

Solar Thermal Energy in Australia

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DOMESTIC SOLAR PRODUCTS

- Solar water heater – a thermal device.
- Photovoltaic cells – direct electricity production.

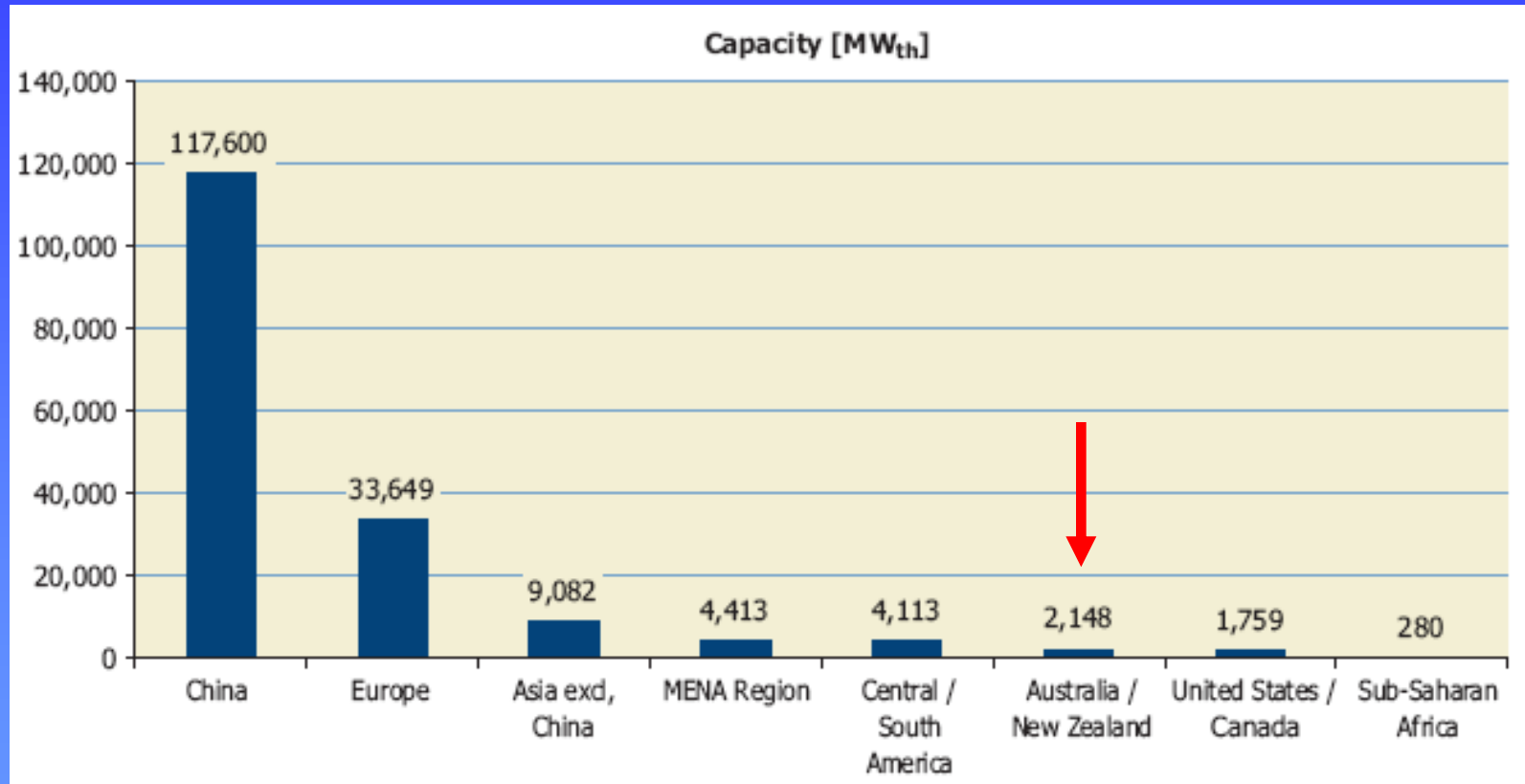


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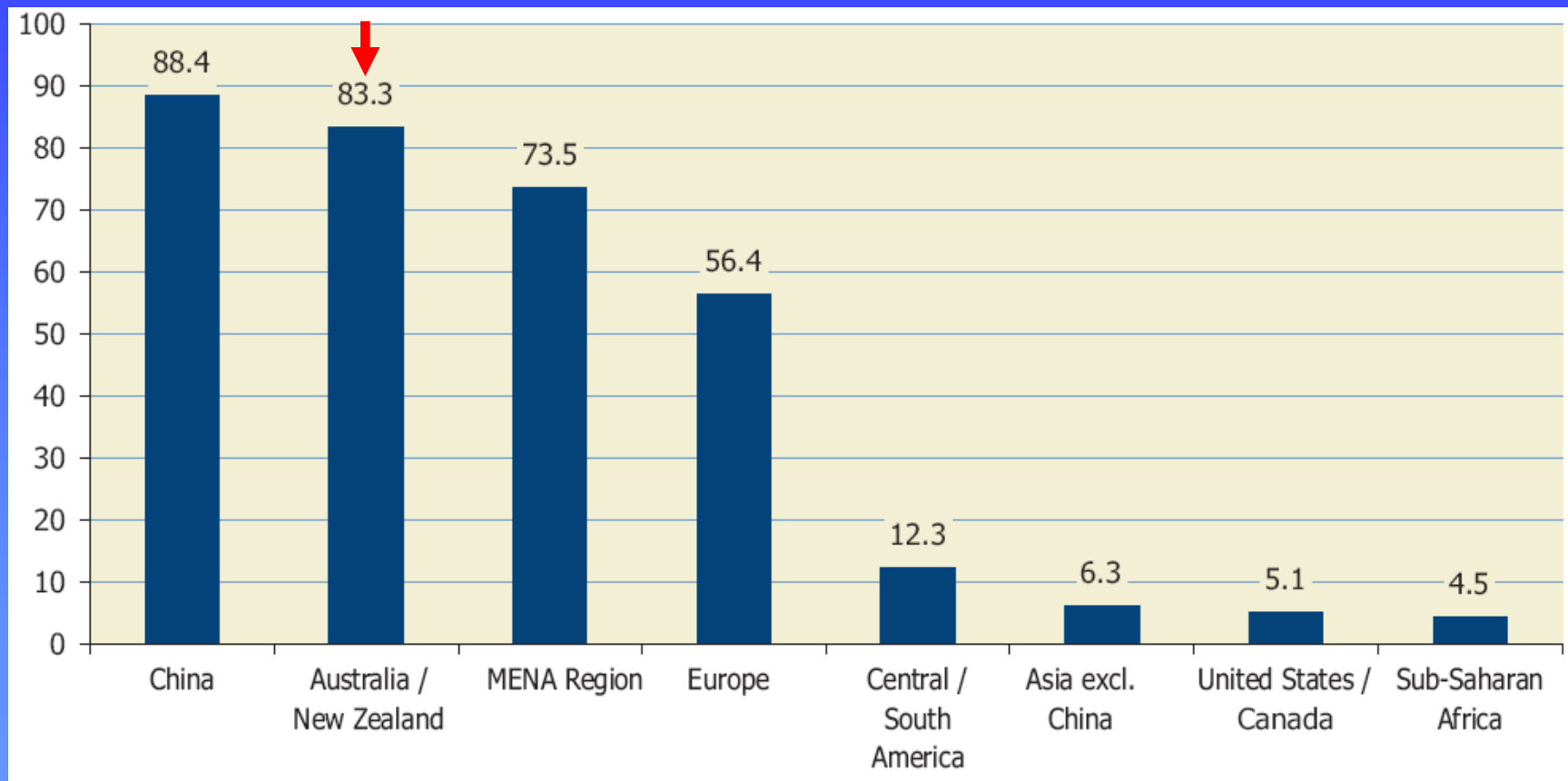


