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Submission on “Introducing the Electricity Demand and Generation Scenarios”

Ministry of Business, Innovation and Employment

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Does this submission contain confidential information	No

The New Zealand Geothermal Association (NZGA) would like to thank the Ministry of Business, Innovation and Employment for the opportunity to comment on the paper entitled “Introducing the Electricity Demand and Generation Scenarios.”

The 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 340 members currently.

General comments

Our core comments revolve around three aspects which we have focussed on:

- Our geothermal technology and resources,
- Demand as a driver for new generation, for which geothermal electricity projects are among the front-runners, and
- Cost of carbon, which increases the competitiveness of renewables relative to fossil fuels (and does apply to geothermal energy to a lesser extent).

Geothermal Technology and Resources

Our geothermal generation technology is reasonably well established. There are small improvements being made but no radical changes recently. One aspect being investigated in New Zealand is the possibility of constructing lower cost binary cycle generators. HERA has

concluded that even without the benefit of mass-manufacture it should be possible to price locally manufactured plant to undercut the World's major supplier of these, Ormat. In turn, Ormat has been pricing units so that this form of generation is competitive with other forms of geothermal generation. Another manufacturer (a United Technologies Corporation company) realised that through simple alteration of components in Carrier refrigeration technology, they could develop binary cycle plant and gain the benefits of mass manufacture. However, they too have priced their units to compete with Ormat. Thus, while this technology is established, there is still opportunity for its costs to come down.

The MBIE discussion paper outlines some concerns around reliance on generic geothermal projects that have not already been proposed by developers. In practice many of the generic projects are staged increments to existing generation on proven fields. As a rule, developers follow a reasonably conservative approach of staging developments as a means of managing the risk of over-exploitation. Reservoir responses are measured to determine if a further stage is justified and, if so, the next stage is built followed by further assessment. A further factor in staging developments relates to land negotiations. Consenting and development follow the successful securing of agreements between landowners and developers, and this can take some years. Consenting will be undertaken on the basis of established capacity to avoid the risk of consents being held up for further evidence, turned down or granted for restricted developments, and follows the securing of land owner support.. Where some development has already occurred on a field then there are some economies in having further increments on the same field. It is quite reasonable to assume that further stages on developed fields will follow even though developers have not disclosed firm plans for these later stages.

A factor that has been completely omitted from the discussion paper and scenarios relates to the build-up of expertise by companies and their resulting effort to maintain a pipeline of projects to retain those skills while building its generation portfolio. As examples:

	Wind Expertise	Geothermal Expertise
Company	Meridian, Genesis, Trust Power, Energy3, Pioneer Generation	Contact, Mighty River Power, Tuaropaki, Top Energy, Eastland Group.

Where companies have built up expertise, they will endeavour to retain these skills and personnel. This may mean that they will undertake a project marginally out of normal merit order. In the case of Mighty River Power geothermal expertise or Meridian wind power expertise as examples, some continuity of work can be achieved through offshore investments. Ultimately, these companies will need to see and implement domestic opportunities or the teams will not be seen as core assets. On that basis, it would seem reasonable to have scenarios in which a steady implementation of these types of projects is maintained (provided no significant price steps are implied).

Demand as a Driver

For several years, geothermal developers have spoken about the flat electricity demand in New Zealand. Geothermal developers were aware that if demand stayed flat then the need for new generation would be reduced. The geothermal industry has been sensitive to this because our generation has been near the front of the merit order so is likely to be affected.

Our own review shows that electricity demand has been flat since around 2007, not only in New Zealand but in many developed countries. What is happening here is characteristic of many other countries and is tied in to global economics. To simply treat a major global shift

in demand patterns in the same way that we have treated slight deviations from past growth trends is an error.

