East Harbour Management Services Ltd
PO Box 11-595, Wellington
New Zealand
Tel: 64-4-385-3398
Fax: 64-4-385-3397
E-mail: brian.white@eastharb.co.nz
www.nzgeothermal.org.nz

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Submission on proposal for national policy statement for renewable electricity generation

To The Chairperson
Board of Inquiry

This is a submission on the (following) proposed national policy statement for renewable electricity generation (the proposal) that was publicly notified on 6 September 2008.

From The President and Executive Officer
New Zealand Geothermal Association

The specific provisions of the proposal that our submission relates to are:

- General support for a national policy statement for renewable electricity generation
- A view that forecast electricity demand has been underestimated but that generation capacity requirements may have been overestimated
- Alternatives to a national policy statement (NPS)
- Policy 3 reversibility aspects in relation to geothermal energy development
- Policy 4 ii. to enable research-scale investigation into emerging technologies, and
- Policy 5 threshold aspects associated with small-scale geothermal developments.

Our submission is:

General Support for a National Policy Statement for Renewable Electricity Generation

At various times, New Zealand Geothermal Association (NZGA) members have advocated for an NPS covering the development of geothermal energy. The specific inclusion of geothermal energy within the wider gamut of renewable energy covered by this NPS largely satisfies this aspiration.

Ultimately geothermal's application is wider than electricity generation, including heat supply and potentially mineral extraction. However, policies and plans associated with electricity generation can readily be adapted to heat applications at least.

Geothermal resources have other uses also. In some cases there are strong reasons for considering protection for environmental reasons. The resources can act as an environmental repository of biodiversity, they can have conservation/cultural/scientific values, and can be an important tourism revenue/employment source of the regional economy.

The NZGA recognises that electricity generation is of national significance as specified in this draft NPS, linking into an integrated national grid and electricity supply network. The significance of heat supplies and the practicalities of consent operation may have been missed in the development of policy though.

At domestic and commercial level, geothermal heating can directly substitute for electrical heating. As such, it is an electricity demand reduction strategy deserving of at least equal benefit weighting to electricity generation when being considered by decision makers. While supplying at local level, in the same way that generation supplies at a local level, the implications for the integrated electrical network are similar, or possibly greater when reduced demand on the network is considered.

Some consents secured primarily for geothermal electricity generation have been partially diverted to the supply of heat:

- A portion of Wairakei consents supply heat to the Geotherm glasshouses,
- Some Mokai steam from a well marginal for connection to the main steam supply heats glasshouses covering 13 ha and proving over 50 jobs for the economic well-being of Mokai and Mangakino,
- An Ohaaki well supplies a ngawha as part of a mitigation measure.

It will complicate the picture if consents are to be issued purely for the less-energy efficient purpose of electrical generation, when it may be more productively and economically efficient in other applications. There is the potential for adverse local effects to be burdened on the local community for national interests, in a way that denies the local community the opportunity for employment that direct use provides.

We fully support the stated drivers for an NPS on renewable electricity generation i.e delivering

- Clean, secure, affordable energy while treating the environment responsibly – Geothermal energy is one of the only renewable forms of energy that can deliver electricity 24 hours per day in a base load manner. It is independent of weather. The prime resources are located relatively close to the major load centre of Auckland. The unit costs of generation are amongst the lowest of all generation options (including fossil-fueled options)
- Low emissions generation – Geothermal resources do emit some CO_2 and other trace gases. The amount varies from field to field and may vary with time and with changing production strategies. On average, New Zealand geothermal developments have emitted about 100g CO_2 / kWh which is about a quarter of that of a gas-fired combined cycle and far less than other fossil fuel alternatives. As such, its displacement of fossil-fuelled stations, at least in terms of new generation directly contributes to addressing climate change concerns.

View on Forecast Electricity Demand

A view has been expressed in the Section 32 Report, in the New Zealand Energy Strategy and other recent documentation the electricity demand growth will be at approximately 1.3% per annum and equated with a requirement for 175 MW of new generation annually. We have issues with both of these numbers.

