



Caribbean Geothermal Technical Assistance

Opportunities Study: Non-Electricity Generating Uses of Geothermal Resources in the OECS

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MFAT



Executive Summary

Overview

Geothermal systems are commonly found in areas of active volcanism and are characterised by the presence of elevated temperatures relatively close to the earth's surface. The energy contained in this heat provides a resource which is commonly brought to the surface via fluids, either naturally or following drilling of wells. Alternatively, heat can be obtained via installation of piping filled with fluid. Globally, geothermal resources are used in a variety of applications, particularly as a low carbon emitting, renewable energy resource supplying electricity to citizens and industry. The Ministry of Foreign Affairs and Trade of New Zealand (MFAT) and the Organisation of Eastern Caribbean States (OECS) Commission have collaborated on this study to investigate opportunities to utilise geothermal resources in the Eastern Caribbean for purposes other than electricity generation.

Geothermal resources include:

- Hot water or steam reservoirs deep in the earth that are accessed by drilling, such as have been proven to exist in Dominica, Guadeloupe, Montserrat and Nevis.
- Geothermal reservoirs located near the earth's surface. These are not present in the Eastern Caribbean, although hot springs do exist suitable for spas.
- The shallow ground near the earth's surface that maintains a relatively constant temperature. Technologies that utilize shallow ground are not limited by geography and ground-source heat pumps may be used to access the energy available. This resource is not considered in detail in this study.

Geothermal reservoirs have certain physical and chemical properties, including heat, gases, water and minerals/elements, which may be used for a wide variety of purposes. Aside from generating power, the most common approach is to use the heat directly – often referred to as geothermal direct use - with applications ranging from bathing in warm water to high temperature industrial uses of steam.

Other resources that can be obtained from geothermal reservoirs include carbon dioxide which can be used to promote plant growth, non-potable water for agriculture, and minerals such as colloidal silica and lithium, which can be sold as commodities. Typically, these opportunities require a power project to be in existence and can provide community benefits, additional income streams or operational improvements.

Geothermal Resources in the Eastern Caribbean

Surface features including hot springs, boiling lakes and fumaroles may provide evidence of geothermal systems, and resources in the Eastern Caribbean have been widely studied using surface investigations. Drilling has been undertaken in six islands (Dominica, Guadeloupe, Montserrat, Nevis, Saint Lucia and Saint Vincent) to target deep geothermal resources for electricity generation. On four islands, geothermal reservoirs have been intersected that show potential for power generation projects (Dominica, Guadeloupe, Montserrat and Nevis). The development of geothermal power plants has been achieved in Guadeloupe, but for other islands development has been ongoing for several years but has not yet been achieved. In some instances, wells have been drilled that will not be used in a power project and so may be available for another purpose.

The geothermal fluids from a reservoir are a mixture of hot brine and steam that have certain chemical signatures. The deep reservoirs encountered across the islands have similar characteristics, being between 1100m and 2000m below ground level, high temperature (200-250°C), liquid-dominated systems (enthalpy <1200kJ/kg), recharged by seawater with relatively benign chemistry. The composition of the resources and scale of project is not especially conducive to mineral extraction and need not be considered further at this time.