



Australian Government
Australian Renewable
Energy Agency

Australia's renewable energy opportunity

Australia's Energy Future Forum at ANU



30 October 2012

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The Australian Renewable Energy Landscape

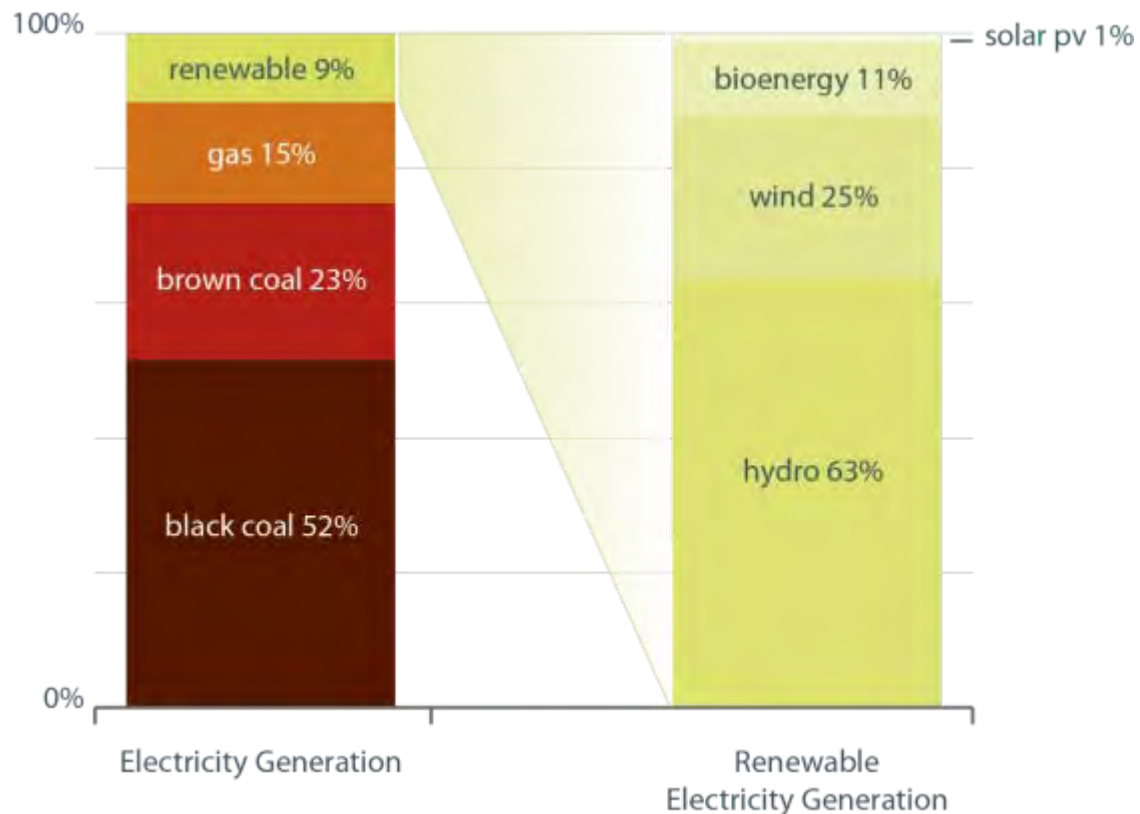


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Renewables in Australia's energy mix

Australian Electricity Generation 2009-10



Percentage total of Australian Electricity Generation for 2009-10

Electricity generated from:

