TRANSPOWER

Huntly–Ōtāhuhu A reconductoring BOB–DRY and HLY–T43 sections

Consultation document

Attachment 1: Demand and Generation Scenarios

June 2026

1 Scenarios

The Huntly–Ōtāhuhu A (HLY–OTA–A) line provides several benefits, including supplying the Bombay substation and supporting reliability in the upper North Island transmission network. For this consultation, we capture part of these benefits using avoided deficit costs, which is sufficient to demonstrate the economic case for reconductoring the relevant sections.

In parallel with consultation, we will undertake electricity market modelling to support the listed project application. This will allow us to calculate broader electricity market benefits and support the calculations needed for indicative pricing allocations.

The purpose of this Attachment is to outline the demand and generation scenarios we propose to use for electricity market modelling. To apply the cost-benefit analysis and calculate indicative pricing allocations for our HLY–OTA–A reconductoring listed project, we must make assumptions about future demand and generation. This Attachment also outlines our proposed variations from the draft Assumptions Book v3.0[1] and explains how they will be used in our analysis.

Approach to developing demand and generation scenarios

We evaluate investment options under a range of market development scenarios. A market development scenario is an internally consistent set of input assumptions that represents a plausible future of the electricity system. Using a range of scenarios ensures our economic analysis is robust to different possible demand and generation futures.

Each market development scenario includes assumptions about:

- future electricity demand, including assumptions regarding base demand, electric vehicle (EV) uptake, solar PV uptake, distributed energy storage, etc.
- existing, decommissioned and future new generation connected to the national grid
- capital and operating costs for existing and future new generation
- fuel availability for generation
- fuel and carbon costs for generation
- grid connected energy storage.

We have used the market development scenarios produced by the Ministry of Business, Innovation and Employment (MBIE) with a number of updates. MBIE's scenarios are called the Electricity Demand and Generation Scenarios (EDGS)[2] and were last updated in July 2024. They consist of five scenarios:

- **Reference:** Current trends continue
- **Growth**: Accelerated economic growth
- **Constraint:** Slower economic growth
- **Environmental:** More ambitious national emissions reduction targets are set than in the Reference scenario
- **Innovation:** Increased rates of development and uptake of new technologies.

For this investigation, we use modified versions of MBIE's 2024 EDGS. Sections 2 and 3 discuss our demand and generation assumptions and approach:

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1 Assumptions Book v3.0 is currently in draft, as discussed in section 4.

2 Electricity Demand and Generation Scenarios (EDGS)

- **Demand assumptions:** MBIE's EDGS 2024 contains mostly national level demand assumptions that we have used to inform the regional and grid exit point (GXP) level forecasts presented below.
- **Generation assumptions:** we propose basing our analysis on the assumptions set out in the Assumptions Book v3.0. The Assumptions Book contains detailed assumptions about generation, including a list of new potential generation projects, assumptions about the decommissioning of plants, fuel cost assumptions, etc. In Section 3 of this attachment, we focus on the regional level generation assumptions most relevant to this project.

2 Demand assumptions

This section presents the Waikato and Upper North Island (WUNI) regional EDGS peak load forecast variations we intend to use for this investigation of the HLY–OTA–A reconductoring listed project.

2.1 Regional forecasts and assumptions

Figures 1 and 2 present our proposed peak load and energy demand forecasts, respectively, for the WUNI region for each of the five EDGS scenarios. Table 1 and Table 2 present the corresponding winter and summer peak load forecasts in 2030, 2040 and 2050, broken down by the factors contributing to that growth:

- Base growth – this relates to the underlying growth in demand driven by factors such as population and economic growth
- Step loads – this relates to new demand that might appear in the future from new developments, such as new commercial and residential developments
- EV – this relates to the uptake of EVs and the "smartness" of their charging
- Solar – this relates to the uptake of residential and commercial solar photovoltaic panels
- Battery – this relates to the uptake of residential and commercial battery storage packs
- Industrial electrification – this relates to the electrification of industrial processes such as the conversion of coal and diesel boilers to electric boilers.