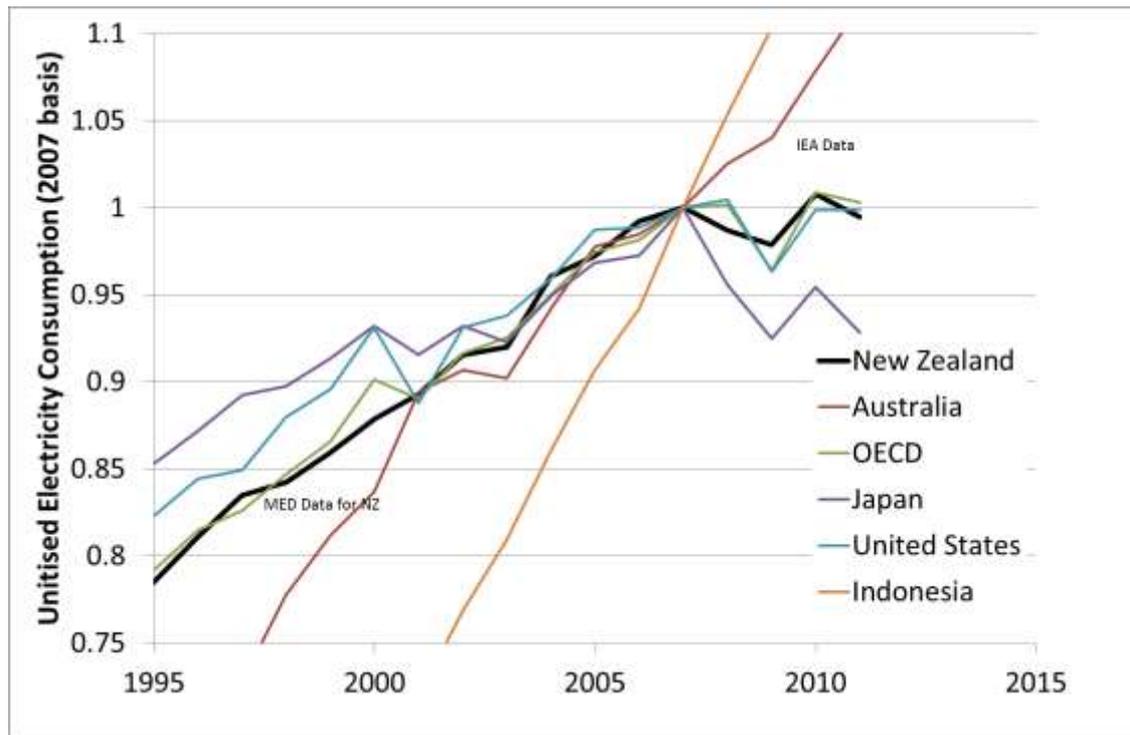


Figure 1: Trends in electricity demand with some comparators (consumption for each country has been unites by dividing by consumption in 2007).

While our neighbours, Australia, have bucked the trend, this is largely because of mining in West Australia. Commentators on Australia's National Electricity Market (NEM) which covers states other than West Australia and Northern Territories have also noted flat demand over the same period.

There was a very strong linear trend in growth prior to 2007, so Transpower's approach of using best fit data from 1974 would have been soundly justified. But trends have clearly changed, such that it may be better to use data from 2007 only.

Existing generators build new plant:

- to meet growing demand,
- to help build reserves if these appear insufficient,
- to assist with fuel substitution, or
- with a view to offsetting upcoming retiring plant.

If the generators build more than the necessary amount then they risk displacing their own existing generation or suppressing the price of electricity through stiff competition which changes the economics of the project. Small generators or lines companies are often more focused on niche embedded opportunities so are not as constrained. All generators like to have some consented projects ready for action.

There has been ongoing investment in new plant, particularly geothermal plant. This has had the effect of building up reserves. However dry year reserves are now up near the highest levels since the current market was established. The amount of generation available has helped to suppress spot market prices, as competition to dispatch increased. The reserve levels are now similar to a period shortly after market establishment when competition levels were so high that eventually TransAlta was forced out of the market. Generator/retailers

would be reluctant to see much more generation growth that was not offset by retirements or new demand growth.

