Understanding Geothermal Regulation in New Zealand: A Day in the Life of the Regulator

Jason Laurent and Penny Doorman

Bay of Plenty Regional Council, PO Box 364, Whakatāne, New Zealand

jason.laurent@boprc.govt.nz; penny.doorman@boprc.govt.nz

Keywords: Geothermal regulation, rules, consent conditions, compliance, Kawerau Geothermal System, Rotorua Geothermal System

ABSTRACT

The Bay of Plenty's geothermal systems are managed by the Bay of Plenty Regional Council under the Resource Management Act 1991 (RMA). The council manages geothermal through its various policy documents. These are developed through a consultative process and within legal requirements. It lays out our approach to management, and the requirements and obligations that must be met for the use of the geothermal resource. It is our contract with the community.

Policy implementation is often where the success of this approach will be decided. Regional policies and rules lay out consenting pathways, and the suite of consent conditions to be expected. These conditions are usually agreed pre-consenting, or through a hearing process and can be upheld through a Court of law, including via enforcement action. On the surface it might appear a 'big stick' approach - and it can be. But our methods are also non regulatory, including guidelines, education, and incentives.

Implementation therefore involves a careful balancing act, working closely with resource users who are part of the community, and have distinct obstacles and challenges. Companies that are owned by iwi have another level of scrutiny and are accountable to their people.

Consent and compliance processes differ hugely depending on the geothermal system. In development systems like Kawerau, consent conditions are prescriptive and consent holders are well resourced to meet consent conditions. In systems like Rotorua, small users have relatively high compliance costs with limited resources or knowledge. This presents unique challenges, and a different regulatory approach. This paper will explore some examples of compliance practices in the Bay of Plenty Region.

1. INTRODUCTION

1.1 Background to management framework

There are 12 geothermal systems in the Bay of Plenty Region which fall within the Taupo Volcanic Zone (see Figure 1). These geothermal systems are managed by the Bay of Plenty Regional Council (BOPRC) under the Resource Management Act 1991 (RMA).

Various policy documents have been developed under the RMA to guide management of geothermal, including the Regional Policy Statement (RPS) and regional plans. They lay out our approach to management. These policies have been developed through a consultative process and are a contract with the community for the sustainable management of the resource.

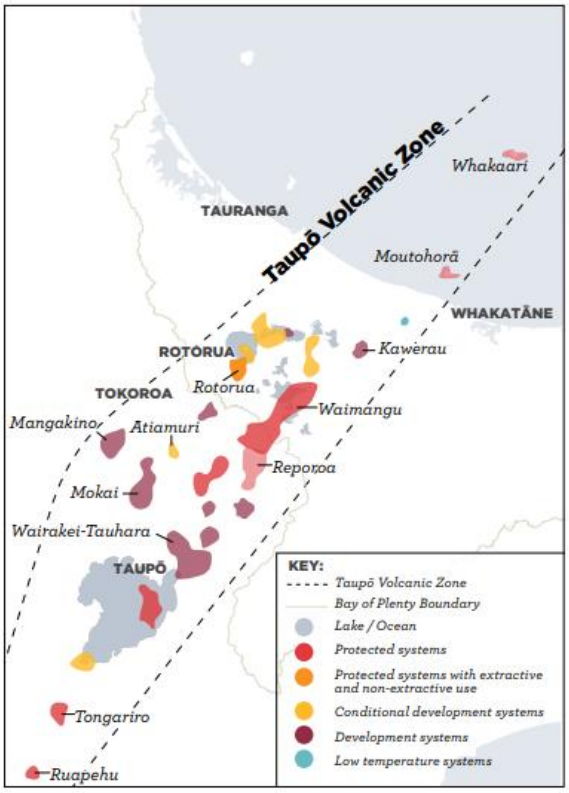

Figure 1: Geothermal Systems, Taupo Volcanic Zone

Under the RPS, geothermal systems are classified from Development to Protection. This provides a regional context to sustainable management. Geothermal use is enabled where the effects are likely to be minor, but limited in other systems where geothermal use could have significant or irreversible adverse effects (e.g. areas with significant surface features, such as Rotorua).

1.2 Resource consents

Under section 14 of the RMA, people are prohibited from taking and using geothermal water, heat and energy, and or discharging geothermal water, unless it is expressly allowed by a rule in a regional plan, or it is permitted as a customary practice (s14(3)(c)).

