DRAFT DECISION
AusNet Services transmission determination
2017–18 to 2021–22

Attachment 5 – Regulatory depreciation

July 2016

AUSTRALIAN ENERGY REGULATOR

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Note

This attachment forms part of the AER's draft decision on AusNet Services' revenue proposal 2017–22. It should be read with other parts of the draft decision.

The draft decision includes the following documents:

Overview

Attachment 1 – maximum allowed revenue

Attachment 2 – regulatory asset base

Attachment 3 – rate of return

Attachment 4 – value of imputation credits

Attachment 5 – regulatory depreciation

Attachment 6 – capital expenditure

Attachment 7 – operating expenditure

Attachment 8 – corporate income tax

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Attachment 10 – capital expenditure sharing scheme

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Attachment 13 – pass through events

Attachment 14 – negotiated services

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Shortened forms

Shortened form	Extended form
AARR	aggregate annual revenue requirement
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
ASRR	annual service revenue requirement
augex	augmentation expenditure
capex	capital expenditure
CCP	Consumer Challenge Panel
CESS	capital expenditure sharing scheme
CPI	consumer price index
DRP	debt risk premium
EBSS	efficiency benefit sharing scheme
ERP	equity risk premium
MAR	maximum allowed revenue
MRP	market risk premium
NEL	national electricity law
NEM	national electricity market
NEO	national electricity objective
NER	national electricity rules
NSP	network service provider

Shortened form	Extended form
NTSC	negotiated transmission service criteria
opex	operating expenditure
PPI	partial performance indicators
PTRM	post-tax revenue model
RAB	regulatory asset base
RBA	Reserve Bank of Australia
repex	replacement expenditure
RFM	roll forward model
RIN	regulatory information notice
RPP	revenue and pricing principles
SLCAPM	Sharpe-Lintner capital asset pricing model
STPIS	service target performance incentive scheme
TNSP	transmission network service provider
TUoS	transmission use of system
WACC	weighted average cost of capital

5 Regulatory depreciation

Depreciation is the allowance provided so capital investors recover their investment over the economic life of the asset (return of capital). In deciding whether to approve the depreciation schedules submitted by AusNet Services, we make determinations on the indexation of the regulatory asset base (RAB) and depreciation building blocks for AusNet Services' 2017–22 regulatory control period.[1] The regulatory depreciation allowance is the net total of the RAB depreciation (negative) and the indexation of the RAB (positive).

This attachment sets out our draft decision on AusNet Services' regulatory depreciation allowance. It also presents our draft decision on the proposed depreciation schedules, including an assessment of the proposed diminishing value method for depreciating new assets and the proposed asset lives used for forecasting depreciation.

5.1 Draft decision

We do not accept AusNet Services' proposed regulatory depreciation allowance of $602.8 million ($ nominal) for the 2017–22 regulatory control period. Instead, we determine a regulatory depreciation allowance of $521.3 million ($ nominal) for AusNet Services. This represents a decrease of $81.4 (or 13.5 per cent) on the proposed amount. In coming to this decision:

- We accept the continuation of AusNet Services' year-by-year tracking approach to calculate the straight-line depreciation of existing assets. However, we have applied an adjustment to AusNet Services' proposed depreciation calculations to ensure the profiles meet the requirements of the NER (section 5.4.3).
- We accept AusNet Services' proposal to accelerate depreciation on assets expected to be removed from service over the 2017–22 regulatory control period by fully depreciating the remaining value over 5 years. We consider this approach is consistent with the nature of these assets no longer being used and provides for a depreciation schedule of their residual values that aligns with the reduced economic life[2] (section 5.4.3).
- We accept AusNet Services' proposed standard asset lives for its existing asset classes used to calculate the regulatory depreciation allowance. We consider AusNet Services' proposed asset classes and standard asset lives are consistent with those approved at the previous transmission determination and comparable to the standard asset lives used for other TNSPs. Accordingly, we consider the

1 NER, cll. 6A.5.4(a)(1) and (3).

2 NER, cl. 6A.6.3(b)(1).

standard asset lives lead to a depreciation schedule that reflects the nature of the assets over their economic lives[3] (section 5.4.2).

- We do not accept the proposed use of the diminishing value method for depreciating new assets reflects the nature of these assets over their economic lives.[4] We have substituted the straight-line depreciation method for these assets consistent with that applying to existing assets (section 5.4.1).
- We made determinations on other components of AusNet Services' proposal that also affect the forecast regulatory depreciation allowance—for example, the expected inflation rate (attachment 3) and forecast capital expenditure (capex) (attachment 6).

Table 5.1 sets out our draft decision on the annual regulatory depreciation allowance for AusNet Services' 2017–22 regulatory control period.

Table 5.1 AER's draft decision on AusNet Services' depreciation allowance for the 2017–22 regulatory control period ($ million, nominal)

	2017–18	2018–19	2019–20	2020–21	2021–22	Total
Straight-line depreciation	180.2	182.1	189.7	192.6	175.6	920.1
Less: inflation indexation on opening RAB	78.1	79.6	80.3	80.4	80.4	398.8
Regulatory depreciation	**102.0**	**102.5**	**109.4**	**112.2**	**95.2**	**521.3**

Source: AER analysis.

5.2 AusNet Services' proposal

For the 2017–22 regulatory control period, AusNet Services proposed a forecast regulatory depreciation allowance of $602.8 million ($ nominal). To calculate the depreciation allowance, AusNet Services proposed:[5]

- the straight-line method for depreciating existing assets
- the closing RAB value at 31 March 2017 derived from our roll forward model (RFM)
- to use proposed forecast capex for the 2017–22 regulatory control period
- standard asset lives for depreciating new assets associated with forecast capex for the 2017–22 regulatory control period consistent with those approved in the 2014–17 transmission determination
- the diminishing value (DV) method for depreciating new assets[6]

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3 NER, cl. 6A.6.3(b)(1).
4 NER, cl. 6A.6.3(b).
5 AusNet Services, *Revenue proposal*, October 2015, p. 175.
6 This method is also known as declining balance, as referred to in AusNet Services' proposal.

- to accelerate the depreciation of assets that are no longer used (or expected to no longer be used over the 2017–22 regulatory control period). It proposed that these assets would be fully depreciated over the 2017–22 regulatory control period.[7]

AusNet Services proposed to change the depreciation method for all new assets being acquired in the 2017–22 regulatory control period. It proposed using a DV depreciation method for new assets, while maintaining a straight-line (SL) depreciation method for existing assets.

The DV method results in higher depreciation in the early years of an asset's life and lower depreciation in the latter years. That is, network customers pay off a higher proportion of the initial cost of the asset in the early years compared to the SL depreciation method. AusNet Services submitted that faster depreciation in the early years may be more appropriate because recent electricity market trends have created uncertainty about future use of electricity networks. For example, AusNet Services pointed to the uptake of solar technology and reductions in the cost of power storage as factors that may impact future use of the network.

AusNet Services noted the proposed change increases the forecast total depreciation allowance and revenues by about 11 per cent and 2 per cent respectively, compared to the current SL method, over the 2017–22 regulatory control period.

Table 5.2 sets out AusNet Services' proposed depreciation allowance for the 2017–22 regulatory control period.

Table 5.2 AusNet Services' proposed depreciation allowance for the 2017–22 regulatory control period ($ million, nominal)

	2017–18	2018–19	2019–20	2020–21	2021–22	Total
RAB depreciation[a]	179.4	194.8	208.9	213.5	199.1	995.8
Less: inflation indexation on opening RAB	75.9	77.8	79.0	79.9	80.4	393.0
Regulatory depreciation	**103.5**	**117.0**	**129.9**	**133.7**	**118.7**	**602.8**

Source: AusNet Services, *Revenue proposal*, October 2015, PTRM.

(a) RAB depreciation as proposed by AusNet Services is based on straight-line depreciation for existing assets and diminishing value depreciation for new assets.

5.3 AER's assessment approach

We determine the regulatory depreciation allowance using the post-tax revenue model (PTRM) as a part of a TNSP's annual building block revenue requirement.[8] The

[7] AusNet Services, *Revenue proposal*, October 2015, p. 175 and the proposed PTRM.

[8] NER, cll. 6A.5.4(a)(3) and 6A.5.4(b)(3).

calculation of depreciation in each year is governed by the value of assets included in the RAB at the beginning of the regulatory year, and by the depreciation schedules.[9]

Our standard approach to calculating depreciation is to employ the straight-line method as set out in the PTRM. Regulatory practice has been to assign a standard asset life to each category of assets that represents the economic or technical life of the asset or asset class.[10] We must consider whether the proposed depreciation schedules conform to the following key requirements:

- The schedules depreciate using a profile that reflects the nature of the assets or category of assets over the economic life of that asset or category of assets.[11]
- The sum of the real value of the depreciation attributable to any asset or category of assets must be equivalent to the value at which that asset or category of assets was first included in the RAB for the relevant transmission system.[12]

To the extent that a TNSP's revenue proposal does not comply with the above requirements, we must determine the depreciation schedules for calculating the depreciation for each regulatory year.[13]

The regulatory depreciation allowance is an output of the PTRM. We therefore have assessed the TNSP's proposed regulatory depreciation allowance by analysing the proposed inputs to the PTRM for calculating that allowance. The key inputs include:

- the opening RAB as at 1 April 2017
- the forecast net capex in the 2017–22 regulatory control period
- the expected inflation rate for the above period
- the standard asset life for each asset class—used for calculating the depreciation of new assets associated with forecast net capex in the above period
- the remaining asset life for each sub-asset class (based on year of acquisition) — used for calculating the depreciation of existing assets.

Our draft decision on a TNSP's regulatory depreciation allowance reflects our determinations on the forecast capex, expected inflation and opening RAB as at 1 April 2017 (the first three building block components in the above list).[14] Our determinations on these components of the TNSP's proposal are discussed in attachments 6, 3 and 2 respectively.

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9 NER, cl. 6A.6.3(a).

10 This is the standard practice for the AER, as well as other jurisdictional regulators. See for example, IPART, *Cost building block model template*, 20 June 2014, Table 1; ERAWA, *Final Decision on Proposed Revisions to the Access Arrangement for the Western Power Network*, September 2012, Appendix 2: Target Revenue Calculation (Revenue Model).

11 NER, cl. 6A.6.3(b)(1).

12 NER, cl. 6A.6.3(b)(2).

13 NER, cl. 6A.6.3(a)(2)(ii).

14 Our final decision will update the opening RAB as at 1 April 2017 for revised estimates of actual capex and inflation.

In this attachment, we assess AusNet Services' proposed standard asset lives against:

- the approved standard asset lives in the transmission determination for the 2014–17 regulatory control period
- the standard asset lives of comparable asset classes approved in our recent transmission determinations for other TNSPs.

We also assess AusNet Services' proposed changes to the methodology used to depreciate new assets and its proposal for accelerated depreciation of assets that are no longer used (or expected to no longer be used) over the 2017–22 regulatory control period. In doing so, we have considered the proposal in a broader review of depreciation in a holistic way. Appendix A to this attachment contains a paper we developed on the role of depreciation in the regulatory context.

5.3.1 Interrelationships

The regulatory depreciation allowance is a building block component of the annual building block revenue requirement.[15] Higher (or quicker) depreciation leads to higher revenues over the regulatory control period. It also causes the RAB to reduce more quickly (excluding the impact of further capex). This reduces the return on capital allowance, although this impact is usually smaller than the increased depreciation allowance in the short to medium term.[16]

Ultimately, however, a TNSP can only recover the capex it has incurred on assets once. The depreciation allowance reflects how quickly the RAB is being recovered and is based on the remaining and standard asset lives used in the depreciation calculation. It also depends on the level of the opening RAB and the forecast capex. Any increase in these factors also increases the depreciation allowance.

The RAB has to be maintained in real terms, meaning the RAB must be indexed for expected inflation.[17] The return on capital building block has to be calculated using a nominal rate of return (WACC) applied to the opening RAB.[18] As noted in attachment 1, the total annual building block revenue requirement is calculated by adding up the return on capital, depreciation, opex, tax and revenue adjustments building blocks. Because inflation on the RAB is accounted for in both the return on capital—based on a nominal rate—and the depreciation calculations—based on an indexed RAB—an adjustment must be made to the revenue requirement to prevent compensating twice for inflation.

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15 The PTRM distinguishes between straight-line depreciation and regulatory depreciation, the difference being that regulatory depreciation is the straight-line depreciation minus the indexation adjustment.

16 This is generally the case because the reduction in the RAB amount feeds into the higher depreciation building block, whereas the reduced return on capital building block is proportionate to the lower RAB multiplied by the WACC.

17 NER, cll.6A.5.4(b)(1) and 6A.6.1(e)(3).

18 NER, cll. 6A.6.2(a) and 6A.6.2(d)(2).

To avoid this double compensation, we make an adjustment by subtracting the annual indexation gain on the RAB from the calculation of total revenue.[19] Our standard approach is to subtract the indexation of the opening RAB—the opening RAB multiplied by the expected inflation for the year—from the RAB depreciation. The net result of this calculation is referred to as regulatory depreciation.[20] Regulatory depreciation is the amount used in the building block calculation of total revenue to ensure that the revenue equation is consistent with the use of a RAB, which is indexed for inflation annually.

This approach produces the same total revenue requirement and RAB as if a real rate of return had been used in combination with an indexed RAB. Under an alternative approach where a nominal rate of return was used in combination with an un-indexed (historical cost) RAB, no adjustment to the depreciation calculation of total revenue would be required. This alternative approach produces a different time path of total revenue compared to our standard approach. In particular, overall revenues would be higher early in the asset's life (as a result of more depreciation being returned to the TNSP) and lower in the future—producing a steeper downward sloping profile of total revenue.[21] Under both approaches, the total revenues being recovered are in present value neutral terms—that is, returning the initial cost of the RAB.

Figure 5.1 shows the recovery of revenue under both approaches using a simplified example.[22] The implications of an un-indexed RAB are discussed further in appendix A. Indexation of the RAB and the offsetting adjustment made to depreciation results in smoother revenue recovery profile over the life of an asset than if the RAB was un-indexed.

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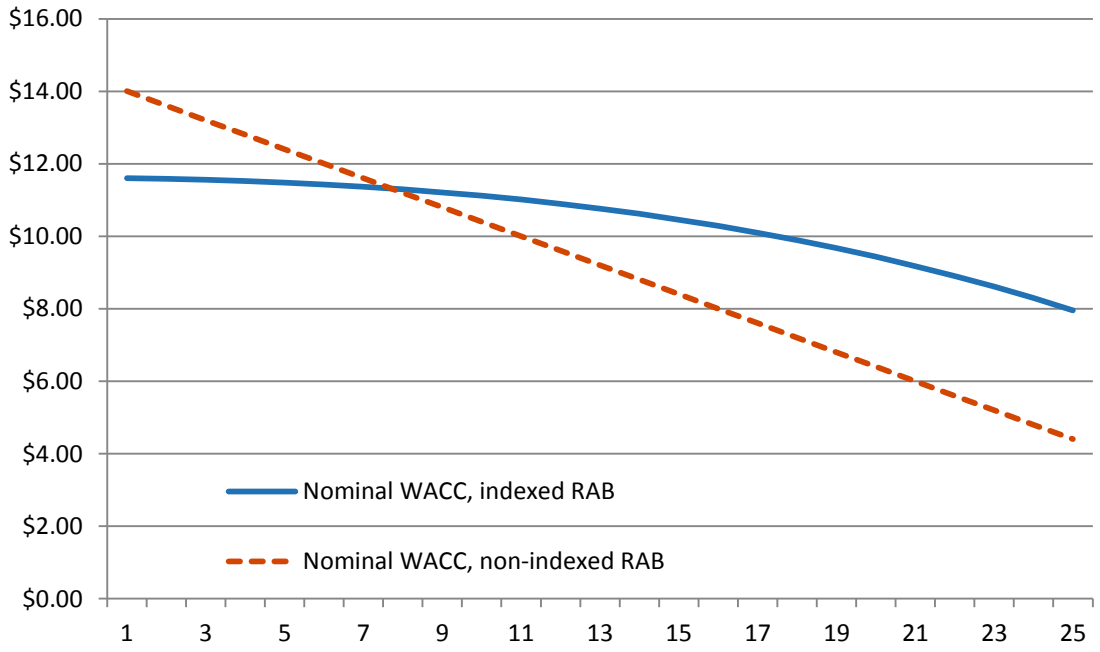
19 NER, cl. 6A.5.4(b)(1)(ii).

