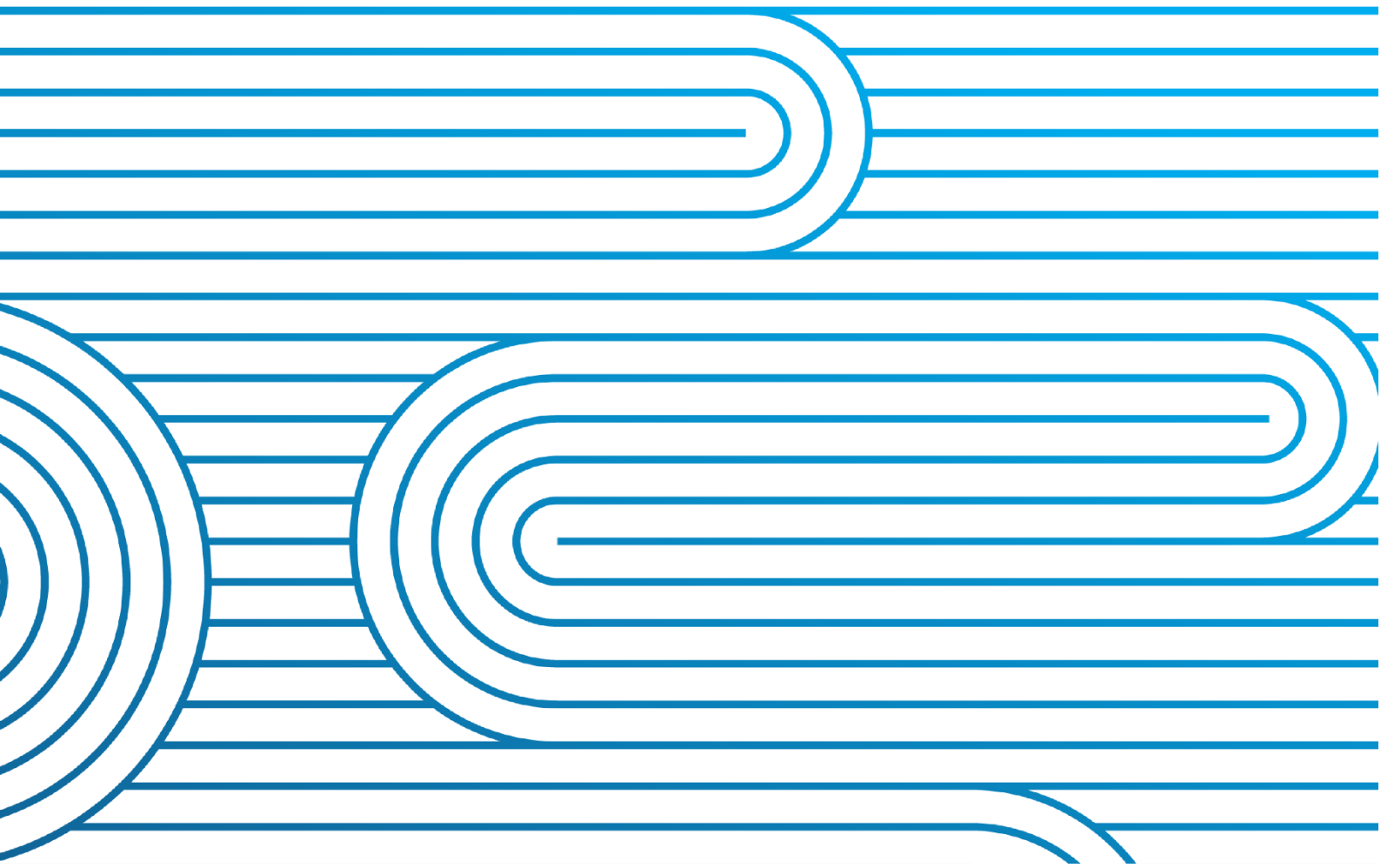


Net Zero Grid Pathways 1

Major Capex Project (Staged) Investigation

Attachment H: Stakeholder Consultation Summary

Date: 02 December 2022





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Glossary

Capex IM	Transpower Capital Expenditure Input Methodology Determination, New Zealand Commerce Commission ¹ .
Code	Electricity Industry Participation Code 2010.
Demand management	The use of demand reduction pre and/or post-contingency to ensure asset capability is not exceeded.
EDGS	Electricity Demand and Generation Scenarios.
GEIP	Good electricity industry practice.
Grid Reliability Standards	The grid reliability standards (GRS) are a set of standards against which the reliability performance of the existing grid (or future developments to it) can be assessed.
GXP	Grid exit point.
Investment Test	The Capex Input defines the 'Investment Test' (IT), being the detailed economic assessment required for Major Capex Projects.
Long-list consultation	Transpower's consultation document entitled NZGP 1 Investigation Long List Consultation (August 2021).
MBIE	Ministry of Business, Innovation and Employment.
MCA	Major Capex Allowance, as defined by the Capex IM, being the maximum amount Transpower can recover from customers in relation to this project
MCP	Major Capex Proposal, as defined by the Capex IM.
MW	Megawatt, one million watts, being the power conveyed by a current of one ampère through the difference of potential of one volt.
MWh	Megawatt hour of electrical energy.
n-1	A security standard that ensures with all facilities in service Transpower's transmission system remains in a satisfactory state following a single fault (e.g. a circuit outage).
P50	Expected peak demand forecast. P50 is the 50 th percentile of the peak demand forecast probability distribution.
Present Value	Future costs discounted to a present value using an assumed discount rate.
Prudent forecast	Prudent peak demand forecast. P90 is the 90 th percentile of our peak demand forecast for the first seven years, then grows at the same rate as the expected for all remaining years in the analysis period.
RFI	Request for information.

