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Review of the Authority's Final Decision on Depreciation

A report for Johnson Winter & Slattery

31 August 2015

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Executive Summary

We have been asked by Johnson Winter & Slattery (JWS) to prepare this report on behalf of ATCO Gas Australia Pty Ltd (ATCO). JWS has asked that we comment on particular aspects of the Economic Regulation Authority of Western Australia's (the Authority's) final decision on proposed revisions to the access arrangement for the mid-west and south-west gas distribution systems submitted by ATCO (the final decision)¹ as well as the Authority's proposed amendments to the final decision.²

The particular aspect of the final decision on which JWS has asked us to comment is the analysis underpinning the Authority's decision to index the capital base for the effect of consumer price inflation (CPI) and so to determine the depreciation schedule for ATCO using the indexed straight line depreciation approach, otherwise referred to as current cost accounting (CCA).³

Errors in the analysis underpinning the final decision

The Authority's analysis of average prices, and its comparison of those with LRMC per GJ and per connection over the 2014 to 2080 period, involves a number of significant errors, which we explain in section 3 and summarise below.

At the outset of our analysis, we explain that in assessing compliance with rule 89(1)(a) little or no weight should be placed on an analysis of LRMC and prices *per connection* over time.⁴

Errors in the analysis of long run marginal cost

The Authority's analysis of the LRMC of natural gas services over time incorporates a number of significant errors. The Authority's final decision draws inferences as to LRMC from data on implicit capital price deflators for the 'electricity, gas, water and waste' industry provided by the Australian Bureau of Statistics (ABS). However, in its use of those data, the Authority:

- errs in its interpretation of the evidence; and
- implicitly disregards this same evidence in its analysis of LRMC per GJ over time;

Although the Authority uses the same ABS data to support its conclusion that LRMC is flat or decreasing in the draft decision,⁵ in the final decision the Authority concludes that the ABS data indicate that LRMC is flat or perhaps slightly rising.⁶

¹ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015.

² The Authority, *Mid-West and South West Gas Distribution Systems Access Arrangement 2015-2019 – Consultation on proposed amendments to the final decision*, 21 August 2015.

³ For an explanation of the approaches to determining the depreciation schedule please see: HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, section 3.

⁴ In the final decision the Authority introduce a new analysis of the extent of departure between LRMC per connection and average prices per connection, ie, total annual revenue divided by total connections, over time.

⁵ The Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South West Gas Distribution System*, October 2014, paragraph 1028. We explain in our earlier report that in the draft decision the authority's precise interpretation of the historical trend data for the purposes of forming a view of the future trend in LRMC was unclear, see: HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 17.

⁶ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 23.

The Authority also draws inferences as to the LRMC of natural gas services over time by deriving estimates of LRMC per GJ using an average incremental cost (AIC) approach. However, in its projection of this variable, the Authority:

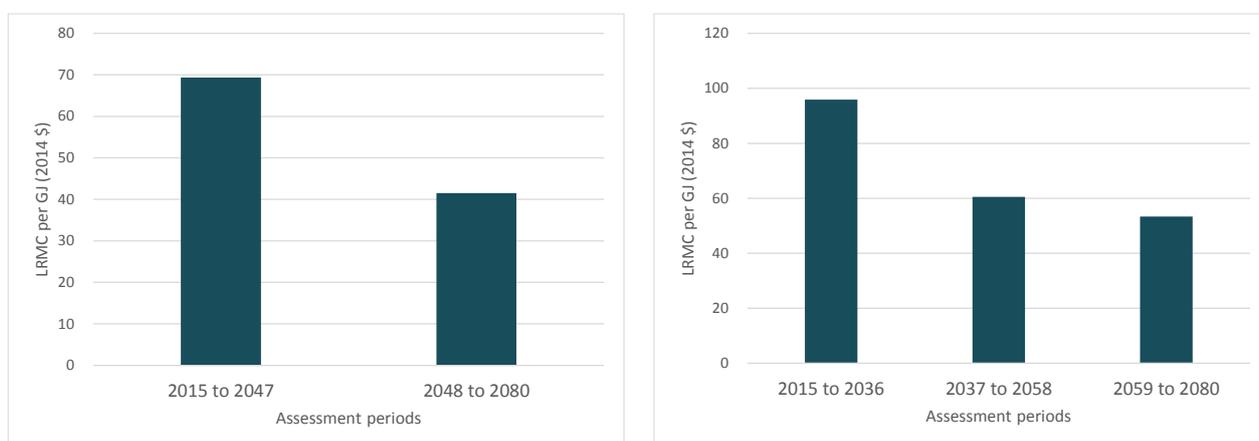
- uses a flawed growth assumption to forecast capital expenditure;⁷
- uses an historical estimate of LRMC to draw inferences as to LRMC from 2015 onwards;⁸ and
- uses historical gas volumes with a material downward bias.⁹

We explain in section 3.2 and 4.2.1 that correcting the errors in the Authority's analysis of the ABS data shows that:¹⁰

... LRMC is likely to decrease in future years and, at its most conservative, to be relatively stable.

Further, in section 4.2.2 we correct the Authority's analysis of LRMC per GJ using the AIC approach and illustrate the results of the revised analysis in Figure 1 below.

Figure 1 Revised estimates of LRMC per GJ using the AIC approach, constant prices



Once the errors in the Authority's analysis of LRMC per GJ using the AIC approach are corrected, these data show that LRMC per GJ is strongly reducing over the 2015 to 2080 period.

On the analysis presented in this report and summarised above, in our opinion the errors in the Authority's analysis of LRMC lead it to the incorrect conclusion that LRMC per GJ is rising.¹¹ Correcting the errors in the Authority's analysis supports the conclusion in the November 2014 report of Greg Houston that:¹²

... LRMC is likely to decrease in future years and, at its most conservative, to be relatively stable. Notwithstanding, for the purpose of the comparisons of LRMC and average prices through time that I undertake below, I adopt the highly conservative assumption that LRMC will be constant in future years.

⁷ See section 3.3.

⁸ See section 3.4.

⁹ See section 3.5.

¹⁰ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 18.

¹¹ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 16 to 20.

¹² HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 18.

In other words, although our best estimate of LRMC per GJ is that it will decrease in future years, the analysis and conclusions presented in both the November 2014 report and this report are premised on the highly conservative assumption that LRMC per GJ will be stable in the future.

Errors in the Authority's analysis of average prices

We explain in section 3.3 that the Authority estimates average prices per GJ over time using an inherently flawed capital expenditure growth assumption, which gives rise to a time profile of capital expenditure per new connection in constant prices that has no empirical basis. In section 4.1 we correct the error in this assumption, and in section 4.3 we present revised estimates of average prices per GJ under different approaches to determining the depreciation schedule.

Results of our analysis

In both its draft and final decision the Authority accepts the proposition set out in Greg Houston's March 2014 report that:¹³

'... the depreciation schedule that best promotes efficient growth in the market for reference services (as required by rule 89(1)(a)) will be that which minimises the extent of departure from LRMC pricing caused by the need to recover sufficient revenues.'

In other words, the Authority accepts that efficient growth in the market for natural gas services will be promoted by a time profile of depreciation that minimises the extent of departure, over time, between the price of natural gas services and the LRMC of providing natural gas services.¹⁴

On the basis of our revised estimates of average prices per GJ and our highly conservative assumption that LRMC per GJ remains flat over time, in section 4.3 we assess:

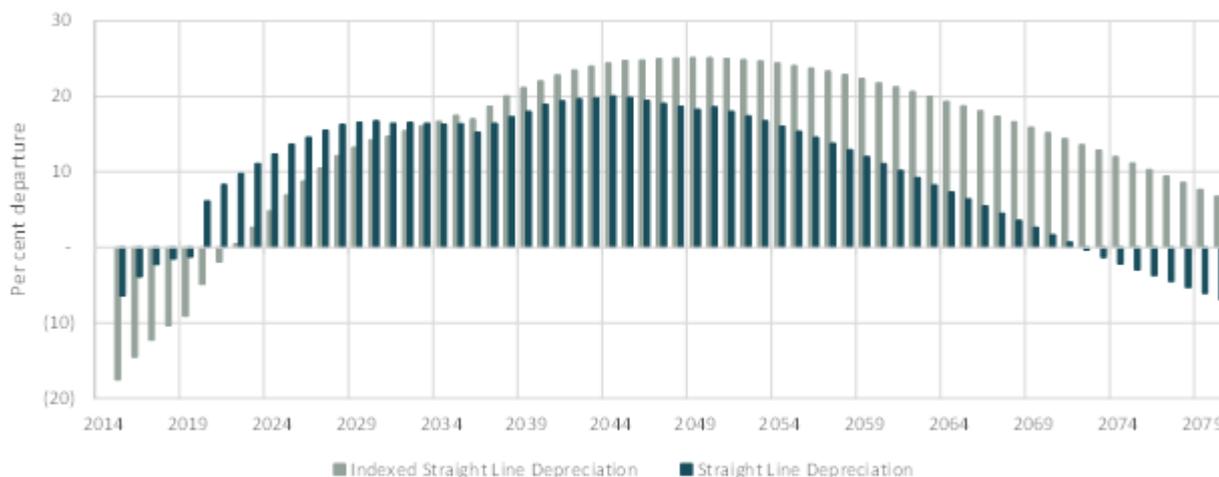
- whether straight line depreciation or indexed straight line depreciation meets the requirements of rule 89(1)(a); and
- whether the transition approach as proposed by ATCO meets the requirements of rule 89(1)(a), as compared with the indexed straight line depreciation approach applied by the Authority in the final decision.

We correct the errors in the Authority's analysis of average prices per GJ and LRMC per GJ and present the results that analysis below. Figure 3 illustrates the extent of departure between prices and LRMC over time under straight line depreciation and indexed straight line depreciation, as applied by the Authority in the final decision.

¹³ NERA, Depreciation Options for ATCO Gas, Expert Report of Gregory Houston, 13 March 2014, page 11.

¹⁴ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, paragraph 2036, page 430.

Figure 2 Difference between the change in unit price per GJ and the indicative LRMC trend, constant prices



The extent of departure from LRMC under straight line depreciation and indexed straight line depreciation can be quantified by calculating the standard deviation of prices from LRMC over time. A higher standard deviation reflects a larger departure from LRMC.¹⁵ The standard deviation of prices from LRMC over the 2014 to 2080 period is:

- 17.8 under indexed straight line depreciation; and
- 13.0 under straight line depreciation.

On the basis of our analysis of the extent of departure between LRMC and prices presented in Figure 2 above, we conclude that, against the highly conservative assumption that LRMC remains flat:

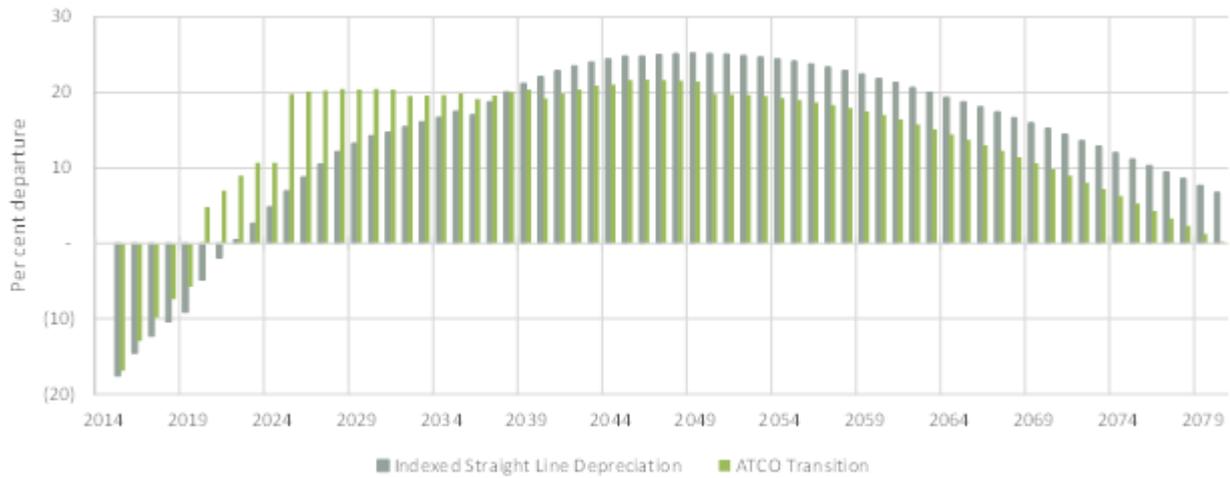
- straight line depreciation complies with rule 89(1)(a);
- indexed straight line depreciation does not comply with rule 89(1)(a);

ATCO's transition approach

We understand that the objective of ATCO's transition approach is to mitigate the relatively higher gas prices in the near term that arise under straight line depreciation, as compared with indexed straight line depreciation, while still providing for the efficiency benefits associated with straight line depreciation over the long term. Figure 3 illustrates the extent of departure between prices and LRMC over time under the transition approach proposed by ATCO and the indexed straight line depreciation approach applied by the Authority in the final decision.

¹⁵ Standard Deviation is a statistical measure used to quantify the extent of dispersion in a data set.

Figure 3 Difference between the change in unit price per GJ and the indicative LRMC trend 2014 to 2080, constant prices



We have quantified the extent of departure between prices and LRMC under ATCO’s transition approach and indexed straight line depreciation, as illustrated in Figure 3, by calculating the standard deviation from LRMC. We find that the standard deviation of prices from LRMC over the 2014 to 2080 period is:

- 17.8 under indexed straight line depreciation; and
- 16.1 under ATCO’s transition approach.

Drawing on the above analysis we conclude that, against the highly conservative assumption that LRMC remains flat:

- ATCO’s transition approach meets the requirements of rule 89(1)(a), as compared with the indexed straight line approach applied by the Authority in the final decision; and
- indexed straight line depreciation does not comply with rule 89(1)(a).

Further, these conclusions would be reinforced if we were to relax the highly conservative assumption that LRMC remains flat and, alternatively, were to assume that LRMC is reducing over time.

It follows that it is incorrect to reject the transition approach proposed by ATCO and that the errors in the Authority’s final decision lead it to the erroneously conclusion that indexed straight line depreciation complies with rule 89(1)(a).



1. Introduction

We have been asked by Johnson Winter & Slattery (JWS) to prepare this report on behalf of ATCO Gas Australia Pty Ltd (ATCO). JWS has asked that we comment on elements of the Economic Regulation Authority of Western Australia's (the Authority's) final decision on proposed revisions to the access arrangement for the mid-west and south-west gas distribution systems submitted by ATCO (the final decision)¹⁷ as well as the Authority's proposed amendments to the final decision.¹⁸

The particular aspect of the final decision on which JWS has asked us to comment is the analysis underpinning the Authority's decision to index the capital base for the effect of consumer price inflation (CPI) and so to determine the depreciation schedule for ATCO using the indexed straight line depreciation approach, otherwise referred to as current cost accounting (CCA).¹⁹

This report builds on the opinions set out in our August 2015 note (the HoustonKemp note), which was prepared on the basis of the information presented in the final decision and submitted to the Authority by ATCO. Since preparing the HoustonKemp note:

- we have been provided with the model underpinning the Authority's final decision on the depreciation schedule that complies with rule 89(1)(a);
- the Authority published proposed amendments to the final decision, which correct an error identified in the HoustonKemp note and make various other changes;²⁰ and
- we have been provided with the model underpinning the Authority's proposed amendments to the final decision on the depreciation schedule that complies with rule 89(1)(a).

