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Submission on the Draft Environment Bay of Plenty Regional Policy Statement

Environment Bay of Plenty
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Attention: David Phizacklea

On behalf of the New Zealand Geothermal Association

1 April 2010

Introduction

The New Zealand Geothermal Association (NZGA) would like to thank Environment Bay of Plenty for their timely consultation on the draft Regional Policy Statement. Of course this process will take many months, through various phases. We would hope that our comments throughout will be seen as helpful, as that is our intention, and we will restrict these specifically to geothermal matters.

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 274 members currently.

Geothermal Resources in New Zealand

Before commencing detailed comment on the draft Regional Policy Statement (draft RPS) we will make a few comments about the geothermal resources of New Zealand to give context to our interest in the geothermal resources of the Bay of Plenty area and related policies and plans.

Table 1: Comparison of potential geothermal applications and associated resource location

	Heat Pump Applications	Enhanced Systems for Heat (or Electricity)	Conventional Heat Applications	Electricity Generation
Location				
Comments	• Potential national application • Best areas have not been defined	• Potential national application • Best areas have not been defined • Basic research is required	• Localised application • Data is being collected • Resource size is being assessed under low temperature research funded by FRST	• Narrowly defined resources • Some resources are effectively protected from large scale development

There are a variety of geothermal resources available throughout New Zealand (see table 1). Arguably, geothermal heat pumps could be installed anywhere in the country to exchange heat with the ground or surface waters, in a more efficient manner than air source heat pumps. Similarly, there is a natural thermal gradient everywhere such that if you drilled deep enough you could find temperatures for what ever process you were considering. While these seem promising, practical economics severely limits these options.