¹ See <https://comcom.govt.nz/regulated-industries/input-methodologies/transpower-ims>

RFP	Request for proposal.
Short-list consultation	Transpower's consultation document entitled NZGP 1 Investigation Short List Consultation (August 2021)
SDDP	Stochastic dual dynamic programming – a market dispatch model used to determine the optimal dispatch of hydro, thermal and other renewable generation.
TPM	Transmission Pricing Methodology, defined in Schedule 12.4 of the Code.
Transpower	Transpower New Zealand Limited, owner and operator of New Zealand's high-voltage electricity network (the national grid).

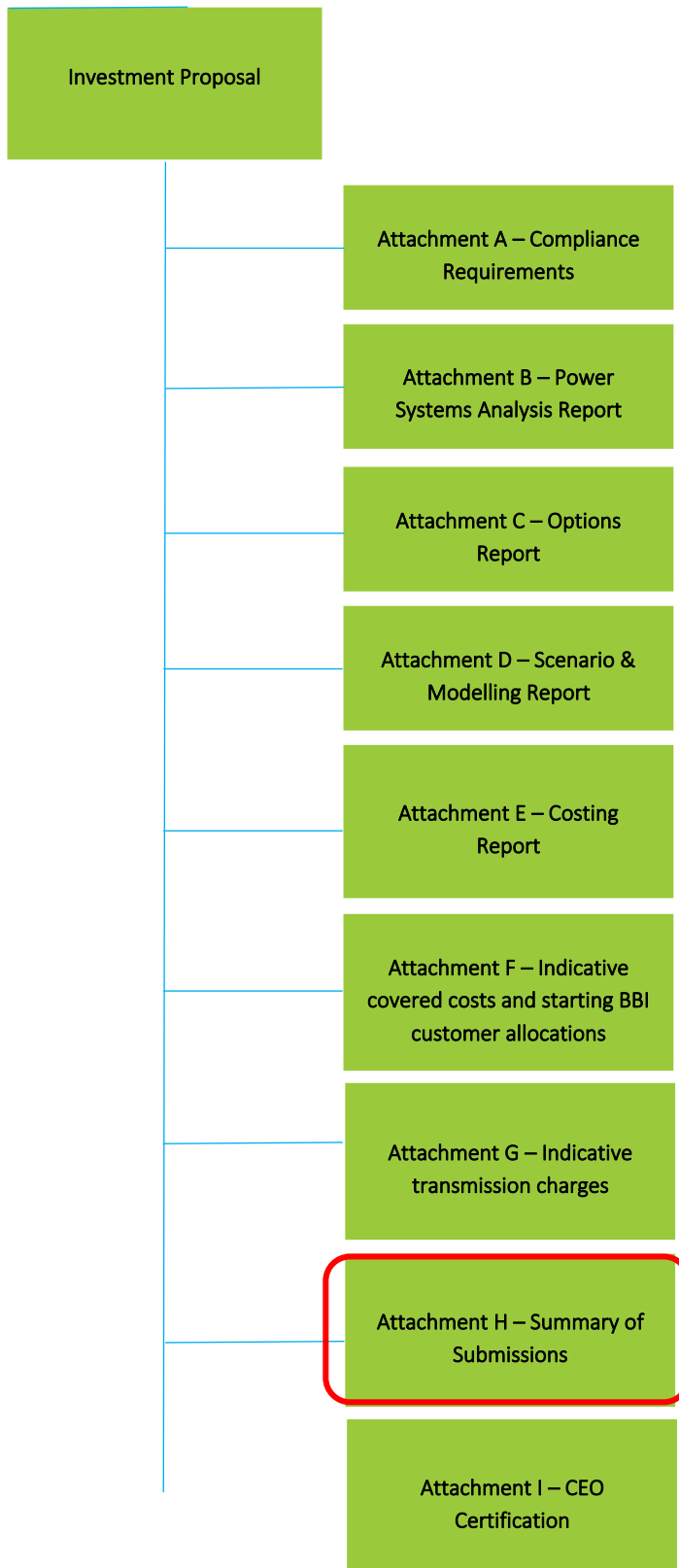


1.0 Introduction

This attachment provides an overview of feedback from our stakeholder consultations on the Net Zero Grid Pathways Project Investigation and our response to that feedback.

It is one of the supporting attachments for our main report ('Net Zero Grid Pathways Major Capex Proposal') and should be read in conjunction with our main proposal.