Black coal 52%

Brown coal 23%

Gas 15%

Renewable energy 9%

Renewable Electricity Generation

Hydro 63%

Wind 25%

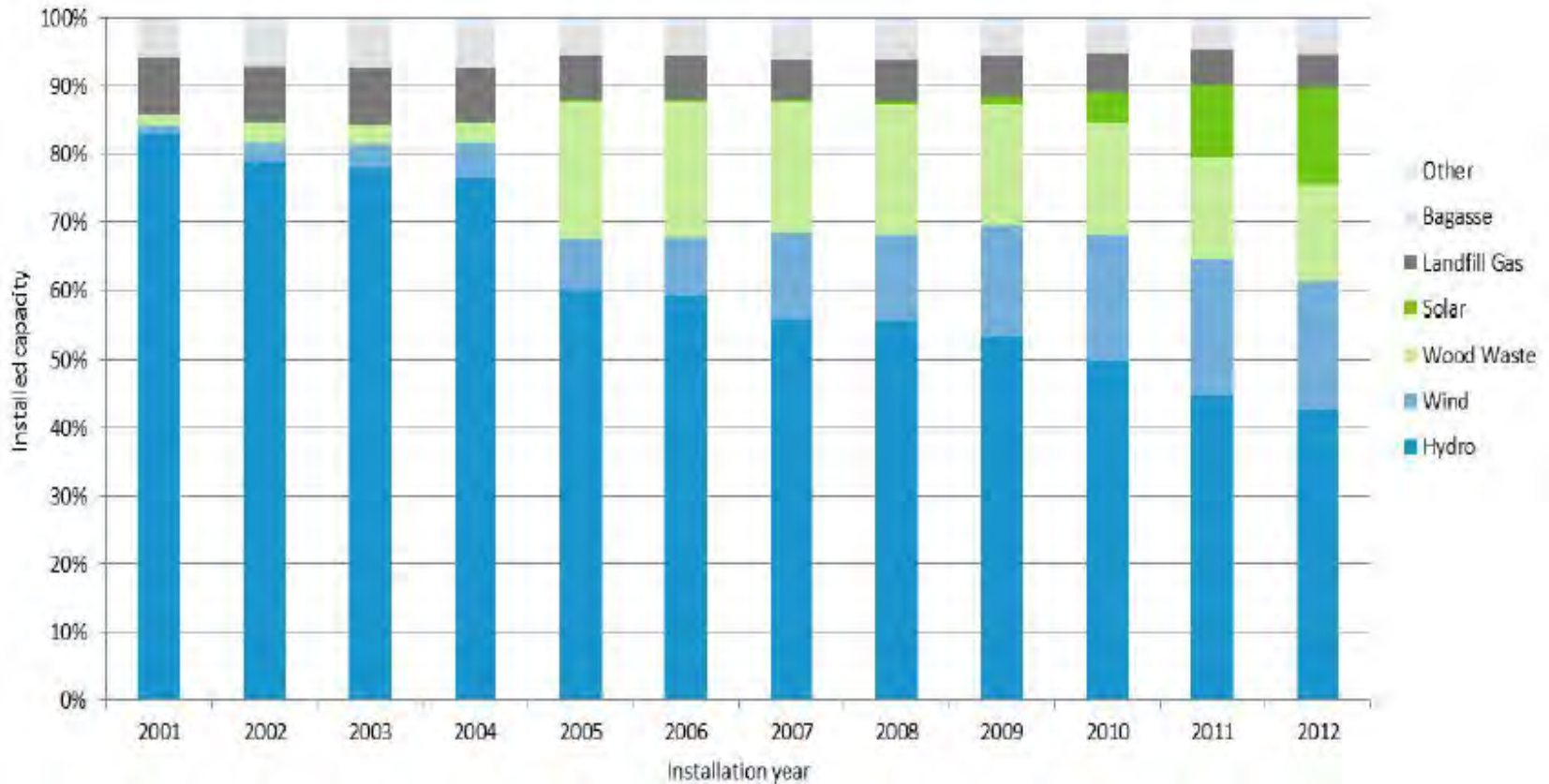
Bioenergy 11%

Solar Photovoltaic 1%

Source: ABARES, *Australian Energy Statistics (2011)*.



Australia's renewable energy mix

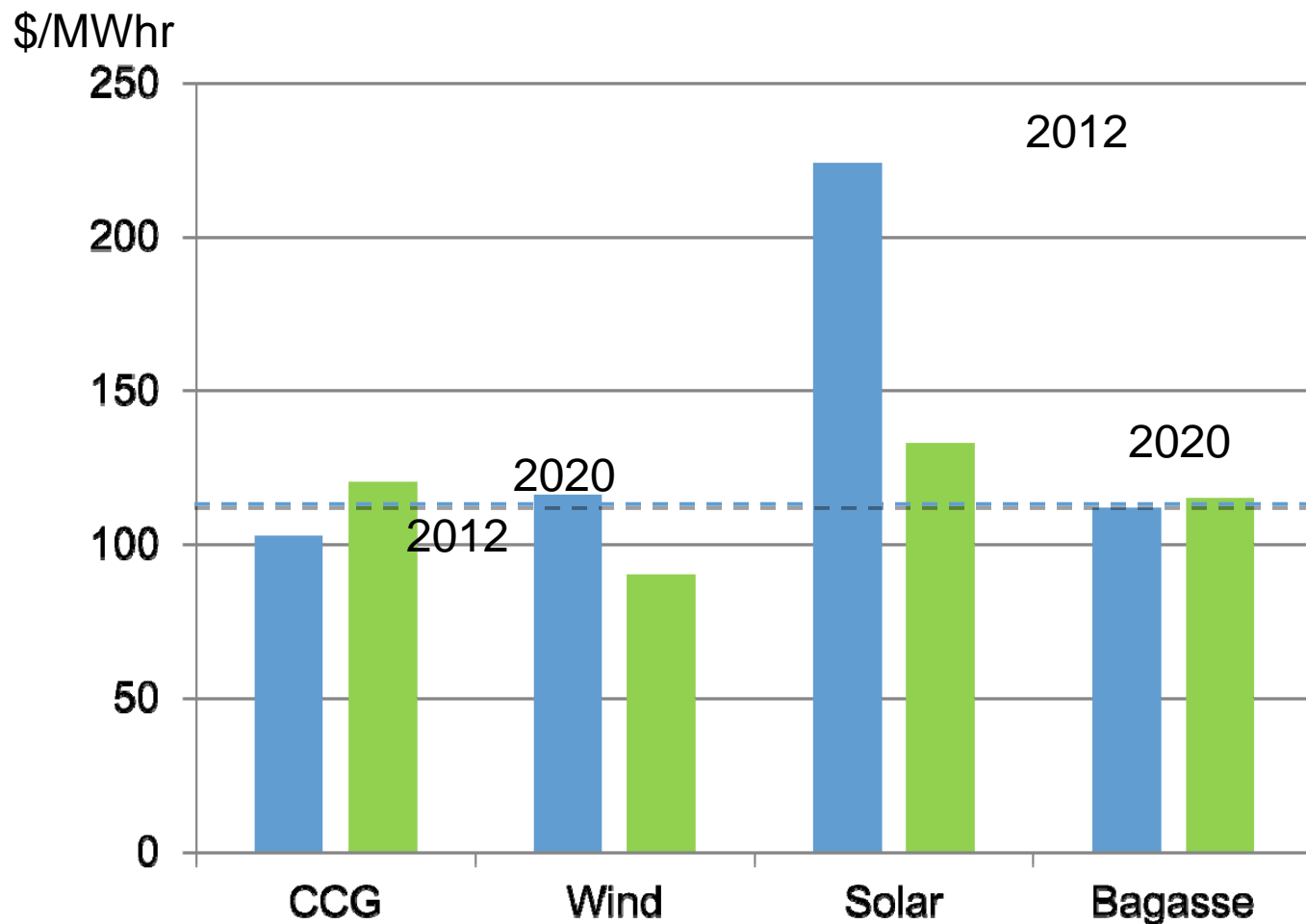


This diagram shows Australia's current mix of renewable generation capacity including bagasse, landfill gas, solar, wood waste, wind and hydro and the percentage of installed capacity for each between 2001-2012.