TOTAL CAPACITY OF SOLAR WATER HEATERS 2010



CAPACITY PER 1000 INHABITANTS

(kWh/1000 inhabitants) 2010



LARGE SCALE SOLAR THERMAL ELECTRICITY

- Parabolic troughs



- Power tower



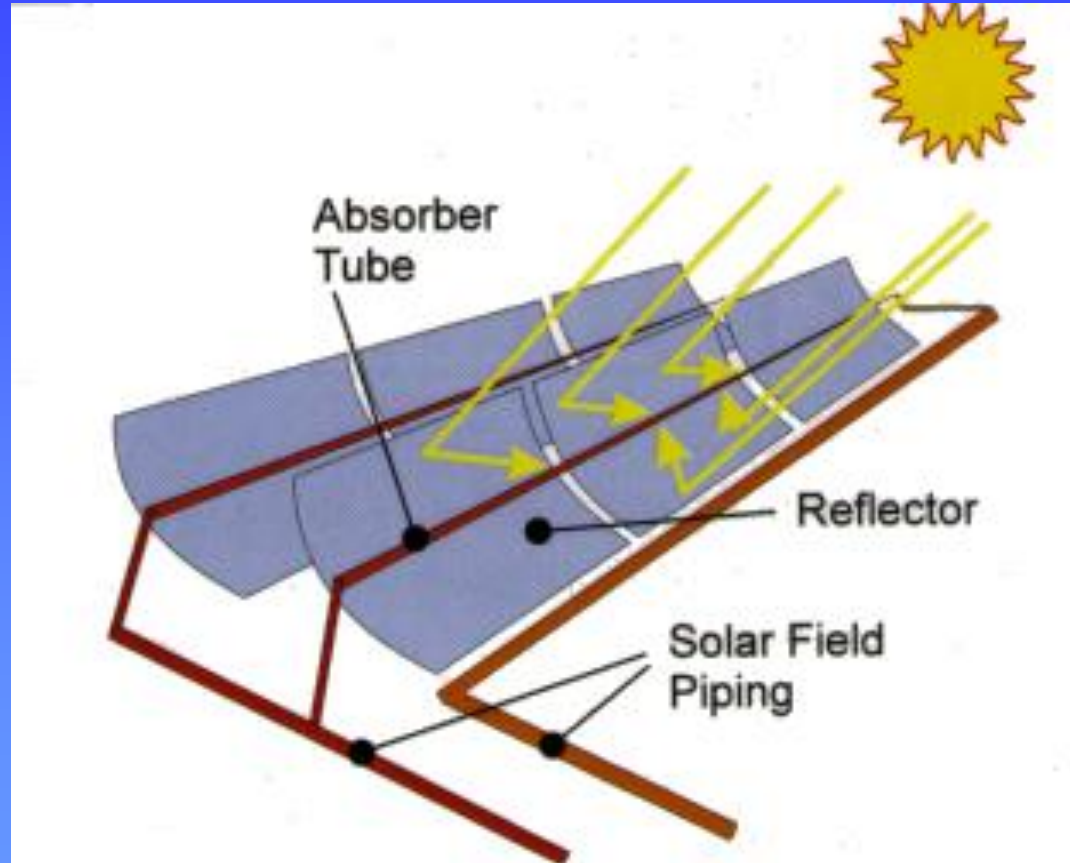
- Parabolic dish



- Linear Fresnel



PARABOLIC TROUGH CONCENTRATOR



TROUGH CONCENTRATORS



ARIAL VIEW OF PARABOLIC TROUGH SOLAR PLANTS



PARABOLIC TROUGH COLLECTORS AND POWER PLANT

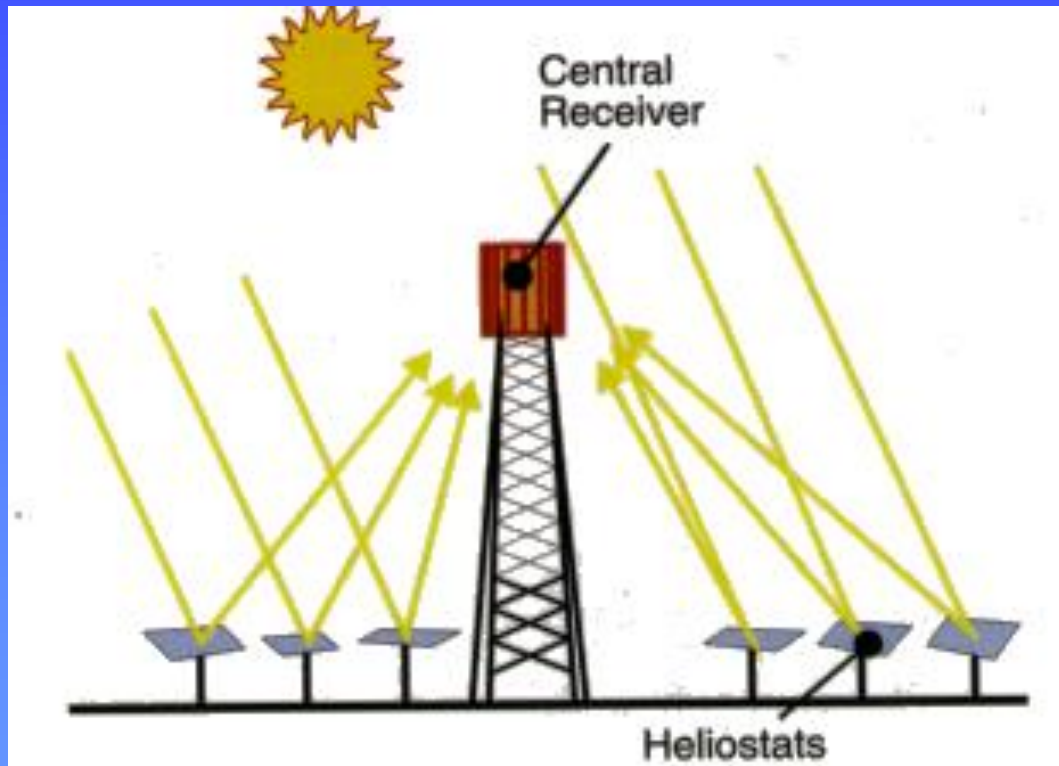


Parabolic trough solar power plants



POWER TOWER

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



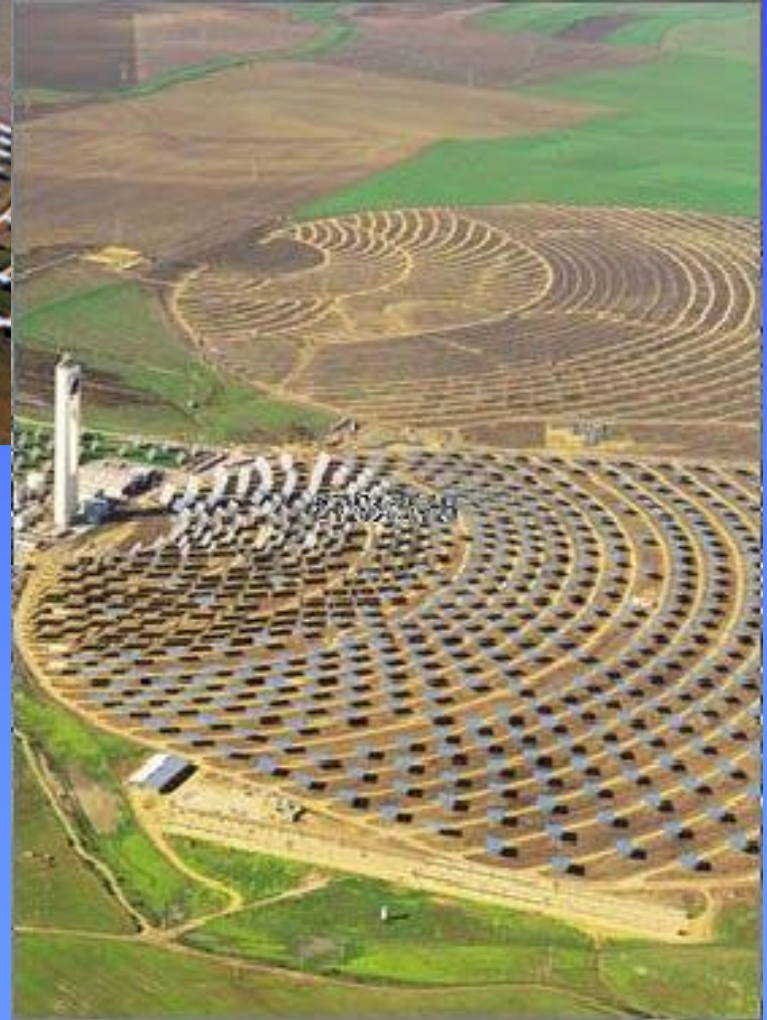
POWER TOWER – SOLAR1



POWER TOWER



PS10 Power Tower Spain



Solar Thermal Power in Australia

- ANU – dish concentrator and steam generation White Cliffs 1981
- ANU – Big dish concentrator and Ammonia storage 1990's
- Wizard Power – Big dish Whyalla

