Technical Advice - Likely market impact of Tekapo temporary tailrace and weir failure by David Weaver

Date	31 March 2026
To	Trinity White, Environmental Manager – South Island Renewables, Genesis Energy
From	David Weaver – Concept Consulting
Project advice provided for	Fast-track Application for Lake Pūkaki Hydro Storage and Dam Resilience Works
Documents referred to	The note I have prepared in relation to this fast-track application is "*Likely market impact of Tekapo temporary tailrace and weir failure*", dated 26 March 2026. Filename "*Tekapo tailrace failure risk v4.0.docx*". During the compilation of this note I have been advised by Genesis on some specific detail of the operation of the Tekapo hydro scheme.
Qualifications and experience	I have a Bachelor of Science, majoring in Physics and minoring in Statistics and Mathematics, from the University of Auckland (2006). I have worked at Concept Consulting since 2008. My current position is Associate Director, and I have held this position since 2024. I lead Concept's electricity market modelling team. As part of this role, I utilize and help develop Concept's proprietary modelling tools. I have advised on numerous market studies, including: • BCG's 2025 "Energy to grow" report on New Zealand's energy system • Transpower's "2025 Generation Stack Report", which is a key input to their Te Kanapu work programme. • Worked with KPMG in 2025 to help Genesis Energy understand the how New Zealand's energy storage needs will change as we transition to a renewable future.
Code of Conduct	As an expert witness I have read, and I am familiar with, the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. This memorandum has been prepared in compliance with that Code. In particular, unless I state otherwise, this response is within my area of expertise and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.
Signature	**David Weaver**, Associate Director

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26 March 2026

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Dear Trinity,

Likely market impact of Tekapo temporary tailrace and weir failure

You have asked for our assessment of the potential impact on New Zealand electricity prices if lowering Lake Pūkaki below its normal operating range (i.e., below 518 metres above sea level, 'masl') were to cause the Tekapo temporary tailrace and weir to fail.

It is not clear to what extent the probability of failure increases with the depth of the lake level falling or the duration at such low levels. However, returning the structure to operational service to control tailwater levels at the Tekapo B power station poses inherent risk associated with the temporary nature of the original design and construction**.** This would require reliance on a temporary tailrace structure that was never designed for routine operation and which, if re-exposed and reactivated, carries a material risk of damage and/or failure based on available technical assessments.

If lowering Pūkaki below 518 masl were to result in the temporary tailrace and weir failing, this would significantly restrict generation from the Waitaki scheme until it was restored. This reduction in generation could lead to an increase in national electricity costs, potentially up to $2.5bn depending on how long it takes to repair the temporary tailrace and weir, storage levels when the temporary tailrace and weir failed and whether inflows in the period beyond such a failure were relatively 'wet' or 'dry'.

The attached note "*Assessment of failure of the Tekapo tailrace*" sets out the details of such analysis. Given time constraints in undertaking the analysis, the note hasn't described in detail the framework for accessing contingent storage in New Zealand's hydro lakes, and therefore assumes the reader has sufficient background knowledge of this framework to understand the context.

Regards,

Dave Weaver – Associate Director

ASSESSMENT OF FAILURE OF THE TEKAPO TEMPORARY TAILRACE AND WEIR

Executive Summary

If Lake Pūkaki is reduced below 518 metres above sea level (masl), the temporary tailrace and weir would be progressively exposed. It is not clear to what extent the probability of failure increases with the depth of the lake level falling or the duration at such low levels.

However, returning the structure to operational service to control tailwater levels at the Tekapo B power station poses inherent risk associated with the temporary nature of the original design and construction. This would require reliance on a temporary tailrace structure that was never designed for routine operation and which, if re-exposed and reactivated, carries a material risk of damage and/or failure based on available technical assessments.

If the temporary tailrace and weir were to fail all generation from the Tekapo Power Scheme (Tekapo A & Tekapo B) would cease until the tailrace was repaired.

In addition, water that would normally flow through the Tekapo canal system would not reach the downstream Ōhau stations, resulting in a significant loss of generation across the upper Waitaki scheme.

While some water that would ordinarily be used for electricity generation through the Tekapo scheme and Ōhau A, B and C stations could still reach Lake Benmore via the Takapō River, this would only commence after Lake Takapō reached its maximum control level, and would occur in a less controlled manner and with reduced operational flexibility across the scheme.

The resulting loss of generation during periods of system stress would likely increase wholesale electricity prices, increase reliance on thermal generation, raise emissions, and create additional risks to security of supply.

This would result in significantly less generation from the Waitaki scheme while it is repaired. Lost generation would be replaced primarily by additional thermal generation, and, in extreme situations, demand response.

Genesis has advised that Meridian’s current proposal does not contain any enforceable restrictions on the depth, duration of frequency on its ability to drawdown the lake below the current operating range. As such, approval of the proposal would materially change the operating context for Genesis-owned infrastructure by creating unplanned and discretionary reliance on the Tekapo B temporary tailrace and weir.

However, allowing easier access to contingent storage will also lead to different outcomes in the wholesale market, including (if the temporary tailrace and weir don’t fail) lower prices on average.

