ASTRI

AUSTRALIAN SOLAR THERMAL RESEARCH INITIATIVE

The future of SOLAR thermal

Uniting the strengths of Australia and the United States to fast track the commercialisation of solar thermal technologies.

Investing in our solar future

The Australian solar thermal initiative (ASTRI), is an $87 million, eight year international collaboration with leading research institutions, industry bodies and universities that will transform Australia into a global leader in solar thermal technologies.

Solar thermal power generation offers a number of benefits over other renewable energy technologies and has already been deployed around the world. However, it is yet to reach the cost levels of wind, hydro or photovoltaic power stations.

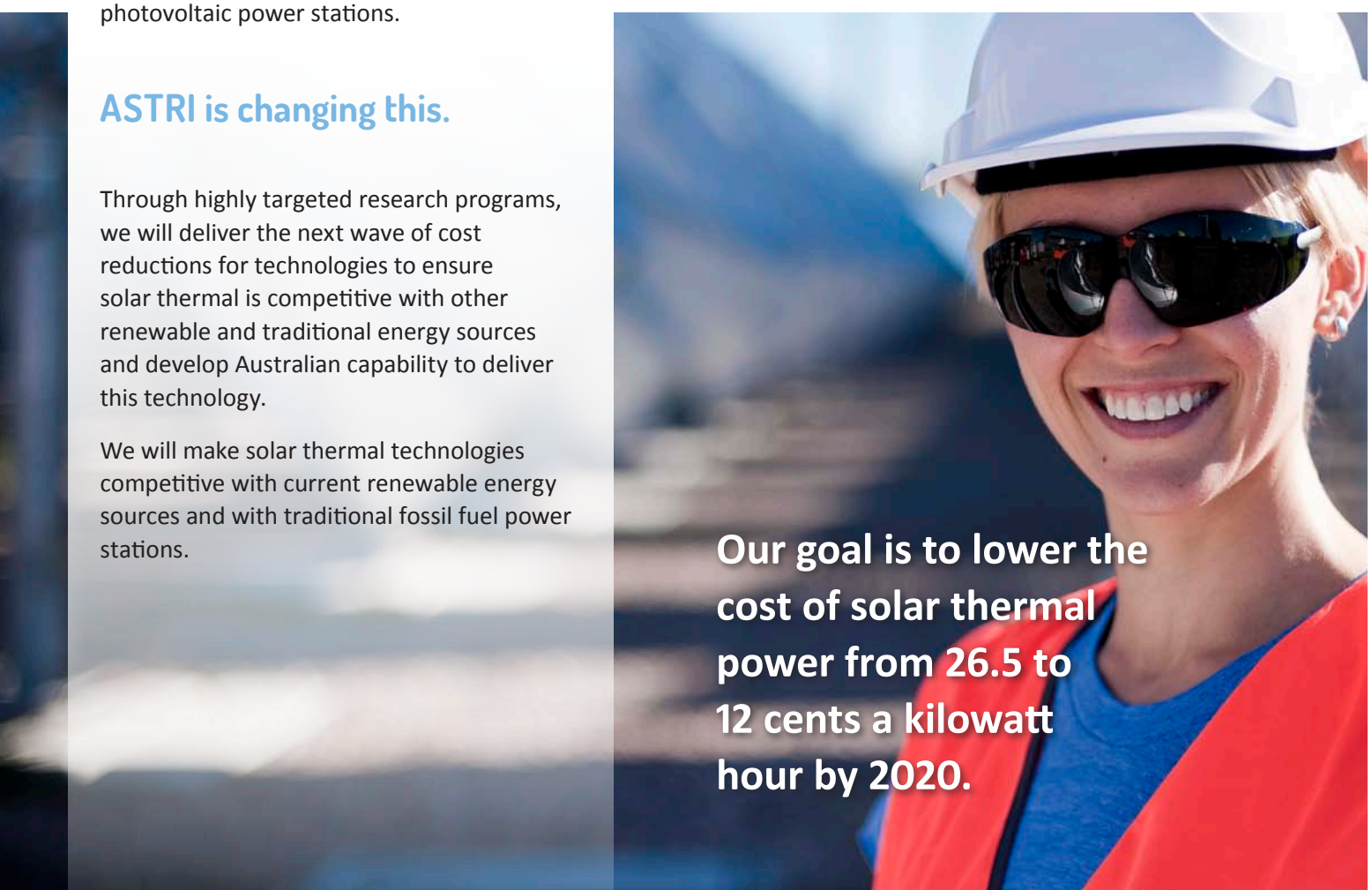
ASTRI was announced in December 2012 as part of the US-Australia Solar Energy Collaboration. The Australian Government committed $35 million with a further $57.3 million in-kind and financial contributions from partner organisations.

