East Harbour Management Services Ltd
PO Box 11-595, Wellington, New Zealand
Tel: 64-4-385-3581
Fax: 64-4-385-3397
E-mail: brian.white@eastharb.co.nz
www.nzgeothermal.org.nz

Submission on Electricity Demand and Generation Scenarios 2015

To Ministry of Business, Innovation and Employment

On behalf of the New Zealand Geothermal Association

15 May 2015

Introduction

The New Zealand Geothermal Association (NZGA) would like to thank the Ministry of Business, Innovation and Employment (MBIE) for the opportunity for discussion around "Electricity Demand and Generation Scenarios".

The New Zealand Geothermal Association (NZGA) is an independent, non-profit association that provides information on geothermal phenomena and utilisation for industry, government and educational organisations. In addition, the NZGA, as a member of the International Geothermal Association, contributes to the international exchange of information within the geothermal development industry. NZGA membership comprises participants, regulators, and interested parties within the geothermal community. It totals 346 members currently.

This submission will be published on the NZGA website, and we have no objection to it being published in any other setting.

The **Question headings** to the comments below relate to specific questions raised in the discussion document (see http://www.med.govt.nz/sectors-industries/energy/energy-modelling/modelling/electricity-demand-and-generation-scenarios/draft-edgs-2015/draft-edgs-consultation-guide.pdf).

Question 1. Pg 15. Do you agree with this description of the purpose of the EDGS, including the material in the appendix?

NZGA supports the definition but points out that these scenarios have wider application in informing the public and groups such as ours about possible future energy paths.

Question 2. Pg 16. In the absence of regional and prudent peak demand projections being a part of the EDGS, the Ministry would like to ask for your feedback on the best way to independently verify regional and prudent peak demand projections?

It should be noted that all lines companies must prepare Asset Management Plans, and these contain demand projections. These are prepared with a similar purpose of planning for development of the local lines networks.

This question brings up regional effects. The price modelling does not include these effects, but some simple cross checks could be included based on average nodal prices through the year to assess local effects. Thus a threshold price that triggers construction for a (geothermal) project in Northland may be much higher than a project in Southland or New Plymouth.

Question 3. Pg 18. Do you agree that the key uncertainties identified in this section, and the proposed eight equally weighted scenarios, sufficiently represent overall uncertainty for the purpose of the EDGS?

The uncertainties modelled coupled with the range of inputs varied in Table 6 represent useful scenarios. Table 6 will be discussed more under question 5.

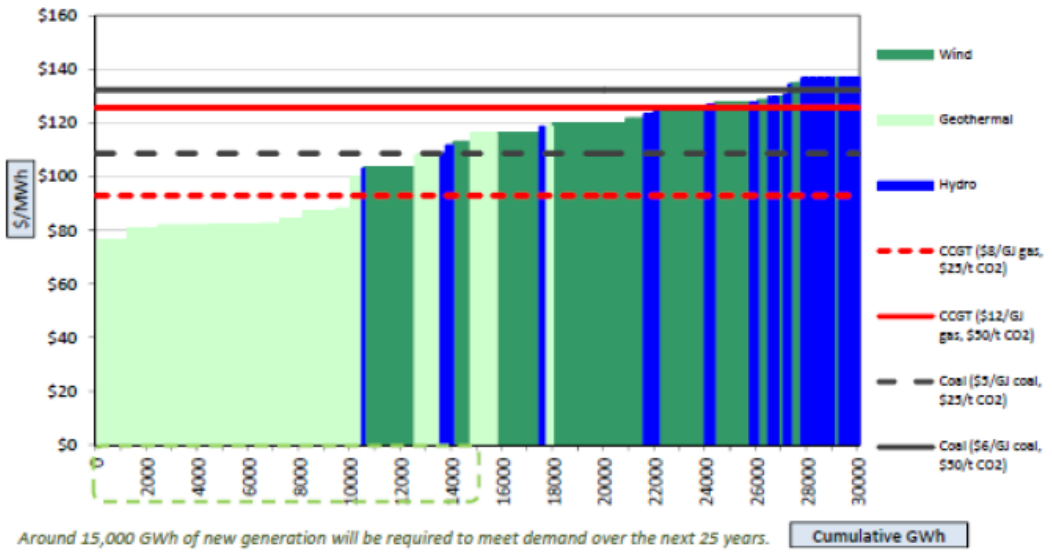
Question 4. Pg 26. Do you have any specific feedback on the proposed EDGS capital cost assumptions which are sourced primarily from the PB generation data update 2011?

