

Geothermal – International Horizons

The year 2013 marked the completion of major geothermal investment programmes by Contact Energy and Mighty River Power. Now, in the face of flat domestic electricity demand, geothermal personnel are drawing a long breath as they wait to see if efforts to develop international markets for our world-class expertise will be fully realised. By Brian White, Executive Officer, NZ Geothermal Association.

First, let us briefly look at three projects that have been commissioned (or are approaching commissioning at the time of writing) this year.

Mighty River Power commissioned its 100MW gross (82MW net) Ngatamariki binary cycle plant using Ormat technology. This is the largest pure binary cycle plant in the world, although there are larger plants that include topping steam turbines.

There were drilling challenges, but all of these were eventually overcome to bring the project in within budget and with better performance than specified. All other geothermal developments in recent years have been on fields where there are existing production facilities (i.e. brownfield developments), but although the Crown drilled four wells at Ngatamariki in the 1980s, this is the first development on this field.

Mighty River Power announced that, “the completion of Ngatamariki also means the significant capital expenditure – of more than \$1.4 billion – that the company has invested in geothermal assets in New Zealand over recent years is at an end, with Mighty River Power unlikely to build a new large power station here in the next three to five years due to the current weak electricity demand outlook.”

Contact Energy has invested \$623 million in redevelopment of the Wairakei field including their novel bioreactor and the 166MW Te Mihi geothermal station. This is a condensing power station with two Toshiba 83MW turbines, representing a re-entry into the large geothermal turbine market for Toshiba. It has been a complex project for which there have been some delays in commissioning (notably oil contamination issues). The project is intended to partially replace some of the existing generation from Wairakei; now 55 years old. Additional wells have been drilled, both to bring production closer to generation and for reinjection purposes, with the project demonstrating the best of modern practice.

Contact has noted that geothermal energy is a significant part of “the most diverse and flexible fuel portfolio in the New Zealand market”. While a number of other Contact renewable energy projects have been dropped, geothermal energy remains a priority and they have stated, “our focus will remain on our Tauhara geothermal development, which we believe is New Zealand’s next best lower cost electricity development option.”

The third project, a 25MW binary cycle installation has been developed jointly by Norske Skog Tasman (NST) and Ngati Tuwharetoa Geothermal Assets at Kawerau, known as TOPP1 and uses Ormat technology.

In effect, this helps to diversify the outputs of NST so that electricity can be exported from the area. At the beginning of the year, NST shut down one of two remaining paper machines, and some of the energy this saves is now used in the TOPP1 plant.

NTGA has actively secured consents and has recently increased reinjection capacity, so the station can be fully loaded. Rules around dispatch have been looked at to ensure there are no unnecessary restrictions on output from the Kawerau area. It will be a little while until effect of diversion of steam from process heat use to generation can be assessed. However, the direct use of steam at Kawerau was the largest industrial use of geothermal energy in the world, and is still likely to be so after these changes. Loss of at least 2PJ/year of direct heat use from Kawerau is likely, which represents a significant setback in the Government’s renewable energy target of increasing biomass and direct use geothermal by 9.5PJ/year over 2005 levels by 2020.

Since 2008, developers have commissioned over 400MW of geothermal generation here. To put this in context, over the same period, approximately 1500MW of geothermal generation has been installed globally. Consequently New Zealand engineers, scientists and developers have current experience at the forefront of development at a time when the expectation for rapid international development of geothermal energy is high. There are major forward Gigawatt-sized programmes set out for Indonesia and Kenya as prime examples, and these have been traditional markets for our geothermal consultants, and for our specialist training.

The major geothermal consultants have traditionally secured much of their work from overseas and this still remains the case. Over the last two years there have been efforts directed at broadening the opportunities not only for pure consultancy but also partnerships that would see consultants, service providers and contractors partnering in combined offers to

international EPC providers; such approaches are being made in the Indonesian and Kenyan markets through collaborations facilitated by Geothermal New Zealand. Longer term, there is an interest in building an even more comprehensive model that could provide project financing to allow participation in the ownership of international developments.

New Zealand has long been recognised as a global ‘centre of excellence’ in terms of geothermal expertise and it will be crucial to sustain this group and leverage off it.

New Zealand and Australian geothermal associations are co-hosting the World Geothermal Congress in 2015, and preparations for this five-yearly event are well in hand with the conference to be held in Melbourne, but a strong programme of field trips and related activities is planned for New Zealand immediately following the conference. This should provide a stronger platform from which to offer services to a more receptive international market from 2015.

Not all attention needs to be directed outward.

There is now approximately 1000MW of operational geothermal generation on New Zealand geothermal fields, all of which takes active monitoring and management to maintain generation levels and manage effects.

Also, there is increasing interest in direct heat use, either using conventional hydrothermal resources or using geothermal heat pumps. As an example, district heating schemes based around geothermal heat pump systems are being looked at for the Christchurch rebuild. While the major generators may not be immediately motivated to install new generation, landowners (such as Maori Trusts), treaty settlement representatives and traditional network companies (such as Eastland Generation or Top Energy) may see niche opportunities for electricity, or heat that they will want to follow up, as they look to grow in the wider energy space.

This perspective has been silent on environmental planning aspects. This is because recent revisions of Regional Policy Statements for Bay of Plenty, Waikato and Northland regions in terms of geothermal development of our high temperature fields have all been made and are largely settled. Developers have clear guidelines on what can (or cannot) be done.

HERA has been working with manufacturing and research groups in an ‘above ground geothermal and applied technologies’ research programme, which will broaden the spectrum

of our interests. One of the projects within this AGGAT programme aims to develop NZ-designed and manufactured binary cycle plant. Whatever the outcome, the programme will place geothermal specialists next to manufacturers and shift the thinking for all people involved.

The geothermal industry requires highly skilled scientists, engineers and technicians with specific geothermal skills. Geothermal courses are now offered at two New Zealand universities (Auckland and Canterbury) and other universities have academic staff with an interest in geothermal research. Courses for training post-graduates from New Zealand and overseas are now established, which assists the international marketing effort.

In addition, retaining and developing the personnel within the geothermal ‘centre of excellence’ will be a priority for employers and the NZ Geothermal Association. The association is putting emphasis on development of interest groups, so that particular interests can be followed up. No doubt, some will take the opportunity for further study and research. But some attrition is inevitable.

Following the Pike River Mine disaster, there has been close attention to health and safety aspects across all industry and the geothermal industry is no exception.

The geothermal industry currently comes under the Ministry of Business Innovation and Employment’s “high hazard” category together with petroleum, mining and quarries. The coming year will see the MBIE focussing on the development of new legislation and bedding in the detail of petroleum and mining regulations in this new legislative context – industry will be watching and commenting.

MBIE, together with WorkSafe NZ, will also develop a raft of regulations targeting ‘major hazard’ industries. Our Geothermal Energy Regulations 1961 need a rewrite “from scratch”, but the coming year will only see slight adjustments as an interim measure, due to these other regulatory pressures.

Nevertheless, the geothermal industry will revise its own Code of Practice for Deep Geothermal Wells, which was developed over 20 years ago, while a range of other issues may be looked at before pressure comes on for changes from 2015.

There will be some real challenges for individuals in the geothermal industry over the coming year as we seek to maintain ‘assets’ and diversify markets.