Not only will the funding provide the vital investment in technology and research, it will also develop the next generation of solar thermal professionals. ASTRI will involve at least 80 professionals, including 40 new postgraduate and undergraduate student positions.

ASTRI is changing this.

Through highly targeted research programs, we will deliver the next wave of cost reductions for technologies to ensure solar thermal is competitive with other renewable and traditional energy sources and develop Australian capability to deliver this technology.

We will make solar thermal technologies competitive with current renewable energy sources and with traditional fossil fuel power stations.



Our goal is to lower the cost of solar thermal power from 26.5 to 12 cents a kilowatt hour by 2020.


Photo: istockphoto.com

Why solar thermal?

Concentrating solar thermal (CST) technologies use mirrors or lenses to concentrate sunlight which is converted into heat to drive a turbine connected to an electrical power generator.

There are three key benefits of CST:

1. A CST power station uses established technology that is readily available (mirrors, tubes, steam and gas turbines and electrical generators) and can be integrated with other technologies to transition conventional power stations towards a renewable energy future.

2. CST offers the unique prospect among renewable energy alternatives to provide stable, flexible electricity supply to the grid. It can provide dispatachable power when the sun is not shining from stored thermal energy, which greatly assists in providing a reliable grid – particularly as demand changes throughout the day.

3. In addition to solar electricity production, concentrating solar thermal can supply industrial heat for chemical processes such as the production of liquid fuels suitable for automobiles and aircrafts.

> “Energy demand in the Asia-Pacific region is set to explode, with more electricity needed for the growing middle classes than ever before. Through proper investment, solar power has the potential to become just as cheap and competitive – yet far more clean – than other energy sources.
>
> US Ambassador to Australia Jeffrey Bleich

Meet the team

Led by Australia’s national science agency, CSIRO, ASTRI draws together leading solar thermal researchers from six Australian universities, plus collaborators from the United States:

ASTRI Partners:

- CSIRO
- Australian National University
- University of Queensland
- Queensland University of Technology
- University of Adelaide
- University of South Australia
- Flinders University
- Arizona State University
- National Renewable Energy Laboratory (NREL)
- Sandia National Laboratories

Together we will work towards:

- large-scale collaboration across Australia creating a platform for new national and international linkages
- delivering world leading research through novel technologies, concepts, know-how, publications and patents
- supporting the success of solar thermal in Australia
- training graduates to deliver advancements in the solar thermal industry
- commercialising solar thermal technology
- informing government decision makers about solar thermal research and technology opportunities.

New directions

Internationally renowned solar thermal expert Dr Manuel Blanco is the Director of ASTRI. Dr Blanco joins CSIRO from Spain’s National Renewable Energy Centre, where he was Director of the Solar Thermal Energy Department. He has over twenty-five years of experience as a solar researcher and engineer, contributing to advancing the state-of-the-art of CST technologies.

Interested in joining ASTRI?

Sarah Miller
ASTRI Chief Operating Officer
t +61 2 4960 6084
e sarah.miller@csiro.au

Concentrating our energy

ASTRI brings together a diverse range of energy research skills and experience to develop a unique solar thermal capability in Australia. Our partners are working together to deliver the next wave of concentrating solar thermal technology and see it become a significant part of the future energy mix.

To ensure rigour and consistency in ASTRI's outputs our team will develop a set of relevant standardised measurements and models for Australian conditions that will allow accurate and informed commercialisation decisions to be made. For example we are creating uniform cost parameters, standardising solar weather data for modelling and ensuring Australian modelling scenarios link with the systems used by the United States National Renewable Energy Laboratories.

Photo: ACCIONA Energy

> "We are proud to join Australian and U.S. researchers on the development of solar energy technologies and projects to spur innovation and identify solutions to global energy challenges.
>
> Sethuraman Panchanathan, Senior Vice President of Arizona State University's Office of Knowledge Enterprise Development

Game changer

Our goal is to lower the cost of solar thermal power from 26.5 to 12 cents a kilowatt hour; targeting 20 cents a kilowatt hour by 2016, whilst providing a power source that can be adjusted to demand (dispatchable generation).

ASTRI includes four research nodes that will help reach this goal:

- Reducing capital expenditure
- Increasing the capacity factor
- Improving efficiency
- Adding product value

This program of work will be supported with world leading economic modelling, knowledge sharing and an education program.

CSIRO will report back to the independent Australian Renewable Energy Agency (ARENA), established by the Australian Government in 2012.

Photo: istockphoto.com


Photo: ACCIONA Energy

Developing the next generation of solar thermal experts

ASTRI will train and develop the next generation of CST industry professionals, using our university partners to develop technical courses and enhance opportunities for higher degree research students in CST activities.

