

Q&A

Popular Questions and Answers about Geothermal or “Hot Rock” energy

(EGS/also known as enhanced geothermal or hot dry/fractured rock). In other places around the world, radiogenic granites can be found. In these granites, as occurs in the earth’s core, the decay of radioactive particles produces heat. Where the radiogenic granites are covered by insulating rocks, such as shale or other fine grained rocks, the heat can be retained. It is these radiogenic granites that are sought by those wishing to generate power from EGS.



What is Geothermal Energy?

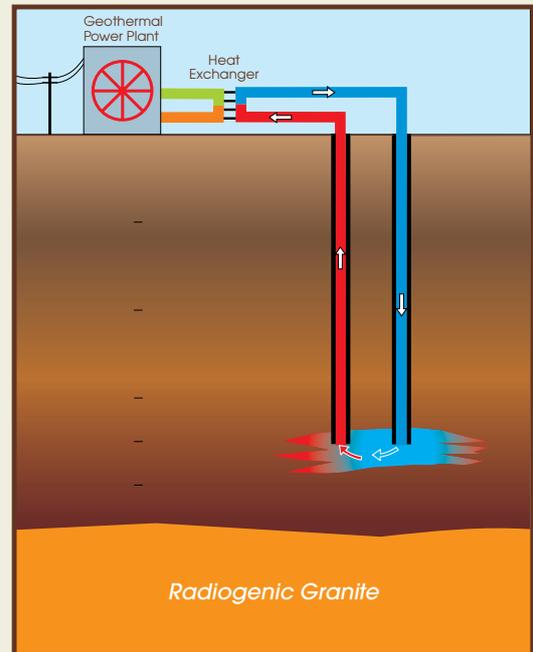
The Earth is constantly generating naturally occurring heat. This heat is known as geothermal heat, and can be used to produce electricity. Electricity produced from geothermal energy is environmentally friendly and renewable.

How is the heat produced?

The slow decay of radioactive particles such as uranium, thorium and potassium produces heat deep within the earth’s core. The heat is transferred or conducted to surrounding rocks (called the mantle) causing a proportion of these to melt and become magma. Convection within the mantle enables magma to move upwards to the earth’s surface. The resulting volcanic areas are targeted by those generating electricity from Conventional Engineered Geothermal Systems

What is the difference between Conventional and Engineered Geothermal Systems?

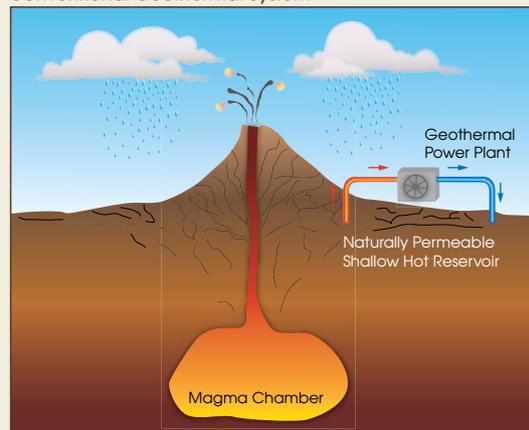
Both Conventional and EGS make use of naturally occurring heat to produce power. Conventional Geothermal Systems are associated with areas of volcanicity, such as Iceland, New Zealand and USA. Characteristically these systems are defined by their high temperatures, relatively shallow depth and degree of natural permeability and flow. In contrast EGSs are located in areas where radiogenic granites have resulted in anomalously high crustal heat flows. In order to trap the heat generated a thick sedimentary sequence is required to act as an insulating blanket. Sediments such as shale and coal beds have a low thermal conductivity and as a result higher temperatures are achieved. EGS resources are typically lower temperature resources than conventional volcanic systems, and by nature, are located at deeper depths. As with conventional systems, permeability varies, but some engineering of the geothermal reservoir is usually required.



How is the geothermal reservoir established in EGS?

Water flow through the geothermal reservoir is the mechanism by which heat is transferred from the subsurface geology to the surface. Water flow within the reservoir will result from permeability along bedding planes, fractures or via natural porosity of the host rock. The natural permeability of the geothermal reservoir can be increased by opening existing bedding planes and fractures and by creating new fractures. Reservoir engineering is achieved when high pressure water is pumped into the reservoir, and the rock induced to shear failure - a process known as hydraulic stimulation.

