

Comments on Changes to the Waikato Regional Policy Statement and to the Proposed Regional Plan, Geothermal Sections

Introduction

This paper is in response to a letter from Environment Waikato, dated 1 May 2003, stating that modifications are proposed to both the Waikato Regional Policy Statement and Proposed Regional Plan, on geothermal issues. The New Zealand Geothermal Association is pleased to have the opportunity to provide pre-submission comments on the proposed changes. We wish to be involved in the on-going process of consultation.

Geothermal energy is a renewable resource with a potential for exploitation over a time scale of centuries. A failure to fully utilise geothermal energy and thereby reduce use of non-renewable resources would not be appropriate sustainable management of the natural resources of the country, a fundamental principle of the RMA. The NZGA reiterates that we are supportive of the principles of sustainable management adopted in the RMA. We do not favour unrestricted development of geothermal energy for power in situations where it would bring net environmental dis-benefits., or hinder legitimate competing uses such as tourism.

Geothermal energy has the potential to make a major contribution to New Zealand's future. Our resources are large (median estimate of 3,600 MW of electrical generation, Lawless 2002) and only about 10 % has been developed so far, mainly for electricity generation. Development of geothermal resources can provide:

- Domestic or industrial direct heat and electricity at a reasonable cost and low environmental impact.
- Lower greenhouse gas emissions than energy based on fossil fuels.
- Security of energy supply in times of drought.
- Replacement for the expected reduction in natural gas production in the near future as the Maui field is depleted.
- A large proportion of the growth in renewable energy as part of the Government's EECA policy for 2012
- A large proportion of the projected growth in electricity demand over the next decade, which presently-committed projects are not sufficient to supply.
- Regional development, as geothermal plants are built where the resource is found.
- Iwi development, as three out of the four most recent geothermal developments in this country have been wholly or partially in Maori ownership.

However, few of these goals will be easily achievable under the Waikato Regional Plan and Policy Statement as proposed. The NZ Geothermal Association has pointed out in previous submissions on renewable energy and climate change policy that the procedures which are currently being adopted under the Resource Management Act (1992) are the single largest obstacle to further renewable energy development in this country.

In the following section we comment on each of the documents on which submissions were invited.

Regional Policy Statement

1. 3.7.1, p. 2, second list of items, (e). While it is correct that geothermal resources *can* be a source of minerals, none of the minerals mentioned are being extracted from geothermal resources in the Waikato region, whereas all of the other “Uses” listed do currently exist. If the minerals named are to be mentioned then gold and silver should be included also, as should zeolites.
2. 3.7.1, p. 2, last para. It should perhaps be clarified that the 10% efficiency applies only to electricity generation, not direct use, and that 10 % is probably a little low even for electricity generation these days with greater use of binary plant. It also ignores the fact that there is considerable energy in the fluid which is reinjected.
3. 3.7.1, p.3. We object strongly to the statement that “geothermal resources are not truly renewable”. It is factually incorrect. Heat *and fluid*¹ are naturally recharged to a geothermal system, at a certain rate in the undisturbed state. It is certainly possible to extract either or both at a greater rate than the original natural recharge, and we acknowledge that this is the case in the larger NZ geothermal developments. However, there are two important caveats:
 - ❑ It is possible to extract geothermal heat and fluid at a rate which does not exceed the rate of recharge (though we do *not* recommend making that a limiting condition for extraction).
 - ❑ The rate of recharge can be significantly stimulated by exploitation, as at Wairakei. It is not possible to accurately predict the extent of the increase before exploitation.

If these two issues are taken into account, there is no fundamental difference between a geothermal resource and a groundwater aquifer, or a managed hydro lake. All can be exploited at a rate which is truly renewable on a human time scale, or at a greater rate.

We suggest a better statement would be: “Although geothermal resources are ultimately renewable, it is physically possible to exploit them at a greater rate than they are recharged with heat and fluid. That would constitute exploitation of renewable resource at a greater than renewable rate ”

The Geothermal Association considers that exploitation at a greater than renewable rate of a geothermal resource which has been designated for development, can be acceptable provided it fits within the requirements for sustainability as given in the Policy Statement, and provided that it does not cause unacceptable environmental effects on the surface.

