

FACTSHEET

Climate change science and solutions.

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Solar Thermal Power

Solar thermal power is a technology that harnesses solar energy and efficiently converts it to thermal energy (heat). Mirrors focus sunlight onto a fluid-filled receiver, heating a liquid to several hundred degrees. The heated fluid is used to create steam, powering electricity-generating turbines. This solar energy can also be stored as heat in insulated tanks for later power generation when the sun is not exposed.

The two most common configurations are:

Parabolic Trough

Curved mirrors focus sunlight onto a fluid-filled tube that runs the length of the trough. The fluid used is often oil and is heated to a relatively low temperature of 400 degrees Celsius.



Power Tower

A field of flat-mirrors focuses sunlight onto a receiver at the top of a tower. Fluid is pumped up the tower to be heated behind the receiver. The preferred fluid is molten-salt, which is heated to over 550 degrees Celsius.



Is solar thermal suitable for 'baseload' power generation?

Solar thermal is a relatively simple, proven technology that is highly scalable. The current optimal size for a solar thermal plant is around 220 Megawatts (MW). By comparison, each turbine at the Hazelwood coal-fired plant in Victoria has a capacity of 210MW.

Fast Facts:

- Solar thermal technology converts sunlight to heat. This heat is used to create steam to turn a turbine.
- Solar thermal power makes it possible to provide 'baseload' electricity from solar energy.
- A Californian solar thermal plant has been supplying electricity to the equivalent of 200,000 homes for 25 years.
- Australia has amongst the best solar resource in the world
- The cost of solar thermal will soon be on par with new coal-fired plants.

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New generation solar thermal plants, such as Gemasolar being constructed in Spain, have the capacity to store heat energy as molten-salt in insulated tanks. The heat can be drawn out as necessary to create steam, driving turbines to create electricity. This ability gives it the same capacity to provide 'baseload' power, day and night, as a conventional coal-fired power plant.

The Gemasolar plant has a capacity factor of 75%, the same as a NSW coal power plant, and will run around 90% of the hours in a year, operating at 60-100% of its rated output.

Isn't solar thermal a new and unproven technology?

Solar thermal technology has been refined through research and development over the last 90 years. The SEGS plant in California's Mojave Desert has been operational since 1984. It has been expanded over the years to a capacity of 354MW, making it the largest solar energy generating facility in the world.

Spain has embraced solar thermal technology and has already built five plants with a total capacity of over 230MW. There are another 32 plants under construction in Spain and more than 200 in the

planning stage. Spanish companies are investing \$24 billion in building solar thermal plants from 2010 to 2013.

The United States is about to undergo a solar revolution with over 97,000MW in solar capacity in the planning stages. This is more than double Australia's total generating capacity of 45,000MW.

Solar thermal's ability to generate 'baseload' electricity without reliance on fossil fuels is proven and future-proof. Companies that build energy infrastructure are aware of this and are making sure they are involved.

In October 2009 Siemens purchased Solel, the company that supplies key technology to most of Spain's solar thermal plants, for just under \$500 million. Google and Lockheed Martin have significant investments in planned new solar thermal plants in the US.

Is solar thermal an expensive way to generate electricity?

Currently solar thermal is a more expensive way to produce electricity than an existing coal plant. However, as more solar thermal plants are built, the construction and operation costs

will reduce rapidly.

The US Department of Energy has conducted research into the economies of scale of solar thermal. They state that by the time 2,600MW of global solar thermal capacity has been constructed, the costs involved will have significantly decreased to the cost of today's wind power. At 8,700MW, the costs drop below that of a new coal-fired plant. Given that the total capacity of planned solar thermal plants in the US alone far exceeds these figures, this should not take long.

Meanwhile, a carbon price and increasing fuel costs will make the operation of coal plants significantly more expensive. Solar thermal power generation is not exposed to the price fluctuations that affect fossil fuels.

Where can Australia put solar thermal plants?

Most of Australia receives ample sunlight to host an efficient solar thermal plant. There are many suitable sites close to existing electricity infrastructure. Transmission losses should therefore not be any greater than from existing coal power plants.



Action:

Beyond Zero Emissions is working to secure Australia's future through a zero emissions economy.

If you would like to learn more about solar thermal technology or find more information about the work that Beyond Zero Emissions does, take a look at our website.

beyondzeroemissions.org