HOUSTONKEMP
Economists

Consequences of declining gas pipeline utilisation

A report for Vector, Powerco and Firstgas

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1. Introduction

This report has been prepared by HoustonKemp on behalf of Vector Limited, Powerco and First Gas Limited (Firstgas) (collectively the gas pipeline businesses). It addresses the consequences of an anticipated decline in the utilisation of piped natural gas in New Zealand for the economic regulation of the gas pipeline businesses by the Commerce Commission (the Commission).

1.1 Context for this report

The New Zealand Government has committed to net zero emissions by 2050 and full reliance on renewable electricity generation by 2030. For example, in a recent report, the Climate Change Commission has made recommendations that are directed at the elimination of the use of natural gas in residential, commercial and public buildings. Regardless of whether these particular recommendations are adopted by government, decarbonisation of the New Zealand economy will likely be associated with a significant decline in the use of natural gas and in the utilisation of regulated gas pipeline infrastructure.

Reductions in the utilisation of regulated gas pipeline infrastructure will have, in turn, profound implications for the Commission's regulation of gas pipeline businesses under Part 4 of the *Commerce Act 1986* (the Act). The building block model framework used by the Commission for this purpose under its input methodologies (IM) is typically applied to mature businesses with stable cashflows and predictable demand. These foundations are threatened by the proposed policy changes, which call into question whether continued application of the status quo will remain in the long-term interest of end users and consistent with the purpose of the regulatory regime.

1.2 Process and issues paper

As the first step in its reset of the default price-quality path (DPP) applying to gas pipeline businesses from 1 October 2022, the Commission released a process and issues paper on 4 August 2021.[1] The paper acknowledges the significance of the challenges raised by decarbonisation for the regulation of pipelines and seeks to consult on the means by which these challenges might be confronted.

The process and issues paper highlights that the Commission is alive to the issues raised by potential government policies. The Commission is also aware of its responsibility to take into account these factors in the context of the Part 4 regime, ie:[2]

> to promote the long-term benefit of consumers in markets referred to in section 52 by promoting outcomes that are consistent with outcomes produced in competitive markets such that suppliers of regulated goods or services—
>
> (a) have incentives to innovate and to invest, including in replacement, upgraded, and new assets; and
>
> (b) have incentives to improve efficiency and provide services at a quality that reflects consumer demands; and
>
> (c) share with consumers the benefits of efficiency gains in the supply of the regulated goods or services, including through lower prices; and
>
> (d) are limited in their ability to extract excessive profits.

[1] Commerce Commission, *Resetting default price-quality paths for gas pipeline businesses from 1 October 2022*, Process and issues paper, 4 August 2021.

[2] *Commerce Act 1986* (New Zealand) s 52A.

This purpose potentially supports a new approach to financial capital management in the gas industry that continues to give suppliers incentives to innovate, invest, and generate efficiency gains that can in turn be shared with consumers.

In assessing the impact of government policies, the Commission observes that the current input methodologies will likely result in lower gas network prices from 1 October 2022 due to:[3]

- material reductions in the IM weighted average cost of capital (WACC) estimates since the previous regulatory control period;
- higher realised line charge revenues than were anticipated in the previous regulatory control period;
- forecasts of strong growth in capital expenditure in gas pipeline businesses' asset management plans that may not account for the government's response to the CCC's recommendations; and
- gas pipeline businesses potentially raising the level of capital contributions from customers seeking new connections.

The Commission recognises that changes to government policy affecting the gas industry are likely to represent 'exceptional circumstances' that merit a change in approach. Its process and issues paper explicitly canvasses a number of potential means of addressing these circumstances, ie:[4]

- rolling over starting prices;
- introducing an optional mechanism to shorten asset lives; and
- introducing an ex-ante allowance to compensate for the risk of asset stranding.

Other suggestions that have been proposed to the Commission, which it considers would be better addressed in the 2022 review of the input methodologies, include removal of indexation and removing and shortening specific asset lives.

1.3 Scope of this report

This report seeks to explore the consequences of declining utilisation of gas for the regulation of New Zealand's gas pipeline networks and, where possible, illustrate their nature and magnitude with some indicative modelling of the regulated gas pipeline industry.

In particular, we note that projections of declining utilisation of regulated gas pipeline businesses raise a number of complex and interrelated challenges, such as:

- that existing and future investments in regulated assets might no longer be able to be recovered from customers through charges determined under the existing regulatory framework;
- that declining demand could lead to volatile and increasing prices for delivered gas over time, raising uncertainty for investments that use gas;
- that declining demand combined with the ongoing costs of providing gas pipeline services may eventually cause pipelines to descope or discontinue their operations and it is desirable for both service providers and customers that any such exit occur in an orderly fashion; and
- that there remains substantial uncertainty as to whether an alternative use for gas pipelines will emerge and, if one does emerge, what the scale of the alternative pipeline usage will be and how it will consequently impact service providers and for customers.

[3] Commerce Commission, *Resetting default price-quality paths for gas pipeline businesses from 1 October 2022*, Process and issues paper, 4 August 2021, para 5.10.

[4] Commerce Commission, *Resetting default price-quality paths for gas pipeline businesses from 1 October 2022*, Process and issues paper, 4 August 2021, para 3.62.

The gas pipeline businesses have asked us to describe these challenges and explain how the Commission could seek to address them in the current DPP reset process within the scope of its input methodologies.

1.4 Structure of this report

The remainder of this report is set out as follows:

- section 2 discusses how the declining utilisation of gas in New Zealand will result in increasing and unstable prices for consumers while also preventing service providers from fully recovering their costs;
- section 3 introduces a framework for assessing options to address these challenges and examines the potential for accelerated depreciation to achieve this; and
- appendix A1 describes how we have updated and extended the Commission's financial building block model of the gas pipeline industry to cover the period up to 2050, which formed part of our analysis in sections 2 and 3.

2. Challenges raised by declining gas utilisation

This section sets out in more detail the likely challenges raised by the declining utilisation of gas in New Zealand for the Commission's regulation of gas pipeline infrastructure.

Gas utilisation is likely to decline over time as part of New Zealand's transition to a net zero emissions economy. Yet, underpinning the current regulatory arrangements is a presumption that service providers will continue to operate on a sustained or indefinite basis, responding to continued and stable demand for the service. This presumption no longer appears to be valid for gas pipeline infrastructure.

This situation raises critical challenges for the regulatory arrangements applying to gas pipelines. In particular, continued application of the current regulatory arrangements on a prospective basis will likely result in:

- prices of regulated gas pipeline services that increase in real terms over time as the costs of providing these services are spread across a smaller base of customers; and
- increasing uncertainty for both
  - service providers, as to whether they will be able to recover their costs in future revenues and in terms of managing their asset investments going forward, especially when replacing aging network elements; and
  - customers, as to whether their own investments will be supported by affordable prices for, and reliable provision of, gas.

2.1 Gas utilisation is likely to decline in New Zealand over time

Amendments made to the *Climate Change Response Act 2002* commit the government to a target of zero net emissions of greenhouse gases by 2050 and every subsequent year.[5] As part of this commitment, the government is currently formulating its first three emissions budgets and the country's first emissions reductions plan, which it is required to release by 31 December 2021. These policies will address emissions across a range of industries, including the energy industry.

Informing the New Zealand government's emissions budgets and the emissions reductions plan is a report prepared by the Climate Change Commission (CCC), called *Inaia tonu nei: a low emissions future for Aotearoa*. The advice in the report indicates the path that the government could take to meet its climate targets.

Among the recommendations made by the CCC are that the government should determine:[6]

> …how to eliminate fossil gas use in residential, commercial and public buildings. Actions should include:
>
> a. Setting a date to end the expansion of pipeline connections in order to safeguard consumers from the costs of locking in new fossil gas infrastructure.
>
> b. Evaluating the role of low-emission gases as an alternative use of pipeline infrastructure.
>
> c. Determining how to transition existing fossil gas users towards low-emissions alternatives.

[5] *Climate Change Response Act 2002*, section 5Q(1).

[6] Climate Change Commission, *Ināia tonu nei: a low emissions future for Aotearoa*, 31 May 2021, recommendation 20.8.

The CCC does not rule out the ongoing use of 'fossil' gas for industrial purposes. However, if its recommendations were adopted by the government, the utilisation of gas pipelines may decline precipitously (and perhaps cease entirely) by 2050.