- Univ Sydney & UNSW 1990's

- CSIRO – 2003 ANSTO & Energy Technology Centre Newcastle

- Graphite Energy – Griffith concentrator and energy storage – 2005

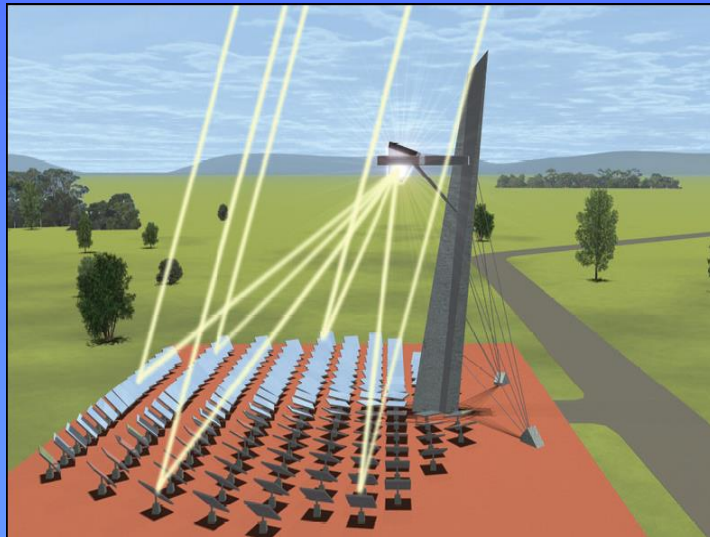
- Vast – High temperature receivers - 2008

- Solar Heat & Power - Liddell power station 2006

CSIRO Solar Chemical Reactor Tower

Heliostat solar concentrator at CSIRO Newcastle National Energy Research centre, designed and supplied by Solar Heat & Power.

200 heliostats each 4 m².