¹ Fluid is not mentioned in the second paragraph: it should be. Experience worldwide has shown that fluid depletion is usually more critical for preservation of the resource (as opposed to preservation of surface thermal activity) than heat depletion. Even in reservoirs which show cooling, such as Ohaaki and parts of Wairakei, it is the encroachment of cool groundwater which is the problem rather than cooling of the rock, which is where most of the heat resides.

4. Geothermal energy is also defined as renewable in several important contexts:
 - ❑ The RMA Amendment Bill (2003) defines "renewables" to include geothermal. Given the foundational role of the RMA to Regional Council operation, any planning or policy development based on the assumption that geothermal is not renewable is fundamentally flawed.
 - ❑ Geothermal energy is included in the list of renewable energy to meet the Government's renewable energy target, as expressed by EECA.
 - ❑ Geothermal energy is similarly regarded for this purpose in Australia.
 - ❑ The UN and EU now recognise geothermal as renewable, and the IGA is represented on various UN committees on this basis.
5. If, on the other hand, if Environment Waikato genuinely consider that heat and fluid are mined from geothermal systems through *any* exploitation (and we do not agree with that), that geothermal is not renewable as claimed, and geothermal environmental sustainability concerns are largely taken care of by the "protected field" status, then there is a strong case for geothermal to be treated the same way as other mining situations i.e. covered by alternative legislation with the possibility of rapid depletion if developers choose. NZGA does not necessarily support this approach, but it does demonstrate the illogical nature of the situation.
6. 3.7.1, p.3. We fully agree with the distinction drawn between renewability and sustainability, and agree with the approach taken by Environment Waikato in that regard, to the effect that it is the regional resource that needs to be considered, not just isolated systems. However, we question the use of four generations as an appropriate time scale to consider. It is simply too long, given the pace of technological development. We need to be clear in this context of sustainability that it is the exploitable geothermal resource as a source of energy that is being considered, not whether a selection of geothermal features needs to be preserved, which we do not dispute. Our great-great-grandchildren may not need or want an exploitable geothermal resource to remain.
7. 3.7.2, first objective. We consider 100 years to be impractically long and unnecessary.
8. 3.7.2, 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 below). It is our understanding that some systems are included in the "Other" category because not enough is thought to be known about their characteristics and possible response to exploitation, rather than because they have characteristics which it is vital not to disturb. If this interpretation is correct, it does not come across clearly enough in the Policy, nor does the possibility of systems in this category moving into the development, or for that matter the protected category, as more information is gained. These aspects are mentioned only in the Plan, somewhat obscurely in item 7.2.2 Policy 2 (c).
9. 3.7.2, Policy one. We do not agree with the concept that small takes of geothermal fluid [only] will be allowed in "Other" systems. This is too restrictive. There are systems which it is proposed to put in the "Other" category where it may be quite appropriate to allow large development, provided suitable criteria for environmental protection are met. To impose this policy would virtually prohibit any new large-scale geothermal

development in the Waikato region, whether or not it can be done in an environmentally responsible fashion.

10. 3.7.2, Policy two, first implementation method. To require that the flow *of fluid* within a Development geothermal system be maintained for 100 years is impractical. Development at Wairakei and Ohaaki has already caused the flow of liquid to the surface to virtually cease. As mentioned above, it is the heat content that needs to be preserved in a development system to ensure that a useable resource remains, not the fluid flow (though that will not necessarily prevent other environmental effects caused by pressure drawdown, such as changes in thermal activity and subsidence).

It is quite possible for a reservoir to more or less dry out (as has happened at The Geysers in the USA), and require supplementary water input from the surface, while still retaining a large heat content in the rocks and providing many hundreds of MW of electrical power. The main reason one would wish to maintain a through-flow of geothermal fluid would be to preserve surface thermal activity, which it is acknowledged is already irretrievably² affected in some development systems. A much better approach, if it is considered necessary for a geothermal resource to remain useable after 100 years (and we do not accept that it is), would be to require that a certain fraction of the original stored heat, above a certain base temperature, remains at the end of the period.