Source: CCA Discussion Paper Oct 2012



Levelised Energy Costs in 2012 and 2020

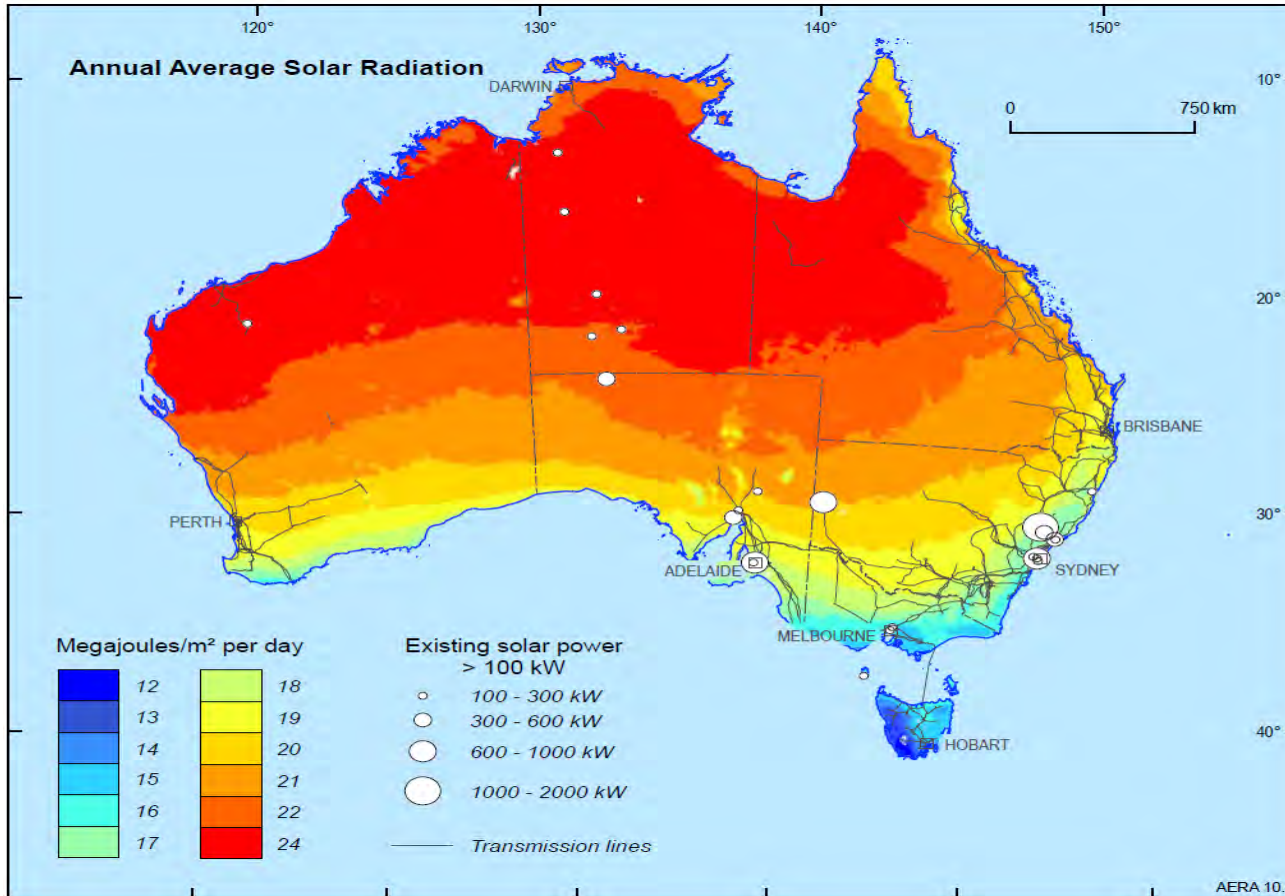


This chart shows a comparison of Levelised Energy Costs (LCOE) between combined-cycle gas, wind, solar and bagasse renewable energy technology in 2012 and 2020.