CSIRO C500 Tower

super critical CO₂ cycle with storage



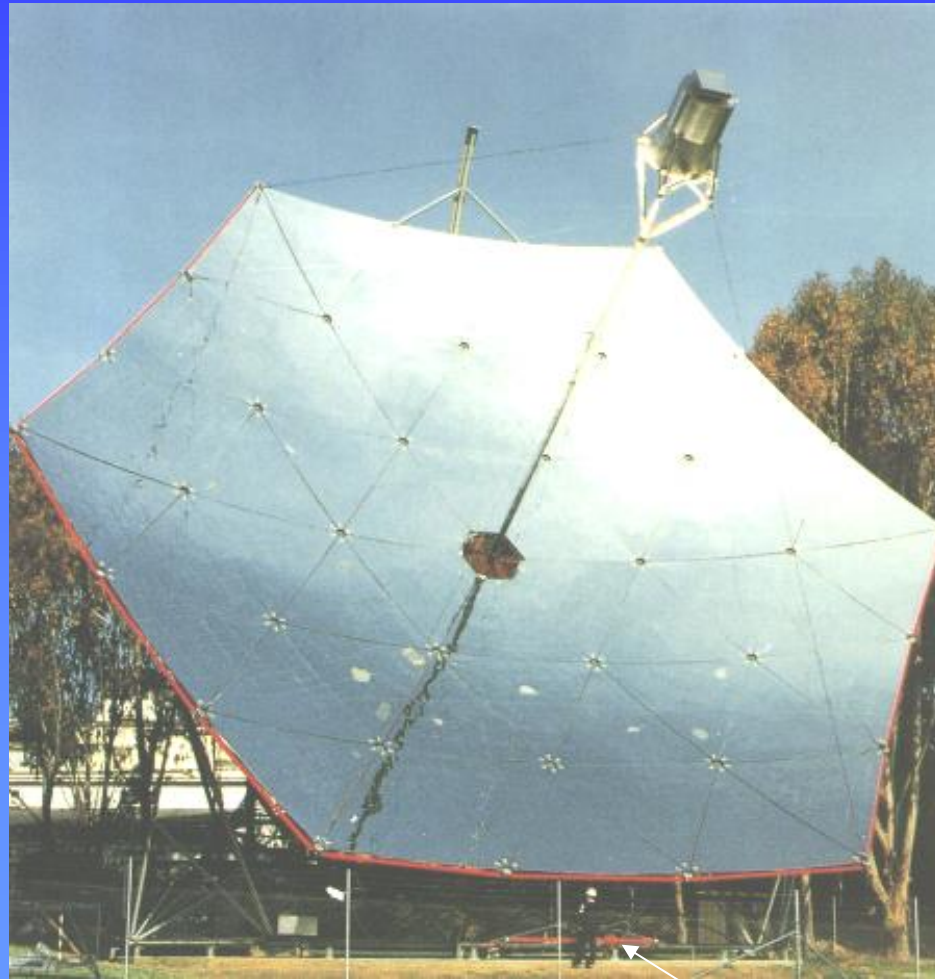
PARABOLIC DISH CONCENTRATORS

White Cliffs solar concentrators



ANU BIG DISH 400 m²

Largest dish concentrator



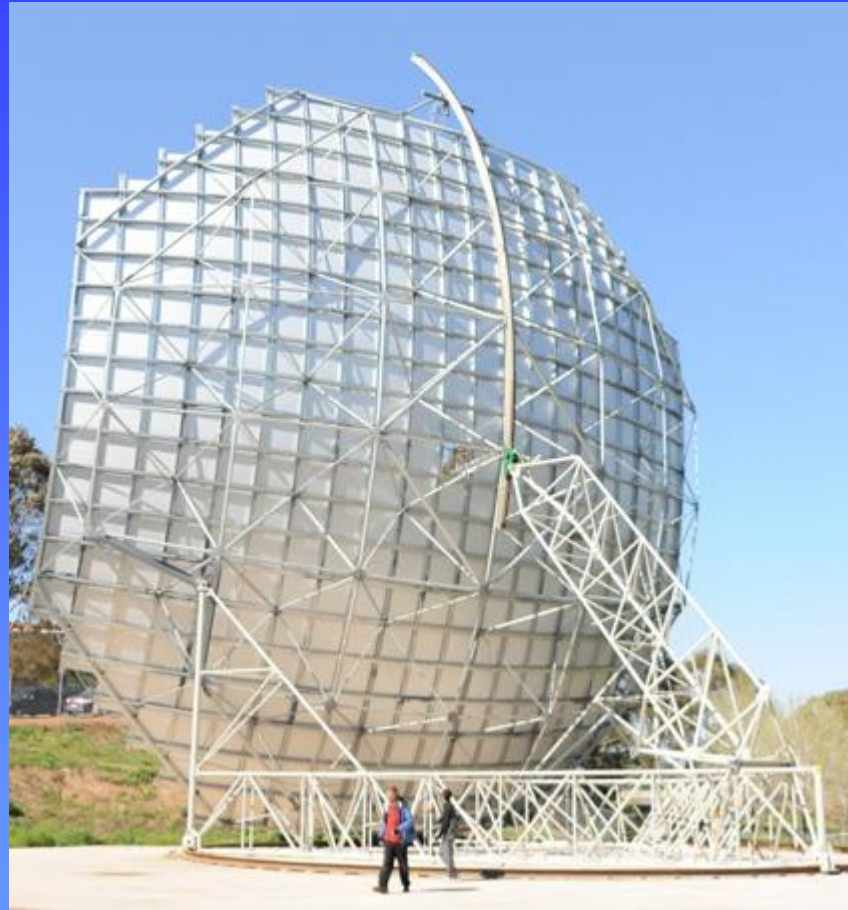
Observer

Wizard Power Big Dish 2



ANU Big Dish parabolic concentrator with steam generation cavity receiver

Wizard Power Big Dish 2



Structure of Big Dish 2 (400 m²)