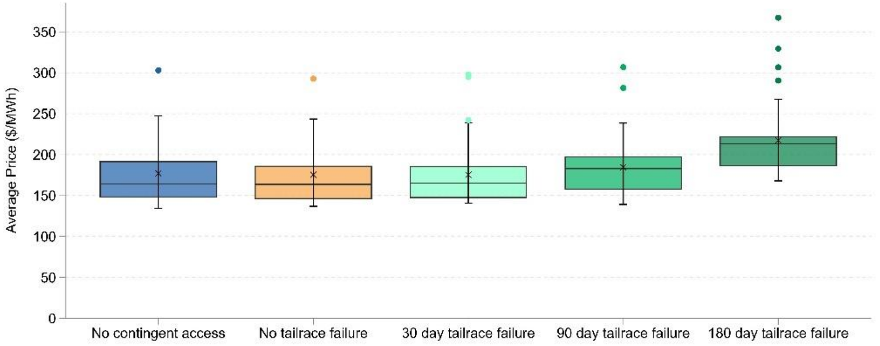
Accordingly, this report considers three types of scenario:

1. “No contingent access”, representing the current contingent storage access arrangements,
2. “No temporary tailrace and weir failure”, representing a system with easier access to contingent storage, but continued operation of Tekapo Power Scheme, and
3. “Temporary tailrace and weir Failure”, representing a system with easier access to contingent storage, but in which the temporary tailrace and weir fails. Three outage durations are considered: 30, 90, and 180 days’ duration.

Price outcomes with easier access to contingent storage

Figure 1 shows modelled 2027 prices for the scenarios during dry winter events. Prices are similar in the two scenarios without a failure of the temporary tailrace and weir.

Figure 1 - Modelled 2027 prices during low storage events[1]



Temporary tailrace and weir failure impact

Also shown in Figure 1 are prices if the temporary tailrace and weir were to fail. The impact of this is highly dependent on the duration of outage. A short outage (e.g. 30 days) has low impact, but an extended outage (e.g. 180 days) has much larger impacts. Expected prices with a long outage are ~43 $/MWh higher.

Asymmetric risk

A key take-away of this analysis is that the risk reward outcomes for allowing easier access to contingent storage are asymmetric. For example, prices will be slightly lower on average, but were the temporary tailrace and weir to fail, prices will be much higher.

Other metrics

In addition to price, we also considered the impact on demand response, thermal carbon emissions and consumer costs. The impacts for all were similar in shape:

1. There is minimal difference between the two scenarios without a temporary tailrace and weir failure.
2. A temporary tailrace and weir failure that is rectified quickly has minimal impact
3. An extended outage leads to significantly worse outcomes.

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[1] The graphs show the change in prices for the 260-day period after lake levels drop below the 518 masl threshold in the scenarios with unfettered contingent storage. There were 21 sequences where this occurred. The equivalent 260-day periods and sequences are used for all runs.

Background

Meridian's application to enable easier access to contingent storage at Lake Pūkaki would require operational reliance on the Tekapo B temporary tailrace and weir. This structure was originally constructed as a temporary facility during commissioning of the upper Waitaki scheme, prior to Lake Pūkaki being raised to its current operating range.

Figure 2 - Exposed Tekapo temporary tailrace and weir following construction

Figure 2 shows the exposed temporary tailrace and weir shortly following construction. The exposed temporary tailrace and weir is underwater at the current minimum non-contingent lake level and so is not currently relied on for operational security of the Tekapo Power Scheme.

If lake levels were to fall below 518 metres above sea level (masl), the tailrace weir and discharge chute become progressively exposed. This would return the structure to operational service to control tailwater levels at the Tekapo B power station. This poses inherent risk associated with the temporary nature of the original design.

This would require reliance on a temporary tailrace structure that was never designed for routine operation and which, if re-exposed and reactivated, carries a material of damage and/or failure based on available technical assessments. This is especially the case where there are no enforceable consent conditions on the duration, depth or frequency of Meridian's drawdown below the current minimum operational levels.

If the temporary tailrace and weir were to fail, not only would all generation from the Tekapo Power Scheme (Tekapo A & Tekapo B) cease until the tailrace was repaired, but water that would normally flow through the Tekapo canal system would not reach the downstream Ōhau stations, resulting in a significant loss of generation across the upper Waitaki scheme.

While some water could still reach Lake Benmore via the Takapō River, this would occur in a less controlled manner and with reduced operational flexibility across the scheme.

The resulting loss of generation during periods of system stress would likely increase wholesale electricity prices, increase reliance on thermal generation, raise emissions, and create additional risks to security of supply.

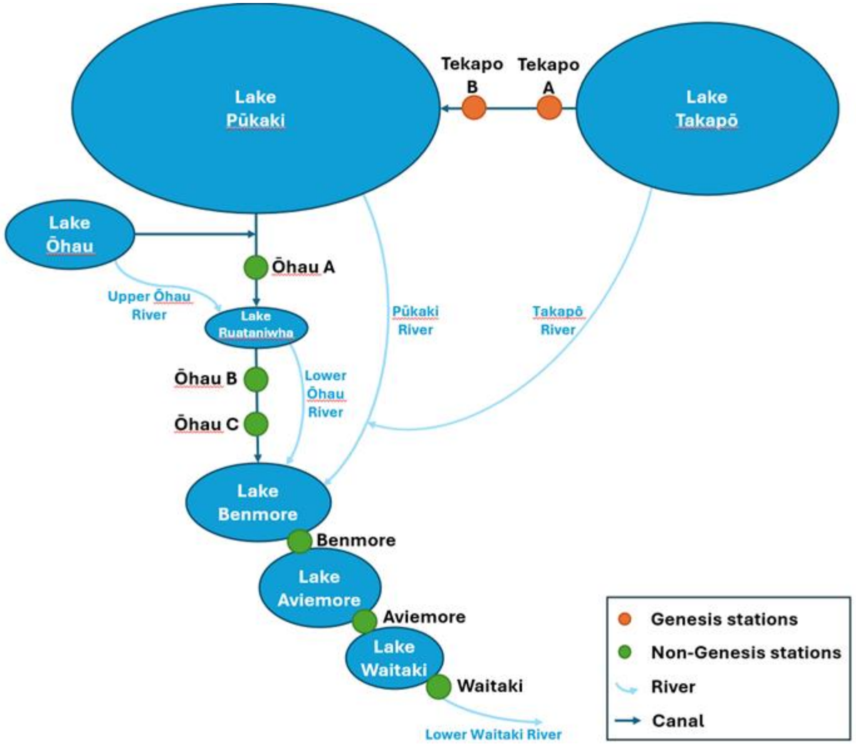
This would almost certainly result in higher wholesale electricity prices for New Zealand while the temporary tailrace and weir was not operational.