Although the CCC notes the potential for low-emissions gas to make alternative use of gas pipeline infrastructure, it cites a lack of evidence of their future availability and cost to support the expansion of existing infrastructure.[7]

Whether the government will adopt the recommendations of the CCC may not be known until December 2021. However, regardless of whether the recommended measures or alternative measures are adopted, the broader context surrounding the government's emissions objectives, and general trends away from reliance on fossil fuels, strongly suggest that utilisation of gas – and gas pipelines – will decline in the future.

As part of this broader context, we also note that:

- an emissions trading scheme commenced in 2008 and was later extended to energy and industrial processes, placing a price on greenhouse gas emissions and increasing the cost of using natural gas;[8]
- in 2018 the government amended legislation such that it would no longer issue permits for offshore oil and gas exploration, and that new permits for onshore exploration would be available only in the Taranaki region;[9] and
- prior to the 2020 election, the Labour government made further commitments to achieving full renewable electricity generation by 2030, bringing forward the previous target by five years.[10]

In its report to the government, the CCC set out projections of future utilisation of gas in the New Zealand economy under the 'demonstration path', which it explains includes the actions that were identified as being critical for meeting the 2050 targets.[11] Consistent with the language used by the CCC, its projections suggest that residential, commercial and government use of gas will be eliminated by 2050. However, the CCC projects that some industrial processes may continue to use gas to 2050 and beyond.

The breakdown of these demand projections into different sectors of the economy is set out in figure 2.1 below. The CCC's projections indicate that:

- industrial use of gas will reduce from 104 PJ in 2022 to 13 PJ in 2050;
- commercial, residential and agricultural use of gas will cease entirely by 2050; and
- electricity generation will reduce its use of gas from 37 PJ in 2022 to 13 PJ in 2050.

We note that the CCC's predictions assume the continuing, albeit reduced, use of gas for electricity generation. Although this is not consistent with the current government's commitments, we note that generally the CCC's projects support a view that use of gas in the New Zealand economy will decline significantly to 2050, consistent with meeting the net zero target by that date.

[7] Climate Change Commission,Ināia tonu nei: a low emissions future for Aotearoa, 31 May 2021, para 15.97.

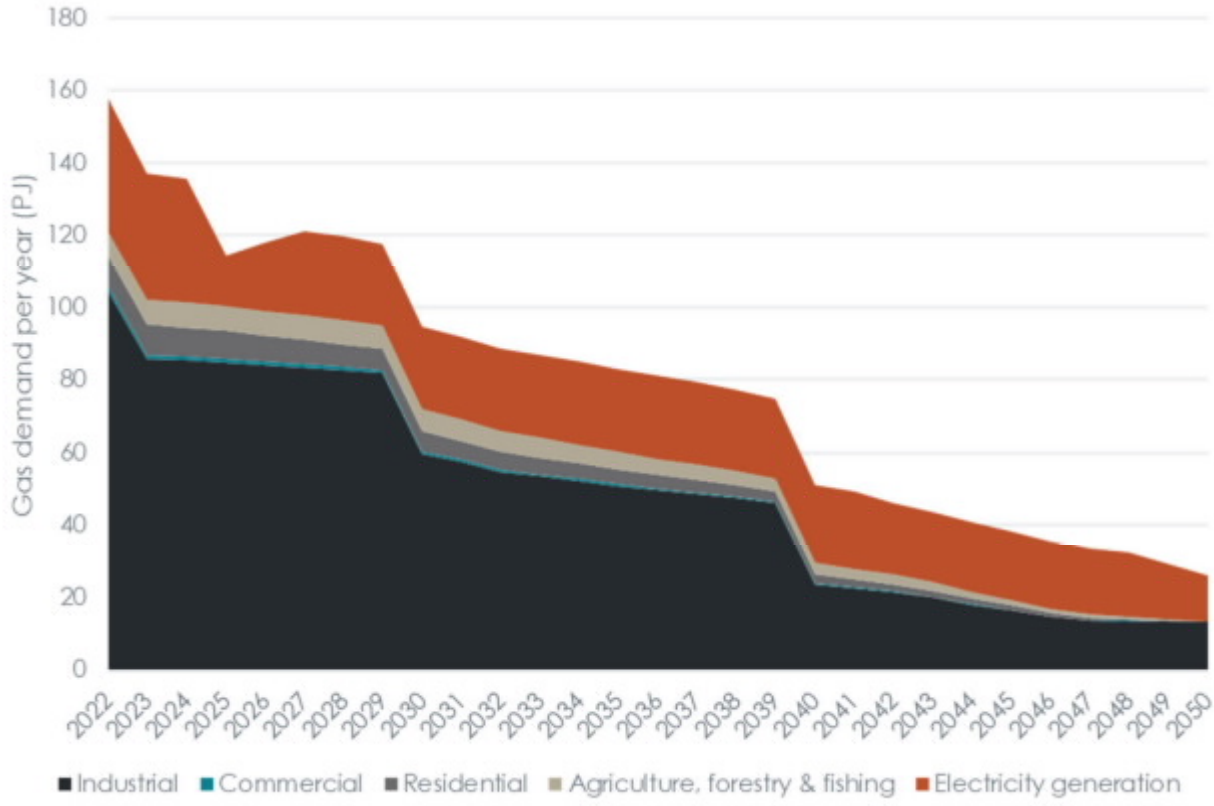
[8] At the time that this report was prepared, the spot price of New Zealand carbon allowances are approximately $50 per tonne of CO2. Assuming carbon intensity for natural gas of 53 kg of CO2 per GJ, this indicates an approximate contribution the price of natural gas of $2.65 per GJ.

[9] Crown Minerals (Petroleum) Amendment Bill, Explanatory note. Available online at https://www.legislation.govt.nz/bill/government/2018/0105/7.0/whole.html#d56e2, accessed 18 August 2021.

[10] Labour party website, https://www.labour.org.nz/release-renewable-electricity-generation-2030, accessed 18 August 2021.

[11] Climate Change Commission,Ināia tonu nei: a low emissions future for Aotearoa, 31 May 2021, para 7.2.

Figure 2.1: Declining utilisation of gas in New Zealand to 2050



Source: Climate Change Commission

The CCC's projection that household, commercial and government use of gas will cease, but that there will continue to be some use of gas by industry and for electricity generation, suggests that the decline in gas usage could have differential impacts across gas distribution networks and gas transmission networks. Notwithstanding, in light of the uncertainty of these projections, in this report we address the impacts of declining gas usage across the entire regulated gas pipeline sector.

2.2 Assumptions underpinning the regulatory framework no longer apply

A presumption that has underpinned the application of the regulatory arrangements applying to gas pipelines to date is that service providers will continue to operate on a sustained or indefinite basis in response to continued demand. This provides regulated businesses a high degree of assurance that the cost of investments will be able to be recovered in future revenues over the long term.

In the present circumstances, in which it cannot be presumed that either demand for gas will be maintained or that gas pipelines will continue to operate indefinitely, the approach that the Commission has taken to date in the determination of regulated revenues and prices will not provide this assurance.

One of the challenges for regulation of gas pipelines in these circumstances is to ensure that the cessation of their operations occurs in an orderly manner, in the interests of customers. Until it is no longer economic for gas pipelines to operate, the interests of customers will be promoted by having access to gas pipeline services for which the price, quality and availability are stable and predictable. Given its underpinning assumptions, this is not a task for which the status quo approach is well suited.

- In this section, we explain that application of the status quo approach to regulation in conditions of declining demand is likely to cause:the costs of providing these services to be spread across a smaller

base of customers, leading to higher prices and/or lower quality for gas services, further reinforcing the decline in demand; and

- the costs of providing these services not to be fully recovered in charges, since ongoing investment will be required to keep gas pipelines operational.

These outcomes are unlikely to promote an orderly cessation of operations for gas pipelines or their customers, leaving customers facing increasing charges, and service providers out of pocket. Rather, unless proactive steps are taken now to address these factors, they are likely to cause the closure of gas pipelines to occur earlier than would be desirable.

2.2.1 Prices will increase as demand declines

In this section, we explain that continued application of the current approach to determining price and revenues for gas pipelines will give rise to prices that increase as utilisation declines, even though the fundamental costs of providing the services remains stable. In our opinion, the long term interests of customers are likely to be served by setting a stable path of prices that reflect the long run costs of supply by better matching the costs to be recovered with the profile of expected utilisation.