CONCENTRATING PV Solar Systems



COOLING OF CONCENTRATED PV ABSORBER

Absorber area 0.23 m^2

Concentration 500X

Incident flux approx 100kW
(400 kW/m^2)

Electrical output 30 kW

Heat to be extracted = 70 kW



GRAPHITE ENERGY STORAGE SYSTEM (Graphite Energy Griffith NSW)



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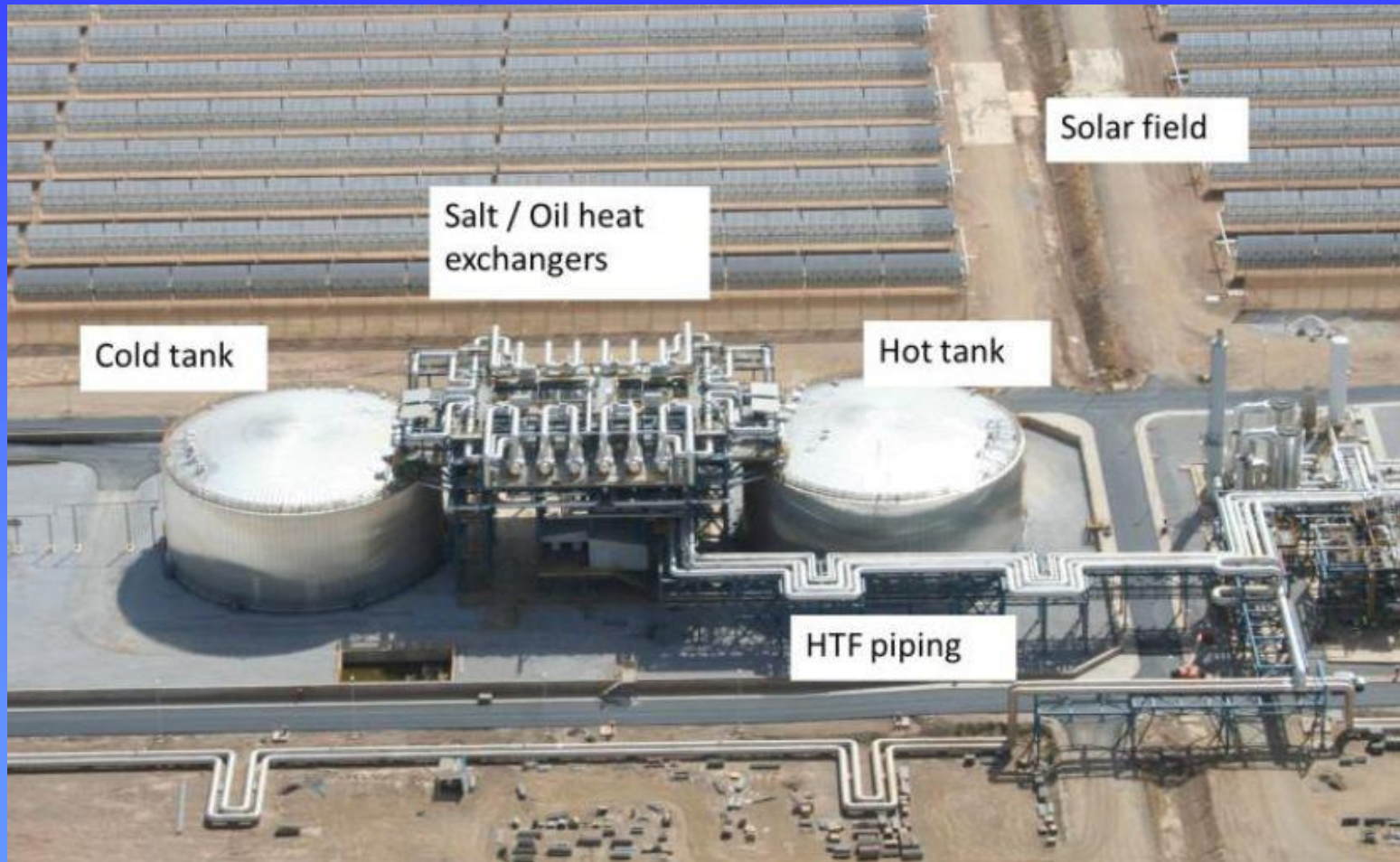
Molten salt thermal energy store



