



Australian Government  
Australian Renewable  
Energy Agency

# Driving the clean energy future



Australian Geothermal Energy Conference, Finance session  
Mr Greg Bourne, ARENA Chair

14 November 2012

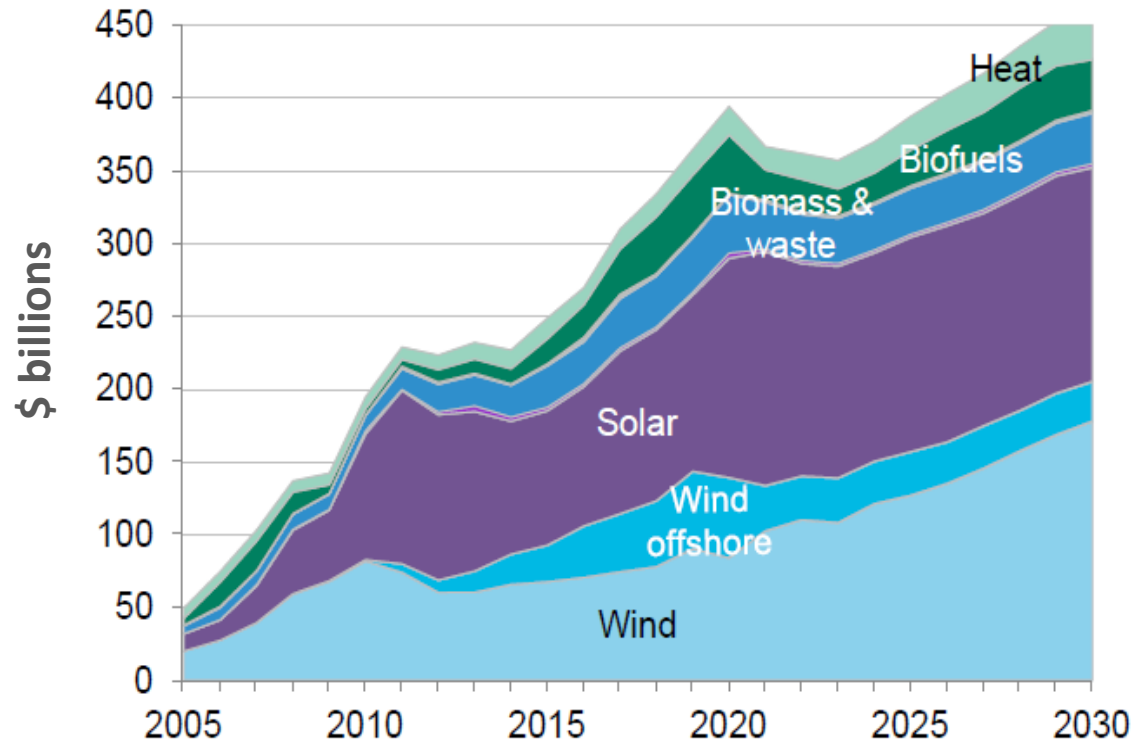
[www.arena.gov.au](http://www.arena.gov.au)

# 1. Renewable Energy – A Global Growth Industry



# Global Investment in Renewables

## Annual Renewable Energy Investment



Source: Bloomberg New Finance (2011)



