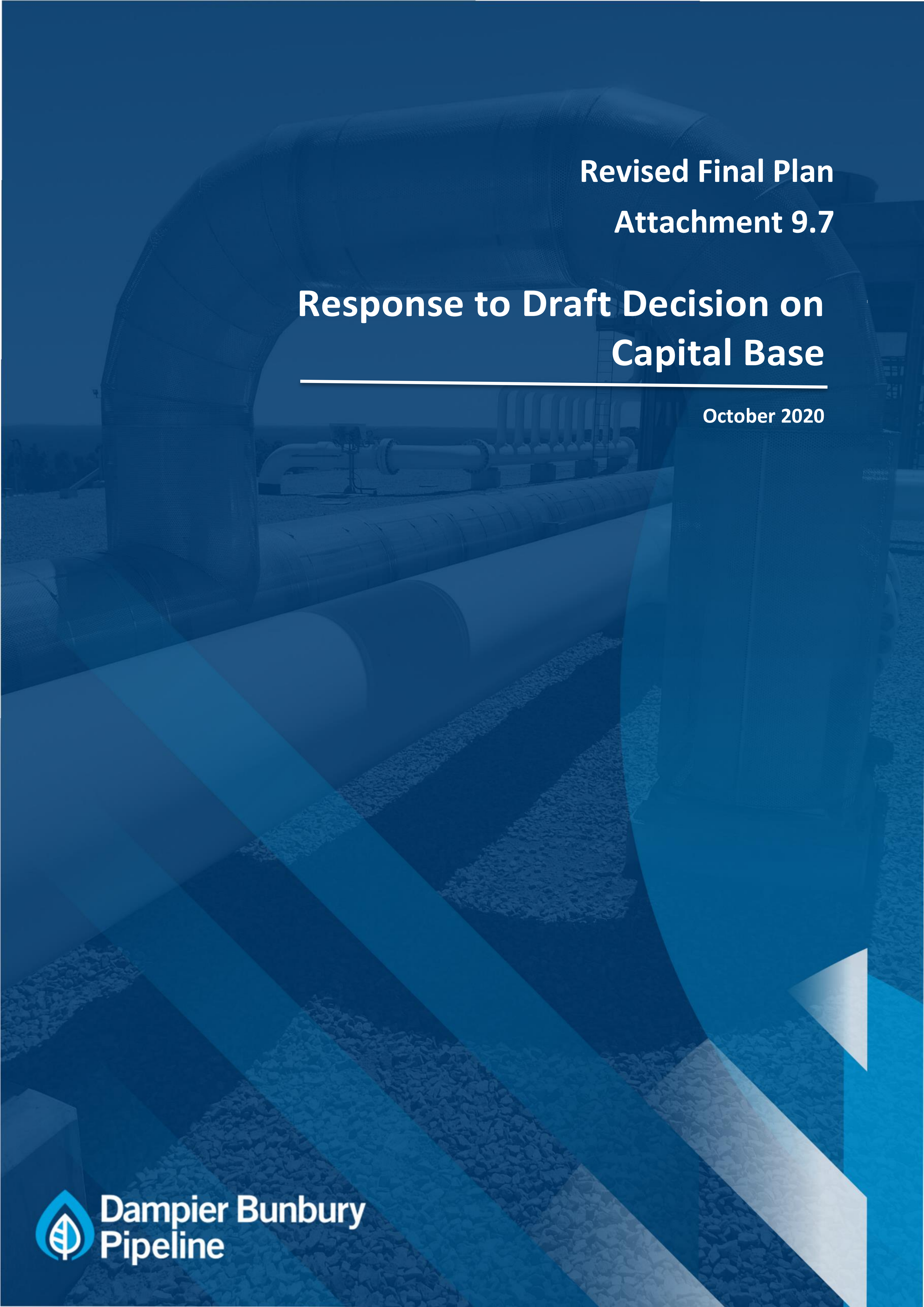


Revised Final Plan

Attachment 9.7

Response to Draft Decision on Capital Base

October 2020

Dampier Bunbury Pipeline

1. Response to Draft Decision on Capital Base

We have rejected part of the ERA's proposed Amendment 13 to the capital base which covers various aspects of our depreciation approach. We have implemented, as an interim measure, the ERA's interpretation of economic life, and highlighted a pathway forward for consideration of this issue. We have modified the ERA's approach to asset recategorisation (including the asset life for "other" assets) and write down assets which would have been fully depreciated under their new categories by 2020 over AA5, leaving assets still in use as we found them in the ERA model to be addressed in AA6 and AA7.

1.1. Overview

This section covers our response in respect of depreciation of the capital base from the Final Plan. In particular, this section provides:

- Our response to the ERA's different approach on asset recategorisation and its effects on depreciation of existing assets.
- The ERA's rejection of our proposal for a ten-year asset life for the "other" category of assets.
- The ERA's rejection of our proposal that the economic life of the whole asset end in 2059.

The ERA has accepted our new asset categories and our depreciation of new capex according to those categories. It has also accepted the new categories for past capex (though not the depreciation therein, detailed below).

Amendment 13 makes reference to Table 112 in the ERA's Draft Decision. This table summarises the outcome of the ERA's deliberations on depreciation. We replicate Table 112 from the Draft Decision below, but with the outcomes of our reasoning in this response to the Draft Decision. The final row of this new table shows the conclusions made by the ERA for reference.

Table 1: AGIG's forecast depreciation ($ million real at 31 December 2020)

	2021	2022	2023	2024	2025	Total
Pipeline	71.5	71.5	71.5	71.5	71.5	357.7
Compression	20.5	20.7	20.8	21.0	21.1	104.1
Metering	14.9	1.6	1.6	1.6	1.7	21.4
Other depreciable	8.3	3.8	3.7	3.2	3.4	22.4
Computers and motor vehicles	18.3	6.6	6.9	6.7	7.2	45.7
Cathodic/corrosion protection	4.3	4.5	4.7	4.9	5.1	23.5
SCADA, electrical, control & instrumentation and communications	44.1	7.1	8.6	9.1	9.8	78.7
Cost of raising equity	0.0	0.0	0.1	0.1	0.1	0.3
BEP lease	0.5	0.5	0.5	0.5	0.5	2.5
Forecast depreciation	**182.4**	**116.2**	**118.4**	**118.6**	**120.3**	**655.9**
*Forecast depreciation from ERA DD Table 112**	*125.5*	*109.5*	*110.2*	*110.1*	*110.9*	*566.2*

**Note – the ERA used dollars of December 2019, whilst this response uses dollars of December 2020. We have accordingly changed the ERA's numbers by applying an inflation rate of 1.25%.*

1.2. ERA Draft Decision

Amendment 13 of the ERA's Draft Decision is as follows:

Required Amendment 13

DBP must amend the forecast depreciation of the capital base for AA5 to $559.09 million (real as at 31 December 2019). The yearly values for each year of the access arrangement period are set out in Table 112 of this draft decision.

Underpinning Amendment 13 are five different parts of our proposal in the Final Plan, which are summarised in Table 2 below.

Table 2: Summary of ERA's Draft Decision on Capital Base

Aspect of depreciation	ERA Draft Decision	ERA Comment
Reclassification of capex into new asset classes	Accept	The move to new assets classes for new and existing assets was accepted, as was depreciation of new assets in these new classes.
Depreciation of existing assets in the new asset classes	Modify	The issue for existing assets is the speed of recovery for the balance at 2020 of assets no longer in use under the new asset categories and assets which are in use but would have shorter lives in the new categories. The ERA used an approach which is slower than the ours.
Change in asset lives for metering capex from 50 years to 30 years	Accept	
Change in asset lives for other capex from 30 years to 10 years	Reject	This was rejected on the grounds that some assets in this class should have a life longer than 10 years.
Cap in economic life to 2059	Reject	The ERA did not engage with our approach from an economic perspective (its consultant EMCa agreed with the method, but asked for more data on the forecasts) but instead approached the question of the legal meaning of economic lives in the NGR. It found this to not be compatible with our approach.

1.3. Our Response to the Draft Decision

Our response to the Draft Decision is outlined below.