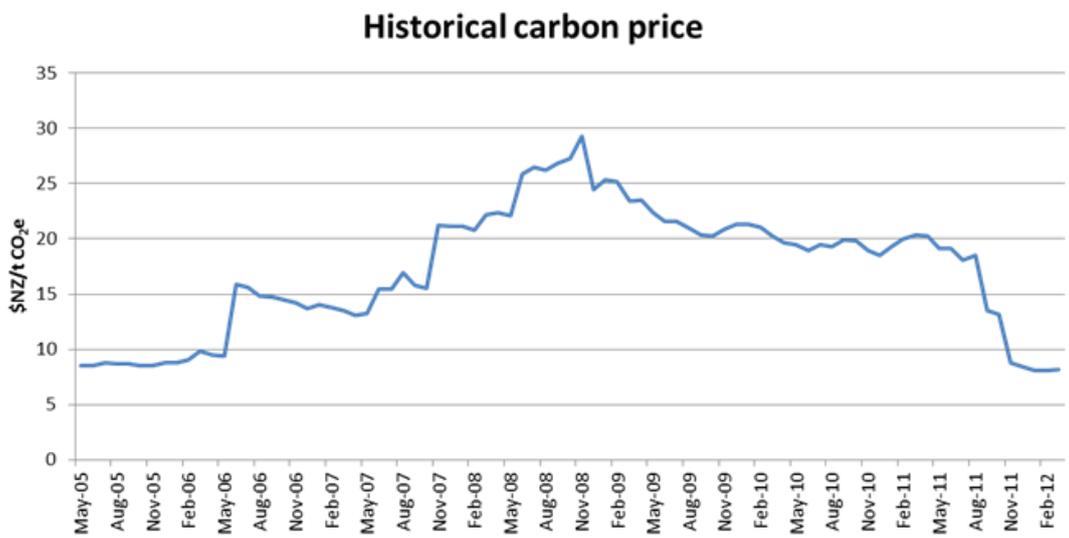
Fuel substitution has not been a major consideration in New Zealand. Overseas this is often driven by renewable standards, or recently by concern over the risks of nuclear generation (Japan followed by Germany). In New Zealand, the changing nature of gas supply and contracts may start to drive limited substitution. If major new gas reserves are not found, we expect thermal generation to move more into the peaking role rather than baseload combined cycle gas turbines. Geothermal generation could usefully fill any baseload gap.

In terms of retirements, the major possibility on the horizon is the retirement of Huntly units. The original 1000MW coal/gas-fired power station is close to retirement now. Genesis has announced retirement plans starting with Unit 3 at the end of this year, but has also reconsented the station through to 2038 as a back-up option.

It is the combination of factors along with demand that leads to the future build of new plant. It is apparent that some hiatus is approaching, though we would expect geothermal electricity to remain near the front of the merit order when new plant is considered.

Cost of Carbon

NZGA is supportive of a cost of carbon being brought in to the market. This has been done through an emissions trading scheme. The cost is determined by the market, but the price path for carbon is not clear and is determined by international interests. The following graph shows recent movement in the cost of carbon. In light of the collapse of the carbon price since the end of last year, projections of carbon rising to more than \$200/tonne of CO₂ equivalent seem fanciful. Projections should be based on expert reports prepared after the collapse of the carbon price.



The scenario modelling for geothermal energy should take into account that geothermal energy does emit carbon dioxide and methane. This is from natural sources and is a small fraction of that associated with fossil fuel stations. Although there is a wide variation between geothermal fields, our current stations emit about 0.14 tonnes CO₂e/MWh.