Each scenario has different assumptions for each of these factors that leads to the overall variation in the forecasts. Across the scenarios, the compound annual growth rates between 2026 and 2055 range from 0.8% to 2.2%.

For this investigation, we have focused on the WUNI region which is most relevant for assessing flows on the HLY–OTA–A line. Network demand for WUNI is aggregated across 43 GXPs in the Northland, Auckland and Waikato regions.

Treatment of EDGS and regional refinements

We have used the 2024 EDGS as a basis for the forecasts but we have updated some aspects.

- At a national level we have attempted to align with MBIE's energy forecasts, but we have not attempted to align with MBIE's peak load forecasts. We have detailed models that model demand profiles at a GXP level that we consider better capture the impact of the scenarios on peak demand.

- We have also moderated the speed of process heat electrification in the early years to be more heavily informed by known potential heat electrification steps rather than on scenario level assumptions about the uptake of electrification. The rate of process electrification is high in MBIE's Environmental and Innovation scenarios.
- MBIE's 2024 EDGS demand assumptions are mostly described at a national level. As such, we have allocated the national level assumptions to a regional and GXP level. We have also used updated historical and GXP level information and information from electricity lines businesses to inform the forecasts.

In this way the forecasts are based on MBIE's 2024 EDGS but are variations of those scenarios.

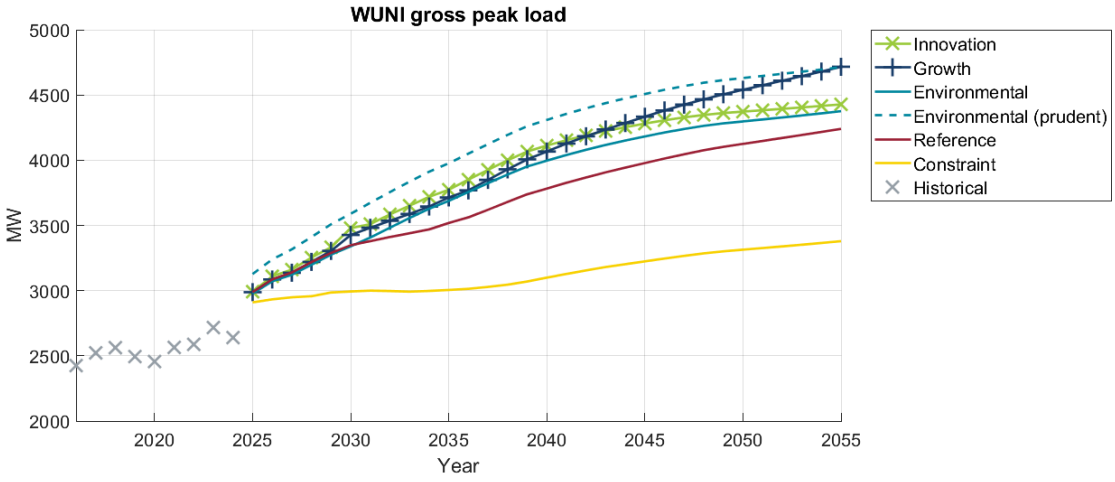

Figure 1: WUNI region peak load forecast, in MW[3]