Table 3: Summary of our response to the ERA's Draft Decision on Capital Base

Issue	ERA Draft Decision	Our Response	Our Comment
Reclassification of capex into new asset classes	Accept	Accept	
Depreciation of existing assets in the new asset classes	Modify	Modify	Neither we nor the ERA followed a principled approach similar to that followed in previous decisions by the ERA and AER to manage price changes. We now propose an approach which better matches this principled approach whilst better managing price impacts
Change in asset lives for metering capex from 50 years to 30 years	Accept	Accept	
Change in asset lives for other capex from 30 years to 10 years	Reject	Modify	The issue in the shift to ten years are a set of assets which the ERA's consultant EMCa suggested be removed from this asset class. We have removed them to compression, which has the 30-year asset life EMCa suggested was appropriate, and set the other class to ten years as originally proposed.
Cap in economic life to 2059	Reject	Modify	We have used the ERA's approach to economic lives as an interim measure, which in an economic life to 2063, as per the outputs of the WOOPS model already submitted to the ERA. However, we think the issue requires a dedicated engagement outside the access arrangement process, which we would like to discuss with the ERA.

We provide no further information about the change to the new asset classes or the shift in metering assets from 50 to 30 years, as these are areas where both we and the ERA are in agreement. We therefore focus on the remaining three areas.

1.3.1. Depreciation of existing assets in new asset categories

There is substantial agreement between ourselves and the ERA is respect of asset recategorisation. In particular, we agree:

- On the categories into which assets should be placed and the lives associated with each of these asset categories (with the exception of the "other" category discussed below).
- That the total approved historical depreciation should not be modified.
- That assets with no remaining life should be written down, and recovered by the business.

The difference is in how best to treat existing assets which have been shifted into new categories. Our approach involved taking the value of each asset from its old category in 2020 and depreciating that value over the full asset life of the relevant new category (see Final Plan Attachment 9.1 pp5-9). By contrast, the ERA:

- Moved each relevant asset into its new category from 2005 to 2015, calculated the depreciation under its new lifespan and, where this was larger than the depreciation under the previous category, returned the difference between the two amounts to the previous category.

- Did nothing for assets invested in during AA4.

The net effect of the ERA approach was to slow down depreciation markedly compared to our approach, and it is at odds with the intent of removing assets that have been fully depreciated from the asset base. It also gave rise to some inconsistencies. For example, if a SCADA asset installed in 2011 and placed into the pipeline category would, under the ERA approach, have the difference between depreciation over 10 years (the life for the SCADA category) and over 70 years (the life for pipelines) for the years 2011 to 2020 returned to the pipeline category. This would then be depreciated until 2081. By contrast, an otherwise identical SCADA asset installed in 2021 would be fully depreciated by 2031. Inconsistencies like this do not arise under our approach.

Both ourselves and the ERA have departed from principled approaches followed by other regulators (including the ERA) in previous decisions, and both of us did so in order to reduce price impacts for customers today which would have resulted from using the principled approach.[1] We are both trying to solve the same problem being how best to treat:

- Existing assets which would be fully depreciated under the new asset categories and now need to have their remaining value recovered.
- Existing assets which would have been partly depreciated under the new asset categories, but more than they have been under the existing categories, and will remain in service.

Our proposed solution to the two-fold issue above in this response is to deal with the first issue now, and to address the second issue in future AA periods, having regard to price impacts for our shippers, along with the ERA Draft Decision, we propose to address the two issues in stages. We discuss this further below.

Analysis of DBP Final Plan and ERA Approach

Issues with our proposed approach and why it was applied

We now provide more detail on our reasoning behind the approach we have taken in this response, and why we differ from both our Final Plan and the Draft Decision. We note that, of the two components to the existing assets issue outlined above, the ERA placed more focus on the first issue in its Draft Decision, noting (see [942]):

> *Furthermore, DBP's approach to reallocating the historic depreciation does not recognise the principle of rule 89(1)(b) as the approach includes values for assets in the projected capital base for AA5, such as computers and motor vehicles, that have ceased to provide any service. Most of these assets would no longer be in service and should not be depreciated going forward as these assets have an economic life of zero.*

We accept assets that cease to contribute to the provision of the pipeline service should be removed from the asset base. Leaving these assets in the capital base results in a higher capital base in a manner that does not reflect the price of providing current and future services to current and future customers. A principled approach should remove these assets from the capital base.

The ERA then notes [944] that it "*does not propose that these assets be written off and no compensation for depreciation be provided*". Which we agree would result in considerable uncertainty for Western Australian service providers and their stakeholders.

[1] See Final Plan attachment 9.1, pp5-9 for a discussion of this from the perspective of our approach.

The reason our Final Plan approach did not write-off assets immediately (with compensation) and depreciated new categories over the full economic life (instead of remaining economic life) from 2020 was to reduce the price impact for customers.

As Incenta discuss in Attachment 9.8 (pp12-15), a balance needs to be struck between ensuring assets are correctly depreciated over their economic life and ensuring price changes are reasonable. The case of the DBNGP reflects that incorrect (too long) asset lives have been applied to assets in the past resulting in out of service assets being depreciated in AA5 and future AA's. Rectification necessitates consideration of price impacts.

Issues with the ERA's approach

The ERA's approach to depreciation also results in depreciation of assets with no economic life left under their new categories remaining in the capital base for up to 60 years (see Attachment 9.8 p14). This is decades longer than our approach, despite the intent of the ERA's approach being to remove these assets from the capital base.

This is because, to ensure that total historical depreciation remains unchanged, the ERA has allocated the excess depreciation (difference between depreciation under the old and new categories for a particular asset) associated with the new asset categories back to the annual balance of the previous asset categories from which they came. Thus, as per the example above, some portion of the depreciation for a SCADA asset (with a life of 10 years) goes back into the pipeline category, which is where it was previously and which has an economic life of 70 years.

This would result in correct economic depreciation if the original lives in a particular asset class (pipelines, say) reflected a weighted average remaining life of all of the assets within that class, however it is not correct in the case of the DBNGP because the original asset lives were not formed as weighted averages of the assets in the respective classes; which is why asset recategorisation is required (see Attachment 9.8 pp9-10).

In the case of the DBNGP, the only effect is to slow down the rate at which capital is recovered for existing assets, to be similar to the case without asset recategorisation for existing assets.

Approach followed in this revised Final Plan

The approach we have applied in this revised Final Plan is in keeping with the principle of economic depreciation when compared to the approach adopted by ourselves in the Final Plan or the ERA in the Draft Decision. This derives from the more detailed discussion in Attachment 9.8.

To ensure that out of service assets are not being depreciated in this or future access arrangements the tariff model must:

- depreciate immediately assets that cease to contribute to the provision of the services; and
- depreciate in service assets over their remaining economic lives.

We refer to this as the 'principled approach' in that it is consistent with the principle of economic depreciation. The principled approach complies with NGR 89 (1) (b) through to (e). It is also consistent with past regulatory practice (see Attachment 9.1 of the Final Plan pp9-10)

The principled approach rolls forward the historical record of how each of the seven asset classes (excluding BEP) have actually accumulated approved depreciation over time. This ensures opening balances at 2020 accurately reflect the depreciated balances of each asset class.

Assets still in service should be depreciated in AA5 over their remaining respective economic lives. At the end of the assets economic life it ceases to exist within the capital base and will not be depreciated over future access arrangements, compliant with NGR 89 (1) (b).

Assets out of service should be deducted from the asset base in the first year. This is because prices should reflect the efficient cost of providing services. Compensation for these immediate write-offs can only be incorporated in the depreciation building block because no other building block can allow for this type of cost.

The issue with applying this approach is it involves increases in depreciation within AA5 to rectify past depreciation being excessively low, which increases price. There is little guidance on how much of a price change is acceptable, or within the rules, with respect to changes in depreciation methodology, particularly where past economic lives applied were incorrect. At face value, this would support removing the assets from the capital base as soon as possible.

An example of regulatory precedent relating to out of service assets is the ERA's requirement that Western Power re-instate sections in the fourth access arrangement stating that Western Power will apply accelerated depreciation to assets decommissioned as a result of the State Underground Power Project. This shows the ERA have permitted some degree of price increase resulting from the depreciation of out of service assets.

The increase in depreciation required in AA5 to rectify both of the problems noted above in respect of existing assets totals $135 million, might be too large compared with the ERA's decision in Western Power and may adversely impact our shippers.[2] The split of this $135 million into assets which have no remaining life under the new asset categories, and the under-depreciation which has occurred to date for assets that still have some remaining life is shown in Table 4.

