Review of Hunter Water forecast responses

Review of Hunter Water's expenditure and demand forecast responses to IPART's Draft Report

A Final Report prepared for IPART

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AITHER

Contents

Tables

1. Introduction

1.1. Background

In March 2020, IPART released its Draft Report and Draft Determination of Hunter Water's water and sewerage prices for the upcoming regulatory period (commencing 1 July 2020).

Aither was engaged by IPART to undertake a review of the efficiency of the operating and capital expenditure and the appropriateness of demand forecasts set out in Hunter Water's pricing proposal. This expenditure review supported IPART's draft decisions regarding Hunter Water's prices.

Hunter Water has subsequently prepared a response to IPART's draft decisions on expenditure and demand forecasts. As a result, IPART has sought targeted advice from the Aither project team on specific issues relating to Hunter Water's expenditure and demand forecasts.

1.2. Purpose and scope

Aither has been engaged by IPART to provide advice in relation to additional information that Hunter Water has provided in response to IPART's Draft Determination on 9 April 2020.

The scope of this report is to assess Hunter Water's responses and positions regarding:

- Additional operating expenditure associated with drought (which is used to justify its position on dynamic pricing)
- Variations to its demand forecasts, both in unrestricted and restricted scenarios, and
- The potential impacts on demand forecasts and expenditure from the COVID-19 pandemic and associated economic implications.

2. Assessment of expenditure responses

2.1. Summary of Hunter Water's response

In response to IPART's Draft Report and Draft Determination Hunter Water has proposed a dynamic water usage price arrangement in the event that drought conditions cause Hunter Water's storage levels to drop below 60 per cent. The dynamic pricing arrangements is proposed to remain in place until storage levels rise above 70 per cent. In justifying its proposal, Hunter Water states:[1]

> *"A return to drought conditions and a prolonged period of water restrictions into the next regulatory period would have material consequences for Hunter Water's financial position. A dynamic water usage price would provide an intra-period protection in those circumstances."*

Hunter Water has proposed additional drought-related operating expenditure underpinning its proposed dynamic water usage price. This expenditure represents additional costs faced by Hunter Water in the event that it needs to implement its drought response plan and, for the most part, represent an adjustment of the costs Hunter Water incurred by activating the plan during the 2019-20.

Table 1 provides an overview of Hunter Water's drought related expenditure (supplied) in 2019-20, totalling just over $14.4m.

Table 1: Hunter Water's drought-related expenditure during 2019-20

Program elements	Expenditure ('000s)	Percentage of total spend
Water conservation measures	2,385	16.5%
Restrictions implementation	548	3.8%
Community engagement	1,687	11.7%
Operational impacts	3,174	22.0%
Belmont desalination operating expenses	554	3.8%
Belmont desalination plant	4,310	29.9%
Belmont desalination pipelines	201	1.4%
Drought response option development	1,108	7.7%
Program support	444	3.1%
Total drought-related expenditure	**14,411**	**100%**

Source Hunter Water response to IPART Draft Decision

[1] Hunter Water's response to IPART's Draft Report

To estimate future drought costs, Hunter Water has used the additional costs incurred in 2019-20 and assessed the likelihood of the business incurring these costs again if a drought affected the Lower Hunter in the upcoming regulatory period.

The following is a list of some of the costs that were incurred in 2019-20 but were identified by Hunter Water as unlikely to be incurred again during the next period:

- Preliminary planning and development of proposed Belmont desalination plant ($5.1m 2019-20)
- Development of Water Efficiency Management Plans (WEMP) for large customers ($1.0m)
- Development of various applications, web-based resources and tools ($0.14m)
- Operating costs associated with the transfer of water to the Central Coast to help ease water scarcity there ($0.8m).

After adjusting for the removal of the above-mentioned costs, Hunter Water derived an annual base case of $7.3m. Hunter Water also identified additional costs that would need to be undertaken in the next regulatory period in the event of actioning its drought response plan:

- Detailed design work on the Belmont desalination plant (this has the potential to cost around $14.5m under 'severe' drought conditions, however Hunter Water is only seeking to include $2.5m for the purposes of establishing the dynamic pricing arrangements)
- Expansion of the WEMPs to include the next tier of non-residential customers. This is estimated to be around 50 per cent of the 2019-20 level ($0.5m).

Based on this analysis, Hunter Water estimates that a drought-response in the upcoming regulatory period would add approximately $10.3m per annum to its operating expenditure (see Table 2).

Table 2: Hunter Water's proposed future costs based on 2019-20 estimates

Program elements	Expenditure ('000s)	Percentage of total spend
Water conservation measures	1,346	13.0%
Restrictions implementation	548	5.3%
Community engagement	1,564	15.1%
Operational impacts	2,328	22.5%
Belmont desalination operating expenses	-	0%
Belmont desalination plant	-	0%
Belmont desalination pipelines	-	0%
Drought response option development	1,108	10.7%
Program support	444	4.3%
Belmont desalination plant – Detailed design	2,500	24.2%
Expansion of WEMPs	500	4.8%
Total drought-related expenditure	**10,337**	**100%**

Source Additional information provided by Hunter Water; Aither analysis.