Regional plans contain the detailed policies and rules for use of the resource, including when a resource consent (a permit) is required, and the conditions that must be followed under that consent. Rules lay out:

ISSN 2703-4275

- the type of consent required (Permitted Activity Standards, Controlled, Restricted Discretionary Discretionary).
- the specific matters that must be considered when assessing whether to grant a consent (assessment criteria or matters of discretion).
- the information that must be included in a consent application.
- the conditions of consent that are to be expected (e.g. monitoring).

The above will vary between different systems, where more enabling policy is to be expected in Development systems such as Kawerau, and more prescriptive provisions will apply to Protected Systems, or Special Purpose Systems like Rotorua.

In the Bay of Plenty, resource consents are generally required for take and use of geothermal water, heat and energy, and discharges of geothermal water. The resource consent lays out the specific rights and obligations around the use of the resource, for a specific period, usually 10 years, but for up to 35 years.

1.3 Regional consent process

Consent applications must include sufficient information and an assessment of environmental effects (AEE) that reflect the scale of potential effects. Following pre-application meetings, applications are submitted to Council. If there is sufficient information, a determination is made as to whether the application will be publicly notified (i.e. whether there is an opportunity for submissions), limited notified, or non-notified.

Most applications are not publicly notified, with most decision making delegated to staff. In the Bay of Plenty 39 geothermal applications were lodged with Council between January 2023 and 31 December 2023. Of those that have been processed, non were publicly notified.

In the case of a notified application, formal submissions may be made, and a hearing may also be held for a hearing panel to consider. The hearing panel will then make a recommendation to Council as to whether the consent is granted or not. Decisions can be appealed to the Environment Court.

In consent processes BOPRC's role is to implement the law in as neutral a manner as possible, thereby representing the sustainable management of the environment, and the wellbeing of our whole community.

1.4 Geothermal consent conditions

The resource consenting process includes an assessment of the potential effects of their application, and the measures to avoid, remedy or mitigate these effects. These measures are included as conditions of the consent. They lay out the rights and obligations of the consent holder.

Consent conditions are dependent on the geothermal system, the site, pproposal, consultation process and other factors unique to the application. Consent conditions are often agreed prior to granting of the consent, or through a hearing process (e.g. in caucusing).

Consent conditions in geothermal vary widely, depending on the scale of effects, but typically will address:

- Consented allocation (how much is allowed to be taken and discharged for a specific period (T/day or kW).
- Monitoring of actual take (e.g. intermittent calorimeter measurements, or continuous metering).
- Monitoring of changes in reservoir characteristics (e.g. chemistry, pressure).
- Submission of data (e.g. flow, level, temperature).
- Monitoring of discharges (e.g. metering, reinjection returns, contaminants).
- Surface feature monitoring (e.g. changes in extent).
- Subsidence and tilt monitoring (e.g. benchmark surveys).
- Review conditions (e.g. when and how a consent can be reviewed).

BOPRC has Standard Operating Procedures (SOPs) and guidelines for consent applications and drafting of consent conditions.

1.5 Enforcement

Conditions of consent lay out the legal rights, as well as the obligations of consent holders. They can be upheld through a Court of Law, via enforcement procedures laid out in the Act.

BOPRC's Compliance Team regulary monitors compliance with consent conditions. Where there is non-compliance with consent conditions, this is ranked as low, moderate or significant. For example, non-submission of data may initially be considered a minor non-compliance, addressed through a verbal and then written request for data. However, an unconsented discharge could result in immediate enforcement action under the RMA.

The way council responds to noncompliance will depend on the extent of non-compliance, but options include:

- Pass to a more appropriate agency to carry out enforcement (see section 2 below).
- Issue a verbal reminder/warning.
- Issue a written warning.
- Issue an abatement notice under section 322(1) of the RMA[1].
- Issue an infringement notice under s343C of the RMA.
- Commence a Prosecution under s338 of the RMA.

