09	2009/10	2010/11	2011/12
4.61%	3.54%	3.21%	3.87%	2.95%

These allocators have been applied to the UT3 proposed system wide and regional costs adjusted for the standard allocator C (Table 58). This recast UT3 proposal, which reflects the system wide and regional costs for a stand alone, government owned, CQCR network manager, are considerably higher than the approved system wide and regional cost allowances in UT3 (at least double the original proposed amounts). This is shown in Table 60. The indicative adjusted UT3 costs more closely resemble the stand alone costs associated with providing coal carrying train services in the CQCR.

Table 60 Adjusted system wide and regional costs proposed by QR Network in UT3 ($'000)

	2009/10	2010/11	2011/12	2012/13
UT3 approved costs	52,622	53,572	55,953	56,928
Indicative adjusted UT3 costs	**101,398**	**105,974**	**112,343**	**117,351**

10.2.2.2 Implications of public listing

The UT3 system wide and regional cost forecasts were developed when the network business was a government owned corporation. However the below rail network business is now a major part of a publicly listed company, Aurizon Holdings Limited, which necessarily incurs additional costs in being a listed public company. Consistent with the allocation of other corporate overhead costs, it is reasonable to allocate an appropriate share of these costs to the network business, noting that it would have to incur these costs on its own if it was a stand-alone company.

Additional costs incurred

Aurizon Network's share of the costs of undertaking an Initial Public Offering (IPO) were specifically not included in the UT3 proposal; they were absorbed by the business. The relevant issue for UT4 (and beyond) is the treatment of the ongoing costs incurred in operating a listed company as these costs have not been reflected in the system wide and regional cost allowance to date.

A survey of newly listed public companies conducted by PwC found that in addition to the more obvious costs such as stock exchange listing fees, listed companies can be faced with significant incremental costs across a range of areas, including: accounting, reporting and financial effectiveness; internal staffing; internal auditing; taxation; budgeting and forecasting; and HR and technology support.[165] Based on responses to its survey, additional costs incurred for financial reporting, regulatory compliance and auditing were estimated as accounting for 54% of the total ongoing costs of being a public company, with legal costs accounting for an additional 17%.

[165] PwC (2012). Considering an IPO? The Costs of Going and Being Public May Surprise You. September, p.13.

In addition to the costs of compiling the information and preparing reports, this also substantially increases the level of internal governance associated with the developing and preparing budgets and monitoring compliance.

Another area identified above where additional costs are incurred is internal and external audit costs. This reflects the additional level of assurance that directors will require as to the effectiveness of the company's risk management, control and governance processes.

Tax accounting and reporting is a further area where additional resources and effort will be required. In Aurizon Holdings Limited's case, its privatisation and listing coincided with its transition from being a 'notional' taxpaying government owned corporation under the Queensland Government's tax equivalence regime, to a full Commonwealth Government taxpayer. This introduces a whole new level of reporting and compliance requirements.

Budgeting and forecasting is important for any business but the level of accountability required of a listed company, including the continuous disclosure requirements, requires an extremely robust framework for the development, approval and monitoring of the company's budget. PwC observes:

> "Budgeting and forecasting will become an increasingly important task in the life of a public company. Research analysts rely on this information, and a public company's ability to meet its own earnings estimates and "The Street's" estimates can have a significant impact on its stock performance. Accurate budgeting and forecasting is critical for a successful IPO and for the ongoing life of a public company."[166]

One additional function now in place is investor relations. The development and maintenance of relationships with domestic and global investors is essential to ensuring the company's ability to access the capital it needs to fund investments. This also extends to analysts and other market participants who have an ongoing interest in the company's performance. Activities involved in managing investor relations include providing financial and other information, responding to inquiries and conducting meetings and investor roadshows.

Regulatory precedent

In Australia, most of the regulated businesses that are publicly listed operate in the energy sector, which is now regulated by the AER. The issue of compensation for the additional costs of operating as a public company has received relatively little focus.

In its most recent access arrangements review for the Roma to Brisbane gas pipeline, the APA Group submitted that, amongst other things, the corporate costs incurred by a prudent service provider would include:

- general prudent capital raising activities such as managing investor relations, raising equity via ASX listing and raising debt via debt market activity; and
- statutory obligations including reporting to shareholders and maintaining shareholder registries.[167]

The AER accepted APA Group's corporate cost proposal.[168]

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166 PwC (2012). p.17.

167 APA Group (2011). APT Petroleum Pipelines Limited, Access Arrangement Submission, Effective 12 April 2012-30 June 2017, October.

168 Australian Energy Regulator (2012). APT Petroleum Pipeline Pty Ltd, Access Arrangement Draft Decision, Roma to Brisbane Pipeline, 2012-13 to 2016-17, April. The only adjustment the AER made to APA Group's proposal was to replace a corporate cost escalator with other labour cost escalators.

Reference was also made to these costs in the AER's review of the access arrangement to apply to the Victorian gas distribution businesses.[169] It noted that the Essential Services Commission of Victoria (ESCV) had previously accepted these costs in its 2008-2012 gas access arrangements review:

> "...costs incurred by a parent entity in undertaking corporate functions that would be required of a distribution business meeting the benchmark assumption should be allocated to the service provider's opex. These functions include corporate governance, treasury, investor relations, HR management and statutory reporting."[170]

The AER agreed with the ESCV's treatment of these costs for these businesses. The assumption that the efficient benchmark firm is a listed entity was confirmed in its first review of the WACC parameters to apply to regulated electricity network businesses, which was concluded in 2009.[171]

10.2.2.3 Foundations of UT4 approach

As outlined above, following the transfer of the non-coal below rail assets to Queensland Rail, which includes the Western System, the Aurizon Network business now comprises the provision of access to, and operation and management of, the Central Queensland Coal Network. Accordingly, it is no longer necessary to allocate costs amongst regions other than the CQCR.

The foundation for the system wide and regional cost forecasts is establishing the nature and scope of the relevant activities. Aurizon Network can identify costs directly and indirectly attributable to the CQCR by reference to specific cost centres that fall within the below rail network function in the accounting and budgeting system. Where a team performs tasks that are not completely related to regulated activities, a reduction has been made from the total budgeted costs to allow for this.

An allocation of corporate overhead has also been made for costs that would be reasonably expected to be incurred if Aurizon Network operated on a stand-alone basis. As described above, it is evident that the approach used to estimate the UT3 allowance (based on the Costing Manual) has resulted in a material and sustained under-recovery of actual corporate overheads over the UT3 period. A new methodology has therefore been applied to allocate corporate overheads, consistent with approaches used by other regulated businesses in Australia.

Reference to 2012/2013 Corporate Plan

Aurizon Holdings Limited produces a Corporate Plan that is developed and reviewed annually.

Aurizon Holdings Limited is held accountable for its financial performance by shareholders and analysts. This includes the extent to which the business has targeted and realised efficiency gains.

The estimates of system wide and regional costs for UT4 are based on an extrapolation of the Aurizon Holdings Limited Corporate Plan for the year ending 30 June 2013 to the years ending 30 June 2014 to 30 June 2017. As outlined in section 2.1, the UT4 volume forecasts are based on expected coal railings, which is also consistent with the Corporate Plan.

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169 Australian Energy Regulator (2010). Draft Decision, Victorian Electricity Distribution Network Services Providers, Distribution Determination 2011-2015, June.

170 Australian Energy Regulator (2010). p.180.

171 Australian Energy Regulator (2009). Final Decision, Electricity Transmission and Distribution Network Service Providers, Review of the Weighted Average Cost of Capital (WACC) Parameters, May.

In any year the actual costs may be higher or lower as a result of variations in total costs or tonnage levels. As noted previously, operating costs are not sensitive to short run volume changes, including the allocation of corporate overhead. As described in section 10.2.1.3, the key implication of the longer term trend growth in volumes has been the significant increase in the below rail network within the context of the supply chains in the CQCR.

All of the forecasts have been produced in real terms.

Reference to Costing Manual

The current Costing Manual was prepared in November 2011 and approved by the QCA in July 2012. Consideration has not been given to the implications of the functional restructure undertaken within the Aurizon Holdings Limited Group in December 2011 on the costing methodology. This is intended to be done prior to 30 June 2013. This update is important in order to align the costing methodology with the current organisational structure and also serves as a benchmark for cost comparisons into the future.

This submission has been framed around Aurizon Network operating as a functional unit within Aurizon Holdings Limited Group during the UT4 period. Hence, while the cost allocation methodology in this submission follows the general principles of the Costing Manual, there will be differences to certain prescribed allocations to reflect the functional restructure undertaken since the current version of the Costing Manual was approved. As stated in the Costing Manual, the manual is not designed to replicate the tariff setting process and the purpose of the manual is not to identify costs.

The fundamental principle underlying Aurizon Network's approach to costing is that, wherever possible, assets, costs, revenues and investments are directly identified or attributed to a function, and functions are directly identified or attributed as a below-rail service provided by Aurizon Network (or another service provided by Aurizon Network). Assets, costs, revenues and investments are only allocated to a function or service where it is not possible or practical to disaggregate those costs and assets in a manner that allows for them to be directly identified or attributed to a function or service.

A comparison of key points within the Costing Manual allocation methodology and the UT4 methodology are provided in Table 61 below.

Table 61 Comparison between Costing Manual cost allocation methodology and UT4 methodology

Costing Manual Requirements	UT4 Methodology
Where costs are directly incurred in the performance of below-rail services provided by Aurizon Network, those costs and assets are directly identified as below-rail costs.	Expenses classified as directly or indirectly relating to below-rail services provided by Aurizon Network have been determined by responsibility-based accounting, based on the cost centre and function for which the costs are incurred.
Where costs are incurred, or assets are used, in common for the provision of below-rail services provided by Aurizon Network and/or other services, and where there is a causal relationship between the resources used for below-rail services provided by Aurizon Network or other services, these costs are attributed on a reasonable basis of cost causality.	Aurizon Network's share of Aurizon Holdings Limited Group's corporate overhead costs has been calculated using a cost allocation methodology based on causal and blended allocation bases. Where clear causal drivers were identified during the benchmarking activity mapping, these were used, and where no causal driver could be identified, a blended allocation rate based on three of the Group's key cost drivers were used. This is consistent with the principles in the Costing Manual.
Where costs are incurred jointly for the provision of below-rail services provided by Aurizon Network	As above.

Costing Manual Requirements	UT4 Methodology
and/or other services, and where there is no direct causal relationship between the resources used for below-rail services provided by Aurizon Network or other services, these costs are allocated on a reasonable basis.	
Corporate overhead is defined in the Costing Manual as "those activities that relate predominantly to the overall management, strategy and governance of the corporation and which do not involve any significant costs relating specifically to the business". Corporate services (e.g. payroll, human resources, computer services, administrative building services, motor vehicle fleet management, legal services and most engineering services) are not to be included in corporate overhead as these services are charged directly to each business unit.	In the costing estimates in this submission, corporate overhead includes services performed by the non-operational functional units that are charged directly to the functional units such as Aurizon Network (i.e. those services that may be classified as corporate services), as well as general corporate overhead costs that are not charged to the functional units but nevertheless represent costs that would be incurred in running a stand-alone business. The 'corporate services' component of corporate overhead costs has been excluded as direct costs of Aurizon Network.
Group management costs (Executive Vice President (EVP), Finance and Legal, Human Resources and Safety) are to be allocated 25% to Aurizon Network, with the remainder to Rollingstock Services and Infrastructure Services.	The allocation of these functions varies in the allocation model applied for UT4 as they are all included in corporate overhead costs, apart from EVP Aurizon Network.
Where it is necessary to calculate corporate overhead outside of Aurizon Holdings Limited's intercompany accounts, corporate overhead is to be allocated to Aurizon Holdings Limited's businesses, and further, in respect to the Aurizon Network share, to below-rail services provided by Aurizon Network as a pro rata on the total of all other identified, attributed and allocated costs excluding: • the cost of motive power fuel and electric traction energy; • internal charges for access and traction electricity; • depreciation and amortisation; • (gain)/loss on disposal and revaluation of assets; • asset impairment gains or losses; • interest expense; • tax expense.	An allocator has been applied to those corporate overhead costs that are not directly related to Aurizon Network but which reflect the provision of services to the below-rail network business and/or would be required for a stand-alone below-rail network business (i.e. all remaining costs after deducting those identifiable as below-rail network or non-below-rail network related). Consideration has been given to the activities performed within each cost centre when choosing an allocator. The following allocators were considered as potentially applicable to each cost centre: • Aurizon Network regulated revenue as a percentage of total Aurizon Holdings Limited Group's revenue (21%); • Aurizon Network full-time equivalents (FTEs) as a percentage of total Aurizon Holdings Limited Group's FTEs (5%); • Aurizon Network assets as a percentage of total Aurizon Holdings Limited Group's assets. This was based on the written down value of assets on the fixed asset register as at 30 June 2012 (47%); • direct operational and capital costs (excluding labour) of Aurizon Network as a percentage of the direct costs of the operational functions of the Aurizon Holdings Limited Group (22%); • a blended allocator, being the simple average of the first three allocators above (25%). Reference is made to section 10.2.4 for further information.

10.2.3 Aurizon Network direct and indirect costs

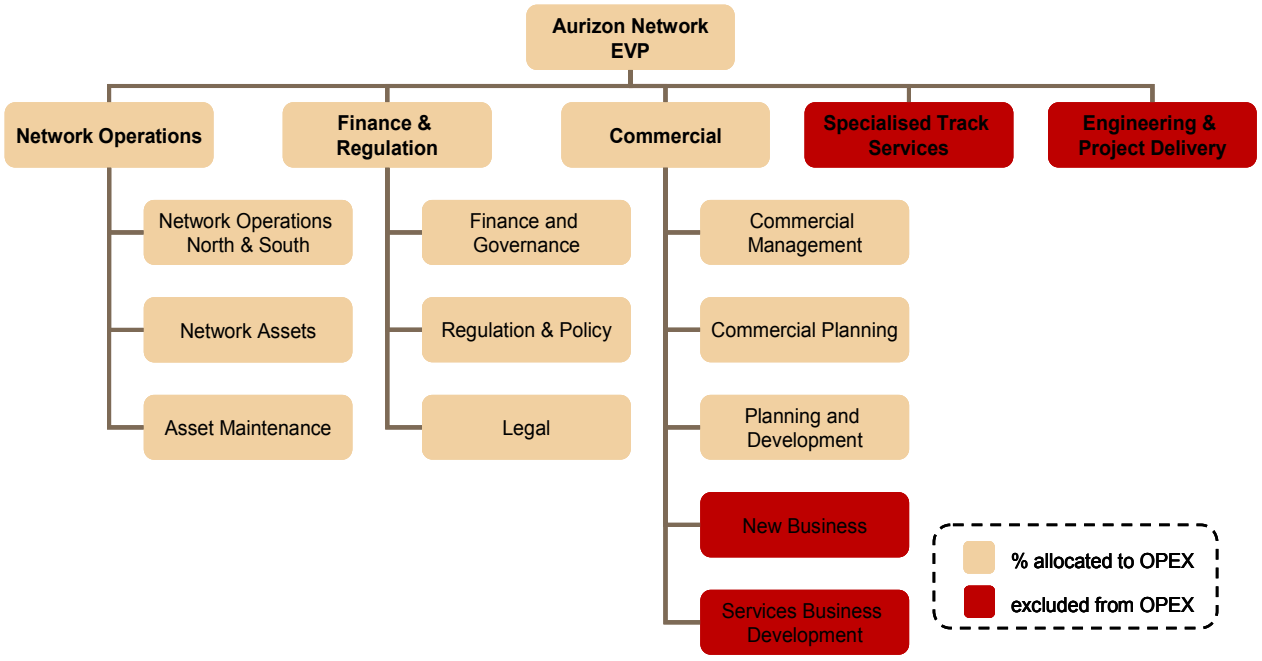
10.2.3.1 Introduction

The utilisation of Rail Infrastructure by Access Holders for the purpose of operating train services includes:

- the use of passing loops and Train queuing and staging, including before and after loading and unloading of Trains;
- the loading and unloading of Trains at facilities that are Rail Infrastructure;
- Train marshalling and shunting:
    - in preparation for running of a Train Service;
    - before or after loading or unloading of a Train; and
    - before or after maintenance and provisioning of a Train;
    - stowage;
- the benefit of other Below Rail Services essential to the use of the Rail Infrastructure such as:
    - signalling;
    - Train Control Services and associated communication; and
    - access to walkways immediately adjacent to, and crew changeover points connecting to, Track.

It should also be noted that in UT3, certain corporate overhead costs were directly allocated to business units (and therefore reflected in the direct and indirect costs). As will be explained in section 10.2.4, these costs are all now included in the corporate overhead allowance and are therefore not reflected in the direct and indirect cost estimates for UT4.

Figure 26 Evolution of organisational structure



Costs within each of the areas have been included in the costing estimates as outlined in Table 62 below. Further explanation of the activities performed within each of the functional areas for which costs have been included in the system wide and regional cost estimates are outlined in the subsections referred to in the table.

Table 62 Allocation of Aurizon Network functional units

Aurizon Network functional areas	% of costs included [1]	Comments	Section reference
EVP Network	50%	Based on a reasonable assessment that the EVP time and hence costs are shared between the Operations and Commercial areas, and Engineering &Project Delivery (E&PD) and Specialised Track Services (STS).	
Network Operations			
– VP Network Operations	100%		
– Network Operations North and South	93%[2]	This area is responsible for operations planning and management (i.e. train control and scheduling); incident management; performance planning command and control. These activities are directly related to the provision of access to customers.	10.2.3.2
– Network Assets	76%[3]	This area is responsible for the development of base standards for track, electrical, telecommunications and signalling; asset maintenance and renewals planning and execution; and maintenance strategies, plans and programs. These are activities that are directly related to the provision of access to customers.	10.2.3.3
– Asset Maintenance	Nil	Included in maintenance cost submission.	
Commercial development			
– Commercial management	87-90%[4]	This area is responsible for commercial negotiations and implementation of contracts for expansions, access, private infrastructure and interface agreements, as well as customer relationship management. Without this contract management, there could be no services provided, so they are essential costs to the provision of access.	10.2.3.4
– Commercial planning	87-90%[4]	This area is responsible for capital forecasting, financial modelling and stage gate management. These activities are indirectly related to the provision of access for customers.	10.2.3.4
– Planning and development	87-90%[4]	This area is responsible for capacity planning and modelling; supply chain planning and modelling; technical proposal development and evaluation. These activities also are indirectly related to the provision of access for customers. Train services would not be able to operate efficiently without sufficient planning.	10.2.3.4

Aurizon Network functional areas	% of costs included [1]	Comments	Section reference
– New business	Nil	As this area is responsible for commercial negotiations and execution of contracts for new major expansions, it is not directly related to the provision of access and no costs of this area have been included in the cost estimates.	
– Services Business Development	Nil	As this area is responsible for commercial negotiations and execution of contracts for external construction and major maintenance, it is not related to the provision of access and no costs of this area have been included in the cost estimates.	
Finance and Regulation			
– Finance and Governance and Network Excellence	25%	The Network finance team is responsible for access, billing and contract management; budgets, forecasting and financial reporting; statutory and regulatory reporting. The purpose of the Network Excellence team is to develop the long-term Network operating systems roadmap and to develop performance and cost optimisation strategies and analytics. Costs of these functions are indirect to the provision of access to rail infrastructure and have been included as part of the Finance function of corporate overhead and allocated using the blender allocator.	10.2.4.4
– Regulation & Policy	87-90% [4]	As the provision of rail access is a regulated service, costs are incurred in managing Aurizon Network's regulatory framework. Activities include compliance management, consideration of regulatory policy, and preparation of public submission material where required.	10.2.3.4
– Legal	100%	Similar to the Regulation and Policy unit, the Legal unit is also an advisor on regulatory issues pertinent to Aurizon Network, but solely from a legal perspective. The 100% allocation of these costs is a recognition that if the regulatory function did not exist within Network, neither would its legal capability, as the Aurizon Group maintains its own, separate legal function.	
Engineering and Project Delivery (E&PD)	Nil	Costs of running the capital program are capitalised into projects once completed and will be included in the capital allowance submitted.	
Specialised Track Services (STS)	Nil	Included in maintenance cost submission.	

1 These percentages have been applied to the budgeted costs of the function, excluding intercompany charges, depreciation and insurance.

2 Reflects allocation to non-coal train services for train control and scheduling.

3 Reflects allocation for non-RAB assets

4 It is recognised that costs directly incurred in relation to the earning of above regulatory returns (ie for GAPE and WIRP) should not be included in the operating costs forecasts for the calculation of reference tariffs. The above regulatory returns are fees that supplement

Aurizon Network's regulatory tariff income and are earned from the same paths. It is somewhat difficult to isolate costs that relate solely to the earning of the above regulatory return when those costs are so inextricably linked to the costs relating to the regulatory returns. This is particularly so for labour costs when time records are not kept to be able to apportion costs. An allowance has been made for costs that should not be included in reference tariffs by reducing the budgeted costs by the percentage of non-regulated revenue as a portion of total Aurizon Network revenue (which varies over the 4 years of the UT4 period between 10% and 13%).

This balance of this section describes the activities that are undertaken by each area within Aurizon Network and identifies the costs of those activities as being directly or indirectly related to the operation of the services identified above.

10.2.3.2 Train control, safeworking and operations (Network Operations – North & South)

A large portion of the cost of providing a service to coal customers is the operation and planning of train paths in an environment that is heavily capacity constrained. This part of the business is directly related to the provision of service to coal customers in the CQCR. Increasing focus on safety management and coal chain throughput in an environment that is heavily constrained, as well as rising coal volumes and system complexity, have led to the significant growth in this function.

The main activities performed are:

- Train control and scheduling (path negotiation and allocation)
- Operations planning
- Operations management
- Master maintenance planning
- Incident management
- Performance planning, reporting and analytics
- Closure planning, command and control
- Design, promotion, oversight and management of supply chain integration structures for system optimisation.

An overview of the key activities is provided below.

Train control

Train control refers to the control of the movement of trains, light engines and track machines along the rail corridor, as well as the safeworking of these rail vehicles through centralised operation of points and signals from the train control centres by the train controllers.

Aurizon Network operates a state of the art rail Network Control Centre that manages the daily movements of more than 70 trains across the 2,300 kilometre network. This is one of the most complex rail freight networks in Australia. Activities include:

- daily train control on mainlines and coal branch lines;
- supervision/management of train control function;
- management of adherence to the Daily Train Plan (DTP), including responding to changes in operator requirements and track possessions;
- collation of train operation information for reporting to railway operators;

- yard control;
- management of rail safety obligations, insofar as they relate to train operations, including the establishment of train operation standards relating to the safety of persons (e.g. safety of workers and the public), as well as operational integrity of the route;
- on-going assessment of train controllers as part of maintenance of competencies; and
- training of future train controllers.

Train controllers also carry out ancillary functions such as managing track possessions by infrastructure staff, incident reporting, the input of train movement statistical data and liaison with train crews and other operating staff.

The CQCR train control function is based at the Rockhampton Control Centre, while a fully functioning duplicate control facility is located in Mackay and is used for Disaster Recovery and training purposes. Both the central and Disaster Recovery Control Centres have a dedicated cost centre in Aurizon Network's accounting system. Typically, labour comprises about 98% of train control cost with the balance relating to other employee expenses and consumables.

The Central Rockhampton and Mackay Disaster Recovery Control Centres comprise nine Train Control Boards and two Electrical Control Boards.

Table 63 System Control Boards

System	Control Boards
Blackwater	Blackwater West Board – Springsure to Noga and Dingo including Branches Blackwater Near West Board – Dingo to Rocklands Blackwater South Board –Rocklands to Callemondah Blackwater Electrical Control Board
Goonyella	Goonyella Far West Board – Broadlea to Blair Athol, North Goonyella and GAPE Goonyella West Board – Hatfield to Broadlea Goonyella Ports Board – Hatfield to Hay Point and Dalrymple Bay Goonyella Electrical Control Board Gregory Board – Ingsdon to Burngrove
Moura	Moura to Callemondah
Newlands	Newlands to Abbot Point

Customer demand requires Aurizon Network to operate the Central Rockhampton Control Centre 24 hours per day, seven days per week across the entire year.

