

IN THE MATTER OF The Resource Management Act 1991

AND

IN THE MATTER OF The Waikato Regional Policy Statement
(Proposed Plan Change 1) and the
Proposed Waikato Regional Plan
(Proposed Variation 2): Geothermal

STATEMENT OF EVIDENCE OF ANDY BLOOMER

NEW ZEALAND GEOTHERMAL ASSOCIATION

1. Introduction

1. My name is Andrew Bloomer; I hold Bachelor of Engineering and Master of Commerce degrees. I am a Chartered Professional Engineer and a member of the Institute of Professional Engineers of New Zealand, of the New Zealand Geothermal Association, the International Geothermal Association and the Geothermal Resources Council. I have 25 years experience in geothermal engineering. I work for Century Resources at Wairakei; however, I make this submission on behalf of the New Zealand Geothermal Association. I am an elected member of the Board of the Association and also hold the position of the chair of the Information and Education Committee.
2. The Association seeks to ensure that the Plan adequately promotes the sustainable development and use of geothermal resources.
3. Quoting from the bylaws: the New Zealand Geothermal Association is a scientific, educational and cultural organisation established to operate in New Zealand. It is a non-political, non-governmental, non-profit organisation. It has no political affiliation.
4. Its aim is to encourage, facilitate and, when appropriate, promote co-ordination of activities related to worldwide and national research, development and application of geothermal resources.
5. The Association is made up of individual members, who are scientists, technologists and other persons engaged in the research, development or utilisation of geothermal energy. Others are involved in management of geothermal resources some have a strong interest in protection of those resources.

6. My evidence today relates to Proposed Plan Change 1 to the Waikato Regional Policy Statement (Geothermal Section) and Proposed Variation 2 to the Proposed Waikato Regional Plan (Geothermal Module). In particular my evidence focuses on:
- The significant change in emphasis in the Proposed Plan Change 1
 - Sustainable resource use and renewability: the 100-year rule
 - The 'Other' classification
 - Information and public education

2. Background and General Comments

7. The Association, being made up of a diverse range of individuals, attempts to reach a consensus among its members on matters of policy. There is a general consensus that geothermal energy – if properly managed – is a renewable resource with a potential for production over a time scale of centuries. A failure to fully use geothermal energy and thereby reduce use of non-renewable resources is not appropriate sustainable management of the natural resources of the country, a fundamental principle of the RMA. The Association does not favour unrestricted development of geothermal energy in situations where it would bring net environmental dis-benefits, or hinder legitimate competing uses such as tourism.
8. In submitting on the geothermal parts of the Plan, the Association seeks to ensure that the Plan achieves a balance between the use of geothermal resources to meet the energy needs of the current generation, the energy needs of future generations while also preserving intrinsic, tourism, scientific and other values associated with the national and regional geothermal resource.
9. The discussion on renewability and sustainability improves on the previous version of the document. However, it still does not clearly distinguish between the following four aspects of conservation. (The proposed words in the Staff Report on the RPS, p.26-28, are better than in the previous draft).
- Conservation of heat, which is the resource that is actually being utilised for large scale energy development, and which is mainly contained in the rocks. Heat will be replenished but over a greater than human time scale. We consider that mining heat is acceptable, provided some of the resource remains for future generations. On that basis developments of the order of 100 MW electrical equivalent for 30-50 years are feasible for typical Waikato Region high temperature geothermal resources.
 - Conservation of fluid in place, which is the means by which the resource can be extracted. Fluid can be replenished either naturally or artificially much faster than the heat. To require that fluid in place be conserved would be more restrictive than requiring heat to be conserved.
 - Conservation of fluid flow through the system. That would require maintaining the pre-development hydrodynamic regime within the system. What that mean in practice is rather site-specific, but for most Waikato high temperature geothermal systems it would permit development possibly of only tens of MW of electrical equivalent.
 - Conservation of surface thermal activity. That is closely related to the previous criterion, but could be even more restrictive and

has the added complication of natural changes in activity. It would virtually preclude any significant geothermal development at most sites.

