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Efficiency and competition assessment of NBN Co's proposed pricing construct

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Summary

Economic assessment of NBN Co's pricing construct

1. We have been asked to provide an expert report in connection with the proposed pricing construct in NBN Co's SAU variation submitted to the ACCC in March 2022. NBN Co's proposed pricing construct was developed following a process of industry and ACCC engagement, and we understand that the main objectives of the construct have been to strike a balance between efficient cost recovery and delivering cost certainty to industry.

2. Economic efficiency and competition are key inputs into the determination of whether the SAU variation should be assessed as reasonable by the ACCC according to the legislative criteria for the acceptance of the SAU variation. The purpose of this expert report is to identify whether, in our opinion, the price terms in NBN Co's proposed SAU variation are likely to lead to economically efficient outcomes and contribute to the promotion of competition.

3. The key elements of NBN Co's SAU variation proposals for prices include revisions to the AVC-CVC construct, revisions to entry-level products, revisions to price caps and restrictions on the use of discounting and related rules for reductions in maximum retail prices.

Economic efficiency, competition and pricing

4. To analyse the efficiency of the pricing proposal, we think it is first necessary to consider the guidance provided on economic efficiency and competition in the legislation. That guidance, set out in Section 2, is useful, but can be further extended with reference to the economic literature on efficient pricing relevant to a firm facing similar demand and cost conditions to NBN Co.[1] In our opinion, that literature further informs the assessment of the economic efficiency of NBN Co's prices in three main ways.

5. The first is that efficient prices are those that maximise the amount of network usage but subject to the constraint that prices should allow for the opportunity to recover efficiently-incurred costs. In other words, prices must be assessed against a realistic efficiency benchmark.

6. The second way is that efficient prices should not solely be derived from costs where (i) a firm has large fixed and common costs and (ii) the patterns of demand are such that maximising usage requires the access provider to be sensitive to the level of access charges as well as usage charges. We find in Section 3 that there is ample evidence of both conditions. Consequently, efficient prices (that minimise the economic distortions from above-marginal cost pricing), should take account of demand conditions through the use of price differentiation and discrimination. Higher use and higher value customers should be offered usage charges close to marginal cost, to maximise total network usage. Lower use and lower value customers should be offered access charges close to marginal cost, to maximise the number of network connections.

7. The third way is that links between efficient pricing and building block models of costs are weak. Building block models have a role in determining efficient prices to the extent that they can be used to estimate the efficient total costs to recover in prices (and therefore average prices). But they cannot of themselves (i) inform as to what pattern of cost recovery over time is most

[1] Set out in Annex A.

efficient and (ii) be used to derive efficient prices for services, because they contain insufficient information about marginal costs or demand. In our opinion, there may be a range of prices and price paths that could promote economic efficiency objectives. NBN Co will need flexibility to react to market developments to alter its prices and price paths.

8. With respect to competition, the main issues are likely to be whether the pricing proposals offer sufficient cost certainty to RSPs, and provide for a sufficient diversity of retail offers. The achievement of both objectives are not absolute but more matters of judgement and degree.

The key matters for assessment

9. In Section 4, we analyse the key matters that arise from NBN Co's pricing proposals. A summary of our assessment of the key matters is as follows.

10. **Linkages between prices and costs:** The first matter is the proposed linkages between prices and costs, and whether this is sufficient to provide for efficiency and cost certainty. Given its cost and demand profile, linkages between NBN Co's prices and costs for individual services can only be weak. In our view, the linkages of prices and revenues across all services with efficient costs is something that is better considered over the course of a number of years rather than arbitrarily connected to the outputs of the building block model. As long as NBN Co can show a price path that is directed towards the recovery of efficiently-incurred costs over time and no more, then we think that is sufficient to satisfy the efficiency criteria. Such an approach would not, of itself, be likely to provide much cost certainty, and we would agree that further limits would need to be placed on the speed of price changes.

11. **New AVC-only constructs for services at speeds of 100Mbps and above**: The second matter we have considered is whether there is an efficiency basis for moving to AVC-only charges for services 100Mbps+. We find that the efficiency case for moving to an AVC-only construct relates to (i) the ability of such customers to bear increases in the fixed costs of access without switching to lower usage and value services, or non-NBN Co services and (ii) any efficiency losses from pricing usage for such services at below the marginal costs of usage. We do not think that either of these factors undermine the efficiency of the AVC-only construct, as efficiency losses are unlikely to be large and lower usage prices can drive more high-speed access connections.

12. Further, providing an AVC-only construct for higher usage customers would limit the uncertainty that RSPs face in selling these products to end users. In our opinion, greater cost certainty provided by NBN Co's proposed AVC-only pricing constructs will increase over time as we expect that more customers will migrate to higher speeds. Demand for higher speed tiers is expected to grow, as suggested by NBN Co's modelling of anticipated usage, international evidence on the uptake of high speed broadband, and the rapid investment in potential high speed substitutes such as 5G mobile infrastructure.

13. **Revisions to the AVC-CVC construct for services provided at speeds of 50Mbps and below:** The third matter is whether the price structure for services 50Mbps and below is efficient. As noted, for these services NBN Co proposes bundled capacity (CVC) inclusions which automatically grow over time and a fixed nominal CVC overage charge, currently proposed at $8 per Mbps per month. This pricing structure has three main effects: it allows for NBN Co to keep the access prices for entry-level bundles relatively low, allows for NBN Co to benefit from the growth of usage and in CVC purchases by RSPs, and provides incentives for RSPs to migrate heavier users to higher speed tier products (with larger inclusions or AVC-only).

14. In our opinion, NBN Co's proposal to reform the CVC construct and limit its applications to lower speed services is likely to enhance efficiency:

a NBN Co faces a serious challenge in keeping lower-usage customers on its network. For these customers, mobile and mobile broadband are likely to be close substitutes to NBN Co services. It will be efficient for NBN Co to maintain low access prices for lower speed tiers to incentivise these customers to stay or connect to the NBN network so long as such customers produce more revenue than their combined marginal costs of access and usage. We estimate that more than 20% of NBN Co's customers could be at least enticed by fixed wireless or mobile broadband at current levels of usage.

b NBN Co's estimates suggest that offering the 50Mbps service as AVC-only would not significantly increase prices for RSPs on average, but would result in significant increases for RSPs in their effective price of serving lower usage customers.[2] Passing these costs through to end users as higher prices would be detrimental to the efficient use of the network, and would undermine NBN Co's ability to recover efficient costs.

c In our view, the key role of the CVC charge is to produce a pricing gradient across speed tiers that dissuades higher-value end-users from choosing lower-value wholesale products. This allows NBN Co to maintain access affordability and maximise total usage, because higher-value, higher use customers can be offered a low or zero usage price in conjunction with a higher AVC charge. This matching of price with willingness to pay allows NBN Co to recover revenues more efficiently within the context of its proposed revenue cap.

d Modelling provided to us by NBN Co indicates that the $8 charge produces the best balance of end user services and revenue, with lower CVC prices expected to produce reductions in customers (up to 2%) and lower revenues (up to 5%).

e With respect to certainty for RSPs, CVC overage is now expected to only contribute less than 5% of NBN Co's TC-4 revenue by 2026, significantly reducing uncertainty for RSPs compared with past pricing constructs. This proportion should further lessen with increasing take-up of AVC-only products and falling real prices for CVC overage.

15. **Revisions to entry level products including increases in base speeds and provision of a voice only product:** A fourth matter is entry level products. As we have noted, NBN Co faces considerable competitive pressure relating to entry level products, as for (i) voice only services, many customers will see a mobile voice service as an effective substitute and (ii) for lower-speed broadband services, many customers will see a mobile broadband service as an effective substitute. NBN Co's entry level proposals provide greater flexibility for RSPs to compete by offering lower entry-level prices for a higher speed service, although the reduction in CVC inclusions would arguably affect cost certainty for RSPs. Given the overall reductions in managing CVC risk for RSPs, we consider NBN Co's approach is reasonable.

16. **Revisions to the price controls applicable to individual products**: A fifth matter is the proposed CPI – X price controls on individual products. The CPI – X price controls on individual products provide certainty over the (maximum) price paths, but are not the only constraints on maximum regulated prices. That is because the main controls on price levels are the overall core services revenue cap, and commercial constraints. In that context, it is somewhat a matter of judgement as to whether the particular X values that are adopted provide a reasonable balance

[2] The reason for this is that NBN Co currently bundles CVC inclusions, so that an end-user that uses less CVC than the bundled allowance effectively costs less to serve when averaged across all of that RSPs end-users. We estimate that RSPs selling to end users taking the 50/20 product that are in the 25th percentile for data downloads would pay an effective price of around $36 per month (FY24) compared with $50 AVC only.

between RSP certainty, maintaining a diversity of retail offers, and NBN Co's ability to structure prices efficiently within the overall revenue constraint.

17. We do not consider that the CPI – X controls would necessarily result in a compression of wholesale prices towards those of higher speed plans, and so a reduction in the diversity of retail offers. That may be possible if the CPI – X controls were the only limits on prices.[3] Within the context of a revenue control, distinct differences in willingness-to-pay across NBN Co's user base and vigorous network competition for lower-usage customers, such compression of prices is implausible, if not impossible.

18. **Limits on discounting arrangements**: A sixth matter is the proposed controls on discounts below maximum regulated prices, and most notably the rule to limit variations in revenue between discounted and undiscounted revenue to 5% (where, if that 5% threshold is exceeded in a given year, NBN Co will 'ratchet down' its Maximum Regulated Prices for the following year to reduce the difference). While discounting below maximum regulated prices is beneficial for users, and would presumably enhance efficiency to the extent it aligns prices more closer with marginal costs and facilitates pricing experimentation, we accept it may undermine objectives relating to price certainty. As for the approach to considering the CPI – X controls, we think a degree of judgement is required to determine whether the discounting proposals offer a sufficient degree of certainty. However, we note that the re-basing of maximum regulated prices and simpler AVC construct reduces NBN Co's ability to discount below maximum regulated prices, and the use of an aggregate measure of difference between discounted and undiscounted revenue offers a reasonably simple approach to determining compliance without strict limitations on discounting.

Pricing trade offs

19. A key point that we make in this paper is that the choice of price structures invariably involves trade-offs for NBN Co. Prices closer to marginal costs encourage more efficient use, but can harm or defer the recovery of efficient fixed and common costs, and so deter investment. Prices that offer more certainty (say with no usage charges) may encourage inefficient use, but facilitate more vigorous retail competition and so offer other efficiency benefits.

20. NBN Co has considered different pricing options and has modelled some of these trade offs as they relate to usage of the network and its revenues. This includes the financial consequences of options that include lower or zero usage prices. The modelling suggests that the financial implications of changes to its current proposals could be material, and also highlights the uncertainty faced by NBN Co and RSPs from price changes.

21. In our opinion, in the situation where NBN Co cannot, for commercial reasons, readily recover its efficient building block costs (even in the absence of any recovery of its ICRA), it is reasonable for NBN Co to seek flexibility in how it sets prices to maximise its returns. However, we recognise that price structure has been a long-term source of contention with RSPs, and addressing their concerns may play a significant role in the trade offs around price structure. Moreover, the balance of flexibility and cost certainty may also change over time as NBN Co increases its ability to recover its costs. This may be best addressed by NBN Co through maintaining pricing principles to guide pricing that emphasise both efficiency and the promotion of retail competition.

[3] That is because the X factor in the controls differs across services.

1 Introduction

1.1 NBN Co's SAU variation

22. NBN Co submitted a variation to its special access undertaking (**SAU variation** or **the variation**) to the ACCC in March 2022. This variation proposes a regulatory framework for use in periodic regulatory resets (replacement modules) and a new pricing framework that will apply from 2023 until the expiry of the SAU in 2040.

23. The ACCC is required to assess particular terms of the variation against the "reasonableness criteria" specified in Part XIC of the Competition and Consumer Act 2010 (Cth) (**CCA**).

24. The reasonableness criteria includes promoting the long-term interests of end-users (**LTIE**), including whether the arrangements encourage the efficient use of, and investment in, infrastructure.

1.2 Pricing elements of the variation

25. The SAU variation proposes a significantly revised pricing construct, which we summarise in **Table 1**.

Table 1: Overview of SAU variation pricing construct, March 2022, and existing pricing construct

Current pricing approach	SAU variation proposal
No voice only product	Voice-only product at a price point of $12/Month.
An entry level product at 12/1Mbps	Alignment of entry level prices between 12Mbps and 25Mbps, and reducing the fixed access charge for the 25Mbps bandwidth profile.
• A two-part AVC/CVC charging model • Bundled CVC inclusions are offered but with limited certainty as to future path via standard access agreement • Provisioned CVC model rather than utilised CVC	• AVC-only pricing construct for plans with a download speed at or above 100Mbps • Introduction of bundled AVC/CVC offers into the SAU for lower-speed services • Defined rules for bi-annual adjustments to the CVC inclusions to reflect actual changes in end-user download utilisation over time • A retention of two-part pricing (Fixed access charge + $8/Mbps variable charge) for entry level and mass market products (25Mbps and 50Mbps) • Change to utilised rather than provisioned CVC with the effect that RSPs will no longer need to actively forecast and manage CVC provisioning

Current pricing approach	SAU variation proposal
Price controls of CPI-1.5% on each service	• CPI + 3% price control on individual AVC-only services for the First Regulatory Cycle (to 30 June 2025), with an ongoing default price control of the greater of CPI and 3% • CPI price control on individual bundle service offerings • Commitment not to increase the price of CVC overage (for the bundle service offerings) over the term of the SAU. The Maximum Regulated Price for CVC overage will be set at $8 per Mbps to 2040 • Retention of the CPI - 1.5% price control on all other services
Few limits on discounting below Maximum Regulated Prices	• Reducing its Maximum Regulated Prices under the new price structure to be more reflective of the effective prices that will be payable by RSPs • Rules for discounting below Maximum Regulated Prices will limit variations in revenue between discounted and undiscounted revenue to 5%. If this limit is exceeded in a given year, **nbn** will 'ratchet down' its Maximum Regulated Prices for the following year to reduce the difference.

Source: NBN Co submission to the ACCC, p. 17.

26. It is important to note that the pricing construct as summarised here is not the only relevant constraint on NBN Co's price setting. The broader regulatory proposal also includes an overall revenue cap set with reference to NBN Co's building block revenue requirement and recovery of accumulated unrecovered costs (**ICRA**). Moreover, NBN Co is subject to legislative non-discrimination obligations.[4]

1.3 The development of the pricing proposals

The working groups

27. The ACCC hosted a series of working groups through the course of 2021 between NBN Co and RSPs. One workshop stream was devoted to pricing issues. The ACCC released a summary of the working group outcomes in December 2021, which included ACCC comments on the 'key outcomes'.

28. The ACCC indicated that it had some concerns with elements of NBN Co's pricing proposals that were discussed at the working groups. This included whether NBN Co's pricing proposal could adequately meet the legislative criteria and principles developed by the working group. At a high level, this included whether prices need to be based on what is best for end-users overall, are based on efficient costs and cost allocations, are relatively stable and certain, enable a diversity of retail offers in the market, and encourage efficient use of the network.[5]

[4] Section 152AXC of the CCA.

[5] ACCC, Summary of Working Group Outcomes, December 2021, pp. 8-9.

Consultation paper observations

29. In May 2022, the ACCC released a consultation paper on the SAU variation. The consultation paper includes a number of comments that are pertinent to pricing and on which the ACCC seeks feedback:[6]

    a That NBN Co's pricing is set independently of the cost base and revenue cap. This means that under NBN Co's proposal there remains no link between underlying costs and the price structure, price levels or projected price paths.

    b Further, NBN Co's proposed pricing and proposed price paths do not appear to contain any direct link to current or future demand.

    c The structure of the proposed price controls allowed for convergence or compression of the prices of different speed tier products, which would damage retail competition and efficient use of the network.

    d Forecast CVC growth of 13% per year appears low compared with historical trends and the retention of CVC pricing will result in escalating costs to access the NBN at an uncertain rate, and force users to purchase high speed inclusions at a price that does not represent "fair value" to them based on their requirements.

    e The level of the CVC overage charge at $8Mbps/month also appears to be above NBN Co's costs of making additional CVC capacity available to retailers.

    f NBN Co has not specified how the X factors for the caps have been determined and why they are appropriate.

    g Retailers may continue to be exposed to price shocks on withdrawal of discounts.

1.4 First report on incentives

30. Frontier Economics prepared a report for NBN Co accompanying its main submission on the SAU variation.[7] The purpose of that report was to highlight the incentives that NBN Co would likely face given the combination of commercial and regulatory constraints over the remaining SAU period.