Specific Response to Queries

Page	Question	Answer here – cells expand downward
7	Q1. Do you agree with the Ministry's	The key assumptions on the demand side seem reasonable. The Association recognises that our current flat electricity

Page	Question	Answer here – cells expand downward
	assessment of what the key EDGS assumptions are?	<p>demand is not simply a local feature but is common with many developed countries, probably linked to the Global Financial Crisis. As such, a key input to future demand scenarios will be expert view on the global economy and restoration of product demand. This global perspective input should be made explicit.</p> <p>For generation, the key costs to consider are unit costs rather than capital costs. It is the combination of capital cost, O&M, fuel costs and load factor that determine the attractiveness of a proposed development to a developer. Below this, the availability of resources, whether renewable or thermal, is key. The emphasis on geothermal resources for renewables, or gas for thermals or coal with respect to carbon price is unnecessary. Views on carbon price will have an influence on decisions made by developers so a careful review is required.</p>
9	Q2. Are you comfortable with the overall demand forecasting approach for the EDGS, including the use of Transpower’s ensemble model for peak demand forecasting?	<p>See comments in our introduction. It is no longer valid to assume that trends evident until 2007 will continue. It may be better to restrict data analysis to post-2007 data. Global views need to be brought to bear, as it is recovery of global economies that will lift demand for our goods and services that will raise our electricity demand.</p> <p>Electric vehicles have the potential for major effect. Depending how this happens, this may have a positive or negative effect on the ratio of peak demand to average demand.</p>
11	Q3. Do you have any contrasting views on demand growth and assumptions?	<p>This question is really addressing the development of scenarios that MBIE is planning.</p> <p>NZIER must draw on views of global economy recovery.</p> <p>While there are low energy alternative directions for our economy, transitioning to this will be a long-term change. In the short- and medium-term our industry will still be strongly influenced by our food and wood products.</p> <p>Table 1 of the report discusses efficiency gains affecting demand. Lessons can be learnt from review of domestic electricity demand (as opposed to commercial and industrial load). This is the one area where electricity demand has continued to grow linearly post-2007. This is despite general improvements in efficiency and government insulation projects. There has been growing recognition that homes are too cold, and it would seem that people are using gains achieved through insulation to improve the quality of life rather than decrease electricity demand. That needs to be factored into future demand considerations.</p>

Page	Question	Answer here – cells expand downward
15	<p>Q4. These scenarios reflect The Ministry’s views on new generation costs and availability. Given that these scenarios will be used for transmission investment planning, do you agree that the general scenario themes cover a sufficient range of uncertainty?</p>	<p>While the scenarios cover a wide range of uncertainty, we do not see a wind vs geothermal scenario as being useful. They are not seen as two ends of a spectrum. Both will contribute and companies that have developed expertise in one or the other of these will maintain pipelines of projects to sustain their teams.</p> <p>The two technologies are not conflicting. Geothermal is optimally suited to baseload generation, while wind is useful when available, but needs peaking capacity to support it.</p> <p>We agree that a high wind scenario could be driven by assuming significant reduction in wind turbine costs based on large global uptake of the technology. However this should be guided by the generators and their views on the future of European turbine prices vs those from elsewhere for which quality may be compromised.</p> <p>See our comments above on the generic geothermal projects. The fact that generators have not proposed and consented specific further stages on developed fields should not be taken as meaning further stages will not take place. Projects are developed in a staged manner and will be developed as generators (and Councils) are comfortable that further generation is sustainable and land access is secured.</p> <p>We question how you will assess the effects of small scale distributed generation. There are likely to be a number of geothermal projects in the sub-10MW range that can have useful local effects but not be directly linked to Transpower’s network. We understand that PV cost is close to the tipping point compared to retail pricing so this should also feature in your planning.</p>
19	<p>Q5. Do you have any specific feedback on the proposed EDGS capital cost assumptions sourced from the report: 2011 NZ Generation Data Update?</p>	<p>Generally capital costs and total O&M costs (fixed plus variable) for geothermal electricity are consistent with other work undertaken. It is debatable how much of the O&M costs should be counted as fixed or variable, but the total amount is acceptable. However, there is an ongoing cost of makeup wells that has not been clearly included. For suggested values refer to http://www.nzgeothermal.org.nz/Publications/Whats%20New/SKM%20Cost%20of%20Geothermal%20Power%20Report%202007%20Cost%20Basis%20R1.pdf</p>