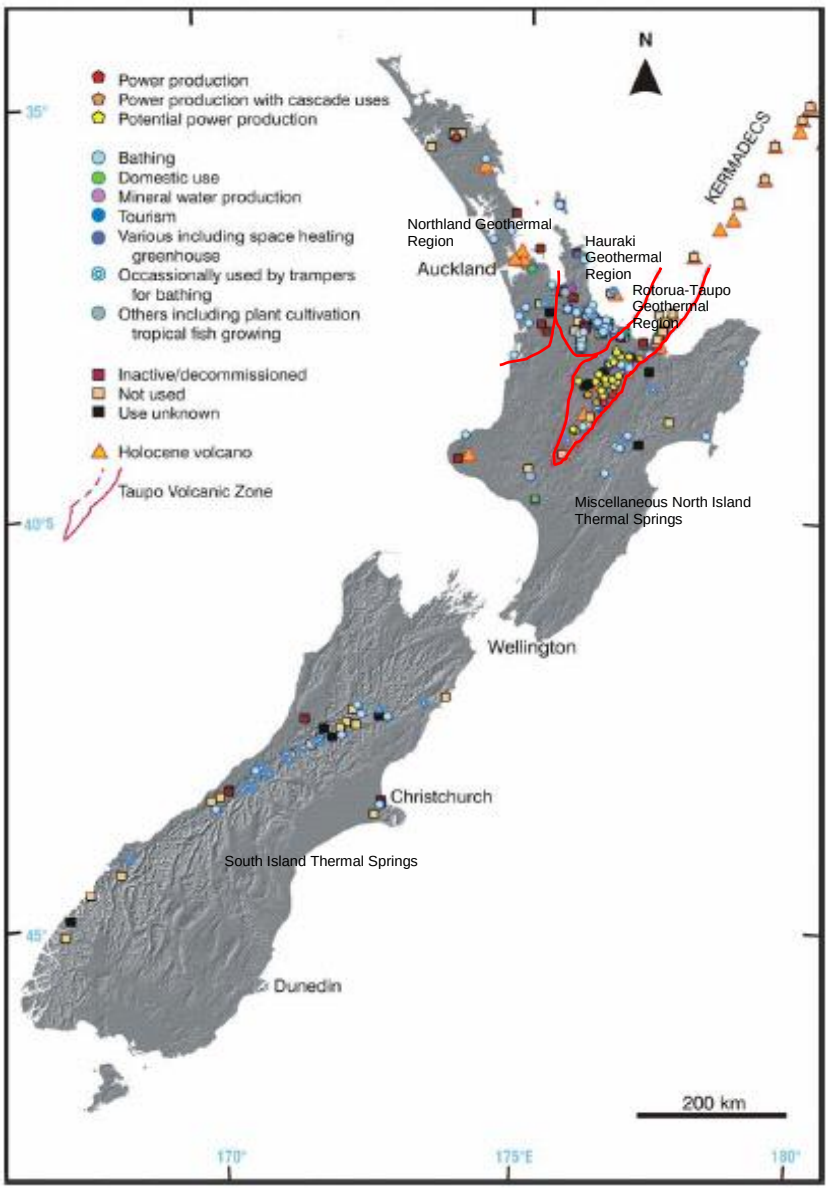

Figure 1: Map showing the main uses of geothermal fluids in New Zealand, and showing the five geothermal regions (based on Thain, Reyes and Hunt 2006)[1]

The next resources to consider are the warm and hot spring systems associated with conventional geothermal systems. Warm springs are found in limited locations in both the North and South Islands (see Figure 1). The associated systems have potential uses with pools and a range of lower temperature direct use applications. We note that there are many low temperature systems within the Bay of Plenty, many of which have been developed to some extent, principally for bathing.

It is interesting to compare direct use of geothermal resources in the Bay of Plenty with the direct use in the adjacent Waikato region. Table 2 is taken from a recent report on direct use nationally[2], and clearly shows the national dominance of the Bay of Plenty use. This is strongly linked to the major direct use developments at Kawerau, but there are diversified applications elsewhere that are on a comparable scale with Waikato use.

[1] I Thain, A G Reyes, T Hunt (June 2006) *A practical guide to exploiting low temperature geothermal resources.* GNS Science report 2006/09 (see http://www.gns.cri.nz/geothermal/2006_09_Lw_tmprtr_gthrml_rsrcs.pdf)

[2] B White (June 2009) *An Updated Assessment of Geothermal Direct use in New Zealand.* NZGA report sponsored by EECA

Table 2: Assessed Geothermal Direct Heat Use (TJ/year)

Geothermal and Council Regions	Space Heating	Space Cooling	Water Heating	Greenhouse Heating	Fish and Animal Farming	Agricultural Drying	Indistrial Process Heat	Bathing and Swimming	Other Uses	Total
Northern										
Northland								6		**6**
Auckland	0.3							58		**58**
Waikato	0.3							63		**63**
Hauraki										
Waikato								27	14	**41**
Bay of Plenty	14			17	2			274	6	**313**
Rotorua-Taupo										
Waikato	24		40	356	271		880	753	823	**3,146**
Bay of Plenty	24		79	6			5,224	520		**5,854**
Miscellaneous North Island										
Gisborne								0.1		**0**
Hawkes Bay								3		**3**
Taranaki								0.2		**0**
South Island										
Marlborough	0.3									**0**
Canterbury	11							40		**51**
West Coast								14		**14**
Otago	2	1								**3**
Total	**76**	**1**	**119**	**379**	**273**	**0**	**6,103**	**1,759**	**843**	**9,552**

Electricity generation is possible on resources greater than 100°C and normally greater than 130°C. However, in New Zealand we have some premium high temperature resources by international standards. These are of such quality that significant development has been occurring at a faster rate than any other country without subsidy from these renewable resources. The following table shows an assessment of geothermal potential of the known high temperature fields based on public information.

Table 3: Potential Development on High Temperature Geothermal Systems

Field	Generating Capacity (P50) (MW)	Capacity Minus Environmental Limitations (MW)	Existing Generation or Use (MW)	Equivalent Period of Past Use (years)	Calculated Available Additional Capacity (MW)
Atiamuri	6	0	0	0	0
Horohoro	5	5	0	0	5
Kawerau	450	225	130	9	58
Ketetahi	100	0	0	0	0
Mangakino	47	47	0	0	47
Mokai	140	140	111	7	4
Ngatamariki	120	120	0	0	120
Ngawha	75	38	25	5	9
Ohaaki	130	130	60	17	37
Orakei Korako	110	0	0	0	0
Reporoa	42	0	0	0	0
Rotokawa	300	300	35	11	252
Rotoma	35	35	0	0	35
Rotorua	35	18	6	45	2
Tauhara	320	160	2	3	158
Te Kopia	96	0	0	0	0
Tikitere-Taheke	240	240	0	0	240
Tokaanu	200	100	0	45	99
Waimangu	280	0	0	0	0
Waiotapu	340	0	0	0	0
Wairakei	510	510	230	30	47
Total					**1115**