To ensure continuity in train control activity it is necessary to employ and train additional persons who can perform train control tasks. Currently a 12 month period is required to train and skill replacement train controllers. Aurizon Network has found it necessary to provide training for future train controllers due to the current age demographic of its train control staff. This risk mitigation strategy ensures Aurizon Network has all boards properly controlled for the periods that customers require train movements on the system.

To meet customer needs, train planners and controllers are required to re-evaluate and re-plan within tight timeframes to enable greater throughput. This is a resource intensive activity which continues to grow with the development of GAPE and WIRP. Aurizon Network contends that the current cost of resources borne within the train control environment reflects an efficient cost for the UT4 period because it reflects the level of resources required to manage the demands of customers in a capacity constrained environment, including maintaining sufficient flexibility to respond to change. Train control costs will continue to rise as more control boards are added to handle traffic on GAPE and to WIRP.

It was also during the UT3 period that the train control centres in Rockhampton and Mackay were consolidated. As outlined above, the Mackay centre is now used for disaster recovery and training. The consolidation of the train control centres has resulted in more efficient train control costs as follows:

- improvement in asset utilisation - the standardisation of processes for managing variation within the day of operations environment provides consistency and certainty for customers;
- lower staff costs – through centralised management and resourcing of staff from the one location;
- lower production costs – through consolidation of infrastructure resulting in reduced communication and support resources;
- lower labour on-costs – through access to a larger, more stable pool of human resources thereby reducing the risk of insufficient train control resources in Mackay to operate the Goonyella system (lower recruitment and selection, improved opportunities for competency training).

Train operations on the network managed by Aurizon Network are comprised of coal and non-coal carrying train services. Accordingly, it is reasonable to allocate a proportion of the costs associated with train control to non-coal services. Table 64 shows the train kilometres for non-coal train services in the CQCR since 2009/10. As non-coal train services are reasonably stable over this period and not expected to grow during UT4, Aurizon Network has allocated 9% of train control (equivalent to 7% of total network operations north and south regions cost centres) and scheduling costs to non-coal train services.

Table 64 Historical non-coal train services (train kilometres)

2009/10	2010/11	2011/12	2012/13 (YTD Annualised)
1,308,551	1,328,340	1,513,168	1,427,509

Safeworking/yard control

The declared infrastructure managed by Aurizon Network includes certain common user tracks in yards (the 'red roads'). Aurizon Network incurs significant cost when undertaking yard control activities at Callemondah, Coppabella, Bluff and Jilalan (which will cease in 2013). Aurizon Network is responsible for the management of the movement of all rollingstock in these sections of the yards. In the CQCR, these roads are usually signalled and there is a local signal panel to control the movement of rollingstock.

Above rail functions are also carried out in yards as well such as shunting, cutting out of wagons for repair and detaching/ attaching locomotives for servicing into and out of above rail facilities located adjacent to the yards. These activities are carried out by Aurizon Holdings Limited staff, not Aurizon Network, and these costs are therefore not included in the system wide and regional cost forecast.

As noted above, train marshalling and shunting in preparation for running a train service is part of the operation of train services. Management of train movements into and out of 'blue'[172] or 'yellow'[173] roads is associated with provision of the declared service. All signals into and out of the declared facility are given by the Network Area Controller (NAC). The only area where this is different is in the Wagon Maintenance Facility where points are manually operated by Aurizon Network shunters (there are different arrangements for each of the yards).

Aurizon Network staff control all movements. All train movements apart from the rollingstock area are via automated points. All movements into and out of roads connected to red roads are controlled by the NAC. The NAC also has a dual signal with the Central Train Control for entry and exit from the network to the yard. Therefore, all Aurizon Network costs are related to the provision of the declared service.

There are only two corridor safeworking systems in use in the CQCR: Remote Controlled Signalling (RCS) and Direct Train Control (DTC). Before the commencement of UT4, all remaining DTC installations will be replaced with RCS. Both systems require the same level of manning, and in both systems all train movements are controlled directly by the Central Train Controllers. There is no requirement for safeworking staff along the line as there is with less sophisticated systems. Train Controllers issue an authority to work on the track and enable safeworking practices/procedures within the train control centre so that trains do not run on the same section of track that is occupied by construction workers. NAC staff may also undertake incident investigations for low level incidents and Yard inspections.

During construction projects normal signalling and safeworking systems have to be suspended and either train movements are suspended or labour-intensive manual systems are introduced temporarily over the affected sections in order to maintain train operations across the affected parts of the network. These costs are not included in the capital works as they are incurred for operational reasons during construction activity. They are therefore addressed in the system wide and regional cost forecast. While costly, this solution has been implemented to minimise the impact of construction works on train services. These costs will continue to be maintained over UT4 given the continued level of construction activity.

Overall, reported costs for safeworking and yard control have increased in recent years due to factors such as the increased need for manual safeworking during construction and increased traffic in yards.

Operations planning

Operations planning is primarily broken down into three horizons – Long-term, Short-term Tactical and Day Of Operations (DOO).

Long-term – The planning horizon is from three months out to two years and encompasses:

- Development of operating options and solutions to access requests.
- Preparation of integrated coal chain production forecasts, which provide an accurate reflection of the capability of the supply chain given the committed resources of the relevant stakeholders.
- Development and maintenance of a two year Critical Asset Calendar (CAC) that aligns network maintenance closures with port, producer, operator and external maintenance works.

Short-term Tactical – The planning horizon is from 48 hours out to three months and encompasses:

- Development and implementation of pathing and constraint visibility.

[172] Above rail infrastructure owned by Aurizon Holdings Limited.
[173] Above rail infrastructure owned by non-related entities.

- Development and implementation of weekly production plans, which are agreed with customers and stakeholders.
- Development and implementation of the Daily Train Plans (DTP), which are agreed with customers and stakeholders.
- Management and integration of track possession bids and the development of Train Notices in reference to these possessions.
- Coordination and management of the integrated planning of the each coal chain to deliver contracted customer and stakeholder outcomes within planned commercial targets including maintenance and production scheduling.
- Coordination and management of DTP change requests, including cancelled and ad hoc services.

Day of Operations – This typically includes the live run out to 48 hours and is primarily covered under Train and Yard Control, however also includes:

- Coordination and facilitation of four hourly supply chain 'hook-ups' to ensure compliance and/or agreement of changes to the live run with supply chain stakeholders.
- Analysis of train operation information and identification of corrective action countermeasures to rectify non-conformances to the DTP.

This is one of the key areas where the significant increase in complexity becomes evident, which has been driven by the longer term trend growth in volumes and the increasing integration between systems. These demands can be expected to continue into the future with continued volume growth and the commissioning of new port terminals such as WICET and Dudgeon Point.

Operations management and other activities

There has been significant growth in the number and scope of activities within Network Operations, which again has been driven by the increased demands on the system and the increase in network complexity, as well as increasing interest by users in supply chain activity and performance.

Other activities that are now performed within Network Operations include:

- Management of production and customer reporting of the performance of the coal systems.
- Management of operational compliance with commercial agreements and information security protocols.
- Development and maintenance of systems for recording performance information.
- Development of frameworks for the performance of train control.
- Analysis and reporting of performance information and the implementation of continuous process improvement activities.
- Provision of regular situational updates on the performance of the relevant coal chain to steering committees, management groups, customers and supply chain forums.
- Negotiation of capacity entitlements and amendments to train schedules.

- Preparation and maintenance of information required for third party operators in order to satisfy Aurizon Network's obligations under the undertaking.
- Incident management, including emergency response, investigation, recording, analysis, review and rectification procedures.
- Risk assessment for changes in operations or the commencement of new operations and Interface Risk Management Plans (IRMP), including:
    - identification of risks;
    - development and implementation of risk control measures; and
    - administrative support.

10.2.3.3 Infrastructure management (Network Assets)

This function is directly related to the provision of services to coal customers in the CQCR through its responsibility for asset performance for those assets that are part of the declared service (referred to as 'red roads'). This includes managing safety, reliability, availability and utilisation of the asset. It manages Aurizon Network's coal systems assets to deliver safe, sustainable rail infrastructure to meet contracted customer and stakeholder outcomes within planned commercial targets, delivering cost effective services for the business and its customers.

The main activities performed are:

- Asset business management
- Asset assurance management
- Electrical assets management
- Telecommunications and signalling assets management
- Track and civil assets management
- Asset strategy
- Corridor assets management.

This area is also responsible for network maintenance and renewals. Network maintenance costs are reflected in the maintenance cost forecasts and are therefore not included here. Forecast renewals are included in capital expenditure.

All of the above activities have been impacted by the growth in volumes and increase in network complexity, as described in section 10.2.1.3. This poses particular challenges for Infrastructure Management, which has been focussed on delivering a safe, efficient and reliable network in a manner that minimises disruptions to network operations and assumes limited corridor access for maintenance.

This function also encompasses the management of connection agreements, including the interfaces with third party infrastructure, systems and safety. This includes the development and maintenance of Aurizon Network's Third Party Requirements Guide for connecting private infrastructure. This guide, which forms part of Aurizon Network's Quality Management System, describes the design, construction and interface requirements for the connection of private infrastructure to Aurizon Network's rail infrastructure.

There are also a number of activities associated with regulatory compliance. This is an area that has continued to expand and is independent of network activity. Across the Aurizon Network business, there are currently 43 pieces of Commonwealth legislation that can impact the business. This number is considerably higher for State legislation. Examples of current issues being addressed by the Network Assets function include:

- compliance with the Coal Dust Management Plan, including field monitoring;
- changes to the Queensland workplace health and safety laws relating to principal contractors, which has also required additional systems and processes;
- managing the rail safety delegations under the legislation, which currently involves negotiating agreements with relevant Local Governments and property owners for all level crossings.

This also includes developing and maintaining standards. This area is also responsible for preparing reports that must be submitted to the QCA, including the End of Period assessment, the annual maintenance cost reports and the capital expenditure report. The End of Period assessment and the annual maintenance cost reports were new obligations introduced in UT3.

As the proportion of work that has been outsourced by Aurizon Network has increased, another area where activity has expanded is the management of these arrangements. An example of this is the associated audit regime, given that Aurizon Network is unfamiliar with the systems, processes and governance frameworks employed by external providers. These audits were previously undertaken at a functional level and are now asset and compliance based.

As the Network Assets division also provides services and support for rail infrastructure that is either not currently included in the RAB (capital expenditure), or not eligible for inclusion in the RAB, an allocation of the costs associated with these assets has been deducted from the proposed cost allowances. On the basis of expected activity levels the percentage of costs that can be attributed to capital expenditure projects and non-RAB assets for the asset management division is 24%. This has been deducted from the proposed UT4 allowance.

Further description of these activities is set out below.

Asset Business Management

The purpose of this function is to:

- lead strategic asset strategy development and major transport planning;
- support the development of cohesive optimised asset planning and business systems plans;
- manage the authorisation for rollingstock to operate on the network; and
- establish and manage the financial systems.

Responsibilities include:

- Development, negotiation, maintenance, and oversight of all major Aurizon Network agreements inclusive of network maintenance supply, network electricity provision, Control Centre Support agreements, telecommunication brokering and network insurance.

- Provision of strategic asset management advice to support the development and implementation of cohesive optimised Network Asset Management Plans and associated Business System Planning in conjunction with the business segments.
- Management of the operator interface, including the Interface Risk Management Planning process (and ancillary requests), to ensure timely and effective planning of intended rollingstock operations on the network.
- Development and management of effective relationships with key stakeholders with regard to asset strategy development, agreements and operator interfaces.
- Coordination of the establishment, monitoring and reporting of the financial systems (inclusive of cost systems) for procured services and ancillary financial support, promoting financial accountability.
- Represent the interests of Aurizon Network in major transport studies with regard to long term infrastructure planning and development.
- Facilitation of the interface with government agencies on strategic developments.
- Provision of maintenance and capital plan development, execution, monitoring, and control.
- Facilitation of the Rail Infrastructure Management (RIM) contract tender and negotiation, including third party infrastructure (TPI) client integration management, and TPI RIM project planning and delivery.

Asset Assurance Management

The purpose of this function is to provide governance and compliance auditing of the safety and condition of the rail infrastructure by developing and implementing asset assurance and compliance strategies and processes. Responsibilities include:

- Provision of asset construction acceptance and verification services to ensure asset safety and quality assurance by undertaking track, electrical, signalling, telecoms, and civil audits.
- Monitoring of network events and the development of improvement strategies.
- Coordination and review of incident reports for Network Operations, including the development and implementation of infrastructure strategies to reduce derailments on rail infrastructure.
- Provision of services and personnel to coordinate operators' interface requirements. Authorisation of rollingstock and configurations to operate on the network, including testing of rollingstock and route definitions for special circumstances (i.e. out of gauge loads).
- Development and implementation of risk management strategies for network interfaces, connection agreements, transfer facility licences and coal traffic.
- Provision of safeworking advice and rollingstock technical interface with network infrastructure, including interface standards identification, risk management processes and system performance, and rollingstock authorisation processes.
- Maintenance of ViziRail[174] data for rollingstock.

[174] ViziRail is an integrated scheduling and network monitoring tool that is currently the primary information system used to manage the network.

- Assessment and provision of advice regarding coal train traffic operational interfaces and coal network capability.
- Authorisation of rollingstock and configurations to operate on the network.
- Regular updating, production and distribution of Aurizon Network's Information Packs.
- Provision and maintenance of an efficient risk assessment and management tool, which guides the way in which certain aspects of the business are managed (e.g. interface management).

Electrical Assets Management

The purpose of this function is to:

- lead the development, implementation, and management of Aurizon Network's Electric Traction Strategies and Asset Management Systems including risk management, governance, interface management, asset information systems, research and development for the operation of the below-rail network electric traction assets; and
- lead, manage and ensure professional standards for scoping, specification, design, construction, verification and validation of the electrical infrastructure necessary to meet current and future capital programs, legal, and regulatory requirements.

Responsibilities include:

- Development and management of best practice electric traction asset strategies and asset systems (including the outworking of connection agreements, standards, specifications and procedures) appropriate for the safe, reliable, efficient, and sustainable operation, maintenance, and construction of electric traction infrastructure within legal requirements.
- Development and management of systems to satisfy the organisation's Governance Management Framework requirements including:
    - management of electric traction risk reviews and the provision of advice and input into Aurizon Network business unit risk registers;
    - assessment of the implications of legislative changes impacting the management of electric assets and the provision of advice to Aurizon Network business units;
    - management of the drafting and determination of electric traction standards, specifications and procedures to document risk treatments for safety risks and legislative requirements;
    - management of compliance with obligations under electrical safety legislation, including developing and managing an annual risk based audit program ensuring attention to interface issues with other Aurizon Holdings Limited companies and third party operators, including the management of compliance reporting and investigations.
- The identification and implementation of all necessary auditing to ensure a safe, reliable, efficient, and sustainable network, including the development and management of the strategies (including safety) for electric traction infrastructure with respect to:
    - power and overhead systems;
    - electrical control systems;

- operational requirements of the network including electrical safety.

- Management of the Entity Works and the Entity Safety Management System and relationships with the Electrical Safety Regulator (which form part of the obligations as owner and manager of an electricity distribution network).
- Management of the electric traction research and development program, approvals and new products to support the growth of Aurizon Network.
- Development and management of key safety strategies and associated plans targeted at improved business outcomes, including electric traction safety and training documentation for above rail operators.
- Management of the process of accepting newly constructed electric traction equipment into the network and the outcomes of investigations into critical network electrical incidents.
- Review and authorisation of user requirements, design competency approval and design verification of third party private infrastructure interface standards.
- Management of all electrical safety as the listed entity for CQCN. This encompasses all roads except for Pacific National's Nebo provisioning facility.

Telecommunications and Signalling Assets Management

The purpose of this function is to:

- lead the development, implementation and management of Aurizon Network's Telecommunication and Signalling Strategies and Asset Management Systems including risk management, governance management, interface management, asset information systems and research and development for the operation of the below rail network telecommunications and signalling assets; and
- lead, manage and ensure professional standards for scoping, specification, design, construction, verification and validation of the telecommunications infrastructure necessary to meet current and future Aurizon Network capital program, legal, and regulatory requirements.

Responsibilities include:

- Implementation of arrangements to ensure the workplace health and safety of employees and contractors directly engaged in telecommunications and signalling assets management, including ongoing Safety in Design for the safety of those constructing, maintaining and operating the infrastructure.
- Management of data sharing agreement with external parties.
- Provision of command control, signalling, telecommunications, asset protection infrastructure and wayside systems strategies.
- Liaison with Network Capital Program managers and other stakeholders to plan for and manage the internal and contracted capability needed to meet the present and future telecommunication needs of Aurizon Network.
- Development and implementation of commercial telecoms procurement and asset strategies, including third party interface arrangements:

- review and authorisation of user requirements briefs
- design competency approval
- design verification.

- Establishment of principles, standards and specifications for Aurizon Network's telecommunications in compliance with its Safety Management System, including:
  - convergence and asset strategies for signalling and telecoms
  - core telecom network proof of concept and projects
  - installation and configuration standards
  - interface business plans
  - system audit responsibility
  - trend analysis and system improvements
  - guidance on operational issues
  - technical asset documentation.
- Operational Systems Engineering, which includes:
  - real time information systems software and configuration projects and maintenance, power supervisor system configuration projects and maintenance;
  - coordination of train control systems activities, systems architecture, checking, and estimating, Universal Train Control software and configuration projects and maintenance;
- Electrical Control Office control software and configuration projects and maintenance.
- Ensure Registered Professional Engineer Queensland certification of engineering output. Ensure compliance with relevant standards, professional practices and legislative requirements in the provision of power systems engineering designs and services targeted at business needs. Maintenance of a Quality Management System to provide consistent output of services and advice.

Track and Civil Assets Management

The purpose of this function is to:

- lead the development, implementation, and management of Aurizon Network's Track and Civil Strategies and Asset Management Systems including risk management, governance management, interface management, technical advices, asset information systems and research and development for the operation of the below rail network electric traction assets; and
- lead, manage and ensure professional standards for scoping, specification, design, construction, verification and validation of the Track and Civil infrastructure necessary to meet present and future Aurizon Network capital program, regulatory, and legal requirements.

Responsibilities include:

- Implementation of arrangements to ensure the workplace health and safety of employees and contractors directly engaged in this function, including ongoing Safety in Design for the safety of those constructing, maintaining and operating the infrastructure (which arises from obligations under the workplace health and safety legislation).
- Review and authorisation of user requirements briefs, design competency approval and design verification of third party private infrastructure interface standards.
- Liaison with Network Capital Program managers and other stakeholders to plan for and manage the internal and contracted capability needed to meet the present and future track and civil service needs of Aurizon Network.
- Development and implementation of commercial procurement strategies, and the establishment of principles and specifications for civil and track in compliance with the Safety Management System.
- Ensure compliance with relevant standards, professional practices, and legislative requirements in provision of power systems engineering designs and services targeted at business needs.
- Facilitation of the provision of Aurizon Network requirements on adjoining developments. Maintenance of a Quality Management System to provide consistent output of services and advice.
- Management of speed and cant standards in addition to other civil and track standards, including the leadership of specialist track and civil engineering investigations.
- Management of bridge inspection and maintenance strategies.

Asset Strategy

The purpose of the team is to lead and manage the rail network support systems to deliver value adding outcomes for the Aurizon Network business by managing, developing, maintaining, implementing and evaluating integrated business and information management, asset management, operational management, operational train command, control and protection and network monitoring systems.

Responsibilities include:

- Management of the Rail Safety Accreditation of the Aurizon Network business and provide management system support and advice with respect to other regulatory issues.
- Management of the strategy, development, and implementation of a whole of business information, asset information, and Information Technology (IT) plan, with a view to achieving value for the business through integration.
- Management of the strategy, development and implementation of the following:
    - integrated business and information management systems (including operational and asset safety and risk management frameworks);
    - asset management systems;
    - operational management systems including Vizi-Rail and operational reporting systems;
    - operational train command, control and protection systems; and

- network monitoring systems.

- Management of the client role for capital project delivery for network wide projects and projects not assigned to network business segments with respect to the above responsibilities.
- Provision of executive leadership input to the Aurizon Network business.
- Provision of Aurizon Network representation at the Cooperative Research Centre for Integrated Engineering Asset Management workshops and meetings, as well as professional advice in the areas of Geodesy, Topology, and GPS transformations.

Corridor Assets Management

The purpose of this team is to manage the Aurizon Network's below rail coal system assets to deliver safe sustainable rail infrastructure to meet contracted customer and stakeholder outcomes within planned commercial targets. The scope of its responsibilities encompasses level crossings, corridor access and rollingstock and train registration.

Responsibilities include:

- Coordination and management of the client role for capital project delivery within the Aurizon Network.
- Coordination and management of the delivery of agreed service outcomes with service providers (third party or internal).
- Management and coordination of activities, initiatives, and strategies in order to ensure accurate records and information for the configuration and condition of the below-rail network infrastructure, including:
    - route maps (CQCN Only)
    - level crossings database
    - network asset maps
    - line diagrams
    - corridor access plans
    - line section codes and naming conventions.
- Management of third party interfaces in relation to fencing, corridor/interface signage, noise barriers, coal dust monitoring and veneering and level crossings.
- Interface point for ports, above rail operators, State and Local Government, the community (including property owners) and mines.
- Business communications support, administration, Infonet advice and carrier liaison.
- Corridor access management and planning, including level crossing assessments.
- Provision of technical advice for road to rail interface and level crossings (e.g. interface agreements, maintenance).

- Provision of corridor access (Way leaves, Licences, Deeds, etc.) and the outworking of actions within these agreements.
- Provision of services for rollingstock, train registration, and configuration management, including third party interface.
- Represent Aurizon Network and manage the interface with external parties involved in transport studies, including the development of interface management plans.

10.2.3.4 Commercial Development

Commercial Management – North & South

These teams are the primary interface between Aurizon Network and users for matters relating to the negotiation and provision of access, including where expansions are required. This is an area where significant growth has been experienced given the increase in activity within a capacity constrained environment. Much of the growth in effort has been in developing and maintaining relationships with users (with a view to better understanding and responding to customer needs), responding to customer queries, developing and scoping of capacity solutions, running expression of interest processes for major growth projects, negotiating agreements and monitoring existing contracts. There are two commercial teams involved in the negotiations and implementation of contracts for expansions, access, connection of private infrastructure and interface agreements: one team focuses on the southern CQCR ('Commercial South') and the other the north ('Commercial North').

Activities undertaken within these teams include:

- Negotiation and management of access:
    - handling all commercial, technical and operational matters in relation to access inquires;
    - negotiating new agreements;
    - negotiation of User Funding Agreements and increased coordination costs of user involvement in project delivery;
    - transfers or modifications to existing agreements;
    - negotiation of access agreements for customer initiated transfers;
    - negotiation of Access Interface Deeds;
    - negotiation of storage agreements for rollingstock;
    - administration of agreements related to access arrangements.
- Management of relationships with operators and coal producers, including:
    - meeting regularly with existing and potential operators to discuss commercial, technical and operational matters, and actively seek new commercial solutions;
    - meeting regularly with existing and potential coal producers, to discuss commercial, technical and operational matters;
    - monitoring existing operator performance;

- interpretation of asset capabilities for rail operators and access seekers.

- Management of negotiations for new expansions:
  - management of the process for new network extensions;
  - evaluation of access requests;
  - negotiations with customers for participation in funding studies;
  - negotiation and management of infrastructure deeds.
- Network management:
  - negotiation of transfer facility licenses at all loading and unloading facilities;
  - negotiation of level crossing agreements – access for any private crossings by landholders/mines;
  - negotiation of connection agreements for private infrastructure;
  - correspondence to coal producers regarding access to the rail corridor.
- New infrastructure construction, including negotiation of:
  - service agreements for funding of studies;
  - Rail Infrastructure Construction Deeds;
  - Access Facilitation Deeds;
  - lease agreements – directly lease corridor from landholders;
  - Bridge License – entitlement for overbridges (if applicable);
  - Conveyor License – entitlement for conveyors (if applicable);
  - Rail Relocation deeds/compensation deeds.
- Management of property and infrastructure agreements:
  - handling commercial matters in relation to contract management;
  - negotiations for amendments to property or infrastructure agreements.