It is asserted that electricity demand growth will only be 1.3% per annum compared with a recent historical 2% per annum. Given current demand at 38,500GWh/year this equates to a projected annual demand growth of 500 GWh versus 770 GWh. Given transmission losses amount to around 10% then generation increase should be between 550 GWh and 850 GWh. While the lower demand growth is based on some detailed analysis, it is useful to step back from the detail to look at the sensibility of the result.

The graph below shows historical growth in electricity generation. The pattern of growth is obvious – a fixed 810 GWh/year increase over more than 4 decades. There are minor changes that could be associated with dry years and associated demand restrictions. But these events and other focuses on energy have had minimal effect on the long term trend. Throughout this time, efficiency increases have been offset by other demand increases. The system is characterised by steady evolution rather than radical revolution. So where is the cause of radical demand reduction? Actually, looking forward, if there is to be radical change

in energy use, say with introduction of electric vehicles to substitute for petrol vehicles, then the impact could be for radical increase in electricity demand.

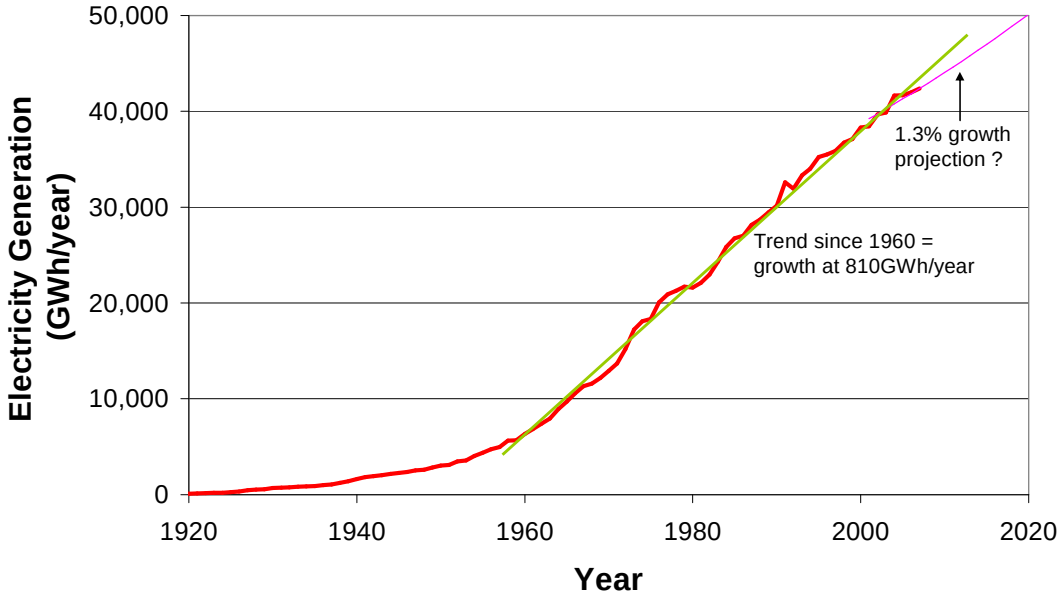

Figure 1: Electricity Generation Growth and Associated Trend

Overall, we suspect that the driver in terms of growing electricity demand has been underestimated.

Dealing with capacity, the 175 MW annual increase of new generation assumes a certain mix of generation. In the past, fossil-fueled generation has been a significant contributor to the total. The point of this NPS is to change the mix of generation so past mixes with their associated load factors will not apply. The new mix of generation is discussed in the folloing paragraphs.