## 2. The Australian Renewable Energy Landscape

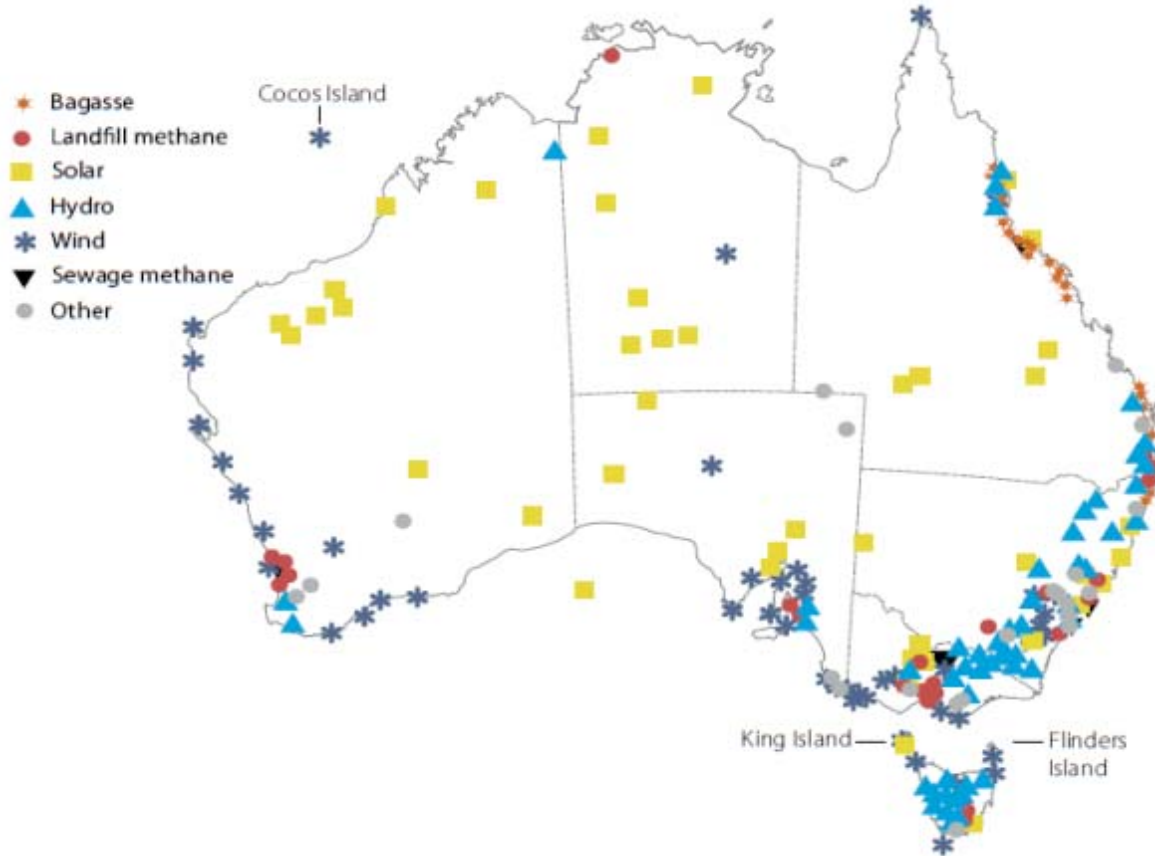


# Australian Renewable Energy Landscape

- Highly complex operational environment
- Fundamental transformation in coming years
- Reducing energy demand
- Many lessons to draw on in past years
- No quick fixes



# Location of Renewable Energy Capacity



A map of Australia showing the location of renewable energy plants operating with a capacity of more than 30 kilowatts. The map shows the locations of bagasse, landfill, methane, solar, hydro, wind and sewerage methane generating plants.