Planning and development

This area is responsible for Aurizon Network's 'strategic' network planning function (medium to long-term planning), maintenance of the network Operating Parameters, capacity modelling, interacting with other supply chain participants and developing and participating in initiatives that could improve supply chain performance.

Supply chain planning and capacity modelling is an inherently complex task. This reflects the large number of factors that influence capacity, the complex interdependencies between these factors and the uncertainty underpinning the location, size and timing of future growth (necessitating the development and testing of scenarios). These complexities have been compounded with the increased integration between systems. Consistent with the other parts of the network business, this has led to growth in the demands on this team in

recent years. An example of other activities that have seen an increased workload is the greater integration of modelling across system interfaces. This is particularly the case for ports, where Aurizon Network is developing models of port operations. Tonnage transfers between mines also add to the work required for medium term planning.

The activities undertaken in this area include:

- Medium and long-term planning for below-rail network expansions:
    - growth forecasts for Queensland coal network;
    - long-term system planning for potential mine and port terminal expansions; and
    - strategic development planning for incremental corridor expansions matching specific terminal developments.
- Development planning:
    - development and implementation of Corridor Development Plans;
    - interface with customers and other supply chain entities to integrate whole of supply chain planning and development;
    - direct the development of concept to feasibility stage gate proposals and ensure adherence to investment standards;
    - evaluation and preparation of development paths and technical requirements for investment requests; and
    - maintenance of relationships with supply chain groups and port developers.
- Supply chain planning:
    - supply chain operational and capacity planning for proposed operational changes and expansions;
    - participate in supply chain forums; and
    - economic evaluation of below-rail network and other supply chain development alternatives.
- Capacity modelling:
    - undertake capacity modelling for expansions and operational improvements;
    - maintenance of system model and associated capabilities; and
    - management of information systems including intellectual property and data.

Commercial Planning

The Commercial Planning area is responsible for the development and implementation of capital projects, including ensuring investments go through the necessary internal governance and approvals process. It is also responsible for managing the contractual interface for electric transmission and distribution network capacity, as well as expansions. This area also manages any pre-approval of capital expenditure sought from users under the voting provisions in Schedule A.

The demands on this team have continued to increase given the number of investment projects under consideration, including adhering to the organisation's stringent internal governance processes. The move to more targeted Working Papers to support user pre-approval of capital expenditure under Schedule A could also see increased demands on this team in UT4.

Activities undertaken within this function include:

- Network capital forecasting and financial modelling:
    - facilitate and contribute to the corporate forecast for major expansion projects;
    - construct, analyse and interpret financial and operational models to support Investment Approval Requests from concept to feasibility; and
    - conduct budget reviews for Commercial Development functions on operating and capital expenditure.
- Network stage gate management:
    - critically review and improve quality of all investment submissions as a permanent member of the Network Investment Committee;
    - prepare minor funding requests and change requests for major projects before they enter stage gates; and
    - prepare Investment Approval Requests and Board papers to see major projects through relevant stage gates from concept to feasibility.
- Strategic Development Plan (SDP):
    - participate in the development of the SDP for the Central Queensland Coal Systems; and
    - plan and conduct stakeholder communication for the SDP.
- Electric traction:
    - lead the commercial negotiations with Powerlink on recontracting for existing feeder stations and the establishment of new feeder stations;
    - investigate financing options with Powerlink for new feeder stations;
    - investigate self-construct and early delivery options for future expansions; and
    - forecast future electricity use against tonnage forecast including input to tariff submission models.
- Staff development:
    - design and deliver a 12 month tailored Commercial Development Program for business/commercial analysts;
    - coordinate advanced financial modelling training for analysts within the Commercial Development teams; and
    - coordinate advanced negotiation training for Commercial Development managers.

10.2.3.5 Network Finance & Regulation

Network Finance and governance costs are included as part of the corporate overhead and are therefore described in section 10.2.4.4 below.

Regulation and Policy

Regulation and Policy is an advisor on regulatory issues to Aurizon Network, monitors and reports compliance with the Access Undertaking, liaises with the QCA on behalf of Aurizon Network, and assists other areas within Aurizon Network to comply with their undertaking obligations. The costs of activities that are performed within this area are cyclical with an increase in cost budgeted for 2015/16 and 2016/17 associated with the development and review of UT5. The work of this team is overwhelmingly concerned with the regulated below rail network. An estimate of the activities that are undertaken that do not relate to the regulated below rail network has been made and this has been excluded from the allowance.

The costs of this area reflect the complex nature of Aurizon Network's regulatory framework and the growth in the volume of tasks required to ensure compliance with this framework on an ongoing basis. The skill sets required for these functions are generally of a specialised nature and as such higher labour costs are associated with retaining staff. Given the dynamic nature of the industry environment and the complexity of the regulatory framework, there is no expectation that the demands on this team will moderate.

10.2.3.6 Costs subject to pass-through

There are some external costs that Aurizon Network incurs as a direct consequence of its compliance with the undertaking that are uncertain. For example, Part 9 allows the QCA to request an audit of compliance of any matter under the undertaking provided it has reasonable grounds to do so. This makes it more difficult to forecast the allowance that needs to be made for these costs. As discussed in section 10.5 of Volume 2, Aurizon Network is therefore proposing an amendment to the clause 4.2(b) of Schedule F to allow for an annual adjustment to System Allowable Revenue for the difference between actual and forecast audit costs.

The estimates included in the forecast of system wide and regional costs are as follows:

Table 65 Allowance for costs subject to pass-through ($'000) (nominal dollars)

Cost item	2013/14	2014/15	2015/16	2016/17
Audit fees	254.5	260.8	267.4	274.1

10.2.4 Corporate overhead

10.2.4.1 Introduction

Whilst the regulated business activities are undertaken in a separate company, Aurizon Network, this company is a subsidiary of Aurizon Holdings Limited and there are certain non-operational costs incurred within the Aurizon Holdings Limited Group that would reasonably expected to be incurred by Aurizon Network if it operated on a stand-alone basis. As such, a portion of these costs should be attributed to the below rail business.

The reasonableness of the corporate cost allowance has been confirmed by an independent benchmarking analysis conducted by Ernst and Young, which was based on a number of sources, including the American Productivity and Quality Centre's Open Standards Benchmarking Collaborative Database, the Global Audit Information Network Benchmarking Survey and data from individual organisations approached for the purpose of this study.

This section defines the relevant corporate overhead cost base and the basis on which these costs are allocated to the below rail business.

10.2.4.2 Corporate overhead base

As noted previously, for the UT3 submission, corporate costs that were able to be directly allocated to business units (in accordance with the Aurizon Holdings Limited corporate cost allocation rules on a usage basis) were included as operating expenses of those functions. These costs comprised shared services such as accounts payable, payroll, HR operations, supply and IT. The overlay for corporate overhead included all other corporate costs such as the Board, the office of the Chief Executive Officer, corporate secretarial, investor relations and corporate finance functions.

The corporate overhead base for the purposes of UT4 now includes all of those functions (including both those shared services costs distributed as intercompany charges and those that are not). Appendix B outlines the functions performed within the Aurizon Holdings Limited Group which Aurizon Network would otherwise undertake if it were to operate as a stand-alone entity. These align with the non-operational functions of the Group's structure and are:

- Board and CEO
- Business Sustainability
- Finance
- Human Resources
- Enterprise Services
- Strategy.

The corporate base within the Aurizon Holdings Limited Group is very different from that applying during UT3. This is for two main reasons. The first is that corporate costs now reflect the listing of the Aurizon Holdings Limited on the Australian Securities Exchange in November 2010. The second is that corporate costs are now more transparent, following the implementation of a functional organisational structure within the Group in December 2011. The restructure resulted in the transfer of certain costs from operational business units to non-operational functional units. Ie, "corporate costs" were previously not fully identified and, therefore, were effectively understated. This has now changed; "corporate costs" that were previously accounted for and contained as business unit costs are now transparently recorded in corporate services areas. This now comprises the corporate overhead base. Some examples of these costs and their applicability to Aurizon Network are outlined in section 10.2.4.4. As described in section 10.2.2, the corporate overhead costs in the prior undertaking periods are not an appropriate benchmark for comparison purposes with the UT4 figures.

10.2.4.3 Cost estimation methodology

In the UT3 period, corporate overhead costs were allocated to QR Network in a manner consistent with the Costing Manual, that is, as a 'mark up' on operating costs excluding fuel, energy, depreciation and maintenance costs. The UT3 cost build-up used a ratio of corporate overhead charged to the business unit via intercompany charges to QR Network's operating costs (excluding fuel, energy and depreciation) of 4.5%.

This methodology only allowed for $2.8 million for corporate overhead relating to the CQCR in 2009/10 (escalated to $3.3 million for 2012/13). The actual corporate overhead reported in the below-rail financial statements for QR Network for the financial years ended 30 June 2010, 2011 and 2012 was $23.6 million, $25.2 million and $18.8 million respectively. The business has borne this under-recovery over the UT3 period, noting that this was based on the application of the previous methodology. However this is not sustainable and is not consistent with the QCA Act's pricing principles.

Further, the methodology is now considered deficient because it does not sufficiently take into account corporate overhead that was not allocated to business units and that would be incurred by a stand-alone company. There are many corporate costs that are not allocated via the intercompany charge and as a result allocating corporate overheads in proportion to intercompany charges is not appropriate.

A more robust approach has been adopted for UT4, involving quantification of corporate overheads costs that would be reasonably attributable to the provision of services to the CQCR if Aurizon Network operated on a stand-alone basis. The key test is, if the regulated below rail network was to operate as a stand-alone business, what activities within these functions would need to be undertaken and hence what costs would be incurred. Ernst & Young was engaged to assist in a benchmarking exercise to support this approach and their report is provided in Annex G. The analysis undertaken involved:

- Identification of all Aurizon Holdings Limited corporate overhead costs/categories.
- Allocation of Aurizon Holdings Limited corporate overhead to the regulated below rail network business.
- Benchmarking of the overhead allocated to Aurizon Network against a number of different organisations to assess the comparability of Aurizon Network's costs relative to benchmark data sets.

Each of these steps is discussed in turn below.

Identification of Aurizon Holdings Limited corporate overhead costs/categories

As for Aurizon Network's direct and indirect costs, an extrapolation of the Aurizon Holdings Limited Corporate Plan for the year ended 30 June 2013 to FY14-FY17 (the UT4 period) has been used as the basis for the overhead cost estimates for UT4. Each of the non-operational functions of Finance, Human Resources, Enterprise Services, Business Sustainability, Board and CEO office and Strategy are considered to be allocable to the below rail network business. That is, if the regulated below rail network was to operate as a stand-alone business, activities within these functions would need to be undertaken and hence costs incurred.

Allocation of Aurizon Holdings Limited corporate overhead to the regulated below rail network business

The Corporate Plan for the Aurizon Holdings Limited Group is built at a cost centre level and it is at this level that the costs have been analysed to determine which costs are included and excluded. The costs that are included are costs that are:

- directly related to below rail network operations (e.g. depreciation of Network land and buildings, Network Legal); or
- not directly related to below rail network operations but which do provide services to the below rail network business and/or would be required for a stand-alone regulated business (i.e. all remaining costs after deducting those identifiable as network or non-network related).

Costs that are not directly related to below rail network operations and which provide no services to the below rail network business are excluded (e.g. Marketing and Operations Finance).

Consideration has been given to the activities performed within each cost centre when choosing an allocator. As explained in the Ernst & Young report, various allocators were considered as potentially applicable to each cost centre:

- below rail network regulated revenue as a percentage of total Aurizon Holdings Limited Group revenue (21%);
- below rail network FTEs as a percentage of total Aurizon Holdings Limited Group FTEs (5%);
- below rail network assets as a percentage of total Aurizon Holdings Limited Group assets. This was based on the written down value of assets on the fixed asset register as at 30 June 2012 (47%);
- direct operational and capital costs (excluding labour) of the below rail network business as a percentage of the direct costs of the operational functions of the Aurizon Holdings Limited Group (22%);
- a blended allocator, being the simple average of the first three allocators above (25%).

In each of these cases, the below rail network business is limited to the Network Operations and support areas and the FTEs exclude staff in Asset Maintenance, Specialised Track Services and Engineering & Project Delivery.

The allocation percentages above are calculated based on data for the 2012/13 budget, except for below rail network assets, which as noted above is based on values in the fixed assets register as at 30 June 2012. These percentages have been applied to the budgeted costs for the four years of UT4, that is, a new allocation percentage has not been calculated for each year.

Aurizon Network's share of Aurizon Holdings Limited's corporate overhead costs has been calculated using a cost allocation methodology based on both causal and blended allocation bases. Research undertaken by Ernst & Young (presented in its 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.

During benchmarking activities, a causal driver for some of Aurizon Network's costs could not be determined. An alternative cost allocation method was required that would be acceptable to the QCA and would realistically represent Aurizon Network's corporate overhead costs. Analysis of other regulated businesses in Australia found that a blended rate was commonly used to allocate overhead costs.

Energex was identified as a comparable business and its blended rate components were adopted for Aurizon Network. The blended allocator used was based on three of the organisation's key cost drivers, being asset value, revenue and FTEs. This was based on the following rationale:

- asset value was considered an acceptable component of the blended allocator as Aurizon Network is an asset intensive business, similar to Energex (and most other regulated infrastructure providers);
- revenue was considered an acceptable component of the blended rate as regulatory precedent shows that it is commonly used by other entities using blended rates such as Energex and Powercor/Citipower. Revenue is also commonly used as a causal allocator for corporate overhead costs; and
- FTEs were considered an acceptable component of the blended rate and are commonly used as a causal allocator. Regulatory precedent also supports the use of FTEs as a component in a blended allocator. This is demonstrated by Energex's use of FTEs as a component in its blended allocator.

The allocation methods applied to each functional area are outlined in Table 66. As outlined above, in some cases there are corporate overhead costs that are specifically attributable to Aurizon Network but also have an allocation of non-identifiable costs. For example, under the Enterprise Real Estate function there are office rental costs specifically attributable to Aurizon Network as they house employees that are directly involved in the provision of the regulated below rail service. In addition, there are other real estate costs incurred at the Group level on behalf of Aurizon Network, such as the general management of real estate facilities. Costs clearly attributable to other parts of the Aurizon Holdings Limited Group are excluded.

Table 66 Allocators of corporate overhead

Corporate Function	Identifiable below-rail network costs	Allocator applied to non-identifiable costs
Board		Blended rate
Finance		
– CFO		Blended rate
– Finance Partner Marketing & Operations		Nil
– Network Finance & Regulation		Blended rate
– Enterprise Planning, Reporting & Services		Procurement – Network direct costs % Payroll – Network FTEs % All other areas – Blended rate
– Investor Relations		Blended rate
– Mergers & Acquisitions		Nil
– Tax		Blended rate
– Treasury		Blended rate
– Capital Excellence		Blended rate
Business Sustainability		

Corporate Function	Identifiable below-rail network costs	Allocator applied to non-identifiable costs
– EVP		Blended rate
– Enterprise Real Estate	$4.5m in depreciation and housing costs	FTEs %
– Enterprise Procurement		Below-rail network direct costs as percentage of total Aurizon Holdings Limited Group's direct costs.
– Safety, Health & Environment	$4.0m – employee costs and professional fees relating to regulated below-rail network activities (excluding contestable services)	FTE % for allocable labour costs and Blended rate % for other allocable expenses.
– Enterprise Effectiveness		Blended rate
– Operational Excellence		Blended rate
– Innovation		Blended rate
Enterprise Services		
– EVP		Blended rate
– Information Technology		Bended rate
– Company Secretary		Blended rate
– General Counsel	$5.5m (100% of cost centre) is for Managing Counsel – Aurizon Network	Blended rate
– Enterprise Risk Management		Blended rate
– Internal Audit		Blended rate
– Branding		Network revenue %
– National Policy		Blended rate
Human Resources		
– EVP		Blended – this includes share-based payment incentives
– Talent & Organisational Development		FTEs %
– Resourcing & Services		FTEs %
– Remuneration & Support		FTEs %
– Employee Relations		FTEs %
– Functional HR Management	$0.4m has been included for the Network Functional HR unit (with the total costs of the unit being apportioned between FTEs involved in contestable and non-contestable services).	Nil
– External Relations & Communications		Blended rate (excluding Corporate Sponsorship and Events – nil allocation)
Strategy		
– Enterprise Strategy		Blended

Benchmarking of allocated overhead

The benchmarks form the basis of an evaluation of the cost effectiveness of Aurizon Holdings Limited's corporate costs allocated to the regulated below rail network business as a stand-alone entity. The Ernst & Young report outlines the benchmarks that have been sourced for the purpose of the analysis:

- APQC Open Standards Benchmarking Collaborative Database – cross industry group and distribution and transport peer group;
- Global Audit Information Network Benchmarking Survey; and
- individual response data provided by key relevant organisations approached for the purposes of this benchmarking study.

Only 6% of the total allocated overhead costs were unable to be benchmarked. Two government-owned railway operators provided data on a no-names basis for the purpose of the benchmarking exercise ('Company 1' and 'Company 2'). When considered in conjunction with the publicly available benchmarks, the costs of these railway companies provide a useful reference point. Variances between Aurizon Network and these benchmarks can be explained as follows.

Table 67 Benchmarking comparisons for corporate overhead

Activity	Comparison	Explanation of differences
Finance	Aurizon Network $3.5 million higher than Company 2.	This can be explained by increased treasury costs, audit costs, ASX listing requirements and more detailed financial accounts.
Legal/Corporate secretarial	Aurizon Network $5.5 million higher than Company 1.	This can be explained by ASX Listing requirements, share registry costs and communications with shareholders.
Internal audit/Enterprise risk management	Aurizon Network $1.2 million higher than company 1 and $0.8 million higher than Company 2.	This can be explained by the greater level of assurance required by the Board and shareholders in a listed environment.
Strategy and branding	Aurizon Network $0.7 million higher than Company 1.	A government owned corporation would be expected to have lower strategy and branding costs.
Information technology	Aurizon Network $12.3 million higher than Company 2, but $8.0 million lower than company 1.	Aurizon Network's costs are therefore neither higher nor lower on average.
Safety, health and environment costs	Aurizon Network's costs are higher than Company 1 but not Company 2.	Aurizon Holdings Limited's vision is to be world-class in safety and consequently it is likely to incur greater costs in achieving this. Safety is a core value of Aurizon Holdings Limited (refer below).

A number of the cost differences are attributable to Aurizon Holdings Limited being a listed public company, whereas the comparables were both government-owned. The drivers of these differences were explained in section 10.2.2.2.

Ernst & Young has benchmarked the estimated Aurizon Network corporate overhead for 2012/13 against the top, median and bottom quartile performers across:

- all industries;
- all industries of a similar size in terms of revenue;

- the distribution and transportation industry; and
- two railway operators.

This analysis shows that overall, Aurizon Network's UT4 cost estimates for corporate overhead place it within the benchmark range expected of a stand-alone business of a similar size and in a similar industry. This is shown in the table below.

Table 68 Corporate overhead cost allocations: benchmarking analysis ($m)

Function	Aurizon Network 2013/14	Bench-mark	Amount above (below) benchmark	Benchmark used [1]
Finance	9.0	8.5	0.5	Distribution/transport industry
General Counsel & Company Secretary	7.4	2.2	5.1	Cross Industry ($1-5 bn)
Internal audit and Risk	2.0	1.3	0.7	GAIN ($0.5-1bn revenue) [2]
Information Technology	18.3	14.9	3.4	Distribution/transport industry
Human Resources	3.2	6.9	(3.7)	Distribution/transport industry
Safety, Health & Environment	6.4	1.7	4.7	Regulated companies
Enterprise Real Estate	5.0	4.6	0.4	Rail Company 2 [3]
Enterprise Procurement	2.8	1.2	1.6	Distribution/transport industry
Enterprise Strategy and Branding	1.8	1.1	0.7	Rail Company 1 [3]
Board and CEO	2.1	3.2	(1.1)	Median costs ascertained from ASX data [4]

[1] These are the individual benchmarks comprising the Cumulative Cross-industry benchmark referred to the Ernst & Young report. The median distribution and transportation industry benchmark from the APQC database is considered the most appropriate for comparability, however it is not available in all circumstances.

[2] The GAIN benchmark was considered more appropriate than those derived from the APQC database as the mapping of activities in the database for the Internal Audit function were not well matched to the activities performed within Aurizon Holdings Limited.

[3] Only data for Rail Companies 1 and 2 was available. The lower of the two companies was chosen as the benchmark.

[4] This benchmark is for remuneration only.

At a more detailed level:

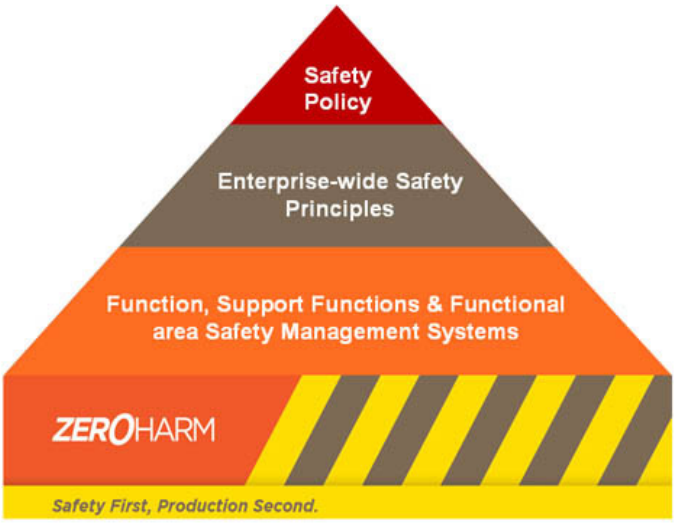
Safety, Health and Environment costs are significantly above the average of the available benchmarks. As mentioned earlier, safety is a core value of Aurizon Holdings Limited and it underpins all activities in all parts of the business (refer below). It is therefore not surprising for the allocated costs to be higher than all of the benchmarks, except for Company 2, which includes all operational safety, health and environment roles. Costs specific to Aurizon Network include labour and oncosts for those employees involved in the below-rail network business, and professional services costs such as the development of safety standards into nationally accredited training, licences, and audit costs. Aurizon Network has also been allocated a share of costs that cannot be identified as relating to any specific function. These costs are approximately half labour and oncosts and half professional fees and depreciation costs. The total costs allocated to Aurizon Network represent 20% of the total costs for the Group in this area.

Safety at Aurizon Holdings Limited

Aurizon Holdings Limited's mission is:

"To be a world leading transport business, to partner with customers for growth and to double the value of the company every five years, whilst becoming the safest transport company in the world."

One of its core values is that the safety of Aurizon's employees and others is the number one priority, which is encapsulated in the goal of Zero Harm. The Safety Management System sets the direction for safety across the company:



There is a specific Safety Management System for the below-rail network business with detailed standards, specifications and procedures that encompass the activities of all activities and roles. This is supported by a comprehensive training program and active compliance monitoring and reporting. Aurizon Holdings Limited's 2011-12 Annual Report noted continuing improving trends on key safety metrics, including a 79% reduction in the Lost Time Injury Frequency Rate since June 2009. However, the overarching goal of Zero Harm will require an unrelenting commitment to improving safety performance in the years to come.

General Counsel and Company Secretary costs are above the average of the available benchmarks. There were limited benchmarks available for these functions. While Aurizon Network would be at the bottom of the cross industry benchmarks on the basis of the allocation method applied, it is also noted that it has dedicated internal legal resources, whereas other companies may be outsourcing some of these activities. Further, Corporate Secretariat costs, including the share registry and shareholder communication costs, may either not be relevant to the benchmarks or the costs may be attributed to functions differently.

Finance and IT costs are consistent with the average of the available benchmarks. During the 2012 financial year Aurizon Holdings Limited Group undertook an outsourcing project to deliver cost reductions in IT. These have been built into the Corporate Plan.

Enterprise Real Estate costs are below the average of the available benchmarks. Occupancy costs have been based on the current rental and outgoings costs of the building at 192 Ann Street, Brisbane, which currently houses the majority of Aurizon Network's support staff. As illustrated in the Ernst & Young report, the costs of this building are conservative compared to other Brisbane CBD rental costs. As business

premises in Rockhampton and Mackay are owned by Aurizon Holdings Limited, only rental costs for Brisbane premises have been considered. Accordingly, it is considered that the costs for real estate have been determined conservatively because costs for premises in Rockhampton and Mackay would be incurred if the below rail network business operated on a stand-alone basis.