We have prepared this report on the basis that the Authority implements the proposed amendments to its final decision in relation to the depreciation schedule that complies with rule 89(1)(a). In the remainder of this report, we refer to the final decision as though it incorporates the proposed amendments to the final decision.

In preparing this report we have been provided with a copy of the Federal Court practice note CM7, entitled *Expert Witnesses in Proceedings in the Federal Court of Australia* (the Guidelines). We have read the Guidelines and agree to be bound by them.

1.1 Structure

We have structured the remainder of our report as follows:

- in section 2 we summarise the key elements of the Authority's final decision with reference to the rules, the draft decision, ATCO's proposed revisions to the access arrangement and the concept of long run marginal cost (LRMC);
- in section 3 we highlight the errors in the analysis underpinning the Authority's final decision to reject the transition approach to determining the depreciation schedule proposed by ATCO and to apply the indexed straight line approach; and

¹⁷ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015.

¹⁸ The Authority, *Mid-West and South West Gas Distribution Systems Access Arrangement 2015-2019 – Consultation on proposed amendments to the final decision*, 21 August 2015.

¹⁹ For an explanation of the approaches to determining the depreciation schedule please see: HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, section 3.

²⁰ The Authority, *Mid-West and South West Gas Distribution Systems Access Arrangement 2015-2019 – Consultation on proposed amendments to the final decision*, 21 August 2015.

- in section 4 we correct the errors in the Authority's analysis and present our revised analysis of the extent of departure between LRMC and average prices over time under different approaches to determining the depreciation schedule.

2. The Authority's Final Decision

The depreciation schedule adopted by the Authority in its final decision is derived on a materially different basis from that proposed by ATCO in its proposed revisions to the access arrangement, ie:

- ATCO proposes to determine the depreciation allowance using an approach that transitions to straight line depreciation (the transition approach); and
- the Authority's final decision is to determine the depreciation schedule using indexed straight line depreciation.

These approaches to determining the depreciation schedule are explained in detail in the November 2014 report of Greg Houston (the November 2014 report).²¹ Nevertheless, it is instructive to note that both the transitional approach proposed by ATCO and the indexed straight line depreciation approach applied by the Authority in the final decision give rise to total revenue streams over the regulatory periods applicable to the life of any particular asset that are equivalent in net present value (NPV) terms.

The principal distinction between these two approaches is that they give rise to different time profiles of depreciation and capital related revenues over the life of an asset. It follows that the approach used to determine the depreciation schedule will have implications as to the time profile of revenue, and so the price of natural gas services, over future regulatory periods.

2.1 Compliance with rule 89(1)(a)

The rules do not stipulate any particular approach to determining the depreciation schedule. Rather, rule 89(1)(a) requires that:²²

'The depreciation schedule should be designed... so that reference tariffs will vary, over time, in a way that promotes efficient growth in the market for reference services.'

In both the draft decision and final decision the Authority accepts the proposition set out in the March 2014 report of Greg Houston (the March 2014 report) that:²³

'... the depreciation schedule that best promotes efficient growth in the market for reference services (as required by rule 89(1)(a)) will be that which minimises the extent of departure from LRMC pricing caused by the need to recover sufficient revenues.'

In other words, the Authority accepts that efficient growth in the market for natural gas services will be promoted by a time profile of depreciation that minimises the extent of departure, over time, between the price of natural gas services and the LRMC of providing natural gas services.²⁴

2.2 Long run marginal cost

LRMC is a forward looking concept and amounts to a measure of the additional cost incurred as a result of an incremental (or relatively small) increase in output, assuming all factors of production are able to be varied. As a matter of principle, setting prices equal to LRMC will promote efficient use and production of goods and services because:

²¹ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014

²² NGR, rule 89(1)(a)

²³ NERA, *Depreciation Options for ATCO Gas*, Expert Report of Gregory Houston, 13 March 2014, page 11.

²⁴ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, paragraph 2036, page 430.

- it ensures that consumers face price signals that reflect the resource cost of providing services, which encourages demand for services only when the benefit to consumers exceeds the cost of their provision; and
- it provides signals to infrastructure providers as to how much users value additional capacity, and thereby plays an important role in financing that capacity.

The forward looking nature of LRMC arises from the observation that historical costs cannot be affected by changing current behaviour. However, future costs pertaining to the expansion of a network can be affected by changes in demand, namely by means of bringing forward or delaying any expansion in capacity. Indeed, Kahn (1988) notes that:²⁵

Marginal costs look to the future, not to the past: it is only future costs for which additional production can be causally responsible; it is only future costs that can be saved if that production is not undertaken. ...in a dynamic economy, with changing technology as well as changing factor prices, there is every reason to believe that future capital costs per unit of output will not be the same as the capital costs historically incurred installing present capacity.

LRMC can be assessed on a number of bases, including by reference to total gas volume delivered, gas throughput, the number of connection points and length of the network.

2.3 Background to the final decision

Before summarising the Authority's final decision and the grounds on which it reaches the conclusions contained therein, it is instructive to summarise the evolution of the Authority's final decision by reference to its draft decision and the November 2014 report submitted as part of ATCO's proposed revised access arrangement.

2.3.1 The draft decision

In the draft decision the Authority considered the extent of departure between the average price and LRMC of natural gas services on a per GJ basis over time and concluded that:²⁶

- LRMC per GJ is flat or, at most, slightly declining over time;²⁷ and
- average prices per GJ are decreasing through time under both indexed straight line depreciation (CCA) and straight line depreciation, where the downward trend is stronger under straight line depreciation.²⁸

On this basis, the Authority's draft decision was that indexed straight line depreciation minimises the extent of departure between prices and the LRMC of natural gas services and so promotes efficient growth in the market for natural gas services, thereby complying with rule 89(1)(a).²⁹

²⁵ Kahn, A, *The Economics of Regulation: Principles and Institutions*, Massachusetts Institute of Technology, volume 1, page 98.

²⁶ The November 2014 report explains that, in the draft decision, the Authority's precise interpretation of the historical trend data for the purposes of forming a view of the future trend in LRMC was unclear. See: HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 17.

²⁷ The Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South West Gas Distribution System*, October 2014, paragraph 1029.

We explain in our earlier report that in the draft decision the Authority's precise interpretation of the historical trend data for the purposes of forming a view of the future trend in LRMC was unclear, see: HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 17.

²⁸ The Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South West Gas Distribution System*, October 2014, paragraph 1022.

²⁹ The Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South West Gas Distribution System*, October 2014, paragraph 1038.

2.3.2 ATCO's proposed revised access arrangement

ATCO's proposed revised access arrangement attached the November 2014 report,³⁰ identifying errors in the Authority's analysis of average prices that, once corrected, resulted in a materially different time profile of average prices.³¹

The November 2014 report shows that LRMC is likely to decrease over time. Nevertheless, the analysis of different depreciation approaches presented in that report is premised on the highly conservative assumption that LRMC will be constant through time. On this basis, the November 2014 report showed that, where LRMC is constant, indexed straight line depreciation does not minimise the extent of departure between prices per GJ and LRMC per GJ, and so does not meet the requirements of rule 89(1)(a).³²

Further, the report concludes that:³³

...after accounting for any price shocks during the transition, the adoption of an unindexed capital base with straight line depreciation better meets the requirements of rule 89(1)(a), as compared with an indexed capital base with indexed straight line depreciation, as proposed to be adopted by the ERA.

2.4 The final decision

The Authority's final decision as to the approach to determining the depreciation schedule that minimises the extent of departure between LRMC and prices over time, and so promotes efficient growth in the market and thereby complies with rule 89(1)(a), is based on an analysis of LRMC and prices over time:

- on a per GJ basis; and
- on a per connection basis.

2.4.1 LRMC and average prices on a per GJ basis

The Authority concludes that average prices per GJ are increasing under both indexed straight line depreciation (CCA) and straight line depreciation (HCA), and that average prices per GJ rise more steeply, and to a higher level, under the indexed straight line depreciation.³⁴

However, this gives rise to a time profile of average prices per GJ that, when combined with the time profile of LRMC per GJ in the draft decision, does not support the Authority's draft decision that:

- the transitional approach proposed by ATCO does not comply with rule 89(1)(a);³⁵ and
- indexed straight line depreciation complies with rule 89(1)(a).³⁶

Notwithstanding, the Authority's final decision draws a different conclusion as to the time profile of LRMC per GJ, as compared with that in the draft decision and, in so doing, the Authority maintains the conclusion it drew in the draft decision.

³⁰ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014.

³¹ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, section 5.2.

³² HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 25.

³³ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 27.

³⁴ We note that the Authority contends that the model used in the November 2014 report applies a level of capital expenditure per new connection that is incorrect; however, we used the level of capital expenditure per connection in the draft decision.

³⁵ The Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South West Gas Distribution System*, October 2014, paragraph 1038.

³⁶ The Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South West Gas Distribution System*, October 2014, paragraph 1043

Table 1 below illustrates the inconsistency between the Authority's draft and final decisions as to the time profile of LRMC per GJ and average prices per GJ, which has led to it maintaining its decision to reject ATCO's proposed transition approach and to conclude that indexed straight line depreciation complies with rule 89(1)(a).

Table 1 High level history of positions on LRMC, revenue per GJ and the depreciation approach

	Time profile of LRMC	Time profile of average prices		Minimises the extent of departure and so complies with rule 89(1)(a)	
		Indexed straight line depreciation (CCA)	Straight line depreciation (HCA)	Indexed straight line depreciation	Straight line depreciation
Draft Decision	Flat or decreasing ³⁷	Decreasing slightly ³⁸	Decreasing steeply ³⁹	✓	✗
HoustonKemp November 2014 report	Flat or decreasing ⁴⁰	Rising then falling ⁴¹	Flat to decreasing ⁴²	✗	✓
Final Decision	Rising ⁴³	Increasing steeply ⁴⁴	Increasing slightly ⁴⁵	✓	✗

The Authority's analysis of LRMC per GJ and prices per GJ in the final decision leads it to the conclusion that:

- the transitional approach to determining depreciation proposed by ATCO, which transitions to straight line depreciation, does not comply with rule 89(1)(a); and
- that indexed straight line depreciation does comply with rule 89(1)(a).

However, the inconsistency in the Authority's conclusions as to the time profile of LRMC per GJ in the final decision, as compared with that in the draft decision, is assisted by problems with the analysis supporting the Authority's final decision that LRMC per GJ is rising over time. Indeed, we have identified material errors in the Authority's analysis that lead it to draw erroneous conclusions as to the depreciation approach that complies with rule 89(1)(a). We describe these errors in section 3.

³⁷ The Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South West Gas Distribution System*, October 2014, paragraph 1029. We explain in our earlier report that in the draft decision the authority's precise interpretation of the historical trend data for the purposes of forming a view of the future trend in LRMC was unclear, see: HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 17.

³⁸ The Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South West Gas Distribution System*, October 2014, Figure 36, page 229.

³⁹ The Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South West Gas Distribution System*, October 2014, Figure 36, page 229.

⁴⁰ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 18.

⁴¹ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, Figure 9 and 10, page 23 and 24.

⁴² HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, Figure 9 and 10, page 23 and 24.

⁴³ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 17 to 20.

⁴⁴ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Figure 29 and paragraph 12, page 694.

⁴⁵ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Figure 29 and paragraph 12, page 694.

2.4.2 LRMC and average prices on a per connection basis

The Authority's draft decision as to the depreciation approach that complies with rule 89(1)(a) was informed by an analysis of LRMC and prices on a per GJ basis only. However, the Authority's final decision introduces a new dimension of analysis, ie, of LRMC and prices on a *per connection* basis.

The Authority finds that average prices per connection are:

- decreasing through time under straight line depreciation;⁴⁶ and
- flat to rising through time under indexed straight line depreciation.⁴⁷

On the basis of its analysis, the Authority concludes that LRMC per connection:⁴⁸

... is likely to **remain flat or perhaps slightly rising** in real terms, given the recent trends in the long run capital costs of the industry. [Emphasis added]

It further concludes that this:⁴⁹

... expectation for **flat to rising costs per connection** is confirmed by the rising trend in the actual marginal costs of connection. [Emphasis added]

The Authority's analysis of LRMC per connection and prices per connection through time appears then to proceed on the basis that LRMC per connection is increasing through time, ie, the Authority states that:⁵⁰

In line with this **increase in the long run marginal cost**, the long run average revenue per connection under the CCA depreciation approach is flat to rising over time. [Emphasis added]

And that:⁵¹

....This [straight line depreciation] results in a declining average revenue per connection over time, which is not consistent with **the rising LRMC of connections**. [Emphasis added]

Notwithstanding this shift in the Authority's reasoning, we have identified material errors in its analysis of average prices per connection and LRMC per connection that lead it to draw erroneous conclusions as to the depreciation approach that complies with rule 89(1)(a). We describe these errors in section 3.

2.4.3 Summary

On the basis of the Authority's analyses of LRMC and prices over time on a per GJ and per connection basis, which involves material errors, the Authority's final decision is that:

- the transitional approach to determining depreciation proposed by ATCO does not comply with rule 89(1)(a);⁵² and

⁴⁶The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 26.

⁴⁷The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 25.

⁴⁸The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 23.

⁴⁹The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 24.

⁵⁰The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 25.

⁵¹The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 26.

⁵²The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, paragraph 2057.

- indexed straight line depreciation complies with rule 89(1)(a).⁵³

2.5 Proposed amendments to the final decision

On 21 August 2015 the Authority published proposed amendments to the final decision.⁵⁴ The proposed amendments to the final decision correct an error that we identified in the HoustonKemp note, and propose various other changes to its analysis of the depreciation schedule that complies with the rules. Further, the Authority explains that none of these proposed amendments have an effect on the final decision.⁵⁵

The proposed amendments that concern the Authority's analysis of the depreciation schedule that complies with rule 89(1)(a) include:⁵⁶

- estimating LRMC using the average incremental cost (AIC) approach in real terms, rather than nominal terms; and
- applying the cost of capital in the final decision to determine the return on capital in the 2014 to 2019 years.

Further, in addition to the amendments published by the Authority, our review of the model underpinning the proposed amendments identified that the Authority has reduced the nominal long run weighted average cost of capital (the rate of return) from 9.4 per cent in the final decision to 6.7 per cent in the proposed amendments to the final decision. This has implications as to the time profile of average prices and the AIC analysis of LRMC in the final decision.

In our opinion, the rate of return used throughout the Authority's analysis should be consistent; compromising this principle introduces potential biases. Nevertheless, for the purpose of illustrating the material errors in the final decision, we have made only the minimum necessary changes to the Authority's analysis and so have not altered the rates of return applied by the Authority.

We have prepared this report on the basis that the Authority implements the proposed amendments to its final decision on the depreciation schedule that complies with rule 89(1)(a). Throughout the remainder of this report we refer to the final decision as though it incorporates the proposed amendments to the final decision.