Source: BREE, *Australian Energy Technologies Assessment 2012*



Australia's Renewable Resources: Solar

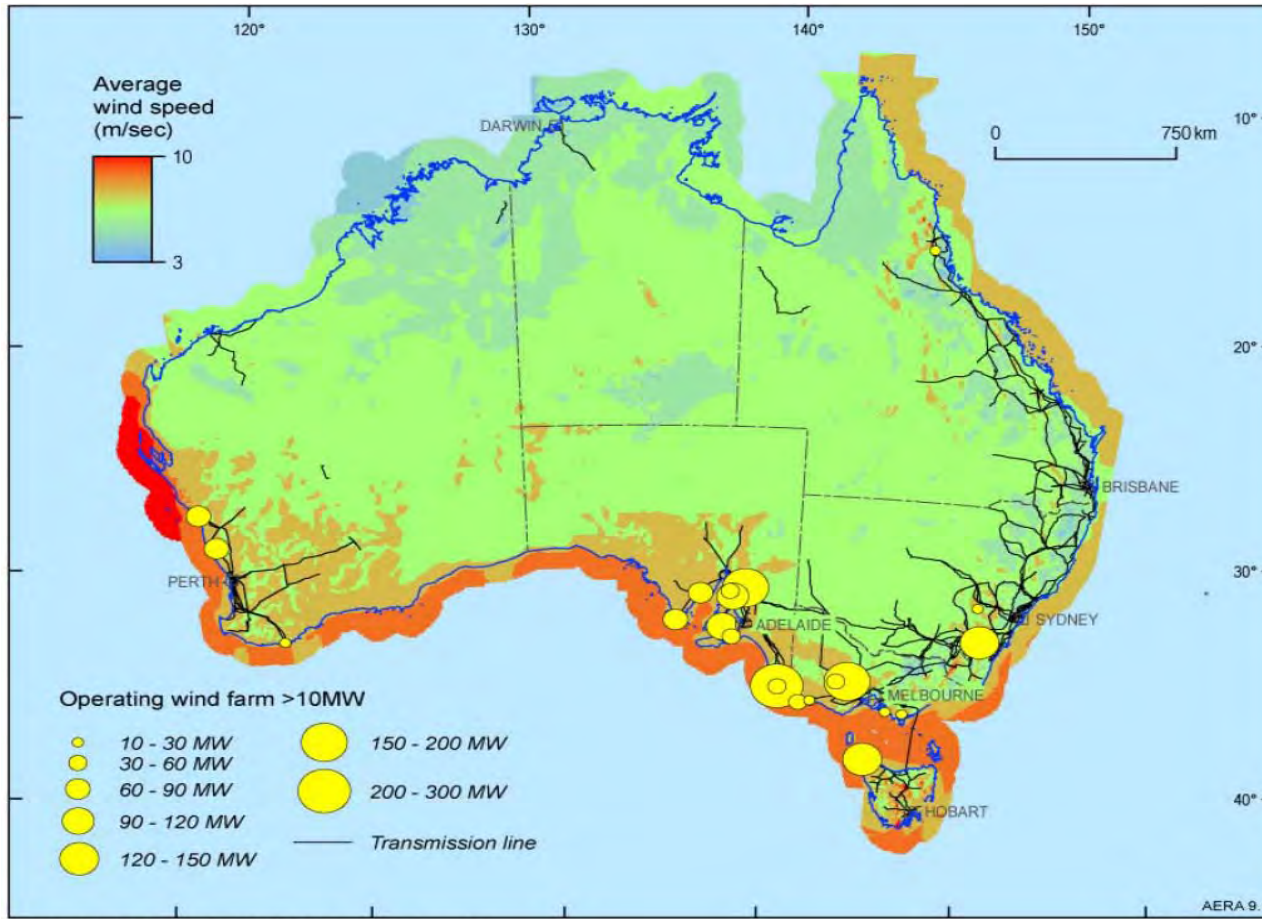


Map of Australia showing the annual average solar radiation and areas of existing solar power greater than 100 kW and up to 2000 Kw.

Source: Geoscience Australia and ABARE (2010) **Australian Energy Resource Assessment**.



Australia's Renewable Resources: Wind

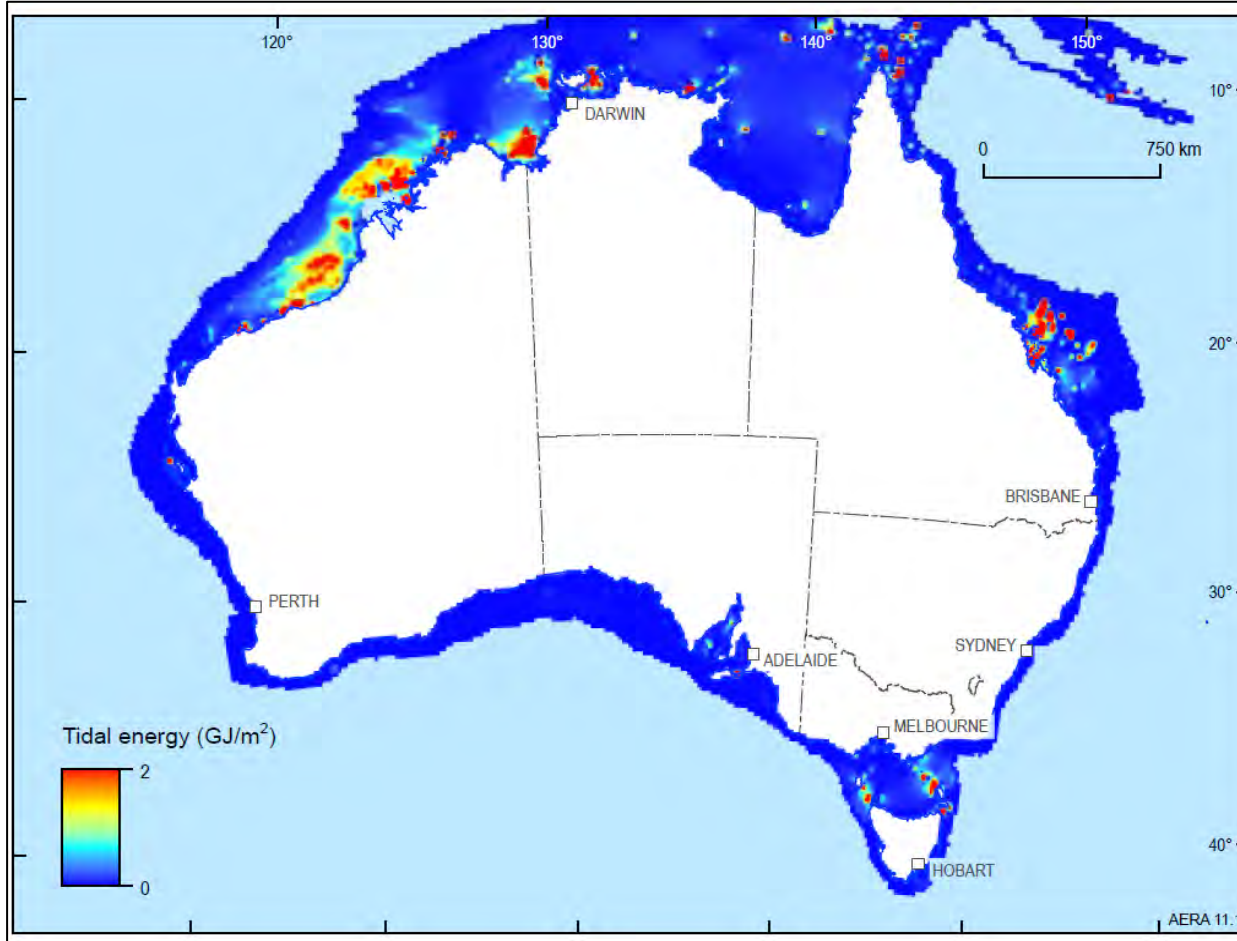


Map of Australia showing the location of operating wind farms. The map indicates areas of wind speeds (m/second) as well as transmission lines. Some of the world's best wind resources are along the south-western, southern and south-eastern margins.

Source: Geoscience Australia and ABARE (2010) ***Australian Energy Resource Assessment***.



