NEW ZEALAND GEOTHERMAL ASSOCIATION INC

East Harbour Management Services Ltd
PO Box 11-595
Wellington, New Zealand
Tel: 64-9-474 2187
Fax: 64-9-385 3397
E-mail:brian.white@eastharb.co.nz
www.nzgeothermal.org.nz

Geothermal Energy: New Zealand's most reliable sustainable energy resource

Current Status, Costs and Advantages of Geothermal

Geothermal energy is heat from the earth. It can be used both for electricity generation and a wide range of other applications including industrial process and domestic heating. It has value for tourism, and may have special value to the communities that live nearby.

Geothermal energy can be found in high temperature fields in the Taupo Volcanic Zone and Northland (suitable for both power generation and direct use); medium/low temperature fields mainly located in the upper North Island or throughout the Southern Alps (potential heating applications); or at shallow depths anywhere in the country (suitable for ground-source heat pump applications).

In the suite of renewable resources available to New Zealand, it is the only resource that can directly supply both heat and electricity, and has become increasingly competitive, especially as thermal fuels have increased in price and exchange rate has improved. Unlike most other renewable energy options it is completely independent of climate. Geothermal is the only renewable energy source which can provide long term reliable base load electricity generation.

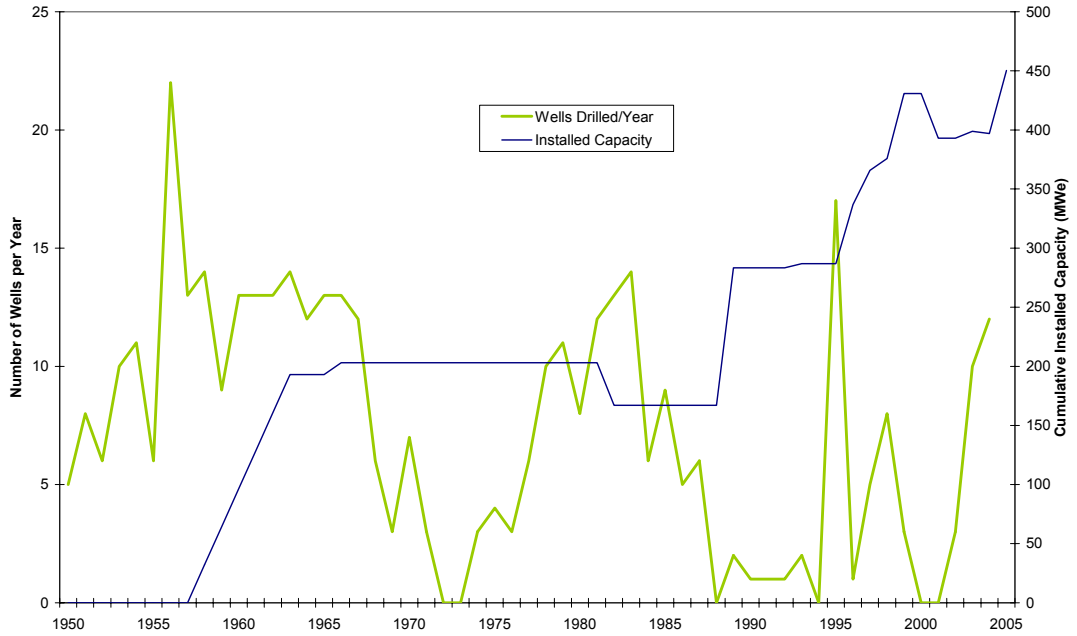
The installed capacity of geothermal electricity generation in New Zealand is currently 450 MW, or about 5 % of total capacity, plus about 7 PJ per year in direct heat largely at Kawerau. Geothermal generation can meet 7 % of peak demand, and typically produces 6% to 8 % of total generation.

Geothermal power and heat plants currently utilise mature technologies with fifty years of successful track record. However, by the application of new technologies it may be possible to exploit known resources to greater depths and with enhanced permeabilities. New Zealand geothermal researchers led the world 50 years ago. Ongoing research will enable New Zealand companies to better exploit our known resources and discover new ones.

New Zealand scientists and engineers have developed a flourishing multi-million dollar export industry in geothermal consulting services, with strong international linkages. A more dynamic domestic industry can only be positive in supporting that.

New Zealand companies have recently been gearing up for increased investment in the domestic market. Initial focus is on further development of existing operations, but some preparations are in hand for "greenfield" developments. The following figure shows the increase in drilling as a precursor to these developments.

Figure 1: Historical Drilling of Geothermal Wells in New Zealand



Potential for Geothermal to Better Contribute to New Zealand's Future Energy Needs

New Zealand has abundant geothermal resources and most remain un-tapped. A median estimate of New Zealand's high temperature geothermal resource base, using only current technology and considering a realistic economic drilling depth, is 3,600 MW of electrical equivalent, or about 70% of the country's electricity demand. Only about 12 % of the potential has been developed. Even acknowledging the need to fully protect many of our resources for cultural, environmental and tourist purposes, a conservative estimate of 1,800 MW of electrical energy is considered achievable. This is about 35% of the country's electricity demand. Applying further levels of conservatism, industry participants consider between 400 and 600 MW of new generation could be constructed over the next 10 years.