Further, we illustrate the effects of correcting the errors in the Authority's analysis by amending the model underpinning the proposed amendments to the final decision. We note that the conclusions we present in this report can be supported by reference to either the model underpinning the final decision or the proposed amendments to the final decision.

⁵³ The Authority, *Draft Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South West Gas Distribution System*, October 2014, paragraph 2059.

⁵⁴ The Authority, *Mid-West and South West Gas Distribution Systems Access Arrangement 2015-2019 – Consultation on proposed amendments to the final decision*, 21 August 2015.

⁵⁵ The Authority, *Mid-West and South West Gas Distribution Systems Access Arrangement 2015-2019 – Consultation on proposed amendments to the final decision*, 21 August 2015, page 8.

⁵⁶ The Authority, *Mid-West and South West Gas Distribution Systems Access Arrangement 2015-2019 – Consultation on proposed amendments to the final decision*, 21 August 2015, page 6 to 8.

3. Errors in the Final Decision

In this section, we explain a range of material errors in the analysis underpinning the final decision, including that the Authority:

- appears to place significant weight on a comparison of LRMC and prices on a *per connection* basis;
- errs in its interpretation of the evidence on implicit capital price deflators for the 'electricity, gas, water and waste' industry provided by the Australian Bureau of Statistics (ABS), and implicitly disregards this evidence in its analysis of the time profile of LRMC per GJ;
- applies a flawed capital expenditure growth assumption;
- errs by drawing inferences as to the LRMC of the natural gas services provided by ATCO from 2015 onwards by reference to an historical estimate of LRMC; and
- uses gas volumes in the 2005 to 2014 years with a bias when applying the AIC approach.

We note that the Authority's proposed amendments to the final decision correct an error identified in the HoustonKemp note, ie, the Authority compares LRMC and prices on an inconsistent basis. On our understanding that the Authority now intends to implement the proposed amendments to the final decision, we have put this matter aside for the purposes of this report.

3.1 LRMC and prices per connection

In any comparison of the anticipated trends over time of LRMC and prices, it is necessary to have some measure of the units by which prices can be assessed, the result of which will be average revenue per unit. In its draft decision, the Authority adopted a 'per GJ' measure of gas use as its preferred unit of analysis. Correspondingly, the focus of Greg Houston's November 2014 report commenting on the Authority's draft decision was also on the time profile of prices assessed on a per GJ basis.

In its final decision, the Authority extended its analysis to include an assessment of the average revenue per connection, explaining only that:⁵⁷

A connection provides access to an alternative, competitive source of energy services. In line with the foregoing paragraphs, the long run marginal cost of connection will reflect the overall cost of developing the network and connecting additional customers.

The decision of the Authority to place significant weight on the time profile of revenue per connection has consequences for its ability to draw the conclusions it does. In particular, since average consumption of gas (per connection) is projected to decline, whereas the number of connections to gas supply is projected to increase, then, all else equal, the time profile of revenue per connection will present as a lower (or falling) variable over time, whereas the time profile for revenue per GJ will not.

Given the different time profile indicated by these alternative measures of revenue per unit, and the need to compare them with the anticipated time profile of LRMC, it is important to consider which is more appropriate for the purposes of the assessment required by reference to rule 89(1)(a). We note that no such assessment is made in by the Authority in its final decision.

In our opinion, the focus of rule 89(1)(a) on promoting efficient growth in the market for reference services means that by far the most important metric for an assessment of time profile of revenues (against the time profile of LRMC) is that per GJ. This is because the predominant form of decision that customers are in a

⁵⁷ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 21

position to make in terms of their use of gas (and so, the prospects for future growth in the market for reference services) is the quantity of gas they consume, once connected.

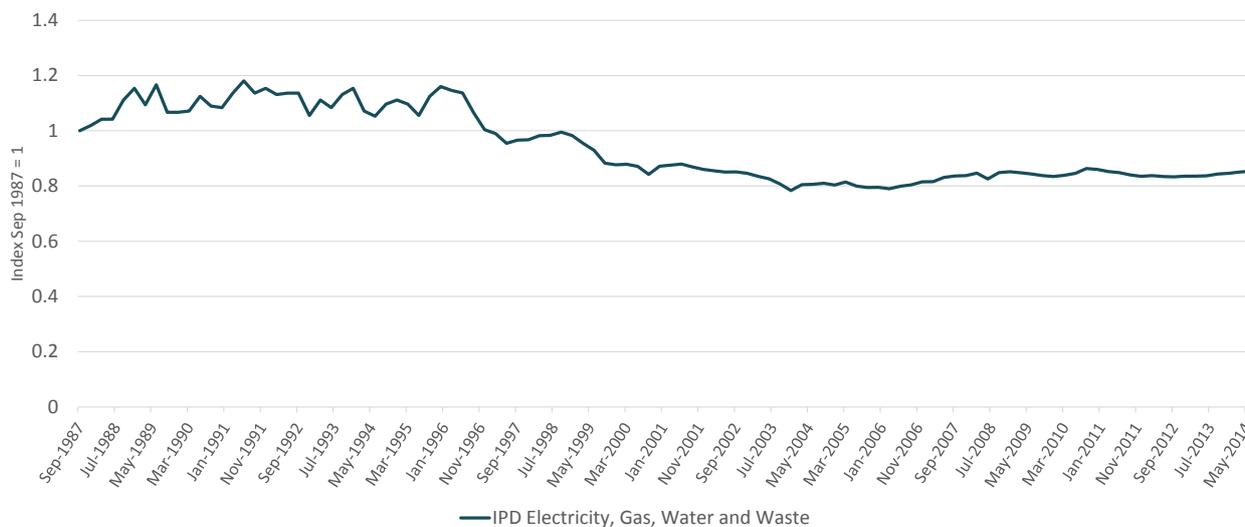
By definition, all existing customers are connected to a gas supply and so the relevant price variable in terms of decisions as to whether to increase or reduce their use of gas over time is the future level of revenue per GJ. In contrast, only a very small proportion of existing and potential customers – being those who are at any one time not connected, but are considering whether to connect – are in a position to respond to the cost per connection.

In simple terms, the future time profile of revenue per GJ is much more important to the prospects for growth in the market for reference services than is the future time profile of revenue per connection. For this reason, in our opinion the focus of the analysis of the future time profile of revenues – for the purpose of its comparison with the future time profile of LRMC – should be wholly on revenue per GJ. Notwithstanding, in Appendix 1 we set out an analysis of LRMC and average prices over time, on per connection basis.

3.2 Interpretations of ABS data

In its draft decision the Authority acquired unpublished data from the ABS so as to estimate implicit capital price deflators for the 'electricity, gas, water and waste' industry. We agree that it is appropriate to use this evidence to draw inferences as to the likely trend in LRMC. We present the ABS data in Figure 4 below.

Figure 4 The Authority's capital implicit price deflator (IPD) for the electricity, gas, water and waste industry from 1987 to 2014



The Authority's interpretation of the ABS data

The November 2014 report explains that, in the draft decision, the Authority's precise interpretation of the historical trend data for the purposes of forming a view of the future trend in LRMC was nebulous.⁵⁸ Nevertheless, in its final decision the Authority explains its draft decision was that LRMC would:⁵⁹

...remain close to flat in real terms.

⁵⁸ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 17.

⁵⁹ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, paragraph 2003.

On the basis of the same information considered in the draft decision, the Authority's final decision is that LRMC:⁶⁰

... is likely to remain flat or perhaps slightly rising in real terms, given the recent trends in the long run capital costs of the industry (Figure 30). [Figure 4 above].

The Authority contends that the drop in capital input prices from 1995 to 2003 is attributable to the microeconomic reform during that period and that LRMC has been flat or slightly increasing thereafter. However, the Authority appears to set aside the observation raised in the November 2014 report that:⁶¹

... the last decade – during which the capital implicit price deflator has been stable – coincides with a mining investment boom of unprecedented scale, the likely effect of which was to put significant upwards pressure on capital prices across a number of sectors. On these considerations, in my opinion the best estimate of the likely trend in the prices of inputs that make up LRMC is a resumption of the decline seen from 1995 to 2003, since this is consistent with the mining boom ramping down and the reasonable prospect of further productivity gains being achieved in the sector.

Having regard to the ABS data, the Authority also highlights an observation in the March 2014 report that the wage price index, a proxy for the cost of operating inputs, is rising and concludes that:⁶²

... this suggests that the overall trend for the electricity, gas, water and waste price index, and hence its long run marginal cost, is flat or perhaps even slightly increasing.

However, the March 2014 report highlights that the provision of natural gas services is capital intensive, and so capital-related costs account for over half of ATCO's total costs, with that proportion expected to rise materially in the future. The Authority appears not to have considered the capital intensity of natural gas services in coming to its final decision that LRMC is flat or rising.

The November 2014 report explains that a long term decline in LRMC is consistent with the 'in principle' conclusion that can be drawn from the economic relationships that underpin long term trends in economic growth, ie:⁶³

'... the unit price of capital assets can be expected to fall over time, relative to economy-wide consumer prices. By contrast, the unit cost of labour and land can be expected to rise over time, relative to economy-wide consumer prices.'

To summarise, the Authority's final decision does not provide robust evidence to refute the clear reduction in LRMC over the past 27 years, as illustrated in the data provided by the ABS. We have therefore proceeded on the basis of the conclusion in the November 2014 report that, having regards to the data provided by the ABS:⁶⁴

... LRMC is likely to decrease in future years and, at its most conservative, to be relatively stable. Notwithstanding, for the purpose of the comparisons of LRMC and average prices through time that I undertake below, I adopt the highly conservative assumption that LRMC will be constant in future years.

⁶⁰ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 23, page 696.

⁶¹ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 17.

⁶² The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 23, page 696.

⁶³ NERA, *Depreciation Options for ATCO Gas*, Expert Report of Gregory Houston, 13 March 2014, page 19.

⁶⁴ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 18.

The Authority implicitly disregards the ABS data when analysing LRMC per GJ

The Authority appears to apply the ABS data selectively to draw inferences as to the LRMC per connection over time, but not LRMC per GJ over time. The Authority's conclusion as to the LRMC per GJ over time is based solely on an analysis using the average incremental cost approach (AIC) and, in so doing, the Authority has erred by disregarding the evidence on implicit capital price deflators for the 'electricity, gas, water and waste' industry provided by the ABS.

Notwithstanding that the Authority's analysis implicitly disregards the ABS data:

- the Authority uses the ABS data to draw inferences as to the time profile of LRMC per GJ in the draft decision;
- in the November 2014 report Mr Houston agreed with the Authority that, when analysing LRMC per GJ, this evidence was robust;⁶⁵
- the Authority uses the ABS data to draw inferences as to the time profile of LRMC per connection in the final decision;⁶⁶ and
- the Authority does not explain why the ABS data should be disregarded for the purpose of analysing LRMC per GJ through time in the final decision.

In our opinion, the ABS data provides robust evidence to the contrary of the Authority's conclusion that LRMC per GJ is rising through time. Moreover, the ABS data does not support the Authority's apparent inference that there will be a sharp increase in LRMC per GJ.⁶⁷

To summarise, in our opinion the Authority has erred:

- in its interpretation of the ABS data; and
- by implicitly disregarding the ABS data for the purposes of analysing the time profile of LRMC per GJ.

For these reasons, our analysis proceeds on the basis of the conclusion in the November 2014 report that, having regard to the data provided by the ABS:⁶⁸

... LRMC is likely to decrease in future years and, at its most conservative, to be relatively stable. Notwithstanding, for the purpose of the comparisons of LRMC and average prices through time that I undertake below, I adopt the highly conservative assumption that LRMC will be constant in future years.

3.3 Flawed capital expenditure growth assumption

For the purpose of the analysis underpinning the final decision, the Authority makes a number of changes to the pricing model it used in the draft decision.⁶⁹ One such change is that the Authority:⁷⁰

... grows customer numbers and new [real] capital expenditure from 2020 on at [sic] a trend rate that is consistent with the Australian Bureau of Statistics (ABS) B series population projections.

⁶⁵ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 17.

⁶⁶ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 23 and Figure 30.

⁶⁷ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 1

⁶⁸ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 18.

⁶⁹ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, page 691 and 692.

⁷⁰ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, page 692.

We agree that it is appropriate to forecast the level of growth in total connections by reference to population projections published by the ABS. However, it is not correct to set the level of growth in capital expenditure equal to the level of growth in total connections, since it gives rise to changes in the level of capital expenditure per connection over time that have no reasonable basis.

Rather, the growth in capital expenditure in constant dollar terms should be set equal to the growth in *new* connections, *not* total connections. The level of capital expenditure can be expected to be highly sensitive to the level of new connections. Further, growing capital expenditure in constant dollar terms at the same rate as the growth in new connections results in the level of capital expenditure per connection remaining constant through time, which is consistent with a stable LRMC.

Before describing the inconsistencies arising from the Authority's inherently flawed capital expenditure growth assumption in the context of its pricing model, we illustrate the effect this assumption by means of a simple illustrative example.

3.3.1 Illustrative example

It is helpful at this point to reiterate that the level of growth in capital expenditure:

- is set equal to the growth in *total* connections in the final decision; but
- in our opinion, should be set equal to the growth in *new* connections.

In order to illustrate the implications of these two different assumptions, consider a city comprising 100 houses, where:

- the capital cost of connecting one house to the network is \$1; and
- one new house was constructed in the current year (year one).

If it was forecast that twice the number of new houses are to be built in year two, it follows that there must be a commensurate increase in the forecast level of capital expenditure, as compared with that in year one. Specifically, in these circumstances the number of new connections is forecast to increase by 100 per cent in year two and so it follows that:

- two new houses are forecast to be connected in year two; and
- \$2 of capital expenditure will be required in year two.

In other words, a 100 per cent increase in the level of new connections in year two necessitates a 100 per cent increase in the forecast level of capital expenditure in year two, as compared with year one. Consequently, the growth in capital expenditure must be equal to the forecast growth in new connections.

Application of the Authority's capital expenditure growth assumption

In the same circumstances as contemplated above, the capital expenditure growth assumption applied by the Authority would set the growth in forecast capital expenditure equal to the growth in *total* connections, rather than *new* connections. This implies that:

- the level of growth in forecast capital expenditure in year two need increase to only two per cent, since the growth in total connections is equal to two per cent, ie, two (new connections) divided by 100 (existing connections); and
- the cost of connecting two houses in the next year is \$1.02, ie, \$1 (expenditure in year one) multiplied by 102 per cent, notwithstanding that the cost of connecting each house is \$1.

The inherent flaws in the capex growth assumption adopted by the Authority can also be illuminated by reference to the observation that:

- if total connections are forecast to increase by 50 per cent from 100 to 150 in year two (an increase of 50 connections); then
- the Authority's capital expenditure growth assumptions implies that 50 new connections can be achieved in year two by increasing capex in that year by only 50 per cent, to \$1.50.

For these reasons, we conclude that the Authority's assumption that the capex growth rate should be set equal to the growth in total connections is inherently flawed and gives rise to a number of inconsistencies.