Offsetting this price impact, the water that would have flowed through the Tekapo scheme would be progressively stored in Lake Takapō until the scheme was repaired. Water can also be spilled down the Takapō river, but only if Lake Takapō reaches maximum consented lake level.. Once the scheme is operational again, this stored water will tend to result in lower prices than would otherwise have been the case in the post-repair period.

On balance, as the modelling set out below demonstrates, the higher prices during the period of outage will tend to outweigh the lower prices in the post-repair period.

As Figure 3 below shows, were the Tekapo canal non-operational, water could still be released down the Takapō river (bypassing the Tekapo Power Scheme) to be used down-scheme during the period of outage. However, current consenting arrangements prevent this from happening in most situations, so we have not considered this possibility and instead assumed water will be stored in Lake Takapō to be used post-repair.

Figure 3 - Waitaki scheme diagram



Approach

System modelling

To quantify the likely impact of the temporary tailrace and weir failing following a lowering of Lake Pūkaki we modelled the operation of the electricity system in 2027 using our ORC model. This is a system model that predicts how New Zealand's electricity system will operate over time and forecasts the prices that will eventuate in that market. At its core it is an

SRMC-based model that finds the least cost solution to providing enough generation and reserves to meet demand.

ORC is developed by Concept from the ground up for the New Zealand market. A key feature of ORC is that it operates fully chronologically using an hourly timestep, and evaluates any future year over 44 'weather years' using concurrent historical hydro inflow, wind, and solar data from 1980 through to 2024.

This allows it to include important dispatch and capacity considerations involved with running the electricity system over a wide range of potential market situations.

For this project we have used higher demand assumptions for 2027 than our central projection. While still within the range of forecasts from various parties (including ourselves), this approach results in more instances of low storage and therefore gives more insight into possible outcomes with a temporary tailrace and weir failure. Note that it will indicate more instances of low storage than we expect in our central demand growth case. However, given that we are not estimating the *chance* of a temporary tailrace and weir failure, this approach provides more insight.

Water value curves

Much of the following discussion references "water value curves". Water value curves are a way of representing the value of water in a storage reservoir depending on system conditions. They are used to determine whether it is worth releasing water to generate electricity 'now' or to store it for release at some later point.

Stored water can be converted into electricity at some point in the future, but the future value of electricity is uncertain. Water value curves are derived by predicting the cost of the avoided alternative source of energy.

For example, if water is later used to avoid running coal fired generation, then the value of water is roughly equal to the cost of running coal fired generation. And if it is used later to avoid demand curtailment, then the value of such water is equal to the economic value of meeting the electricity demand that would have been curtailed. On the other hand, stored water can be worth nothing if the water is eventually spilt due to excessive inflows.

Because of this, the value of water depends on time of year and energy storage levels. Water is more valuable in winter when electricity prices are higher. Water is less valuable when storage is high because it might end up being spilled.

Water value curves are probabilistic and vary depending on the derivation methodology used and appetite for risk. Two parties may calculate different water values for the same reservoir.

ORC endogenously develops water value curves that optimise the storage and release decisions of New Zealand's hydro schemes across the normal operating range of the various reservoirs. In addition, ORC also allows for access to contingent storage in some schemes, such as the Waitaki, if New Zealand's electricity prices rise above a threshold level.

With the current restrictions on Pūkaki contingent storage, our standard approach to valuing contingent storage is to price it above the first tranche of demand response (> 700 \$/MWh).[2] This reflects our observation of the current ease of access to contingent storage. During the extreme prices of winter 2024 (with prices reaching almost 800 \$/MWh for a week) access to contingent storage was made easier but was still not completely relaxed.

With our standard access restrictions on contingent storage, contingent storage is never used across our simulated weather years in 2027. That does not mean that it would never be used in practice, but rather that a significant "black swan event" beyond our standard modelled outcomes (such as the failure of a large thermal unit or multiple units for an extended period combined with low inflows) would be necessary for this water to be used. We believe this is consistent with the purpose of contingent storage: a form of emergency reserve to provide system resilience to high impact low probability events that are inherently hard to forecast but nonetheless genuine risks that may occur.

To test system outcomes with easier access to contingent storage, we modified ORC so that it could have unrestricted access to contingent storage in Lake Pūkaki. i.e., the lake levels currently classified as contingent storage are treated as being part of the normal operating range for the development of water value curves. This leads to a lower lake level on average because the water value curves change.

With unrestricted access, the water value at 518 masl varies across the year, but can be as low as 150 \$/MWh. With this mode of operation, what was previously "contingent storage" is used frequently, approximately once every two to three years – but bear in mind our modelling has a high demand forecast.

Selecting sequences for analysis

Out of the 44 weather years modelled, we have 21 instances of lake levels dropping below 518 masl if there is unrestricted access to contingent storage, and we use these as the basis for calculating outcomes in a temporary tailrace and weir failure.