2.2. Overview of Aither's assessment of the proposed additional expenditure

Aither has assessed Hunter Water's proposed drought-related operating expenditure that underpins its proposed dynamic water usage pricing proposal. This includes:

- An assessment of the process used to estimate the historical actual costs
- An overall assessment of the efficiency of these costs in response to drought conditions.

2.3. Hunter Water's process for identifying drought-related costs

The additional, drought-related costs presented by Hunter Water reflect the current estimate of drought-related costs for 2019-20. This estimate represents actual expenditure for the first 9 months, with the 3-month forecast (April to June) based on the assumption that restrictions are lifted at the end of April.

In developing its estimates, Hunter Water stated that all actual drought-related expenditure in 2019-20 was assigned to separate work orders and collated by their finance team. This process did not involve the costs for the reallocation of internal staff – any costs associated with such an arrangement were only included where backfilling of the existing FTE position was required. Where this was the case, the cost of the backfilling was the cost that was captured as drought-related.

Following the development of the estimated annual drought-related operating costs, Hunter Water undertook an assessment of these costs to determine which costs would not need to be incurred again if there was another drought in the upcoming regulatory period and the business was required to enter restrictions again. This process for identifying those non-recurrent costs was based on advice from Hunter Water's water resilience program manager and the finance team.

Aither considered the types of expenditure that have been captured by Hunter Water through this process. This breakdown is provided in Table 3 below. It can be seen from this high-level analysis that Hunter Water has not incorporated any internal labour costs associated with responding to the drought. This is consistent with Hunter Water's statements that shifts in labour resourcing had not been captured unless there was backfilling required.

Table 3: Breakdown of Hunter Water's proposed ongoing drought-related expenditure by cost categories

Cost categories	Expenditure ('000s)	Percentage of total spend
Contractors and consultants	5,029	68.5%
Advertising/pricing/promotional	1,465	20.0%
Tomago Borefields (electricity and lab costs)	500	6.8%
Other	344	4.8%
Total ongoing annual drought-related expenditure	**7,337**	**100%**

Source Additional information provided by Hunter Water.

Note This breakdown only applies to those costs that are considered likely to be incurred again. It does not include the proposed additional costs associated with the detailed design of Belmont desalination plant or expansion of the WEMPs.

Based on our assessment of the information provided, we consider that the process undertaken by Hunter Water to identify the actual costs associated with its response to the current drought and water restrictions to be appropriate.

2.4. Aither's assessment of the proposed additional expenditure

Hunter Water's processes for developing its forecast drought-related costs reflect the limited time between the consideration of the dynamic pricing concept and the response to IPART's Draft Report. Aither acknowledges this, however this abbreviated process means that it is difficult to robustly assess the proposals put forward by Hunter Water.

2.4.1. Current drought activities reflective of future drought activities

Hunter Water has assumed that the costs associated with responding to the current drought will reflect the activities and costs associated with responding to a future drought and subsequent period of water restrictions. Based on our assessment of the activities undertaken by Hunter Water, we would expect that the types of activities undertaken by Hunter Water would likely need to be undertaken again by Hunter Water in future periods of water restrictions.

However, it is very difficult to determine whether the level of those current costs is appropriate for future periods of drought. This will be dependent on several factors, such as the comparative severity of the future drought, economic conditions at the time, government policy and customer behaviour and sentiment.

Given the significant uncertainty in attempting to predict the nature of a future drought event, we have worked from the assumption that the actual level of costs incurred by Hunter Water in responding to the current drought represent a reasonable starting point for determining costs for future drought responses.

2.4.2. Belmont desalination plant

One of the most significant cost items forecast by Hunter Water is the expected detailed design costs for the Belmont desalination plant. This follows the preliminary planning and development for the project whereby Hunter Water has already incurred approximately $5.1m.

Hunter Water has identified potential costs of $14.5m associated with the detailed design of the Belmont desalination plant. These costs are based on a combination of contractors, external engagements, direct costs and contingencies.

The key issue for a desalination plant such as this, is the risk associated with the ongoing need for its construction. Based on Hunter Water's hydrological modelling, it has estimated the following probabilities in relation to whether it is likely to be required to undertake specific drought-related activities:

- Probability of triggering the detailed design (1 in 2)
- Probability of triggering long lead-time construction items (1 in 4)
- Probability of starting construction (1 in 15)
- Probability of operation (1 in 700)

While we have not tested these probabilities, it indicates that there is a reasonable likelihood that Hunter Water would be required to undertake the detailed design however the construction of the desalination plant would not be triggered (due to likely rainfall and increased storage levels that avoid the trigger for starting construction).

For most capital projects, the detailed design costs would be capitalised as part of the construction costs. Hunter Water has advised that its finance team considers that any expenditure on conceptual and/or detailed design for the Belmont desalination plant would be treated as operating expenditure under the accounting standards. This is due to the low probability of the plant continuing to the construction phase. The detailed design costs would be capitalised only if there was a binding commitment to commence construction activities shortly after the completion of the detailed design.