Human Resources costs are significantly below the average of the available benchmarks. All costs except for the share-based payments incentives expense have been allocated on the basis of FTEs. Aurizon Network's FTEs (being direct Aurizon Network employees plus an allowances for corporate FTEs allocated to Network) as a percentage of the Group's FTEs is very low and hence so are the allocated costs. If considered as a stand-alone company, theoretically there would be a certain level of fixed costs and a variable component based on the number of FTEs. This would be difficult to ascertain in practice and hence FTEs have been used as the allocator of total costs, resulting in costs that are likely to be lower than under a true stand-alone costing.

Board and CEO costs are significantly below the average of the available benchmarks. The allocated costs for Board and CEO are considered conservative. The benchmark included in Table 68 is only remuneration. The costs incurred by Aurizon Holdings Limited also include professional fees and travel costs and if these were factored into the benchmark, it would place Aurizon Network at the lower end of the range.

While the costs of some functions may exceed the benchmark, others are below, and in using the allocator approach the costs should be viewed in aggregate. The benchmarking exercise completed by Ernst & Young shows that overall, Aurizon Network's UT4 cost estimates place it within the benchmark range expected of a stand-alone business of similar size and in similar industry. It is also considered that the allocation approach adopted for UT4 reflects a more thorough review of all of the corporate overhead costs that would be incurred if Aurizon Network operated as a stand-alone business.

Aurizon Network has an obligation to demonstrate to the QCA and its stakeholders that its forecast costs are reasonable and efficient. Achieving efficient costs is also integral to delivering value to shareholders as part of a listed company, noting that the business is publicly accountable for its financial results and any variances between budgets and forecast. The fact that the cost estimates for UT4 fall within the range of comparable benchmarks analysed by Ernst & Young supports the premise that the costs are efficient.

10.2.4.4 Specific Aurizon Network support costs included in corporate overhead

Due to the functional restructure there are some costs that are now included in corporate overhead that were included as business support costs for UT3 (that is, part of the direct and indirect cost build up). The resultant costs to Aurizon Network under the allocation approach are likely to be lower than under an alternative (bottom up) approach because they are being allocated in the same way as other cost centres while being more heavily focussed on the below rail network business. These cost areas are summarised below.

Network Finance and Governance

Aurizon Network maintains its own finance team independent from the finance function of the Aurizon Holdings Limited Group. This area performs financial accounting for the below rail business including the following significant activities:

- Production of reports and statements, including those that are required for regulatory purposes, using financial and non-financial data. This includes the below rail Financial Statements and reviewing and maintaining Aurizon Network's Costing Manual.

- Production of performance and other reports for senior managers as well as Aurizon Network's Senior Executive and Board by sourcing and collating financial and non-financial data from other parts of the Aurizon Holdings Limited Group. This includes developing and maintaining reports of financial and operational performance.
- Management of the development and implementation of management accounting and costing systems to ensure appropriate decisions can be made relating to capital budgeting and planning, and repair versus renewal decisions.
- Review of business cases and Board submissions from across the business in consultation with financial, economic, legal and taxation advisers, senior Aurizon Network Managers and other relevant stakeholders as necessary.
- Coordination of the annual capital and operating plans including detailed profit and cost centre budgets. This includes twice yearly forecasting reviews.
- Completion of the monthly general ledger procedures and the development, production and analysis of detailed monthly financial reports and variance analysis for senior managers.
- Management of the Aurizon Network component of the Fixed Assets Register to ensure the information is reliable and relevant.

Human Resources

The Human Resources function in Aurizon Holdings Limited includes a dedicated team that partners with Aurizon Network, providing support and advice in the areas of general human resources management, rehabilitation, workplace relations issues and organisational development, case management (e.g. performance planning and review, and investigations) and performance management (e.g. terminations, employee mediation, and employees in transition).

Safety, Health and Environment

The Safety, Health and Environment unit within Aurizon Holdings Limited includes a manager for Systems and Governance and a manager for each of the operational business units, including Aurizon Network. Activities undertaken within this area includes:

- Incident investigation and management:
    - manage routine rail investigations;
    - lead rail safety investigations;
    - monitor the incident/accident reporting and investigation system;
    - undertake trend analysis in events on the network;
    - provide updates on investigations being undertaken;
    - provide interim reports to the Department of Transport and Main Roads;
    - manage reports and recommendations through the NIARC process;
    - undertake special investigations on request and in response to trends;

- provide Accident Investigation training;
- undertake and provide advice on Workplace Health and Safety investigations;
- provide support to conferences and workshops to ensure the transfer of safety learnings; and
- provide support for the undertaking of safeworking audits.

- Emergency and safeworking systems:
  - management of Emergency Response processes;
  - Signal Passed at Danger (SPAD) management;
  - management of changes to safeworking systems;
  - recommendations management and tracking;
  - operational risk management;
  - coordination of recommendation actions for network safety; and
  - safeworking/operational project management.
- Operation safeworking:
  - safeworking standards integration;
  - national rules and procedures (safeworking);
  - provision of safeworking expertise;
  - safeworking standards development;
  - reviewing training;
  - manager SWK standard amendment process; and
  - services agreements.
- Operational safety:
  - safeworking standards and interface risk;
  - Interface Risk Management Plan (IRMP) audit; and
  - overall divisional audit coordination network systems and capability.
- Group Safety Advisor:
  - provide Workplace Heath and Safety advice and support to all staff in Aurizon Network;
  - key contact for employee accident/incident reporting, recording and investigations including monitoring of processes;
  - contact for Zero Harm/DuPont initiatives & activities;

- Workplace Heath and Safety business instructions that apply to Aurizon Network;
- Aurizon Network representative for Aurizon Workplace Health and Safety forums; and
- facilitate internal and external Workplace Health and Safety audits.

Other

Prior to the functional restructure, the following other functions were performed within Aurizon Network but are now integrated into, and sourced from, an Aurizon Holdings Limited Group function (i.e. separate teams do not exist within Network or within the non-operational function in which they sit):

- *Network systems*: the main responsibility of the Network systems team was the training, support and ongoing development of ViziRail, the primary information system for managing the network. ViziRail is an integrated scheduling and network monitoring tool which provides Aurizon Network with a single source of network information for the entire rail network. ViziRail continues to be used within all Network Planning, Yard and Control Centres throughout Queensland and provides Aurizon Network with valuable information regarding train performance, rail maintenance activities and network incident data.
- *Strategic communications*: activities such as coordinating external communications are now performed centrally within the External Relations & Communications area within Human Resources, but continue to require a strong Aurizon Network focus. Given the size of the investments in infrastructure it is necessary to keep stakeholders as well as other interested parties informed about the status of the projects and activities that are designed to meet customer needs.

10.2.4.5 Summary: corporate overhead costs

The corporate overhead base comprises the non-operational functions of the group and budgeted costs over the UT4 period as outlined in Table 69 (reference can be made to Table 66 for the activities subsumed under each function). The costs allocated to the below rail network using the methodology detailed below results in approximately 18% of the Aurizon Holdings Limited corporate overhead base being allocated to the regulated below rail business. While the methodology results in a higher claim for corporate overhead than in previous years, it is considered reasonable when viewed in terms of the total corporate overhead base, and also when considered against the benchmarking data.

Table 69 Budgeted corporate overhead costs ($'000) (nominal dollars)

Function	2013/14	2014/15	2015/16	2016/17
Finance	9,385	9,849	10,313	10,753
General Counsel and Company Secretary	7,605	7,865	8,129	8,388
Internal Audit and Enterprise Risk Management	2,054	2,151	2,248	2,341
Information Technology	18,998	19,637	20,285	20,924
Human Resources	3,439	3,620	3,801	3,972
Safety, Health and Environment	6,632	6,949	7,269	7,572
Enterprise Real Estate	5,111	5,249	5,390	5,533
Enterprise Procurement	2,960	3,102	3,246	3,381
Enterprise Strategy and Branding	1,818	1,882	1,946	2,009
Managing Director/CEO	2,203	2,310	2,417	2,519
Non-benchmarked functions	5,768	6,005	6,244	6,474
Total corporate overhead costs	**65,973**	**68,619**	**71,288**	**73,866**

To the extent possible, costs have been allocated to the coal systems that consume the resources and services provided. Allocation rules have been applied to each of the cost centres comprising the train control, safeworking and operations and Infrastructure management functions to allocate the costs to systems. The rules are outlined in Appendix D and include the measures of tonnes, electric gross tonne kilometres and maintenance costs over the four years of UT4.

Tonnes relating to WICET have been allocated between the Blackwater and Moura systems based on origin. Tonnes relating to GAPE have been included as part of the Newlands system.

Business management, business support and overhead costs have then been allocated to the systems as shown below, in proportion to the total train control and infrastructure maintenance costs attributed to those systems in accordance with the system allocation rules referred to above.

Table 70 System allocations for business support costs and corporate overhead (%)

System	2013/14	2014/15	2015/16	2016/17
Blackwater	26.8	27.2	28.3	28.9
Goonyella	48.8	48.2	47.6	46.6
Newlands	7.7	7.4	7.2	7.4
Moura	6.2	6.1	5.5	5.6
GAPE	10.5	11.1	11.4	11.5

10.2.5 Summary of system wide and regional costs

10.2.5.1 Basis of approach

The system wide and regional cost forecasts for the UT4 period have been determined with reference to Aurizon Holdings Limited's Corporate Plan for the year ending 30 June 2013, taking into account projected coal tonnages for the CQCR utilised to establish the reference tariffs. The estimates include:

- direct costs – costs for those activities that are solely attributable to the provision of access in the CQCR. These costs are ascertained from specific cost centres within the relevant functional area;
- indirect costs – these are costs of activities undertaken within the relevant functional area that are not solely attributable to the provision of access; and
- corporate overhead – an allocation of corporate overhead has been made for costs that would be reasonably expected to be incurred if Aurizon Network operated on a stand-alone basis.

10.2.5.2 Cost Escalation

The system wide and regional cost estimates have been prepared with 2012/13 as the base year. Nominal proposed system wide and regional costs estimates have been obtained by escalating the cost forecasts in 2012/13 dollars by the appropriate escalator.

The costs have been classified as either labour or non-labour costs. Non-labour costs comprise approximately 37% of the total costs and have been escalated by the forecast consumer price index.

Labour costs have been further disaggregated into labour cost classifications consistent with the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006.

The escalators used for 'General Labour' is wage movements in Australia for the following industry sectors:

- Professional, Scientific and Technical Services, which includes units mainly engaged in providing professional, scientific and technical services including engineering, legal, accountancy, management and other consultancy services;
- Administration and Support Services, which includes units mainly engaged in performing routine support activities for the day-to-day operations of other businesses and organisations;
- Financial and Insurance Services, which includes units mainly engaged in financial transactions involving the creation, liquidation, or change in ownership of financial assets, and/or facilitating financial transactions; and
- Transport, Postal and Warehousing, which includes units mainly engaged in providing transportation of passengers and freight by road, rail, water or air.

Aurizon Network engaged BIS Shrapnel to provide forecasts for the Average Weekly Ordinary Time Earnings for each industry classification. A copy of the report is provided Appendix F. The following tables summarise the forecasts used to escalate the proposed UT4 labour costs.

Table 71 BIS Shrapnel AWOTE Index Forecasts

Industry Classification	2012/2013	2013/14	2014/15	2015/16	2016/17
Professional, Scientific and Technical Services	1680.8	1763.0	1864.8	1967.6	2063.4
Administration and Support Services	1211.7	1262.6	1326.5	1391.5	1452.3
Financial and Insurance Services	1623.4	1692.5	1776.8	1856.0	1932.6
Transport Sector	1397.9	1460.3	1536.2	1614.2	1690.1

Table 72 BIS Shrapnel AWOTE Percentage Change Forecasts

Industry Classification	2012/2013	2013/14	2014/15	2015/16	2016/17
Professional, Scientific and Technical Services	4.5%	4.9%	5.8%	5.5%	4.9%
Administration and Support Services	3.7%	4.2%	5.1%	4.9%	4.4%
Financial and Insurance Services	3.4%	4.3%	5.0%	4.5%	4.1%
Transport Sector	6.5%	4.5%	5.2%	5.1%	4.7%

Table 73 Aurizon Network Real Labour Cost Escalation

Industry Classification	2012/2013	2013/14	2014/15	2015/16	2016/17
Professional, Scientific and Technical Services	2.0%	2.3%	3.2%	2.9%	2.3%
Administration and Support Services	1.2%	1.7%	2.5%	2.3%	1.8%
Financial and Insurance Services	0.9%	1.7%	2.4%	1.9%	1.6%
Transport Sector	3.9%	1.9%	2.6%	2.5%	2.1%

In preparing the UT4 nominal system wide and regional costs forecasts, the real labour cost escalators are first applied to the labour costs and then the forecast CPI is applied to the real system wide and regional cost estimates.

10.2.5.3 Cost summary

Aurizon Network's estimate of system wide and regional costs for UT4 is summarised by system and function below.

Table 74 UT4 system wide and regional costs by system ($'000) (nominal dollars)

System	2013/14	2014/15	2015/16	2016/17
Blackwater	35,370	37,550	41,155	43,268
Goonyella	59,992	61,590	64,709	65,522
Newlands	8,790	8,858	9,105	9,682
Moura	7,883	8,070	7,738	8,128
GAPE	11,516	12,780	13,981	14,485
TOTAL	**123,551**	**128,848**	**136,688**	**141,085**

Table 75 UT4 system wide and regional costs by function ($'000) (nominal dollars)

System	2013/14	2014/15	2015/16	2016/17
Train control, safeworking and operations	31,132	32,648	34,210	35,724
Infrastructure management	15,935	16,630	17,344	18,039
Business management	10,511	10,952	13,847	13,457
Finance	9,385	9,849	10,313	10,753
General Counsel and Company Secretary	7,605	7,865	8,129	8,388
Internal Audit and Enterprise Risk Management	2,054	2,151	2,248	2,341
Information Technology	18,998	19,636	20,284	20,923
Human Resources	3,439	3,620	3,801	3,972
Safety, Health and Environment	6,632	6,949	7,269	7,572
Enterprise Real Estate	5,111	5,249	5,390	5,533
Enterprise Procurement	2,960	3,102	3,246	3,381
Enterprise Strategy and Branding	1,818	1,882	1,946	2,009
Managing Director/CEO	2,203	2,310	2,417	2,519
Non-benchmarked functions	5,768	6,005	6,244	6,474
TOTAL	**123,551**	**128,848**	**136,688**	**141,085**

The operating costs comprise:

- Train Control, Safeworking and Operations and Infrastructure Maintenance - this includes all forecast expenses within the Network Operations operating business unit (excluding Asset Maintenance);
- Business Management - this includes VP Network Operations and certain functions within the Commercial Development unit and Regulation and Policy teams;
- Business Support and Corporate Overhead – this includes a portion of costs for the Executive Vice President of Aurizon Network, and the allocated corporate overhead costs.

This is closely aligned to the categorisation of costs in the UT3 period, though due to the functional restructure there are some costs that are now part of corporate overhead that were included in the other categories for UT3.

10.2.5.4 Operating Expenditure: Conclusion

Aurizon Network's business has continued to evolve since the approval of UT3. As detailed above, the most significant change that has occurred since then has been the separation of QR National (including the below rail coal network) and Queensland Rail, requiring the re-establishment of certain below-rail network functions that were previously shared. This has led to a loss of economies of scale impact.

The CQCN environment also remains capacity constrained where every endeavour to meet customer requirements and facilitate railings of customers' coal tonnages is made. The growth in demand, the expansion and development of new port terminals and the increasing integration of the coal systems has continued to see a material increase in network complexity and the demands on Aurizon Network's resources.

As a result, Aurizon Network's current operational model is fundamentally different than the operational models considered in previous assessments of the benchmark efficient below rail costs. Thus, the below rail network system wide and regional costs prior to the separation and listing of the business in the second half of 2010 are not considered to be an appropriate benchmark for UT4 Operating Expenses.

An additional change has been the impact of the listing of QR National, now Aurizon Holdings Limited, which means that the business now incurs costs that were not incurred as a government owned corporation.

Aurizon Network submits that there was a significant understatement of corporate overheads in UT3. Aurizon Network has absorbed this understatement for the duration of UT3, but this is not sustainable.

Aurizon Network has submitted an allowance for corporate costs under UT4 which has been assessed against an independent benchmarking analysis conducted by Ernst and Young. This analysis was based on a number of sources, including the American Productivity and Quality Centre's Open Standards Benchmarking Collaborative Database, the Global Audit Information Network Benchmarking Survey and data from individual organisations approached for the purpose of this study.

There is no other rail infrastructure provider with a directly comparable business, particularly in terms of nature of business, business environment, supply chain characteristics and regulatory framework. While there are inherent difficulties in benchmarking the operating costs of the below rail network business as a whole, Ernst & Young has provided benchmarking analysis to support the corporate overhead component of the system wide and regional cost estimates. The analysis undertaken by Ernst & Young shows that the corporate overhead allocation is within a reasonable range of comparable benchmarks.

10.3 Transmission connection costs

Aurizon Network supplies and sells electricity to railway operators for the purpose of operating electric traction train services in the Blackwater and Goonyella coal systems. This occurs via the distribution of electricity through a 25 kv overhead power distribution network. Electricity is sourced directly from an electricity retailer which procures electricity from the National Electricity Market (NEM). This electricity is transmitted from the NEM to the overhead power system via connections with a Transmission Network Service Provider (TNSP).

The costs associated with the provision of these connections represent a significant component of the AT5 tariff. The services associated with these connections are provided by a TNSP in accordance with the requirements of the National Electricity Rules (NER). The connections also provide for the export of electricity generated by railway operators back to the national electricity grid.

These transmission services are provided under a combination of negotiated and prescribed transmission services. As the prescribed transmission services are subject to the approved allowable revenue by the Australian Energy Regulator (AER) under Part 6A of the NER, the approval of the relevant TNSP revenue proposals can give rise to variation in the TNSP pricing which triggers the Endorsed Variation Event threshold. Transmission use of system charges are managed directly through the connection agreements between Aurizon Network and the TNSP and not indirectly through the electricity retailer.

This section outlines matters relevant to the forecasting of these costs.

10.3.1 Description of Costs

The majority of the transmission connections between the TNSP and the Blackwater and Goonyella feeder stations are dedicated customer connections. As such the majority of the connection costs are associated with the provision of these dedicated connections and the balance of the connection costs represents a contribution to common use infrastructure, or Transmission Use of System (TUOS) charges.

Details of the TNSP pricing methodology is available from Powerlink's Pricing Methodology which has been approved by the AER.[175] The costs of each connection point are comprised of the following charges:

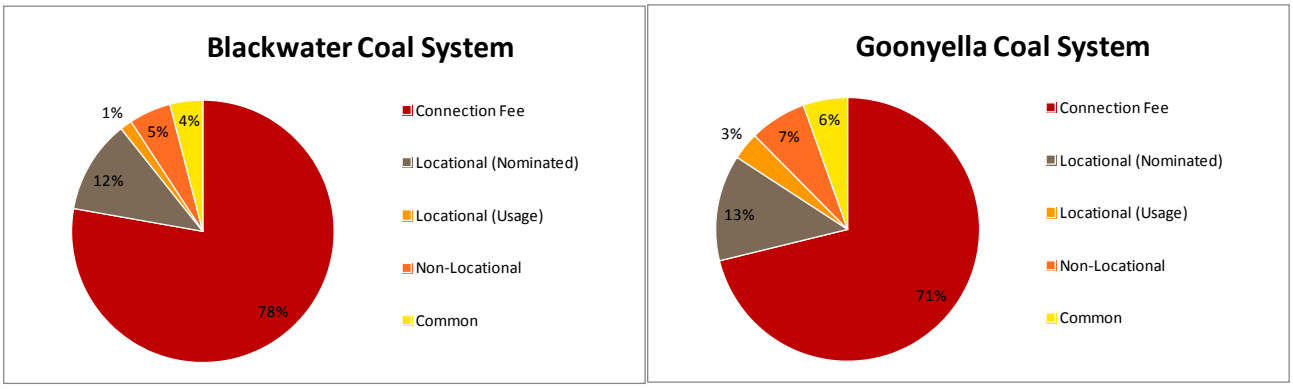
Connection Fee: the costs associated with the prescribed and negotiated exit services.

- *TUOS – Locational (fixed component):* A fixed component based on the nominated demand proportion of estimated use of the transmission system assets.
- TUOS – Locational (usage-based component): A usage based settlement charge.
- TUOS – Non-locational: A postage stamp price applied to historical demand (the actual usage in the same billing period two years earlier)[176].
- *Common Service:* A charge for the operating and maintenance costs for the provision of common transmission services applied to historical demand.

Excess demand charges may apply where actual locational demand exceeds the nominated demand.

The allocation of the Powerlink charges for the Goonyella and Blackwater Systems forecast for the 2012/13 year are shown below.

Figure 27 Forecast allocation of Powerlink charges 2012/13



[175] Powerlink (2012) Powerlink's Pricing Methodology, available at http://www.powerlink.com.au/Network/Connection_and_pricing/Pricing.aspx

[176] For new feeder stations where there is no historical demand the price is determined on actual usage.

It is evident from the proportion of the each charging component comprising the transmission connection cost that the majority of the cost components are fixed costs, dominated by the annual connection fees.

10.3.2 Prescribed and Negotiated Transmission Services

Under the requirements of the NER, transmission services provided by a TNSP associated with dedicated customer assets are no longer subject to a regulatory determined pricing arrangement and must be negotiated with the relevant network service provider. The connection services provided to Aurizon Network by Powerlink are a combination of prescribed transmission services (those connections that were in place prior to the changes in the NER taking effect) and negotiated transmission services.

Negotiated transmission services are provided for the following connections:

- Alligator Creek (DBCT)
- Raglan
- Wycarbah
- Bluff
- Duaringa.

The new connection for the Wotonga feeder station will be a negotiated transmission service.

Prices for negotiated transmission services are escalated quarterly by the CPI. Accordingly forecasting changes in negotiated transmission services only requires estimation of the one variable, being CPI.

The remaining connections are prescribed transmission services. The connection agreement associated with these connections expires during the term of UT4. Under the grandfathering provisions in section 11.6.11(d) of the NER these services will cease to be prescribed transmission services. However, 11.6.11(a) also requires that:

> "If, at the date a Transmission Network Service Provider submits a Revenue Proposal after the 2009 commencement date to the AER under new Chapter 6A, a connection service does not satisfy each of the above criteria, then the connection service remains a prescribed connection service until the start of the next regulatory control period to which the Revenue Proposal relates, from which time it ceases to be a prescribed connection service."

As the terminating dates for the Powerlink 2012/2017 Revenue Proposal and UT4 are aligned to 30 June 2017, these connection services will remain prescribed transmission services for the forecast period. Aurizon Network is currently engaging with Powerlink to determine the terms and conditions of the agreement that will apply to those connections after this date.

In contrast, forecasting of prescribed exit services charges is more complex as the charge is dependent on a number of more complex variables including:

- the cost allocations of Powerlink's annual service revenue requirement to exit services;
- the optimised replacement cost valuations for the relevant Aurizon Network connection assets relative to other valuations in that class; and
- the forecast changes in those relativities over the forecast period.

For the purpose of forecasting prescribed exit service prices for the UT4 period, Aurizon Network has applied the forecast CPI to the 2012/13 notified prices.

10.3.3 TUOS Escalation

Powerlink does not produce price forecasts beyond one year due to the significant variability in the factors that effect individual prices. In forecasting escalation of TUOS prices Aurizon Network has used the forecast growth in Powerlink's approved annual service revenue requirements and forecast customer sales in energy growth. As Wotonga is a new feeder station and not expected to be commissioned until 2014/15, the TUOS component has been forecast as the escalation of the average of all connection points in the Blackwater and Goonyella systems.

The forecast locational and non-locational TUOS prices are shown in the tables below.

