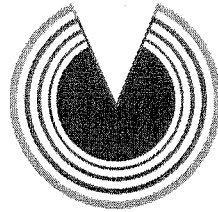


Submission No:

137



petratherm

**House of Representatives Standing Committee on
Industry and Resources**

“Development of Non-Fossil Fuels in Australia”

**Submission by Petratherm Limited
“Explorer and developer of Geothermal Energy”**

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Australian Geothermal Energy Industry Overview

- Australia is endowed with unique geological features with 'hot rocks' or granites that contain a significant heat resource from the natural breakdown of heat producing elements at just a few kilometres beneath most of the continent's surface.
- Most of the known heat resource is centred around previous oil and gas provinces including the Cooper and Eramonga Basins in a region known as the "South Australian heat flow anomaly" – an area that runs through the large parts of South Australia, New South Wales and Queensland and which exhibits twice the average heat flow of the Earth's crust.
- The resource potential from the development of 'hot rocks' – also referred to as Enhanced Geothermal Systems (EGS) has been estimated in a report for the Commonwealth Government as capable of providing Australia's total energy needs for many centuries.
- A recent US report from the Massachusetts Institute of Technology (MIT) concluded that up to 10% of the electricity needs in the U.S.A. could met by EGS by 2050 and evidence is building in Australia that geothermal energy could make a significant contribution to Australia's baseload energy requirements within a similar timeframe. The ESAA recently estimated that 8% of the country's needs could be met by geothermal energy by 2030 and the industry is currently undertaking work to determine a realistic target.
- The technological tools – such as deep drilling techniques & rigs and fracture stimulation methods – to enable EGS are readily available and the challenge is to utilize those existing tools to create commercial EGS projects in prospective geological settings. The challenge is seen as being similar to the technological issues that faced coal seam methane less than five years ago, that have since been successfully addressed.
- The Australian Geothermal Energy Industry is growing rapidly with nineteen companies developing projects at various stages and over 140 license application areas covering about 150,000 square kilometres. More than \$100m has already been invested with a further planned work program of over \$650m.
- Recent independent studies of various energy sources, both renewable and conventional were conducted by McLennan Magasanik & Associates (MMA) and the South Australian Electricity Supply Industry Planning Council (ESIPC) have shown that geothermal energy is expected to be the lowest cost energy source within two decades and once an emissions trading scheme is introduced. (Refer Figures 1, 2 and 3 below).
- The key advantages of geothermal energy include low cost, baseload capacity, long term reliability, energy security and zero emissions and there is increasing evidence that it can be delivered at large scale within the next decade.
- In recognition of the substantial potential from geothermal energy the Federal Government recently launched the Australian Geothermal Industry Development Framework process to establish a detailed framework for the large scale development of the industry and of related policy and program measures.

- The sector is receiving interest from the financial market with existing and new companies experiencing strong support in their equity raisings and share prices. At the same time, the market is not ready to support the full-cycle of investment through to development and is looking closely at Government policy settings.
- Companies operating in the sector are at various stages of development with some now close to proving the concept and preparing for pre-commercial demonstration, while others are exploring new, distinct geologic setting and with alternative competitive models for extracting thermal energy.

Energy, Renewable Energy and Climate Change

- The Australian Geothermal Energy Industry has developed its view on renewable energy policy and specific geothermal energy sector initiatives based on the following key assumptions:
 - Australia's energy security and cost competitiveness are paramount and will require a mix of energy sources to deliver internationally competitive and reliable electricity to the market.
 - Climate change is increasingly a key driver behind energy policy settings and requires effective and substantial measures to avoid serious impacts. These measures need to ensure that Australia's economy and international competitiveness are maintained or enhanced.
 - Geothermal energy can be a major part of Australia's long-term energy security and international competitiveness and can concurrently provide a low cost and material impact in our efforts to address the climate change challenge.
- The Australian Geothermal Energy Industry believes that all forms of zero emission or low emission technology will play a part in meeting future energy demand and climate change needs.
- The deployment of all clean energy technologies will require both:
 - a national emissions trading incentive; and
 - a policy incentive that will meet the difference between the black energy price with an emissions trading incentive and the cost of delivering clean energy into the national market
 until the emissions trading incentive increases to meet that gap.
- The geothermal industry believes that the lowest cost pathway to meet that gap is through the introduction of a market scheme within which all forms of clean energy must compete to deliver the most cost effective policy outcome.
- Over time, geothermal energy will consistently deliver lower cost energy than all other forms of clean or emissions free energy (refer Figures 1 and 2 below).
- Figures 1 and 2 illustrate the predicted cost curves of clean energy technologies out to 2050 and provide an indication of the level of incentive that all clean energy technologies will need to compete with coal fired electricity out to 2050.