For every instance where lake levels drop below 518 masl in the unrestricted contingent storage runs, we compare price outcomes with the equivalent sequences in the runs where standard access restrictions to contingent storage remain.

It is important to bear in mind that our analysis is *not* showing expected outcomes. Rather, it shows outcomes during low lake levels when there is the possibility of a temporary tailrace and weir failure.

Additional low lake storage situations

Note that all instances of low storage occur during the end of winter (potentially continuing until spring). While the consent application will allow Lake Pūkaki to be drawn down at any time of the year, our assessment is that the operator of the lake is very unlikely to do so, given their commercial incentives to supply energy over winter.

If the lake were lowered below 518 masl in late summer and/or autumn this would have significantly higher impacts on the market than we calculate below. Entering winter with low storage is much more likely to

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[2] This excludes response from the Tiwai aluminium smelter which is modelled separately. Some tranches of Tiwai demand response are called upon before wider market demand response.

lead to energy shortage than leaving winter with low storage. Given this, it may be prudent to limit access to contingent storage seasonally – although doing so must be implemented with care to avoid perverse outcomes.

It is plausible that the operator would choose to lower Lake Pūkaki at the end of winter with relatively high storage in other hydro reservoirs, potentially to perform required maintenance. We have not modelled outcomes in this scenario, but note that the impact of a temporary tailrace and weir failure in such a situation would be significantly lower because the market would be less stressed overall.

Scenarios

We consider three main scenarios when assessing outcomes. These are:

1. Current access arrangements, with the assumption that contingent storage is not used, and continues to be kept as an emergency backstop against major unexpected supply interruptions.
2. Unrestricted access arrangements, with no Tekapo temporary tailrace and weir failure.
3. Unrestricted access arrangements, with a Tekapo temporary tailrace and weir failure. The failure can be:
    - 30 days' duration
    - 90 days' duration
    - 180 days' duration

We need all scenarios to fully understand the impact of relaxing access to contingent storage. However, most results showed minimal difference between scenarios 1 and 2, when compared to the impact of scenario 3.

Tekapo temporary tailrace and weir failure scenarios

We model the impact of a temporary tailrace and weir failure[3] by removing the direct and indirect (i.e. water that would have flowed through the Ōhau stations) generation from water that can no longer flow down the Tekapo canal. ORC dispatches the system on an hourly basis, so for each hour, we replace the lost generation with increasingly expensive thermal generation (where available) in the first instance, and demand response if there is insufficient thermal generation.

While this is a relatively straightforward approach, there are some additional assumptions required.

Duration and timing of outage

It is unknown how long it would take to restore the temporary tailrace and weir to operation. We have addressed this by considering three scenarios for return to service:

- 30 days
- 90 days
- 180 days

We considered two points at which the temporary tailrace and weir could fail as these appear to be the most likely – when the lake first falls below 518 masl, and when the lake reaches its lowest level for that winter.

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[3] Different parts of the tailrace may fail. The extent of failure will determine the nature of repair and hence associated outage duration.

Applying this approach for each of the 21 low storage trajectories, we have modelled 42 situations with a possible temporary tailrace and weir failure.

Each price outcome sequence includes the period from which storage first dropped below the threshold and the following 260 days. This period is long enough to include the 180 day outage, as well as time for the extra stored water in Lake Takapō to be reintegrated to the system.

After return to operation

With the unavailability of the Tekapo canal, Lake Takapō would "fill up" while generation is constrained.[4] Our modelling tracks storage in Lake Takapō while the canal is unusable, meaning that prices are temporarily lower after the canal returns to operation.

However, the impact of this additional generation is less than the impact of the lost generation, because once the system returns to normal the market is normally significantly less stressed. In other words, losing the generation at a time of system stress will result in higher cost resources being called upon than will be displaced by the stored water in the post-repair situation when the market will tend to be less stressed.

Chance of failure

It is not clear to what extent the probability of failure increases with the depth of the lake level falling or the duration at such low levels. We have not estimated the chance of failure as this is outside our area of expertise.

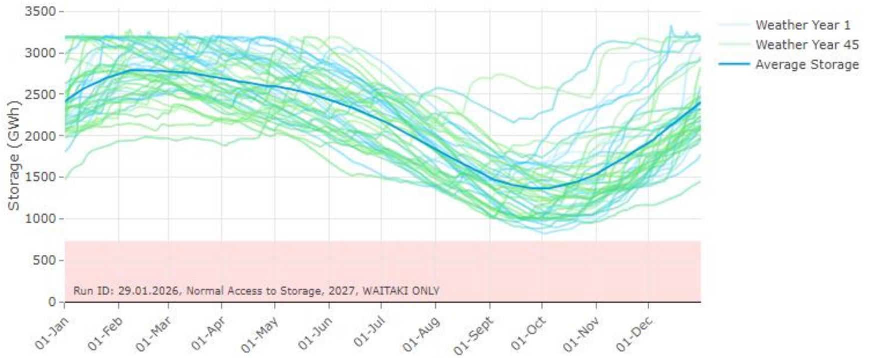
However, as set out above, Genesis has advised, as supported by its technical analysis, that returning the structure to operational service to control tailwater levels at the Tekapo B power station poses inherent risk associated with the temporary nature of the original design and construction**.** This would require reliance on a temporary tailrace structure that was never designed for routine operation and which, if re-exposed and reactivated, carries a material risk of damage and/or failure based on available technical assessments.

Results

Storage levels

Total Waitaki storage levels are shown below for both the current access arrangements (1) and the unrestricted access scenarios (2 and 3).

