



Asset valuation methodologies for the Tarcoola to Darwin Railway – Discussion Paper

Essential Services Commission of South Australia

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1. Introduction and Summary

Background

1. The Essential Services Commission of South Australia (“**Commission**”) must, for five-year periods, conduct a review of the revenues earned from third party access to infrastructure services on the Tarcoola to Darwin railway (“**TDR**”) where no sustainable competitive prices exist (e.g., where potential alternative transport services do not provide an effective constraint on the prices for infrastructure services on the TDR). The Commission must determine if “excessive” revenues have been earned, having regard to various factors. The relevant revenues for the review are only those earned from access seekers for whom no sustainable competitive prices exist (e.g., currently mining freight, as assessed by the Commission) and earned under either access awards made through arbitration processes and/or access agreements commercially negotiated.
2. In determining whether the access provider of infrastructure services has earned “excessive” revenues, the methodology for the Commission’s periodic review is a comparison of the relevant revenues earned against an estimated maximum revenue limit for those same rail infrastructure services. Key inputs in calculating the maximum revenue limit include the method of valuing capital assets for the purposes of the review and the method to allocate capital assets and operating costs between users of rail infrastructure services.

Project scope and context

3. The Commission has asked NERA to prepare a report setting out the different asset valuation methodologies that could be used in assessing whether the relevant revenues earned on the TDR have been “excessive”. Specifically, we have been asked to:
 - a) Outline methodologies for valuing rail infrastructure assets, and explain the economic arguments for and against adopting each approach including referencing any relevant theory, empirical evidence, and regulatory precedent;
 - b) Note the regulatory context for the five-year periodic reviews of revenues that must be undertaken by the Commission, including the relevant factors listed under clause 50 of the *AustralAsia Railway (Third Party Access) Code* (“**the Code**”) and the access pricing principles outlined in the Schedule to the Code (“**Schedule**”); and
 - c) Discuss any practical considerations relating to asset valuation methodologies such as:
 - i. If an alternative asset valuation methodology were to be adopted, should it be applied prospectively or retrospectively; and/or
 - ii. If a market value methodology were to be adopted, how should asset purchases during any five-year review period be dealt with.
4. Regarding the appropriate valuation methodology, several contextual factors are relevant from an economic perspective:
 - a) Clause 50(6) of the Code states that the costs to be applied in the review of revenues must be efficient. This might suggest a more forward-looking view of costs.
 - b) When describing the methodology to be followed by the Commission in a periodic review of revenues, Clause 50(5)(c) of the Code specifies an appropriate commercial return on the relevant required infrastructure should be determined having regard to the expected risks prevailing at the date of commencement of construction and, in respect of any expansion or extension, the date of that expansion or extension. Some might interpret this to suggest a more historic view of costs is appropriate.

- c) The Schedule to the Code specifically sets out the use of the Depreciated Optimised Replacement Costs (“DORC”) asset valuation methodology in the event of an arbitration. Anticipated arbitrated outcomes may strongly influence commercially negotiated outcomes and thus may be the method the access provider would expect the maximum revenue limit to be calculated. The former access provider (One Rail Australia (North)) previously supported the use of DORC for the purposes of the revenue review.
- 5. Our understanding is that the Commission has formed a view that it is possible to adopt another asset valuation methodology if the DORC valuation methodology is no longer considered the most appropriate for the purposes of determining whether revenues earned have been “excessive”. Our working assumption is that the Commission’s position on the matter is correct and is supported by the relevant statutory frameworks. It is beyond the scope of our paper to assess the relative merits of the Commission’s position in this regard. The Commission’s view is that the asset valuation to be adopted for the purposes of the revenue review must be efficient, and that the revenue review must be meaningful in all respects. This includes the potential for the DORC valuation methodology to be considered no longer the most appropriate in that overall context, even though the regulator may have adopted it in the past. This is where a key consideration arises: the ability for different asset valuation methodologies to be applied in the revenue review and in an arbitration process, given the context of the excessive revenue assessment and the arbitration process.

Assessment

- 6. To determine the pros and cons of the different asset valuation options, we assess each option against the following assessment factors:
 - a) **Accurately measures excess returns:** returns can be assessed from the perspective of both the asset and the owner (noting that there may be differences in returns between these two perspectives). For example, an investor may purchase an asset for a high price with the expectation of earning monopoly profits. As a result, the owner doesn't earn excess returns, but the asset does earn excess returns.
 - b) **Accurately measures the efficient forward-looking costs:** we assess whether the asset valuation methodology is consistent with ensuring efficient prices. This means that the prices account for efficient and forward-looking costs (“efficient costs”) while minimising distortions to consumption/use.
 - c) **Consistency with the reasonable expectations of investors:** we consider the regulatory risk directly attributable to a particular asset valuation method and a change of method. Perceptions of regulatory risk can undermine dynamic efficiency by disincentivising investment and innovation. In particular, regulatory risk means that firms may factor in the possibility that the goal posts could be shifted after they have made investments.
 - d) **Practicality:** we assess the informational requirements to apply the methodologies and consider whether the methods would be understood by stakeholders.
- 7. A summary of our views on the appropriate asset valuation methodology for determining whether the TDR has earned excessive revenues is as follows:
 - a) Depreciated Historical Cost (“DHC”) measures whether the firm’s earned revenues exceeded the required return on the original construction costs. It thus measures the return to the asset and to the original owner. DHC, therefore, does not necessarily measure the efficient forward-looking costs if these costs were higher than would have been incurred by an efficient operator and/or the efficient costs have materially changed since construction. In principle, an advantage of this method is that it can rely on objective data, which can be audited by independent parties, so is typically seen as being robust to manipulation and having low information requirements once a base valuation has been established. Applying DHC for the

entire TDR may be challenging, however, given that historic records for cost data for the Tarcoola to Alice Springs line (built in 1980) may be difficult to obtain, collate and verify. The construction of the Alice Springs to Darwin line in 2004 may be more applicable to DHC. Regarding investor expectations, DHC has not been adopted in recent revenue reviews and is not outlined for use in arbitration. However, as noted, there are aspects of the Code that suggest a backward-looking view of costs, which may suggest a method such as DHC.

- b) **DORC** measures the theoretical cost of an efficient new entrant. That is, the theoretical replacement costs associated with new assets that are optimised and adjusted for depreciation. In this sense, DORC measures the return to the asset. The theoretical and subjective nature of the assessments can mean that the estimated DORC differs from the true efficient replacement cost. For instance, there is sometimes a concern that the estimated DORC may overestimate the efficient costs, and so allow for monopoly profits (the opposite concern is of course also possible). Regarding investor expectations, if DORC is overestimated (or misallocated between competitive and non-competitive users), then it is not reasonable for investors to expect to earn monopoly rents. At the same time, general Australian regulatory precedent to date, the arbitration clauses, and the Commission's use of DORC may suggest that investors will have formed an expectation that DORC will continue to be used. We understand, however, that the Commission's view is that it is not bound to use DORC, and so it might be reasonable to expect that investors have interpreted statutory frameworks and relevant factual matters in the same way. Our assessment considers both the currently applied DORC (valued in 2005) and a DORC that is revalued today:
 - i. An advantage of the 2005 DORC is that it is practical as the value is on hand and is known by stakeholders. A disadvantage is that the 2005 DORC may not accurately measure the current efficient costs given it is now nearly twenty years old; and
 - ii. Revaluing DORC could more accurately measure efficient costs, but revaluing can be costly, complex, and contentious.
- c) **Market value** is the asset's economic value as recorded when a transaction occurs. In this sense, it generally measures the return to the new owner. The primary advantage of using a market value is that it can objectively reveal the efficient costs if the market value is constrained by the risk of bypass, either from an efficient entrant or alternative mode. It is also possible, however, that the market value reflects other variables, such as the ex-post level of demand being below the ex-ante expectations when the asset was constructed. Therefore, the extent that market value measures efficient costs rests on the underlying drivers of the purchase price (either bypass or level of demand).

Considering limitations: the ability to reveal information may be affected if the TDR is purchased as part of a bundle of assets, such as the recent Aurizon transaction. A possible risk is that using a market value may surprise investors (if using it for the ex-post assessment changes the constraints on pricing compared to what was reasonably expected when the asset was purchased) and so undermine dynamic efficiency. On the one hand, this risk is less relevant if it is reasonable to expect that DORC is overestimated (or misallocated), so that the market value is revealing the efficient costs. On the other hand, this risk is more relevant if investors bought the assets at a discount compared to DORC because of lower than expected demand (as the discounted value would be locked in even if the market recovers).

Our assessment considers three different varieties of market value:

- i. **Ongoing revaluations** approach, which updates the asset base, whenever there is a new transaction. While this approach means that the asset base can update periodically (and so reflects new information), the primary drawback is that it can lead to a circularity, in which a potential purchaser anticipates that the purchase price determines the maximum revenues and, therefore, the cashflows (which in turn drives the market value). The extent

of this circularity problem in practice depends on the interactions between the expected future cashflows, the regulated rate of return, and the market rate of return.

- ii. “**Line-in-the-sand**”: which uses a prior purchase price that is not updated. By using a prior purchase price and not signalling the approach in advance, this approach is less affected by the circularity issue. The disadvantage is that it cannot update the asset base to reflect new information including any future owner’s contributed capital. Also, the approach relies on a credible commitment to no further updates.
 - iii. **Hybrid** of market value for the asset base but DORC for depreciation. This approach can make sense if the Commission believes that the market value measures the efficient costs yet is worried that adopting a market value will mean that the TDR will not provide a constant level of service to consumers. We note, however, that the precedent for this approach comes from the UK where it was used in the context of a direct price control. In that context, the regulator could enforce a “broad equivalence” condition (capex being equal to depreciation) to ensure a constant level of service is provided. Applied to an ex-post review, it is unclear how broad equivalence would be enforced. In this context, if capex is less than depreciation, the asset base would trend towards zero over time, which could lead to perverse outcomes. Specifically, an asset that earned normal returns over its life would show low returns early in its life and then high returns in the future.
- d) An **economic value** approach estimates the value to the owner of holding the asset i.e., the net present value of future cash flows. This approach would infer the asset base using current prices, so only makes sense if the current prices already reflect efficient costs. Using an approach to value assets that assumes prices are efficient to assess whether prices are excessive appears to go against the purpose of an ex-post review. Practically, it would involve bottom-up modelling of the TDR’s future cashflows (including forecasting mining volumes), which could be contentious and complex.
8. Regarding the two practical questions:
- a) Retrospectively applying a new methodology may arguably be a shifting of the goal posts, as firms would not have been given an opportunity to change their behaviour in response to a change in methodology. Making regulatory changes based on a retrospective finding that revenues are excessive using a new methodology may therefore have dynamic efficiency consequences. On the other hand, prices for access can be commercially negotiated, the Code allows for a retrospective review of revenues, and a delay in applying the new methodology could result in any monopoly rents being earned for longer. On balance, we recommend that any potential change in asset valuation methodology is applied prospectively.
 - b) If the market value is applied, then a one-off or line-in-the-sand should be applied. The main reason is that deviating from a line-in-the-sand may introduce circularity if firms anticipated that the purchase price would influence the regulated asset base and therefore the maximum revenue limit.

