TRANSPOWER

Keeping the energy flowing

Consultation
Prioritising the enablement of new wind and solar generation

30 April 2021

Contents

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1. Background

Net Zero Grid Pathways

Our Net Zero Grid Pathways (NZGP) project is a project which will support New Zealand's pathway towards greater renewable electricity generation and electrification of our energy consumption.

The output from NZGP will be a long-term transmission plan, showing how we envisage the transmission system could be developed between now and 2050. This is important information for potential generation investors as it provides some certainty about future transmission grid capacity.

We are undertaking NZGP in two phases. Phase 1 is focused on the timeframe to 2035 and considers the grid backbone implications of enabling the new renewable generation we forecast will need to be built. To reflect the uncertainty involved, our intention is to use scenarios which allow us to test the boundaries of those parts of the grid backbone identified as likely to become constrained as generation is built. Work undertaken in late 2020 identified these as the High Voltage Direct Current (HVDC) link and the 220 kV grid between Bunnythorpe and Whakamaru. We are launching investigations, as discussed in our webinar in March 2021. A recording of the webinar is available on the Transpower website.

Phase 1, although focused on grid investments needed to 2035, will also necessarily look out to 2050 and so we also expect to identify those parts of the grid backbone which may become constrained after 2035. In Phase 2 we will focus on these additional parts of the grid backbone, along with parts of the regional network, which may become constrained as new renewable generation is built. We will be engaging with industry on Phase 2 later this year.

The HVDC link and 220 kV grid between Bunnythorpe and Whakamaru are interdependent in that the sizing and timing of either depends upon the other. Our investigations will require a common set of assumptions and we began developing these in 2020. As required by Commerce Commission regulation, the analysis will be based upon variations of current Electricity Demand and Generation Scenarios (EDGS) developed by the Ministry of Business, Innovation and Employment (MBIE).

Prior consultation on variations to Electricity Demand and Generation Scenarios (EDGS)

In November 2020 Transpower convened an expert panel to help us review the EDGS and revisions were recommended to bring them up to date. The result was a set of draft EDGS variations, which we then consulted on from December 2020 to February 2021.

Having considered and incorporated feedback from that consultation, we are satisfied that we now have EDGS demand variations which are up to date, cover a reasonable range of future electricity demand uncertainty and are suitable for our NZGP project.

That is not the case with EDGS supply variations however and the purpose of this consultation is to help us finalise those variations.

2. Confidential consultation process

We are using a confidential approach to this consultation, which we hope will encourage all generation investors to participate. The generation investment market in New Zealand is very competitive and historically, participants have been reluctant to share their plans and thoughts with Transpower, for fear that information would reach their competitors. Unlike our normal consultations, where submissions are considered public unless confidentiality is requested, replies to this consultation will be considered confidential unless specifically noted as publishable.

The outcome of this consultation will be EDGS supply variations. These will be published to the Transpower website. Individual submissions will not be publicly available unless authorised by the submitter. However, we will need to confidentially share all submissions received with the Commerce Commission, to show the rationale for the variations, which will in turn form the basis for Transpower's future major capex proposals for grid investment.

This consultation is open until 5:00pm, Friday 11 June 2021

Please email submissions to nzgp@transpower.co.nz with the subject line 'Draft EDGS 2019 Supply Variations Consultation'.

Submitters may comment on any relevant aspect of our topic. We have asked some specific questions below and would welcome submissions on those questions, but all relevant comments are welcome.

Submissions will be considered confidential unless specifically noted as being publishable.

3. Prioritising the generation stack

MBIE updated the generation cost stack used to compile the EDGS, in 2020. The stack includes a long list of potential new generation projects. This is good from the point of view of reflecting that New Zealand has an abundance of renewable generation development options. However, some aspects of the long list of projects means our generation expansion model struggles with producing consistent results, and we are seeking your feedback so we can improve the modelling results.

While the geothermal, hydro and thermal projects are all distinctly different, the list of new wind and solar projects is not.

The wind generation stack, for instance, includes 11 GW of potential onshore wind projects, with 75% having a capital cost of $2200/kW +/- 10%. Our generation expansion model struggles with that information, because with so many similarly priced developments in the stack[1] there are many solutions which meet the optimal least-cost generation expansion plan.

Similar is true of the solar generation stack.

[1] The generation expansion model works by trying multiple combinations of future generation projects. The model concludes it has an optimum answer when it is within a certain % of a theoretical optimum. It does not always try combinations in the same order so, can identify multiple optima when the costs are close.

We need your help to prioritise the wind and solar generation projects on the generation cost stack, in order to guide the generation expansion model and in turn, help prioritise our transmission planning efforts.

Although the generation expansion modelling approach is based on minimising cost, we are aware many other factors contribute to generation investment decisions (for instance the ability to gain the required consents, generation portfolio management, and availability of capital). In aggregate these may or may not result in the same generation development as forecast by our expansion model.

