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1 Executive Summary

- 1. Transpower is seeking feedback on:
 - our proposal to treat the Central North Island (CNI), High Voltage Direct Current (HVDC)
 Reactive Support and Wairakei components of the Net Zero Grid Pathways 1 major
 capex project (staged) (NZGP1.1) as separate benefit-based investments (BBIs), and
 - our proposed starting BBI customer allocations (starting allocations) for the CNI and HVDC Reactive Support BBIs, calculated under the transmission pricing methodology (TPM).¹ The starting allocations and covered cost for the CNI and HVDC Reactive Support BBIs will be used to calculate each investment's benefit-based charges (BBCs).

1.1 Net Zero Grid Pathways Phase 1

- 2. Net Zero Grid Pathways (NZGP)² is our project to develop plans for evolving the transmission grid as New Zealand pursues a goal of achieving net zero carbon emissions by 2050. In December 2022, we submitted our major capex project (MCP) proposal for NZGP Phase 1 (MCP proposal) to the Commerce Commission (Commission).³ We expect the Commission to publish and commence consultation on its draft decision on whether to approve the MCP proposal in May 2023, and to make its final decision later in 2023.
- 3. The MCP proposal takes a staged approach aimed at enhancing the grid backbone prior to 2035. Staging allows us to start investing, while continuing to refine the scope and costing of projects that will not commence until the late 2020s. The MCP proposal seeks approval to recover the costs of investing to deliver the shorter-term initiatives (NZGP1.1), and funding to investigate further longer-term planning issues and larger investments (NZGP1.2 and possible NZGP1.3).
- 4. The proposed BBIs comprised in NZGP1.1 are as follows:
 - HVDC Reactive Support BBI: New reactive plant at Haywards to enhance the availability of maximum transfer over the HVDC (\$103m).
 - CNI BBI: Tactical thermal upgrades (TTUs) of the Tokaanu-Whakamaru and Bunnythorpe-Tokaanu lines and duplexing of the Tokaanu-Whakamaru lines, and other components⁴ to enhance the capacity of transfer through the central North Island (CNI) (\$257m).

The TPM, as published by the Electricity Authority (**Authority**), is at https://www.ea.govt.nz/documents/1812/New-TPM.pdf.

Net Zero Grid Pathways (transpower.co.nz).

NZGP1 submission (transpower.co.nz).

Implementing VLR and TTU of the 220 kV Bunnythorpe-Tokaanu A and B circuits, splitting the 110 kV Bunnythorpe-Ongarue A circuit at Ongarue, upgrading protection on the 220 kV Huntly – Stratford 1 circuit on the Huntly-Taumaranui A line and Stratford-Taumaranui A line, and replacing the special protection scheme at Tokaanu.

- Wairakei BBI: TTU of the Wairakei-Whakamaru C line to enhance the capacity of the Wairakei Ring and TTU of the Edgecumbe-Kawerau 220 kV circuit (\$23m).
- 5. Shortly before we submitted the MCP proposal to the Commission, we confirmed the Wairakei investment has an expected cost of \$23m and is therefore expected to exceed the \$20m high-value BBI threshold. We are not consulting on the Wairakei BBI allocations at this stage as we are yet to progress the modelling for it. We plan to calculate and consult on allocations for the Wairakei Ring later in 2023.

1.2 Feedback requested and next steps

- 6. This consultation requests your feedback on the proposed starting allocations for high-value post-2019 BBIs.⁵ We welcome any feedback on:
 - our proposal to treat the CNI, HVDC Reactive Support and Wairakei investments as separate BBIs; and
 - our application of the TPM's price-quantity method to calculate the proposed starting allocations for the CNI and the HVDC Reactive Support BBIs.
- 7. Following consideration of feedback from this consultation, and subject to the Commission's decision whether to approve the MCP proposal, we will finalise our calculation of the starting allocations for the CNI and HVDC Reactive Support BBIs.
- 8. This is the first time we have consulted on BBI proposed customer allocations when the investment decision by the Commission is unknown. However, following implementation of the new TPM, under which individual customer expected benefits determine cost allocations, the initial pricing information may be useful to inform stakeholders' submissions to the Commission's consultation process on the MCP proposal. Should the Commission's process result in changes to the MCP, we may need consult again on new proposed customer allocations. We welcome any feedback you may have on our consultation timing and approach.

1.3 Applying the TPM to the CNI and HVDC Reactive Support BBIs

9. The CNI and HVDC Reactive Support BBIs are both high-value post 2019 BBIs because the expected value of the assets comprised in each investment exceeds \$20m. Transpower must use a standard method under the TPM to determine its beneficiary⁶ customers and calculate their starting BBI customer allocations, because the CNI and HVDC Reactive Support BBIs will be high-value post-2019 BBIs.

The TPM requires us to consult publicly on proposed starting allocations for high-value BBIs. A high-value BBI is an investment we make in the interconnected grid that is expected to cost more than the base capex threshold as defined in the Transpower Capex IM (currently \$20m).

⁶ A 'beneficiary' under the TPM being a customer that receives a positive customer allocation for a BBI.

- 10. Our proposal is that the CNI and HVDC Reactive Support investments (and the Wairakei investment) should be treated as separate BBIs. This is because the investments:
 - are in different electrical regions of the grid i.e. the link between the North and South Islands (HVDC Reactive Support project) vs. the central North Island (CNI project) and the region north of Taupo (Wairakei project), and therefore are likely to have different beneficiaries;⁷
 - have different periods in which the benefits accrue to beneficiaries in addition to the CNI BBI's benefits resulting from relieving constraints, an important aspect of the CNI BBI's benefits results from it reducing transmission losses which occur whenever power is flowing through the CNI. The HVDC Reactive Support BBI only provides benefits when flow is approaching the existing capacity of the HVDC; and
 - have different expected commissioning dates.⁸
- 11. Transpower is required to apply the price-quantity method to both the CNI and HVDC Reactive Support BBIs. The price-quantity method must be used for all high-value post-2019 BBIs that are not resiliency BBIs. There are no material resiliency risks being mitigated by the CNI or the HVDC Reactive Support BBIs, therefore they are not resiliency BBIs.
- 12. We have used the modelling assumptions and inputs from the MCP proposal to calculate the starting allocations for the CNI and HVDC Reactive Support BBIs.