The status quo approach to setting prices and revenues

The Commission undertakes economic regulation of gas distribution businesses and gas transmission businesses under Part 4 of the Act. Prior to the commencement of each regulatory control period, the Commission determines default price-quality paths (DPPs) for each gas pipeline business. Under the Act, the Commission has flexibility to set starting prices at the beginning of each regulatory control period, as either:[12]

- prices that applied at the end of the preceding regulatory control period; or
- prices, determined by the Commission, that are based on the current and projected profitability of each supplier.

The Commission's approach for businesses regulated under Part 4 of the Act has, to date, been to determine prices that are based on the current and projected profitability of each supplier, which we refer to as the 'status quo approach'. Under this approach, in the DPP reset process, the Commission:[13]

- calculates expected costs of each business in each year of the regulatory control period using a building block methodology, ie, as the sum of return on capital, depreciation,[14] operating costs and taxation, less upward valuations of assets;
- uses building block cost information to determine a smoothed path of maximum allowed revenue (MAR) that will recover the present value of costs incurred over the regulatory control period; and
- sets starting prices (for gas distribution businesses) or revenues (for gas transmission businesses) that provide for the recovery of the maximum allowed revenue (MAR) given forecast demand.[15]

[12] Commerce Act 1986, section 53P(3).

[13] Commerce Commission, *Resetting default price-quality paths for gas pipeline businesses from 1 October 2022*, Process and issues paper, 4 August 2021, para 5.3.

[14] The Commission applies an approach that it calls 'real straight line depreciation', whereby the cost of an investment is returned to the service provider through a constant real return of capital over the life of the investment.

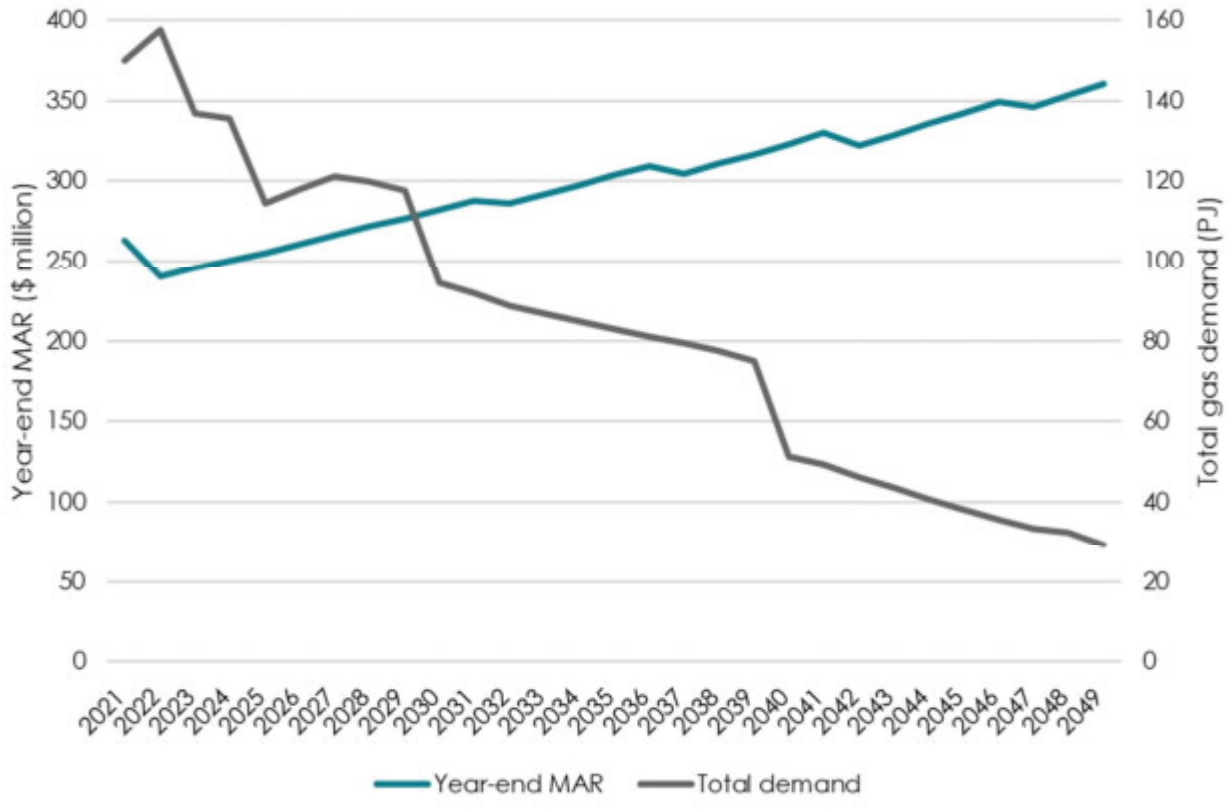
[15] Gas distribution businesses face a weighted average price cap and gas transmission businesses face a revenue cap. The essential difference between these structures is that the Commission uses a demand forecast over the regulatory control period to set a price path for gas distribution businesses. This exposes these businesses to volume risk, such that they may earn increased returns if demand exceeds the forecast (and lower returns if demand falls short of the forecast. On the other hand, gas transmission businesses face a revenue path over the regulatory control period and can adjust prices to attempt to recover that revenue.

Consequences of declining demand for average prices

Both forms of regulation applying to gas distribution and gas transmission businesses use demand (or forecast demand) as a denominator in calculating prices. That is, prices over a regulatory control period are a measure of the average costs per unit of demand, measured over or allocated to that period.

We show in figure 2.2 below that if the status quo approach continues to be applied without change, then MAR is likely to gradually increase over time, even as projections of demand decline. This estimate of MAR is based on illustrative modelling that applies the status quo approach to 2050 to the regulated gas pipeline industry, using simplifying assumptions for key inputs such as capital expenditure, operating expenditure and cost of capital.[16]

Figure 2.2: Gas industry revenues increase even as utilisation declines, 2022-2049



Source: HoustonKemp analysis using Commerce Commission financial model and Climate Change Commission's forecasts

The divergence of the paths of MAR and overall gas demand has important consequences for the price of gas pipeline services that would result from continued application of the status quo approach and – through that – the price for delivered gas.

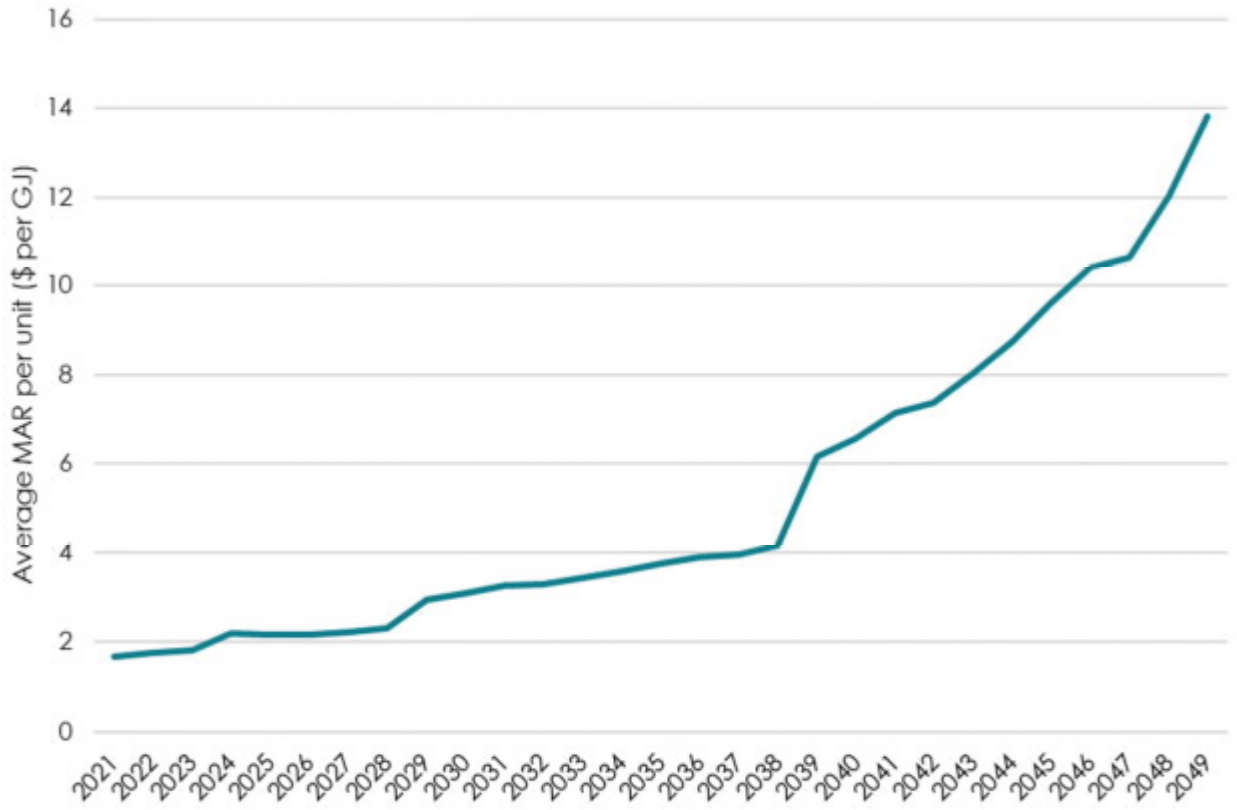
Since increasing MAR is assumed to be recovered from a shrinking base of demand, the average price of gas pipeline services required to recover MAR would be expected to increase even further over time compared to the price path under the status quo. Demonstrating this effect, figure 2.3 below indicates that average prices for pipeline services would need to increase almost seven-fold between 2022 and 2050 to recover MAR.