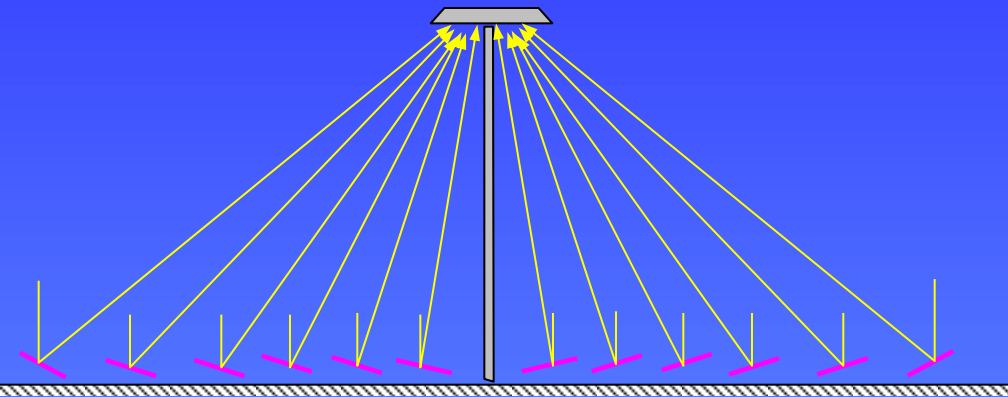
Liquid potassium and sodium nitride operating between 450°C and 250°C

Current thermal stores hold 6 hours peak output

Molten salt thermal energy store



COMPACT LINEAR FRESNEL CONCENTRATOR (CLFR)