Roadmap for the review

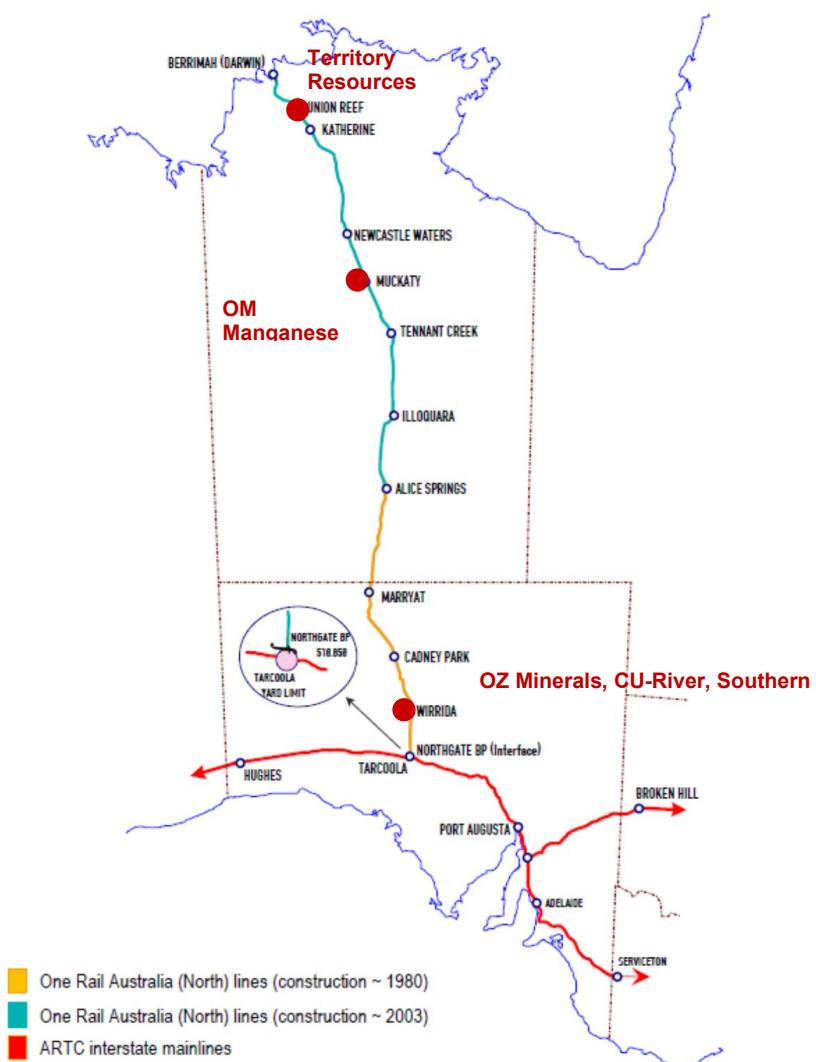
9. In the rest of this report, we:
- a) Provide an overview of the TDR’s institutional, regulatory, and legal framework (section 2);
 - b) Set out a framework to assess asset valuation methodologies (section 3);
 - c) Describe the various methodologies for valuing assets (section 4);
 - d) Survey regulatory precedent in Australia, New Zealand, and the United Kingdom (section 5);
 - e) Assess the various methodologies (section 6); and
 - f) Address the practical questions put to us by the Commission (section 7).

2. The Tarcoola to Darwin railway

2.1. Background

10. The TDR consists of 2,239km of railway line that runs from Tarcoola in South Australia to Darwin in the Northern Territory (Figure 1). The line was built in two discrete parts. The first part was built in 1980 and spans approximately 824km of rail line (including track and signalling systems) to connect Tarcoola to Alice Springs. The second part was built in 2004 and spans approximately 1,415km of line to link Alice Springs to Darwin.¹

Figure 1: Map of the Tarcoola to Darwin railway line (mining users overlaid in red)



Source: Commission recent 5-year review, figure 1 on p. 6. Dots and associated names in red refer to mines that use the TDR.

¹ For further background on the building/completion of the Tarcoola to Alice Springs line in 1980, we refer to ESCOSA, *Tarcoola-Darwin railway: 10-year review of revenues – final report*, August 2015, p. 6 and AustralAsia Railway Corporation, *History of the railway*, p. 1.

11. In building the second section of the TDR, (from Alice Springs to Darwin), Asia Pacific Transport Consortium (APT) received government contributions of approximately \$559 million.² This government contribution was motivated by building a “land bridge” that would connect Australia with overseas markets and further economic progress in the north of Australia.³ As a result, those contributions reduced the risk exposure on the project funds contributed by the private sector investors.
12. In terms of the ownership of the TDR, in 2010, One Rail Australia (North) purchased the right to operate the rail infrastructure for a total cost of \$334 million (nominal).⁴ More recently, on 29 July 2022, Aurizon completed its purchase of One Rail Australia including One Rail Australia (North). Amongst other assets, this includes the leasing of the right to operate the TDR infrastructure under the AARC concession deed.⁵
13. The TDR is used by three distinct end-user types. In Table 1, we list the end-user types, their revenue share between 2013/2014 and 2017/2018, and whether the user type faces a sustainable competitive price.⁶ The Commission’s previous assessment found that intermodal freight and passenger users do face a sustainable competitive price. The Commission found, however, that the rail transport of mineral ore did not face a sustainable competitive price.⁷ The final “revenue share” column provides context on the materiality of the activities.

Table 1: Revenue share and the Commission’s view on the status of competition of each end-user

| End user types | Face competition | Revenue share (%) |
|--------------------|------------------|-------------------|
| Intermodal freight | Yes | 52 |
| Passenger | Yes | 6 |
| Mining | No | 42 |

Source: Commission’s recent 5-year review, section 3 on p. 10.

14. The usage of the TDR is an important consideration. The relevant required railway infrastructure is defined in the Code as the portion of the rail infrastructure required from the access provider to provide the relevant infrastructure services to the access seeker. While passenger and intermodal freight use the entire line, miners typically do not – instead, transporting ore to the closest port.⁸ It is therefore apparent that mining firms only use some sections of the TDR, and these use patterns will matter materially for how costs are allocated in the periodic reviews of revenues

² Specifically, the Commonwealth Government, the South Australian Government and the Northern Territory Government contributed funding in approximately equal portions. The AARC (AustralAsia Railway Corporation) was established in 1997 to build the Alice Springs to Darwin segment of the rail line. In 2000, the AARC awarded the contract to design, construct and operate the rail line under a build, own, operate and transfer arrangement to the Asia Pacific Transport Consortium (APT). FreightLink was awarded the contract to operate below-rail services from APT. APT was the holder of the AARC concession deed prior to One Rail Australia (North) (formerly Genesee & Wyoming Australia (North)) and, more recently (as of 29 July 2022), Aurizon.

³ ESCOSA, *Tarcoola to Darwin Railway: 5-year Review of Revenues 2013-14 to 2017-18*, March 2021, (“Commission’s recent 5-year review”) S2.2, p. 4.

⁴ At the time, One Rail Australia (North) operated under the company name of Genesee and Wyoming Australia (North).

⁵ See Aurizon ASX Announcement 29 July 2022: “Aurizon completes acquisition of One Rail Australia”.

⁶ See section 3 on p. 10 of the Commission’s recent 5-year review: “Assessment of sustainable competitive prices”.

⁷ To be specific, intermodal freight and passenger services could substitute to alternative options (in particular, road). Mining users, however, cannot easily substitute to another mode because mineral ore is generally heavy, bulky, and transported over long distances. See section 3 of the Commission’s recent 5-year review: “Assessment of sustainable competitive prices” for a more in-depth discussion.

⁸ See section 4.2.2 on p. 16 to 20 of the Commission’s recent 5-year review: “Allocation of costs across segments of the rail infrastructure required by access holders”.

(Table 2). In Table 2, we list the mining end-users between 2013-14 and 2017-18 to show that these users only use portions of the track. We list the name of the firm, the period of use, the mineral transported, and the rail segment used (for clarity, we also plot the mining location and direction of travel on the map in Figure 1). The table highlights the importance of considering and accurately adjusting for cost allocation for the purposes of reviewing the revenues earned for access to rail infrastructure services. For instance, 3 out of 5 firms (OZ Minerals, CU-River, and Southern Iron) primarily use the ~130km section of rail line from Wirrida to Tarcoola, which represents only 6% of the entire TDR line.⁹

Table 2: Summary of mining end-users for 2013-2018

| Mining Firm | Period | Mineral | Rail section |
|---------------------|---------|---------------|---|
| OM Manganese | 2013-18 | Manganese ore | ▪ Muckaty to Darwin |
| OZ Minerals | 2013-18 | Copper ore | ▪ Wirrida to Tarcoola (majority) ▪ Wirrida to Tennant Creek (minority) |
| Territory Resources | 2013-15 | Iron ore | ▪ Union Reef to Darwin |
| CU-River | 2016-18 | Iron ore | ▪ Wirrida to Tarcoola |
| Southern Iron | 2013-18 | Iron ore | ▪ Wirrida to Tarcoola |

Source: Commission's recent 5-year review, table 1 on p. 5.

2.2. Institutional, regulatory, and legal framework

15. Several existing publications outline the regulatory and institutional framework that applies to the TDR.¹⁰ We briefly summarise key aspects of the framework, paying particular attention to the Code's clause 50 review of revenues.
16. As mentioned earlier, the Commission regulates third party access to rail infrastructure services on the TDR in accordance with the Code.¹¹ The Code sets out a framework for commercial negotiation between an access provider and an access seeker. The Code provides for dispute resolution processes including conciliation and arbitration. It includes a Schedule that outlines access pricing principles for the purposes of arbitration. Those pricing principles provide directions for access pricing in different circumstances accounting for the degree of competition that exists for certain railway infrastructure services. The Commission has issued guidelines, including for floor and ceiling pricing purposes for arbitration, and for the calculation of arbitrated outcomes, pursuant to the Code. The Schedule to the Code specifically sets out the use of the DORC asset valuation methodology in the event of an arbitration.
17. Pursuant to clauses 50(4) and 50(10) of the Code, the Commission must, at regular intervals, (currently set at every five years), review the revenues earned by the access provider where no sustainable competitive prices exist. The most recent five-year period for the Commission's review was 2013-14 to 2017-18. (The previous revenue review was for the ten-year period ending in 2012-13 and this was completed in 2015). In assessing whether excessive revenues were earned under clauses 50(4) of the Code, the Commission must, in accordance with clauses 50(5), 50(6) and 50(7), have regard to a range of factors.

⁹ Appendix A discusses the importance of cost allocation between users of rail infrastructure services.

¹⁰ ESCOSA, *Review of rail guidelines for the Tarcoola-Darwin railway*, October 2019; Commission, *10-year review of revenues – Final report*, August 2015 (“Commission's 10-year review”); and National Competition Council, *Final Recommendation – February 2000*, Application for certification under section 44M(2) of the Trade Practices Act 1974.

¹¹ The Code is a schedule to the *AustralAsia Railway (Third Party Access) Act 1999 (SA)* and the *AustralAsia Railway (Third Party Access) Act 1999 (NT)*.

18. The Code requires that the Commission:
 - a) Reviews actual revenues earned for infrastructure freight services where no sustainable competitive prices exist;
 - b) Takes into account revenues earned from both awards by arbitrators and from commercially negotiated access contracts;
 - c) Compares actual revenues against the efficient costs of providing those same infrastructure freight services; and
 - d) Determines efficient costs by applying an objective and appropriate methodology, which has regard to investment in all railway infrastructure, applies an appropriate commercial return (accounting for the project risk at the time of construction, development and operation), and takes into account the avoidable costs and a reasonable contribution to fixed costs from access holders (users) of the rail infrastructure.
19. Our understanding is that the Commission has formed a view that it is possible to adopt another asset valuation methodology if the DORC valuation methodology is no longer considered the most appropriate for the purposes of determining whether revenues earned have been “excessive”. The Commission’s view is that the asset valuation to be adopted for the purposes of the revenue review must be efficient, and that the Commission’s revenue review must be meaningful in all respects. This includes the potential that the regulator can consider that the DORC valuation methodology is no longer the most appropriate in that overall context, even though the regulator may have adopted it in the past. This is where a key consideration arises: the ability for different asset valuation methodologies to be applied in the revenue review and in an arbitration process, given the context of the excessive revenue assessment and the arbitration process. As outlined earlier in the paper, our working assumption is that the Commission’s position on the matter is correct and is supported by the relevant statutory frameworks. It is beyond the scope of our paper to assess the relative merits of the Commission’s position in this regard.
20. As a final point, clauses 50(8) and 50(9) of the Code allow the regulator to determine a course of remedial action depending on the outcome of the review of revenues.¹² These requirements apply only if the regulator determines that the revenues have been excessive.

2.3. Outcome of the previous revenue reviews

21. The Commission has conducted two previous revenue reviews: one for the ten-year period ending in 2012-13 and one for the five-year period ending in 2017-18. Both reviews concluded that the relevant revenues earned were not excessive, and both noted that the value of the DORC asset value was a reason why the maximum revenue limit well exceeded the actual revenues earned.¹³
22. In the recently completed five-year revenue review ending in 2017-18, the Commission estimated maximum revenue limits, as calculated under two alternative cost allocation methodologies, and risk premiums and returns when including contributed assets. Given the uncertainty surrounding certain factors in the methodology, including the cost allocation method and the risk premiums and returns to be adopted, sensitivity analysis was undertaken.
23. The results of the five-year review produced maximum revenue limits of \$387 million and \$186 million under the two cost allocation methodologies adopted; both were above the \$106 million

¹² More specifically, the access provider must submit a “remedial plan” to be assessed by the Commission. If this is rejected by the Commission, then the Commission itself will make a determination.