20 If the asset lives are extremely long, such that the RAB depreciation rate is lower than the inflation rate, then negative regulatory depreciation can emerge. The indexation adjustment is greater than the RAB depreciation in such circumstances

21 A change of approach from an indexed RAB to an un-indexed RAB would result in an initial step change increase in revenues to preserve NPV neutrality.

22 The example is based on the initial cost of an asset of $100, a standard economic life of 25 years, a real WACC of 7.32%, expected inflation of 2.5% and nominal WACC of 10%. Other building block components such as opex, tax and capex are ignored for simplicity as they would affect both approaches equally.

Figure 5.1 Revenue path example – indexed vs un-indexed RAB ($ nominal)



Source: AER analysis.

Figure 2.1 (in attachment 2) shows the relative size of the inflation and RAB depreciation and their impact on the RAB based on AusNet Services' proposal. A ten per cent increase in the RAB depreciation causes revenues to increase by about 2.9 per cent.

5.4 Reasons for draft decision

We accept AusNet Services' proposed straight-line depreciation method for calculating the regulatory depreciation allowance on existing assets. However, we do not accept its proposal to use the diminishing value depreciation method for calculating the regulatory depreciation allowance on new assets. We accept the proposed asset classes, including a new 'Accelerated depreciation' asset class.

Overall, we approve a regulatory depreciation allowance of $521.3 million (nominal) for the 2017–22 regulatory control period. This is $81.4 million (or 13.5 per cent) lower than AusNet Services' proposal. This amendment also reflects our determinations regarding other components of AusNet Services' revenue proposal—for example, the forecast capex (attachment 6), the expected inflation rate (attachment 3) and the opening RAB as at 1 April 2017 (attachment 2)—that affect the forecast regulatory depreciation allowance.

5.4.1 Diminishing value method

We do not accept AusNet Services' proposal to applying the DV method for depreciating new assets because we do not consider it conforms with the requirements

in clause 6A.6.3(b) of the NER.[23] We do not consider this approach results in a depreciation profile that reflects the nature of these assets over their economic lives.[24] In particular, we consider the following:

- The proposed profile of depreciation under the DV method does not reflect the nature of the assets over their economic lives.[25] This is based on our assessment of expected utilisation trends. The initial doubling of depreciation through the use of a multiple in the DV calculation is arbitrary and not consistent with our assessment of expected utilisation trends for new assets.
- The DV method employed by AusNet Services results in a residual value at the end of the asset's economic life. This means the sum of the real value of the depreciation attributable to new assets is not equivalent to the value at which those assets were first included in the RAB.[26]
- AusNet Services has not provided evidence to support a different forecast utilisation of new and existing assets.[27] We consider the type of asset and the purpose for which is needed, rather than whether it is new or existing, will determine utilisation. Further, overall demand trends are likely to impact both new and existing assets to a similar degree. This means that two separate depreciation approaches (that result in substantially different depreciation profiles) cannot both reflect the nature of the assets based on such a distinction as new and existing. We consider the SL method meets the requirements of the NER for both new and existing assets based on our assessment of expected utilisation.
- AusNet Services has not demonstrated how the objectives of the NER (in particular the long run interests of consumers) are promoted by the DV method of depreciation. We consider this method will lead to inefficient use and management (such as early replacement) of the assets. The higher prices under the DV method could encourage lower utilisation creating a self-fulfilling outcome that would not be efficient.

These points are discussed further in the subsections below.

In accordance with clause 6A.6.3(a)(2)(ii) of the NER, we have assessed the approaches to depreciation available taking into account the requirements of clause 6A.6.3(b), and applied the SL depreciation method for both new and existing assets.

AusNet Services proposed to use the DV method to determine depreciation for new assets. It proposed to continue applying the SL depreciation method to determine depreciation for existing assets. AusNet Services' proposal to use the DV method to accelerate depreciation was put to customers as part of its stakeholder consultation process prior to making the revenue proposal. AusNet Services' stakeholders were

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[23] NER, clause 6A.6.3(a)(2)(i)

[24] NER, cl. 6A.6.3(b)(1).

[25] NER, cl. 6A.6.3(b)(1).

[26] NER, cl. 6A.6.3(b)(2).

[27] Nor is there any stranding risk associated with new or old assets, as discussed below.

opposed to accelerated depreciation due to concerns over the price impact.[28] AusNet Services submitted that its proposal to apply accelerated depreciation only to new assets is a conservative approach and balances mitigating potential utilisation risk with addressing stakeholders' concerns regarding price. We note Powerlink, in its recent revenue proposal, has not proposed to change from the SL depreciation method for its assets, following initial consultation with its stakeholders.[29] Powerlink submitted that feedback from its stakeholders did not provide any basis for changing its current depreciation approach. Powerlink stated that its stakeholders expected it to focus on ensuring cost reflective and efficient levels of network pricing in the short term, which may assist in preserving or improving current and future levels of utilisation.[30]

AusNet Services' proposal stated that the uptake of low-cost, alternative energy solutions could lead to inefficient under-utilisation of its network.[31] Under revenue cap regulation such a decline in utilisation would increase the price per unit of energy supplied to future customers. This is because under the regulatory regime, AusNet Services' historical costs will continue to be recovered, regardless of the level of demand on the network.

In response to falling utilisation, AusNet Services has proposed to accelerate depreciation of new assets being installed on its network from 1 April 2017. AusNet Services submitted that this approach will reduce the cost burden on the future customer base and contribute to more equitable access to electricity across generations.[32]

In our *Issues paper* we presented the impacts of the change in approach, and set out some initial concerns we had with the proposed approach.[33] We received two submissions to our *Issues paper*. They were from the Consumer Challenge Panel (CCP)[34] and the Energy Users Coalition of Victoria (EUCV)[35]—neither of whom supported AusNet Services' proposal in this regard. The CCP asked why the proposal had been made in the first place given its lack of support from customers in earlier consultations.[36] AusNet Services did not respond to the *Issues paper* in relation to its depreciation proposal.

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28 AusNet Services, *Revenue proposal*, October 2015, p. 187.

29 Powerlink owns, operates and maintains the electricity transmission network in Queensland.

30 Powerlink Queensland, *Revenue proposal 2018–22*, January 2016, p. 98.

31 AusNet Services, *Revenue proposal*, October 2015, p. 183.

32 AusNet Services, *Revenue proposal*, October 2015, p. 184.

33 AER, *Issues paper AusNet Services electricity transmission revenue proposal 2017 to 2022*, December 2015, pp. 16–23.

34 Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016, pp. 30–37.

35 Energy Users Coalition of Victoria, *A response to AusNet revenue reset proposal for the 2017-2022 period*, February 2016, pp. 42–44.

36 Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016, p.32.

Depreciation of the RAB and the resulting building block allowance, tend to follow an established regulatory approach (straight-line depreciation and indexed RAB) as set out in the published PTRM template, and has been a relatively uncontroversial part of a regulatory decision for electricity and gas network service providers. In recent years there have been a few proposals put to us by service providers for accelerated depreciation of their asset bases (or part thereof), using a variety of arguments to support their cases. Against this background, we have sought to outline the role of depreciation in a holistic way. Appendix A to this attachment contains a paper we developed on depreciation's role in the regulatory context. This paper also provides a theoretical framework for our assessment of AusNet Services' proposal on the depreciation approach.

The paper (as presented in appendix A) highlights how our current approach to depreciation delivers a relatively even recovery of revenues over an asset's life, and that in itself, such a profile is not distortionary to consumption or investment decisions. It notes that, in theory, an ideal depreciation profile would be set based on known future changes in demand and real replacement costs of assets. However, it also notes that future changes in demand and real replacement costs are unknown and that many networks we regulate are mature, with overall demand and real replacement costs that are relatively stable compared to, say, a new network with limited customers. The paper also highlights that depreciation is a very blunt instrument[37] given its interactions with other building blocks and how all assets (at various stages of their lives) can be affected identically. The long term implication of a short term acceleration of depreciation also needs to be considered. Against these considerations, a change in depreciation approach from the current standard approach is a proposition that needs to be well justified.

The following discussion builds on the analysis in the *Issues paper* and appendix A, and presents some further considerations based on AusNet Services' proposal. The discussion begins by explaining the two depreciation methods and their impacts, before looking at the evidence or situations that may support the application of a particular method. Specific issues are also addressed in separate subsections, before concluding comments are presented.

DV compared to SL depreciation

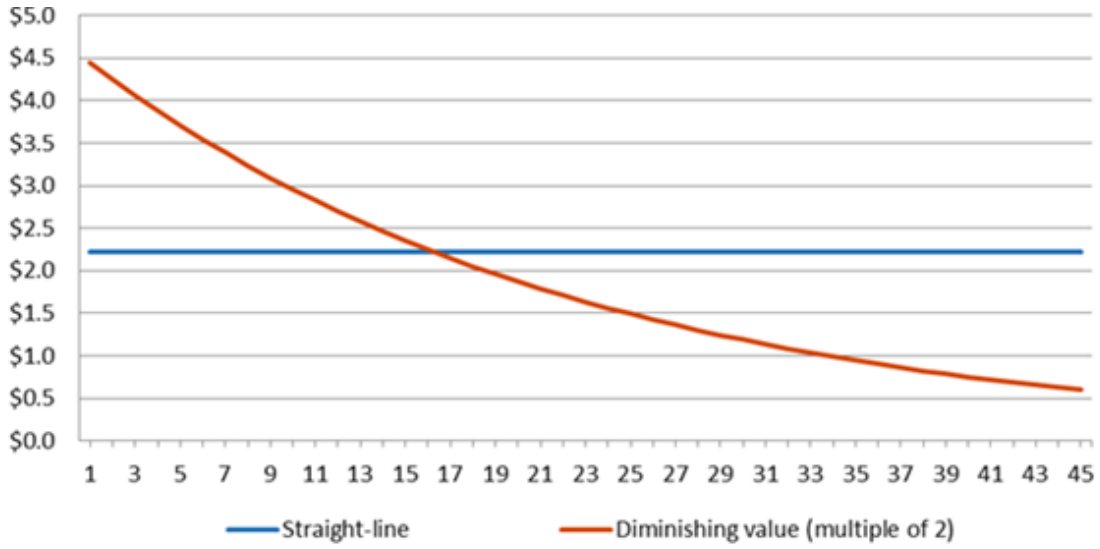
SL depreciation is calculated by dividing the asset value by the number of years it is expected to be in service. This means that there is an even recovery of depreciation, in real terms, over the life of the asset.

The DV method, on the other hand, depreciates an asset’s remaining value by a given percentage each year. Regardless of the percentage chosen, DV results in the depreciation amount diminishing (reducing) each year as the percentage is applied to a

[37] That is, the impact of the change of depreciation approach can be disproportional to the size of the potential problem and there could be more targeted alternatives for dealing with the issues.

decreasing asset value. This difference is shown in Figure 5.2 below for an asset with an expected standard asset life of 45 years and a starting value of $100.

Figure 5.2 Depreciation allowance under different depreciation methods ($ real)



Source: AER analysis.

Notes: 'Multiple of 2' refers to the multiple used in AusNet Services' proposed DV depreciation rate formula.

Figure 5.2 shows that under the DV method more depreciation is being recovered from customers early in the asset's life. Additionally, the depreciation allowance in this example is higher under the DV method until year 16 of the asset's life.[38] This means that the cost recovery of new assets will be more heavily borne by current users of the assets rather than later users of the assets.

AusNet Services' proposal does not prevent falling utilisation. It could actually encourage lower utilisation due to prices being higher than they would otherwise be under the SL method of depreciation. In such circumstance, customers (particularly those who stay on the network) may face higher prices from both the change of depreciation approach and any subsequent fall in utilisation.[39]

Implied utilisation under different depreciation methods

There are economic arguments to suggest that depreciation should reflect the expected utilisation (demand) of an asset over time to avoid distorting consumption decisions. This is because changing the amount of depreciation can send economic

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[38] The depreciation at the start of the asset's life being higher under the DV method in this case also reflects the multiple of 2 that AusNet Services applied to the depreciation rate.

[39] Accelerating depreciation does not differentiate between customers likely to stay on and those likely to leave the network. A customer staying on the network could therefore pay accelerated depreciation on the assets they use and then the residual cost of the assets of anyone that leaves the network.

price signals to customers.[40] There are also equity arguments for the depreciation profile to reflect utilisation to prevent current and future customers paying different shares of depreciation simply due to changing utilisation.[41]

The current SL method allows an asset's cost to be recovered evenly over the period of its service and effectively assumes an even utilisation (on average) over the asset's life.[42] It does not attempt to predict increasing or decreasing utilisation rates and therefore has an even recovery profile in real terms.

In contrast, the DV method front loads (accelerates) depreciation early in the asset's life and is predicated on the expectation of continually falling utilisation. If utilisation is expected to fall in a similar profile to depreciation under the DV method, then recovery could be relatively even on a per customer/unit basis. That is, higher customer numbers today could better support higher depreciation today. As customer numbers fall, depreciation should also fall to reflect the lower customer numbers. Over time, per customer depreciation costs are then not impacted by falling customer numbers.

Expectation of increasing demand on the other hand would suggest back loading depreciation to better match utilisation, with depreciation increasing as utilisation increases. For example, this could apply to a new line asset that sees an increasing number of customers connected over time until it reaches capacity. The CCP in its submission to the *Issues paper* noted that both accelerated and decelerated depreciation are equally likely depending on the projected asset use. It also suggested that if assets are used less, they may last longer, which would warrant a deceleration of depreciation.[43]

Figure 5.3 shows the difference in the value of an asset under the SL and DV depreciation methods, based on the above example where the asset has a starting value of $100 and expected standard life of 45 years.