Table 4: Split of under depreciation

	AA5 Depreciation
Under-depreciation on assets still in service	84.3
Under depreciation resulting from assets with no remaining life	51.3
Total	**135.7**

Our proposed approach in this response is to deal only with the assets which have no remaining life; an increase in depreciation of $51 million. We propose to deal with the remaining $84 million in future AA periods. We have provided a description of how our changes have been implemented in the tariff model so that the ERA can easily follow the detail of what we have done (see Attachment 9.10).

1.3.2. Change in asset lives for "other" capex

We proposed in our Final Plan that the "other" asset category should have its life changed from 30 years to ten years, as this was more reflective of the vast majority of assets within that class. We were aware of the issue, raised by our consultant Incenta,[3] that there were a number of assets within this category from AA3 which have a life much longer than 10 years, and appeared to have been misclassified at the start of AA3. However, we took a deliberate decision not to shift any assets from one existing asset class to another to avoid re-making a past decision made by the ERA (see Attachment 9.1, p5, footnote 6).

[2] The figure of $135 million includes consideration of the shift of assets out of the "other" category and the change of that asset life from 30 to 10 years. The two interact with each other, and it is thus difficult to separate out effects. This can be thought of as the net effect associated with both issues.

[3] ERA Draft Decision, [901].

The ERA's consultant EMCa recommended that the ERA also assign these same assets, identified by Incenta, to a category with a 30-year life, rather than the other category with a ten year life.[4][5] However, the ERA chose to keep the assets where they were, and to keep the "other" category at 30 years.

We agree with Incenta and EMCa that these specific assets should sit in a category with a life of 30 years, and not a category with a life of ten years. However, we disagree with the ERA's conclusion in the Draft Decision that the best way to give effect to this is to give all assets in the "other" category a life of 30 years. This is because assets other than those specifically identified by Incenta are things like tools, furniture and office fit-outs which have an economic life far shorter than 30 years.

To this end, we have identified each of the assets in the "other" category which we, Incenta and EMCa believe should be in categories with a life of 30 years, and moved them to a category which has an asset life of 30 years (compression). The remaining assets in the "other" category, as well as any new expenditure, is given an economic life of ten years. We detail this in Table 5.

Table 5: Recategorisation of assets within the other category

Asset	Value in 2020 ($ mil)
Stage 5B CS1 850kW GEA (engine & alternator)	$ 0.04
Stage 5B CS2 850kW GEA (engine & alternator)	$ 6.27
Stage 5B CS2 Temporary DEA (600kW)	$ 0.30
Stage 5B CS3 850kW GEA (engine & alternator)	$ 1.41
Stage 5B CS3 Permanent Standby DEA (600kW)	$ 0.63
Stage 5B CS4 850kW GEA (engine & alternator)	$ 6.44
Stage 5B CS4 Temporary DEA (600kW)	$ 0.31
Stage 5B CS5 850kW GEA (engine & alternator)	$ 1.84
Stage 5B CS5 Permanent Standby DEA (600kW)	$ 0.77
Stage 5B CS6 850kW GEA (engine & alternator)	$ 6.10
Stage 5B CS6 Temporary DEA (600kW)	$ 0.30
Stage 5B CS7 850kW GEA (engine & alternator)	$ 6.73
Stage 5B CS7 Temporary DEA (600kW)	$ 0.32
Stage 5B CS9 850kW GEA (engine & alternator)	$ 1.21
Stage 5B CS9 Permanent Standby DEA (600kW)	$ 0.61
Stage 5B CS1 Inlet scrubber	$ 0.07
Stage 5B CS2 Inlet scrubber	$ 3.17
Stage 5B CS3 Inlet scrubber	$ 3.21
Stage 5B CS4 Inlet scrubber	$ 3.34
Stage 5B CS6 Inlet scrubber	$ 3.10
Stage 5B CS7 Inlet scrubber	$ 3.58
Stage 5B CS8 Inlet scrubber	$ 0.01
Stage 5B CS9 Inlet scrubber	$ 0.00
Stage 5B CS4 Decommission 230kW GEA	$ 0.09
Stage 5B CS7 Decommission 230kW GEA	$ 0.10

[4] ERA Draft Decision, [911].

[5] We note that EMCa also argued that the ERA should separate out buildings and provide these with a life of 50 years (see Draft Decision [912]). The ERA has not acted on this recommendation, and we agree with the ERA on this point. Not only are these assets small in value (as Incenta point out, see Draft Decision [909]) but, more importantly, any buildings in either the existing capital base or in new capex are associated with the provision of pipeline services (they have no alternative use; most are in remote regions) and are thus subject to the potential for economic asset stranding which we address by setting a cap on economic lives to 2059.

DBNGP Power Gen Equ	$ 1.24
DBNGP Power Gen Equ	$ 0.06
Total	**$ 51.27**

We note that the effect of making this change is that the other category in 2020 changes from around $100 million to around $50 million. We note further that this is a one-off change; the inclusion of these assets in the other category is a function of decisions made in the AA3 period which should have been corrected some time back. It sets no future precedent for future recategorisation between existing categories.

1.3.3. Cap in economic life at 2059

In our Final Plan, we suggested that an appropriate cap on economic lives across the DBNGP was 2059. We were responding to the issue of future competition and, in particular, the potential for a future competitive energy marketplace to emerge, characterised by renewable power (solar, wind, batteries) and hydrogen deployed at varying scales, close to demand. This has the effect of potentially producing a competitive market price for energy which is lower than the regulated building block price, leading to part of our asset base being stranded.

Whilst the ERA's consultant EMCa agreed with the issue we were addressing and the economic approach we used to address it in the WOOPS model (but disagreed that the answer should be 2059), the ERA focussed on the legal meaning of 'economic life' as used in NGR 89, which it found was not consistent with our approach. This is primarily because we do not expect to cease using the assets in 2059.

For the purposes of this revised Final Plan, we have implemented the ERA's interpretation of economic life in NGR 89 (but as explained below, it is not the only available meaning). In the WOOPS modelling work already provided to the ERA, this leads to an economic life ending in 2063 as this is the date at which we would need to charge a negative transport price for gas as the wholesale price of gas rises above the (delivered) price of renewable energy. This leads to a small under-recovery of our efficiently incurred capital base (around $125 million) which we believe is an acceptable risk given the time remaining to improve the model and the uncertainty which exists about the future. We note that this acceptance is contingent upon broad agreement with the future scenario we set out in attachment 9.2 of the Final Plan as being most credible (that is, the one that led us to 2059). Significant differences on that point would represent an unacceptable risk of under-recovery to us.

However, we note that acceptance of the ERA's approach is a short-term response to a larger issue of how best to manage depreciation in a world where future competition is likely. Implemented as a long-term solution, it would have perverse effects on investment and would not be in the long run interests of consumers. We maintain our belief that our approach in our Final Plan does meet the long run interests of consumers, but the fact that the ERA had difficulty reconciling its views about the legal meaning of economic life with what we had proposed suggests that more work is required to determine the best way forward. Since this is hard to do in the environment of a regulatory decisions-making process, and since it potentially affects other businesses as well, we propose to work with the ERA and our customers and stakeholders outside the AA5 process to refine the approach further.

In this response we:

- Outline how we come to the figure of 2063 using the ERA's view on economic life.
- Explain why this must be viewed as a temporary solution to a larger problem, and start to outline some pathways forward on different treatments of this issue.

- Address comments made by EMCa (noting the ERA said nothing in its Draft Decision about our economic arguments) around whether our most likely scenario was too aggressive in respect of the likely timing of any future competitive market for energy.

1.3.3.1. Our suggested way forward for AA5

As noted above, for the purposes of this revised Final Plan, we implement the ERA's definition of economic life, being tied to asset retirement. We note that, in the WOOPS modelling already provided to the ERA, this produces an economic life for the DBNGP out to 2063.