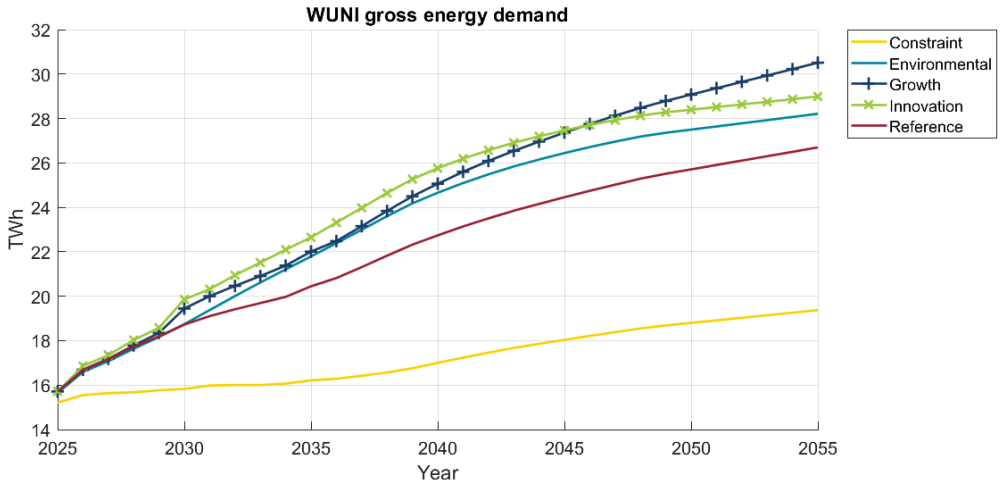

Figure 2: WUNI region gross energy demand forecast, in TWh

[3] Figures 1 and 3 show the peak load, net of embedded generation. The gross load values are represented in the accompanying tables and spreadsheet.

Table 1: WUNI region winter peak demand forecast, in MW

Scenarios	Year	Peak	Base	Step loads[4]	EV	Solar	Battery	Electrification
Innovation	2030	3479	2921.3	426.9	24.9	-0.9	-7.7	15.4
	2040	4112.2	3012.6	677.2	118.4	-5.2	-61.1	287.4
	2050	4372.3	3054.7	677.2	229.8	-3.6	-129.9	468.7
Growth	2030	3426.5	2961.9	369.9	32	0	-7.5	3.1
	2040	4066.4	3223.7	562.6	165.5	-1.4	-47.2	114.9
	2050	4539.9	3406.7	562.6	333.6	-1	-82.5	280.2
Environmental	2030	3339.5	2931.3	369.9	25.2	0	-7.7	5.7
	2040	3996.7	3073.8	562.6	118	-3.5	-61.6	314.9
	2050	4297.2	3127.4	562.6	224.2	-2.6	-131.6	530.4
Reference	2030	3348	2940.2	366.6	24.5	0	-7.4	3.1
	2040	3782.4	3021.9	559.4	144.4	-1.4	-41.7	99.6
	2050	4125.1	3075.7	559.4	310.9	-0.9	-66.2	254.3
Constraint	2030	2993.2	2915.5	56.7	20.2	0	-7.1	3.4
	2040	3099.7	2874.1	62.8	120.4	0	-32.7	68.3
	2050	3313.8	2813.4	62.8	286	0	-42.9	189

[4] We give the maximum demand of each step load instead of their demand at the time of the WUNI peak. This gives a clearer indication of the variation in step loads between scenarios.

Table 2: WUNI region summer peak demand forecast, in MW

Scenarios	Year	Peak	Base	Step loads[5]	EV	Solar	Battery	Electrification
Innovation	2030	3055.6	2540.4	414.9	26.9	-53.6	-5.5	2.3
	2040	3640.5	2571.1	658.9	124.2	-82.4	-47.1	287
	2050	3724.1	2486.8	658.9	227.7	-79.3	-102.7	417.4
Growth	2030	3004.9	2564.6	358.1	34.5	-49.7	-5.2	2
	2040	3540.3	2697.2	545.7	167.3	-68.7	-34.7	133.1
	2050	3779.1	2689.1	545.7	322.7	-71.9	-58.2	261.1
Environmental	2030	2922.3	2540.4	358.1	27	-47.9	-5.5	21.3
	2040	3483.4	2602.2	545.7	122	-76.4	-48.6	311.3
	2050	3601.2	2524	545.7	221.5	-73.5	-105.6	471.8
Reference	2030	2917.2	2548.9	354.9	27.1	-47	-5.1	2
	2040	3324.5	2572.5	542.5	147.4	-61.3	-31	117
	2050	3507.8	2513.2	542.5	292.5	-65.2	-48	241.3
Constraint	2030	2549.3	2508.9	53.4	20.8	-37.5	-5.1	2
	2040	2668.8	2461.6	59.5	117.7	-43	-24.9	83.2
	2050	2799.2	2355.7	59.5	257.9	-42.9	-30.7	185.2