31. In summary, we found that NBN Co would likely have incentives to set efficient prices. Primarily, this was because its proposed price controls would mean that its revenue requirement could only realistically be met by increasing volumes of access and usage. Increasing volumes would require it to structure prices in a way that promoted access and usage of the network, which should coincide with efficient prices. We said that efficient prices in this context should not be read as the "first best", but rather be considered as "constrained efficient", meaning the most efficient that could be produced consistent with the objective of recovery of prudently-incurred costs and of other objectives.

32. Our report did not specifically consider or demonstrate how NBN Co's proposed price construct and price paths were likely to be efficient or promote competition compared with alternative price structures.

6 ACCC, Proposed variation to the NBN Co Special Access Undertaking Consultation paper May 2022

7 Frontier Economics, xxx, March 2022.

1.5 This report

33. NBN Co has now asked Frontier Economics to prepare an expert report on its pricing offers, and the extent to which these offers are consistent with key elements of the reasonableness criteria relating to economic efficiency and competition.

34. In this report, we also address the concerns raised with NBN Co's pricing approach by the ACCC and by retail service providers through the course of the working groups and in the consultation paper.

35. An overview of the paper is as follows:

- In section 2, we set out the assessment framework for the pricing proposals, including the relevant legislative criteria.
- In section 3, we provide relevant context to NBN Co's pricing decisions, namely the level and structure of its costs and demand for its services.
- In section 4, we examine NBN Co's pricing proposals against efficiency and competition criteria, and how alternatives that have been suggested compare.
- In Annex A, we provide a further review and analysis of the relevant literature on public utility pricing, including how it relates to NBN Co's position.
- In Annex B, we discuss why it is reasonable to expect increasing demand for higher speed tiers.
- In Annex C, we provide further details on NBN Co's modelling of alternative pricing constructs.
- In Annex D, we provide further information on price structures for similar broadband services in other comparable jurisdictions, and in other Australian regulated industries.

2 Assessment framework

2.1 The legislative criteria relevant to the assessment of prices

36. In assessing NBN Co's SAU variation, the ACCC will consider whether particular terms and conditions in the proposed variation are reasonable, having regard to whether the terms and conditions promote the long-term interests of end-users (LTIE) and other reasonableness matters.[8]

37. Two key considerations within the reasonableness criteria are economic efficiency and competition.

    a Both are relevant to the LTIE, in respect of which the ACCC must consider:

        i Encouraging the economically efficient use of, and the economically efficient investment in, infrastructure.

        ii The extent to which that thing promotes competition in markets for listed services.[9]

    b A further reasonableness criterion is whether the proposed access terms would promote the economically efficient operation of a carriage service, a telecommunications network or a facility.

38. We now consider the relevance of pricing to both of these matters.

2.2 Economic efficiency

39. It is well established by the ACCC and the Australian Competition Tribunal (the Tribunal) that references to economic efficiency should be considered in relation to the achievement of allocative, productive and dynamic efficiencies.[10]

40. The setting of prices by an access provider most closely relates to allocative efficiency, and so this is the focus of this report.

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[8] Subsection 152CBD(2) of the CCA requires that the ACCC must not accept an SAU unless the ACCC is satisfied that:

- the terms and conditions of the SAU in relation to compliance with the Category B SAOs in section 152AXB are consistent with those obligations and are reasonable;
- particular types of conduct specified in the SAU promote the long-term interests of end-users and particular related terms and conditions are reasonable; and
- the SAU is consistent with any Ministerial pricing determinations.

In turn, subsection 152AH of the CCA sets out matters to which regard must be had when determining whether particular terms and conditions are reasonable.

[9] In *Telstra Corporation Limited v Australian Competition Tribunal [2009]* FCAFC 23 at [270], the Full Federal Court commented on weighing up the LTIE objectives: "In our view, no individual objective has primacy in terms of its weight or influence upon the relevant decision over either of the other objectives".

[10] See for example ACCC, *Final decision: NBN Co Special Access Undertaking*, December 2013, p. 49, and *Re Telstra Corporation Limited (ACN 051 775 556) [2006]*, ACompT 4 (2 June 2006), at 94.

41. As we highlighted in our First Report, allocative efficiency refers to how well resources are allocated between competing uses. Prices drive resource allocation decisions, and, as the Tribunal has recognised: "Allocative efficiency will be best promoted where the price of a service reflects the underlying marginal cost of providing the service."[11] This is effectively the "first best", because this would facilitate all sales that would make buyer and seller better off (and so maximise the sum of consumer and producer surplus).[12]

42. The ACCC has also recognised that the achievement of allocative efficiency can involve a trade off with other dimensions of efficiency, and with other legislative criteria. For example, an access price that promotes the economically efficient use of infrastructure in the short term may, in some cases, not encourage efficient investment in infrastructure and may not be consistent with the legitimate business interests of the access provider. In particular, an access price based on the direct incremental or marginal cost of providing access may not always allow an efficient access provider to recover all its costs over the long term, including its previously incurred sunk costs.[13]

43. It has also been accepted by the Tribunal that it is reasonable for firms recover a markup on incremental costs to recover fixed and common costs and that this is consistent with efficient use of infrastructure:

> *We consider that it is in the long-term interests of end-users of the [mobile termination service] and in the legitimate business interests of Optus that Optus recover an appropriate mark-up on its incremental costs of supplying the [mobile termination service] to cover the contribution to its [fixed and common costs]. Consistently with s 152AB(2)(e) of the Act, the recovery of such [fixed and common costs] is likely to result in the encouraging of the economically efficient use of, and the economically efficient investment in, the [mobile termination service].*[14]

44. This statement emphasises that allocative efficiency for an infrastructure provider with large fixed and sunk costs is a constrained maximisation problem.[15] "Second best" efficiency is maximised through setting prices as close to marginal costs as possible[16] while still meeting the constraint that prices allow for the seller to remain financially viable by recovering sunk and future costs, on the condition that these are efficient costs. In this way, second best prices would

11 *Re Telstra Corporation Limited (ACN 051 775 556) [2006]*, ACompT 4 (2 June 2006), at 94. This statement assumes that there are no other relevant factors, such as externalities, which might cause prices to efficiently deviate from marginal costs.

12 *Re Optus Mobile Pty Limited & Optus Networks Pty Limited [2006]* ACompT 8 (22 November 2006) at 157.

13 ACCC, Review of the 1997 Guide telecommunications access pricing principles for fixed line services, Discussion Paper, December 2009, p. 16. The ACCC cites a number of Tribunal decisions supporting this approach, fn 38.

14 *Re Optus Mobile Pty Limited & Optus Networks Pty Limited [2006]* ACompT 8 (22 November 2006)

15 While this view was controversial in the first part of the 20th century, Coase's 1946 paper and subsequent work identified the likely inferiority of marginal cost pricing supported by government subsidies to recover fixed and common costs. See R. Coase, "The Marginal Cost Controversy", *Economica*, 13(51), 1946, pp. 169–82.

16 We also note that this may not strictly hold for complements such as access and usage, a point to which we return in section 3.

promote the most efficient use of the network possible while also promoting efficient investment.

45. Of course, it is also true that losses in allocative efficiency will be larger where (i) NBN Co prices in ways that do not reflect the likely demand response of RSPs and end users to prices and (ii) NBN Co seeks to recover larger amounts of sunk costs. It should, however, be clear that the first-best is not a reasonable benchmark for efficient pricing: there are inherent trade-offs relating to cost recovery under any commercially-feasible set of prices which diminish the efficiency in use of the network to increase the efficiency of investment.

46. Given these benchmarks and trade offs, we think it is helpful to draw further on the literature from efficient public utility pricing to determine propositions for allocatively-efficient prices under the demand and cost conditions faced by NBN Co (which are further analysed in Section 3). These propositions are that:

    a Efficient pricing will require some consideration of the marginal costs of supplying access to and usage of NBN Co's networks, but some or all prices must exceed marginal costs to allow for cost recovery.

    b Non-linear tariffs with access or connection fees can improve on a linear usage pricing schedule in terms of maximising economic welfare (through higher overall usage).

    c Recovering all fixed and sunk costs in access fees will not be possible if end-users are sensitive to access fees and would switch to alternatives, or not buy at all.

    d As access and usage are complements, efficient prices for both services may deviate from marginal costs. We should not therefore expect specific connections between access and usage costs and the efficient prices that maximise total access and usage.

    e Optimal price structures that maximise total usage subject to cost recovery will likely involve differentiation, discrimination and self-selecting tariffs.

    f Prices under such a scheme will fulfil their normal roles of rationing existing demand and encouraging investment, but will also be needed to encourage RSPs and end-users to select plans that deliver the best value for their likely level of usage.

    g Prices should offer higher use and higher value end-users usage charges close to marginal cost, to maximise total network usage.

    h Prices should offer lower use and lower value end-users access charges close to marginal cost, to maximise the number of network connections.

    i As well as allocating costs efficiently between services, costs should also be allocated efficiently over time by maximising the total value of consumption.

47. A further discussion of these propositions is in **Annex A**. In that Annex, we also further document the reasons for our opinion that building block models cannot readily be used to set efficient prices. Such models can be used to estimate total efficient costs. But price differentiation and discrimination will produce much more efficient use of infrastructure and better facilitate cost recovery than cruder attempts to derive prices from a building block model.

48. In summary, we consider that the main challenge that NBN Co must address in its pricing is to develop prices and price paths that are efficient given the constraints it faces. As we will discuss, these constraints include organisational objectives to recover prudently-incurred costs, become financially sustainable and provide a return to shareholders, the nature of its demand which is both uncertain and very diverse among types of users, RSPs desire for certain and stable prices,

competitive pressures from alternative networks, and limits on its ability to price discriminate and differentiate its products.

2.3 The promotion of competition

49. Subsection 152AB(2) provides that in determining whether a particular thing promotes the LTIE, regard must be had to the objective of promoting competition in markets for listed services. Pricing by an access provider can have implications for the promotion of competition. As the Tribunal has suggested:

> *150 "Promoting competition" is typically achieved by increasing the number of firms serving a market or, more relevantly, is understood to mean increasing the degree of competition between existing players in the market through increasing the opportunities for interactive rivalry in all dimensions of the price-product-service package. Any of these conditions should be manifested in an increase in the price and non-price rivalry of firms in the market. For example, increased rivalry will likely increase the services offered by firms which are seen by end-users as offering close substitutes.*[17]

50. Prices that maximise the number of firms serving a market and allow existing firms to better compete through rivalrous offers would therefore promote competition. For example:

    a Choosing a price structure which favours larger firms over smaller firms could have a detrimental effect on competition, for example, if it favours firms of larger scale.[18]

    b Providing for a uniform wholesale price could enhance downstream competition in higher cost areas, if it reduces barriers to entry or expansion.[19]

51. A further dimension of pricing that is relevant to competition and particularly relevant to NBN Co is pricing certainty.

52. If access seekers do not have sufficient certainty about price paths that they and their users are likely to experience, the prices may fail to promote competition or efficient investment in downstream markets.[20] It would be concerning if, for example, a change in pricing approach reduced returns to RSPs' sunk investments and this meant that RSPs were less likely to make efficient investments *in future*.[21] This would also likely reduce dynamic efficiency.

17 *Application by Chime Communications Pty Ltd (No 2)* [2009] ACompT 2 (27 May 2009).

18 See *Re Virgin Blue Airlines Pty Limited* [2005] ACompT 5 (12 December 2005), Paras 301-310.

19 Noting that it could also lessen competition, if entry barriers were so high that entry was unaffected by the access price. See *Re Telstra Corporation Ltd (No 3)* [2007] ACompT 3 (17 May 2007), from 133.

20 The ACCC considered that regulatory certainty is likely to promote competition in ACCC, *Assessment of FANOC's Special Access Undertaking in relation to the Broadband Access Service – Draft Decision*, December 2007, p.138.

21 This argument is analogous to that made by Biggar when he suggests a key reason for regulation is to protect the sunk investments of users from expropriation by a natural monopoly. Biggar, Darryl R., *Is Protecting Sunk*

2.4 NBN Co's objectives

53. We understand that the ACCC is limited in its consideration to the objectives listed in the CCA and, that, accordingly, NBN Co's objectives are not specifically relevant to the assessment. However, these objectives do provide some relevant context as to the nature of NBN Co's pricing challenges and the constraints that it faces.

54. NBN Co's objectives as an entity are set by a "Statement of Expectations" issued by Shareholder Ministers, and last updated in August 2021. The August Statement of Expectations provides some references to pricing.[22] It states that NBN Co should, within legal and policy parameters, generate sufficient revenue to support investment in the network, as well as appropriate returns to the Commonwealth as shareholder.[23] NBN Co should also target an optimal capital structure, with a focus on achieving a standalone investment grade credit rating and delivering an appropriate return to the Commonwealth as shareholder.[24] Further, that NBN Co should support retailers to deliver affordable, reliable and resilient services to consumers, and promoting competition and innovation.[25]

55. The Government further recognises that, in meeting its obligations, NBN Co cannot generate a commercial return on all of its activities in parts of regional and remote Australia. It is expected the Company will support these activities through returns in other parts of its business, and contributions from the Regional Broadband Scheme.[26]

56. From these objectives, we observe NBN Co is required to address the desire for recovery of past costs (including a suitable return), provide support for unprofitable activities and deliver affordable services to retailers that will further support competition and innovation. These goals are not easily reconcilable and will involve trade-offs – for example, increasing affordability can make it hard to recover costs.

Investment by Consumers a Key Rationale for Natural Monopoly Regulation? (January 24, 2008). Available at SSRN: http://ssrn.com/abstract=1086866

22 https://www.financeminister.gov.au/media-release/2021/08/31/statement-expectations-sets-clear-objectives-NBN Co

23 Ibid.

24 Ibid.

25 Ibid.

26 Ibid.

3 Overview of NBN Co's costs and demand

57. In section 2, we suggested that any consideration of the efficiency of NBN Co's pricing constructs must take account of both its cost structure and the nature of demand that it faces. In this section, we explore the key characteristics of NBN Co's costs and demand, which are used to inform the development of its pricing construct.

58. In summary, this section highlights that:

    a NBN Co has large fixed and sunk costs, of which it proposes to recover a fraction to 2040.

    b The forward-looking costs of usage are difficult to measure, but in any event only play a minor role in efficient price setting for NBN Co's services.

    c NBN Co faces diverse demands from users, with reasonable expectations of demand growth but competitive threats apparent and looming.

3.1 NBN Co's costs and cost structure

59. As we have suggested, the costs relevant to efficient pricing are forward looking. That is because marginal costs are the relevant benchmark for efficiency, and marginal costs are always defined with respect to a decision that involves opportunity cost – which is explicitly forward looking.[27]

60. With that said, we have recognised in the previous section that if we are concerned about promoting efficient investment, NBN Co will have to consider the recovery of prudent and efficient past costs in its pricing.

3.1.1 Network costs are largely sunk and fixed

61. NBN Co operates seven different networks in its MTM mix; FTTP, FTTN, FTTC, FTTB, HFC, fixed wireless and satellite. In building these networks, NBN Co has incurred a large amount of costs which are sunk (have few alternative uses) and are generally fixed with respect to the amount of usage of the network. These costs have been accepted by the ACCC as being prudent under the existing SAU, which established the regulatory framework under which those costs would be assessed.

62. In particular the following types of costs are mostly fixed and sunk: costs associated with civil works (ducting, trenches), cables and installation, network electronics, and customer connection costs. Other costs relating to the lease of network infrastructure are not sunk, but are fixed with respect to output.

63. In addition to these capital and lease costs, NBN Co has also been permitted to roll forward initial "losses" that include the under-recovery of operating expenses. These costs are now also fixed and sunk. It is, however, apparent from NBN Co's proposed variation that the sunk network costs

[27] See, for example, Robert S Pindyck and Daniel L Rubinfeld, *Microeconomics*, 6th ed, Pearson (2005) p 214.

cannot all be recovered by the expiry of the SAU in 2040. For this reason, NBN Co has proposed to recover a fraction of the accumulated losses (ICRA).

64. We have stated that NBN Co's pricing challenge is to propose controls on prices that are "constrained efficient", where the constraint is that given by the recovery of efficient past costs. In effect, the recovery of the ICRA though the proposed revenue cap provides that overall constraint on prices.

3.1.2 There are costs of increasing network capacity and usage

65. As we have identified, it is forward-looking marginal costs that are the relevant benchmark for economic efficiency in the use of an existing network. Facilitating recovery of these costs would also allow for efficient new investment costs to be recovered. These would be the costs that should be recovered in usage charges if NBN Co was able to recover all of its fixed and sunk network costs (or the relevant portion considered prudent and efficient, if that is different) in access charges.

