CSIRO Helping Perth Reach Geothermal Potential

The Western Australian Geothermal Centre of Excellence (WAGCoE) has several demonstration projects underway to help Perth realise its potential as one of the top 10 'geothermal cities' in the world, as judged by the US Geothermal Energy Association.

WAGCoE is a science collaboration between Western Australia's leading and innovative research institutions - CSIRO, the University of Western Australia and Curtin University.

The Centre's projects involve the National Centre for Desalination in Rockingham, sorption chilling – which turns heat into cooling energy - and includes plans for CSIRO to drill Perth's first deep exploration well on site in Kensington, a suburb close to the city centre.

WAGCoE was funded in 2009 by the WA Government to develop new methods to explore and utilise low-grade heat, which is an overlooked opportunity for broadening the footprint of geothermal energy utilisation in many parts of the world.

WAGCoE is a three-year project, with a total value of $14M - which includes the WA Government Centre of Excellence foundation funding of $2.3 MM. A proposal has recently been submitted for further WA Government funding for the next five years. The Centre's future will be revealed when the state government reveals its 2012–13 Budget in May.

As the Perth Basin's sedimentary geology has abundant shallow groundwater of moderate temperature, the Centre focuses on direct heat use technologies such as geothermally powered air conditioning and desalination. It is particularly focused on geological settings where exploitable heat can be used near the location, as transporting it proves exorbitantly expensive.

The Centre spent its first three years building a geological model to de-risk geothermal use and make it more economically viable. Approximately 60% of its efforts since its establishment have been on working out how to assess the geothermal potential of the Perth Basin, including assessing existing wells data, sedimentology, seismic, core and well log analysis.

Geothermal energy can be used to provide direct heating and cooling, without the need to convert heat into electricity. The hot water can be used for heating and through a sorption chiller it can also be used for cooling. This

Professor Klaus Regenauer-Lieb

involves using a refrigerant with a very low boiling point, which evaporates, taking heat with it and providing the cooling effect. Sorption chillers are an environmentally friendly alternative to conventional compression chillers.

At the helm of UWA's School of Earth and Environment is Professor Klaus Regenauer-Lieb, a world leading expert in global geothermal initiatives, who has made it his mission to "make Perth the first geothermally cooled city in the coming decades".

He is also the co-founder of the Institute of Geothermal Resource Management in Germany, which is the leader in geothermal technology and is pushing ahead with other renewables. Chancellor Angela Merkel's government passed legislation in June 2011 setting the country on course to generate a third of its power through renewable sources - such as wind, solar, geothermal and bioenergy - within a decade, reaching 80% by 2050. Regenauer-Lieb was instrumental in helping the country with this task.

During his time at the Institute of Geothermal Resource Management, Regenauer-Lieb was consulted in the early phase of planning for a geothermal production system in Unterhaching (near Munich) that has a flow rate of 68,000 bpd (125 L/second).

Unterhaching produces 3.4 MW of electricity and even in winter it produces 40 MW of heat which they use for base-heating in the city, he said. The Institute was also in charge of delivering a Geothermal Resource Atlas for Rhineland Palatinate which boasts the site of the first commercial plant in Landau, Germany and produces about 3 MW of electricity out of the sedimentary basin to power the town.

"If you have a power station that reticulates heat in an underground network so people can use it when they need it, then you have an economic case. That's what is being done overseas, where waste heat from power stations is being used in district settings, like heating, ventilation and air conditioning", Regenauer-Lieb said.

"Our strategy is to start with the lowest risk, because it's very difficult to raise capital in today's market."

Currently, there are six relatively small geothermal projects in Perth, all heating swimming pools - Bicton Pool, Craigie Leisure Centre, Christ Church Grammar School, Claremont Aquatic Centre, Challenge Stadium (the biggest project in Perth) and St Hilda's Anglican School for Girls, whose geothermal project was launched in 2011 and is also providing space heating as well as heating an Olympic-sized pool.

Regenauer-Lieb said that electricity generation has not responded to geothermal energy in the same manner as direct heating, which has a much shorter lead-time and can be deployed much sooner.

"Electricity generation (from geothermal energy) will shoot up without doubt, but may not happen until 2020 or so", he said. "Direct heat is a way to de-risk geothermal energy and learn more about the deeper resources. This is why the Centre is also developing geothermal engineering for desalination as well as cooling and dehumidification."

At the National Centre for Desalination in Rockingham, south of Perth, WAGCoE intends to use the extracted geothermal water both as a heat source and feedstock to develop its protected distillation-based desalination technology by constructing a small, containerised 4 m3/day desalination plant. "Ultimately we want to go to 4000 m3/day – industrial use", Regenauer-Lieb added.

WAGCoE's research initiatives are being driven by extensive national and international collaboration ensuring that the research, technology and its applications bring together world-leading expertise to deliver leading-edge solutions. WAGCOE is also working closely with geothermal lease holders, city planners and other stakeholders to advance the geothermal industry and the application of the technology in Perth and beyond. ∎