Since this table (with EBOP systems in yellow) was produced a year ago, 132 MW has been developed at Rotokawa (Environment Waikato) and 23 MW has been developed on Tauhara, while Mighty River Power is now starting exploration and development work on Ngatamariki. The end result will be a heavy weighting of future projects in the Bay of Plenty region. All of the data is based on publicly available data, and private data may indicate that some fields have potential quite different to that indicated, though these seem to have been useful figures for initial development. Note that NZGA recognises that there will be "environmental limitations", some explicitly imposed by councils, but some that developers may accept themselves for initial developments as a means of winning over nearby communities. So NZGA has taken a conservative approach where there are significant built-up area over a field, and have simply halved the potential in those cases recognising that local opposition may reduce development plans, at least initially.

With this in mind we consider the resources in the Bay of Plenty Region to be a valuable national renewable asset, and would like to see policies and plans that reflected that importance. Where the nation cannot meet its energy needs through conservation or energy efficiency then we should be using renewable resources, such as geothermal resources, as opposed to high emission fossil fuels. In this case, the attractive economics and low environmental impact mean that these resources may be a natural priority for development. Various developers have already started to develop Kawerau, while consideration is being given to further expansion of Kawerau, and new developments at Tikitere-Taheke and Rotoma. The combined resources at Tikitere-Taheke may now be the single largest opportunity for geothermal development nationally. We are pleased that plans open these fields to development. The detail of the Plans and Policy Statement now need to reflect that enabling intent.

This discussion has been focused on high temperature geothermal systems, but there are many low temperature systems too. Many of these systems have already been developed to some extent. For a list of these systems and known use see the following NZGA report in the Appendices:
http://www.nzgeothermal.org.nz/Publications/Whats%20New/Updated%20Direct%20Heat%20Report.pdf

The New Concept of Enhanced Geothermal Systems

We believe policy statements should have a degree of forward thinking and vision, along with provision for upcoming technologies and developments. One such technology associated with geothermal energy is that of Enhanced Geothermal Systems (EGS). The natural thermal gradient through the earth was mentioned in earlier paragraphs. Some of the modelling of heat loss in the Taupo Volcanic Zone is based on an assumption of magma at a depth of around 10 km depth. Assuming a linear temperature gradient from this magma to the surface in places where the formations are impermeable and convection cells do not exist, implies gradients comparable with the Cooper Basin in Australia, Fenton Hill in the USA or Soultz-sous Forets in France i.e. comparable with the best systems currently or previously under development anywhere in the world.

EGS relies on the development of artificial (or enhancement of poor) reservoirs at depth. Wells are drilled to intersect the fractured reservoirs and fluid is circulated through production and injection wells to progressively flush out the heat from the created reservoir. The flushed heat can be used for large scale heat applications or for electricity generation.

Given EBOP's potential enhanced geothermal systems are likely to be world-class, it is reasonable to make provision for development of these. We concede that conventional developments are likely to be economically more attractive in the short term, but interest in research and development of these systems is likely to grow with time, especially given the huge current international investments in this technology, and New Zealand developer's long term interest.

Consideration of the Small Developer

It appears to us that there are occasions when policies have been meant with a view to large developments while not adequately considering the small developers. Provision of heat in some of the coastal communities or development of embedded small-scale generation as examples are useful functions for a resource, but this can be discouraged if caught up with extensive monitoring or modelling programmes.

EBOP's "Infrastructure and Energy" Chapter and Encouragement of Renewable Energy

EBOP has developed a suite of objectives, policies and methods around infrastructure and energy. It is unfortunate and we think erroneous that this chapter and policies are separate from (and sometimes in conflict with) a discussion of geothermal resources.

As your chapter states "The NPS on Renewable Electricity Generation has been developed to recognise the national significance of renewable electricity generation by promoting the development, upgrading, maintenance and operation of new and existing renewable electricity generation, so that 90% of New Zealand's electricity will be generated from renewable sources by 2025."

When Government's thinking on "renewable energy" is reviewed it is seen that the principle source of renewable energy through which the renewable target will be reached by new generation is geothermal energy (see Figure 2 from the New Zealand Energy Strategy). Thus the intended policy of encouraging renewable energy (policy 17) should be particularly directed at geothermal energy, in contrast to a policy of applying a precautionary approach (policy 14).

