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2018 Interstate Access Undertaking: Regulatory pricing frameworks for track access

Pacific National

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Project Team

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1. Introduction and Summary

1. The Australian Rail Track Corporation (ARTC) has submitted a proposed undertaking for interstate rail access to the Australian Competition and Consumer Commission (ACCC) covering its planned operations and revenues for the coming five years. ARTC's proposal encompasses a negotiate-arbitrate framework. The negotiate-arbitrate model includes a band for recovering revenue that lies between a ceiling price equal to its own calculation of the total cost of providing the service and a floor price equal to the "direct" cost of providing the service on each segment of the interstate network. This is referred to by ARTC as the "banded negotiate-arbitrate model" (BNAM).

2. Pacific National asked NERA to prepare a paper which:

   a) Comments on whether the floor and ceiling prices proposed by ARTC are likely to promote efficient use of the network;

   b) Describes international precedent in regulation generally, and of rail in particular, with a focus on productivity and quality of service targets or incentives.

3. Throughout this report we have taken the banded negotiate-arbitrate framework as given, rather than considering alternative regulatory designs.

4. A summary of our conclusions is as follows:

   a) The fact that ARTC does not recover its view of the full economic cost of the interstate network from track access charges suggests:

      i) ARTC's view of "full economic costs" is inflated; and/or

      ii) Willingness to pay for track access by freight users is less than full economic cost.[1]

   b) In a bargaining framework, such as that proposed by ARTC, the floor and ceiling prices are the "reservation prices" of the buyer and seller, being the prices at which either party would "walk away" from the deal;

   c) The efficient floor price is the variable cost of running a train across the network, which is likely to primarily be an estimate of track damage;

   d) The ceiling price is the lessor of market value and replacement cost;

   e) Most regulatory regimes, including those for rail, include productivity and performance incentives/targets.

5. This paper proceeds as follows:

   a) Section 2 sets out our understanding of ARTC's proposed access undertaking and the methods used to set the floor and ceiling prices used in the bilateral bargaining framework;

[1] This would occur either because of competition from road/sea freight or because rail investments are made on the basis of benefits to non-rail freight users

b) Section 3 provides a high-level overview of the economics of bilateral bargaining and the efficient levels of floor and ceiling prices in that context;

c) Section 4 explains that any floor price above true variable cost risks distorting use of the network;

d) Section 5 explains that a ceiling price above the lesser of market value or replacement cost may result in an efficient use of the network; and

e) Section 6 describes the theoretical case and precedent for including productivity and quality of service targets or incentives for ARTC.

2. Overview of the 2018 Interstate Rail Network Access Undertaking (2018 IAU)

6. This section sets our understanding of the proposed approach to pricing access to ARTC's network.

2.1. The Banded Negotiate-Arbitrate Model (BNAM)

7. The approach to pricing in the 2018 IAU is summarized in the *2018 IAU Explanatory Guide* as follows:[2]

The negotiate-arbitrate model proposed by ARTC within the 2018 IAU provides that access pricing will be the result of direct negotiation between ARTC and its customers within a framework that delivers a unique level of transparency for infrastructure access by defining for each segment:

- *The direct cost of operating that segment, as defined in the published floor price;*
- *The full economic cost of that segment, as defined in the ceiling price;*
- *Historic prices for the provision of services being on the public record; and*
- *Commercially agreed terms and conditions being published for all existing and potential users to access such prices.*

8. ARTC further describes the purpose of the ceiling and floor within it's negotiation model on page 13:

The value of changes in service quality is customer specific and ARTC believes that the IAU should provide ARTC and its customers the flexibility to negotiate arrangements that accurately reflect the needs of each customer…

The ceiling and floor prices therefore define the negotiation range for below rail access prices between ARTC and its customers. The final price will be a reflection of the allocation of risk between the parties within the overall constraint provided by the competitiveness of road.

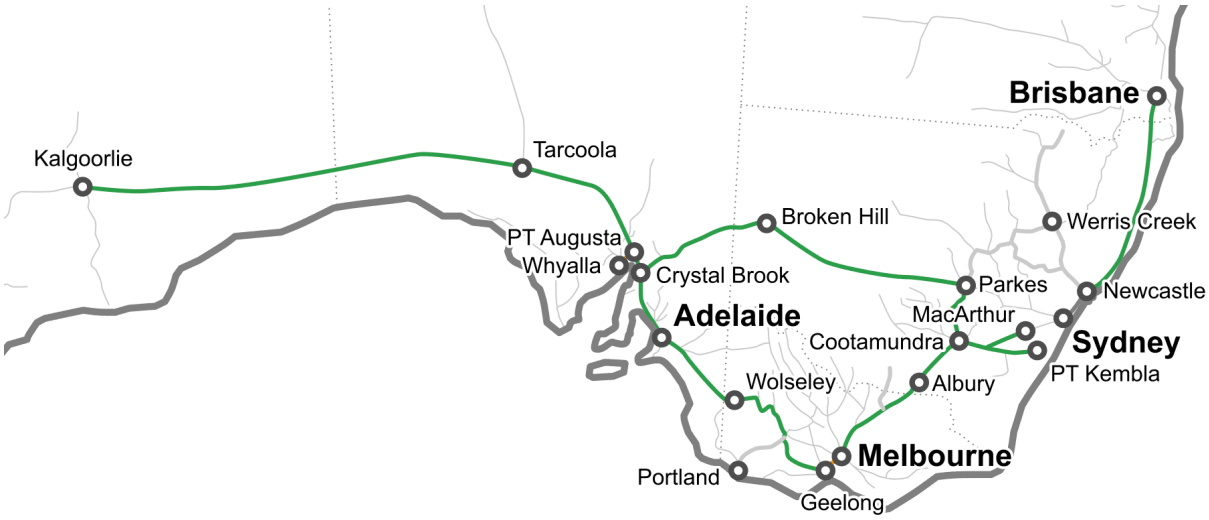
9. The discussion in the *2018 IAU Explanatory Guide* describes the above rail operators as the customers for track access.[3] While it is correct that the bulk and intermodal contractual customers of ARTC are the above rail operators, the above rail operators are effectively agents for bulk end customers as well as for an atomistic intermodal end customer base. Thus any discussion of the differing characteristics of customers should reflect the differing needs of the end customers of bulk and intermodal rail freight services, whom the above rail operators are negotiating on behalf of.

10. ARTC's ceiling and floor prices apply to "segments" of the interstate rail network, where a typical bulk and intermodal train service will generally take in multiple segments from origin to detstination. The interstate network is shown in Figure 2.1 below.

[2] Page 6, *2018 IAU Explanatory Guide.*

[3] E.g. Section 4.4 which states *"ARTC is negotiating for access with an oligopsony of above rail providers…"*

Figure 2.1: ARTC interstate rail network



Source: https://www.artc.com.au/customers/standards/route/access/defined-interstate/

11. ARTC's segmental charging structure presents a slight mismatch between how track access is charged and how rail freight operators charge end customers. For example, to ship freight from Kalgoorlie to Melbourne, a rail freight operator will offer a single price (origin to destination), whereas the rail freight operator would be charged separate track access charges for each of the segments it traverses on its journey.

12. At a high level, we interpret the economic goal of the banded negotiate-arbitrate model (BNAM) to be to allow for customer specific pricing within a pricing bandwidth that limits ARTC's ability to exercise market power through the ceiling price and to ensure there are no cross subsidies through the floor.