3.3.2 Capex per connection from 2020 onwards

The Authority's erroneous capex growth assumption has significant implications for its final decision as to the depreciation approach that complies with rule 89(1)(a). In particular, the Authority's capital expenditure growth assumption gives rise to levels of capex per connection from 2020 onwards that have no logical foundation.

By way of example, the Authority's final decision is that in 2019:

- there will be 11,960 new connections;
- forecast capital expenditure of \$75.4 million; and so
- forecast capital expenditure per new connection is \$6,303.⁷¹

The Authority forecasts the growth in connections from 2020 onwards using data on population growth from the ABS and, on this basis, adopts the assumption that, in 2020:

- the number of new connections will increase by 38 per cent, as compared with that in 2019, to 16,529;
- forecast capital expenditure increases by only 2.2 per cent to \$77.0 million,⁷² as compared with that in 2019 (using its capex growth assumption); and so
- each new connection requires only \$4,661 of forecast capital expenditure.

To summarise, the Authority's capital expenditure growth assumption implies that the number of new connections can be increased by 38 per cent in 2020, as compared with that in 2019, but with an increase in capital expenditure of only 2.2 per cent. This implies that the level of capital expenditure per connection in constant dollars falls from \$6,303 in 2019 to \$4,661 in 2020.

Further, the Authority's inherently flawed underlying assumption results in capital expenditure per connection in constant dollar terms more than doubling between 2020 and 2080. There is no basis for these inconsistencies, which arise solely from the Authority's capital expenditure growth assumption.

We explain in section 4.1 that a more robust capital expenditure growth assumption would involve growing capital expenditure in constant dollar terms from 2020 onwards such that the level of capital expenditure per connection in the final decision for the 2019 year is held constant from 2020 onwards.

3.4 Historical estimate of LRMC and the AIC approach

We explain in section 2 that LRMC is a forward looking concept, ie, it reflects the additional cost of capacity yet to be installed. The forward looking nature of LRMC arises from the observation that historical costs cannot be affected by changing current behaviour. However, future costs pertaining to the expansion of a network can be affected by changes in demand – namely by bringing forward or delaying the need to expand capacity. Indeed, Kahn (1988) notes that:⁷³

⁷¹ \$75.4 million divided by 11,960.

⁷² Calculated equal to the growth in total connections in 2020, ie, (771,359 – 754,830) divided by 754,830.

⁷³ Kahn, A, *The Economics of Regulation: Principles and Institutions*, Massachusetts Institute of Technology, volume 1, page 98.

Marginal costs look to the future, not to the past: it is only future costs for which additional production can be causally responsible; it is only future costs that can be saved if that production is not undertaken. ...in a dynamic economy, with changing technology as well as changing factor prices, there is every reason to believe that future capital costs per unit of output will not be the same as the capital costs historically incurred installing present capacity.

Given the forward looking nature of LRMC, it is not possible to draw robust inferences as to the level of LRMC today, or in the future, from historical estimates of LRMC relating to prior years.

It is helpful at this point to reiterate that the depreciation schedule that complies with rule 89(1)(a) is that which results in a time profile of depreciation that minimises the extent of departure, over time, between the price of natural gas services and the LRMC of providing natural gas services. In other words, the objective of the Authority's analysis is to identify the approach to determining the depreciation schedule that minimises the extent of departure between prices and LRMC from 2015 onwards. This analysis requires information as to:

- average prices, as a proxy for tariffs, from 2015 onwards; and
- the level of LRMC from 2015 onwards.

However, the Authority errs by using an historical estimate of LRMC in 2006 to derive inferences as to the time profile of LRMC from 2015 onwards.

3.4.1 The Authority's historical estimate of LRMC

The Authority applies the AIC approach to estimate the level of LRMC in 2006 using a combination of ATCO's historical and forecast costs, and demand.⁷⁴ The Authority then compares this estimate of LRMC with estimates of LRMC in 2020 and 2036, and concludes that LRMC is likely to rise through time.⁷⁵

The use of an historical estimate of LRMC to draw inferences as to the level of LRMC in 2015 onwards is without any economic foundation. We are not aware of any other circumstances where historical estimates of LRMC are used to draw inferences as to future LRMC. As Kahn notes, 'marginal cost looks to the future, not to the past'.⁷⁶

The only inference that can be drawn from the Authority's historical estimate of LRMC is an assessment as to whether a forward-looking estimate of LRMC may be higher or lower than in 2006. However, this inference provides no information as to the level of LRMC in 2015 onwards. By way of an example to the contrary, the level of LRMC may decrease from 2015 to 2080, but, over that period, still be higher than that in 2006.

Significantly, and notwithstanding its other errors in the analysis of LRMC, the Authority's own analysis suggests that LRMC will decrease in the years following 2015. In particular, the Authority's analysis shows that, over the 2020 to 2036 and 2037 to 2080 assessment periods, LRMC per GJ in constant dollars will decrease from \$182 to \$73.⁷⁷

On the basis that LRMC is a forward looking concept and that no inferences as to the level of LRMC today or in the future can be derived from historical estimates of LRMC, we have corrected the Authority's analysis by estimating LRMC over the 2014 to 2080 period. We present the results of this analysis in section 4.2.

⁷⁴ We note that only capital expenditure related to growth should be considered when applying the AIC approach, however, the Authority has used total capital expenditure for the purpose of its analysis. We have not corrected this error since it is unlikely to have a material effect on the time profile of LRMC, only the absolute value of LRMC.

⁷⁵ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, Table 144 and Table 145, paragraph 17 and 24.

⁷⁶ Kahn, A, *The Economics of Regulation: Principles and Institutions*, Massachusetts Institute of Technology, volume 1, page 98.

⁷⁷ The Authority, *Mid-West and South West Gas Distribution Systems Access Arrangement 2015-2019 – Consultation on proposed amendments to the final decision*, 21 August 2015, Table 144, page 8.

3.4.2 Other comments

The use of inconsistent assessment periods

In applying the AIC approach the Authority's uses three assessment periods of varying length to estimate LRMC, ie:

- the 13 years from 2006 to 2019;
- the 15 years from 2020 to 2035; and
- the 45 years from 2035 to 2080.

It is not correct to estimate LRMC by reference to assessment periods of varying length. Rather, the assessment periods should be of equal length so that the quantum of the relevant expenditure can be assessed by reference to identical periods over which the additional capacity is to be provided.

By way of an example, if a dollar of expenditure on an asset provides additional annual gas volume over a 40 year period, an estimate of LRMC over one year will be higher, as compared with that arising from an assessment period of 40 years.

Relevance of the historical data provided by the ABS

Notwithstanding that no inferences as to the LRMC of natural gas services provided by ATCO from 2015 onwards can be derived from a historical estimate of LRMC, it remains appropriate to use the historical data on implicit capital price deflators (the ABS data) to draw inferences as to the likely trend in LRMC.

Although the historical nature of the ABS data is a limitation of that particular source of information, it does not warrant setting it aside. Indeed, each of the different sources of information has their respective limitations and benefits. By way of example, the ABS data is from a reputable source, covers a period of 26 years and so can be used to draw inferences as to the long term trends in capital input prices for utilities. Similarly, the corrected AIC approach has the advantage of not relying on historical trends to derive inferences as to LRMC.

3.5 Inconsistent measure of gas volumes

The Authority applies the AIC approach to estimate LRMC on a per GJ basis using data on ATCO's total gas volumes in each year of the assessment period. However, the Authority's calculation uses:

- total gas volume *excluding* customers receiving prudent discounts in the 2005 to 2014 years; and
- total gas volumes *including* customers receiving prudent discounts in the 2015 to 2080 years.

This inconsistency in the Authority's analysis compromises its estimates of future LRMC, since the total volumes used the Authority's calculation over the 2005 to 2014 years incorporate a downward bias, as compared with the measure of total gas volume used from 2015 onwards.

Further, the Authority's use of total gas volumes with a downward bias in the 2005 to 2014 years gives rise to a material step change in total volumes in the 2015 year. Specifically, in 2015 the total gas volume including customers receiving prudent discounts is forecast to decrease by 209TJ, as compared with that in 2014. However, by using a total gas volume in 2014 with a downward bias, the Authority's analysis erroneously estimates that total gas volume in 2015 increases by 2,768TJ. This significantly compromises the Authority's estimate of LRMC per GJ, since it implies that expenditure in 2015 generated an artificially large increase in total gas volume.

In addition to the Authority's incorrect use of historical data to estimate LRMC, other aspects of the Authority's analysis mean that:

- the historical gas volumes underpinning its analysis are biased and so its estimate of LRMC is compromised; and
- in a corrected, forward looking analysis of LRMC, the forecast increase in total gas volume in 2015 is calculated by reference to an unbiased measure of total gas volume in 2014.

4. Revised Analysis of Tariffs and LRMC

In this section we explain our approach to correcting the errors in the Authority's final decision and present the resulting estimates of LRMC and average prices over time.

4.1 Correcting the capital expenditure growth assumption

Before presenting our revised estimates of LRMC and average prices, it is helpful to explain our approach to correcting the flawed capital expenditure growth assumption applied by the Authority in the final decision, since this has implications for the relevant estimates of both LRMC and average prices over time.

We explain in section 3.3 that the growth assumption used by the Authority to forecast capital expenditure from 2015 to 2080 is inherently flawed and gives rise to a level of capital expenditure per new connection that:

- is not consistent with the level of capital expenditure per new connection in the final decision; and
- results in the level of capital expenditure per new connection in constant dollars doubling over the assessment period.

In particular, the Authority forecasts that in 2020 an increase in forecast capital expenditure of only 2.2 per cent is sufficient to increase new connections by 38 per cent, as compared with that in the final decision for the 2019 year.⁷⁸ This implies that capital expenditure per new connection in constant dollars decreases by 25 per cent, from \$6,303 in 2019 year to \$4,661 in 2020.

Further, the Authority's growth assumption results in capital expenditure per connection in constant dollars doubling between 2020 and 2080. We have seen no evidence that would be consistent with such changes in the level of capital expenditure per connection and, in our opinion, the results are without logical foundation.

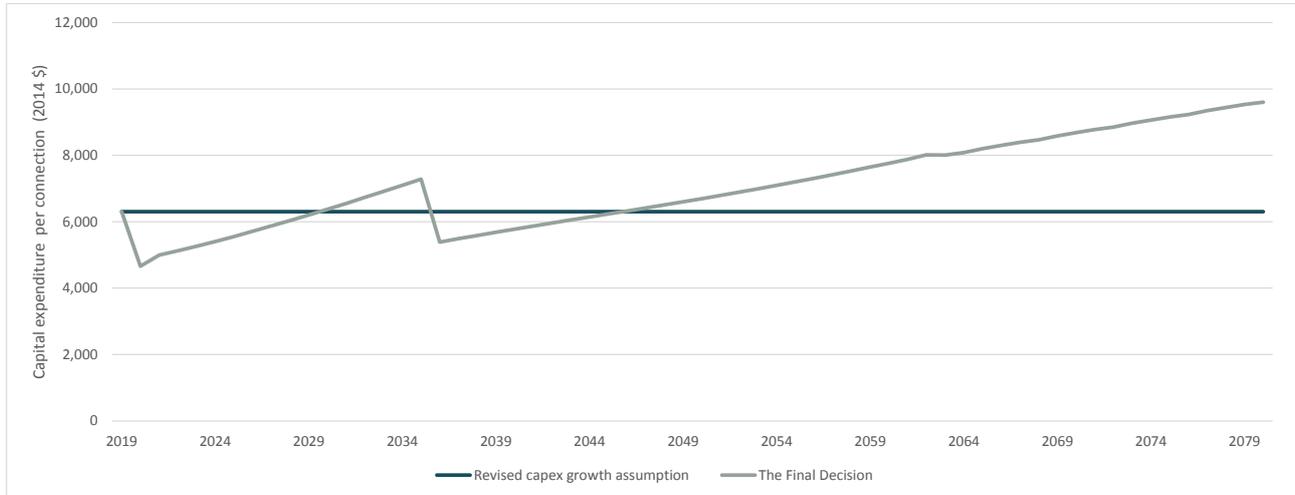
We have corrected the Authority's capital expenditure growth assumption so that capital expenditure per connection in constant dollar terms is held constant over the 2020 to 2080 period and equal to that in the final decision for the 2019 year. Further, holding the level of capital expenditure per connection constant through time is consistent with a stable LRMC.

We note that correcting the Authority's capital expenditure growth assumption has implications as to the Authority's estimate of LRMC using the AIC approach and its estimate of the time profile of average prices.

Figure 5 below illustrates the time profile of capital expenditure per new connection from 2019 to 2080 derived by reference to our revised capital expenditure growth assumption and the Authority's flawed growth assumption.

⁷⁸ Calculated equal to the growth in total connections in 2020, ie, $(771,359 - 754,830)$ divided by 754,830.

Figure 5 Capital expenditure per connection from 2019 to 2080, constant dollars

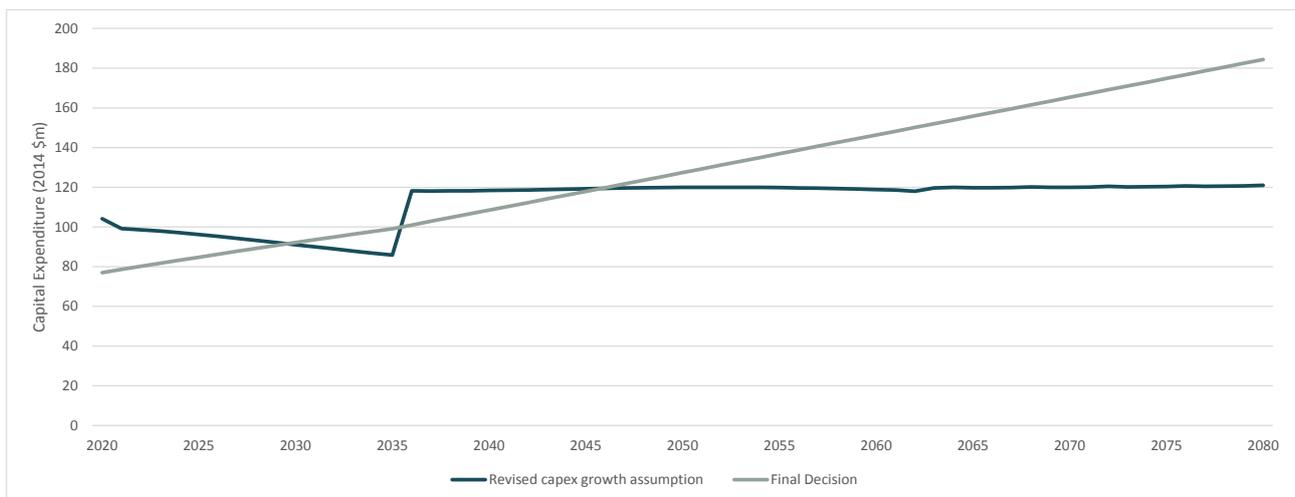


We illustrate the level of capital expenditure in constant dollars arising from our corrected capital expenditure growth assumption, as compared with the Authority's inherently flawed capital expenditure growth assumption, in Figure 6 below. We note that the relatively higher level of capital expenditure in the 2020 year, as compared with that in the final decision, and the step change in capital expenditure occurring in 2036 reflects the Authority's forecast that:

- the level of new connections increases by 38.2% in 2020, as compared with 2019; and
- the level of new connections increases by 37.7% in 2036, as compared with 2035.