[1] 322(1) An abatement notice may be served on any person by an enforcement officer
(a) requiring that person to cease, or prohibiting that person from commencing, anything done or to be done by or on behalf of that person that, in the opinion of the enforcement officer,
(i) contravenes or is likely to contravene this Act, any regulations, a rule in a plan, or a resource consent; or
(ii) is or is likely to be noxious, dangerous, offensive, or objectionable to such an extent that it has or is likely to have an adverse effect on the environment:
(b) requiring that person to do something that, in the opinion of the enforcement officer, is necessary to ensure compliance by or on behalf of that person with this Act, any regulations, a rule in a plan or a proposed plan, or a resource consent, and also necessary to avoid, remedy, or mitigate any actual or likely adverse effect on the environment
(i)caused by or on behalf of the person; or
(ii) relating to any land of which the person is the owner or occupier: the best practicable option of ensuring that the emission of noise from that land or water does not exceed a reasonable level.

The enforcement tools provided under the RMA are the same regardless of the user or the geothermal system. This might appear a 'big stick' approach but there is a degree of discretion around when and which enforcement action is taken by Council. The Compliance Team applies the 4Es model to compliance - **engaging** with consent holders and stakeholders, **educating** as to the relevant rules and regulations, **enabling** opportunities for people to see and implement best practice, and escalating to **enforcement** where required.

Implementation therefore involves a careful balancing act, working closely with consent holders who are part of our community. Small users, such as in Rotorua, have distinct obstacles and challenges that differ from those of large companies. Māori owned entities potentially face another level of scrutiny, being accountable to their own people to adhere to tikanga for example.

The discussion below presents two very different examples of compliance in practice.

2. KAWERAU GEOTHERMAL SYSTEM

The Kawerau Geothermal System is a Development System in the east of the Bay of Plenty. Major consent holders include Mercury NZ Ltd, Ngāti Tūwharetoa Geothermal Assets, Eastlands, (operating as Geothermal Development Ltd, and Te Ahi O Māui Ltd). Kawerau is now one of New Zealand's largest developed geothermal resources. The system has consented takes of close to 200,000 tonnes per day with generation of close to 160MWe of electricity and direct industrial use by 5 major commercial enterprises, contributing substantially to the regional economy.

BOPRC manages the system on behalf of the community, reflecting the policies in the RPS and regional plan, while working closely with the consent holders, who are critical to achieving these outcomes (Bay of Plenty Regional Council, 2019).

2.1 Consent holders

Resource consents for the Kawerau System have a term of 35 years (10-year terms are more common for other systems). This reflects the substantial investment made by industry in establishing infrastructure. The consent conditions are comprehensive, and all of the major consents contain similar conditions, with some nuances to reflect their unique circumstances. Technical support in administering the conditions of consent (e.g. compliance) is provided by a three-person technical Peer Review Panel (PRP).

The major consent holders have very different structures and focus, influencing the way that Compliance Staff interact. Mercury (37% of consented take) has geothermal operations in both Waikato and BOP, operating the KGL 100MW Power Plant in Kawerau. Mercury is a larger company and owns and upkeeps the Kawerau Geothermal Reservoir Model. Commercial agreements for the model's use are a key part of field management. It has a substantial skilled staff involved in geothermal.

Eastlands is a relatively small rapidly growing company which holds the smallest geothermal take at Kawerau (12%) but is a growing company, with new investment in another binary plant. They also have a joint venture with Māori land trust Kawerau A8D, to form Te Ahi o Māui, a 25 MW plant.

Ngāti Tūwharetoa Geothermal Assets (NTGA) has 51% total consented take for the field. It is a direct use provider selling steam to industry and the other tappers. The company is owned by Ngāti Tūwharetoa Settlement Trust (NTST) and is a relatively small agile company. The relationship with NTST as the holder of a Statutory Acknowledgement on the system, and NTGA as the operator, requires careful balancing by Council when administering consents.

These consent holders all have a high public profile, have significant financial capacity relative to small users, and their scale means that they can employ expertise in their geothermal processes. They are visible and accountable to the community, in a way quite different to small users in other systems such as Rotorua.

2.2 Compliance practices: integrated management

Integrated system management is a requirement of the RPS. To promote this integrated approach and to ensure cooperation between all consent holders, BOPRC led the development of the Kawerau System Management Plan (KSMP). The KSMP is a whole system plan, which provides guidance to BOPRC in its decision-making processes, in the administration of resource consents. This includes agreed operational protocols both amongst consent holders and between consent holders and BOPRC.