Generally, the capital costs appear to be correct on a US$ basis for greenfield projects. We do note the exchange rate used is US$0.65, significantly lower than the current exchange rate, and commodity prices have generally fallen since the publication of the 2011 NZ Generation Data Update Report. Drilling costs may also have fallen with the cost of oil dropping. These factors may warrant an update to the 2011 NZ Generation Data Update Report.

Question 5. Pg 29. Is the variation in key assumptions consistent with the scenario design and future uncertainty?

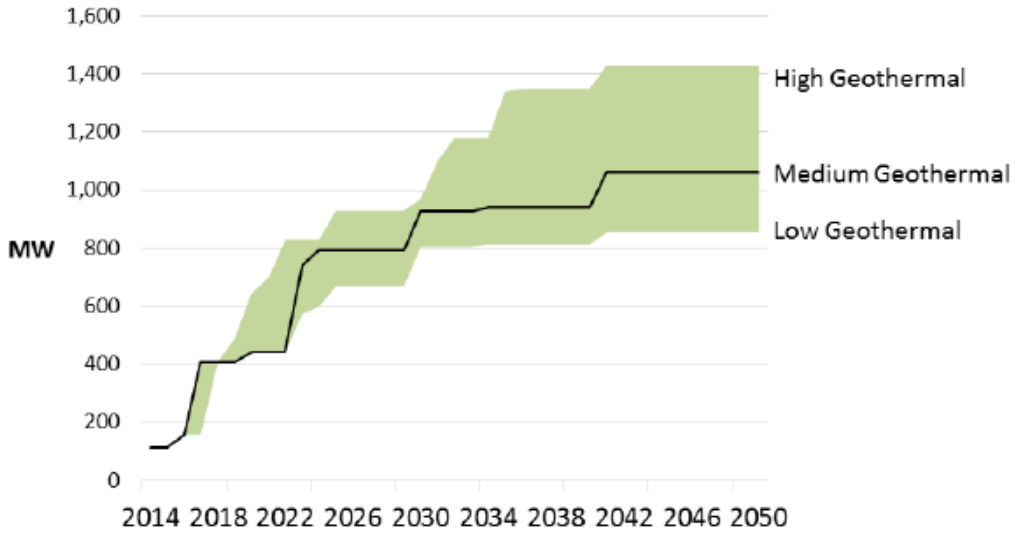
Figure 3 of the consultation guide is very informative. It emphasises the large volume of low cost geothermal electricity generation possible. In effect this is capped by the possibility of low cost gas-fired CCGT plant.