66. It is apparent from the working groups that most RSPs would prefer no usage-based (CVC) charges, and if that is not possible, then prices should reflect "the efficient cost of provisioning additional network capacity to meet forecast demand".[28] The costs of increasing network capacity, which in the context here is total network throughput to meet higher peak demands, primarily arise in NBN Co's transit and aggregation networks.[29] These networks take traffic from network nodes back to points of interconnection, and must be upgraded as consumers increase their usage, including through choice of faster plans.

67. Through the course of the working groups, we understand that NBN Co presented estimates (in $/Mbps/month) that had been drawn from a long run marginal cost study. This study included the costs of adding more capacity in the transit network, which is used to supply all end-users on the NBN, and also to address localised bottlenecks in its access networks.

68. In our view, the specific nature of costs that might be considered to be (long run) marginal costs of increasing NBN Co's capacity is complicated. NBN Co operates a number of different networks that are in different stages of capacity growth, and has a very uncertain growth trajectory. Moreover, there are a number of cost types for which it is unclear whether usage is the primary or sole cost driver, which could lead to over- or under-estimation of these costs.[30] This will tend to result in LRMC estimates that are likely to vary substantially with different assumptions.[31]

69. Although we agree that, in principle, the most efficient outcomes would have usage prices reflecting long-run marginal costs, the combination of:

    a the requirement for mark-ups on usage prices if access demand is not perfectly inelastic,

    b the complex nature of marginal cost estimation and

28 ACCC working group outcomes, p. 10.

29 In the HFC network, this is the local network at the optical nodes.

30 An example is the costs of network upgrades to the access network which also increase shared network capacity.

31 In this regard, we note that LRMC estimates are produced using different methodologies, commonly known as the 'average incremental cost' and 'pertubation' methods, but that each requires detailed forecasts of demand capital and operating costs many years into the future, creating considerable scope for divergence of estimates.

c RSPs preferences for AVC-only charging

mean that the forward-looking costs of usage must only play a minor role in efficient price setting for NBN Co's services.

3.2 Demand for NBN Co's services

3.2.1 NBN Co faces diverse sources of demand for core services

70. We have contended that NBN Co will need to account for demand for its services to price as efficiently as it can. To better understand NBN Co's pricing proposals, we sought information on how NBN Co analyses its demand for pricing purposes.

71. The information provided indicates that NBN Co regularly undertakes studies of its demand from end-users using a variety of study methods. This includes surveys that monitor trends over time and take advantage of discrete choice or conjoint analysis to estimate likely consumer responses to different bundles of product attributes – for example, higher speeds, lower prices, etc.

72. These analyses highlight that:

a The potential user base for fixed line broadband services is diverse

b There are key trends in the data which suggest likely growth in the use of NBN Co's services

c Competitive threats are apparent and growing

A diverse user base

73. NBN Co's user base appears to have a range of different preferences for services, with:

a Users showing a high average sensitivity to product characteristics including speed, price and available data (with unlimited products strongly favoured)[32]

b A relatively high proportion of NBN Co users uncertain of which speed tier they are currently on[33]

c A higher proportion of high-speed (100mpbs+) users indicating they are likely to upgrade their speeds further than their current speed tier as compared to lower-speed users

d A willingness to pay premium for very high speed tiers compared with 50/20 plans that is (i) only modest for the median user (<$10 per service per month) but (ii) very high for those in the top 20% of user willingness to pay (>$70 per service per month).[34]

e Price remains the most important consideration for lower income households, although they are attaching greater importance to data allowances over time.[35]

32 Ergo, *Residential End User Pricing – 2021*, May 2021, Slide 18

33 Ibid. Slide 36

34 Ibid. Slide 39.

35 Ibid. Slide 62.

Key trends favour growth in bandwidth and usage

74. These analyses also highlight some key trends which favour growth in the use of high speed broadband services, including:

    a Widespread adoption of streaming (around 78% of households) which increases demands for high speeds and data throughput

    b Growth in gaming which increases demand for high speeds and throughput as well as low latency

    c Growth in video uploading which increases demand for high upload speeds

    d Growth in connected home devices (e.g. smart TVs, security systems) which increases demand for high speeds and data throughput.

75. The key trends also appear to be reflected in increasing willingness to pay for various attributes, most notably speed.[36]

Competitive pressures are significant

76. While demand for high speed broadband is likely to grow, the analyses also highlight that mobile networks are providing increasing competitive pressure on NBN Co services, particularly in Metropolitan areas where mobile network coverage is strongest. While mobile networks are likely to be more capacity constrained than the NBN[37], the survey data indicates that

    a Those with mobile connections as their main internet connection were more likely to recommend that connection than other connection types (including the NBN)[38]

    b Mobile home internet users report significant increases in services being "worth what is paid" in the period 2017-2021[39], and this trend is particularly strong in metropolitan areas[40]

    c To some degree, while mobile users have historically been concerned about price, mobile households are increasing driven by speed and data allowances.[41] This trend appears to be reflected in survey evidence that shows that currently the households most likely to take up 5G are typically younger, wealthier, busier and prioritise speed.[42] We return to this in Section 3.2.3.

3.2.2 NBN Co's demand is derived from RSPs and then end-users

77. A further important feature of the demand for NBN Co's products is that it does not hold direct end-user relationships. NBN Co must sell its products through retail service providers (**RSPs**), creating a complementarity in the supply chain. That is, NBN Co's products are complementary to

36 Ibid. Slide 19

37 This is due to mobile networks having higher variable data costs arising from limited spectrum.

38 Ibid. Slide 24

39 Ibid. Slide 26

40 Ibid. Slide 27

41 Ibid. Slide 31

42 Ibid. Slide 33

the retail and network connectivity services offered by RSPs. Several implications arise from these relationships.

78. A first implication is that NBN Co has a more limited ability to target its offering to end-users than do RSPs. NBN Co only knows how much data the end-customer uses, their speed tier and their current premises. RSPs are able to develop and access richer customer data sets which would allow more precise targeting of attractive products. NBN Co is reliant on RSPs to assist in the design and implementation of efficient wholesale pricing constructs.

79. The second and related implication is that NBN Co's pricing structure may not necessarily translate into the pricing structure faced by end users. RSPs that mirror NBN Co's price structure will minimise their risk that patterns of consumer usage will increase costs by more than forecast. However, if end users have strong preferences over – for example – fixed and variable charging, then RSPs may find that competition means they need to reflect this in their pricing. In that context, it is notable that mobile service retailers in Australia predominantly offer unlimited data plans for mobile fixed wireless, even though the costs of bandwidth on a mobile network are higher than fixed networks. This can dampen the effect of wholesale pricing signals which seek to efficiently ration consumption and induce investment, or to differentiate products. To give two examples:

    a NBN Co might charge RSPs the marginal cost of usage in a CVC-type charge, but RSPs might not elect to pass this charge through directly or indirectly

    b NBN Co may wish to target a particular user type with a product for a group of end-users that it believes has a high willingness to pay for such a service. But retailers might decide that the scale of the end-user group is too small to target with a particular price offering.

80. The third implication is that NBN Co must also consider how its prices and changes in those prices are likely to incentivise complementary investments by RSPs. Generally, the determinants of investment are complex and hard to explain, but we think it is uncontroversial that pricing uncertainty is likely to hinder it. The more certain are prices and price paths the more likely it is that efficient complementary investment by RSPs will occur.

81. A fourth implication is that NBN Co must be cognisant of how the particular products and prices that it offers will affect competition, even if it offers the same products at the same prices to all users. For example, it may wish to avoid pricing constructs that favour larger-scale users to avoid creating barriers to entry.

3.2.3 There is significant risk of competitive substitution

82. The competitive threat posed by mobile networks is well known and addressed in our First Report. We highlighted that the threat of 4G/5G fixed wireless services has moved from the theoretical to the actual[43], and that three of NBN Co's largest fixed line customers are capable of

[43] Noting that both TPG and Optus advertise their services as alternatives to the NBN, offering unlimited data and high speeds (TPG: https://www.tpg.com.au/5g-home-broadband) and Optus (https://www.optus.com.au/broadband-NBN Co).

supplying 4G/5G fixed wireless services and would appear to have strong incentives to do so given the higher contribution margins earned on retail mobile compared to retail fixed services.[44]

83. NBN Co also competes with alternative fixed networks. Our first report highlighted TPG's superfast broadband services, offered at rates competitive with NBN-based retail plans whilst delivering comparable speeds.[45]

84. We also noted that it may well be true that, consistent with the ACCC's past views[46], there will be a significant number of end-users for whom 5G, satellite or alternative fixed line services are not a close substitute[47], and so inefficient prices may have little impact on their consumption decisions. However, the focus of NBN Co's attention must be on the effect of wholesale prices at the *margin*. If there are a sufficient number of end-users that use relatively little data or value access well below the average user, NBN Co would need to design pricing strategies that account for these variations in demand and willingness to pay.[48]

85. NBN Co's data on usage of its network highlights the magnitude of its challenge. **Figure 1** highlights data from a sample of users that shows their usage per month (in GB), ranked into percentiles (so the user at 0.05 is within the 5th highest percentile for usage). As expected, this shows that users on faster speed plans tend to download more, and that although there is no clear point of demarcation, there will be many users for whom mobile broadband will be unlikely to offer sufficient capacity to be an effective substitute.

44 For example, Telstra's Full Year 2021 results highlight EBITDA contribution margins of almost 40% for mobile services and around 6% for fixed line - consumer & small business. See Telstra 2021 full year results at D.4, available at: https://www.telstra.com.au/aboutus/investors/financial-information/financial-results. TPG also cites "higher margin" fixed wireless services in its reporting, see TPG Telecom Annual Report 2021, p. 7 while its investor presentation cites fixed wireless margins between $15-$30 per user, per month and on-net fixed line margins between $25-$45 higher.

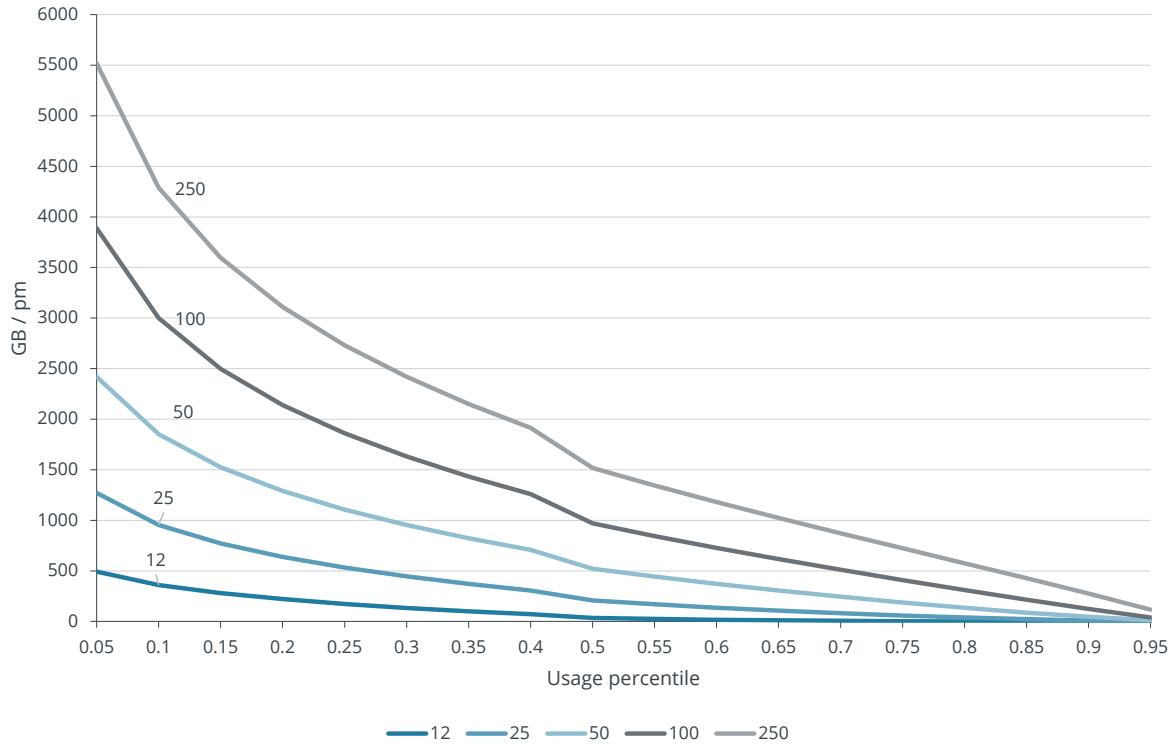
45 ACCC, *Superfast Broadband Access Service and Local Bitstream Access Service declaration inquiry – Final Decision*, p. 24

46 In 2021, the ACCC considered substitution issues through its inquiry into the declaration of fixed line broadband networks (https://www.accc.gov.au/regulated-infrastructure/communications/fixed-line-services/lbas-sbas-declarations-inquiry-2020/final-decision) and found that "Most end-users appear to maintain a preference for fixed line broadband to perform data intensive activities given the increasing need for non-limiting data allowances and reliable download and upload speeds."

47 This may often be true due to availability and mobile network capacity limitations rather than a consumer choice.

48 Our first report highlighted that, as an example, recent disclosures from TPG indicated it was targeting for the 2022 financial year an increase in on-net fixed wireless customers of 160,000, and on-net fixed line customers of 150,000. If successful, we would expect that the vast majority of these customers would be existing NBN Co users (Noting that TPG has highlighted that in 2021, it signed up 80,000 new customers to fixed wireless home and that "two out of every three customers switching across to our fixed wireless services are in fact former NBN Co customers." *Commsday*, 17 March 2022.) Together this shift would represent 310,000 or around 4 per cent of NBN Co's existing 8.5 million premises connected. NBN Co has very high fixed costs and, as a consequence, would not experience material cost reductions from this loss of customers. In other words, losing 4% subscribers would mean NBN Co would still need to recover close to 100% of the cost from 4% less subscribers. See TPG Telecom Limited 2021 Full-Year Results, February 2022, slide 8. Available at: https://www.tpgtelecom.com.au/investor-relations/financial-results.

Figure 1: Network usage (GB per month downloaded), by speed tier



Source: Frontier Economics based on NBN Co sample data (May 2022)

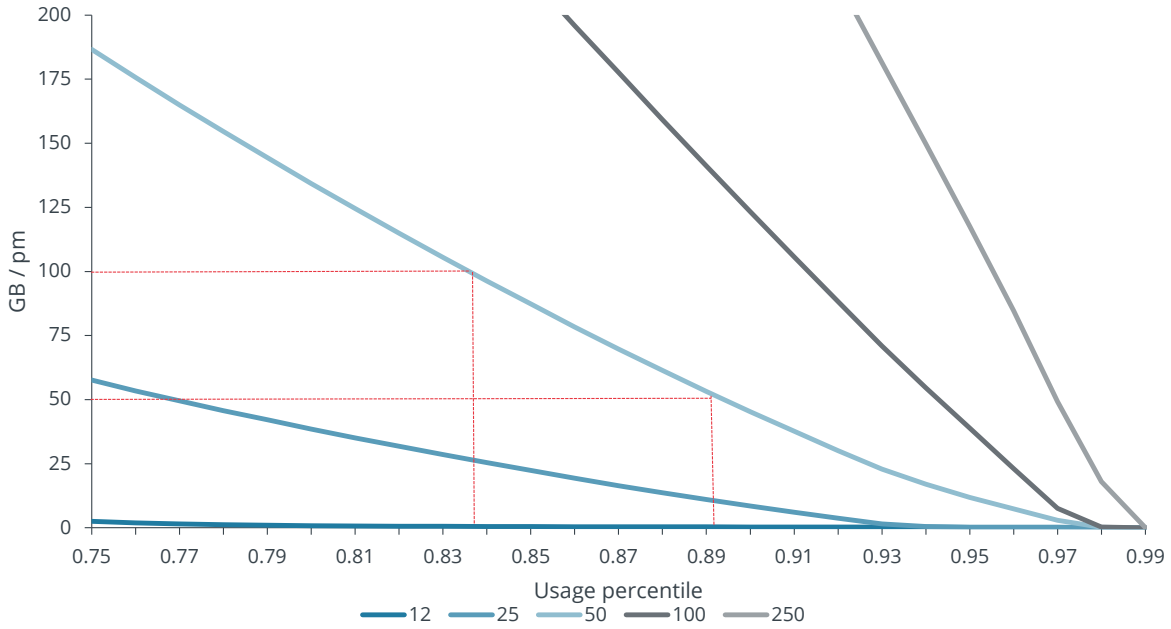
86. By zooming in on the right hand side of **Figure 1**, **Figure 2** highlights that there are many NBN Co users that would be characterised as lower use, even if not lower willingness-to-pay:

    a More than 12% of 50/20 end-users on NBN Co's network that – in the month sampled – used less than 50GB of data. That is more than 500,000 users. Further, 16% or more than 900,000 users used less than 100GB.

    b 23% of users on 25/5 plans use less than 50GB – a further 275,000 users.