Compliance processes have presented some interesting challenges. Prior to 2016 operations on the system were individually focused, centered on the commercial agreements that Council was not part of. Commercial sensitivity was front of mind, and annual peer review panel meetings were all held individually. Communication between Council and consent holders, and between some of the consent holders themselves, could at times be tense.

The KSMP process was a catalyst for improved relationships between all parties and an understanding of mutual goals. The 2020 annual Peer Review Panel (PRP) meeting (to discuss the technical data from the 2019 reporting year) was a watershed moment. For the first time all consent holders collaborated to prepare a single system wide assessment and attend a joint annual meeting, with the goal of sustainable management of the field demonstrated by all concerned.

In response, the PRP said "The 2019 Annual Report (Technical) for the Kawerau Geothermal Field is the first joint technical report prepared by all Tappers. The report, which was prepared under extraordinary conditions, is the outcome of the collective and collaborative effort of all scientific and reservoir engineering teams involved and the Peer Review Panel takes this opportunity to congratulate and thank all Tappers for their efforts. The joint technical report is well presented and demonstrates the benefits of field wide integrated interpretation of the reservoir data."

From a compliance perspective, this approach was not a requirement of consent conditions. Instead, it involved listening to concerns, building relationships and making decisions with no fear or favour. It also required a common goal and agreed steps to reach a resolution and meet the needs of all concerned, including those of the regulator.

Since this seminal moment, yearly reports and associated meetings have become more focused and efficient. Balance has moved from devotion to the legal aspects of field utilisation, to integrated sustainable management of the system.

2.3 Compliance practices: adaptive management

Adaptive management is central to many geothermal consents and is a major focus of the consent conditions in Kawerau. While operationally essential, adaptive management is difficult to administer from a compliance perspective because it involves agile processes, and discretion in decision making. In practice, using adaptive management to administer changes in production and discharge strategies at Kawerau involves multiple meetings between BOPRC staff, the Peer Review Panel, consent holders, technical staff, and management.

The System Management Plan provides useful guidance and lays out transparent and equitable processes around adaptive management. Generally, where there is a potential system wide impact, or where system wide trends are observed, BOPRC takes a lead role in coordinating a response. However, bi-tapper issues (e.g. well interference) are typically addressed directly by consent holders (e.g. through commercial agreements) and BOPRC provides nominal overview, unless there is a breach in consent conditions. BOPRC does not take a dispute resolution role, although does in some cases act in a quasi-mediation role.

An example of the application of adaptive management in consent compliance, are provisions that allow for changes in casing depth for reinjection and production wells, with the approval of Bay of Plenty Regional Council under the Kawerau System Management Plan. While the consent conditions stipulate casing depth, in some cases casing depth can be changed with little consequence to the sustainably management of the system, or on other users. However, an agreed process for these applications to be considered is very important on a multi tapper system, for example what information is to be shared by the applicant with other users (keeping in mind commercial sensitivity). The KSMP resulted in an agreed, consistent and transparent procedure.

Another example is a recent application by one consent holder to change the reinjection strategy, including a move to some intermediate depth reinjection. Being a fieldwide issue this needed to be considered by all consent holders and the peer review panel was enlisted to provide technical advice on potential effects. The compliance role in this case, was to facilitate the collective consideration of this proposal, and ensure that decision making was evidence based and transparent.

3 CASE STUDY ROTORUA

The Rotorua Geothermal System is currently managed under the Rotorua Geothermal Regional Plan, and the Rotorua System Management Plan. These plans have an approach similar to that put in place by Central Government following the Rotorua bore closures in 1989, which was in response to the collapse of the geothermal system through overuse. The system is now managed to protect the significant geothermal surface features as a priority (Bay of Plenty Regional Council, 2024).

3.1 Consent holders

Geothermal use in Rotorua is very different to that in Kawerau. Sustainable customary use of geothermal by Māori is still part of everyday day life in Rotorua. These customary practices are not regulated by Council. However, there are about 120 consented takes of geothermal water and energy in Rotorua. These include production/reinjection systems as well as downhole heat exchangers (DHX).