Further, the modest decline in capital expenditure between 2020 and 2035 reflects the reduction in new connections forecast by the Authority over that period, while the relatively stable level of capital expenditure from 2036 to 2080 reflects the relatively stable level of new connections each year over that period.

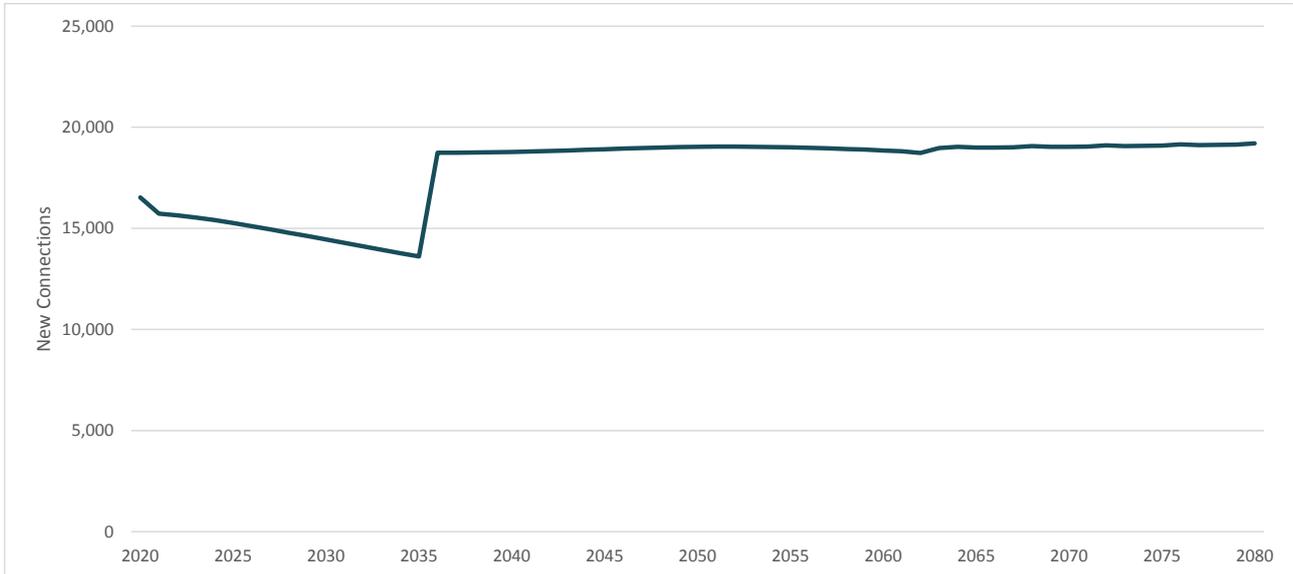
Figure 6 Real capital expenditure from 2020 to 2080, constant dollars



By way of reinforcement for the link established between new connections and real capital expenditure by the revised capital expenditure growth assumption, we illustrate the level of new connections forecast by the Authority between 2020 and 2080 in Figure 7 below. The similar time profiles of capital expenditure in Figure 6, and the number of new connections in Figure 7, reflects the revised capital expenditure growth

assumption which, in turn, results in the stable level of capital expenditure per connection illustrated in Figure 5 above.

Figure 7 The Authority's forecast of new connections from 2020 to 2080



4.2 Long run marginal cost

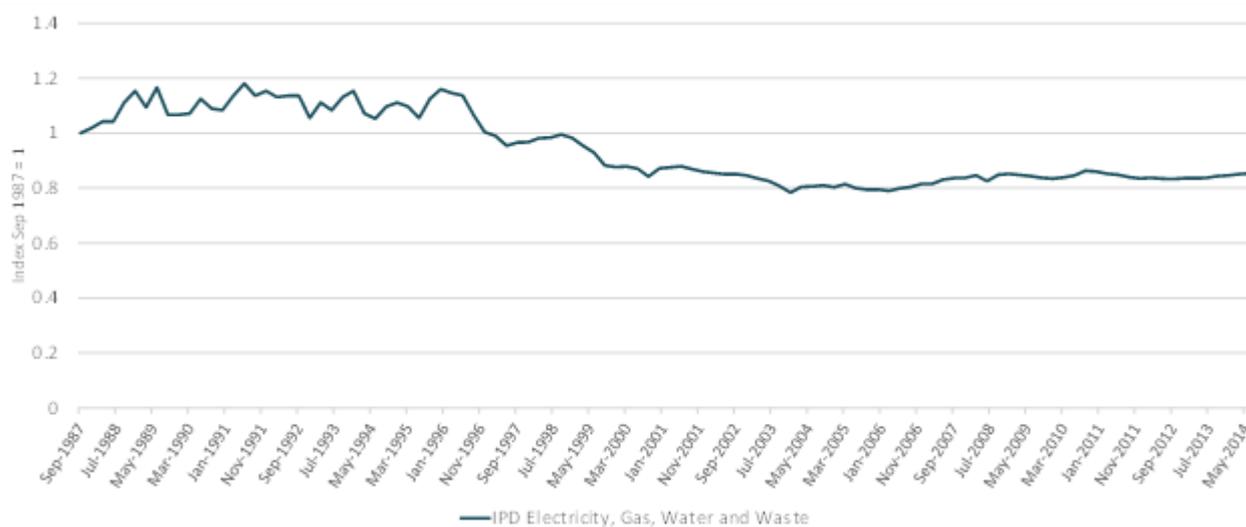
The Authority's analysis of LRMC over time relies on data on implicit capital price deflators provided by the ABS and an analysis of LRMC using the AIC approach. We explain in section 3 that the Authority's analysis of LRMC in respect of both these sources of evidence is incorrect.

4.2.1 Evidence provided by the Australian Bureau of Statistics

In section 3.2 we explain the errors in the Authority's interpretation of the evidence on implicit capital price deflators for the 'electricity, gas, water and waste' industry provided by the ABS. We illustrate the ABS data in Figure 8 below.



Figure 8 The Authority's capital implicit price deflator (IPD) for the electricity, gas, water and waste industry from 1987 to 2014



We explain in section 3.2 that the Authority's final decision does not provide robust evidence contradicting the clear reduction in LRMC over the past 27 years, as illustrated in the data provided by the ABS. Therefore, we agree with the conclusion in the November 2014 report that:⁷⁹

... LRMC is likely to decrease in future years and, at its most conservative, to be relatively stable.

4.2.2 The Average Incremental Cost Approach

We explain in section 3 that the Authority's analysis of LRMC using the AIC approach,⁸⁰ and its subsequent comparison of the resulting estimates with average prices, is erroneous because it:

- uses a flawed growth assumption to forecast capital expenditure – see section 3.3;
- uses historical information on ATCO's costs to draw inferences as to LRMC – see section 3.4; and
- uses historical gas volumes with a material downward bias – see section 3.5.

In section 4.1 we explain our approach to correcting the Authority's capital expenditure growth assumption, ie, we grow the level of capital expenditure such that in constant dollar terms from 2020 to 2080 it is held equal to that in the final decision for the 2019 year.

Further, we explain in section 3.4 that it is incorrect to use an historical estimate of LRMC in 2006 to draw inferences as to the level of LRMC in 2015 onwards. We have therefore corrected the Authority's application of the AIC approach by estimating the LRMC of the natural gas services provided by ATCO in 2015 and later years.

We explain in section 3.5 that, when estimating LRMC per GJ using the AIC approach, the Authority calculates the change in total volumes using:

- total gas volumes excluding customers receiving prudent discounts in the 2005 to 2014 years; and
- total gas volumes including customers receiving prudent discounts in the 2015 to 2080 years.

⁷⁹ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 18.

⁸⁰ The Authority applies the AIC approach by calculating the net present value of capital and operating expenditure over a period and dividing it by the net present value of the cumulative increase in total gas volume over that period.

We correct this error by calculating the change in gas volume in 2014 and 2015 by way of reference to total gas volumes, including customers receiving prudent discounts in 2013 and 2014. For completeness, we note that we have undertaken our analysis of LRMC in constant dollar terms.

We noted above that the Authority estimates LRMC over three periods of varying length, when the assessment should be undertaken over equal periods such that each dollar of expenditure has an equal period over which to provide additional capacity. Consequently, we estimate LRMC using three assessment periods, ie:

- from 2015 to 2047 and from 2048 to 2080, ie, using two equal assessment periods; and
- from 2015 to 2036, 2037 to 2058 and from 2059 to 2080, ie, using three equal assessment periods.

Before setting out the results of our corrected analysis it is instructive to note that estimating precisely the level of LRMC at any point in time is a complex and inherently difficult task. With this in mind, we note that the Authority's application of the average incremental cost approach in this context is inadequate for the purpose of robustly estimating the level of LRMC.⁸¹ Rather, the results of this analysis can be interpreted, at best, as providing evidence as to the change in LRMC over time.

We set out the results of this analysis on a per GJ basis in Figure 9 below.

Figure 9 Estimates of LRMC per GJ using a corrected AIC analysis, constant prices

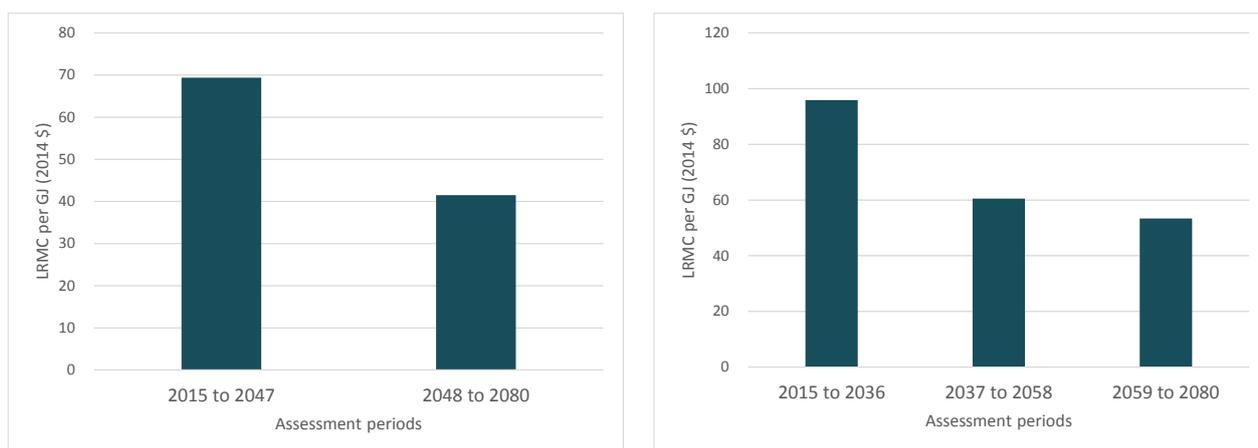


Figure 9 shows that the LRMC per GJ of natural gas services provided by ATCO is likely to decrease markedly from 2015 onwards. The finding that LRMC is likely to reduce over the 2015 to 2080 period is reflected in the results of the Authority's own, albeit flawed, analysis, ie, Table 144 in the final decision shows that, when assessed over the 2020 to 2035 period and the 2036 to 2080 period, LRMC per GJ reduces by approximately 60 per cent.⁸²

4.2.3 Conclusion

In our opinion, evidence on implicit capital price deflators for the 'electricity, gas, water and waste' industry provided by the ABS supports the conclusion that LRMC per GJ will decrease from 2014 onwards. Further, correcting the Authority's analysis shows that LRMC per GJ is likely to decrease strongly from 2015 onwards.

⁸¹ By way of example, we note that only capital expenditure related to growth should be considered when applying the AIC approach, however, the Authority has used total capital expenditure for the purpose of its analysis. We have not corrected this error since it is unlikely to have a material effect on the time profile of LRMC, only the absolute value of LRMC.

⁸² Calculated equal to (\$182 -\$73) divided by \$183, See: The Authority, Mid-West and South West Gas Distribution Systems Access Arrangement 2015-2019 – Consultation on proposed amendments to the final decision, 21 August 2015, Table 144, page 8.

Therefore, we maintain the conclusion in the November 2014 report that LRMC is likely to decrease in future years. Nevertheless, for the purpose of an analysis of the extent of departure between LRMC and the average prices over time, we adopt the highly conservative assumption that LRMC will be constant in future years. We note that this is the exact same position adopted in the November 2014 report, which stated that:⁸³

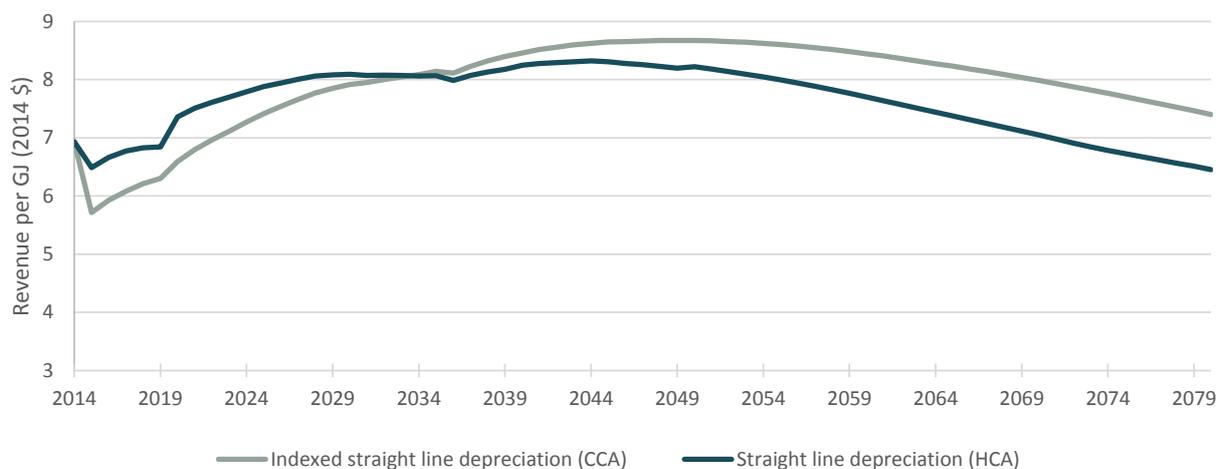
... LRMC is likely to decrease in future years and, at its most conservative, to be relatively stable. Notwithstanding, for the purpose of the comparisons of LRMC and average prices through time that I undertake below, I adopt the highly conservative assumption that LRMC will be constant in future years.

4.3 Revised average prices and compliance with rule 89(1)(a)

A material proportion of the total cost of operating a gas network comprises capital related costs, and so it follows that correcting the Authority's assumption as to the level of growth in capital expenditure will give rise to a different time profile of average prices, as compared with that in the final decision.