87. While we would expect that not all of these end-users would be at risk of substitution, for the reasons already explained, it indicates that the potential for substitution is non-trivial.

Figure 2: Network usage (75th-99th percentiles)



Source: Frontier Economics based on NBN Co data (May 2022)

88. A further point in favour of mobile network substitution is that these suppliers are not subject to the Government's Regional Broadband Service (RBS) levy, which otherwise levies suppliers of fixed line broadband services $7.10 per month.[49] This levy helps to fund NBN Co's fixed wireless and satellite services in regional areas, which are loss-making. The effect of the levy (in the case of non-NBN Co fixed line suppliers) or the supply of loss-making services (in the case of NBN Co) is to make it more expensive to supply fixed line broadband services.

89. For other services such as alternative fixed line or satellite, we consider that it is sufficient to note that threats once seen as longer-term (such as LEO satellites) are now nascent, with Starlink commencing service in Australia and appearing to offer much faster actual median speeds than services delivered using NBN Co's own satellites and, indeed, median fixed broadband speeds.[50] This applies competitive pressure to NBN Co in rural and regional areas where such networks are likely to be uncongested.

3.2.4 Future growth in demand for fixed line broadband

90. The future path of demand is an issue that is critical to efficient pricing and efficient cost recovery. The regulatory arrangements enshrined in the existing SAU, via the ICRA, allowed for the deferral of cost recovery until the network had been deployed and the demand for fixed line broadband had grown.

91. We are also aware that the ACCC has questioned whether the demand for higher speed services is likely to be driven by actual or perceived consumer value, or by NBN Co 'forcibly moving' consumers to higher speeds via prices which favour that migration.

49 Indexed by CPI as per Telecommunications (Regional Broadband Scheme) Charge Act 2020.

50 See https://www.speedtest.net/insights/blog/starlink-hughesnet-viasat-performance-q3-2021/

92. We consider that forecasting future demand for broadband services is very difficult, particularly when it comes to forecasting speed tier mix and consumers' changing needs for speeds. Although we express no opinion on the forecasts themselves, we note that:

    a It does not appear unreasonable to forecast growing demand for speed and usage in light of use cases for high speed broadband that have developed in recent years, such as content streaming, video uploading, and working-from-home.

    b NBN Co is likely to have incentives to migrate end-users to higher speed tiers not merely to maximise revenue and profit, but also because the higher speed tiers highlight the competitive advantages of its products – noting that its networks have far greater capacity to deliver consistent high speeds to large numbers of end-users than either mobile or satellite networks.

    c There are benefits from higher speeds that are likely to become apparent with experience.[51]

3.3 Implications

93. Our analysis in this section suggests that NBN Co prices will necessarily involve some losses of allocative efficiency compared with the 'first best'. It is also true that lowering NBN Co's prices towards marginal costs will reduce such efficiency losses, and that, conversely, the efficiency losses will be larger where (i) NBN Co prices in ways that do not reflect the likely response of RSPs and end users to prices and (ii) NBN Co has to recover larger amounts of sunk costs. It is clear that if NBN Co is to minimise the losses of allocative efficiency, it will need to pay close attention to its end user demand, which is both uncertain and very diverse among types of users, RSPs desire for certain and stable prices, and competitive pressures from alternative networks.

[51] The ACCC has recognised, for example, that promotional discounts for very high speed services had some more permanent effect: "As the 'Focus on Fast' promotional discounts have now ended, the number of very high speed services over 100 Mbps fell by around 140,000 services, or by 40 per cent, in the March 2022 quarter. However, there are still more than eight times as many very high speed services connected to the NBN than in late-2020 when the promotion began." https://www.accc.gov.au/media-release/telstra-tpg-and-optus-lose-wholesale-market-share-for-NBN Co-services-to-smaller-providers

4 Assessment of NBN Co's pricing proposals

94. In the previous section, we highlighted the challenges for NBN Co in developing prices and price paths that are efficient and promote competition given the constraints it faces.

95. In this section, we assess NBN Co's pricing proposals by considering their likely impact on economic efficiency and competition. We first set out the construct and then assess the key elements separately.

4.1 NBN Co's SAU pricing construct proposal

96. NBN Co's proposed pricing construct in the SAU variation is set out in **Table 2**. The key features are:

- the introduction of a voice-only 12/1 service priced at $12/month
- the introduction of an AVC-only pricing construct for NBN Co ethernet TC-4 services supplied with a bandwidth profile of Home Fast (100Mbps) or higher
- bundled AVC/CVC offers for lower-speed NBN Co ethernet TC-4 services, and defined rules for bi-annual adjustments to the CVC inclusions over time
- the imposition of a $8/Mbps CVC overage charge for the bundled AVC/CVC offers, with no right for NBN Co to increase this amount in real or nominal terms over the SAU term.

Table 2: NBN Co proposed pricing constructs

AVC TC-4 bandwidth profile[71]	Common Reference	Pricing Terms		
		Monthly charge	CVC inclusions (Mbps)	CVC TC-4 Overage Charge ($/Mbps)
ELB [12/1] (capacity usage ≤ 0.1Mbps)*	Voice-only	$12	0	$8 (Utilised CVC)
ELB [12/1] (capacity usage > 0.1Mbps)	Entry Level Bundle	$26	0	
FW 12 [12/1]		$26	0	
B25 [25/5, 25/10]		$26	0.1	
B50 [50/20] and Wireless Plus	Standard Bundles	$50	2.45	
Home Fast [100/20]	High Speed Services (AVC-only Offers)	$60	NA	$0
Home Superfast [250/25]		$70		
Home Ultrafast [up to ~1000/50]		$80		
Premium Bundle [100/40]		$65		
Premium Bundle [250/100]		$100		
Premium Bundle [500/200]		$160		
Premium Bundle [1000/400]		$230		

Source: NBN Co.

4.2 Assessment of efficiency and competition effects

4.2.1 AVC-only constructs for 100Mbps+ services

97. NBN Co is proposing to introduce AVC-only pricing constructs for NBN Co ethernet TC-4 services with a bandwidth profile of Home Fast (100/20) or higher. As noted in section 2, 'more cost certainty over access costs for access seekers' is one of the five key outcomes that the ACCC considers should inform the regulatory framework applicable to the NBN network. If access seekers do not have sufficient certainty about price paths that they and their users are likely to experience, the prices may fail to promote competition or investment in downstream markets.

98. It therefore follows that NBN Co's proposed AVC-only pricing constructs should promote cost certainty and competition. RSPs will have no exposure to overage-related cost variability for end-users on the Home Fast (100Mbps) or higher speed tiers, which in turn means greater cost certainty with respect to these end-users. This should provide increased incentives to compete to develop attractive high speed offerings to end users.

99. We further note that the greater cost certainty provided by NBN Co's proposed AVC-only pricing constructs will increase over time as we expect that more end-users will migrate to higher speeds. Demand for higher speed tiers is expected to grow. NBN Co modelling of anticipated usage requirements indicates that more than half of end-users will be on plans at 100Mbps or above by FY30.[52] This growth in demand is also supported by international evidence on the uptake of high speed broadband, and the rapid investment in and use of 5G mobile infrastructure (see **Appendix B**).

100. From an efficiency perspective, the AVC-only construct is likely to promote efficient network use where (i) the marginal costs of network use are relatively low, and (ii) users can bear the additional fixed costs of access without switching to lower usage and value services, or to other networks.

101. We do not know with certainty the marginal costs of usage, but we can observe that it is likely to vary significantly across NBN Co's networks.[53] It would therefore be difficult to determine the size of such inefficiency and it may vary across end-user groups.

102. On the possible efficiency losses if prices are insufficient to recover marginal usage costs, we note that this may still be worthwhile to the extent that (i) usage-related marginal costs are low[54] and (ii) access and usage are complements (more access drives more usage). Complementarity means that it can be worth pricing usage low if that has a strong effect on boosting access connections.[55] We would view the majority support for the AVC-only construct by RSPs as suggesting that there is likely to be a benefit to connection demand from AVC-only products and, indeed, NBN Co's modelling of the price points in its SAU variation does not predict a decline in access connections for such services.

52 NBN Submission, p. 269

53 That is because NBN Co has multiple networks that tends to require upgrading to increase usage capacity on a localised basis, so while some parts of the network may be upgraded relatively easily, other parts can be more expensive.

54 This is likely to be true on a short run basis, although less clear in the long run.

55 See J.J. Laffont and J. Tirole, *Competition in Telecommunications*, MIT Press, 2000, p. 69.

4.2.2 Bundled AVC-CVC constructs

103. NBN Co is proposing to retain CVC pricing constructs for 50Mbps and lower-speed services, but to alter their form through the use of automatically-adjusting bundled CVC inclusions, to lower overall CVC charging and to enhance RSP certainty, and utilisation-based billing CVC services, to reduce complexity and costs associated with managing CVC requirements.

104. We think it is well understood that NBN Co has concerns that if it were to introduce AVC-only pricing for lower speed tiers in a revenue-neutral manner, users would likely face a significant price shock as fixed access charges increased, and that this may reduce take-up and use of the NBN network by low data users.[56]

105. While we think this concern is quite legitimate, NBN Co's proposed AVC-CVC constructs for 50Mbps and lower services should be seen as achieving two objectives:

    a to encourage lower-usage, lower value end-users to connect and

    b to discourage higher value, higher usage end-users from choosing lower priced plans which will lead to lower service quality for all end-users on the lower speed tiers.

106. As we have set out in Section 3, there is ample evidence that low usage end-users are likely to be particularly sensitive to access prices, which may act as a barrier for connection to the NBN. This loss of end-users would reduce NBN Co's opportunity to recover its efficient costs. NBN Co would be required to recover its efficient costs (which, as discussed above, are largely fixed) across a smaller number of end-users, potentially leading to further price increases, and further reductions in NBN Co's capacity to recover its efficient costs.

107. In our view, it would be efficient for NBN Co to maintain low access prices for lower speed tiers, while maintaining some form of usage-based charge to assist with recovery of costs across access and usage. Such an approach is consistent with maximising network usage overall, and will provide NBN Co with a greater opportunity to recover its efficient costs.[57]

108. The second objective of the AVC-CVC construct is to discourage high usage end-users from choosing lower speed plans. As we demonstrate in **Annex A**, a pricing construct that better discriminates between users on the basis of willingness to pay can enhance efficiency. Here, the concern is that the absence of a CVC price on lower speed plans would encourage some high usage end-users that are subscribed to the 100Mbps or greater plans to 'downgrade' to a lower speed plan to reduce their overall costs. This will lower their network usage and NBN Co's AVC revenue. To prevent this downgrading, NBN Co would likely raise AVC prices for lower speed

[56] For example, NBN Co's submission cited research commissioned from Accenture as part of its June 2021 SAU discussion paper. That research, which drew on a discrete choice consumer survey, shows that AVC-only pricing would lead to a significant increase in prices for customers on data capped retail offerings as RSPs transition these customers onto unlimited data retail offerings. Accenture estimated that in March 2021 there were approximately 1.4 million households on data capped retail offerings, of which around 88% are on 50Mbps or lower speed tiers. It concluded that some consumers would downgrade into lower speed tiers and an estimated 69,000 current customers would disconnect from the NBN. See NBN Co Supporting Submission, March 2022, p. 87.

[57] Generally speaking, we would expect that if NBN was willing to recover less revenues overall, it would be likely to wish to maintain a pricing structure that preserved some ability to charge high value customers relatively more, as this would still be the most efficient way to recover those reduced revenues. This might argue for a retention of CVC charging in some form. While reducing or removing all CVC charges is likely to maximise usage, it is likely to cause some "downshifting" of speed tiers by customers that wish to pay lower access fees. This suggests that maximising usage may come at the expense at higher average AVC prices than if some CVC charges remained to support a more differentiated price structure.

plans. As we have discussed above, low usage end-users are likely sensitive to fixed costs, and so an increase in AVC prices may result in such end-users leaving the network. This would reduce network usage, lowering total welfare and further reducing NBN Co's capacity to recover its efficient costs.

109. In our view, it is reasonable for NBN Co to charge CVC prices for lower speed tiers. CVC pricing provides RSPs with a financial incentive to encourages consumers to 'self-select' a plan that best suits their preferences given their willingness to pay for product characteristics. It means that a greater number of end-users would be paying a price that is closer to their willingness to pay. Such an approach is consistent with maximising network usage, and will provide NBN Co with a greater opportunity to recover its efficient costs.

110. It also remains to consider whether the CVC construct undermines pricing certainty. We are aware that this has been a major reason for RSPs discontent with NBN Co's pricing structure, and this is mentioned as a key design principle by the ACCC in its framing paper on industry discussions.[58]

111. NBN Co has two additional proposed measures to address CVC uncertainty.

    a Bundled inclusions, which automatically increase at one-half of the rate of growth in network usage

    b Charging CVC on the basis of actual utilisation rather than provisioned amounts will reduce the risk exposure for RSPs of unforeseen spikes in usage.

112. Uncertainty must also be considered in conjunction with the AVC-only constructs. Modelling provided to us by NBN Co suggests that revenue earned from the CVC charge will account for less than 5% of revenue in 2026 – in comparison to around 35% in 2017. Moreover, we think there is a reasonable expectation that this share will not increase (or increase much) over time. Although CVC revenues should grow over time as inclusions grow more slowly than usage growth, this will be offset by increased shifting of consumers to AVC-only plans, and the falling real price of overage.

113. The imposition of CVC charges is also consistent with the charging structures adopted in comparable international jurisdictions (see **Appendix D**). We examined three countries that share some of Australia's infrastructure model (New Zealand and Singapore) and geographical challenges (Canada). In both Singapore and Canada, usage based charges akin to NBN Co's CVC charge are used. In New Zealand, it is open for access seekers to create 'new services' outside of the standard wholesale prices list by adding increments of download capacity. While such international comparisons should be considered indicative, due to differences in network architecture, market structure and demand patterns between countries, that main point we take from this comparison is that there is no universal move to phase out usage based charges.

114. In our opinion, there must be some judgement applied as to whether the proposals provide sufficient certainty. However, at the least these proposals offer far more certainty that previous CVC constructs, and result in CVC payments accounting for a far lower share of total RSP payments to NBN Co.

[58] ACCC, ACCC Industry Roundtable on regulatory arrangements under NBN Co's Special Access Undertaking, June 2021, Principle 2.

4.2.3 A CVC value of $8 (nominal)

115. While the retention of some CVC charging for services under NBN Co's current commercial constraints is likely to enhance efficiency, it remains to consider the specific level that is proposed by NBN Co. NBN Co proposes to retain the current $8 CVC charge, and not increase that charge (in nominal or real terms) beyond this value to 2040.

116. The ACCC's consultation paper identifies the level of this charge as an issue in the consultation paper, noting that $8 "appears to be above NBN Co's costs of making additional CVC capacity available to retailers".[59]

117. As we have already noted, we do not think the $8 charge can be simply assessed against whether it reflects NBN Co's costs of making available CVC capacity. While a marginal cost price would maximise the efficiency of network usage, such an approach overlooks the two other roles of prices for NBN Co:

    a To facilitate cost recovery: the revenue earned from CVC overage will contribute to paying NBN Co's fixed and variable costs over the SAU period. As we have noted above, however, we understand that CVC revenue is expected to be small.

    b To facilitate price discrimination: as discussed in the preceding section, the CVC charge must be sufficiently high to encourage higher value end-users to select a plan that matches their willingness to pay for higher service quality (speeds and usage). In our view, this is the primary purpose of the CVC charge, and the value of the charge is critical to ensuring the effectiveness of this price discrimination role.

118. If one accepts that there is a legitimate basis for price discrimination to facilitate cost recovery, then price differences must reflect not cost differences but differences in demand and willingness to pay. As a consequence, the $8 charge should not be rejected on the basis that it does not match a reasonable estimate of marginal cost. It should be assessed on whether it achieves its objective of producing a set of prices for low speed tiers such that the total cost paid by a end-user is less than the willingness to pay for low usage end-users and more than the willingness to pay for high usage end-users.

119. Consider, for example, End-user A who requires 2Mbps of CVC and End-user B who requires 5Mbps. The total wholesale monthly price for each end-user on the 25/5 plan would be approximately $40.40 for End-user A and $64.40 for End-user B.[60] If the willingness to pay for End-user A was between, say, $40 to $50, the RSP would encourage A to stick with the 25/5 plan rather than upgrading to the 50/20 which has a fixed monthly cost of $50. Equally, if the willingness to pay for End-user B was, say, between $60 to $100, the RSP would be better upgrading B to a 100/20Mbps plan for a lower fixed monthly price of $60 and may be able to charge B more for the higher quality service. The purpose of the $8 CVC charge is to allow RSPs and end-users to self-select products based on their own assessment of their willingness to pay and expected demand.