11. 3.7.2, Policy 3, first implementation method. As described above, it is not necessary to maintain the flow of fluid through a geothermal system to maintain it as an energy resource. The objective of this method is to preserve surface thermal activity, which is more appropriately and sufficiently dealt with by the requirement to preserve significant geothermal features. The method as presented is too restrictive to development.
12. 3.7.2 Policy 3, implementation method 4(ii). We disagree with the need to discourage new large takes of geothermal water etc. in “Other” geothermal systems. It is too restrictive to development.
13. 3.7.3, Policy two. We agree with the definitions proposed for significant geothermal features in Protected and Other geothermal systems for mud geysers, sinter, fumaroles, geothermal wetlands etc. and significant geothermal habitats. We disagree with the definitions for geyser and sinter-depositing springs to the extent that they do not include the words “naturally occurring”. Presumably the omission is intentional. It seems illogical to require preservation of an artificially-created feature, especially if its continued existence is dependent on a resource consent with a finite life. However, it is unlikely that sinter-depositing springs and geysers would *inadvertently* result from exploitation – they would have to be deliberately created.

The situation is different for the definition of hydrothermal eruption craters, which also omits the words “naturally-occurring”. There are several examples where hydrothermal eruptions have inadvertently resulted from geothermal exploitation. We consider that it is quite inappropriate to require the preservation of such artificially-created and sometimes unwanted structures, especially since there may be sound practical reasons why they should be modified (e.g. by flooding) to mitigate undesirable effects including threats to public safety.

² [0]Where efforts have been made to retrieve features (eg Rotorua), they have sometimes been successful. There has never been an attempt at Wairakei Tauhara.

14. The latter point is particularly significant in that only *natural* geothermal characteristics are required to be protected in Development and Other geothermal systems by Policy four and Policy five. There is an inconsistency with the Significant Geothermal Features that are included in the maps for the Wairakei–Tauhara area and Ohaaki, in that they clearly include features which are not natural and in some cases did not exist before exploitation. It also contrasts with the last item of 3.7.4. The combination of those two points mean that hydrothermal eruptions as a result of exploitation should be avoided (3.7.3), but if they do occur the craters must be preserved (because of the definitions in 3.7.3). This is illogical.
15. 3.7.4 Policy one, under “Environmental result anticipated”, item 1. While differential land subsidence is generally the more serious aspect, it should be acknowledged that both horizontal movements and widespread subsidence resulting from geothermal exploitation can have adverse effects.

Regional Plan

1. 7.2.2, Policy one, Table 7-1. We agree that Waimangu, Waiotapu and Waikite should be protected systems, but consider that lumping Waimangu together with the other two implies a physical connection which most scientific research does not support.
2. 7.2.2, Policy one, item (c). We consider that it is illogical to include the Ngatamariki, Tokaanu and Reporoa geothermal systems in the “Other” category. Ngatamariki is better known than Atiamuri, Horohoro and Mangakino, through the drilling and testing of four deep wells, and it appears to be a much better resource for development. It has few geothermal features of interest and they are not accessible to the public. Tokaanu is less well understood as it has not been drilled, but the geophysics indicate there is a large system extending well to the south that could probably be developed without having major adverse effects on the Waihi and Tokaanu springs. Reporoa is also well understood through drilling. It has no major significant geothermal features and it is stated elsewhere in the Policy Statement that they have already been disturbed by land drainage. The suggestion of a connection between Reporoa and Waiotapu has been effectively discredited.
3. 7.2.3.1. The definition of system boundaries must be extended to “other” systems, since they have legal significance.
4. 7.2.3.6. The NZGA strongly supports environmental education, and will assist as appropriate.
5. 7.2.4.4. There appears to be an inconsistency between item (b) and item (g) in that the former refers to 100 tonnes per day and the latter to 200 tonnes per day.
6. 7.2.4.6. A majority of members have expressed the opinion that full reinjection should be required in all cases, but some members have expressed a contrary view.
7. 7.2.4.7. The combination of this condition, making new takes of geothermal energy in “Other” geothermal systems non complying, and 3.7.2 Policy 3 of the Policy Statement, make the barrier too high for the development of “Other” systems.

