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The Committee Secretary
House of Representatives Standing Committee on Industry and Resources
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Parliament House
Canberra, ACT

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Dear Sir

CASE STUDY INTO RENEWABLE ENERGY SECTORS IN AUSTRALIA

We welcome the opportunity to provide input to the second case study for the inquiry into the development of the non-fossil fuel energy industry in Australia.

Green Rock Energy Limited is an ASX listed company focused on developing commercially sound renewable geothermal energy projects. The Company has projects in Australia and Europe and is a sponsor member of the International Energy Agency's Geothermal Implementing Agreement.

Other than hydro-power which is vulnerable to periods of low rainfall, geothermal energy is the only renewable energy source that can provide base load electricity supply. It has little or no emissions, a small geographical footprint, operates at high availability levels (around 95%) and, where located close to market or the power grid, can be developed incrementally, thus significantly reducing development risk.

The extraction of energy from deep-seated hot rocks, also referred to as enhanced geothermal systems, hot dry rocks and hot fractured rocks, is the next step in the evolution of geothermal energy. Australia is sitting in a prime position to lead the world in the development of this technology, which has the potential to become one of the most significant renewable energy sources globally.

- **Enormous potential** – Geothermal energy is the natural heat found within the earth. To be viable for conversion to usable energy, deep-seated hot rocks need to have an effective insulating sedimentary cover, to trap the heat. Vast areas of Australia have been identified as having these properties. A recent estimate by Geoscience Australia suggests that the first 5km of the Australian continent has enough contained heat to supply Australian electricity needs for the next 22,000 years at current consumption rates.
- **Base load power** – Unlike other sources of renewable energy, geothermal energy produces power 24 hours a day, 7 days a week.

- **Proven capability** – The conventional geothermal and the petroleum industries have shown that the component techniques required to source heat and generate electricity from deep-seated hot rocks are well proven.

The only technique yet to be commercialized is the generation of multiple fractures (“fracking”) in the hot rocks to produce the heat collecting fractured reservoir. This has been proven at the Soultz sous Forêts project in France and the Habanero project in the Copper Basin, South Australia, although not as yet commercialized.

To be effective, the underground generated fractured reservoir must enable the water to flow at a rate sufficient to economically generate electricity. To generate a sufficient flow rate, high pressured water is injected to open the naturally occurring fractures in the hot granite rocks. This fracking can result in small seismic events that in some instances can be felt up to a 10 to 15km radius of the rocks being fractured. Due to ill-informed fears, this effect has reduced the fracking, and hence the effectiveness of the underground generated reservoirs, in projects that are close to townships.

For example, although the fracking at the Soultz project was successful, its use has been restricted to date due to the generation of small seismic events in this heavily populated part of Europe, even though these events were not dangerous to either people or property.

In areas that are not in close proximity to such infrastructure, for example in the majority of areas being evaluated in Australia, this potential effect from fracking will not be an issue.

The effectiveness of the fracking process at the Habanero project in the Cooper Basin will be shown following the drilling of the 2nd deep well which will complete the water circulation flow through the fractured reservoir.

- **Unprecedented exploration and evaluation** – Australia’s potential for deep-seated hot rock projects can be seen by the number of geothermal exploration licences being applied for across Australia, with over 20 companies undertaking geothermal exploration and evaluation projects. This number exceeds all other projects being undertaken in the rest of the world.
- **Australia as the technical centre of excellence** – Australia is well advanced in providing the technical skills required for deep-seated hot rock development as a result of a number of innovative commercial projects that are pushing Australia to the forefront of this field. If the exploration and evaluation projects, that form the basis for the geothermal exploration licences issued throughout Australia, are taken through to fruition, Australia will clearly be at the forefront of applying scientific and engineering technologies required to exploit these geological systems.
- **High exploration cost** – The costs associated with the exploration and evaluation of geothermal leases are high; and there will be both successes and failures, similar to the petroleum industry. Success will be a function of the variations in geology from location to location and the location of the potential geothermal resources relative to markets. Although this may limit the rate of development of the industry, the overall benefits of this base load renewable energy source will ensure its ultimate growth.
- **Competitive production costs** – The production cost of electricity (capital and operating costs) generated from geothermal energy will depend upon the depth of the wells, the temperature of the hot rocks or trapped geothermal water, the ability of the underground generated reservoirs to flow geothermal water at commercial rates and the distance from markets.

As geothermal energy cannot be commercially converted on site to some other form of energy, such as LNG from natural gas, electricity generated from geothermal energy must be

connected to its market by a high voltage transmission line. This means that lower temperature geothermal resources located close to markets may be more economic to develop than higher temperature resources located remote from markets which have both higher transmission costs and line losses.

It is envisaged the total production cost will be competitive with wind generated electricity, possibly lower, and provide all the benefits of base load power.

As with the development of the intermittent renewable energy sources such as wind power and solar industries, the sale of carbon credits, or renewable energy certificates, will be essential to provide the geothermal industry with momentum. An additional mechanism for the encouragement of renewable energy development, operating effectively in Europe, are feed-in-tariffs where the government sets the electricity tariff for the specific renewable energy source and guarantees input/access to the national grid. This has spurred the fast growth of geothermal energy in Germany.

Initial support for the high upfront exploration and evaluation stages of the projects would also provide important traction for the industry. For example, a \$150 million federal government fund, to provide grants (on a dollar for dollar basis) for say 10 projects would provide this traction for the industry.


Without such support, the evolution of the Australian geothermal industry will be much slower, with the resultant environmental benefits being delayed and the expertise and technical excellence being developed offshore where the fiscal support for renewable energy development is greater.

- **Additional uses** – Geothermal energy is used for more than electricity production. There is widespread use of geothermal energy for domestic, industrial and agricultural heating and cooling, particularly in the cooler areas of Europe, Japan and USA. The use of geothermal energy from deep-seated hot rocks as the energy source for desalination plants is also being evaluated by Australian companies and, although in the early evaluation stage, is potentially economically viable. The commercialization of these applications would also be assisted by the availability of carbon credits and grants for the evaluation stage.

Australia has the opportunity to be a world-leader in the application of enhanced geothermal systems; an application that will provide long life base load electricity and greatly assist the world in reducing green house gas emissions. The Australian Government's support for this evolving industry should not be overlooked.

Again, we thank you for the opportunity to provide input.

Yours sincerely



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Managing Director