Figure 3: LRMC for new generation - base case assumptions

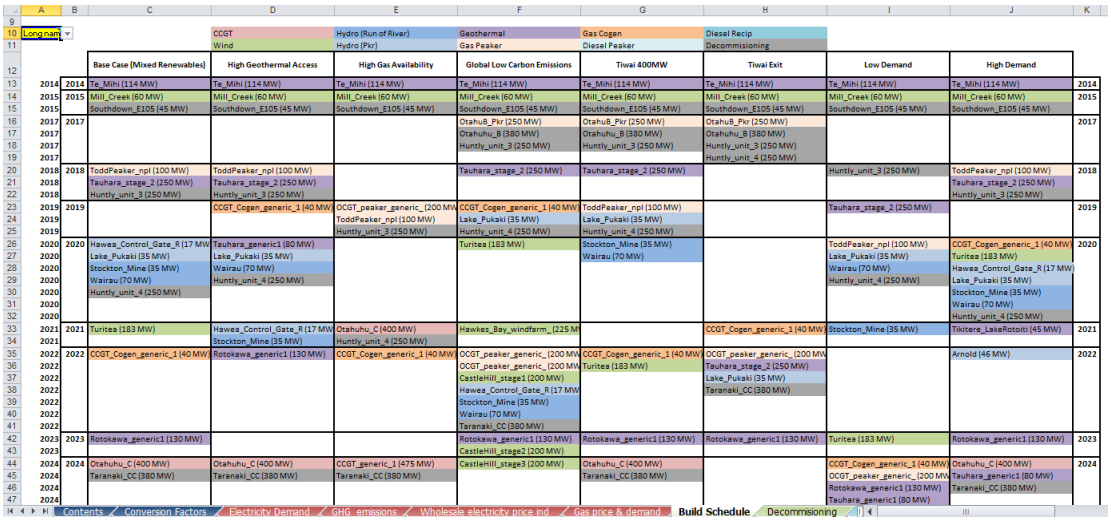


However, one of the challenges for the MBIE modelling team is to work out availability of the geothermal resource in the face of the varying scenarios. The assumed availabilities are shown in figure 8 of the consultation guide, with 6 of 8 scenarios using the medium projection of project availabilities.

Figure 8: Assumed projections for available geothermal generation



The end result of this assumed slow development of geothermal projects onto the market despite their lower cost is that a range of other generation including gas-fired CCGT plant must make up any shortfall between demand growth and new geothermal build. The following figure shows a snapshot from scenario summary worksheet (see http://www.med.govt.nz/sectors-industries/energy/energy-modelling/modelling/electricity-demand-and-generation-scenarios/draft-edgs-2015/scenario-summary.xlsx)