Figure 2 is taken from the New Zealand Energy Strategy and shows price curves for a range of generation technologies under certain assumptions. This figure is highly illustrative of the current drivers for geothermal investment, at least in terms of electricity generation. The fat grey line in Figure 2 shows the effective price of the cheapest thermal generation under the assumptions of the Energy Strategy analysis. Below this line there are cheaper options including about 300MW of hydro (load factor about 50%), between 400 and 1400 MW of wind (load factor about 42%) and about 1000 MW of geothermal (load factor about 93%). If electricity generation growth is about 800 GWh/year, these renewable energy options equate to 1.6 years of growth for hydro development, 1.8-6.4 years for wind and 10.2 years for geothermal i.e. based on the Energy Strategy assumptions on a purely economic basis there could be 14 to 18 years before it is sensible to build new thermal generation[1].

[1] These are crude assumptions. Estimates could be greatly reduced if old thermal plant was retired.

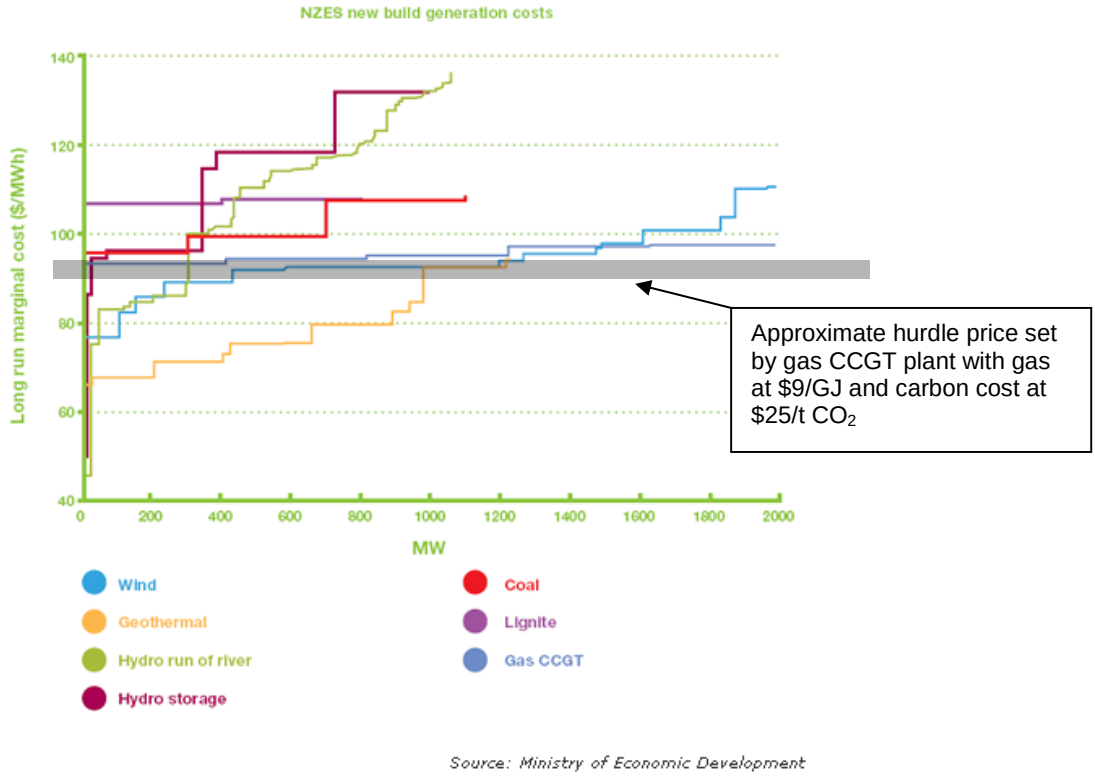

Figure 2: Long Run Costs for a Range of Generation Options (from the New Zealand Energy Strategy)

The following table outlines calculations of annual capacity increase requirements under various assumptions. From the table it is clear that the requirement for installed capacity under any of these demand growth scenarios is far less than the 175MW/year used in the Energy Strategy and in the Section 32 Report behind the NPS. The principle reason for this is the significant contribution that can be made by geothermal power stations with their very high load factors.