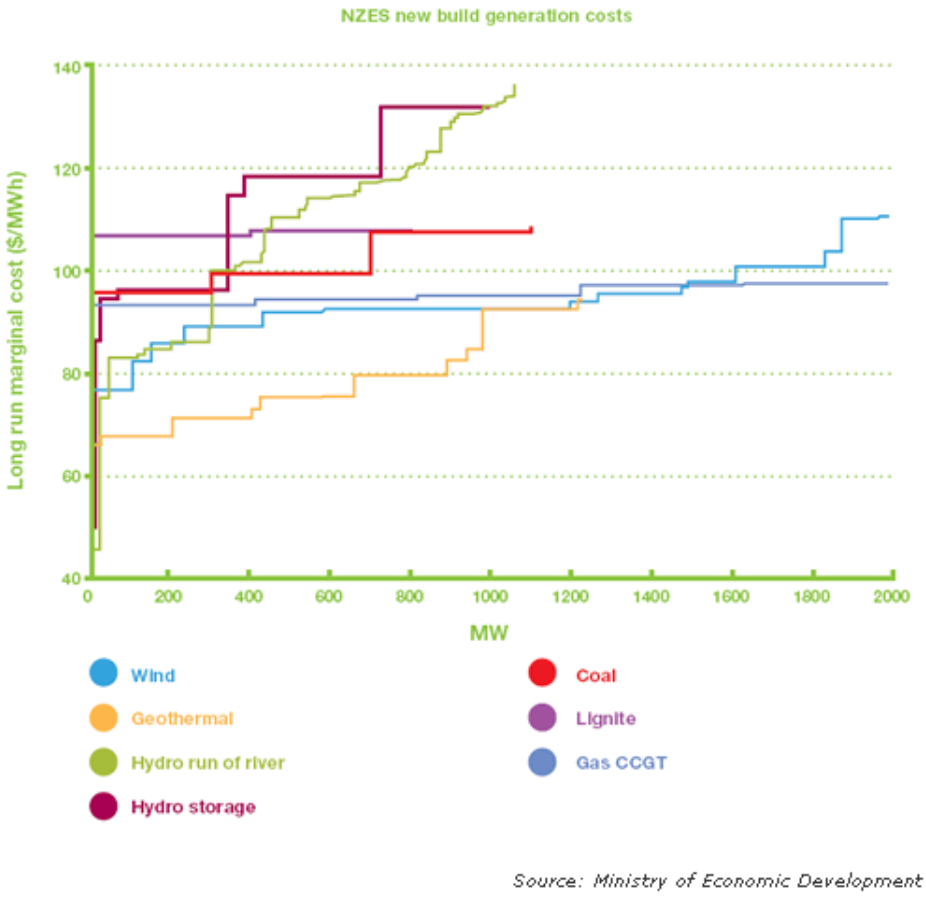

Figure 2: Graph of various energy sources in New Zealand showing associated prices and quantities (taken from the New Zealand Energy Strategy)

The following graph (Figure 3) is derived from the Ministry of Economic Development's Energy Outlook and shows the anticipated source of renewable generation for values over that existing in 2009 i.e. anticipated growth in renewable energy beyond 2009.