Although we did not highlight it in our Final Plan, the 2063 end date is clear when examining the WOOPS model. The WOOPS model is set up to avoid negative transport prices. Thus, when the wholesale price of gas rises above the delivered price of energy, the model imposes a price, and hence a revenue of zero; in other words, the asset is retired. This can be seen by considering row 86 of the "results" tab of the WOOPS model when our central scenario is implemented in the "Capital Base and Reg Revenue" tab, and is also discussed in attachment 9.3 of the Final Plan (see, for example, p42).[6]

The 2063 economic life obtained for the DBNGP is associated with the transport of natural gas. The lifetime of the pipeline may extend if it switches to transport hydrogen. However, for the purposes of this revised Final Plan, we don't believe this potential future is relevant for three key reasons in AA5:

- At present, the definition of 'natural gas' in the National Gas Law which underpins the whole regulatory regime does not accommodate hydrogen (other than to the extent hydrogen can be blended with natural gas and still be principally methane- see NGL, page 44). This may change in the future, but it would be inconsistent to reject our approach overall based on the current drafting of the depreciation rules in the NGR (specifically regarding economic life), ignoring the fact that this may change, and at the same time consider a life carrying hydrogen based on future changes which might be made to the National Gas Law.
- From a technical point of view, there is uncertainty as to whether he DBNGP could in fact convert to the carriage of hydrogen given the physical characteristics of steel pipe and, even if it can be converted, it is entirely unclear how much hydrogen it would be economic to carry, or what kind of haulage contracts would prevail in such a future marketplace.
- The WOOPS framework is designed to ensure that we can recover our efficiently-incurred costs under regulation and when faced with competition with no double-recovery. In the competitive marketplace, price will be set by competitors, and would be the same whether or not we carried hydrogen. We thus do not need to explicitly assume hydrogen carriage to arrive at our conclusions in respect of economic life.

The 2063 economic life is, however, only an interim solution and a compromise between our and the ERA's principled positions in AA5. This is because of the incentives created by using straight line depreciation and basing economic lives on asset retirement. We discuss this further below, but in essence there are two approaches which lead to the same outcomes in terms of meeting the long run interests of consumers. These are:

[6] Note that the model also reports "Last year of pipeline operation" and "last year regulated price is charged" (see the ACIL report p45, for example). The latter should be earlier than the former in reality, and it will be if depreciation is sufficiently slow that the asset is not depreciated fully before the wholesale price of gas is greater than the delivered price of renewables. However, in the model, the regulated price is charged until the pipeline is fully depreciated and then the model assumes opex also ceases. However, so long as the wholesale price of gas is below the delivered price of renewables, the model assumes gas is transported (though basically for zero price). This is just a quirk of model construction which had little relevance when the model was put to its original use, but might cause some confusion if not understood in the context of asset retirement. This is why the results tab gives the more accurate picture of the asset retirement date.

- Keeping straight line depreciation and changing the concept of economic life to put a focus on the positive value remaining at the conclusion of regulation (as per the New Zealand Commerce Commission) and ensuring that value matches what can be recovered in a future competitive marketplace, as per our WOOPS approach.
- Keeping the concept of economic life tied to asset retirement as per the ERA's Draft Decision but changing the profile of depreciation to allow different depreciation schedules for the regulatory and competitive phases of the lives of the assets involved.

1.3.3.2. Economic depreciation – economic lives *and* depreciation profile

As noted above, whilst the ERA's approach to economic life in the NGR is acceptable as an interim measure (contingent upon acceptance of our future scenarios), it does not represent a sustainable long-term solution due to the impacts it has on investment incentives. Our proposed approach to economic depreciation in our Final Plan represents one sustainable solution. However, the ERA's reasoning in its Draft Decision has alerted us to the fact that there may be others.

We present below a sustainable solution which builds upon the ERA's reasoning. We also show how this sustainable solution leads to the same outcome as our approach from the perspective of economic efficiency and we conclude with a call for further work to shape a pathway which can be more broadly applied to deliver an approach which meets the long-run interests of consumers.

The main focus of the ERA's discussion on depreciation is on NGR 89(1)(b); whether we are depreciating the DBNGP over its economic life.[7]

There are two elements to any depreciation schedule; the economic life (or the time taken until the asset is fully depreciated) and the depreciation profile, or the pattern of depreciation over time. In a world where the only possibility is monopoly and thus the regulated firm can always earn its cost of capital, the depreciation profile does not matter as much.[8]

The National Gas Rules do not explicitly require a depreciation profile to be straight line, or indeed to be any other profile, although the NGR does mention the specific case of low initial demand, where depreciation is deferred. However, given that straight line depreciation is simplest, and given that the monopoly has been the only conceivable state of the world for energy firms, regulators have generally used straight line depreciation, and the matter of profile has been given very little consideration.

More thought is required, however, in a world where there are two states; the present where there is monopoly and the future, where there is competition. In this scenario if economic life is defined by reference to asset retirement, a change is required to the profile of depreciation. This is outlined in more detail in Attachment 9.9, but is illustrated below.

To see this, consider a pipeline which currently has an economic life out to 2085 as a transporter of natural gas. Consider, however, that:

- It is possible to foresee that competition in the renewable energy sector will lead to delivered energy prices for renewable energy lower than the regulated building block price for delivered gas circa 2056.

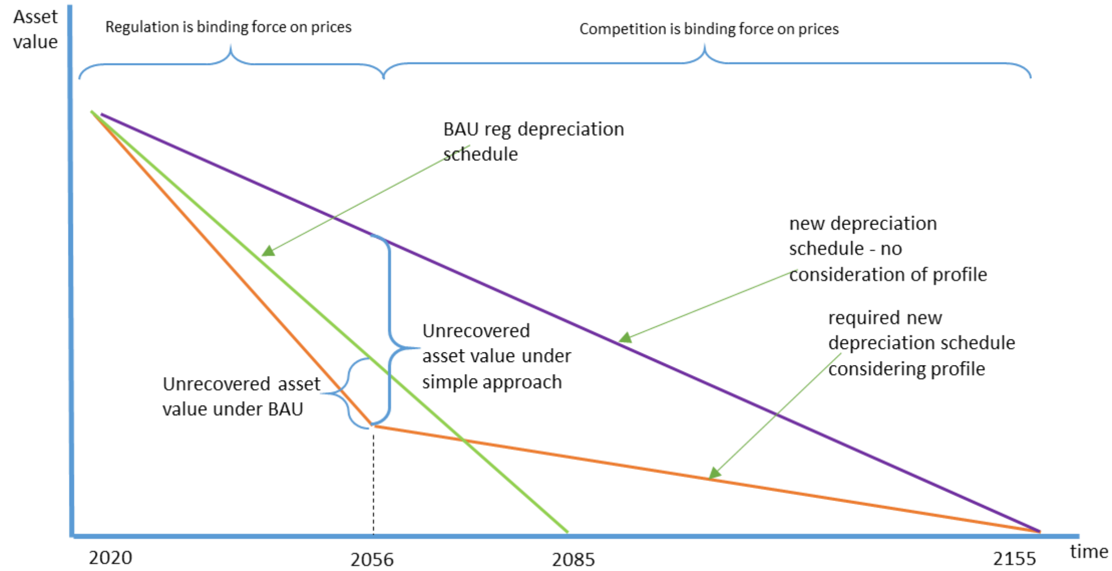
[7] The ERA also notes 89(1)(c) (see Draft Decision [897]) which refers to changes in the economic life. There is nothing in our approach which precludes changing economic lives as this is necessary (in fact we point out in Attachment 9.3 that this is a key part of our approach), and we take the ERA's meaning in [897] to be that it does not think this particular change to economic lives is appropriate.

[8] See Schmalensee, R, 1989, "An Expository Note on Depreciation and Profitability under Rate of Return Regulation", Journal of Regulatory Economics, 1:293-8.

- That the pipeline has an option, it can make changes now to lower its unrecovered asset base by 2056, to make a switch to hydrogen, and thereby keep itself in business in a new competitive energy market for 100 years.
- A regulator seeing all of this with perfect clarity today, who looks only at economic life defined as the time over which the asset in question is providing an economic service, and pays no attention to the profile of depreciation.

The problem which arises is highlighted in Figure 1.

Figure 1: The problem with looking only at economic life and not profile



The green line represents the BAU asset value with the BAU depreciation schedule. At 2056, this depreciation schedule would leave the asset value too high to be recovered in the future competitive marketplace. The pipeline operator therefore wants to follow the orange line; to depreciate more now, and then to depreciate much more slowly in the competitive marketplace, to reach a point of zero in 2155.[9]

However, the regulator, looking out from today and considering only economic life and not depreciation profile, imposes the purple line; straight line depreciation to the point where the asset is retired. This means that the amount of under-recovery in 2056 increases substantially.