In Figure 10 we show the revised estimates of average prices per GJ in the Authority's pricing model that arise from the use of indexed straight line depreciation and straight line depreciation to determine the depreciation schedule. For the avoidance of doubt, the only substantive change we have made to the Authority's pricing model, as compared with that used in the final decision, is to correct the Authority's assumptions as to the level of growth in capital expenditure, the approach to which we explain in section 4.1.⁸⁴

Figure 10 Revenue per GJ in the Authority's corrected model, constant prices



The reduction in prices in the 2015 year illustrated in Figure 10 reflects the Authority's final decision on ATCO's other cost building blocks, the effect of which is amplified under indexed straight line depreciation since it defers the recovery of depreciation until later years. However, the implications of deferring the

⁸³ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 18.

⁸⁴ We note that we also amended the 2014 gas volume used by the Authority to remove the downward bias that we discuss in section 3.5. Further, we note that we use the outturn annual average gas price in the 2014 year since this was the approach adopted by the Authority in its analysis underpinning the final decision. In addition, the step change in revenue per GJ in the 2020 year arises from inconsistent rates of return applied by the Authority from 2015 to 2019 and from 2020 to 2080. The higher rate of return applied by the Authority in the 2020 to 2080 years acts to increase the level of revenue in those years, as compared with that in the 2015 to 2019 period. Correcting this inconsistency would give rise to a more modest increase in average prices over the 2020 to 2080 period. However, for the purpose of our conservative analysis we have not revised the rate of return assumptions applied by the Authority.

recovery of depreciation are evident in later years, where indexed straight line depreciation gives rise to relatively higher prices, as compared with straight line depreciation.

We note that the relatively higher natural gas prices under indexed straight line depreciation in later years will be amplified by any decline in demand. Indeed, electricity customers in eastern Australia are currently facing such circumstances, where demand for electricity is declining but electricity prices are rising since there is a material level of network costs yet to be recovered, ie, there is less demand over which to distribute the cost of the existing network.

Figure 11 below is derived from Figure 10 and illustrates the extent to which average prices per GJ depart from LRMC over the period from 2014 to 2080, against the highly conservative assumption that LRMC will be stable over that period, ie, there will be no future improvement in productivity.

It is again helpful to note that it is the extent of departure, ie, the gap between LRMC and average prices per GJ throughout the period being compared, that is relevant to the assessment as to which depreciation schedule gives rise to a tariff profile that best complies with rule 89(1)(a).

Figure 11 Change in unit price per GJ and indicative LRMC trend, constant prices

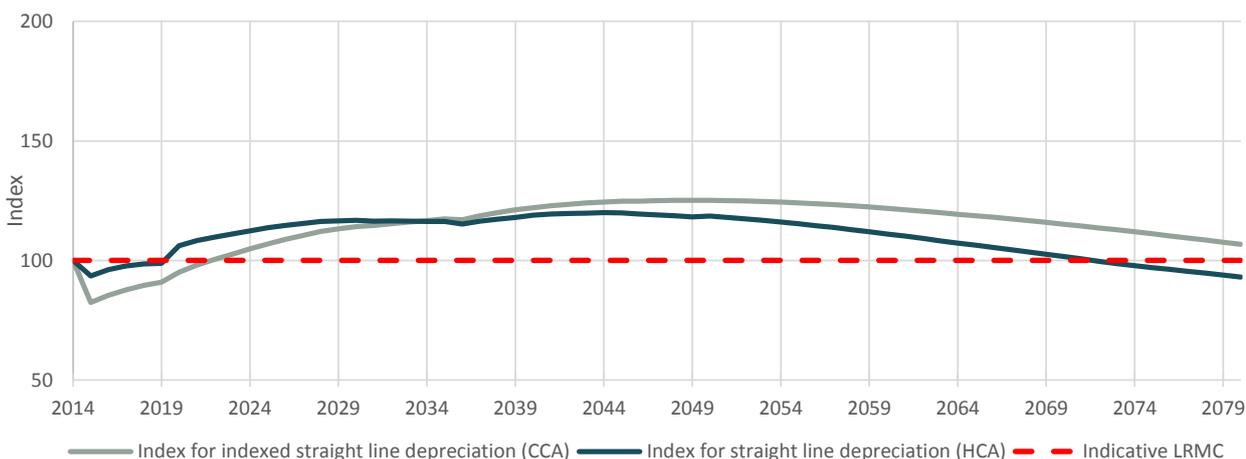
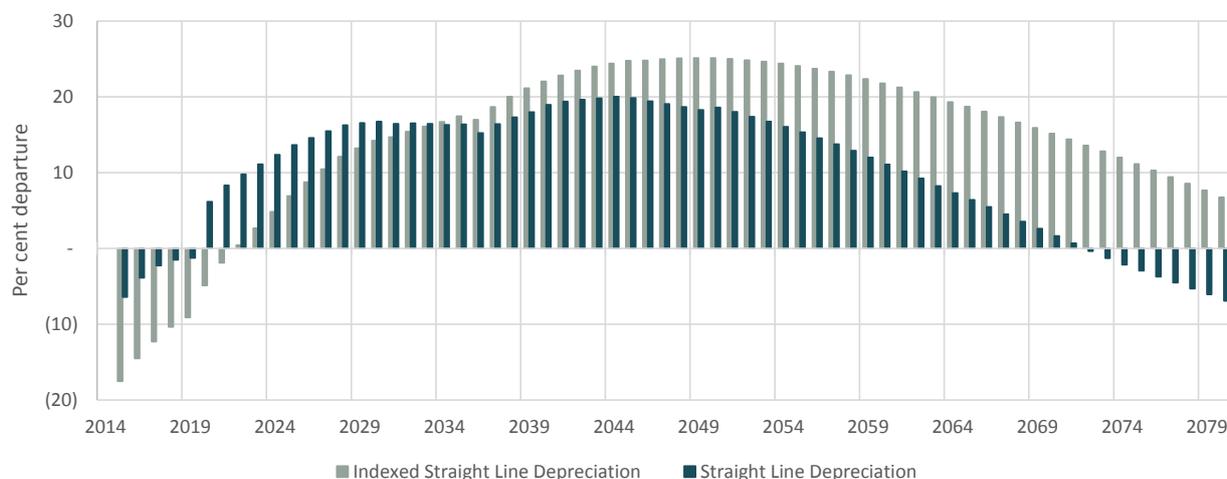


Figure 11 shows that, over the period that reflects the life of ATCO's assets, the departure from LRMC is minimised under straight line depreciation, as compared with indexed straight line depreciation.

To illustrate these relationships more clearly, Figure 12 below shows the gap between the change in these two unit price scenarios and the indicated LRMC trend from 2014 to 2080, all drawn from Figure 11 above.



Figure 12 Difference between the change in unit price per GJ and the indicative LRM trend, constant prices



The extent of departure from LRM under straight line depreciation and indexed straight line depreciation illustrated in Figure 12 can be quantified by calculating the standard deviation of prices from LRM over time, where a higher standard deviation reflects a larger departure from LRM over time.⁸⁵ The standard deviation of prices from LRM over the 2014 to 2080 period is:

- 17.8 under indexed straight line depreciation; and
- 13.0 under straight line depreciation.

Drawing on the analysis of the likely time profile of LRM (albeit, adopting the conservative assumption that LRM will remain stable), and the revised average prices per GJ calculated using the Authority's pricing model, we conclude that, when evaluated on a per GJ basis:

- applying straight line depreciation meets the requirements of rule 89(1)(a); and
- applying indexed straight line depreciation does not meet the requirements of rule 89(1)(a).

4.3.1 ATCO's transition approach

Notwithstanding that the adoption of straight line depreciation meets the requirements of rule 89(1)(a), in this section we provide our opinion as to whether the transitional approach, as proposed by ATCO, meets the requirements of rule 89(1)(a), as compared with the indexed straight line depreciation approach applied by the Authority in the final decision.

We understand that the objective of ATCO's transition approach is to mitigate the relatively higher gas prices in the near term that arise under straight line depreciation, as compared with indexed straight line depreciation, while still providing for the efficiency benefits associated with straight line depreciation over the long term.

It follows that the prices arising under ATCO's transition approach in the near term are not directed towards the efficiency-based objective of rule 89(1)(a). Rather, the near term prices arising under ATCO's transition approach are intended to address the Authority's concerns as to near term price shocks. With this in mind, the November 2014 report finds that ATCO's transition approach and indexed straight line depreciation:⁸⁶

⁸⁵ Standard Deviation is a statistical measure used to quantify the extent of dispersion in a data set.

⁸⁶ HoustonKemp, *Evaluation of ERA's Draft Decision on ATCO's Depreciation Allowance*, November 2014, page 25.

...give rise to similar prices from 2015 to 2025, and so, to the extent relevant, the transition approach alleviates the effect of any short term price shocks associated with adopting straight line depreciation.

The November 2014 report assessed the extent of departure between prices and LRMC from the end of the transitional period to 2080 and concluded that, after accounting for any price shocks during the transition, and against a highly conservative assumption that LRMC is flat, that indexed straight line depreciation approach does not comply with rule 89(1)(a).

In this report we build on the analysis applied in the November 2014 report. Nevertheless, in Appendix 2 we show that, after correcting the errors in the final decision, the analysis applied to the draft decision in the November 2014 report supports the same conclusion when applied to the Authority's final decision. In particular, the analysis in Appendix 2 shows that, after accounting for any price shocks during the transition, and against a highly conservative assumption that LRMC is flat:

- ATCO's transition approach meets the requirement of rule 89(1)(a), as compared with indexed straight line depreciation; and
- indexed straight line depreciation does not comply with rule 89(1)(a).

In this report we assess the extent of departure between prices and LRMC over the 2014 to 2080 period, rather than from 2024 to 2080. Figure 13 below illustrates the average prices arising under ATCO's transition approach and indexed straight line depreciation over 2014 to 2080.⁸⁷

Figure 13 Revenue per GJ in the Authority's corrected model, constant prices

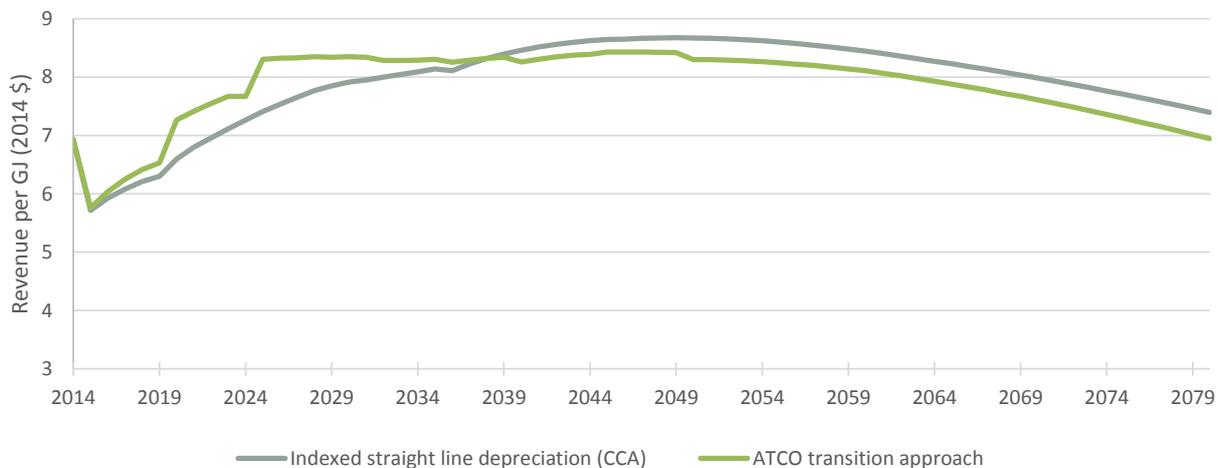


Figure 14 below is derived from Figure 13 and illustrates the extent to which average prices depart from LRMC over 2014 to 2080, again by reference to the highly conservative assumption that LRMC will be stable or flat over time, ie, there will be no improvement in productivity over this period.

⁸⁷ We note that we use the outturn annual average gas price in the 2014 year since this was the approach adopted by the Authority in its analysis underpinning the final decision. Further, we note that the higher rate of return applied by the Authority from 2020 onwards, as compared with the 2014 to 2019 period, is a significant contributor to the higher average prices from 2020 onwards.

Figure 14 Change in unit price per GJ and indicative LRMC trend, constant prices

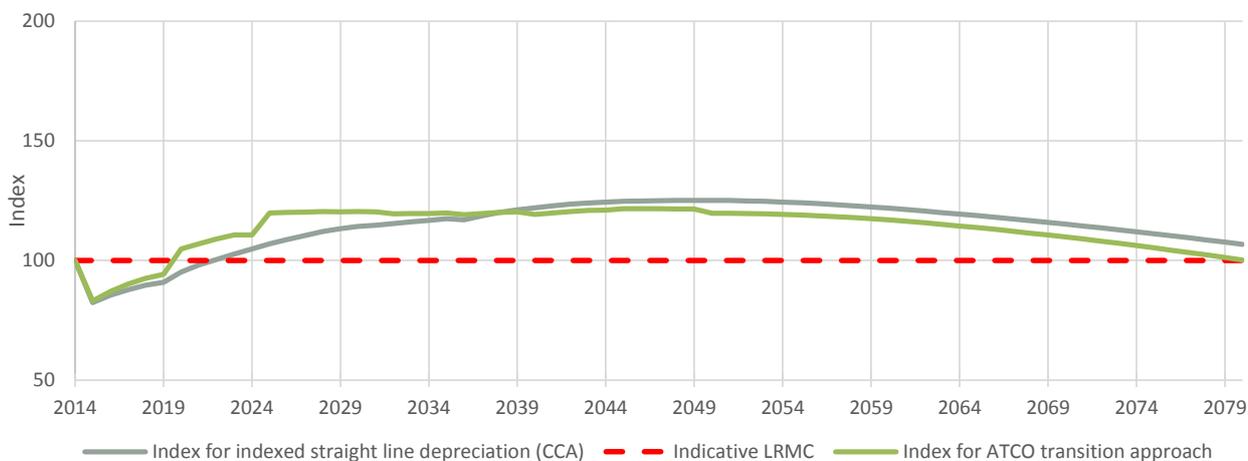


Figure 14 shows that, over the period that reflects the life of ATCO Gas’ assets, the departure from LRMC is minimised under ATCO’s transition approach, as compared with indexed straight line depreciation.

In order to illustrate this finding more clearly, Figure 15 shows the gap between the change in unit price and the indicative LRMC trend from 2014 to 2080, as drawn from Figure 14 above.

Figure 15 Difference between the change in unit price per GJ and the indicative LRMC trend 2014 to 2080, constant prices



It is again helpful to note that it is the extent of departure, ie, the gap between LRMC and average prices per GJ over time, that is relevant to the assessment as to which depreciation schedule gives rise to a tariff profile that complies with rule 89(1)(a). Further, the March 2014 report highlights the importance of undertaking this assessment over the long term.⁸⁸

We have also quantified the extent of departure from LRMC under ATCO’s transition approach and indexed straight line depreciation by calculating the standard deviation from LRMC, where a higher standard

⁸⁸ NERA, Depreciation Options for ATCO Gas, Expert Report of Gregory Houston, 13 March 2014, page 15 and 16.

deviation reflects a greater departure from LRMC.⁸⁹ We find that the standard deviation of prices from LRMC over the 2014 to 2080 period is:

- 17.8 under indexed straight line depreciation; and
- 16.1 under ATCO's transition approach.