1.1 Stakeholder engagement to date

Date	Activity
September 2020	Net Zero Grid Pathways industry webinar
October 2020	Scenario Development Panel
December 2020	Net Zero Grid Pathways EDGS Scenario Variations Consultation
May 2021	Consultation to prioritise generation scenarios
July 2021	Net Zero Grid Pathways brochure ²
August 2021	Net Zero Grid Pathways 1 Long List Consultation and Request for Information on Non-transmission Alternatives
December 2021	NZGP1 Scenario Update
June 2022	Net Zero Grid Pathways Stage 1 Short List Consultation
July 2022	Net Zero Grid Pathways Stage 1 Short List Consultation webinar

Details of the long-list and short-list consultations can be found in the following sections. A summary of other stakeholder engagement activities is in the main proposal.

² [Net Zero Grid Pathways Brochure, July 2021](#)

2.0 Long-list stakeholder consultation (August 2021): Summary of submissions with Transpower responses

This section summarises submissions received on Transpower’s *NZGP long-list consultation of August 2021*³. We have endeavoured to summarise submitter’s key points briefly. Please refer to their submissions for further detail, and to Appendix **Error! Reference source not found.** for how we addressed issues raised.

Submissions were received from:

- Vector Ltd (**Vector**), an electricity (and gas) distribution company in the Auckland region.
- **Unison** and Centralines Ltd (**Centralines**), as electricity distribution companies on the East Coast of the North Island
- **Taheke 8C**, The Proprietors of Taheke 8C and Adjoining Blocks (Inc) – a Māori landowner
- **Smart Wires**, a global power technology company
- New Zealand Geothermal Association (**NZGA**), a not-for-profit organisation, with a focus on use, development and protection of geothermal resources.
- Meridian Energy (**Meridian**), an electricity generator and retailer
- Mercury Energy (**Mercury**), an electricity generator and multi product utility retailer.

This section includes submitters’ comments against the nine specific questions asked in the consultation report, plus any general comments of relevance to specific questions.

2.1 Need and project scope

Q1 Is our need description for this investigation reasonable?

³ The consultation paper, the non-confidential submissions and this document are available at [NZGP Long-list Consultation](#)

Most submitters either agreed to the need and scope or did not comment.

Mercury supports a holistic approach being taken to ensure that the impacts on all other areas of the grid are captured. For instance, the HAY to BPE corridor should be included as part of the assessment. Increased north flow from the HVDC (as per the long list options and scenarios) and the potential for new regional generation development is likely to put stress on this part of the grid.

Mercury would like to highlight the possible lack of consideration given to the 110 kV system. From previous experience, the industry has seen that the potential benefits of major work on the 220 kV network can be handicapped by the issues on 110 kV network.

Vector submitted that more information on timing is needed. They recognise Transpower needs to start planning for major infrastructure in due time, but flexibility and optionality should be maintained so a project can be amended or cancelled if evidence appears that it is no longer required.

Transpower response: *Transpower thanks participants for their feedback. We agree. We continue to monitor the impacts of potential investments and forecast demand/generation changes on the wider transmission network. We monitor what is occurring across the entire transmission network and where there are future constraints we model these in our analysis. Vector's submission on investment timing is important. NZGP1 MCP is a staged MCP because of significant uncertainty in regards to future electricity demand and supply. The investments included in our proposal are least regrets in that they balance that uncertainty with the need to enhance the grid as required and provide certainty to potential (electricity demand and supply) investors. Our proposal assumes Tiwai aluminium smelter closes in 2024 because it is prudent for us to ensure we have plans in place in the event this does occur. As noted elsewhere in this proposal, we have limited flexibility to change our plans if Tiwai closure is deferred. The HVDC Stage 1 works are justified on the basis of improving the availability of HVDC transfer capability, which is independent of Tiwai closure. Connection enquiries in the vicinity of the Wairakei Ring are also largely independent of Tiwai closure. The investments proposed for the CNI are those most closely related to Tiwai closure, but they are also the most difficult to defer because of workforce planning and outage requirements. We have no flexibility to defer these investments. Our Stage 2 MCP is planned to include a 4th Cook Strait cable and this can be deferred if Tiwai does not close in 2024.*

Taheke 8C's submission notes that the use of transmission corridors through Māori land should be the last option for lines upgrades and projects. In addition, any of Taheke's land (or Māori land in general) that is no longer needed for transmission services should be returned to mana whenua.

Transpower response: *Transpower thanks participants for their feedback.*



Transpower's project work involves significant engagement with interested stakeholders including mana whenua. We will continue to engage with impacted parties as this investigation/project progresses.

When land acquired for transmission purposes is no longer required Transpower meets its obligations under the Public Works Act 1981.

Q2 Should Transpower be looking to enable investment in new generation and demand ahead of when that generation or demand is confirmed?

Most submitters supported our long list of components or did not comment. NZGA noted that planning for these renewable energy projects can take several years and ability to get maximum generation is important to the business case, so timely investment (or commitment to investment) ahead of generation is needed.