120. To provide an opinion on the appropriateness of the $8 charge, we have considered NBN Co's modelling of different overage charges (see 4.3 below). This modelling suggests that lower CVC charges would result in end-user churn and a worsening high speed tier mix – and ultimately

[59] ACCC Consultation Paper, p. 24.

[60] For End user A, the RSP's estimated monthly bill on the 25/5 plan is: [26+(2-0.2)*8]=40.40. For End user B, the RSP's estimated monthly bill on the 25/5 plan is: [26+(5-0.2)*8]=64.40.

result in less usage. While these results depend on certain assumptions, the findings are not inconsistent with our expectations. We also note that relative to international benchmarks (see **Annex B**), the $8 CVC charge does appear higher than CVC equivalent charges applied in other comparable countries, but would now no longer apply to end-users on 100Mbps and higher speed tiers, which are AVC-only under NBN Co's SAU variation.

4.2.4 Amendments to entry level products

121. NBN Co is proposing to elevate its entry level bundle to the 25/5 speed tier (the current entry level bundle is the 12/1 speed tier), which affects both types of end-users:

    a For the 25/5 bundle, NBN Co is proposing to reduce the access price from $37 to $26 per month, and to remove the 1.6Mbps of CVC inclusions.

    b For the 12/1 speed tier, when used as a broadband service, will be migrated to the 25/5 speed tier. This will see an increase in the access price from $22.50 to $26 per month with no CVC inclusions whereas when used as a voice service, it will be offered at $12 per month.

122. NBN Co has estimated that this change will result in an average effective wholesale price for entry level products of $35 for RSPs, with the option to offer lower prices for lower usage end-users through management of CVC.

123. As for other measures, the question of efficiency relates to whether such changes encourage more usage or otherwise increase NBN Co's capacity to recover its efficient costs. There are two impacts that need to be considered. First, the proposal reduces the effective wholesale price for the 25/5 speed tier. This will make it easier for RSPs to compete for low usage end-users that desire to be on this speed tier and might otherwise be attracted to competitive services such as 5G fixed wireless. Second, the proposal increases the effective wholesale price for the 12/1 speed tier. End-users who are willing to pay the higher price for the improvement in service quality will remain on the NBN, while end-users that are unwilling to pay the increase in price will substitute to a competing service. If the net effect is an increase in usage and revenue to facilitate better cost recovery, the proposal will be welfare enhancing.

124. On the issue of cost certainty, the removal of CVC inclusions on the 25/5 product exposes RSPs to potentially higher CVC overage costs from end-users that take up the entry level products. However, CVC costs for end-users on these plans tend to be relatively small[61] and, as we have noted above, overall CVC costs will be a small proportion of total RSP costs. In addition, the transition to utilisation-based billing will allow RSPs to cap their CVC risk through tighter management of throughput by end-users on CVC plans.

4.2.5 CPI – X price controls

125. In addition to the pricing construct, NBN Co develops price paths for individual products using CPI – X price controls. We observe that the ACCC has identified that NBN Co has not specified how the X factors for the caps have been determined and why they are appropriate, and indicated it is considering whether the individual price caps may provide less pricing flexibility to respond to significant shifts in demand for different products than may be available under a weighted average price cap.

[61] NBN Co submission, p. 99.

126. Our view is that within NBN Co's total pricing and revenue constraint framework, the specific role of the CPI – X price controls on individual products is simply to provide greater certainty over the (maximum) price paths for RSPs. While CPI – X controls on individual products can, in some circumstances, offer incentives to lower costs and share these with customers, this role within NBN Co's framework is filled through the revenue control developed using the BBM. In that context, it is somewhat a matter of judgement as to whether the particular X values that are adopted provide a reasonable balance between RSP certainty and NBN Co's ability to structure prices efficiently within the overall revenue constraint.

127. The question from an efficiency perspective is whether the individual price caps unduly limit pricing flexibility to respond to significant shifts in demand for different products. In our opinion, we do not think it likely that the caps would limit flexibility in this way, for the following reasons:

    a In the short term, it does not appear that there are likely to be large efficiency gains from further price restructuring. NBN Co has only ever reduced its prices for core services since the commencement of the SAU in 2013.

    b Large price movements are not likely to be favoured by RSPs or end users for the reasons already described.

    c NBN Co does not expect to be able to raise prices for products in real terms; rather, what is more likely is a slowing in the rate of real price decreases. The proposed caps would accommodate this.

    d The price of new products will not be affected by the CPI – X controls.

128. The ACCC has also suggested in the consultation paper that the CPI – X controls would not prevent a compression of retail prices towards those of higher speed plans. That may be true, under certain assumptions, if the caps were the only limits on prices. Within the context of a other regulatory constraints including the revenue control and commercial constraints that include competition for lower usage end-users, we think that such compression of prices is highly implausible, if not impossible.

4.2.6 Discounting

129. NBN Co's pricing construct proposals also include new limits on discounting below Maximum Regulated Prices. The major change is to limit variations in revenue between discounted and undiscounted revenue to 5% (where, if that 5% threshold is exceeded in a given year, NBN Co will 'ratchet down' its Maximum Regulated Prices for the following year to reduce the difference).

130. The efficiency basis for discounting from Maximum Regulated Prices (as opposed to lowering the prices permanently) is that NBN Co can use the temporary lower prices to assess the effects of changes in relative prices. At face value, discounting below Maximum Regulated Prices is unambiguously beneficial for users, and would presumably enhance efficiency to the extent it aligns prices more closely with marginal costs. However, we accept it may undermine objectives relating to price certainty if such discounts become too widespread or too 'steep' meaning that NBN Co could later lift prices substantially.

131. As for the approach to considering the CPI – X controls, we think a degree of judgement is required to determine whether the discounting proposals offer a sufficient degree of certainty. However, we note that the re-basing of Maximum Regulated Prices and simpler AVC-only construct reduces NBN Co's ability to discount below Maximum Regulated Prices, and the use of an aggregate measure of difference between discounted and undiscounted revenue offers a reasonably simple approach to determining compliance without strict limitations on discounting.

4.3 Modelling of alternative pricing proposals

132. We have found that NBN Co's AVC-CVC pricing proposals could be consistent with maximising efficiency under its constraints. That is, by maximising access and usage to its networks subject to recovering efficient costs. However, it is complex to assess whether particular decisions – such as making only services 100Mbps+ AVC only rather than all services – meet this standard.

133. We therefore asked NBN Co for its modelling of its pricing construct against the existing approach as well as alternatives it has considered. We consider that such comparisons can demonstrate the trade-offs between different pricing proposals and identify whether the proposals likely maximise efficiency under the constraints around cost recovery that we have already identified in Section 3.

134. The particular proposals assessed by NBN Co were:

- *AVC-only or No CVC overage* – this involves removing the CVC overage charge for all NBN Co end-users and charging fixed prices for all NBN Co ethernet TC-4 services.
- *Lower CVC overage* – this involves maintaining the bundled AVC/CVC offers for NBN Co services with speeds of 50Mbps and lower, but reducing the CVC overage charge from NBN Co's proposed value of $8/Mbps to values of $6, $4 and $2.
- *AVC-only on 50 Mbps* – this involves introducing AVC-only pricing constructs for 50Mbps and higher services, while maintaining bundled AVC/CVC offers for lower-speed services at NBN Co's proposed rate of $8/Mbps.

135. Although it did not specifically model them, NBN Co has considered plans that cap the amount of usage (say measured in GB per user) as an alternative to CVC charging for lower-speed plans. We note that, while such plans do have the benefit of increasing charging certainty for RSPs, it is less obvious that they could enhance efficiency or provide for a diversity of retail offers.

136. For example, offering such plans would require NBN Co to specify caps and price points, which may both reduce RSPs options (noting that they can already construct such plans under CVC charging) and raise the risks of misalignment between NBN Co's plans and the preferences of RSPs customers. Moreover, we understand that there are operational requirements for RSPs to implement capped data usage, and not all RSPs currently have the system capability to do this, so it is unclear whether this would be supported by RSPs.

137. We first discuss each of these alternative pricing proposals in the sections below.

4.3.1 No CVC and Lower CVC options

138. The 'No CVC' and 'Lower CVC' options would, in the absence of any other changes to NBN Co's tariff structure, reduce the prices for NBN Co ethernet TC-4 services with a speed of 50 Mbps or lower. All else equal, this would be expected to result in:

- *An increase in demand for NBN Co services* – lower prices for 50 Mbps and lower services would allow RSPs to reduce the price of their low speed packages which may incentivise end-users that were previously not using an NBN Co service to connect to the NBN. This would increase NBN Co's revenue.
- *Lower prices for existing end-users on 50Mbps or lower services* – removing the CVC charge without any offsetting increase to access prices will reduce the effective price paid by

existing end-users using NBN Co TC-4 services with a speed of 50 Mbps or lower. This would decrease NBN Co's revenue.

- *Downshifting by higher usage end-users onto lower speeds* – some end-users using 100Mbps and higher services may be incentivised to drop to a lower speed tier to take advantage of the lower relative price. Since higher TC-4 speed tiers incur higher charges, this shift would reduce NBN Co's revenue.

139. It would be reasonable to expect that the 'No CVC' and 'Lower CVC' options would result in a net reduction in revenue. We expect that any increase in demand for the NBN as a result of a reduction in prices for lower speed services is likely to be minimal. The incremental end-users are likely low usage end-users that are subject to significant competition from mobile and fixed wireless services. On this basis, we expect that any increase in revenue from end-user growth will likely be outweighed by a fall in revenue from existing end-users and the downshifting of end-users to lower speed tiers.

140. To address this, we expect NBN Co would need to raise access prices to offset the lost CVC revenue and allow it to recover its efficient costs.

141. As noted in section 3, Ramsey pricing suggests that an efficient response would be to allocate a greater proportion of costs to end-users whose demand is less responsive to price, (i.e. for whom the price elasticity of demand is low or relatively inelastic). The quantity of the product consumed by these end-users will change less in response to the higher price than other end-users.

142. On the surface, this suggests that NBN Co should increase access prices for end-users on higher speed tiers, for whom alternative services such as mobile and fixed wireless are likely to be less suitable substitutes as they will not deliver the speed and bandwidth they require. In practice, evidence provided by NBN Co casts doubt on whether this could be a solution.

143. NBN Co's evidence suggests that while a reasonable proportion of customers have very high willingness to pay, this rapidly drops towards the median user. To give two examples, NBN Co estimates that:

    a. the median willingness to pay by end-users for a retail 50/20 service over a standard 25/5 service provided by RSPs is $13 per month. This means that if the price of the 50/20 service was more than $13 higher than the 25/5 service, a majority of end-users would 'downshift' to the 25/5 service. On this evidence, significantly raising *relative* prices for the higher speed tiers (that is, without raising prices on lower speed tiers) would lead to a significant number of end-users shifting to slower but more affordable plans. This would both reduce benefits to those end users, and further reduce NBN Co's opportunity to recover its efficient costs.

    b. the median willingness to pay by end-users for a retail 250/25 service over a 50/20 service is only $8 per month, although the 10% of users with the highest willingness to pay would pay a premium of up to $146 per month. This indicates that the trade off for NBN Co is:

        i. it could set a relatively low price for the 250/25 and attract customers up to the faster speeds, and earn lower margins on a larger number of customers, or

        ii. charge a higher price with much higher margins for the 250/25 service, but see most customers stay on 50/20 plans (and forego the premiums that might be earned from attracting these customers to the faster speeds).

144. In addition, while high usage end-users may have a high willingness to pay, it would be difficult for NBN Co to specifically target these end-users. At the higher speed tiers, end-users are charged on an AVC-only basis. This means that prices are independent of usage, and the only basis upon which NBN Co can price discriminate is through setting the AVC price. This leaves very little ability for NBN Co to charge a premium for the 250/25 plan versus the 100/20. So, there is a limit to how effective price discrimination can be at the higher speed tiers.

145. An alternative approach would be to raise prices for lower speed tiers. However, in our view, this would put NBN Co at serious risk of being undercut for low usage end-users, where substitutability with mobile and fixed wireless solutions are feasible. A significant amount of end-user churn at the low usage level would likely damage retail competition and efficient use of the network, and may undermine NBN Co's ability to recover its efficient costs.

4.3.2 AVC-only on 50 Mbps

146. This option will change the effective price of the 50Mbps speed tier while leaving other construct elements unchanged.

147. Under NBN Co's proposed tariff structure with bundled inclusions, it is important to note that RSPs selling to lower usage end-users on the 50Mbps speed tier would pay a lower effective AVC price. That is because bundled CVC inclusions can be used by RSPs to cover the cost of their high usage end-users. For example, NBN Co has provided information indicating that approximately 500,000 end-users on the 50Mbps speed tier currently use less than 50GB/month. Assuming CVC inclusions of 2.5Mbps and an $8 overage rate, the RSP would face an effective price as low as $30 since RSPs would be able to re-purpose the unused bundled CVC to reduce their purchases to service higher usage end-users.

148. Under this alternative pricing proposal, the CVC inclusions and overage would be removed. NBN Co would have two options:

    a to charge all end-users on the 50Mbps tier a revenue-neutral AVC-only price, or

    b to set the AVC-only price at a lower price (say at the current AVC price, or the current AVC price less the value of bundled CVC inclusions).

149. Absent any other changes, the average price under option (a) does not increase substantially, reflecting that bundled inclusions are mostly sufficient for the average user. However, the effective price for low usage end-users on the 50Mbps tier would increase substantially to equal the access price (i.e., as much as an approximate 40% increase, based on the data provided by NBN Co). If RSPs pass through this effective increase – as we would expect – then there is a significant risk that such end users would either downshift to a lower speed tier, or switch to a competing service like mobile or another fixed wireless service.

150. If NBN Co pursued option (b), it may mitigate the loss of customers, but this would come at the direct loss of margin on these customers. Given the value of bundled inclusions, pushing AVC-only prices to the point where few low-use customers lost could lead to a significant cost.[62]

[62] For a low use end-user, their effective wholesale price paid by the RSP is reduced by the value of unused bundled inclusions which are shared with other users. The AVC-only price might need to fall substantially for RSPs to not raise prices for all existing end-users on the 50Mbps tier (i.e., the current AVC price less the value of bundled CVC inclusions). We estimate that more than 1 million users on the 50/20 plan would require CVC of less than 1 mbps and so their RSPs pay an effective price of less than $31.80.

151. Against this, we might expect that RSPs would be prepared to push 50Mbps services to higher-usage end-users more aggressively, as they will no longer be liable to pay any CVC overage.

4.3.3 NBN Co modelling of alternative scenarios

152. NBN Co has modelled expected price and revenue outcomes under these scenarios for the FY2024-27 period. A summary of these results is presented in **Table 3**, and an explanation of the underlying model is set out in **Appendix C**. This modelling indicates that:

    a Lowering CVC charges from $8 to $6, $4 or $2 results in (1) churn of lower use end-users for whom AVC charges would need to rise to offset lost CVC revenue and (2) a change in the speed tier mix because it decreases the number of plans for whom RSPs would otherwise have incentive to switch users to faster tiers (e.g. where NBN Co's service charge to the RSPs charge for the 50Mbps service would be higher than the AVC-only 100Mbps charge.)

    b Making the 50/20 product AVC-only would cause a significant amount of churn for lower use end-users, because it would result in a significant effective price rise once inclusions are accounted for and (2) a loss of incentive to move end-users to higher speed tiers as described for (a).

Table 3: NBN Co analysis of alternative pricing constructs for FY2024-27

Scenario	Description	Change in revenue	Loss of connections
Baseline	$8 CVC, AVC only on 100Mbps+		
Scenario 1	$6 CVC	-0.6%	20,000
Scenario 2	$4 CVC	-1.6%	40,000
Scenario 3	$2 CVC	-2.0%	60,000
Scenario 4	No CVC	-4.9%	170,000
Scenario 5	AVC-only on 50Mbps	-4.1%	100,000

Source: NBN Co. Note: Estimation of end-user churn and changes in speed tier are explained further in Appendix C.

153. It is evident that each of these scenarios requires assumptions regarding changes in prices, end-user churn and speed tier mix. It is not certain that all of these assumptions would hold in practice. This highlights that there is risk in moving to a significantly changed pricing approach that may result in quite different outcomes to those modelled – for example, it is plausible that the loss of connections could be even greater resulting in an even greater impact on NBN Co. However, in our view, the basic results are not surprising. Any 'No CVC' options and going to AVC-only on 50Mbps requires significant pricing changes and each appears to come with significant risk of churn. The modelling of the CVC charge suggests that, while an important feature of pricing, the precise level of this charge that produces the best efficiency outcomes is less certain.