These takes are typically reasonably small, with the largest take being about 800T/d. Takes include individual and group domestic takes for space and water heating, commercial takes for space and water heating (often hotels or motels), municipal takes, the hospital, and wellness and bathing. Commercial uses account for over 75% of the total volume allocated (Doorman et al., 2022).

Compliance issues in Rotorua are markedly different to those in Kawerau. In Rotorua, compliance is required for over 120 consented sites, involving multiple individual users, small group schemes, or relatively small businesses. Key issues are discussed below.

3.2 Compliance in practice: monitoring of actual takes

All resource consents in Rotorua require monitoring of actual use. However, while methods are well established for the measurement of mass flow, temperature and pressure for large industrial geothermal takes at Kawerau, these methods are not easily replicated for multiple small direct heat takes in Rotorua.

In the past, conditions of consent have required intermittent calorimeter testing (twice during a 10-year period). This has proven inadequate in understanding the total take from the system, because it is not continuous or accurate. Non-compliance around submission of data has also been an issue, likely due to the cost of testing, inconvenience, and a lack of understanding of the value of the data in management of the system.

Council is now reviewing consent conditions of the largest 30 users on the system to require installation of continuous metering. An issue is affordability for small single residential users and as such Council is providing a financial contribution to assist transition over a 2-year period. Rather than forcing absolute and radical change, Council has worked with users and industry to land on a pragmatic solution, that is reasonable and effective (Zuquim et al., 2022).

3.2 Compliance in practice: monitoring of actual takes

Perhaps the most pressing compliance issue in Rotorua is the construction, maintenance, and abandonment of geothermal wells. There are nearly 300 operational geothermal wells in Rotorua, used for direct heat such as space and water heating and bathing. Their safe construction and maintenance are necessary to minimise the risk to public safety, ensure the ability to quickly control wells in the event they fail, allow testing of wells.

Legacy issues include having only a single well drilling operator for many years, the age of wells, lack of regulatory oversite and poor practices (e.g. pressure from users to reduce costs in well maintenance).

Many bores in Rotorua are well over 20 years old, and have not been well maintained, often because of a lack of understanding of risks. This has and is leading to costly, hard to resolve and potentially dangerous well failures.

The increasing cost of maintaining and replacing wells is also resulting in substandard practices and driving many users out of the market. While this may not be a bad thing for the overall health of the system, from a compliance perspective it is incredibly complex and difficult to address.

For example, the legislation is overlapping with three agencies requiring best practice standards when building and maintaining geothermal wells:

- The Geothermal Regulations 1961 (administered by WorkSafe).
- Rotorua Lakes Council (RLC) Geothermal Bylaw 2016 and Rotorua City Geothermal Energy Empowering Act 1967.
- Bay of Plenty Regional Council geothermal resource consents under the Resource Management Act 1991
- The Health and Safety at Work Act 2015 manages risks in a place of work (e.g. contractors working on private geothermal wells or commercial premises with a well).
- RLC- have a responsibility towards public safety/health using Geothermal Bylaw 2016.

The three Parties have specific but overlapping roles and responsibilities under various legislation (Figure 2). An Operational Agreement between the agencies outlines how these roles will be coordinated. Staff also meet regularly at an operational level, to share information, build relationships, address any issues, and discuss their roles and responsibilities.

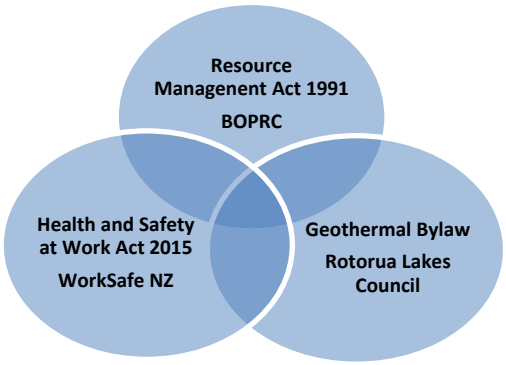

Figure 2: Schematic displaying overlapping responsibilities.

3.3 Enforcement action

With over 300 geothermal wells and about 120 consented takes, annual compliance visits are not viable or cost effective for small users. Compliance visits are therefore done over a 3 yearly cycle, with ongoing follow up inspections of wells that have failed previous inspections. Additional compliance is carried out for higher risk wells, or when there is a complaint.