[5] We give the maximum demand of each step load instead of their demand at the time of the WUNI peak. This gives a clearer indication of the variation in step loads between scenarios.

2.2 National demand forecasts reference

Figure 3 and Figure 4 present national demand forecasts.

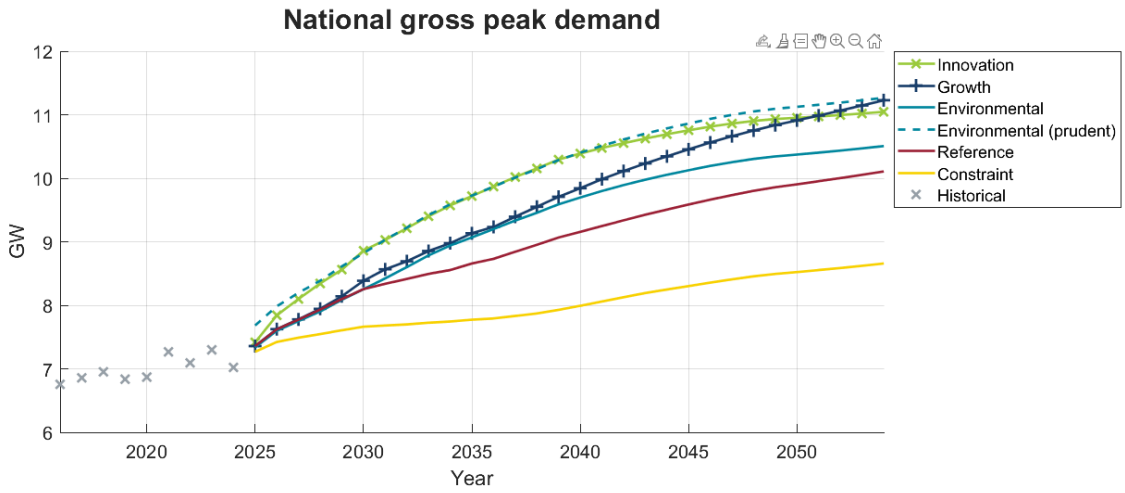

Figure 3: National peak demand forecasts, GW

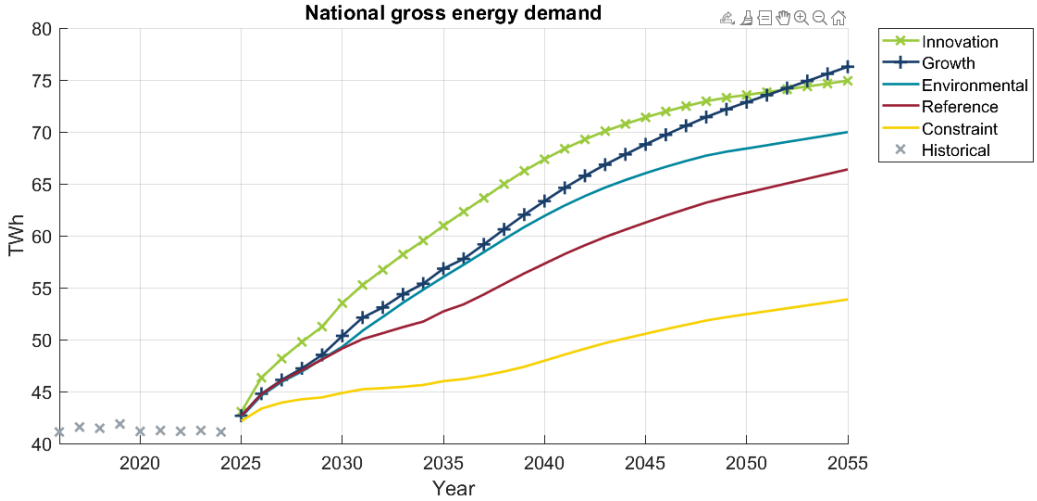

Figure 4: National energy forecasts, annual TWh

Q5. Do you consider our demand assumptions appropriate for this investigation? Please provide us with any information about developments in the region that could help inform our forecasts.

3 Generation assumptions

This section presents information relating to the generation assumptions that we intend to use for this project.

Generation assumptions apply to our:

- **OptGen Generation expansion plan model**, which determines the location, timing, and technology of new (modelled) generation.
- **SDDP wholesale market model**, which simulates the wholesale electricity market by calculating a least cost optimal dispatch over the study horizon.

We will use these models to evaluate the net electricity market benefit of different investment options for the HLY–OTA–A reconductoring listed project application.

However, for this consultation stage, instead of running the OptGen and SDDP models, we apply a simplified approach to calculate the benefits of the reconductoring options, using the deficit benefits. These deficit benefits are assessed by comparing each option against a base case where the line is dismantled and the Bombay substation would be unsupplied. We use the forecast load at the Bombay substation, together with the first deficit tranche of $700/MWh in accordance with the draft Assumptions Book v3.0, to derive the deficit benefits for the reconductoring options.

3.1 Existing generation

The WUNI region has over 2.1 GW of total installed capacity with over 92% of this located in the Waikato region. Therefore, the normal flow of electricity is northwards from Huntly to Ōtāhuhu. The distribution of capacities by technology and region as of January 2025 are shown in Figure 5.

We assume that most existing generation will continue to operate throughout the analysis period. Some plant is expected to retire; retirement dates for the thermal generators vary by scenario and can be found in Appendix F of the Assumptions Book v3.0.