[16] A detailed description of the assumptions made and method used are set out at appendix A1 of this report.

Such an increase would in turn be expected to have a significant effect on the price paid by customers for gas. By way of illustration, we understand that gas pipeline charges currently comprise approximately 27 per cent of this price. If these charges were to increase in line with the increase illustrated in figure 2.3 below and the prices of other elements of the gas supply chain were to remain unchanged, then this would result in retail gas prices approximately doubling over time.[17]

We note that the calculation of prices in figure 2.3 below assumes perfectly inelastic demand for gas, ie, that customers would not respond by reducing consumption in the face of higher prices. A more realistic assumption is that there would be a significant decrease in demand in response to a doubling of retail prices. This in turn would mean that an even greater increase in average prices than indicated in figure 2.3 would be required to recover MAR.

Figure 2.3: Gas industry MAR per unit of projected gas demand, 2022-2049



Source: HoustonKemp analysis using Commerce Commission financial model and Climate Change Commission's forecasts

A path of prices that increases such as that illustrated in figure 2.3 above is not likely to be in the interests of customers.

The Commission's process and issues paper observes that many customers must make investments in equipment to support their use of gas. Prices for gas that are volatile, or are not predictable, do not provide a stable environment for customers to make these investments and are not likely to be in their interests.[18]

[17] We do not have any reason to expect that prices for other elements of the gas supply chain would remain constant. However, the scope of this report does not extend to an assessment of the factors that may influence prices for these other elements.

[18] Commerce Commission, *Resetting default price-quality paths for gas pipeline businesses from 1 October 2022*, Process and issues paper, 4 August 2021, para 3.48.

Volatile or unpredictable prices may be appropriate if they in turn reflect costs of providing gas pipeline services that are themselves rapidly changing. However, our illustrative modelling assumes constant nominal costs. The seven-fold increase in charges resulting from continued application of the status quo approach shown by our illustrative modelling does not reflect a trend in costs, but may reflect the inability of the existing framework, applied without change, to address circumstances caused by a decline in the use of gas.

2.2.2 Costs of investment will not be fully recovered in charges

We explain at section 2.2.1 that average prices for gas pipeline services will need to increase to recover MAR that result from continued application of the status quo approach to regulation. In this section, we explain that even recovery of MAR under this approach would likely not allow gas pipeline businesses full cost recovery in expected terms.

Declining utilisation of gas pipelines gives rise to the prospect that they will eventually need to discontinue operations. The date at which gas pipelines might be expected to cease operations is uncertain and depends on many factors. It may be realistic to assume that gas pipelines will cease to operate on or before 2050 if no alternative use becomes economic before then.

Before closure, gas pipelines will require ongoing capital expenditure to ensure that they remain capable of reliable and safe operation, even if they do not connect any new coverage or expand their footprint. To promote efficient investment in providing these services in the interests of customers who use them, it is important that the regulatory regime provides a reasonable prospect, in expectation, that this investment will be able to be recovered in future charges.

However, continued application of the status quo approach to regulation without change would leave the industry with a substantial RAB by the end of 2050 that could not be recovered in future charges from customers. Further, a substantial proportion of this RAB is likely to be comprised of capital expenditure that will be required in the future to continue provision of gas pipeline services.

On an aggregate basis, the average remaining lives of existing assets are less than 30 years, and so without future capital expenditure the industry asset base would decline to zero by 2047, although we note that the periodic re-weighting of the life of the RAB would vary from DPP to DPP. This estimate reflects a conservative simplification of the Commission's approach to rolling forward asset values, because it assumes away the diversity of asset lives that underpin the assets within the existing RAB. A detailed implementation that accounted for this diversity would see a significant quantum of RAB not recovered by 2050, consistent with there being a significant number of individual assets which have remaining lives extending beyond 2050.[19]

However, with consideration of capital expenditure to maintain operation of existing pipelines and supply to existing customers (which we discuss in more detail at appendix A1 to this report) the industry RAB remains positive throughout the entire period, reaching a closing value of $890 million at the end of the regulatory year beginning 2049. That is, without significant change to the status quo approach to regulating gas pipeline services, the industry is unlikely to be able to recover a substantial proportion of the capital expenditure that it will have to invest to continue operating gas pipeline assets.

[19] Schedule 4 of each gas pipeline business's 2020 information disclosure shows several asset categories with more than 30 years' weighted average remaining asset lives. Assuming zero additional capex and straight line depreciation for each asset category, the gas pipeline businesses as a whole will still have approximately $250 million worth of assets in real terms that remain undepreciated as of June 2050. This corresponds to a nominal value of approximately $453 million in 2050 when scaled by CPI. We note that this may still be an underestimate since the gas pipeline businesses' actual asset lives are likely to be more diverse than that the asset categories presented in Schedule 4 of the information disclosure.

3. Addressing challenges using building blocks

This section discusses some of the potential solutions to the challenges identified in section 2 with a particular focus on the use of accelerated depreciation, which is within the powers of the Commission under the existing input methodologies, to address these issues. In undertaking these assessments, we also comment on two of the responses proposed by the Commission, ie, a 15 per cent acceleration of depreciation and the 'rolling over' of existing prices.

An important insight from the analysis that we present in section 2 is that a sustainable outcome for consumers and the gas pipeline industry requires higher prices in the near term that better reflect the long run costs of providing gas pipeline services and the period over which customers will be willing to bear these costs. Without higher prices in the near term, consumers over the long term will confront unstable and unpredictable prices and service providers will face the prospect of not being able to recover their efficient investments.

In this section we show that a smooth price path that increases with inflation up to 2050 and provides for the recovery of all efficient costs by 2050 requires substantially higher prices for gas pipelines services than are currently charged to customers. We understand that setting a price on this basis is not feasible within the existing input methodologies, but it nevertheless provides a useful reference point for the assessment of other approaches to addressing the challenges posed by unstable prices and under-recovery.

Furthermore, our modelling shows the importance of the DPP in managing the transition to higher prices, as it can shift the long-run price trajectory towards the right direction. Delaying this transition will increase the burden on future consumers, and our indicative modelling indicates that consumers will face average gas prices that are around $0.62 per GJ higher between 2026 and 2027. However, if the Commission were to delay this transition to 2027, then consumers over the period from 2027 to 2040 would pay materially higher prices for delivered gas than would have been the case had the transition occurred in 2022.

We show that accelerating depreciation over the regulatory control period from 2022 to 2027 by reducing the remaining lives of existing assets can positively affect these results. Such changes would be expected to reduce both:

- the extent to which prices would need to increase in 2027 to return to a smoothed price path allowing for cost recovery; and
- the extent to which prices applying under a smoothed price path starting from 2027 would exceed prices that would otherwise have applied under a smoothed price path starting from 2022.

Our illustrative modelling suggests that reductions in remaining assets lives in the order of 25 to 30 per cent would have a material effect on these outcomes. Lesser reductions would still leave prices significantly below levels that provide for cost recovery and will impose additional costs on future consumers as well as ongoing instability and uncertainty.