While Hunter Water has estimated that the detailed design of the plant would cost approximately $14.5m, it has only proposed to include an annual allocation of $2.5m in the dynamic pricing arrangements. This is driven by the notion that the detailed design costs are one-off in nature and unlikely to be required in an ongoing basis if restrictions remain in place. The process for determining the appropriateness of the $2.5m allowance was rather arbitrary and based on the notion that it would be inappropriate to incorporate the full estimate of the costs when there is a chance (albeit small) that drought restrictions could last beyond one year.

Hunter Water proposed that any amounts related to the detailed design costs that were recovered through the dynamic price (i.e. the $2.5m annual allowance) would not be added to the regulatory asset base (RAB) if the plant was indeed commissioned.

Aither's findings for Belmont desalination plant

In relation to Hunter Water's proposed costs for the detailed design of the Belmont desalination plant, we note that:

- The detailed design costs for a project such as this are likely to be significant
- The likelihood of the project being commissioned following the detailed design is uncertain

- Hunter Water is not seeking to recover the full estimate of the detailed design costs.

Aither agrees with Hunter Water's position that it would be inappropriate to include the full costs of the detailed design ($14.5m) within the calculation of an annualised dynamic price as there is a risk that restrictions (and therefore the dynamic price) could be applied over multiple years. This would result in an over-recovery of these costs from customers. Given this risk, if the costs associated with the detailed design are to be incorporated within the annualised dynamic price, then ideally a decision is required on the likelihood that restrictions will last beyond one year and how the risk of these costs should be shared between Hunter Water and its customers. In the absence of any further information on the risks associated with such a decision, Hunter Water's proposal to include a $2.5m annualised allowance for detailed design expenditure appears reasonable.[2]

As outlined above, there is considerable uncertainty as to whether the detailed design would need to be undertaken and whether the plant would need to be subsequently commissioned. Given this, Aither recommends that IPART consider excluding the detailed design costs and treating them as capital expenditure for regulatory purposes if they are incurred. While Hunter Water has advised that its accounting advice is to treat the expenditure as operating expenditure for its statutory requirements, we consider that there is scope to have an alternative treatment for the purposes of economic regulation.

If this approach were to be adopted:

- Hunter Water would still incur the costs for the detailed design of the Belmont desalination plant, with these costs to be captured as part of the pricing review for the subsequent regulatory period. The costs would then be assessed against IPART's efficiency principles by its appointed expenditure review consultants before being added to the RAB as capital expenditure
- To balance the risk between Hunter Water and its customers, IPART could adopt a shorter asset life for this detailed design expenditure in the RAB. To determine the shorter asset life, IPART could consider the likely 'shelf-life' of such detailed designs[3].
- If the desalination plant is subsequently constructed and commissioned, the detailed design costs that had not already been recovered would be incorporated with the cost of the plant and treated as normal (i.e. as standard detailed design costs are treated).

The consideration of whether the detailed design costs should be treated as capital expenditure or operating expenditure (as an annualised allowance through the dynamic price) will be a decision for IPART based on its assessment of the likely alignment between the costs and benefits, how risk should be allocated between Hunter Water and its customers and the broader regulatory framework for Hunter Water.

If IPART considers that the best approach to managing risks between Hunter Water and its customers is to incorporate an annualised allowance for the detailed design costs within the dynamic pricing arrangements, we consider that Hunter Water's proposed $2.5m is reasonable.

[2] We note that this amount is less than an annual allocation of $3.6m per year which is equal to $14.5 spread evenly over the four years of the regulatory period.

[3] Hunter Water has indicated that final detailed designs would generally have a 'shelf life' of more than 5 years.

2.4.3. Other expenditure categories

Based on the information provided by Hunter Water and the time available for the review, Aither accepts the nature and processes for the costs associated with each of the other expenditure categories as being reasonable.

2.4.4. Operating expenditure savings from reduced demand

As part of our assessment of Hunter Water's proposed drought-related operating expenditure, we requested information from Hunter Water on the potential operating expenditure savings from reduced demand during restrictions. Hunter Water submitted that it has a short-run marginal cost (SRMC) estimate of $0.113 per kL for chemical and pumping costs. We note that this estimate was previously considered and adopted as part of IPART's Draft Report and therefore consider it to be a reasonable estimate.

Based on our recommendations on drought-restricted demand forecasts, Aither estimates that the average annual reduction in demand as a result of restrictions is 3,588ML across the regulatory period. Using Hunter Water's SRMC estimate, this results in a reduction in operating expenditure of $0.4m per annum.

Based on our assessment of the information provided by Hunter Water, we do not consider there are any other clear operating expenditure savings for Hunter Water due to reduced demand through periods of restriction.