4.4 Conclusions

154. We have found that there is evidence to suggest that NBN Co's prices effectively target different customer types to maximise access and usage to its networks, subject to recovering as much of its efficient costs as is commercially feasible.

155. A key point that we make in this paper is that the choice of price structures invariably involves trade-offs for NBN Co. Prices closer to marginal costs encourage more efficient use, but can harm or defer the recovery of efficient fixed and common costs, and so deter investment. Prices that offer more certainty (say with no usage charges) may encourage inefficient use, but facilitate more vigorous retail competition and so offer other efficiency benefits.

156. NBN Co has considered different pricing options and has modelled some of these trade offs as they relate to usage of the network and its revenues. This includes the financial consequences of options that include lower or zero usage prices. The modelling suggests that the financial implications of changes to its current proposals could be material, and also highlights the uncertainty faced by NBN Co and RSPs from price changes.

157. In our opinion, in the situation where NBN Co cannot, for commercial reasons, readily recover its efficient building block costs (even in the absence of any recovery of its ICRA), it is reasonable for NBN Co to seek flexibility in how it sets prices to maximise its returns. However, we recognise that price structure has been a long-term source of contention with RSPs, and addressing their concerns may play a significant role in the trade offs around price structure. Moreover, the balance of flexibility and cost certainty may also change over time as NBN Co increases its ability to recover its costs. This may be best addressed by NBN Co through maintaining pricing principles to guide pricing that emphasise both efficiency and the promotion of retail competition.

A Pricing and economic efficiency

A framework for efficient pricing

158. The economic literature on efficient public utility pricing provides useful context for the assessment of the efficiency of NBN Co's prices against the legislative criteria. Much of this framework is well known. However, based on our review of the papers produced for the working groups and the ACCC's consultation paper, there appears to be some uncertainty among stakeholders regarding:

    a the role of costs and demand in determining efficient prices for a firm such as NBN Co; and

    b the efficiency of prices that would be derived from or closely linked to a "standard" building block model.[63]

159. We find that the economic literature is clear that for a firm like NBN Co, the setting of efficient prices cannot be derived only from costs, and therefore cannot be derived solely from a high level model of efficient costs such as a building block model. As we will discuss, however, prices can be efficiently limited to those consistent with efficient cost recovery as might be measured in a building block model under certain conditions.

Prices that maximise efficiency

160. It is uncontroversial that efficient pricing will require some consideration of the marginal costs of supplying access to and usage of NBN Co's networks. Marginal cost is the increase in total costs that arises from a decision to produce an extra unit of output.[64]

161. In regulatory settings, regulators commonly require firms to price on the basis of long-run costing concepts, such as long-run marginal or incremental costs. The efficiency justification for this type of pricing is that it explicitly allows for consumers to face the (opportunity) costs of maintaining and expanding service capacity over time.[65] Such prices will generally be higher than short-run marginal or incremental costs, because they allow the firm to recover costs that will become fixed and sunk (including depreciation costs and a return on capital invested).[66] Setting prices that send signals about the costs of increasing capacity is particularly important in situations where existing infrastructure is likely to need enhancement to service demand growth,

63 We use the word "standard" here to refer to the approach of determining building blocks for depreciation and the return on capital using (indexed) straight line depreciation.

64 This definition can be found in all introductory textbooks of microeconomics See, for example, J. Gans, S. King and N. Mankiw, *Principles of Microeconomics,* Thomson, 2nd ed, 2002, p 271. Economics always defines costs in terms of opportunities that are forgone as a result of particular decisions. The marginal cost is the value of opportunities that are forgone as the result of a decision to increase the rate of output by one unit. The idea behind the rule that prices should equal marginal costs (the 'first best') is that this will ensure that individual producers' decisions on how much to produce (to maximise their profits) will be consistent with economic efficiency — namely, maximising the value that can be generated by the resources that are available to society at large.

65 See e.g. A. Kahn, *The Economics of Regulation*, 1988, pp.88-89.

66 Short run marginal costs may be higher than long run marginal costs if demand exceeds existing capacity.

and where infrastructure-based competition is potentially feasible in the longer-term, because it may provide better "build or buy" signals.

162. However, pricing at marginal cost – even long run marginal cost – is only optimal (first best) assuming the firm does not need to recover sunk costs from past investments or common costs (costs that are common to different types of products).[67] To address these considerations, economists have developed 'second best' pricing rules.

Some or all prices must exceed marginal costs

163. A 'second best' pricing approach is one that facilitates cost recovery while minimising the losses in efficiency that may arise from pricing services at levels above their marginal costs. The issue of how to minimise such efficiency losses has been given considerable attention in the economic literature.

164. Some well-known results from this literature include that:

a For single or linear tariffs, Ramsey pricing maximises efficiency. Ramsey pricing is the optimal pricing approach to the second-best problem of marking up marginal costs to recover fixed and common costs.[68] Ramsey pricing involves allocating a greater proportion of fixed and common costs to end-users whose demand is less responsive to price, i.e., whose price elasticity of demand is low or relatively inelastic. The quantity of the product consumed by these end-users will reduce less in response to the higher price than other end-users with more responsive demand, minimising the economic loss, in terms of under-consumption, from diverging from marginal cost pricing. Those end-users that are most responsive to changes in price, i.e., whose price elasticity of demand is high or relatively elastic, face a price that is closer to marginal cost.[69]

b Two-part, or more generally multi-part, tariffs can improve on a linear pricing schedule in terms of minimising loss in economic welfare. Multi-part tariffs consist of a fixed access charge that does not vary with usage, and variable usage charges. This allows variable usage prices to be closer to marginal costs. It is possible for a two-part tariff to achieve first best outcomes if fixed and common costs can be completely recovered by access fees, and usage is charged at marginal cost.[70]

c Markups on usage and access fees may be required. Recovering all fixed costs in access fees will not be possible if end-users are sensitive to access fees. This may occur if there is strong competition, in terms of available substitute products or services, that end-users may switch to. In that case, efficient pricing will not necessarily involve the setting of *either* access or usage prices at marginal costs – as stated by Train: "…when access

67 Other reasons from diverging from marginal cost include externalities and complementarities between products. While externalities do not appear to have any specific bearing here, complementarity between products is relevant.

68 The problem of finding the best linear prices was first solved by Frank Ramsey (1927), then Marcel Boiteux (1956), and Baumol and Bradford (1970). See Baumol and Bradford, "Optimal Departures from Marginal Cost Pricing," *American Economic Review* Vol 60, no 3 (June 1970) pp 265-283 for a discussion of the theorem and the history of the literature.

69 As Baumol and Bradford point out, the theorem: "…seems to say that ordinary price discrimination might well set relative prices at least roughly in the manner required for maximal social welfare in the presence of a profit constraint." *ibid.*, p 267.

70 This result is first attributed to R. Coase, "The Marginal Cost Controversy", *Economica*, 1946, 13: 169-82.

demand is price sensitive, the optimal access fee is lower and the optimal usage fee is higher than when access demand is fixed".[71]

d We can expect that both prices will need to be marked up to minimise total consumption distortions, and these prices will need to account for the complementarity between access and usage – see **Box 2**.

e Better efficiency results again may be obtained if multiple access fees and usage prices can be set with the consumer to choose which combination they prefer.[72] This would allow for end-users with the least elastic demand to bear more of the fixed cost through higher access fees and to keep prices low for users with elastic demand and low willingness-to-pay.[73] This kind of approach explicitly brings in demand as well as cost to allocate fixed costs to users.

71 Train, *Optimal Regulation: The economic theory of natural monopoly*, p. 201.

72 Willig (1978) is usually credited with first demonstrating this result. R. Willig, "Pareto-Superior Nonlinear Outlay Schedules", *The Bell Journal of Economics*, Vol. 9, No. 1 (Spring, 1978), pp. 56-69. Willig also states that "It has been shown that any outlay schedule which fails to offer the largest purchaser a marginal price equal to marginal cost can be strongly Pareto dominated by another nonlinear outlay schedule." The intuition is that it is always better to offer larger consumers the lowest price because they will consume relatively more at this lower price than will smaller users.

73 See R. Sherman, *The Regulation of Monopoly*, 1989, p. 146

Box 1: Optimal markups for complements

For complements such as access and usage, the formula for determining the markups is as follows:

$$\frac{P_a - MC_a}{P_a} \cdot (\epsilon_a - \epsilon_{ua}) = \frac{P_u - MC_u}{P_u} \cdot (\epsilon_u - \epsilon_{au})$$

Price cost markup

Net or 'super' elasticity

"inverse elasticity rule" says these must be equal across services (access, usage)

where

- P_a, MC_a, P_u, MC_u: prices and marginal costs for access and usage

- ε_a, ε_u are own price elasticities

- ε_{au}, ε_{ua} are cross-price elasticities i.e. ε_{au}=elasticity of access with respect to the usage fee

Where the cross-elasticities are zero, it can be observed that this simply reverts to the simple Ramsey formula for independent products. It would be unusual if the cross-price elasticities were zero, because higher prices for usage would ordinarily reduce the benefits of access and result in lower-usage customers not purchasing access, and similarly, higher access prices will reduce access connections and so usage.

Source: *See K. Train, Optimal Regulation: The economic theory of natural monopoly, pp. 196-200.*

Optimal tariff structures likely involve differentiation, discrimination and self-selecting tariffs

165. Efficient pricing under demand conditions with end-users sensitive to both access and usage fees, which for reasons discussed in section 3 are relevant to NBN Co's demand, requires a pricing schedule that responds to differences in demands via multi-part pricing that allows for different combinations of usage and access prices. This will maximise the number of end-users that are using the service, and so increase the firm's ability to recover its costs. Ideally, it will also offer heavier users prices for usage that are closer to marginal costs, as this will maximise total network usage.[74]

166. These prices might reflect, for example, that end-users respond to different product attributes differently. For example, "gamers" may tend to value speed and quality factors very highly compared to price, while those on low incomes may focus more on the level of access charges and less on speed or large data allowances.

167. It is important to emphasise here that under this pricing approach, prices now have a third role in addition to the two standard roles of rationing demand and sending signals about the value of new investment. The third role is to guide RSPs and ultimately their end users to 'self-select' a plan (with a mix of access and usage fees) that best suits their preferences given their

[74] See footnote 72.

willingness-to-pay for product characteristics. Such prices can also increase the firm's ability to recover its costs by maximising the number of end-users that are using the service.

168. For example, plans with high access fees and low usage prices can be used to attract high usage, high value end-users. Alternatively, plans with lower access fees and higher usage charges can be used to attract low usage end-users who may be sensitive to access charges. In this case, usage fees must be sufficiently high to discourage higher-value users from selecting such plans, otherwise we would expect that most end-users will select the plan with lower access fees to reduce their overall costs, which would mean that the differentiation strategy would be ineffective at increasing recovery of fixed costs. An example of how such plans can make both consumers and suppliers better off is highlighted in **Box 2**.[75]

Box 2: Optimal self-selecting two-part tariffs

Two part tariffs can produce first best outcomes where all fixed and common costs can be recovered in fixed access charges. Where that is not the case, and usage prices are above marginal costs, there is a loss of allocative efficiency. That loss in efficiency can in turn be minimised using optimal non-linear tariffs assuming that the firm can price discriminate and differentiate between users.

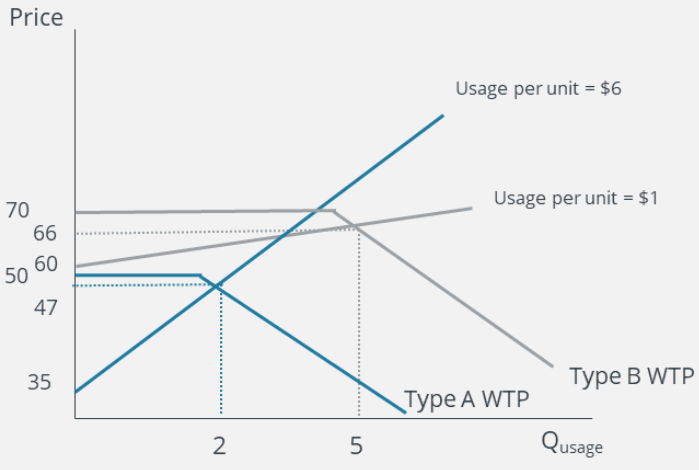
A simple example of tariff design can illustrate how NBN Co can use multi-part self selecting tariffs to make both itself and consumers better off, in that we have more users and more usage and the firm has higher revenues and profits. Suppose there are two user types, A and B, with different willingness to pay – suppose $50 and $70 respectively. Our example compares a single two part tariff with two two-part tariffs. Suppose that:

- The application of the Ramsey markup rule results in a single two-part tariff with both access ($42) and usage ($3 per unit) charges above their respective long run marginal costs of $40 and $1 per unit.
- Both types of users obtain access, with usage of 2.5 units (A) and 3 units (B) for a total of 5.5 units. Revenues are ($42 x 2 + $3 x 5.5 = $101). B obtains some consumer surplus while price = WTP for A. Setting a higher access charge would result in A users not purchasing.

Now suppose the firm offers two packages that are available to all users (see **right**):

- $35 access, $6 per usage unit (Tariff 1)
- $60 access, $1 per usage unit (Tariff 2)

At such prices (and making assumptions about consumption changes):



[75] This example is loosely based on J.J. Laffont and J. Tirole, *Competition in Telecommunications*, MIT Press, 2000, p. 111.

- both customers types are profitable to service (revenues exceed sum of access and usage costs)
- the tariffs are "incentive compatible" – type B users are better off on Tariff 2 as the gains from lower usage prices exceed access price savings ($66 < $35 + 6 x $6 = $71)
- the higher use customer type (B) consumes the efficient amount (as P = LRMC)

Table 4: Comparison of single two-part tariff with self-selecting two part tariffs

	Access price	Usage price	Q_A	Q_B	Revenue	
Single tariff	42	3	2.5	3	$101	$101
Tariff 1	35	6	2		$47	$113
Tariff 2	60	1		6	$66	

Source: Frontier Economics

To summarise, compared with a single two-part tariff, the dual two part tariff approach:

- recovers more revenue and profit (revenue – marginal cost)
- increases network use (from 5.5 to 8 units) and
- increases prices for Type B users while lowering prices for (lower WTP) Type A users.

Because network use increases, we can say that the proposal increases allocative efficiency.

Source: Frontier Economics

169. It is clear from the theory and the example we provide that it is very difficult to draw any specific connection between service costs and efficient prices that maximise total access and usage. In our opinion, reasonable (but broad) goals in this regard are:

    a To offer a wide variety of wholesale services to capture different preferences for access and usage.

    b To offer higher use and higher value end-users usage charges close to marginal cost, to maximise total network usage.

    c To offer lower use and lower value end-users access charges close to marginal cost, to maximise the number of network connections.

170. For instance, electricity network businesses typically do not recover all of their residual costs through network access charges as this would lead to a significant increase in the fixed tariffs paid by end-users. Instead, a portion of residual costs is typically recovered by marking up usage charges above LRMC. In the gas sector, the AER has recognised that setting prices equal to LRMC is generally not feasible as it does not allow a gas network to recover all its costs and does not adequately account for the competitive constraint that gas faces from electricity. Gas networks typically seek to maintain low fixed charges to reduce barriers to connecting to gas, and declining

block tariffs to encourage greater volumes. In water, while LRMC is still seen as an important reference point, a number of regulators place considerable weight on a range of other factors when setting tariff structures including end-user views on tariff structures and equity impacts. Further information on pricing in these other infrastructure sectors is set out in **Appendix D**.

Costs must also be allocated efficiently over time

171. Efficient pricing that facilitates the recovery of efficient investments requires the allocation of past costs between services and between time periods.

172. As we contended in our first report, a number of paths of cost recovery can provide for efficient investment, so long as the expected NPV = 0 condition is met and there is no risk of asset stranding. However, exactly the same principles for allocating costs between services apply to the allocation of costs across time.

173. Efficient pricing over time requires the application of Ramsey pricing principles that account for differing price elasticities over time.[76] If demand and willingness-to-pay for services are likely to increase over time, then prices should also start relatively low and increase over time (in real terms). Of course, if there is also a trend of increasing product quality, the true price increases required may be quite small. That approach is efficient because it maximises total usage / consumption and therefore consumer welfare.

A building block model cannot readily be used to set efficient prices

174. The purpose of a building block model (BBM) is to estimate the revenue required by a business to provide regulated services, having regard to past investments by the business, and the efficient capital and operating cost requirements in providing the services delivered by the business in future.[77] While the BBM can usefully produce an estimate of the efficient total cost, or of average cost, we think there should be serious misgivings about setting prices directly from a building block model.