Australia's Renewable Resources: Tidal



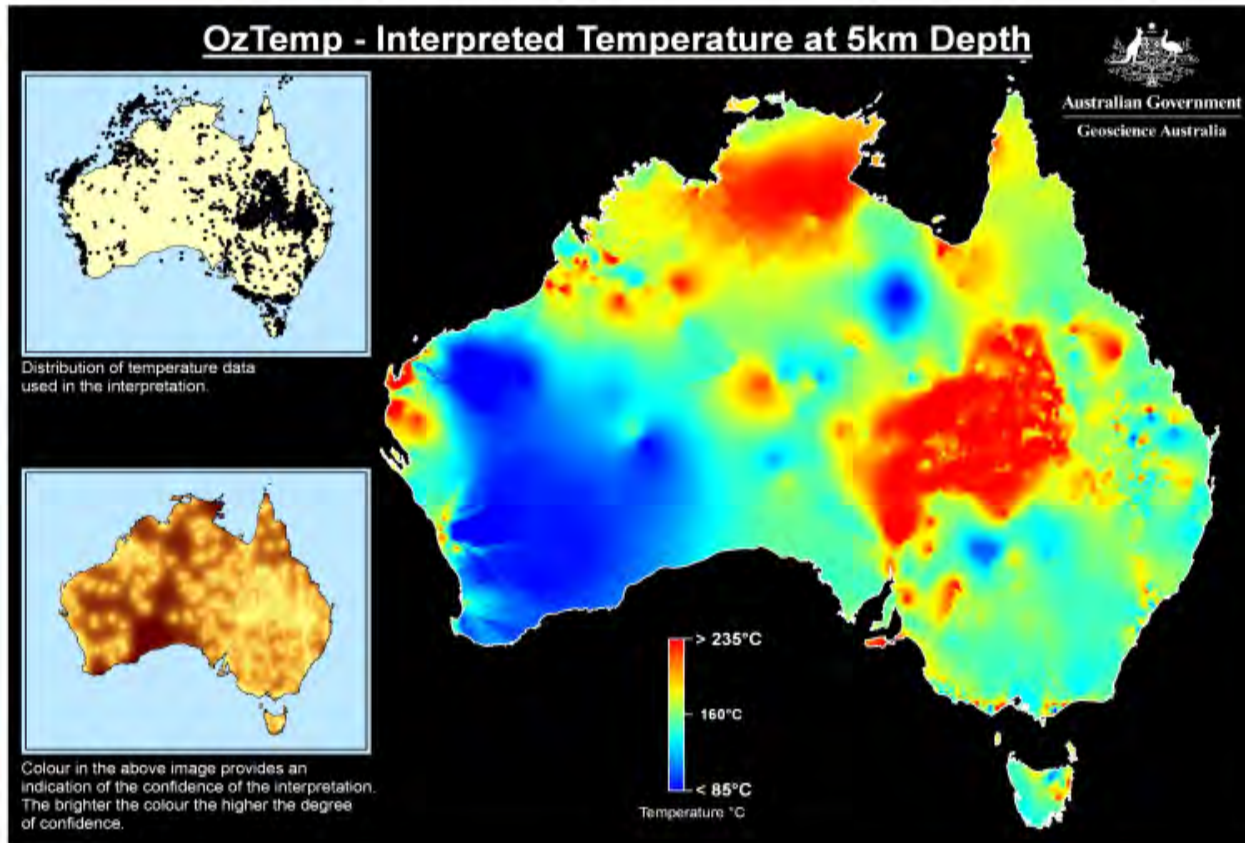
This map shows the total annual tide kinetic energy (in gigajoules per square metre) on the Australian continental shelf.

The northern half of the Australian continental shelf has limited wave energy resources, but has sufficient tidal energy resources for local electricity production in many areas, particularly the Northwest shelf, Darwin, Torres Strait and Southern Great Barrier Reef.

Source: Geoscience Australia and ABARE (2010) Australian Energy Resource Assessment.