¹³ ESCOSA, *10-year review of revenues – Final report*, August 2015, p. 1-4. Additionally, the Commission’s recent 5-year review, sections 4.4 and 4.5 on p. 31-33.

of revenue earned for the same period.¹⁴ Therefore, irrespective of the cost allocation selected, the Commission's assessment was that the revenues earned were well below any of the maximum revenue limits estimated. Further, the Commission performed a sensitivity analysis, which considered both including and excluding government contributed assets and adjusting for risk premiums. These analyses produced maximum revenue limits that ranged from \$186 million to \$670 million.¹⁵

24. In terms of asset valuation, the Commission highlighted in October 2021 (in its draft report) and in March 2022 (in its final report) that it intended to produce a discussion paper on the topic of asset valuation, and that the discussion paper process would allow stakeholders the opportunity to submit evidence and views on the matter.

¹⁴ One cost allocation approach was based on allocating costs across the entire rail line, while the other was based on allocating costs across only a portion (48 percent) of the line.

¹⁵ See sections 4.4 and 4.5 on p. 31-33 of the Commission's recent 5-year review: "Comparing relevant revenues to the estimated maximum revenue limits" and "Sensitivity analysis".

3. Assessment Framework

25. In this section, we set out an assessment framework to be applied to various asset valuation methodologies, paying attention to the Commission's primary statutory objective of the "*protection of the long-term interests of South Australian consumers with respect to the price, quality and reliability of essential services*". When considering the economic interpretation of "excessive" as calculated on an ex-post basis: a key tension lies between respecting the regulatory compact that was in place when the investments were made and the welfare of current and future consumers. Or put more plainly, the choice of asset valuation can have distributional effects between asset owners and consumers, and additionally consumers over time. The Commission must therefore consider whether changing an income distribution in favour of customers in the short-term will harm incentives for the regulated entity to make investments and efficiency improvements into the future (which ultimately benefits future consumers).
26. Against, this background, we consider the long-term interests of consumers by assessing options using the following assessment framework:
 - a) **Accurately measures excess returns:** returns can be assessed from the perspective of both the asset and the owner (noting that there may be differences in returns between these two perspectives). For example, an investor may purchase the asset for a high price with the expectation of earning monopoly profits. As a result, the new owner doesn't earn excess returns, but the asset does earn excess returns.
 - b) **Accurately measures the efficient forward-looking costs:** we assess whether the asset valuation methodology is consistent with ensuring efficient prices. This means that the prices account for the efficient and forward-looking costs, while minimising distortions to consumption/use.
 - c) **Consistency with the reasonable expectations of investors:** we consider the regulatory risk directly attributable to a particular asset valuation method and a change of method. Perceptions of regulatory risk can undermine dynamic efficiency by disincentivising investment and innovation. In particular, regulatory risk means that firms may factor in the possibility that the goal posts could be shifted after they have made investments.
 - d) **Practicality:** we assess the informational requirements to apply the methodologies and consider whether the methods would be understood by stakeholders.
27. Using the assessment framework described above, we assess several asset valuation methods. This assessment aims to inform the Commission and stakeholders about asset valuation methodologies, and to provide criteria to consider methodological options.
28. As requested by the Commission, we complement our base assessment framework by further considering the following two practical considerations:
 - a) If an alternative asset valuation methodology were to be adopted, should it be applied prospectively or retrospectively; and/or
 - b) If a market value methodology were to be adopted, how should asset purchases during any five-year review period be dealt with.

4. Asset valuation methods

29. This section briefly outlines methodologies commonly used to value infrastructure assets in the context of regulatory frameworks.¹⁶ The asset value, which in regulatory contexts, is often referred to as the regulated asset base (“RAB”) is a key input in determining the maximum revenue limit under the Commission’s test of whether the access provider has earned “excessive” revenues. Therefore, the objective of access pricing, and by extension asset valuation for setting prices or assessing revenues, is typically to ensure that:
 - a) **The assets (or the owners of the assets) do not earn excessive returns:** Excessive returns are typically defined as returns exceeding the weighted average cost of capital (WACC); or
 - b) **That prices are efficient:** Meaning that prices link to a measure of efficient cost.
30. Importantly, these two objectives can be in conflict: Assessing whether a firm has earned excess returns is typically backward-looking while assessing the efficiency of prices is primarily forward-looking.
31. The various methodologies that could be used to value assets *at a given point in time* are:
 - a) Depreciated Historic Cost (“DHC”);
 - b) Depreciated and Optimised Replacement Cost (“DORC”);
 - c) Economic or market value;
 - d) Hybrid of market value for the “return on” capital from the RAB and replacement cost for the “return of” capital i.e., depreciation; and
 - e) Optimised deprival value.
32. Beyond the asset valuation method, a further consideration concerns the policy around the valuation date. The two options are:
 - a) Periodic revaluation: the asset is revalued from time to time (potentially regularly); or
 - b) “Line-in-the-sand”: the regulator commits to a single valuation that is not revalued.
33. An overview of these methodologies (and the two options for timing) is set out below.

4.1. Depreciated Historic Cost

34. The DHC approach uses the original capital cost as the initial asset value and then scales the asset value down according to the extent that the asset’s economic life has passed. The DHC represents the ‘opportunity cost’ of the resources that the original investors used to build the asset, measured at the time the asset was constructed. This consideration is particularly important for private investors who require a return on their invested capital.
35. DHC thus represents both the cost of the asset and capital deployed to build that asset. It is therefore a measure of the returns the asset earns over its economic life and the returns earned by the owners if the original owners still own the asset.

¹⁶ This paper does not consider how the RAB is rolled forward. This is typically done by including new capital expenditure at its cost and indexing the RAB for inflation. In some cases, particularly for land, periodic revaluations occur to “mark to market”. By way of background, the Commission’s latest revenue review for the TDR set an initial asset value in real terms and this was rolled forward taking into account depreciation and capital additions and disposals (see section 4.2 p. 15-20 of the Commission’s recent 5-year review: “Methodology for establishing the maximum revenue limit”).

4.2. Depreciated and optimised replacement cost

36. DORC measures the cost of using modern equivalent assets to replace the remaining service potential of the existing asset (i.e., adjusted for depreciation). The “O” in DORC relates to the fact that the assets can be “optimised” to consider the scope and nature of the asset that would be built today.¹⁷ DORC is known as a forward-looking valuation measure. For instance, the ACCC notes that:¹⁸

DORC is consistent with the price that would be charged by an efficient new entrant as well as the price that would prevail if the asset owner were operating in a workably competitive market.

37. The DORC of an asset is estimated using the following two-step process:¹⁹
- First, estimate the cost of replacing the existing asset with an optimally configured (and sized) new asset that is constructed using modern engineering equivalent materials (the optimised replacement cost (ORC)); and
 - Second, account for differences in the service potential and costs of operating the existing asset and the optimised asset by ‘depreciating’ the ORC (DORC).
38. As we discuss later in this report, DORC can be applied in two ways:
- Using a historic DORC estimate, as a line-in-the-sand of sorts; or
 - Revaluing DORC, and possibly conducting ongoing periodic valuations.
39. Regarding historic estimates of DORC, in 2005, shortly after the construction of the second segment of the track, BOOZ Allen Hamilton calculated the DORC of the TDR to be \$2.3b (real terms). By 2017-2018, this DORC value had, for the purpose of the Commission’s revenue review, fallen to an estimated \$1.74b (real). This fall reflected that estimated depreciation had consistently exceeded capital investment into the railway.²⁰

4.3. Economic or market value

40. The economic value represents the value to the owner of operating the asset. This value represents the net present value of the cash flows from owning the asset (or the scrap value net of disposal costs if scraping the asset is more profitable).²¹
41. The market value is the asset’s economic value as recorded when a transaction occurs. Accordingly, the market value is a snapshot of the economic value at a particular time. The implicit assumption being that markets for ownership are efficient.
42. Both of these methodologies, by focusing on the value to the owner of the asset, provide a measure of the returns earned by the owner of the assets, rather than the asset. Though in a competitive market, one would expect the market value to track measures of cost, and thus also reveal information about the returns to the asset.

¹⁷ This optimization could occur on either a greenfield (“scorched earth”) or brownfields (referred to as “scorched node” in telecommunications). The former assumes one is starting from scratch and thus the network topography could be reconfigured, whereas the latter takes the network topography as given and builds a network using the existing topography but modern methods/equipment.

¹⁸ ACCC, *Draft Statement of Principles for the Regulation of Transmission revenues*, 27 May 1999, p. 39.

¹⁹ For an example of DORC applied to a railway, see GHD Advisory, *Developing a Regulatory Asset Base value for the Australian Rail Track Corporation Interstate Network, using the Depreciated Optimised Replacement Cost method, Concluding Public Report for the ACCC*, April 2021.

²⁰ Based on values taken from p. 22 and 23 of the Commission’s recent 5-year review.

²¹ Throughout the paper, we assume that the value from operating the asset exceeds its scrap value (net of decommissioning and disposal) because the rail line is a sunk asset with limited salvage value.

43. Note that because the market and economic value are driven by the valuation of future cashflows, they will not necessarily coincide with cost-based measures of the asset. In general, the market value might be below the replacement or historical cost of the assets in circumstances where:
 - a) Competition, rather than the regulatory regime, is the binding constraint;
 - b) The risk-adjusted rate of return required by investors exceeds the regulated rate of return (e.g., if the regulator has set the WACC too low); or
 - c) The asset has been constructed for non-economic (i.e., social) reasons.
44. On the other hand, the market value might be above replacement cost or historical cost of the assets in circumstances in which:
 - a) There may be anticipated cost efficiencies;
 - b) An expectation of earning monopoly profits;
 - c) An expectation of possible new services or options to provide new services (growth options); or
 - d) The risk-adjusted rate of return required by investors is lower than the regulated rate of return (e.g., if the regulator has set the WACC too high).

4.4. Market value for return and replacement cost for depreciation

45. The Commission's project scope specifically requested consideration of the approach taken for water businesses in the United Kingdom, whereby the initial asset value was determined using market value, but depreciation was based on replacement cost. We understand the context for this request is that in the United Kingdom at the time of privatisation the value of replacement costs was well in excess of the initial market value of those assets. Given the specific contextual reasons motivating this approach, for further detail, we refer to the section covering regulatory precedent (section 5).

4.5. Optimised deprival value

46. The optimised deprival value (ODV) is the cost to the owner of being deprived of the asset. It is the lesser of DORC and the economic value. ODV recognizes situations in which the market value is less than the replacement costs of the assets, for example because competition is constraining the prices the firm can charge. Similarly, in situations where the market value is greater than the replacement cost, the cost to the owner of being deprived of the asset is the cost of replacing it.

4.6. Date and frequency of valuation

47. The policy underlying the date and frequency of valuations is an additional consideration beyond the method used to value the asset. There are two possible options.
 - a) **Periodic revaluation** means that the asset is revalued from time-to-time, potentially on a regular timeline. Revaluing assets means that the asset value reflects current conditions. For example, if a DORC value is from 1970, then the DORC represents the cost of an efficient entrant in 1970. The regulator may therefore revalue DORC to recover the cost of an efficient entrant that enters today.
 - b) **Line-in-the-sand** implies that the regulator commits to a single valuation that is not revalued. Therefore, the regulator draws a "line-in-the-sand" using a recent or past valuation rather than a current one. Drawing a line-in-the-sand can address concerns that arise when assets are periodically revalued.

5. Regulatory precedent on asset valuation

48. This section draws lessons for the appropriate asset methodology for the TDR line by covering regulatory precedent on both asset valuation (and cost allocation where applicable) for:
- Australian rail (section 5.1);
 - Australian non-rail sectors (section 5.2);
 - New Zealand (section 5.3); and
 - The United Kingdom (section 5.4).

5.1. Australian Rail

49. In Table 4 (see appendix), we show that the ACCC and most Australian state regulators currently apply DORC to value rail infrastructure assets. Some regulators, however, have noted deficiencies concerning the application of DORC in certain circumstances. In particular, there is currently an ongoing ACCC consultation exploring alternatives to DORC for the interstate network. In brief, the ACCC is concerned that DORC includes non-commercial assets, which it defines as government expenditure for broader social, environmental, or economic reasons. The ACCC's primary concern is that including the full cost of such investments in the RAB would result in commercial rail users being charged for benefits that accrue to society more broadly and thus may be more appropriately funded by the government. Further, charging the full cost to users would likely result in underuse of the rail network and run counter to the objectives of government funding to promote use of rail.²²
50. Turning to cost allocation, we find a precedent of the ACCC dividing the asset base into segments. More specifically, the ACCC segments the asset base for both the Interstate Rail Network and the Hunter Valley Network.²³ The ACCC effectively defines a segment as the smallest component for which the Ceiling Limit and Floor Limit applies.²⁴

5.2. Non-rail sectors in Australia

51. In Table 5 (see appendix), we show that Australian regulators have typically adopted DORC to establish the initial RAB for gas, electricity distribution, and airports. Regulators have often supported DORC on the basis that it approximates the cost of a new market entrant and is commonly adopted across industries.
52. Concerning regulators that have adopted methods different than DORC, several water regulators (IPART, ESCV and ICRC) set the initial asset base using an economic value methodology for state-owned water retailers. Regulators sought to establish an initial asset base based on existing prices as a transition to a regulatory regime in which capital additions and disposals to and from the asset base would be efficient and made at cost. We note that to the extent that water prices had previously been set implicitly relative to DORC, the initial asset base would likely reverse engineer a DORC estimate.
53. In terms of other industries, in Telecommunications the ACCC uses DHC given it considers that the build/buy efficiency rationale of forward-looking cost measures is now less relevant in

²² [ACCC, ARTC's Interstate network access undertaking 2023: Guidance Paper](#), July 2022, p.15.