175. The first misgiving is that prices derived from a BBM do not reflect economic conceptions of efficient prices, which must bear some relation to the (short or long run) marginal cost. These concepts are explicitly forward looking, and so cannot be derived from a building block model.

176. The second misgiving is that building block models of the kind used by NBN Co capture many kinds of services that share common assets. Standard approaches to cost allocation in building block models take no account of the demand for different services, which, as we have observed above, is critical to determining the most efficient set of prices.

177. The third misgiving is that building block models also allocate costs over time in ways that are not necessarily the most efficient. Attempting to align prices, revenues and annualised costs without considering the most efficient path of depreciation of capital assets (here including both the RAB

[76] First Frontier Report, at 57.

[77] This approach is consistent with the "Expected NPV = 0" or financial capital maintenance conception of the building block model. While other approaches are possible – for example, by revaluing assets periodically – they are no longer in standard use in Australian regulation.

and the ICRA) may result in prices that are too high or too low in a particular year, in the sense that they do not maximise the total amount of consumption across the life of the assets.[78]

178. In our opinion, the building block model can be used to estimate total efficient costs, which are relevant to the statutory criteria on efficient use and investment. It is also true that in some circumstances – for example, if service demands are highly inelastic – prices can be directly derived from a building block model with no or minimal loss of efficiency. That may have been suitable for Telstra's pricing of copper services in its FLSM. But in circumstances similar to those faced by NBN Co, with uncertain and elastic demand (at least for some consumers), a pricing approach that facilitates price differentiation and discrimination will produce much more efficient use of infrastructure and better facilitate cost recovery than simple attempts to derive prices from a building block model.

[78] This can potentially be addressed by using an alternative depreciation methodology, but again such methods are not widely in use in Australian regulation.

B Demand for high speed products is growing

179. The ACCC's consultation paper suggests that NBN Co's pricing proposal "is likely to force households and businesses to purchase high speed inclusions at a price that does not represent fair value to them based on their requirements."[79] Part of this concern appears to be that NBN Co's expectations of higher demand will not be met. The ACCC cites Bureau of Communications and Arts Research that "the median household speed requirement will be 29 Mbps in 2028 and that 99.9% of households will need no more than 78 Mbps."

180. It appears that the ACCC has interpreted NBN Co's 100 Mbps speed tier as providing an average (or sustained) speed of 100 Mbps to households on this tier. This is not accurate. To our understanding, the 100 Mbps speed tier is better understood as reflecting a *burstable* speed of up to 100 Mbps (PIR). In general, in order to provide a specific average speed during peak periods, NBN Co needs to provide additional overhead (or burst speed) above the average to account for the higher data usage during these periods.

181. Consider, for example, a scenario where a household's required average speed during a peak period was 40 Mbps. In this case, if NBN Co only provided the household with a 40 Mbps service, the average speed during peak periods would be less than 40 Mbps (i.e., less than the household's requirements). An additional overhead is required above 40 Mbps to maintain this average speed during the peak period. It follows that peak speed, and not average speed, is the key driver of an end-user's speed requirements.

182. In our view, there is a body of evidence to support a finding that household demand for higher speeds is increasingly. Internationally, we see strong uptake by households of higher broadband speed tiers. For instance, in New Zealand, Chorus has seen strong growth for 100 Mbps and above services, which now accounts for approximately 93% of the UFB product mix.[80] In the UK, average actual download speed of residential fixed broadband services are increasing rapidly, rising 20% to 50.4 Mbps over the period November 2019 to March 2021. Ofcom has identified that the main driver of higher average connection speeds is people upgrading to faster packages rather than improvement in the performance of individual services.[81]

183. In addition, we have also seen strong demand for and uptake of very fast 5G mobile services. The ACCC has noted that it expects to see significant growth in 5G sites in 2022.[82] These investments are being undertaken on the back of expectations of strong demand for high speed 5G services by households and businesses. Telstra's main explanation page for 5G services states that "Ridiculously fast 5G Home Internet is here", indicating that speed is clearly a major selling point for 5G services.[83] In 2021, Telstra reported that it had around 1.6 million 5G devices connected to its network, up from 210,000 in the previous year. This rapid uptake of 5G services, combined with continued investment in extending 5G coverage demonstrates that end-users value high speed, low latency internet connections. Similar trends in 5G growth can be observed in countries around the world.

79 ACCC Consultation Paper, p.22.

80 Grex Consulting, *Regulatory framework in New Zealand and a comparison to the NBN*, 22 December 2021, p.19.

81 Ofcom, *UK home broadband performance*, 9 September 2021, p.6.

82 ACCC, *Mobile infrastructure report 2021*, p.10.

83 https://www.telstra.com.au/coverage-networks/what-is-5g, accessed June 2022.

184. In our view, this evidence suggests that NBN Co must be cognisant of competitive threats such as 5G networks that are able to provide high speeds, and so provide services that similar speeds at reasonable value. NBN Co's cost advantages in throughput provide some means of differentiation in competing against mobile providers, but this is less obviously of benefit while 5G networks are relatively uncongested and uncapped plans are widespread.

C NBN Co modelling of alternative price scenarios

185. To facilitate our analysis of the efficiency impacts of its proposed pricing construct, NBN Co provided us with modelling of the expected price and revenue outcomes under a number of alternative price scenarios for the FY2024-27 period.

Scenarios considered

186. NBN Co modelled the following alternative scenarios:

- *AVC-only or No CVC overage* – this involves removing the CVC overage charge for all NBN Co end-users and charging fixed prices for all NBN Co ethernet TC-4 services.
- *Lower CVC overage* – this involves maintaining the bundled AVC/CVC offers for NBN Co services with speeds of 50Mbps and lower, but reducing the CVC overage charge from NBN Co's proposed value of $8/Mbps to values of $6, $4 and $2.
- *AVC-only on 50 Mbps* – this involves introducing AVC-only pricing constructs for 50Mbps and higher services, while maintaining bundled AVC/CVC offers for lower-speed services at NBN Co's proposed rate of $8/Mbps.

Key assumptions

187. A summary of key assumptions underpinning NBN Co's modelling is provided below:

- **AVC prices** – In each scenario, where expected CVC revenue has been lost, AVC prices have been estimated to increase in a revenue neutral manner, i.e., the AVC price for a given speed tier is increased to account for lost CVC overage revenue for an average end-user at that speed tier. To demonstrate how this works, consider a hypothetical example where an average end-user on the 25Mbps speed tier uses 1.2Mbps at a $26 AVC charge and a $8 overage charge. In this case, the effective price would be $34 ([$26+(1.2-0.2)*$8). Under a lower overage charge of, say, $4, the effective price would be $30 ([$26+(1.2-0.2)*$4]). In this hypothetical example, NBN would raise the AVC price by $4 to compensate for the lost CVC overage revenue. Note that in the model, provision is made for approximately 20% additional headroom over expected usage.
- **Speed tier mix** – NBN has calculated the expected speed tier mix (in %) based on an 'upsell' model. This was based on a sample of actual usage from approximately 80,000 end-users in May 2022, NBN calculated the distribution of usage for each speed tier to the 0.01 percentile and calculated the effective price for each percentile based on the AVC and CVC rates for each scenario. NBN then compared each of these effective prices with the effective price that would have resulted if the end-user was on the higher speed tier. If the latter price is lower than the former price, NBN has assumed that an RSP would 'upsell' the end-user to the cheaper, higher speed plan.
- **Network usage** – The model includes NBN Co's forecasts of mean busy hour throughput (MBHT, in Mbps). This is allocated to each speed tier using the speed tier mix calculated in the manner above to produce forecasts of MBHT by speed tier. As noted above, the model provides for approximately 20% additional headroom over this expected usage. We

understand that the purpose of this headroom is to reduce the impact of congestion on service quality during peak periods (i.e., to minimise any throttling of speeds that may arise).

- **Active services and end-user churn** – The model includes NBN Co's forecasts of the number of active services. This incorporates estimates of end-user churn which we understand are derived from willingness to pay data provided by Ergo Strategy, which NBN Co commissioned to conduct a choice based conjoint survey and develop a simulation model to enable such scenarios to be investigated.[84] The CBC survey was conducted in 2020. The total sample for the residential sector was N = 4011, and for the business N = 1608.

Observations on assumptions

188. We have not undertaken a comprehensive review of NBN Co's model and its input assumptions. It is evident that some of the assumptions underpinning the calculations are uncertain and may not hold in practice. While we are not in a position to comment on the robustness of all of the input assumptions used in the model, in our view, the approach that NBN Co has used to develop its input assumptions forms a reasonable basis for making judgements about the effect of pricing changes.

[84] In a choice-based conjoint survey, respondents are presented with a number of plans with different speed tiers, download limits, prices and other attributes. They are then asked which plan they would choose if all these plans were available in the market. The responses can be analysed using statistical models to determine consumers' willingness to pay for different attributes of a plan.

D What happens elsewhere

189. To gain further insight into the suitability of NBN Co's pricing proposal, we have compared it to access prices that are adopted by other broadband networks (in New Zealand, Singapore, and Canada). We have also compared NBN Co's pricing proposal to how access prices are determined in other infrastructure sectors, specifically electricity, gas and water.

Comparison with other broadband networks

190. It must first be recognised that it is inherently difficult to compare the broadband pricing constructs across different countries. Among other reasons, this is due to differences in the network architecture, market structure and demand patterns of users. Further, the PoI practice varies significantly between countries (i.e., whether PoIs are available at the local, regional or national level). Comparisons in general should be largely considered indicative rather than comprehensive.

191. Many countries have variants of wholesale broadband services. Within this set, we examined three countries that share some of Australia's infrastructure model (NZ and Singapore) and geographical challenges (Canada). Each of these countries have a different approach towards the pricing of layer 2 Ethernet access products:

- In New Zealand, there is just a single charge for a given speed of service, which incorporates both the access charge and the connectivity charge. The wholesale pricing also includes a committed information rate (CIR) component, which provides a guaranteed minimum speed. Access seekers can create 'new services' that are not captured in the price list by adding to a base reference offer in specified increments of CIR and EIR.
- In Singapore, there is a similar two-part tariff structure to NBN Co. This includes an Aggregation Ethernet Virtual Circuits component (AG-EVC) as the CVC equivalent and a Per-End User Connection component as the AVC equivalent. The AG-EVC component is a volumetric charge that is charged in incremental blocks of 250 Mbps of CIR, with charges varying across four different classes of service. The CVC equivalent charge is lower than that proposed by NBN Co, ranging from approximately $1.50/Mbps to $3.70/Mbps, depending on the service class, but applies to all services.
- In Canada, there is also a two-part tariff structure, consisting of a volume based capacity rate, and a per end-user access rate. The capacity rate is charged in incremental blocks of 100 Mbps for the aggregated service, and 50 Mbps for the disaggregated service. It varies quite substantially across different networks, ranging from approximately $1/Mbps to $4.50/Mbps.

192. The main point that we take from this comparison is that there is no universal move to phase out usage charges. Further, while the level of usage charges in Australia appears higher, it should be remembered that usage prices have a more limited role under NBN Co's proposed construct, as they only apply to products 50Mbps and below. A high level comparison of the pricing approaches is summarised in the table below.

Table 5: Comparison of NBN Co pricing with other broadband networks

Country	Access charge	Usage Charge	Usage price relative to NBN Co
Australia	Yes	Current – Yes Proposed – AVC < 50mbps	
New Zealand	Yes	No	
Singapore	Yes	Yes	Lower, but levied on all services
Canada	Yes	Yes	Lower, but levied on all services

Source: Frontier Economics

Comparison with other Australian infrastructure sectors

193. We have reviewed the pricing structure approaches used by Australian regulated businesses and regulators in the electricity, gas and water sectors. In part this review has shown the complexity of tariff setting and the need for tariffs to adapt to the very different settings of each sector. However, one common theme within the review is that while regulators and policy makers are often initially attracted to setting marginal cost usage prices (for the efficiency benefits), it is not universally adopted because other factors are also relevant:

    a All electricity network businesses adopt a two-part tariff structure consisting of fixed charges, called network access charges, and volume based usage charges (on demand or energy). Network businesses typically do not recover all of their residual costs through network access charges as this would lead to a significant increase in the fixed tariffs paid by end-users. Instead, a portion of residual costs is typically recovered by marking up usage charges above LRMC. However, network businesses are gradually transitioning their tariffs so that a greater proportion of residual costs are recovered through network access charges.

    b In the gas sector, the AER has recognised that setting prices equal to LRMC is generally not feasible as it does not allow a gas network to recover all its costs and does not adequately account for the competitive constraint that gas faces from electricity. Gas networks typically seek to maintain low fixed charges to reduce barriers to connecting to gas, and declining block tariffs to encourage greater volumes. Gas networks tend to account for LRMC in setting the first tariff block, and apply tariff reductions in subsequent blocks to 'upsell' gas heating.

    c The extent to which urban water prices are closely linked to LRMC varies across States and has been somewhat loose. Some economic regulators expect to see a fairly close link between volumetric prices for water and estimates of LRMC (e.g., IPART). In other jurisdictions, while LRMC is still seen as an important reference point, businesses and regulators often place considerable weight on a range of other factors when setting tariff structures including end-user views on tariff structures and equity impacts (e.g., bill impacts on large families).

Other broadband networks

New Zealand

194. Crown Infrastructure Partners (CIP) entered into contracts to deploy the Ultra-fast Broadband network (UFB) with four companies – Chorus, Tuatahi First Fibre (previously Ultrafast Fibre), Northpower Fibre and Enable Networks.

195. In 2018, when the build phase was almost complete, the New Zealand government introduced a new regulatory framework that required the Commerce Commission to develop a price-quality path for certain fibre services provided by Chorus, and imposed information disclosure requirements on all regulated fibre wholesalers. The *Telecommunications (Regulated Fibre Service Providers) Regulations 2019* provide that Chorus will be subject to price-quality regulation for all fibre fixed line access services except to the extent that a service is provided in a geographical area where a regulated provider (other than Chorus) has installed a fibre network as part of the UFB initiative.

196. The first price-quality path for Chorus was published in December 2021. It sets out the maximum revenues that Chorus can earn from the provision of regulated fibre services, and the quality standards that Chorus is required to achieve in providing those services, over the first regulatory period (1 January 2022 to 31 December 2024). Chorus must set prices for its regulated services to earn revenue less than or equal to this maximum.

197. Chorus' price list is based on a single fixed charge per month for defined services, and no further CVC type charge. The CIR capacity provides a guaranteed minimum throughput at all times. Access seekers can create 'new services' that are not already captured in the price list. Any new service must be based on the base reference offer for the service in question, which for residential bitstream 2 based services is: 30 Mbps / 10 Mbps with 2.5 Mbps / 2.5 Mbps CIR.

Table 6: Chorus bitstream 2 price list (NZD)

Service	End-user type	Price / month
GPON Bitstream 2 or Bitstream 2 Accelerate 30 Mbps down / 10 Mbps up with 2.5 Mbps symmetrical CIR	Residential	$44.22
GPON Bitstream 2 30 Mbps down / 10 Mbps up with 10 Mbps CIR down / 2.5 Mbps CIR up	Residential	$48.13
GPON Bitstream 2 or Bitstream 2 Accelerate 30 Mbps down / 10 Mbps up with 5 Mbps symmetrical CIR	Residential and business	$51.98
GPON Bitstream 100 Mbps down / 50 Mbps up with 10 Mbps CIR down / 2.5 Mbps CIR up	Residential and business	$51.93
GPON Bitstream 2 Accelerate 100 Mbps down / 20 Mbps up with 2.5 Mbps symmetric High Priority CIR	Residential	$47.87
GPON Bitstream 2 Accelerate 100 Mbps down / 50 Mbps up with 2.5 Mbps symmetric High Priority CIR	Residential	$51.93

GPON Bitstream 2 Accelerate 100 Mbps down / 100 Mbps up with 2.5 Mbps symmetric High Priority CIR	Residential	$52.03
GPON Bitstream 2 Accelerate 200 Mbps down / 20 Mbps up 2.5 Mbps symmetric High Priority CIR	Residential	$56.00
GPON Bitstream 2 Accelerate 200 Mbps down / 100 Mbps up with 2.5 Mbps symmetric High Priority CIR	Residential	$56.00
GPON Bitstream 2 Accelerate 200 Mbps down / 200 Mbps up with 2.5 Mbps symmetric High Priority CIR	Residential	$56.00
GPON Bitstream Additional 2.5 Mbps CIR down		$1.30
GPON Bitstream Additional 2.5 Mbps CIR up		$2.60
GPON Bitstream Additional 10 Mbps EIR down		$1.40
GPON Bitstream Additional 10 Mbps EIR up		$2.81

Source: [Insert reference source text here]

198. To give an example, suppose a service provider requires a residential service with the following characteristics: access speed 50/20 EIR Mbps with 15/5 Mbps CIR to support. Based on the base reference offer for Bitstream 2, which is 30/10 Mbps with 2.5/2.5 Mbps CIR priced at $44.22 the Service Provider requires additional 20/10 Mbps EIR; and 12.5/2.5 Mbps CIR (see **Table 7**).

