Prepared for

Queensland Competition Authority

Subject

A preliminary view: Regulatory economics assessment of the proposed Western System asset valuation approaches

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8 April 2015

UniQuest Project No: C02173

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A Preliminary view

Regulatory economics assessment of the proposed Western System asset valuation approaches

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EXECUTIVE SUMMARY

I have been engaged to provide an independent opinion on the extent to which the asset valuation approaches that have been canvassed for Queensland Rail's Western System network are consistent with the economic principles embedded in the QCA's legislative framework. In particular, I will consider the DAC (depreciated actual cost) and DORC (depreciated optimised replacement cost) approaches proposed in the QCA's Consultation Paper, and the DORC approach proposed in the QCA's draft decision (October 2014). As explained in Section 1 below, a key difference between the DORC approaches in the consultation paper and in the draft decision is that the latter proposes to place zero value on assets whose actual life has exceeded their expected useful life.

My preliminary view, based on the reasons outlined below, is that both the proposed DAC approach and the DORC approach – placing zero value on assets with an expired expected life – are likely to satisfy the QCA's statutory requirements to promote the economically efficient operation of the Western System, to provide incentives for QR to efficiently invest in the network and to promote competition in relevant markets.

As I explain in this report, it is unlikely that a single asset valuation method (or a single initial value) will satisfy the QCA's statutory obligations. Given the trade-offs involved in achieving allocative, productive and dynamic efficiency, different valuation approaches will likely resolve these trade-offs differently but may still be appropriate for fulfilling the QCA's statutory obligations.

Roughly speaking, and this will be made more precise in the report below, a DAC approach can be seen as yielding the lowest tariff that may be consistent with allocative and productive efficiency, allowing QR to recover the costs of infrastructure that is directly linked to the transport of coal. In a similar vein, the DORC approach of the draft decision can be seen as yielding the highest tariff that may be consistent with allocative, productive and dynamic efficiency. However, as I explain in Section 3.1 below, these two approaches have advantages and disadvantages and there is no clear cut way to choose between them.

However, in my view the DORC approach put forward in the discussion paper, which values assets whose actual life has exceeded their expected useful life, is not appropriate as it would yield QR windfall gains. As expounded in Section 3 below, allowing QR to earn windfall gains is not necessary for ensuring that it has incentives to invest in the network and could potentially impact competition in relevant markets.

This report is organised as follows. Section 1 provides the wider context in which the proposed asset valuation approaches are to be considered, while Section 2 relates the QCA's statutory obligations to economic principles. Section 3 proposes a simple conceptual framework to aid understanding of the role played by initial asset values in regulatory regimes and, in particular, to provide a framework that can be used to assess the advantages and disadvantages of the DAC and DORC approaches. In turn, Section 4 briefly reviews Australian and international regulators' approaches to setting initial asset values. Finally, in Section 5 I provide my preliminary assessment of the proposed approaches.

1. THE CONTEXT

Queensland Rail (QR) is a statutory authority that owns and operates an 8,000 kilometre rail network. The services provided by QR's intra-state rail network are subject to the third party access provisions of the *Queensland Competition Authority Act 1997* (the QCA Act).

The entire below-rail (track) network is subject to the 2008 access undertaking (AU), which was approved by the QCA for the then QR Network, and amended in June 2010. However, a reference tariff only exists for the Western System that transports coal from mines on the Darling Downs to the Fisherman Islands export terminal at the Port of Brisbane. Following its separation from Aurizon Holdings in 2010, QR is seeking to replace the 2008 AU.

Broadly speaking, the reference tariffs ought to allow QR to recover the efficient costs of providing the coal train services on the Western System. Under the building blocks approach that prevails in Australia, these costs include a return on capital and a return of capital (depreciation) and operating costs. The return on capital is determined by defining both the value of the regulated assets and a rate of return.

The Western System was built in the 1860s to connect Brisbane to the agricultural districts of the Darling Downs. Coal export rail services from the Darling Downs coalfields west of Toowoomba began in 1996–97.

As noted by B&H in its September 2014 report, the system was built when construction methods were rudimentary by today's standards, and the line has only relatively recently started to haul large volumes of coal. While QR has upgraded components of the infrastructure, the system was not built for the purpose of carrying heavy-haul coal services, unlike other coal haulage lines in Queensland. This has an important implication for the implementation of a DORC methodology. As discussed in Section 3.1 below, this implies that a new (optimised) railroad would necessarily be very different from the existing network, making it very difficult to determine how to depreciate the optimised new network to reflect the existing configuration of assets.

The Western System reference tariff, established by an approved undertaking since 2006, was never calculated on the basis of a settled asset value. While the existing tariff is based on a draft asset value that was included in the QCA's December 2009 draft decision, QR Network objected to key aspects of the QCA's proposed asset valuation. (For details, see the QCA's draft decision at Chapter 8, Section 8.3 and Appendix C, October 2014).

Over the last three years, QR has submitted three different versions of a Draft Access Undertaking (DAU). QR withdrew the previous two DAUs to address stakeholders' concerns. The last DAU (June 2013) included a proposed reference tariff for coal train services on the Western System, which also faces objections from stakeholders.

Queensland Rail's 2013 DAU by and large sought to roll forward the asset value in the 2009 draft decision with some changes. In light of the failure to agree on a valuation in previous determinations and stakeholder submissions questioning the valuation proposed by QR in its 2013 DAU, the QCA decided to reconsider the opening value of the Western System assets.

In its June 2014 consultation paper, the QCA sought advice from stakeholders on two distinct asset valuation approaches. Under the first approach, asset values would be based on historical costs (DAC) since 1995 and allocated 100 per cent to coal transportation services. The second approach entailed using a DORC methodology that would allocate assets between coal and non-coal services based on the fraction of train paths they used.