2.4.5. Efficiency adjustment

As outlined above, most of the costs put forward by Hunter Water are based on actual costs incurred due to the current restrictions. Our assessment considered that the actual costs put forward by Hunter Water were a reasonable starting point for considering the drought-related expenditure to include for the upcoming regulatory period.

Aither notes that this is the first time that Hunter Water has entered restrictions since the early 1990s. Given this we would expect that the business would be learning how it responds to these situations and what is required from a customer perspective. We expect that these lessons learnt will result in a more efficient approach if Hunter Water were to enter water restrictions in the upcoming regulatory period. We therefore recommend an efficiency adjustment of 15 per cent given the recent expenditure on restrictions is likely to result in significant learnings and systems, processes and materials that can be drawn upon in the future.

We note that if IPART chooses to incorporate the $2.5m annualised allowance for detailed design expenditure within the dynamic price we do not consider it appropriate to apply the efficiency adjustment to this amount. This is because this is an allowance in nature (rather than based on previous actual expenditure) and is also likely to under-recover the costs to be incurred.

2.5. Summary of findings

Aither's assessment of drought-related expenditure is based on Hunter Water's proposed costs and whether these reflect the likely costs that would be incurred by Hunter Water in future periods of water restrictions. We have not considered whether it is appropriate for Hunter Water to recover these costs within its regulatory framework. This will be a decision for IPART based on its assessment of the proposed dynamic pricing approach and how it aligns within the broader regulatory framework for Hunter Water.

Aither's key recommendations in relation to Hunter Water's proposed drought-related expenditure are:

- That the actual expenditure provided by Hunter Water is a reasonable basis for determining costs for future drought responses by Hunter Water
- Hunter Water's removal of cost items that are unlikely to be incurred again in future drought conditions is accepted
- The costs associated with the detailed design of the Belmont desalination plant, if incurred, should be treated as capital expenditure and incorporated into the RAB
    - If IPART considers it appropriate to capture an annualised allowance for the detailed design expenditure in the dynamic pricing arrangements, the $2.5m allowance proposed by Hunter Water is reasonable
- A reduction in operating expenditure of $0.4m based on Hunter Water's estimate of the short run marginal cost of supply and the estimated change in demand under water restrictions
- An efficiency adjustment of 15 per cent given the recent expenditure on restrictions is likely to result in significant learnings and systems, processes and materials that can be drawn upon in the future[4]

Table 4 outlines our recommended drought-related costs for the upcoming regulatory period to be considered as part of the dynamic pricing arrangements.

Table 4: Aither recommended drought-related annualised costs for the dynamic price

Program elements	Expenditure ('000s)
Water conservation measures	1,144
Restrictions implementation	466
Community engagement	1,329
Operational impacts	1,979
Belmont desalination operating expenses	-
Belmont desalination plant	-
Belmont desalination pipelines	-
Drought response option development	942

[4] This efficiency adjustment is not applied to the annualised allowance for the detailed design costs for the Belmont desalination plant if this is included in the dynamic pricing arrangements.

Program elements	Expenditure ('000s)
Program support	377
Expansion of WEMPs	425
Short-run operating expenditure reductions	(405)
Total drought-related expenditure (exc. Detailed design)	**6,257**
Belmont desalination plant – Detailed design	2,500
Total drought-related expenditure (inc. Detailed design)	**8,757**

Source Aither analysis.

3. Assessment of demand responses

3.1. Demand adjustments (behaviour change)

3.1.1. Hunter Water's proposed adjustments

Hunter Water's response to IPART's Draft Report proposed a reduction to its IPART-approved demand forecasts to reflect more recent demand information. The proposed adjustments are to reduce:

- water demand by approximately 4.4 per cent on average (varies from 4.1 to 4.7 per cent over the regulatory period)
- non-residential wastewater discharge by about 3.3 per cent (varies from 2.2 to 4.5 per cent over the regulatory period).

Hunter Water estimated the recent savings from water restrictions, and the savings by non-residential customers implementing water efficiency management plans (WEMPs) and/or leak rectification on their properties that have occurred following the previously approved demand forecasts. In relation to residential water demand forecasts, Hunter Water has assumed that a proportion of the achieved water savings will continue once water restrictions are lifted, and it will maintain the behavioural change across the customer base.

The reduction in non-residential wastewater volumes were calculated consistent with the assumed non-residential water demand reduction. The reduction decays over time as some of the non-residential water savings are short-term and new leaks develop.

3.1.2. Aither's assessment of behaviour change impacts on demand forecasts

Overview of approach

Our assessment was informed by Hunter Water's submission to IPART, responses to queries sent to Hunter Water and interviews with selected staff to clarify concepts and intentions. Timeframes for the assessment did not allow an examination of internal reporting and approval processes or detailed quantitative analysis of the proposed adjustments.

Demand prediction model

There is a regression component of Hunter Water's demand forecasting model that relates the majority of customer consumption to climate variables. The regression component and the other components, like all modelling, is an inexact science based on underlying assumptions. Aither observes from Figure 6.2 in Hunter Water's response to IPART's Draft Report, that approximately +/-3 percentage point accuracy has been achieved in the calibration period for the model.