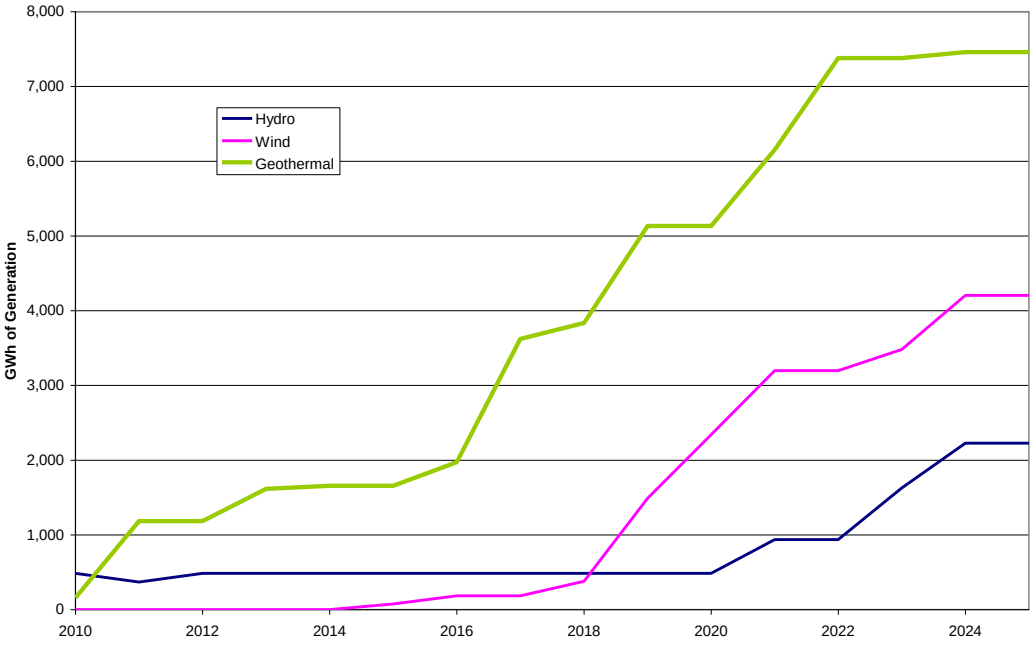

Figure 3: Anticipated growth above 2009 values in renewable energy generation based on MED's Energy Outlook Reference Case.

From Figure 3 it is seen that single greatest anticipated source of new renewable energy for electricity generation is geothermal energy, and this is likely to be the most immediate source of growth too. If this anticipated growth occurs, MED still anticipates that the percentage of renewable energy for electricity generation will only reach 83% in 2025, up from a value of 72% in 2009, but still well down from the 90% target. Other scenarios run by MED in their energy modelling all suggest a similar result.

There are price implications of a precautionary approach. If, say, both EBOP and Environment Waikato took a protective path eliminating or severely curtailing the geothermal option, then Figure 2 shows that the roughly $70/MWh (7c/kWh) generation option will be removed and after rapid uptake of wind options the country will be forced into uptake of $95/MWh (9.5c/kWh) gas-fired generation. The marginal generation sets the wholesale electricity price, so such an action would result in a 2.5c/kWh jump in electricity price. The effect would be nation-wide.

It is possible to consider the Bay of Plenty in isolation. From demand data provided to NZGA by Energy Link, total electricity consumption in the Bay of Plenty area for the 12 months up to the end of February 2010 was 2,568GWh so the associated annual cost to Bay of Plenty electricity users (homes, businesses and industry) due to a 2.5c/kWh price increase would be about $64million/year. Re-expressing this on a per-capita basis with roughly 272,000 people, this is a cost of around $240/year per man, woman and child in the Bay of Plenty area. If the equivalent effect across the nation is considered, with a total electricity consumption of 40,000 GWh/ year a 2.5c/kWh increase in price equates to an additional cost to the nation's electricity consumers of $1 billion/year.

If EBOP is to appropriately take account of the NPS on Renewable Electricity Generation then they need to prioritise "encouragement" of this renewable energy source over any "precautionary" approaches[3].

With this in mind, EBOP could go further than simply not discouraging geothermal development, to actually encouraging geothermal development. There are a range of incentives offered in other countries to encourage renewables. A service that EBOP could consider to remove some of the development risk for small scale developers and users of low temperature fields while satisfying your own information requirements would be to undertake supporting studies on these fields. As an example we understand you have already undertaken baseline flora and fauna studies in most fields. Databases of well data (temperatures at feed zones, mass flow, stratigraphy, casing details) would also provide firmer planning data. We are not suggesting market distortions, but particularly bridging information gaps to allow better risk and cost assessment. A forced sharing of this information is not appropriate for large scale high temperature fields where major developers have invested millions of dollars to establish a position on a field that others could readily take advantage of if information were made public.

Support for Iwi Resource Management Issues

The NZGA is broadly supportive of policies designed to recognise matters of significance to Maori and to involve them in the consultation process. In many cases, Maori Trusts or business units will be development proponents for geothermal developments.

Concerns over Protection of Geothermal Features

With our diverse interests in geothermal resources, the NZGA is supportive of efforts to protect the rare environments that are found in geothermal areas. However, this support is limited by the recognition that any development will cause change, and that broadly speaking, development of certain geothermal resources is desirable. Policies should protect features from unnecessary tampering, but we would support the view developed by Environment Waikato, that mitigation efforts should be focussed on offsetting fields, possibly those that already have protection status at the margins of the Bay of Plenty region e.g. Waimangu.