Taking into account stakeholders' submissions and its statutory obligations, the QCA's draft decision proposed to use a DORC methodology to set asset values adjusted so that it places zero value on assets whose actual life has exceeded their expected useful life.

The aim of this report is to assess the various proposed approaches to value the assets of the Western System from the point of view of regulatory economics principles. Particular emphasis is placed on how the proposed approaches relate to the economic principles embodied in the QCA's statutory obligations.

2. THE QCA'S ASSESSMENT CRITERIA AND ECONOMIC PRINCIPLES

Section 138(2) of the QCA Act specifies overarching criteria to be considered by the QCA when deciding whether to approve the valuation of QR's Western System network as part of a DAU. One of the criteria to be taken into account is the object of Part 5 of the Act, 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.*

In economics parlance, Part 5 aims to promote allocative, productive and dynamic efficiency. Of course, in industries characterized by sunk costs, lumpy capacity and demand uncertainty, these concepts may diverge. For example, while allocative efficiency requires prices to be closer to the marginal or incremental costs, dynamic efficiency requires prices to cover average costs.

This suggests that the regulator is bound to balance potentially conflicting objectives. This balancing act goes even further. For example, Section 138(2) of the Act directs the regulator to explicitly consider the legitimate business interests of the owner or operator of the service, the public interest, the interests of persons who may seek access to the service, and the effect of excluding existing assets for pricing purposes. The QCA also needs to satisfy the pricing principles established in Section 168A of the Act. These require that the access price:

- *a) 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;*
- *b) allow for multi-part pricing and price discrimination when it aids efficiency; not allow a related access provider to set terms and conditions that discriminate in favour of the downstream operations of the access provider or a related body corporate of the access provider, except to the extent the cost of providing access to other operators is higher; and*
- *c) provide incentives to reduce costs or otherwise improve productivity.*

The different interests of users as defined by Section 138 may at times be in conflict and the application of the pricing principles established in Section 168A also entails trade-offs. It is a matter for the QCA how it balances potentially conflicting objectives.

The economic aims of the objects clause and the pricing principles will be used in my assessment of the appropriateness of various methodologies to determine the initial value of the regulatory asset base.

3. A CONCEPTUAL FRAMEWORK

This section develops, from first principles, a conceptual framework that I will use to assess how well the different approaches to asset valuation meet the regulatory objectives.

The conceptual framework is centred on a simple example. Thus, by construction, this example is a stylised, simplified representation of the economic issues faced by the regulated company, access seekers, access holders and the regulator. However, this example will allow me to explore the issue of asset valuation in the wider context of the regulator's decision.

The starting point for this simple example is to consider an unregulated firm that invests a dollar amount I at the beginning of time period 1. This investment involves the purchase of a single asset that is used to provide a service for two periods only, and D_1 and D_2 denote the depreciation (loss in value of the asset) at the end of the first and second periods, respectively.

The service is an input to the production of a final good. The rate of inflation in this example is equal to zero and there are no operating costs. The firm's cost of capital is equal to ρ and its rate of return equal to r. If we refer to the book value of the asset at the beginning of periods 1 and 2 by B_1 and B_2, respectively, this situation can be depicted as follows:

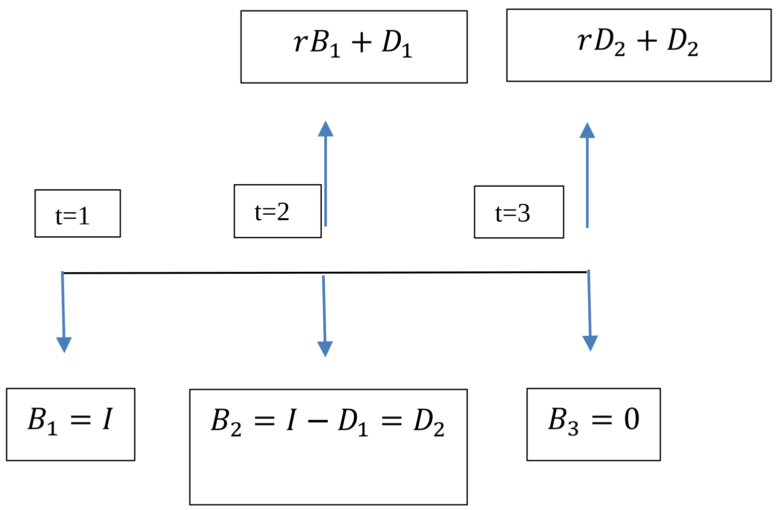

Figure 1 The Investment Decision.

As illustrated above, at the end of period 1, the firm earns a return on its opening book value plus depreciation. At the beginning of period 2, the firm's book value is simply the difference between the opening book value and period 1 depreciation. It follows that at the end of period 2 the firm earns a return on its revised book value plus depreciation. In this example, the book value is equal to zero at the end of period 2, when the life of the asset expires.

In an unregulated market, the firm undertakes the investment I as long as its net present value (NPV) is greater than or equal to zero:

$$(1)\ NPV = -I + \frac{rI + D_1}{1+\rho} + \frac{rD_2 + D_2}{(1+\rho)^2} \geq 0.$$

The rate of return earned by the firm is what the market can bear. Broadly speaking, economists argue that if the output market is perfectly competitive, and access to capital markets is unconstrained, this firm will earn a rate of return that is equal to its cost of capital, yielding a zero NPV.

We now turn to the case of a regulated firm. The standard rationale for the introduction of price regulation is the existence of a natural monopoly, typically in a normative sense; the industry's unit cost is minimised when the entire market is served by a single firm. Price regulation is then used to restrict the ability of a monopolist to raise prices to a level that is detrimental to social welfare.