2.2. Ceiling price calculation

13. The ceiling price is calculated as the "full economic cost", which is defined in 4.4 (f) of the *2018 IAU*.

For the purposes of this Part 4, Economic Cost of a Segment means:

(i) Segment Specific Costs;

(ii) a return on Segment Specific Assets, being determined by applying a real Rate of Return to the value of Segment Specific Assets;

(iii) an allocation of Non-Segment Specific Costs;

(iv) an allocation of Depreciation of Non-Segment Specific Assets;

(v) an allocation of return of Non-Segment Specific Assets, being determined by applying a real Rate of Return to the value of Non-Segment Specific Assets; and

(vi) the costs described in clause 4.4(f)(i) to (vi) as applicable to Additional Capacity.

14. 4.4 (c) (i) also specifies that the "Initial Regulatory Asset Base (Initial RAB)" will be valued using "depreciated optimised replacement costs" (DORC).

15. We therefore interpret the ceiling price to effectively be a standard regulatory building block model calculation of the maximum allowable revenue (MAR) for each given segment.

2.3. Floor price calculation

16. The methodology for the floor price calculation is set out at 4.4 (b) of the *2018 IAU*.

The Floor Limit means revenue for ARTC sufficient to cover the incremental cost of that Segment or group of Segments. For the purpose of this clause, incremental costs means the costs that could have been avoided if a Segment was removed from the Network including Segment Specific Costs and Non-Segment Specific Costs relating to the following activities:

(i) track and signalling and communication maintenance;

(ii) maintenance contract support, administration and management and project management;

(iii) train control and communication;

(iv) train planning and operations administration; and

(v) system management and administration;

but excluding Depreciation and return on assets relating to Segment Specific Assets and Non-Segment Specific Assets, such return being determined by applying a real Rate of Return to the value of these assets.

17. The floor price, by treating the increment as a segment, results in the floor effectively being the *average* fixed operating costs of that segment.

3. Economics of Bilateral Bargaining for Rail Access

18. Perfectly competitive, efficient markets set prices equal to marginal costs. Such markets are allocatively efficient: In these conditions, no demand that could profitably be served goes unserved and therefore social welfare is maximized. The perfectly competitive firms of classical economic theory have low barriers to entry and exit and the competitive equilibrium also covers their average cost of service.

19. The railway industry is a classic case of a natural monopoly. Unlike the atomistic firms of perfectly competitive markets, it has high up-front costs of installing, operating and maintaining the network. These fixed costs do not vary with additional output. It also has low marginal costs of providing the service, mostly in the form of damage to track from running trains. As a result, the average cost of service provision falls as output increases, at least until any given stretch of capacity is fully utilized.

20. Given these cost conditions, setting access prices for rail equal to marginal cost would result in the network failing to recover any contribution to fixed costs and the entire cost of the network being recovered from taxpayers. As a result, most railways internationally aim to trade-off the efficient use of the network and the recovery of fixed costs in the prices charged to end users. The hypothetically efficient set of prices results in different prices for different network users: mark-ups are highest for customers with the most expensive alternative options (and therefore the most inelastic demand).[4]

21. We interpret the BNAM to be an attempt to allow ARTC and its customers to negotiate an outcome as close as possible to the efficient set of prices to occur with protections against the exercise of market power and cross subsidy.[5] Viewed this way, the purpose of the floor and ceiling prices is to prevent ARTC agreeing socially suboptimal prices whilst allowing ARTC to identify commercial outcomes with its customers. In particular:

    a) The purpose of the ceiling in this context is to rule-out prices that could only be as an abuse of market power by the network operator and/or prices that would prevent efficient uses of the network by pricing above individual users' willingness to pay; and

    b) The purpose of the floor is to prevent taxpayers subsidising inefficient over-use of the network and/or cross subsidies between customers.

22. However, the hypothetical floor and ceiling prices proposed by ARTC do not correspond to what economics suggests the boundaries would be in a commercial negotiation. The economic framework of "bi-lateral bargaining" posits that each party to a negotiation will have a "reservation price". The negotiated outcome will then fall somewhere between the reservation prices, with the precise price level depending on the relative bargaining power of each party.

23. Reservation prices are the price at which either party would "walk away" from a deal:

[4] For an application of this principle, referred to as the Ramsey Price Vector, to the utility industry see: Baldwin, R. & M. Cave (1999): Understanding Regulation – Theory, Strategy and Practice, chapter 15.

[5] Charging different prices to different customers does not necessarily imply cross-subsidy, even where costs of service are the same. Cross-subsidy occurs when a seller charges one customer group below the marginal costs of service, whilst another customer group is charged above its standalone costs. Standalone costs refer to the hypothetical cost to the customer group of bypassing the service and establishing their own separate system. Cross-subsidy necessarily leads to inefficient usage of the network, since some groups would be better off bypassing an under-utilised system, whilst the provider serves others at a loss.

a) For buyers, this is the price at which the deal is no longer profitable, or at which an "outside option" becomes binding.

b) For sellers, it is the price below which they would not be covering the incremental costs associated with the sale in question.

24. In a world with perfect information and no transaction costs, ceiling and floor prices outside the band set by reservation prices would have no impact on whether efficient bargains would occur. I.e. the floor and ceiling wouldn't be binding and the parties would still negotiate an outcome within the reservation prices.

25. In this world, the floor and ceiling prices will only affect the outcome of negotiations if the ceiling is below the buyer's reservation price or the floor is above the seller's reservation price. In either of these situations the floor and ceiling are binding and might prevent efficient bargains from occurring.

26. In practice, information asymmetries and transaction costs in real-world negotiations may result in one party attempting to negotiate an outcome that falls outside the bounds set by the reservation prices. Such a bargain would result in inefficient use of the network and may result in a protracted and contentious failure to reach agreement.[6]

27. Academics and policymakers have previously commented on the need for clear and realistic boundaries for effective negotiations between utilities and their customers.[7]

28. Therefore, it is still important to attempt to set the floor and ceiling as close to the reservation price as possible. As we explain in the following sections, the ceiling and floor prices in the *2018 IAU* do not correspond with the properly defined reservation prices of above and below track operators.

[6] Chatterjee K. & L. Samuelson (1987): "Bargaining with Two-Sided Incomplete Information: An Infinite Horizon Model with Alternating Offers", Review of Economic Studies 54(2), p. 175-192

[7] Littlechild, S. & B. Mountain (2015): "Customer engagement methodologies in water price setting: experience in England and Wales and Scotland, and possible application to Victoria", A paper for the Essential Services Commission of Victoria, p.48

4. The Efficient Floor Price is Short-Run Marginal Cost

29. The purpose of the floor price is to ensure that ARTC and its customers have the freedom to negotiate prices that do not prevent any efficient use of the network and allow any use of the network which makes a positive contribution to the fixed costs of the network. Any floor price above the variable cost of service does not deliver this purpose. As a result, rail access charges in the European Union start from the presumption that users will pay only the variable cost of the network.

4.1. Economic First Principles Support Marginal Cost as the Floor Price

30. What costs are "incremental" depends on the size of the increment chosen. At one end of the spectrum, if the increment is a single train running along a train path, then the incremental cost would be the short run marginal costs (SRMC) of that train running on the tracks (which is effectively just an estimate of track damage). At the other end of the spectrum, as is effectively assumed by ARTC, the incremental cost is based on all traffic across a given segment.