Table 1: Calculation of Required Generation Capacity Increase

	Generation Growth = 800GWh/year		Generation Growth = 550GWh/year	
	Minimum Capacity	Maximum Capacity	Minimum Capacity	Maximum Capacity
Generation Capacity (MW)	Hydro 300 Wind 400 Geoth. 1000	Hydro 300 Wind 1400 Geoth. 1000	Hydro 300 Wind 400 Geoth. 1000	Hydro 300 Wind 1400 Geoth. 1000
Years of growth	14	18	20	26
Installed capacity/year	120MW/year	150MW/year	80MW/year	100MW/year

Significant investments not included in the calculation above relate to retiring plant. In terms of geothermal plant, it is envisaged that the Te Mihi station will replace the existing Wairakei station. While this is sometimes modelled as a generation growth of 65MW, it requires an investment in a 225MW station. New Plymouth is in the process of being retired, but has previously served as backup for outages at CCGT plant and operates at around 150MW through the frequent winter crises we now experience so can be associated with a lost generation contribution of around 360GWh/year. This is equivalent to roughly a half year of growth so should have minimal effect on the calculations. Possibly more important in MED's calculation is an assumption of eventual replacement of other thermal plant with like plant. It is these replacement stations that will significantly contribute to the projected growth in installed capacity.

The major difference between the 175MW/year capacity growth assumption in recent Government documentation including the Section 32 report and the values in Table 1 is likely to reflect the major contribution of replacement thermal plant, while also reflecting the importance of enabling geothermal energy development in order to change the future mix, and minimise overall capacity increase.

Alternatives to a National Policy Statement

Prior to discussing any alternatives to an NPS on Renewable Electricity Generation, NZGA notes that geothermal development has been proceeding recently in all regions where there are high temperature fields (the current source of geothermal electricity generation). As examples, consents have been obtained and plant has been constructed at Ngawha in Northland and at Kawerau in the Bay of Plenty, and construction is proceeding for the Rotokawa and Tauhara plants in the Waikato region. Systems are in place that enable development, whereas a few years ago there was a sense of frustration at being unable to progress projects. While development was frustrated there were calls for reform with an NPS being suggested as a mechanism. However, with progress being made on premium fields, the need for this type of reform seems somewhat reduced.

Whatever reforms are introduced there will always be opportunities:

- to improve RMA processes,
- to introduce efficiencies, and
- to achieve progress against statutory timeframes.

Several alternatives to an NPS were suggested in the Section 32 Report.

We would oppose significant modification of the call-in process. Currently, Contact Energy is satisfied with this route into the consenting of geothermal developments, whereas Mighty River Power and others are satisfied with following conventional processes. The overall goal must be a consenting environment that encourages development. While the perspectives of the respective Boards are different, what is important for investment is that they can see acceptable paths forward. Hence interference with this call-in option could be counterproductive.

NZGA does favour the use of an NPS to focus decision makers' attention on the national significance of these projects.

If the effect over time on policies and decisions is not significant then a third choice would be amendment of section 6 of the RMA to include renewable electricity generation as of being of national importance.

Policy 3 Reversibility Aspects

Policy 3 requires decision-makers to "have particular regard to the relative degree of reversibility of the adverse environmental effects" of a development.

Firstly, NZGA has concerns around this policy given that geothermal systems are dynamic in nature. Surface features naturally change with time so would not revert to their original state after development ceases.

Secondly, geothermal projects are intended as renewable and sustainable developments. Wairakei can be considered as an example. After 50 years of operation, the plant is getting old and in need of replacement, with the Te Mihi plant suggested to fulfil this. However, some of the same wells and pipes will be used to supply the new station, from the same resource. There is no intent to abandon or allow the field to revert.

There is a fundamental error in considering reversion as a criterion for projects that are renewable and sustainable, and therefore of potentially infinite resource life. For as long as there is demand for electricity (or potentially for heat in the case of geothermal energy) then consented sites will continue to be occupied.