²³ For further explanation of these two lines, see ACCC role in rail, ACCC accessed July 24 <https://www.accc.gov.au/regulated-infrastructure/rail/accc-role-in-rail>.

²⁴ Australian Rail Track Corporation ([ARTC](#)), *Hunter Valley Coal Network Access Undertaking*, 2 June 2021, p.96, section 14 Definitions. “Segment Specific Assets” means the assets that the ARTC can directly identify belong to a segment; [ARTC, The Interstate Access Undertaking](#), 15 June 2021, p.47.

telecommunications. For airports, the ACCC drew a line-in-sand based on the 2005 DORC value (but using market value for land). The ACCC's reasoning for applying a line-in-the-sand was to end the common practice, in which airports would revalue their assets upwards when the replacement cost increased.

5.3. New Zealand

54. In Table 6 (see appendix), we show that the New Zealand Commerce Commission ("NZCC") typically applied a historical DORC as a line-in-sand to establish the initial asset base for gas, electricity distributors, and airports (the exception being land for airports). Following this initial asset base, new capital investment enters at historical cost. The NZCC's reasoning for its approach is that the initial valuation (using DORC) was 'consistent with competitive outcomes'. The NZCC justified its line-in-the-sand approach by stating that:²⁵

"in the context of a continuing relationship between suppliers and consumers, material changes to valuations—either upward or downward—would be unlikely to be consistent with the outcomes produced in workably competitive markets in which there is a high degree of asset specialization"

55. The exception to applying DORC is the recent rollout of fibre broadband, which is regulated using DHC. The reasoning for applying DHC was that the fibre broadband network is new and considered to be built by private investors on an efficient basis (i.e., not over-designed or having redundancies). In this situation, the DHC effectively is the DORC at the time of construction.
56. The NZCC allocates costs based on usage, so the costs allocated to the regulated sector are based on the extent that the regulated sector uses the assets. For example, an airport segments its RAB based on the proportion of terminal space split between the regulated activity (e.g., aeronautics) and the non-regulated activity (e.g., food court).²⁶

5.4. United Kingdom Utilities

57. In Table 7 (see appendix), we cover how regulators in the United Kingdom (UK) determined the initial asset base for the following five utilities of water, telecommunications, gas, electricity, and rail. To determine the initial asset base, the regulator typically applied the market value at privatisation (which was sometimes significantly lower than the replacement value of assets). We summarise the UK privatisation process by noting the following four points:

- a) **All utilities were initially state-run and then privatised:** The initial investment was undertaken by the government which may have made many capital investments without intending to achieve a return on capital. For example, because of general government inefficiency (hence the motivation for privatisation) or the government seeking wider social objectives (e.g., overbuilding rail to benefit small towns, which might not be commercially viable).²⁷

²⁵ NZCC, *Input Methodologies (EDBs and GPBs) - Reasons paper*, December 2010, paragraph 4.3.2 on p. 98.

²⁶ For further detail see: NZCC, *Input Methodologies (Airport Services) - Reasons paper*, December 2010, para. B2.7 and B2.1. 1. The NZCC primarily requires firms to allocate costs using the accounting-based cost allocation (ABAA), where costs are allocated based on causal factors, or on proxy factors if causal allocation is not available. Examples of causal relationships given by the NZCC for airports included: the number of staff hours recorded against each service; or the proportion of terminal space split between regulated and other activities. Causal relationships are defined in relation to asset values: "a circumstance in which a factor influences the utilization of an asset..." or operating costs: "a circumstance in which a cost driver leads to an operating cost being incurred".

²⁷ Another example can be seen in the case of water and sewerage companies. Prior to privatisation, water and sewerage companies in the United Kingdom were reportedly earning accounting rates of return on replacement costs of about 2 percent, which was well below estimates of the cost of capital of between 7 and 8.5 percent. See Armstrong, Cowan and Vickers, 'Regulatory Reform: Economic Analysis and British Experience', MIT Press, 1994, p. 345.

- b) **Privatisation implies there are no dynamic inefficiencies to applying a market value below replacement costs:** In other words, the government did not apply a market value method to change or reduce the asset value of privately owned firms. This distinction implied that applying market value (that reduced the asset value) did not undermine the dynamic efficiency of private investors.²⁸
- c) **Regulatory settings and the principles at the time of privatisation provided an anchor to determine market values:** For instance, in the case of water and sewerage companies in the United Kingdom, regulatory settings (including the existence of a price control regime), alongside the principle that existing owners should neither gain nor lose under the new regime, provided an anchor for the calculation of an initial indicative asset value.²⁹ Indicative asset values were set by reference to what companies would have earned had the previous regime continued.³⁰ This value provided an anchor to expectations of future cash flows in advance of companies' flotation. Following floatation, the regulator used the initial market values as a better measure of the asset base than the indicative values.³¹ Therefore, the regulatory settings, and the process involved, appears to have resolved the circularity issue that may arise when choosing to adopt a market value approach to determining a regulated asset value.
- d) **Depreciation was often calculated using replacement cost to ensure constant quality:** For instance, in the case of water firms, the market value (implied by the regulated prices) was roughly 4% of the replacement value. To ensure the assets were maintained in perpetuity, Ofwat applied DORC for depreciation. Importantly, depreciation was subject to a test of "broad equivalence" meaning that water companies had to verify they were actually maintaining the assets so that the level of service provided would stay constant. The test of broad equivalence was enforced through law and service standards, and depreciation was often reframed as a pass-through charge (so firms benefited from this maintenance spending).³²

²⁸ For example, Ofwat explains the rationale behind privatization in Ofwat, *The development of the water industry in England and Wales*, section 4 "Privatization" on p. 30.

²⁹ Armstrong et al (1994, p. 345) explain that: "... [v]aluing the existing asset for [capital] setting purposes at replacement cost of assets would have caused a very large jump in prices and would have benefited owners at the expense of consumers. The existing owners were the government in the case of water and sewerage companies and private shareholders in the case of water-only companies. In the end it was decided to value the existing assets by implementing the principle that the existing owners should neither lose nor gain from the change in regime". Grout and Jenkins (2001, pp. 33) also outline the principle that was followed at the time in which existing owners should neither gain nor lose under the new regime. See Grout and Jenkins, 'Regulatory opportunism and Asset Valuation: Evidence from the US Supreme Court and UK Regulation', CMPO Working Paper Series No. 01/38, August 2001.

³⁰ For example, this involved assuming companies would have earned the low accounting rate of return on the replacement cost of the existing assets and projecting forward hypothetical cash flows. These were discounted by the cost of capital in order to determine indicative asset values. Armstrong et al (1994, pp. 345-346) and Grout and Jenkins (2001, pp. 33-37).

³¹ Grout and Jenkins (2001, p. 34-37).

³² For further explanation see Ofwat, *Final determinations, Future water and sewerage charges 2000–05*, section 7.3.8 'Current cost depreciation and 'broad equivalence'' on p. 108 or Ofwat, *Setting price limits for 2010-15: Framework and approach*, 2009 p. 41.

6. Assessment of asset valuation methodologies applied to the TDR

58. In this section we use our framework to assess the various asset valuation methodologies. Our working assumption is that the asset valuation methodology is applied correctly, and we assume that all regulatory parameters, such as the cost allocation, are correctly specified.³³ We acknowledge that it is difficult to assess the exact extent of perceptions of risk associated with any particular asset valuation methodology and the regulatory risk of a change in methodology, and investors' interpretation of this. That is, perceptions of risk largely depend on the extent to which a methodology and change in methodology is seen as credible and durable by different stakeholders.

6.1. DHC

59. DHC measures the opportunity cost to the original owner to construct the assets. In this sense, the returns to the initial owner align with the returns to the asset. If the investors who built the asset no longer own it, as is the case for the TDR, this link between returns to the asset and the owner is broken.
60. By nature of being a backward-looking measure, DHC may not accurately measure the efficient and forward-looking costs of the service. This is because the forward-looking costs of providing the service may have changed since the time of construction. Additionally, it may be the case that the initial construction costs were higher than would be achieved by a truly efficient entrant.
61. In principle, a known advantage of the DHC method is that it relies on objective data that can be audited by independent parties. It is therefore seen as being robust to manipulation and having low information requirements once a base valuation has been established. Furthermore, as already noted, there are aspects of clause 50 of the Code that some might interpret to suggest a historic view of costs. However, we understand that DHC may not be practical to implement for the entire rail line. The Tarcoola to Alice Springs line was constructed more than 40 years ago. The historic records of construction costs and depreciation figures may be difficult to obtain, collate and verify. Historic cost data should be available for the more recent extension from Alice Springs to Darwin (constructed in 2004).
62. Any lack of historic data and information on the depreciated historic cost of the initial line segment could potentially raise complications when undertaking the review of the revenues. More specifically, a lack of data on the initial line segment may constrain the review of revenues to be focused solely on the basis of excluding government contributed assets. Though, if the focus of the review was to assess revenues excluding government contributed assets, this could be less of a problem.
63. Regarding the reasonable expectations of investors, by allowing investors to recover their initial investment, DHC is consistent with the reasonable expectations of the *original* investors. However, it may not be reasonable for a new owner to earn a return on capital that it has not contributed.

6.2. DORC

64. We begin this section with some general observations on DORC, before assessing two possible implementations of DORC in the present context:
- The currently applied DORC valuation, which was estimated in 2005; and

³³ Appendix A considers the implications of incorrectly specified regulatory parameters.

- b) A DORC that is revalued today.
- 65. DORC represents a *theoretical* estimate and so is inherently subjective. As a result, any estimate of DORC is likely to differ from the true efficient costs, because of variation caused by imperfect assumptions. This means that two estimates of DORC, both following reasonable approaches and adopting plausible assumptions could arrive at materially different valuations. Thus, while DORC is intuitively appealing as a measure of the current costs of an efficient new entrant, in practice the estimated DORC value (used by the regulator) could differ from efficient costs. In the context of the TDR, the main concern is that the DORC may be overestimated relative to the true efficient costs. Although, in general, it is also possible, that DORC could be underestimated, which would limit a firm from earning “normal” profits. As a result, a DORC value can be contentious given the impact that different assumptions can have on the resulting valuation.
- 66. Considering the reasonable expectations of investors, some points can be made about DORC in general. DORC in general *may* be consistent with the reasonable expectations of investors for several reasons:
 - a) The arbitration clause requires DORC;
 - b) General Australian regulatory precedent regarding the use of DORC; and
 - c) The Commission’s use of DORC in its 2015 review of revenues.
- 67. However, to the extent that the DORC is overestimated (or misallocated), it could lock in monopoly profits. An expectation of monopoly profits is not reasonable and so investors should not reasonably expect that the Commission retains an overestimated DORC. Though resolving differing views on whether a particular DORC value is overstated is likely to be difficult.
- 68. In addition, as we describe in Section 5, there is precedent for regulators using valuation methodologies besides DORC, so it would seem unreasonable for investors to always expect DORC without an assessment of the specific regulatory context. We understand that the Commission’s view is that it is not bound to use DORC. It might be reasonable to expect that investors have interpreted statutory frameworks and relevant factual matters in the same way.

6.2.1. DORC (2005 valuation)

- 69. The currently applied DORC valuation was performed in 2005, so it is in some sense a historic measure of replacement cost, as opposed to the current cost of replacing the assets. This interpretation has parallels with a line-in-the sand type approach applied to airports in Australia, as the 2005 DORC is neither the original cost of constructing the assets nor the current cost of constructing the assets.
- 70. The DORC valuation date of 2005, however, is very close to the timing of construction of the second part of the TDR (Alice Springs to Darwin). Therefore, the 2005 DORC should closely proxy the historical cost of the new segment and thus provide a good indication of the returns to the asset for this segment, over the lifetime of the relevant assets (i.e., effectively similar to the DHC). By contrast, the first segment was constructed in 1980, so the 2005 DORC is likely to differ from the DHC of that segment.
- 71. Given the 2005 DORC is a historic estimate of cost, similar to using DHC, the 2005 DORC only correctly measures forward-looking costs to the extent that the replacement cost of building the rail line has not materially changed in the last 17 years.
- 72. Last, we note that the 2005 DORC is practical (since the data is available) and is simple to apply, though this does abstract away from whether the 2005 DORC is actually an accurate measure of the replacement cost in 2005, given the subjective and complex nature of replacement cost valuation exercises.