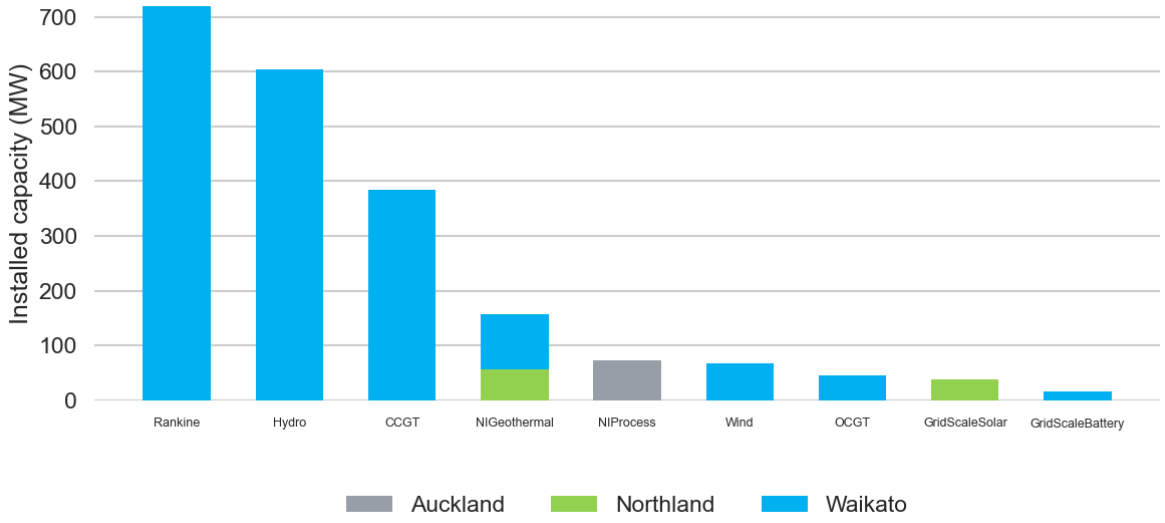

Figure 5: Installed capacities per technology at the WUNI region

3.2 Committed generation

In our generation expansion modelling we include 'committed' generation projects which we judge as likely to proceed. The criteria for classifying a project as committed are specified in the Capex IM.[6] These plants are listed in Table 3. The timing of these builds is exogenously specified in the generation expansion model based on publicly reported development schedules.

Table 3: Modelled Waikato and upper North Island committed generation

Type	Modelled Transmission Node[7]	Name	Capacity (MW)
Utility Solar	WHU110	S_Tauhei_s2	147
Utility Solar	KPU066	S_Whitianga	23.75
Utility Solar	KOE110	S_TwinRivers	24
Utility Solar	HLY220	S_Taiohi	22.4
Utility Solar	BRB220	S_Ruakaka	130
Utility Solar	MTO110A	S_GoldenStai	17.6
Utility Solar	KOE110	S_Pukenui	19.5
Onshore Wind	MPE110	W_Kaiwaikawe	77
2hr batteries	HLY220	HLY_BESS	102.1
2hr batteries	HLY220	HLY_BESS_s2	100
2hr batteries	GLN220	GLN_BESS	100

6 Transpower-Capital-Expenditure-Input-Methodology-IM-Review-2023-Amendment-Determination-13-December-2023.pdf

7 We model the AC transmission network down to 66 kV in SDDP. Generation which connects below this level is represented at a nearby model node.

Type	Modelled Transmission Node[7]	Name	Capacity (MW)
2hr batteries	GLN220	GLN_BESS_s2	200
2hr batteries	BRB220	Ruakaka	100

3.3 Potential generation

The WUNI region has significant potential for the development for different generation projects. The potential generation projects in our stack are listed in the Assumptions Book v3.0. The generation expansion model determines a capacity expansion plan from these candidate projects based on a least cost optimisation condition (i.e., the capacity expansion plan provides the lowest cost mix of generation which can meet demand).