Mercury submitted that new generation (e.g., solar) and load development (e.g., electric boilers) can be deployed much faster than transmission enhancements.

Vector and Mercury recognises the needs to start planning for major transmission infrastructure in due time, however, the process should ensure flexibility and optionality is maintained so a project can be amended, upgraded or cancelled as required. (i.e., projects that maintain optionality should be preferred).

Transpower response:

Transpower thanks participants for their feedback.

We agree although note that building, or having plans to build, transmission is important to generation investors to provide them confidence the transmission infrastructure they require will be in place both where and when they need it.

The best outcome for electricity consumers will balance both needs.

In general our least regrets approach, along with and ability to stage MCP's but be able to prepare for future investments ahead of time, is consistent with Vector's sentiment. We note there are constraints on flexibility because of the need to determine our workforce plans ahead of time and the difficulty of getting outages on the backbone grid as electricity flows increase.

Q3 Are our long-list options (B1 and B2 in Table 3.1) to meet the overall need for this investigation, reasonable?

Q4 Are our long-list options for enhancing capacity of the HVDC reasonable?

There was general agreement from most submitters. Mercury understands the need to provide HVDC options in comparison to AC options. However, both Mercury and Unison/Centralines's view is that a point-to-point HVDC solution for the middle and lower NI lacks flexibility in terms of interconnectability of new generation and load in the region.

Transpower response: *Transpower thanks and notes your feedback. A point-to-point HVDC solution has not been included on the shortlist of options included in this consultation.*

Q5 Are our long-list options for enhancing capacity of the CNI 220kV corridor reasonable?

Mercury submitted that the solution for the CNI corridor should be decided with a clear understanding of the long-term strategy of the HVDC link.

Unison/Centralines submitted that options which concentrate transmission in a narrow corridor should be avoided. In particular routes that diversify 220kV transmission away from the Central North Island volcanic hazard zone should be favoured.

Vector submitted that contracting demand side services from distributors (e.g., hot water load control) should also be considered in options to enhancing capacity of the CNI 220kV. Meridian submitted that they are not convinced a battery option would provide long-term transmission requirements to support renewable developments and the broader needs of the CNI investigation.

Transpower response: *Transpower thanks participants for their feedback. We recognise the synergies between the CNI and the HVDC which is why we are including both as part of NZGP. NZGP Phase 2 will further investigate the economic case and potential routes for a new line north of Bunnythorpe. Network resilience will be a key consideration in those investigations. The use of demand response is considered a non-transmission solution (NTS) which are important considerations in considering options to address a need. We released a RFI for NTS solutions as part of our August 2021 Long-list consultation. As discussed more fully in response to Q2 in section 3.1, NTS are most likely to be economic, if required, in enabling the outages required for delivering identified transmission enhancements.*

Smart Wires proposed the use of modular power flow control (MPFC) to assist in achieving the network balancing and relief of thermal line constraints described within the long-list consultation paper.

Transpower response: *Thank you for submitting this information. We have passed on this information to the appropriate teams within Transpower for their consideration.*

Q6 Are our long-list options for enhancing capacity of the Wairakei Ring reasonable?

Most submitters supported our long list of components or did not comment.

Mercury submitted that the options in this region provide some good short-term options considering the advanced stages of the new generation development projects in the region and appears to have little remaining capacity to accommodate additional growth.

Transpower response: *Transpower thanks participants for their feedback. Our proposal recognises the need for more transmission capacity rather than just thermally upgrading the WRK -WKM line. Our proposal reflects investigating the best next steps: i.e., upgrading the existing WRK-WKM A line, or building a new WRK-WKM D line.*

2.2 Criteria for short-listing

Q7 Are there other criteria we should consider when evaluating our long-list of options and reducing it to a short-list?

Most submitters agreed to or did not comment on our criteria for short-listing.

Those that did submit suggested Transpower should develop criterion to include:

- carbon emissions reduction when evaluating long-list of options and reducing it to a short-list in achieving the “Net Zero” target (NZGA)
- options that add resilience particularly in the face of natural hazards for example through increased diversity of transmission routes should be given greater weighting (Unison/Centralines)
- favouring investments that provide enhanced grid access for renewables (Unison/Centralines)
- prioritising solutions that fit with and promote the enablement of and support of DER (Unison/Centralines).

Transpower response:

Transpower thanks participants for their feedback.

Our EDGS scenario variations include significant amounts of renewable generation. Our analysis and decision-making framework considers costs and benefits to electricity consumers on a national basis. We consider that this project to be enabling renewables and any investment resulting from this investigation would support renewable uptake.

Resilience of the transmission grid is an important consideration in grid planning. Because the grid spans the entire country, it is exposed to many natural hazards and diversity of transmission routes is one way of minimising risks to electricity security of supply.

We agree with Unison's comments and note that, in the Central North Island, exposure to volcanic activity is the most significant natural hazard.