No rational pipeline operator would propose a situation like the purple line in Figure 1 to a regulator, as doing so would leave that operator worse off than if no change to economic lives were proposed. In fact, the incentives created by a situation like that illustrated in Figure 1 would see the pipeline operator take credible, active steps to retire the regulated asset before 2085. This is the only course of action which reduces the shortfall experienced in 2056 when competition starts to impact the pipeline. This would involve different (and certainly lower) investment and/or changing asset replacement and maintenance schedules to give greater certainty to an earlier retirement date.

[9] Note that the pipeline could just as easily adopt a curved depreciation profile (different depreciation amounts in each year) such that the downward-sloping curve of asset value passes through the value which can be supported in a competitive environment in 2056. Mathematically, the result is identical. We use a kinked schedule consisting of two straight lines here because it makes for a simpler exposition of the issues. This should kept in mind whenever we refer to kinked depreciation schedules below.

If the pipeline is essentially independent from the future energy marketplace, and the timing of competition is relatively certain, this might not matter very much; the current generation of consumers use up the pipeline asset in the haulage of gas and then switch to a new asset when the new market environment arrives.

However, the future is uncertain, and there may be many options whereby re-purposing of the pipeline to play a role of some kind in the future of energy represents a lower long-run cost to consumers than replacing its capacity. By adopting the purple line in Figure 1, the regulator is essentially taking away any stake which the pipeline operator would have in one of these low cost options and thus the incentive to invest and plan to bring them about. The result is a perverse incentive for the pipeline operator to act to avoid these lower cost options by removing not only any positive benefit the pipeline operator might get from them, but also some of the potential to recover investment in existing assets. If a definition of economic life which looks at asset retirement was maintained, a different depreciation profile would need to be considered such as the kinked orange line in Figure 1.

A kinked profile like that shown in Figure 1 is consistent with NGR 89(1)(a) which requires the depreciation schedule be designed so that tariffs will vary, over time, in a way that promotes efficient growth in the market for reference services. As Incenta explain in Attachment 9.9, this principle directs consideration of both demand and supply of reference services, namely, (p6):

> a) *Demand side – the time path of reference tariffs that are implied by the depreciation profile be most consistent with encouraging the efficient use of the asset, and*
>
> b) *Supply side – the profile of depreciation be consistent, so far as it is relevant, with providing the capacity for the investment and operating activities required to ensure that the efficient growth in the market is served.*

Incenta's view is that (ibid p6):

> *...regard to the supply-side condition is only needed in certain circumstances. For regulated businesses, in most cases they are monopolies that are protected from competition and other threats to cost recovery. Therefore, recovery over the economic life provides a reasonable assurance that costs will be recovered and so support investment for growth in the service.*
>
> *However, where there is a prospect that the service provider may have its prices or revenues constrained by a competitor or some other factor below the level that will be required to recover costs, then the supply side dimension become an important factor. In particular, to the extent that the market may evolve in the future such that, under some profiles of depreciation competition may preclude the (future) unrecovered costs to be recovered, then this rule would require the profile of depreciation to be altered as necessary to create the reasonable expectation that costs will be able to be recovered. In doing so, efficient investment, and so efficient growth, in the service will be promoted.*

In addition, Incenta consider the revenue and pricing principles, in particular the principle that a service provider should be provided with a reasonable opportunity to recover at least the efficient costs, support the above approach to NGR 89(1)(a). Further, a framework which encourages efficient investment in, and operation of, gas pipelines will advance the national gas objective.[10]

[10] Ibid, section 2.2

Incenta conclude that, assuming it is the case that technological change has a real potential to create meaningful competition from alternative energy sources, which may in turn constrain the prices that DBP is able to charge in the future, the appropriate response would be to alter the profile of depreciation in order to restore the situation where are given an opportunity to recover efficient costs.[11] This is the kinked depreciation profile shown above. Incenta state (ibid p9):

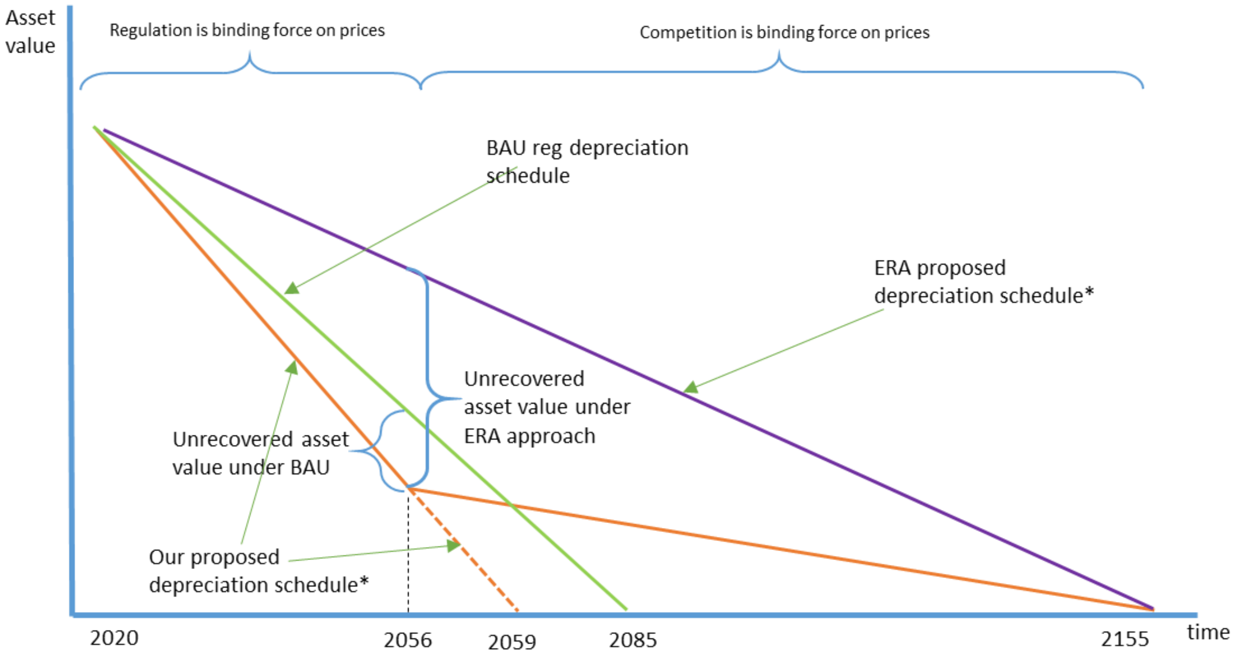
> *In our view, such a depreciation profile would meet the requirements of Rule 89(1)(a) for the supply side as well as Rule 89(1)(b) (economic life), and most likely result in a time path for reference tariffs that encourages efficient use (and so meet the requirements of Rule 89(1)(a) for the demand side).*

Contrasting our approach with that of the ERA

In its Draft Decision, which points to use of the DBNGP post 2059, the ERA is implicitly imposing an outcome like the purple line in Figure 1; without explicitly arguing for a particular date for the end of that economic life.

The approach in our revised Final Plan is not to impose a kinked depreciation schedule, but it gives rise to exactly the same outcomes as the kinked schedule during the time when regulation determines prices. Our proposed approach has exactly the same effect on investment incentives to facilitate a transformation of the energy sector, largely because it is identical to Figure 1 up to 2056. To see this, consider a small adjustment to Figure 1, shown below in Figure 2.

Figure 2: A representation of our depreciation approach



** Assuming that the competitive market life extends for 100 years, as per the illustration in Figure 1. We note that the ERA has not made such an explicit assumption, and we use this end date for illustrative purposes.*

The dotted line above is essentially the tail end of what the rational pipeline operator (with sufficient freedom of action) would do if the regulator did not allow a kinked depreciation schedule. However, it is dotted because the pipeline operator is not affected by regulation post-2056 as the competitive price has fallen below the regulatory building block price; the value of zero occurs only in the regulatory building block model, which will itself no longer operate post

[11] Ibid, section 2.3

2056.[12] Therefore, the pipeline operator does not focus, either then or now, on retiring the asset, but only on making sure that the asset reaches the value, in 2056, that can be supported by the coming competitive marketplace. This is another way of maintaining the same option value noted above for a kinked depreciation schedule and differs only in the fact that it ends in a positive value (in 2056) when regulation ceases informing price.

