

GEOTHERMAL

Good things going for hot fractured rock

Creating energy from the earth's heat is an under-utilised science, even in New Zealand and Iceland, writes **Robin Bromby**

PROponents of hot fractured rock energy argue they have three things going for them: the technology needs no fuel, produces no emissions and there is no waste at the end of the cycle.

They could also mention a fourth factor — that is, that Australia might not have too many options apart from geothermal when it comes to meeting future growth in demand for electricity. As this was being written, there were warnings being sounded of "brownouts", the euphemism for power cuts, in eastern Australia during 2008 if the drought does not end soon.

The Snowy Mountain hydro scheme's water flow is in a parlous state and there is even a threat to coal-fired generation in Victoria and NSW where, after coal, water is the other key component.

So, with all that and the growing tide of public opinion against more coal-fired power stations and the emissions that come with them, it starts to pose a challenge as to how Australia is to get the extra 25,000 megawatts the Australian Bureau of Agriculture and Resource Economics estimates we will need by 2030. This is a task that requires increasing present power generation capacity by another 50 per cent.

South Australia has its own particular problem in that the Leigh Creek coal field, which supplies the 400MW Port Augusta power station, has at most 15 years' life remaining.

Barry Goldstein, director of petroleum and geothermal with the Department of Primary Industry and Resources of South Australia (PIRSA), told a recent conference in Adelaide he expected spending on hot rock geothermal — exploration, feasibility studies and demonstration plants — to total more than \$500 million by 2012.

Given the level of activity now, that will probably turn out to be a conservative projection.

Fracturing hot rock is one form of geothermal — existing schemes overseas usually involve extracting water that is already hot and passing that through a heat exchanger. With the hot rock method an artificial underground heat exchanger is created by fracturing deep hot rocks; cold water is then pumped from the surface, heating up as it passes through the fractured rock and comes back to the surface as super-heated water. The heat extracted from the water in turn heats a low boiling-point liquid, which when brought to the boil, produces high-pressure steam used to drive electricity turbines.

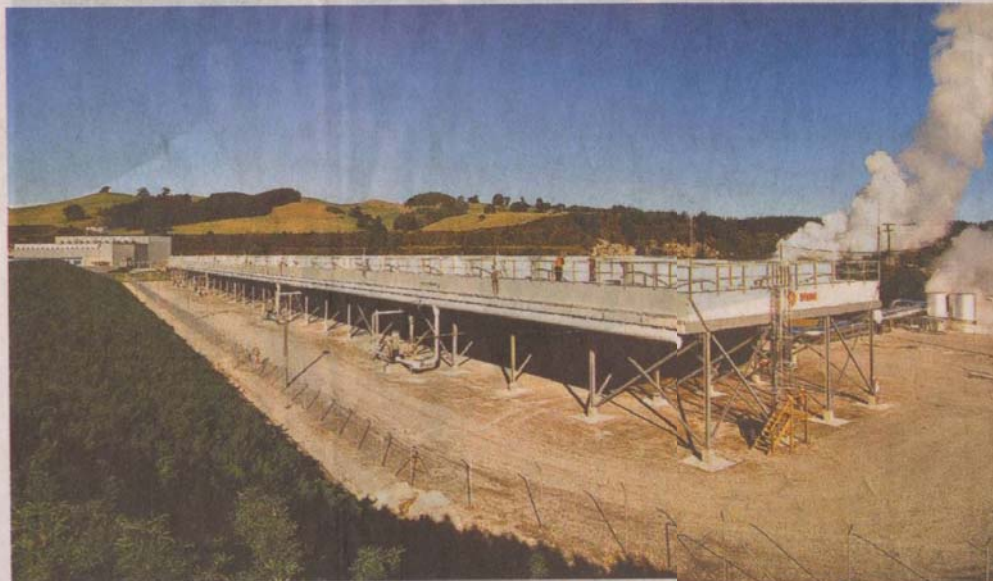
In South Australia, where most of the hot rock action is taking place and rock temperatures at depth can be between 250C and 300C, 12 companies have already applied for 116 areas. Goldstein estimated that Australia by 2030 would be getting nearly 7 per cent of its electricity from hot rock power stations.