Figure 4 – Waitaki storage trajectories under current arrangements



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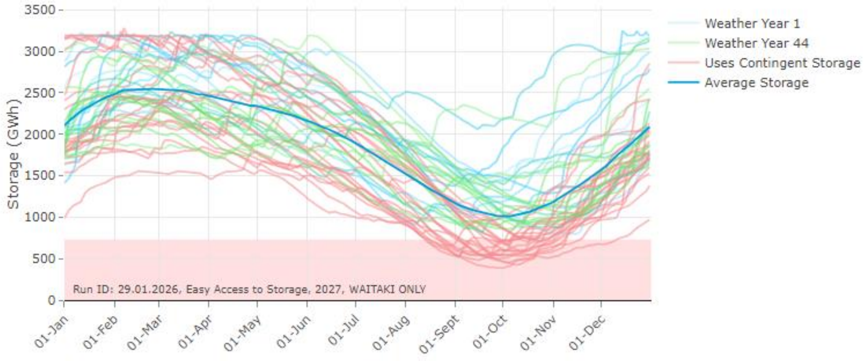
[4] While water can be released down the Takapō river to allow generation in the three lower Waitaki stations, we understand this is constrained by consents and we have assumed no Takapō river releases.

Contingent storage is never called upon in our standard modelling. It is very highly priced, so all thermal generation and some demand response is used preferentially. This reflects an implicit approach whereby contingent storage is only to be used during periods of extreme stress such as an extended unplanned thermal outage during a dry year.

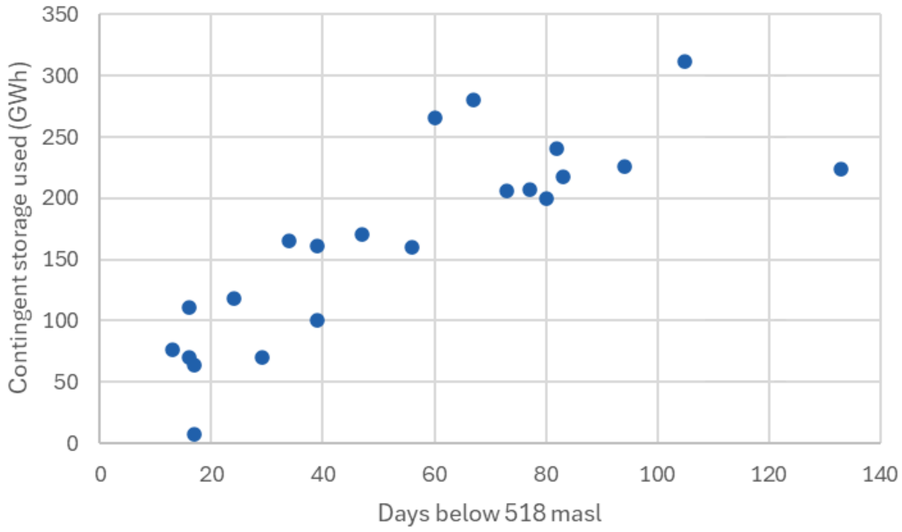
Figure 5 – Waitaki storage trajectories w/ relaxed access to contingent storage



However, Figure 5 is very different. Contingent storage is treated identically to other storage and is frequently utilized.

21 of the 44 weather years drop below 800 GWh storage.[5] These are shown in Figure 6.

Figure 6 - Depth and duration of contingent storage access



Price changes

Our analysis looks at outcomes across the 21 low storage sequences. We present results summarizing these. The graphs show the change in prices for the 260 day period after lake levels drop below the 518 masl threshold in the scenarios with unfettered contingent storage – 21 sequences in total. The equivalent 260 day periods and sequences are used for the 'No contingent access' run.

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[5] This graph shows *scheme* storage, so Lake Pūkaki is only a portion of this. Lake Pūkaki makes up slightly less than 75% of total scheme controllable storage, so we set the threshold to be slightly below 800 GWh. Our modelling does not track individual lake levels within schemes.

Figure 7 - Modelled 2027 price outcomes

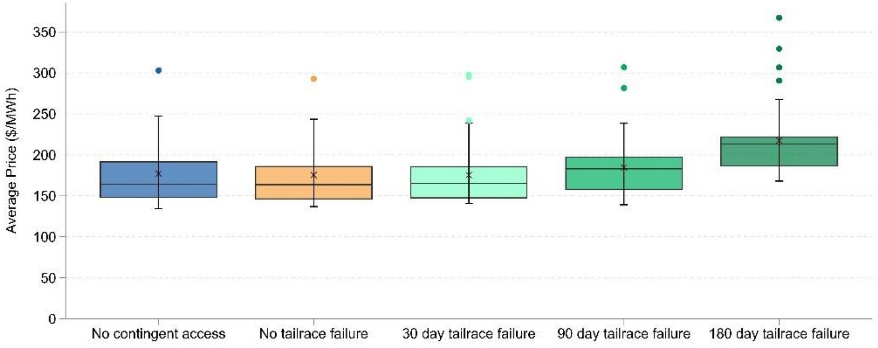

Figure 7 is a box and whisker graph. It shows the median (the middle line), the region where most prices fall (the box) and the spread of prices (the "tails" and outlier dots).

Price outcomes are similar in the "no contingent access" scenario and the easier access to contingent storage scenario (assuming there is no temporary tailrace and weir failure.) However, temporary tailrace and weir failure increases prices, with longer outages leading to larger price increases.