Australia's Renewable Resources: Geothermal

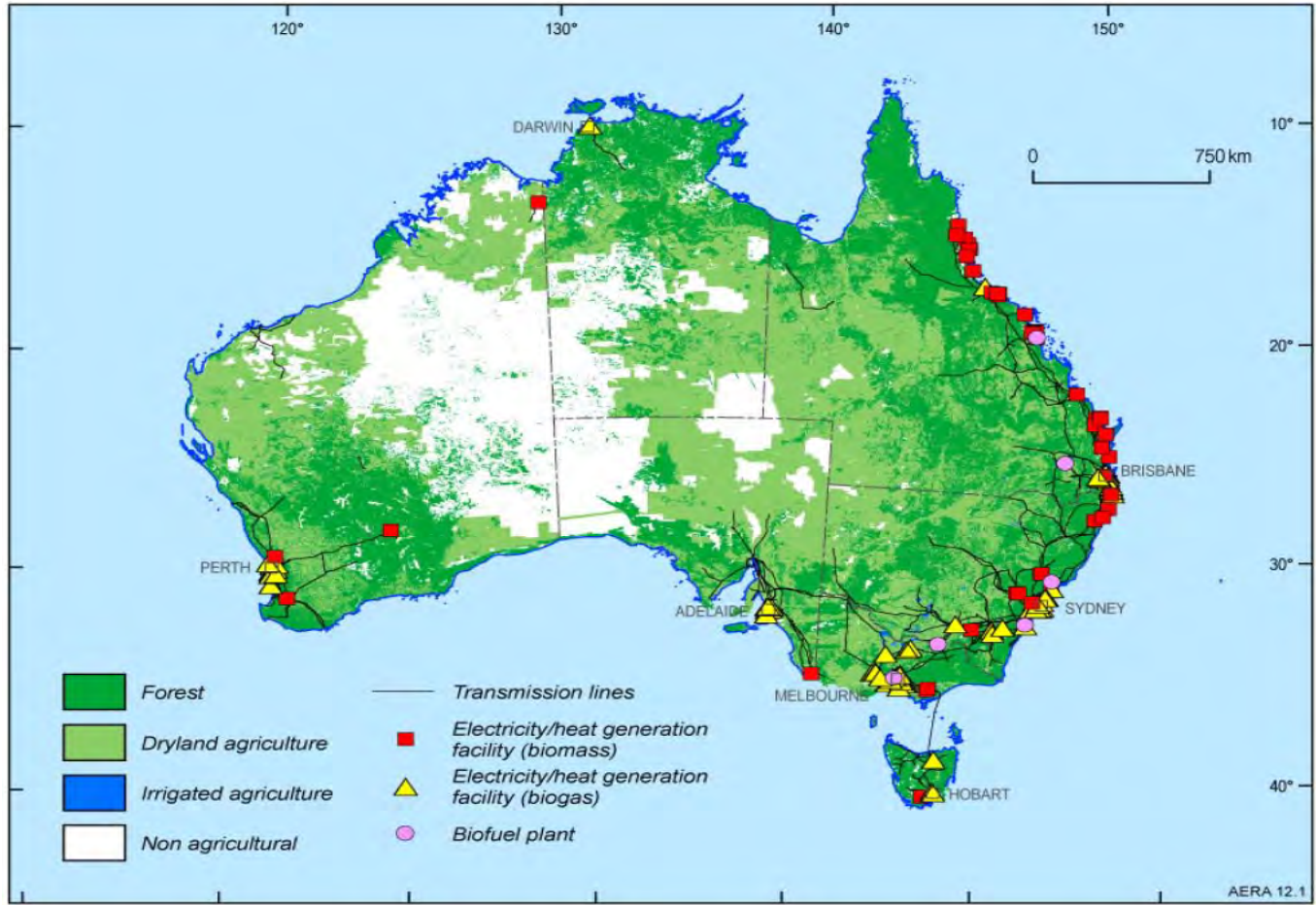


This map shows interpreted temperature at 5km depths. Australia's geothermal resources are based on data such as temperature measurements across Australia.

Map showing the
Source: Geoscience Australia (2011) *OZTemp - Interpreted Temperature at 5km Depth Image*



Australia's Renewable Resources: Bioenergy

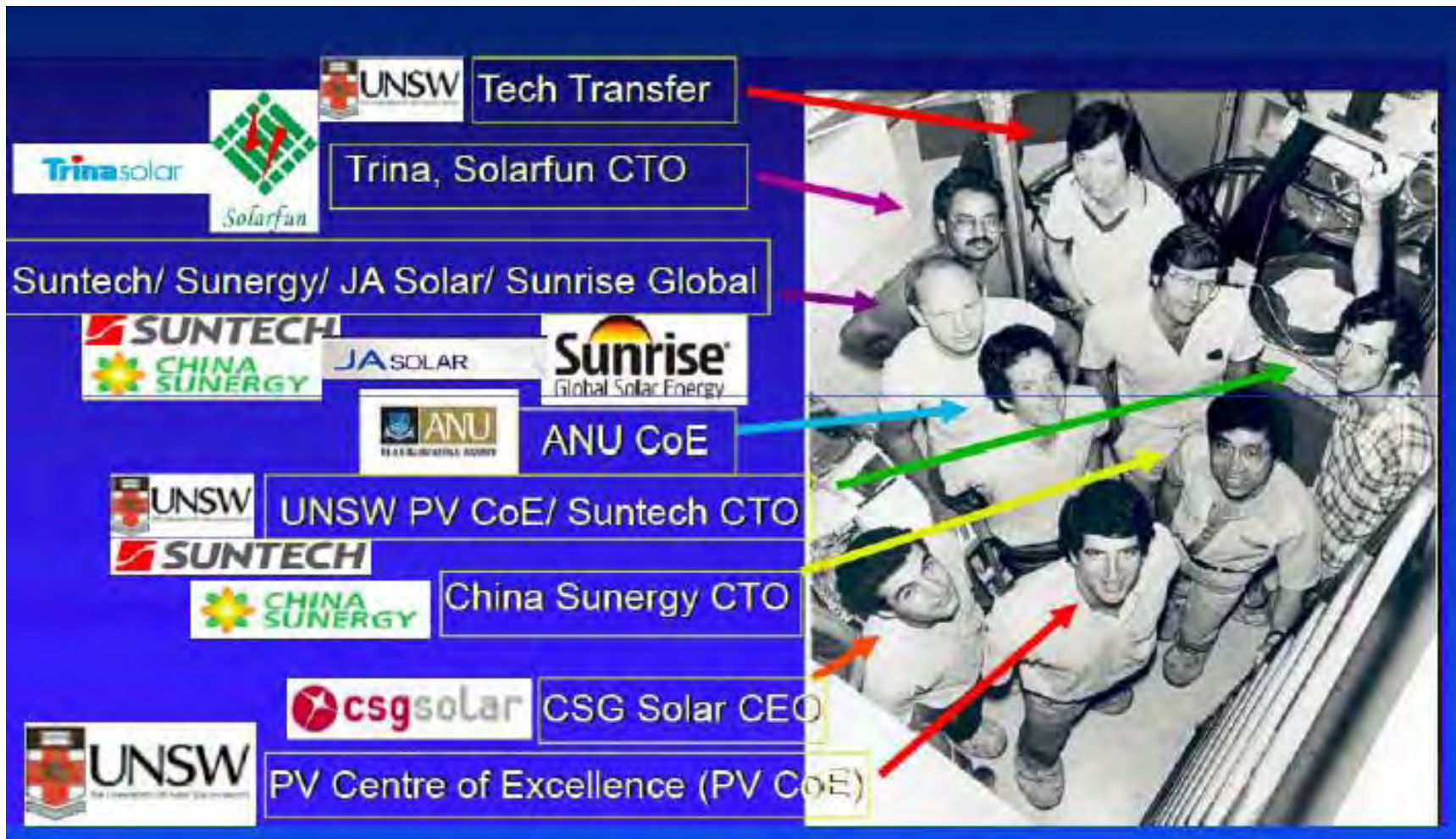


Map showing Australia's bioenergy resources. Currently Australia's bioenergy use for generating heat and electricity is sourced mainly from bagasse (sugar cane residue), wood waste and capture of gas from landfill and sewage facilities.

Source: Geoscience Australia and ABARE (2010) *Australian Energy Resource Assessment*.