This simple example suggests that the price setting process requires the regulator to come to a view about the value of the assets, depreciation and the allowed rate of return. These are some of the building blocks, along with operating costs, which will determine the maximum allowable revenue for the regulated businesses under the building blocks approach widely used by Australian regulators. Maximum prices (price caps) are then backed out based on some estimate about demand so that the price cap times the estimated quantity is equal to the maximum allowable revenue. Alternatively, the regulator may set a revenue cap.

In practice, of course, the regulator's problem is considerably more complicated than what was suggested in the above paragraph. There are multiple assets with different life spans and potentially different depreciation schedules. Moreover, the existence of asymmetric information – with regulated firms knowing more about the state of their assets and opportunities to decrease costs or provide better services than the regulator – introduces additional constraints on regulators.[1]

[1] See, for example, the QCA's recent discussion paper on incentive regulation available at http://www.qca.org.au/getattachment/739ec863-a226-4c4a-a97d-c972c6f5899b/Incentive-Regulation-Discussion-Paper.aspx.

While the focus of this report is on asset valuation, the example above can be used to illustrate a couple of points that are relevant in understating how asset valuation interacts with other features of the regulatory regime.

First, if the regulator uses the book value to determine the value of regulated assets as in the example above, and sets the allowed rate of return equal to the firm's cost of capital, then equation (1) becomes:

$$(2)\ NPV = -I + \frac{\rho I + D_1}{1+\rho} + \frac{\rho D_2 + D_2}{(1+\rho)^2}.$$

As $I = D_1 + D_2$, simple algebra can be used to show that (2) implies that $NPV = 0$. This is a well-known result in regulatory economics, formalised among others by Schmalensee (1989)[2]; that if a regulated firm is allowed to earn its actual (nominal) one-period cost of capital on the depreciated original cost of its investments, and if actual earnings equal allowed earnings, then the net present value of all investments is zero for any method of computing depreciation and the regulated firm should be indifferent between depreciation profiles.[3]

However, the relevance of this result for the case at hand is to highlight that there is a continuum of asset valuations, depreciation schedules and allowed rates of return that will satisfy $NPV = 0$ without distorting the firm's investment decision (although they will likely be associated with different levels of allocative efficiency).

Equation (2) can also be used to make another point that is relevant to the case at hand. Suppose that the regulator sets the regulatory asset base at book value, the allowed rate of return at the firm's cost of capital, and uses a standard depreciation schedule. In the example above, there was no distinction between nominal and real rates as price increases (inflation) were assumed away. In practice, however, regulatory asset values and other costs are adjusted, usually annually, to account for inflation. For example, QR's reference tariff is adjusted annually to account for the effect of inflation on costs. However, it is very unlikely that the input prices built into the regulatory asset values will increase precisely by the general rate of inflation. This means that even if the original regulatory choices were in some sense accurate, it is unlikely

[2] R. Schmalensee (1989), 'An Expository Note on Depreciation and Profitability,' *Journal of Regulatory Economics Vol. 1*, pp. 293-298.

[3] There may, however, be other reasons for having specific depreciation patterns for a congestible facility. For example, the depreciation charged should be higher during years when the asset is used to capacity and lower when there is excess capacity to maximise allocative efficiency. See, for example, W. Baumol (1971), 'Optimal Depreciation Policy: Pricing the Products of Durable Assets.' *The Bell Journal of Economics and Management Science*, Vol. 2, pp. 638-656.

that they will yield a $NPV = 0$ and may result in either over or under recovery of costs. The general point here is that asset valuation interacts with other features of the regulatory system in a non-trivial way.

In summary, it is unlikely that there will be a single asset value that will be appropriate to fulfil the regulatory objectives of ensuring that the firm recovers the efficient costs of providing the service, and promoting allocative and productive efficiency. This is either because there are multiple combinations of asset values, depreciation, rates of return and other features that achieve these objectives, or because even if it were possible to set asset values accurately in some sense, other features of the regulatory regime would result in either over or under recovery of costs. I now turn to the issue of how to set the initial asset value and again refer to the simple example above to expound some key economic principles.

3.1 Determining the initial asset value

In the example above, the regulator has set the asset value at its book value. As long as the capital expenditure has passed some efficiency test, doing so promotes the regulatory objective of allowing the firm to recover efficient costs. For new capital expenditures, this is indeed by and large what regulators in Australia and around the world do.

However, a key issue arises when assets have to be valued (or revalued) for regulatory purposes after the initial investment has already been made. In unregulated markets, asset values are simply determined by the market – and reflect expectations about earnings that may be generated by the assets – and book value becomes irrelevant.

In contrast, in regulated markets, asset values are a key component of the determination of the firm's revenue and, therefore, cannot be determined by estimating expected revenue. Instead, the regulator or sometimes the government has to decide what the initial value should be.[4] Typically this initial value is then rolled over for the next regulatory period, when new capital expenditure (tested for efficiency) is added to the regulatory base and depreciated assets excluded from it.[5]

[4] Note that in many instances, especially in the case of government-owned companies that were corporatised and subjected for the first time to an independent regulator, book values were simply not available to be used to set initial asset values.

[5] The rollover of the (indexed) initial asset value to future regulatory reviews, however, is not ubiquitous. For example, in industries subject to substantive technological change (such as telecommunications), regulators often revisit initial valuations to avoid consumers bearing the full costs of stranded assets. In the context of the regulation of firms that have been privatised with a market value lower than their current book values, UK regulators have applied a discount to the allowed rate of return in the first review following privatisation. Such a discount is based on the ratio of the market value to the book value. This approach has a similar effect to reducing the initial asset value

Thus, over time, the value of the initial capital base will become irrelevant. Of course, given the importance of capital costs in determining the maximum revenue that the regulated business can earn from users and the long life of assets, the financial impact of different initial regulatory asset values on the regulated firm will be substantial, have lasting effects and, as a result, be controversial.