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

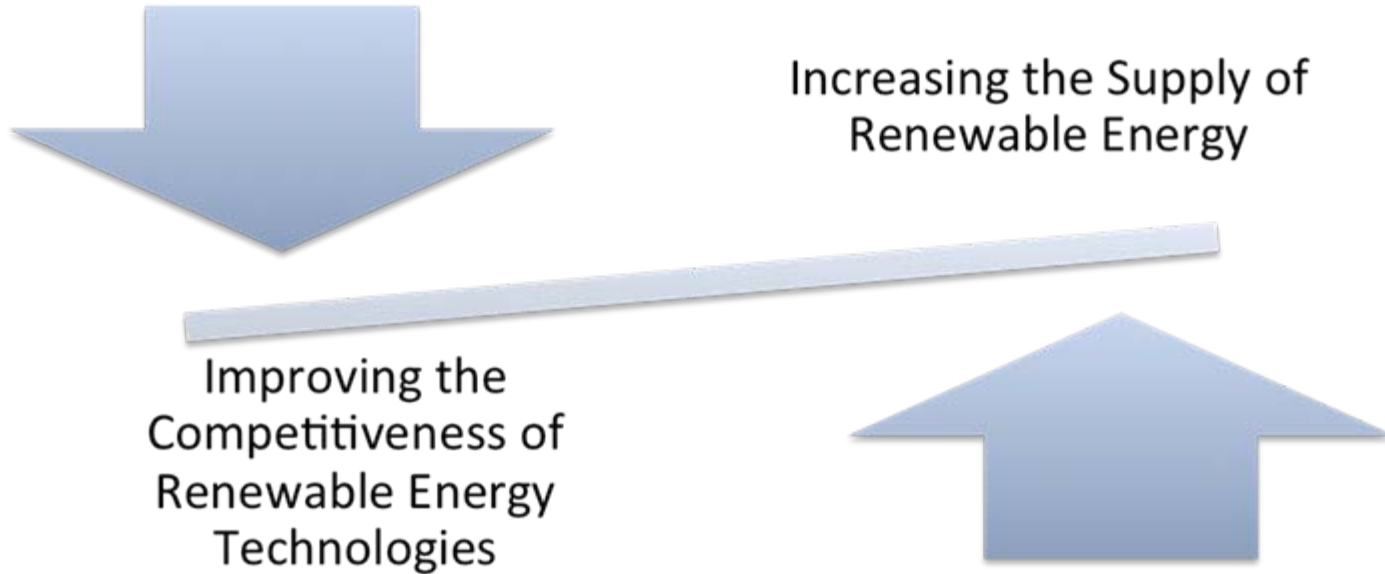


## 3. ARENA's Role



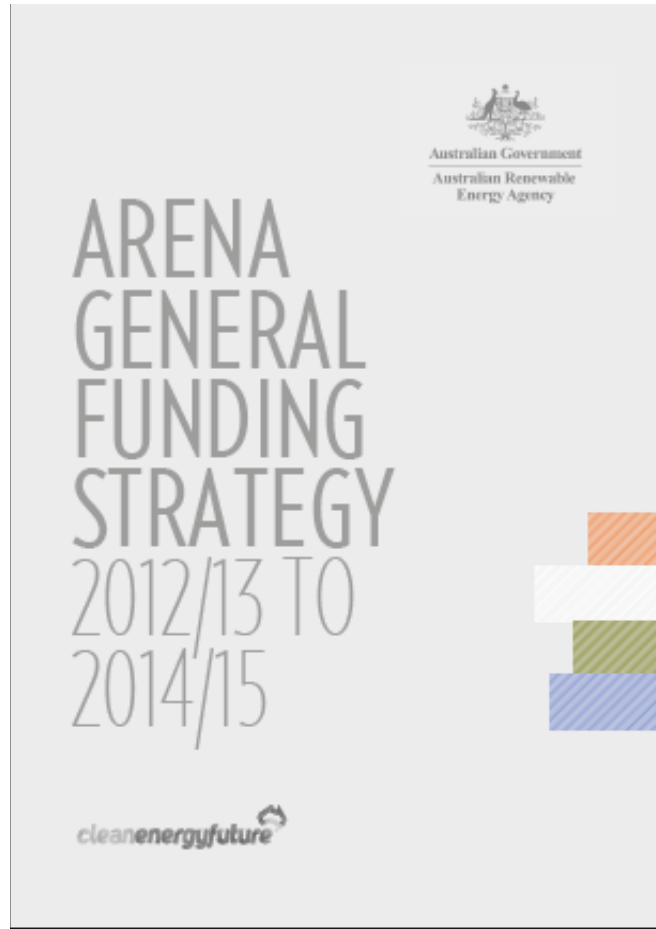
# ARENA's role

\$3.2 billion in funding





# General Funding Strategy and Investment Plan



# General Funding Strategy

## **GENERAL PRINCIPLES**

COMPLEMENTARITY  
CONFIDENCE BUILDING  
DIVERSITY

## **ALONG THE WHOLE INNOVATION CHAIN**

RESEARCH (basic and applied)  
DEVELOPMENT  
DEMONSTRATION  
COMMERCIALISATION

## **INVESTMENT PLAN**

STRATEGIC INITIATIVES  
SUPPORTING INITIATIVES  
COMPLEMENTARY INITIATIVES



# Investment Plan

**STRATEGIC INITIATIVES** are larger in scope and scale and typically fund market-oriented, near commercial, demand pull projects.