Hunter Water used the same model in its original submission to IPART to correct for climate. Aither is satisfied this methodology used by Hunter Water remains appropriate.

Residential behaviour change

In the year following the model calibration and prior to the introduction of restrictions, the observed per capita residential demand was 3 per cent lower than the model prediction. Hunter Water has

assumed it will be able to maintain this level of reduction into the future. This assumption is based on a short time period - so its persistence and consistency with other weather conditions and seasons into the future is uncertain.

Visually, without any statistical analysis, it appears that the confidence band of observed savings might not be far above zero. That is, the saving from behavioural change proposed by Hunter Water is within the approximately +/-3 per cent accuracy range for the model.

Hunter Water presented post-restriction water consumption graphs for four other water utilities[5], to indicate that a reduction in demand persists beyond restrictions. It is Aither's view that this comparison is weakened by the fact that these other utilities experienced multi-year water restrictions, and their customers' behaviour change would be greater/more persistent because of the repetitive messaging and restrictions over multiple years. In contrast, Hunter Water's customers have been under water restrictions for approximately 8-9 months and therefore the change in behaviour may not be as embedded as those other utilities.

To be clear, Aither would expect some lag in returning to pre-restriction consumption behaviours, however Hunter Water has not presented an option or evidence for a gradual return to pre-restriction demand. Given the timeframes and information available, Aither is not able to estimate what the gradual return period might be.

These observations lead Aither to conclude that Hunter Water's proposed behavioural change assumption for residential demand is ambitious and is not sufficiently justified at this time to be reflected in prices for the upcoming regulatory period.

Table 5 outlines our recommendation in relation to residential water demand.

Table 5: Aither recommended changes to forecast residential water sales volumes (ML)

Property Type	2020-21	2021-22	2022-23	2023-24
IPART Draft Report	38,439	38,579	38,705	38,859
Hunter Water revised proposal	36,700	36,833	36,952	37,097
Aither's recommended forecasts	**38,439**	**38,579**	**38,705**	**38,859**
Recommended variations to Hunter Water revised proposal	1,739	1,746	1,753	1,762
Recommended variations to IPART Draft Report	0	0	0	0

Source Aither analysis.

Non-residential behaviour change

Hunter Water has a program of working with and funding non-residential customers to develop WEMPs. Approximately 160 WEMPs have been developed to-date, and over 30 leaks on customer properties have been repaired. Billing information, data loggers and audits were used by Hunter Water to identify the current savings from the WEMPs. Scheduled actions in the WEMPs not yet implemented were based on the savings predicted in the plans, discounted by Hunter Water by

[5] Barwon Water, Sydney Water, City West Water and Central Coast Water

50 per cent because of their unverified status and the uncertainty created by the recent COVID-19 shut-downs.

More than 100 WEMPs are currently in development and planned for the remainder of the financial year, but no water savings have been forecast by Hunter Water because the magnitude of savings is uncertain. In addition to this, Hunter Water has assumed the water savings will be transient and has classified them as short, medium and long-term. The savings are assumed to decay from 1,079ML in 2021 to 742ML in 2024.

Aither considers that the description of the methodology implemented by Hunter Water to be appropriate, however we have not sighted any report or data to form an opinion about the savings achieved or the decay rate. It would be difficult, given the specificity of each non-residential customer and the timeframes for the review, to develop any contrary view to that proposed by Hunter Water. Aither notes however, the relatively arbitrary nature of the 50 per cent discount on actions yet to be implemented in the completed WEMPs. The significant uncertainty in relation to the economic response to COVID-19 suggests a more prudent approach would be to assume no further savings than those that have already been verified by Hunter Water.

Given this, Aither considers the proposed adjustments based on the implemented WEMP activities to be appropriate, however the adjustments for the actions yet to be implemented have not been justified.

Table 6 outlines our recommendation in relation to non-residential water demand.

Table 6: Aither recommended changes to forecast non-residential water sales volumes (ML)

Property Type	2020-21	2021-22	2022-23	2023-24
IPART Draft Report	20,594	20,879	20,887	20,949
Hunter Water revised proposal	19,515	19,912	20,032	20,207
Aither's recommended forecasts	**19,937**	**20,193**	**20,173**	**20,207**
Recommended variations to Hunter Water revised proposal	422	281	141	0
Recommended variations to IPART Draft Report	(658)	(686)	(715)	(742)

Source Aither analysis.

Non-residential wastewater demand

Hunter Water took the non-residential water forecast and translated the impact to wastewater discharge volumes. It appears, in aggregate, Hunter Water used a sewage discharge factor of approximately 34 per cent. Aither has adopted the same approach except to apply it to the amended water sales forecasts in Table 6. The resultant non-residential wastewater forecast shown in the table below:

Table 7: Aither recommended changes to forecast non-residential wastewater volumes (ML)

Property Type	2020-21	2021-22	2022-23	2023-24
IPART Draft Report	7,029	7,111	7,191	7,277
Hunter Water revised proposal	6,710	6,848	6,980	7,120
Aither's recommended forecasts	6,855	6,945	7,029	7,120
Recommended variations to Hunter Water revised proposal	145	97	49	0
Recommended variations to IPART Draft Report	(174)	(166)	(162)	(157)

Source Aither analysis.