Geothermal Energy Specific Policy

- More than 95% of the geothermal energy resource potential in Australia is hot rock based and focused on producing electricity.
- The remainder of projects are focused on more conventional hydrothermal systems and on direct use of heat.
- The technological tools required to develop a hot rock geothermal energy project to produce electricity are well established and available within existing disciplines and industries. The challenge is to utilize those available tools to create commercial energy projects. The main risk and challenge lies in creating the underground heat exchanger that enables the substantial heat resource to be commercially exploited.
- Ongoing technology improvement and increasing expertise will assist the continuing quest for cost reduction.
- Geothermal energy is an emerging renewable energy technology and requires strategically targeted assistance to bring forward investment and allow geothermal energy technology to move rapidly down the technology cost curve.
- As with the oil and other resource industries, exploration activities are highly capital intensive and high risk. It is unrealistic to expect that all drilling activities will produce viable projects. A proportion of overall activity will not produce productive wells.
- Policy support will be required at two levels to develop and grow the industry:
 1. Direct funding across the research and development and project demonstration to technology improvement stages. The industry expects that a three (industry) to one (public) proportion should deliver adequate leverage to attract private funds to produce a level of activity that will grow the industry.
 2. Once developed, projects will need a market policy framework to enable the delivery of clean energy into the electricity markets until the price gap converges with an emissions trading incentive.

1. Funding Support to Assist in the Development of Projects

Public funding supports:

- Resource demonstration: drilling play-maker deep hot boreholes¹ to prove temperature gradients and geothermal reservoirs, and then drilling a second well to demonstrate that heat energy can be flowed from one hole and re-circulated through an enhanced geothermal systems. This support is currently provided through the Renewable Energy Development Initiative (REDI)
- Commercial demonstration of generating power from hot rocks - potentially available to industry projects through the Low Emissions technology Demonstration Fund (LETDF).

¹ A 'play' describes the different methodologies that various companies are taking in their exploration, drilling and economic approaches to projects. For example, there is a trade off between the cost of drilling to deeper heat sources against the economic efficiencies produced from cooler, shallower boreholes..

The REDI program does not cover 50% of the real costs of the proof-of-concept phase of projects to show heat energy can be flowed from one hole and re-circulated into enhanced geothermal systems. A REDI styled scheme that was specifically targeted to the geothermal sector would foster the proof-of-concept phase, after resources are proven with play-maker wells.

REDI (Geothermal Industry Impact)

The REDI fund provides very important and strategic support of up to \$5m for geothermal projects at the R&D stage. If the program is to effectively assist in the delivery of a new low cost, clean geothermal energy industry, REDI will need to expand the support it offers at this early stage of project development. Support will be required for fracturing and for the drilling of a second well to prove the concept upon successful completion of the first stage. To reach this point projects are expected to cost between \$15m to \$25m and may well require more than \$5m in assistance to attract adequate private investment.

The growth of the geothermal industry will require the successful completion of a range of projects and from a range of various geological formations and 'plays' due to the specific aspects of site specificity challenges and economics for individual projects. The successful development and demonstration of a single or limited number of projects without geological variations is unrealistic and the REDI program will need to address this.

LETDF (Geothermal Industry Impact)

Once the wells have been drilled and rock fracturing completed, the injection, heat exchanger, uplift and energy production components of the project need be demonstrated. Commercial demonstration will need also need to occur over a number of site specific geological and hydrological 'plays' given the variety of these conditions across Australia in the areas where the known heat resource is vast.