4. What information does Transpower need?

We took the list of potential wind and solar generation projects from the generation cost stack and ordered them into decades before which they will not be built. This information is shown in Table 2.

We have a list of questions relating to both Table 2 specifically and some more general questions in relation to supply scenarios. For those related to Table 2, we seek views on whether our:

- assumption that up to 2000 MW distribution, plus grid-connected solar generation, is likely to be built by 2050 is reasonable
- ordering of projects between regions and decades is reasonable.

Table 2 contains the same wind generation projects included on the generation stack and uses the same regions as included in the Wind Generation Stack Update (2020) report by Roaring40s Wind Power Ltd report, available on the MBIE website.

Table 2 contains the ID3 solar generation forecast[2] from the generation stack[3]. We used the same regional names as for the wind generation projects for readability, but have added two, where solar may emerge but wind is unlikely and the solar regions are larger than the wind regions. The wind and solar regions are all shown on Figure 1 (Appendix 1).

In deriving the breakdown of generation shown in Table 2, we used the generation cost stack, publicly available market information and our own judgement. We favoured low cost generation first and for illustration the nominal average Levelised Cost of Energy (LCOE) of the wind generation increases from $67 per MWh before 2030, to $72 between 2030-2040 and $77 between 2040-2050.

Table 2 includes more new generation than is required to meet forecast demand in each decade. This in order to ensure generation developers can compete. For comparison, Table 1 shows the EDGS 2019 and WiTMH new generation builds, by scenario, by 2050.

[2] which assumes global solar production slowed from 2019.

[3] which forecasts up to 2000 MW distribution and grid-connected solar being economic by 2050. The solar report notes that 10-15% of the 2000 MW is assumed to be connected within distribution networks. ID3 reflects future wholesale electricity costs closest to those observed in our work-to-date.

Table 1 – New wind and grid solar generation build needed to meet forecast demand by 2050, for EDGS and Whakamana i Te Mauri Hiko scenarios

		2050 demand, TWh	New wind, GW	New solar, GW
EDGS	Global	47	1.4	0
	Reference	57	3.4	0
	Disruptive	71	4.7	1.2
WiTMH	Measured action	63	5.1	0
	Accelerated electrification	70	6.4	1.0
	Mobilise to decarbonise	80	8.5	1.0

Table 2 – Proposed restrictions on wind and solar generation projects by decade, by region – earliest build date by decade - MW

		Committed	2021-2030		2031-2040		2041-2050		2021-2050		Total
Region			Wind	Solar	Wind	Solar	Wind	Solar	Wind	Solar	
1	Far North	0	0	150	0	150	100	0	100	300	400
2	Northland	0	0	150	400	150	200	0	600	300	900
3	Auckland	0	50	0	0	0	200	0	250	0	250
4	Waikato	0	250	100	400	150	0	0	650	250	900
5	BOP-Taupo	0	150	100	500	0	350	200	1000	300	1300
6	Eastland	0	0	0	0	0	300	0	300	0	300
7	Central Plateau	0	200	0	0	0	400	0	600	0	600
8	Hawkes Bay	176	0	0	0	0	0	200	176	200	376
9	Taranaki	133	0	0	0	0	0	0	133	0	133
10	Manawatu	222	150	0	200	0	100	0	672	0	672
11	North Wairarapa	0	500	0	700	0	100	0	1300	0	1300
12	South Wairarapa	0	0	0	0	0	100	0	100	0	100
13	Wellington	0	0	0	100	0	100	0	200	0	200
14	Marlborough	0	0	0	200	0	0	0	200	0	200
15	Nelson	0	0	0	0	100	0	100	0	200	200
16	West Coast	0	0	0	0	0	0	0	0	0	0
17	North Canterbury	93	200	0	0	0	0	0	293	0	293
18	South Canterbury/ North Otago	0	0	100	0	150	0	200	0	450	450
19	Central Otago/ South Otago	0	300	0	100	0	400	0	800	0	800
20	Southland	0	200	0	150	0	400	0	750	0	750
	Totals	624	2000	600	2750	700	2750	700	8124	2000	10124

Questions for submitters to address

1) Is it reasonable to assume that no more than 2000 MW of distribution and grid-scale solar generation will be economic by 2050 in our planning?

   We are aware that the LCOE of wind generation is forecast to be lower than solar generation, but the lower entry barriers for solar may make it a more attractive proposition for generation developers. For clarity, this solar generation does not include domestic and commercial rooftop solar. These installations are estimated separately and factor into our scenarios as demand reductions at our grid exit points.

2) What are the main drivers when considering wind versus solar generation development?

3) Is it reasonable to allocate new wind and solar generation projects, from the MBIE generation cost stack, in the manner shown in Table 2?

4) Are the proposed allocations by region and decade reasonable? Comments may be general, on specific regions, or on the decade split.

5) We would welcome (confidential) comments on any specific plans generation developers have, as well as general comments.

6) Although this is not a consultation on the generation cost stack information, are there any comments we should be aware of? The detailed information can be found on the MBIE website here.