Findings

Based on our assessment of Hunter Water's proposed adjustments to its demand forecasts from behaviour changes, Aither's findings are as follows:

- The residential demand adjustments based on recent variations in usage are not justified
- The non-residential demand adjustments based on the implemented WEMP activities to be appropriate and justified
- The non-residential demand adjustments based on the WEMP activities that have not yet been implemented are not justified
- The derivation of the non-residential wastewater volumes is appropriate and are modified based on changes to the non-residential water demand.

Table 8 provides a summary of the recommended demand forecasts and how these vary from Hunter Water's proposal and IPART's Draft Report.

Table 8: Aither recommended changes to forecast water sales volumes (ML)

Property Type	2020-21	2021-22	2022-23	2023-24
IPART Draft Report based on November 2019 forecast				
Residential	38,439	38,579	38,705	38,859
Non-Residential	20,594	20,879	20,887	20,949
Bulk sales	1,385	1,426	1,518	1,611
Total	60,418	60,884	61,110	61,419
Hunter Water proposals based on April 2020 forecast				
Residential	36,700	36,833	36,952	37,097
Non-Residential	19,515	19,912	20,032	20,207
Bulk sales	1,385	1,426	1,518	1,611
Total	57,600	58,171	58,502	58,915

Property Type	2020-21	2021-22	2022-23	2023-24
Aither's recommended forecasts				
Residential	**38,439**	**38,579**	**38,705**	**38,859**
Non-Residential	**19,937**	**20,193**	**20,173**	**20,207**
Bulk sales	**1,385**	**1,426**	**1,518**	**1,611**
Total	**59,761**	**60,198**	**60,396**	**60,677**
Recommended variations to Hunter Water's April 2020 proposal				
Residential	1,739	1,746	1,753	1,762
Non-Residential	422	281	141	0
Bulk sales	0	0	0	0
Total	2,161	2,027	1,894	1,762
Recommended variations to IPART Draft Report				
Residential	0	0	0	0
Non-Residential	(658)	(686)	(715)	(742)
Bulk sales	0	0	0	0
Total	(658)	(686)	(715)	(742)

Source Aither analysis.

3.2. Demand forecasts during water restrictions

3.2.1. Hunter Water's proposed adjustments

As part of Hunter Water's proposed dynamic price, it has sought to forecast water demand during times of water restrictions for the upcoming regulatory period. These forecasts are based on customer demand responses to:

- The imposition of water restrictions, and
- Increases in the usage price through the application of the dynamic price (through estimates of customers' price elasticity of demand).

3.2.2. Aither's assessment of demand forecasts during water restrictions

Overview of approach

Our assessment was informed by Hunter Water's submission to IPART, responses to queries sent to Hunter Water by Aither and interviews with selected staff to clarify concepts and intentions. Timeframes for the assessment did not allow an examination of internal reporting and approval processes or detailed quantitative analysis of the proposed adjustments.

Severity of the scenario used to derive the demand during water restrictions

Hunter Water has a streamflow-storage-demand model that simulates the operation of the water supply system. It uses scenarios of generated streamflows from climate data and a demand model to adjust monthly demands for climate. Based on its high-level description and the information provided, Aither considers this approach is reasonable.

Hunter Water used outputs of monthly storage from this model, with all scenarios starting at the then current storage. The model gives a storage level at each month for each scenario, and there are hundreds of scenarios. The scenario of monthly storage levels selected by Hunter Water was the scenario that had 99 per cent of scenarios ranked above it.

The monthly storage levels are used to determine the level of restrictions to be applied. The adopted scenario delivers Level 1 restrictions from the first month of the scenario.[6] The scenario then has restrictions in every month of the 48-month sequence – 6 months at Level 1 and 42 months at Level 2.

In Aither's view, this is a severe scenario that materially exceeds Hunter Water's service standard intent to impose restrictions:

- Less than once per 10 years, on average
- Less than 5% of the time, on average, and
- Aim to allow storage to fall to 10% less than once per 10,000 years, on average.

Hunter Water is of the view that the dynamic price applies during restrictions which reflect these unusual conditions. However, Hunter Water states that when a dynamic price is triggered, there is a high chance that customers would face a short period of Level 1 restrictions followed by a rain event and the lifting of restrictions (and a return to the normal usage price).

Based on the analysis, Aither is of the view that Hunter Water is calculating the dynamic price based on a severe event that is most likely to be applied to a less severe drought event.

Mismatch in demands being used

The demand model within the streamflow-storage model is a simplified version of the relationship between climatic variables and demand. Given Hunter Water's recent changes to its main climate model of demand, it is possible there is a mismatch. Hunter Water stated that the simplified demand model is only used to add seasonality to the annual demand forecasts that are input into the model and that the demand impact is less significant than the streamflow scenarios.