Regional Australia's Renewables (*Consultation underway*)  
Deploying utility scale renewable energy

**SUPPORTING INITIATIVES** more limited in scope and address specific roadblocks to the success of a strategic initiative

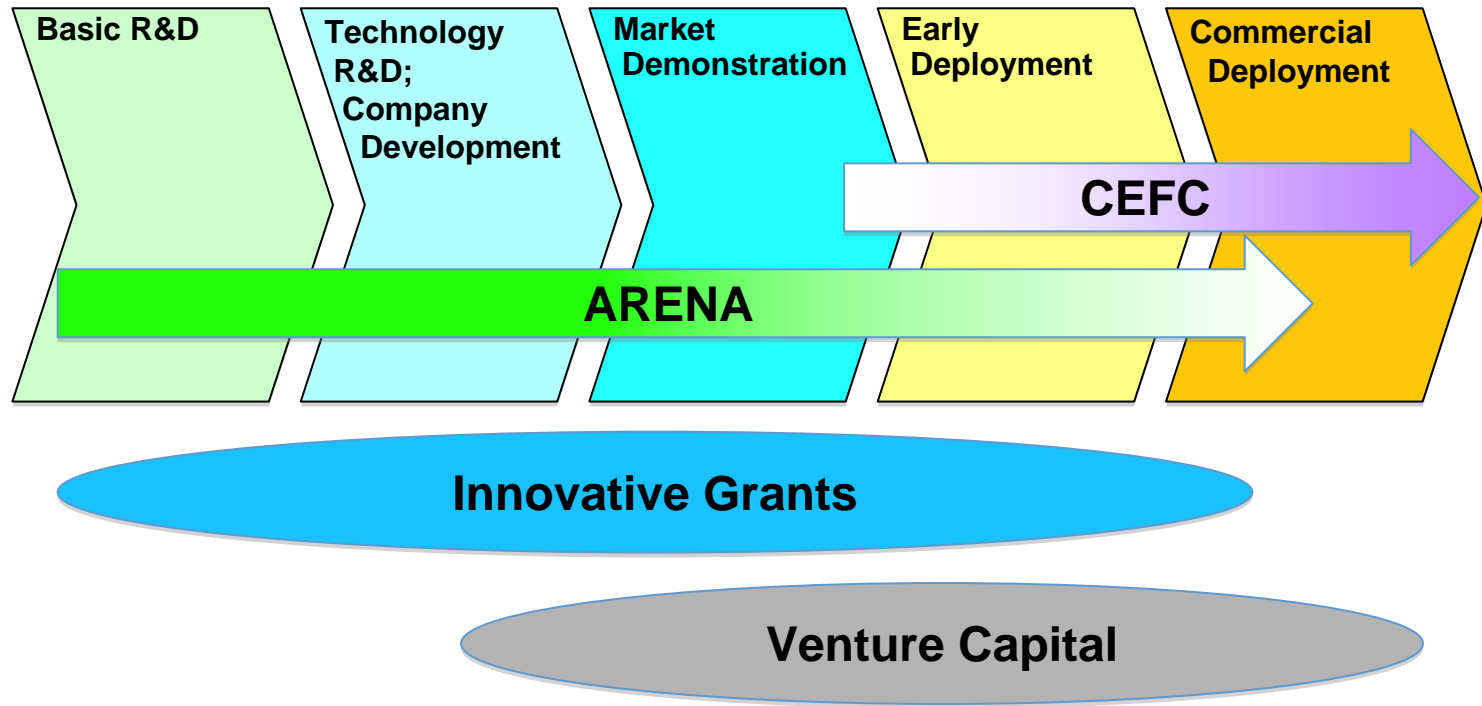
Removing roadblocks for regional and remote renewable energy  
Building Australia's next generation solar

**COMPLEMENTARY INITIATIVES** provide ARENA with the flexibility to do those things necessary to fulfil all of its functions.