3.1 Smoothed price paths that achieve cost recovery

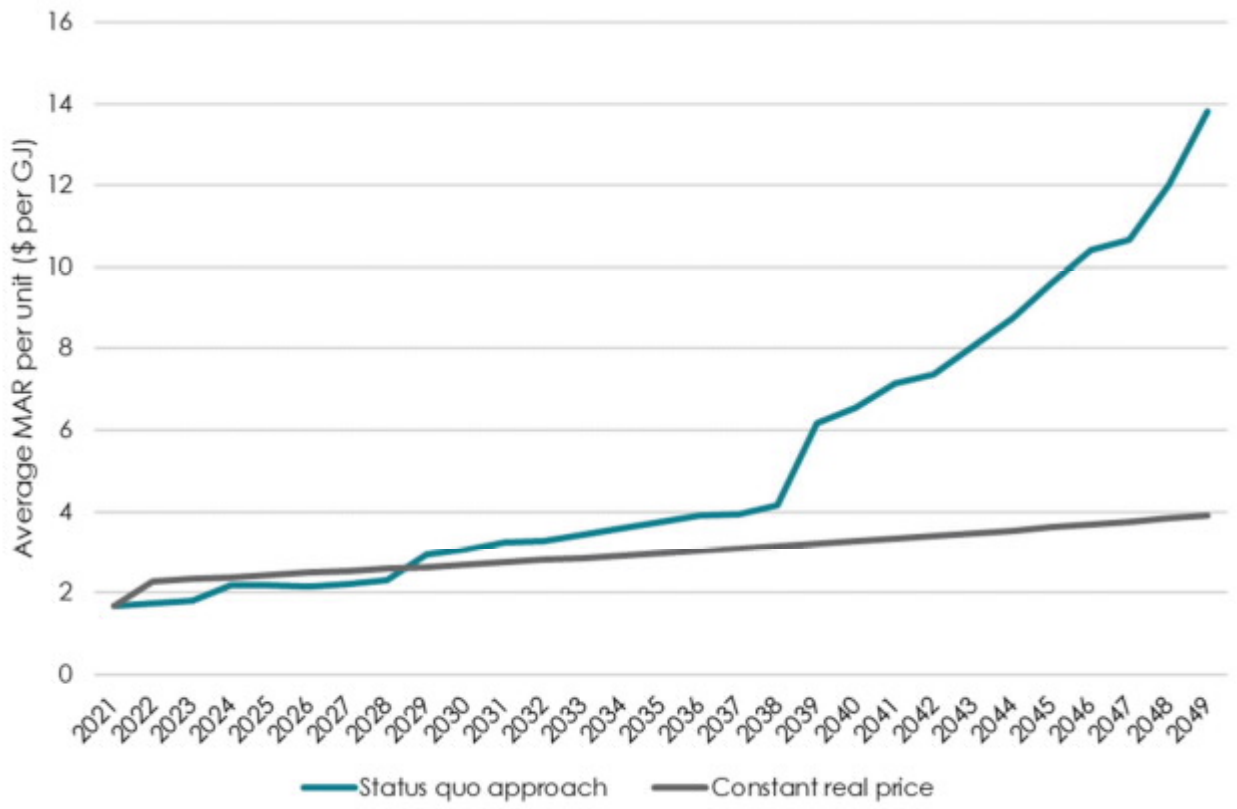
As described in section 2.2 above, declining utilisation of gas pipelines means that the Commission's current approach for determining maximum prices will result in increasing and unstable prices for consumers while also preventing service providers from fully recovering their costs. Any proposed solutions should thus be evaluated based on how well they address these problems, namely in terms of improving price stability and cost recovery.

One illustrative example is to assume that the Commission sets an initial price that increases annually with inflation up to 2050. This approach is equivalent to treating the entire 2022 to 2050 period as a single 28-

year regulatory period. Under this example, the initial price can be set such that gas pipeline businesses will fully recover the present value of residual costs that will be incurred up to 2050, assuming that gas demand follows the CCC's forecasts. In this way, the approach addresses both problems described in section 2.2. We refer to this approach in the remainder of this report as a 'smoothed' price path.

Figure 3.1 shows the MAR implied by the smoothed price path approach (assuming that the Commission implements the approach starting in 2022), along with the CCC's demand forecasts. Smoothed prices result in revenues that decline with demand, such that the small subset of consumers using the gas pipelines close to 2050 will pay the same real prices as the corresponding larger group of consumers in 2022.

Figure 3.1: Effect of moving to a smoothed price path at 2022



Source: HoustonKemp analysis using Commerce Commission financial model and Climate Change Commission's forecasts

We use the smoothed price path shown in figure 3.1 as a reference against which other potential solutions may be 'benchmarked'. It is not necessarily a practicable solution for immediate adoption, for two reasons.

First, adopting a smoothed price path until 2050 represents a significant departure from the current approach to setting prices and revenues for regulated gas pipeline businesses and may not be achievable using the existing levers available to the Commission under the input methodologies.

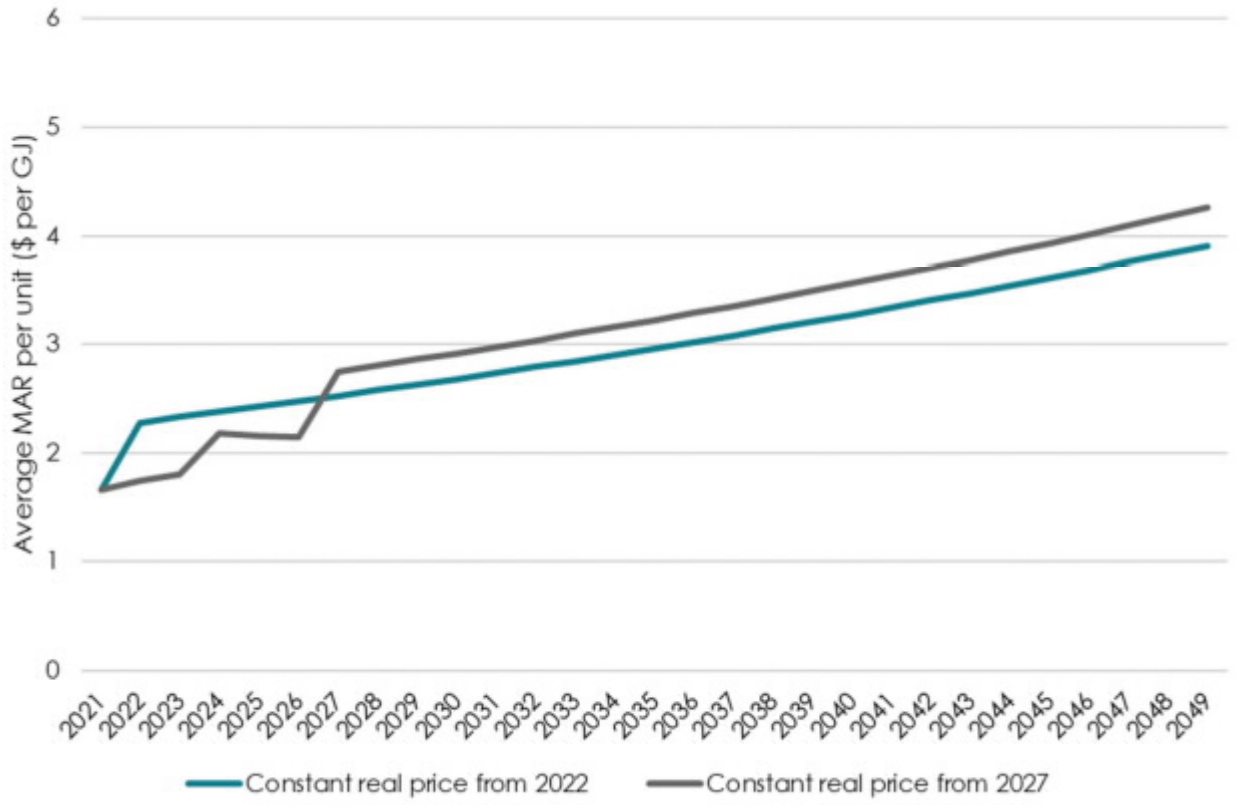
Second, although a revenue path that declines with demand may be desirable in principle, it may also promote closure of gas pipelines. This occurs because service providers continue to incur capital expenditure while in operation. Should the present value of future expenditure exceed the present value of future cash flows at any point before 2050, the service provider would then have a commercial incentive to shut down its pipeline early. This will be to the detriment of consumers that would have continued to use the pipeline until 2050, although we note that shutting down a pipeline early may be economically efficient.

Additionally, we note that the smoothed price path requires an immediate and significant increase in average price for gas pipeline customers – an average increase of $0.62 per GJ between 2026 and 2027. This increase is approximately equivalent to a 37 per cent increase in the price of delivered gas.