Table 7: Example end-user residential package with Chorus (NZD)

Item	CIR		EIR		Price
	Down	Up	Down	Up	
Existing	2.5 Mbps	2.5 Mbps	30 Mbps	10 Mbps	$44.22
Additional	12.5 Mbps				$6.50
		2.5 Mbps			$2.60
			20 Mbps		$2.80
				10 Mbps	$2.81
					$58.93

Source: [Insert reference source text here]

Singapore

199. Singapore's Next Generation Nationwide Broadband Network (NGBN) is provided through two parties. Netlink Trust is responsible for designing, building and operating the passive infrastructure, such as dark fibre and ducts, while Nucleus Connect is responsible for designing, building and operating the active infrastructure, such as lit fibre, routers, servers and switches. Under the terms of their licences, these parties must provide other service providers with open access to the NBN infrastructure through a default Interconnection Offer (ICO) or a Customised Agreement approved by the Infocomm Media Development Authority (IMDA).

200. Nucleus Connect, the operating company for the NGBN, adopts a similar two-part tariff structure to NBN Co. Their charges include an Aggregation Ethernet Virtual Circuits component (AG-EVC) as the CVC equivalent and a Per-End User Connection component as the AVC equivalent. The AG-EVC component is a volumetric charge that is charged in incremental blocks of 250 Mbps of CIR, with charges varying across four different classes of service (see **Table 8**).

Table 8: Monthly AG-EVC charges for Nucleus Connect (SGD)

Class of service	Jitter	Latency	Packet loss	AG-EVC charge per 250 Mbps CIR	Equivalent charge per Mbps CIR (AUD)(1)
Real Time	0.5ms	1ms	0.1%	$910.10	$3.68
Near Real Time	0.5ms	3ms	0.1%	$752.40	$3.04
Mission Critical	2ms	5ms	0.05%	$551.80	$2.23
Best Effort	Best effort	10ms	Best effort	$358.30	$1.45

Source: Nucleus Connect, Service schedule – Aggregation Ethernet Virtual Connection (AG-EVC), Jan 2020. Notes: (1) Assumes an exchange rate of 1 SGD : 1.01 AUD.

201. The Per-End User Connection component varies for residential and non-residential end-users. Residential end-users are charge a single fixed price of $17.50 per month. The prices for non-residential end-users vary by the class of service, the type of port, and the CIR. The default packages include a minimum of 25 Mbps CIR, but service provides can purchase additional CIR in increments of 5 Mbps (see **Table 9**).

Table 9: Nucleus Connect non-residential per end user charges (SGD)

Class of service[1]	First 25 Mbps			Next 5 Mbps
	GPON (100 Mbps Port)	AE (100 Mbps Port)	AE (1 Gbps Port)	
Real Time	$89.40	$155	$1,065	$8.00
Near Real Time	$84.10	$149	$1,005	$6.80
Mission Critical	$76.90	$141	$925	$5.20
Best Effort	$71.50	$135	$865	$4.00

Source: Source: Nucleus Connect, Service schedule – Non-residential per-end-user connection, Jan 2020. Notes: (1) The definition of each class of service varies by GPON and AE, and is different to that set out for the AG-EVC.

Canada

202. In Canada, wholesale broadband networks are provided by a number of incumbent local exchange carriers (ILECs) and cable companies, including Bell Canada, Bell MTS, Cogeco, Eastlink, RCCI, SaskTel, Shaw, TCI, and Videotron. The Canadian Radio-television and Telecommunications Commission (CRTC) regulates the wholesale services provided by these companies.

203. Historically, the CRTC has required these companies to provide an aggregated wholesale service. This provides competitors with high-speed paths to end-user premises throughout an incumbent carrier's entire operating territory from a limited number of interfaces (e.g., one interface per province). However, in pursuance of its long-term objective of promoting facilities based competition, the CRTC is transitioning to a new framework under which the companies are required to provide a disaggregated wholesale service. This limits the portion of the network leased from incumbent carriers to essentially the last mile, allowing competitors to interconnect closer in proximity to their end users, but also requiring competitors to invest in or lease transport facilities to that point.

204. The CRTC sets tariffs for aggregated wholesale services, and has also published interim tariffs for disaggregated wholesale services for Ontario and Quebec. In both cases, the CRTC adopted a two-part tariff structure, consisting of a volume based capacity rate, and a per end-user access rate. The capacity rate is charged in incremental blocks of 100 Mbps for the aggregated service, and 50 Mbps for the disaggregated service (see **Table 10**).

Table 10: Monthly capacity rate for regulated wholesale services in Canada (CAD)

Company	Aggregated wholesale service capacity rate per 100 Mbps	Disaggregated wholesale service capacity rate per 50 Mbps (1)
Bell Canada	$138.43	$15.04
Cogeco	$323.73	$161.56
RCCI	$319.68	$143.99
Videotron	$395.36	$126.91
Bell MTS	$88.14	
Eastlink	$353.35	
Shaw	$296.10	

Source: CRTC, https://crtc.gc.ca/eng/archive/2017/2017-312.htm; CRTC, https://crtc.gc.ca/eng/archive/2021/2021-181.htm. Notes: (1) At this stage, the CRTC has only set interim rates for regulated wholesale providers in Ontario and Quebec.

205. Access rates vary by speed tiers, with the exception of Bell Canada for which the CRTC approved a single rate for each of the bonded and unbonded services.[85] Access rates for disaggregated wholesale services are set out in **Table 11**.

Table 11: Monthly access rate for disaggregated wholesale services in Canada (CAD)

Company	Speed	FTTN access rates	FTTP access rates
Bell Canada	All – Non-bonded	25.62	121.79
	All – Bonded	52.32	172.43
Cogeco	0-6 Mbps	14	43.24
	7-15 Mbps	15.64	46.02
	16-40 Mbps	21.86	49.37
	41-60 Mbps	32.48	56.9
	61-120 Mbps	52.51	66.7
	121-250 Mbps	61.41	72.28

85 Bonded access service is a DSL service offered over two copper loops where service over FTTN is available. It enables incumbent local exchange carriers to provide higher-speed Internet access services than non-bonded access service, which is offered over a single copper loop.

Company	Speed	FTTN access rates	FTTP access rates
RCCI	0-15 Mbps	21.71	27.21
	16-30 Mbps	24.52	30.24
	31-60 Mbps	26.5	32.37
	61-100 Mbps	28.88	34.93
	101-249 Mbps	40.77	47.74
	250-499 Mbps	54.05	62.03
	500-749 Mbps	61.54	70.11
	750-1024 Mbps	76.93	86.68
Videotron	0-5 Mbps	17.57	
	6-10 Mbps	19.61	
	11-30 Mbps	23.1	
	31-60 Mbps	30.57	
	61-120 Mbps	35.88	
	121-200 Mbps	39.63	
	201-500 Mbps	56.89	
	501-1000 Mbps	75.81	

Source: CRTC, https://crtc.gc.ca/eng/archive/2017/2017-312.htm.

Other network utilities

Electricity

206. Electricity network businesses in the National Electricity Market (NEM) are natural monopolies and are regulated under the National Electricity Law and the National Electricity Rules (NER). The Australian Energy Regulatory (AER) is responsible for giving effect to this regulatory framework, and for compliance and enforcement.

207. Electricity network businesses are currently subject to a revenue cap form of control. The AER makes periodic determinations in relation to the maximum revenue that network businesses are permitted to earn from the provision of regulated services (typically every 5 years). Network businesses must set prices to recover this revenue allowance and no more. In doing so, the NER establishes a number of rules that network businesses must comply with when setting their network tariffs.

208. With respect to distribution networks, clause 6.18.5(e) of the NER states that:

> *"Each tariff must be based on the long run marginal cost of providing the service to which it relates to the retail customers assigned to that tariff …"*

209. The principal determinant of costs for electricity network assets is the expected maximum (or 'system peak') demand. As such, the LRMC of an energised connection is typically expressed in terms of the cost per kW (or cost per kVA) of maximum demand.

210. Electricity network businesses have significant fixed costs. It follows that pricing at LRMC will not allow a network business to recover its total costs. That is, there will be 'residual costs' that will not be recovered from setting prices equal to marginal cost. The NER establishes limits on the residual costs that can be recovered from any one group of end-users. In particular, clause 6.18.5(g)(3) of the NER states that residual costs must be recovered from each tariff in a manner that minimise distortions to price signals for efficient usage.

211. The absence of substitutes for the network service means that a end-users' decision to purchase an energised connection is highly price inelastic. That is, it is generally not feasible for end-users to sever their connection to the network in favour of some alternative supply option, even if prices for the service increase. Given that end-users will tend to remain connected, it follows that residual costs can generally be recovered via fixed charges.

212. All electricity network businesses adopt a two-part tariff structure consisting of fixed charges, called network access charges, and volume based usage charges (on demand or energy). Network businesses typically do not recover all of their residual costs through network access charges as this would lead to a significant increase in the fixed tariffs paid by end-users. Instead, a portion of residual costs is typically recovered by marking up usage charges above LRMC. However, network businesses are gradually transitioning their tariffs so that a greater proportion of residual costs are recovered through network access charges.

213. This is reflected in the statement from Essential Energy below:[86]

> *"As most of our costs are residual and fixed, we would ideally allocate residual costs to the network access charge (fixed daily cost) component of our prices. However, this would have a considerable price impact on customers, so we are only increasing the fixed component of our distribution network charges for*

[86] Essential Energy, *2019–24 Tariff Structure Explanatory Statement*, January 2019, p.15.

> *Residential and Small Business customers at a slow and steady rate, with the remainder allocated to the energy consumption components of our charges."*

214. Similarly, Jemena has noted that prices are set to recover the residual costs of supplying end-users on the tariff in a manner that:[87]

> *Best replicates (and least distorts) the price signal the customer receives [from prices that signal LRMC]. All else equal, we intend to rebalance the recovery of costs towards fixed charges and away from relatively more distortionary usage charges."*

215. The manner in which residual costs are recovered from distinct tariff structures will also affect price signals for efficient usage of the network. Consider, for example, a scenario where a customer has an option of choosing a declining block tariff, a time-of-use tariff, or a demand tariff. Assuming that energy charges have been set based on LRMC, the demand tariff provides a more efficient price signal than the time-of-use tariff, which in turn provides a more efficient price signal than the declining block tariff.

216. Electricity network businesses generally allocate residual costs across different tariff structures to encourage end-users to move towards the most efficient tariff structure. Typically, this involves recovering a greater proportion of residual costs from less efficient tariff structures, such as flat or declining block tariffs, and a commensurately lower proportion of residual from more efficient tariff structures, such as time of use or demand tariffs. In this way, end-users on more efficient tariffs pay a smaller quantum of residual costs.

217. This is reflected in the statement from Essential Energy below:[88]

> *"To ensure we are achieving the network pricing objectives, we allocate more residual costs to our least efficient distribution network charges – i.e. network charges that do not provide customers with efficient pricing signals for their energy consumption have higher distribution network charges than those on more efficient distribution network charges such as demand charges or ToU energy charges."*

218. In practice, these factors have led to Essential Energy allocating a higher share of residual costs to charging parameters that are not closely linked to LRMC cost drivers (e.g., fixed daily charges and the usage component of its 'Anytime' flat tariff), with the comparatively more efficient demand based charging parameters receiving the least residual costs.

87 Jemena, *Tariff Structure Statement for 1 July 2021 to 30 June 2026,* p.20.

88 Essential Energy, *2019–24 Tariff Structure Explanatory Statement*, January 2019, p.14.

219. Likewise, Jemena notes that it sets tariffs so a end-user's network bill will typically be lower if they are on the time of use tariff or demand tariff, than if they were on the less efficient single rate tariff:[89]

> *"for our residential customers, we will set our annual prices so that a typical customer's network bill is:*
>
> *Equivalent whether they are on a demand tariff or our default ToU tariff,*
>
> *which by the end of the 2021-26 period will be:*
>
> *Around 5 per cent lower than if the customer was on our single rate or closed 7am-11pm peak period ToU tariffs—the gap increasing by one per cent per year."*

220. Pricing in this way encourages end-users to choose cost-reflective network charges.

221. An exception to the rules set out above occurs where a substitute exists for the service. For example, in the case of controlled load for water heating, a end-user has the option to switch to other sources of energy and so disconnect from the controlled load service. The existence of a substitute for the service means that electricity network businesses often mark-up usage charges rather than fixed charges, so as to ensure that end-users with low levels of usage do not cease to purchase the service.

Gas

222. Gas pipelines in Australia are subject to different types of regulation depending on their coverage classification.

223. Full regulation pipelines in eastern Australia are regulated by the AER, and must periodically submit access arrangements to the regulator for approval. An access arrangement sets out the terms and conditions under which third parties can use a pipeline. These access arrangements typically cover forecast expenditure and revenue requirements for a five year period, and specify at least one reference tariff for a defined reference service sought by a significant proportion of the market. The regulator assesses the revenues required to recover its efficient costs and provide a return on capital, and uses this to calculate reference tariffs. Three transmission pipelines and six gas distribution networks are subject to full regulation by the AER. Pipelines that are not subject to full regulation generally determine their own tariffs but are required to comply with certain information disclosure requirements and arbitration arrangements to resolve access disputes.

224. Clause 94(4) of the National Gas Rules (NGR) provides that a tariff, and each charging parameter for a tariff class:

[89] Jemena, *Tariff Structure Statement for 1 July 2021 to 30 June 2026,* p.20.

> *"must take into account the long run marginal cost for the reference service or, in the case of a charging parameter, for the element of the service to which the charging parameter relates"*

225. In applying this provision, the AER has recognised that setting prices equal to LRMC is generally not feasible as it does not allow a gas network to recover all its costs, and does not adequately account for the competitive constraint that gas faces from electricity. Gas networks typically seek to maintain low fixed charges to reduce barriers to connecting to gas, and declining block tariffs to encourage greater volumes. Gas networks tend to account for LRMC in setting the first tariff block, and apply tariff reductions in subsequent blocks to 'upsell' gas heating.

226. This is reflected in the following statement from Jemena Gas Networks (JGN):[90]

> *Given gas is a discretionary fuel for many customers, fixed charges are a barrier to gas connection as it must be paid in addition to the electricity fixed charge. To ensure natural gas remains competitive—recovering some costs via usage rather than fixed charges empowers customers to be able to control their bills and increases the attractiveness to new connecting customer*

227. In this case, JGN has a fixed charge well below estimate of LRMC, a first block rate well above estimate of LRMC, and subsequent block rates well below estimates of LRMC. The AER ultimately approved JGN's reference tariffs.

Water

228. In most jurisdictions in Australia, water businesses and governments have attempted to provide signals for efficient water use by setting the volumetric rate with reference to the long-term cost of supply. This is embedded in pricing principles set out in the National Water Initiative (to which all States and Territories agreed in 2004) which sought to establish user pays approaches in the urban water sector. In particular, Principle 3: Cost reflective tariffs states that "The water usage charge should have regard to the long run marginal cost of the supply of additional water".

229. In practice, the extent to which urban water prices are closely linked to LRMC varies across States and has been somewhat loose:

- Some economic regulators expect to see a fairly close link between volumetric prices for water and estimates of LRMC. For example, IPART (the regulator in NSW) has tended to take a more prescriptive approach to tariff structures adopted by the businesses it regulates including setting prices which align as closely as possible with LRMC. Indeed, in NSW IPART has also been moving to LRMC based pricing for wastewater and has started developing LRMC estimates for transport.

[90] Jemena Gas Networks (NSW) Ltd, *2020-25 Access arrangement proposal – Attachment 4.1: Our reference services and tariffs*, 30 June 2019, p.36

- In other jurisdictions, while LRMC is still seen as an important reference point, businesses and regulators often place considerable weight on a range of other factors when setting tariff structures including end-user views on tariff structures and equity impacts (e.g., bill impacts on large families).

230. Concerns that LRMC pricing is not responsive to changes in water availability and can lead to costly water restrictions has also been reflected in many water businesses adopting inclining block tariffs (IBTs), which set a higher volumetric charge for consumption that exceeds certain thresholds, particularly in periods of severe shortage (e.g. drought). In the water sector, a further complicating issue is that there is typically a range of estimates of LRMC depending on assumed scenarios of future water availability, particularly under alternative climate change scenarios.

231. In summary, whilst LRMC is an important input into setting urban water prices, it is typically used as a reference point amongst a range of considerations rather than being used in a mechanistic way.

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