Supporting high value Australian renewable energy knowledge (SHARE)  
Continuing programs such as Emerging Renewables Program and Renewable Energy Venture Capital Fund.



# CEFC and ARENA on the Innovation Chain



This slide shows ARENA and CEFC's relationship on the innovation chain, from early research through to commercial deployment. ARENA and CEFC will work together to drive projects and technology. ARENA may complement CEFC's provision of debt and equity to provide market side support.



## 4. Current support for geothermal



# Current support for geothermal

**ARENA's portfolio includes almost \$170 million in funding for six projects:**

\$1.9 million to National ICT Australia to improve data for targeted geothermal exploration;

\$1.25 million to the University of Adelaide to research fluid flow rates in hot sedimentary aquifers (HSA);

\$7 million to Petratherm for the 'Paralana' project to demonstrate a robust geothermal heat exchanger;

\$90 million to Geodynamics for a 25 megawatt demonstration project in the Cooper Basin, South Australia and \$7 million for its Hunter Valley project;

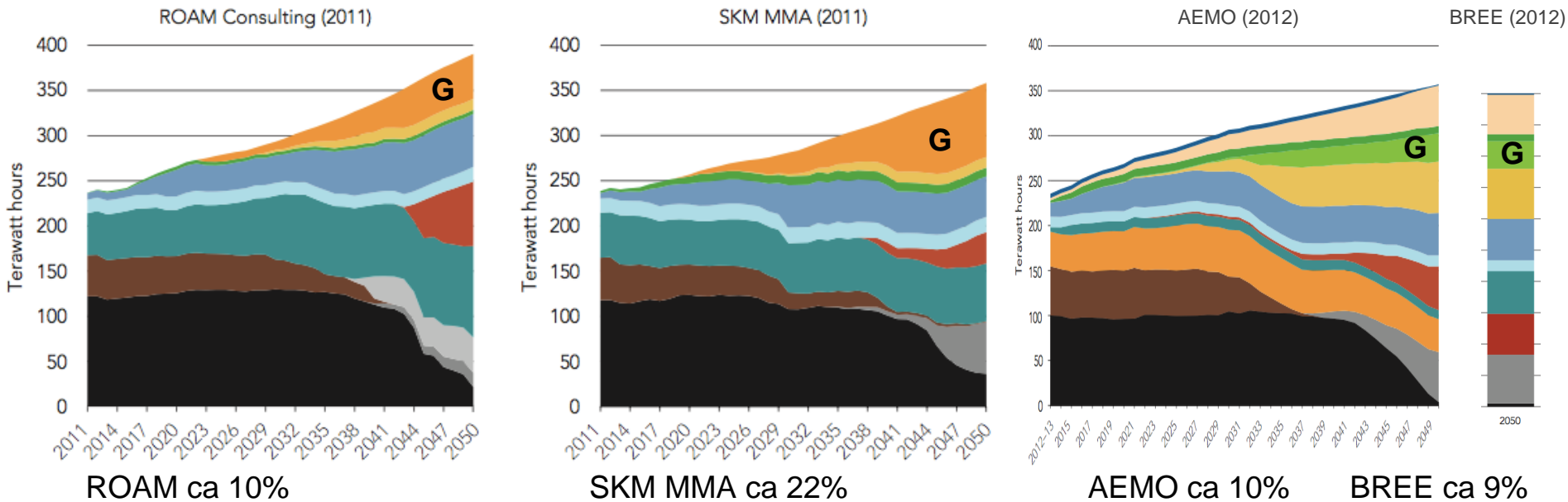
\$62.8 million MNGI/Petratherm project to develop a 30 megawatt demonstration power station.