31. As alluded to in section 2.3, by defining the increment with reference to an entire geographic segment of the network, ARTC is using an increment that does not correspond with how the network is designed, used or priced by above rail operators. This is in part acknowledged by ARTC when they note that removing a segment would "break" the network:[8]

The Access Undertaking defines incremental costs as the costs that could have been avoided if a Segment was removed from the Network excluding Depreciation and a return on assets employed.

Because of the relatively linear nature of ARTC's network, the question of removing Segments from the network is purely hypothetical. In most cases, removal of a segment would break the rail transport link between the east and west (or north and south of the east coast) of Australia. It is unlikely that the relevant ARTC business on either of these national corridors would continue in each case.

32. The floor price in a negotiate arbitrate framework should correspond to ARTC's "reservation price" for the increments of traffic that are relevant to the negotiation in question. For example, the increment might be for a specific customer's total traffic that it is threatening to switch to road freight. It would be rational for ARTC to let a train run across the network if the track access charges cover the short-run marginal costs of that train running across the network, i.e. track damage plus any directly attributable labor cost plus any congestion the additional train imposes.

33. Given the floor and ceiling prices are setting the bounds for subsequent negotiations between ARTC and rail freight operators, who have many customers of varying sizes, it would seem sensible to set the floor at short-run marginal cost, i.e. assuming the increment is a single train path.

[8] Page 32, *2018 IAU Explanatory guide*.

4.2. International Precedent Supports Track Access Charges for Freight Based on Marginal Costs

34. Rail policy in Europe, in common with other infrastructure industries, is designed to make the most efficient use of common infrastructure and promote the economic development of member states. As a result, the European Commission has long established marginal cost pricing as the default pricing method with only very limited exceptions: The Commission first established this principle twenty years ago in a white paper from 1998 that stressed the efficiency properties of such an approach. [9]

35. European Union (EU) rail sector legislation implemented in 2001, namely Directive 2001/14/EC turned this concept into legislative reality. The Directive explicitly stipulates that track access charges be based on "direct costs" with "mark-ups" only being levied on those types of traffic that can bear those surcharges. The same Directive also defined direct costs as "*cost that is directly incurred as a result of operating the train service*".[10]

36. Although the Commission's intent was to lower track access charges to cover only the variable costs of service, the lack of clarity in the definition of direct costs in the Directive led to several disputes and requests for clarification referred to the European Court of Justice. Amongst these, a dispute with Hungary (C-473/10) highlighted the necessity of having a coherent methodology for the application of the direct cost principle. While paying lip service to the direct costs principle, Hungarian legislation failed to specify a concrete mechanism by which to evaluate the direct costs. A further dispute with Poland (C-512/10) exemplified the problems inherent in defining what constitutes direct cost and what does not. In a seminal decision for future developments, the court ruled that financial costs and depreciation if not explicitly tied to track degradation caused by train movement, as well as any cost category not linked to the train service could not be considered part of track access charges. The jurisprudence thus slowly but surely shifted pricing decisions by infrastructure managers towards the concept of marginal cost.

37. The European Commission subsequently incorporated these rulings in Regulation 2015/909. It defines direct costs as "*the difference between, on one hand the costs for providing the services of the minimum access package and for the access to the infrastructure connecting service facilities, and, on the other hand, the non-eligible costs"*,[11] which broadly include fixed and overhead costs, financing costs, and maintenance costs not directly incurred by operation of the train service.[12]

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[9] European Commission, 1998: White Paper on Fair Pricing for Transport Infrastructure Use.

[10] 2001/14/EC, Preamble

[11] Regulation 2015/909, Article 3(1)

[12] The full list of exceptions is: a) fixed costs relating to the provision of a stretch of line which the infrastructure manager must bear even in the absence of train movements; b) costs that do not relate to payments made by the infrastructure manager. Costs or cost centres that are not directly linked to the provision of the minimum access package or to access to infrastructure connecting service facilities; c) costs of acquisition, selling, dismantling, decontamination, recultivation or renting of land or other fixed assets; d) network-wide overhead costs, including overhead salaries and pensions; e) financing costs; f) costs related to technological progress or obsolescence; g) costs of intangible assets; h) costs of tack-side sensors, track-side communication equipment and signaling equipment if not directly incurred by operation of the train service; i) costs of information, non-track side located communication or telecommunication equipment; j) costs related to individual incidences of force majeure, accidents, and service disruptions without prejudice to Article 35 of Directive 2012/34/EU; k) costs of electric supply equipment for traction current if not directly incurred by operation of the train service. Direct costs of operation of the train services that do not use electric supply shall not include costs of using the electric supply equipment; l) costs related to the provision of information mentioned under item 1 (f) of Annex II to Directive 2012/34/EU, unless incurred by operation of the train service; m) administrative costs incurred by schemes of differentiated charges referred to in Articles 31(5) and 32(4) of Directive 2012/34/EU; n) depreciation which is not

Even more succinctly, in a series of position papers, the Independent Regulators Group—Rail (IRG Rail) explicitly advocates that the "*'cost that is directly incurred' should be interpreted as the 'short-run marginal cost' (SRMC)*".[13]

38. The EU-wide introduction of a direct-cost charging system with a tightened definition of what constituted direct costs eroded the revenue base for infrastructure managers, as was the case in France and Austria.[14] In practice, the deleterious effects of this drop in revenues were contained by a provision in Directive 2012/34/EU that allows mark-ups to be levied under certain conditions. Thus, faced with the reduced revenue base, France chose to levy mark-ups on those trains that can bear them to retain the same total level of charges. However, out of the 23 EU countries on which data is available, 16 continue to charge at the direct-cost level see section 5.2, below).

39. Where "mark-ups" above marginal cost *are* being charged in the European rail sector, these can only be levied if a formal test has established that the market can bear them, which has meant that no mark-up has been levied on freight, even in the majority of those countries that have generally applied them to other market segments (see section 5.2, below). The introduction of such a "market can bear" test is designed to avoid freight traffic migrating to road as much as possible given the EU's stated goal of increasing the share of non-road freight traffic given rail's superior environmental properties.[15]

determined on the basis of real wear and tear of infrastructure due to the train service operation; o) the part of the costs of maintenance and renewal of civil infrastructure that is not directly incurred by operation of the train service.

[13] IRG, *An introduction to the calculation of direct costs in respect of implementing regulation 2015/909*

[14] Trampisch, C. (2018). *Track access charges on the basis of European legal framework –First experiences with direct cost calculation*. Amsterdam.

[15] Specifically, in a 2011 white paper the European Commission set a target of shifting 30 % of road freight transported greater than 300 km to other modes of transport, such as rail or sea by 2030, and more than 50 % by 2050. See EUROPEAN COMMISSION, *WHITE PAPER: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system*, 28 March 2011

5. The Efficient Ceiling Price is the Lesser of Market Value and Replacement Cost

40. If prices rose above replacement cost, it would indicate that the lack of competition was allowing ARTC to price above the level at which competitors would theoretically enter. The purpose of capping network access charges at replacement cost is to prevent customers being charged prices which reflect ARTC's market power. In practice, ARTC is likely to face constraints below replacement or even historical cost in determining prices with its customers. In the EU, public funds account for a large proportion of the total revenue of rail networks.