6.2.2. DORC (revalued)

73. Revaluing DORC is conceptually attractive because it means that the revalued RAB should reflect the *current* cost of an efficient new entrant, and so better reflects forward-looking costs compared to either DHC or the 2005 DORC.³⁴ An important consideration determining the benefit of revaluing is the extent that a revalued DORC would materially differ compared to the 2005 DORC. That is to say, a revaluation would only add value to the extent that replacement costs have materially changed since 2005, so that the revalued DORC would be significantly different than rolling forward the 2005 DORC. It is hard to know whether this would be the case in the present case without going through the exercise. Equally, even if it is different, if it wouldn't change the outcome of the assessment (because either DORC valuation would be likely to not find excessive returns), then the costs of going through the exercise would not be justified. This was the view the Commission took in its initial ten-year review, where it noted: "The process of revisiting the DORC is costly, *yet unlikely to change the outcome of this Review*".³⁵
74. Similar to the 2005 DORC, there are reasons that suggest that a revalued DORC may be consistent with reasonable expectations of investors (and some possible countervailing reasons). It is, however, unclear whether investors would expect that the DORC would be revalued.³⁶ In this direction, firms in other similar settings have supported revaluing.³⁷ Though equally, the use of DORC in other regulatory contexts typically involves a one-off DORC valuation of the initial RAB that is indexed for inflation rather than periodically revalued.
75. Regarding practicality, revaluing DORC is likely to be expensive and contentious. For example, in its recent update of guidelines for the purposes of arbitration, the Commission decided to roll forward the initial DORC valuation, as opposed to revaluing DORC in part because "conducting periodic DORC revaluations is costly".³⁸ A revaluation may also be contentious in the sense that any revalued estimate may be contested by either the owners of the TDR, other stakeholders (such as access seekers), or the Commission.
76. As a final point, we note that a revalued DORC means it is possible for the owner to earn excessive returns if the revalued DORC is materially greater than the previous DORC and the revaluation is not treated as income. Therefore, the Commission would need to form a view on how to treat historic revaluation gains.

6.3. Market value

77. The market value represents the opportunity cost of the funds used by the owner to purchase the asset, and so accurately measures the return to the purchaser of the assets (at the time of the transaction). In this section, we cover three varieties of market value:
 - a) Line-in-the-sand: The Commission defines the RAB using a *prior* transaction. For instance, the most recent transaction by Aurizon in 2022;

³⁴ Again, on the proviso of estimating the theoretical rather than actual cost.

³⁵ Commission's 10-year review, p. 36.

³⁶ The possibility for revaluation was discussed p. 2 and p. 24 in the Commission's recent 5-year review. It might therefore be reasonable to think that investors would be aware of the possibility of revaluation and take this into account.

³⁷ For example, the ARTC supported using a revalued DORC when considering the ACCC's evaluation of the interstate network See ARTC, ARTC proposal to ACCC re Methodology for Revaluation of the Interstate Network, August 2019.

³⁸ ESCOSA, *Review of Rail Guidelines, for the Tarcoola-Darwin Railway Final Decision*, October 2019. See Section 3.2.1.1 "Roll forward method" on p. 14.

- b) Ongoing revaluations: The RAB updates whenever a transaction involving the TDR occurs. For example, the 2010 transaction would determine the RAB in 2010 and then the RAB would have updated using the value from the 2022 transaction; and
 - c) Hybrid of market value and DORC for depreciation: This method uses the market value to set the RAB but applies depreciation using DORC.
78. To avoid repeating arguments, this section follows a structure of initially introducing concepts for the line-in-the-sand method and then only revisits these concepts to the extent that they differ for the ongoing revaluations and hybrid approach.

6.3.1. Market value (line-in-the-sand)

- 79. The market value represents the opportunity cost of the funds used by the owner to purchase the asset. A line-in-the-sand pegs the RAB to a prior transaction. For instance, the 2010 transaction or the recent Aurizon transaction. By linking the RAB to a transaction in which an investor purchases the assets, market value accurately measures the return to the owner of the assets.
- 80. The primary advantage of applying a market value is that it can accurately measure the forward-looking and efficient costs (at the time of transaction) if customers have a credible option to bypass the TDR. Bypassing means that an efficient entrant could enter to build an alternative infrastructure to serve these customers or an alternative service (e.g., road freight) is an economic substitute. Therefore, market value measures the efficient costs if actual or threatened competition is the constraint on pricing, rather than regulation. In this case, the market value represents an objective data point that reveals the cost of an efficient entrant/rival. Similar to DORC and DHC, market value only correctly measures forward-looking and efficient costs to the extent that these costs have not changed since the time of the transaction.
- 81. An additional advantage of a market value is that it can reveal the extent of non-commercial assets. An example is the UK utilities in which the government had built assets with non-commercial and social objectives, which caused the replacement cost/book value of the assets to exceed the efficient costs associated with commercial provision of the service. Privatisation served as a way to value the commercial aspect of the assets. We note that this advantage may be less pronounced for the TDR, given that the extent of private contributions compared to public contributions is already known.
- 82. Market value can, however, reflect other factors unrelated to efficient costs. In particular, the TDR was a risky greenfields project, so future demand (at the time of construction) was very uncertain. Accordingly, it is possible that *realised* demand turned out to be lower than expected (e.g., due to mine closures or lower than expected volumes from mining customers) and this would likely have reduced the market value. The implication is that a low market value (i.e., well below replacement cost as we understand may be the current case for the TDR) can arise simply because the railway earns low profits as opposed to the TDR's profits being constrained by the possible bypass from an efficient rival.
- 83. If market value is applied in this situation (so that profitability is measured against the purchase price) then an increase in demand could show up as excess returns. Applying market value in this situation could therefore disincentivise the access provider from investing effort to expand demand for the service beyond what it expected. The elimination of upside is similar to the well-known issue in regulation of asymmetric truncation, whereby regulation caps the upside of an investment but not the downside. For comparison, if investors' perceived pricing constraints were based on replacement costs (which would allow for higher-than-expected demand); then the market purchase value would include both expectations of demand as well as a premium/real option value for demand risk.
- 84. It is thus possible that applying a market value as a line-in-the-sand may surprise investors (by nature of changing the constraint on pricing and, in effect, remove the real option value for

demand risk). This could undermine dynamic efficiency. At the same time, if there is no material demand risk premium included in the market value (and/or investors did not assume that replacement costs were the pricing constraint in an *ex-post* review), then using the owner's market value could simply lock in the valuation they placed on the assets at the time of the purchase (provided that the regulated rate of return equals the market rate of return).

85. At this stage it is worthwhile to compare the circumstances of the TDR to those of the United Kingdom utilities, where privatisation resulted in the RAB being set at a value below book and replacement cost and did not undermine dynamic efficiency. To be specific, the United Kingdom Government itself suffered a loss when reducing the RAB below replacement cost when privatising. Therefore, the government was not lowering the value of assets owned by private investors.
86. For completeness, we note, it is also possible for a market value to be above replacement cost. Applying market value in this case would lock in monopoly rents, which is a typical reason that market value is avoided. One solution to this risk is to apply a variant of the optimised deprival value, in which the Commission would use the lesser of the market value and DORC.³⁹
87. Regarding practicality, both the 2010 and 2022 transaction prices are readily available. There exist several practical challenges, however, to applying these market values. An initial challenge is that transactions (for instance the recent Aurizon transaction) can include the TDR as part of a broader transaction. The Commission would therefore need a method for allocating market value to the TDR when a transaction spans several assets. The flipside is that the market value would eliminate the need to determine how to treat government contributed assets.

6.3.2. Market Value (ongoing revaluations)

88. A key advantage to ongoing revaluation is to update the valuation as circumstances change. For instance, new technology may greatly lower the efficient costs and so introduce a bypass threat. This new technology would lower the market value of TDR, which is then revealed whenever there is a new transaction. Alternatively, the output markets of downstream markets might expand, resulting in a higher market value for the TDR.
89. Ongoing revaluations can introduce a concern, in which there is a circularity between the rational purchase price of the TDR and the RAB used to assess revenues. This circularity arises through the following logic:
 - a) The purchaser's valuation is based on the discounted cashflows from owning the TDR;
 - b) The purchaser knows that the purchase price determines the RAB; and
 - c) The RAB determines the maximum revenue limit (by nature of being used in the *ex-post* review) and in turn the cashflows (so therefore the purchaser's valuation).
90. That is to say that the market value is based on the expected cashflows, which are constrained by the RAB, and the RAB is determined by the market value. This circularity can lead to perverse feedback loops (either negative or positive). A negative loop implies that the rational purchase price could fall to low levels, while a positive loop could inflate the market value to that of a firm that is not subject to regulation (i.e., the unregulated monopolist) as the price of the assets simply gets bid up to capitalise the monopoly rents.⁴⁰

³⁹ As explained in section 4.5, regulators typically apply the optimised deprival value as the lesser of DORC and the economic value. It would also be possible to apply the optimised deprival value using the market value in place of economic value.

⁴⁰ Whether a positive or negative feedback loop exists depends on the relationship between regulated and market rate of return. A negative loop occurs if the regulated rate is less than the market rate. This difference leads to a *lower* market value as private investors are less willing to pay for future cashflows. The lower market value, however, would lower the

91. It is not clear how this circularity would be broken if ongoing market valuations was the adopted approach in the context of an ex-post review. The ways that the circularity concern has been addressed are:
 - a) Apply line-in-the-sand (i.e., a one-off) based on a prior transaction (as assessed in subsection 6.3.1). By its nature, the line-in-the-sand is based on a prior transaction, so avoids the circularity, in which the purchaser anticipates the effect of the purchase price on the allowable revenues. In the case of water and sewerage companies in the United Kingdom at the time of privatisation, this was a reason that the regulator selected its use of the initial market value from flotation rather than adopting a current market value;⁴¹ or
 - b) Directly regulate prices in a way which doesn't depend on market value, as this pins down the expected future cash flows. For instance, in the case of water and sewerage companies in the United Kingdom, existing regulatory settings, and the principle that existing owners should neither gain nor lose under the new regime, provided an anchor. This commitment meant that the market value capitalised profits implied by the existing regulatory regime.⁴²
92. The United Kingdom experience illustrates that the use of market value is in some sense based on the premise that current prices are already reasonable (and thus can be locked in via using market value to set the RAB).
93. In addition, if ongoing revaluations were conducted, the Commission would need to decide whether to treat the changes in market value over time (which are essentially capital gains/losses) as income/losses when assessing profitability.
94. Regarding the reasonable expectations of investors, the discussion in section 6.3.1 equally applies to ongoing valuations when they are first introduced. However, once the approach is embedded, there would not be any issue with surprising investors. However, investors' expectation that the purchase price would set the RAB is the source of the circularity we have described.

6.3.3. Hybrid: Market value for RAB but depreciated using DORC

95. This section focuses on the implications and motivations for using DORC, rather than the market value, for depreciation. Accordingly, the discussion is agnostic about whether a line in the sand or ongoing market valuations is used. This hybrid method was applied by Ofwat – the UK water regulator – so we start by describing the approach taken by Ofwat.
96. While Ofwat applied this hybrid, they also required that firms achieve "*broad equivalence*" meaning that capital expenditure and depreciation broadly coincide. This equivalence implies that the RAB should at a minimum remain constant but would increase to the extent that firms invested in growing/improving the network (as they in fact did). As described in section 5.4, Ofwat's reasoning for applying DORC for depreciation was to ensure that consumers would receive a constant level of service. Over time the hybrid approach becomes somewhat irrelevant

allowable revenues and so cashflows leading to an even lower market value. By contrast, a positive loop occurs if the regulated rate is greater than the market rate. This difference leads to a higher market value as now investors are willing to pay more for the future cashflows. The higher market value would increase the allowable revenues and therefore the future cashflows. In practice, it is unlikely that the negative loop would actually occur (in which the TDR would be sold for very low levels) since it would require the current owner to sell when the asset is worth more to the seller than to a potential buyer. Therefore, the seller would prefer to hold onto the asset rather than sell it. By contrast, the positive spiral may be more likely to occur. This is because the positive loop causes the allowable revenues to increase so that the buyer would value the assets more than the seller.