It is possible that a more gradual transition would be a preferable basis for moving to a smoothed price path. Nevertheless, we consider a smoothed price path to be a useful tool for assessing other approaches to addressing these issues.

One useful insight from the smoothed price approach is that the Commission's timing in implementing its solution can have a material impact on consumer prices and on service providers' incentives. Figure 3.2 shows the resulting price path if the Commission decides to delay implementation of a smoothed price path to 2027.

Figure 3.2: Effect of delaying movement to a smoothed price path to 2027



Source: HoustonKemp analysis using Commerce Commission financial model and Climate Change Commission's forecasts

With this delay, the increase in price required in 2027 to move onto a path of cost recovery is materially higher than it would have been in 2022. Further, the stable price path beginning in 2027 remains 8.8 per cent higher than the smoothed price path beginning in 2022 for every year between 2027 and 2049.

These results indicate that there are material costs involved in deciding not to undertake action to move prices closer to a smoothed and stable price path over the 2022 to 2027 regulatory control period. Those costs include the prospect of an even greater price correction at a later time and permanently higher prices for consumers, if the regulatory regime is to continue to provide suppliers the opportunity to recover their efficient costs.

3.2 Accelerating depreciation of residual asset lives

The price profile set out at section 3.1 above relies on a smoothed price path, recovering costs over the long run to 2050. As such, it cannot be achieved under the current input methodologies, which requires prices to be set by reference to costs measured within discrete regulatory control periods of no more than five years, using real straight line depreciation.

In this section, we discuss how the status quo approach to regulating gas pipeline businesses under the current input methodologies could be applied over the regulatory control period between 2022 and 2027, so as to:

- address the challenges set out in section 2 above; and
- reduce the scale of the issues that remain to be addressed when the Commission next resets prices in 2027.

An important insight from the analysis that we present in section 2 is that a sustainable outcome for consumers and the gas pipeline industry requires higher prices in the near term that better reflect the long run costs of providing gas pipeline services. Without higher prices in the near term, consumers over the medium to long term will confront unstable and unpredictable prices and service providers will face the prospect of not being able to recover their efficient investments.

Within the scope of the existing input methodologies, one method to provide higher prices in the near term, while retaining present value neutrality, involves the acceleration of the depreciation of the existing RAB through shortening asset lives. This approach is consistent with one of the options raised in the Commission's process and issues paper, which proposes an optional adjustment, similar to that applied to EDBs as part of the 2016 input methodologies process.[20] In that process, the Commission decided that a downward adjustment to remaining asset lives, capped at 15 per cent, would be the best way to reflect the higher uncertainty attached to the risk of partial capital recovery due to technological change.

We explore the consequences of various degrees of accelerated depreciation, parameterised as a reduction in the remaining lives of existing assets on:

- the path of average MAR per GJ that applies across the regulated gas pipelines over the regulatory control period from 2022 to 2027;
- the extent to which average prices would need to increase (or potentially decrease) at 2027 to place them onto a smoothed path providing for cost recovery to 2050;[21] and
- the extent to which a smoothed price path providing for cost recovery from 2027 to 2050, contingent on the degree of acceleration, exceeds the level of prices if the industry were to move to that path in 2022.

Figure 3.3 below shows:

- with a black line, the smoothed price path starting from 2022 that provides for present value cost recovery for the gas pipeline industry; and
- with lines in various shades of teal, the price path that results from ongoing application of the status quo approach to determining regulated revenues and prices under alternative assumptions for accelerated depreciation, ranging from no (zero) adjustment to existing asset lives up to a 50 per cent adjustment to remaining asset lives.

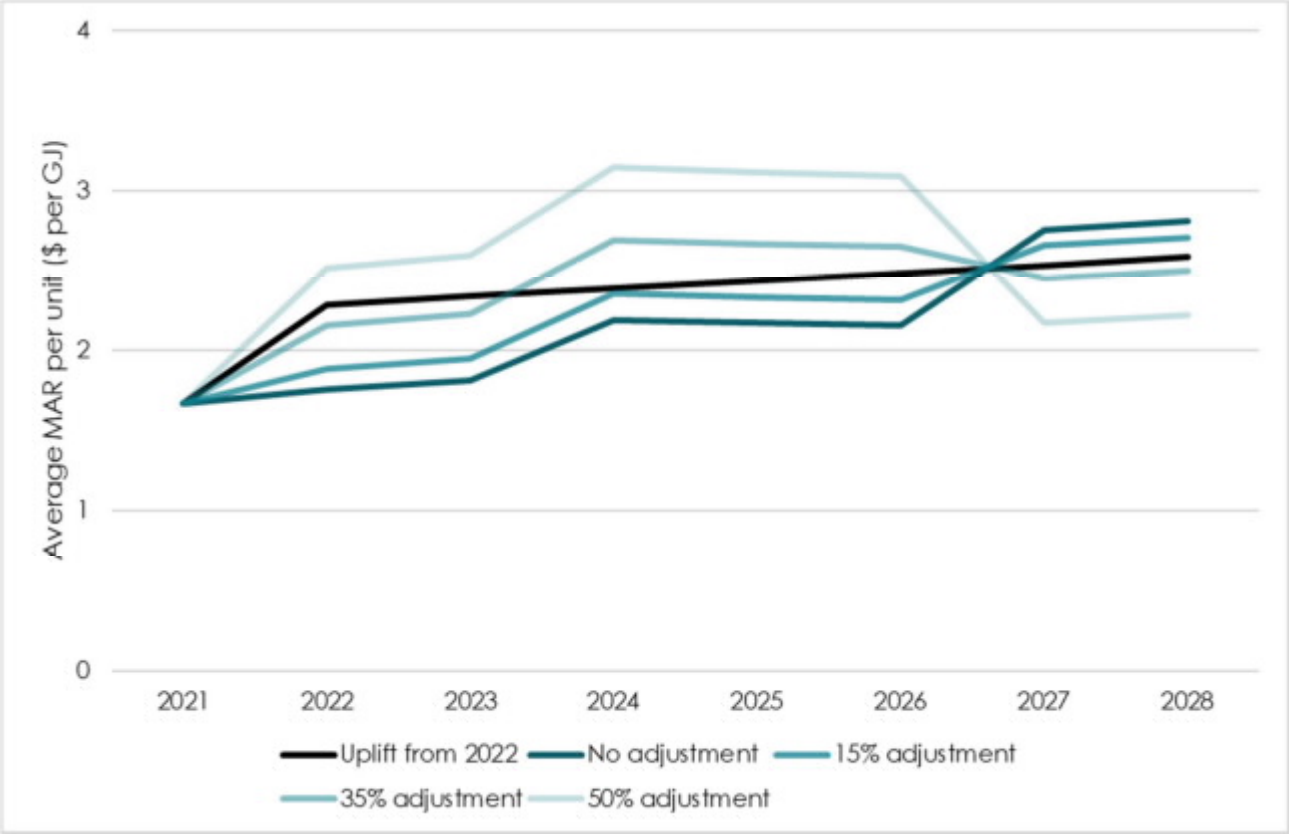
As the degree of acceleration of depreciation increases, this increases the total amount of costs that are recovered during the 2022 to 2027 regulatory control period, thereby reducing the residual amount of costs

[20] Commerce Commission, *Input methodologies review decisions*, Topic paper 3: The future impact of emerging technologies in the energy sector, 20 December 2016, para X9.

[21] We reiterate that our derivation of the smoothed price path is intended to indicate a path for potential cost recovery. It should not be construed as a practicable solution for immediate adoption.

that remain to be recovered in prices over the period between 2027 to 2050. This in turn reduces the smoothed path of prices from 2027 that provides for cost recovery.

Figure 3.3: Effect of accelerated depreciation on the future path of prices



Source: HoustonKemp analysis using Commerce Commission financial model and Climate Change Commission's forecasts

Consistent with the analysis at section 3.1 above, figure 3.3 indicates that, if no change is made to depreciation during the 2022 to 2027 regulatory control period, the smoothed price path applying from 2027 would be 8.8 per cent higher than the smooth price path that would have applied from 2022, ie, prices will permanently be 8.8 per cent higher due to this decision.[22]

Figure 3.3 also demonstrates that when depreciation is accelerated, the extent of the price increase required to return prices to a smoothed price path in 2027 is lower, and the extent to which this new path is higher than the smoothed price path that would have applied from 2022 is also lower. Indeed:

- when reductions in existing asset lives exceed about 35 per cent, prices no longer need to increase to return to a smoothed price path from 2027, and will reduce at higher rates of depreciation ; and
- when reductions in existing asset lives exceed about 30 per cent, a smoothed price path from 2027 will no longer be higher than a smoothed price path applying from 2022.