Mathematically, there is also no difference between our approach and the kinked depreciation schedule in respect of asset recovery; in both cases only the efficiently incurred capex is recovered and there is no double recovery (see below). Moreover, in both cases, precisely the same depreciation schedule obtains during the regulatory period when it actually matters for pricing. This is discussed in more detail in Attachment 9.9 (p10-11).

Other regulators have adopted a basic framework like ours (though not with the WOOPS model to inform it) which focuses on the appropriate positive asset value at the end of the regulatory period rather than when the asset is retired; most notably the New Zealand Commerce Commission, with its notions of economically stranded assets. This is detailed further in Attachment 9.9 (Appendix A), but in simple terms, if an asset has a RAB of a billion dollars in 2056, but can only recover $800 million in the competitive market which follows, then there are $200 million of assets which are "economically stranded" and thus, to the extent that this is known before 2056, this is the value which needs to be recovered prior to, in this instance, 2056.

The WOOPS framework essentially provides rigour to the New Zealand Commerce Commission's approach by providing a transparent means of using currently available information to ensure that the asset value remaining at the end of the regulatory period (and hence the amount of economic asset stranding recovered during the regulatory period) is correct. This can be seen via a simple manipulation of Equation 1 from Attachment 9.2 in our Final Plan. Note that the two integrals are independent of each other (describing two different states of the world; one regulatory and one competitive), linked only by their end and start points (respectively), M.[13] This means the first one, describing the returns under regulation, can be brought across to the left hand side thus:

$$Z - \int_0^M e^{-rt}\left[\frac{Z}{T-K} + s\left(\frac{tZ}{T-K}\right)\right]dt = \int_M^T e^{-(r+\gamma)t} P_0 X dt \qquad \text{(Equation 2)}$$

Equation 2 now says that the invested capital value (Z) minus the NPV of revenues under regulation (the first integral) needs to be equal to the NPV of expected returns under the forthcoming competitive market scenario (the second integral); or the asset value in that context. If the invested capital value minus the regulatory revenue is larger than the asset value under competition, then the amount by which it is larger is the economically stranded asset. Where this occurs, K can be increased to remove economic stranding. It is also worth pointing out that K can be decreased in future, and even made negative, in order that the equality in Equation 2 is maintained. This means that small changes to depreciation made now are a "no regrets" approach, as they can be changed later as necessary, with consumers never being asked to pay for more than the invested capital which exists at any point in time.

The ERA's approach and the legal meaning of economic lives

The ERA's approach is based upon its view of the legal interpretation of economic life as used in NGR 89. If the ERA's interpretation of the Rules in this respect is incorrect, and in particular, if the views are too narrow and inappropriately exclude our WOOPS approach, then our most

[12] Strictly speaking, the model may still exist, and regulators may still build building block prices, but these will not be the prices in the marketplace.

[13] Note that this also ensures that the whole asset is only depreciated once, as there is no overlap between the two integrals.

appropriate response to the Draft Decision would have been to stick to our Final Plan approach. We therefore explore the ERA's views here.

As the ERA has pointed out in the Draft Decision, "economic life" is not defined in the NGR or the NGL and must be interpreted according to its ordinary meaning, or commonly understood technical definition. The interpretation must be considered in light of not only the national gas objective, but also the revenue and pricing principles and the regulatory framework as a whole.

The ERA's reasoning runs from paragraph 869 to 897. It begins by looking to definitions of economic life in the Australian Accounting Standards[14] and the Income Tax Assessment Act.[15] Both of these Acts appear to focus on the life over which the asset will actually be used, but the former notes that technical or commercial obsolescence is a factor, and the latter notes that it may be scrapped, so in both cases the asset is not necessarily used for as long as was planned when it was first installed.

The key to the ERA's reasoning appears in paragraphs 889 to 892 when the ERA looks at regulatory precedent. It notes firstly a case from rail which notes that the economic life is the period over which the asset will be earning access revenues. The focus on access revenues looks positive from the perspective of our approach, and suggests a possible pathway to considering a positive asset value when regulation ends and the notion of economic asset stranding as outlined above. However, the ERA does not take this pathway.

The second example looks at AER practice which suggests that economic life is the period over which the regulated service is the lowest cost way of providing the service. Again, this looks positive from the perspective of our approach because we too focus on the period over which the relevant regulated service is the lowest cost way of providing the service, but again the ERA does not follow this pathway.

The third is a more basic AER practice, which it has applied in many instances[16] and that is that an asset in use and not retired is an asset which is still economically "alive". Ultimately, it is the third definition of economic life that the ERA adopted;[17] the economic life of an asset is the time until it is retired.

The ERA's approach reflects is one possible interpretation of economic life, but there may be others. The correct interpretation is unclear. However, what is clear is that the regulatory depreciation framework in NGR 89 was not designed with circumstances where the regulated asset will face a competitive market at a future point in time in mind. It may be that in the future a rule change is required to revisit the concept of economic life in NGR 89 given the challenge of competition from alternative energy sources that regulated networks will increasingly face.

Conclusions in respect of principled approaches to economic lives

Our Final Plan presented an approach which is in the long run interests of consumers, provides the appropriate incentives for future investment and, we maintain, meets the requirements of the NGR in respect of depreciation. However, it is not the only approach which meets these requirements. In particular, it is likely open to a regulator to form a view about economic life that is based upon asset retirement, as the ERA has done.

The problem with the ERA's view on economic lives arises because it is not accompanied by any change in the view of an appropriate depreciation schedule. We note that the ERA has not

[14] ERA Draft Decision, [875] to [881].
[15] ERA Draft Decision, [882] to [888].
[16] see the Jemena Final Decision, Attachment 4 pp12-13 and 16-17
[17] ERA DRAF Decision, see [894] to [897], and in particular [897].

actively imposed a straight line schedule, but it has not considered the implications of keeping a straight line schedule.

We consider there to be two approaches which might be taken in respect of deprecation in light of the potential for future competition. Both approaches give essentially the same results, particularly during the time over which regulation is the defining force on prices. These are:

- Accept the ERA's interpretation of economic life, but alter the depreciation profile to allow for kinked (or curved) profiles to meet the needs of both the regulatory and the competitive life of the assets concerned.
- Maintain the straight line depreciation profile but construe economic life (or change the depreciation rules) to allow for a positive value at the end of the regulatory part of the life of the asset concerned, where that positive value is formed using a transparent approach (the WOOPS model) which equates it to the value of the asset in the future competitive market.

The approach taken in the ERA's Draft Decision has highlighted to us these two approaches and their various characteristics. We now consider that the best approach forward in the longer term is to take the debate about economic lives and depreciation outside the framework of a regulatory decision, and to involve all relevant stakeholders in the debate; noting that the issue has widespread application across the regulated energy sector.

It may be that changes to regulatory practice can reasonably be accommodated within the NGR as it stands at present, or it may be that a targeted rule change, which recognises a competitive future which was arguably not anticipated by the original drafters of the NGR, is appropriate. In either case, we would welcome working together with the ERA to bring about a sustainable long term solution in time for AA6, and present the discussion above (and in Attachment 9.9) as the starting point for this future work.

1.3.3.3. Further evidence on future competitive markets for energy

As noted above, our acceptance of the ERA's approach to defining economic lives is predicated upon broad acceptance of the central scenario which gives rise to 2063 as the end of economic life under the ERA's definition. Substantial differences in view about the future, particularly, a view that any competitive forces are only likely to emerge decades later than our Final Plan suggests would represent an unacceptably high risk in terms of unrecovered assets.

To this end, although the ERA did not comment on our economic evidence, EMCa did, suggesting that we have "not provided a sufficiently compelling case" to cap the lives of our assets to 2059,[18] and that our proposal "is weighted towards scenarios and logic that support its proposal and provide insufficient recognition of counter-arguments and equally plausible assumptions that would not support its proposal".

It is very difficult to respond in detail to such comments because they are not particularly precise about what the particular issues are. For example, EMCa provides no information about which aspects of our proposal led to the conclusion that our case was not sufficiently compelling, now what "counter-arguments" it believes should have been considered, save for some references to what some consumers have said about lower gas prices and the use of hydrogen (see below).