These are conservative estimates. World-wide there is a significant expansion of geothermal energy usage going on, including the application of improved technologies, which will have the effect of reducing costs and making lower-temperature resources economic to use. So it is reasonable to expect that the size of the economic resource base will increase in the future.

Geothermal is a renewable energy resource. It can be developed and operated in a "sustainable" manner, in line with national objectives for sustainable energy supply. No geothermal resources have ever been totally depleted. Geothermal energy use is sustainable in terms of the definitions in the Resource Management Act (preserving the needs of future generation) and a greatly expanded use of geothermal energy would still be sustainable.

It will be difficult for New Zealand to meet the Government's renewable energy target without more geothermal use.

Location of Resources

With one exception, all of our high temperature geothermal resources are located close to the major load centres in the upper North Island. Many are also located near major wood processing facilities, which are potentially major users of the geothermal fluids for heat or power. The exception is the high temperature field at Ngawha near Kaikohe in Northland that could have the potential to meet all the electric power requirements north of Auckland for years to come but is currently stalled within the RMA process.

Figure 2: Location of High Temperature Fields in New Zealand

Geothermal plants are built where the resource is found, delivering Regional Development benefits, but requiring a robust electrical transmission system to allow the energy to get to market.

Environmental Benefits, and Iwi Benefits of Geothermal

Geothermal power generation has low greenhouse gas emissions compared to fossil fuel alternatives. The average CO_2 emissions from current geothermal plants in New Zealand per GWh are around 25 % of those of combined cycle gas turbine plant (representing the most efficient form of fossil fuel generation readily available), or less than 10% of that of a modern coal-fired plant.

The involvement of New Zealand companies in overseas geothermal projects provides a valuable linkage to potentially fulfilling our Kyoto obligations through the Clean Development Mechanism.

Maori ownership of access to many geothermal resources is delivering support for Iwi development. Since 1997, five developments, including plant expansions have been wholly or partially owned by Maori. Maori interests now own some of the existing Kawerau steamfield assets, and will have involvement in the new Kawerau power development currently being consented.

What Are the Constraints?

As with all power stations the longest lead time is generally negotiating access. This tends to increase with the effective footprint of the plant. For example wind farms, hydro and geothermal have relatively large footprints compared to gas or coal plants. This is a normal commercial constraint.

Technical aspects and absolute cost are not seen as particular constraints on further development (though there are a number of useful research projects that could be carried out to deal with specific technical issues and reduce costs generally). There are regulatory constraints, and commercial constraints since possible geothermal investments will always be compared with alternative thermal and other renewable investments by potential developers.

A concern and cause of frustration to geothermal developments is the Resource Management Act. Recent geothermal projects in New Zealand have been small in comparison both to the size of the resources and to developments overseas. This is partly because of regulatory constraints. The regulatory process can lead to long delays, which impose significant up-front costs on the projects, reducing their financial viability. The New Zealand Geothermal Association is supportive of the principles of the RMA. Recent revisions to the RMA have been helpful but some members do not think these go far enough. We can and have provided specific suggestions for further improvement to the RMA process, many of which do not require legislative changes.

Selection of a geothermal source for heat or electricity depends on the relative economics when compared with other energy options. Some of the risks of field selection and cost of development have been reduced through a legacy of Crown exploration wells drilled in previous decades. Geothermal energy can be thought of as a low fuel cost/high capital cost development option. In the past, it has been competing principally with gas (a low capital cost/high fuel cost option). With the depletion of the Maui gas field (and limited known alternatives), gas prices are rising, driving the economics further in favour of geothermal energy. This is simultaneously associated with growing concern over greenhouse gas emissions that will further swing the economics in favour of geothermal energy.

There are also concerns over the availability of human resources to support the geothermal industry. Academic training has previously been provided by the engineering and earth sciences departments of some of our universities. A specialist geothermal course was provided through the Geothermal Institute (University of Auckland) to both national and international students until recent years, along with further post graduate training. A revitalised Geothermal Institute could both assist with national training and help strengthen international linkages if directed at an international market.

What Needs to Happen?

1. Incentives are needed to promote a greater proportion of renewable energy use. The 'projects' mechanism within the Government's renewable target policy has gone some way towards this, as will the proposed change in tax regime for geothermal drilling costs.

2. Removal of regulatory barriers to greater renewable energy use, in particular some members have suggested removal of those aspects of the Resource Management Act which cause long delays to projects.

3. There is some support for the development of a National Policy Statement for geothermal under the RMA covering sustainability and balancing of environmental effects. That could be part of the proposed NPS on generation generally.

4. Provision of assistance with disseminating information on costs and relative merits of geothermal heat and electricity.

5. Continue the initiatives by EECA and MfE.

6. Support greater research into geothermal science and technology aimed at expanded production from known resources, reduced development costs and mitigating environmental effects.

7. Promote training in geothermal technology, possibly by supporting the re-instatement of the Geothermal Institute.