In the next section I provide a brief review of how regulators in Australia, including the Queensland Competition Authority, have determined initial asset values in practice. Here instead I focus on basic economic principles that underpin the choice of an appropriate initial asset value.

The starting point of the analysis is that of a facility (consisting of a combination of existing assets but facing zero operating costs), which originally cost *I* to build, and can only be used to provide one unit of an input in the production of a single good that is sold in a final goods market. If not used as an input, this facility has no other use and its scrap value is denoted byV_S. Now suppose that perhaps due to existing IP or mining rights, there is only one potential user of the facility and this user can produce at most one unit of output which it sells in the output market at price P. This strategic situation is known in the economic literature as bilateral monopoly.

Operating costs to produce the final good are normalised to zero, so if the user pays an access fee equal to A, her profits are equal to $P - A$. Further, the user can build a facility to provide the same services at a one-off cost of $V_R > V_S$. It is assumed that V_R is the cost to build a modern equivalent of the existing facility at the least cost possible to provide the same services as the existing facility and that V_R is less than P (so the user can profitably build another facility).

Determining A in this example boils down to agreeing on an initial value of the assets. The access fee is simply equal to the initial value of the assets. Note that in this example, the sunk nature of the investment means that whether or not the firm can recover I (that is, whether $A > I$) is irrelevant for future investment decisions.

Economic principles suggest that, in the absence of price regulation, negotiation between the parties, if successful, will result in an access price A in the following interval:

$$V_S \leq A \leq V_R$$

to reflect the lower market valuation. I will return to this example later when discussing the appropriateness of allowing regulated firms to earn windfall gains.

The access provider would not accept any access fee lower than the scrap value and the access seeker would not agree to pay more than the cost of building a new facility, which provides the same services as the existing one.

In this instance, we would expect parties to agree on an access price in the interval above.[6] Whether the access price is closer to V_S or V_R will depend on the negotiating skills of the two parties. Such a price will be efficient as it avoids the situation where the access seeker bypasses the lower cost existing facility.

However, there are reasons why an agreement may not be reached even though it is efficient to do. For example, when each party is uncertain about the value of her counterpart (V_S or V_R), negotiations may break down. This may happen, for example, if the access provider has an excessively optimistic view about the access seeker's maximum willingness to pay.[7] Negotiations can also fail when there are multiple access seekers as the strategic nature of the interactions becomes more complex.[8] Moreover, in the presence of many access seekers with multi-unit demands for the input, the bargaining power of the access provider is likely to increase and, conceptually, the strategic situation can change to be closer to that of a standard monopoly, leading to an access price that can distort competition in the output market.

The role of access regulation in this context, under the negotiate-arbitrate model that is pervasive in Australia and espoused by Part 5 of the QCA Act, is to intervene (or arbitrate) when negotiations between the parties are likely to fail. Thus, in the case at hand, when parties have disagreed on what the initial asset values should be, the QCA has to come to a view of what value would satisfy its statutory obligations. In particular, as expounded in Section 2, the initial asset values ought to be consistent with allowing QR to recover the efficient costs of providing its services, and with promoting allocative, productive and dynamic efficiency, in a manner consistent with the QCA Act.

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[6] Under some specific conditions, when both parties know the values of V_S and V_R, it can be shown that any price in the above interval can emerge as an equilibrium. For a summary of the economic theory of bargaining, see J. Sutton (1986), 'Non-Cooperative Bargaining Theory: An Introduction.' *The Review of Economic Studies*, Vol. 53(5), pp. 709-724. Another possible equilibrium for the bilateral monopoly case is vertical integration. This may arise to minimise transaction costs (see, for example, O. Williamson (1985), *The Economic Institution of Capitalism*, Free Press, New York) or to allocate property rights efficiently (see, for example, S. Grossman and O. Hart (1986), 'The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration', *Journal of Political Economy*, pp. 691-719).

[7] For a formal analysis, see K. Chatterjee and W. Samuelson (1983), 'Bargaining under Incomplete Information.' *Operations Research*, Vol. 31(5), pp. 835-851.

[8] For example, some parties may hold out for better deals, inefficiently delaying the conclusion of the negotiations. See H. Cai (2000), 'Delay in Multilateral Bargaining under Complete Information.' *Journal of Economic Theory*, Vol. 93(2), pp. 260-276, and F. Menezes and R. Pitchford (2004), "A Model of Seller Holdout.' *Economic Theory*, Vol. 24, pp. 231-253.

The example above suggests that there may be multiple initial asset values that will result in efficient outcomes. Any value higher than the opportunity cost for the access provider and below the cost of building an identical facility may avoid inefficient bypass but may have different implications for allocative and productive efficiency.[9] Such a value may also not allow the access provider to fully recover the historical costs of the initial investment. However, as discussed before, this should have no bearing on future investment and may be consistent with dynamic efficiency.

In particular, if the regulator can commit to allow future actual efficient capital expenditures to be recovered and other regulatory parameters (such as the WACC and depreciation allowances) are set appropriately, the initial valuation can become a distributional issue with no impact on incentives to invest, as long as the access price is not so high that it affects competition in the output market.

In practice, however, regulators typically pay attention to historical costs when reassessing values during reviews and when establishing initial asset values. Focusing on historical costs has advantages. For example, in industries where technology (or competition from other services) does not evolve rapidly, (depreciated) historical costs can be a better proxy for replacement costs than a theoretical construct that aims to estimate such costs. Moreover, setting the initial asset values based on historical costs ensures that the regulated firm recovers the initial investment, perhaps reinforcing the regulator's commitment to cost recovery in the future.