Transpower has been working with University of Canterbury, GNS, University of Auckland and Massey University to understand the risks that volcanic activity pose to the national grid. Our understanding of these credible risks has improved greatly from the recent research and efforts in this area. The quantitative information for ashfall and lahar for the high frequency cone volcanoes (Taranaki, Ruapehu, Tongariro), shows that the network is exposed. We acknowledge that an option within a narrow corridor will have less resilience where that corridor is much more likely to see ashfall or lahars. We are actively considering resilience of options and ways to mitigate the impacts through route choice and other means.

2.3 Relevant scenarios and demand

Q8 Is our process for developing relevant scenarios reasonable?

Most submitters agreed to or did not comment on this question.

Unison/Centralines submitted that, scenarios should also consider a future with high EV uptake and charging behaviour with low demand response where consumers value availability of mobility over reduced costs from flexibility in charging.

Transpower response:

Transpower thanks participants for their feedback.

The result of such behaviour would be to increase demand at peak times of the day and the cost to meet such demand would likely be very high. We have assumed that, over time, incentives will be developed to discourage such behaviour, given the likely cost.

We also consider that technology and other variables (such as higher tariffs for faster charging) would temper adverse network impacts. Battery capacity is also

improving such that a single charge on later model EVs provides sufficient range for charging to not be required every day.

Q9 Are our proposed NZGP1 demand forecasts reasonable?

Most submitters offered no suggestions for enhancing the demand forecasts, but Vector commented on the importance to be mindful of that new technologies and changes in customer behaviour could impact demand forecasts.

Transpower response: *Transpower thanks participants for their feedback. There is uncertainty in any forecast and Transpower will be publishing the results of the scenarios separately, which is a proxy for undertaking sensitivity analysis on demand growth as required by the Capex IM. [Subsequent to this, as part of the Short-list consultation Transpower consulted using the up to date 2019 forecasts]*

Q10 Is our proposal to identify base scenarios and sensitivity scenarios reasonable?

There was general agreement with our base and sensitivity scenario approach.

Q11 Is our process for identifying potential generation scenarios reasonable?

Most submitters agreed to or did not comment on this question.

NZ Geothermal Association submits that growth in geothermal generation should be integral to all generation scenarios, rather than simply giving it prominence in 2 of 15 scenarios. Geothermal is a fundamental building blocks of our low carbon New Zealand electricity generation.

Transpower response: *Transpower thanks participants for their feedback. There are only five EDGS scenario variations. All scenarios use the same generation stack which includes geothermal generation. The generation expansion model takes the stack and decides what and when generation to build in each scenario variation. There is a range of future geothermal build reflected in those scenarios, varying from 280 – 920 MW. Our*

generation expansion model does not build the most expensive geothermal generation, we presume as a result of the cost to access the geothermal steam.

Q12 Is our approach to determining an appropriate number of scenarios reasonable?

Most submitters agreed to or did not comment on this question.

Q13 Is our choice of scenarios to include in our analysis reasonable?

Most submitters agreed to or did not comment with anything additional to that already mentioned for this question.

Q14 Is our set of sensitivity scenarios reasonable?

Most submitters agreed to or did not comment on this question.

Meridian notes the potential of flexible hydrogen production to manage dry year risk should also be acknowledged in the sensitivity scenarios.

Transpower response:

Transpower thanks participants for their feedback. How dry year risk will be managed in the future is an important issue for the transmission grid. This risk will need to be resolved to achieve 100% renewable generation, but it is too early to form a view on the likely options. Our EDGS variations are based on a generic North Island solution (which is least distortionary to our analysis). We will consider alternatives such as the development of Lake Onslow (South Island) in NZGP Phase 2. Depending upon how big any South Island solution may be, the topology of the transmission grid may need to change, but it is too early to draw such conclusions. We will also consider one or two hydrogen production futures in our NZGP Phase 2 analysis. We may need further input as to where and how big any flexible hydrogen plants should be.

Q15 Is our approach to determining the weighting for each scenario appropriate?

Most submitters agreed to or did not comment on this question.

2.4 Discount rate assumptions

Q16 Would interested parties support the use of a discount rate for Investment Test analysis, closer to Transpower's current WACC?

Most submitters agreed to or did not comment on this question.

2.5 Market costs and benefit assumptions

Q17 Are there other market costs or benefits which should be reflected in our Investment Test analysis?

Submissions either echoed earlier comments (already outlined in this summary) or did not provide any other market costs or benefits that should be considered.

NZ Geothermal Association recommended the inclusion of a projected market or shadow price or carbon (now a major cost), especially as we attempt to move to "Net Zero" carbon emissions.

They also request that Transpower mitigate the impacts of decisions on iwi and Māori, employees, employers, regions, and wider communities in the Investment Test Analysis.

Transpower response: *Transpower thanks participants for their feedback. Transpower includes cost of carbon in our modelling. Our modelling reflects IEA carbon cost projections, which assume the cost of carbon will increase to \$357 per tone CO₂e by 2050. We have a focus on mitigating the impacts of its investment decisions on local communities and iwi. For example, Transpower's CommunityCare Fund has been assisting communities affected by our overhead assets (typically transmission lines and towers) by investing in community-based projects that add real value and benefit to those wider communities since 2008.*

The fund makes one-off grants to community-based projects near the National Grid.⁴

⁴ [CommunityCare Fund | Transpower](#)



3.0 Short-list stakeholder consultation (June 2022): Summary of submissions with Transpower responses

This section summarises submissions received on Transpower’s *NZGP short-list consultation* of June 2022⁵. We have endeavoured to summarise the submitters’ key points. Please refer to their submissions for further detail.