We support the view that protection of Waimangu should be extended to protection of the associated Tarawera resource also.

Some Specific Concerns with the Current Draft

We have the following concerns with the wording in the draft RPS.

<u>Section 3.3 Geothermal Resources</u>

The map only shows high temperature fields, while there are many lower temperature fields that are currently (or could be) actively developed. A second map showing these low temperature fields should also be developed.

The first paragraph only deals with high temperature resources. The discussion should be extended to cover lower temperature resources and the potential EGS developments.

Perhaps on EGS developments you could add a paragraph along the lines "The concentration of conventional high temperature geothermal systems in the Taupo Volcanic Zone is associated with one tectonic plate diving beneath another plate. A plume of magma rises above this subducting and melting plate to relatively close to the surface. Where heat is not quickly transported to the surface via deep circulating water convection cells, heat will still be transported by conduction. In these impermeable areas there will be high thermal gradients that could make attractive Enhanced Geothermal System targets. Such areas may

[3] We note that Mighty River Power is making a separate submission that includes some comments on the precautionary approach

have little or no surface expression but still have potential for the supply of energy for heat or electricity."

Table 3: As with all tables, the reference pages will have to be corrected.

Objective 7: We support the protection of surface expressions of the Regional Geothermal Resource to an extent (but see our earlier comments on the need for encouragement of renewables). The protection of features in the Waimangu-Tarawera area is a first priority with that of individual features on other fields as a secondary priority.

Related Policies (these are shown in the order they appear in Table 3):

Policy 12 (Protecting geothermal features) is based on Appendix F Criteria (should be "set") 2 and 3 and definitions of geothermal features of significance, which also refer to Appendix F Set 4 and 5. The definitions of significant feature are so broad as to cover almost every occurrence of geothermal (with the exception of potential EGS systems). This policy appears to preclude any development on sites which contain any features defined by the criteria listed.

Policy 12: (b) It is not possible to protect "natural flows of geothermal water from deep within the system to the surface." Any perturbation of pressure will alter natural flows. It may be possible to offset changes with injection programmes as has been done at Ngawha, Northland, but this still represents a change in flows. This is not a workable policy.

Policy 12 (d) The "prevention of new takes/discharges unless they are for scientific investigation or to remedy or mitigate existing adverse effects" is blatantly contrary to the policy of encouraging development of renewable energy and should be deleted. It extends well beyond any precautionary principle also.

Policy 13 (Requiring integrated management of geothermal systems). We support the concept of integrated management of geothermal systems. We note that the geothermal system classification referred to in Policy13 (a) (and Policy 15 (a)) was omitted from Appendix A and that should be corrected. We assume that these are the management groups currently within policy 121 of the Regional Water and Land Plan. If that is the case then we would also want to see a map showing the boundary for protection around the combined Waimangu/Rotomahana/Tarawera system. Maps around some of the other systems (in a similar manner to Environment Waikato maps) would be useful.

Policy 14 (Applying a precautionary approach to managing natural and physical resources). As stated previously, we see application of a precautionary approach as being contrary to the encouragement of renewables.

As a matter of semantics, in policy 14 and others the term 'level of development' is used. Perhaps a better term than 'level' in the context of geothermal development is 'extent'.

Policy 58 (Use of geothermal resources) (a). We do support the distinction between large and small scale development, though think some definition should be given to this scale. From an electricity generation perspective, large scale may be somewhat over 30MWe, so large scale development could be defined as the equivalent of a heat flow capable of generation more than 30MW of electricity.

Policy 58 (b) Delete 'of' so that it reads 'and effects of…'

Policy 58 (c). The scale considerations should also apply to policy 58(c) as comprehensive monitoring of every feature may be well beyond the scope of a small direct use cluster say at Papamoa. Monitoring vs precautionary principles need to be thought through further. If the extent of protection currently reflected in the Policy Statement is carried through, there will be no need for monitoring as effects will be negligible.

Policy 15 (Providing for the sustainable use of geothermal resources) (b). NZGA is broadly supportive of a single system management plan for efficient field management. Some people have an issue to do with clarity of the wording. There will be practical difficulties in the working out of this policy if one operator has a consent within a particular field and a new developer comes along. All the onus is on the newcomer to have complete cooperation with the original consent holder, who would not be incentivised to cooperate.

