



Australian Government  
Australian Renewable  
Energy Agency

# Renewable energy technology and the future; driving the long-term transformation to a clean energy technology economy in Queensland

## Queensland Energy 2013



20 February 2013

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

# Summary

- The Australian Renewable Energy Landscape
- Policy drivers
- Price and non-price barriers and challenges to build investor confidence
- ARENA strategy and investment plan
- Opportunities through ARENA
  - Building skills and capacity
  - Driving renewable energy deployment in regional and remote locations
- Investment highlights in Queensland

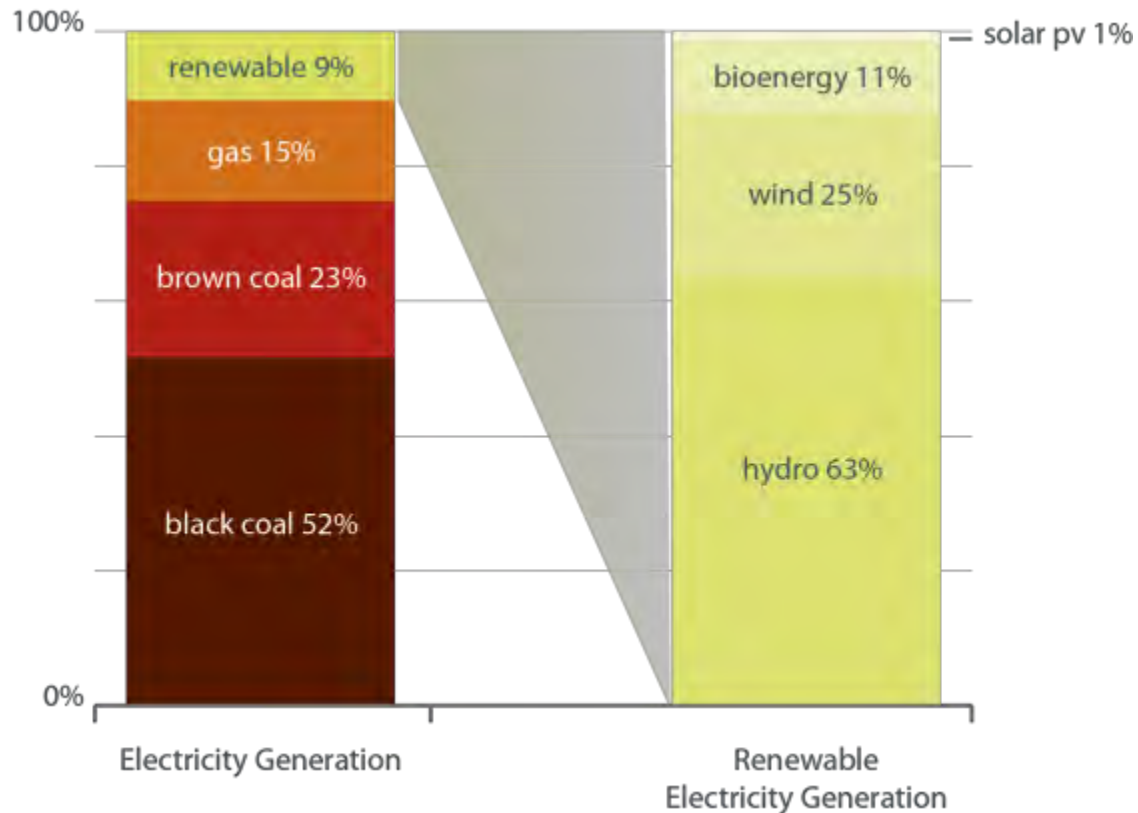


# 1. The Australian Renewable Energy Landscape



# Renewables in Australia's energy mix

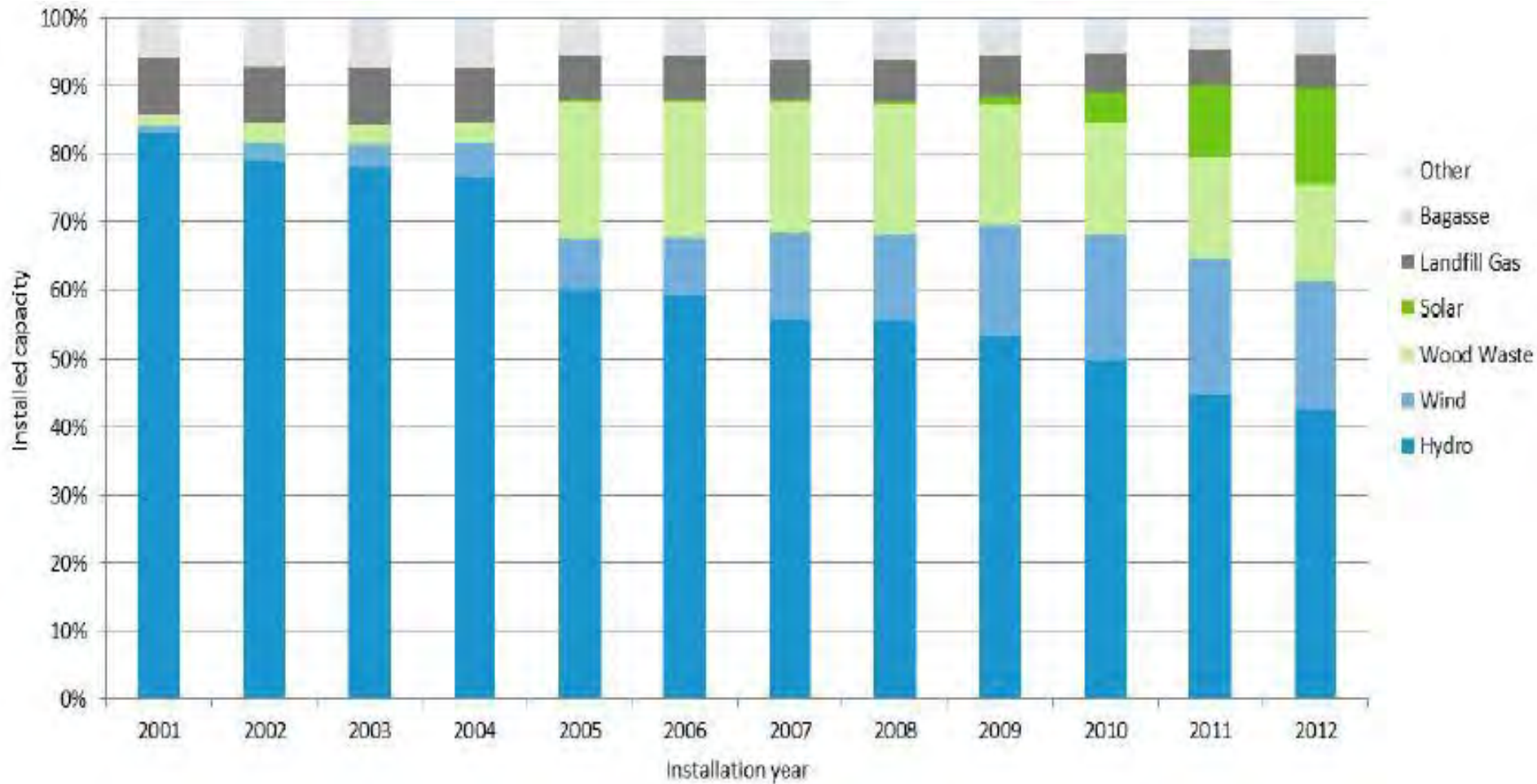
## Australian Electricity Generation 2009-10