However, to the extent that such views might lead to a very different view about the future than the central scenario which leads, under the ERA's definition of economic lives, to an end point of 2063 (when we would retire the asset due to negative transport prices), it is important that we provide some response.

[18] EMCa, [513].

Since we undertook our analysis, other work has come to light which suggests that, far from our work ignoring potential scenarios which might support a longer economic life, we are, if anything, significantly conservative in many of our assumptions. We have not changed our modelling results in response to this, as we believe that a degree of conservatism is appropriate when the future is this uncertain, but we summarise some of this information below. We focus first on gas for power generation, and then on our larger industrial consumers.

Gas for power generation

Power generation is a sector subject to substantial change at present, due to the impact of renewable power. Not only is this falling rapidly, but the cost of renewable power is now lower than fossil fuels.[19] This represents a structural break in the uptake of such power from being based on relative cost to being based upon the speed at which investment in this lower cost option can be accommodated into power grids.

In Attachment 11.3, we highlight how AEMO's forecasts of demand over the course of AA5 have dropped some 20% between 2017 and today (see Figure 5 in Attachment 11.3). This reflects just the impact of distributed renewable power, and that of grid-scale renewables. This is not an issue of forecasting error on the part of AEMO, or a change in AEMO's approach. Heal (2020), in a recent NBER working paper in the US considers what it would cost (net of plant replacement and fuel costs) to shift the US to a zero-carbon electricity sector by 2050.[20] The analysis repeats the approach the author took in 2017. Then, the net cost was US$1.28 - $3.97 trillion. Now the net cost is $179 billion; or slightly less than Apple's cash pile. This is a significant reduction, and it is due to decreases in renewable costs since 2017; most particularly, solar has crossed the threshold whereby it is now the lowest cost form of generation, and this causes a significant step-change in the uptake of solar power.

This is having a substantial effect on real-world investment planning. There have been many plans in the past about how the switch to renewable power might occur, but this was usually associated with cost; the price which would need to be paid in order to lower emissions. Increasingly, this is no longer the case. Phadke and Wooley (2020) in the "2035 Report", outline how the US could move to getting 90% of its power from carbon-free sources (which include nuclear in the US) in 2035.[21] This switch would result in power that is around 10% cheaper than electricity is in the US at moment. Prices reduce because renewables are already the cheapest form of power at a marginal cost (so produce lower prices in electricity markets) which provides an incentive to invest in these new plants.[22] Similar to the Rocky Mountain Institute study we discussed in our Final Plan,[23] this study sees no role for any new gas investment (a small role remains for existing plant), because it is too expensive. Interestingly, in drawing this conclusion, the authors used gas prices of between US$1.50 to US$2.50 per GJ, which is substantially lower than even the lower bound of our sensitivity analysis.

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[19] BNEF estimate that two-thirds of the world's population live in places where solar or wind are the lowest cost means of generating electricity and the world record lowest auction price for renewable power is $17/MWh or around one-third of the cost of new gas-fired generation; even in the US where gas is relatively cheap (seehttps://about.bnef.com/blog/peak-emissions-are-closer-than-you-think-and-heres-why/?utm_medium=Newsletter&utm_campaign=BNEF&utm_source=Email&utm_content=wirdec18&mpam=21051&bbgsum=DG-EM-12-19-M21051)

[20] See Heal, G, 2020, Economic Aspects of the Energy Transition, NBER Working Paper 27766, available from http://www.nber.org/papers/w27766

[21] Available from https://www.2035report.com/

[22] The rate of investment required is challenging, but only a little faster than the US has already achieved in its "dash for gas" during the first 20 years of this century.

[23] See See Rocky Mountain Institute, 2019, The Growing Market for Clean Energy Portfolios, available from https://rmi.org/insight/clean-energy-portfolios-pipelines-and-plants/

Many countries are taking more concrete steps towards decarbonisation. In the UK, zero net emissions by 2050 is mandated by law, and each year, National Grid produces its FES publication which maps out how the UK could meet this legislated target.[24] In the most recent version of this publication, it is predicted that gas use in the UK, with its very high heating load, will have halved by 2035, dropped to a quarter by 2040, and ceased by 2050; replaced by green hydrogen. This is affecting regulation too, with OfGEM being directed to consider decarbonisation as part of its regulatory role, and developing plans to this effect.[25]

In Australia, AEMO is planning the world's most rapid transition to renewable power with 74% of power generated by renewables by 2040 in its base case and 94% in its step-change scenario in its 2020 Integrated System Plan.[26] This is due to a window of opportunity created by the retirement of much of the coal fleet in the NEM. This requires between 26 and 55 GW of new grid-scale renewables, supported by between 6-19 GW of storage (depending on scenario), and AEMO notes that gas is only likely to be able to compete with batteries when the sun and wind are unavailable if its prices are very low.

In Western Australia, until very recently, government planning revolved around providing incentives for more renewable power, particularly at the household level. Now, penetration of distributed generation is so high that planning has needed to shift to changing the SWIS and market rule to prevent demand for power in the network from falling to unsustainably low levels.[27] Moreover, this is not a long-term goal; distributed energy sources are projected to start impacting the stability of the SWIS by 2022 and will start to impact the ERA's own decision-making in the next Western Power regulatory determination process, which starts next year.

All of this is relevant to our case. All of the developments noted above are either direct functions of technological change lowering renewable costs or will produce such lower costs by creating demand for renewable power with decarbonisation policies. This technology can be deployed anywhere, and indeed there is a strong incentive for the owners of technology to deploy it globally to amortise their research and development costs. If renewable power is able to force gas to less than 10% of the power generation load in the US by 2035 with gas prices that are roughly half the price we assume in our "low" scenario in the WOOPS model, then our assumptions in the WOOPS modelling appear highly conservative.

Larger industrial and mining customers

EMCa suggests [506] that we have not adequately considered the possibility of gas prices remaining very low and the effect that this might have on increasing demand for various services and the creation of new mining and industrial demand, and nor have we adequately considered the possibility that cheap hydrogen might one day push gas prices down further.

EMCa have not defined what "low" gas prices mean, or what support they have for prices lower than the prices we have used from the International Energy Agency. We addressed the question of what very low gas prices might mean for our conclusions, which we did as part of our sensitivity analysis in Attachment 9.2 (see Table 6). EMCa suggest considering new demand based on this potential low price, and the role hydrogen might play in keeping gas prices down.

Taking the second proposition first, if low hydrogen prices are only a local phenomenon, then it seems unlikely that this would depress gas prices as gas producers still have the option of selling gas overseas at a higher price not affected by the local effects of hydrogen. It is unclear why gas

[24] See https://www.nationalgrideso.com/future-energy/future-energy-scenarios/fes-2020-documents
[25] See https://www.ofgem.gov.uk/publications-and-updates/ofgem-s-decarbonisation-action-plan
[26] See https://aemo.com.au/energy-systems/major-publications/integrated-system-plan-isp
[27] See https://www.wa.gov.au/government/publications/der-roadmap

producers would respond to this local market pressure particularly since any gas reservation policy which required them to reserve gas for the local market, as at present, would be pointless in a world where local cheap hydrogen was available as a substitute.

If low hydrogen prices are a global phenomenon, then this would drive down gas prices globally. The question, in respect of new demand for gas, then becomes one of cost-reducing technological progress in gas and hydrogen. Industrial and mining plant typically requires decades of operation to pay back the invested capital, particularly if it is large enough to warrant a spur line from the DBNGP. If the manufacturing cost of hydrogen is falling due to rapid technological progress and technological progress in the gas industry is slow, then the investors in the industrial or mining operations that might use gas would need to consider not the situation at that point in time, but over the life of the plant. This is likely to make the choice of gas difficult, even if it has been pushed down by hydrogen at a point in time. This is exacerbated because gas is a natural resource which needs to be extracted and extraction costs tend to rise, not fall, over time, as the lowest cost gas fields are depleted.[28] For this reason, it seems unlikely that any potential for hydrogen to force down gas prices might lead to significant new demand for gas.[29]

Turning to the first proposition whereby gas is cheap for a long time for some other reason, perhaps because the industry is in glut as renewable power destroys demand. In this situation, there may be potential for some new users to emerge who are able to take advantage of gluts of gas. However, there are several forces working against this:

- As noted above, the cheapest gas is extracted first. Thus, once any "glut" is cleared, new gas would need to be discovered and brought to market, and this would be more costly.
- The prices of renewables are not standing still, but falling rapidly, and the longer term effects of this would need to be considered by any potential new investor.
- Policy positions point towards less, not more carbon being emitted into the atmosphere, and any investment favouring gas would need to consider exposure to this. Even today, NAB reports that it seeks rates of return of only 3-5% on renewable projects, but 15-17% for fossil fuel projects because of these kind of carbon liabilities.[30] The CSIRO (2018) deals with this in its projections by adding 5% to the required return on capital for fossil fuel projects when assessing different energy sources.[31]

Although we are seeing significant falls in demand for gas for power generation in AA5, demand from our mining and industrial shippers is stable (see Attachment 11.3 – and note that it is stable, not rising). These shippers have always been a significant market for us, given their very large energy requirements, and it might be easy to think that renewables are largely a "SWIS phenomenon". However, we are seeing more and more of our mining and industrial shippers exploring the use of renewable power for their operations. For example:

- Woodside, once one of the larger providers of gas on the DBNGP is now working on a hydrogen transition, seeking deals with customers overseas, and investing $40 million into hydrogen research.[32]

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[28] This assessment ignores the effect of carbon pricing or of restrictions on carbon emissions.