Policy 15 (f) Some guidance on the meaning of efficiency of use should be given. Currently policy 15 only allows development and use of a system if efficiency of use can be demonstrated. Direct use applications are typically only 50% efficient with the other half of the energy rejected. For electricity generation, conversion efficiency is often in the range 10-15% because of the low temperatures of the geothermal resources say compared with temperatures developed in a boiler. There are fundamental thermodynamic laws that mean it is not possible to generate at much higher efficiencies. This should not be used to stop geothermal development in preference to coal and gas-fired options.

Policy 59 (Geothermal use, takes and discharges) (c) There is a missing 'is'. The third line should say "…consents **is** not consistent with…"

Policy 59(e). The application of a bond is contrary to the encouragement of renewables. Geothermal projects are capital intensive compared with gas or coal developments. There is already a high upfront capital investment. Internationally, policies of governments and states to encourage geothermal development take a number of forms but these can include means to reduce the upfront cost. An addition of a bond is clearly contrary to this good practice.

Policy 60 (Requiring an integrated system for geothermal management) refers to "significant" geothermal use. Perhaps this should be restated in terms of the definition of large scale development we gave earlier. Many of the subpolicies are only applicable to large scale developments.

Policy 60(f) We are not sure what the intended meaning of use of "resource buffers" is?

Policy 60(g) We would like it clearly stated that remedying or mitigation of significant adverse effects on significant features can occur on other fields, as for Environment Waikato.

Policy 61 (Requiring discharge in accordance with a discharge strategy) (d) Differential subsidence might only be an issue in built up environments or where flooding might result. For most rural situations, subsidence and differential subsidence is not an issue. Perhaps this should be altered to say that the discharge strategy should address "avoidance/mitigation of subsidence or differential subsidence or evidence that the effects are minimal."

We note there is significant repetition between policy 61 (i) and (k), (d) and (l) and (e) and (m).

Policy 62 (Protecting significant features by maintaining geothermal systems). We support the protection of pressures and temperatures in Protected Systems. See our earlier comments about the omission of these from Appendix A and for the need for maps to define their boundaries. We think that Rotorua is a special case. Protection of the geysers is clearly required, but problems are created due to the very broad definitions of "significant features".

Policy 16 (Protecting and managing geothermal features and ecosystems) (b) Insert 'protection' so that it reads 'geothermal system protection'

<u>Section 3.4 Infrastructure and Energy</u>

Policy 17 (Encouraging renewable energy sources). The explanation of the policy for encouraging renewable energy sources should specifically cover geothermal energy as this was a primary intention of the NPS on Renewable Electricity Generation (see earlier discussion).

Policy 17(d) it is unclear why renewable energy sources should specifically be encouraged in new urban developments and the coastal marine area and not in rural settings. Geothermal heat supplies could play a bigger part in horticultural developments or could be developed for local electricity development in rural areas. It should be noted that there are several parts of the Bay of Plenty region where electricity supplies are marginal. There have been cases where weeks have passed after natural disasters where remote sites remain without connection to the electricity network, as network owners have prioritised other areas and have sought to put pressure on users to disconnect. Remote geothermal use for heating or generation to reduce the load on the distribution network should be encouraged to help maintain the integrity and viability of current remote sites.

Policy 18 (Promoting energy efficiency and energy conservation) the explanation of the policy for promoting energy efficiency and energy conservation could specifically list geothermal applications e.g. explanation (d) could list geothermal heat exchangers.

Under Policy 19 (Protecting regionally significant infrastructure), we believe regionally significant infrastructure includes the electricity distribution lines that connect between the generators on the national transmission grid to the end user.

Section 3.5 Iwi Resource Management Issues

We will leave others to comment in detail on this. We are generally supportive of these policies and strongly supportive of policy 75 related to recognising matters of significance to Maori.

Section 3.8 Natural Hazards

We have few comments on this section. It does seem that the repetition of policies 34 and 80, 35 and 81 and 36 and 82 is unnecessary.

Throughout the RPS we noted typos and reference errors which we assume that you will sort out before the next round of consultation.

Final Comments

We would be happy to discuss details of this submission, and would like to be involved in the ongoing process of policy revision.

Yours faithfully

Brian White
Executive Officer
New Zealand Geothermal Association