Figure 8 - Price effect of temporary tailrace and weir failure

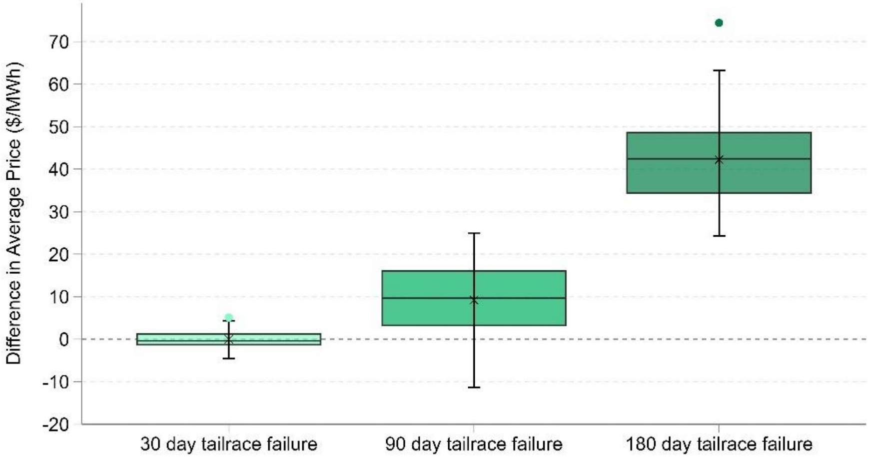

Figure 8 shows just the incremental effect of the temporary tailrace and weir failure. There is minimal price change with a 30 day outage. This reflects that the outage is a temporary loss of capacity, but merely a *deferral* of energy. When the Tekapo stations are operational again, they are able to generate more and largely offset the period of higher prices while they were non-operational.

The longer outages have much more effect, because during a longer outage, more water would be spilt, and this loses energy, rather than just defers it.

It is possible for prices to be *lower* with a temporary tailrace and weir outage. This can occur because the outage effectively forces conserving water, and occasionally, this can lead to better outcomes than using it earlier, depending on inflows. However, the better way to interpret these very small modelled differences (both positive and negative) is indicating essentially no difference between the two scenarios.

Table 1 summarises mean price outcomes for the different outage durations and scenarios.

Table 1 – Average North Island prices ($/MWh)

	No contingent access	Access but no tailrace failure	Access and 30 day failure	Access and 90 day failure	Access and 180 day failure
Mean	177 $/MWh	175 $/MWh	175 $/MWh	185 $/MWh	218 $/MWh
Median	164 $/MWh	164 $/MWh	165 $/MWh	183 $/MWh	213 $/MWh

Figure 9 - Waitaki generation (selected years)[6]

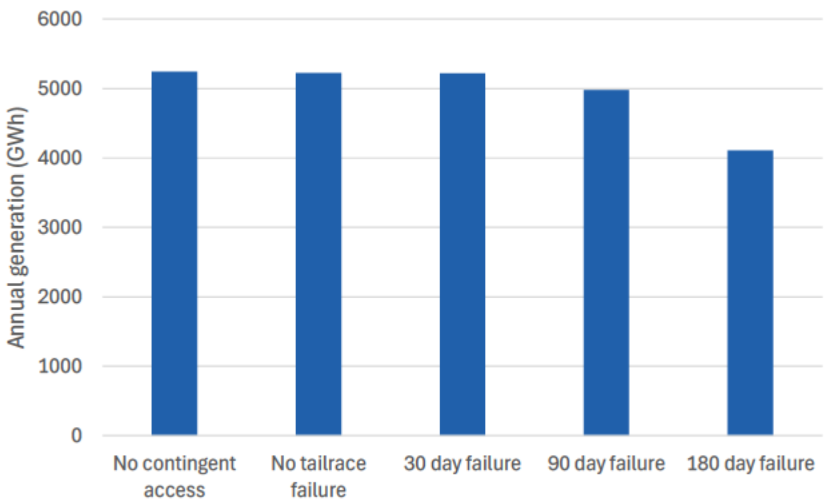

Figure 9 shows the generation from the Waitaki scheme in the different scenarios. There is minimal change in generation quantity with a 30 day outage, because water can just be stored, but longer outages have less generation because water must be spilt.

Emissions

When less hydro generation is available, the model first calls upon thermal generation to meet this shortfall. Calling upon additional thermal generation leads to higher emissions.

Figure 10 shows emissions in kilo-tonnes of CO_2 across all scenarios.

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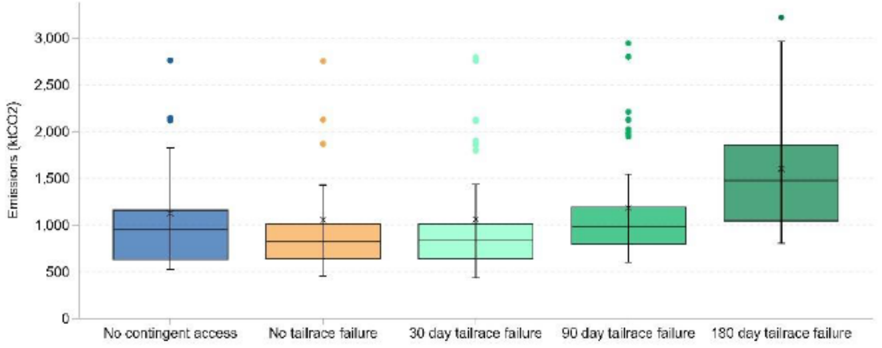
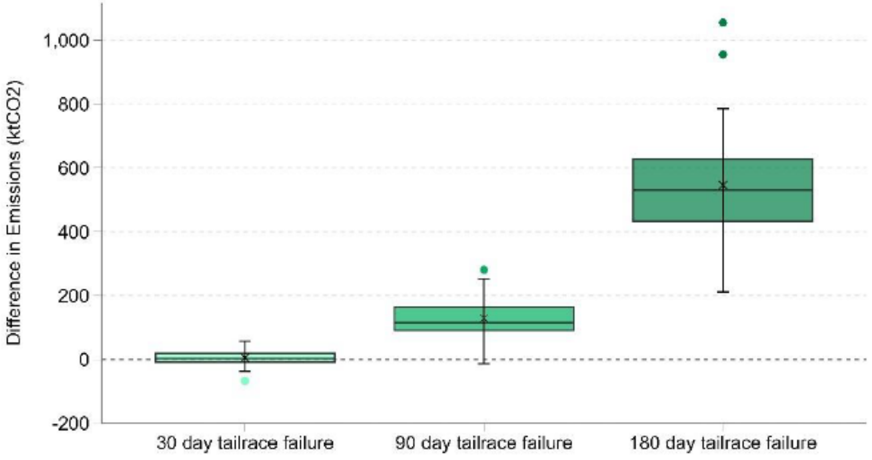
[6] This is mean generation across the 21 low storage sequences, and is only for the 260 day period analysis.