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		<p>While the PB report indicates that costs could vary by $\pm 30\%$, the costs for the various technologies are not fully independent. To the extent that this variation is influenced by price of steel or exchange rates as examples then technologies will move in cost together.</p>
19	<p>Q6. In GS4, the Ministry will adjust the relative costs of wind and geothermal to favour wind. Do you agree that there is enough uncertainty between the relative costs of these technologies to make this adjustment in one of the generation scenarios?</p>	<p>See comments above on the sympathetic movement of costs with price of commodities or exchange rate. We do not agree that there is some simple competition between the development of these resources, though do agree that there is a possibility for the price of wind to drop more than the price of geothermal due to greater international uptake of the technology.</p>
20	<p>Q7. Do you have any views on potential geothermal resources, “consentability” and/or how the Ministry could model these uncertainties?</p>	<p>See earlier comments on the staged development of geothermal fields. We see the generic developments as being equally valid and proposals will be firmed by developers as they develop comfort with a field’s potential. Many of these generic developments are simple further stages on developed fields up to their roughly assessed potential.</p> <p>A further major factor on staging of developments relates to land owner negotiation. Developers continue to negotiate with landowners, and it is only after securing access to resources that developers will attempt the consent process or make public announcements. All developers are in active discussions with landowners and announcements will be made when all are ready. The current silence on further stages should not be interpreted as lack of progress or lack of development options, and should not be used as a reason to limit development in the coming decade.</p> <p>On our website, we have identified over 1,100MW of developable geothermal resource, some developed since the table was prepared – see http://www.nzgeothermal.org.nz/geo_potential.html .</p> <p>In developing this total we used conservative assumptions. One assumption we need to change relates to fields on which there are townships or industry. We had assumed that in those cases available resources would be half the assessed potential. This had been based on public reaction to the initial Tauhara consent applications for what became the Tenon development. Recent consenting for Tauhara 2 indicates that this downrating was not justified. Without this downrating then New Zealand geothermal potential could be as high as 1,600MW of additional capacity.</p>

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23	Q8. Do you agree with the Ministry's views on gas market scenarios?	No comment
26	Q9. Do you agree with the Ministry's approach to carbon price assumptions?	See earlier comments in the introduction. International views developed after the market price dropped to its recent level should be sought.
26	Q10. Is there anything else the EDGS should consider in relation to existing thermal generation or coal prices?	No comment
27	Q11. The Ministry's assessment of the likely price and demand effects is based on understanding developed through the Energy Outlook process. Have there been any other considerations omitted from this discussion?	We note that the Ministry is changing multiple variables with each scenario so that it may be difficult to determine the relative influence of each factor.
28	Q12. Table 4 summarises the Ministry's proposed EDGS assumptions. When considering the assumption set as a whole, do you have any specific comments?	<p>We do not agree that there will be a limited build of geothermal in the coming decade (compared to scenarios with no timing restrictions). However we do think that generators will maintain a pipeline of projects for the technologies they have developed expertise in, so scenarios should be modified to show increments in both wind and geothermal energy.</p> <p>The main limitation on build will be demand growth, but nothing is particularly holding back geothermal development.</p>

Specific Comments on the Base Capital Cost Assumptions for the EDGS

This table should include all significant inputs to the LRMC calculation. It is not sufficient to comment on capital costs or O&M costs. We are aware that MBIE wants to alter the capital costs in their scenario modelling, but it is the full suite of inputs that should be confirmed.

We trust these comments will be helpful.

Yours faithfully



Brian White
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New Zealand Geothermal Association