Geothermal Energy in the Perth Basin

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In 2008, the Government of Western Australia amended the onshore Petroleum Act to include rights to explore for and produce geothermal energy. The first geothermal exploration rights under this legislation were granted to Green Rock Energy in the Perth Basin at the end of July 2009 after a process of application by tender. The Perth Basin straddles the south western coast where most of Western Australia's population and power infrastructure is located. This favourable location close to markets together with the Perth Basin's geological potential to contain large geothermal resources presents the opportunity to supply energy for electricity production and direct use including air-conditioning and desalination of water.

The Perth Basin is a 1,000 kilometre long geological rift containing a thick sequence of sediments in places up to 15 kilometres deep. With its thick sequences of sandstones and the presence of thermal insulating sediments and coals the Perth Basin has potential to house geothermal energy resources in the form of hot sedimentary aquifers (HSA).

The highest known heat flows in the Basin have been determined from petroleum wells in or near producing oil and gas fields in the northern Perth Basin. Green Rock Energy holds 6 Geothermal Exploration Permits (GEPs) there near high voltage power grids where some heat flows exceed 100mW/m^2. Temperatures in hot sedimentary aquifers at depths less than 4,000 metres should be sufficient for the commercial generation of electricity provided sufficient geothermal water flow rates can be achieved.

In the central Perth Basin, where Green Rock Energy holds another two Permits, heat flows are generally lower and geothermal waters are expected to be commercially suitable for direct heat uses rather than electricity generation. In and near Perth low enthalpy geothermal energy resources have been intersected in numerous water bores drilled to 1,000 metres deep into highly permeable aquifers. Within Green Rock Energy's Permit GEP 1 in the western suburbs of the city of Perth geothermal energy recovered from aquifers less than 1,000 metres. This geothermal water is used to heat a number of major swimming centres including the Challenge Stadium Aquatic Centre where the World Swimming Championships have been held twice in the past decade.

At its Perth Permit, GEP1, Green Rock Energy plans to recover geothermal water to power air-conditioning and heating at the main campus of the University of Western Australia. Geothermal energy will be used directly to replace electricity currently used for air-conditioning at the University campus. To achieve this objective the Company proposes to drill one production and one injection well to depths between 2.5km and 3kms deep into sandstone aquifers. Preparatory work is underway to enable this drilling to be carried out in 2010. Drilling wells to these depths should not present any particular difficulty as there is abundant history of petroleum wells drilled without significant problems in the Perth Basin. The laterally consistent stratigraphy makes geological expectations and the drilling prognosis reasonably predictable in the Perth Basin.

Commercial viability will depend on obtaining adequate geothermal temperatures and water flow rates from the sandstone aquifers at depth. Geothermal water temperatures of between 80ºC and 100ºC are required for commercial operation of the absorption chillers which will provide chilled water for the campus. Temperatures at the target depths should be adequate as indicated by heat flow estimates determined from temperatures measured by Green Rock in deep water bores within and adjacent to the Permit. A 208 metre drill hole recently completed at the UWA campus confirmed the estimated heat flows beneath the campus.

To confirm the sub-surface structural geology and flow potential from sediments beneath the University campus the Company evaluated existing seismic surveys and data from petroleum wells adjacent to the Perth Permit and completed a gravity survey near the proposed well sites. Hydrodynamic flow modelling has also been carried out to model the effects of temperature drawdown and re-injection on the reservoirs over time. This has indicated that geothermal production will be sustainable over decades using the targeted permeabilities and proposed production and injection well configuration.