Further, figure 3.3 indicates that progressive reductions in existing asset lives have an *increasing* effect on recovery over the period from 2022 to 2027 and therefore on the smoothed prices that apply from 2027.

[22] We note that the accelerated depreciation price paths in the figure do not increase linearly because of year-to-year fluctuations in the CCC's demand forecasts.

These consequences for price changes in 2027, and prices that apply from 2027, are set out for completeness in table 3.1 below.

Table 3.1: Change in prices in 2027 under different assumptions for accelerated depreciation

Reduction in remaining asset lives	Present value of MAR, 2022 to 2027	Price increase per GJ to move to a smoothed price path from 2027	Price difference per GJ from 2027 relative to 2022 smoothed price path
0 per cent	$1,108 million	$0.60	8.8 per cent
5 per cent	$1,133 million	$0.53	7.6 per cent
10 per cent	$1,160 million	$0.44	6.3 per cent
15 per cent	$1,191 million	$0.34	4.9 per cent
20 per cent	$1,225 million	$0.24	3.2 per cent
25 per cent	$1,265 million	$0.11	1.3 per cent
30 per cent	$1,310 million	-$0.03	-0.8 per cent
35 per cent	$1,363 million	-$0.20	-3.3 per cent
40 per cent	$1,426 million	-$0.40	-6.3 per cent
45 per cent	$1,500 million	-$0.63	-9.9 per cent
50 per cent	$1,591 million	-$0.92	-14.2 per cent

Source: HoustonKemp analysis using Commerce Commission financial model and Climate Change Commission's forecasts

By way of example, the results of the illustrative modelling shown in table 3.1 above indicate that a 15 per cent reduction in remaining asset lives would result in the recovery of $83 million in revenues over 2022 to 2027, in present value terms. This would reduce the impact of a move to a smoothed price path, but by less than a third, relative to taking no action at all. That is, a 15 per cent reduction in remaining asset lives may still either result in:

- a significant one-off adjustment in average prices in 2027 in order to return to a smoothed price path allowing for recovery of costs; or
- ongoing instability and unpredictability in prices.

Further, consumers would face ongoing charges that were 4.9 per cent higher than if the move to a smoothed price path had been undertaken in 2022.

By contrast, a reduction in asset lives in the order of 25 to 30 per cent would go much further to returning prices to a level close to a smoothed price path, reducing significantly the prospect of further price instability and unpredictability from 2027.

A further advantage to acceleration of depreciation of existing assets is that this may support a smoother transition in the future to the use of gas pipelines to transport clean gases, if this becomes technically feasible. Although the Commission cites the potential for gas pipelines to transport clean gases as a rationale not to accelerate depreciation, the opposite may be true. In particular, if the costs of providing gas pipeline services are not recovered from consumers of natural gas today, they may potentially be recovered from consumers of clean gas in the future. This could have the effect of delaying a transition to clean gas.

3.3 Rolling over starting prices

The Commission notes that there are indications that applying the status quo approach to resetting prices from 1 October 2022 would reduce prices for gas pipeline services.[23] Noting that reducing prices at this time could have potentially adverse consequences for consumers, the Commission suggests that one alternative is that gas network prices at the end of the previous regulatory control period could potentially be rolled over as starting prices from 1 October 2022, instead of reducing prices.

As set out in section 2.2.1 above, the Act grants the Commission flexibility to pursue this alternative approach. However, the Commission will continue to set the rate of change for revenues according to the CPI-X approach as required by the Act.[24]

The Commission contends that rolling over current prices will provide higher revenue allowances compared to resetting the input methodologies, thus ameliorating some of the increased risk of economic network stranding.[25] If correct, this approach might have the benefit of smoothing the price path for consumers, which reduces price volatility while enhancing certainty for consumer budgeting purposes.

Our modelling based on the combined cost structure of the gas pipeline businesses suggests that rolling over starting prices may not have the effect anticipated by the Commission, or at least may not have a significant effect.

We expect that the Commission's indications of starting prices may have assumed stable or constant levels of forecast demand. However, we note that the CCC's forecast of demand predict a significant decline in demand over this period – from 157.6 PJ in 2022 to 121.2 PJ in 2027 – a decrease of 23 per cent.

If the Commission's estimates of starting prices were to take into account significant decreases in the use of gas, it is less likely that it would forecast a reduction in starting prices. In particular, we estimate that the starting prices would increase slightly in the 2022 regulatory year under the status quo approach to setting prices. However, we acknowledge that our modelling is only indicative, and does not take into account exactly how gas pipeline costs are recovered from different types of consumers, which could affect these comparisons.

Further, even if rolling over starting prices were to deliver slightly higher prices in the short term, it is unlikely that this would persist for long. We show in figure 2.3 above that average MAR per unit increases significantly over time, associated with reductions in the use of gas networks. In these circumstances, it appears likely that rolling over prices would at best provide a small and short-lived increase to near-term revenues and prices and exert a commensurately small effect on future revenues and prices. It would not address to any significant extent the fundamental problems of long run price instability for consumers and insufficient recovery of costs for service providers.

3.4 Removal of indexation and other approaches

Another approach being considered by the Commission is the removal of CPI indexation of the RAB, which is similar to the framework currently applied to Transpower. This approach mitigates asset stranding risks by front-loading capital recovery in a present value neutral way through higher near-term revenues.[26]

[23] Commerce Commission, *Resetting default price-quality paths for gas pipeline businesses from 1 October 2022*, Process and issues paper, 4 August 2021, para 5.10.

[24] Commerce Commission, *Resetting default price-quality paths for gas pipeline businesses from 1 October 2022*, Process and issues paper, 4 August 2021, para 5.18.1.

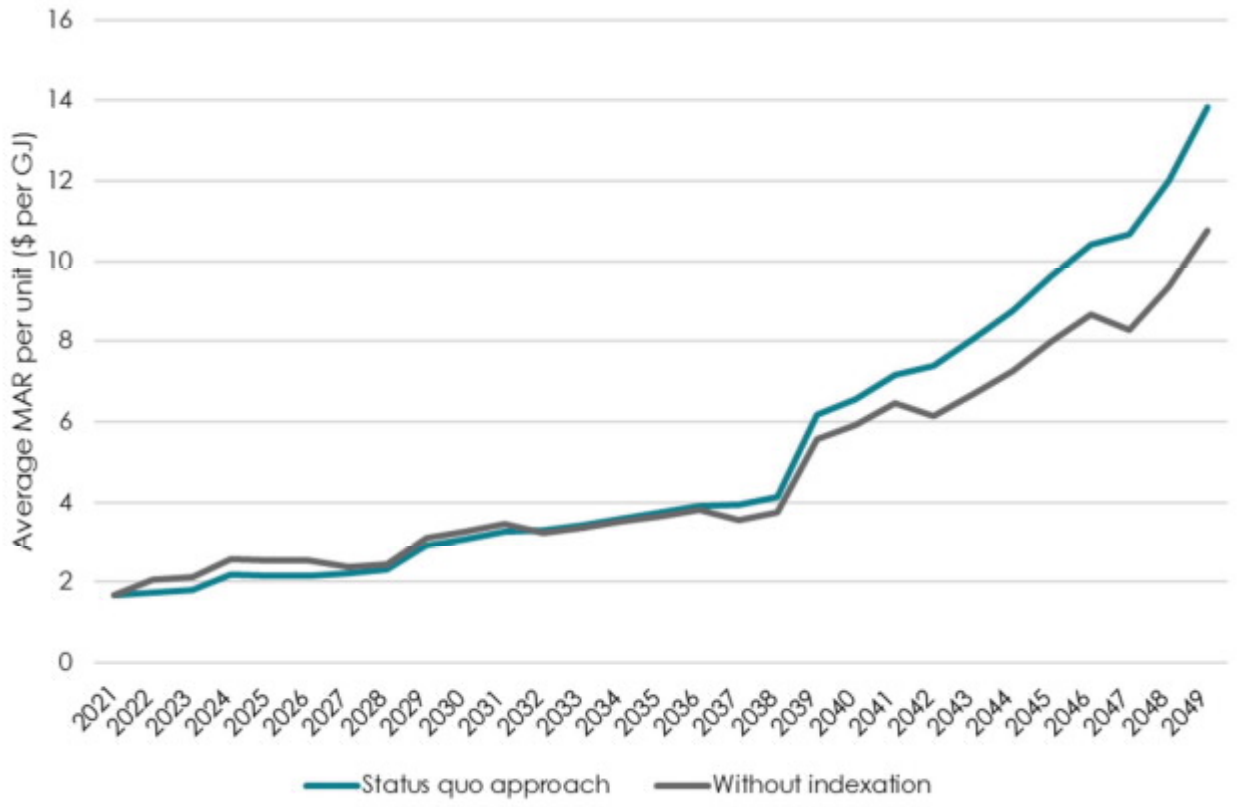
[25] Commerce Commission, *Resetting default price-quality paths for gas pipeline businesses from 1 October 2022*, Process and issues paper, 4 August 2021, para 5.13.