	Base Case (Mixed Renewables)	High Geothermal Access	High Gas Availability	Global Low Carbon Emissions	Tiwai 400MW	Tiwai Exit	Low Demand	High Demand
		CCGT, Wind	Hydro (Run of River), Hydro (Pkr)	Geothermal, Gas Peaker	Gas Cogen, Diesel Peaker	Diesel Recip, Decommissioning		
2014	Te_Mihi (114 MW)	Te_Mihi (114 MW)	Te_Mihi (114 MW)	Te_Mihi (114 MW)	Te_Mihi (114 MW)	Te_Mihi (114 MW)	Te_Mihi (114 MW)	Te_Mihi (114 MW)
2015	Mill_Creek (60 MW), Southdown_E105 (45 MW)	Mill_Creek (60 MW), Southdown_E105 (45 MW)	Mill_Creek (60 MW), Southdown_E105 (45 MW)	Mill_Creek (60 MW), Southdown_E105 (45 MW)	Mill_Creek (60 MW), Southdown_E105 (45 MW)	Mill_Creek (60 MW), Southdown_E105 (45 MW)	Mill_Creek (60 MW), Southdown_E105 (45 MW)	Mill_Creek (60 MW), Southdown_E105 (45 MW)
2017				OtahuB_Pkr (250 MW), Otahuhu_B (380 MW), Huntly_unit_3 (250 MW)	OtahuB_Pkr (250 MW), Otahuhu_B (380 MW), Huntly_unit_3 (250 MW)	OtahuB_Pkr (250 MW), Otahuhu_B (380 MW), Huntly_unit_3 (250 MW), Huntly_unit_4 (250 MW)		
2018	ToddPeaker_npl (100 MW), Tauhara_stage_2 (250 MW), Huntly_unit_3 (250 MW)	ToddPeaker_npl (100 MW), Tauhara_stage_2 (250 MW), Huntly_unit_3 (250 MW)		Tauhara_stage_2 (250 MW)	Tauhara_stage_2 (250 MW)		Huntly_unit_3 (250 MW)	ToddPeaker_npl (100 MW), Tauhara_stage_2 (250 MW), Huntly_unit_3 (250 MW)
2019		CCGT_Cogen_generic_1 (40 MW)	CCGT_peaker_generic_ (200 MW), ToddPeaker_npl (100 MW), Huntly_unit_3 (250 MW)	CCGT_Cogen_generic_1 (40 MW), Lake_Pukaki (35 MW), Huntly_unit_4 (250 MW)	ToddPeaker_npl (100 MW), Lake_Pukaki (35 MW), Huntly_unit_4 (250 MW)		Tauhara_stage_2 (250 MW)	
2020	Hawea_Control_Gate_R (17 MW), Lake_Pukaki (35 MW), Stockton_Mine (35 MW), Wairau (70 MW), Huntly_unit_4 (250 MW)	Tauhara_generic1 (80 MW), Lake_Pukaki (35 MW), Wairau (70 MW), Huntly_unit_4 (250 MW)		Turitea (183 MW)	Stockton_Mine (35 MW), Wairau (70 MW)		ToddPeaker_npl (100 MW), Lake_Pukaki (35 MW), Wairau (70 MW), Huntly_unit_4 (250 MW)	CCGT_Cogen_generic_1 (40 MW), Turitea (183 MW), Hawea_Control_Gate_R (17 MW), Lake_Pukaki (35 MW), Stockton_Mine (35 MW), Wairau (70 MW), Huntly_unit_4 (250 MW)
2021	Turitea (183 MW)	Hawea_Control_Gate_R (17 MW), Stockton_Mine (35 MW)	Otahuhu_C (400 MW), Huntly_unit_4 (250 MW)	Hawkes_Bay_windfarm_ (225 M		CCGT_Cogen_generic_1 (40 MW)	Stockton_Mine (35 MW)	Tikitere_LakeRotoiti (45 MW)
2022	CCGT_Cogen_generic_1 (40 MW)	Rotokawa_generic1 (130 MW)	CCGT_Cogen_generic_1 (40 MW)	OCGT_peaker_generic_ (200 MW), OCGT_peaker_generic_ (200 MW), CastleHill_stage1 (200 MW), Hawea_Control_Gate_R (17 MW), Stockton_Mine (35 MW), Wairau (70 MW), Taranaki_CC (380 MW)	CCGT_Cogen_generic_1 (40 MW), Turitea (183 MW)	OCGT_peaker_generic_ (200 MW), Tauhara_stage_2 (250 MW), Lake_Pukaki (35 MW), Taranaki_CC (380 MW)		Arnold (46 MW)
2023	Rotokawa_generic1 (130 MW)			Rotokawa_generic1 (130 MW), CastleHill_stage2 (200 MW)	Rotokawa_generic1 (130 MW)	Rotokawa_generic1 (130 MW)	Turitea (183 MW)	Rotokawa_generic1 (130 MW)
2024	Otahuhu_C (400 MW), Taranaki_CC (380 MW)	Otahuhu_C (400 MW), Taranaki_CC (380 MW)	CCGT_generic_1 (475 MW), Taranaki_CC (380 MW)	CastleHill_stage3 (200 MW)	Otahuhu_C (400 MW), Taranaki_CC (380 MW)		CCGT_Cogen_generic_1 (40 MW), OCGT_peaker_generic_ (200 MW), Rotokawa_generic1 (130 MW), Tauhara_generic1 (80 MW)	Otahuhu_C (400 MW), Tauhara_generic1 (80 MW), Taranaki_CC (380 MW)

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While this figure shows Tauhara II coming online around 2018, there are frequently several years delay until the next (Rotokawa) project becomes available (often in 2023). These are often preceded by more expensive hydro, CCGT and sometimes wind options. We believe that the slow development of geothermal projects in these scenarios distorts the generation picture. We note that geothermal developers have retained their readiness for projects.