Submissions were received from:

- A Batkin
- Contact Energy Limited (**Contact**), an electricity generator and retailer
- **Helios Energy**, an oil and gas exploration company
- Horizon Energy (**Horizon**), an electricity distribution company in Waitomo and the King Country region
- Independent Electricity Generators Association (**IEGA**), representing more than 40 regional electricity generation businesses
- The Major Electricity Users’ Group (**MEUG**), a trade association representing major electricity users Independent Electricity Users Group
- Mercury Energy (**Mercury**), an electricity generator and multi product utility retailer
- Meridian Energy (**Meridian**), an electricity generator and retailer
- New Zealand Offshore Wind Development Limited (**NZOWD**), an organisation developing offshore wind resource in New Zealand
- Nova Energy (**Nova**) an electricity and gas generator and multi product utility retailer
- **Powerco** Ltd, an electricity (and gas) distribution company
- **solarZero**, a solar energy services company
- **The Lines Company** (TLC), an electricity distribution company in Waitomo and the King Country
- Vector Ltd (**Vector**), an electricity (and gas) distribution company in the Auckland region.
- **Venture Taranaki**, an economic development agency in New Plymouth
- WEL Networks (**WEL**), an electricity distribution company in the Waikato

⁵ The consultation paper, and the non-confidential submissions are available at [Net Zero Grid Pathways: Phase One to 2035 | Transpower](#)



- **Wind Quarry Zealandia** Limited, is a developer of offshore wind power projects

This section includes submitters' comments on the eleven questions asked in the consultation report, plus general comments of relevance. We provide our response where appropriate.

3.1 Project staging

Q1 Do you agree with our staged approach to this major capital investment programme?

Most submitters either had general agreement to the staged approach or did not comment.

Wind Quarry Zealandia, New Zealand Offshore Wind Development and Venture Taranaki believe the pace of potential renewable connections in Taranaki with the recent, keen investment interest and proposed scale of offshore wind development signalled for New Zealand is stronger than currently modelled. Therefore they believe that Transpower is not completely taking into account the likelihood of significant generation being added to the grid in Taranaki from multiple large-scale projects within the next decade.

Transpower response: *Transpower thanks participants for their feedback and this is noted. In NZGP Phase 2 we will be considering the transmission grid implications of Taranaki offshore wind. At this point in time no project is firm enough to be considered explicitly in our analysis.*

Q2 Is our approach to NTS reasonable?

Submissions had mixed views on our approach to NTS and believe Transpower should provide more information in this area.

Vector, WEL, NZOWD, and Mercury consider that Transpower should not draw a conclusion that NTS are not of sufficient scale from a lack of responses to the previous long-list RFI. One possible reason for this lack of responses may be due to the high-level nature of the previous RFI.

While Mercury agrees in general with Transpower's approach for excluding NTS options from the present MCP and to explore their use at a relevant time in the future, Mercury is concerned that Transpower may understate the value of NTS options going forward.

Transpower response:

Transpower thanks participants for their feedback. Transpower is committed to exploring the application of NTS to replace, defer, or enable transmission investment, where economically feasible. Our NZGP1 long-list consultation posed a number of questions regarding how NTS could be incorporated into the development plans created by NZGP1. We received limited responses and of the responses received, there were none that appeared sufficient to meet the investment need. Electricity flows over the backbone grid differ considerably to those elsewhere in the grid. They are less determined by electricity demand peaks and troughs than market operation. Being the platform for operation of our electricity market, flows are dependent on operation of that market and at times peak flows even occur at off-peak demand times. As a result it is difficult to predict when they will occur. If anything, they are more aligned to hydrology than demand. In the future, when the North Island thermal generation is closed, they may become more aligned with the strength of the wind and cloud cover, which is even less predictable.

We have formed a view that due to these issues, it is unlikely NTS would be a viable substitute to the projects covered in this MCP. However, NTS may be able to help manage operational risk due to unavailability of grid assets during delivery of the investments included in this proposal and we will explore opportunities for this once they are known.

Our experience to date with contracting NTS for major projects has been hindered by process. We have evaluated NTS as long-list or short-list options, but often several years ahead of the need for such NTS. Our understanding is that, not surprisingly, NTS proponents have been reluctant to commit to services that far ahead. The process we follow is a regulatory requirement, developed when neither ourselves nor the regulator had experience with NTS. For that reason and to ensure NTS providers are offered a reasonable opportunity, we are proposing this MCP without having fully assessed NTS, but with an undertaking to explore the use of NTS at the relevant time. For NZGP1 this would likely be during the delivery phase of any approved works.

3.2 Derivation of short-list of options

Q3 Is our reduced list of options for enhancing capacity of the HVDC reasonable?

