Correction to algebraic LRMC model
22 May 2024

1 IPART algebraic LRMC model July 2022

In July 2022, IPART published an information paper that described a new way to calculate the Long Run Marginal Cost of water supply (Water LRMC). This new approach, called the "algebraic" method, has certain advantages over alternative methods based on simulation to calculate the Average Incremental Cost or "Turvey" LRMC estimates.

This method is described here:

https://www.ipart.nsw.gov.au/documents/information-paper/information-paper-more-accurate-way-estimate-lrmc-8-july-2022?timeline_id=15193

We also published a spreadsheet model that performs the algebraic water LRMC calculation:

https://www.ipart.nsw.gov.au/documents/spreadsheet-model/spreadsheet-standard-algebraic-method-lrmc-model?timeline_id=16267

We consulted with a working group comprised of representatives from Sydney Water, Hunter Water, Water NSW, Central Coast Council, Essential Water, the Department of Planning and Environment (as it was then), NSW Treasury and the Public Interest Advocacy Centre on ways to improve LRMC estimates generally, and the algebraic method specifically. The working group concluded its meetings in May 2023 with a broad consensus on the way forward.

2 Error noted in model February 2024

In February 2024, Hunter Water noted an error in IPART's standard algebraic LRMC model. The lead time adjustment is double counted when calculating present value factors. The specific problem is that the tab "LRMC – Linear" calculates separate present values of cost and water produced for each augmentation, assuming that construction starts now. As Hunter Water noted, this calculation treats the water as being generated for an augmentation only after the lead time. In contrast, the present value of costs on that tab reflects the immediate recognition of the capital costs. Energy costs and annual opex excluding energy costs begin only after the lead time. Thus the lead time adjustment for capital costs is embedded in the present values for cost and water emanating from this tab. There is no lead time adjustment for energy or opex costs because these occur only as water is produced.

The tabs "LRMC – Spare Capacity Ignored" and "LRMC – Spare Capacity Counted" reflect the present values of cost and water over a combination of augmentations that begin at different times. A separate present value factor is calculated for cost and water and for each augmentation. These present value factors reflect the differing start times for the different augmentations. The PV factor for cost is (1+discount rate)^ -(start year + lead time/2). The PV factor for water is different: (1+discount rate)^ -(start year + lead time). Therefore, there is an additional lead time adjustment inherent in these PV factors.

3   After consultation LRMC model re-issued

We have implemented the following changes to the standard algebraic LRMC model to rectify the double-counting of the lead time adjustment:

- On the tabs "LRMC – Spare Capacity Ignored" and "LRMC – Spare Capacity Counted", use the same PV factor for costs and water, and that factor should be = (1+discount rate)^ - start year.

- On the tab "LRMC – Linear" modify the calculation of PV costs in cell $K17 (and other rows in that column)

    o   Now   =IFERROR($E17

        +$G17*$L17+$F17*((1+DiscountRate)^-$H17)/DiscountRate,"")

    o   Future   =IFERROR($E17*(1+DiscountRate)^-($H17/2)

        +$G17*$L17+$F17*((1+DiscountRate)^-$H17)/DiscountRate,"")

The reason for the second change is that capital costs are assumed to occur evenly across the lead time, not 100% at the beginning.

This change was supported by Hunter Water, Sydney Water and NSW Treasury who were the only stakeholders to comment.

The amended spreadsheet model is now available on our web site here:

https://www.ipart.nsw.gov.au/documents/spreadsheet-model/spreadsheet-standard-algebraic-method-lrmc-model

4   Impact of this change on LRMC estimates

The corrections noted above have a modest effect on the LRMC estimates generated by the model. For example, using the input values from the version on our web site, the changed estimates are shown in the table below.

Table 1. Effect of formula correction on LRMC estimates ($/kL)

Basis of LRMC estimate	Original model	Corrected model
Increment above existing capacity	3.42	2.86
Increment above existing usage	1.10	1.05

Depending on the input assumptions, the impact of the model change could differ from Table 1.