Paralana Geothermal Energy Project
May 2010
Community Consultation Meetings

petratherm

The following questions were among those most commonly raised at a series of community consultation meetings held at Hawker, Leigh Creek, Nepabunna, Arkaroola and Port Augusta in the region surrounding the Paralana Geothermal Energy project.

How far away are you from putting in plant at the Paralana site?

As soon as we have proof of concept we will be looking toward planning this stage of the project. The plant will be near the wellhead and we would look to install a low voltage line to our customer, the Beverley mine, which is only 10km away. To date, we have drilled and successfully cased our Paralana 2 deep injection well. Our forward plan, subject to equipment availability, is:

3rd Qtr 2010
Well perforation and injectivity test. Fracture stimulation aiming to link the zone where fluid is trapped under pressure

4th Qtr 2010
Review of fracture stimulation results/flow testing and design Paralana 3 producer well

2011
Drill Paralana 3, circulation tests, Proof of Concept

Late 2011/early 2012
Begin construction of power plant

What does the well perforation and fracture stimulation involve?

Well perforation involves making small holes in the steel casing at the bottom of the Paralana 2 well hole then pumping a small amount of water into the rock at depth to confirm fracture initiation and propagation.

The fracture stimulation programme will involve injecting a larger volume of water at higher rates. The aim of this process is to produce small, almost horizontal fractures in the rock to create an underground reservoir. The high pressure fluid opens up pre-existing hairline fractures within the rock. When the rock fractures, a small amount of slip occurs along the fracture line. Once pumping of the fluid ceases, the fracture will remain open as both pieces of rock are not perfectly aligned.

The volumes of water involved will depend on the microseismic response as the water under pressure activates the natural fracture network. This is a routine operation in the oil and gas industry and has been performed at many other engineered geothermal project sites across the world, including the Geodynamics site in the Cooper basin.

Each fracture produces a micro-seismic event. In our project this will be happening about four kilometres below the surface. During the course of the fracturing process, which may take several weeks, many thousands of tiny fractures are opened within the rock.

The fracture stimulation will be monitored through an existing seismic listening array which is capable of detecting events associated with the breaking of rock. These events are too small to be felt at the surface so the array aims to pinpoint where the fractures are occurring.

On extremely rare occasions, at other geothermal sites, a seismic event has been triggered that can be felt at surface. Petratherm, Beach and PIRSA are working together to finalize a seismic risk management plan to ensure that, in the unlikely event a larger seismic event is triggered, the fracture stimulation process can be immediately modified to bring the treatment back within acceptable limits.

By creating an underground reservoir it means that water injected into the Paralana 2 well can slowly move through small fractures created in the hot rocks.

The superheated water can then enter the yet-to-be-drilled producer well and rise to the surface. The superheated water then drives a turbine and creates electricity before being re-injected back into the system.

How will Petratherm monitor the events during the fracturing process?

We have been monitoring the natural seismic events that occur in the region of our Paralana geothermal energy project. The Institute of Earth Science and Engineering in New Zealand has been overseeing the seismic array that has been recording since April 2008 including:

- 1 deep borehole sonde at 1790m in Paralana 1b to remotely measure seismic events
- 6 borehole sondes at 200m
- 8 surface seismometers
- 2 accelerometers to measure the velocity of seismic events

Our monitoring of the area and our calculations mean we do not think anyone will feel anything during the process but we want to make people aware to ensure they are not taken by surprise if they are in the vicinity and do feel an event.
In this region there is already regular natural seismic activity that is often felt. The community around Hawker, for example, view the size of any events on a PIRSA monitor at the local service station.

Do you know where you will be getting the water from?

Until Petratherm begins trial circulation tests between an injection and production well it is difficult to determine the required water use. Some fluids have been encountered during the drilling of the well that will need to be assessed in terms of how this can be used in the circulation.

If the system requires further water, it will be sourced from the Great Artesian Basin aquifer, a prescribed water source by the South Australian Government. Petratherm would require a water allocation licence and the amount of water available would be determined after an environmental impact study and assessment of other water users in the region.

All the water produced in an engineered geothermal system is re-injected so, provided there were only minor water losses between the injection wells and production wells, water usage is unlikely to be significant.

Will the Paralana Hot Springs water levels drop from any out take of water?

The Paralana Hot Springs are supplied by a hydrological system which is not connected to the proposed Paralana reservoir site. The Paralana geothermal energy site is 30 kilometres away from the springs and the proposed project reservoir is contained. As an extra precaution, Petratherm will monitor the hot springs to ensure any change would be immediately detected.

How many wells will be required to produce the 30MW?

Our calculations suggest each production well may generate approximately 3.75 MWe net power. It is currently envisaged, that we will require one injection well for every two production wells. Given these assumptions a 30MW plant will require 8 production wells and 4 injection wells.

Will the well grow cold?

The geothermal heat at the Paralana site is constantly being generated. Localised cooling of the rock through long term circulation of fluid will occur, however, once circulation stops the cooled rock will reheat to its natural temperature. The design of the production and injection system is such that individual production wells will aim to produce power without any major loss of temperature over an operating life of 20 years.

Petratherm exploration manager Peter Reid with Nepabunna Chief Executive Officer Russ Riessen (left)

Local community members at the public meeting at Port Augusta, South Australia

What energy source are you using on site at the moment?

For the drilling process we have used diesel but our challenge is to displace the use of fossil fuel by making this work and producing clean, emission-free baseload energy. Engineered geothermal energy is virtually free of carbon dioxide and other emissions. The equivalent of a 1000 megawatt geothermal power plant could save 20 million tonnes of Carbon Dioxide each year (3% of Australia's current greenhouse gas emissions), by replacing a coal fired power plant.

During drilling of the first few wells at Paralana, Petratherm will use diesel as the energy source. However, as the field develops, we will use the electricity produced from our geothermal resources to power the drilling rigs, pumps and facilities, reducing the overall impact of the project on the environment.

How long until geothermal can compete with other forms of energy?

An independent study by MacLennan Magasanik Associates (MMA), a leading independent economic consultant with particular skills in the area of energy markets, shows that Engineered Geothermal Energy is expected to be highly competitive with all forms of generation and the lowest cost renewable, reducing in cost over time to be under $100/MWh. Long-term price modelling by MMA indicates that with technical improvements in the production of Engineered Geothermal Power, it could become the lowest cost renewable energy producer by about year 2020.

What economic benefits will the project bring to the local region?

The number of people at the site will vary, for example there were about 55 people on site during our drilling process, and these people may travel through surrounding towns and contribute to the economy. There may also be further activity during the next few years that will attract people to our site who will travel through the local towns.

The number of jobs that this project can generate is directly related to the ultimate size of the development of the Paralana Project. Should the project achieve a capacity of 260 megawatts over the next 10-15 years, then it is estimated that a total of 200 jobs could be created.

Petratherm will seek to offer employment to the local community and encourage indigenous employment.

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