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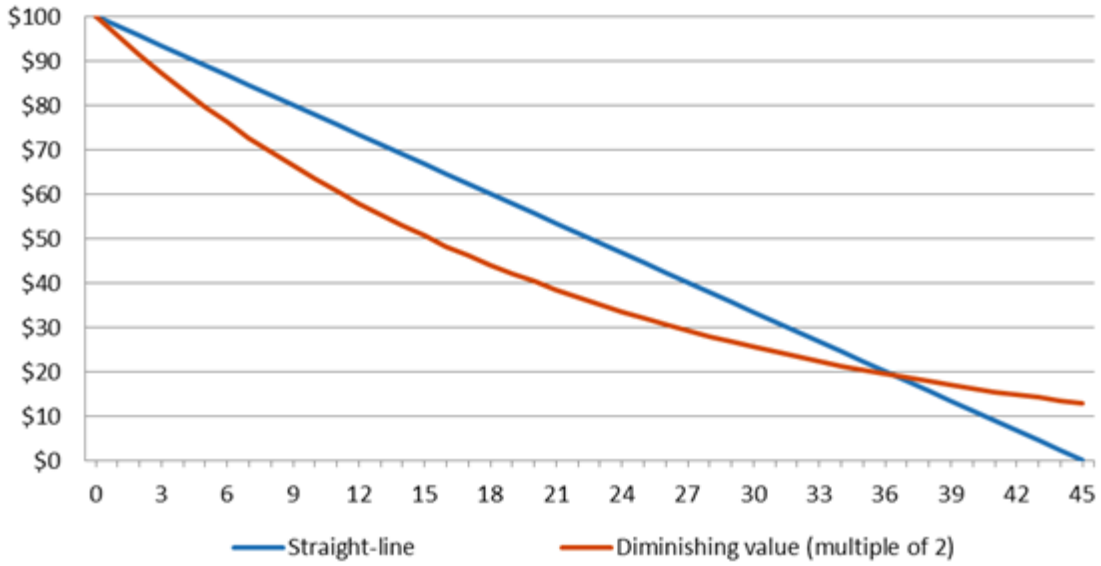
[40] It does so to the extent it impacts the overall level of revenues, although other building block costs can be even more significant at affecting overall revenues. Tariff structures also provide scope for economic signalling that does not necessarily need overall revenue to change.

[41] For example, if an early user of a new asset faces relatively high depreciation initially due to lower customer numbers, the economic behaviour of that customer could be significantly affected. The customer could decide to use less energy now, in expectation of lower prices in the future.

[42] At any point in time, for a RAB made up of a variety of assets at different stages in their life and utilisation, such an 'on average' outcome would reasonably be expected.

[43] Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016, p. 34.

Figure 5.3 Asset value under different depreciation methods ($ real)



Source: AER analysis.

Notes: 'Multiple of 2' refers to the multiple used in AusNet Services' proposed DV depreciation rate formula.

Under AusNet Services' proposed DV method, by year 16 the asset has been depreciated by more than half (51.7 per cent) its initial value, although it still has an expected remaining economic life of 29 years (45 years minus 16 years). This profile suggests at year 16, utilisation of this asset must be much lower (less than half) compared to when it first started service, if per unit depreciation costs are to be relatively similar to those at the start of the asset's life.

At the end of the asset's economic life (year 45), the DV method (unlike the SL method) leaves a residual asset value at the time utilisation is expected to be zero. For an asset with a 45 year economic life, there is still 12.9 per cent of the asset's initial value to be recovered at the end of that economic life.[44] AusNet Services did not explain how such residual values should be dealt with in its proposal. Nor did AusNet Services address this in response to our *Issues paper*, where we first raised the matter.[45] We consider that such residual values remaining in the RAB is not consistent with the NER requirement that an asset's value be recovered over its economic life.[46]

Without a significant decline in forecast demand, a switch to the DV method would not encourage appropriate utilisation of the asset. This is because customers today will pay more than those in the future on a per customer/unit basis. In this regard, the EUCV stated that the proposed approach merely transfers the cost from future

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[44] The size of the residual value varies depending on the standard economic life of the asset.

[45] AER, *Issues paper: AusNet Services electricity transmission revenue proposal 2017 to 2022*, December 2015, p. 22.

[46] NER, cll. 6A.6.3(a)(1) and (b).

customers to current customers and reduces AusNet Services' risks that at some point in the future its shareholders may be exposed to having to absorb the cost of assets that are no longer used.[47] The CCP, while acknowledging that technology could affect utilisation, considered the initial doubling of the rate of depreciation on new assets to be opportunistic.[48]

Forecasts of future utilisation

We do not accept that there is sufficient evidence to expect falling utilisation on AusNet Services' network. Overall, we expect utilisation to increase into the future, although at a slower rate due to alternative technologies.

AusNet Services stated that accelerating the depreciation for new assets will better match revenue recovery with expected network usage over time.[49] There are various factors that can be used to measure utilisation. Some of these factors include customer numbers, volume of energy delivered, and the level of demand for an asset at a particular point in time. In its proposal, AusNet Services has not clearly defined the term 'utilisation'.

AusNet Services cited an AEMO report and noted an expected 6.2 per cent reduction in peak demand by 2034–35 due to emerging technologies—such as solar panels and battery storage usage—that allow changes to energy sourced from traditional centralised network sources.[50] However, the reduction noted in the AEMO report was not relative to current maximum demand but relative to forecast maximum demand at 2034–35 without these emerging technologies. This suggests that the technologies discussed may defer augmentation or replacement on the network. AEMO's analysis suggested a more gradual increase in utilisation than without these technologies. However, maximum demand including the impacts of emerging technologies is still forecast to increase by around 10 per cent between 2015–16 and 2034–35. Figure 5.4 is from AEMO's report and shows this trend.[51]

AEMO also noted the impact of storage on maximum demand is forecast to be small in the short term.[52] As can be seen from Figure 5.4, integrated photo-voltaic (PV) and storage systems are forecast to have no significant impact over the 2017–22 regulatory control period.

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47 Energy Users Coalition of Victoria, *A response to AusNet revenue reset proposal for the 2017-2022 period*, February 2016, p. 42.

48 Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016, p. 32.

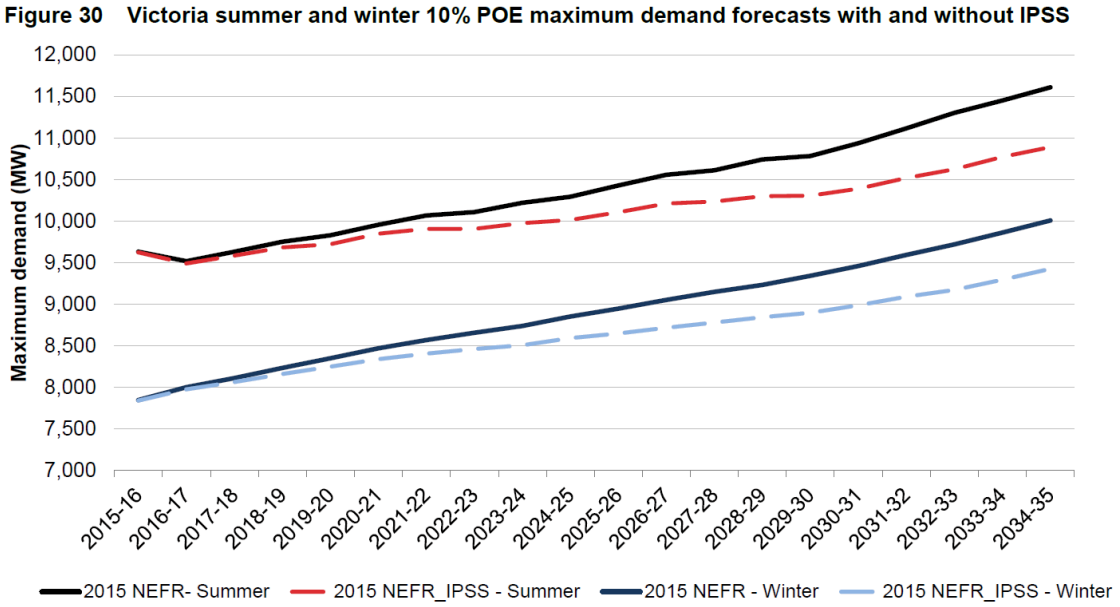
49 AusNet Services, *Revenue proposal*, October 2015, p. 53.

50 AusNet Services, *Revenue proposal,* October 2015, pp. 179–181.

51 AEMO, *Emerging Technologies Information Paper, National Electricity Forecasting Report*, June 2015, p. 53.

52 AEMO, *Emerging Technologies Information Paper, National Electricity Forecasting Report*, June 2015, p. 52.

Figure 5.4 Victoria summer and winter 10% POE maximum demand forecasts with and without IPSS



Source: AEMO, *Emerging Technologies Information Paper, National Electricity Forecasting Report*, June 2015, p. 53.

Notes: IPSS is shorthand for integrated PV and storage systems; POE is shorthand for probability of exceedance; NEFR is shorthand for national electricity forecasting report.

The above forecasts were presented in our *Issues paper*.[53] AusNet Services did not respond to these findings. The CCP, in response to the *Issues paper*, noted that AusNet Services has not provided any concrete examples of how emerging technologies were affecting its transmission business. It considered that if assets were used less, deceleration of depreciation may be required, as the asset may last longer.[54] The CCP noted the one example presented by AusNet Services was in relation to closure of the Point Henry smelter, which it says was identified as far back as 2012 as not being financially viable.[55] The CCP also noted that the argument of falling utilisation had not been made by AusNet Services in relation to its recent distribution proposal or by any other Victorian distributor in their recent proposals.[56] It concluded that the link between emerging technologies and risk to AusNet Services'

[53] AER, *Issues paper: AusNet Services electricity transmission revenue proposal 2017 to 2022*, December 2015, p. 18.

[54] Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016, p. 34.

[55] Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016, p. 31.

[56] Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016. pp. 34–35.

transmission business has not been adequately demonstrated.[57] We agree with this assessment.

Stranding risk

In its proposal, AusNet Services submitted that the closure of a major customer—Alcoa's Point Henry aluminium smelter—on its network highlights the exposure of its transmission assets to stranding risk. AusNet Services noted that while not driven by the uptake of disruptive technologies, the closure highlights the exposure of AusNet Services' transmission assets to stranding risk.[58]

We do not consider that the current regulatory framework results in uncompensated stranding and therefore a risk to AusNet Services. The NER provides that if prudently acquired, an asset will be included in a service provider's RAB and the cost of that asset will be recovered by the service provider.[59] The residual funds of any assets that are no longer used can be recovered from remaining customers. The EUCV's submission to our Issues paper did not support such compensation on the basis that in competitive markets businesses bear the cost of any stranded assets.[60] However, we do not consider the NER allows such uncompensated adjustments to the RAB. We agree with the EUCV's statement that the regulatory framework allows service providers certain benefits that may not be available in competitive markets such as being allowed a return on assets that may only be partially utilised. However, such benefits are a trade-off so that service providers are willing to make large sunk investments in the first place. That is, such benefits are part of the 'regulatory compact' as some economists have labelled it.

The DV percentage calculation

The DV method proposed by AusNet Services includes a multiple of two (or 200 per cent) in the depreciation rate calculation based on tax guidelines. We consider that the economic basis for choosing the multiple has not been established by AusNet Services. It would be coincidental if the tax multiple of two as proposed by AusNet Services resulted in a depreciation rate that best matched the expected change in utilisation rates over the expected lives of the new assets. The CCP also questioned the economic basis of the multiple in its submission to the *Issues paper*, which

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57 Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016, p. 37.

58 AusNet Services, *Revenue proposal*, October 2015, p. 180.

59 We note there are circumstances where an asset may be removed from the RAB. However, compensation can be provided for in this situation. See NER, cl. S6A.2.3.

60 Energy Users Coalition of Victoria, *A response to AusNet revenue reset proposal for the 2017-2022 period*, February 2016, pp. 42, 44.

identified this matter.[61] It further submitted that the multiple was designed to encourage investment and reduce the tax liabilities of businesses.[62]

The multiple of two under the DV method effectively doubles the initial depreciation rate compared to the SL method. The formula below shows how AusNet Services calculated the depreciation rate on an asset with an expected standard life of 45 years.

$$\text{DV depreciation rate} = \frac{1}{standard\ asset\ life} \times 2$$

$$= 2.22\% \times 2$$

$$= 4.44\%$$

The DV method is predicated on falling utilisation, not rising utilisation. The multiple goes to the issue of how quickly utilisation is expected to fall. The multiple chosen should reflect the expected fall in utilisation into the future. That is, the faster utilisation is expected to fall, the higher the multiple should be. However, choosing a multiple under the DV method that will accurately reflect the expected decline in utilisation over the life of an asset is difficult. Figure 5.5 shows the path of annual depreciation under the DV method with multiples of one (that is, effectively no multiple) and two. The outcome under the current SL method is also shown. With no multiple the DV method results in depreciation that slowly declines relative to the SL method. It suggests a slowly declining level of utilisation of the asset from the initial level of utilisation. Such a profile could be consistent with a slower decline in utilisation. A multiple of two presumes much faster declines in utilisation than a multiple of one—that is, twice the rate. With a multiple of two the depreciation under the DV method increases relative to the SL method and then declines at a much faster rate than the DV method with no multiple.

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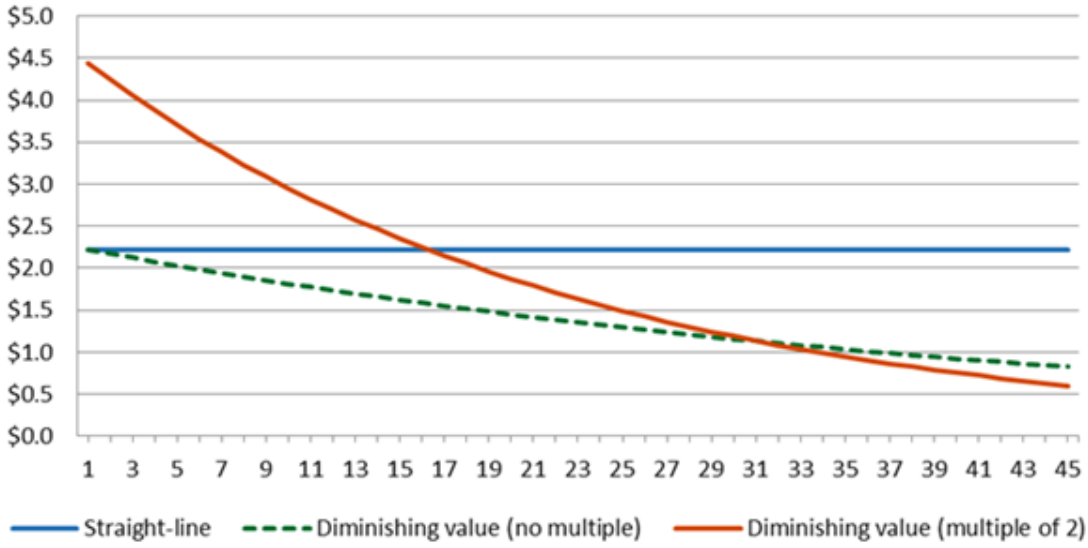
61 AER, *Issues paper: AusNet Services electricity transmission revenue proposal 2017 to 2022*, December 2015, p. 22.

62 Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016, p. 32.

Figure 5.5 Depreciation under different depreciation methods ($ real)



Source: AER analysis.

We consider that if falling utilisation was expected, then the decline in depreciation should begin from the current level of depreciation. A doubling of depreciation affects all customers, both those staying and those leaving the network. This will impact the consumption decisions of all customers. It is possible that customers, who may have stayed on the network, may be encouraged to leave due to the higher charges. The multiple also significantly accelerates the rate of decline in depreciation. As discussed above, we have not seen evidence of even modest overall decreases in utilisation of the network. We therefore do not consider AusNet Service's proposal to double depreciation on new assets reflects the nature of the assets over their economic life.

Size of the RAB

AusNet Services' proposal submitted that the SL method coupled with an indexation of the RAB leads to an ever increasing RAB.[63] This is incorrect. In terms of the example above, the asset will have zero value after 45 years under the SL method regardless of how significant inflation indexation proves to be. The only way a RAB can expand in the long run under the SL depreciation method is through additional capital expenditures. Given it is generally unlikely that all replacement and expansion of a network will cease, the RAB can generally be expected to continue to grow.