7) One challenge we face is managing dry winter risk as we move towards 100% renewables. The New Zealand Battery Project is considering this issue and there are many potential outcomes from that project. We might see much reduced thermal generation in the upper North Island, replaced by North Island renewables and/or significant new hydro storage in lower South Island.

   Whether we rely on solutions in the North Island, or in the lower South Island, to manage dry year risk could materially change the need for grid backbone investment.
   Any indications of generation investment plans for dry year risk, or comments on how this might best be achieved, would be welcome.

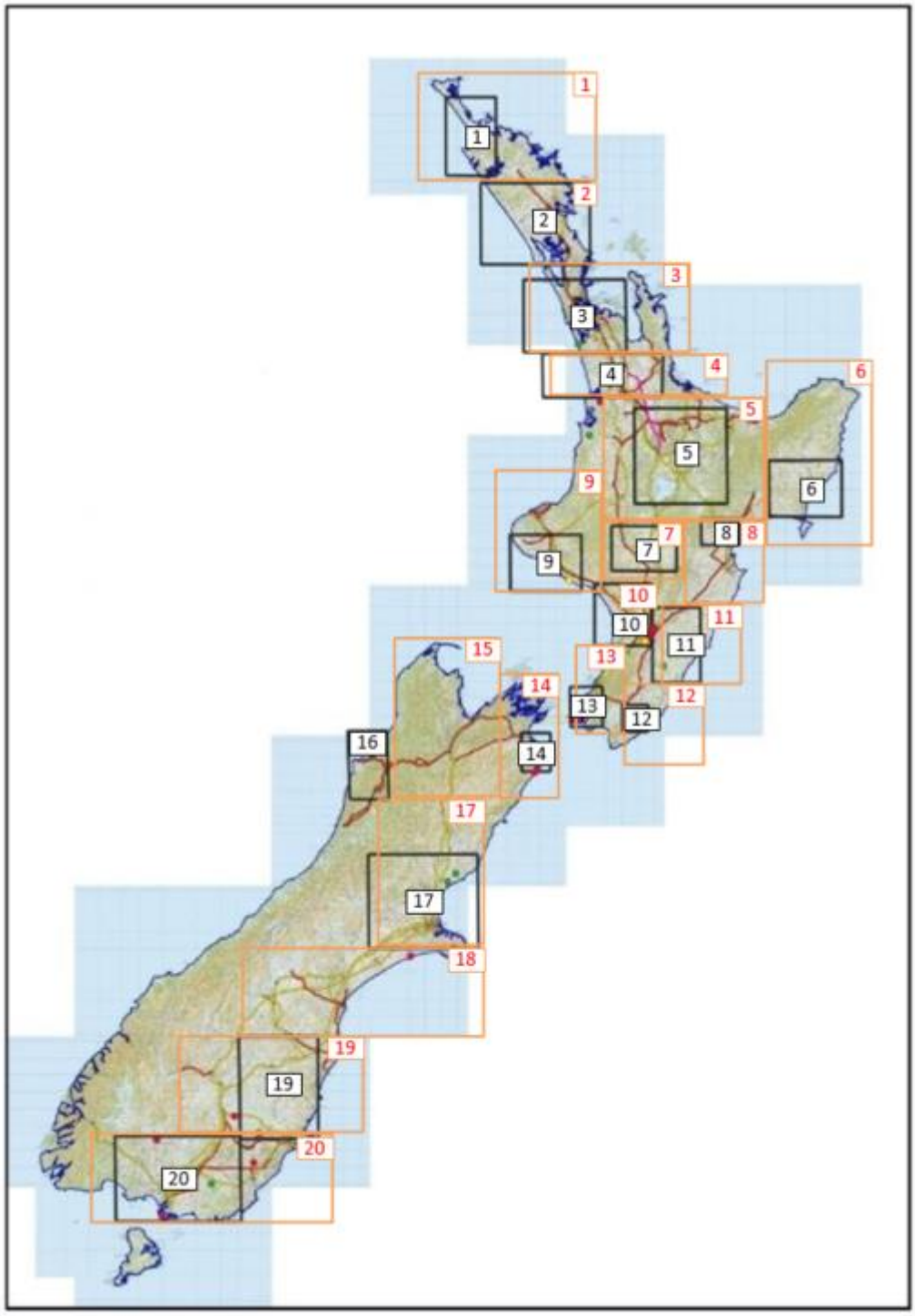
8) Is there any information Transpower could provide that would help generation investors select locations or timing of their projects with more certainty?

All submissions will be considered confidential unless they specifically state that they are publishable.

Please note that no information from the numerous generation enquiries we have received is reflected in this consultation or in the table. This consultation is an opportunity for generation developers to inform the generation forecast and in turn influence future grid development.

Appendix 1 – Map of wind and solar regions

Figure 1 – New Zealand map showing wind and solar regions as referred to in Table 2



Key:

- Black regions are wind
- Orange regions are solar