Glossary: Waikato Regional Plan

1. We question the definition of “significant geothermal features”, as discussed above in relation the policy statement.

Glossary: Waikato Regional Policy Statement

No comments.

Maps

1. Maps of system boundaries need to be included for the “Other” geothermal systems as well, since different rules apply within and outside these areas. They therefore need to be legally defined. Figure 7-1 is not adequate for this purpose.
2. It would be useful on each of the Significant Geothermal Features maps to say within which geothermal system they lie, and its status.
3. Several of the maps do not include the specified Significant Geothermal Features, but rather say they are “To be added”. It is difficult for us to make meaningful comment on those without seeing the completed maps. NZGA requests that we can make a further submission on that point once the maps are completed.
4. We question the inclusion of the Ohaaki Steamfield activity, activity at Broadlands Rd., Crown Rd., Craters of the Moon and Te Rautehuia as Significant Geothermal Features. All of these areas have already been severely modified by exploitation. In many instances the activity has increased as a result of exploitation. From now on the nature of the activity there will be controlled by the exploitation reservoir management regime. If exploitation were to cease or if a significantly different reinjection regime were to be adopted, much of the activity would change and may in some places completely cease. The features should be regarded as ephemeral. Under the circumstances it is not reasonable for the activity to be defined in a way which will constrain future reservoir management, except perhaps in special cases where there are other reasons for preservation, for example at Crater of the Moon where there is a large area of geothermally-influenced vegetation. Even there, the anomalous vegetation has managed to adapt successfully to previous changes in activity, and further changes in the future are inevitable.
5. Significant geothermal features at Rotokawa. The area defined as comprising a significant geothermal feature is excessively large, and appears to have been based on different, more inclusive criteria than for the other systems. Much of the area included has no thermal activity and has been severely affected by past sulphur mining. It is questionable whether Lake Rotokawa itself meets the criteria for a “geothermal lake”, as most of it is less than 30°C. Other Rotokawa springs to the north that are monitored and possibly have a more direct connection with the reservoir, are not included in the area defined (though that is *not* intended to imply that we consider they should be).

Presentation

While the Powerpoint presentation sent with the document is presumably not officially part of the Plan, it does deserve some comment as it perpetuates some of the statements in the main

document which we regard as incorrect, and some of the examples shown for various forms of activity are inappropriate :

Slides 7 and 29: we object to the statement that geothermal resource are not renewable, for the reasons stated above.

Slide 20: the use of the Okoroire swimming pool as an example of a hot spring is not particularly appropriate. Some at least of the Okoroire pools are fed by an artificial channel from the actual hot springs. This slide could give the impression that artificial bathing pools have to be regarded as hot springs.

Slide 22. The use of Craters of the Moon as an example of steaming ground is inappropriate, since that is not a natural occurrence.

Slide 28: The use of the Rotokawa area as an example of a map of a significant thermal feature is unfortunate since as noted above this is one area that is likely to be disputed.

Slide 33: The use of the Lady Knox "Geyser" is an inappropriate image, since that is an artificial feature.

Some of these latter objections to the presentation could be considered trivial, but we are concerned that they reflect muddled thinking within Environment Waikato as to the distinction between artificial and natural features.

Conclusions

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 are to be congratulated in taking this initiative.

However, there are still matters where we consider that further improvements need to be made (some of which would be a reversion to the 1999 draft). Points of particular contention are:

1. The need to define system boundaries for the "Other" systems
2. The selection of "Other" systems, which appears illogical
3. The rules and policies imposed on "Other" systems.
4. Definitions of Significant Geothermal Features, and the specifics of which individual features should be so designated especially where they are not of natural origin
5. The renewability of geothermal energy

The New Zealand Geothermal Association wishes to continue to be involved in the consultation process, and wishes to be heard when the hearing is held. We also request that we can make a further submission when the maps of significant geothermal features and system boundaries are completed.

References

Lawless, J V; 2002: New Zealand's geothermal resource revisited. New Zealand Geothermal Association Annual Seminar, Taupo.