Most submitters either generally agreed to our reduced list of HVDC options or did not comment.

WQZ, A Batkin and Venture Taranaki supported the inclusion of a completely new HVDC link route to the investigation.



Transpower response: *Transpower thanks participants for their feedback. A completely new HVDC transmission link does not appear warranted at this point in time, but may be justified when we consider the possible futures where South Island hydro (eg Lake Onslow) is used to provide North Island dry year cover, or if Taranaki offshore wind is developed. Both of these possible futures will be considered in NZGP Phase 2.*

Q4 Is our reduced list of options for enhancing capacity of the CNI 220 kV corridor reasonable?

Most submitters either agreed that the reduced list of CNI options were reasonable or did not comment.

Mercury suggested that Transpower consider enhancing or introducing alternative transmission route options around the central North Island to the investigation that would enhance overall network resilience.

The Lines Company also expressed concerns about Transpower's proposal to introduce a split at Ongarue.

Transpower response: *Transpower thanks participants for their feedback. NZGP Phase 2 will further investigate the economic case and potential routes for a new line new of Bunnythorpe. Network resilience will be a key consideration in those investigations. We note The Lines Company's concerns around a split being introduced onto the 110kV network at Ongarue. We are undertaking discussions with The Lines Company in regard to this point.*

Q5 Is our reduced list of options for enhancing capacity of the Wairakei Ring reasonable?

Most submitters either agreed that the reduced list of Wairakei Ring options were reasonable or did not comment.

Mercury expressed concern about what happens after the thermal upgrade capacity is exhausted. Contact's believes that some upgrades or a new line should be brought forward due to the difficulty in managing outages in the region. Outages are already requiring renewable generation to be curtailed or come off completely; additional new generation in the region will exacerbate the issue.

Transpower response: *Transpower thanks participants for their feedback. Our NZGP Stage 2 investigations include whether a new line or enhancing an existing line should be preferred. We agree that our proposal will only provide new capacity for a short timeframe and our Stage 2 investigations will be treated with some urgency.*

3.3 Economic assumptions

Q6 Are our scenario weighting sets reasonable?

Most submitters were either supportive for giving zero weighting to Global and Reference Scenarios, or did not comment.

Horizon, NZIER and Wind Quarry Zealandia expressed concerns on Transpower's approach. Horizon considers the probability of a New Zealand recession to be non-zero and MEUG considers the range of forecasts to be too narrow to exclude other possibilities.

WQL submitted: "...the global and reference scenarios anticipate low growth compared to other industry forecasts and are given lower or no weighting. While reducing the importance of these scenarios is helpful the process is still based on the remaining three scenarios which WQZ argues do not enable New Zealand to reach the New Zealand Government's target of 100% renewable electricity by 2030 and net zero by 2050."

Helios supports Transpower's allocation of weightings across the five scenarios, and is especially supportive of the down-weighting of scenarios that are inconsistent with policy and statutory targets. Helios notes that in all scenarios, Tiwai is assumed to close at the end of the contracted period in 2024. Given the magnitude of Tiwai load, Helios recommends that Transpower is explicit about the impacts that Tiwai remaining has on options. While the MCP will include a Tiwai sensitivity, Helios believes a 'Tiwai remains' scenario be included to understand relative tradeoffs and prioritisation amongst generation options.

Transpower response: *Transpower thanks participants for their feedback. In our Short-list Consultation we suggested that our variations of MBIE's Global and Reference scenarios should be given zero weighting in our calculation of expected net market benefits, as those two scenarios were inconsistent with achieving net zero carbon by 2050. The reason for that suggestion arose because electricity demand growth in those two scenarios is low and seemingly inconsistent with the significant electrification expected in scenarios which are consistent with achieving net zero carbon by 2050.*

We have been unable to verify that suggestion. Electricity demand growth could be low due to prevailing global economic conditions, yet those scenarios may reflect significant electrification.

As a result of being unable to verify our original hypothesis, we are no longer proposing to give a zero weighting to those two scenarios in our analysis.

With respect to a Tiwai closure, we have not considered a Tiwai remains (beyond 2050) sensitivity, but have considered a Tiwai closure in 2034 sensitivity.

3.4 The short-list

Q7 Is our shortlist of HVDC and CNI options reasonable?

Most submitters were either in agreement or did not comment.

IEGA supports the options but notes that it is unclear whether Transpower's assumptions include new investment in distributed generation capacity (including battery storage capacity).

Mercury and WQZ agree and seek including additional HVDC cable capacity to the mix.

Contact notes that NZGP1 will no address the issue where the HVDC is reserve constrained, and the economic implications of delaying this to Stage 2 should be assessed.

Transpower response: *Transpower thanks participants for their feedback. Our demand forecasts consider the impact of distributed generation (behind the GXP generation). Battery storage is an option available to the generation expansion model, as an alternative to peaking generation in particular. Our supply scenarios do reflect battery storage being built, but we acknowledge this is an area for further study in NZGP Stage 2. We are modelling batteries for use on the grid, but are not explicitly considering the possibilities of batteries where value stacking is accessed.*

Q8 Is our shortlist of Wairakei Ring options reasonable?