The basis of support for LETDF program may be:

- The demonstration of 2 or 3 larger projects based on various 'plays' of typically around a 30-40 MW capacity with each project requiring a two to one subsidy.;
- The demonstration of smaller projects focusing on proving reserves in a range of contexts. Five projects with around four wells each and prolonged well testing; or
- A combination of the above.

2. Market Policy Framework

In the early years of operation, geothermal electricity will be competing in the national market with fossil fuelled electricity. Current cost predictions are being examined as part of an economic modelling project underway with MMA. Until the incentive provided by an emissions trading scheme meets the price gap between the cost of generating electricity from fossil fuels and the cost of geothermal generation, an additional policy mechanism to deliver incentives will be required to facilitate all renewable and low emission energy projects including geothermal energy. The Commonwealth introduced the Mandatory Renewable Energy Target (MRET) scheme in 1997 as a means to deliver such an

incentive and the geothermal industry supports the introduction of a similar market based scheme to meet the same policy goal. The timeframe for and level of that incentive will depend on the emissions cap set under an emissions trading scheme and the price that the market sets in response to that cap.

Cost Curves

The following cost curves have been produced by MMA and the SA ESIPC and demonstrate clearly that geothermal energy will play a very significant role in Australia's energy supply mix on the basis of cost alone without consideration of the climate change, baseload and energy security benefits in the longer term.

The geothermal industry believes that over the coming decades the industry will be self sufficient and independent from the need for specific policy support and that a long term carbon pricing framework will see the industry highly competitive with all other forms of energy generation. Any investment that governments make in the development of the industry in the early years will position the Australian geothermal industry to make a strategically important, low cost contribution to national energy supply and to export the expertise globally.

NB. These cost curves developed in 2006 are currently being analysed and updated by MMA for REGA and will be released as soon as they become available.