1.4 Proposed regional customer groups and regional allocations

13. Tables 1 and 2 show the proposed regional customer groups and the regional allocation each group receives. Table 3 shows the proposed starting allocations for both the CNI and HVDC Reactive Support BBIs.

Table 1: CNI BBI: Proposed regional customer groups and regional allocations

Proposed regional customer group	Proposed regional allocation (2 d.p.)
Upper North Island Load	56.12%
Lower North Island Wind and Cogeneration	7.04%
Lower North Island Run-of-River Hydro and Solar Generation	1.90%
Lower North Island Peaking Generation	0.14%

For example, we expect generators in the Wairakei region will benefit from the Wairakei Ring but not the HVDC Reactive Support or CNI projects.

The majority of the assets that make up the HVDC Reactive Support, CNI, and Wairakei investments are expected to be commissioned by 2026, 2027, and 2024 respectively – see section 3.3.5 of NZGP1

Attachment D – Scenario and Modelling Report.



Lower North Island Generation with Embedded Load	0.08%
South Island Controlled Hydro Generation	34.62%
South Island Run-of-River Hydro, Wind, and Solar Generation	0.11%

Table 2: HVDC Reactive Support BBI: Proposed regional customer groups and regional allocations

Proposed regional customer group	Proposed regional allocation (2 d.p.)
North Island Load	57.33%
South Island Hydro Generation	42.54%
North Island Load with Embedded Generation	0.14%

1.5 Proposed starting BBI customer allocations

14. Table 3 shows the proposed starting allocations for both the CNI and HVDC Reactive Support BBIs.

Table 3: Proposed starting allocation for the CNI and HVDC Reactive Support BBIs

Customer Name	CNI proposed starting allocation (2 d.p.)	Customer Name	HVDC proposed starting allocation (2 d.p.)
Vector Ltd	28.08%	Meridian Energy Ltd	29.48%
Meridian Energy Ltd	24.05%	Vector Ltd	22.28%
Powerco Ltd	7.89%	Powerco Ltd	11.52%
Contact Energy Ltd	7.75%	Contact Energy Ltd	9.39%
Unison Networks Ltd	4.37%	Wellington Electricity Lines Ltd	5.81%
Genesis Energy Ltd	3.64%	Unison Networks Ltd	3.47%
WEL Networks Ltd	3.27%	WEL Networks Ltd	2.60%
Northpower Ltd	2.53%	Genesis Energy Ltd	2.44%

Customer Name	CNI proposed starting allocation (2 d.p.)	Customer Name	HVDC proposed starting allocation (2 d.p.)
Counties Power Ltd	1.98%	Northpower Ltd	2.01%
Mercury SPV Ltd	1.79%	Counties Power Ltd	1.57%
MEL (West Wind) Ltd	1.62%	New Zealand Steel Ltd	1.20%
New Zealand Steel Ltd	1.51%	Waipa Networks Ltd	1.09%
Waipa Networks Ltd	1.38%	Pan Pac Forest Product Ltd	1.08%
Pan Pac Forest Product Ltd	1.36%	Manawa Energy Ltd	1.00%
Tararua Wind Power	1.30%	Horizon Energy Distribution Ltd	0.94%
Horizon Energy Distribution Ltd	1.19%	Electra Ltd	0.81%
Manawa Energy Ltd	1.08%	Eastland Network Ltd	0.77%
Waverly Wind Farm Ltd	1.07%	The Lines Company Ltd	0.66%
Eastland Network Ltd	0.97%	Winstone Pulp International	0.59%
MEL (Te Apiti) Ltd	0.76%	Centralines Ltd	0.31%
Winstone Pulp International	0.74%	Scanpower Ltd	0.22%
The Lines Company Ltd	0.72%	Beach Energy Resources NZ (Holdings) Ltd	0.19%
Whareroa Cogeneration Ltd	0.49%	Methanex New Zealand Ltd	0.13%
KiwiRail Holdings Ltd	0.13%	Aurora Energy Ltd	0.11%
Nova Energy Ltd	0.12%	KiwiRail Holdings Ltd	0.11%
Aurora Energy Ltd	0.09%	OMV NZ Production Ltd	0.10%
Westpower Ltd	0.07%	Westpower Ltd	0.09%
Alpine Energy Ltd	0.03%	Alpine Energy Ltd	0.04%



Customer Name	CNI proposed starting allocation (2 d.p.)	Customer Name	HVDC proposed starting allocation (2 d.p.)
Southdown Cogeneration Ltd	0.01%	Top Energy Ltd	0.02%
Southpark Utilities Ltd	0.00% ⁹	Southdown Cogeneration Ltd	0.01%
		Southpark Utilities Ltd	0.00% ¹⁰

Southpark Utilities has a starting allocation of 0.001% when rounded to 3 d.p. Southpark Utilities has an allocation of 0.001% when rounded to 3 d.p.

2 Purpose

- 16. The purpose of this consultation is to seek feedback on: (i) our proposal to treat CNI, HVDC Reactive Support and Wairakei as separate BBIs, and (ii) the proposed starting allocations for the CNI and HVDC Reactive Support components of the NZGP1.1, calculated under the TPM.
- 17. The proposed BBIs comprised in NZGP1.1 are as follows:
 - **HVDC Reactive Support BBI:** New reactive plant at Haywards to enhance the availability of maximum transfer over the HVDC (\$103m).
 - **CNI BBI:** Tactical thermal upgrades (TTUs) of the Tokaanu-Whakamaru and Bunnythorpe-Tokaanu lines and duplexing of the Tokaanu-Whakamaru lines, and other components¹¹ to enhance the capacity of transfer through the central North Island (CNI) (\$257m).
 - Wairakei BBI: TTU of the Wairakei-Whakamaru C line to enhance the capacity of the Wairakei Ring and TTU of the Edgecumbe-Kawerau 220 kV circuit (\$23m).
- 18. Shortly before we submitted the MCP proposal to the Commission, we confirmed the Wairakei investment has an expected cost of \$23m and is therefore expected to exceed the \$20m high-value BBI threshold. We are not consulting on the Wairakei BBI allocations at this stage as we are yet to progress the modelling for it. We plan to calculate and consult on allocations for the Wairakei Ring later in 2023.¹²
- 19. The CNI and HVDC Reactive Support investments are both post-2019 BBIs because they will be commissioned after 23 July 2019. The CNI and HVDC Reactive Support BBIs are both high-value post-2019 BBIs because their estimated capital costs when fully commissioned are more than \$20m. Under the TPM we are required to publicly consult on the proposed starting allocations for high-value post-2019 BBIs.
- 20. This is our third consultation on the application of the price-quantity method, but the first for which the Commerce Commission had not already approved the project before the TPM came into effect on 1 April 2022. We have previously consulted on the application of the



