



2020 Discharge Management Community Report Covering Consent 67151

15 September 2021

Background

Ngati Tuwharetoa Geothermal Assets Ltd. (NTGA) is an iwi-based geothermal energy supplier to the Kawerau Industrial Complex and to geothermal power plants. The Kawerau Industrial Complex is the world's largest industrial geothermal direct use operations, utilising geothermal steam from the Kawerau Geothermal System to provide the process heat required by the various industrial operations. Utilising geothermal steam in place of fossil fuel-based energy sources enables geothermal energy customers to use an indigenous and renewable source of energy, reduce industrial green-house gas emissions, and contribute to the decarbonisation of the New Zealand economy.

Resource consents authorise and set the conditions for activities related to the utilisation of geothermal energy for direct thermal use and for power generation. One of these resource consents allow the flow of a portion of the geothermal fluid from NTGA's geothermal operations to the Tarawera River through two outflow points along the east and west banks of the river. The geothermal fluid from the Kawerau Geothermal System mixes with the flow of the Tarawera River, in addition to the natural geothermal flows from geothermal springs and seeps along the river. The natural geothermal flows into the River have reduced over time since the development of the geothermal system from the 1950's for use by the mills. The development of the geothermal system for steam production is also believed to have artificially reduced the level of shallow geothermal pressure and surface activity.

In partial fulfilment of NTGA's responsibilities as a sustainable geothermal operator, consent holder and community member, this community report has been prepared to provide updates on NTGA's activities under its resource consent to flow geothermal fluid to the Tarawera River and to summarise the monitoring and scientific information and reports gathered in 2020 in the exercise of this consent.

Trends in volume of geothermal flow to Tarawera River and to reinjection wells

The volume of NTGA's geothermal flow to the river is limited to 870 cubic metres an hour from both outflow points, with provisions for temporary higher volume flows, up to 1170 cubic metres and hour, during operational upsets. These volumes of geothermal flow were assessed to not cause adverse effects on the ecology and health of the Tarawera River.

In 2020, the total volume of geothermal flow from the two outflow locations to the Tarawera River averaged around 764 cubic metres per hour, lower than the consented flow limits.

The outflow metering instrument recorded 19 different days of contingency flows due to a combination of operational upsets and weather events. The number of days required for contingency flows were higher than last year due to operational upgrades at the TOPP1 power plant, commissioning of the upgraded plant and heavy rain events during the year. In all cases, the Regional Council was notified of the event and the reason for the contingency discharge through regular reports. Planned operational upsets were also communicated to the relevant stakeholders to notify expected changes to the West Lagoon hot water inflow, mainly around reduced flow due to well cleanout and maintenance. All contingency flows were within the contingency flow limits and the maximum days for contingency flows.

The portion of geothermal water flowing to the river from NTGA's operations is presently at 47%, almost similar than last year due to the contingency flows related to the power plant upgrade.

Comparing this year to 10 years ago, the proportion of geothermal water flowing to the river is significantly lower at 47% versus 60%. The proportion of geothermal water reinjected is also significantly higher at 53% versus 40%.

In the last 10 years, NTGA has increased its capacity to inject separated geothermal water through investments in additional deep reinjection wells, pipelines and pumps ahead of consent requirements. We are also continuing to invest in advanced computer modelling studies and scientific experiments to review and inform us of the best reinjection strategy for the geothermal system.

Trends in energy and chemistry of geothermal flow to the river

The energy and the chemistry load of the geothermal water flowing to the river are limited by consent conditions assessed at levels that would not cause adverse effects on the ecology and health of the Tarawera River. The temperature of the outflow points is measured to ensure that energy to the river is within consented levels. Too

much energy flow to the river will raise the river temperature downstream of the outflow points and could have negative effects on the health of river plants and animals that cannot tolerate hotter temperatures. The chemistry of the geothermal flow to the river is also regularly analysed to ensure no adverse effects on the river, keeping in mind the geothermal characteristics of the river from natural geothermal springs and seeps that also flow into the river.

In 2020, the energy flow to the river were compliant with the consent conditions, with contingency flow rates required due to plant upgrades and weather events. The contingency energy flows are due to contingency flow volumes rather than an increase in discharge temperature.

In 2020, the geochemical content of the flow to the river was compliant with all consent conditions.

Geothermal flow to the West Lagoon

NTGA's resource consent requires the maintenance of the geothermal flow to the West Lagoon located adjacent to the western outflow point. The continuous geothermal flow is required to maintain the thermal characteristic and ecology (e.g. thermal vegetation) of the West Lagoon and to uphold the cultural values it supports. The geothermal flow to the Lagoon provides hot water to a thermal bathing pool adjacent to it.

In 2020, the required flow of hot geothermal water to the Lagoon was maintained. Flow reductions during maintenance shutdowns were notified to the relevant stakeholders. The chemical components of the geothermal fluid in the Lagoon (sampled at the western outflow point) were within the expected range and did not require any chemistry-related notification to the trustees of the Matata Lot 39A2A block (Savage Papakainga Land Trust) that owns the bathing pool.

The baseline monitoring and restoration plans are carried out by Wildlands in collaboration with NTGA and the Savage Papakainga Land Trust.

Trends in downstream heat utilisation

The remaining heat from separated geothermal water in the east is used to generate renewable electricity in the binary cycle power plant TOPP1. Geothermal heat from separated geothermal water in the west was used to generate electricity in the binary cycle power plant TG02 until 2016 when an electrical fire damaged the plant making it inoperable. This hot water is now flowing directly to the West Lagoon and continues to provide heat to the bathing pools and maintain the Lagoon's thermal characteristics.

Additional heat utilisation projects are being considered but these projects must meet a combination of economic, cultural and environmental requirements.

Summary

NTGA's geothermal operations continue to provide a renewable, reliable, indigenous, and low-carbon energy supply to New Zealand process industries for over 60 years. In the last 16 years since NTGA's purchase of the Crown steam field assets and steam supply business, it has continuously improved its capability to monitor, understand, and manage the separated geothermal water from its operations in the Kawerau Geothermal System and its interaction with the Tarawera River. NTGA continues to improve its capability to manage the separated geothermal water and will continue to engage and collaborate with all stakeholders to ensure that it harnesses the energy of the Kawerau Geothermal System in a manner that is sustainable to the geothermal resource, the environment, and the community that it supports.