

Transmission Pricing Methodology market modelling and application consistency review

Summary report

April 2023

Reliance Restricted

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Ernst & Young Limited ("Ernst & Young" or "EY") was engaged on the instructions of Transpower New Zealand Limited ("Client" or "Transpower") to review Transpower's market modelling outputs used in calculating the Net Zero Grid Pathways Project ("NZGP1") HVDC Reactive Support and Central North Island (CNI) project benefits and to provide an independent review of the consistency of Transpower's application of the Transmission Pricing Methodology ("TPM") with chapter 3 of the Assumptions Book (the "Services") in connection with the TPM, in accordance with the consultancy service order dated 8 November 2022, NZGP1 and P2CTR TPM modelling review.

The results of Ernst & Young's work, including the assumptions and qualifications made in preparing the report, are set out in Ernst & Young's detailed report dated 27 April 2023 ("Management Report"). This report represents a summary of the Detailed Report and outlines key aspects of the Detailed Report. This summary report is hereinafter referred to as the "Report". The Report should be read in its entirety including the applicable scope of the work and any limitations. A reference to the Report includes any part of the Report. Our work commenced on 21 February 2023 and was completed on 27 April 2023. No further work has been undertaken by Ernst & Young since the date of the Report to update it.

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1. Introduction and key findings

This Report will be used for the purpose of providing Transpower management greater comfort around the market modelling of the NZGP1 Benefit Based Investments (BBI) and the application of decision gates when applying the TPM to these BBIs.

This document presents findings from:

- 1. EY's review of Transpower's market modelling outcomes used as input in determining benefit-based investment (BBI) customer allocations, and*
- 2. EY's review of Transpower's application of the Transmission Pricing Methodology (TPM) in determining starting BBI customer allocations. Specifically verifying that section's 3.3.3.6, 3.3.4.5, and 3.3.6.7-3.3.6.13 of the v1.1 Assumption Book (AB) are being followed.*

All results within this document pertain to the Net Zero Grid Pathways, HVDC Reactive Support and Central North Island (CNI) projects. These investments come under the standard method of the TPM as high-value, benefits-based investments.

For clarity, EY had no role in preparing the inputs for the TPM or developing the application of the TPM.

1.1 Market modelling review

EY has conducted a range of agreed upon tests on Transpower's market modelling outcomes and considers the tests pass with results sitting within acceptable tolerance limits. Where there are inconsistencies in test outcomes, a reasonable and logically consistent reason for the observed modelling outcome has been identified.

A summary of each test is provided in the table below:

Test number	Test description
1	Confirm differences in transmission flows into/out of each modelled region are only due to changes in regional generation or regional demand in and between each modelled region.
2	Verify if the sum of generation and deficit is equal to the sum of demand and losses.
3	Verify if transmission flows on the HVDC and CNI circuits, as output by the model in the first year of the horizon, compare well with historical flows during calendar year 2020.
4	Check that during periods where a transmission constraint binds, the price at the bus downstream of the constraint is greater than the price at the bus upstream of the constraint.
5	Confirm that during periods where no transmission constraint is binding, price separation between the North and South Islands is reflective of losses only.
6	Check that the short run marginal cost of un-dispatched thermal generators is greater than the price at the relevant generation pricing node. Furthermore, the SRMC of dispatched thermal generators is less than or equal to the price at the relevant generation pricing node.
7	Check that all generators with SRMC below the region price are fully dispatched (i.e., their output is equal to their maximum available capacity).
8	Check the net present value of revenue for individual new generators and compare it to the NPV of capital cost disbursements. The revenues must be equal to or greater than the capital costs.
9	Check that adding an additional wind generator with low levelised cost of energy does not reduce the objective function of the generation expansion model.

Test number	Test description
10	Check that the generation built by the model during the first modelling year does not materially exceed the amount of generation expected from publicly announced committed projects.
11	Verify if total annual output of existing generators for the first modelling year aligns with observed historical data.
12	Verify that generation output always sits between the minimum and maximum levels specified within the SDDP inputs and are consistent with the Assumptions Book v1.1.
13	Verify that hydro stations with a minimum flow constraint either do not violate the constraint or pay a penalty for a violation.
14	Verify that water is being conserved along the hydro chains within the model.
15	Check the convergence of the SDDP policy calculation.
16	Verify the retirement of thermal generators in the model aligns with the Assumptions Book.
17	For the CNI project only, where AC constraints are enabled, check that losses on the AC circuits are greater in the counterfactual scenario than the factual scenario.

1.2 TPM application review

EY has reviewed Transpower's draft record of the application of the price quantity method for the HVDC Reactive Support and Central North Island Projects.

For the decisions that Transpower has made and that lie within EY's scope of review, EY has observed that Transpower follows a mechanical specification of the Assumptions Book as it relates to the application of the TPM. Where there have been departures from the mechanical application of the assumptions book, or where the assumptions book does not fully specify a decision-making process, the reasoning is clear, well documented, and logically consistent.

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