Implementing VLR and TTU of the 220 kV Bunnythorpe-Tokaanu A and B circuits, splitting the 110 kV Bunnythorpe-Ongarue A circuit at Ongarue, upgrading protection on the 220 kV Huntly – Stratford 1 circuit on the Huntly-Taumaranui A line and Stratford-Taumaranui A line, and replacing the special protection scheme at Tokaanu.

Our MCP proposal submitted to the Commerce Commission (https://www.transpower.co.nz/about-us/our-strategy/net-zero-grid-pathways/nzgp-phase-one/nzgp1-submission) includes indicative covered costs and starting BBI customer allocations and indicative charges, but for the Wairakei BBI we had not done the modelling necessary to determine indicative allocations for the Wairakei BBI as a high-value BBI, so we treated it as low-value for the purpose of providing indicative allocations and charges for our major capex proposal.

- price-quantity method for the Clutha and Upper Waitaki Lines Project (**CUWLP**)¹³ and HVDC Pole 2 Converter Transformer Refurbishment (**Pole 2 Refurbishment**).¹⁴
- 21. We have defined some terms in this consultation paper for convenience. Please also reference the glossary in the BBC assumptions book (assumptions book), which we have applied to calculate the proposed starting allocations.¹⁵ Other terms used in this consultation package have the meanings given to them in the TPM. All clause references are to clauses in the TPM, unless stated otherwise.
- 22. Part D of the TPM and chapter 3 of the assumptions book are relevant to the calculation of covered cost and starting BBI customer allocations. You may also wish to refer to our TPM information sheets on covered cost and the standard methods for calculating BBCs.¹⁶

Transpower, Determination of the starting customer allocations for the Clutha Upper Waitaki Lines Project (**CUWLP**) benefit-based investment (BBI) at: https://www.transpower.co.nz/our-work/industry/grid-pricing/transmission-pricing-methodology/tpm-benefit-based-investment.

Transpower, Proposed starting BBI customer allocations for HVDC Pole 2 refurbishment, available at: https://www.transpower.co.nz/our-work/industry/grid-pricing/transmission-pricing-methodology/tpm-current-consultations

Transpower, TPM Determination: BBC Assumptions Book v1.1, 16 March 2023, available at: https://www.transpower.co.nz/our-work/industry/grid-pricing/transmission-pricing-methodology/tpm-benefit-based-investment.

[&]quot;Information sheet on benefit-based charges: Covered cost" and "Information sheet on benefit-based charges: Standard methods" are available at: About the TPM | Transpower.

3 Consultation process and scope

3.1 Consultation package

- 23. This consultation package comprises:
 - this consultation paper;
 - the draft record for the CNI BBI;
 - the draft record for the HVDC Reactive Support BBI;
 - technical assurance on aspects of the method and calculations for the proposed starting allocations, from KPMG and EY, as explained in section 12 below;
 - legal assurance on the compliance of this consultation package with the assumptions book and TPM, from Chapman Tripp, as explained in section 12 below;
 - the post-processing models used for calculating the NZGP1.1 CNI and HVDC Reactive Support BBI's respective proposed starting allocations, which include the intra-regional allocators, as explained in the draft records; and
 - summaries of modelling data outputs and inputs from the wholesale market model, as explained in the draft records.

3.2 Additional information

24. For additional information on the NZGP project, including the CNI, HVDC Reactive Support and Wairakei investments, refer to our MCP proposal submitted to the Commission.¹⁷ The proposal includes indicative covered costs and starting BBI customer allocations¹⁸ and indicative charges.¹⁹ Please note that the calculations included with the MCP proposal were not at the level of detail we have applied when determining proposed starting BBI customer allocations for this consultation.



https://www.transpower.co.nz/about-us/our-strategy/net-zero-grid-pathways/nzgp-phase-one/nzgp1-submission.

NZGP1 MCP ATTACHMENT F - Indicative covered costs and starting BBI customer allocations.

¹⁹ NZGP1 MCP ATTACHMENT G - Indicative Charges.

3.3 Consultation process

- 25. The consultation period is 6-weeks commencing Thursday 27 April 2023. Submissions are due by 5pm on Thursday 8 June 2023. This is followed by a 2-week period for cross-submissions. Cross-submissions are due by 5pm Thursday 22 June 2023.
- 26. Please send submissions and cross-submissions to tpm@transpower.co.nz. We will acknowledge receipt of all submissions and cross-submissions. Submissions and cross-submissions will be published on our website at https://www.transpower.co.nz/our-work/industry/grid-pricing/transmission-pricing-methodology/tpm-current-consultations.
- 27. If your submission or cross-submission contains confidential material, please ensure this is clearly identified and provide a version of your submission or cross-submission that can be published.
- 28. Please note that all information provided to Transpower is subject to potential disclosure under the Official Information Act 1982.
- 29. If you have any questions about this consultation, please send them to tpm@transpower.co.nz. Your questions and our responses to them will be published on our website for reference by other submitters and stakeholders.²⁰

3.4 Feedback sought

- 30. For the avoidance of doubt, matters relating to the efficacy or merits of the TPM or whether the Commission should approve the NZGP1.1 investment proposal are outside the scope of this consultation. Likewise, the estimated covered cost and indicative BBCs are for your information only and not part of the consultation.
- 31. We welcome any feedback on: (i) our proposal to treat the CNI, HVDC Reactive Support and Wairakei investments as separate BBIs; and (ii) our application of the price-quantity method to calculate the proposed starting allocations for the CNI and the HVDC Reactive Support BBIs, including responses to the following questions:
 - Q1. Do you agree that the CNI, HVDC Reactive Support and Wairakei investments should be treated as separate BBIs?
 - Q2. Do you agree with the proposed regional customer groups for the CNI and the HVDC Reactive Support BBIs?
 - Q3. Do you consider our application of the price-quantity method to the CNI and HVDC Reactive Support BBIs is consistent with the TPM and the assumptions book?