## 5. Finance and risk for geothermal



# Geothermal in Australia's 2050 energy mix?



The graphs on this slide show a range of energy forecasts to 2050.

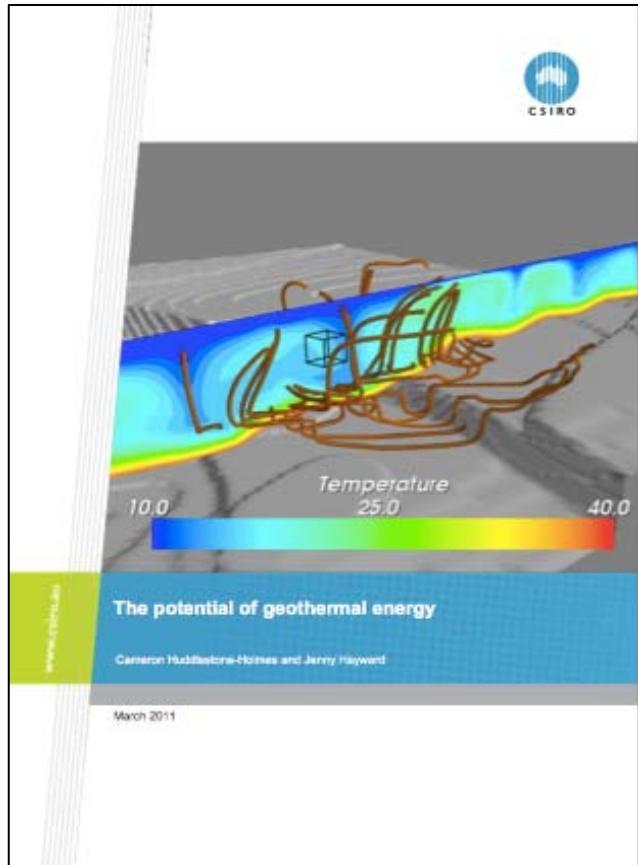
Source: Energy White Paper 2012 Figures 3.7 , 3.8 and 6.1.

**But only if everything comes together!**





# Uncertainties in Australian Geothermal



$$MW \approx c_p \times F \times \Delta T \times \eta - P$$

	EGS	HSA Power	HSA Direct Use
$C_{\text{drill}}$	High, Uncertain	Med	Low
$C_{\text{BOP}}$	Med - High	Med - High	Low
$C_p$	~ Constant	~ Constant	~ Constant
$F$	Low, Uncertain	High, Uncertain	High, Uncertain
$\Delta T$	High, Uncertain	Med, Uncertain	Med, Uncertain
$\eta$	Poor	Very Poor	High
$P^\#$	High, Uncertain	Med, Uncertain	Med - Low

