



**Explorers and Developers  
of Geothermal Energy**

## Industry Leader

Petratherm Limited, a company which listed on the Australian Stock Exchange in July 2004, is one of the foremost developers of clean geothermal energy technologies, both in Australia and Internationally. Geothermal energy aims to harness the earth's vast natural heat resources turning the heat energy into power. The potential global resource base is large, emission free, base-load, and competitively priced.

Petratherm's expertise includes its pioneering methodology to locate new geothermal resources. It has applied leading edge mineral exploration technologies and advanced crustal thermal modelling in collaboration with researchers from the University of Adelaide to generate strategies specifically designed to explore for shallow heat resources below the earth's surface.

Petratherm's business strategy is centered on creating a portfolio of quality projects and continually looking at how to reduce costs, reduce risks, and increase revenues in order to enhance shareholder value.

Through its board, management, partners, consultants and contractors, Petratherm has the full range of skills, abilities and experience to successfully execute its planned strategies. These skill sets cover exploration, deep drilling, fluid engineering, electricity generation, grid connection, power transmission and marketing - critical elements to being a lead player in the Australian electricity market.

### What is geothermal energy?

Naturally occurring heat from the earth is a massive, environmentally friendly energy resource. As the earth is constantly generating heat, the energy is classified as a renewable resource.

Conventional geothermal systems tap, for power generation purposes, the heat contained in natural volcanic structures such as hydrothermal springs, and have been operating commercially for many years. Engineered Geothermal Systems (EGS/also known as enhanced geothermal or hot dry/fractured rock) require a man-made fluid reservoir to be created in hot rock. The EGS resource base is very large and is only just beginning to be commercially exploited.

This involves the circulation of water down an injection well, through deep (2 to 5 km) hot rocks with temperatures typically around 200°C. In

order to allow the flow of water, tiny fractures are engineered creating an underground heat exchanger. As the water passes through the heat exchanger, it is rapidly heated to a high temperature by contact with the hot rock. The superheated water, is then returned via a production well to surface where the heat energy is converted to electricity (Figure 1).

### Why geothermal energy?

Petratherm believes that the need for power from renewable energy sources will increase, and that EGS-type geothermal energy is one of the few energy renewables that can provide base-load power without significant impact on the environment.

- Zero greenhouse gas emissions
- Competitively priced
- Provides base-load capacity
- Minimal environmental impact
- Extremely long-term source

### Commercial Targeting Strategy

- Proximity to major electricity markets and transmission infrastructure
- Targeting high temperature conventional and engineered geothermal resources
- Identify sites with natural fluid flow characteristics or sites amenable to an engineered flow
- No restrictions to project permitting, and access to market from project location.

## Market Differentiation

Petratherm has successfully differentiated itself in the geothermal energy sector through both its innovative Exploration Model and the Heat Exchanger within Insulator (HEWI) model.

The Exploration Model that aims to find "**Shallow hot rocks close to market**" has been further enhanced with the completion of a comprehensive economic pre-feasibility study and financial model to assess Petratherm's (current and proposed) projects and the projects of competitors.

The Exploration Model aims to optimise the five key economic parameters namely:

- Temperature differential
- Drilling depth/cost
- Flow rate/circulation
- Network connection costs
- Generation plant cost/efficiency

and to achieve the lowest cost of electricity delivered to the market while minimising risks. The Exploration Model has been vindicated by the

recent excellent temperature results at Paralana, which confirmed the Company's expectations of temperatures of 200°C being reached as shallow as 3.6 kilometres.

The HEWI model (refer Figure 1) contends that significant cost and risk reductions can be achieved by creating the requisite underground heat exchanger within the naturally permeable and porous insulating rock above the granite heat source.

The aim of the HEWI Model is to achieve optimal energy exploitation (extraction) through shallow (lower cost) drilling, controlled rock fracture and obtaining appropriate fluid flows and circulation.

Confirming the validity and applicability of the HEWI model will form the next major stage of development work at Paralana.

## Project Summary South Australia

### Flagship Paralana project - a Joint Venture with Beach Petroleum

Petratherm's most advanced EGS project, Paralana, 130 kilometres east of Leigh Creek in South Australia's northern Flinders Ranges, is on track to deliver Australia's first commercial geothermal energy supply by early 2010. The customer will be the Beverley Uranium Mine - just 11 kilometres away. Petratherm plans to develop an initial small scale commercial plant of around 7.5MW to meet local demand needs with the view of growing to 30MW as scheduled mining operations expand in the region.

In addition, Petratherm has commenced examining the potential for supplying large scale, base load power into the National Grid region of South Australia and is targeting two entry points, namely Port Augusta and Olympic Dam. The large scale options, under examination include developments that range between 260MW and 520MW.

Heat Exchanger Within Insulator(HEWI) Model

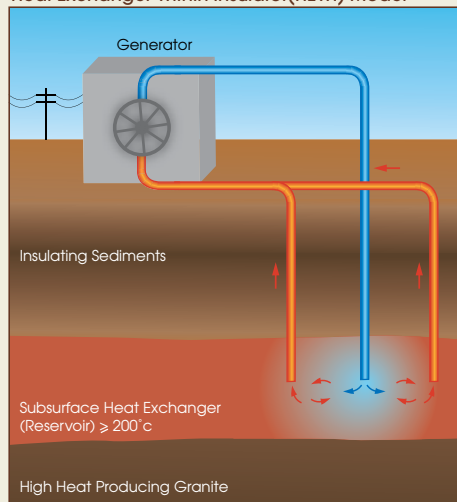


Figure 1. Schematic diagram demonstrating the basic concept of an Engineered Geothermal System using the HEWI (Heat Exchanger Within Insulator) model.