⁴¹ Grout and Jenkins (2001, pp. 34-37)

⁴² Grout and Jenkins (2001, p. 35)

as the original assets valued at market value are depreciated out of the RAB and replaced by new capex which enters at actual cost.

97. As Ofwat was directly regulating water utilities, it was able to enforce broad equivalence. This is a different context to the TDR where the Commission is conducting an ex-post review. It is thus unclear to us how the Commission would force the owner of the TDR to increase capex to match the regulatory measure of depreciation, if it didn't already.
98. Our understanding is that broad equivalence does not currently hold as annual below-rail capital expenditure has been roughly between \$7 million and \$11 million each year over the past five years or more, while *actual* reported annual depreciation has been a little higher at roughly between \$10 million and \$15 million each year.⁴³
99. To the extent that broad equivalence does not hold in the TDR (i.e., the rail operators are depreciating the asset), the hybrid approach could lead to perverse outcomes in the context of an ex-post review of revenues. If DORC is substantially higher than market value and there is little ongoing required capex, then the asset base could depreciate to zero well before the end of the asset's useful life. In effect, the hybrid approach would essentially become a form of front-loading depreciation. In the context of the Commission's profitability assessments, this would mean that for:
 - a) Early periods: The Commission would likely find that revenues were not excessive, as the high depreciation allowance would increase the allowable revenues; then
 - b) Later periods: Once the asset base reaches zero or is very small, the Commission would likely find that revenues were excessive as the return on capital component of allowable revenues would fall to zero or be very small, as would the depreciation allowance.

100. This could occur even if the owner of the TDR earned no excess profits over the life of the assets.

6.4. Economic value

101. Economic value is the opportunity cost to the current owner. Unlike market value, the economic value is the current opportunity cost rather than the opportunity cost of the funds used to purchase the asset, at the time of the transaction. In the context of the TDR, an economic value method estimates the RAB using a discounted cash flow model using either the current prices or based on regulated prices. Similar to market value, applying an economic value method is thus premised on a view that current prices are already considered to be efficient. Because of this, economic value may be an inappropriate method for an ex-post review that seeks to determine if current prices are excessive.
102. Similar comments to those made for market value apply with respect to our assessment criteria regarding measuring excess returns, measuring forward-looking costs and reasonable investor expectations, so we do not repeat them here.
103. The practicality of this option is however different from the market value approach as it would require a bottom-up valuation model. This approach would require the Commission to forecast future mining volumes. Such an approach is therefore much more complex and contentious than using an observable market data point.

⁴³ These values were provided to us by the Commission. These figures relate to actual depreciation. However, in previous revenue reviews, depreciation was calculated by the Commission on a theoretical basis based on the length of the concession deed.

6.5. Summary of assessment

104. In Table 3, we summarise our assessment of the different asset valuation methodologies as applied to the TDR. The first three columns summarise methods that measure the return to the asset, while the last four columns summarise methods that measure the return to the owner. When considering variation of a particular methodology (e.g., 2005 DORC vs. revalued DORC), we sometimes use a single summary to covers both variations.

Table 3: Summary table of Asset Valuation Methods applied to the TDR

| Criteria | DHC | | DORC | | Market Value | Hybrid (RAB = MV) | Economic value |
|--|--|---|--|--|--|---|----------------|
| | 2005 | Revalued | Ongoing revaluations | Line-in-the-sand | DORC = depreciation | | |
| a) Accurately measures excess returns | Asset at the date of construction (and by implication the initial owner). | Asset in 2005. | At the revaluation date. Possible for the owner to earn excessive returns if the revalued DORC is greater than the previous DORC and revaluations aren't treated as income. | Owner at the date of transaction, which would coincide with replacement cost in a competitive market. Line in the sand does not measure the return to a new owner if the asset is subsequently purchased. | | Owner at the date of valuation. | |
| | | | A firm can earn excess returns if the <i>estimated</i> cost exceeds the <i>true</i> cost (due to the theoretical and subjective nature of the assessments). Equally if it is below the true cost then it would prevent normal returns from being earned. | | | | |
| b) Accurately measures the efficient forward-looking costs | Not necessarily as the initial construction costs, might not have been efficient, and/or the efficient costs may have changed since construction. | Not efficient if efficient costs have materially changed since 2005. | In theory, measures the cost of an efficient new entrant today. | Yes – if market value reflects the risk of bypass (at transaction date) or efficient costs. No – if market value reflects reasons unrelated to efficient cost. | No – if ongoing revaluations cause a circularity between the purchase price and allowable revenues. | Depends if prices are currently set with reference to efficient costs. | |
| c) Consistency with the reasonable expectations of investors | Reasonable for investors to expect to earn their initial investment if it was efficient and for commercial assets. May not be reasonable if the initial investment includes non-commercial/government contributed assets. | On the one hand, yes, as the arbitration clause requires DORC. The Commission's use of DORC in the 2015 revenue review, and Australian regulatory precedent regarding the use of DORC. On the other hand, no, if DORC is overestimated (or misallocated) as an expectation of monopoly profits is not reasonable. In addition, there is also precedent for regulators using valuation methodologies besides DORC. Further, the Commission's view is that it can adopt an alternative method. Regulatory risk may therefore have been incurred at introduction of the Code. | | May surprise investors if applying market value results in the constraints on pricing changing ex-post (i.e., investors value demand risk based on the existing DORC constraints on pricing, but ex-post the amount they paid becomes the new, lower constraint on pricing, which does not allow the demand risk premium/real option value). However, the market value may simply lock in the investor's valuation which is arguably consistent with investor expectations. Further, the Commission's view is that it can adopt an alternative method and regulatory risk of a change may therefore have been incurred at introduction of the Code. Ongoing revaluations will not surprise <i>future</i> investors if the approach is signalled now. | | | |
| d) Practicality | May not be practical given that historical cost information might not be available. Simple, however, if the information is available. | The 2005 DORC valuation is available and simple to apply. | Revaluing DORC is generally considered complex, costly, and contentious. Simple, however, to apply the revalued DORC. | Recent transaction prices are available. Complexity regarding a bundled transaction. | Recent transaction prices are available. Complexity regarding a bundled transaction. Requires broad equivalence. | Complex bottom-up approach that would require determining the implied market value. | |

7. Practical considerations

105. This section addresses the questions on practical considerations put to us by the Commission.
- If an alternative asset valuation methodology were to be adopted, should it be applied prospectively or retrospectively; and/or
 - If a market value methodology were to be adopted, how should asset purchases during any five-year review period be dealt with.
106. Regarding the first question, if the Commission changes its methodology in a way that provides a stricter assessment of what is excessive, then applying the method retrospectively to a period when the firm had a reasonable expectation that the previous method would be used could increase perceptions of regulatory risk. The primary issue is that the firm wouldn't have had any opportunity to set access prices consistent with the regulation now being used to assess it. We understand that the Commission's view is that it is open to it to use an asset valuation besides DORC. It might be reasonable to expect that investors have interpreted statutory frameworks and relevant factual matters in the same way, which could suggest that investors would always have known that the methodology could change. This might suggest that waiting is not necessary, and a new methodology could be applied retrospectively since investors always would have been aware it was a possibility.
107. On balance, we recommend that any potential change in asset valuation methodology to be applied prospectively. The downside of only applying the updated method prospectively is that if the Commission has reached the view that a different methodology is appropriate, waiting extends the period of time in which the firm can potentially earn excess revenues. Possible middle grounds would be to have a transitional period where either:
- The assessment is conducted under both methods (including the presentation of sensitivity analysis), but any findings of "breach" would only be based on the prior methodology (which may be seen as being consistent with expectations for the time period of the review);
 - Any finding of a breach only applies if the initial methodology was grossly inappropriate, so that it would not be reasonable for the owner to expect to earn monopoly profits; or
 - The assessment under the new methodology only occurs from the point in time after the Commission concludes its consultation and makes a decision (for example, if the decision is made one year into a 5-year period, the assessment might only assess the final 4 years).
108. Regarding the second question of asset prices during the period, if market value is applied, then a one-off or line-in-the-sand should be applied. As explained in section 6, the main reasoning is that deviating from a line-in-the-sand may introduce valuation circulatory if firms anticipated that the purchase price would influence the RAB and therefore the maximum revenues.

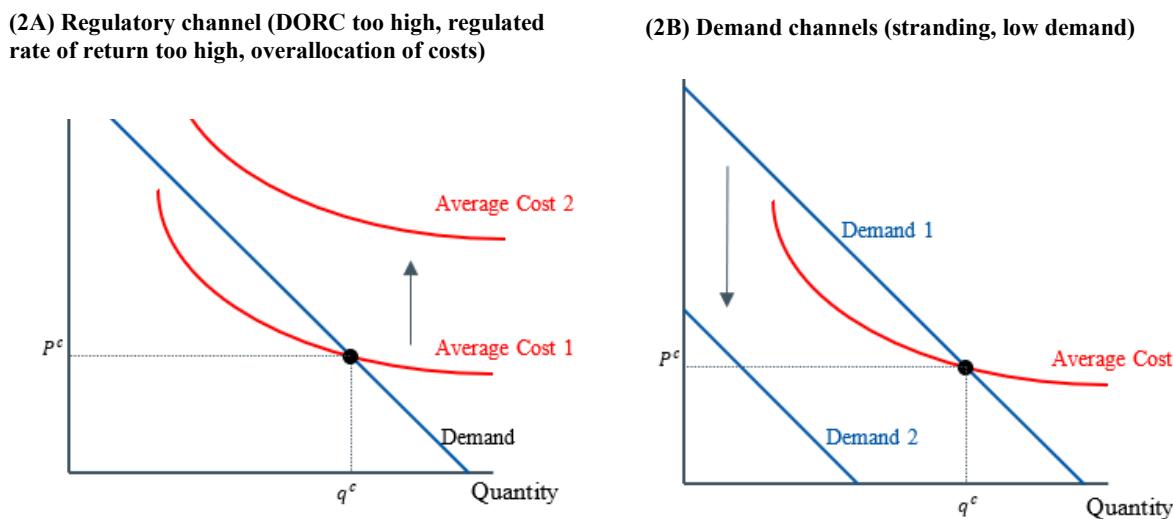
Appendix A. Possible explanations for why DORC has not been a binding constraint in the previous revenue assessments

109. Given our analysis above, we now discuss some reasons for why actual revenues can fall below the implied competitive revenues from DORC and additionally how the market value can be significantly below DORC. These two outcomes could arise through the following two channels:

- A regulatory channel, in which regulatory parameters are erroneously set too high and/or calculated incorrectly. For instance, the DORC value could be overstated; the regulated rate of return calculated for the purposes of reviewing revenues could be too high; costs could be over allocated to the non-competitive sector; or theoretical estimates of depreciation may overstate depreciation amounts adopted in the maximum revenue calculated.⁴⁴ These are just a sample of regulatory issues that could arise.
- A demand channel, in which realised demand is lower than expected at the time of construction. More specifically, future demand (at the time of construction) was uncertain, so that realised demand could reasonably be low because either competition was a stronger competitive constraint (i.e., the TDR has less market power than expected) or ex-post demand was lower than expected (i.e., lower than expected mining production).⁴⁵

110. Figure 2 illustrates the regulatory and demand reasons graphically by plotting a stylized demand curve and average cost curve. The left figure uses a black dot to illustrate the case in which regulation binds, so that price equals average cost, and the asset does not earn excessive returns. Relative to the standard case, the regulatory reasons increase the average cost to be recovered, so it may be impossible for the regulated firm to recover these costs even if it fully exploits its market power. By comparison, while the firm may potentially exercise market power, demand may be insufficient to achieve the regulated revenues.

Figure 2: Regulatory and demand reasons for regulation that does not bind



⁴⁴ We understand the Commission calculates depreciation using the life of the lease.

⁴⁵ We note that the demand channel still exists even though risk is accounted for in the risk premium. Greater risk, by definition, implies that there is a greater possibility that realized demand might fail to earn the regulated revenues.