Solar Heat & Power

FRESNEL PROTOTYPE TESTING

Solar Heat & Power at Liddel power station



LIDDELL POWER STATION Stage 2



Kimberlina Fresnel concentrator California

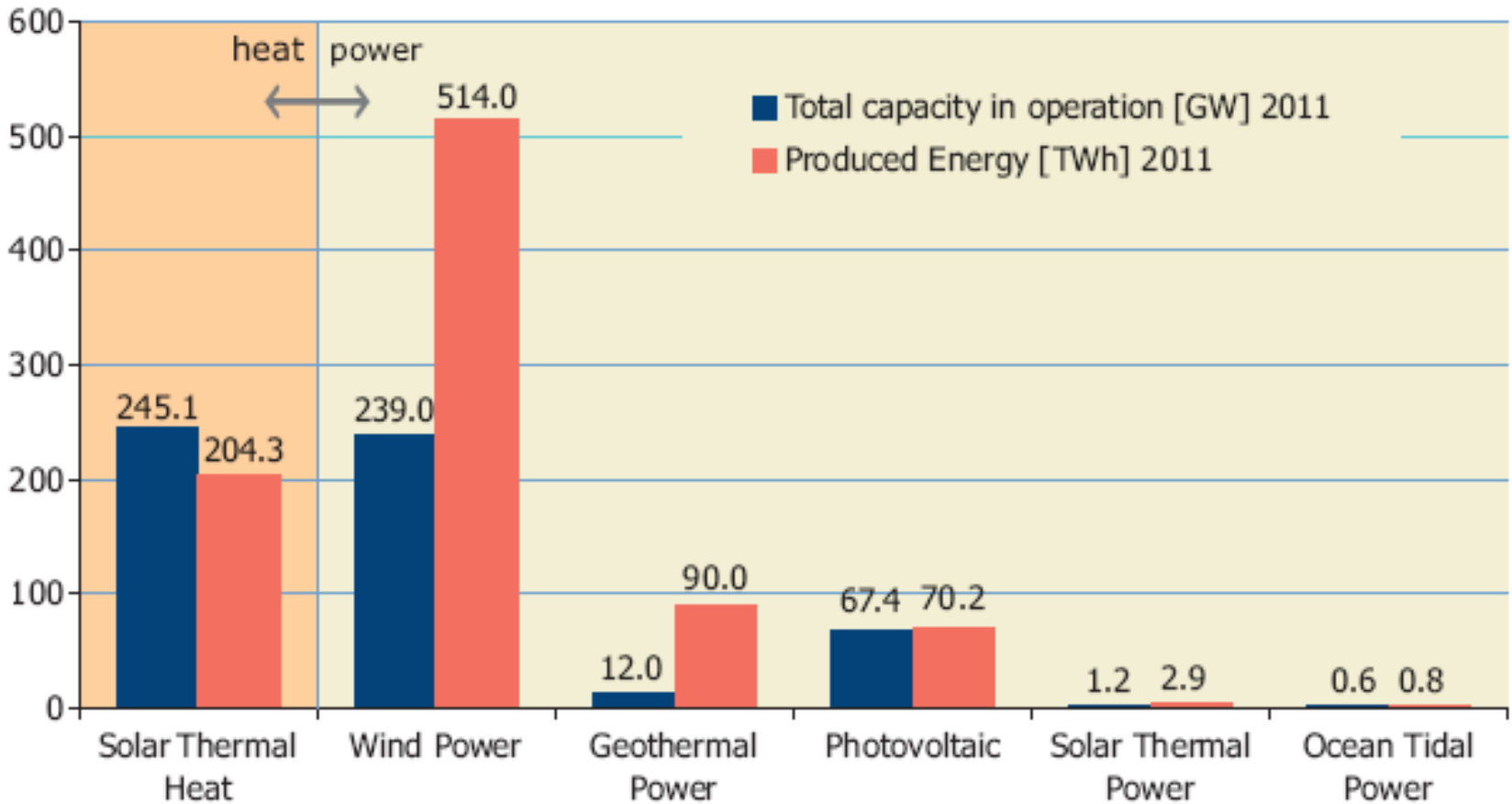


Kimberlina Fresnel Concentrator



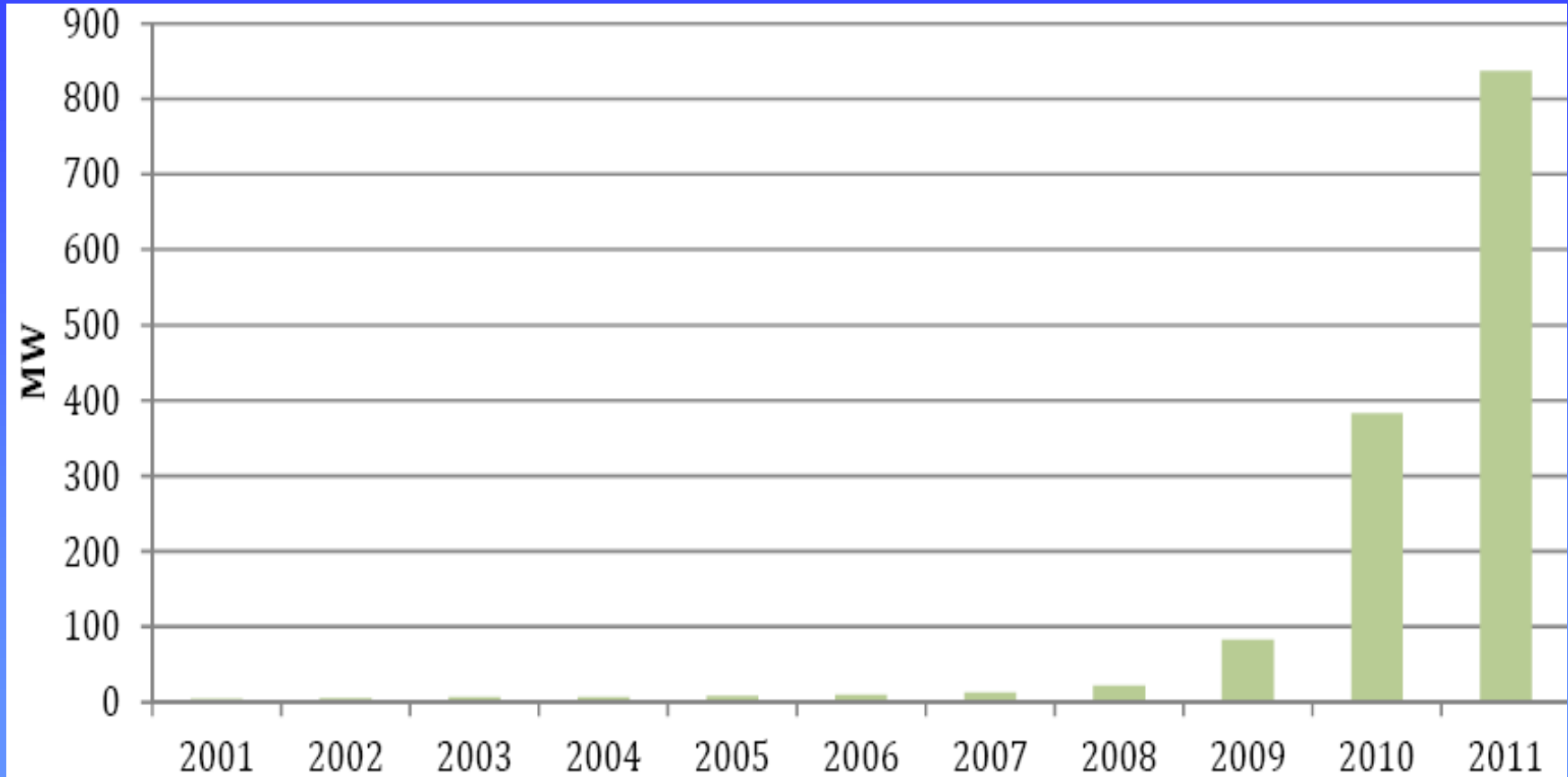
CURRENT IMPLIMENTED CAPACITY AND ENERGY PRODUCED

Total Capacity in Operation [GW_{el}], [GW_{th}] and Produced Energy [TWh_{el}], [TWh_{th}], 2011