Details of the capacity plans, including a selection of new generation in the upper North Island region are provided in Appendix C.

Q6. Do you have any additional information that could materially affect our electricity demand forecast or generation assumptions?

4 Variations from Assumptions Book v3.0

For generation assumptions, we propose to base our analysis on the assumptions set out in the benefit-based charges (BBC) Assumptions Book v3.0.[8] We have recently consulted on changes to the Assumptions Book. If changes are subsequently made to the Assumptions Book v3.0, it is most likely we will use the assumptions from the updated Assumptions Book.

We have identified several variations from Assumptions Book v3.0 (draft version):

- When running OptGen, we apply two additional constraints on new generation build in the upper North Island (UNI). These constraints reflect findings from the 2022 Northland Renewable Energy Zone (REZ) study,[9] which showed that, without significant transmission investment, generation north of HPI should be limited to around 440 MW, with a further 200 MW potentially accommodated at HPI.
- We included the following 'modelled projects'. These were considered the most likely investments in our WUNI2 project:[10]

8 Assumptions Book | Transpower: The Assumptions Book contains inputs and assumptions we use to calculate benefit-based charges customer allocations under the transmission pricing methodology.

9 Renewable Energy Zones Northland Pilot Concept 2022

10 Waikato and upper North Island (WUNI) Upgrades | Transpower

- Connect the Otahuhu–Whakamaru A&B line to Ohinewai, duplex the section south of Ohinewai and reconductor the northern section
- Shunt capacitors and dynamic reactive plant as required; and
- ±150 MVAr STATCOM in Auckland.

Q7. Do you agree with our proposal to use our BBC Assumptions Book v3.0 variations as the basis for our market scenarios for this investigation?

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