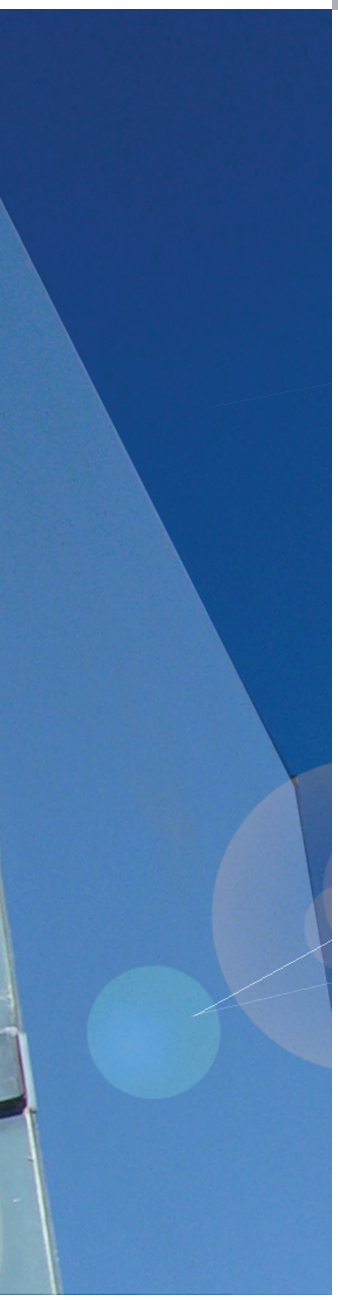
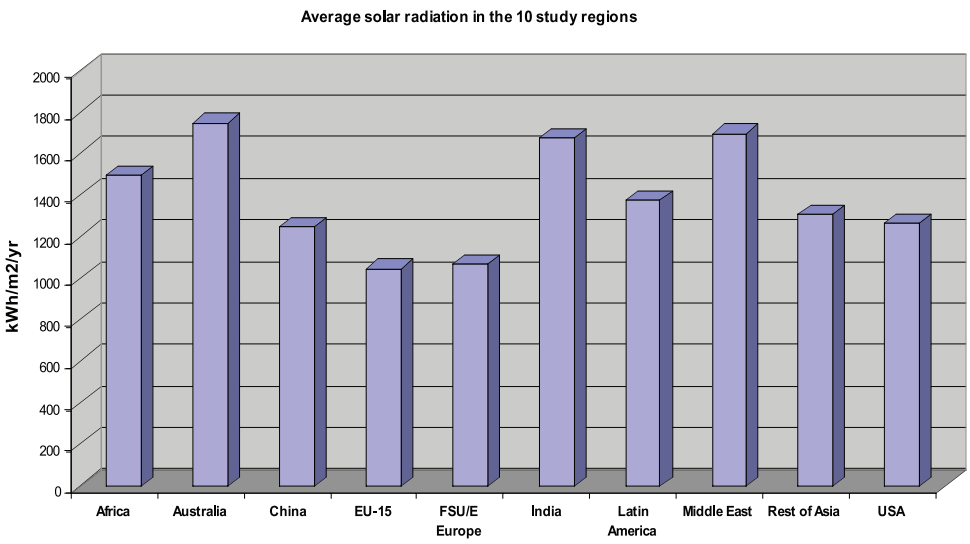
The National Solar Energy Centre
Solar Power and Solar Technologies



Solar power is Australia's most abundant energy resource. As shown below, Australia has the highest average solar radiation of any continent.

Concentrating Solar Thermal Power

Solar thermal has the potential to become a major solar technology as it is currently cheaper than many other solar technologies in terms of capital investment and levelised energy costs. Solar thermal technologies can be readily hybridised with fossil fuel and in some cases adapted to utilise thermal storage, providing dispatchable power during periods when solar energy is not available. Hybridisation and thermal storage can enhance the economic value of the electricity produced and reduce its average cost. Solar thermal also integrates easily with existing power station technology.



