

Productivity Commission: National Water Reform 2026 submission

Thank you for the opportunity to submit to the inquiry. I have recently completed a PHD, with the extensive support of Professor Andrew Western, in valuing water in storage and want to provide an excerpt as a submission. The emphasis of the doctorate was on how climate independent water supply sources changed the optimal release strategy from a reservoir, with a focus on urban water supplies.

The current regulatory approach, with a focus on long-run marginal cost pricing to drive efficiency, exacerbates the boom-bust cycle of water infrastructure investment and results in suboptimal drought response plans and poorer investment decisions. In particular this submission is responding to:

Part A – NWI assessment question:

What policy, legislative, regulatory, funding or governance barriers are affecting progress towards NWI outcomes in your jurisdiction or operating context (including how responsibilities, decision-making and oversight are organised)?

Part A – Pricing and Economic Regulation the question:

- How are trade-offs made during the price setting process, especially between long-term objectives (such as those relating to asset expenditure and renewal) and short-term social equity objectives (such as affordability)?

Part B - Secure, resilient and sustainable services the question:

How do current arrangements affect how trade-offs are made between service reliability, long-term financial sustainability, affordability and any other objectives?

Current policy, regulatory and pricing arrangements do not adequately incorporate short-term risk preferences associated with water security decision-making, which creates a barrier to achieving National Water Initiative (NWI) outcomes.

Economic analysis adopts a risk neutral approach to balancing investment in water supply systems and the cost of failure against the probability of that failure. However, it trades off the extreme costs of those events against the certain costs of building the infrastructure. It should be trading off the probability of triggering a decision to augment a water supply system, which is the real decision utilities are confronted with, which occurs at a higher storage and with greater frequency, than critical supply failure.

Given the lag between the decision to build a climate independent water supply source and its availability to produce water, there is a risk of reservoir failure associated with the decision to augment. The amount of short-term risk, ie the likelihood that a Day Zero event will occur, will have a significant influence on the augmentation decision and also the operations of the existing water supply system. However, the pricing framework does not adequately incorporate this short-term risk, and, consequently, the trade-offs involved are not objectively considered when setting drought response plans. This is because it treats the expected augmentation timeframe as exogenous to the pricing decision.

As shown in Chapters 6 & 7, a short-term risk preference will influence the optimal drought response plan and the expected augmentation timeframe. Additionally, existing drought response plans have an implicit level of short-term risk preference that has not been quantified, meaning the trade-offs involved in increasing the level of security in the water supply system will not have been defined.

The implications for water bills can be substantial. A short-term risk measure was used to calculate the expected cost of maintaining the water supply system for Melbourne. It found that the expected costs of supplying water would be reduced by approximately 15 per cent, or \$47.5 million, by operating the existing desalination plant at a higher level of storage than in its then drought response plan.

The attached excerpts from the PhD dissertation *The Economic value of water in storage* examine how the expected social benefits of an optimal release strategy changes when a climate independent augmentation option is available. It examines the features that determine the optimal augmentation trigger for a climate independent water supply source, and how hydrological risk influences this trigger. It proposes a security cost function reflective of the key variables in the augmentation decision, specifically the level of hydrological risk, the timing of an augmentation, and the level of service that defines reservoir failure. This has been lacking in past decisions on optimal release strategies and from regulatory frameworks governing the operation of water supply systems.

The attached extracts describe:

- An abstract outlining the reason for the study and its implications.
- Chapter 1: which details the typical ways in which hydrologists understand the behaviour of a reservoir and define the risks associated with supplying water. It also has a high-level description of long-run marginal pricing and how the regulatory framework interacted with the Millennium Drought.
- Chapter 4: describes how having climate independent water supply sources available alters the decisions a reservoir operator can make and changes the optimal drought response plan.

- Chapter 6: puts forward a model that illustrates how incorporating short-term risk preference changes the level of storage at which the augmentation is triggered.
- Chapter 7 (confidential): provides a practical example based on a stylised representation of a major capital's water supply system. It highlights that, depending on short-term risk preference, the storage level at which a water supply system is augmented can vary from almost full to almost empty. This is important because the short-term risk preference will influence the optimal drought response plan *and* the operation of the water supply system. It also influences the expected augmentation timeframe dramatically.

This highlights the importance of incorporating the short-term risk preferences into regulatory pricing decisions. The short-term risk preference will influence the frequency and probability of *triggering* the decision to augment a water supply system. It will also influence the optimal release strategy, or drought response plan, and the operational costs of maintaining a water supply system. Currently these considerations are outside the long-run marginal cost pricing framework adopted in NSW.

This creates a disconnect between planning and operational decisions and price determinations. As a result, current arrangements struggle to transparently balance trade-offs between water security risk and costs of supply augmentation and system operation.

The long-run marginal costs should incorporate the short-term risks as these will influence the expected augmentation timeframe. It should include a focus on the trade-offs associated with different levels of these short-term risks. Bringing a closer focus on planning for extreme events, ironically, is likely to result in a lower expected cost of supplying water over the long-term.