

# EGS in Australia

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## Introduction

In the past decade, EGS (Enhanced Geothermal Systems) in Australia has gone from an academic concept to a very active alternative-energy sector. There are six EGS-focused companies listed on the Australian Securities Exchange (ASX) and dozens more private entities holding tenements.

The main reasons for the rapid growth have been:

- Good geology;
- Supportive equity markets;
- Supportive state and federal governments;
- Buy-in from research institutions; and
- A co-operative, information sharing culture among companies, the government, and academia.

Despite the global financial crisis, the EGS sector in Australia still is healthy, albeit operating within a constrained investment climate.

The sector was financed initially by stock market floats and then *Joint Ventures* with oil,

gas, and energy utilities and assistance by federal-government grants schemes. However, the current economic climate means all these will be in short supply in the near future at least. Several projects ready to drill initial proof-of-concept deep wells are on hold awaiting financing. On the other hand, the projects that secured financing before the financial downturn are progressing, meeting, and overcoming technical challenges as they go.

Within the next few years, at least three EGS projects will have drilled for proof-of-concept and at least one will have commissioned a pilot generating plant. [Outside EGS, the same can be

said for at least another three Hot Sedimentary Aquifer (HSA) projects.] Two EGS projects have been approved for federal government funding at the demonstration stage.

## Government Initiatives

Prior to 1990, outside of small-scale utility uses, the study and appreciation of the potential to harness geothermal energy within Australia was limited to a few workers in academia and federal governmental studies.

A seminal paper appeared in 1994 in the form of a report commissioned by the federal government written by Somerville, Wyborn, Chopra, *et al.*, titled, *Hot Dry Rocks Feasibility Study*. The paper extended an earlier national heat-flow data compilation into a comprehensive database called GEOTHERM that allows routines

to be established to estimate the temperatures of basement rocks at various depths. As the title suggests, the paper focused on the hot dry rock—currently

better known as the EGS—potential within Australia and determined which locations in the Cooper Basin and the Hunter Valley were most prospective. Wyborn and Chopra later were involved in forming the company, Geodynamics Limited, which now has these two areas under tenement.

In 2000, the Australian Government passed the *Renewable Energy (Electricity) Act*. This introduced a *Mandatory Renewable Electricity Target (MRET)* of an extra, annual 9,500 GWh of electricity from renewable-energy sources by 2010, compared with a 1997 baseline—meaning 2% of Australia's

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electricity demand would be from renewables by that date.

In 2004, the federal government reaffirmed the 2% MRET target and released a new energy policy called, *Securing Australia's Energy Future*. This policy introduced a *Low Emissions Technology Development Fund* to provide A\$500 million for demonstrating new low-emission technologies with the potential for significant, long-term greenhouse-gas abatement. Other federal government initiatives, notably the *Renewable Energy Development Initiative* scheme, offered grants up to A\$5 million toward the development of new technologies and processes—and a number of such grants were given to geothermal companies and projects up to the time of the scheme's abandonment in 2008.

In 2006 the federal government announced its *Onshore Energy Security Initiative*. Under this, a geothermal project team was established within Geoscience Australia (Australia's national geoscience agency). Initially the project focused on EGS resources and the project continues.