Australia's Renewable Resources: a Track Record of Innovation



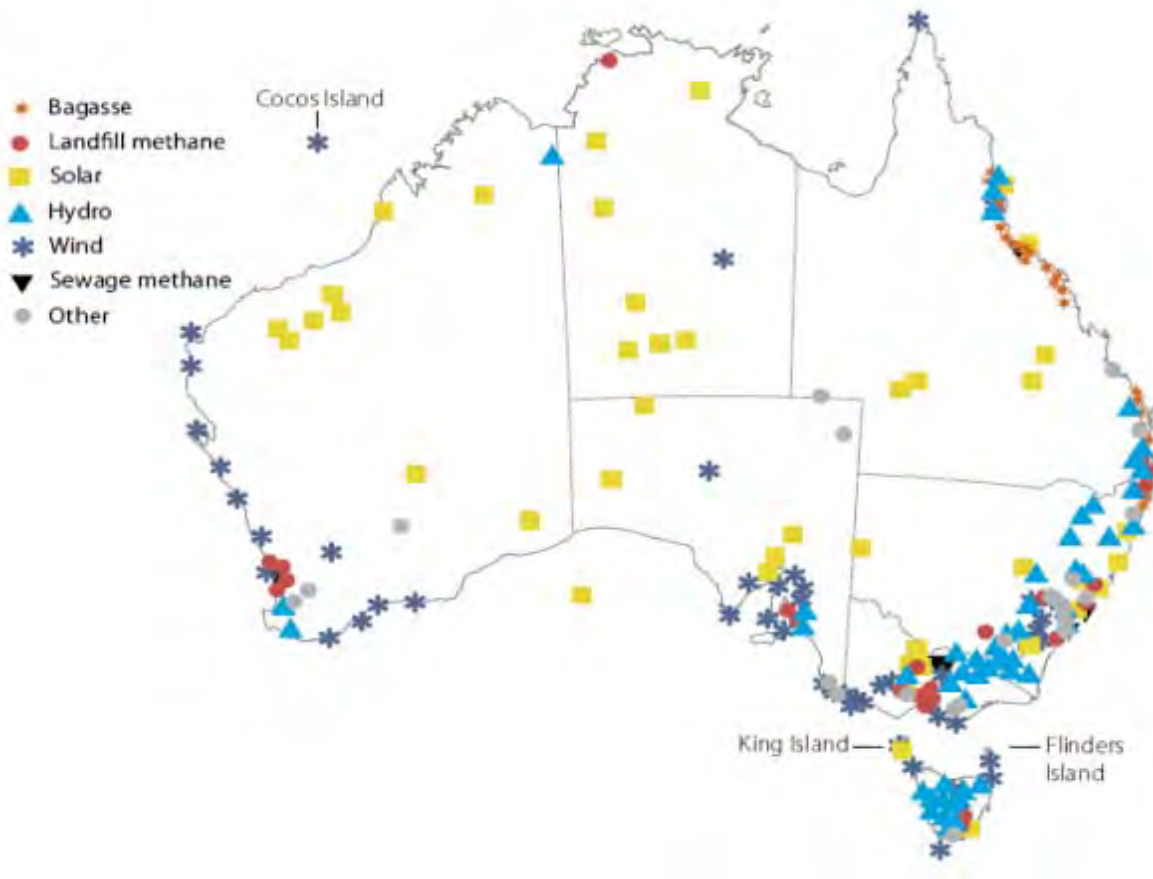
Source: Professor Stuart Wenham, *China: Threat or Opportunity?* (2012)



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Location of Renewable Energy Capacity



Map showing the location of Renewable Energy generators operating plants with capacity of more than 30 kilowatts.

Hydroelectricity capacity in Australia is located mostly in New South Wales, Tasmania, Queensland and Victoria; while wind farms are most abundant in South Australia and Victoria. Almost all bagasse-powered energy facilities are located in Queensland where sugarcane production is located. In contrast, there is a more even distribution of biogas-powered facilities across Australia, as these facilities are mostly based on gas generated from landfill and sewerage.