A strategic partner in Paralana's commercialisation is ASX-Listed Top 5 Australian oil and gas producer and explorer, Beach Petroleum Limited, which has committed up to A\$30 million to help bring Paralana on stream.

The Company is well advanced in its preparations to develop a fluid circulation system at Paralana, which is the next key milestone in the commercialization plan. Development of the HEWI model will involve drilling of both an injector and producer well and the establishment of a robust heat exchanger (connecting fluid pathway) between the wells. The first of these two wells is scheduled to be drilled in the first half of 2008.

### Assistance of US expert

One of the foremost geothermal experts in the United States, West Coast-based Global Power Solutions, is advising Petratherm on its projects, particularly Paralana. Global Power Solutions is a world-leading geothermal energy consultancy experienced in more than half of the world's installed geothermal plants (over 5,000 MW) of which the majority are in the US. It is responsible for providing technical oversight to the Paralana well design and drilling process, together with planning and engineering design work for the requisite power generation plant and the integration of the above and below ground works.

### Top Australian drilling manager

Melbourne-based Australian Drilling Associates Pty Ltd (ADA) is undertaking Paralana's well design, rig specification and selection process. ADA is an Australian oil and gas project manager with experience in deep well design and drilling and has achieved major reductions in time, cost and risk with its projects in the Bass Strait.

### Stakeholder Support

Petratherm's approach is centred on bringing in expert staff and resources, with local, "hands on" knowledge.

Petratherm's ongoing research and development effort has been assured and further strengthened through exclusive consultancy agreements with Professor Richard Hillis (Head of Petroleum Geology) and Associate Professor Martin Hand - both from the University of Adelaide.

In Spain, Petratherm has employed a highly experienced Manager, Raul Hidalgo, and is working in partnership with a local expert geological consulting company Prehenita and researchers from the University of Salamanca.

The large Spanish media, property and alternative energy group, Barcelona-based Editorial Prensa Iberica Communications (EPI), owns a stake in Petratherm with a view to becoming a key long-term partner. EPI - which has considerable property, industrial and agricultural holdings in South Australia, is represented in Adelaide by Global Intertrade Pty Ltd.

Petratherm's Joint Venture partner for the Paralana project - Beach Petroleum - has the critical drilling and field engineering skills and experience needed for future stages of project development.

Renowned ASX-listed minerals explorer, Minotaur Exploration, is a 35% shareholder.

### Other SA projects

The Company also holds geothermal licences at:

- Callabonna: located 80 kilometres northeast of Paralana, where a shallow test well (690m) has confirmed an exceptional thermal gradient of 68°C per kilometre.
- Ferguson Hill: 110 kilometres east of Prominent Hill (potential supplier to the Olympic Dam and Prominent Hill mines).
- Riverland: located 26 kilometres northwest of Renmark. The area takes in the highly prospective Renmark Trough and is close to two major high voltage transmission lines.

### Overseas

#### **Mainland Spain**

Petratherm is set to become the first company to formally develop geothermal energy projects in Spain. It is undertaking geothermal projects in the key large electricity consuming markets of Madrid and Barcelona.

The Madrid project already has three wells - previously drilled to depths of 3.1-3.5 kilometres - providing critical temperature, hot water flow rates and geological data and hence creating a valuable opportunity for significant and low cost project advancement in the near term.

The entry into the Spanish market provides "first mover" advantage and is consistent with the Company's objective of examining areas where the geology, the energy market and the regulatory environment are conducive to commercially viable geothermal energy projects for shallow geothermal resources, close to market.

Spain (40 million population) is one of the fastest growing member countries of the European Union (EU) and its electricity market is the fifth largest in the EU, with an annual growth rate of 5.0% or double the EU average. Within this, around 50% is thermal generated (coal/gas), 25% hydro, 15% nuclear and 10% renewables.

#### **Canary Islands - Conventional geothermal project**

Petratherm has secured a geothermal exploration licence on Tenerife - the largest of the seven volcanic islands comprising the Canary Islands' archipelago off the northwest coast of Africa.

The intent is to tap super hot (over 250°C) volcanic structures at relatively shallow depth of around two kilometres and in an area very close to substantial transmission infrastructure. Commercial success would reduce the Island's reliance on imported fossil fuels and help cope with peak electricity demand caused by massive summer tourist inflows.

#### **China**

Petratherm is the only Australian geothermal developer formally endorsed by the Chinese and Australian governments through the Asia-Pacific Partnership, to help China - the world's fastest growing market for electricity - rapidly progress its highly promising geothermal energy opportunities.

Governments within the Asia Pacific Partnership on Climate and Clean Development (APP) comprise the United States, China, India, Japan, South Korea and Australia.

Petratherm will progressively move into China throughout 2007 and 2008 to identify potential hot rock sites - and plans to take an equity position in sites that offer the best potential for commercial geothermal development. The work will be undertaken in co-operation with Chinese geological institutions, provincial governments and local energy utilities.





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