This approach will foster collaboration and knowledge sharing between participating institutions.

Among other initiatives, ASTRI postdoctorate and undergraduate students will participate in development activities with universities and potentially with international partners. Practical or project components of courses will be undertaken with participating ASTRI partners to ensure access to the best possible technology, infrastructure and people in the solar thermal research field.

Visit **www.astri.org.au** for more information.


Photo: istockphoto.com

1

Node 1: Reducing capital expenditure

REDUCING THE COST OF BUILDING SOLAR THERMAL POWER PLANTS

Lead by: Australian National University and Flinders University

We are aiming to reduce one of the biggest barriers to the uptake of large-scale solar thermal power stations – the cost of the power plant itself. The reductions in cost will reduce the investment risk and make solar thermal power plants more attractive to industry and the investment sector.

We will develop a suite of improvements to the solar field, receiver and all the supporting components of the power plant through novel design and incorporating the latest technologies.

Financial modelling, system design and industry engagement will be key to our success in the first stages of the project.

This project will link with the National Renewable Energy Laboratory and Sandia National Laboratories in the United States to research low-cost heliostats and receivers.

2

Node 2: Increasing the capacity factor

INCREASING OPERATION HOURS, TO SELL MORE ELECTRICITY TO THE GRID

Lead by: CSIRO and University of South Australia

A critical determinant in the levelised cost of energy of weather-dependant generators, such as solar thermal power stations, is the capacity factor, or how many hours of the year the station can operate to produce electricity that can be sold into the grid.

We are aiming to improve current capacity through the development of solar thermal energy storage systems suited to Australian conditions.

This research will link with the National Renewable Energy Laboratory, Sandia National Laboratories and Arizona State University.

> We are building the capabilities in Australia so that we can manufacture and build power plants here and create export markets, ultimately leading to more jobs.
>
> Professor David Lewis, Director, Centre for NanoScale Science and Technology, Flinders University

Photo: istockphoto.com

3

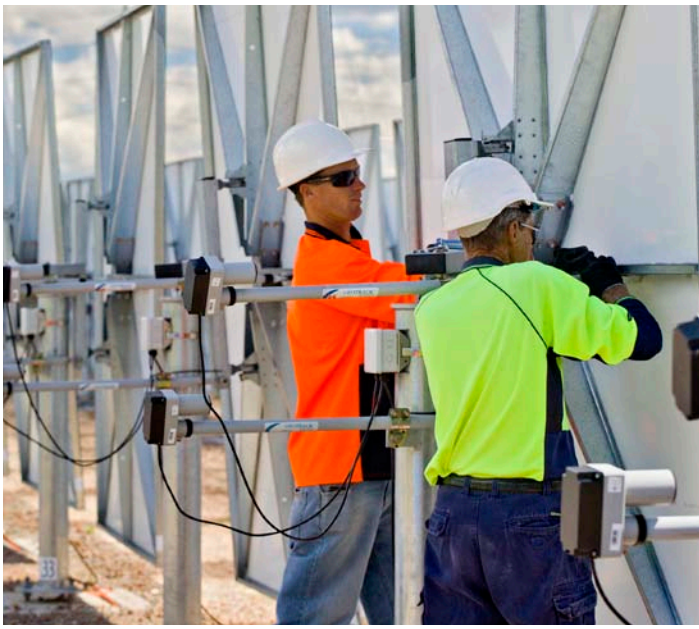
Node 3: Improving efficiency

PRODUCING MORE SOLAR THERMAL POWER FOR LESS COST

Lead by: University of Queensland and CSIRO

Through detailed analysis and technology trials of the collectors, receivers and energy transfer and storage systems we will improve the performance of solar thermal power plants.

We will collaborate with the National Renewable Energy Laboratory and Sandia National Laboratories to investigate materials and their performance.



4

Node 4: Adding product value

REDUCING THE OPERATING AND MAINTENANCE COSTS OF SOLAR THERMAL POWER PLANTS

Lead by: University of Adelaide and Queensland University of Technology

Adding product value will arise from minimising operating and maintenance costs and developing new, high value, solar thermal products.

Through collaboration with industry, we will better understand the source of operating and maintenance costs in solar thermal power plants with the aim of setting new benchmarks for the solar thermal industry. Approaches such as new surface coatings and cleaning strategies are examples of solutions that will be developed to reduce operating costs in remote areas.

In addition we will be investigating the cost effective production of liquid and gaseous fuels to add value to Australia's intensive industrial and resource processes, and provide alternative clean energy solutions.

This research will be conducted in collaboration with the National Renewable Energy Laboratory and Arizona State University.