Hunter Water used its primary demand model to calculate the monthly restricted demand corresponding to the storage level at each month in the 48-month sequence. A mismatch occurs since while the demand is adjusted for the expected impact of restrictions (based on the outputs of the streamflow-storage model), the underlying demand is based on average climatic conditions. Apart from an occasional wet month or two, it is reasonable to expect a severe event (especially the scenario put forward by Hunter Water that results in 48 months of restrictions) to have above average demand.

Another mismatch occurs due to Aither's earlier recommendation to not accept Hunter Water's proposal to reduce residential demand by approximately 3 per cent for behavioural changes (section 3.1). Aither understands that these behavioural changes are already captured within the demand forecasts used by Hunter Water.

[6] This may change if Hunter Water updates the starting storage to current levels.

Applying restrictions to demand forecasts

The key link between the streamflow-storage model and its primary demand forecasting model is the application of restriction levels that are derived from the streamflow-storage model. The primary demand model uses this scenario of Level 1 and Level 2 restrictions to apply reductions to its baseline level of demand forecasts (which, as noted above are based on different climatic conditions).

The application of the demand restrictions occurs at a granular level within Hunter Water's detailed model and varies depending on the level of restrictions applied. For example, it assumes a 10 per cent reduction in residential use under Level 1 restrictions and 50 per cent reduction in residential use under Level 2 restrictions.

Without undertaking a detailed assessment of the level of these reductions, the concept and how it has been applied by Hunter Water appear reasonable.

Materiality of using average demands with behavioural change

In considering this mismatch in climatic scenarios, Aither has sought to understand the potential materiality of the mismatch. Hunter Water stated that it considered that using average climatic conditions was a reasonable assumption and not as materially important as Aither suggests. Given the timing available for the assessment we have only been able to undertake a very high-level assessment of the materiality. Table 8 outlines the variation in total water usage across Hunter Water over the previous five years. This shows a reasonable degree of volatility from year to year.

Table 9: Hunter Water actual water sales (ML)

Water usage	2015-16	2016-17	2017-18	2018-19	2019-20
Total water usage	53,968	54,412	56,190	53,643	56,790

Source Information provided by Hunter Water.

From this high-level analysis, Aither concludes that the difference arising from the mismatch of climatic scenarios is likely to be material.

Adjustments to baseline demand forecasts for dynamic price

While Aither has concerns about the severity of the scenario adopted for the forecasting of storage levels and the application of restrictions, the key issue for Aither is the mismatch of demands between the two models. Based on the information provided, Aither is of the view that this mismatch in demands across the models is likely to have a material impact on the calculation of the dynamic price. Given this, Aither is unable to support the demand forecasts proposed by Hunter Water.

Ideally, Hunter Water would re-run the demand model based on consistent climate scenarios. However, this assessment has been undertaken in a restricted time period and the re-run of the model to create this consistency is unable to be undertaken. Given this, Aither is recommending some overarching adjustments to Hunter Water's proposed restriction demand forecasts to reflect its findings. Aither notes that these findings are based on a high-level assessment with limited information, a more appropriate adjustment would require more detailed assessment.

Aither's recommended adjustments to Hunter Water's proposed demand forecasts under restrictions are:

- Adjusting the demand forecasts to account for Aither's earlier recommendation to remove the behavioural change impact (see section 3.1)
- Applying an uplift in forecast usage as a result of expected dryer weather conditions (to better align with the streamflow-storage model scenario)[7]

These recommended adjustments only apply to the calculation of the dynamic price and should not be adopted in any other aspects of IPART's consideration of Hunter Water's demand forecasts. These adjustments also do not impact on the changes to demand as a result of price elasticity.

Table 10 below provides Aither's recommended adjustments to Hunter Water's proposed demand forecasts under restrictions for the purposes of calculating the dynamic price.

Table 10: Recommended adjustments to forecast demand under restriction scenario (ML)

Water usage	2020-21	2021-22	2022-23	2023-24
Hunter Water's proposed unrestricted demand forecast (for comparison)	57,600	58,171	58,502	58,915
Hunter Water's proposed restricted demand forecast	52,771	50,028	50,460	51,472
Aither adjustments				
Accounting for behavioural changes	2,005	1,901	1,917	1,956
Accounting for climatic scenario	2,310	1,870	2,310	2,530
Recommended restricted demand forecast for dynamic price	**57,086**	**53,800**	**54,687**	**55,958**
Adjusted demand if Hunter Water's behaviour change is accepted	55,081	51,898	52,770	54,002

Source Aither analysis.

Price elasticity of demand

Hunter Water has applied a price elasticity factor to reflect the potential impact from a higher price being implemented (the dynamic price) through periods of water restrictions. Hunter Water has adopted the price elasticity estimates applied by IPART to determine the dynamic price for Sydney Water. This also includes the 50 per cent reduction to the elasticity factor that IPART applied.