In contrast, the proposed DV method actually introduces the potential for an ever increasing RAB even without any new capex. This would occur if the rate of inflation is greater than the rate of depreciation. While unlikely in current inflation conditions, the theoretical possibility of an ever expanding RAB only emerges under the DV method.

[63] AusNet Services, *Revenue proposal*, October 2015, p. 179.

The residual asset value under the DV method noted above, will also lead to an ever expanding RAB unless they are dealt with in some way.[64]

AusNet Services' modelling of prices

AusNet Services presented modelling in its proposal to show the expected trend in prices under both depreciation methods. AusNet Services suggested its approach leads to smoother prices. We made observations raising questions with this proposition in the *Issues paper*.[65] AusNet Services has not responded to our observations in that paper.

Figure 5.6 shows that, when the DV method is applied to new assets, prices are expected to have a greater range than continuing under the current SL method. Prices are higher than under the DV method until 2031 and then lower after that.[66] They are evidently not flatter than under the SL method. While the assumptions underlying this projection are questionable, we agree with the general outcomes illustrated. That is, the proposed approach would lead to a significant increase in price over the short to medium term, followed by significant declines (other things being equal).

In the long run, the front loading of depreciation may leave the business in a poor financial position as its depreciation allowance and prices continually falls. To forestall this, the service provider may seek to replace assets early to increase the size of the RAB to maintain prices. The EUCV also noted the potential increase in free cash flows from accelerated depreciation could also result in new capex prematurely.[67]

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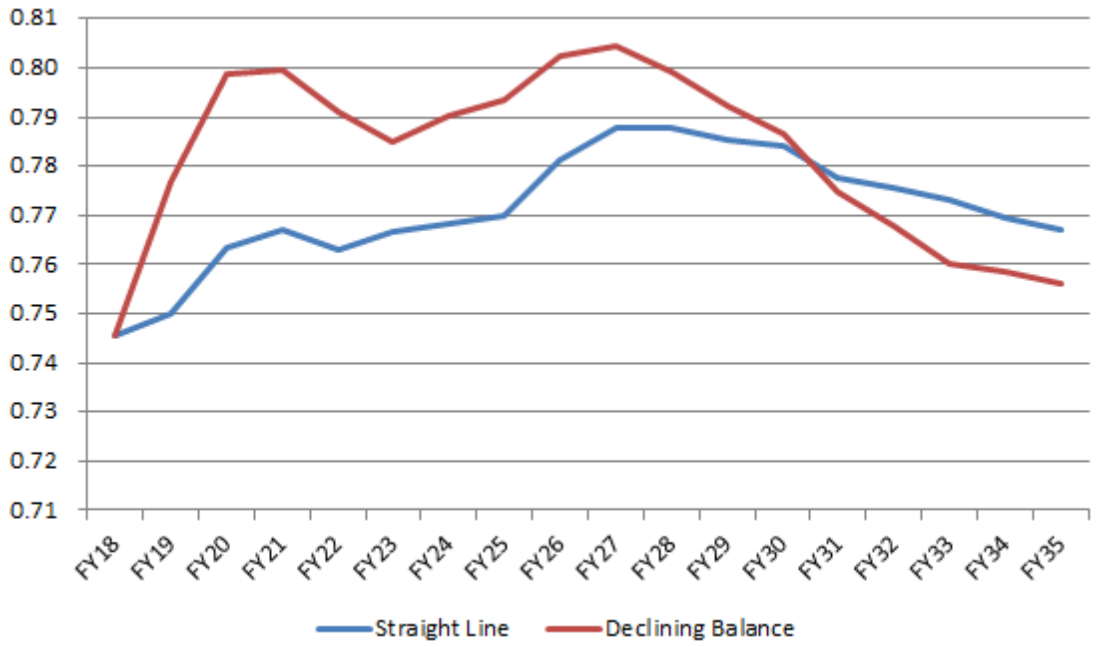
64 That is, although new assets are added to the RAB, no assets are ever fully depreciated under the proposed DV method as the residual value remains for many years after the asset's assigned economic life. The example in figure 5.2 showed that 12.9 per cent of the asset's initial value still had to be recovered at the end of its economic life. We understand under tax law the asset is only fully written off (in one year) when the depreciated value reaches $1000.

65 AER, *Issues paper: AusNet Services electricity transmission revenue proposal 2017 to 2022*, December 2015, pp. 22–23.

66 In AusNet Services' long term analysis there is a significant reduction in prices around 2037. As noted in the *Issues paper*, this on the face of it would suggest today's prices should be significantly lower in anticipation of this drop in prices. That is, depreciation should be back loaded, not front loaded as AusNet Services has proposed. However, we understand this drop is caused by assets leaving the RAB. It is unclear whether these assets would be replaced. We have therefore focused on the medium term outcomes presented by AusNet Services.

67 Energy Users Coalition of Victoria, *A response to AusNet revenue reset proposal for the 2017-2022 period*, February 2016, p. 44.

Figure 5.6 AusNet Services' price forecasts under the two depreciation approaches (cents per KWh)



Source: AusNet Services, *Email response IR007*, 15 December 2015.

We note the UK experience with accelerated revenue suggests that this approach was not clearly successful. In particular, this approach appears to have placed a disproportionate burden of costs on present day consumers at the expense of future users, who nonetheless enjoy comparable use of the same (though largely depreciated) assets. The Office of Gas and Electricity Markets (Ofgem) engaged Cambridge Economic Policy Associates (CEPA) to consider 'issues related to accelerated depreciation'. In the UK context the debate focuses on whether the business is 'financeable'—that is, can it meet certain financial ratios.[68] CEPA summarised the UK experience with accelerated depreciation as follows:

> Even when NPV neutral approaches are adopted there may be unintended consequences – for example, the most recent electricity distribution determination saw an increase in the proportion of assets that are subject to accelerated depreciation in part because the previous acceleration exacerbated the perceived cash-flow constraints as the capex programme grows. Further, when long lived assets are affected, as is the case with accelerated depreciation, there is a real possibility of significant inter-generational equity issues arising. Existing consumers are paying higher prices and future consumers, in say 20 to 40 years, are paying lower prices than would otherwise have been the case. While these sort of price adjustments over a five or 10

[68] Financeability is discussed further in appendix A.

year period may be expected to have a relatively small inter-generational impact, over this longer period a more significant impact can be expected.[69]

We discuss the UK experience in greater detail at appendix A.

Utilisation of new and existing assets

We consider it likely that any impact from disruptive technologies would affect both existing and new assets. The CCP also made this point in its submission to our *Issues paper*.[70] We consider the type of asset and the purpose for which is needed, rather than whether it is new or existing, will determine utilisation.[71] Further, overall demand trends are likely to impact both new and existing assets to a similar degree, particularly for AusNet Services' mature and diversified network. That is, for the purpose of determining a depreciation method, we consider new and existing assets on AusNet Services network to be of a similar nature. It is therefore questionable why the DV method as proposed by AusNet Services would only apply to new assets.

Whether the AER should approve the construction of new assets in the face of falling utilisation is another consideration. New assets are generally acquired to either replace existing assets or to expand the network. When an asset is being considered for replacement, consideration should be given to whether the asset should be replaced at all and whether the existing asset's life could be extended in some way. Decisions to expand the network also have to be carefully considered. If utilisation is expected to fall, these considerations become more important. The EUCV submitted there was an inconsistency in AusNet Services seeking both accelerated depreciation and increased capex.[72] In contrast, AusNet Services stated that there are likely to be many circumstances where a long lived asset may be required even where its long term utilisation is uncertain.[73]We recognise that there is inherent uncertainly in long term investments. However, this observation does not (of itself) support either the approval of the capex or the accelerated depreciation of new assets. Attachment 6 discusses our assessment of AusNet Services' forecast capex for the 2017–22 regulatory control period.

We consider that applying the DV method only to new assets represents incorrect targeting of the perceived problem of falling utilisation. This would lead to a depreciation profile inconsistent with the nature of the assets over their economic lives, as discussed above.[74] . At the same time extending the DV method to all assets is

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69 CEPA, *RPI-X@20: providing financeability in a future regulatory framework*, May 2010, pp. i–ii.

70 Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016, p. 31.

71 As discussed below, we have approved a new 'accelerated depreciation' asset class for those particular assets being identified as being (or becoming) unused over the next regulatory control period.

72 It advocated bringing depreciation and capex assessments together into a single analysis of efficient investment. See Energy Users Coalition of Victoria, *A response to AusNet revenue reset proposal for the 2017-2022 period*, February 2016, pp. 43–44.

73 AusNet Services, *Revenue proposal*, October 2015, p. 186.

74 NER, cl. 6A.6.3(b)(1).

disproportional to the perceived problem. This appears to have been recognised by AusNet Services. It suggested that if we considered there no reason to expect different utilisation profiles between existing and new assets, then the DV method should be applied to all assets, and the revenue impact limited to that of just applying the DV method to new assets.[75] This statement suggests AusNet Services was mindful of the disproportional revenue impact of applying the DV method to all assets. AusNet Services' depreciation proposal increases revenues in the 2017–22 regulatory control period (other things being equal) relative to the current method by on average 2.55 per cent per annum. If the DV method was applied to all assets the impact would be several times greater than by limiting the change of approach to new assets over the 2017–22 regulatory control period (other things being equal).[76]

Concluding comments

We do not accept AusNet Services' proposal to apply the DV method of depreciation to new assets as it results in a depreciation profile inconsistent with the nature of those assets over their economic lives.[77] We are not satisfied the proposed approach is consistent with customers' long term interests under the National Electricity Objective as outlined above because it does not encourage efficient use or management of the assets. Importantly, we do not consider that there is evidence to suggest utilisation rates are falling in a way that would warrant the approach proposed by AusNet Services. The depreciation approach is a blunt instrument to deal with particular issues. We would require a high level of certainty on the size and direction of expected utilisation trends across all assets before such a change could be justified. The SL method, by providing a relatively even recovery of revenues over time, is largely neutral to these trends and therefore is less likely to distort consumption and investment decisions in the long run. It also provides for a depreciation profile that reflects the nature of the assets over their economic lives.[78] We also consider that there are other more targeted approaches to dealing with specific issues which would promote customers' long term interests. Section 5.4.3 illustrates such an approach for assets that are no longer expected to be used in the short term.

5.4.2 Standard asset lives

We accept AusNet Services' proposed standard asset lives for its existing asset classes because they are:

- consistent with the approved standard asset lives in the determination for AusNet Services' 2014–17 regulatory control period

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75 AusNet Services, *Revenue proposal,* October 2015, p. 187.

76 Based on AusNet Services' proposal, new assets of $745 million are expected to be acquired over the 2017–22 regulatory control period, compared to existing assets of $3228 million as at 1 April 2017. The proportion of assets subject to the DV method will increase in the long run as the existing assets are depreciated and new assets acquired.

77 NER, cl. 6A.6.3(b)(1).

78 NER, cl. 6A.6.3(b)(1).

- comparable with the standard asset lives approved in our recent transmission determinations for other TNSPs.[79]

Table 5.4Table 5.3 shows how AusNet Services' standard asset lives compare for its main network asset classes to other TNSPs. It shows that the differences in the standard asset lives are marginal (particularly in terms of their impact on overall depreciation) and reflect slight variations on what assets are included in each asset class, as indicated by the different asset class labels used across the TNSPs. For example, AusNet Services has an asset class covering 'Towers and conductors', whereas some other TNSPs has employed further disaggregation of their conductor assets with separate asset class allocations for overhead lines and underground cables.

Table 5.3 AusNet Services' main network asset classes' standard asset lives compared to other transmission services providers' standard asset lives (years)

AusNet Services asset class	AusNet Services asset life	TransGrid asset life	ElectraNet asset life	Powerlink asset life	TasNetworks asset life
Switchgear[a]	45	40	44.8	40	60, 45, 15
Secondary[b]	15	15	15	15	15, 4
Transformers[c]	45	40	55	40	60, 45, 15
Towers and conductors[d]	60	50, 45	55, 40, 27	50, 45, 30	60, 45, 10

Source: AER analysis.

(a) TransGrid: 'Substations'; ElectraNet and Powerlink: 'Substation primary plant'; TasNetworks: 'Substation assets - long, medium and short life'.

(b) TransGrid: 'Secondary systems'; ElectraNet: 'Substation secondary systems - electronic'; Powerlink: 'Substations secondary systems'; TasNetworks: 'Protection and control - short life'.

(c) TransGrid: 'Substations'; ElectraNet and Powerlink: 'Substation primary plant'; TasNetworks: 'Substation assets - long, medium and short life'.

(d) TransGrid: 'Transmission lines', 'Underground cables' and 'Transmission line life extension'; ElectraNet and Powerlink: 'Transmission lines - overhead', 'Transmission lines - underground' and 'Transmission lines - refit'; TasNetworks: 'Transmission line assets - long, medium and short life'.

We are satisfied the proposed standard asset lives lead to a depreciation schedule that reflects the nature of the assets over the economic lives of the asset classes.[80]

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[79] AER, *Final decision: Powerlink transmission determination 2012–13 to 2016–17, April 2012, p. 209;* AER, *Final decision: ElectraNet transmission determination 2013–14 to 2017–18*, April 2013, p. 149; AER, *Final decision: TransGrid transmission determination 2015–16 to 2017‑18*, *Attachment 5 – Regulatory depreciation*, April 2015, p. 5-10; AER, *Draft decision: TasNetworks transmission determination 2015–16 to 2018‑19*, *Attachment 5: Regulatory depreciation*, November 2014, p. 5-14.

[80] NER, cl. 6A.6.3(b)(1).

Table 5.4 sets out our draft decision on AusNet Services' standard asset lives for the 2017–22 regulatory control period.

Table 5.4 AER's draft decision on AusNet Services' standard asset lives (years)

Asset class	Standard asset life
Secondary	15.0
Switchgear	45.0
Transformers	45.0
Reactive	40.0
Towers and conductor	60.0
Establishment	45.0
Communications	15.0
Inventory	n/a
IT	5.0
Vehicles	7.0
Other (non-network)	10.0
Premises	10.0
Land	n/a
Easements	n/a

Source: AusNet Services, *Revenue proposal*, October 2015, PTRM.

n/a: not applicable. The 'Land' and 'Easements' asset classes do not have assigned standard asset lives because these assets do not depreciate over time.

Note: Benchmark equity raising costs are generally amortised over the weighted average life of the RAB. AusNet Services does not require any benchmark equity raising costs in respect of its forecast capex for the 2017–22 regulatory control period. Accordingly, we have not assigned a standard asset life for amortising equity raising costs.