Conventional Geothermal System



How is electricity produced?

Water is injected into the geothermal reservoir via an injection well, and flows through the geothermal reservoir using the network of fractures. As the water passes through the reservoir it is rapidly heated - this is known as the underground heat exchanger. Under pressure the heated water is returned to the surface via a production well.

On the surface Binary Cycle or Flash Steam power plants can be used to generate electricity from the superheated water.

Binary Cycle power plants use a surface heat exchanger to extract heat. The heat exchanger is a series of pipes which allow the transfer of heat from the geothermal water to another liquid, without the liquids ever mixing. The second liquid is allowed to boil, producing high-pressure steam that is used to drive the electricity turbines. Once the heat has been removed from the geothermal water it can be re-injected into the reservoir to be heated and used again.

Flash Steam power plants allow the geothermal water to turn to steam, and the steam is directly used to turn electricity turbines. Any remaining water is re-injected into the reservoir for re-use.

Will the heat ever be used up?

Geothermal energy is constantly being generated by the earth over geological time. However EGS sites, where water is circulated through the same geothermal reservoir, will find temperatures are reduced over time. To combat this, a project may develop multiple reservoirs which are used on a rotational basis. The dormant reservoir will naturally re-gain temperature and be available for use again.

Is geothermal energy environmentally friendly?

Geothermal energy is virtually free of carbon dioxide and other emissions. The equivalent of a 1000MW geothermal power plant could save 20 million tonnes of CO2 each year.

What are the advantages of EGS over other forms of renewable power?

The supply of power from wind, solar and wave sources is not constant and relies on particular environmental conditions for electricity generation to be possible. Geothermal power has no such restrictions, and represents the only renewable energy source which can provide long-term base load power.

Why is Geothermal Energy being explored in Australia?

The Proterozoic granite rocks which dominate the geology of South Australia have been found to generate significantly more heat than other similar Proterozoic rocks elsewhere in the world. Data from deep bore holes have defined an area of South Australian crust which is twice as hot as typical Proterozoic crust. This area of elevated heat flow is known as the South Australian Heat Flow Anomaly or SAHFA.

As a result of the SAHFA the majority of EGS exploration is based in South Australia, with around 17 companies holding Geothermal Exploration Licences (GEL).

Is power being commercially produced by EGS in Australia?

Within Australia, commercial power is not yet available from an EGS

supply with companies involved in the exploration of EGS being at differing stages of development.

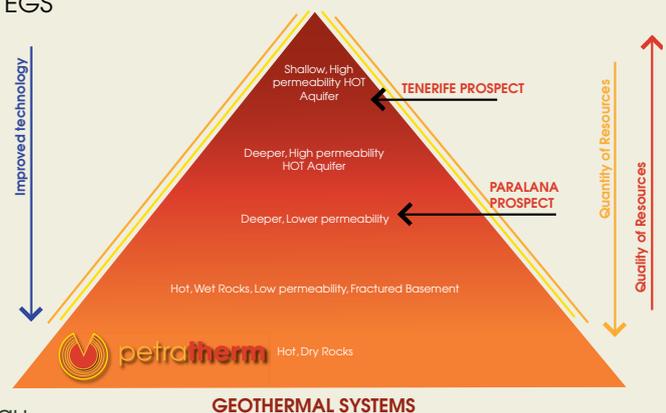
Petratherm plans to provide power to Beverley uranium mine by 2010, from its flagship project at Paralana in the northern Flinders Ranges.

How big is the potential market for EGS in Australia?

The National Electricity Market in eastern Australia is expected to require at least 5000MW of new electricity generation capacity over the next decade - a figure that represents one and a half times South Australia's current capacity. Geothermal energy could make a significant contribution to this demand.

Is there support for geothermal initiatives?

Both the South Australian and Federal Governments have been very supportive of the geothermal industry in recognition of the substantial role it may play in Australia's future power generation. The SA Government has provided legislative policy framework to promote and allow exploration, as well as providing pre-competitive data and financial drilling support. The Federal Government has launched the Australian Geothermal Industry Development Framework, in addition to financial support through R&D grants.



Petratherm Ltd
ACN 106 806 884
105-106 greenhill road
UNLEY 5065
adelaide south australia
australia
f (61 8) 8274 5000
f (61 8) 8272 8141
admin@petratherm.com.au
www.petratherm.com.au