Table 11: Price elasticity factors used by Hunter Water

Customer group	Price elasticity of demand
Houses	(0.109)
Apartments	(0.0315)

[7] This uplift was based on a high-level consideration of previous variations in annual water usage for Hunter Water and taking into account the different proportions of the summer period that were under Level 1 and Level 2 restrictions (i.e. those years that were forecast to have longer periods in Level 2 had a greater restriction applied to the demand forecast).

Customer group	Price elasticity of demand
Non-residential (Tier 1)	(0.132)

Source Aither analysis.

In the absence of any further information regarding price elasticity studies that have been undertaken on Hunter Water's customer base, Aither considers the approach undertaken by Hunter Water to be reasonable.

Findings

Based on our assessment of Hunter Water's proposed adjustments to its demand forecasts from applying water restrictions, Aither's findings are as follows:

- That the drought scenario adopted by Hunter Water to estimate the dynamic price is an extreme scenario
- There are disconnects in the estimation of demands, such as:
  - The streamflow-storage model uses a simplified version of the climate model used elsewhere
  - The dynamic pricing model uses restricted demands that apply to average climate events and so under-estimates the restricted demand for the extreme storage scenario
  - Based on a high-level assessment, Aither considers that this difference is likely to have a material impact on the demand forecast.
- Ideally, Aither would recommend that Hunter Water re-run its demand modelling to ensure consistent climate scenarios are adopted, however this is not possible given the timeframes available for this review. In light of this, Aither has made two high-level adjustments to Hunter Water's forecasts:
  - Adjusting to account for Aither's findings on behavioural changes (see section 3.1)
  - Applying an uplift in forecast usage as a result of expected dryer weather conditions (to better align with the streamflow-storage model scenario)
- Hunter Water's use of the price elasticity factors as appropriate.

3.3. Impact of changed demand forecasts on capital expenditure

Based on our assessment of Hunter Water's proposed adjustments to its demand forecasts (see section 3.1), Aither did not make a material change to IPART's draft determination for the baseline demand. Given this, we have not proposed any changes to the capital program for the upcoming regulatory period

The changes to the demand due to the restrictions are expected to be temporary and uncertain. Given the temporary nature of the changes and the uncertainty as to whether Hunter Water will enter restrictions for the upcoming regulatory period, we have not proposed any changes to the capital program for the upcoming regulatory period. If demand is materially impacted by restrictions through the upcoming regulatory period, the impact on Hunter Water's capital program will be assessed by IPART as part of its subsequent expenditure review.

3.4. COVID-19 recovery scenarios

3.4.1. Hunter Water's proposed adjustments

Hunter Water has considered 4 possible scenarios arising from the COVID-19 outbreak and the consequent government directives to maintain social distancing. Hunter Water has used information from metered consumption changes so far, broader economic sources and developed spreadsheets in which they can test their own assumptions.

Hunter Water describes possible effects of the COVID-19 pandemic on forecast connections and demand over the upcoming determination period. They qualify the information and analysis as both indicative and speculative. Given this, Hunter Water's response has not proposed any explicit adjustments to IPART's draft decisions based on the impact of COVID-19.

3.4.2. Aither's assessment

Given that Hunter Water has proposed no adjustments, Aither's assessment is confined to strategic observations.

Aither was informed by Hunter Water's submission to IPART and we received copies of Hunter Water's spreadsheets. Aither has not formed an opinion about the COVID-19 outcomes, considering it would be highly speculative. That said, Aither is supportive of Hunter Water's attempts to scenario plan as part of risk management for their business.

Hunter Water has not, nor could it be expected to, assign probabilities of occurrence to the scenarios.

Aither has sighted Hunter Water spreadsheets and found them to be quite well structured and detailed. That however does not overcome the inherent uncertainty and lack of precedents for what is being experienced.

Aither found that Hunter Water assumes no make-up in connection numbers once social distancing restrictions are lifted. From a housing demand perspective, Hunter Water scenarios assume a reduction in connections in the short-term, but they do not consider any make-up of that unsatisfied demand for housing in later years. It returns to normal trends, which seems to imply there is net migration out of the region. Hunter Water should consider any assumptions about migration out of the region, any make-up of supplies of housing stock in the medium term and any change in household occupancy levels.

Findings

Aither is unable to comment on the accuracy of the assumptions made by Hunter Water. Aither notes that the future impacts are highly uncertain and without modern precedent, and impacts will depend strongly on decisions and actions taken by the NSW and Federal governments actions in response to the spread of the disease and transmission hot spots. It will also depend on future economic activity and the influence of any government stimuli.

Aither supports Hunter Water's efforts to understand the risks and impacts on their business, and recommends they consider assumptions about migration out of the region, household occupancy levels and unmet demand for housing stock.

Hunter Water did not propose alternative expenditure profiles based on the different scenarios. Given the high degree of uncertainty regarding the potential impact of COVID-19, Aither considers this to be a reasonable position and did not seek further information.

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