5.4.3 Remaining asset lives

We accept the continuation of AusNet Services' year-by-year tracking approach to calculate the straight-line depreciation of existing assets. However, we have applied an adjustment to AusNet Services' proposed calculations to ensure the profiles meet the requirements of the NER.[81] We also accept AusNet Services' proposal to accelerate depreciation on assets expected to be removed from service over the 2017–22

[81] NER, cl. 6A.6.3(b)(2).

regulatory control period by fully depreciating the remaining value of these assets over 5 years.[82]

Year-by-year tracking approach

AusNet Services proposed to continue with the year-by-year tracking approach for calculating depreciation of its existing assets, consistent with that approved for its previous determinations.[83] Therefore, under this approach, there is no requirement for a single remaining asset life for each asset class for the reasons discussed below. We accept this aspect of AusNet Services' proposal as it complies with the NER.[84]

However, we have applied an adjustment to AusNet Services' depreciation calculations to ensure the depreciation profiles meet the requirements of the NER.[85] In particular, each asset class' depreciation profile has been scaled in the PTRM to ensure the full opening RAB value at 1 April 2017 is returned over the remaining life of the asset. This scaling reflects minor divergences that emerge due to differences in the treatment of inflation between RAB components in the RFM and AusNet Services' depreciation calculations.[86]

Remaining asset lives as at 1 July 2017

AusNet Services did not propose any remaining asset lives at the asset class level. This is the result of AusNet Services continuing to use the year-by-year tracking approach for depreciating its existing assets, which is not the standard straight-line depreciation calculation in the PTRM. Unlike our standard approach in the PTRM, AusNet Services' depreciation modelling does not require an average remaining asset life for each asset class at the start of each regulatory control period. Instead, AusNet Services included in the PTRM separate worksheets containing year-by-year tracking calculations for straight-line depreciation of its existing assets and diminishing value depreciation calculations for new assets.

We accepted the use of the year-by-year tracking approach for depreciation existing assets at the 2013 transmission determination for AusNet Services, and accept its continued use for this draft decision in respect of the 2017–22 regulatory control period. However, as discussed above, we do not accept the use of the diminishing value method for depreciating new assets and have amended the depreciation calculations for new assets to be based on straight-line depreciation.

New asset class – Accelerated depreciation

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82 NER, cll. 6A.6.3(b)(2) and S6A.2.3.

83 Under the year-by-year tracking approach, capex within each asset class is disaggregated by year of expenditure and separately depreciated.

84 NER, cl. 6A.6.3(b)(1).

85 NER, cl. 6A.6.3(b)(2).

86 The RFM applies different inflation observations to index the RAB components for actual inflation—unlagged observation to index the opening RAB, and one-year lagged observations to index capex and depreciation. This leads to a mismatch between the opening RAB calculated in the RFM, and the sum of the depreciation calculated in AusNet Services' depreciation model that uses a single (lagged) inflation indexation method.

AusNet Services proposed that a new 'Accelerated depreciation' asset class be created for assets expected to be removed from service, and that the remaining value of these assets be subject to accelerated depreciation, to be fully depreciated in 5 years.[87] It provided information on why certain assets (with a remaining value of $11.6 million) had been removed from service (or are expected to be removed from service over the 2017–22 regulatory control period).[88]

This is a targeted approach to dealing with the issue that some assets may no longer be utilised. We consider it is reasonable that such assets, which have not been fully depreciated and therefore have a remaining value, be subject to accelerated depreciation reflecting its reduced economic life. We therefore accept this aspect of AusNet Service's proposal in principle.

However, we note that this is not always a clear decision as an asset unused for a time, may be utilised in the future. Therefore, we reviewed the information on the specific assets identified by AusNet Services as having been removed from service (or expected to be removed from service over the 2017–22 regulatory control period).[89] The decommissioning of some of these assets was also subject to advice from AEMO. We note AEMO has since provided advice that these assets are not required and may be retired.[90] As such, the contingent projects for the replacement of the Brooklyn and Templestowe reactive power assets—which are the subject of the proposed accelerated depreciation—are also not required (see attachment 6).

Our draft decision is to approve the proposed accelerated depreciation of $11.6 million of assets over the 2017–22 regulatory control period. However, AusNet Services made an error in its approach to reallocating the assets it had proposed for accelerated depreciation. It correctly reallocated the amounts between asset classes for the return on capital calculation. However, no such adjustment was made to the depreciation calculation, which is tracked separately. AusNet Services' proposal effectively depreciated the $11.6 million of assets twice. We have corrected for this error by removing this asset value from the depreciation allowances of the 'Transformers' and 'Reactive power' asset classes to reflect the amounts now depreciated through the new 'Accelerated depreciation' asset class.

The EUCV's submission did not support this proposal, stating that a business should bear the cost of any stranding.[91] However, as discussed in section 5.4.1, we do not consider that the NER allows for such stranded assets to go uncompensated.[92] Against this background, we consider it reasonable to depreciate assets that have been removed from service relatively quickly so they don't impact revenues and distort

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87 AusNet Services, *Revenue proposal*, October 2015, p. 178 and PTRM.

88 AusNet Services, *Revenue proposal*, October 2015, p.178 and pp. 189–190.

89 AusNet Services, *RINs Schedule 1 - 21.4. RAB Accelerated Depreciation Analysis.xlsx*, October 2015.

90 AusNet Services, *Transmission Revenue Reset: Update on Synchronous Condensers*, 7 April 2016, Attachment 1.

91 Energy Users Coalition of Victoria, *A response to AusNet revenue reset proposal for the 2017-2022 period*, February 2016, p. 42.

92 NER, cll. 6A.6.3(b)(2) and S6A.2.3.

prices well into the future. Such an approach also leads to a depreciation profile consistent with the nature of the assets no longer being used, as required by the NER.[93]

[93] NER, cl. 6A.6.3(b)(1).

A Depreciation approaches in the regulatory context

This appendix discusses depreciation approaches in the regulatory context.

A.1 What is depreciation?

Traditionally, depreciation is an accounting construct. Depreciation in accounts indicates the use of an asset over the accounting year and accounts for its loss of value due to wear and tear over its useful life. Some assets, such as land, are not depreciated as they have an unlimited useful life.[94]

For assets that do depreciate,[95] their useful life is used to either account for the reduction in the asset value evenly over that life (called straight-line approach)[96] or to determine a percentage[97] that is then applied to the asset value to work out the annual depreciation amount.[98] Applying a percentage leads to a declining depreciation amount over time and is therefore called a 'diminishing value approach'.[99]

The size of the annual depreciation charge also depends on the basis of the accounting approach used for valuing the asset. The two broad approaches to asset valuation are historical cost and current cost accounting. Historical cost accounting records the asset value at the nominal price paid. Current cost accounting will update the asset value for inflation and may also revalue the asset periodically using various revaluation approaches.

The circumstance in which depreciation is applied determines the precise accounting approach. For example, the tax office generally only allows historical cost accounting

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94 Australian Accounting Standards Board, *AASB 116, Property, plant and equipment*, December 2015, paragraph 58.

95 Depreciation is defined in AASB 116 (property, plant and equipment) as the systematic allocation of the depreciable amount of an asset over its useful life. The accounting standard requires depreciation to be charged on a systematic basis over the life of the asset.

96 This approach is also referred to as prime cost.

97 For example, an asset with 10 year life could have a depreciation percentage of 10 per cent (i.e. 1/10) applied to the remaining asset value each year. This percentage may also have a multiple applied. For example, tax law may allow the 10 per cent to be doubled to 20 per cent for certain assets. The higher the multiple applied, the greater the decrease in the value of the asset early in its life due to faster depreciation.

98 Accounting standards also allow a 'units of production' approach. Under this approach annual depreciation depends on units produced. For example, a car may be able to 'produce' 300,000 km of travel in its life. A per km depreciation charge could be developed and an annual charge determined based on km driven each year. This approach is information intensive and therefore unlikely to be practical in many cases. For many regulatory assets, the units of production are likely to be 'years of service'. For example, a power line with an expected life of 40 years is unlikely to produce for another 40 years just because its capacity was half used for the first 40 years. If 'years of service' is the 'production unit', the units of production approach effectively becomes a straight-line depreciation approach.

99 This approach is also referred to as declining balance.

for the value of the asset, but allows both the straight-line and diminishing value[100] approaches for determining the annual depreciation amount.

A.2 Depreciation in a building block revenue framework

Regulated service providers invest in large sunk assets. While some connection assets may be recovered from customers upfront, the greater proportion of the sunk costs are recovered over time. A depreciation charge is used for this purpose.[101]

The current depreciation approach applies the straight-line method (coupled with an indexed asset base and nominal rate of return) and results in a relatively even recovery of sunk costs over time.[102] This is shown in the next section. Such a profile of recovery is generally neutral in terms of incentives.[103] That is, of itself, an even recovery profile does not encourage or discourage early or later consumption or investment. Such a general proposition, however, may not be appropriate in specific circumstances. In the AER's APA GasNet final decision, two specific circumstances were noted:[104]

1. Where large lumpy investments occur with little initial demand. In this case, the deferral of depreciation may be necessary to encourage asset use. Economies of scale and scope will be encouraged by having lower prices initially to encourage use of such an asset.
2. Where capacity has been reached and no augmentation occurs. In these circumstances tariffs may have to rise (which can be achieved in the short to medium term by increasing depreciation), rather than remain flat. However, there are a variety of ways to achieve this. In the first instance, the efficient response would be to restructure tariffs to deal with any localised constraints. If the network is constrained overall, tariff structures are less relevant and the recovery of sunk costs more quickly could be an efficient way to ration supply of the fixed capacity.

Economic literature has supported even recovery, back loading, and front loading (accelerated) depreciation based on certain assumptions such as expected changes in demand and real replacement costs over time.[105] For example, if demand and costs

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100 The diminishing value approach is favoured by a business trying to minimise their tax payments in the short run. The use of this method is also optimal given that the tax office does not allow asset values to be indexed for inflation. That is, historical cost accounting could lead to NPV<0 outcomes as inflation is not accounted for. Of course, a competitive business is free to set any price it wishes and may therefore recover this inflation cost outside of tax depreciation credits.

101 The term amortisation is used to describe the depreciation of non-tangible assets such as goodwill.

102 This even recovery profile of straight-line depreciation is also recognised in Australian Accounting Standards Board, *AASB 116, Property, plant and equipment*, December 2015, paragraph 60.

103 The neutrality in our depreciation approach is also reflected in the regulatory asset base (RAB) roll forward. We have moved away from actual depreciation to forecast depreciation in rolling forward the RAB for electricity service providers. In doing so we noted that it makes the roll forward approach more neutral in its incentives and therefore does not distort the capital expenditure sharing scheme (CESS).

104 AER, *Final Decision APA GasNet, Part 3*, March 2013, pp. 128–129.

105 Appendix B summarises some of the economic literature on depreciation.

are expected to be relatively constant over time then an even depreciation profile is supported by some economic literature. Some service providers have also recently been proposing accelerated depreciation and submitting that they face particular circumstances warranting a change of approach.[106] In the economic literature, accelerated depreciation is most likely to have relevance in industries characterised by rapid technological change such as telecommunications (where demand for a technology may suddenly fall due to obsolescence) and in circumstances where the business bears the risk of any stranding of assets. We consider that expectations of a persistent decline in demand and persistent declining real replacement costs may also support such an approach.[107]

However, changing the depreciation approach in a building block framework can have a significant impact that goes beyond the depreciation allowance. The approach interacts with:

- the return on capital, through depreciation's impact on the remaining value of the asset base
- the weighted average cost of capital (WACC) depending on whether it is measured in real or nominal terms
- the approved capex (and the CESS incentives in electricity).

These interactions make the depreciation approach a large and blunt instrument to achieve particular purposes. That is, the impact of the change of depreciation approach can be disproportional to the size of the potential problem[108] and there could be more targeted alternatives for dealing with the issues.

The networks we regulate are often mature and growing (albeit slower than early in their life). Accordingly, we would expect a mix of assets at different stages of their lives that are being replaced with continuing demand for the services and some new growth related assets. At a high level, we consider that a high degree of predictability on future demand and real replacement cost trends would be needed to assume the trend in real replacement costs or demand are to change significantly for that historically observed.

A.3 Proposed changes and the impact on the revenue profile

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106 AusNet Services, *Revenue proposal 2017–22,* October 2015, pp. 175–190; AGN, *Revised proposal: Attachment 9.5 2016/17 to 2020/21 access arrangement information response to draft decision—Financeability*, January 2016, pp. 1–14.

107 Both trends in real costs and demand would need to be considered. For example, if there is an expectation of persistently falling real costs, but even faster rising demand then back loading depreciation may be preferable. Accelerating depreciation on the expectation of persistent falls in real costs alone encourages greater use in the future and with rising demand will likely lead to steep falls in prices, congestion and potentially earlier need for augmentation. This example illustrates that determining an ideal depreciation path is difficult when expected trends in real costs and demand have a high degree of certainty.

108 We noted this in the APA GasNet decision and how all assets are affected in the same way, even when the problem may relate only to a certain section of the network.

There have been three components of the depreciation approach where gas and electricity service providers have proposed changes that impact the revenue recovery profile. These areas of change are:

- reducing asset lives
- non-indexation of the asset base
- a diminishing value, rather than straight-line depreciation approach.

We discuss the impact of each of these areas of changes briefly, before exploring the arguments for and against some of these proposals. In all cases, however, the proposals are aimed at increasing (or accelerating) the rate at which funds are recovered by the service provider.[109]

A.3.1 Asset lives

Both the electricity and gas legislation require the funds invested to be recovered over the economic lives of the asset. [110,111] Determining the economic life of an asset is difficult. The economic life need not match the technical life of the asset, but if an asset is technically available for use then clearly it can serve an economic purpose.[112] An implicit assumption in most analysis of depreciation is that the economic and technical lives are closely related in practice, particularly if the investment was approved with relative certainty. We have generally taken a similar approach in practice.

The proposed changes we have encountered regarding asset lives relate to both standard asset lives (the expected useful life of new assets) and the remaining asset lives (the expected useful life of existing assets). We have generally conducted the assessments of standard asset lives from an engineering perspective, by way of general benchmarking of these lives across service providers.[113] Some consumer groups have advocated further work in this regard.[114] We have also allowed the revision to the remaining asset lives in particular cases. Shorter asset lives (that accelerate depreciation) were approved for the Amadeus Gas Pipeline (although the resulting expected stranding of that pipeline did not occur) and shorter gas meter

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109 Each change is NPV neutral in that it returns the initial cost of the asset. That is, only the profile of revenue is affected. This is discussed further in the subsection on NPV neutrality below.

110 NGR, rr. 89(1)(b) and (d); NER, cll. 6.5.5(b) and 6A.6.3(b).

111 We have considered r. 89(1)(a) of the NGR at times to review the price impact of a change in remaining asset life proposed based on efficient growth in the market. However, the AER has never rejected a proposed change to remaining asset lives on the grounds of an unduly large price impact that may affect efficient growth of the market as yet.

112 That is, an asset at the end of its technical life has no economic worth. Similarly, an asset that is technically sound may have no economic worth if no one demands it at any price.

113 In some cases, we have been limited by the use of non-standardised asset categories across service providers reflecting previous regulation across different jurisdictions.

114 Consumer Challenge Panel, *Response to AusNet proposal and AER issues paper for AusNet transmission revenue review 2017-2022*, February 2016, p. 36.

remaining lives were applied for Envestra based on revised technical performance data.

Accelerated depreciation was also allowed where specific assets were destroyed and no longer providing services –for example, the remaining value of Ergon Energy's assets destroyed by Cyclone Larry was allowed to be recovered over one regulatory control period. For similar reasons as discussed in attachment 5, we accept AusNet Services' proposal to accelerate the depreciation of specific assets it has identified as no longer being used.

Finally, we have also accepted changes to the way remaining asset lives are updated between regulatory control periods. Year-by-year tracking of depreciation has become more popular in recent times compared to the weighted average remaining lives approach. In the short run, all things being equal, this has increased the depreciation allowance of those who adopted it. In the long run, however, the depreciation profile will come to depend more on individual timing of replacement of the year-by-year tracked assets.