Fig 1 – MMA - Average cost – wind, biomass, geothermal, small-hydro

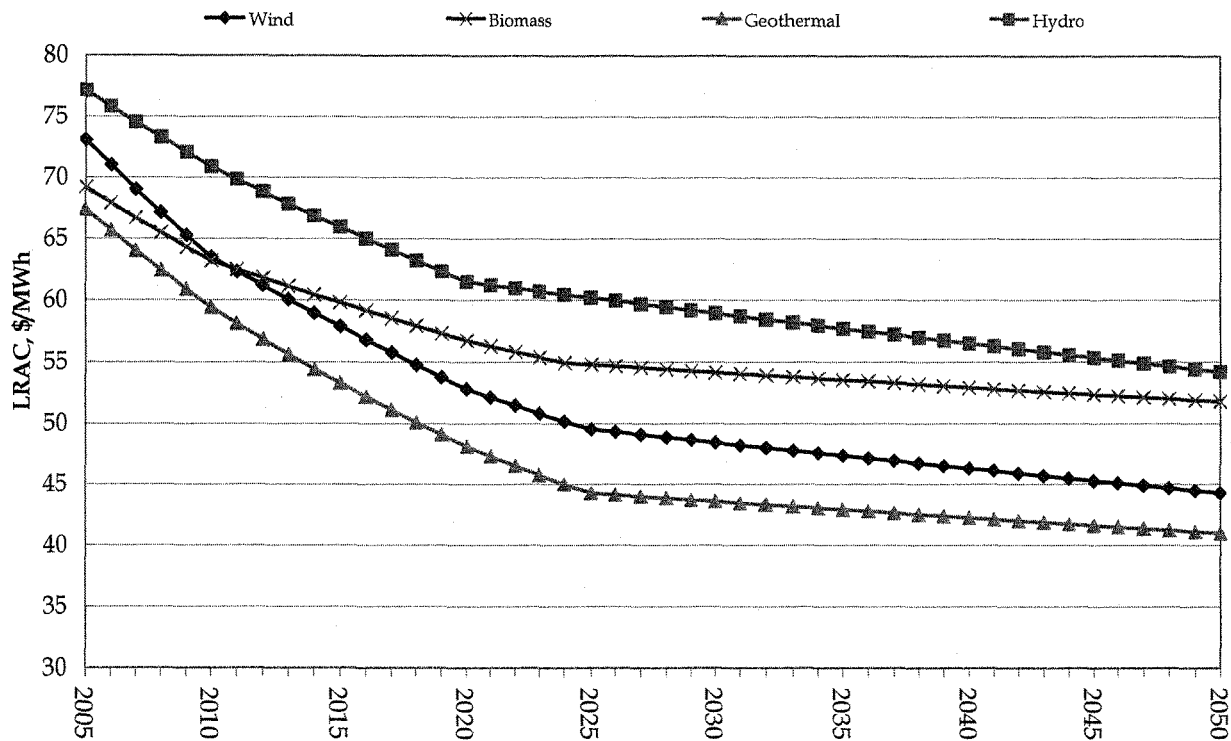


Figure 2 – MMA - Renewables cost envelope versus coal, gas and nuclear

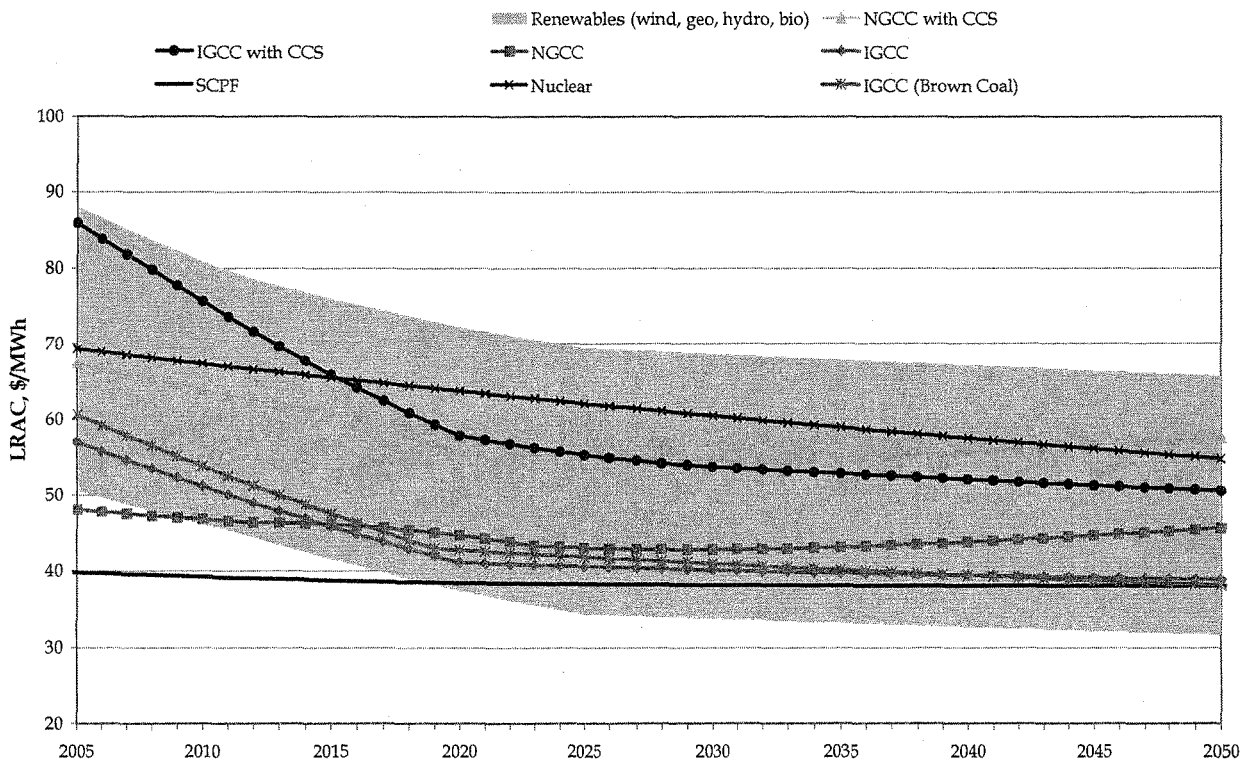


Figure 3 – ESIPC - New Entrant Generation Costs versus Emissions