10. In our opinion the most appropriate of these criteria that should be taken into account in the context of assessing the sustainability of *the resource* is the first: conservation of heat. The other items are of course important, but they should be separately addressed and regulated.
11. The NZGA does not accept the EW view that geothermal energy is non-renewable energy resource. The IGA, UNDP, IEA and other International Organisations have classified geothermal energy as a renewable energy resource. The renewability rationale generally accepted is set out in the paper presented at WGC2000 by Val Stefansson, entitled "The Renewability of Geothermal Energy". This was submitted with our written evidence.
12. It is stated on p.9 of the Summary report that "the durations of typical geothermal systems range from 5,000 to 1,000,000 years". That statement is misleading. As pointed out by Grindley (1965) and Lawless (1988), and based on numerous mathematical models of cooling intrusions, it is highly improbable that any geothermal system remains at a constant rate of heat emission for 1,000,000 years, or even 50,000 years. Repeated pulses of heat pass through the same volume of rock, and the area may retain *some* heat continuously for longer periods, giving the illusion of a steady-state system, but in reality there must have been large temperature fluctuations and hence hydrodynamic variations during the history. During a period of 1,000,000 years erosion, deposition and tectonic process must also make huge difference to the hydrology of geothermal systems. In the Taupo Volcanic Zone during the past 1,000,000 years elevation changes have been on the order of kilometres. On a geological time scale high temperature geothermal systems are essentially ephemeral.
13. It is stated on p.11 of the Summary report that "... the fluid must remain above a certain temperature to prevent deposition of minerals leading to clogging of pipes [in the context of reinjection]." That is an over-simplification. Maintaining temperature is one way of preventing silica deposition, but it should be acknowledged that there are chemical means for doing so, and mechanical and time factors are also important. There are technologies available which are practical but not economic in New Zealand because of the low energy prices. Furthermore, temperature is not the real issue, it is silica saturation, which is affected by flash fraction (hence separator pressure/temperature), whether condensate and/or NCG is re-combined, time (affecting polymerisation and which silica phase controls solubility) as well as temperature.
14. It is stated on p.11/12 of the Summary report that, "new power plants are likely to be as efficient as current technology allows". That is an over-simplification. New power plants will be as efficient as the *economics* dictate. For example it would be technically possible to add more heat exchangers to existing binary plants to extract significantly more energy and thus be more thermodynamically efficient (assuming the silica issues can be dealt with), but it would not be economic to do so. An alternative is to use older second-hand plant: this will have a lower cost, but not be as efficient.
15. We are concerned at the basis for classifying certain geothermal systems as "Other" systems expressed on p.15 of the Summary Report. When classification of geothermal systems was first mooted in the Regional Plan, in 1997-1999, the distinction between Protected and Development systems and the reasons for categorising them was clear enough. At that stage "Unclassified" systems, which became "Protected 2" systems in a later draft, were selected on the basis that there was insufficient knowledge to class them as Development or Protection systems.

16. There appears to have been a shift in thinking in the latest draft, where the basis for classifying geothermal systems as “Other” is that small takes may be acceptable but large takes are not. That implies that there is sufficient current knowledge about the systems to make that call. We are not aware that the state of knowledge about all of those systems has increased significantly in the last few years, and so regard decisions on that basis as premature. It also conflicts with the statement on p. 57 of the Summary Report to the effect that many of the “Other” geothermal systems are not adequately surveyed. If the issue is one of uncertainty rather than a *proven* need to preserve the system from a large take, then the documents should say so.
17. Operators have noted that the barrier to getting a Plan Change to get an Other System reclassified to Development and then secure a development consent is just too high for any commercial developer, and will just not happen. Developers face enough resource risks without doubling the normal consent processes. Given that potential developers of geothermal resources are the most likely providers of funds for exploration and scientific investigations, any unnecessarily restrictive classification will reduce the scientific knowledge obtained in the future.
18. It is stated on p.25 of the Summary Report that “...much general information collected in the past using public money is now retained in confidence by Treasury and is not publicly available”. That is true, but it should be extended to acknowledge that such information is also retained in confidence by other organisations both public and privately owned, as part of their intellectual property, including Century Resources, the Institute of Geological and Nuclear Sciences, Contact Energy and probably the remaining Crown-owned generating SOE’s such as Mighty River Power and companies that have bought information – along with wells – from the Crown. We do not intend by this statement to be critical of the institutions concerned, but it is important for any future proposal for information sharing to realistically take this into account and not to suppose that more disclosure by Treasury will entirely resolve the issue.