Most submitters were either in agreement or did not comment.

Mercury repeated their concerns around capacity once the thermal upgrades are exhausted. Mercury suggests that to be prepared Transpower should investigate a new WRK-WKM line or replacing the WRK-WKM A line as a priority given the long lead times.

Contact expressed concern over the disruption to the grid caused by the implementation of options W1 and W4, when compared to option W7. W1 and W4 will require longer term planned outages that will need to be managed with respect security of supply and increased fuel costs due to the forced reduction in renewables. We acknowledge the short-term benefit of option of W1.

Transpower response: *Transpower thanks participants for their feedback. Please see our response to Q5 in section 3.2. We acknowledge the disruption to existing generation that options W4 and W7 will impose and this is one of the reasons for prioritising this investigation in NZGP Stage 2.*

3.5 The preferred option

Q9 Is our choice of the preferred option reasonable?

Most submitters supported the preferred option.

While WQL supported the preferred option they believe it is insufficient to support the transition of the electricity sector that is required to achieve net zero by 2050. Both WQL and Mercury support the deployment of a new HVDC cable to increase HVDC capacity.

Meridian and Helios believe a 1400MW HVDC, TKN-WKM TTU and new WRK-WKM D line should still be considered.

WEL is supportive but is concerned that the Net Benefit of the shortlist of HVDC, CNI and Wairakei Ring (WR) options (presented in Table 20) has very few positive values across the 18 options and 4 scenario weightings – only 9 of the total 72 options in the matrix (12.5%) are positive. WEL queries whether these results indicate the Net Benefit value of these investments at this time is ‘marginal’?

Transpower response: *Transpower thanks participants for their feedback. We note that these options will be considered further in our NZGP Stage 2 investigations.*

With respect to WEL’s concern, we also note that the net benefits of these investments are not large. Rather than say these investments are marginally economic, we would point to the conservative nature of our analysis:

- a) *we have studied 1 hour load block resolutions in our analysis. It is questionable whether this approach appropriately captures the benefits of the HVDC and CNI in ensuring South Island hydro can be used to firm North Island intermittent generation. In our NZGP Phase 2 analysis we hope to improve that situation, but in the meantime are of the opinion that this benefit is undervalued.*
- b) *Similarly, we have assumed a North Island mixed dry year reserve solution. In our modelling dry year reserve is provide from a combination of generation over-build, replacement of the Huntly Rankine units with a bio-peaker and some deficit. This approach reflects the uncertainty over how such dry year reserve will be provided and is designed to be as neutral as possible to future grid configurations. If dry reserve is provided from north of Whakamaru, our analysis is reasonable. If it is provided from south of Whakamaru, then our analysis is conservative, as flows over the CNI lines and/or HVDC would likely be higher.*

Our economic analysis demonstrates that our proposal is economic even under such conservative assumptions and it is likely the benefits are much higher.

Q10 Is our conclusion that upgrading existing assets is more economic than bypassing the existing grid reasonable?

Most submitters were in agreement with our proposal to upgrade existing assets before building new assets.

Meridian was in agreement but, as the consultation notes, should major projects or other significant changes occur, then this may need to be reconsidered

Contact agree but note that the cost of new HVDC systems is prohibitive. They also note that economic consideration needs to be given to the disruption cost considerations regarding whether to upgrade existing AC lines or build new lines.

WQL was not in agreement because they believe the EDGS assumptions which underpin the analysis is out of date and not in touch with the commercial developments already underway in NZ. WQL believe it is advisable for Transpower to consider developing a new grid backbone (perhaps a 500kV system) to overlay and support the existing 220 kV system.

Transpower response: *Transpower thanks participants for their feedback and we agree with all points made.*



In terms of WQL comments, we note that NZGP Stage 2 will further study the grid backbone implications of Taranaki offshore wind.

Q10 Do you agree that our choice of preferred option is robust against sensitivity analysis

Most submitters were in agreement.

MEUG noted the sensitivity analysis do not materially alter the net present value of the net benefits from Option 10 (the preferred option). This value is \$63 million in Table 20 and varies between \$48 million and \$67 million for the sensitivity analysis. MEUG suggests the sensitivity tests may therefore not be affecting key drivers of the project benefit.

Helios submitted that there should be more Tiwai sensitivities including a Tiwai remains indefinitely scenario.

Transpower response: *Transpower thanks participants for their feedback.*

With respect to MEUG’s submission, as noted in our response to Q1 in section 3.5, we believe our analysis is conservative and the benefits are likely higher. It could also be that the flows over the HVDC and CNI do not vary as much as might be expected because these are backbone grid elements of the grid. Either way, our approach to this analysis possibly misses some benefits and the lack of sensitivity of the economic results is pointing toward the proposal being robust under our approach.

Since our short-list consultation we have included a Tiwai leaves in 2027 sensitivity and a Tiwai leaves in 2034 sensitivity, but not a Tiwai remains (until after 2050) sensitivity.