Papers and supporting material relating to TPM current consultations are online at https://www.transpower.co.nz/our-work/industry/grid-pricing/transmission-pricing-methodology/tpm-current-consultations.

- Q4. Is there any aspect of our application of the price-quantity method for which you think there is a better way to achieve consistency with the TPM and the assumptions book?
- Q5. Do you consider the intra-regional allocators we have used to be correct and accurate?
- Q6. Do you have any other comments on our application of the price-quantity method?

3.5 Next steps

- 32. Following consideration of feedback from this consultation, and the Commission's decision whether to approve the MCP proposal, we will finalise our calculation of the starting allocations for the CNI and HVDC Reactive Support BBIs. We expect the Commission to make its final decision on the MCP proposal later in 2023.
- 33. In our analysis, we have used the expected commissioning dates of the CNI and HVDC Reactive Support BBIs as at the time of the proposal. It is possible these dates may change as we get better information on operational matters such as procurement timeframes and outage windows, or as a result of the Commission's evaluation process. Consequently, we may update expected commissioning dates in our final calculation of the starting allocations. We do not expect commissioning date assumptions to materially impact the beneficiaries or allocations.
- 34. If the MCP is approved as proposed, we expect to commission the HVDC Reactive Support BBI investment during 2027 and the CNI BBI progressively between 2024 and 2028. The BBCs for the BBIs will commence in the pricing year commencing from April in the year after the financial year (ending June) in which the relevant assets are commissioned.

4 The NZGP1.1 Major Capex Project

- 36. NZGP is our project to develop plans for evolving the transmission grid as New Zealand pursues a goal of achieving net zero carbon emissions by 2050. It aims to ensure the grid backbone has enough capacity to accommodate new renewable generation and maintain a secure and reliable supply of electricity. It has two phases:
 - Phase 1 enhance the existing grid backbone to 2035
 - Phase 2 address the likely need for a larger grid backbone with new interconnections beyond 2035 (including regional grid developments)
- 37. We submitted our MCP proposal to the Commission in December 2022.²¹
- 38. We have proposed NZGP as a **major capex project (staged)**.²² Staging allows us to start investing, while continuing to refine the scope and costing of projects that will not commence until the late 2020s. The MCP proposal seeks approval to recover the costs of investing to deliver the shorter-term initiatives (**NZGP1.1 proposal**), and funding to investigate further longer-term planning issues and larger investments (NZGP1.2 and possible NZGP1.3).
- 39. The proposed BBIs relate to grid outputs proposed for NZGP1.1 as summarised in Table 4 below: ²³

Table 4: NZGP1.1 BBIs at a glance

NZGP1.1 BBIs at a glance

What:

Enable efficient dispatch of new generation and a reliable supply for future demand growth over the interconnected grid through investing in:

HVDC investment (HVDC Reactive Support BBI)

Purpose: To increase HVDC transfer capacity north from 1070 MW to 1200 MW

• Implement new +/-60 MVAr continuous/120 MVAr overload STATCOM, +49MVAr filter bank, bus extension and associated equipment.

Central North Island (CNI) investments (CNI BBI)

Purpose: To increase transfer capacity north from Bunnythorpe by between 60% and 90%:



Net Zero Grid Pathways 1, Major Capex Proposal (Staged), 2 December 2022.

Transpower-capital-expenditure-input-methodology-determination-consolidated-29-January-2020.pdf (comcom.govt.nz): "major capex project (staged) means a major capex project consisting of two or more projects and includes any major capex project that is a continuation of an existing major capex project (staged)".

Net Zero Grid Pathways 1, Major Capex Proposal (Staged), 2 December 2022 in which Table 1 summarises the proposed NZGP1.1 grid outputs. For this consultation paper, we have excluded from Table 1 the preparatory work components because approval of preparatory grid outputs will not result in a BBI. Approval to invest in BBIs resulting from the preparatory works is expected to be sought as NZGP1.2 and possibly NZGP1.3.

NZGP1.1 BBIs at a glance

- Implement Variable Line Rating and tactical thermal upgrade (TTU) of both 220 kV circuits on the Tokaanu-Whakamaru A and B lines to 95°C
- Duplex the 220 kV Tokaanu-Whakamaru A and B circuits with Goat conductor to operate at a maximum temperature of 120°C
- Implement VLR and TTU of the 220 kV Bunnythorpe-Tokaanu A and B circuits to 95°C
- Split the 110 kV Bunnythorpe-Ongarue A circuit at Ongarue
- Upgrade protection on the 220 kV Huntly Stratford 1 circuit on the Huntly-Taumaranui A line and Stratford-Taumaranui A line, between Huntly and Stratford
- Replace the special protection scheme at Tokaanu

Wairakei investments (Wairakei BBI)

Purpose: To increase Wairakei Ring transmission capacity by 25% (300 MW) under typical operating conditions:

- TTU the 220 kV Wairakei-Whakamaru C circuits to 100oC
- TTU of the 220 kV Edgecumbe-Kawerau 3 circuit on the OHK-EDG A and KAW-DEV A lines between Edgecumbe and Kawerau to 90°C

When:	Commence work as soon as funding is approved. Commissioning date assumption: 30 June 2028
How much:	Major capex allowance: \$393.0 million.
Incentive elements:	Major capex incentive rate: 15% Exempt major capex: none
Approval expiry	31 December 2030

- 40. Shortly before we submitted the MCP proposal to the Commission, we confirmed the Wairakei investment is expected to exceed the \$20m high-value BBI threshold. We are not consulting on the Wairakei BBI allocations at this stage as we are yet to progress the modelling for it.
- 41. The Commission is currently considering our MCP and has not yet consulted on the matter. We previously signalled to stakeholders our intention to consult on customer allocations prior to the Commission consultation and draft decision on whether to approve the investment.²⁴ Our aim in consulting now is to ensure stakeholders have information about the allocation they are likely to receive prior to the Commission's consultation.
- 42. We expect the Commission to publish and commence consultation on its draft decision on whether to approve that proposal in May 2023, and to make its final decision later in 2023.