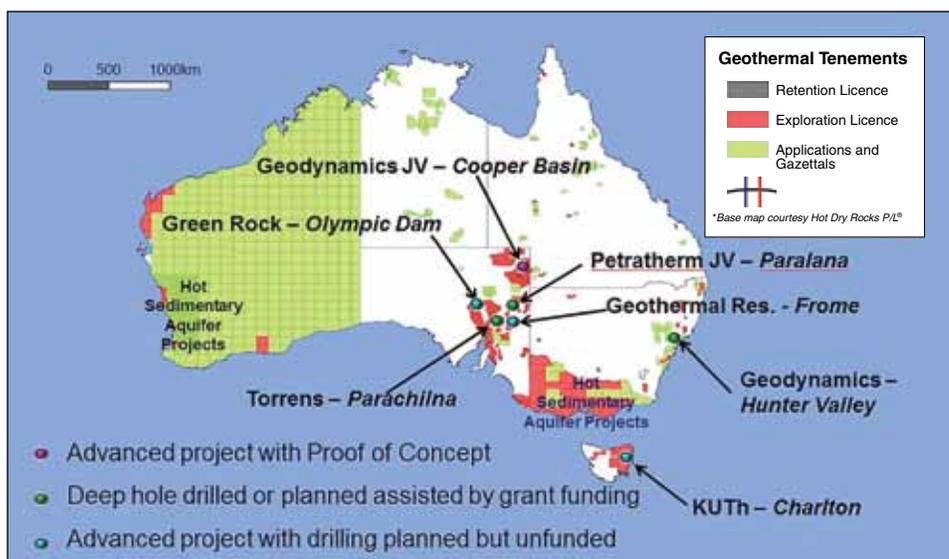
Geothermal momentum continued into 2007 with the beginning of the federal government's *Geothermal Road Map (GRM)*, constructed in

conjunction with industry. The GRM led, in turn, to a formal framing of positive federal policies to deal with geothermal energy. Along with the change in government in late 2007 came a greater focus on renewable energy and climate change—and an increased MRET. Of significant, tangible benefit to the geothermal sector was the establishment in 2008 of the *Geothermal Drilling Programme*, the centerpiece of which was A\$50 million allocated toward assistance in proof-of-concept deep geothermal drilling. Companies would be eligible for A\$7 million per project toward the cost of drilling, as long as the company could otherwise fully fund the drilling. The fund was fully taken up within a year.

### Birth of the Private Sector

As noted, before 2000 several early governmental and academic workers on geothermal energy saw the commercial potential for developing EGS. They formed Geodynamics Limited and raised seed capital in 2001. The company was floated successfully on the ASX the following year. Geodynamics continues to be the largest geothermal company in Australia and arguably the most active EGS company in the world.

From 2002 to late 2007, five additional companies targeting EGS geothermal came onto the ASX (Petratherm, Geothermal Resources, KUTh, Green Rock, and Torrens). The ASX listing of EGS enterprises is a model almost unique to Australia and it begs the question as to why. The answer lies in the mining exploration expertise and entrepreneurship in Australia and the willingness of stock market investors to fund projects incorporating "exploration risk." *After Geodynamics, all the remaining listed companies came about from companies or management already in the resources sector who saw EGS as*



**AUSTRALIA – Active Companies and their advanced EGS Projects, August 2010.**

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*another type of exploration and development challenge, rather than a technology challenge requiring venture capital.* Australian investors make a significant allocation of their portfolios toward exploration juniors, and in the buoyant market prior to 2008 allowed a succession of EGS juniors to raise exploration capital on the ASX.

Interestingly after 2007, the companies who made it onto the ASX were targeting HSA projects rather than EGS projects. But again, they were floated by management already in the resources sector in Australia.

There is no doubt that policies of successive federal governments, and also of certain state governments, greatly supported the geothermal sector in the 2000s and encouraged private investment. The sector worked hard to become transparent to investors, including developing the world's first *Code for Reporting Geothermal Resources and Reserves*, which standardizes the language and terminology companies can use to report their primary assets to the market. The Australian Geothermal Energy Association (AGEA) was formed in 2007 to lobby governments—in particular to develop policies supportive of geothermal energy in Australia. The first industry-sponsored geothermal energy conference in Australia was held in Melbourne in 2008.

### The Scene Today

Presently all Australian states and the Northern Territory have legislation that enables exploration and development of geothermal resources. Those jurisdictions with superior legislation and regulations have seen massive investment, with the clear winner being South Australia.