5.1. Above Rail Reservation Price determined by willingness to pay

41. As described in section 3 above, the ceiling price in a bi-lateral bargaining framework reflects the purchaser's maximum willingness to pay. An above rail operators' maximum willingness to pay is a function of:
    a) The profitability of carrying freight on the corridor in question;[16]
    b) The prices for road and sea freight, which determine the bypass option for end customers of rail freight; and
    c) The cost of the freight operator bypassing the rail network by building its own network;
42. The reservation price is therefore the lower of the price which causes bypass (replacement cost) and the price at which rail freight would switch to road.
43. Two further observations are apparent from the above list:
    a) Willingness to pay for track access will vary both by route and depending on the commodity carried, although the latter may have less relevance to the interstate network, which predominantly carries non-bulk or intermodal freight, for which we understand price discrimination is difficult; and
    b) Replacement cost is only relevant for calculating bypass costs, which are only relevant if the cost of bypass is below the above rail operator's willingness to pay (excluding track access charges).
44. As discussed above and set out in the 2018 *IAU explanatory guide*, ARTC's prices have been materially and persistently below the replacement cost based building blocks price/revenue. This suggests that either the valuations/costs are inflated, or that road and sea freight compete directly and are a binding constraint with the consequence that the reservation price is below replacement cost.
45. Put another way, the "market value" of the interstate network, being the value a profit maximizing private firm would pay for the assets, is below replacement cost.
46. In economic regulation, the use of historic cost or replacement cost is often used to break the circularity between the allowable revenues the regulator is setting and the market value of the assets. This circularity arises because the value of an asset is the discounted

[16] I.e. the level of competition on the route in question, the cost (excluding track access) of carrying the freight and end customer willingness to pay for freight (i.e. certain customers may operate in more profitable downstream markets and therefore have a higher willingness to pay, all other things being equal).

net revenue stream the owner expects to earn, given the rate of return required by investor. Thus, using a market valuation of a monopoly asset would embed excess returns into the allowable revenue. As the ACCC noted when considering the initial RAB for Telstra's fixed line business:[17]

Revenue-based methodologies value assets on the basis of forward-looking, future revenues. There is some circularity associated with this approach, because current regulated prices are used to estimate the cash flows for which future regulated prices are to be derived.

47. By setting allowable revenues by reference to a measure of cost, this circularity is broken.

48. Similarly, the use of replacement cost to assess economic profitability in competition inquiries has sometimes been justified on the basis a concept known as "deprival value" or the "value to owner principle". For example, in its Energy market investigation the UK Competition and Markets authority described the concept of deprival value and why in practice it *usually* coincides with replacement cost:[18, 19]

Assets utilised should reflect their current value to the business, which is the loss the entity would suffer if it was deprived of the asset involved. That measure, which is also referred to as the deprival value, or value to the owner, will depend on the circumstances involved. Deprival value reflects the opportunity cost to the firm of owning that asset in a competitive market as explained below.

In most cases, as the entity will be putting the asset to profitable use within its current operations, the asset's value in its most profitable use (in other words, its recoverable amount) will exceed its replacement cost. In such circumstances, the entity will, if deprived of the asset, replace it, and the current value of the asset will be its current replacement cost.

49. That is, if the economic or market value of the asset in question exceeds its replacement cost, a rational, profit maximizing owner would replace the asset if it was deprived of it.

50. However, as already discussed, ARTC appears to be in a situation that differs from most regulated infrastructure assets – the market value of assets, ignoring benefits to the government unrelated to rail and externalities to road users, is less than replacement cost.

51. This appears to be due to the combination of competition from road and sea freight and the fact that investments in rail can be justified on the basis of factors besides the willingness to pay of freight users. For example, in the *2018 IAU Consultation Paper*, the ACCC notes that the Inland Rail business case identifies "reduced congestion on highways" and "increased passenger rail services in the Sydney network" as benefits of the project in addition to those accruing to freight.

52. Pertinently for the present discussion, the Inland Rail business case contains a financial analysis which assessed whether the investment could be justified solely on the basis of track access charges to rail:[20]

The results suggest that below rail revenue is not sufficient to recover the significant capital outlay required for construction of Inland Rail. The results also indicate Inland Rail has

[17] ACCC, *Review of the 1997 telecommunications access pricing principles for fixed line services: Draft report*, September 2010

[18] Paragraph 42 of CMA, *Energy market investigation: Final report*, 24 June 2016.

[19] Technically, deprival value is the lessor of replacement cost and the recoverable amount, which is the higher of "value in use" and "net realizable value", aka scrap value.

[20] Page 202, *Inland Rail Business Case.*

positive operational cash flows, i.e. if capital costs are excluded, an operational Inland Rail is cashflow positive.

53. This more generally raises the question of the "efficient costs" of the service in the context of 44ZZCA pricing principle that regulated access prices should:

be set so as to generate expected revenue for a regulated service that is at least sufficient to meet the efficient costs of providing access to the regulated service or services;

54. The proceeding discussion highlights that because the willingness to pay by users of rail freight is less than the replacement costs of the asset, the "efficient costs" are not replacement cost.

55. On the basis of both the "deprival value" concept and the reservation price of above rail operators, the ceiling price should therefore be set at the lesser of market value and replacement cost. For most segments, this would result in the asset value being lower than replacement cost.

56. The externalities-based rationale for the business case for Inland Rail highlights another important issue with the bilateral bargaining framework: The externalities are not priced into the negotiations between ARTC and above rail operators. In a situation where the bargaining power sits (overwhelmingly) with the below rail operator, the (unconstrained) bargaining outcome will be one where the positive externalities are not being realized. This is because if there is imperfect market/customer segmentation, the bargaining outcome prioritizes prices set to recover the network's replacement cost based on higher charges over the realization of larger positive externalities due to allowing larger but lower profitability traffic flows onto the network. It can therefore be efficient to impose further caps limiting charges below replacement cost.

57. If the market value is greater than replacement cost, this suggests that road and sea freight are not a binding constraint for the segment in question. Therefore, ARTC would be likely to have market power in these segments. Deprival value would appropriate set the asset value at replacement cost in this circumstance.

5.2. Regulators Internationally Price Network Access Based on Willingness to Pay

58. Although the direct cost principle remains the guiding principle within the EU, the EU's legal framework foresees the possibility of charging markups, whenever they are needed "*to obtain full recovery of the costs incurred by the infrastructure manager*" where full cost refers to those costs not covered by subsidies (see section 5.3) and the "*market can bear it*".[21] Although not mandating a Ramsey-Boiteux approach whenever mark-ups are levied, this formulation does suggest a preference for it: if faced with the necessity of recouping costs, the least-distortionary mechanism is to be preferred.

59. This involves evaluating the price elasticities of demand in different market segments and designing markups in the different segments to be inversely related to them. This ensures that higher markups are levied in those segments where the change in demand caused by the mark-ups is comparatively small. From a welfare perspective, this leads to the second-best outcome. Intuitively, this is because whenever the non-distorted outcome where charges are equal to the marginal cost is unattainable, distortions (as expressed through larger mark-ups) are introduced in those market segments that are relatively more robust to them.