TPM Consultation Schedule (v3 Jan 2023).



date:

5 Applying the TPM to the CNI and HVDC Reactive Support BBIs

5.1 Determine if project has >1 BBI

- 43. We applied paragraph 219 of the assumptions book to consider whether the CNI, HVDC Reactive Support and/or Wairakei components of NZGP1.1 should be combined. Consistent with the assumptions book, we consider that the CNI, HVDC Reactive Support and Wairakei investments should each be treated as separate BBIs because:
 - are in different electrical regions of the grid i.e. the link between the North and South Islands (HVDC Reactive Support project) vs. the central North Island (CNI project) and the region north of Taupo (Wairakei project), and therefore are likely to have different beneficiaries;²⁵
 - have different periods in which the benefits accrue to beneficiaries in addition to the CNI BBI's benefits resulting from relieving constraints, an important aspect of the CNI BBI's benefits results from it reducing transmission losses which occur whenever power is flowing through the CNI. The HVDC Reactive Support BBI only provides benefits when flow is approaching the existing capacity of the HVDC; and
 - have different expected commissioning dates.²⁶
- 44. We have not included NZGP1's proposed upgrade of the HVDC to 1400 MW as part of the HVDC Reactive Support BBI or the proposed reconductoring of the Brunswick-Stratford A line as part of the CNI BBI as these projects are part of a second stage of NZGP1 (NZGP1.2) for which we are not currently seeking approval from the Commission.

5.2 CNI and HVDC Reactive Support are both high-value BBIs

45. Because the CNI and HVDC Reactive Support BBIs would be high-value post-2019 BBIs, Transpower must use a standard method under the TPM to determine its beneficiary customers and calculate their starting BBI customer allocations.



For example, we expect generators in the Wairakei region will benefit from the Wairakei Ring but not the HVDC Reactive Support or CNI projects.

The majority of the assets that make up the HVDC Reactive Support, CNI, and Wairakei investments are expected to be commissioned by 2026, 2027, and 2024 respectively – see section 3.3.5 of NZGP1

Attachment D – Scenario and Modelling Report.

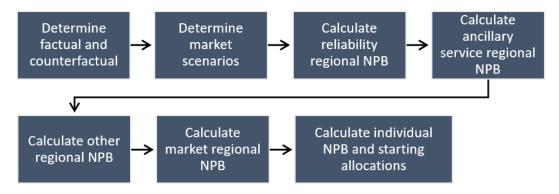
5.3 We are required to apply the price-quantity method

- 46. The price-quantity method is required to be used for all high-value post-2019 BBIs that are not resiliency BBIs.
- 47. We have used the price-quantity method (one of two standard methods in the TPM) for the CNI and HVDC Reactive Support BBIs because they are not resiliency BBIs their primary investment need is to alleviate, or prevent, transmission constraints that would affect quantities and prices in the wholesale market for electricity, not to mitigate a risk of cascade failure or a high impact, low probability event.

5.4 Application of the price-quantity method

- 48. The draft records contain detailed description of our application of the TPM to calculate proposed starting allocations for the CNI and HVDC Reactive Support BBIs. Our application of the price-quantity method follows the assumptions book. This section contains an overview of the draft records.
- 49. The price-quantity method involves the following steps, which are summarised below.

Figure 1: Steps in the price-quantity method



5.5 Clause 51 v 52

- 50. Within the price-quantity method there are two options for calculating market regional NPB arising from changes in the wholesale market for electricity. The default option is to calculate market regional NPB based on quantities during periods of benefit (clause 51). The alternative option uses both quantities and prices to calculate market regional NPB (clause 52).
- 51. The criteria for choosing between clauses 51 and 52, and the way in which we apply those criteria, are set out in section 3.3.6.7 of the assumptions book. Broadly, we are required to use clause 51 (the default method) to calculate market regional NPB unless certain conditions are met, as specified in clauses 51 and 52.
- 52. Having considered the matters in paragraphs 301 to 303 of the assumptions book, we have determined clause 51 does produce starting allocations that are broadly proportionate to



- expected positive net private benefit (**EPNPB**) from the CNI and the HVDC Reactive Support BBIs.
- 53. Section 8.5 of the draft record contains more information and sets out our assessment of which clause applies. We have applied clause 51 for the both the CNI and HVDC Reactive Support BBIs.

5.6 Key modelling inputs

- 54. The key modelling assumptions and inputs we have used in our application of the pricequantity method to the CNI and HVDC Reactive Support BBIs are as follows:
 - We have used the market scenarios from the NZGP1.1 proposal, as described in the MCP proposal Attachment D.²⁷ Unless otherwise stated in section 4.2 of Attachment D, these are consistent with the assumptions in the assumptions book.
 - In the application of the investment test to NZGP1.1, the Tiwai Point aluminium smelter (**Tiwai**) is assumed to close in December 2024, with a sensitivity of Tiwai closing in 2034 (as noted in section 1.5.1 of the MCP proposal). Therefore, we have included this sensitivity in our application of the standard method. The NZGP1.1 proposal did not assess any other sensitivities relating to the market scenarios. On the basis that we do not consider any other sensitivities meet the assumptions book criteria at section 3.3.2.6 and for consistency with the assumptions used in the application of the investment test, we have not used any other sensitivities (consistent with clause 43(5)).
 - We have used the generation scenarios from the application of the investment test, rather than re-running our generation expansion model specifically for the application of the TPM.
 - There are some differences relating to the network assumptions used to calculate the starting allocations compared to those used in the investment test. These were chosen either to comply with the TPM and assumptions book, or to isolate benefits to the CNI or HVDC Reactive Support BBIs given these are modelled as separate BBIs (whereas the investment test modelled all projects in a single analysis).
 - Expected market benefits and disbenefits have been discounted at a rate of 7% per annum (the standard method discount rate), which is the same as the discount rate used in the application of the investment test.
 - The majority of the assets that make up the CNI and HVDC Reactive Support BBIs are expected to have useful lives of greater than 20 years. Therefore, we used a 20-year standard method calculation period (the maximum possible standard method calculation period), beginning on 1 January 2028 for the CNI BBI, and 1 January 2027 for the HVDC

NZGP1 Attachment D – Scenario and Modelling Report, December 2022.