We have previously encouraged MBIE to consider a pipeline of projects for developers. Thus it is reasonable to look at parallel streams of work for both Contact and Mighty River, probably in partnership with Maori interests. With this in mind, it is reasonable to assume a parallel 'Mighty River' project (such as a further Rotokawa project) in parallel with a Contact Tauhara project. Note that Contact may consider staggering the Tauhara II project into 2 units then 1 unit in order to avoid flooding the market with new generation. But you would be unlikely to have a situation (as in the high geothermal generation scenario) where successive developments followed on the same field one year apart. Normally a field response would be

measured before planning of subsequent developments on the same field, so an allowance of 5 years could be reasonably made to allow for testing, consenting and construction.

It is worth noting that Ngawha generation does not show up in scenarios until 2027 in one scenario and 2033 in two other scenarios (and later in others). Despite this pessimism, Top Energy has just initiated consents for development, and would only do so if it thought the project was approaching commercial viability. This may reflect the weakness in the modelling through absence of nodal pricing. Clearly higher nodal prices in Northland could mean that this project is decades ahead of scenario projections.

Returning to the scenarios themselves, putting aside the distortion by assumed slow release of geothermal projects for development, then the breadth of scenarios seems useful. The table of key assumptions taken from the consultation guide is shown in table 6.

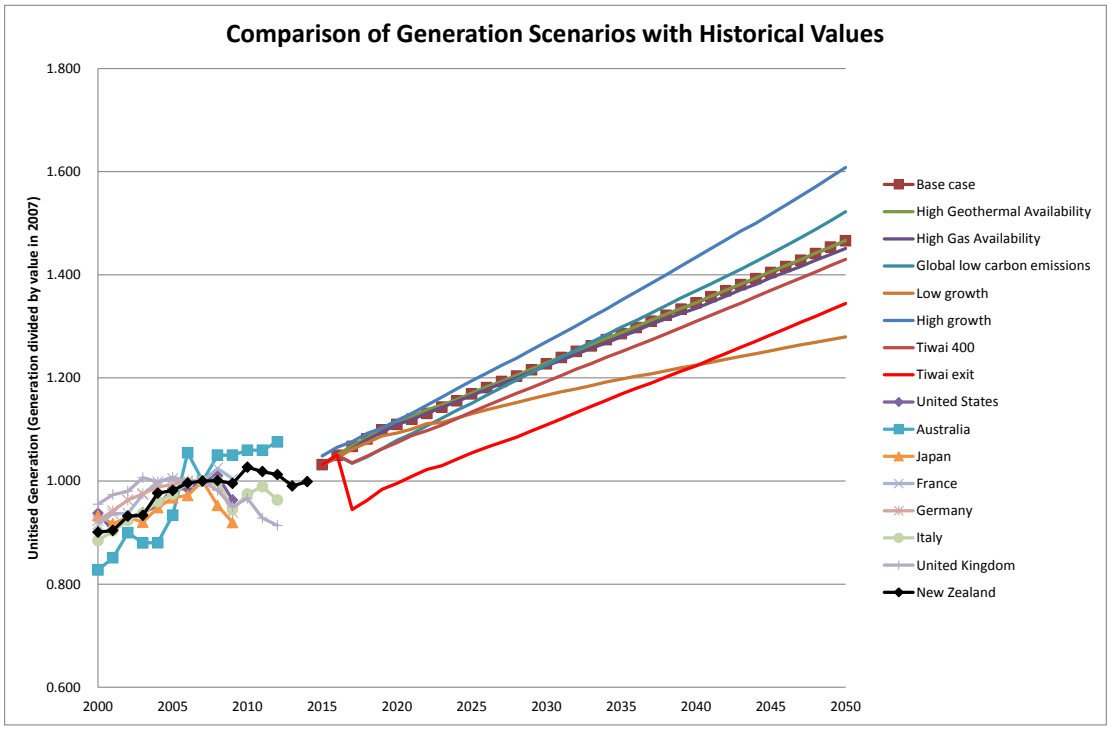
Table 6: Key assumptions for each of the eight scenarios