A.3.2 Indexation of the asset base

The electricity legislation requires the indexation of the asset base with the use of a nominal WACC.[115] This means that to prevent double counting of inflation, we remove the revaluation (indexation) gain on the asset base from the depreciation building block. The net depreciation allowance is then termed as 'regulatory depreciation'.[116]

In gas the case is not so prescribed. The indexation of the asset base, and therefore the impact on regulatory depreciation, was challenged by APA GasNet in relation to its access arrangement proposal in 2012. The AER considered the proposal but decided that indexation of the asset base remained appropriate. APA GasNet subsequently sought review of the matter by the Australian Competition Tribunal, which upheld the AER decision. AGN's current access arrangement proposal is based on a similar adjustment to the indexation of the asset base. The higher regulatory depreciation caused by un-indexing the asset base is offset by a quicker reduction in the value of the asset base (and therefore the return on capital that is earned) thereby still achieving NPV neutrality in the long run. However, the profile of total revenue recovery (regulatory depreciation plus return on capital) over the asset's life is altered significantly.

In theory there are three possible methods for determining revenue profiles using straight-line depreciation and asset lives based on their expected usefulness:

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115 NER, cll. S6.2.3(c)(4) and S6A.2.4(c)(4).

116 The indexation (revaluation) gain is subtracted from depreciation by convention. It could instead, for example, be included as a separate negative building block. The impact of changing this indexation on overall revenues will be the same regardless of its labelling.

1. applying a real WACC to the asset base indexed for inflation to determine the return on capital and applying straight-line depreciation of the indexed asset base to determine the return of capital (used previously by the ESCV, ESCOSA and IPART)
2. applying a nominal WACC to the asset base indexed for inflation to determine the return on capital and applying straight-line depreciation of the indexed asset base, plus an adjustment for the inflation of the asset base, to determine the return of capital (the AER's standard approach, also applied by the ACCC and QCA)
3. applying a nominal WACC to the asset base at historical cost (un-indexed) to determine the return on capital and applying straight-line depreciation of the historical cost asset base to determine the return of capital (APA GasNet's and AGN's proposals[117]).

The first and second approaches above deliver the same cash flow outcomes over the life the asset.[118] The cash flows of these methods lead to a relatively flat revenue profile which is expected to generate relatively stable prices, and a relatively even utilisation of the asset over its life.[119] In contrast, the third method front loads cash flows and consequently produces a steeper revenue profile leading to higher prices early in the asset's life, and lower prices later in the asset's life.[120]

Figure 5.7 shows recovery of revenue over the assumed entire useful life of an asset of 25 years, with a real WACC of 7.32 per cent, CPI of 2.5 per cent and nominal WACC of 10 per cent. The cost of the asset is initially $100.[121]

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117 AGN's proposal is to only un-index the asset base by a fixed percentage so the impact in terms of the change in the slope of the line is only proportional to what APA GasNet proposed.

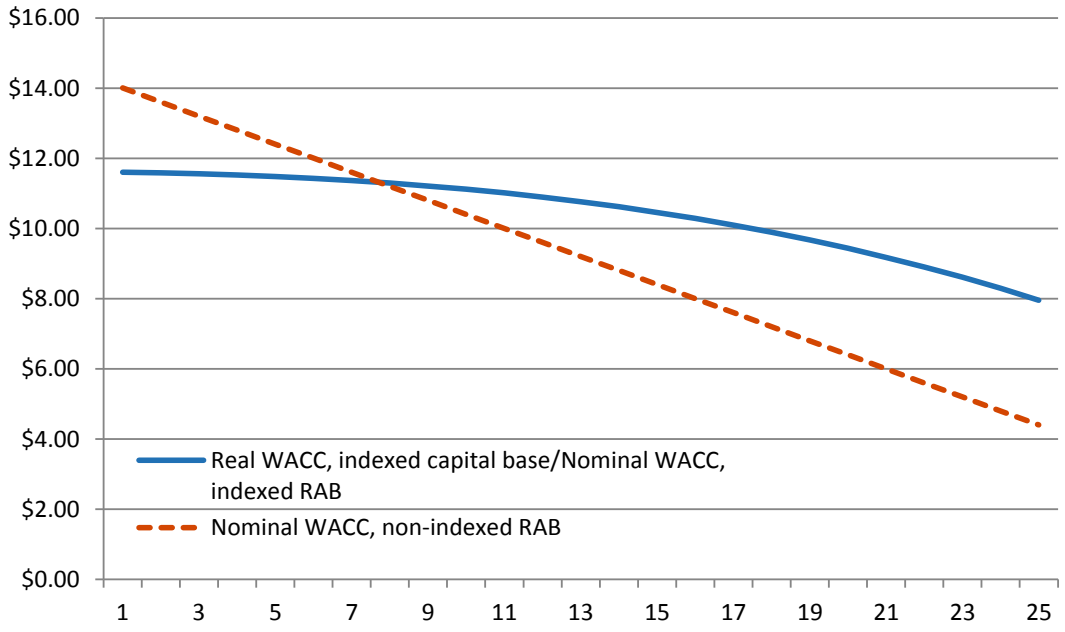
118 All three methods lead to an NPV neutral revenue profile over the life of the asset.

119 The precise path can be a slow decline or increase depending on such factors as the WACC and inflation, but relatively speaking the approach is flatter than the accelerated or back load approaches, which are obviously not of themselves aimed at achieving a flat revenue profile.

120 A switch in approach midway through an asset's life can be done in an NPV neutral way. When it occurs there is a step change in depreciation at the time of the switch. This timing also affects the change to future depreciation for each year of the asset's remaining life. For example, a switch that causes an increase in depreciation immediately requires depreciation to reduce in later years. The bigger the initial increase, and the closer the switch occurs towards the end of the asset's life, the steeper the decline in depreciation that has to occur over the remaining life of the asset to maintain NPV neutrality.

121 This example was first presented in the APA GasNet draft decision. AER, *Draft Decision APA GasNet*, Part 2, September 2012, pp. 177–178.

Figure 5.7 Revenue path example – indexed vs un-indexed asset base ($ nominal)



Source: AER analysis.

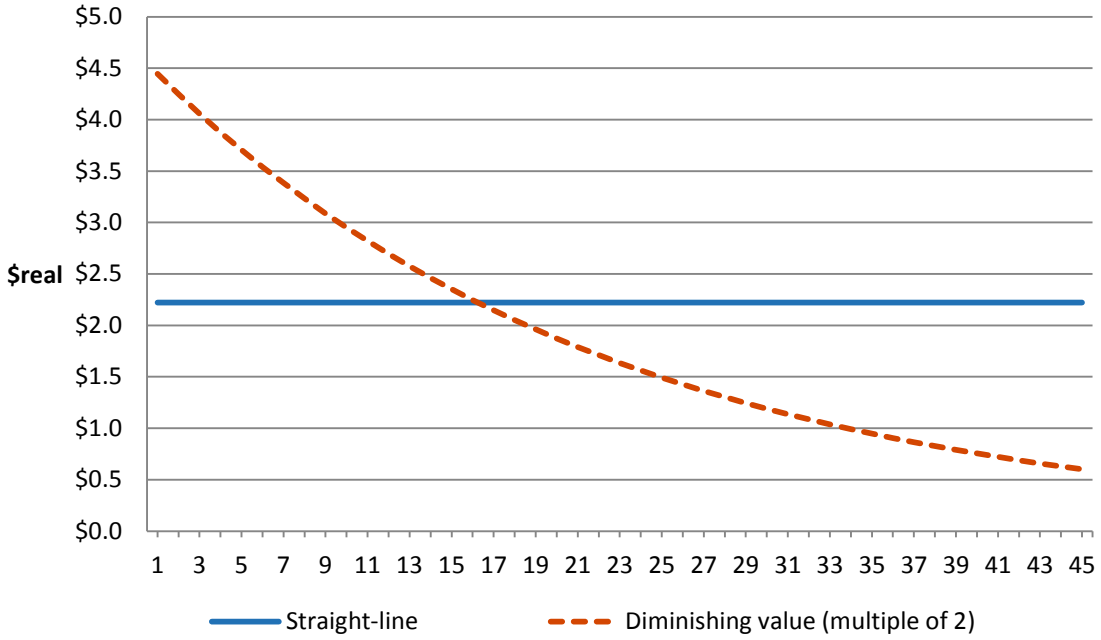
The decision to un-index the asset base is a significant one. The service provider's revenues increase by roughly the amount of the expected inflation rate multiplied by its asset base. Within the legal context, the proportionality of such a change would need to be considered against the size of the issue to be addressed and the quality of the supporting evidence.

A.3.3 Straight-line versus diminishing value approach

Straight-line depreciation is calculated by dividing the asset value by the number of years the asset is still expected to be in service. This means that there is an even recovery of depreciation, in real terms, over the life of the asset.

The diminishing value method, on the other hand, depreciates an asset's remaining value by a given percentage each year. Regardless of the percentage chosen, diminishing value results in the depreciation amount declining (reducing) each year as the percentage is applied to a decreasing asset value. This difference is reflected in Figure 5.8 for an asset with an expected standard asset life of 45 years and a $100 starting value. It also uses a multiple of two in the diminishing value formula as proposed by AusNet Services (transmission) in its proposal, which doubles the depreciation amount initially (year 1). The analysis is in real dollars.

Figure 5.8 Depreciation path – straight line vs diminishing value ($ real)



Source: AER analysis.

The diminishing value method leaves a residual value for the asset after it is expected to expire, whereas the straight-line method does not. This requires an ad hoc adjustment at the end of the asset's useful life to remove the remaining value or the life is effectively extended indefinitely.

The decision to switch to a diminishing value approach with a multiple is a significant one. It would be less so, if there was no multiple applied to the way the diminishing value rate was calculated. In that case, depreciation would reduce relatively slowly from its current levels. However, if a multiple is applied to the calculation (such as the value of two proposed by AusNet Services) then there will be an initial step change in depreciation equal to this multiple and the rate of decline in depreciation will also be greater compared to no multiple being applied. Within the legal context, the proportionality of such changes would need to be considered against the size of the issue to be addressed and the quality of the supporting evidence.

A.4 The arguments for and against accelerated depreciation

There are economic arguments that could be made for accelerated depreciation in specific circumstances.[122] Some of these on the face of it appear to conflict but are

[122] There have also been arguments presented for back loading depreciation, particularly in relation to greenfield pipelines, but we have not presented these arguments as no stakeholder is currently seeking such an outcome.

presented as discrete issues by the service providers.[123] The arguments for accelerated depreciation that have been put forward by network service providers are:

- Their proposal leads to an NPV neutral outcome.
- The network is becoming constrained.
- The network is becoming under-utilised due to disruptive technologies.
- Stranding risk.
- Promoting smooth prices for customers.
- Financeability concerns.

A.4.1 NPV neutrality

Both the electricity and gas legislation require the service provider to be allowed to recover only the funds it invested in net present value terms.[124] No revaluation gains can be kept by the service provider.[125] By the same token, there is no scope for prudently acquired assets to be written down without compensation, as would have occurred under previous optimisation approaches in valuing assets (e.g. under the depreciated optimised replacement cost—DORC—approach).[126] The proposed changes above are all NPV neutral in their application.

NPV neutrality is generally considered an important principle.[127] Even though it is an explicit principle in our regulatory framework, many economists recognise NPV neutrality as an implicit part of the regulatory compact.[128] NPV neutrality has also been an important element in the UK in discussions on financeability. Uncertainty over whether financing concerns may be over stated and to prevent service providers getting any windfall gain or loss in the long run, accelerating depreciation has been considered as an option by regulators in the UK because it is at least NPV neutral. Other changes to depreciation, such as un-indexing of the asset base, while causing step change increases in depreciation initially, can also be NPV neutral by requiring depreciation to fall relatively more (than the indexed approach) in later years.

Economically, back loading of depreciation is usually justified by theories such as fostering positive network externalities by encouraging connections or to overcome a first mover disadvantage or prisoner dilemma.

123 The CCP in response to our Issues Paper on AusNet Services' proposal also noted the various rationales being presented by the service providers for accelerated depreciation.

124 NGR, r. 89(1)(d); NER, cll. 6.5.5(b)(2) and 6A.6.3(b)(2).

125 Inflation is compensated for through the use of a nominal rate of return.

126 This rule was largely developed to provide investor certainty in the context of a debate at the time as to how assets should be valued.

127 There are also approaches that look beyond this principle. Such approaches can recognise depreciation as the stream of future benefits from the assets over its life and may even include the cost of eventual replacement of the asset. In such cases, the depreciation allowance is divorced from the actual costs paid by the regulated service provider (and does not affect the asset base). The AER has allowed such outcomes in limited circumstances. For example, in public lighting the AER has allowed an annuity based approach to depreciation to be used based on the expected replacement cost of these lighting assets and a set expected asset life.

128 See appendix B.

NPV neutrality is an important principle but it is also a directionless one as almost a limitless number of NPV neutral depreciation profiles could be developed. To take an extreme example for illustrative purposes, the funds of an asset with a 50 year standard life could be recovered in five years in an NPV neutral way. Theoretically, a customer should be indifferent to paying for an asset in five or 50 years, as long as the customer has use of the asset for 50 years.[129] However, if the speed of recovery is too extreme, demand will be inefficiently deterred. In such an extreme case a service provider may also find it difficult to operate for another 45 years if they had received all the funds back in five years .[130]

In the APA GasNet decision we considered that:

> …APA GasNet's proposed change of depreciation approach was largely NPV neutral. However, there are two important points to observe regarding this standard:
>
> 1. NPV neutrality is not equivalent to efficiency. It is adopted as a standard to make sure a business is kept whole—that is, what is invested by the business is returned to it in NPV terms over the economic life of its assets. However, even if recovery of funds were, say, deferred by a hundred years in a NPV neutral way, this deferral would likely send the business bankrupt. Similarly, if customers were asked to pay for all investment immediately (again consistent with NPV neutrality) those customers could go bankrupt or simply stop consuming. Neither outcome would be efficient.
>
> 2. NPV neutrality from the business perspective is unlikely to be NPV neutral from a customer perspective. It is reasonable to assume that the current service provider will still be delivering the service into the future. Accordingly, there is scope to consider when it is optimal for the business to recover sunk costs. However, it is less certain that today's customers will also be future customers. It is even less likely customers will consume the same amount of services in each period, which would be necessary for NPV neutrality from a customer perspective.[131]

The Tribunal in accepting the AER's position in relation to APA GasNet has also implicitly accepted that more than just NPV neutrality needs to be shown by the service provider to justify an accelerated depreciation approach.[132]

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[129] Obviously if the asset is replaced as soon as funds are recovered, the customer would not be indifferent to the recovery period.

[130] In theory, however, the service provider could set aside money received in advance to continue to operate the full 50 years.

[131] For example, assume mortgage interest rates drop two per cent in the market. Your bank may come to you and say it is planning to keep interest rate at their previous (now higher) level on the basis that it will provide lower than market interest rates in ten years' time. Such a pricing approach may be NPV neutral for the bank's perspective. However, it would not be for a customer with only 10 years left on their mortgage. That customer would pay only the higher than market interest rate and receive no benefit from the lower than market rate in the future.

[132] Australian Competition Tribunal, *Application by APA GasNet Australia (Operations) Pty Limited (No 2) [2013] ACompT8*, 18 September 2013, para. 181.

A.4.2 Network constraints

This premise was presented by APA GasNet who suggested that higher depreciation (that leads to higher prices) at that time would better allocate scarce resources.[133]

The AER accepted this argument at a high level but rejected APA GasNet's approach on the following grounds:

- General network wide constraints were not evident. Only certain parts of the network appeared to possibly be subject to constraint. We suggested peak pricing solutions for these areas. Adopting an unindexed asset base approach would have accelerated depreciation across the entire network.
- Augmentation allowances were approved that could be used to remove these constraints. If no augmentation was planned constraints may have been expected to be more prevalent.