One of the more recent entrants is Chris Matthews at Torrens Energy, who believes his company has one big plus — its South Australian licence areas are all located on the state's power grid, one running along the edge of Lake Torrens just north of Port Augusta, another in the Barossa and a third beginning at the northernmost suburbs of Adelaide.

In April, Torrens added two exploration permits just north of Melbourne. But Matthews sees South Australia as the ideal place to be. It has the country's best potential hot rock resources, and peak power supply in the state looks like being outstripped by demand within two to five years, so there is plenty of room for all those trying to get projects going.

"We don't see other geothermal companies as competitors — we're in a state of dire energy shortage," he said. The environmentally friendly appeal of hot rock geothermal would make it the energy of the future.

"The world is not going to accept a non-sustainable future — nor a dirty energy future.



Hot stuff: Contact Energy's plant is among New Zealand's seven geothermal plants

"There's a very bright future for us."

Geoscience Australia has estimated this country's geothermal energy resource at about 1.2 billion petajoules; to put that into context, Australia's total proven and probable gas reserves amount to 140,000PJ.

The whole idea of hot rock energy has, inevitably, been viewed with considerable scepticism by some — but the fact that several companies have managed to get initial public offerings away suggests that there is now growing belief that this could all work.

Moreover, there is some serious money also involved. Woodside Petroleum and Origin Energy hold shares in Geodynamics, the first

hot rock player out of the blocks and most advanced in its exploration.

Geodynamics plans to have a 40MW plant in operation by 2010. But that is only the beginning. By 2015 this company has set its sights on having 500MW in generating capacity, comparable to the output of the Snowy Mountains scheme.

It has been exploring the Cooper Basin, the oil and gas rich structure that stretches from the north-east of South Australia into the south-west of Queensland.

Geodynamics believes its main tenements could contain more than 390,000PJ of high grade thermal energy — enough, it says, to

support power plants totalling 10,000MW in capacity.

Petratherm, the other big name in geothermal, has \$30 million from Beach Petroleum riding on its hot rock plans and intends to sell power to the nearby Beverley uranium mine as its first step into revenue earning.

It also recently started its second project in Spain, applying for areas just north of Barcelona looking for both conventional and hot rock geothermal resources.

The others include Green Rock Energy, which has prospects close to the Olympic Dam mine and is working with a Hungarian oil company and an Icelandic geothermal special-

ist to develop a power project in the eastern European state, but that involves tapping hot geothermal water rather than injecting water into hot rock. Geothermal Resources is targeting a section of South Australia just across the border from Broken Hill, and Eden Energy which also has targets in South Australia.

The newest local player is targeting not South Australia, but Tasmania. Nickel producer Allegiance Mining has applied for a 3000sq km special exploration licence in the western part of the island to look for hot granite rock.

Hot rock energy is being taken seriously elsewhere. A small power plant is being developed in France, but Iceland has very big plans indeed. The Icelandic National Energy Authority is working with Germany's Energie Baden-Wurttemberg to tap hot rocks on the volcanic island state and lay a 1930km cable on the seafloor which would link to the British and German national grids.

This cable would enable Europe to harness Iceland's clean energy — not only the hot rock potential, but all the hydro-electric capacity that has been left untouched because of Iceland's tiny power needs.

New Zealand has been a big geothermal player, but its operations involve drawing already heated water out of the earth. The first of its geothermal stations, Wairakei, was commissioned in 1958 after the New Zealanders had studied the world's first such installation at Larderello in Italy.

New Zealand now has seven geothermal power stations. Earlier this year, one of that country's large power generation companies, Contact Energy, outlined plans for another 260MW of geothermal capacity involving two new stations near Taupo in the central North Island and upgrading Wairakei.

In total, geothermal technology now accounts for close to 9000MW in electricity generating capacity across the globe. Geothermal may now be a pinprick on the world electricity scene, but Chris Matthews and the other geothermal believers intend to change that.