Domestic PV installations in Australia

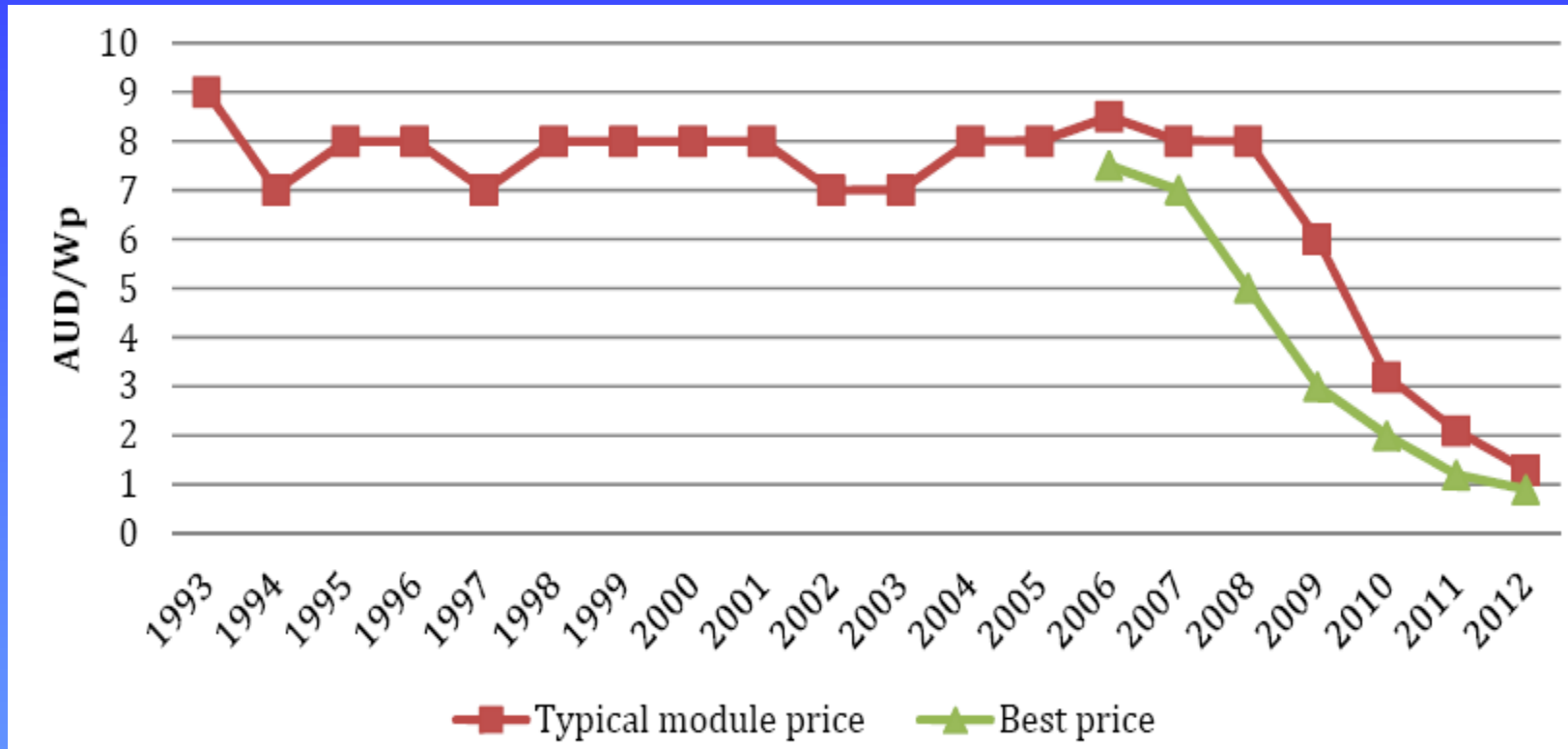
MW / year



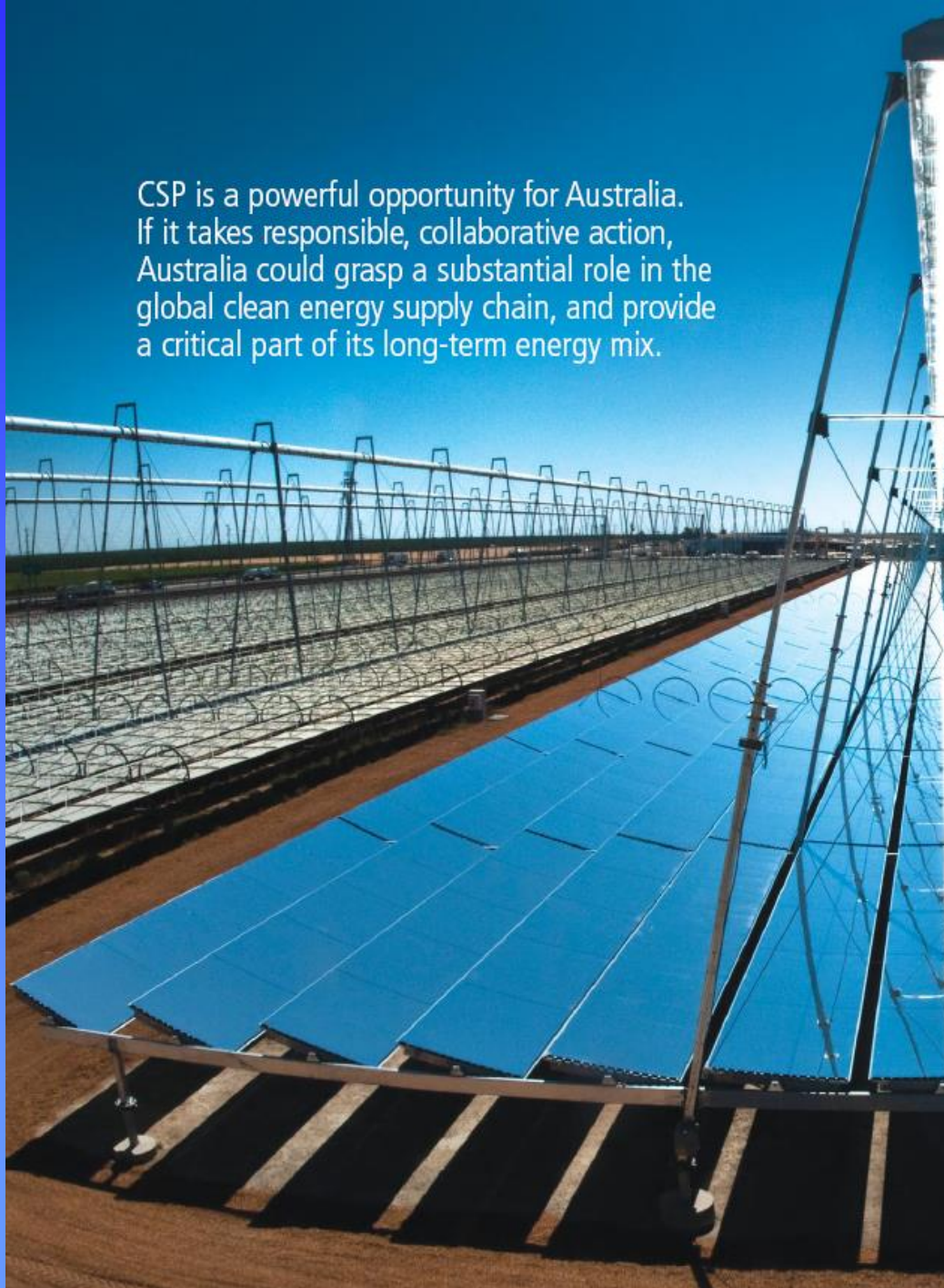
DOMESTIC, GRID CONNECTED PHOTOVOLTAIC CELLS



Australian PV module price



CSP is a powerful opportunity for Australia. If it takes responsible, collaborative action, Australia could grasp a substantial role in the global clean energy supply chain, and provide a critical part of its long-term energy mix.



Realising the potential of
concentrating solar power.
Australian Solar Institute 2012