Drawing on the above analysis we conclude that, against the highly conservative assumption that LRMC remains flat:

- ATCO's transition approach meets the requirements of rule 89(1)(a), as compared with the indexed straight line approach applied by the Authority in the final decision; and
- indexed straight line depreciation does not comply with rule 89(1)(a).

Further, these conclusions would be reinforced if we were to relax the highly conservative assumption that LRMC remains flat and, alternatively, were to assume that LRMC is reducing over time.

It follows that it is incorrect to reject the transition approach proposed by ATCO and that the errors in the Authority's final decision lead it to erroneously conclude that indexed straight line depreciation complies with rule 89(1)(a).

⁸⁹ Standard Deviation is a statistical measure used to quantify the extent of dispersion in a data set.

A1. Prices and LRMC per Connection

In the final decision the Authority introduced a new dimension of analysis that was not considered in its draft decision and on which there had been no consultation, ie, the extent of departure between average prices and LRMC on a per connection basis, rather than on a per GJ basis.

We explain in section 3.1 that compliance with rule 89(1)(a) should be assessed by reference to an analysis of the extent of departure between average prices and LRMC on a per GJ basis. Notwithstanding our conclusion that a per connection analysis warrants little or no weight, for completeness, we set out below an analysis of LRMC and prices over time on a per connection basis. The results of this analysis do not alter the conclusions we draw in this report.

A1.1 LRMC per connection

The errors in the analysis underpinning the Authority's final decision as it related to LRMC per GJ that we explain in section 3 similarly arise in its analysis of LRMC per connection.⁹⁰ In particular, in assessing LRMC per connection over time, the Authority errs in its interpretation of the ABS data and applies the average incremental cost approach using:

- an inherently flawed growth assumption to forecast capital expenditure;⁹¹
- an historical estimate of LRMC to draw inferences as to LRMC from 2015 onwards;⁹² and
- historical gas volumes with a material downward bias.⁹³

We correct the errors in the Authority's application of the average incremental cost approach and present the results in Figure 16 below.

Figure 16 Estimates of LRMC per GJ using a corrected AIC approach, constant prices

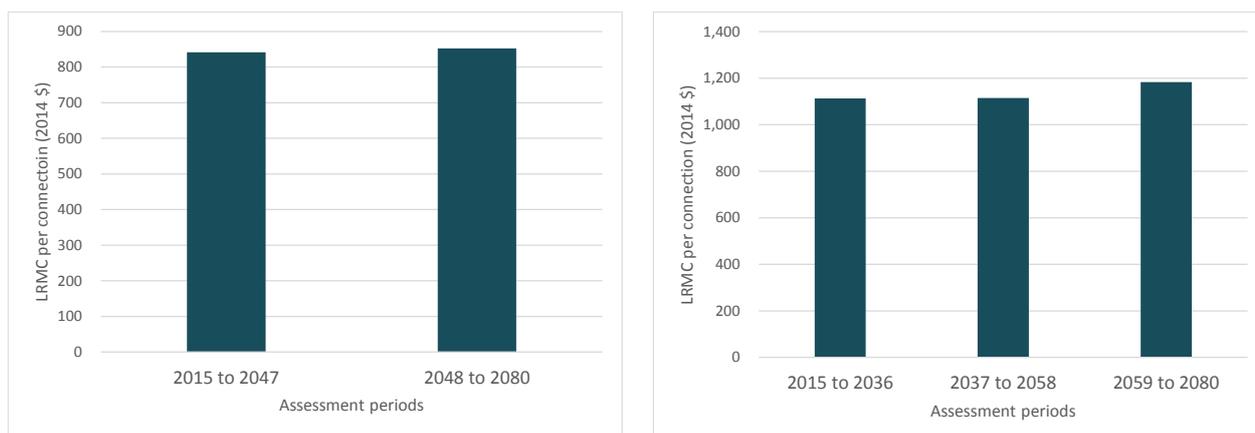


Figure 16 above shows that the LRMC per connection of natural gas services provided by ATCO is likely to remain relatively stable from 2015 onwards. In particular, our assessment of LRMC using two and three assessment periods shows that LRMC rises, respectively, by 1.3% and 6.4 per cent over a period of 65

⁹⁰ With the exception of the error relating to the Authority implicitly disregarding the ABS data when assessing LRMC per GJ over time.

⁹¹ See section 3.3.

⁹² See section 3.4.

⁹³ See section 3.5.

years. Taking this finding with our conclusion from the ABS data in section 3.2 and 4.2.1, in our opinion, LRMC per connection is likely to decrease in future years, and at its most conservative, to be relatively stable.

It follows that the Authority has erred by concluding in the final decision that LRMC per connection is likely to remain flat or slightly rising over time⁹⁴ and by undertaking its analysis on the basis that LRMC is rising, ie, the Authority states that:⁹⁵

In line with this **increase in the long run marginal cost**, the long run average revenue per connection under the CCA depreciation approach is flat to rising over time. [Emphasis added]

And that:⁹⁶

....This [straight line depreciation] results in a declining average revenue per connection over time, which is not consistent with **the rising LRMC of connections**. [Emphasis added]

A1.2 Average prices per connection

We explain in section 3.3 that the Authority forecasts average prices using an incorrect capital expenditure growth assumption and, in section 4.1, we explain our approach to correcting this assumption. We present the revised analysis of the extent of departure between LRMC per connection and prices per connection below.

For the avoidance of doubt, we have undertaken our analysis on the basis of a highly conservative assumption that LRMC remains flat in future years, ie, there are no improvements in productivity over the next 65 years to 2080. Further, the only substantive change we have made to the Authority's pricing model, as compared with that used in the final decision, is to correct the Authority's assumptions as to the level of growth in capital expenditure, the approach to which we explain in section 4.1.⁹⁷

Figure 17 below illustrates the revised time profile of average prices per connection under straight line depreciation and indexed straight line depreciation, as applied by the Authority in the final decision.

⁹⁴ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 23 and 24.

⁹⁵ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 25.

⁹⁶ The Authority, *Final Decision on Proposed Revisions to the Access Arrangement for the Mid-West and South-West Gas Distribution Systems*, June 2015, Appendix 9, paragraph 26.

⁹⁷ We note that we also amended the 2014 gas volume used by the Authority to remove the downward bias that we discuss in section 3.5.

Figure 17 Revenue per connection in the ERA's corrected model, constant prices

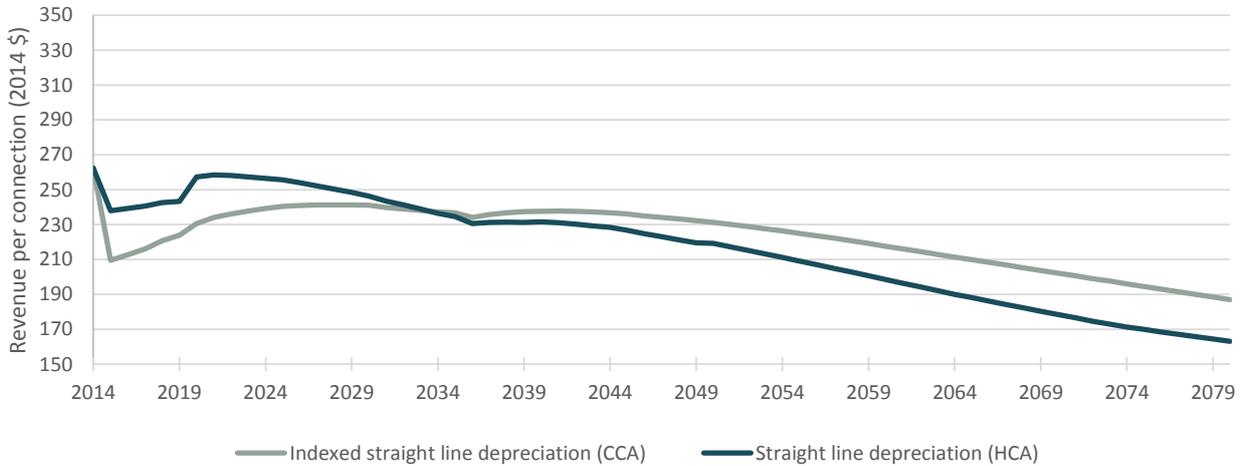


Figure 18 below illustrates the extent to which average prices per connection depart from LRMC per connection over the period from 2014 to 2080, against the highly conservative assumption that LRMC will be stable over that period, ie, that there will be no future improvement in productivity.

Figure 18 Change in unit price per connection and indicative LRMC trend, constant prices

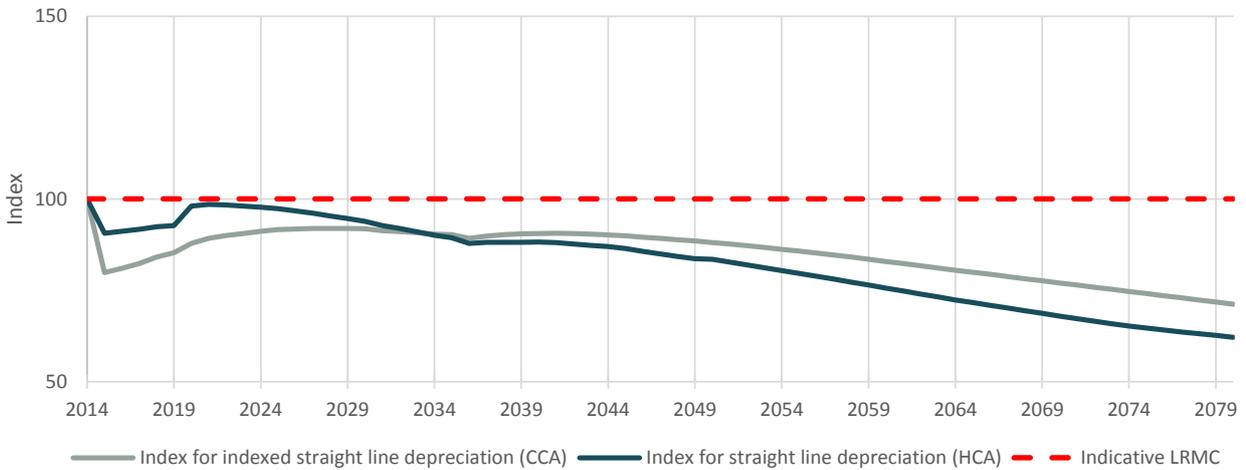
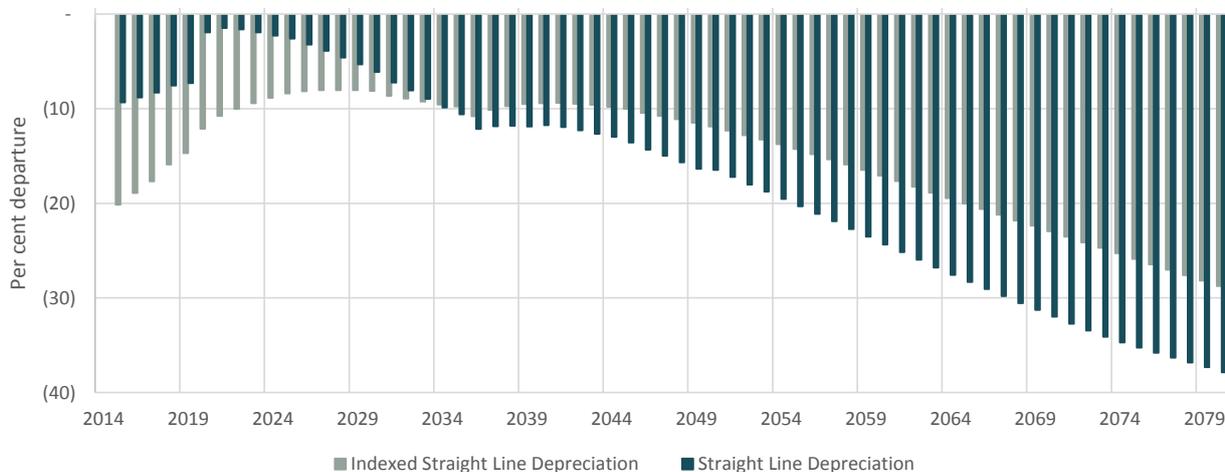


Figure 18 shows that, over the period that reflects the life of ATCO's assets, and on the basis of the highly conservative assumption that LRMC per connection will be stable over that period, the departure of average prices per connection from LRMC is minimised under indexed straight line depreciation, as compared with straight line depreciation. Figure 19 below shows the gap between the change in these two unit price scenarios and the indicated LRMC trend, all drawn from Figure 17 above.

Figure 19 Difference between the change in unit price per connection and the indicative LRMC trend, constant prices



This analysis indicates that, over the period that reflects the life of ATCO's assets, and on the basis of the highly conservative assumption that LRMC will be stable over that period, the departure of average prices per connection from LRMC is minimised when indexed straight line depreciation is applied, as compared with straight line depreciation.

However, it is important to consider this finding in the context of:

- the contrary conclusion reached when this assessment is undertaken on a per GJ basis;
- the highly conservative assumption that LRMC is flat over time; and
- that in assessing compliance with rule 89(1)(a), little or no weight should be placed on an analysis of LRMC and prices per connection over time, ie, little or no weight should be placed on this analysis.

A1.2.1 ATCO's transition approach

In this section we provide our opinion as to whether the transitional approach, as proposed by ATCO, meets the requirements of rule 89(1)(a), as compared with the indexed straight line depreciation approach applied by the Authority in the final decision

Figure 20 illustrates average prices (expressed as revenue per connection) under ATCO's transition approach and under the indexed straight line depreciation approach from 2014 to 2080.⁹⁸

⁹⁸ We note that the higher rate of return applied by the Authority from 2020 onwards, as compared with the 2014 to 2019 period, contributes to the higher average prices from 2020 onwards illustrated in Figure 20.

Figure 20 Revenue per connection in the ERA's corrected model, constant prices

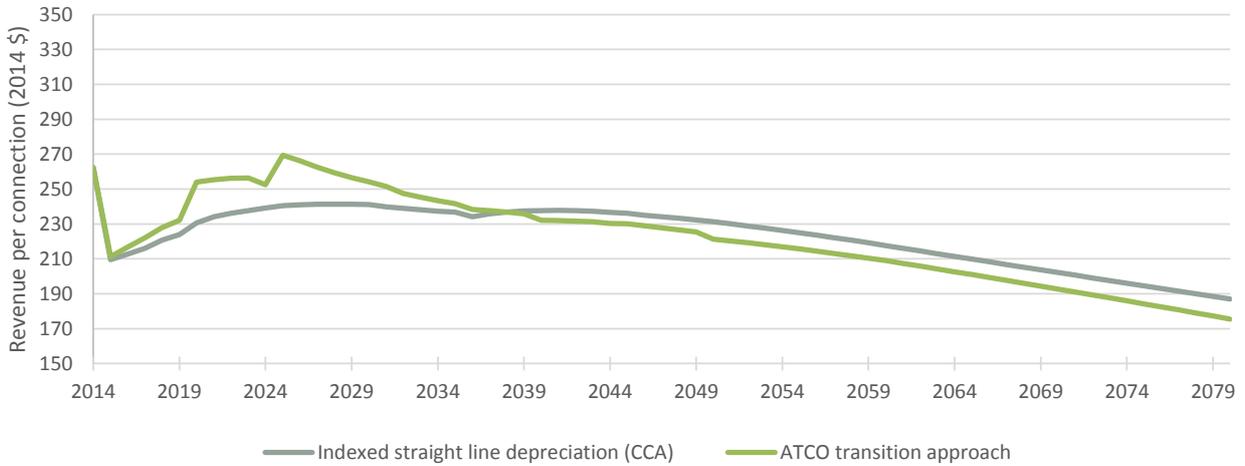


Figure 21 below illustrates the extent to which average prices depart from LRMC from 2014 to 2080, again by reference to the highly conservative assumption that LRMC will be stable or flat, ie, there will be no improvement in productivity over this period.

