

What is geothermal energy?

Energy is classified as renewable and non-renewable. Renewable means it can be replenished quickly or can be supplied almost continuously like energy from the sun, wind, water waves, biomass and hot rocks. Non-renewable resources are those that are used faster before they can be replenished such as the fossil fuels coal, oil and natural gas.

Geothermal is considered a form of renewable energy as heat is continuously produced from deep in the earth.

Geothermal energy originates from heat stored in the earth's crust. The word geothermal comes from the Greek words geo (earth) and therme (heat). This heat can be recovered as steam or hot water and used to heat buildings and generate electricity.

High temperatures can be continuously produced inside the earth from the slow decay of radioactive particles occurring in the rocks such as granites. The heat from the decaying rocks underground is trapped by another layer of rock; the thicker the layers of covering rock, the higher the temperatures of the rocks under the surface.

What are the major types of geothermal energy resources?

There are four main types of geothermal energy resources:

Hydrothermal Resources are located at depths between 100 metres to 4.5 kilometres below the earth's surface. They are created when hot water or steam is formed in fractured or porous rock. The geothermal energy from this can be captured by drilling into the aquifer and extracting the hot water or steam which can then be used for electricity generation or direct heating.

Geopressured resources are deep reservoirs found at 3 to 6 kilometres under the surface. They consist of high-pressure hot water that contains dissolved methane.

Hot Dry Rocks refers to an area of hot rocks that contain little or no water. This resource is more accessible than other geothermal resources

Magma although the largest geothermal resource is the least accessible and is found at depths 3km-10 km under the earth's surface.

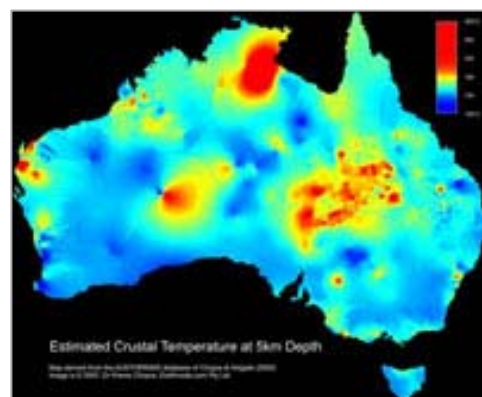
What is the potential for geothermal energy in Australia?

Australia has large volumes of identified high heat producing granites within 3 to 5 kilometres from the surface. This is potentially a vast resource of energy that can be trapped by hot fractured rock geothermal technology. Extensive exploration is underway to explore for shallow geothermal resources in the Eromanga Basin in south-west Queensland and parts of far north South Australia. Interest is also being shown in geothermal energy sources along the Queensland coast and closer to existing transmission lines.

Research is currently being undertaken to investigate the potential of tapping hot saline, geothermal aquifers that lie 2 kilometres to 4 kilometres underground in many parts of Australia. The combined desalination and power system involves a vaporisation process which separates the salt from the water utilising the low pressure environment underground. The resulting vapour turns rotors which generate electricity.

How is geothermal energy created from hot dry rocks?

Injection wells are drilled down into the hot rocks, surrounding rocks are fractured and an artificial reservoir is created. Cold water is pumped into the reservoir which becomes super heated by the hot rocks.



Estimated crustal temperature at 5k depth
Source: Geoscience Australia



Production wells return the heated water under pressure to the surface where it is used to drive turbines to generate electricity. The water now cooled is returned to the underground aquifer where the process is repeated.

This technology is currently being tested in Innamincka South Australia.¹

Where is geothermal energy used in Australia?

The Birdsville Geothermal power station

Currently Australia's only geothermal power station is located in Birdsville western Queensland¹. The power station allows geothermal power to meet the town's electricity demand at night and during winter. The Queensland government is investing in research to investigate the amount of energy that could be obtained from these 'hot rocks'.



Geothermal equipment at Birdsville.
Image courtesy of Ergon Energy

What are the advantages and disadvantages of geothermal energy?

Advantages	Disadvantages
Geothermal power stations have a very low land area requirement	Geothermal energy produces some pollutants, mainly carbon dioxide, hydrogen sulphide, sulphur dioxide and methane.
A geothermal power plant emits low levels of sulphur dioxides and between 1,000 and 2,000 times less carbon dioxide than a fossil fuel plant.	There is the potential for geothermal production to cause ground subsidence.
Geothermal resources can be sourced locally if the geology is suitable.	Sources of geothermal energy are often located in remote areas away from the electricity grid
Geothermal power stations are designed to operate 24 hours a day.	Local depletion of heat energy can occur at some sites

¹Geodynamics Australia

²Owned and operated by Ergon Energy

Queensland Resources Council acknowledges the following as sources of information for this fact sheet.

For more information:

Energy Futures Queensland Government
Western Power
Geodynamics Limited
Ergon Energy

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