

# Large Scale Solar Power

## Fact Sheet - The Technology

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The new, large-scale solar power station in Victoria will consist of Solar Systems' **Heliostat Concentrator Photovoltaic (HCPV)** technology.

### Solar Systems' HCPV Technology description

- Solar Systems has developed an ultra powerful solar module, which can produce about 1500 times more power than a typical solar panel.
- In an HCPV system, sunlight is beamed from mirror collectors, or 'heliostats', to the solar modules, which convert the concentrated light directly to Megawatts of power.
- Solar photovoltaic (PV) modules are an electrically connected array of solar cells that convert sunlight directly into electricity (photovoltaic literally means 'electricity-from-light')
- Most of the system is made of ordinary materials like glass, steel and concrete.
- This unique combination of high technology and common building materials enables a high performance solar power station to be built at low cost.
- The essential components of an HCPV power plant, developed by Solar Systems over the past 16 years, are as follows:
  1. An ultra powerful solar module for use in concentrated sunlight
  2. A cooling system to keep solar cells operating at 60°C to optimise the operation of the PV modules in a concentrated solar beam that can melt steel
  3. Low cost, high performance mirror concentrator systems
  4. A control system to manage the power station to deliver maximum output and reliability
- The essential components of HCPV technology are already proven in Solar Systems' commercially operating remote solar dish power plants.
- These systems use only a relatively small amount of ultra high efficiency PV materials and does not use silicon PV, which is currently in short supply.

### HCPV performance

- The PV modules in the HCPV system run at 500 times sunlight concentration. They are also three times more efficient than standard solar panels. This means their output is 1500 times greater than the same area of standard flat plate PV modules.
- This year Solar Systems has achieved a world record in commercial solar power performance. Solar cell efficiencies are continuing to improve and HCPV will utilise this world leading technology.
- Solar Systems technology also automatically tracks the sun so it can produce more energy per unit area than fixed solar panels
- The solar resource is widespread, which means there are flexible options for location.
- The technology can be easily upgraded - as solar cell technology develops the plant's PV components can be replaced
- The technology can be deployed in different sized configurations from 1MW to GW scale
- The heliostats and receiver fields will be appropriately sized and distributed over a number of separate locations and matched to the electricity network and other local requirements
- The power station is made up of repeatable units of the technology which enables high volume production and reduces risk associated with building a large power station
- The first project will result in a cost reduction of electricity grid scale solar power by approximately 75 per cent relative to traditional PV technology
- The systems puts out standard three-phase AC power to the electricity grid

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## Technology history

Solar Systems has invested more than \$50 million over 16 years in developing technology from designs conceived by the Technical Director, John Lasich. The company has the sole rights to the technology worldwide with 10 patents granted and pending.

Solar Systems and Boeing subsidiary, Spectrolab, have optimised 'multi-junction' solar cells originally developed to power satellites to produce a high performance solar power technology for electricity generation on earth.

John Lasich says about the technology: "This is a new generation of solar technology. The secret is to be able to make a solar power module work about 1500 times harder than standard solar panels. If you can do this at high efficiency using low cost materials, you have the recipe for an infinite supply of clean energy at affordable prices."

This technology demonstrates these principles.



*World record solar PV receiver in Solar Systems' factory at Hawthorn*

The receiver is made up of PV modules. Each PV module contains an array of PV cells.

This receiver, the size of a small window, can power the equivalent annual power needs of over 15 houses.



Mirrors concentrate sunlight by 500 times onto a receiver that contains photovoltaic cells

The large scale Victorian plant will use fields of heliostats instead of mirrors in a dish and a central receiver.



Sunlight is converted directly into electricity by the photovoltaic cells in the receiver and then transmitted to the electricity grid

*World record solar PV receiver generating electricity from concentrated sunlight in a solar dish in Central Australia*

## **LARGE SCALE SOLAR POWER PLANT SPECIFICATIONS**

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**Project:** Large scale solar concentrator power plant

**Project timeframe:** Full commissioning expected 2013, first stage complete in 2010

**Capacity:** 154MW

**Generation:** 270,000 MWh per annum (equivalent to the annual electricity needs of 45,000 homes)

**Technology:** Heliostat Concentrator Photovoltaic (HCPV)

**Plant components:** Heliostats – 19,250; Receivers – 246; PV Modules – 62,976

**Reduction in greenhouse gas emissions:** 396,000 tonnes per annum