[21] 2012/34/EU, Article 32(1)

60. In practice, freight has not been charged a mark-up above marginal cost in most places, as it has been deemed unable to bear those mark-ups. A schematic overview of the use of mark-ups across Europe is shown in Table 5.1. 16 out of 24 countries do not levy mark-ups on freight at all. Out of the remaining 8 countries, two (Norway and Hungary) only charge mark-ups for certain geographical segments of the network, two (the Netherlands and Germany) have offset mark-ups with additional government funding and a further two (Austria and the UK) only apply mark-ups to a small subset of freight trains (essentially block trains in Austria and iron ore/nuclear fuel / coal and biomass transports in the UK). The experience in the EU hence broadly suggests that in a direct-cost system with the possibility of charging mark-ups that the market can bear, freight transportation does not pay above the marginal cost in most cases.

61. Different countries have used different approaches to segmenting or not segmenting the freight sector using mostly geographic or operational criteria[22] rather than goods carried as information on actual goods carried is limited in most places. E.g. the association of European rail regulators (IRG Rail) explicitly highlights that *"Germany and Slovenia for example reported that their infrastructure manager did not have information on the types of goods transported by freight trains, thus preventing them from using this criterion to segment the market."*[23] The closest any European country comes to segmenting by commodity carried is the UK charging system where separate mark-ups for the following commodities are levied i) nuclear fuel, ii) coal, iii) iron ore and iv) biomass while all other freight traffic including all containerized freight does not pay any mark-up.[24]

62. Moreover, at least two countries (Austria and the UK) have applied market can bear tests that assess whether the reduction in traffic caused by a charge increase exceeds a certain threshold (around 1% to 2%) thus imposing an additional constraint on charging that is consistent with the recognition that rail has important positive externality properties that may be undermined if charges are levied on segments with relatively elastic levels of demand.

[22] E.g. Austria only differentiates by operating mode (block train vs. single waggon / combined road and rail transport) because these elements are readily observable by the infrastructure manager while the type of goods transported are not.

[23] See IRG Rail (9 Nov 2016): Initial approach to market segment definition and criteria for an assessment of markups in consideration of Directive 2012/34/EU, para 44.

[24] See ORR (Jun 2018): 2018 periodic review draft determination: Supplementary document – Charges and incentives: Infrastructure cost charges consultation, p. 22 and
CEPA (28 Sep 2017): PR18 Structure of Charges Review – Market can bear analysis – freight services, pp. 43-46.

Table 5.1: Mark-ups in European countries

	Mark-ups	Comments / Caveats
Austria	✓	Two-freight segments. Only block trains pay a mark-up while wagonload and combined transports don't. The overall revenue target is below the full cost of the network of total cost.
Belgium	×	
Bulgaria	×	-
Croatia	×	-
Denmark	×	-
Estonia	×	-
Finland	×	-
France	×	-
Germany	✓	All freight segments pay mark-ups Charges notionally recover the full cost of the network but large parts of the network are directly funded by government and not included in charges and there will be a government-funded rebate for freight starting in 2019[25]
Greece	×	-
Hungary	✓	Mark-up varies for different types of trains and along different parts of the network
Italy	✓	Mark-ups are charged to meet the government's revenue target rather than by explicit ability to bear analysis
Latvia	✓	Most mark-ups primarily charged on Russian export cargos transiting the country
Luxemburg	×	-
Netherlands	✓	Will apply mark-ups to all segments but will then impose politically mandated reductions[26]
Norway	✓	Mark-ups levied only on Gardermoen line
Poland	×	-
Portugal	×	-
Romania	×	-
Slovakia	×	-
Slovenia	×	-
Spain	×	-
Sweden	×	-
UK	✓	Mark-up on selected goods only (nuclear waste, biomass, coal, iron ore)

Source: National Network Statements, Correspondence with regulatory authorities, IRG publications

5.3. Internationally, Rail Networks Do Not Recover their Full RAB-Based Costs Without Recourse to Public Funds

63. Another factor that is driving infrastructure charging in Europe is the degree of direct subsidisation that is affecting track access charges for freight and passenger rail services.

64. Driven to a large extent by social and environmental goals, the European railway sector receives a substantial amount of direct funding from governments and other public

[25] See e.g. https://www.evg-online.org/mitmachen/kampagnen-und-aktionen/bundestagswahl-2017/meldungen/halbierung-der-schienenmaut/ (in German)

[26] See https://www.railtech.com/policy/2018/06/26/dutch-track-access-charges-to-be-lowered-to-german-level/

bodies. Public funding takes on different forms and is granted to different entities on different stages of the railway sector.

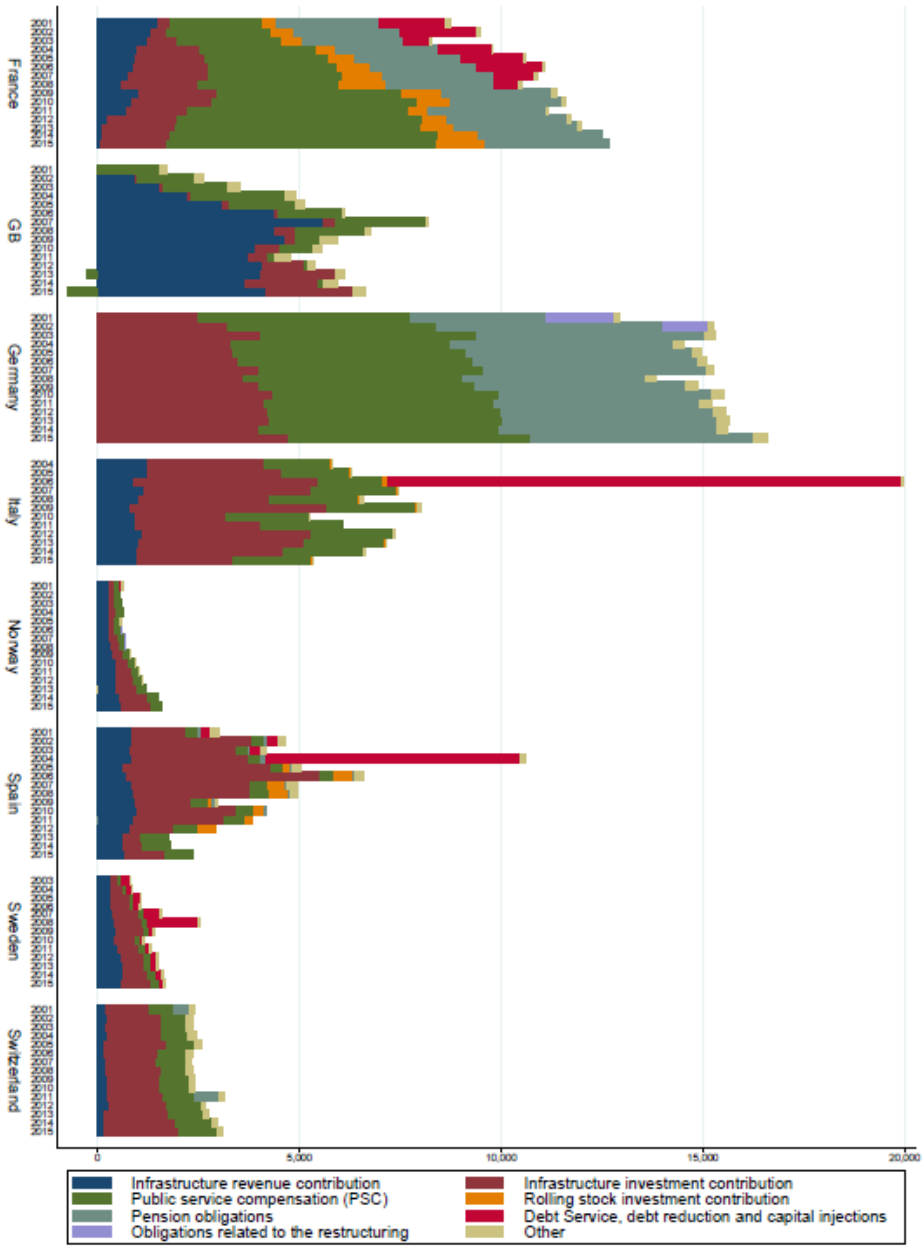
65. Directive 2012/34/EU addresses public funding of the infrastructure operator in Article 8 allowing member states to provide infrastructure operators with funding consistent with their function, the size of their network and financial requirements. In particular to facilitate new investments. Article 9 further establishes that member states shall help reduce indebtedness of railway undertakings if necessary to enable sound financial management. Any assets financed by the state in this way are not included in track access charges.