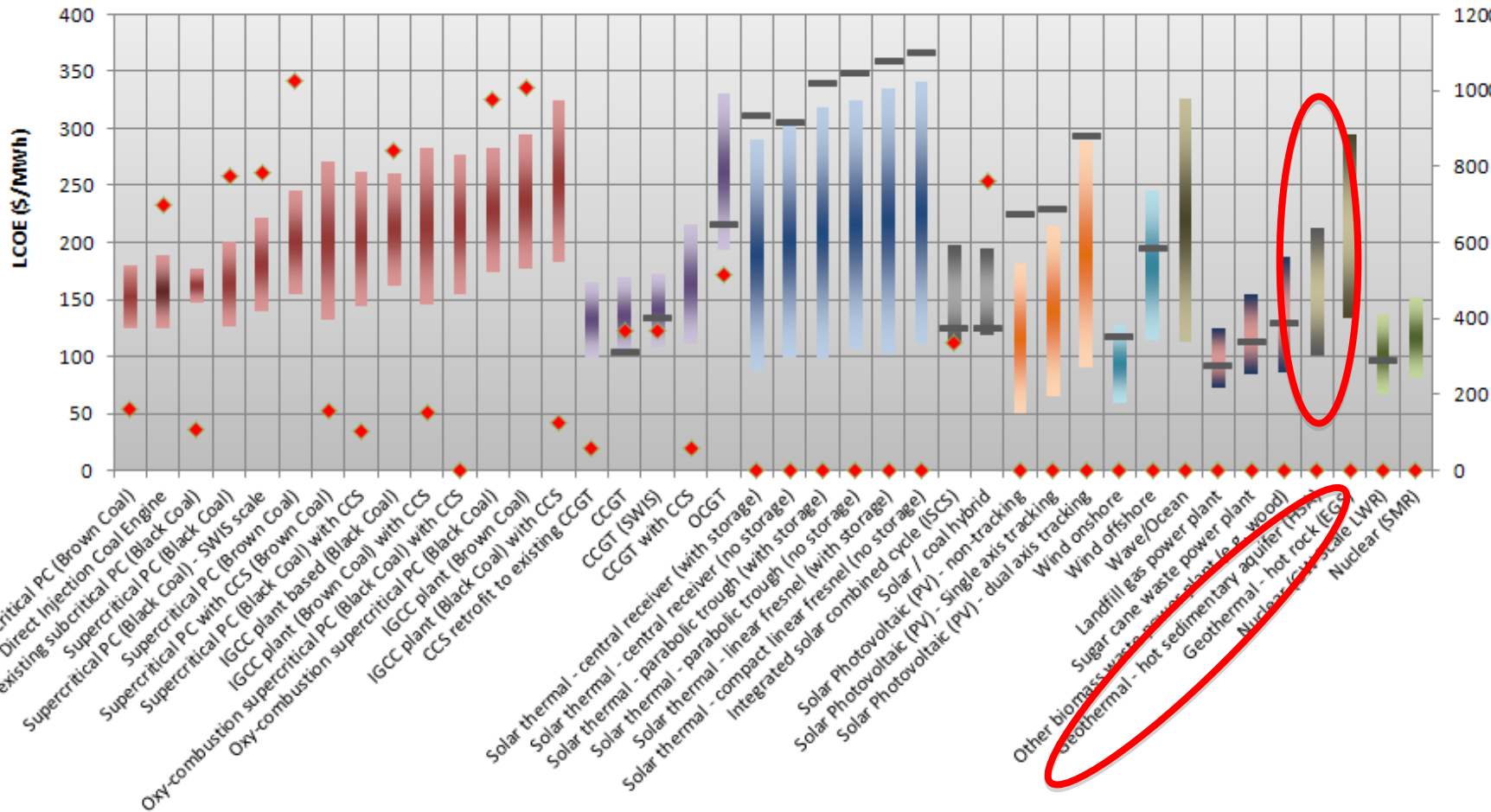
This slide includes a formula to calculate the electricity produced using geothermal energy technologies and a table showing a range of variables that affect the costs of geothermal energy including Enhanced Geothermal Systems (EGS) and Hot Sedimentary Aquifers (HSA).

Source: CSIRO The Potential for geothermal energy



# Levelised Energy Costs in 2030

kgCO<sub>2</sub>e/MWh



# Where to next?

- **ARENA and our 6 projects have much good work ahead of us.**
- ARENA is not planning to be funding a Multi Well Exploration Program as put forward by AGEA.
- There is much work to be done in:
  - Establishing pathways to commercialisation
  - Researching way to de-risk resource characterisation without drilling wells
  - Researching ways to de-risk downhole engineering and surface engineering without building plant.
  - Understanding resource depletion/decline from other overseas projects
  - Collaboration with overseas research
- **ARENA is interested in hearing proposals from industry that show a good understanding of the balance of risk versus opportunity.**



## 5. Summary



# Summary

- ◆ ARENA's General Funding Strategy and Investment Plan have now been published.
- ◆ We are focussing on themes and outcomes rather than technologies per se.
- ◆ ARENA can be a key to unlocking commercial financing
- ◆ Very commercially minded – Very technically aware
- ◆ Flexible, responsive and open for business
- ◆ We're interested in your views