Most non-compliance in Rotorua relates to non-submission of monitoring data, or poorly maintained wells, as described above. However, an unsafe well that could pose a risk to life and property is treated as a significant non-compliance, requiring immediate action, or sometimes well closure. The Rotorua Geothermal Bylaw 2016 allows fast resolution. Potentially dangerous wells are referred to Rotorua Lakes Council, who will then act with support from the BOPRC and WorkSafe. In these cases, enforcement action may be needed to require closure of a well (Rotorua Lakes Council, 2016).

In Rotorua most consent holders are small users, with limited geothermal expertise. For this reason, providing information, support and education before enforcement is preferable. Council works with its community, not against it, and reliable and safe use of geothermal is a shared goal. How the consent holder reacts in the case of repetitive and/or ongoing non-compliance may increase the chances of a punitive response.

Compliance officers generally have well established relationships with consent holders, and often will provide informal advice when requested, with the aim of avoiding enforcement action. Consent holders often have no expertise, or worse are ill informed, and a lack of suitable qualified expert person (SQEP) in Rotorua means that advice (and construction material) is not always readily available. The complex regulations with different technical requirements, and the involvement of multiple agencies, can also lead to confusion and frustration.

BOPRC, Rotorua Lakes Council and WorkSafe work closely together to try and avoid duplication and to ensure that well owners are well informed. The Parties aim to provide consistent advice to well owners. They hold joint workshops for consent holders to explain legal obligations, requirements for SQEPs, demonstrate principles of well maintenance, and to meet well owners in the area. These workshops are extremely well attended. The agencies have also worked together to provide Guidelines on Well Maintenance. These measures help reduce conflict, costs, risk to health and safety, litigation and even paperwork!

As a result of this compliance work, there has been a marked improvement in well maintenance, safe abandonment of dangerous wells and proper testing of potentially dangerous wells. BOPRC has also made changes to consent conditions for drilling to drive improvements to drilling practices. Changes have also been made to consent conditions for take and use, to require well construction that requires best practice maintenance, and rapid and safe closure of wells.

4 CONCLUSIONS

Compliance is a crucial part of BOPRC's regulatory role in managing the geothermal resource. The RMA lays out the regulatory functions of Council, and consent conditions lay out the specific rights and obligations of consent holders.

Council's compliance approach must follow the law, but involves some discretion, and is influenced by the geothermal system, the type and scale of geothermal use, the consent holders, and the community of interest.

Examples are provided which illustrate the different compliance focus required. In Kawerau there are a small number of large users, with a track record in geothermal and other energy developments. Compliance has focused particularly on developing improved relationships between users, and integrated reporting on the health of the system.

In Rotorua, the focus has been on improved records on actual use of geothermal, plus marked change in the way that compliance is carried out on well construction, maintenance and abandonment. While the law provides the backbone to compliance and enforcement, many gains are achieved through applying judgement and discretion, by providing advice, building trusted relationships and by working with consent holders.

ACKNOWLEDGEMENTS

Thank you to Trudy Richards (Team Leader Compliance) Bay of Plenty Regional Council for reviewing this paper. Thank you also to Andrew Austin (Rotorua Lakes Council) and Rhys Fenton (WorkSafe NZ) for your continued contributions to developing a collaborative approach to geothermal compliance.

REFERENCES

Bay of Plenty Regional Council, The Science Story Environmental Summary Report: Rotorua Geothermal System (2019).

Bay of Plenty Regional Council, Kawerau System Management Plan (2019).

Bay of Plenty Regional Council, Rotorua System Management Plan (2024).

Doorman, P, Camburn, F, Scholes P, Zuquim, M. Nga Wai Ariki o Rotorua Changing the Way We Manage the Rotorua Geothermal System, 44th New Zealand Geothermal Workshop, Rotorua, New Zealand. (2022).

New Zealand Government, Resource Management Act (1991).

Operational Agreement Well Maintenance, Bay of Plenty Regional Council, Rotorua Lakes Council and WorkSafe NZ, 2019.

Rotorua Lakes Council, Geothermal Bylaw, 2016

Zuquim, M., Doorman, P., Laurent J., Danthala R., Zarrouk, S. Metering of geothermal takes in Rōtorua – Project Update, Proc. 44th New Zealand Geothermal Workshop, Rotorua, New Zealand. (2022).