66. Götz and Schäfer (2018) examine public contributions to the railway sector across European countries for the period 2001-15 classifying them into different categories capturing contributions to network operating costs in contrast to contributions to specific investment projects or other forms such as payments to reduce indebtedness or pension obligations. [27]

67. Figure 5.1, which is taken from the study, shows the total amount and the structure of public contributions to the railway sectors in the sample countries. The public contribution reaches from 1-2 billion EUR (around 1.5-3 billlion AUD) per year in Norway up to above 15 billion EUR (around 24 billion AUD) per year in Germany.

[27] Götz and Schäfer (2018): Public Contributions to the European Rail Sector, Review of Network Economics.

Figure 5.1: Public contributions to railway sector in different EU countries (in millions of PPP adjusted EUR)



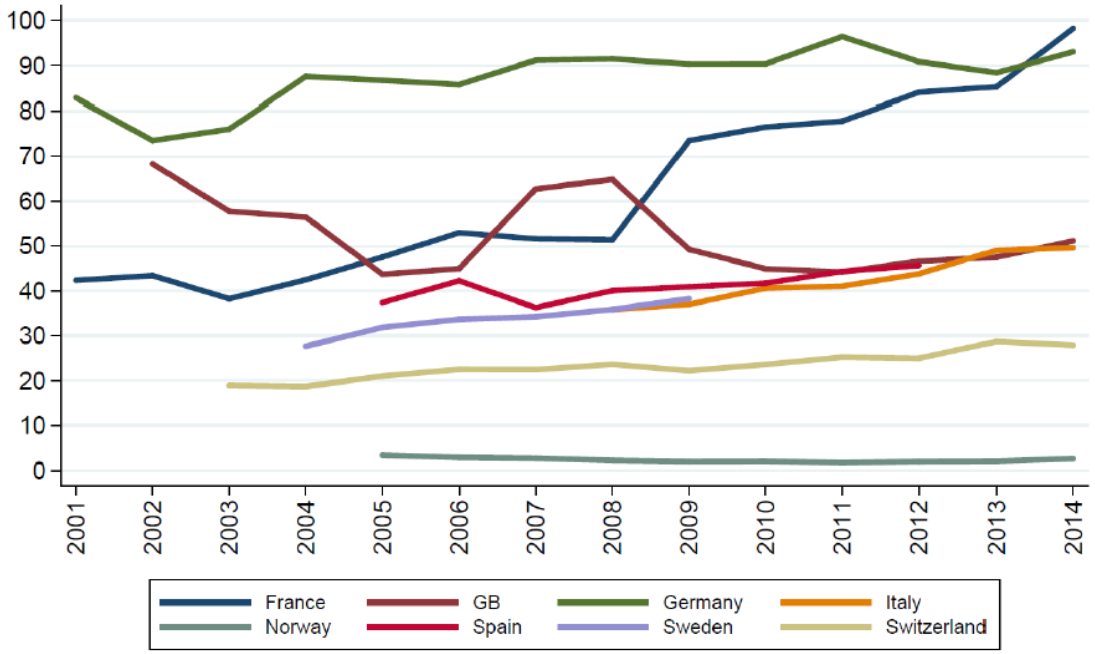
Source: Götz and Schäfer (2018): Public Contributions to the European Rail Sector, Review of Network Economics.

68. The importance of public contributions to the railway sector and, in particular, to the operation of networks can be examined by scaling subsidies to the size of the economy, the cost of network operation or the size of the network.

69. When comparing the above contributions to the size of the economy, they account for about 0.5% of total GDP in Germany and 0.25% to 0.5% of total GDP in Norway.

70. Figure 5.2 shows that the share of infrastructure operating cost covered by track access charges ranges between greater than 90% and less than 10% among the eight countries in the sample. Hence countries like Norway, GB, Italy and Switzerland all charge less than 50% of the operating cost of the network to its users

Figure 5.2: Share of infrastructure operating cost covered by access charges (in %)



Source: Götz and Schäfer (2018): Is there a tradeoff between track access charges and public service contributions?, Presentation at the Track Access Charges Summit 2018, Amsterdam, p. 6.

71. To conclude, European governments provide substantial funding to the railway sector and, in particular, to the infrastructure operation and investments in rail infrastructure. Revenues from access charges/traffic are not sufficient to cover full costs of the rail services and networks in most places. There is, however, substantial variation in absolute size and relative importance of public contributions across countries

6. Incentives for Quality and Cost Reduction

72. The principal rationale for regulatory intervention in natural monopoly industries is ensuring that monopolists do not abuse monopoly power and provide the services that customers want at prices which reflect the underlying cost of delivery. As a result, regulatory regimes across the world aim to prevent consumers from paying more for services provided by natural monopolies than the efficient costs of providing those services.

6.1. The role of Productivity and Quality Incentives

73. Economic theory suggests that in competitive markets, a combination of competition and the profit motive provides strong incentives to reduce costs. Many natural monopolists have been or continue to be state-owned and have not had the benefit of these incentives. Worse-still, if regulated in a fashion such that they may simply pass through any costs incurred, regulated firms have no effective incentive for cost reduction.[28] Accordingly, much of the academic heritage of economic regulation stems from an environment in which the current costs of the regulated firm are above efficient levels and in which services are arguably gold-plated for consumers.

74. As a result, regulators do not typically take the stated costs of regulated companies as given but seek to ensure that they only remunerate the efficient costs of regulated companies. Measures to ensure that regulated firms recover only efficient costs may include:

a. Cost-sharing mechanisms, which allow both consumers and industry to benefit from the cost-reducing efforts of the monopolist(s) over time; and

b. Productivity targets, which align the prices that consumers pay with the predicted reductions in the monopolist's costs.