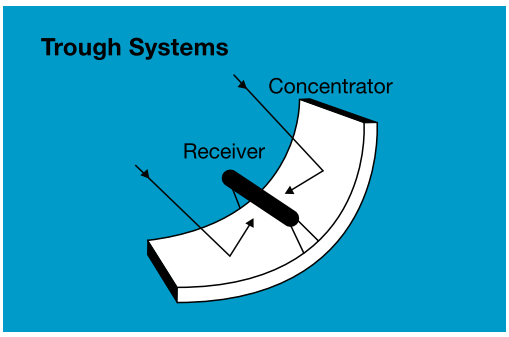
Source: IEA GHG R&D program – The potential of solar electricity to reduce CO2 emissions

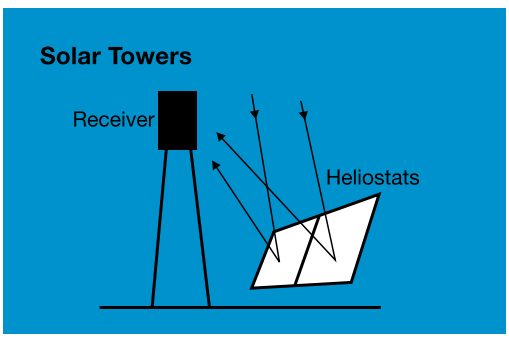
Collecting the Energy

Parabolic Trough systems use parabolic trough-shaped mirrors to focus sunlight onto receiver tubes through which a heat transfer fluid is passed. This fluid is heated by the sun and used to produce a hot fluid that can power a turbine generator to produce electricity. Alternatively the hot fluid can be used directly for many other applications.

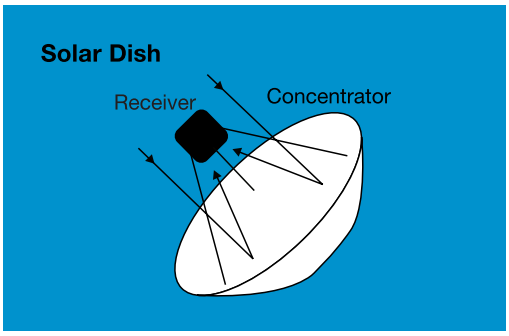
Solar Tower systems use an array of heliostats (large individually-tracking mirrors) to focus sunlight onto a central receiver mounted on top of a tower.

Water/steam systems, compressed air and molten-salt receivers have been demonstrated or are under development elsewhere.





Dish/Engine systems use parabolic dish-shaped mirrors to focus solar energy onto a receiver located at the focal point of the dish. Fluid in the receiver may be heated and used to generate electricity in a small engine attached to the receiver. Engines currently under consideration include Stirling and Brayton cycle engines. The dish could also be used to heat fluid for use in a centralised heat engine.



Linear Solar Collectors

Linear solar collectors are typically in the shape of a trough, but can also be based on the Fresnel principle. Although this reduces the optical efficiency, it shows considerable potential for overall energy cost reduction.

Challenges

The current focus of CSIRO's solar research includes challenges such as:

- Cost effective solar collection
- Storage of solar energy
- Transport of solar energy

By utilising the resources available at the National Solar Energy Centre, CSIRO aims to move towards overcoming some of these challenges.

Solutions

Individual heliostats and troughs are replicable ensuring solar collection is cost effective.

The low concentration linear solar array [solar troughs and evacuated tube collectors linked to an Organic Rankine Cycle (ORC)] uses a Rankine Cycle driven by solar heated thermal oil.

This provides:

- Short term solar energy storage
- Low operating temperatures to improve efficiency

The high concentration solar tower array (featuring 200 heliostats focused on a 17m high solar reactor) combines natural gas, water and energy from the sun to produce SolarGas™ or solar hydrogen which provide:

- Long term storage for solar energy
- Transportable products produced from solar energy

CSIRO

Contact Us

Phone 1300 363 400
+61 3 9545 2176
Email enquiries@csiro.au
Web www.csiro.au

For further information about The Solar Power and Solar Technology

Contact Wes Stein - Renewable Energy Manager
Phone +61 2 4960 6094
Email wes.stein@csiro.au
Web www.csiro.au