Over the past two years, the federal government has continued to roll out grants that have assisted the sector to progress through the global financial crisis. The *Geothermal Drilling Programme* saw A\$7 million grants awarded to four EGS projects in South Australia and New South Wales—with the funding used to offset the cost of drilling initial deep wells for the projects.

A further A\$150 million was awarded, in total, to Petratherm and Geodynamics toward the cost of the Demonstration Stage of their respective projects. The Petratherm grant is conditional on the company's first achieving proof-of-concept.

On the downside, the federal government's renewable-energy policies have been subject to great uncertainties in the past six months, partly due to the impending federal government election. The incumbent Labor Party has all but abandoned its planned *Emissions Trading Scheme*, at least for a number of years.

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**Geodynamics**, which continues to be the leader in EGS with its Cooper Basin *Joint Venture* with Origin Energy, has had a series of technical setbacks, the most serious being a blow-out in one of its wells in 2009 just prior to commissioning the 1 MWe pilot plant. The incident has delayed the overall project over a year. However, the company has reaffirmed an expansive forward program and recently re-entered well Jolokia 1, with a view to creating a second geothermal reservoir in the Cooper Basin through stimulation and fracturing. A 25 MWe demonstration plant is planned. In the Hunter Valley in New South Wales, Geodynamics has obtained A\$17 million in state and federal grants to drill proof-of-concept wells, planned for 2012.

**Petratherm**, the second company to list on the stock exchange, has drilled its first deep well for its proof-of-concept at Paralana and is planning to begin stimulation work this August. A 30 MWe demonstration plant is planned after a proof-of-concept is achieved. The company recently announced a variation of funding arrangements with its *Joint Venture* partners, Beach Petroleum and TruEnergy, to preserve its cash in the short term. The Petratherm project is a variant on the traditional granite-hosted EGS model; it is hoped the reservoir will be created in sediments immediately above the heat producing granite.

Both the Geodynamics and Petratherm projects are in remote areas and require a substantial power-transmission infrastructure to be built in order to deliver power to the grid.

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How this is to be funded is unclear. All companies floating on the ASX after Petratherm have made a virtue of their proximity to grid infrastructure.

**Torrens** reached a *partnership agreement* with the energy utility AGL Energy, and offered a 50% participation in its Parachilna EGS project north of Adelaide in exchange for AGL funding for the first proof-of-concept well. AGL declined to participate but remains involved in the project elsewhere. Torrens received an A\$7 million grant to defray its share of the drilling costs and will seek alternatives to AGL to help finance the balance.

**Green Rock** initially was focused on its Olympic Dam EGS project in South Australia but has since focused more on HSA projects elsewhere.

**KUTH** undertook a successful grass-roots exploration program for EGS resources in Tasmania, helped by a federal government *REDI grant*, but failed to obtain a *GDP grant* and the project now is stalled.

Likewise, **Geothermal Resources** has a good technical story in South Australia but has been unable to attract a funding partner.

Possibly 20 or more privately held companies hold tenements thought prospective for EGS in Australia. However, the environment for stock-market floats is poor and the companies are unlikely to grow or develop their properties, due to funding constraints.

## In Conclusion

The growth of EGS in Australia in the past decade has been extraordinary, based on a funding model unique in the world. Recently the global financial crisis slowed investment in the sector considerably, and whilst government grants have helped in the past 18 months, considerable new investment is required. Several good-technical projects are likely to be stalled until commerciality is shown elsewhere or the investment climate fully recovers. The two or three projects with funding partners will continue to develop slowly but surely.



*Geodynamics well Jolokia 1, as photographed in 2008. PHOTO COURTESY OF GEODYNAMICS LIMITED.*

Technically speaking, companies—and Geodynamics in particular—have made very significant advances, particularly in drilling and reservoir stimulation. Junior companies such as KUTH and Torrens have successfully explored for—and discovered—EGS resources using innovative grass-roots techniques. Software modelling development has been advanced by both geothermal and support companies. ■