75. The principal method used in regulated industries to provide incentives for efficient cost reduction is to allow regulated companies to retain a portion of their cost savings. In in simplest form, regulated companies operating under incentive regulation may have an entirely fixed cost allowance for any given regulatory period. Within that regulatory period, the regulated firm has an incentive to reduce costs because it retains all the profit from doing so. At the following price review the regulated firm's cost allowance is updated. Fixed cost allowances of this form have led to cycles of cost reduction because the incentive to reduce costs is greatest at the beginning of the regulatory period when the firm retains the margin between the cost allowance and actual costs for the longest period.[29] Many regulatory regimes operate hybrid schemes which allow companies to retain a proportion of cost reduction to avoid exposing them to the full risks of cost

[28] Averch, H. and Johnson, L. (1962): "Behavior of the Firm Under Regulatory Constraint", American Economic Review. 52 (5): 1052–1069

[29] Weitzman M. (1978): "Optimal Revenue Functions for Economic Regulation", American Economic Review. 68(4): 683-691

overruns and/or operate under rolling incentives that maintain constant incentives for cost reduction throughout the regulatory period.[3031]

76. Formally speaking, productivity targets in the form of reducing allowed revenues over time do not provide any incentive to reduce costs. A regulated firm's profit increases by the same amount following cost reduction whatever the productivity target. However, where the regulated company is government-owned it is not necessarily the profit motive that motivates the firm's behaviour. In circumstances where the management of a business may spend to budget or satisfice the ultimate shareholder's desire for surplus (or equivalently, minimum subsidy), productivity targets themselves may induce cost reduction by firms.[32]

77. Insofar as regulatory regimes provide incentives for cost reduction, they may also result in incentives for delivering quality output. Accordingly, providing incentives for ensuring quality of service has been a more recent concern in regulatory theory and practice. Increasingly, regulatory regimes have adopted standards of performance and incentives for quality of service which ensure that the regulated companies deliver the services customers want.

78. We discuss international examples of regulatory regimes which incorporate incentives for cost reduction and provision of quality in Sections 6.2 and 6.3 below.

6.2. Incentives and Targets for Cost Reduction in Practice

79. Incorporating productivity targets into the prices paid for services in regulated industries has a long and venerable history. The approach of allowing a regulated company's prices to increase with inflation (the Retail Price Index) less an assumed rate of productivity growth (X) originated in the United Kingdom. Stephen Littlechild, subsequently the Director General of Electricity, proposed that the method be used for the regulation of the *prices* of British Telecommunication in a now obscure and out-of-print report submitted to the Department for Trade and Industry in 1983.[33] Regulators in the UK and indeed the globe have subsequently applied this method of regulation across a wide range of sectors, including gas, electricity, water, post and indeed rail.

6.2.1. Productivity Targets in Rail

80. The Queensland Competition Authority's (QCA) draft decision on Aurizon's network access undertaking includes provisions for productivity improvements. The QCA proposed an efficiency factor for a target level of annual maintenance cost reduction, at a cumulative rate of 2 percent over FY19 to FY21.[34] The QCA noted that this would

[30] For example, the AER's Efficiency Benefit Sharing Scheme (EBSS) allows networks service providers (NSP) to retain cost savings for 5 years.. As noted by the AER, this results in any increase or decrease in opex, relative to the allowance, being shared approximately 30:70 between NSPs and consumers. See, AER, *Explanatory Statement: Efficiency Benefit Sharing Scheme for Electricity Network Service Providers*, November 2013.

[31] In rail, the QCA's recent draft decision in respect of Aurizon's network access undertaking, it is seeking proposals for the sharing of efficiency gains. The QCA notes that, under the current form of regulation, Aurizon retains the full benefit of outperforming its regulated expenditure allowances, so the QCA is considering approaches to share some of this benefit with customers - QCA, *Aurizon Network's 2017 draft access undertaking*, Draft decision, December 2017.

[32] Dalen, D.M. (1997): "Regulation of Quality and the Ratchet Effect: Does Unverifiability Hurt the Regulator?", Journal of Regulatory Economics, 11:139-155

[33] Littlechild, S. C. (1983): "Regulation of British Telecommunications Profitability: A Report to the Secretary of State of Trade and Industry", London.

[34] See section 8.7.3 of QCA (2017), "Aurizon Network's 2017 draft access undertaking", Draft decision, December.

address some of the inefficiencies identified in its investigation, as well as provide an incentive for Aurizon to out-perform the efficiency factor and retain some of the productivity gains.[35]

81. Article 30 of Directive 2012/34/EU establishes that infrastructure operator in the rail sector shall be given incentives to reduce their costs of providing infrastructure either through a contractual agreement between the infrastructure operator and the regulatory authority or through regulatory measures or both. Some EU Member States have implemented or are currently in the process of implementing these requirements on productivity incentives in different forms. A recent study found that ten-member states have some sort of productivity incentive or target in place to date.[36]

82. As a specific example, at Network Rail's last price control in 2013, the British railway regulator, the Office of Rail and Road (ORR), adopted a "test-year" approach for the government-owned rail network company, Network Rail. ORR decomposed the efficiency target into three broad categories:

    a) An assumed increase in Real Unit Operating Expenditure (ROUE), largely derived from long term trends in the costs of labour and materials of comparator sectors (including regulated utilities);

    b) A Frontier Shift parameter which ORR used to pick up differences between the productivity growth resulting from technological and process improvements in the general economy featured within the Retail Price Index and comparator sectors for Network Rail; and

    c) A bottom up assessment of the potential for productivity improvement within each of four specific functions at Network Rail resulting from the existing inefficiency in 2013 and allowing for catch-up to the efficient frontier.

83. The combination of these sources of efficiency improvement amounted to a cumulative reduction of allowed costs of around 20 per cent across its support, operations, maintenance and renewals costs over the course of Control Period 5 from 2014 to 2019 (see Table 6.1 below).

Table 6.1: ORR Set Separate Efficiency Targets for Network Rail Based on Bottom-Up and Top-Down Assessments at PR13

Expenditure	2014-15	2015-16	2016-17	2017-18	2018-19	CP5 total
Support	9.0%	4.9%	6.2%	3.3%	4.3%	24.9%
Operations	1.9%	2.9%	4.3%	4.2%	5.4%	17.4%
Maintenance	3.7%	3.3%	3.5%	3.5%	3.6%	16.4%
Renewals	8.4%	3.6%	3.8%	2.7%	3.2%	20.0%
Weighted average efficiency	**6.8%**	**3.6%**	**4.0%**	**3.1%**	**3.6%**	**19.4%**

Source: Network Rail PR13 Final Determination[37]

[35] *Ibid.*, at p.258 and p.290.

[36] IRG-Rail (2017): *UPDATED REVIEW OF CHARGING PRACTICES FOR THE MINIMUM ACCESS PACKAGE IN EUROPE*, Version 4, p. 7/8

[37] ORR (2013), *Periodic Review 2013: Final determination of Network Rail's Outputs and Funding for 2014-19*, October 2013, Table 4.3, page 153.

84. In Germany, the regulatory framework of the railway sector was revised in 2016 with the introduction of the "Eisenbahnregulierungsgesetz" (ERegG, "Railway Regulation Act"). The ERegG aims to implement the requirements of the aforementioned Directive 2012/34/EU. This revision also established that a productivity factor is to be applied to the level of total costs in order to set incentives for cost reductions.

85. ERegG establishes that the regulatory authority Bundesnetzagentur shall determine the base level of total costs of the infrastructure operator DB Netz AG before the beginning of the 5-year regulatory period. Over the period charges are indexed by a general inflation factor minus a productivity factor.[38]

86. The productivity factor is determined as the average productivity growth of the German economy over the last five years before the start of the regulatory period and sets an incentive to reduce costs over the regulatory period, as costs above the allowed level cannot be recovered through track access charges.[39]

6.2.2. Approaches in Other Sectors

87. Regulators internationally and in other sectors in Australia have adopted similar approaches for distinguishing the potential for efficiency improvement resulting from changes in input prices, frontier shift and catch-up.