Table 76 Cost escalation factors

	2013/14	2014/15	2015/16	2016/17
Forecast MAR growth	5.7%	5.7%	5.7%	5.7%
Cumulative MAR growth	5.7%	11.7%	18.1%	24.8%
Forecast Energy growth	3.6%	4.9%	6.7%	3.9%
Cumulative Forecast Energy growth	3.6%	8.6%	15.9%	20.5%
Derived Unit price growth	2.0%	2.8%	1.9%	3.6%

Table 77 Non-locational TUOS price forecasts

		2012/13	2013/14	2014/15	2015/16	2016/17
General energy	¢/kWh	0.6150	0.6274	0.6325	0.6265	0.6372
Common energy	¢/kWh	0.4800	0.4897	0.4937	0.4890	0.4973

Table 78 Non-locational TUOS price forecasts (by feeder station)

		2012-13	2013-14	2014-15	2015-16	2016-17
Bolingbroke QR	$/kW/month	1.627	1.660	1.673	1.658	1.686
Calemondah	$/kW/month	0.633	0.646	0.651	0.645	0.656
Coppabella	$/kW/month	2.110	2.153	2.170	2.150	2.186
QR Mackay Ports	$/kW/month	2.193	2.237	2.255	2.234	2.272
Dingo	$/kW/month	2.109	2.152	2.169	2.149	2.185
Grantleigh	$/kW/month	0.710	0.724	0.730	0.723	0.736
Gregory	$/kW/month	1.726	1.761	1.775	1.758	1.788
Mindi	$/kW/month	1.627	1.660	1.673	1.658	1.686
Moranbah South	$/kW/month	2.038	2.079	2.096	2.076	2.112
Mt McLaren	$/kW/month	2.038	2.079	2.096	2.076	2.112
Norwich Park	$/kW/month	2.155	2.199	2.216	2.195	2.233
Oonooie	$/kW/month	2.193	2.237	2.255	2.234	2.272
Peak Downs	$/kW/month	2.549	2.601	2.622	2.597	2.641

		2012-13	2013-14	2014-15	2015-16	2016-17
Rangal	$/kW/month	1.948	1.987	2.003	1.985	2.018
Rocklands	$/kW/month	0.710	0.724	0.730	0.723	0.736
Wandoo	$/kW/month	1.627	1.660	1.673	1.658	1.686
Raglan	$/kW/month	0.710	0.724	0.730	0.723	0.736
Wycarbah	$/kW/month	0.710	0.724	0.730	0.723	0.736
Duaringa	$/kW/month	1.712	1.747	1.761	1.744	1.774
Bluff	$/kW/month	1.948	1.987	2.003	1.985	2.018
Wotonga	$/kW/month	1.654	1.687	1.701	1.685	1.713

10.3.4 New Connections

Aurizon Network has committed to one additional connection during the UT4 period in relation to the Wotonga feeder station to support the GSE140 expansions.

The Wotonga feeder station is expected to be commissioned in 2014/15. The need for the Wotonga feeder station was identified in the 2010 CRIMP. Aurizon Network sought user endorsement of the scope of this project in December 2011, and this was obtained in February 2012.

Aurizon Network is currently assessing a prepayment option for this connection which would involve an upfront payment of the connection charges for a 12 year period. In considering the merits of this option Aurizon Network has considered the net present value impacts to users against the following approaches:

- not accept prepayment and retain monthly charges in the operating cost allowances;
- capitalise the prepayment as an intangible asset into the RAB and depreciate over a life of 12 years; or
- convert the prepayment into a real annuity with a 12 year life and escalate by actual CPI.

Aurizon Network's financial analysis of the prepayment option indicates that it represents a lower cost to Aurizon Network and ultimately access holders. Accordingly, it is therefore necessary to determine how the cost of this prepayment would be recovered over the 12 year period. While an escalated annuity approach would more closely replicate the cash flows associated with monthly charges, it is also inconsistent with how intangible assets would be treated in the RAB. Therefore, the prepayment of connection charges associated with the Wotonga feeder station have been included in the Goonyella electric asset RAB with a 12 year economic and tax life.

The costs associated with the connection are commensurate with the recent negotiated transmission services and are based on the Offer to Connect by Powerlink made on 23 May 2011 and revised on 21 July 2011. The connection requires:

- land acquisition for line connection works and substations;
- line connections works; and
- substation works.

An additional connection is currently being studied to support electrification of the Rolleston branchline. The incremental benefits of electrifying Rolleston were discussed in section 8.3.5. The preliminary design for this connection will integrate the 132kv to 25kv into a single feeder/substation minimising facility duplication between Aurizon Network and the relevant network service provider. Based on preliminary estimates from the connection enquiry the connection charges are expected be in the order of $1.9 million per annum in 2012/13 dollars.

10.3.5 Summary of UT4 forecast transmission connection costs

The forecast transmission connection costs for UT4 are summarised in the following tables.

Table 79 UT4 forecast transmission connection costs (excludes Rolleston connection costs)

	2013/14					
	Nominated	Actual	General	Common	Connection	TOTAL
Blackwater	2,631,406	397,584	1,814,762	1,416,399	31,582,070	**37,842,221**
Goonyella	3,678,698	924,369	1,980,686	1,545,901	22,371,843	**30,501,496**
	2014/15					
	Nominated	Actual	General	Common	Connection	TOTAL
Blackwater	2,652,665	400,796	1,442,122	1,125,558	32,371,622	**37,992,763**
Goonyella	3,795,172	896,086	2,179,162	1,700,809	26,873,053	**35,444,282**
	2015/16					
	Nominated	Actual	General	Common	Connection	TOTAL
Blackwater	2,627,600	397,010	1,428,496	1,114,924	33,180,913	**38,748,943**
Goonyella	3,971,581	910,697	2,224,193	1,735,956	31,585,342	**40,427,769**
	2016/17					
	Nominated	Actual	General	Common	Connection	TOTAL
Blackwater	2,672,340	403,769	1,452,818	1,133,907	34,010,436	**39,673,270**
Goonyella	4,039,204	926,203	2,134,623	1,666,048	32,374,975	**41,141,053**

10.4 Electricity on-selling costs

Aurizon Network obtains the benefit of a specific exemption under section 20Q of the *Electricity Act (1994)* to supply and sell electricity to third parties for the purpose of operating train services. Under the terms of section 250 of the QCA Act, the supply of electricity for this purpose is not a declared service. However, Aurizon Network has (voluntarily) committed to supply electricity to access seekers at cost in its 2013 Undertaking.

The electricity which Aurizon Network onsells to an access holder is procured through a supply agreement entered into with a registered electricity retailer. The EC rate is intended to allow Aurizon Network to recover the costs associated with providing this ancillary service to access holders.

Aurizon Network currently procures its electricity through a fixed nodal supply price agreement (excluding environmental, loss factors and other NEM related charges), which expires in 2013/14. Aurizon Network will continue to investigate and pursue cost efficient supply and procurement models over the UT4 period. This includes further assessing the benefits of managed procurement models involving indirect market participation with purchase by the retailer, on the instruction of Aurizon Network, in blocks of required electricity load over a three year contract period from the forward contract market. This model provides flexibility around purchase decisions, for example options to lock in a percentage of total loads for the full contract period or rolling yearly requirement. However, these types of models necessarily involve greater retail electricity price volatility.

While the costs associated with procuring electricity are certain for the 2013/14 period based on the supply contract, it is difficult to forecast with any degree of certainty the electricity supply costs beyond this as they will be impacted by a number of different variables. These variables include:

- the impacts of future carbon pricing;
- the costs associated with compliance with mandated renewable energy targets;
- regional loss factors; and
- the impact of regenerative braking.

As a consequence of the forecasting risk associated with these factors Aurizon Network has not prepared electric retail cost forecasts beyond 2013/14. While the electricity supply costs are known for 2013/14, the regional loss factors and environmental charges applicable for that year are not yet available and the EC tariff will be revised once these parameters become known.

A more detailed discussion on these factors is provided in the following sections.

10.4.1 Carbon Price Impacts

A key driver of the retail price forecasts for the UT4 period is the market value of carbon permits. The carbon pricing arrangements commenced on 1 July 2012, with the price of carbon to be fixed for the first three years of the scheme. From 1 July 2012 the carbon price started at $23 per tonne of CO2e and will progressively increase by 2.5% plus inflation in 2013/14 and 2014/15. The scheme then reverts to a market based model for determining the price of carbon.[177]

As the market based carbon price will be influenced by the international price of carbon in the European Union (EU) Emission Trading Scheme the carbon price is exposed to sovereign policy risk with possible legislative changes in the EU being contemplated to reduce an apparent oversupply of carbon units.[178] In addition, the Climate Change Authority notes the political uncertainty with domestic carbon pricing policies and cites a survey by Jotzo from the Centre for Climate Economics and Policy at the Australian National University, which found that 40 per cent of respondents think the carbon price will be repealed by 2016 with half of those respondents thinking it will be re-instated by 2020.[179]

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[177] Australian Government (2012). An Overview of the Clean Energy Package, p. 5 http://www.cleanenergyfuture.gov.au/wp-content/uploads/2012/05/CEF-overview_Apr2012.pdf

[178] Hepworth, A (2012).'EU Carbon Call to Lift Prices' The Australian, Nov. 28 http://www.theaustralian.com.au/national-affairs/carbon-tax/eu-carbon-call-to-lift-prices/story-fndttws1-1226525257295

[179] Climate Change Authority (2012). Renewable Energy Target Review – Final Report, December, p.30 http://climatechangeauthority.gov.au/sites/climatechangeauthority.gov.au/files/20121210%20Renewable%20Energy%20Target%20Review_MASTER.pdf

These costs are outside of the control of Aurizon Network and will continue to be subject to pass through arrangements.

10.4.2 Loss Factors

The retail price at the point of connection is adjusted to reflect the energy losses associated with transmission losses. These are determined on an annual basis by the Australian Energy Market Operator (AEMO) having regard to the generation and demand drivers within the NEM.

The regional loss factors published by AEMO for 2012/13 saw a significant increase in regional loss factors in Central Queensland, with AEMO noting the while loss factors decreased across Queensland on average:

> "…this decrease is not uniform across the region and the demand variations between Southern, Central, and North Queensland are substantial. This, together with the reduction in generation from Central Queensland power stations, has resulted in a significant decrease in the power transfer from Central and Northern Queensland to Southern Queensland, with the effect of increasing MLF values in Central and Northern Queensland."[180]

The following table shows the change in the weighted average loss factor for connection points in the CQCR applicable to the 2011/12 and 2012/13 periods.

Table 80 Weighted Average Regional Loss Factors

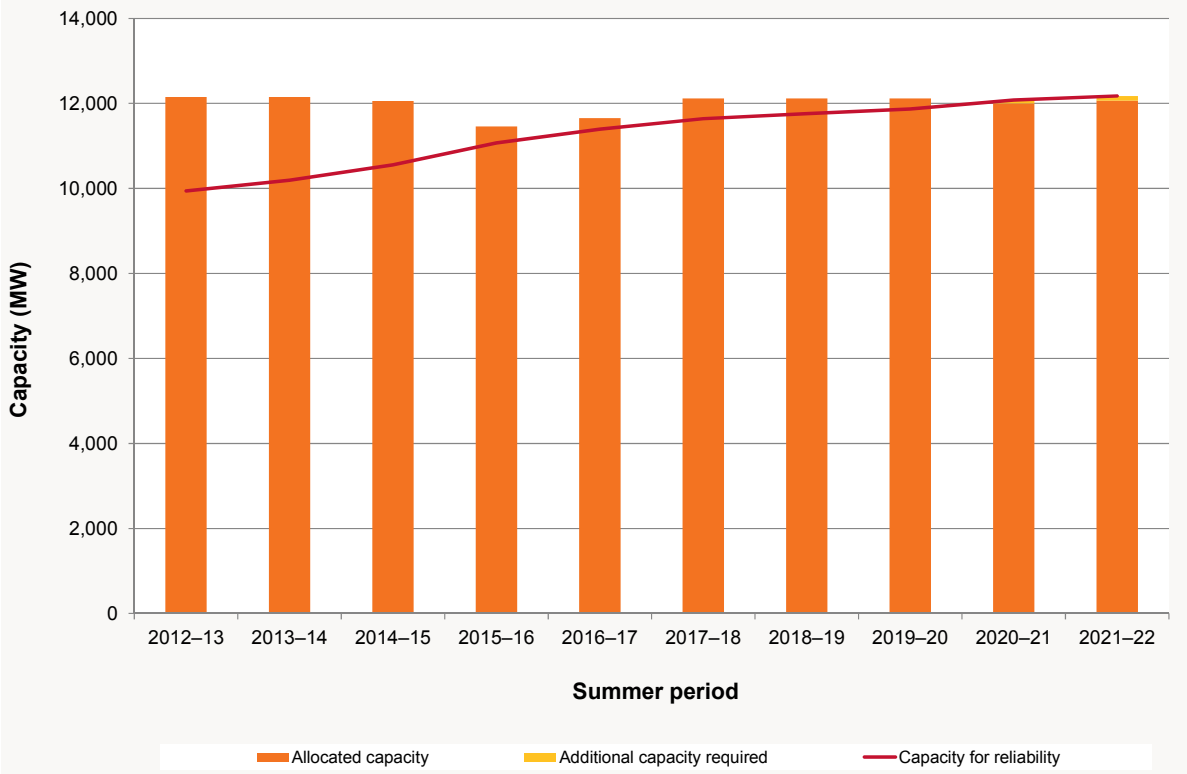
System	2011-12	2012-13
Blackwater	0.990	1.021
Goonyella	1.053	1.091

The high loss factors are expected to prevail until such time as the regional supply and demand balance in Central and Northern Queensland is altered through development of additional generating capacity in the region. The AEMO's 2012 Statement of Opportunities shows that no additional generation capacity is required in Queensland. It is therefore reasonable to expect that current generation and flows will not materially change over the UT4 period and that loss factors will remain at or close to current levels.

The Goonyella loss factors may increase further with the pending retirement in 2016 of the 34 MW Mackay Gas Turbine. Loss factors may also be impacted in the future if the proposed 1500 MW Aldoga Power Station is developed. However, this development is not currently considered a committed project by the AEMO.

[180] Australian Energy Market Operator (2012). Regional Boundaries and Marginal Loss Factors for the 2012-13 Financial Year, http://www.aemo.com.au/Electricity/Market-Operations/Loss-Factors-and-Regional-Boundaries

Figure 28 AEMO Queensland summer supply/demand outlook



Source: Australian Energy Market Operator (2012). 2012 Electricity Statement of Opportunities, Figure 3-2. http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities

10.4.3 Environmental Charges

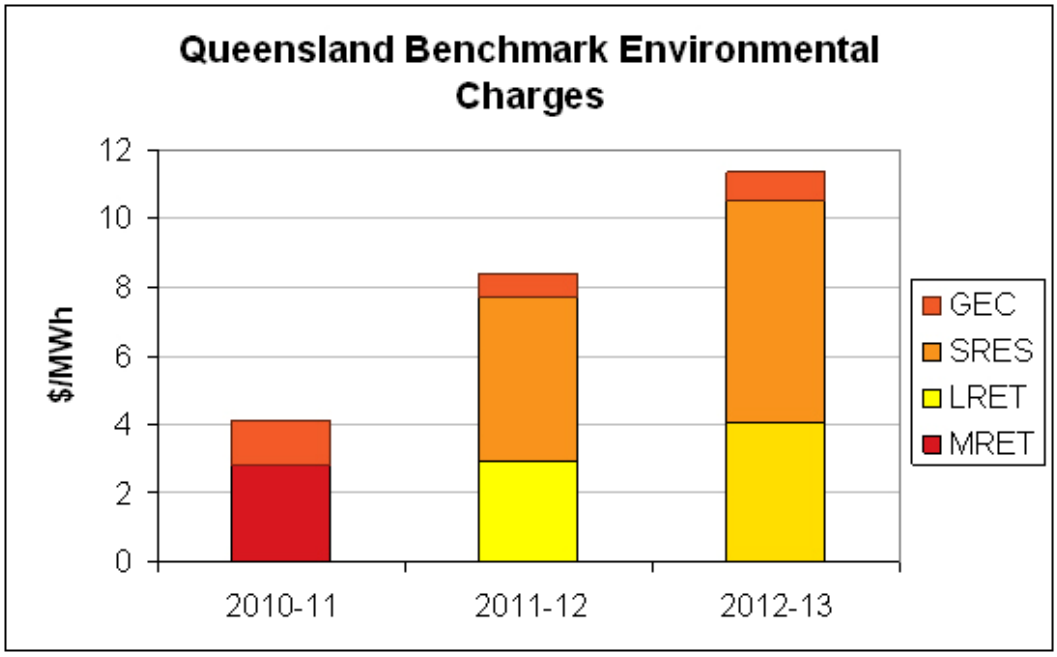
Aurizon Network retail electricity supply price includes the pass-through of various retailer costs associated with complying with relevant government energy legislation. This is comprised primarily of:

- the Queensland Gas Scheme, which currently requires electricity retailers and other major users to source 15 per cent of electricity from gas-fired generators. There is the option for this to increase to 18% by 2020181; and
- the Enhanced Renewable Energy Target, which requires retailers to purchase Large-Scale Generation Certificates and Small Scale Technology Certificates in order to meet the mandatory Renewable Energy Target.

The introduction of the Large-scale Renewable Energy Target and the Small-scale Renewable Energy Scheme has seen a large increase in the environmental charges being passed on by electricity retailers since it replaced the Mandatory Renewable Energy Target in 2011. The following graph shows the increase benchmark cost from $4.00 per $MWh to $11.30 per MWh for a retailer to comply with these schemes, as reflected in the QCA's Benchmark Retail Cost Index. The recent increases in the EC tariff can be largely attributed to these costs and the uplift in the regional loss factors.

[181] http://www.energyfutures.qld.gov.au/gas/qld-gas-scheme.htm

Figure 29 Compliance costs for environmental energy policies



Source: Queensland Competition Authority. Regulated Retail Electricity Prices: Final Decisions, 2011-12, 2012-13.

The cost of compliance with these schemes are in addition to the carbon tax policy and represents a tax imbalance between diesel and electricity as a fuel source for train services. This point is acknowledged by the Climate Change Authority (CCA), who notes:

> "The RET can be viewed as a tax to support the development of the renewable energy industry. In this scenario, liable entities represent the tax base. As a general rule, broadening the tax base is usually more economically efficient as it decreases the distortions in the market. If the cost burden is spread more broadly, each liable entity's obligation is smaller. A broad based tax may also be more equitable, as it does not, on its face, advantage any particular group."[182]

Aurizon Network agrees with the CCA that the operation of these schemes is effectively a tax. In order to avoid the erosion of competitiveness of these businesses and industries relative to competitors who are otherwise not subject to the same tax, the scheme also includes exemptions for Energy Intensive Trade Effected industries (EITE), with the CCA also noting:

> "The general rationale for providing assistance to EITE activities is that these businesses are competing in an international setting where their competitors do not face a similar impost. EITE businesses are unable to pass on the additional cost of the RET to their customers, to remain competitive, and must absorb the additional cost of the RET."[183]

The policy framework for exemptions is primarily focused on the cost impost to trade sensitivity. The exemptions framework does not extend to circumstances where a supplier of services is subject to competition and substitution in a downstream domestic industry. That is, the exemptions framework does not contemplate the prospect of energy substitution that may arise due to the objective of supporting the development of the renewable energy industry. The carbon pricing policy is fuel choice neutral as the price of CO2e is common between both fuel sources. The GEC, LRET and SRES is analogous to imposing an obligation that diesel be comprised of 20% biofuel that has a much higher production cost than refinement of

[182] Climate Change Authority (2012). Renewable Energy Target Review – Discussion Paper, p.109 http://climatechangeauthority.gov.au/sites/climatechangeauthority.gov.au/files/DiscussionPaper-RET-Review-20121031.pdf

[183] Climate Change Authority (2012). Renewable Energy Target Review, Discussion Paper, October, p.110.

crude oils. As such the schemes promote lowest cost renewable energy generation, but promote electricity generation from sources which are not supported under current wholesale energy supply and carbon prices.

Accordingly, in order to avoid distorting the competitiveness of more efficient electric traction services Aurizon Network has classified the costs associated with compliance with schemes as a tax and included as an overhead cost. Variations between the forecast compliance costs and the actual compliance costs will be addressed through the adjustment to the AT_{2-4} System Allowable Revenue. The forecast compliance costs for the UT4 period are detailed below.

Table 81 Forecast environmental charges ($)

System	2013/14	2014/15	2015/16	2016/17
Blackwater	1,896,831	2,392,994	2,951,793	3,250,214
Goonyella	2,676,624	2,944,511	3,141,506	3,332,879

10.4.4 Regenerative Braking

Modern AC traction locomotives are equipped with regenerative braking capabilities that allow some of the train's braking force to be transferred from pneumatic brakes in the wagons to the traction motors in the electric powered trains. The electricity generated is transferred through the locomotive pantograph into the overhead power system. This electricity is either consumed within the network, either by another train in the same electrical section drawing a concurrent load or through distribution losses between the point of generation and the point of connection with the electricity grid, or is exported back into the electricity grid.

Aurizon Network is currently undertaking regenerative braking trials in the Goonyella system to assess the system performance stability and ensure the minimum technical standards prescribed in its connection agreements with its transmission network service provider continue to be satisfied. Similar trials are expected to commence in the Blackwater system 2013/14.

The electric tariff is uniform price based on gross tonne kilometres, which reflects the relative homogeneity in the load demand per train for that unit of measurement. However, this average load approach may not provide an EC price which is reflective of the net energy characteristics of a train which is regenerating electricity back into the overhead power system compared to a train that is not generating (noting that a train with regenerative capability which is not actually generating will have a similar load characteristic to a train without regenerative capability). It may also not reflect the difference between two trains each regenerating, as the amount of energy put back into the network depends on numerous factors, including driver behaviour and installed above-rail technology like ECP braking.

As electric trains currently operating, and expected to be operating, in the Goonyella system are AC traction with regenerative braking capabilities, an EC tariff based on net energy demand in that system will continue to reflect the relatively homogenous train operations. In contrast, Aurizon Network expects that older DC traction electric locomotives will continue to operate within the Blackwater system. A continuation of a uniform tariff arrangement within that system may not lead to an allocation of costs between train services that adequately represent the incremental costs of that individual train service.

While this may support differential pricing of the EC tariff between train services it is not possible to derive rates that reliably and accurately represent the costs of the actual services. The prospect of material pricing error is highly likely due to:

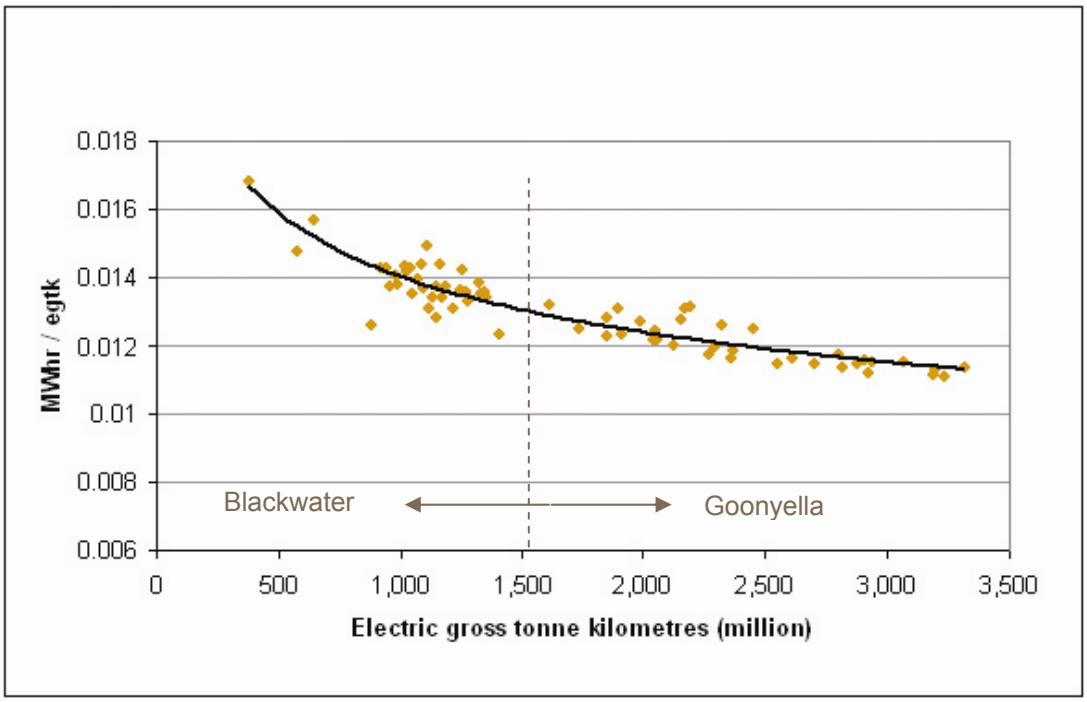
- the inability of Aurizon Network to reliably determine the amounts of energy generated by an individual train service;
- the inherent variability in the regenerative amounts per individual train service; and
- the complexity and variability in measuring and allocating system losses.