Figure 21 Change in unit price per connection and indicative LRMC trend, constant prices

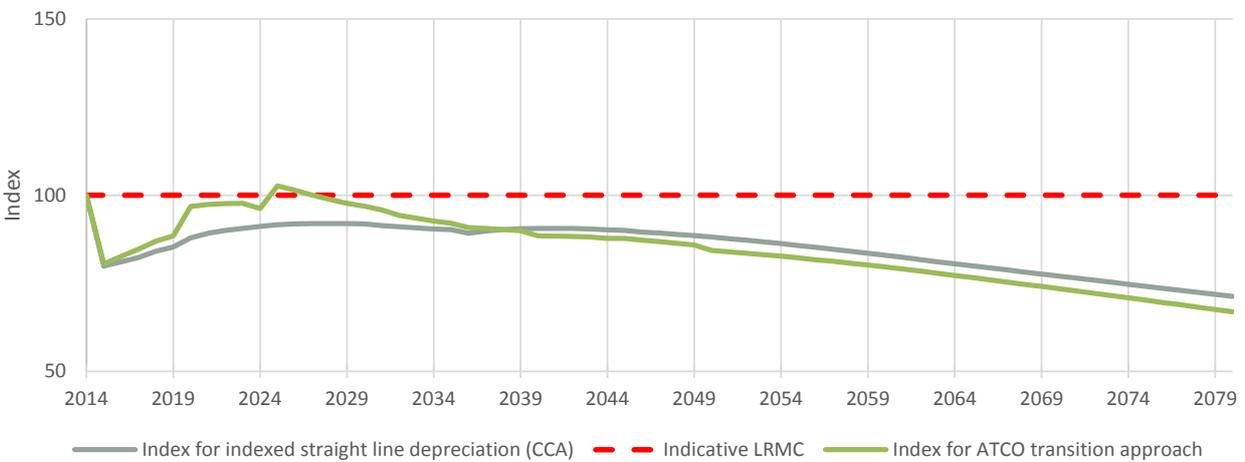
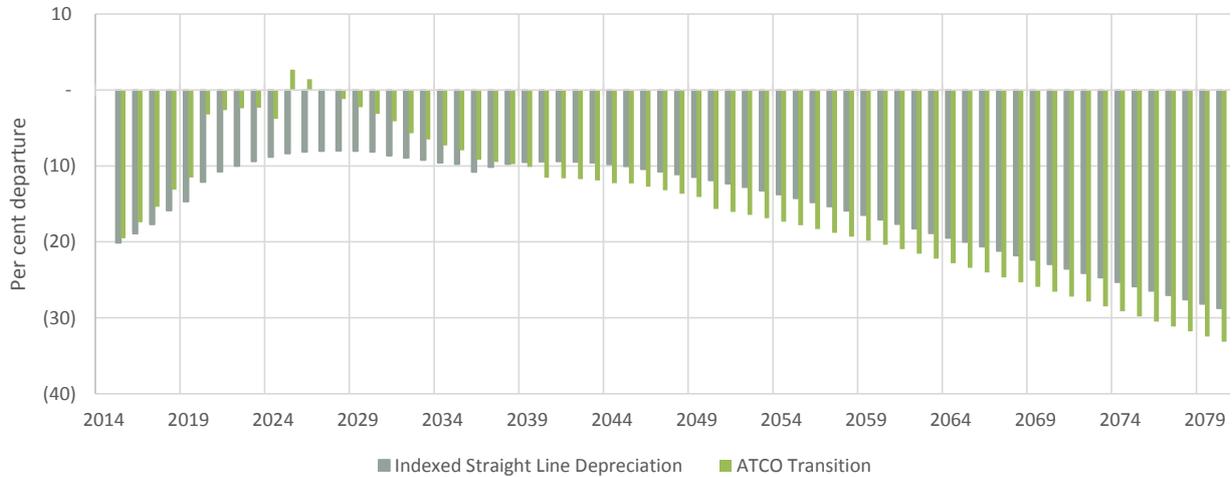


Figure 21 shows that, over the period that reflects the life of ATCO Gas' assets, and when assessed on a per connection basis, the departure from LRMC is minimised under indexed straight line depreciation, as compared with ATCO's transition approach. In order to illustrate this finding more clearly, Figure 22 shows the gap between the change in unit price and indicative LRMC trend from 2014 to 2080, as drawn from Figure 20 above.

Figure 22 Difference between the change in unit price per connection and the indicative LRMC trend, constant prices



Our analysis indicates that, over the period that reflects the life of ATCO's assets, and on the basis of the highly conservative assumption that LRMC will be stable over that period, the departure of average prices per connection from LRMC is minimised under indexed straight line depreciation, as compared with straight line depreciation.

However, this finding should not be considered in isolation. Rather, it should be considered in the context of:

- the contrary conclusion reached when this assessment is undertaken on a per GJ basis;
- the highly conservative assumption that LRMC is flat over time; and
- that in assessing compliance with rule 89(1)(a), little or no weight should be placed on an analysis of LRMC and prices per connection over time, ie, little or no weight should be placed on this analysis.

A2. Applying the analysis in the November 2014 to the Final Decision

In this Appendix we show that, after correcting the errors in the final decision, the analysis applied to the draft decision in the November 2014 report supports the same conclusion when applied to the Authority's final decision. In particular, the analysis in this Appendix shows that, after accounting for any price shocks during the transition, and against a highly conservative assumption that LRMC is flat:

- ATCO's transition approach meets the requirement of rule 89(1)(a), as compared with indexed straight line depreciation; and
- indexed straight line depreciation does not comply with rule 89(1)(a).

Figure 23 illustrates that average prices (expressed as revenue per GJ) under ATCO's transition approach and under the indexed straight line depreciation approach both give rise to broadly similar prices for the period from 2015 to 2024 – as is the intention of ATCO's proposed transition.

Figure 23 Revenue per GJ in the Authority's corrected model, constant prices

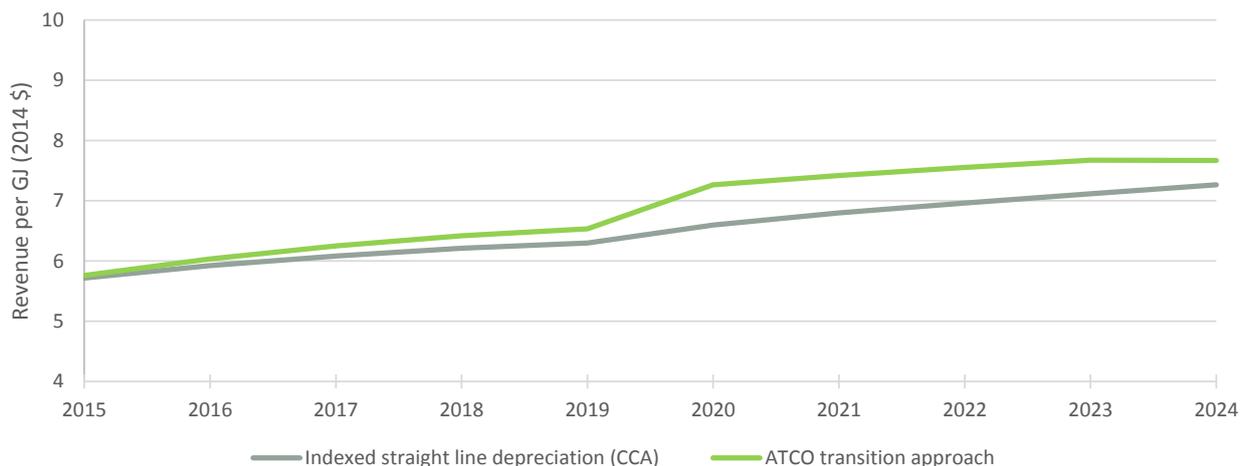


Figure 23 shows that both approaches result in substantially the same prices from 2015 to 2020. It also shows that, although there is some limited divergence from 2020 to 2025, average prices converge to very similar levels in 2024, ie, by the end of the transition and the AA5 regulatory period.

In other words, the transition approach and indexed straight line depreciation give rise to similar prices from 2015 to 2025, and so, to the extent relevant, the transition approach alleviates the effect of any short term price shocks associated with adopting straight line depreciation. Further, we note that the higher rate of return applied by the Authority from 2020 onwards, as compared with the 2014 to 2019 period, is a significant contributor to the higher average prices from 2020 to 2024.

Figure 24 below is derived from Figure 23 and illustrates the extent to which average prices depart from LRMC from the end of this transition period, again by reference to the highly conservative assumption that LRMC will be stable or flat, ie, there will be no improvement in productivity over the next 65 years.

Figure 24 Change in unit price per GJ and indicative LRMC trend, constant prices

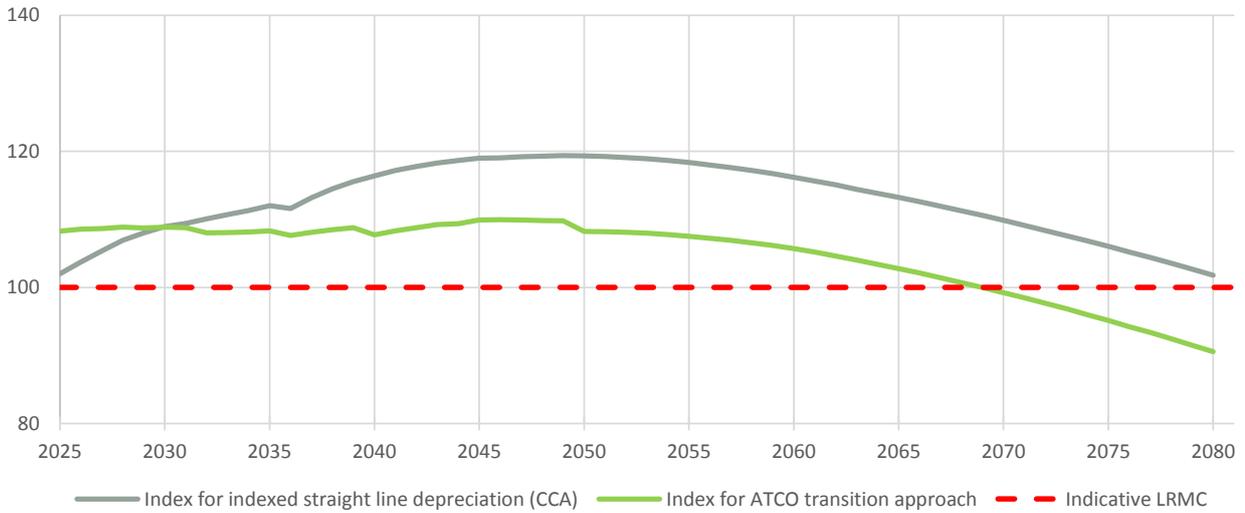
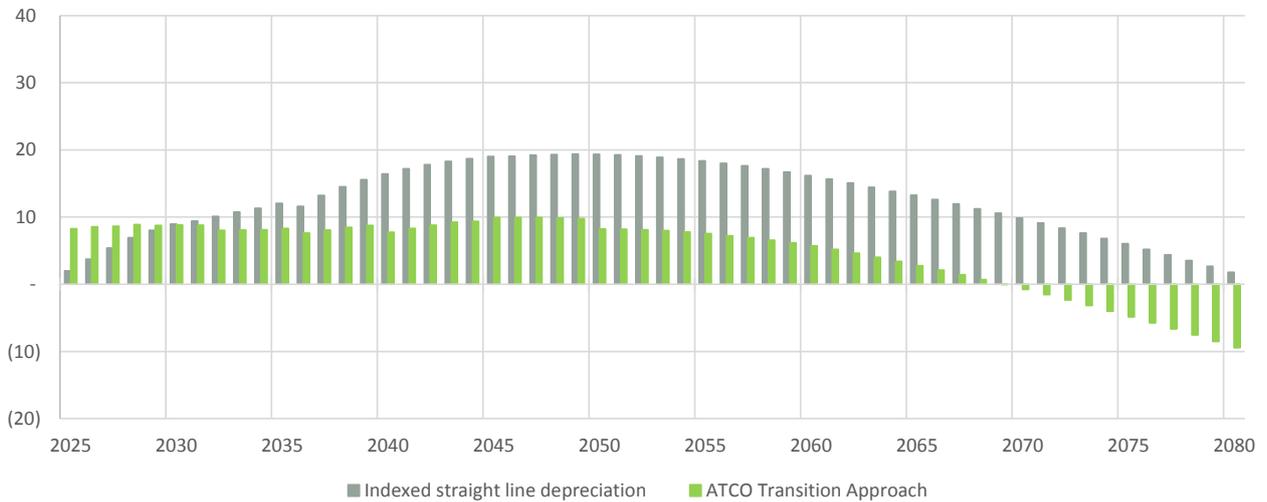


Figure 24 shows that, over the period that reflects the life of ATCO’s assets, the departure from LRMC is minimised under ATCO’s transition approach, as compared with indexed straight line depreciation. In order to illustrate this finding more clearly, Figure 25 shows the gap between the change in unit price and the indicative LRMC trend from 2024 to 2080, as drawn from Figure 23 above.

Figure 25 Difference between the change in unit price per GJ and the indicative LRMC trend 2024 to 2080, constant prices



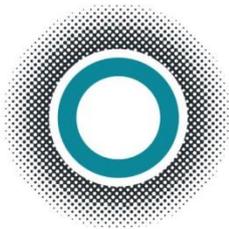
Our analysis shows that the merit of ATCO’s transition approach is that it alleviates any price shocks throughout the transition to an unindexed capital base, while still providing for the efficiency benefits associated with an unindexed capital base to be realised throughout the remainder of the period we analyse, ie, 2025 to 2080.

Drawing on the above analysis we conclude that, after accounting for any price shocks during the transition, and against the highly conservative assumption that LRMC remains flat:

- the adoption of ATCO's transition approach meets the requirements of rule 89(1)(a), as compared with the indexed straight line approach applied by the Authority in the final decision; and
- indexed straight line depreciation does not comply with rule 89(1)(a).

Further, these conclusions would be reinforced if we were to relax the highly conservative assumption that LRMC remains flat and, alternatively, were to assume that LRMC is reducing over time.





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