Source: BREE (2012) *Energy in Australia 2012*



ARENA's Role

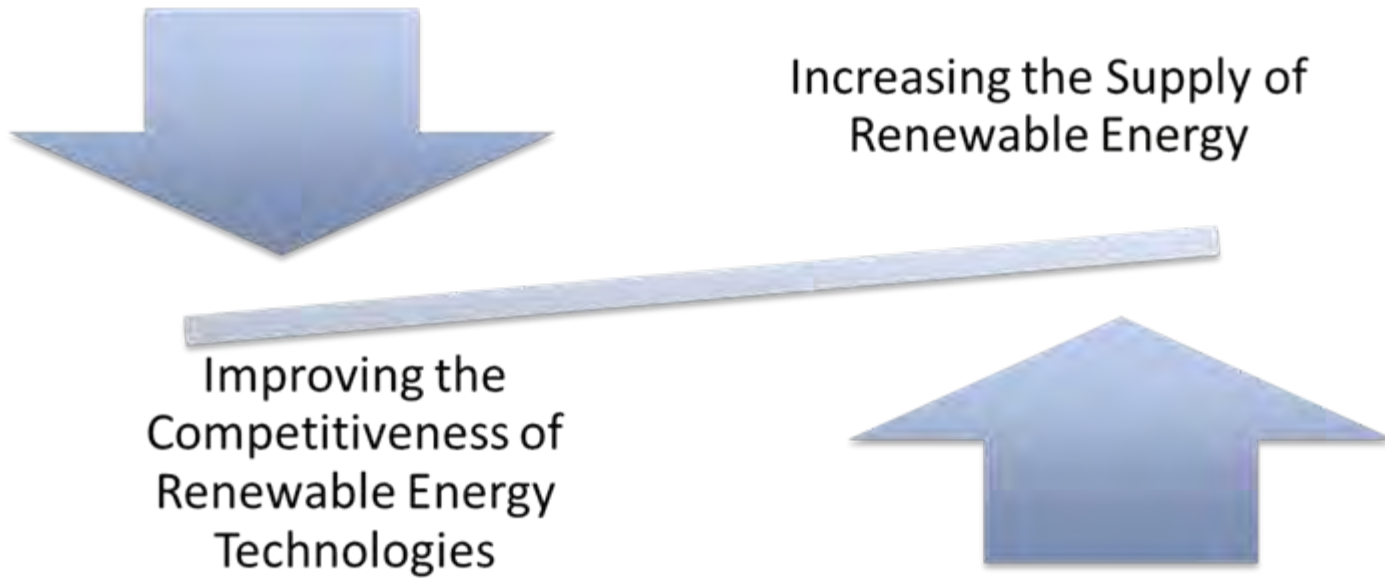


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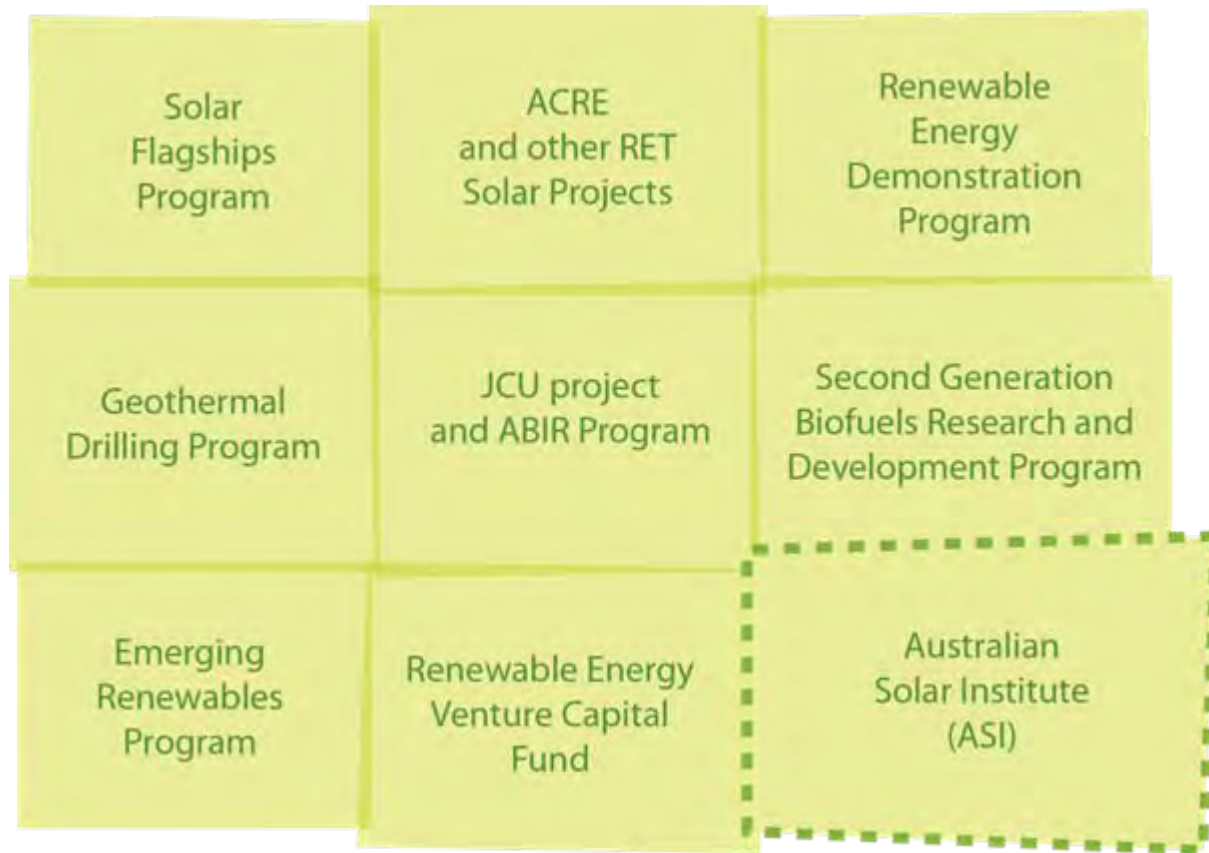
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The Basics

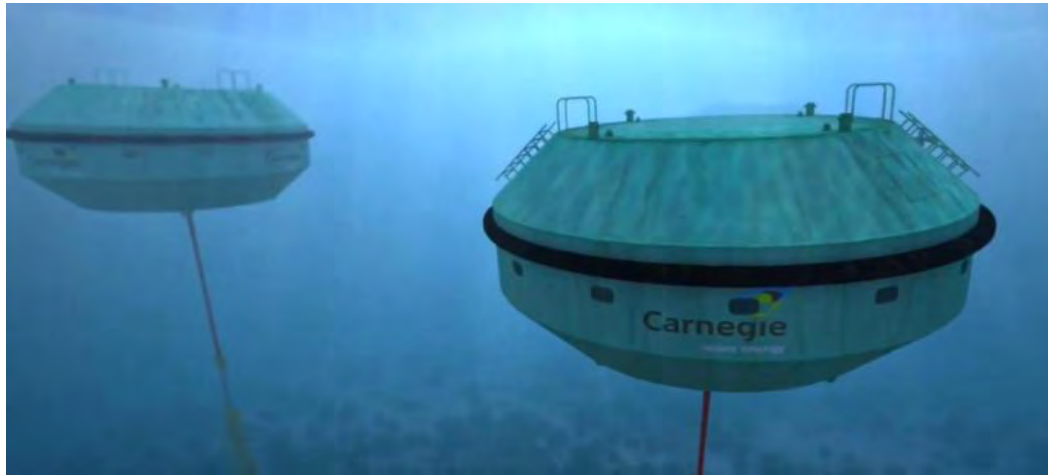
\$3.2 billion in funding



Strong Foundations



Existing Projects



Photographs of Australian Renewable Energy projects: Carnegie Wave Energy Project in Western Australia; James Cook University's macro algae to bio-crude oil project and Kogan's Creek Solar Boost project.



Strategy and programs



What Next?



Games changers

- **Grid integration**
- **Storage technologies**
- **Remote energy**
- **Distributed generation**



Summary

- ◆ Significant international investment
...and local opportunity
- ◆ ARENA is a key part to unlocking commercial financing
- ◆ ARENA has an open approach

arena@arena.gov.au