A.4.3 Network becoming under utilised

This argument is currently being made by AusNet Services to justify a diminishing value approach that accelerates depreciation for new assets. AusNet Services' submission is largely made on equity grounds. That is, if customers leave the network, remaining customers pay higher per customer depreciation amounts. Based on our assessment of the evidence before us, we have identified the following concerns with the proposal, which are discussed further in attachment 5:

- AEMO data suggests that new technology may only slow the rate of increase in utilisation, not cause a fall in overall utilisation of the network.[134] Anecdotal evidence also suggests customers with new technologies are also interested in exporting to the grid and retailers developing ways to better manage this.[135]
- Higher depreciation and prices will accelerate any decline in utilisation. The accelerated depreciation approach is not trying to avert falling utilisation. It actually risks creating the 'death spiral' that some commentators have suggested may occur because of new technologies. That is, higher prices (caused by accelerated depreciation) may encourage even more customers to look at alternative technologies.
- Incentives for efficient capex. Our specific concerns are:

  (a) Is the capex warranted – If utilisation of an asset is expected to fall significantly, it would be questionable whether the capex should be approved in the first place. Rather than accelerating depreciation on new assets, providing service

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133 AER, *Access Arrangement final decision, APA GasNet Australia (Operations) Pty Ltd, 2013–17, Part 2: Attachments*, p. 147.

134 AEMO, *Emerging Technologies Information Paper, National Electricity Forecasting Report*, June 2015, p. 53.

135 A recent Catalyst report show how one retailer was offering a service where that retailer bid into the NEM on behalf of their customers when wholesale prices spiked. The retailer's software draws down from the customer's battery storage to do so.

providers with incentives to extend the lives of existing assets, by disallowing replacement capex, may be preferable. Other alternatives, such as requiring greater upfront connection costs for augmentation could also be a better solution for specific areas of concern rather than a change to a depreciation approach that affects all new assets and customers in the same way.

(b) Accelerated depreciation can encourage early replacement – If the asset is largely depreciated before its useful life ends the service provider may be encouraged to replace the asset sooner. Indeed, if the financeability argument has any merit, the lower returns in later year (given the asset value has been quickly depreciated away) necessarily provide incentives for early asset replacement to maintain prices at higher levels. More generally, it is questionable whether a service provider would be willing to continue to operate an asset for many years on which it is getting very little return, having recovered most of its money in the early years of the asset's life.

(c) There will be a greater step change in depreciation when the asset is replaced – Assuming the asset is replaced by an asset of similar expected life and real value[136] as the original, the AER's approach (which encourages an even recovery of depreciation over the asset's life) does not result in a change in annual depreciation.[137] However, apply those same assumptions to an asset that is depreciated using an accelerated depreciation profile, can create a significant jump up in annual depreciation when the asset is replaced.[138]

A.4.4 Stranding risk

AusNet Services submitted that some of its assets are becoming stranded. There is also economic literature supporting front loading of depreciation where there is stranding risk—that is, the risk the service provider will be uncompensated if the asset is no longer used.[139] Such positions are usually advocated in rapid change technological sectors such as telecommunications.

We do not consider that the current regulatory framework results in uncompensated stranding, as the residual funds of any assets that are no longer used can be recovered from remaining customers.[140] There is also scope for prudent discounts to

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136 If the real value of replacing the asset is higher than the original, then there will be a step change under the SL approach. The step change under the DV method in such circumstances is even bigger. Back loading depreciation would be the best way to prevent a jump in depreciation when an asset is replaced, if real costs are expected to be higher when the asset is replaced.

137 For example, an asset with a real value of $100 and an expected life of 10 years has an annual depreciation amount of $10. If replaced by an identical asset the annual depreciation amounts before and after it is replaced are the same.

138 How significant the jump is depends on the particulars of the approach. In terms of the example in the previous footnote, if depreciation was in the first year of the asset life $20, but by the final year only $2, there would be a tenfold increase in depreciation when the asset is replaced.

139 See appendix B.

140 NER, cl. 6A.6.3(b)(2).

be used to help keep customers on the network (and thereby contributing to some of the sunk costs) where bypass options may be possible.[141]

However, we note that some stakeholders have submitted that not compensating businesses for stranded assets would be consistent with what happens in competitive markets when assets become stranded.[142] While the regulatory framework allows service providers certain benefits that may not be available in competitive markets (such as being allowed a return on assets that may only be partially utilised), such benefits are traded off so that service providers are willing to make large sunk investments in the first place. That is, such benefits are part of the 'regulatory compact' as some economists have labelled it.

As discussed in attachment 5, we accept another part of AusNet Services' proposal that allows for specific assets that are no longer used or are likely to no longer be used over the 2017–22 regulatory control period to be fully depreciated over that period.

A.4.5 Smoother prices

Coupled with the arguments above, APA GasNet, AGN and AusNet Services have submitted that their approaches lead to smoother prices.

While we accept smooth revenues, particularly within a regulatory control period, as an important consideration, it is not an end in itself. If it is efficient for prices to fall or rise due to changes in the efficient costs of other building blocks, they should do so. We consider that the depreciation approach should not be amended to offset a lower WACC or any other building block, thereby maintaining prices at higher than economically justified levels, distorting investment and consumption decisions.

Some service providers have submitted other building block cost reductions are only 'temporary'.[143] These suggestions go beyond expected use and replacement costs of the assets. We consider that to engage in such broader forecasting is effectively extending the entire building block assessment beyond the relevant regulatory control period. Forecasting is uncertain, particularly across a number of regulatory control periods as there is more scope for things to change over multiple periods. Errors in such long term forecasting are more likely to lead to unintended impacts.[144] Arguments on the temporary nature of cost reductions also have not addressed annual updates that occur in the regulatory framework. For example, the WACC is updated annually for the cost of debt. [145] If the cost of debt rises each year, the WACC will rise each year. If

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141 NER, cl. S6A.2.3(a)(3)(i).

142 Energy Users Coalition of Victoria, *A response to AusNet revenue reset proposal for the 2017-2022 period*, February 2016, pp. 42, 44.

143 Incenta, *Assessing financeability for a benchmark regulated business: comment on the draft decision*, January 2016, p. 3.

144 For example, the replacement costs of assets may be expected to rise in the future suggesting back loading of depreciation. However, if depreciation is instead accelerated due to a lower WACC than previously, then this will create a step change problem in depreciation and therefore prices when the asset is replaced.

145 There are also annual cost pass throughs that can occur during a regulatory control period.

depreciation has been increased too (due to accelerated depreciation) during the regulatory control period then customers face higher prices from both the higher depreciation and the rising WACC over that period.[146] The impact on customers of changing the depreciation approach is not 'temporary' but long lasting (even if cost reductions prove to be 'temporary'). If the cost of debt falls or remains relatively flat each year, then cost reductions could not be considered 'temporary'.

We have been able to demonstrate that accelerated depreciation is unlikely to lead to smoother long term prices in the cases encountered to date.[147] It would only be in coincidental circumstances—for example, coincidental timing of replacement of assets or specific changes in other building block costs—that a declining depreciation profile would lead to smoother revenue than our approach that adopts a flat depreciation recovery profile. Such coincidental circumstances are unlikely to be maintained in the long run. Instead, in the modelling conducted, accelerating depreciation generally leads to relatively higher prices for a number of regulatory control periods before prices reduce significantly. After the initial step up in depreciation (and therefore prices), prices only slowly decline for a number of periods, because the 'temporarily' lower costs are still rising to their assumed future level in the models. From that point on, the downward trajectory of accelerated depreciation dominates the change in prices year on year.

A.4.6 Financeability

APA GasNet and AGN (more recently) submitted that we should adjust the depreciation allowance in order to meet certain financial metrics necessary to achieve the adopted benchmark credit rating for estimating the return on debt.

As discussed in the APA GasNet decision and attachment 5 of the AGN final decision, we are not persuaded that these financial metrics can be used determinatively in a building block revenue framework. As a result, we are not satisfied that there is strong evidence in support of an accelerated depreciation profile. Nonetheless, we assessed AGN's revised proposal to accelerate depreciation via an adjustment to the indexation of the asset base. Overall, we were not satisfied that AGN has addressed the potential consequences of its proposed approach. Specifically, we considered:

- Increasing depreciation in the short run will mean relatively lower depreciation in the future. Unless the return on equity increases substantially, this may exaggerate the impression of weak financial metrics.[148] We illustrate this effect below.

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[146] That is, an overshooting in revenues necessarily occurs over the regulatory control period. To prevent this outcome within the regulatory control period, any step change in depreciation during the regulatory control period would have to be avoided. Instead, depreciation would have to decline from its current levels as the cost of debt increases to maintain stable prices over the regulatory control period.

[147] See for example; AER, *Access arrangement final decision APA GasNet Australia (Operations) Pty Ltd 2013–17 Part 3: Appendices,* March 2013, pp. 137–142.

[148] However, we consider that the credit ratings agencies might also be inclined to accept lower metrics in line with the lower return on equity environment.

- We are required to estimate the rate of return in a way that achieves the allowed rate of return objective. Similarly, we set revenue allowances to compensate the service provider for its efficient opex, tax and capital expenses (through return on and of capital). As we are satisfied that the rate of return achieves the allowed rate of return objective, we are not persuaded there is a basis to make compensatory adjustments to the depreciation allowance.

Illustration of impact on financeability

To illustrate the effect of accelerating depreciation on financial metrics, we have set out a simple example of a building block revenue stream over a 20 year time period.[149] In these examples, we have assumed constant opex, and returns on debt and equity over time. Then, under these conditions we have calculated financial metrics using the approach adopted by Incenta (on behalf of AGN). The following focus on funds from operations (FFO) to debt,[150] which is identified by Incenta as the key financial metric that ratings agencies focus on.

For the reasons discussed in appendix D of the AGN final decision[151], we are not persuaded that these metrics are applied as rigidly as Incenta submitted, or that variations in these metrics over time will necessarily result in changes to credit ratings. However, adopting the approach proposed by Incenta and applying it to a generalised building block scenario, we conclude that:

- Accelerating depreciation has significant long term implications for financial metrics calculated using benchmark revenue assumptions.
- Even if we do not accelerate depreciation in the short term, there is a natural tendency for financial metrics to improve over time as the RAB is depreciated.
- Forecasting the ultimate impact of accelerated depreciation depends on assumptions about future input costs or capital base additions (and hence debt and equity raising). This sort of forecasting is difficult and imprecise, which indicates a high degree of risk in relying on these forecasts.
- However, accelerated depreciation in one or more regulatory control periods means that future financial metrics will necessarily be relatively worse compared to a long term straight-line depreciation approach in the same circumstances of input costs.

The following charts step through different underlying assumptions that impact on the results. For context, Incenta submitted in its initial report that approximately a two per

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[149] For simplicity, we haven't included all of the calculations here. However, the key assumptions are: the opening capital base is valued at $100. The standard life of the asset is 30 years and gearing is 60 per cent. The starting RoD is 8% and the RoE is 10%. We assume $10 of opex per year (roughly 30 to 40 per cent of revenue), gamma is 0.4, the tax rate is 30 per cent, and that tax depreciation is equal to regulatory depreciation. Further, we assume that inflation is zero.

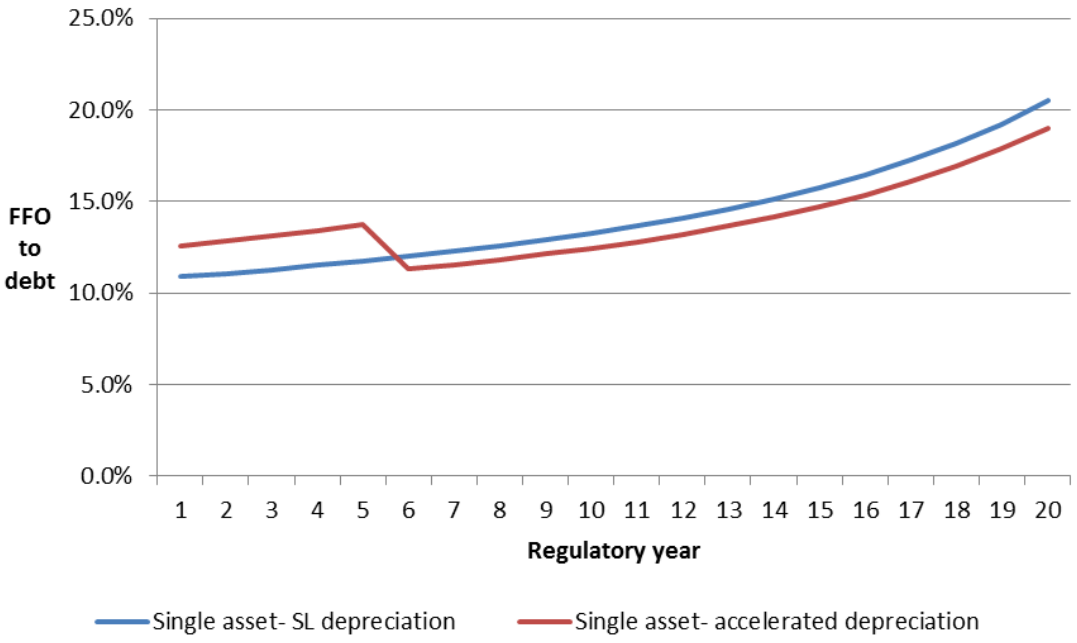
[150] FFO in this context is the service provider's revenue allowance less opex, tax and interest expenses.

[151] AER, *Final decision – Australian Gas Networks Access Arrangement 2016 to 2021 – Attachment 5 – Regulatory depreciation*, May 2016, Appendix D.

cent improvement in the FFO/debt ratio would result in the benchmark efficient entity maintaining a BBB+ rating,[152] compared to potentially falling to a BBB– rating. Simplistically this suggests that, based on Incenta's analysis, a one per cent difference between paths could result in a single band downgrade or upgrade:

- Credit metric scenario 1—A single asset base that depreciates but is never added to (i.e. no capex). This shows that if the asset base is allowed to depreciate in a straight-line without substantial additions, financial metrics will gradually improve as depreciation becomes a relatively higher proportion of revenue compared to the return on capital. The two lines in Figure 5.9 compare a scenario of straight line depreciation against a scenario where depreciation is accelerated for five years, then this accelerated portion is 'caught up' over the following 15 years. To shorten the period of 'catch up' results in the accelerated depreciation profile dipping even further below straight-line depreciation after the initial period of acceleration.

Figure 5.9 Credit metric scenario 1—single asset and no new capex



Source: AER analysis.