Further, as noted above, the amount of energy generated and returned to the overhead power system is highly dependent on where the train service is operated and more importantly the driver braking behaviour. For example, Network Rail submitted to the Office of Rail Regulation that:

> "The use of regenerative braking is vital in achieving energy efficiency. Incentives to actively use regenerative braking should encourage this. However, it is difficult to model the benefits of regenerative braking where operators' usage is still estimated using modelled consumption rates. Emerging data from OTM suggests that regenerated energy is highly variable. We consider that the current regenerative braking discounts are too simple to accurately reflect the real savings from regenerative braking. Therefore, we would suggest that, by the end of CP5, incentives are introduced to encourage operators to adopt regenerative braking for metered usage only."[184]

Aurizon Network notes that even where an individual train service is metered it is still necessary to deduct from that metered reading the system losses associated with transmission of that energy within the network. In this regard, transmission losses are highly dependent upon the utilisation levels of the network. For example, the Blackwater system energy efficiency would materially increase through increased utilisation of the power system. The following graph shows the energy efficiency of the Goonyella and Blackwater system with changes in utilisation. The graph shows significant variability in energy consumption between 2010/11 to 2011/12, which is highly correlated with volume and the slope of the curve which best fits the data points representing the system losses.

Figure 30 Electric system efficiency



[184] Network Rail (2012). Periodic Review 2013 Consultation on Incentives – Network Rail's Response. http://rail-reg.gov.uk/pr13/PDF/pr13-incentives-response-network-rail-response.pdf

This variability and lack of precision in the estimation of was also noted by Network Rail in relation to transmission losses:

> "ORR has raised the possibility of setting an efficient losses mark-up, although this is not addressed explicitly in its consultation document. The key problem with this proposal is that until an Electricity Supply Tariff Area (ESTA) is 100% metered, it is not possible to measure transmission losses. A losses mark-up would therefore seem to us to be impossible to implement until 100% metering is complete."[185]

In contrast to the heterogeneous train mix within the UK market, Aurizon Network does not consider that it is necessary to implement full train metering in order to provide a substantial benefit to train operators where the gross load demand for individual train services within the CQCR remain reasonably consistent. The substantial variability of transmission losses would also suggest that it would not be feasible to credit an operator for its regenerated energy at the point of on train metering.

A viable model for distributing the benefit of regenerative braking and promoting a stronger incentive for operators to invest, use and maximise energy return would be to establish a quarterly 'Regen Credit Pool' based on the value of the export meter deductions at the point of connection by its electricity retailer. The Regen Credit Pool would then be distributed between rail operators in proportion to their metered regen amounts. The EC tariff would continue to be calculated on import metered consumption. The transfer of those regen credits between the rail operator and its customers would need to be determined between those parties.

Aurizon Network acknowledges that the full benefit of regenerated energy will not accrue to those rail operators where a proportion of that energy is consumed within the overhead power system. Notwithstanding, there should be sufficient financial incentive for an operator to invest in regenerative braking. Given the expected level of network density for electrical sections and the requirement for an electric train to be drawing load instantaneously with a regenerating train, the large majority of generated energy is expected to be exported.

The following table provides details of the exported energy from connection points during the period of July to December 2012. The indicative value assumes a purchase price of $50 per MWh.

Table 82 Regenerative braking and export energy

	Jun-12	Jul-12	Aug-12	Sep-12	Oct-12	Nov-12	Dec-12	Avg
Locomotives	20	20	20	20	20	20	20	20
Exported MWh	219.9	229.1	328.5	278.6	279.9	252.3	301.3	269.9
MWh per Loco	11.0	11.5	16.4	13.9	14.0	12.6	15.1	13.5
Indicative Value of Exported Energy ($)	10,995	11,455	16,425	13,930	13,995	12,615	15,065	13,495
Average Value per Loco ($)	550	573	821	697	700	631	753	675

[185] http://rail-reg.gov.uk/pr13/PDF/pr13-incentives-response-network-rail-response.pdf

The implementation and crediting of amounts from the Regen Credit Pool is depended on the following conditions being satisfied:

- the ability to utilise the regenerative braking technology needs to be unrestricted (in order to promote competition in the downstream rail haulage market). Where the ability to utilise this technology is unable to be unrestricted, an appropriate and equitable allocation of regenerative braking rights will need to be established; and
- Aurizon Network must agree with relevant access holders the processes and assurance framework for meter reading, maintenance, compliance and testing.

Until such time as these conditions have been satisfied the amounts exported from the overhead power system will be reflected in the common EC tariff rate. However, Aurizon Network considers that it in order to promote efficient investment in and use of rail infrastructure it is highly desirable that investment is made in on train meters to record regenerative braking amounts to allow the crediting of net export amounts to an operator. The financial incentive created by proportionally allocating export amounts will promote improved information to an operator about driver performance with respect to the quantity of electricity generated from traction motor braking.

Consistent with the views of Network Rail, Aurizon Network considers this will only be feasible where all trains with regenerative braking are equipped with on train meters. Subject to the views of relevant stakeholders, Aurizon Network proposes to require trains with regenerative braking capability to have meters installed by 1 July 2016 in order to participate in the Regen Credit Pool distribution. This provides a three year period for fitting of meters and establishment of the necessary billing and compliance arrangements. This period could be brought forward by agreement with train operators should the technical and administration issues for the metering be able to be expedited.

Where an operator has not installed meters by this date, Aurizon Network considers that the operator would still obtain the indirect benefits of regeneration as this would be reflected in the net load demand in the EC tariff. However, in this case it would be necessary to cap the credit to an operator with meters at the metered output less and allowance for system losses. This approach would be substantially more complex than the arrangements with 100% metering. It therefore remains an option to mandate on train metering in the system wide requirements for trains with regenerative braking capability.

There a number of commercial and technical complexities as to how the Regen Credit Pool will be administered and managed. Aurizon Network intends to conduct a number of workshops with rail operators in 2013/14 to further develop the policy and pricing frameworks around regenerative braking.

10.5 Risk and insurance

10.5.1 Introduction

In providing network infrastructure for rail services, Aurizon Network is exposed to a range of incidents that are outside its control, as well as risks where avoidance is not economically justifiable. In managing risks, Aurizon Network can elect to either:

- over-engineer or invest in protection measures to ensure the risk is fully mitigated;
- partially mitigate the risk through a combination of operating and capital expenditure;
- use external insurance;

- self-insure; and/or
- seek regulatory mechanisms such as re-opening and pass-through provisions.

In practice, regulated businesses will rarely adopt the first measure and are more likely to employ a combination of the other measures. Aurizon Network's risk management is based on a combination of insurance, self insurance and pass-through. These risks are typically asymmetric in nature and not compensated under the cost of capital methodology employed by the QCA. Accordingly, it is reasonable to include mechanisms to allow for the recovery of the efficient costs associated with managing asymmetric risks. This is primarily via the operating expenditure allowance and also requires provisions in the Access Undertaking.

This section briefly summarises the current arrangements in the 2010 Undertaking and discusses changes to the methodology employed in determining the costs associated with identified asymmetric risks in UT4. Details of the methodology used to determine those costs are also included.

It is also important to note that the approach adopted by the regulated firm in managing asymmetric risks need not align to the approach used to value the risk in a regulatory framework. This is particularly relevant to a vertically integrated firm where the same risk is managed under an umbrella policy across business units and risk premiums cannot be allocated through a risk-based assessment (i.e. derailment risks).

10.5.2 UT3 Risk and Insurance Allowances

In UT3, Aurizon Network undertook a robust quantitative assessment of asymmetric risks. This included an actuarial assessment of residual risks and the estimation of a self insurance amount as a proxy for the insurance costs of rail infrastructure damage from derailments attributable to a stand-alone network provider.

Due to numerous data limitations and the absence of 'claims history' for weather related damage associated with prolonged drought conditions prevailing in the CQCR since the commencement of regulation, Aurizon Network reduced its proposed pass through threshold from $8 million (in its original September 2008 proposal) to $1 million. This was accepted by the QCA in its approval of the Review Event provisions in the 2010 Undertaking.

This approach was validated as, during the course of UT3, the losses incurred by Aurizon Network from weather related infrastructure damage not subject to pass through materially exceeded the estimated losses included in the operating cost allowances. In its August 2012 supplementary submission to the QCA on the pass through of $7.9 million in costs associated with flooding in central Queensland in December 2010 and January 2011, Aurizon Network advised the QCA as of that date:

> "…weather losses over the UT3 period have totalled $6.8 million (net of this proposal) which is considerably more than the original estimate of $1.4 million and the revised calculation based on the historical data set of $0.5 million."[186]

Similarly, Aurizon Network has also advised the QCA that a further review event occurred in January 2013 associated with the rain event from cyclone Oswald. The amounts to be included in this Review Event are expected to be in the order of $13 million.

[186] Aurizon Network (2012). Supplementary Information and Variations to 2010 Review Event Claim, August, p.3.

Aurizon Network acknowledges that the change in the self insurance threshold for the weather related damage from $8 million to $1 million gave rise to some uncertainty as to the exact nature of the risks that Aurizon Network was being compensated for and to what extent the costs of weather related events would be recovered from users through a variation to reference tariffs. This is evident in the QCA's decision on the December 2010 and January 2011 flooding Review Event which stated:

> "As a consequence, while holding some concerns regarding QR Network's approach to demonstrating the adequacy or otherwise of its self insurance arrangements (especially the late provision of additional analysis by Finity), the Authority accepts that the flood review event damage costs are not covered by the existing self insurance arrangements and thus are eligible to be recovered via adjustments to Reference Tariffs.
>
> However, the Authority is concerned that significant uncertainty regarding the coverage and nature of the self insurance arrangements continues to exist."[187]

Accordingly, in preparing the UT4 proposal Aurizon Network has sought to address this uncertainty through clear and transparent specification of the asymmetric risk management framework. Commensurate with previous representations the UT4 proposal does not include a board resolution to self insure those risk which are not subject to insurance as this resolution is made on an annual basis when the Aurizon Group places its insurance.

10.5.3 UT4 Proposal

Table 83 outlines the framework for assessing the prudency of managing asymmetric risks employed by Aurizon Network in the development of UT4.

Table 83 Asymmetric risk management in a regulatory framework

Risk Mitigation	Approach	Typical Application	Residual Cost and Self Insurance
Fully mitigate legitimate business risks with maintenance and capital costs reflected in prices.	Asset standards	Risk is controllable and consequences of risk are so extreme or catastrophic that it is not desirable to insure.	No self insurance cost as risk is fully mitigated.
Partially mitigate business risk to reduce to acceptable levels with commensurate maintenance and capital costs reflected in prices	Asset standards	Risk is controllable but consequences are less than the risk adjusted costs of fully mitigating	Residual cost = probability of event x severity of event x consequence of event.
Take out insurance for all or part of the residual cost	Insurance	Risk is typically low probability and high consequence[188] or medium probability and medium consequence with known and measurable loss history	Residual cost = probability of event x severity of event x consequence of event, less any amounts recoverable under the insurance policy

[187] Queensland Competition Authority (2012). Decision – QR Network's Review Event Submission Central Queensland Flooding, October, p. 5.

[188] This would also require insurance where the consequence is so high to be funded through self insurance (either because the amounts accumulated could not meet the resultant liability or that the remaining economic life is materially lower than the probability of a severe event).

Risk Mitigation	Approach	Typical Application	Residual Cost and Self Insurance
Take out no insurance at all	Self insurance	Risk is medium to high probability with low to medium consequence.	Residual cost = probability of event x severity of event x consequence of event.
Transfer asymmetric risk through price review mechanism	Cost-pass through	Risk is low to medium probability with medium consequence. Residual cost is difficult to determine.	No self insurance cost and risk is fully reflected in prices

Aurizon Network notes that during the UT3 period stakeholders have queried why damage to rail infrastructure from weather related events is not covered under an external insurance policy. Aurizon Network manages the risks associated with weather related damage having regard to the framework outlined above. This includes:

- The inclusion of high value critical assets in the external insurance policy (this includes rail infrastructure in port precincts and material civil assets such as nominated bridges and tunnels). These assets fall within the category of being low probability but of potentially high consequence; and
- Effectively self-insure for weather related damage to all other rail infrastructure on the basis that:
  - insurance costs are prohibitive and are often based on maximum exposure limits;
  - insurance products will typically command large deductibles to reduce premiums; and
  - the policy will generally not be new for old replacement meaning a large residual cost will still need to be estimated and included in regulatory cash flows.

The UT3 and the UT4 regulatory cash flows explicitly address the effective self insurance through the following:

- An actuarial estimate of weather related damage where consequences of events are less than $1 million. These events are typically frequent with a medium to high probability of occurrence and a low to medium consequence; and
- A cost pass through for weather related damage where the consequences of events are greater than $1 million. The probabilities and consequences of these events are highly unpredictable, potentially exposing the firm to windfall gains and losses if the self insurance allowances over or underestimate probability and consequence. This is particularly relevant for railways which span large geographical areas. This approach reduces costs to users relative to insurance, provided the users have the capacity to pay any claims which are made through Review Events. (This can also be mitigated through caps on amounts that may be passed through in a given year with the balance rolled forward for recovery in subsequent years.)

Aurizon Network has also reviewed its capital expenditure program to identify how the materiality of the costs associated with weather related events can be mitigated through improving asset resilience (for example flood rock).

These arrangements can be contrasted with the annual compliance test in the Hunter Valley Coal Network Access Undertaking where the uninsured risks are subject to an effective cost pass-through of efficient costs, which avoids the requirement for complex and costly actuarial assessment of forecast losses.

As part of the Aurizon Holdings Limited Group, Aurizon Network is covered under a Group insurance policy for Industrial and Special Risks, and corporate insurances including general liability, employment practices liability and professional indemnity. Table 84 outlines the key insurance coverage for rail infrastructure damage risks under the Group insurance policy for Industrial and Special Risks and how these risks have been assessed and proposed to be managed under the UT4 regulatory framework.

Table 84 UT4 insurance and self insurance assumptions

Risk	Group Insurance Coverage	UT4 Assumptions
Derailment	Damage to rail infrastructure from rollingstock	Self insured up to an amount of $8 million per incident for damage by rollingstock
Damage to Rail Infrastructure from flood, landslip, subsidence, earthquake and any act of God	Nominated major rail infrastructure assets insured. All non-covered rail infrastructure self insured.	Nominated major rail infrastructure assets insured and estimated on a stand alone policy basis. Weather related infrastructure damage from a single event (flood, storm, cyclone, etc) less than $1 million is self –insured. Weather related infrastructure damage from a single event greater than $1 million is subject to pass-through. Catastrophic events such as war, terrorism, earthquake, meteor, etc self insured for a single event up to $8 million. Events greater than $8 million subject to pass-through.
Liability	Insured for legal liability to third parties in respect of personal injury and/or property damage occurring during period of insurance as a result of an occurrence happening in connection with the business	Stand alone policy for legal liability to all operators (third party and related operators) under the Standard Access Agreement with self insurance for a deductible of $500,000

As can be seen from the above table, the UT4 assumptions include self insurance estimates for risks that are insured under the Aurizon Group policy. It is therefore unnecessary to seek a board resolution to self insure for risk that are covered under an insurance policy and the board has resolved to self-insure for the deductible when writing those insurance policies.

The insurance policies are not a reliable basis for determining the costs associated with provision of the declared service due to the following:

- the umbrella policy assumes internalisation of liability between Aurizon Network and related operators and premium allocations would need to be based on measures of risk in order to ensure that tariffs did not include costs which were not attributable to the provision of the declared service; and
- the insured amounts will not include residual costs where the policy does not reflect new for old replacement which will still require an actuarial based estimate of forecast losses.

In determining the proposed amounts for insurance and self insurance for UT4, Aurizon Network engaged Finity Consulting Pty Ltd (Finity) to provide self insurance estimates for the stand-alone insurance policy premiums and deductibles advised as being prudent by Willis Australia Limited. The remainder of this section details:

- Willis Australia Limited's opinion on the cost of corporate insurances and relevant Industrial and Special Risks insurance for Aurizon Network as a stand-alone entity; and
- The quantification of risks that are self-insured based on the expected costs of the risks, having regard to the probability of the risk (from modelling based on historical experience) and financial consequence of the event occurring. Finity has estimated annual losses arising from self-insured risks of the network including both losses relating to uninsured risks and below-deductible losses on insured risks.

A copy of both reports included as confidential attachments to this submission.

10.5.4 Insured Risks

Aurizon Holdings Limited has a Group insurance program that includes a number of different insurance policies direct with the insurance market. These policies extend to the activities of Aurizon Network. A specific premium for Aurizon Network is not allocated by the insurers. For the purpose of UT4, Willis was engaged to provide annual insurance premium costings for Aurizon Network on a stand alone basis for the following classes of insurance specifically in relation to the Central Queensland Coal Network (CCQN):

- Industrial and special risks (ISR) – property and buildings;
- Third party liability (General Liability) in accordance with the requirements of the Standard Access Agreement;
- Directors and Officers Liability;
- Employment Practices Liability;
- Professional Indemnity; and
- Corporate travel.

To do this, Willis approached insurance companies in both the Australian and London insurance markets who have an understanding of the specific risks and exposures relating to the activities of Aurizon Network and underwrite businesses of this nature.

The premium levels obtained are based on levels of cover selected in consultation with Aurizon Network. In relation to deductible levels, Willis obtained premiums from the insurance market based on market deductibles currently available for risks of this nature. All premiums have been calculated on the basis of there having been no or only minor claims specifically related to the CQCN. If there had been large losses this would likely increase either, or both, the premium and deductible levels.

Insurers were unable to provide premiums for each year of the UT4 forecast period as impacting factors are still unknown. As highlighted by Willis, these factors include:

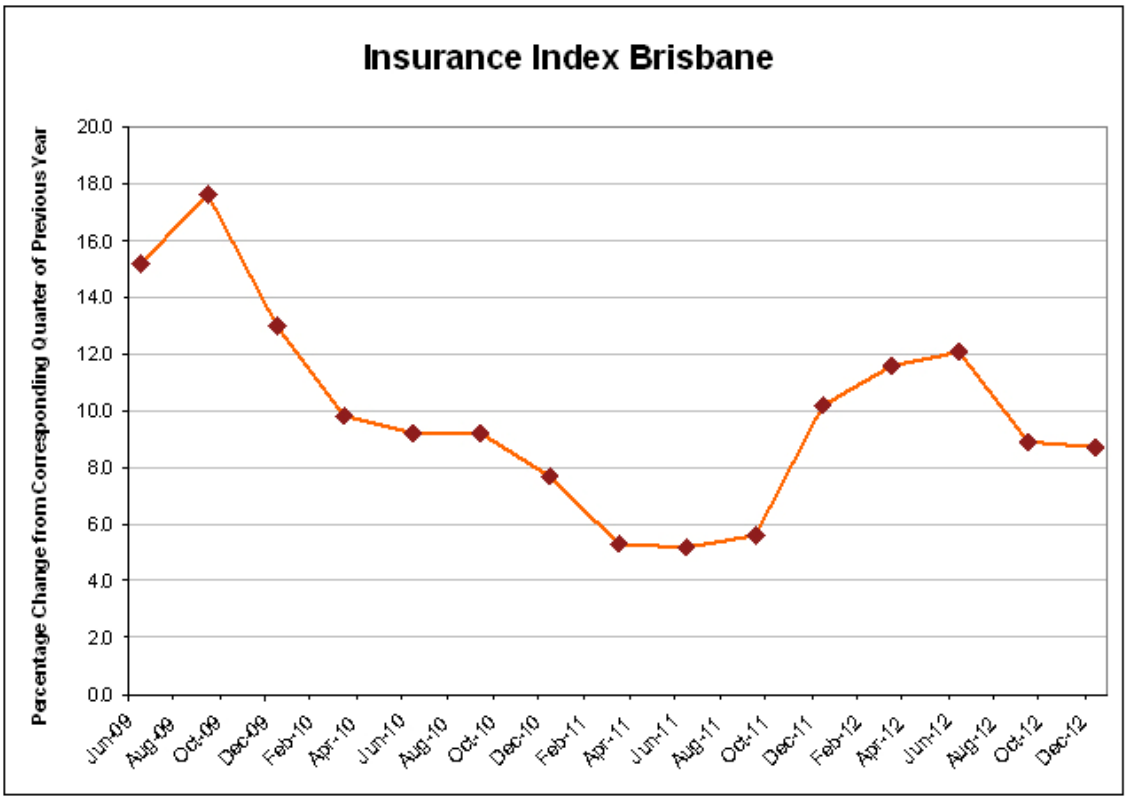
- insurance market conditions;

- individual claims history for a specific risk;
- loss history for each category of risk;
- reinsurance costs;
- appetite of insurers to underwrite a specific risk;
- changes to the risk, including fluctuations in assets and liabilities; and
- capacity of the insurance market.[189]

In the absence of further natural disasters, premiums could ease slightly, however any further large events could result in a withdrawal of indemnity capacity or put upward pressure on premium ratings. As a result, it is proposed that the annual premium indications for 2012/13 be inflated by CPI of 4% to derive the premiums in nominal dollars. Natural disasters in Australia and overseas in 2012/13 would be expected to place further upward pressure on premiums.

The figure below shows the annual percentage change from one quarter to the corresponding quarter in the insurance component of the Brisbane CPI. This shows the insurance cost escalation over UT3 materially exceeding the CPI.

Figure 31 Brisbane Insurance Cost Index



Source: Australian Bureau of Statistics (2012). 6401.0 Consumer Price Index, Table 12. Series ID: A3602804T

[189] Willis (2012). Expert Opinion on the Cost of Insurance Premiums for the Purposes of the QR Network Access Undertaking 2013.

10.5.4.1 Industrial and Special Risks

Aurizon Network obtains the benefit of coverage under the Industrial and Special Risks (ISR) – Property/Rollingstock policy for physical loss or damage to Aurizon Network's assets as declared under that policy. This covers a very limited number of assets:

- bridges - $379 million;
- feeder stations - $560 million;
- other network assets e.g. computer equipment, network control and monitoring equipment - $97 million;
- buildings – no assets declared; and
- rollingstock – no assets declared.

Rail infrastructure is a specific exclusion from this policy and therefore Aurizon Network self-insures this infrastructure. In addition, insurance for business interruption is not obtained due to the revenue cap form of regulation.

The premium has been based on a policy limit of liability of $500 million for any one occurrence. This overall limit is subject to sub-limits for certain risks, such as removal of debris, the cost of re-writing records and accidental damage. Premium costings were obtained from the Australian market and are based on deductibles (or the excess) typical for a risk of this nature, being $250,000 for each and every loss for all physical loss or damage.

While maintenance rollingstock is insured under the rollingstock ISR policy, the policy covers all rollingstock assets owned and operated by the Aurizon Group. The policy coverage differs between depreciated value and replacement depending on the age of rollingstock, which inhibits the ability to allocate a premium percentage to 'maintenance' rollingstock with any degree or precision. As discussed in Volume 4, the plant charges have been determined using a gross replacement value methodology. As this approach assumes assets are in a new state it is also necessary to derive a maintenance rollingstock premium estimate which reflects replacement.