FUNDING PARTNER

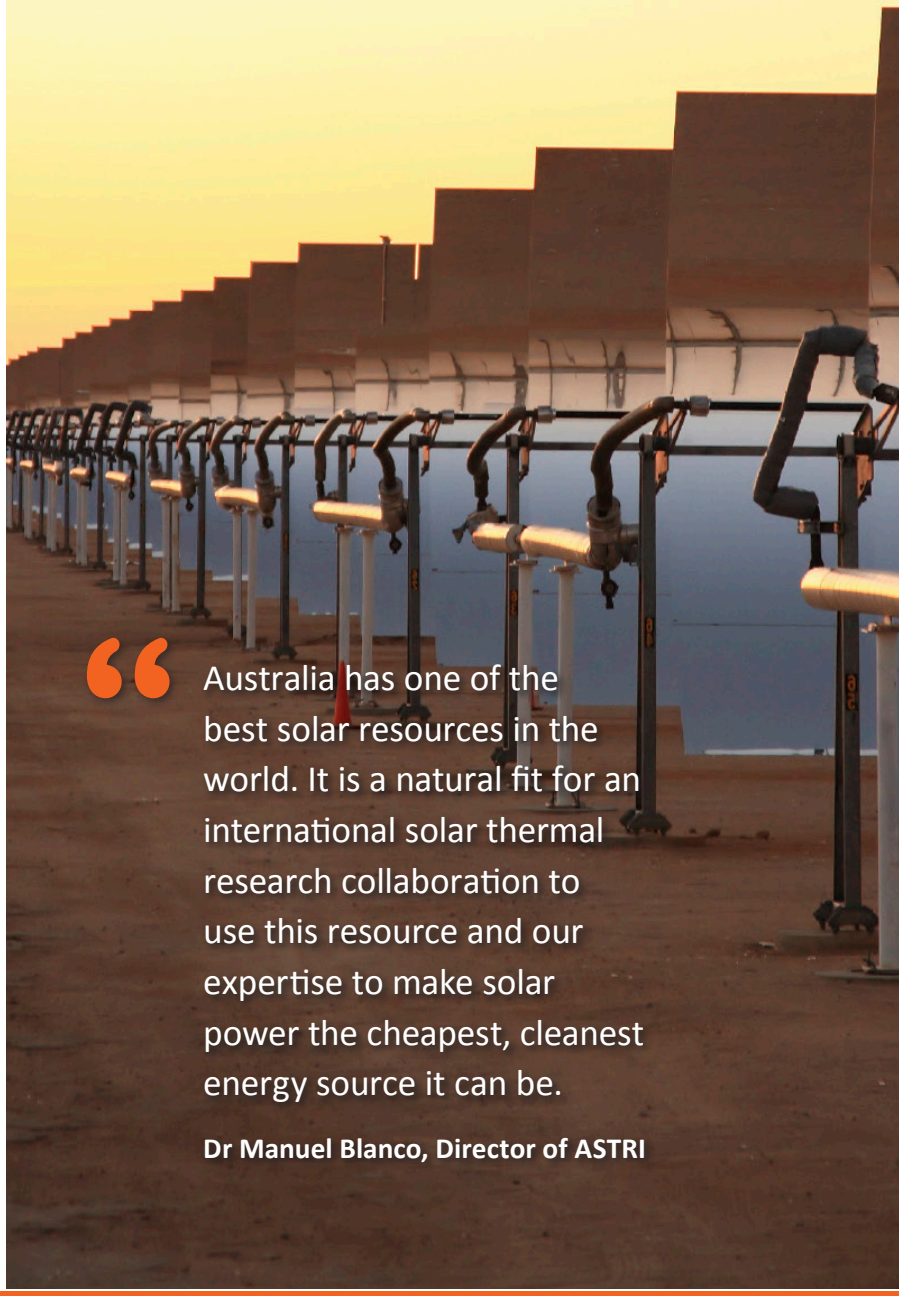
Australian Government
Australian Renewable Energy Agency

AUSTRALIAN PARTNERS

The University of Adelaide
Australian National University
CSIRO
Flinders University
The University Of Queensland AUSTRALIA
University of South Australia
QUT

UNITED STATES PARTNERS

Arizona State University
NREL National Renewable Energy Laboratory
Sandia National Laboratories



> Australia has one of the best solar resources in the world. It is a natural fit for an international solar thermal research collaboration to use this resource and our expertise to make solar power the cheapest, cleanest energy source it can be.
>
> **Dr Manuel Blanco, Director of ASTRI**

WORK WITH US
Sarah Miller
ASTRI Chief Operating Officer
CSIRO Energy Technology
t +61 2 4960 6084
e sarah.miller@csiro.au
w www.astri.org.au

STUDENTS
For more information about ASTRI, please visit **www.astri.org.au**