Replacement costs are also often used by regulators, at least as a reference point when determining initial asset values (or revaluing assets) so as to avoid inefficient bypass. However, determining the costs of building a facility that can provide the same services as the existing facility is problematic at best. These facilities often involve large construction costs, which are difficult to predict and are prone to cost overruns and delays. There are other complications such as how to value easements,[10] the impact that the construction of a new, large project can have on input prices or whether to use the same or different physical location for the network (brownfield versus greenfield approaches). It follows that, in practice, determining replacement costs has a large subjective component. Actual (historical) costs approaches stand in contrast

[9] Moreover, an asset value in the lower end of the interval may also induce greater levels of investment in exploration and development of mines, promoting dynamic efficiency and reducing any undue distortion of investment decisions.
[10] It is not clear how or whether easements should be replaced. Moreover, in many instances, easements may have been granted to government-owned enterprises.

to the subjectivity associated with estimating replacement costs and also figure prominently in regulators' approaches to asset valuation.

While in the next section I provide a brief overview of the approaches undertaken by regulators in Australia to establish the initial value of the regulatory asset base, next I describe conceptually the two key basic approaches. In particular, I explain the notions of DAC and DORC and examine how they relate to the economic principles expounded above (namely, how they fare in terms of allocative, productive and dynamic efficiency).

DAC represents the original value of an asset net of all accumulated depreciation. Provided that there is accurate data, this approach, by construction, ensures that the regulated firm recovers its actual costs, reinforcing the credibility of the regulator's commitment to allowing full cost recovery. Provided the DAC estimate is lower than or equal to the replacement cost, such a valuation also promotes allocative efficiency as it avoids inefficient bypass. Another potential advantage of this approach is that, provided that technology has not evolved quickly and that input prices have not changed significantly, the original costs (if efficient) will be similar to the replacement cost.

Note that such an approach can also be compatible with the outcome of competition for the market. For example, if the regulator had tendered a long-term contract to provide the services being delivered by the access provider, the historical cost could be seen as the cost that the winner of the tender would have incurred and DAC would reflect the value of these assets today. Below we argue that DORC can be thought of as the cost that would be incurred if the tender occurred today (with appropriate depreciation adjustment) and so these two concepts are linked.

The important caveat, however, is that there are no guarantees that these historical costs would have been efficient as the original investment decision was not the outcome of a tender for a long-term contract and, as a result, the resulting value could exceed replacement cost. Nevertheless, the point remains that DAC can in some circumstances be thought of as a replacement cost, and if it is lower than a DORC valuation, it can lead to good allocative and productive efficiency outcomes as discussed at the end of this section.

The second type of asset valuation approach, DORC, attempts to measure the replacement costs associated with new assets that are optimised and adjusted for depreciation, so that they provide services that are equivalent to those provided by the existing asset.

Regulators typically interpret DORC as an estimate of the highest price an access seeker would be willing to pay for an existing asset, given the option of building a new asset. [11] In effect, however, a DORC valuation is an attempt to estimate how much it would cost to build the best facility possible to provide the optimal level of service (the ORC component)[12] and at the same time take into account all of the differences in the forward-looking service potential and costs associated with the existing asset, compared to the new asset discounted to a present cost (the D component).[13]

That is, the DORC valuation is an estimate of the price that an asset would sell for if that asset was traded in a market for used assets. The difficulty is that such a market does not exist and so an access seeker would not have the ability to purchase it. Instead, to bypass the existing facility, an access seeker would likely build a different asset, which would provide a different (likely improved) level of service.

To put it differently, suppose the government tenders a long-term contract for the future provision of services demanded by access seekers. It is possible to think of the ORC (the optimal facility delivering the optimal level of service) component as the price determined through the tender.[14] DORC then is simply an artificial construct aimed at adjusting (typically reducing) ORC to approximate the cost a new entrant into the market might face to provide the existing level of service.[15]

While this step, moving from ORC to DORC, is usually problematic given the various assumptions that are required and which may vary from case to case, it is particularly challenging for the case at hand. As indicated earlier, the Western System was not built to

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[11] See, for example, Australian Competition and Consumer Commission, Draft Statement of Principles for the Regulation of Transmission Revenues, May 1999, pp.39-40.

[12] Typically ORC is determined by estimating the replacement cost of the optimised existing assets with modern equivalent assets (MEA); the lowest cost of replacing the service potential of the existing assets.
Asset optimisation can reduce total asset value as redundant or over-sized assets are removed from the asset base.

[13] Depreciation of the optimised assets adjusts for the extent to which the original assets' service potential is less (or more) than that of a new asset

[14] Incidentally, under no inflation and no technological change, this value should be similar to the value determined if the government had tendered a long-term contract at the time that the existing facility was built, of course brought forward to today using the firm's cost of capital.

[15] The lumpiness in the investment means that it may not be possible to build a facility to replicate the existing facility. For example, consider an original facility built 10 years ago with a 20 year life. Now suppose we tender today for the future provision of services (10 years). If someone can build an optimal facility that lasts 10 years then there would be no need to use depreciation. However, the lumpiness of investment means that the winner of the tender would instead build a new optimal facility that would last 20 years. This is the ORC value that needs to be adjusted so that it approximates what a facility with a 10 year life would cost (the D part). This is further complicated in practice by the fact that, in addition to differences in useful life, the optimal new facility may provide a very different level of service and the adjustment must somehow account for this as in the case of the Western System assets.

transport coal, and is characterised by conditions and technical standards that are very different from those of an optimised new network. It follows that the D component in the DORC methodology requires careful attention in valuing the Western System.