[29] Note also that gas pipelines cost around US$800,000 per km, so for a new project, distant from an existing gas pipeline, manufacturing hydrogen on-site may be a more attractive option (see Energy and Mines vol 25 p22 available from https://energyandmines.com/)

[30] See Energy and Mines, vol 24, p27, available from https://energyandmines.com/. NAB's target is $70 billion loaned to the renewable sector by 2025, one of many banks with sustainable finance targets (see Energy and Mines, vol 19 p12)

[31] CSIRO, 2018, GenCost 2018: Updated projections of electricity generation technology costs for AEMO, December 2018, p24, available from https://publications.csiro.au/publications/#publication/PIcsiro:EP189502

[32] See https://www.energynewsbulletin.net/on-the-record/news/1396053/woodside-progresses-opportunities-for-hydrogen-future

- Goldfields has recently commissioned and built a combination wind (18MW), solar (4MW) and battery (4MWh) system which delivers 23 to 38% cost savings for its mine, and can achieve between 50 and 80% penetration for renewables in its energy mix.[33]
- FMG has developed its Chichester Solar-Gas Hybrid in the Pilbara, involving a 60MW solar PV field and connections to Alinta's Newman power station and battery storage (see below) which can provide 100% of its daytime stationary energy needs and between 25 and 30% of its overall energy needs.[34]
- BHP, FMG, Anglo American and Hatch have formed the Green Hydrogen Consortium to jointly explore different ways of using green hydrogen in their respective mining operations, and to overcome barriers to its more widespread use.[35] BHP, along with Woodside and ourselves have also been shortlisted for the $70 million ARENA green hydrogen funding round aimed at initiatives to produce hydrogen below $2/kg by 2030.[36] This funding round attracted 36 applications totalling more than $3 billion worth of investment.
- BHP is currently studying the potential to supplement its existing hydrogen demand at its Nickel West facility with green hydrogen, and FMG is exploring its use to displace diesel for material movement, and is planning to purchase 10 hydrogen-fuelled buses to replace part of its diesel fleet as part of its $32 million investment in hydrogen-fuelled transport.[37]
- Rio Tinto is investing $98 million in a 34-megawatt PV array and 12-megawatt-hour lithium-ion battery system to help power its Koodaideri mine in Pilbara. The system will meet all of the mines electricity needs during peak solar production time and 65% of its overall electricity needs.[38]
- Alinta in the Pilbara added a 30MW battery to its Newman power station in 2018, which it is now looking to expand, and is upgrading and building transmission lines in the region to allow it to install a 60MW solar farm at Chichester (in addition to the 150MW solar farm owned by FMG). It is also looking to invest in 20-80MW of wind power in the region.[39]
- The Asian Renewable Energy hub which plans 15,000MW of renewable power in the Pilbara with 3000MW available to large energy users in the region and the remainder for expert into Asia achieved its environmental approvals in May 2020, and plans FID by 2025 and construction to commence in 2026.[40]

Many of these examples come from a monthly publication called "Energy and Mining" which focuses on the increasing use of renewable mining by miners. More examples and details are available in the publication itself (see https://energyandmines.com/.). Globally, the Rocky Mountain Institute maintains a database of renewable power used in mining sites which currently lists mining projects totalling more than 5000MW across 65 different countries.[41]

As a final point, industrial heat is often considered the "last frontier" for renewable power, as it is often difficult to electrify, and is a purpose for which gas is very well-suited. There is, however, a

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[33] See Energy and Mine vol 24 p5, available from https://energyandmines.com/.

[34] See Energy and Mines, Issue 22. Available from https://energyandmines.com/

[35] See https://www.hatch.com/en/About-Us/News-And-Media/2020/03/Industry-comes-together-to-form-Green-Hydrogen-Consortium

[36] See https://arena.gov.au/news/seven-shortlisted-for-70-million-hydrogen-funding-round/

[37] See Energy and Mines vol 24 p17 and Vol 25 p17 Available from https://energyandmines.com/

[38] See https://www.greentechmedia.com/articles/read/mining-giants-embrace-renewables-but-decarbonization-remains-a-steep-climb?utm_medium=email&utm_source=Solar&utm_campaign=GTMSolar

[39] https://reneweconomy.com.au/alinta-looks-to-wind-and-more-batteries-to-turn-pilbara-into-high-renewables-grid-52632/

[40] See https://asianrehub.com/

[41] see https://rmi.org/our-work/industry-and-transportation/material-value-chains/renewable-resources-at-mines-tracker/

considerable push globally to establish ways of bringing down the carbon content of industry, with a particular focus on industrial heat. We have assumed in our WOOPS modelling that hydrogen will perform this role, and eventually supplant gas, but this is not the only technology being developed, and may not be the first to be adopted for widespread use.

This is clearly an emerging area, but the scope of research is very wide; and the fact that is such an active area of research is itself indicative of the potential challenges faced by gas in respect of industrial heat in the future. An optimistic view of the field is provided by ARENA,[42] and a less optimistic view by Friedmann, Fan and Tang (2019).[43] Amongst our shippers we note that Alcoa, is conducting research into the use of electrified mechanical vapour recompression as a decarbonised alternative to the heat gas we transport currently provides as this technology (which is supported by affordable green hydrogen) can be retrofitted to existing plant.[44]

The practical upshot of the discussion outlined above is that yes, it is feasible that gas prices might remain low for some time, though we think this unlikely. It is also feasible that said lower prices might result in new demand, but we think the various forces ranged against significant growth are likely to mean that, in the long term, substantial growth is unlikely.

1.4. Summary

Our revised proposal modifies the ERA's approach on asset recategorisation. Recognising that neither ourselves nor the ERA adopted a solution which matches principles established by other regulators (and the ERA for other regulated entities), and noting that we both did so to reduce pricing impacts, we present a third approach which essentially sits between our respective approaches in dollar terms, and does provide a better fit with regulatory precedent.

In respect of asset lives, the ERA's interpretation of economic life resulted in us reconsidering this issue from a principled perspective. It is clear that our approach is not the only one which is a sustainable support to the long run interests of consumers. This highlights the need for further debate, outside the confines of a regulatory decision, and we outline the form this debate might take in the submission.

The ERA's approach to economic lives is not sustainable as it stands, but applying it using the information about the future we have presented as part of our WOOPS modelling suggests an economic end life of 2063. This represents a reasonable compromise on principles for AA5, whilst we work with the ERA on a more appropriate long term solution, even though it leaves some of our asset base unrecovered.

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[42] See ITP, 2019, Renewable Energy Options for Industrial Process Heat, Report for ARENA, November 2019, available from https://arena.gov.au/knowledge-bank/renewable-energy-options-for-industrial-process-heat/

[43] Friedmann, J, Fan, Z and Tang, K, 2019, Low Carbon Heat Solutions for Heavy Industry: Sources, options and costs today, Colombia Centre on Global Energy Policy Working Paper, October 2019, available from https://www.energypolicy.columbia.edu/research/report/low-carbon-heat-solutions-heavy-industry-sources-options-and-costs-today

[44] See Energy and Mines, Issue 24, pp20 and 29. Available from https://energyandmines.com/