Aurizon Network also requested Willis to provide a premium estimate for a rollingstock policy for major plant with a replacement cost value greater than $5,000,000. Willis has provided two estimates with a high ($1,000,000) and low ($100,000) excess. As no provision has been made in the maintenance allowance for asymmetric risks, the insurance estimate has been based on the low excess amounts to ensure costs are commensurate with the costs and risks of providing maintenance services.

Based on this underwriting information, the annual premium has been quoted as $2.276 million (2012/13). This includes the statutory terrorism premium. As noted above, business interruption has been excluded from the premium estimate due to the protection of the revenue cap.

10.5.4.2 Corporate insurances

General Liability

This policy covers Aurizon Network in relation to the CQCN for its legal liability to third parties for personal injury or property damage. The premium costings provided are for a policy that includes coverage (in accordance with standard policy terms and conditions) for Aurizon Network's exposures outlined in the Indemnities and Liabilities provisions in the Standard Access Agreement.

Whilst the insurance market bases its premium calculations on a number of rating factors, including estimated turnover, payroll, wages and employee numbers, it should be noted that the underwriters advised that their main consideration is the estimated turnover, which is indicative of activity. This has been estimated as $948.9 million. The estimated premium is not particularly sensitive to a change in the number of employees or payroll.

The London market was approached for premium indications for this type of insurance. Insurers advised that to write a risk of this nature on a stand-alone basis, a minimum excess of $500,000 for each and every occurrence would be required.

The premium has been based on a policy limit of liability of $350 million for any one occurrence and in the aggregate separately in respect of product, pollution and bushfire liability. The policy structure comprises various layers to achieve the $350 million limit.

Based on this underwriting information, the annual premium for General Liability has been quoted as $633,262 (2012/13).

Other insurances

Consultation was undertaken with insurers in the Australian market to cost premiums for the other insurances as follows.

Table 85 Estimated premiums: other insurances (2012/13)

Type	Premium ($)	Basis for premium
Directors and Officers	290,956	Estimated revenue and rate of declared assets to liabilities was taken into consideration in arriving at the costing. The premium is reflective of a policy limit of $150,000 and deductible levels of $250,000 for company reimbursement and $500,000 for securities coverage.
Professional indemnity	27,062	As no professional services are undertaken, this represents the minimum premium that would be required if they were.
Employment Practices Liability	3,033	Based on a policy limit of $5 million with a policy deductible of $50,000 and employee numbers of 450.
Corporate Travel	3,355	Estimated on the basis of travel expected to be undertaken over a 12 month period (550 trips domestically and 5 international trips).

10.5.4.3 Estimated premiums: Industrial and Special Risks and corporate insurance

To summarise, the total annual premiums for Industrial and Special Risks and corporate insurance are summarised below.

Table 86 Forecast insurance premiums ($'000)

Base Year (2012/13)	2013/14	2014/15	2015/16	2016/17
3,233.945	3,325.249	3,773.497	3,998.971	4,137.335

10.5.5 Self-insured Risks

Finity was engaged to provide actuarial advice in relation to the self-insured risks of the CQCN. The CQCN is subject to property losses from perils such as derailment, weather (storms, flood, extreme heat), dewirements, earthquake, fire and bush fire and accidental and malicious damage. From modelling historical data, Finity has been able to estimate future losses for derailment, weather and dewirements. No costs have been estimated for other perils. Future losses have also been estimated for liability losses below the deductible amount.

Consistent with UT3, it has been assumed that the following events will continue to be subject to pass-through:

- major weather events where below-rail losses to the network exceed $1 million;
- catastrophic damage to the network from perils such as earthquake, terrorism, war etc where losses exceed $8 million; and
- liability losses which exceed $8 million.

It is considered that the pass-through option is an efficient way of dealing with extreme events which occur infrequently, are extremely difficult to model and are beyond the normal control of the business. Finity's approach is summarised below.

Table 87 Summary of Finity's approach to assessing self-insured risks

Class	Type of risk	Approach
Uninsured	Property damage	
	- Derailment	Estimated using historical loss data
	- Dewirement	Estimated using historical loss data
	- Weather	Estimated using historical loss data for losses less than $1 million Pass-through for losses greater than $1 million
	- Catastrophe	Pass-through for losses greater than $8 million
Insured	Public liability	Estimated using historical loss data for below-deducible losses Pass-through for losses greater than $8 million

Some of the estimated losses for uninsured risks are in fact subject to insurance policies. This is particularly the case for derailment losses which are covered under the umbrella Industrial and Special Risk policy where the damage to rail infrastructure by rollingstock is an included risk. Given the integrated nature of this policy and the difficulty of disaggregating the premium amounts into the relevant risk components, the self insurance premium estimated here is intended to be a proxy for this premium allocation and is limited to an estimation of losses below the deductible amount only.

10.5.5.1 Derailments

Derailment risk is a standard business risk for a heavy haul railway such as the CQCN. The risks of derailment are managed and controlled through a range of measures including maintenance and relevant track and interface standards. Fully eliminating derailment risk is not economically feasible and the maintenance and capital costs required to mitigate derailment risk to negligible levels would be cost prohibitive. As a consequence, Aurizon Network is exposed to derailment risks and the residual costs associated with restoring business continuity.

Methodology

The methodology used to estimate losses in respect of derailment was:

1. Analyse loss history by type of derailment (track, yard/siding, large). Large derailments were defined as derailments with a below-rail cost of more than $500,000.
2. Estimate future derailment frequency based on historical frequency of derailments per gtk.
3. Estimate average loss of derailments based on historical losses, adjusted for inflation.
4. Calculate projected losses as the product of selected frequency, projected gtk and selected average loss.

Railroad statistics for selected railroads from the US Federal Railroad Administrative Office of Safety and Analysis were reviewed to obtain an independent benchmark to support the analysis of Aurizon Network's historical loss history. Those selected were Burlington Northern Santa Fe, CSX and Union Pacific. The very high volumes of traffic on these railroads make them a reasonable benchmark for the CQCN. The US data is based on a large sample of derailment experience, both in terms of annual train kilometres travelled and the number of years for which data is available. The benchmark therefore provides a relevant indication of the frequency and cost of derailments and is particularly relevant for large derailments where there is limited data available from the CQCN.

Finity concluded that the frequency of derailments as well as the size of losses in the CQCN was broadly consistent with the US benchmarks and therefore the assumptions for estimating the costs were based on Aurizon Network's historical data, without specific adjustment for benchmark experience. The base frequency and size of loss assumptions for 2013/14 are equal to the observed average frequency over the last eight years and is outlined below (and compared to those from the UT3 period).

Table 88 Derailments: frequency and size of loss assumptions

	UT4			UT3		
Assumption	Track (excl Large)	Yards/ sidings (excl Large)	Large*	Track (excl Large)	Yards/ sidings (excl Large)	Large*
Frequency assumption (per billion GTK)	0.12	0.97	0.024	0.06	1.10	0.016
Size of loss ($)	117,000	7,000	926,000	165,000	12,500	460,000

* For the UT4 period Large has been defined as a derailment with a below-rail cost of more than $500,000, whereas in the UT3 period it was defined as a derailment with a total cost (above and below-rail) of more than $1 million.

Exposure

The gtk estimates are based on Aurizon Network's contracted tonnages, allowing for the growth in the network as follows.

Table 89 Exposure to derailments (assume load for coal lines, billion gtk)

2013/14	2014/15	2015/16	2016/17
80.5	90.2	97.0	103.7

Frequency

Some variation in the number of derailments from year to year is expected. The analysis of the historical frequency of derailments showed:

1. The number of derailments occurring in yards or sidings each year is much higher than the number occurring on track, particularly as many of these yard/siding derailments are very small incidents.
2. The frequency of yard/siding derailments has fallen significantly, which may be attributed to Aurizon Network's focus on improvements in risk management and safety awareness.
3. The number of track and large derailments in the period from 2009 to 2012 was higher than in the period 2005 to 2008. This may be partially due to considerable rain and flooding in the latter period relative to the prior four years which was much drier.

Size of loss

In relation to size of loss, when compared to the UT3 assessment:

1. The average cost of track derailments has reduced, which can be attributed to an increase in frequency and because some track derailments have been categorised as large.
2. The average cost of yard/siding derailments has reduced, possibly due to improvement in the financial information available for a larger number of incidents.
3. The average cost of large derailments has increased significantly, most likely due to the change in definition from the previous period. It is also noted that due to the relatively small number of losses, it is expected the costs would be volatile from period to period.

Summary

The estimated cost of litigation and liability for derailment incidents over the four year UT4 period (in 2013/14 dollars) is $16.3 million, as detailed below.

Table 90 Forecast derailments self insurance premium ($m)

Year	Track (excl Large)	Yard/siding (excl Large)	Large	Total
2013/14	1.16	0.55	1.82	**3.53**
2014/15	1.30	0.61	2.04	**3.95**
2015/16	1.40	0.66	2.19	**4.25**
2016/17	1.49	0.70	2.34	**4.53**
Total	**5.35**	**2.52**	**8.39**	**16.26**

The estimated cost is higher than that estimated in UT3 mainly due to a significant increase in exposure, and the number of track and large derailments. The frequency of derailments, as well as the size of losses, incurred by Aurizon Network in the CQCN was broadly consistent with the US benchmarks and therefore the resultant costs estimated using those assumptions are considered reasonable.

10.5.5.2 Weather

The UT4 maintenance program has not made provision for restoration works associated with flood events. Coal system infrastructure has been built to a standard that ensures limited damage from flood events. For example, attention to hardening exposed sections of formation along the track and ensuring the provision of adequate drains can minimise the impact of regular inundations of the track (or overtopping) where the engineering design standard is exceeded (that is, where a flood exceeding the one in a year flood immunity design of the track occurs).

The impact of exceeding the flood immunity of a section of track is that the track is inundated by flood waters and therefore trains are immediately halted. Once flood waters recede sufficiently, the track is inspected and generally, rail operations are quickly recommenced (although a speed restriction may continue to apply). Flooding damage can be either immediate, or progressive. Immediate effects may include structural failure from scouring, landslips and undermining of foundations.

Flood damage impacts, such as localized formation failure, may appear following the resumption of train services due to continued significant dynamic loading being applied to saturated formations. The result is randomised failures or ‘holes’ in the formation, with ballast being pushed into the hole. Repairing such holes requires excavating and replacing the surrounding formation. The incidence of such localised formation failure is a function of the type of material used to construct the formation, the level of rainfall and the level of rail activity (that, gross tonnes using the section of track).

In some circumstances a temporary repair may be undertaken to support restoration of train services under operating restrictions with subsequent repairs necessary to reinstate unrestricted services. Both repairs constitute legitimate and prudent costs not included in the maintenance cost allowances.

The maintenance costs have been developed for an activity based on assumptions which precludes activities attributable to rail infrastructure restoration from weather related damage.

The methodology used to calculate the future cost of weather-related losses to the CQCN was:

1. Calculate historical annual losses from weather events per track kilometre.
2. Exclude, in total, pass-through events greater than $1 million.
3. Apply selected annual weather losses per track kilometre to projected track kilometres.

This was applied to 13 years of Aurizon Network's experience and therefore includes both benign and severe weather events. Due to the severe weather conditions in recent years, the assumed cost per track kilometre has increased from $144 per track kilometre in UT3 (or $160 in 2012/13 dollars) to $334 per track kilometre.

The total estimated cost for weather events over the four year UT4 period (in 2013/14 dollars) is $3.41 million, as detailed below.

Table 91 Forecast weather events self insurance premium

Year	Estimated CQCN track (km)	Cost per km per year ($)	Estimated cost ($m)
2013/14	2,441	334	0.82
2014/15	2,514	334	0.84
2015/16	2,590	334	0.86
2016/17	2,667	334	0.89
Total			**3.41**

10.5.5.3 Dewirements

The intimate contact between the overhead power system and the rollingstock means the CQCN will be subject to occasional dewirement. Aurizon Network's historical data from the last four years was analysed and an implied cost of $101 per electrified track kilometre was estimated as follows:

1. Calculate historical annual losses from dewirements per electrified track kilometre.
2. Apply selected annual dewirement losses per electrified track kilometre to projected electrified track kilometres.

The UT4 maintenance cost estimate has excluded the costs for dewirements, including labour costs.

The total estimated cost for dewirements over the four year UT4 period (in 2013/14 dollars) is $0.72 million, as detailed below.

Table 92 Forecast dewirements self insurance premium

Year	Estimated CQCN electrified track (km)	Cost per km per year ($)	Estimated cost ($m)
2013/14	1,701	101	0.17
2014/15	1,701	101	0.17
2015/16	1,905	101	0.19
2016/17	1,905	101	0.19
Total			**0.72**

10.5.5.4 Below-deductible losses

Consideration has been given to losses that may be incurred below deductible limits on the Insurance and Special Risks and corporate insurance policies discussed above. The following below-deductible losses were considered:

1. Public and product liability losses – an estimate has been made based on Aurizon Network's historical information.
2. Property losses – no estimate has been provided for this as losses are expected to be small. This is because little of the CQCN is covered by the Aurizon Holdings Limited combined property insurance policy. Coverage is limited to CQCN property within Aurizon Holdings Limited premises and does not, in general, include tracks and related wires, signalling and communication equipment.
3. Other classes of losses – no estimate has been provided for any other losses as there is no historical information available.

An estimation of below-deductible losses for public liability has been made based on the summary of Aurizon Network's historical experience over the last four years, taking into account the following:

1. Only losses relating to the CQCN were included.
2. Only losses where the net value was greater than $100,000 were included.
3. Bush fire losses were calculated at full value and then 50% applied to derive the below-rail network cost.
4. All uninsured or fully below-deductible losses were excluded.
5. For losses not finalised, current reserve data was included.
6. All Queensland Rail matters pre-separation were excluded.

An analysis of the historical claims information provided, including the below-deductible cost of claims (assuming a $500,000 deductible) divided by turnover, shows the below-deductible cost per million dollars of turnover as $482 across the four year period. Noting that data for losses under $100,000 was not provided, this estimate is considered to be conservative. Turnover has been used as the exposure measure for public liability claims as this is one of the standard exposure measures used by public liability insurers.

The total estimated cost for below-deductible events over the four year UT4 period (in 2013/14 dollars) is $1.93 million, as detailed below.

Table 93 Forecast below-deductibles self insurance premium

Year	Projected turnover CQCN ($m)	Claims cost per million turnover ($)	Estimated claims ($m)
2014	949	482	0.46
2015	987	482	0.47
2016	1,026	482	0.49
2017	1,067	482	0.51
Total			**1.93**

10.5.5.5 Summary: self insurance

To summarise, the estimated costs of self insurance for the UT4 period (in 2013/14 dollars) are as follows.

Table 94 Estimated self insurance costs (2013/14 $m)

Year	Derailments			Weather	Dewirements	Liability	Total
	Track (ex Large)	Yard/siding (ex Large)	Large				
2014	1.16	0.55	1.82	0.82	0.17	0.46	**4.97**
2015	1.30	0.61	2.04	0.84	0.17	0.47	**5.44**
2016	1.40	0.66	2.19	0.86	0.19	0.49	**5.80**
2017	1.49	0.70	2.34	0.89	0.19	0.51	**6.14**

The estimates are central estimates and include an allowance for future growth in the CCQN's operations. The estimates are not discounted for the time value of money. They do not contain margins for expenses, reinsurance or profits and as advised by Finity, are expected to be lower than the commercial costs of insurance.

To estimate the notional premiums corresponding to estimates of self-insured losses, Finity has allowed for benchmark premium loadings. The benchmark loadings assumed are 10% of premiums for expenses and 15% of premiums for profit and the net cost of reinsurance. These loadings are based on commercial property insurance benchmarks.

Aurizon Network has retained the 10% loading for expenses on the basis that the costs associated with claims management and administration by an insurer would be reflected in insurance premiums, which the self insurance estimate for derailment is intended to proxy. As Aurizon Network does not administer a self insurance 'fund' for those risks which are not insured the application of the 10% loading for expenses is applied only to the derailment component of the risk estimate.

Finity has noted that the profit margin adopted is similar to the average return on capital achieved by Australian general insurance in recent years. It has also noted that Aurizon Network only gets the opportunity to 're-price' every four years, whereas an insurer has the opportunity to re-price annually, thus providing greater certainty as they can re-adjust premiums to recoup losses.

The estimation of notional insurance premiums (in 2013/14 dollars) is as follows.

Table 95 Estimated notional premiums for self-insured losses (2013/14 $m)

Year	Uninsured Losses	Below Deductibles	Total
2013/14	4.51	0.46	4.97
2014/15	4.96	0.48	5.44
2015/16	5.30	0.49	5.80
2016/17	5.62	0.51	6.14

10.5.6 Variations

In order to address any variations to the volume forecasts associated with the approval of the UT4 proposal, or to accommodate revenue variations attributable to additional access rights not contemplated in the Capital Indicator, Aurizon Network also requested Finity to provide a unit rate applicable to the relevant exposure metric which could be used to forecast variations in the cost allowances for changes in risk. This is provided in the table below.

Table 96 Cost per relevant unit of risk ($2013/14)

Loss Type	Exposure Measure	$ Loss / Unit of Exposure
Derailment	GTK (Billions)	$43,784
Weather related losses	Track Km	$334
Dewirements	Electrified Track Km	$101
Liability	Turnover	$482

10.5.7 Summary: UT4 risk and insurance allowance

The claim for UT4 reflects:

- A premium for relevant specifically insured risks under the Industrial and Special Risks policy. Of the below-rail assets, only selected bridges, tunnels and feeder stations are covered and there is no cover for rail track infrastructure.
- A premium for the following corporate insurances which have been costed on the basis of Aurizon Network being a stand-alone entity:
    - General liability (Third Party Liability)
    - Directors & Officers Liability
    - Professional Indemnity and Excess
    - Employment Practices Liability
    - Corporate travel.
- A premium based on managing the below-rail asymmetric risks such as derailments, dewirements, weather events and below-deductible liability losses.

The assessment is supported by expert reports from Willis (the costs of corporate insurance and Industrial and Special Risks) and Finity (self insurance).

The proposed UT4 risk and insurance premium in nominal dollars is summarised in the table below.

Table 97 Proposed UT4 allowance for risk and insurance ($m)

Category	2013/14	2014/15	2015/16	2016/17
Industrial and Special Risks	3.33	3.77	4.00	4.14
Self insurance	4.97	5.65	6.25	6.88
Total	**8.30**	**9.42**	**10.25**	**11.02**

The estimated amount for 2012/13 (last year of UT3) was $7.8 million.

For insurable risks, it is not relevant to make any direct comparisons with the UT3 estimates (which were produced at the start of that period) because as outlined above, premiums will be influenced by a number of factors including the prevailing conditions in the insurance market (to the extent that it is not possible to get specific estimates of the costs of insurance policies over the four year forecast horizon, other than indexing next year's estimate to inflation).

Aurizon Network is therefore also bearing the risk that its actual insurance costs are different from the approved allowance, given the premiums will be updated annually in line with market conditions. This similarly applies in the case of self-insured risks, as noted by Finity:

> "We also note that unlike an insurer, QR Network only gets the opportunity to "re-price" every 4 years whereas an insurer has the opportunity to re-price annually thus providing greater certainty as they can re-adjust premiums to recoup losses."[190]

Self insurance costs have increased since UT3 because of:

- the significant increase in the per kilometre track cost of weather events, based on the severe weather events that impacted the CQCN in recent years; and
- the ongoing growth in network activity, noting that derailment costs is one of the main drivers of self insurance costs.

10.6 Working capital

10.6.1 Issues with the current modelling framework

The model that is used to develop Aurizon Network's MAR and reference tariffs is very complex. The model was originally designed to accommodate Aurizon Network's hybrid price cap[191] form of regulation and the same framework continued to be applied when Aurizon Network changed to a revenue cap form of regulation following the commencement of the UT2 period.

There are some inherent complexities in the regulated pricing framework that cannot be avoided. Aurizon Network considers that there is scope to remove unnecessary complexity from the modelling framework, as this would facilitate the ease of use and understanding of the model and reduce the risk of error. Key sources of this complexity include:

- the tax allowance is solved iteratively as part of the determination of the price path;
- when solving for a price path, the calculation of tax on aggregate post tax revenue does not allow for transparent and disaggregated tax calculations for contributed assets to allow for revenue attribution;
- the model seeks only to solve for NPV over the regulatory period;
- the assumption of intra-year cash flows, which also has some economic flaws (discussed further below); and

[190] Finity Consulting Pty Limited (2012). Review of Self Insurance Risk Premium – Access Undertaking UT4, QR National – Central Queensland Coal Network.

[191] That is, a price cap with triggers to re-open prices if actual volumes deviated from forecast above a specified threshold.

- the escalation of operating costs to end of year dollars and subsequent de-escalation for NPV calculations.

One of the most significant implications of the above is for working capital. An alternative modelling framework is therefore described below.

10.6.2 Proposed modelling framework

The most prominent regulatory model in Australia is the post tax revenue model (PTRM) that was originally developed by the Australian Competition and Consumer Commission (ACCC). This is now maintained by the Australian Energy Regulator (AER) in the revenue regulation of all of the electricity and gas network businesses under its jurisdiction (which are also subject to a revenue cap form of regulation). The PTRM framework is now widely accepted amongst stakeholders. It is open and transparent, with the development and review of the modelling guidelines subject to stakeholder consultation. A copy of the model is available from the AER's website.

A key objective of the *Competition and Infrastructure Reform Agreement* is to establish a consistent national approach to economic regulation of infrastructure[192]. Aurizon Network considers the implementation of a regulatory financial model which more closely aligns to the AER's PTRM is consistent with this objective.

Aurizon Network is therefore proposing to separate revenue and pricing into separate stand-alone (but linked) models, with the revenue model replicating the economic framework of the AER's PTRM. This would have a number of benefits. For example, the Allen Consulting Group has observed:

> "…a simple approach for calculating target revenues, and reliance only on annual forecasts, has significant attractions – it both adds to the transparency of regulatory decision making process, and also reduces the cost of complying with regulatory requirements."[193]

The most significant is that Aurizon Network's revenue model would be aligned with an approach that is understood and well accepted in the market. It would also facilitate wider distribution of the model as it would not contain any confidential information. It would also eliminate the need for a separate working capital allowance.

Apart from the separation of revenue determination from pricing outcomes, the key features of the PTRM that differ from Aurizon Network's existing price and revenue model (referred to here as 'the UT3 model') are as follows.

10.6.2.1 No intra-year cash flows

The UT3 model assumes all costs and revenue occur at the end of the year. The free cash flow (or post-tax revenue) is then discounted by half the WACC based on the assumption that revenue is recovered uniformly across the year and therefore available for reinvestment. Currently, the QCA applies a working capital allowance in recognition of the need to manage these intra-year cash flows.

It should be noted that determination of accurate working capital requirements is inherently complex as the timing of cash flows needs to be considered, thereby imposing administration and compliance costs. Such cash items include tax flows and imputation credits, cost pass throughs, return of capital, interest income, interest payments and dividend payments. In any case, there are some specific economic flaws with this approach.

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[192] COAG (2006) Competition and Infrastructure Reform Agreement, Clause 2.1.
[193] Allen Consulting Group (2002). Working Capital: Relevance for the Assessment of Reference Tariffs, Report to the ACCC, p.10.

First, payments to lenders (debt service payments) are made on a monthly basis throughout the year, rather than a bullet payment at year end. It is therefore not considered appropriate to apply intra-year discounting here (as the revenues that are being applied to these debt service payments are not available for reinvestment).

Second, under the dividend imputation assumptions all remaining cash flows would be paid out to equity holders in the form of semi-annual dividends. Discounting retained earnings after debt servicing by half the WACC does not reflect the dividends paid at half year. That is, the firm does not obtain the benefit of reinvesting the income for the remainder of the year. If discounting is therefore to be applied to the cash flows to equity holders, it should only be at a quarter of the WACC to recognise that the first of the two assumed dividend payments would have to be made half-way through the year.

If the PTRM framework is adopted, no intra-year discounting would be applied. As the working capital allowance has been provided in recognition of the need to manage the cash flow impacts of the intra-year discounting assumption, this will no longer be required. Some of the previous remarks made by the ACCC on the relationship between working capital and intra-year discounting are provided in the Box below.

Australian Competition and Consumer Commission (2004). Draft Decision, NSW and ACT Transmission Network Revenue Cap – TransGrid, p. 32.