111. The regulatory channels can cause the maximum revenues to exceed actual revenues for the following three reasons:

- a) **DORC may be inflated because of:**
 - i. **Overbuilding:** meaning the assets are over specified relative to demand. A common case of overbuilding occurs when a government is the investor (as for example, the United Kingdom utilities). More specifically, the government may pursue non-commercial objectives such as serving rural customers at high cost or providing higher quality than consumers would demand if they were to pay the real cost of high quality. The ACCC's current review of the application of DORC for the interstate network has raised the issue relating to the inclusion of significant "non-commercial" assets (assets that a commercial operator would not have purchased/constructed).
 - ii. **Current DORC greater than the initial build cost:** investors built the rail expecting to earn a return on their invested funds. DORC, however, can be higher than the initial investment if the input prices of modern equivalent assets increased (e.g., because of a significant increase in the price of labour and steel since the time of construction). In this scenario, it is possible that the lower maximum revenues based on the DHC would bind but the higher allowable revenues based on a DORC would not bind. Put differently, the rail was economic based on its construction costs but not economic based on replacement cost (holding demand constant across the two cases).
- b) **Regulated rate of return is too high:** The return to investors depends on the regulated return to be adopted for the purposes of the revenue review. If the regulator sets a rate of return (including risk premiums to reflect risks at the time of construction and the contributions from government to the project) that is above the market return, then the allowable revenues are larger, which makes it more likely that the regulated revenues may fail to bind.
- c) **Costs overallocated to mining:** Because the Commission is only assessing revenues for which there are no sustainably competitive prices, the Commission must allocate costs between the following two end-user types on the TDR: users facing sustainable competitive prices (e.g., intermodal freight and passenger services) and users facing non-sustainable competitive prices (e.g., mining operations). The allowable revenues increase the more that costs are allocated to the mining sector. Therefore, if the Commission over allocates costs to the mining sector, then the revenues might not bind (when they would bind if the allocation were correct).

112. Additional to the three regulatory reasons, regulation may fail to bind for the following two demand reasons:

- a) **Stranding due to unforeseen competition:** The firm may have expected to hold market power, but unforeseen competition entered, which eroded its market power. The risk of stranded assets is well-known in gas (competition from electricity) and telecommunications (competition from alternative broadband technologies). By contrast, there is limited stranding risk for a pure monopolist, such as for water or distribution of electricity. Stranding could manifest itself for the TDR in two ways:
 - i. Mining freight becomes subject to alternative forms of freight.
 - ii. Road freight becomes more of a competitive constraint to intermodal and passenger services than initially expected. Therefore, the TDR sold fewer intermodal and passenger services (and at a lower price) than expected. This is relevant for the assessment of non-competitive services due to the cost allocation issues already described. If the TDR loses contestable volumes to road freight, then more costs will be allocated to mining customers.

- b. **Demand lower than expected:** a firm can be a monopolist yet fail to earn the regulated revenue if *ex-post* demand turns out to be significantly lower than expected when the assets were constructed (i.e., low commodity prices may force mines to close). For instance, the investors of the TDR may have expected there to be significantly higher mining freight demand, which would have caused the regulated revenues to bind. Despite these expectations, there was less mining demand, and the demand from these revenues is insufficient for the regulated revenues to bind. In this low-demand case, the owner of the TDR can charge monopoly prices on the remaining customers yet earn significantly less than the maximum revenues.

109. We make the following comments on regulatory factors:

- a. **Overbuilding might be unlikely:** as private investors funded 42% of the assets (Tarcoola to Darwin) expecting to earn a return on their invested capital. As part of their due diligence, ATP – the private firm that invested in the railway – would have analysed their expected returns to decide that the project was commercially viable.⁴⁶ The other 58% of the rail was funded by government contributions and these subsidies should have funded the non-commercial part of the line and thus accounted for any overbuilding.⁴⁷
- b. **DORC could only significantly exceed DHC for the Tarcoola-Alice Springs line built in 1980:** as the DORC was calculated in 2005, so input prices could have increased significantly between 1980 and 2005. As the second part of the line was built in 2004, it strikes us as unlikely that the DORC for this part could be significantly inflated relative to the historical build cost.
- c. **Unlikely that the regulated rate is too high on total assets:** The regulated rate is the risk-free rate plus the risk premium from the time of construction. Our understanding is the Commission undertook a consultation to determine the industry-wide WACC in 2003.⁴⁸ Based on this WACC, the Commission then calculated the regulated rate of return on *total assets* (i.e., including government contributed assets) was around 2.5% (real, post-tax). In contrast, it is around 14.5% when adjusted for project funds (that is, including a risk premium of 13.1% on project funds only). In this case, the risk premium *at the time of construction* for project funds results in a WACC that is high relative to the WACC used by other regulators.
- d. **Plausible that costs are overallocated to mining firms:** because the cost allocation occurred over the entire rail line. Therefore, it is possible the rail is earning excessive returns on particular segments of the line. For example, Wirrida to Tarcoola could plausibly be a segment and Table 2 shows that 3 of 5 mines (CU-River, Southern Iron, OZ Minerals) use the Wirrida to Tarcoola segment to access Port Augusta. This segment represents 6% of the total track (130km/2246km) and table D4 in the appendix lists that mining has a 31% usage share (124,007 KGTK/398,315 KGTK). As a result, allocating costs based for this segment would apportion 1.8% of the RAB to mining (6% multiplied by 31%).

110. Beyond listing out some possible reasons for why DORC could be the correct asset valuation method yet fail to bind; it is beyond the scope of this report to make any detailed comments and

⁴⁶ See ESCOSA, *Tarcoola-Darwin Railway: Regulated Rates of Return Provisional Determination*, July 2003

⁴⁷ Based on the Table on p. 9 of ESCOSA, *Tarcoola-Darwin Railway: Regulated Rates of Return Provisional Determination*, July 2003

⁴⁸ See p. 25-28 of the 5-year revenue review. The higher risk premium is included for the purposes of arbitration guidelines in order to account for, among other things, the risks prevailing at the time of construction.

assessments on actual versus realised demand,⁴⁹ calculations of risk premiums, and cost allocation methodologies.

⁴⁹ It is noted that in 2003 the Commission calculated the expected distribution of returns using a model which accounted for traffic growth, potential market size, the strength of non-rail competition, Asian trade growth, and shipping costs amongst other variables. The analysis notes that there is an asymmetrical probability distribution meaning there is a long tail of low returns. It seems plausible that current demand is one of the low demand cases. Commission, *Tarcoola-Darwin Railway: Regulated Rates of Return Provisional Determination*, July 2003. See Appendix C “The railway’s probability distribution of expected returns” p. 80.

Appendix B. Tables of regulatory precedent on asset valuation

Table 4: Rail in Australia: Asset valuation and cost allocation

| Regulator & firm | Method used and regulator reasoning |
|--|---|
| ARTC interstate network ACCC. ⁵⁰ | <p>Currently uses DORC that was estimated in 2008.</p> <ul style="list-style-type: none"> However, there is currently a consultation on alternatives to DORC given that “DORC value is likely to include non-commercial assets (assets that an efficient commercial operator would not have invested in)”. The concern is that by including non-commercial assets to DORC, this implies high ceiling limits, which would allow ARTC to significantly increase prices in the future and earn a return on historical non-commercial assets.⁵¹ Government contributions are excluded from RAB except if the rail owner was required to earn a commercial return on that funding.⁵² Cost allocation by segment |
| Western Australia Economic Regulation Authority Western Australia. ⁵³ | <p>Currently uses Gross replacement value (GRV): Sets the whole life average annual capital cost as if the infrastructure service was provided by assets that would be used if the network was constructed today, with operating and maintenance costs also set on this assumption.</p> <ul style="list-style-type: none"> However, they are considering a change from GRV to DORC because the regulator believes that DORC better reflects what would be achieved in a competitive market. If they do move to DORC, they would apply back, tilted depreciation for railway owners that invested on the assumption of GRV and couldn't obtain the benefits of DORC from the beginning of their asset's life. Government contributed assets are included in the cost of capital for the purpose of calculating the GRV and total cost. The value of an asset will be accounted for as an equivalent annuity payment which is to be included in the revenue earned on the asset for the purpose of the ceiling price test. |
| New South Wales IPART NSW. ⁵⁴ | <p>Currently uses DORC.</p> <ul style="list-style-type: none"> However, once the ACCC makes a decision on whether or not to continue using DORC for the Interstate network, IPART will take into account that decision and may follow the decision made by the ACCC. The current methodology includes assets that are funded from government grants. They also apply economic depreciation based on an operating cost building block for rail access calculations. |
| Queensland Queensland Competition Authority ⁵⁵ | <p>Currently uses modified DORC for the West Morton rail line, and DORC for the Aurizon network.</p> <p>The QCA reasons that a traditional or standard DORC is not appropriate given there is no direct modern engineering equivalent to these assets and the assets were not built for the purpose for which they are used today. That is, building an asset to transport coal today would look very different from the current network. Therefore, QCA estimated the initial asset base excluding maintenance-intensive assets or assets that have exceeded their expected useful life. This resulted in an initial RAB of \$272.2m (July 2015), compared to \$471.5 million which was estimated using a standard DORC as calculated by Queensland Rail.</p> |

⁵⁰ ACCC, *Valuation approach for the Interstate network, Issues Paper*, September 2019, p.3.

⁵¹ ACCC, *DORC valuation of ARTC's Interstate network, ACCC supplementary paper to GHD's valuation paper*, October 2021, p.1.

⁵² ACCC, *DORC valuation of ARTC's Interstate network, ACCC consultation paper*, June 2021.

⁵³ Government of Western Australia, *Review of the Western Australian Rail Access Regime, Final Decision Paper*, February 2020, Section 2 “Asset Valuation” p.7

⁵⁴ IPART, *Review of the NSW Rail Access Undertaking, Issues Paper*, November 2021, Section 6.2, p.29.

⁵⁵ For West Morton: QCA, *Queensland Rail's 2015 Draft Access Undertaking, Draft Decision*, October 2015, Section 8.7, p.159. For Aurizon: QCA, *QR Network's 2010 Access Undertaking, Consolidation, Version prepared as of June 2014*. Section 6.2.4 p. 52.

Table 5: Non-rail sectors in Australia: Asset valuation and cost allocation

| Regulator | Method used and regulator reasoning |
|--------------------------|---|
| Water | |
| ESCOSA. ⁵⁶ | <p>Line in the sand (GFFCR) approach using economic value</p> <ul style="list-style-type: none"> The Going Forward Full Cost Recovery (GFFCR) approach calculated a return on assets (6.0% for non-legacy and new assets post June 2006, and 3.1% for legacy assets), which together with allowances for operating costs and depreciation, set the 'target revenue' to be secured through water prices each year The full value of the ADP (net of the commonwealth contribution) was included in the value of the initial RAB since "it was found to be a key asset in securing the supply of water to Adelaide consumers and businesses and improving the security of water supply across the State" |
| IPART NSW. ⁵⁷ | <p>Line in the sand approach using Economic value</p> <ul style="list-style-type: none"> Current prices and returns were determined (from IPART's 2001 price determination) and this was capitalised using IPART's assessment of the WACC. A PwC report justified IPART's decision to use economic value by showing that the asset value from EV would be similar to that of DORC and minimise any disruption.⁵⁸ |
| QCA. ⁵⁹ | <p>Deprival value which resulted in DORC</p> <ul style="list-style-type: none"> QCA states "DORC best approximates the cost of a new entrant the market." Additionally, they justify their decision by stating that "DORC is also applied in most regulatory asset valuations in Australia" |
| ICRC. ⁶⁰ | <p>Deprival value, which resulted in Economic value as it takes into account and compares both the DORC and Economic value</p> |
| ESC. ⁶¹ | <p>Line in the sand approach using an economic value method</p> <ul style="list-style-type: none"> In 2004, ESC used a "line in the sand" approach which entailed reverse engineering the building block framework to determine the value of assets that would be consistent with a variety of return and pricing assumptions. The initial asset value was calculated assuming that each business continues to earn the returns observed in 2004-2005 (measured as revenue less operating expenditure, tax and <i>regulatory</i> depreciation calculated using the RAB). In those cases where the ESC concluded that there was a risk to the businesses' financial viability, a higher value (4-6% increase) was adopted by the Minister. |

⁵⁶ SA Water Pricing Inquiry, *Final report of the SA inquiry into water prices*, 2019 p.6.

⁵⁷ IPART, *Public submission to the ACCC's Bulk Water Charge Rules Issues Paper, Submission to the bulk water issues paper*, 2008 p.21.

⁵⁸ NERA/PWC 2009 report

⁵⁹ QCA, *Gladstone Area Water Board: Investigation of Pricing Practices, Final Report*, June 2010, p.73.

⁶⁰ IPRC, *ACTEW's Electricity, Water, & Sewerage Charges for 1999/2000 to 2003/2004*, May 1999.