Reactive Support BBI – the first 1 January after the expected effective full commissioning date of each BBI.²⁸

5.7 Types of benefits

- 55. Transpower's draft assessment is that the benefits from the CNI and HVDC Reactive Support BBIs are wholesale electricity market benefits only:
 - Reliability benefits: We do not expect either of the two BBIs to have reliability benefits
 (as defined in the TPM and assumptions book) relative to the counterfactual because
 the investment does not increase the redundancy of supply to any grid points of
 connection (it adds no new lines or circuits).
 - The only other reliability benefit associated with the HVDC would relate to avoiding an AUFLS²⁹ event. Increased transfer across the HVDC does not affect the likelihood of AUFLS being activated (assuming the HVDC would be the reserves risk setter at its maximum transfer level in both the factual and counterfactual) so the investment does not materially reduce the extent or duration of any potential interruption to supply. This assumption is consistent with our application of the investment test for the HVDC Reactive Support BBI.
 - Ancillary service benefits: We do not expect either of the two BBIs to materially reduce the cost allocated to our customers of any specified ancillary service (through changes in price or quantity).
 - Market benefits: We expect both the BBIs to have material impacts on prices and/or dispatch quantities in the wholesale electricity market because they significantly alleviate constraints that would apply in the wholesale electricity market in the counterfactual.
 - Other benefits: We do not expect either of the BBIs to have any material or measurable other benefits. Specifically, we do not expect any customer or embedded plant owner to receive benefits other than wholesale electricity market benefits from either of the BBIs.

5.8 TPM requirements for covered cost

56. The cost recovered through the BBCs for a BBI is referred to in the TPM as the BBI's 'covered cost'. A BBI's covered cost is calculated annually, using the same approach for every BBI.

See section 3.3.4 of <u>NZGP1 Attachment D – Scenario and Modelling Report</u>.

Automatic Under Frequency Load Shedding (**AUFLS**) is an under-frequency management tool used to manage power system stability and prevent total system blackouts. The scheme disconnects large blocks of demand in the event of a large loss in energy supply. The automatic disconnection of demand aims to restore the supply-demand balance necessary to maintain the stability of the power system and prevent blackouts.

- 57. The covered cost includes capital components (return on and of investment) and an allocation of Transpower's total operating costs (including overheads). These components are calculated for each pricing year (1 April N to 31 March N+1) using inputs from the previous financial year (1 July N-2 to 30 June N-1). This means the covered cost of a BBI tracks the actual cost of the BBI, with a lag.
- 58. Estimates of the covered cost for the CNI and HVDC Reactive Support BBIs are provided in Appendices A and B respectively.

6 Starting allocations for the CNI BBI

6.1 Regional customer groups

- 59. We applied the process described in section 3.3.6.13 of the assumptions book to determine the proposed regional customer groups.
- 60. The CNI BBI reduces losses on energy transported through the central North Island and reduces transmission constraints in the same region.
- 61. The benefits are primarily to generation upstream and load downstream of constraints.
- 62. By reducing losses and constraints on energy transport through the central North Island, the CNI BBI is expected to deliver positive net private benefits to load north of the investment, and generation south of the investment. This is primarily because the prevailing flow of energy across the interface is south to north, meaning load downstream of the interface will experience lower energy prices due to reduced losses, and generation upstream of the interface will receive higher energy prices and be more competitive with generation downstream as price separation reduces. Similarly, load will disbenefit in the region where generation benefits, and vice versa.
- 63. We applied paragraph 348 of the assumptions book to determine if potential regional customer groups should be combined. As a result of this process, the CNI BBI has several regional customer groups relating to different generation technologies.

Table 5: Proposed regional customer groups and regional allocations

Proposed regional customer group	Proposed regional allocation (2 d.p.)
Upper North Island Load	56.12%
Lower North Island Wind and Cogeneration	7.04%
Lower North Island Run-of-River Hydro and Solar Generation	1.90%
Lower North Island Peaking Generation	0.14%
Lower North Island Generation with Embedded Load	0.08%
South Island Controlled Hydro Generation	34.62%
South Island Run-of-River Hydro, Wind, and Solar Generation	0.11%

6.2 Proposed starting allocations

- 64. We calculated each customer's proposed starting allocation for the CNI BBI as the customer's individual NPB divided by the sum of all customers' individual NPBs. This results in the allocations (to two decimal places) set out in Table 6.
- 65. We note the starting allocations for a BBI are fixed over the lifetime of the BBI, subject to specific adjustment events such as customer or large plant entry or exit.
- 66. Table 6 also shows indicative BBCs for PY 2035/36 for the CNI BBI, which is when we expect the covered cost to peak (at just over \$26.3m). These indicative charges have been arrived at by allocating the estimated covered cost (Appendix 1) in accordance with the proposed starting allocations.
- 67. These BBCs are indicative only. The BBCs for the CNI BBI, which will apply from PY 2025/26 onwards, will be calculated annually based on actual covered cost.
- 68. The actual covered cost for the CNI BBI will not be known until the BBI has been approved and fully commissioned and the assets added into Transpower's asset register, and will vary from year-to-year.