Figure 10 – Thermal emissions



The first point to note is that easier access to contingent storage results in lower emissions. With more storage, we can wait longer for inflows, and turn on thermal generation later. This is a real benefit, and is consistent with other analysis.

Figure 11 - Effect of temporary tailrace and weir failure on thermal emissions



When comparing temporary tailrace and weir failure scenarios, the results are similar to average prices. There is minimal difference for the 30 day outage, with progressively larger impacts for longer outages.

Table 2 - Additional thermal emissions compared to "No temporary tailrace and weir failure"

	No contingent access	Access and 30 day failure	Access and 90 day failure	Access and 180 day failure
Mean	71 $ktCO_2$	6 $ktCO_2$	129 $ktCO_2$	546 $ktCO_2$
Median	46 $ktCO_2$	4 $ktCO_2$	115 $ktCO_2$	531 $ktCO_2$

Table 2 shows the incremental emissions compared to the no temporary tailrace and weir failure scenario.

Demand response

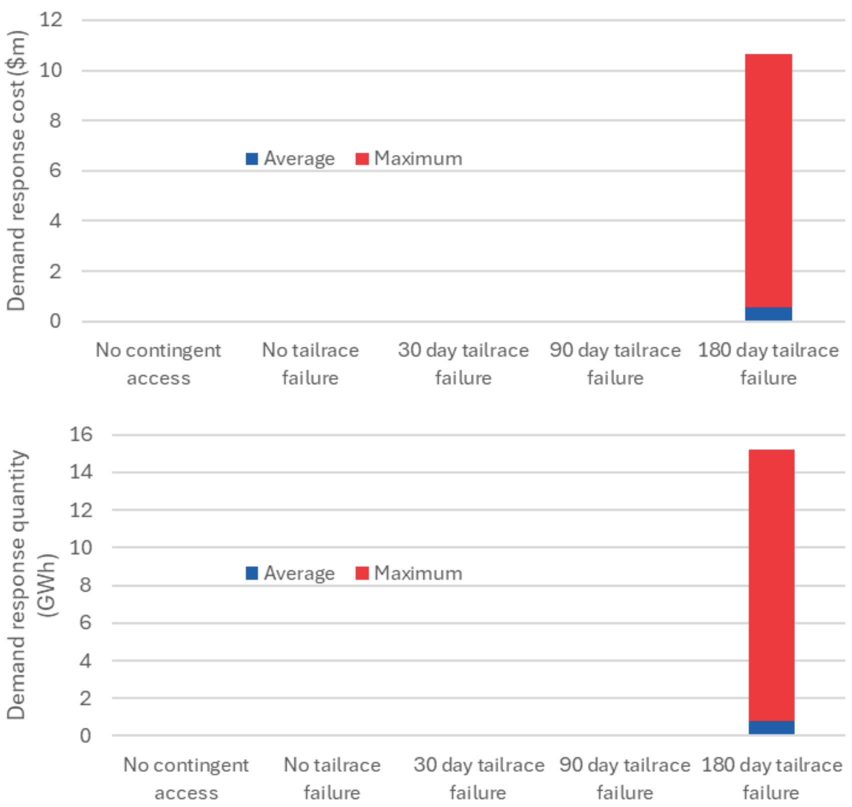
When all available thermal generation is utilized, the model calls upon progressively more expensive tranches of demand response (DR). The model includes four tranches of DR, the cheapest two of which are considered to be semi-voluntary or "elective". The more expensive tranches represent customers that do not ever wish to be non-supplied and so are considered to be "forced curtailment".

Figure 12 shows the cost and quantity of modelled demand response.[7] There is no demand response except for two storage sequences in the 180 day outage scenario.

The worst of the outage sequences has ~15 GWh of demand response, which has a cost of slightly over $10m.

All demand response is from the lower-priced "elective" demand response tranches.