3. Regional Policy Statement

19. 3.7.1, p.3: We disagree with the use of 100 years as the time over which geothermal sustainability should be considered. It is too long both in terms of our ability to accurately predict effects and in terms of the pace of technological development. When assessing resource sustainability we consider a better criterion would be that a significant proportion (e.g., a third to half) of the resource should remain at the end of the consent period. This comment also applies to the WRP.
20. The biggest problem facing users of a geothermal resource is the lack of information on the long-term sustainability level of production at useful rates, from the resource, at the onset of a development. While tentative initial estimates can be made it is not until the system has been tapped and prodded to see how it reacts to a significant level of exploitation that more accurate estimates of the long-term sustainable output from the resource can be made. Years of production may be required to gain an understanding of the total capacity and optimum heat recovery strategy for a particular hydrothermal system. Also within the 100-year time scale technical advances, such as enhanced energy recovery from deep within the resource, will render even the very best of today’s sustainable output predictions obsolete.
21. The wording of the proposed EW policy (3.7.2) requires the user to achieve from the resource after 100 years an output equivalent to the initial take. This could in fact sit quite well with the need to first tap the resource at an initial low, say 50 MWe, to see how it reacts to exploitation.

Once this information obtained decisions can be taken on a more realistic sustainable output over the economic operating life of the power plant. By the end of the economic life of the first power plant sufficient information would be available to guide the power take from the resource over the remaining life towards achieving its initial output level of 50 MWe at the end of 100 years.

22. The level of sustainability is difficult to determine and there is very little research being conducted on the long-term sustainable production from geothermal resources of New Zealand. This research needs to include evaluating the energy content of the whole system, expected advances in technology and the efficiencies it will bring, the value of geothermal energy for preserving the environment and the value as a baseload and to provide fuel diversity.
23. 3.7.2, p.6, Policy One. We support the concept of classifying geothermal systems into levels of development and protection. However we question the specifics as to which systems are classified as "Other", and the level of protection which is placed on "Other" system (see above comments). We do not agree with the concept that small takes of geothermal fluid [only] will be allowed in "Other" systems. This is too restrictive.

4. Plan Submission

24. 7.2.3, p.5. Policy 1. NZGA applauds the transfer of Ngatamariki geothermal system from the Other to the Development category.
25. We consider that it is illogical to include the Tokaanu and Reporoa geothermal systems in the "Other" category.
26. Method 7.2.4.6. NZGA strongly supports the initiative by EW to promote environmental education in relation to geothermal. However we regard the proposed Method as overly restrictive and one-sided, in that it focuses only on effects on Significant Geothermal Features, and therefore on the negative effects of geothermal development. It would be better to promote education on a wide range of issues and to take a more balanced view including the positive environmental benefits of using geothermal energy, including the preference of direct use where it is more appropriate than electricity generation. That would be more consistent with WRPS 3.7.3 Policy Six (2).
27. Rule 7.2.5.8. NZGA regard the prohibition of new takes of geothermal water in "Other" geothermal systems as too restrictive, since in many cases the reason for classifying the system as "Other" is because of lack of information, not any proof of detrimental effects, as discussed above. It would be better to make this non-complying.

5. Conclusion

28. The proposed changes to the Waikato Regional Plan and Policy Statement are a positive step forward, in that they are an improvement on the previous draft. Environment Waikato is to be congratulated in taking this initiative. However there are still matters where we consider that further improvements need to be made

The New Zealand Geothermal Association wishes to continue to be involved in development of geothermal policy.