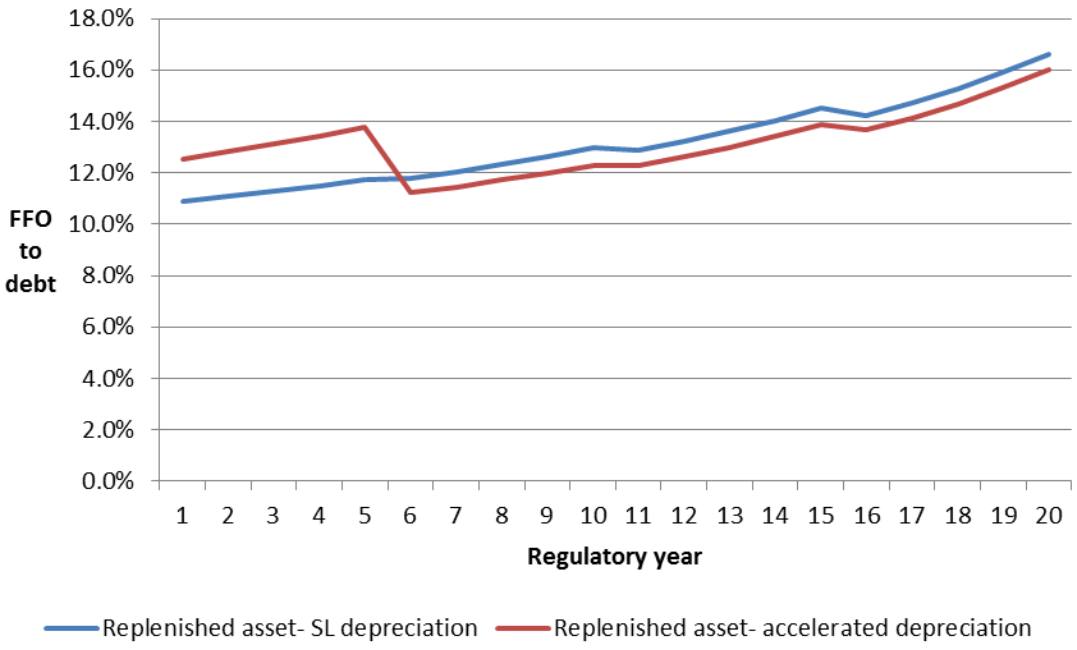
- Credit metric scenario 2—An asset base with the same starting assumptions as scenario 1, but assumes that a proportion of the opening asset base is increased through capex at the start of each period.[153] This is to show a more realistic (although still simplified) profile of cash flows over time where a firm incurs capex compared to a single asset that is never added to. In particular, Figure 5.10 shows

[152] Incenta, *Using the Profile of Prices During an Access Arrangement Period and Return of Capital to Improve Financial Metrics*, June 2015, p. 23.

[153] Specifically, 20 per cent.

that credit metrics do not uniformly rise over time as capex is added to the capital base. This is because, where new assets are added to the capital base, the return on capital (and hence assumed interest payments) makes up a larger proportion of the overall revenue allowance compared to a more heavily depreciated asset. However, unless very sizeable additions are made to the capital base, the financial metrics will still tend to improve over time.

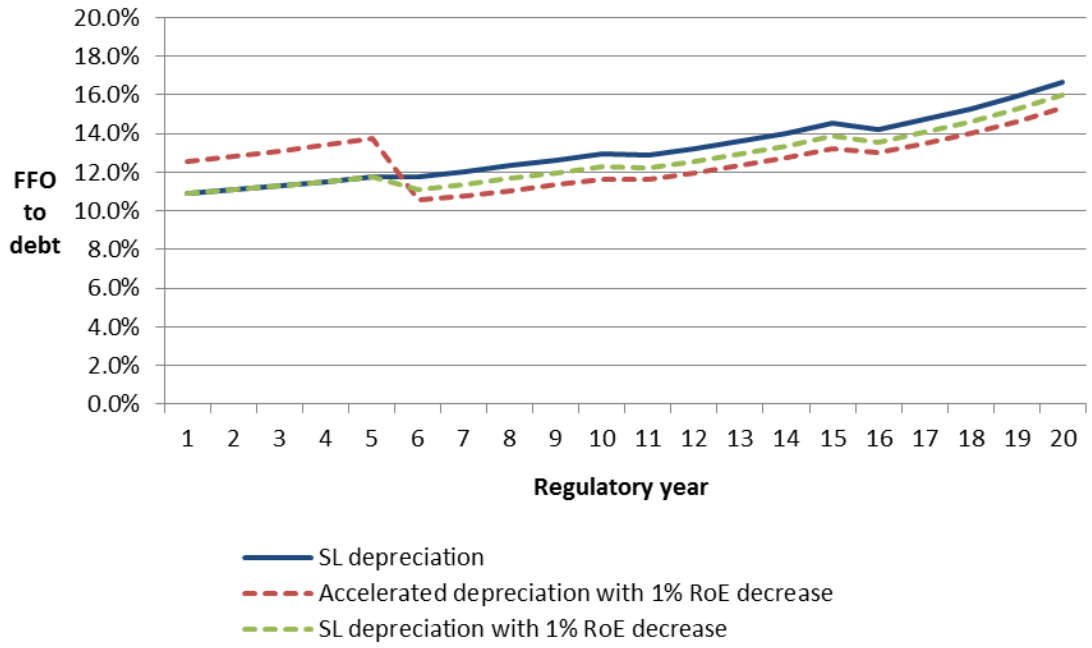
Figure 5.10 Credit metric scenario 2—new capex added at the start of each access arrangement period



Source: AER analysis.

- Credit metric scenario 3—This shows the same asset base profile as scenario 2. However, we test the impact of a one per cent ongoing decrease in the return on equity in regulatory year 6 under the two different depreciation paths. Figure 5.11 shows that the necessary downward drag on credit metrics from 'catching up' accelerated depreciation, coupled with a drop to the return on equity, could result in problematically lower credit metrics than forecast. This is important, because proposals to accelerate depreciation in the short term depend significantly on forecasts and assumptions about long term input costs and demand.

Figure 5.11 Credit metric scenario 3—one per cent ongoing increase or decrease in the return on equity



Source: AER analysis.

The UK experience with financeability adjustments

In AGN's proposal, and the reports prepared by its consultants, they have referred to precedent in the UK. Specifically, in past determinations the energy (Ofgem) and water (Ofwat) regulators have at various points accelerated revenue in part driven by financeability concerns. While some of these adjustments were not made strictly as adjustments to the depreciation allowance, the adjustments appear to have been NPV neutral and therefore have the same effect as accelerating depreciation.

Our assessment of the UK experience with accelerated revenue suggests that this approach was not clearly successful. In particular, this approach appears to have placed a disproportionate burden of costs on present day consumers at the expense of future users who will also enjoy comparable use of the same (though largely depreciated) assets.

We note that, in developing its own financeability policy, Ofgem engaged CEPA to consider 'issues related to financeability'. CEPA summarised the UK experience with accelerated depreciation as follows:

> Regulation which is expected to mimic the operation of competitive markets has adopted an approach to financeability which places a major cost on today's consumers. In the energy sectors this has led to inter-generational equity concerns since the solution to financeability has been to halve the economic life of assets for depreciation in electricity distribution and transmission and to expense 50 per cent of a significant capex programme in gas distribution. In a

> competitive market when funding is required for projects with strong business cases but additional debt would breach financial ratios there would be a call on equity investors. There is no reason why this approach cannot happen in the regulated sectors and has been used recently by Ofwat (and to an extent Ofgem at TCPR4).
>
> If there are concerns about the credibility of the regulatory system which would lead to a higher cost of finance there are additional actions that can be taken to strengthen regulatory commitment. Given that a strong regime with a significant track record exists it is difficult to believe that insufficient commitment is perceived by the markets, but if that is the case Ofgem can take appropriate actions.
>
> What is key is ensuring that the building blocks which ensure that the commitment to long-term financial capital maintenance is delivered are estimated appropriately. There are primarily incremental actions that Ofgem can take to strengthen its existing position.[154]

Ofgem noted similarly that:

> Our approach of shortening the assumed asset lives for the DNOs and expensing 50% of gas mains replacement for the GDNs are largely to ensure that modelled cash flow ratios are consistent with those required for a comfortable investment grade credit rating. However, arguably, these measures mean that current consumers may be bearing too much of the cost of assets that have useful lives well beyond those assumed.[155]

Similarly, Ofwat observed that:

> We have not adopted a policy of accelerated depreciation in our past price determinations as we have considered it breaks the link between asset lives and the capital expenditure required to maintain and replace the asset base.[156]

A.5 Conclusion

Depreciation is only one driver impacting overall revenues and therefore prices. Pricing structures can also be used to address many issues without adopting a particular depreciation profile. Adopting a particular depreciation profile may counter other aspects of the regulatory decision (for example, a higher depreciation allowance offsetting a lower WACC).

The gas and electricity rules require the depreciation profile to reflect the nature of the assets over their economic lives in the asset base.[157] An approach that allows recovery

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154 CEPA, *RPI-X@20: providing financeability in a future regulatory framework*, May 2010, p. viii.

155 Ofgem, *Emerging thinking—Embedding financeability in a new regulatory framework*, January 2010, p. 13

156 Ofwat, *Financeability and financing the asset base – a discussion paper*, March 2011, p. 29. See at http://www.ofwat.gov.uk/wp-content/uploads/2015/11/prs_inf1103fpl_financeability.pdf.

157 NGR, rr. 89(1)(b) and (d); NER, cll. 6.5.5(b) and 6A.6.3(b).

of depreciation evenly in real terms over an asset's useful life reflects a general expectation that both present and future customers are likely to get similar economic use from the assets. Of itself, even recovery of invested funds does not distort the timing of consumption or investment decisions. Accelerating or decelerating depreciation necessarily distorts the timing of consumption and investment decisions to achieve a particular end—for example, accelerating depreciation in the face of falling utilisation, raises prices and is likely to encourage further reductions in utilisation. Given depreciation is a blunt instrument great confidence in the size and direction of any expected trends would be needed before a particular depreciation profile adopted. The consequences of applying a particular depreciation profile in the short run may exacerbate the problem it was intended to solve or create new problems in the long run. Using a depreciation approach to deal with short term cash flow problems and falling utilisation (as proposed by AusNet Services) looks particularly problematic in the long run. Accelerating depreciation reinforces these problems in the long run, absent some future counterbalancing factors.

B Literature review and observations

The academic literature on depreciation in a regulatory context broadly addresses two distinct issues:

- What conditions are necessary to ensure that a regulatory depreciation allowance will be 'compensatory'. A compensatory depreciation allowance is one under which the net present value of depreciation cash flows are exactly equal to the face value of the initial investment, which means that the firm is fairly compensated from the perspective of both investors and consumers.
- Amongst compensatory depreciation paths, which path of depreciation over time is optimal for the regulated service provider, and which path is optimal for consumer welfare.

Importantly, the theory of depreciation is closely linked to the rate of return framework. All conclusions about whether a depreciation approach is compensatory depend on the combination of the depreciation approach with a compatible approach to the return on capital.

B.1 Compensatory depreciation

Schmalensee stated the requirements for a compensatory depreciation path within a depreciated original cost framework are as follows:[158]

> … even though rate-of-return regulation is based on accounting profitability, rate-of-return regulation is in principle fair to both investors and rate-payers no matter how depreciation is computed. More precisely, if a regulated firm is allowed to earn its actual (nominal) one-period cost of capital on the depreciated original cost of its investments, and if actual earnings equal allowed earnings, then the net present value of all investments is zero for any method of computing depreciation.

A 'depreciated original cost' framework refers to a regulatory framework where the asset base is valued at historical cost less the cumulative value of depreciation on that asset to date. This is different to the framework we operate in, where the asset base is indexed each year for inflation. However, Brennan showed that the same principle applies under an 'inflation adjusted original cost' framework.[159] This is close to the framework that we apply, and is equivalent in NPV terms.[160]

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158 R Schmalensee, *An expository note on depreciation and profitability under rate-of-return regulation, Journal of regulatory economics*, Vol. 1, Iss. 1, September 1989, pp. 239–298.

159 T Brennan, *Depreciation, investor compensation, and welfare under rate-of-return regulation, Review of industrial organization*, Vol. 6, Iss. 1, January 1991, pp. 73–87.

160 The key difference is that the return on capital in an IAOC framework is calculated using the inflation-adjusted asset base and a real return on capital. In contrast, we use a nominal return on capital, and make an adjustment to the depreciation allowance to offset the indexation of the asset base. This adjustment is necessary to prevent double counting of inflation when a nominal rate of return is applied to the inflation adjusted asset base.

This means that under the capital cost framework that we adopt, investors are fairly and fully compensated regardless of the depreciation path that we choose. We have previously discussed this equivalency in detail in the 2013 APA GasNet decision.

Crew and Kleindorfer analysed a scenario where technological change or new competition might require front-loading of depreciation in order for the firm to be assured of full recovery of its asset base.[161] However, under the NER and NGR[162] frameworks, once capex enters the asset base the service provider is guaranteed to recover the investment over the lives of the assets. As a result, this risk has relatively lesser weight in our analysis.

B.2 Optimal depreciation paths

The academic literature on the optimal path of depreciation for regulatory purposes is typically based on relatively simplified models of capital costs within a regulatory model. Given the relatively greater complexity of applying these frameworks in practice, we found no definitive principles that we could straightforwardly apply. However, these papers do illustrate some important intuitive conclusions:

- Brennan found that if the regulator determines the same discount rate as investors (i.e. sets the rate of return at the investors' true rate of return) and real demand and costs are constant over time, then the optimal depreciation path is that which contributes to constant real output prices.[163]
- Crew and Kleindorfer analysed a scenario where technological change or new competition might require front-loading of depreciation in order for the firm to be assured of full recovery of its asset base.[164]
- Burness and Patrick found that, where demand and input costs are stationary, both the welfare and profit optimising depreciation path is achieved by back-loading depreciation. They further find that stationary demand and some technological progress are sufficient conditions for back-loading.[165]

Compared to these theoretical analyses with predictable costs and/or demand trends, an even recovery profile (i.e. straight-line depreciation) is not likely to be the optimal approach in all cases. However, in practice, neither demand nor costs are reliably predictable over the life of the assets. This makes the choice of an optimal depreciation path challenging. For example, a service provider might argue that future demand is

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161 M Crew and P Kleindorfer, *Economic depreciation and the regulated firm under competition and technological change, Journal of regulatory economics*, Vol. 4, Iss. 1, March 1992, pp. 51–61.

162 Under the NGR assets made be set aside as redundant, but can re-enter the asset base if they are used again. No assets have ever been deemed as redundant by the AER.

163 T Brennan, *Depreciation, investor compensation, and welfare under rate-of-return regulation, Review of industrial organization*, Vol. 6, Iss. 1, January 1991, pp. 73–87.

164 M Crew and P Kleindorfer, *Economic depreciation and the regulated firm under competition and technological change, Journal of regulatory economics*, Vol. 4, Iss. 1, March 1992, pp. 51–61.

165 HS Burness and R Patrick, *Optimal depreciation, payments to capital, and natural monopoly regulation, Journal of regulatory economics*, Vol. 4, Iss. 1, March 1992, pp. 35–50.

likely to decrease on its network. Therefore, to maintain stable real output prices (or to mitigate the risk of non-recovery), it would argue that the regulator should accelerate depreciation so that a greater proportion of cost is recovered over the period where there is relatively higher current demand. However, if the underlying assumptions about demand have not been forecast accurately and stay constant or increases, the accelerated depreciation imposes an unnecessarily high burden on current customers. In turn, this results in a welfare outcome that is worse than either back-loading depreciation or straight-line depreciation.

Accordingly, while straight-line depreciation may not be optimal where costs and demand trends are knowable and therefore a more targeted depreciation profile can be developed, it mitigates the risk of mis-forecasting which could lead to highly undesirable welfare consequences. It effectively assumes that in the long run demand will be reasonably stable. As a general proposition, for mature networks of significant size and with assets at various stages of their lives demand is likely to be relatively stable. The approach also effectively assumes real replacement costs are relatively stable (based on historical actuals). As a general proposition, this expectation is appropriate. Falling real replacement costs into the future would provide some support for a declining depreciation profile, but such general trends have not been observed over previous regulatory control periods.