88. In Australia, for example, the Australian Energy Regulator (AER) adopts an ongoing efficiency assumption for the change in the costs of the regulated companies. The AER describes its high-level approach as basing its productivity estimate on recent trends in productivity, unless those recent trends are a poor indicator of future performance. For example, in the October 2017 ElectraNet electricity transmission draft decision, the AER notes:[40]

Our productivity growth forecast reflects our expectation of the productivity an efficient service provider in the transmission industry can achieve. It reflects historic industry opex productivity growth to the extent we consider past performance to be a good indicator of future performance under a business-as-usual situation.

89. Looking offshore, both the British energy regulator, Ofgem, and the multi-utility regulator in the Netherlands, ACM, have relied on separate estimates of the scope for catch-up and frontier shift. Both have both relied on benchmarking to assess the scope for catch-up which varies by firm and a general productivity growth assumption derived from the long-run productivity growth in comparator sectors.41 Ofgem uses its estimate of efficient total expenditure to determine the overall incentive payment and strength of incentives for cost reduction under the IQI matrix described above. The ACM reduces the revenues of the government-owned electricity and gas network companies from current to its estimate of efficient levels over a five-year period.

90. The German regulator, the aforementioned BNetzA, combines the process of estimating efficient costs (i.e. the level) and improvement over time using benchmarking methods

[38] § 25, ERegG

[39] § 28, ERegG

[40] Page 15, AER (2017): *Draft Decision ElectraNet electricity transmission determination 2018 to 2023Attachment 7 – Operating expenditure*

[41] Ofgem assumed productivity growth of 0.8-1.0 per cent at RIIO-ED1 and GD1. The ACM assumed 0.6 per cent in its latest analysis on potential productivity growth for GTS in the Netherlands.

ACM (2017): Incentive regulation of the gas and electricity networks in the Netherlands, p.17

referred to as Data Envelopment Analysis (DEA). In a decision taken earlier in 2018, the BNetzA first estimated the efficient frontier in a reference year before the start of the period. It requires inefficient companies (i.e. those not at the efficiency frontier) to catch-up and reduce their costs to those of the efficient frontier over a fiver-year period. The BNetzA then also estimated the change in the efficient frontier over time directly from the frontier itself (known as a Malmquist index) and using a second index method known as the Törnquist index. The final ongoing productivity assumption, which captures both changes in input prices relative to RPI and changes in technology was 0.49 per cent.[42]

91. Whilst the precise methods differ in each case, all the above examples cover cases in which a regulator has required regulated companies to decrease their cost base over time.

6.3. Quality and Performance Incentives in Rail

92. ARTC's access undertaking for the Hunter Valley rail network includes a specific mechanism for holding ARTC accountable for its performance. The mechanism has been described by the ACCC as "highly complex", but in summary it provides firstly for a regular "true up" to determine whether there has been sufficient capacity on the network to meet contractual entitlements, taking into account factors such as maintenance.[43] Then, where a shortfall in capacity is found, ARTC pays access seekers a rebate on certain take-or-pay charges those access seekers pay. The ACCC found that this mechanism "if successful, should partially incentivise ARTC to operate the network efficiently to avoid liability for capacity under-delivery".[44]

93. In Queensland, the QCA is consulting on whether to incorporate a "network performance incentive" into the regulatory framework for Aurizon's access undertaking.[45] The QCA has suggested some possibilities as to how this may be done, such as by removing the efficiency factor (discussed above) if Aurizon meets or exceeds performance outcomes, although it has yet to make a final view on this approach.

94. In Europe, the EU legislation stipulates that railway infrastructure charging systems must include incentives for quality and performance improvements in the form of so-called performance schemes. These schemes shall encourage network operators and railway undertakings to minimise delays and maximise the network's performance. To do so they may include monetary penalties/compensations for both parties in case of service disruptions. Article 35 of Directive 2012/34/EU specifies:

1. Infrastructure charging schemes shall encourage railway undertakings and the infrastructure manager to minimise disruption and improve the performance of the railway network through a performance scheme. This scheme may include penalties for actions which disrupt the operation of the network, compensation for undertakings which suffer from disruption and bonuses that reward better-than-planned performance. […].

95. Performance schemes and other incentives to increase performance and service quality for railway network operators exist in nearly all EU member states. A survey conducted by the European railway regulator network IRG-Rail among regulators of IRG member

[42] BNetzA (2108): Decision BK4-17-093. The BNetzA used both the Malmquist- and the Törnquist-Index to determine ongoing productivity. Due to adopting a best-of procedure, the final decision of 0,49% was based on the Törnquist-Index.

[43] See section 5.6.2 of ACCC (2011), "Decision In Relation to Australian Rail Track Corporation's Hunter Valley Rail Network Undertaking", 29 June.

[44] *Ibid.*, at p.14.

[45] QCA (2018), "Aurizon Network's 2017 draft access undertaking: maintenance allowance and practices", Consultation paper – request for comments, May.

states[46] found that performance schemes have been implemented in 20 of 21 countries. Only in Switzerland (which is not a full member of the EU) has no performance scheme has been implemented up to date.

96. The survey further finds that all performance schemes in place include some sorts of penalties as compensation payments for disruptions caused by the infrastructure operator or by the railway undertaking. However, the design of the penalty system varies substantially across countries:

    a) In Austria, Germany and Slovenia the level of penalties relates proportionally to the minutes of delay caused (within a lower and an upper bound for the penalty payment).

    b) Except for Bulgaria, Lithuania, Portugal, Sweden and passenger services in the UK (where there is a cap for freight only), all countries apply a cap and collar to the payments of penalties. This provides some certainty to both parties about costs incurred due to the scheme.

    c) In several countries, penalties vary across different segments like e.g. passenger vs. freight traffic (Bulgaria, France, Italy, Lithuania, Portugal, Spain, Sweden, and the UK) or scheduled vs. ad-hoc trains (Italy, Romania) or commercial vs. service trains (Italy, Sweden).

    d) Penalties can be calculated in absolute terms (e.g. EUR per minute Austria, DKK per delayed train in Denmark, HUF per minute in Hungary) or in relative terms as percentage of the access charge (e.g. in Romania the penalty may not exceed 1% of the total access charger per month)

97. The success of performance related incentive schemes in driving improvements in quality has been mixed in Europe to date. According to the IRG-Rail survey, few countries (Bulgaria, Croatia, Denmark, Italy and Portugal) confirmed that the implemented performance schemes have a positive impact on performance results. In other countries, the IRG did not find clear results on the effectiveness of the schemes (Austria, Finland, Belgium, France, Germany, Slovenia and the UK) or no results at all (Greece, Hungary, Lithuania, The Netherlands, Norway, Romania and Sweden).

98. In a sign of increased focus on the effectiveness of these schemes, the German regulator BNetzA recently dismissed the delay reduction scheme developed by the network operator DB Netz as insufficiently strong to incentivise behavior, requiring DB Netz to develop a new one that provided sufficiently effective signals.[47]

[46] IRG–Rail Working Group Access (2017): Overview on European Performance Schemes.

[47] See Centre on Regulation in Europe, *Track access charges: reconciling conflicting objectives: Case Study – Germany*, 9 May 2018, pp22-23.

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