[26] Commerce Commission, *Resetting default price-quality paths for gas pipeline businesses from 1 October 2022*, Process and issues paper, 4 August 2021, para D49.

We note that although the use of indexation is sometimes considered through the lens of inflation risk, its effect is to push back recovery of the costs of assets until later in their economic lives. Removing indexation would be expected to bring forward recovery of investments, potentially bringing revenues more closely into line with expected utilisation of gas pipeline networks.

Figure 3.4 below shows that removing indexation would have the effect of increasing prices in 2022 and reducing future prices, particularly those applying after 2040. Although this would not generate price stability for customers (since prices would still increase six-fold) it would represent some improvement upon application of the status quo approach.

Figure 3.4: Gas industry MAR per unit of projected gas demand without indexation, 2022-2049



Source: HoustonKemp analysis using Commerce Commission financial model

A1. Updating the 2017 Gas DPP financial model

We have updated and extended the Commission's building block financial model to generate combined gas pipeline businesses' allowed revenue forecasts from 2022 up to 2050 based on the Commission's current approach of resetting MAR every five years. We then derive maximum prices by dividing MAR by the CCC's 'demonstration path' gas demand forecasts.

We have also implemented an illustrative alternate approach that treats 2022 to 2050 as a single regulatory period. Under this approach, we smooth prices over 2022 to 2050 instead of resetting revenues every five years.

We note that our modelling utilises several simplifying assumptions to keep the analysis tractable but illustrative. While our assumptions will differ from the Commission's actual parameter assumptions, the insights drawn from our analysis are nonetheless likely to be applicable.

The remainder of this appendix sets out:

- the inputs and assumptions that we used from 2022 onwards;
- our approach for generating maximum prices; and
- our approach for deriving gas pipeline businesses' combined allowed revenue estimates based on an illustrative approach that generates a smoothed price path by treating 2022 to 2050 as a single regulatory period.

A1.1 Inputs and assumptions from 2022 onwards

We derived inputs to the Commission's financial model from various sources.

A number of inputs are the same for all suppliers, such as:

- CPI forecasts up to five years ahead derived from updated RBNZ data inserted into the Commission's CPI model.[27] We assume CPI forecasts beyond five years to be 2 per cent, in line with the midpoint of the RBNZ's inflation target;
- rate of return parameters for which we used a 4.81 per cent vanilla weighted average cost of capital (reflecting the 67th percentile), 2.74 per cent cost of debt, and 42 per cent leverage. These correspond to 6.06 per cent pre-tax WACC and 4.49 per cent post-tax WACC;[28]

Other inputs are specific to individual suppliers, such as:

- initial conditions, which we obtain from the 'RAB', 'Tax', and 'BBAR' sheets of the Commission's 2017 financial model;
- forecast operating expenditure, which we assume to be constant in nominal terms from 2022 onwards;
- forecast constant price revenue growth, value of disposed assets, and other regulated income, which we assume to be zero from 2022 onwards;
- forecast value of commissioned assets, which:

[27] We obtained inflation forecasts from Figure 2.16 of the RBNZ's May 2021 Monetary Policy Statement.

[28] The Commission's 67th percentile vanilla WACC point estimate is 4.83 per cent. The Commission did not publish 67th percentile estimates of the pre-tax WACC and post-tax WACC, but we derived these using the Commission's published WACC parameter estimates. We use a 4.81 per cent vanilla WACC in order to maintain consistency with our pre-tax and post-tax WACC estimates, with the difference being the result of rounding. See: Commerce Commission, *Cost of capital determination for disclosure year 2022 for information disclosure regulation*, 2 August 2021, pp 4 and 6.

- up to 10 years ahead we obtain from Schedule 11a of each gas pipeline business's asset management plan (AMP).[29] We deduct forecast expenditure for 'consumer connection' and 'system growth' from the reported value of commissioned assets; and
- beyond ten years ahead we assume that the remaining value of commissioned assets remains constant in nominal terms beyond the longest available forecasts.

We also simplify the Commission's timing assumptions by assuming that the first building block year of each regulatory control period is assigned 75 per cent weight when calculating present values, while 25 per cent weight is applied to the last building block year of the regulatory control period.

Finally, we assume that at the beginning of each regulatory control period, the value of assets commissioned over the previous five years are rolled into the opening RAB value for 'existing assets'. This ensures that the asset life and resulting depreciation allowance for 'existing assets' are updated every five years to incorporate newly commissioned assets.

A1.2 Calculating maximum prices

The CCC's dataset includes forecasts for several scenarios. We rely on gas demand forecasts from the 'demonstration path' scenario, which reflects:[30]

> The main path which underpins the Commission's recommended emissions budgets (with illustrative extension to 2050).

Our analysis in this report draws on the gas demand forecasts in the dataset. Although the dataset contains a further breakdown of gas demand into different categories such as residential, electricity generation, transport, and other sectors, we nevertheless use only the forecasts of total gas demand. We calculate maximum prices in dollars per GJ terms as MAR divided by forecasts of gas demand.

We note that forecasts of total gas demand may not accurately reflect the demand for natural gas transport services provided by gas pipeline businesses because some gas may be consumed on-site or transported by unregulated pipelines. Nevertheless, we consider that these forecasts illustrate how the declining gas utilisation brought about by the proposed emissions budgets will affect the asset stranding risks faced by gas pipeline businesses.

A1.3 Constant real prices

In section 3.1 we determine benchmark prices under the assumption that the Commission sets an initial price that increases annually with inflation up to 2050. The initial price is set such that gas pipeline businesses fully recover the present value of their costs by the end of 2049/50 building block year, assuming that gas demand follows the CCC's forecasts.

That is, we first calculate the gas pipeline businesses' costs as the sum of the present value of:

- the existing asset base as at 2022;
- future capex up to the 2049/50 building block year; and
- future opex up to the 2049/50 building block year.

We discount these costs using the Commission's August 2021 pre-tax WACC (6.06 per cent).

[29] Firstgas transmission published a combined Schedule 11a for MDL and Vct. We apportioned 30% of the resulting annual capex estimate to Firstgas transmission MDL and the remaining 70% to Vct, based on our observation that the Commission's financial model estimated MDL's depreciation to be roughly 28-29% of Firstgas transmission's total depreciation from 2015 to 2022.

[30] Climate Change Commission, *Scenarios dataset for the Commission's 2021 Final Advice (output from ENZ model)*, 22 June 2021.

Next, we estimate maximum allowable revenues up to the 2049/50 building block year by multiplying the CCC's gas demand forecasts with a price series that increase in line with inflation. We then discount the gas pipeline businesses' revenues using the Commission's August 2021 post-tax WACC (4.49 per cent).

Finally, we solve for the initial price for the year that the Commission begins setting constant real prices. This initial price is set such that the present value of the businesses' costs will be equal to the present value of its maximum allowable revenues.[31]

Our analysis assesses how the initial price changes with the regulatory period in which the Commission adopts this approach. For example, if the Commission were to adopt the approach in 2022, then the initial price will reflect gas pipeline businesses' ability to recover their costs over the entire period up to 2050. Conversely, if the approach were to be adopted in 2027, then the initial price will reflect the shorter period over which costs can be recovered.

[31] Our approach, which discounts future costs using the pre-tax WACC and discounts future revenues using the post-tax WACC, provides a simplified method for incorporating the tax allowances of the building block model.

An alternative method would be to solve for the initial price at which the present value of all future revenues – discounted using the vanilla WACC – would be equal to the present value of the Commission's building block revenues up to the 2049/50 building block year plus the present value of the residual RAB at the end of the 2049/50 building block year, also discounted using the vanilla WACC. This method would only require the vanilla WACC to be used for discounting, but would further require fairly complex calculations of tax allowances.

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