⁶¹ NERA/PWC 2009 report

| Electricity Distribution | |
|--|--|
| Eastern Australia. ⁶² | Deprival value, but in practice DORC. Exception is Victoria where adjustments to DORC were made to individual networks to maintain rural/urban pricing ⁶³ |
| Western Australia | Deprival value, but in practice DORC. The economic value (EV) limb of deprival value was used as it was the cheaper of the two methods, however the EV was only 0.5% below DORC. ⁶⁴ |
| Gas | |
| ACCC, ORG, SAIPAR, IPSRT, IPRC, QCA, ERA ⁶⁵ | <p>Mainly DORC given that the National Third Party Access Code for Natural Gas Pipeline Systems (Gas Code)</p> <ul style="list-style-type: none"> DORC was chosen because DORC provides a consistent valuation between new and existing assets, regardless of past operating and accounting policies. It also sends correct price signals as to the cost of providing the services |
| Airports | |
| ACCC ⁶⁶ | <p>Line in the sand</p> <ul style="list-style-type: none"> A line in the sand was drawn and asset values for the purpose of the monitoring regime was based on those values reported on 30 June 2005. Previously, the ACCC had allowed firms to revalue their non-land asset base using DORC.⁶⁷ This led to firms revaluing their assets when they believed the DORC value had increased. Therefore, the productivity commission argued (and the ACCC accepted) to draw a line in the sand based on a historical DORC given that “<i>From an efficiency perspective, the case for sanctioning higher charges based on changes in the ‘optimised replacement value’ of above ground assets, or the value of land in alternative uses, is weak</i>”.⁶⁸ |

⁶² AER, NSW, and ACT Transmission Network Revenue Caps 1999/00-2003/2004 (2000), Queensland Transmission Network Revenue Cap 2002-2006/2007 (2001); South Australian Transmission Network Revenue Cap 2003-2007/08 (2002); Victorian Transmission Network Revenue Caps 2003-2008, 2002; Tasmanian Transmission Network Revenue Cap 2004-2008/09, 2003.

⁶³ Office of the Regulator General, 2001 electricity distribution price review of cost of financing consultation, 2001.

⁶⁴ Western Power Corporation, Physical Asset Valuation as of 30 June 2004, Report to the Valuation Committee, June 2004, p.7.

⁶⁵ NERA/PWC 2009 report

⁶⁶ ACCC (2009), Airport prices monitoring and financial reporting guideline, Information Requirements under Part 7 of the Airports Act 1996, and Section 95ZF of the Trade Practices Act 1974, June 2009, p.22-21.

⁶⁷ ACCC, Sydney Airports Corporation Ltd – Aeronaautical Pricing Proposal: Final Decision, May 2001,

⁶⁸ Productivity Commission, Review of Price Regulation of Airport Services, 14 December 2006, pp. xxii-iii.

| Telecommunications | |
|------------------------------|---|
| ACCC ⁶⁹ - Telstra | Modified DHC <ul style="list-style-type: none"> ACCC initially considered that efficient ‘build/buy’ incentives promoted by a DORC approach are now less relevant due to the aging legacy network and delivery of services across a variety of emerging technologies. On the other hand, DHC enables providers to achieve a commercial return on their actual investments. ACCC calculated a range between DHC and DORC and ultimately modified the DHC (applied an increment) so that the calculated prices were consistent with previous prices under which investments had been made. |
| ACCC - NBN ⁷⁰ | DHC <ul style="list-style-type: none"> By nature of NBN being a new entity with cost information being available and ongoing investment, the RAB is determined using actual expenditure since the “Cost Commencement Date”, being the date NBN first incurred costs. Thus, the question of determining the initial RAB was not as contentious as it has been in other sectors. |

⁶⁹ ACCC, *Review of the 1997 telecommunications access pricing principles for fixed-line service, Draft Report*, September 2010 and ACCC, *Inquiry to make final access determinations for the declared fixed line services: Final Report*, July 2011.

⁷⁰ NBN, *NBN Co Special Access Undertaking given to the ACCC in accordance with Part XIC of the Competition and Consumer Act 2010 (Cth) accepted by the ACCC on 13 December 2013 as varied up to and including 1 April 2021*, Schedule 1D and ACCC (2013), *NBN Co Special Access Undertaking Final Decision*, December 2013.

Table 6: New Zealand: Asset valuation and cost allocation

| Regulator and firm | Explanation |
|---|--|
| Fibre⁷¹ | |
| NZCC Chorus, Entrust, Northpower, Tuatahi First. Price-Quality, Information disclosure | DHC: Initial value of RAB set as at 2022 using DHC. Capital additions are added to the RAB at cost in the year the asset is first used for a regulated service. Under the cost-cased approach, cost is defined as the actual cost to the supplier (i.e., of constructing or acquiring the asset) net of any capital contributions (i.e., by access seekers or end users, and does not include Crown financing). ⁷² The RAB excludes government contributions: Fibre companies received Crown financing on favourable terms to assist with the construction of fibre networks under the UFB initiative. This is accounted for in a separate Crown financing building block, representing the costs fibre company avoided by accessing this lower cost funding, which is deducted from the return on assets. Cost allocation based on utilisation: as implied by the accounting-based cost allocation (ABBA) standard. |
| Electricity Distribution networks | |
| NZCC many EDBs. Price-Quality, Information disclosure | ODV (line in the sand): EDB's required to value their assets in 2004 using ODV then under information disclosure regulation, these 2004 ODV valuations—and any subsequent capital additions—were updated year-on-year using straight line depreciation and CPI-indexation. In 2009, EDBs entered into a new regulatory system and adopted the rolled forward 2004 ODV valuation as the initial RAB. ⁷³ Cost allocation based on utilisation: as implied by the ABBA standard. |
| Gas | |
| Powerco, Vector GasNet, FirstGas, Transpower, | ODV (line in the sand): In 2009, the NZCC used the most recent ODV valuations prepared by each firm consistent with the approach set out in a 2000 ODV handbook. ⁷⁴ These values and any subsequent capital additions—were updated year-on-year using straight line depreciation and CPI-indexation updated. ⁷⁵ Cost allocation based on utilisation: as implied by the ABBA standard. |
| Airports | |
| NZCC Wellington Airport, Auckland Airport, Christchurch Airport | Line in the sand - DORC (non-land) MV (land) ⁷⁶ Initial RAB set in 2010 using DORC for non-land assets and Market Value Alternative Use (MVAU) valuations for land assets. ⁷⁷ Cost allocation based on utilisation: as implied by the ABBA standard. |

⁷¹ NZCC, *Fibre input methodologies: Main final decisions – reasons paper*, October 2020.⁷² For example, where assets are vested at no cost to the supplier, the RAB value of the asset would be nil.⁷³ NZCC, *Input Methodologies (EDBs and GPBs) - Reasons paper*, December 2010, paragraph 4.3.24 on p. 104.⁷⁴ The valuation method used for existing regulatory asset values differs between suppliers but are generally based on replacement cost depending on when the RAB was last revalued.⁷⁵ NZCC, *Input Methodologies (EDBs and GPBs) - Reasons paper*, December 2010, paragraph 4.3.24 on p. 104.⁷⁶ NZCC, *Input Methodologies (Airport Services) - Reasons paper*, December 2010, section 4.3.21 on p. 79⁷⁷ The MVAU approach calculates the market value of the land in the highest [value] alternative use and excludes any value of airport-related improvements, or costs of converting land to an airport

Table 7: UK utilities: Asset Valuation

| Water - Ofwat, 10 firms. ⁷⁸ | |
|---|---|
| Asset values | Market Value. Calculated as debt (at privatization) + equity (average over the first 200 days of trading). Market value was 3.6% of the book value. |
| Depreciation | DORC (in effect), which implies economic depreciation meaning that depreciation should reflect the amount required to maintain assets, so that the level of service provided stays constant. Importantly, the structure of depreciation meant that the RAB would not fall. Specifically, if the implied depreciation was greater than capital maintenance then the depreciation would be adjusted ("broad equivalence" test). ⁷⁹ As a result, even though the RAB was substantively below RC, and depreciated using RC, the RAB was guaranteed to be maintained (and in actual fact grew). Ofwat have maintained this method with some tweaks to today. ⁸⁰ |
| Revaluation | No |
| Telecommunications – Oftel (Now Ofcom), British Telecom | |
| Asset values | DHC for the first two regulatory reviews (1988 and 1992). ⁸¹ Then DORC (effectively) from the third regulatory review (1996). |
| Depreciation | Same as the asset valuation so DHC for first two regulatory reviews (1988 and 1992), Then DORC (effectively) from the third regulatory review (1996). ⁸² |
| Revaluation | Yes: From DHC to DORC (1997) to ensure that regulated prices follow from the cost required to replace the network i.e., a measure of forward-looking costs. ⁸³ In theory these prices would encourage a rival to build their own networks and undercut BT's prices if the competitor was more efficient and so able to build a cheaper network. |

⁷⁸ Ofwat, RD 04/10: *Regulatory capital values 2010-15*. RD 04/10: *Regulatory capital values 2010-15 - Ofwat*

⁷⁹ For further explanation of broad equivalence, see Ofwat, *Final determinations, Future water and sewerage charges 2000–05*, section 7.3.8 *Current cost depreciation and 'broad equivalence'* on p. 108 or Ofwat, *setting price limits for 2010-15: Framework and approach*, 2009 p. 41 To summarise here: Ofwat separates the above-ground assets (e.g., treatment works) from the underground assets (e.g., pipes). For above ground, Ofwat applies current cost depreciation (CCD), which is full asset revaluation (on a modern equivalent asset basis), so can be interpreted as DORC. For consistency, Ofwat compares CCD to maintenance non-infrastructure (MNI) expenditure to ensure broad equivalence of the depreciation charge with expected maintenance expenditure. It makes an adjustment to the CCD where these are **not broadly equivalent** ("Broad Equivalence Test"). The notion here being that CCD should broadly reflect the amount of maintenance expenditure required to maintain assets in steady-state. For below ground, Ofwat adopted infrastructure renewals charge (IFC), in which the assets need to be maintained in perpetuity. Therefore, there was no depreciation charge *per se*, and instead, there was an annual charge to the profit and loss for infrastructure maintenance reflecting the long-term level of expenditure consistent with a defined level of service. Again, this is effectively DORC.

⁸⁰ See, Ofwat, *Delivering Water 2020: Consulting on our methodology for the 2019 price review*, July 2017 p. 222-225. In summary, a minor change to depreciation occurred to confirm to IFRS accounting standards. More specifically, depreciation changed to run-off rate of the RAB, but most water firms effectively continued using the old methods. Ofwat defines the natural RAB run-off rate as the "*economic value of capitalised expenditure expensed to the profit and loss account*". It also notes that the run-off rate can be interpreted as follows: "*an equivalent re-investment [...] required to maintain assets in steady-state*". Thus, Ofwat considers that the natural rate should be based on an economic depreciation concept as opposed to accounting terms.

⁸¹ Telecommunications Act 1984, Section 5, pp. 210–1.

⁸² Ofcom, *Valuing copper access*, February 2005, para. 4.21 on p. 20.

⁸³ Ofcom, *Valuing copper access*, February 2005, para. 1.5.

| Gas - Ofgas (now Ofgem), British Gas | |
|---|--|
| Asset values | Market value and Economic value for gas distribution (2003) |
| Depreciation | Initially based on DHC and then changed to market value in 1997. ⁸⁴ |
| Revaluation | <p>Yes:</p> <ol style="list-style-type: none"> Change to economic value when restructuring gas distribution because Ofgem decided to allocate the RAB between the local distribution zones using cash flows rather than physical assets. This decision implied that consumers connected to different networks would face similar charges (whereas the asset approach would imply differing charges)⁸⁵ Changed depreciation from HC to Market value. |
| Electricity – Offer, 12 regional electricity companies | |
| Asset values | Market value. ⁸⁶ |
| Depreciation | DORC |
| Revaluation | Yes: Uplift changed from 50% to 15% multiplied by 1.15 |
| Rail - Office of Rail Regulator, Railtrack | |
| Asset values | Market value: using the value at the close of the 1st day of share trading. Required subsidies to cover costs |
| Depreciation | DORC ⁸⁷ |
| Revaluation | No |

⁸⁴ Competition Commission, *A report under the Gas Act 1986 on the restriction of prices for gas transportation and storage services*, 2011. The summary of the report can be found [here](#).

⁸⁵ Ofgem, *Separation of Transco's distribution price control: Final proposals*, 2003. Ofgem, ‘Separation of Transco’s distribution price control: Final proposals’, 2003 p. 24–5.

⁸⁶ The opening RAB at the 1990 privatisation was determined as market value multiplied by 1.5 (50% increase).

⁸⁷ John Stittle and Sean McCartney (2015), “Accounting for producer needs: The case of Britain’s rail infrastructure”. *Accounting Forum*, Vol.39, No.2, p.109-120

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