Figure 12 – Cost and quantity of demand response



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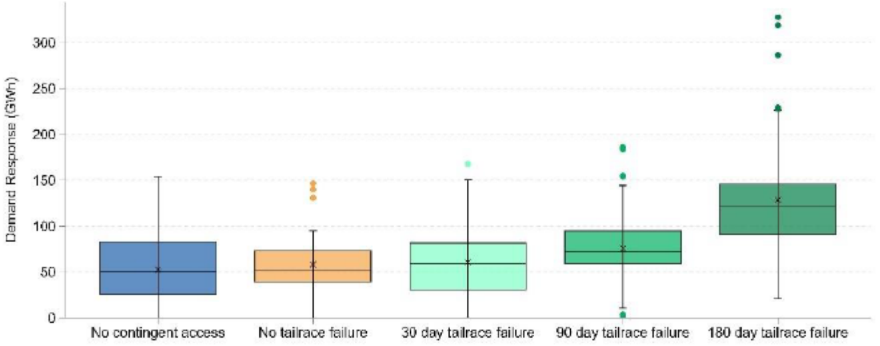
[7] These results are not presented as box and whisker plots because the majority of sequences have zero demand response.

Demand response – Tiwai

The model handles demand response from the Tiwai aluminium smelter differently. The smelter cannot respond dynamically, and once turned off, it must remain off for an extended period of time.

Figure 13 - Demand response from Tiwai aluminium smelter



The quantity of response from Tiwai follows a similar shape to the previous metrics. “No contingent access” has similar response to “no temporary tailrace and weir failure”. Progressively longer temporary tailrace and weir failures have increasingly more significant effects. The 30 day outage has a small increase, while the 180 day outage has a much larger one.

Table 3 - Tiwai demand response quantity (GWh)

	No contingent access	Access but no tailrace failure	Access and 30 day failure	Access and 90 day failure	Access and 180 day failure
Mean	53 GWh	58 GWh	60 GWh	76 GWh	129 GWh
Median	50 GWh	52 GWh	59 GWh	72 GWh	121 GWh

Consumer costs

Higher wholesale prices will lead to higher prices paid by consumers. The market impact can be estimated by multiplying the increase in wholesale price by the demand affected.[8]

Figure shows the distribution of consumer cost outcomes. Note that these are the costs for the entire system, so are very large, and vary significantly between years.

Again, we see minimal difference between “no contingent access” and “no temporary tailrace and weir failure”.

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[8] This calculation may not accurately reflect impacts on consumers in the market, because many consumers will have forward contracted for their power at an agreed price. However, “PxQ” (price times quantity) is a common metric used when estimating the impacts of price changes.

Figure 14 – Consumer costs ($m)[9]

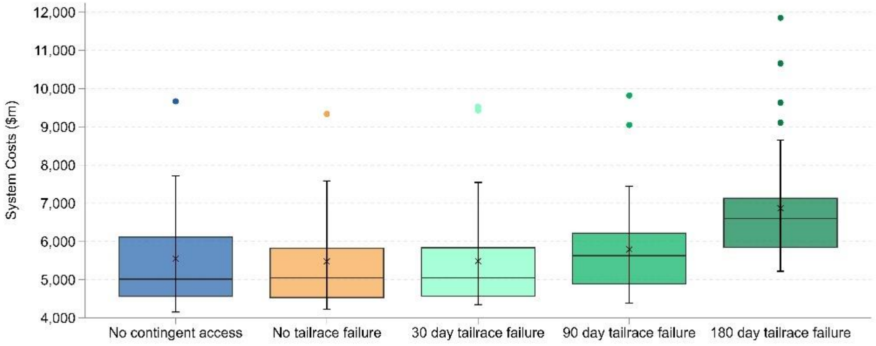
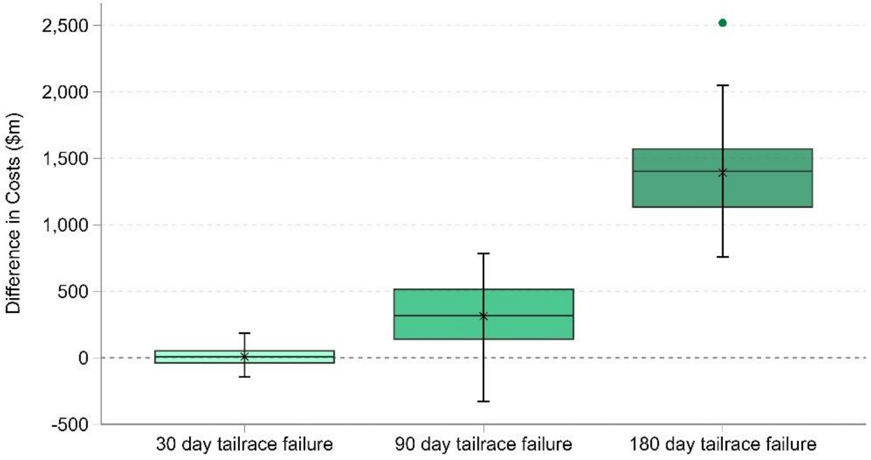


Figure 15 shows the effect of a temporary tailrace and weir failure, relative to the no temporary tailrace and weir failure scenario.

A 30 day failure has minimal effect on average costs (including some reductions in costs, as observed above for average prices). Longer outages have much larger effects, because some generation is lost – up to 2.5 billion in the worst of the 21 sequences for the 180 day failure, as illustrated in Figure 15 below.

Figure 15 - Incremental system costs with temporary tailrace and weir failure



Conclusion

If lowering Pūkaki below 518 masl were to result in the temporary tailrace and weir failing, this would significantly restrict generation from the Waitaki scheme until it was restored.

If the re-construction of the tailrace and weir was only to take a month, the costs would likely be relatively minor. However, the costs of an outage start to grow exponentially the longer the repairs take. Our analysis indicates that a three-month outage would likely cost ~$300m, and a six-month outage would cost ~ $1.4 billion – and up to $2.5 billion in the worst of our 43 weather years modelled.

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[9] Note the non-zero y-axis. This is consumer costs for the whole market, but we focus in on differences between the scenarios.