To the extent that a DORC valuation avoids inefficient bypass, it is potentially consistent with allocative efficiency as long as it does not imply monopoly-like prices. As DORC valuations often, but not always, yield higher asset values than historical costs, they are also consistent with allowing the firm to recover the costs of delivering the service.

However, DORC valuations can in practice imply prices that are close to those that would apply to new infrastructure assets built today at today's prices, allowing access providers to earn returns on investment levels that they will not make.[16] While this may simply be a distributional issue (that is, how any existing rents are shared between access seeker and access provider), competition in the output market may be distorted if DORC-based prices are too high.

Importantly, the economic analysis above questions the often expounded view that a DORC valuation allows regulatory prices to be consistent with prices in a perfectly contestable market. As explained above, while competition for the construction of a new asset would likely yield an ORC value, the steps taken to depreciate the ORC value to reflect the existing assets means that the DORC valuation may reflect the value of an asset that will not be built let alone be traded in a market.

[16] See, for example, D. J. Johnstone (2003), 'Replacement Cost Asset Valuation and Regulation of Energy Infrastructure Tariffs.' *Abacus* Vol. 39(1), pp. 1-41. A somewhat similar point was made by the Australian Competition Tribunal in its review of the ACCC's Decision of Telstra's 2009 DAU. See Application by Telstra Corporation Limited [2010] ACompT 1 (10 May 2010). Available at http://www.austlii.edu.au/au/cases/cth/ACompT/2010/1.html.

4. REGULATORS' APPROACHES TO SETTING INITIAL ASSET VALUES

This section summarises the Australian regulators' experience with setting initial asset values. This experience has been covered extensively in a number of ways including through submissions to the QCA's discussion paper, the QCA's own draft decision and in other regulatory proceedings. Therefore, I will be brief and focus on key outcomes.

Before turning to the Australian experience, I note two relevant international experiences. In the United States, independent regulators have had over a century of experience in regulating the prices of services such as electricity, rail, water, and telecommunications.

In the US, market-based approaches were rejected in favour of a historical cost approach[17], especially after the Hope Case US Supreme Court decision (1944).[18] In this case, the US Supreme court reaffirmed the decision of the then Federal Power Commission in declining an initial asset valuation proposed by Hope, a company that produced, purchased and marketed natural gas and sold it to mainly five companies who then distributed it to final consumers. In its decision, the Federal Power Commission dismissed Hope's proposal to rely on reproduction costs[19] and instead relied on actual costs (including actual existing depreciation and depletion) as "*a sound basis for future regulation and control of rates*."

The US experience highlights the relevance of historical costs for regulatory purposes. As argued above, historical costs ensure that regulated companies recover their investments, and to some extent can be seen as tracking replacement costs better than artificial constructs such as DORC or reproduction costs.

The UK experience is also relevant to the QCA's decision. Asset valuation typically became a concern during the first regulatory review following privatisation. In particular, a key concern was that if there was undervaluation of the assets at privatisation, there would be no reason to provide shareholders with windfall gains by valuing assets at current cost account (CCA) book values (which can be thought of as replacement cost as explained in Section 3.1 above).[20] As Table 1 below shows, undervaluation was pervasive in the UK privatisation process.

[17] For a discussion of regulatory behaviour prior to the Hope Case, see P. A. Grout and A. Jenkins (2001), 'Regulatory opportunism and asset valuation: Evidence from the US Supreme Court and UK regulation'. *Leverhulme Centre for Market and Public Economics Working Paper Series* No. 01/38.
[18] Available at https://supreme.justia.com/cases/federal/us/320/591/case.html.
[19] This refers to the cost of duplicating improvements of an asset as of a particular date. It differs from replacement costs in that it reproduces the actual existing asset rather than an asset that provides the same services as the original asset but is optimally configured.
[20] See, for example, D. Newberry (1997), 'Determining the regulatory asset base for utility price regulation.' *Utilities Policy*, Vol. 6(1), pp. 1-8.

Table 1 Privatisation in the UK.

Utility Companies	**Market value divided by CCA book value (%)**
British Telecom	97.3
British Gas	42
Water & Sewerage Companies	3.6
Regional Electricity Companies	60.5
National Grid Company	40.4
National Power	57.1
PowerGen	48.9
Railtrack	68.8

Reproduced from P. Grout and A. Zalewska, 'Circularity and the Undervaluation of Privatised Companies.' *Leverhulme Centre for Market and Public Economics Working Paper Series* No. 01/39, p. 7.

The issue of undervaluation at privatisation was triggered when British Gas and the industry regulator, Ofgas, were unable to reach agreement. This led to a decision by the Monopolies and Mergers Commission (MMC) to set the allowed rate of return at just over 60% of the risk adjusted cost of capital to reflect the difference between market value and CCA book value. That is, the MMC decision involved an implicit market valuation for assets. Subsequent regulatory decisions mostly reflected market value as indicated in Table 2 below.

Table 2 Asset Values for Privatised Utilities in the US.

Companies and regulatory bodies	**Outcome of periodic review/MMC enquiries**
British Telecom/Oftel	Historic cost at the first two regulatory reviews (1988 and 1992), CCA from third regulatory review (1996)
British Gas/Ofgas	Implicit market value at the end of 1991 adopted after MMC enquiry
Water Companies/Ofwat	Market value averaged over first 200 days
RECs/Offer	Market value at close of first day's trading plus 15%
NGC/Offer	Market value at close of first day's trading
Northern Island Electricity/Offer	Market value at close of first day's trading plus 7.5%
Railtrack/Office of Rail Regulator	Market value at close of first day's trading

Reproduced from P. Grout, A. Jenkins, and A. Zalewska (2003), 'Privatisation of utilities and the asset value problem,' *European Economic Review*, Vol. 48, pp. 927 – 941

The UK experience is relevant for the QCA's decision as it highlights how the regulatory process can deal with windfall gains. I will return to this later in this section.