"The ACCC considers that a TNSP should be compensated for working capital given that it is an appropriate operating cost for a TNSP. However, the allowed revenue determined by the ACCC's Post Tax Revenue Model provides adequate compensation for any mismatch between the timing of income and expenditure."

Australian Competition and Consumer Commission (2000). Draft Decision, Access Arrangement by East Australian Pipeline Limited for the Moomba to Sydney Pipeline System, p.xiii.

"Rather than model the timing of EAPL's cash flows throughout the year, the Commission assumed in its model that all costs and revenue are incurred on the last day of each year. In reality, EAPL's cash flows would occur at regular intervals throughout the year, giving EAPL a benefit above the regulated revenue equal to the time value of money on the net cash flow received throughout the year. The Commission considered that this benefit more than compensated EAPL for any gap between payments and collections during the year."

Australian Competition and Consumer Commission (2002). Final Approval, Access Arrangement Proposed by Epic Energy South Australia Pty Ltd for the Moomba to Adelaide Pipeline System, p.13.

"The Commission's cash flow modelling errs on the side of the service provider by providing for total revenue that exceeds that which is calculated in a more precise and explicit model. Explicit compensation for working capital in conjunction with the adoption of the PTRM cash flow modelling approach would double count the working capital cost in addition to erring on the side of the service provider."

Australian Competition and Consumer Commission (2002). Final Decision, Access Arrangement Proposed by NT Gas Pty Ltd Amadeus Basin to Darwin Pipeline, p.70.

"The cash-flow model used by the Commission assumes that the service provider receives the share of revenue in respect of capital costs on the last day of the year. As revenue is received over the course of each year, it would be expected that target revenue would overstate the opportunity cost associated with investors' funds and would more than offset any shortfall in the cost of financing operating expenditure (ie the required return on working capital).

The Commission's modelling confirms that NT Gas already receives an advantage as a result of the time value of money under the Commission's cash flow modelling that is significantly greater than the working capital cost.

If NT Gas's cash flow were modelled more precisely (such as on a monthly or a daily basis rather than annually) it would be appropriate to explicitly include the working capital component. As a result, however, the total required revenue for NT Gas would be less than that determined under the Commission's modelling approach. Modelling cash flows on an annual basis results in reduced administration and compliance costs while adding to the transparency of regulation."

Aurizon Network has therefore not included a working capital allowance in its proposed operating expenditure allowance for UT4.

10.6.2.2 Tax is calculated independently

Under the PTRM tax is calculated separately as part of the 'raw' (or unsmoothed) building block revenues. This will make the tax allowance more transparent and materially reduce complexity in the model. Importantly, this will also assist Aurizon Network in attributing revenues to mine specific infrastructure assets that are subject to a rebate agreement, as well as managing any future arrangements entered into under SUFA (where funding users are required to obtain the imputation adjusted tax benefits accruing to that infrastructure).

10.6.2.3 Revenue smoothing

Revenue smoothing is typically applied by regulated energy network businesses to manage any price shocks to end customers (many of which are households) from 'lumpy' network investments. The PTRM addresses this issue by allowing the regulated business to determine the revenue profile through the selection of appropriate revenue escalators. Given the nature of Aurizon Network's end customer base (being mining companies rather than households), it is considered appropriate to have some flexibility in setting the revenue profile over the course of the regulatory period.

10.6.2.4 Capital expenditure

While costs and revenues in the UT3 model are in end of year dollars capital expenditure is written in at mid-year. This is based on the assumption that on average, most capex will be operationally commissioned and providing a service in the middle of the year. The main problem with this approach is that the discounting assumes a full year but only half a year's revenues are received. When assessing the NPV and IRR over the economic life this does not achieve a zero NPV outcome. Aurizon Network's concern is that this will not yield the required NPV over multiple regulatory periods, although this will not be readily apparent because the existing model is only based on ensuring NPV equality over the term of the regulatory period.

The PTRM assumes that capital expenditure is incurred in the middle of the year (on average), with that half year's return capitalised into the opening asset value at the start of the following year. This approach may not be compatible with user funding to the extent that this requires the payment of revenues in the same year the asset is commissioned. It is also not consistent with establishing a new reference tariff, which requires an identified revenue stream in the year of operational commissioning.

Aurizon Network proposes to address this by assuming that the asset is written into the value of the asset base at the beginning of the year, with no depreciation in the year of commissioning. This option achieves a full year's return on asset and is likely to generate revenues proportional to a mid-year write in date as currently applies. The return on assets also monetises the interest during construction (IDC) costs that would otherwise be included in the RAB (IDC would only be calculated up to the start of the year of commissioning as opposed to the middle of the year as is current practice). The variation in first year cash flows between the UT3 and the proposed UT4 approaches is dependent on the assumed asset life and rate of return. The following table show the cash flow variation between the two approaches as a percentage of the RAB value.

Table 98 First Year Cash Flow Differences between Mid and Start of Year RAB Write in Dates (as a percentage of the RAB value)

Economic Life	Weighted Average Cost of Capital					
	7.50%	8.00%	8.50%	9.00%	9.50%	10.00%
20	-0.2%	0.1%	0.3%	0.5%	0.7%	1.0%
21	0.0%	0.2%	0.4%	0.6%	0.9%	1.1%
22	0.1%	0.3%	0.5%	0.8%	1.0%	1.2%
23	0.2%	0.4%	0.6%	0.9%	1.1%	1.3%
24	0.3%	0.5%	0.7%	0.9%	1.2%	1.4%
25	0.4%	0.6%	0.8%	1.0%	1.3%	1.5%
26	0.4%	0.7%	0.9%	1.1%	1.3%	1.5%
27	0.5%	0.7%	1.0%	1.2%	1.4%	1.6%
28	0.6%	0.8%	1.0%	1.2%	1.5%	1.7%
29	0.6%	0.9%	1.1%	1.3%	1.5%	1.7%
30	0.7%	0.9%	1.1%	1.4%	1.6%	1.8%

The approach however does provide a greater degree of flexibility than the AER PTRM model in that if the first year revenue is too high relative to the timing of the commencement of the applicable trains services and the volume profile, it is possible to capitalise a proportion of the first year return on assets into the opening RAB value for the following year to achieve a required target revenue. As the model does not include part-year depreciation it maintains consistency in the discounting of cash flows to achieve the required NPV and IRR outcomes.

10.6.3 UT4 proposal

Aurizon Network has submitted separate revenue and pricing models to the QCA, with the revenue model based on the key assumptions reflected in the AER's PTRM. This also avoids the need for the provision of a separate working capital allowance in the operating expenditure proposal.

10.7 Tax depreciation

Tax depreciation forecasts have been prepared in accordance with Aurizon Holdings Limited's statutory requirements under the *Income Tax Assessment Act 1997* and the *Income Tax Assessment Act 1936.*

The tax depreciation forecasts are also based on the capital expenditure amounts that are expected to be approved by the QCA for 2011/12 and the expected capital expenditure claim for 2012/13.

The tax depreciation forecasts are obtained from SAP records in relation to assets included in the RAB and adjusted for amounts optimised by the QCA in the approvals process. With respect to assets in the RAB in the original valuation there is a margin of error in relation to the complete and accurate reconciliation of the RAB with the fixed asset register. This is reflective of the methodology used to derive and establish the original DORC valuation. However, Aurizon Network notes that tax values for identified assets installed prior to 2001 is less than $60 million. Accordingly, even if there is a 5% error in the identification of RAB assets in the Fixed Asset Register this would not result in a material impact on the tax allowances in the regulatory financial model.

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Appendix B – Aurizon Holdings Limited Functional Support Areas

Business Sustainability

Business Sustainability will develop, coordinate and implement a Transformation Program to deliver fundamental change in business process and practice, lifting Aurizon Holdings Limited to world's best practice.

Enterprise Real Estate

Capital transactions

Manage real estate acquisitions and divestment

Deliver divestment program

Plan land acquisition

Lead expansion of corridor land

Facilities management

Facilities management strategy

Aggregate and manage service providers

Risk, safety and compliance

Manage cost of services

Portfolio

Long and short-term strategies for Real Estate assets

Aggregate and rationale portfolio footprint

Head Office strategy and workplace management

Reporting framework and property database

Strategy & Governance

Policies, procedures and guidelines for Real Estate use

3-5 year property plans

Plans for significant landholdings

Housing strategy

Enterprise Effectiveness

Design, develop & manage Executive Leadership Team meeting forums including inputs, outputs, agendas, supporting systems & processes

Develop & manage the Management Leadership Team agendas, content & processes

Increase effectiveness of Quarterly Business Review processes & structures

Operational Excellence

Provide Business Improvement, Collaboration Engineer and Project Management skills, tools and expertise to enterprise – ie focus on collaborative behaviours and key integration points, cost reduction and operating efficiency.

Oversight and drive project-specific outcomes for strategic, growth and key operational projects

Inbound supply chain management improvement – focus on operations efficiencies within Operations and Network.

Enterprise Services

The Enterprise Services team is the provider of proficient enterprise-wide professional, advisory and governance services.

Information Technology

Day to day management of all information, and business systems

Deliver information and business systems in line with strategy and governed by the IT Steering Committee

Responsible for the effectiveness of investment in IT

Leverage and prioritise IT investment

Standardisation of enterprise application capability

IT infrastructure, technical design, customer support, telecoms and security.

Design, implementation and maintenance of online, integration, core and legacy systems.

Financial, commercial and governance IT arrangements

IT compliance, risk and policies

Company Secretary

Ensure compliance by Aurizon National and its subsidiaries with the statutory obligations specified under the Corporations Act and the governance requirements set out in the ASX Listing Rules

Prime interface between the Board and Management

General Counsel

Identify/advise on legal obligations, exposure and potential liability to Management and the Board

Responsible for placement of Aurizon National's insurance coverage and management of claims

Management of workers' compensation claims, as well as common law and personal injury claims and litigation

Enterprise Risk Management

Provide an enterprise wide services and approach to risk management and legal compliance

Monitor/support risk management practices

Risk training and coaching

Enterprise risk reporting

Internal Audit

Provide independent and objective assurance to Management and the Board on the adequacy of governance, risk management and internal control systems

Develop risk based annual audit plan

Manage the investigations of alleged fraud and corruption

Conduct audits

National Policy

Propose Aurizon National policy positions (pertaining to transport and logistics sectors) to influence industry and public policy formulation

Support internal alignment to policy positions

Provide economic regulatory support to Aurizon functional groups

Position Aurizon National as a respected voice in industry and public policy

Represent Aurizon National enterprise level concerns and requirements to national and state regulators

Enterprise Records Management

Records management strategy and framework development, and implementation

Implementation of effective enterprise records management systems

Enterprise Procurement

Procurement transformation program

Procurement strategy

Enterprise-wide procurement/ sourcing

Procurement capability building

Supplier relationship management (SRM)

Procure to pay (P2P)

Manage the national network of local procurement officers

Supplier contract management

Finance

The Finance team is responsible for the protection and value add of Aurizon National through high quality, timely financial information to enable the best decision making internally and benchmark reporting to external stakeholders.

Finance Partner Marketing and Operations

Provision of financial and commercial support to the Marketing function, focused on Coal and Bulk

Provision of financial and commercial support to the Operations function, focused on integrated planning, regional support, maintenance and engineering

Provision of financial and commercial support to the Strategy & Business Development functions

P&L analytical support focused on Iron Ore & Intermodal

Network Finance and Regulation

Provision of financial and commercial support to the Network function

Enterprise Planning, Reporting & Services

Manage an integrated framework to maximise total shareholder returns

Align KPIs across the organisation

Customer, corridor, product & consolidation planning and reporting (P&L, cash flow, & Balance sheet)

Statutory and management (Board) reporting

Balance sheet and cash flow analysis

Finance governance framework

Corporate plan and reforecast

Accounts Payable, credit services, card services, Fixed Assets, Payroll

Financial support for non-operational functions

Investor Relations

Providing the investor community with an accurate portrayal of Aurizon performance and plans through investor relationship management and investors communications and presentations

Mergers & Acquisitions

Providing governance and specialised M&A skills to optimise transaction outcomes for Aurizon.

Tax

Tax compliance and strategy to minimise cash tax and tax expense, comply with the law and maximise franking credits for shareholders, including: tax accounting, forecasting, advice and planning, policies and procedures and risk management.

Treasury

Providing liquidity, cash management and financial risk management advice and protect and support AurizonN financial and operational objectives

Facilitate Balance sheet optimisation

Funding relationships with banks

Financial risk management

Treasury accounting, reporting and compliance

Treasury risk management systems, policies and procedures

Capital Excellence

Manage investment framework

Independent peer review & post implementation review

Investment risk

Capital portfolio optimisation

Capital plan, forecast, expenditure reviews & reporting

Capital Value Maximisation methodology, process, tools & training

Human Resources

The HR team is responsible for establishing a national function that defines workforce skills, capabilities, behaviours, and how the workforce should be sourced, engaged, remunerated and managed to best support and execute the Enterprise strategy.

Talent & Organisational Development

HR Strategy

Organisational structure & design

Organisational culture

Employee engagement

Change management

People systems integration and design

Talent & succession management

Leadership pipeline & development – all layers

Capability development

Resourcing & Services

Deliver end to end recruitment and employment function – including recruitment, contract administration and inductions

Workforce planning systems, analysis and reporting

Career transition management

Majors skills program (includes apprentices, trainees and graduates)

Diversity program

Remuneration & Support

Salaried remuneration program

Remuneration analytics

Remuneration consulting to Board

Organisation wide performance objective & measurement framework

Functional delivery of HR service for the consolidated services:

- Marketing
- HR
- Finance
- Business Sustainability

Employee Relations

Employee relations strategy & management support

Industrial negotiations, implementation and evaluation

Advocacy

Dispute resolution

Policy development and compliance

Union consultation and relationships

Functional HR Management – Operations, Strategy and Business Development, and Network

Functional delivery of HR services

HR strategy implementation

Strategic business partnership

External Relations & Communications

Media and external relations

Corporate sponsorship and events

Stakeholder relations management

Corporate affairs

Organisational communication

Community engagement

Branding

Manage and protect the value of the Aurizon National brand on behalf of the enterprise

Develop, deliver and manage enterprise marketing communications that are consistent, effective and support our brand positioning

Strategy

The Strategy are responsible for the design, development and articulation of the enterprise strategy, securing significant growth options for Aurizon National. It also includes the incubated Iron Ore and Intermodal businesses. Only costs in relation to Enterprise Strategy are relevant to the Network business.

Enterprise Strategy

Conducts necessary strategic analysis to develop enterprise strategy

Development of enterprise and portfolio strategies

Assist, guide and develop functional strategies

Strategy feed into integrated planning

Competitor result/strategy analysis

Portfolio strategy development

Macroeconomic trends

Integrated strategy and planning systems

Innovation

Provide long term strategic advice to the Managing Director & CEO and the Board by championing different thinking across the organisation

Improve innovation capability

Develop world class commercialisation

Aurizon Operations

The Operations function is responsible for the national delivery of all coal and bulk haulage services, yard operations and maintenance, fleet maintenance and engineering services. Operations is comprised of five divisions that leverage Aurizon's key operational capabilities by bringing together several teams from former business units including Coal, Freight, Operational

Excellence and Network Services.

The Operations divisions include the National Operations Centre, Rollingstock Maintenance, Engineering Services, Service Delivery Coal Markets and Service Delivery Bulk Markets. The Operations function employs approximately 5000 people throughout Queensland, New South Wales and Western Australia.

National Operations Centre

The National Operations Centre manages Aurizon's above rail daily logistics with responsibility for the 24 hour above rail Service Delivery Centres in Brisbane, Townsville, Jilalan and Rockhampton.

The Centre provides oversight for train deployment, live run management and network interaction around the clock.

Collaborates with Marketing's Commercial and Planning division to ensure rollingstock allocation, maintenance and network performance enables QR National to deliver for our customer.

Rollingstock Maintenance

National delivery of reliable rollingstock and yard assets into service with assured technical integrity.

Management of approximately 30 facilities in Queensland, New South Wales and Western Australia.

Maintenance Depot Operations providing regional based preventative maintenance, component exchange and light repair functionality.

Heavy Workshop Operations providing major rollingstock and component refurbishment, fabrication and heavy repair project delivery.

Engineering Services

Engineering services provides a range of specialist services in rollingstock design, program delivery and field support to the Operations Function.

Fleet Strategy and planning are managed in accordance with defined performance criteria to ensure rollingstock solutions are commissioned in time for reliable revenue service.

Rollingstock performance standards are implemented and maintained through the application and refinement of Asset Management and Reliability Systems in accordance with strict governance protocols.

Service Delivery Coal Markets

Our coal operation is the world's largest rail transporter of coal from mine to port for export markets and transports approximately 200 million tonnes of coal per annum.

Operation of allocated rollingstock in Coal North, Coal South and NSW regional corridors.

The Service Delivery team is responsible for crewing assigned trains, yard operations and planning, train provisioning and maintaining traction, route and safe working competencies.

Service Delivery Bulk Markets

Freight transports approximately 60 million tonnes per annum of bulk minerals and commodities including iron ore, agricultural products, mining and industrial inputs and general and containerised freight.

Operation of allocated rollingstock in Bulk North, Bulk South and Western Australian regional corridors.

The Service Delivery team is responsible for crewing assigned trains, yard operations and planning, train provisioning and maintaining traction, route and

Safety, Health & Environment

Transform Safety, Health and Environmental Management systems

Manage Aurizon's accreditation (i.e. rights and authorities to operate)

Management of Safety, Health and Environmental resources for the enterprise

Environmental sustainability

Carry out day to day environment work

Environment systems governance and assurance frameworks

Environment licences

Environment reporting for CSC, Board and regulators

Systems and Governance

Safety and health systems, governance and assurance frameworks

Rail, WHS and licences

Training accreditation frameworks

Safety performance reporting for CSC, Board and regulators

Safety and Health Network

Carry out safety and health work

Day to day safety performance

Incident/injury management

Safety performance reporting

Operational and safety technical training delivery

Appendix C – Marketable Reserves at 1 July 2013

UT4 Mining Operation	Region	Marketable Reserves (tonnes)
Arcturus	Blackwater	44,300,000
Baralaba	Moura	32,650,000
Blackwater (Kinrola & Boorgoon)	Blackwater	471,150,000
Blair Athol / Clermont	Northern Bowen Basin	168,250,000
Boonal / Jellinbah East (Boonal)	Blackwater	45,405,000
Boundary Hill	Moura	128,940,000
Burton	Northern Bowen Basin	23,400,000
Byerwen	Northern Bowen Basin	302,500,000
Carborough Downs	Northern Bowen Basin	33,043,227
Caval Ridge	Northern Bowen Basin	153,000,000
Collinsville / McNaughton	Northern Bowen Basin	48,195,500
Colton (Maryborough)	Blackwater	5,875,000
Cook (Koorilgah) / Koorilgah	Blackwater	15,300,000
Coppabella	Northern Bowen Basin	25,300,000
Curragh	Blackwater	181,550,000
Dawson	Moura	220,250,000
Drake	Northern Bowen Basin	119,000,000
Ensham / Yongala	Blackwater	111,000,000
Foxleigh (German Creek)	Northern Bowen Basin	43,050,000
German Creek / Lake Linsday/German Ck	Northern Bowen Basin	82,310,000
Goonyella / Riverside	Northern Bowen Basin	564,000,000
Gregory	Blackwater	43,150,000
Hail Creek	Northern Bowen Basin	61,000,000
Isaac Plains	Northern Bowen Basin	27,050,000
Kestrel	Blackwater	116,327,500
Lake Linsday	Northern Bowen Basin	50,850,000
Lake Vermont / Vermont	Northern Bowen Basin	183,000,000
Middlemount	Northern Bowen Basin	49,200,000
Millennium Coal	Northern Bowen Basin	28,200,000
Minerva	Blackwater	13,190,000
Moorvale	Northern Bowen Basin	11,025,000
Moranbah North	Northern Bowen Basin	121,975,000
Newlands	Northern Bowen Basin	82,190,000

North Goonyella	Northern Bowen Basin	119,100,000
Norwich Park	Blackwater	57,000,000
Oaky Creek	Blackwater	93,330,100
Peak Downs	Northern Bowen Basin	513,000,000
Poitrel (Daunia)	Northern Bowen Basin	174,850,000
Rolleston / Togara	Blackwater	434,750,000
Saraji	Northern Bowen Basin	336,600,000
Sonoma	Northern Bowen Basin	16,050,000
South Walker Creek	Northern Bowen Basin	159,600,000
Washpool	Blackwater	108,200,000
Yarrabee (Boonal) / Yarrabee (loading from Curragh)	Blackwater	40,225,000

Source: WoodMackenzie

Appendix D – System Allocations

Cost Centre	Description	Allocator Basis	System	2013/14	2014/15	2015/16	2016/17
TRAIN CONTROL							
1900026	TRAIN CONTROL ROCKHAMPTON	Tonnes	BLACKWATER	26.8%	27.1%	28.3%	28.9%
1900027	TRAIN CONTROL MACKAY		GOONYELLA	48.8%	48.3%	47.5%	46.6%
			NEWLANDS	7.7%	7.4%	7.2%	7.4%
			MOURA	6.2%	6.1%	5.5%	5.6%
			GAPE	10.5%	11.1%	11.5%	11.5%
1902082	GOONYELLA COAL CHAIN	Tonnes Goonyella & Newlands	GOONYELLA	86.4%	86.7%	86.9%	86.3%
			NEWLANDS	13.6%	13.3%	13.1%	13.7%
1902083	CAPRICORNIA COAL CHAIN	Tonnes Blackwater & Moura	BLACKWATER	81.1%	81.6%	83.8%	83.8%
			MOURA	18.9%	18.4%	16.2%	16.2%
1906075	PLANNING & PRODUCTION SOUTH	Tonnes	BLACKWATER	26.8%	27.1%	28.3%	28.9%
1906593	PLANNING & PRODUCTON NORTH		GOONYELLA	48.8%	48.3%	47.5%	46.6%
			NEWLANDS	7.7%	7.4%	7.2%	7.4%
			MOURA	6.2%	6.1%	5.5%	5.6%
			GAPE	10.5%	11.1%	11.5%	11.5%
1900604	COAL YARDS CALLEMONDAH	Yards	BLACKWATER	100.0%	100.0%	100.0%	100.0%
1901054	COAL YARDS MACKAY	Yards	GOONYELLA	100.0%	100.0%	100.0%	100.0%
1902824	INTEGRATED BUSINESS SYSTEMS	75% Tonnes	BLACKWATER	29.5%	29.8%	30.6%	31.1%
		25% Maintenance Costs	GOONYELLA	47.2%	46.6%	46.3%	45.5%
			NEWLANDS	7.7%	7.5%	7.3%	7.5%
			MOURA	7.1%	7.0%	6.5%	6.6%
			GAPE	8.5%	9.1%	9.3%	9.3%
INFRASTRUCTURE MANAGEMENT							
1902819	GENERAL MANAGER ASSETS	75% Tonnes	BLACKWATER	29.5%	29.8%	30.6%	31.1%
1902820	COMMERCIAL	25% Maintenance Costs	GOONYELLA	47.2%	46.6%	46.3%	45.5%
1902821	TRACK & CIVIL SYSTEMS		NEWLANDS	7.7%	7.5%	7.3%	7.5%
1902822	SIGNALLING AND CORRIDOR SYSTEMS		MOURA	7.1%	7.0%	6.5%	6.6%
1906206	ASSURANCE		GAPE	8.5%	9.1%	9.3%	9.3%

1906241	NETWORK TRACK & CIVIL ASSETS
1906243	NETWORK ASSETS ASSURANCE
1900578	TELECOM BACKBONE

1902823	ELECTRICAL ASSETS	50% EGTKs	BLACKWATER	38.4%	43.1%	42.2%	42.1%
1902805	NETWORK ASSETS	50% Maintenance Costs	GOONYELLA	51.6%	46.9%	47.8%	47.9%
1906205	ASSET STRATEGY		NEWLANDS	3.8%	3.8%	3.8%	3.8%
1906242	NETWORK ELECTRICAL ASSETS		MOURA	4.8%	4.8%	4.8%	4.8%
			GAPE	1.4%	1.4%	1.4%	1.4%