Table 6: Each customer's proposed starting allocation for the CNI BBI

Customer Name	Proposed starting allocation (2 d.p.)	Indicative BBC in PY 2035/36
Vector Ltd	28.08%	\$7,384.7k
Meridian Energy Ltd	24.05%	\$6,325.3k
Powerco Ltd	7.89%	\$2,076.1k
Contact Energy Ltd	7.75%	\$2,038.6k
Unison Networks Ltd	4.37%	\$1,149.3k
Genesis Energy Ltd	3.64%	\$958.6k
WEL Networks Ltd	3.27%	\$860.6k
Northpower Ltd	2.53%	\$665.0k
Counties Power Ltd	1.98%	\$520.6k
Mercury SPV Ltd	1.79%	\$471.5k
MEL (West Wind) Ltd	1.62%	\$426.5k
New Zealand Steel Ltd	1.51%	\$397.1k

Customer Name	Proposed starting allocation (2 d.p.)	Indicative BBC in PY 2035/36
Waipa Networks Ltd	1.38%	\$361.7k
Pan Pac Forest Product Ltd	1.36%	\$357.8k
Tararua Wind Power	1.30%	\$341.9k
Horizon Energy Distribution Ltd	1.19%	\$312.1k
Manawa Energy Ltd	1.08%	\$284.8k
Waverly Wind Farm Ltd	1.07%	\$282.5k
Eastland Network Ltd	0.97%	\$254.5k
MEL (Te Apiti) Ltd	0.76%	\$199.0k
Winstone Pulp International	0.74%	\$195.4k
The Lines Company Ltd	0.72%	\$188.6k
Whareroa Cogeneration Ltd	0.49%	\$129.4k
KiwiRail Holdings Ltd	0.13%	\$33.7k
Nova Energy Ltd	0.12%	\$32.1k
Aurora Energy Ltd	0.09%	\$23.3k
Westpower Ltd	0.07%	\$18.6k
Alpine Energy Ltd	0.03%	\$8.7k
Southdown Cogeneration Ltd	0.01%	\$1.8k
Southpark Utilities Ltd	0.00%30	\$0.4k

 $^{^{\}rm 30}$ Southpark Utilities has a starting allocation of 0.001% when rounded to 3 d.p.

7 Starting allocations for the HVDC Reactive Support BBI

7.1 Regional customer groups

- 69. We applied the process described in section 3.3.6.13 of the assumptions book to determine the proposed regional customer groups.
- 70. The HVDC Reactive Support BBI increases the average operational capacity of the HVDC for flow in both a north and south direction.
- 71. By reducing constraints between the North and South Islands, the HVDC Reactive Support BBI is expected to deliver private benefits to load north of the investment, and generation south of the investment. This is primarily because the prevailing flow of energy across the HVDC is south to north, meaning load in the North Island will experience lower energy prices due to reduced losses, and generation in the South Island will receive higher prices. Similarly, load will disbenefit in the region where generation benefits, and vice versa.
- 72. We applied paragraph 348 of the assumptions book to determine if potential regional customer groups should be combined. As a result of this process, the HVDC Reactive Support BBI has three regional customer groups, as shown below.

Table 7: Proposed regional customer groups and regional allocations

Proposed regional customer group	Proposed regional allocation (2 d.p.)
North Island Load	57.33%
South Island Hydro Generation	42.54%
North Island Load with Embedded Generation	0.14%

7.2 Proposed starting allocations

- 73. We calculated each customer's proposed starting allocation for the HVDC Reactive Support BBI as the customer's individual NPB divided by the sum of all customers' individual NPBs. This results in the allocations (to two decimal places) set out in Table 8.
- 74. We note the starting allocations for a BBI are fixed over the lifetime of the BBI, subject to specific adjustment events such as customer or large plant entry or exit.



- 75. Table 8 also shows indicative BBCs for PY 2029/30 for the HVDC Reactive Support BBI, which is when we expect the covered cost to peak (at just over \$13.5m). These indicative charges have been arrived at by allocating the estimated covered cost (Appendix 2) in accordance with the proposed starting allocations.
- 76. These BBCs are indicative only. The BBCs for the HVDC Reactive Support BBI, which will apply from PY 2028/29 onwards, will be calculated annually based on actual covered cost.
- 77. The actual covered cost for the HVDC Reactive Support BBI will not be known until the BBI has been approved and fully commissioned and the assets added into Transpower's asset register, and will vary from year-to-year.

Table 8: Each customer's proposed starting allocation for the HVDC Reactive Support BBI

Customer Name	Proposed starting allocation (2 d.p.)	Indicative BBC in PY 2029/30			
Meridian Energy Ltd	29.48%	\$3,979.7k			
Vector Ltd	22.28%	\$3,007.5k			
Powerco Ltd	11.52%	\$1,554.7k			
Contact Energy Ltd	9.39%	\$1,267.5k			
Wellington Electricity Lines Ltd	5.81%	\$784.7k			
Unison Networks Ltd	3.47%	\$468.1k			
WEL Networks Ltd	2.60%	\$350.5k			
Genesis Energy Ltd	2.44%	\$328.9k			
Northpower Ltd	2.01%	\$270.8k			
Counties Power Ltd	1.57%	\$212.0k			
New Zealand Steel Ltd	1.20%	\$161.7k			
Waipa Networks Ltd	1.09%	\$147.3k			
Pan Pac Forest Product Ltd	1.08%	\$145.7k			
Manawa Energy Ltd	1.00%	\$134.9k			
Horizon Energy Distribution Ltd	0.94%	\$127.1k			
Electra Ltd	0.81%	\$108.9k			

Customer Name	Proposed starting allocation (2 d.p.)	Indicative BBC in PY 2029/30			
Eastland Network Ltd	0.77%	\$103.7k			
The Lines Company Ltd	0.66%	\$89.2k			
Winstone Pulp International	0.59%	\$79.6k			
Centralines Ltd	0.31%	\$41.7k			
Scanpower Ltd	0.22%	\$29.1k			
Beach Energy Resources NZ (Holdings) Ltd	0.19%	\$25.6k			
Methanex New Zealand Ltd	0.13%	\$17.0k			
Aurora Energy Ltd	0.11%	\$14.7k			
KiwiRail Holdings Ltd	0.11%	\$14.5k			
OMV NZ Production Ltd	0.10%	\$13.9k			
Westpower Ltd	0.09%	\$11.7k			
Alpine Energy Ltd	0.04%	\$5.5k			
Top Energy Ltd	0.02%	\$2.9k			
Southdown Cogeneration Ltd	0.01%	\$0.8k			
Southpark Utilities Ltd	0.00%31	\$0.2k			

 $^{^{\}rm 31}$ Southpark Utilities has a starting allocation of 0.001% when rounded to 3 d.p.