Inputs varied	Scenario number and name							
	1	2	3	4	5	6	8	7
	Base case (mixed renewables)	High geothermal availability	High gas availability	Global low carbon emissions	Lower Tiwai demand	Tiwai exit	Low demand growth	High demand growth
Population, household numbers and GDP	Medium						Low	High
Projection of residential demand per household	Medium						Low	High
Tiwai load from 2017	572			400		0	572	
Geothermal resource availability	Medium	High	Medium	Low	Medium			
Gas supply availability	Medium		High	Low	Medium			
Cost of wind generation	Medium			Low	Medium			
Carbon prices	Medium		Low	High	Medium			
Solar energy uptake	Medium		Low	High	Medium			
Uptake of electric vehicles	Medium			High	Medium			
Retirement of old Huntly units	2018, 2020		2019, 2021	Early: 2017, 2019		Early: 2017, 2017	2018, 2020	
TCC retirement	2024			2022	2024	2022	2024	
Otahuhu B refurbishment	Refurbish 2021			Convert 2017			Refurbish 2021	

NZGA has pointed out the flat electricity demand/generation previously, both domestically and internationally for developed countries. This is shown in the following graph, where generation from a range of countries has been unitised by dividing by the respective generation in 2007. It appears that demand/generation is particularly linked to GDP so GDP projections later in the Consultation guide are important. Unfortunately the basis for these is confidential to NZIER so are not open to scrutiny. Without radical change in national or international markets it is difficult to see why there should be a return to growth, so we would favour greater use of low GDP growth scenarios.

The following graph compares the current low demand/generation growth rates in many countries including New Zealand, with the various scenario projections. The past recent history does not support the scenarios presented (with the exception of the Tiwai exit

scenario). MBIE should present a good case for future generation growth rates appearing to be optimistic compared with the recent past.



We note in the scenarios above, the "Global low carbon emissions" scenario assumes a particularly low availability of geothermal projects. In practice, geothermal energy is one of the key means of ensuring a low carbon future. This scenario, in particular should have assumed a high availability of geothermal projects.

We note, for the high geothermal availability scenario that project pipelines have not been considered so that there is a long delay before Mighty River projects proceed, while Contact faces commissioning of two Tauhara projects in successive years.

Question 6. Pg 32. Given the current flat demand environment, should we put more weighting on low demand growth scenarios?

Yes. See discussion above.

Question 7. Pg 35. Does the high uptake of electric vehicles (and Solar PV) that are used in our Global Low Carbon Emissions scenario adequately future uncertainty?

We agree that uptake of electric vehicles is one of the largest uncertainties in the market. Obviously this will need to be closely monitored in future.

Question 8. Pg 38. Should we put more weighting on the low gas availability option given the current level of oil prices?

No comment.

Question 9. Pg 43. Does the retirement for the Huntly units across the scenarios adequately reflect the associated uncertainty?

The various scenarios show retirement of the first unit commencing as early as 2017 with the last unit as late as 2021. While NZGA would advocate for maximum reasonable use of geothermal energy as soon as possible, we also recognise that coal has been a useful fuel. We are not in a position to comment on the overall security of supply should all coal-fired generation be removed from our national mix.

Question 10. Pg 43. Are there any other comments on the build schedules or other key results published in this document and the accompanying excel files?

We note that the Electricity Authority undertook an analysis of electricity consumption patterns[1]. A conclusion was that there had been no change in the fundamental relationships between demand and causal factors. Has the general relationship been established and used as a cross check on the anticipated demand from the various scenarios?

We trust these comments are helpful, and would be happy to be involved in further discussion.

Yours faithfully

Brian White
Executive Officer
New Zealand Geothermal Association
Ph 0274 771 009 Email brian.white@eastharb.co.nz

[1] http://www.ea.govt.nz/dmsdocument/18765