I now turn to the experience of Australian regulators with setting initial asset values. Broadly speaking, initial asset value decisions have reflected a range of factors including different legal frameworks (for example, at state or federal levels and across industries), transition arrangements in the case of privatisation and corporatisation, and also particular financial or economic factors affecting an industry or a regulated company.

NERA/PwC (2009)[21] provides a comprehensive review of decisions for gas, water, electricity and airports. Appendix A of their report is particularly useful as it lists the initial asset valuation methods across the four different industries and regulators. Regulators have used straight DORC valuations in a large number of cases.

DORC valuations have also been widely accepted as benchmarks even when not used directly. However, regulators by no means limited themselves to DORC valuations and instead took into account a wide range of factors. For example, the DORC valuations for the five electricity distributors in Victoria were adjusted up or down to promote uniform pricing across urban and rural consumers.[22]

NERA/PwC (2009) also highlights a second asset valuation approach that has been extensively applied. They refer to this approach as the "Line in the Sand" method. They use this terminology to reflect the fact that under this approach valuations are determined to lock-in existing prices, revenue or profits. However, the extent to which such an approach differs from a DAC approach is not clear as presumably existing prices, revenue or profits are linked to actual or historic costs.

The report also notes that while the "Line in the Sand" approach has often led to valuations that are lower than DORC, this was not always the case. Moreover, as noted above, these valuations were rarely set in isolation and instead were determined within a wider assessment of other valuation methods (including DORC), and economic and financial considerations.

In summary, the NERA/PwC Report illustrates that while DORC has played a prominent role, there is a range of asset valuation methods that have been used by regulators in Australia, and highlights that determining initial asset values also entails wider considerations that are likely to vary on a case-by-case basis. Moreover, as discussed in Section 3.1, Australian regulators by and large use a DAC approach for updating the value of assets: once the initial asset value has

[21] NERA/PwC (2009), 'Initial Value of Regulatory Assets - the Australian Experience: Report for Orion and Powerco.' Available at www.comcom.govt.nz/dmsdocument/7019.
[22] NERA/PwC (2009, p. 10)

been set, it is rolled forward with new assets added based on actual costs, and the value of existing assets depreciated according to a depreciation schedule.

Similar points have been made in some of the submissions to the QCA's Consultation Paper, and by others, such as the Productivity Commission in its Review of the National Access Regime, for different contexts and have been endorsed by judicial reviews.

For the remainder of this section, I explore how Australian regulators have dealt with windfall gains associated with the introduction of regulation. These include, for example, whether regulators have allowed regulated companies to recover investment that was undertaken prior to privatisation/corporatisation and the establishment of an independent regulator but that perhaps, given historical trends, and in the absence of regulation, would not be recoverable.[23]

The NERA/PwC Report suggests that regulators in general have not allowed regulated firms to recoup 'unrecovered' investment: [24]

> *Regulators in Australia have not generally placed significant weight on estimates of the amount of an investment that remains 'unrecovered' given historical expenditure, revenues and required returns.* [25]

In a similar vein, windfall gains from regulation can be generated by allowing a regulated firm to recover costs associated with assets that, despite having an expired useful life, are still functioning. These are windfall gains as the firm could not have anticipated that there would be other uses for the asset at the time of construction, when its useful life was determined for the purpose of calculating depreciation and expected returns.

It follows that as the firm's expected return from the initial investment placed no value on the life of the assets being extended, not allowing the firm to earn these windfall gains cannot increase regulatory risk. In this sense, not allowing windfall gains seems consistent with the pricing principle listed under Section 168A(a) of the QCA Act.

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[23] This could have happened, for example, with government-owned companies pre-corporatisation, when governments set prices to achieve other objectives rather than cost recovery or profit maximisation.
[24] They note, however, that there are exceptions such as when the existing asset has started to operate recently and prices have been set according to a known methodology so that the 'unrecovered' investment could be calculated.
[25] NERA/PwC (2009), p. 3.

Note that it does not matter whether the firm has actually recovered the initial construction cost. What matters is that the firm could not have anticipated the extension of the asset's useful life and therefore could not expect further compensation.

Indeed, there is regulatory precedent that excludes assets with no remaining life value (but that are still functioning) from the regulatory asset base.[26]

[26] See, for example, Queensland Competition Authority (2001). 'Final Decision – Proposed Access Arrangements for Gas Distribution Networks: Allgas Energy Limited and Envestra Limited.'

5. A REGULATORY ECONOMICS ASSESSMENT OF THE QCA'S PROPOSED ASSET VALUATION APPROACHES

In this final section, I assess the asset valuation approaches that have been canvassed for Queensland Rail's Western System network based on economic principles embedded in the QCA's legislative framework.

In particular, the focus is on how the proposed initial asset valuation approaches promote allocative, productive and dynamic efficiency. Productive and allocative efficiency require an asset valuation method that avoids inefficient bypass, does not distort competition and provides incentives for cost efficiency. Dynamic efficiency requires that the asset valuation method promotes efficient investment.

While DORC often plays an important part in the determination of initial asset values, in my view, the DORC approach put forward in the discussion paper, which values assets whose actual life has exceeded their expected useful life, is not appropriate. As discussed above, the Western System was not built for the purpose of transporting coal and is very different from what a new, optimised system would look like. This means that care needs to be taken with the depreciation step. In particular, valuing assets that have exceeded their useful lives would allow QR to earn windfall gains. As expounded in Section 3 above, allowing QR to earn windfall gains is not necessary for ensuring that it has incentives to invest in the network and could potentially impact competition in relevant markets.