Policy 4 Enabling Research-Scale Investigations into Emerging Technologies

As a rule, current plans and policies in the regions of current development focus are probably adequate for geothermal development. However, this policy may become of increasing interest as the high temperature, high production fields are developed and next options are considered. There may be growing interest in development of lower temperature resources largely for heating (and therefore outside the current scope of a National Policy Statement). The next electricity options on the global scene are known as enhanced geothermal systems (EGS) and could be located almost anywhere in the country.

There is a natural temperature gradient everywhere, typically equating to around 33^{o}C/km in New Zealand and internationally. Deep wells drilled for oil and gas in Taranaki or Canterbury basins as examples have encountered temperatures exceeding 150^{o}C which is suited to electricity generation. Basic research is required to identify sites of enhanced gradient or optimal properties for development. Australia has several sites of this nature and numerous companies have sprung up there to develop EGS resources. Experience gained there can readily be transferred to New Zealand. Currently, these developments do not appear to be financially viable, at least in New Zealand. However, this is an emerging technology that could eventually be viable here as low cost alternative generation options are taken up and the cost of emerging technology decreases.

There are currently no good models of RMA-planning-related policy with respect to EGS resources. Despite the comprehensive nature of Environment Waikato's geothermal plan and policy statement, EGS resources were not specifically covered. Discussions with planning staff indicates EGS resources could potentially be covered as a non-complying activity under their "Small Geothermal System" category (despite their global nature), but there is no explicit policy related to them.

We note that if Policy 4 is introduced, then because of potential national application of EGS, then every region will have to consider policies related to this.

Policy 5 Threshold Aspects for Small-Scale Geothermal Developments

We note that some councils (especially Environment Waikato) already have policies and plans specifically to enable the development of small scale electricity generation. The Board of Inquiry is seeking some guidance on potential thresholds to be targeted by such a policy.

In the case of geothermal developments, there have been several examples of incidental projects that take advantage of otherwise unused heat streams. Examples include the binary cycle plant at Kawerau (totalling 5.9 MW) and the more recent Wairakei binary plant (rated at 14 MW but capable of up to 20 MW on occasions). These could all be considered small scale efficiency improvements to a development

There are several places where the Crown has drilled existing wells so developments are possible on those wells with relatively low resource risk. One example just developed by a private party is based on the KA24 well also at Kawerau and totals 8.3 MW. There is the possibility of greater private single well developments at Kawerau and elsewhere, but almost certainly under 20 MW, if not under 15 MW in capacity.

These days the cost of drilling poses a significant hurdle to development. Individual wells can cost $6 million to drill, but developers would have to commit to a programme of 3 or 4 exploration wells to prove a field. Normally interest would be in large scale development, but if a field had unfavourable production characteristics, then a decision could be made to

abandon further development and try to maximise the benefit from the poor exploration wells. In this event, a small-scale threshold of the order of 15 to 20 MW suggested by the cases above is likely to cover a development.

We seek the following changes to the proposal:

Policy 3 related to reversibility should be deleted as it is an inappropriate policy for a sustainable development. Currently this policy states: *"When considering proposals to develop new renewable electricity generation activities, decision-makers must have particular regard to the relative degree of reversibility of the adverse effects associated with proposed generation technologies."*

Consequently, other policies should be renumbered.

I do not wish to be heard in support of my submission

If others make a similar submission, I will consider presenting a joint case with them at a hearing.

Colin Harvey
President,
New Zealand Geothermal Association

Brian White
Executive Officer
New Zealand Geothermal Association

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Address for service of submitter:	New Zealand Geothermal Association C/- Level 8, CMC Building, 89 Courtenay Place PO Box 11-595, Wellington
Telephone:	0274 771 009
Fax/email	04 385 3397/ brian.white@eastharb.co.nz
Contact person	Brian White Executive Officer, NZGA