8 Assurance of the consultation package

- 78. The contents of this consultation package have been subject to independent assurance.
- 79. This consultation package contains assurance for the technical aspects of the consultation package e.g. data inputs and sources.
 - KPMG was engaged by Transpower to assure our determination of the proposed starting
 allocations for the CNI and HVDC Reactive Support BBIs, and associated disclosures in the
 respective draft records, in accordance with the assumptions book and the requirements
 of the TPM.
 - EY was engaged by Transpower to review the outputs of our market model, and to review the discretionary decisions we made in post-processing in accordance with the assumptions book.
- 80. This consultation package contains assurance for the legal aspects of this consultation package. Chapman Tripp assessed legal compliance of this consultation package, specifically whether our draft record complies with the TPM, and whether it is consistent with particular aspects of Transpower's assumptions book.
- 81. Through this consultation process Transpower will consider all submissions and cross-submissions. The assurance letters provided with respect to this consultation package do not limit this in any way.



Appendix A: CNI BBI estimated covered cost

- 82. The initial annual covered cost of the CNI BBI will be confirmed if the project is approved by the Commerce Commission and as part of calculating transmission charges for PY 2025/26.
- 83. The CNI BBI will be commissioned over five years from FY 2023/24 to FY 2027/28, with the majority commissioned by the end of FY 2027/28.
- 84. Our current estimate of the CNI BBI's covered cost into the future relies on a number of estimates including final asset composition and asset values, which we will not know until after the investment is fully commissioned. This section summarises the assumptions and results of our latest estimate of the covered cost for the CNI BBI.
- 85. The key assumptions we have made are:
 - The Commerce Commission approves the CNI project based on the major capex allowance in our proposal.
 - Asset commissioning values and timing are based on forecasts as at 21 November 2022.
 - The accounting and tax depreciation rates used are the weighted average of forecast assets commissioned.
 - WACC (6.83%) and cost of debt (5.39%) for RCP4 are consistent with forecasts used in our published RCP4 consultation document. We have used these same forecasts for RCP5.³²
 - We have assumed that the RCP4 and RCP5 Attributed Opex Ratio (AOR) will be consistent with RCP3.
- 86. Figure 2 and Table 9 summarise the estimated covered cost for the CNI BBI.



RCP4 consultation document: <u>Transpower - RCP4 Consultation</u>, September 2022.

Figure 2: CNI forecast (estimated) covered cost



Table 9: CNI forecast (estimated) covered cost

Pricing year, PY (ending 31 March)	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36
Accounting Depreciation (Da)	-	-	0.6	0.6	1.1	2.7	5.1	5.1	5.1	5.1	5.1	5.1
Capital charge (C)	-	0.1	1.4	2.1	3.6	9.3	17.0	16.6	16.3	15.9	15.6	15.2
Attributed opex component (AO)	-	-	0.6	0.6	1.1	2.8	5.1	5.1	5.1	5.1	5.1	5.1
Sum of Transpower's depreciation tax loss/gain and income tax on the capital charge (Ta)	-	0.0	(0.4)	(0.2)	(0.2)	(0.8)	(1.8)	(1.1)	(0.5)	(0.0)	0.4	0.8
Total forecast covered cost	-	0.1	2.1	3.1	5.7	14.0	25.4	25.7	25.9	26.1	26.2	26.3

Appendix B: HVDC Reactive Support BBI estimated covered cost

- 87. The initial annual covered cost of the HVDC Reactive Support BBI will be confirmed if the project is approved by the Commerce Commission and as part of calculating transmission charges for PY 2028/29.
- 88. The majority of the HVDC Reactive Support BBI is expected to be commissioned by the end of FY 2026/27.
- 89. Our current estimate of the HVDC Reactive Support BBI's covered cost into the future relies on a number of estimates including final asset composition and asset values, which we will not know until after the investment is fully commissioned. This section summarises the assumptions and results of our latest estimate of the covered cost for the HVDC Reactive Support BBI.
- 90. The key assumptions we have made are:
 - The Commerce Commission approves the HVDC Reactive Support project based on the major capex allowance in our proposal.
 - Asset commissioning values and timing are based on forecasts as at 21 November 2022.
 - The accounting and tax depreciation rates used are the weighted average of forecast assets commissioned.
 - WACC (6.83%) and cost of debt (5.39%) for RCP4 are consistent with forecasts used in our published RCP4 consultation document. We have used these same forecasts for RCP5.³³
 - We have assumed that the RCP4 and RCP5 AOR will be consistent with RCP3.
- 91. The covered cost of a BBI incorporating HVDC assets will, once actual BBCs are calculated, include an allocation of the insurance and reserve costs associated with the HVDC link (called HVDC opex in the TPM). Our current estimate of covered cost for the HVDC Reactive Support BBI in this consultation paper does not include any HVDC opex. As noted above, actual covered cost will be confirmed as part of calculating transmission charges for PY 2028/29.
- 92. Figure 3 and Table 10 summarise the estimated covered cost for the CNI BBI.

RCP4 consultation document: <u>Transpower - RCP4 Consultation</u>, September 2022.





Table 10: HVDC Reactive Support forecast (estimated) covered cost

Pricing year, PY (ending 31 March)	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31	2031/32	2032/33	2033/34	2034/35	2035/36
Accounting Depreciation (Da)	-	-	-	-	0.3	3.4	3.4	3.4	3.4	3.4	3.4	3.4
Capital charge (C)	-	-	-	-	0.9	7.0	6.8	6.6	6.3	6.1	5.8	5.6
Attributed opex component (AO)	-	-	-	-	0.3	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Sum of Transpower's depreciation tax loss/gain and income tax on the capital charge (Ta)	-	-	-	-	0.2	(0.4)	(0.2)	0.1	0.3	0.5	0.6	0.8
Total forecast covered cost	-	-	-	-	1.6	13.5	13.5	13.5	13.5	13.5	13.4	13.3

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