Therefore, in this section I focus only on the DAC approach proposed in the QCA's Consultation Paper and on the DORC approach proposed in the draft decision which excludes windfall gains. As I explain below, in my view both of these options are potentially consistent with the economic principles embodied in the QCA's regulatory objectives.

Under the proposed DAC approach, 100% of the post-1995 capital expenditures and none of the pre-1995 assets would be recovered from access seekers. According to the QCA's Draft Decision (P.132):

> *The option was based on the observation that the pre-1995 assets are part of a much older network and, in some respects could be regarded as sunk (the business itself had valued them at a scrap value in 1995)*.

As many of the pre-1995 assets are still functioning and have remaining asset lives, the QCA, in its draft decision (p. 137) concludes that such a DAC approach would not satisfy its statutory obligation as it '*does not provide QR with an appropriate return on its investment*'.

In my view, the fact that investments in the pre-1995 assets were undertaken with no expectation that they would be recovered through an access charge for the transport of coal or any other means, reflected in the assets' value being set at a scrap value in 1995, implies that, from an economic perspective, they should have no impact on future investment.

In contrast, it stands to reason that the business expected to recover its post-1995 capital expenditure, which has not been valued at a scrap value. The expectation that this investment would be recovered from either the transport of coal or other sources is reasonable as otherwise the investment should not have been made as it would not have passed a zero-NPV test. The proposed DAC valuation, by allocating 100% of this capital expenditure to coal transport, ensures the recovery of these investments.

Also, as the DAC valuation is lower than the DORC valuation, there are no incentives for inefficient bypass. This valuation is also less likely to impact negatively on competition in relevant markets as it is less likely to embody monopoly rents.

I now turn to the DORC valuation proposed in the Draft Decision. The DORC approach, as discussed in Section 3 above, is a theoretical construct. As such, it is subjective in nature. This is especially the case for the Western System where a DORC-equivalent asset would simply not be built. Instead, a new system would have characteristics that are markedly different from the existing system, which is old, outdated and not of the quality of a new, optimised equivalent system. This means that a DORC valuation would allow QR to earn returns on an asset that will never be built.

This, per se, may not be inefficient. As long as the prices associated with a DORC valuation do not affect competition in relevant markets (for example, by making miners uncompetitive in the international coal market or by discouraging exploration and investment in new mines) and prevent inefficient bypass, allowing QR to earn a return on a facility that will never be built may simply be a transfer between miners and QR without social welfare losses. Thus, the key issue is to ensure that the asset value does not result in access prices that embody monopoly rent.

The proposal to place a zero value on longstanding assets with expired expected useful lives, including timber and steel sleepers, tunnels and roads, mitigates the risk that access prices are set too high and impact adversely on competition in a relevant market. It also ensures that QR earns an appropriate return. In contrast, a DORC approach that places a positive value on longstanding assets with expired expected useful lives yields a higher return than could have been anticipated by an investor undertaking the initial investment decision. This increases the risk that access prices are sufficiently high to distort competition in relevant markets and impact adversely on investment in coal exploration and production.

Moreover, allowing QR to earn a return on assets with an expired life would yield windfall gains. At the time of construction, an investor could not have expected that the lives of these assets would be extended beyond their projected lives and, as result, an investor could not have expected to recoup these investments beyond the expected useful lives of the assets.[27]

In other words, allowing QR to earn a return on assets with an expired expected useful life is not necessary to ensure that QR recovers efficient costs. Doing so would result in a return that is higher than that anticipated at the time of the initial investment. If the initial investment decision was based on a zero expected NPV, as one would expect in a competitive environment, then allowing QR to earn a return on these assets would result in a positive (ex-post) NPV and would not be commensurate with the return that a DORC valuation should entail.

Note that whether QR (or previous entities) has fully recovered the investments associated with the assets with expired lives is not relevant for this discussion. The key issue is that when making the investment, an investor could not have anticipated the extended life of these assets and, therefore, could not reasonably have expected to recover their investment beyond their original expected life. As observed in Section 4, Australian regulators have generally not placed significant weight on estimates of the amount of “unrecovered” investment given historical costs and revenues. Importantly, there are several examples of regulators in Australia and overseas that have not allowed investors to earn windfall gains as discussed in Section 4 above.

In summary, in my view, both approaches considered above may satisfy the QCA’s statutory obligations to ensure the economically efficient operation of the Western System, to provide incentives for QR to efficiently invest in the network and to promote competition in relevant markets. Both approaches, however, have advantages and disadvantages and there is no clear cut way to choose between them.

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[27] Of course, some assets are still in use with an expired life because of maintenance work, which was been fully funded through access prices. See QCA’s Draft Decision Oct 14, p. 193.

The DAC approach is simple and transparent. It ensures that there is no over-recovery of costs. While the 1995 date may be considered arbitrary, treating the pre-1995 assets as sunk promotes allocative efficiency and allowing recovery of 100% of the post-1995 assets from access fees provides incentives to invest in the network. As the DAC valuation is below the DORC valuation, it should avoid inefficient bypass.

The proposed DORC approach in the QCA's draft decision, in contrast, may improve investment incentives, prevents inefficient bypass, and has been applied extensively, but not exclusively, by Australian regulators including the QCA. Removing assets with expired lives from the asset base avoids rewarding QR with windfall gains and mitigates the risk that DORC-based prices will adversely impact competition in relevant markets. In contrast, a DORC approach that places a positive value on longstanding assets with expired expected asset lives would yield a return that was not anticipated at the time the investment was made, and increase the risk that prices are sufficiently high to impact competition in relevant markets.