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



# Australia's renewable energy mix



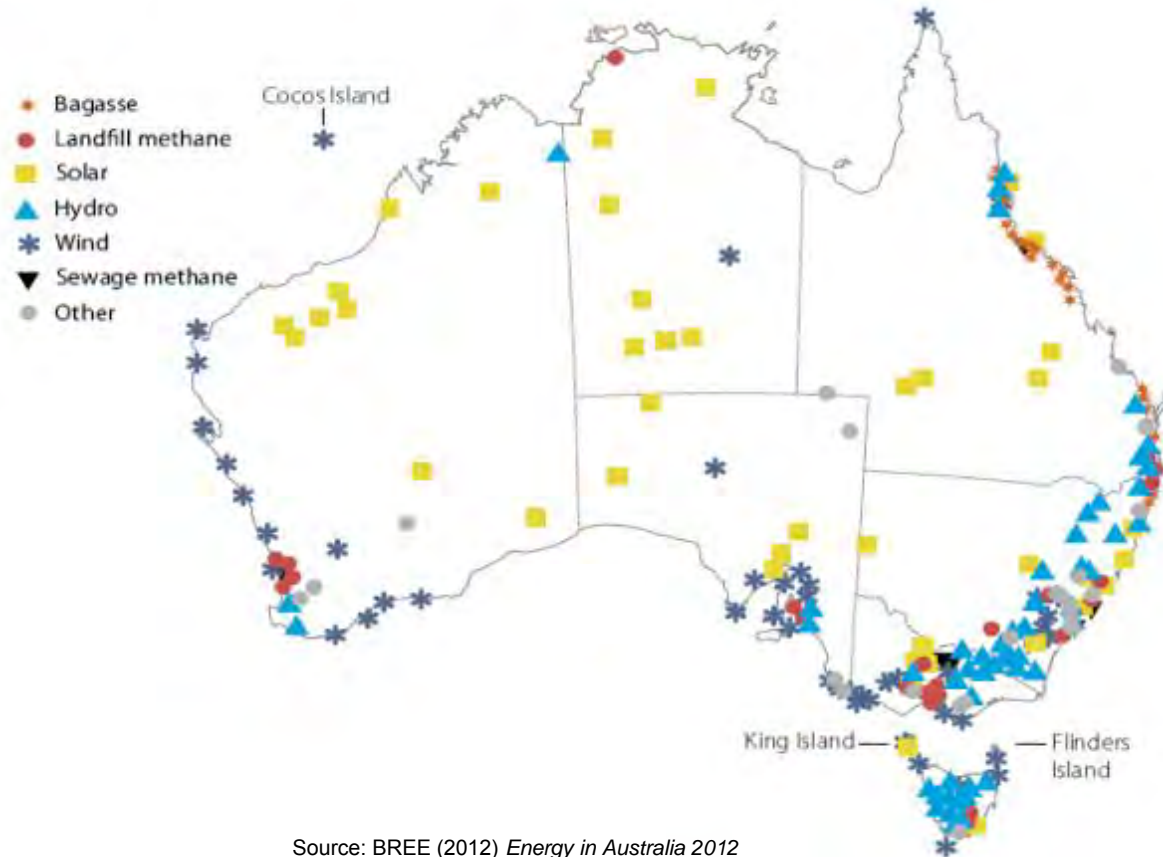
Source: CCA Discussion Paper Oct 2012



Australian Government  
Australian Renewable  
Energy Agency

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

# Location of renewable energy capacity



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



# Capacity of renewable energy generation in Australia (in 2010)

	Hydro	Wind	Bioenergy	Solar PV <sup>a</sup>	Solar thermal	Geothermal	Wave	Total
	MW	MW	MW	MW	MW	MW	MW	MW
NSW	4 677	234	166	328	3	0	0	5 408
Tas	2 316	142	5	8	0	0	0	2 471
Vic	803	432	113	152	0	0	0.2	1 500
Qld	669	12	429	256	0	0.1	0	1 366
SA	4 115	1	20	130	0	0	0	1 305
WA	30	204	33	141	0	0	0.1	408
ACT	1	0	4	19	0	0	0	25
NT	0	0	1	6	0	0	0	7
<b>Australia</b>	<b>8 501</b>	<b>2 175</b>	<b>772</b>	<b>1 041</b>	<b>3</b>	<b>0.1</b>	<b>0.3</b>	<b>12 492</b>

<sup>a</sup> Includes small-scale Solar PV.





# Towards secure, reliable and cost-effective supply in Qld- the framework

## Potential medium-term and long-term objectives

Customer

Encourage equitable access to secure, reliable, cost-effective and sustainable electricity supply for Queenslanders to meet their economic and lifestyle requirements.

Empower the customer with greater control, choice and cost outcomes.

Market

Facilitate a competitive market that encourages innovation to drive greater efficiencies.

Optimise private sector participation and investment in the sector over the long term.

Government

Provide a stable regulatory and policy framework that minimises unnecessary market intervention.

Support the needs of customers by ensuring adequate protections are in place, while providing equitable, targeted concession arrangements that are cost-effective for government.

Encourage environmental responsibility to mitigate any adverse effects from the electricity supply sector.

## Renewable Opportunity

PV / Wind forecast to be amongst lowest cost in 30 year time frame. Distributed generation and consumer choice opportunity.

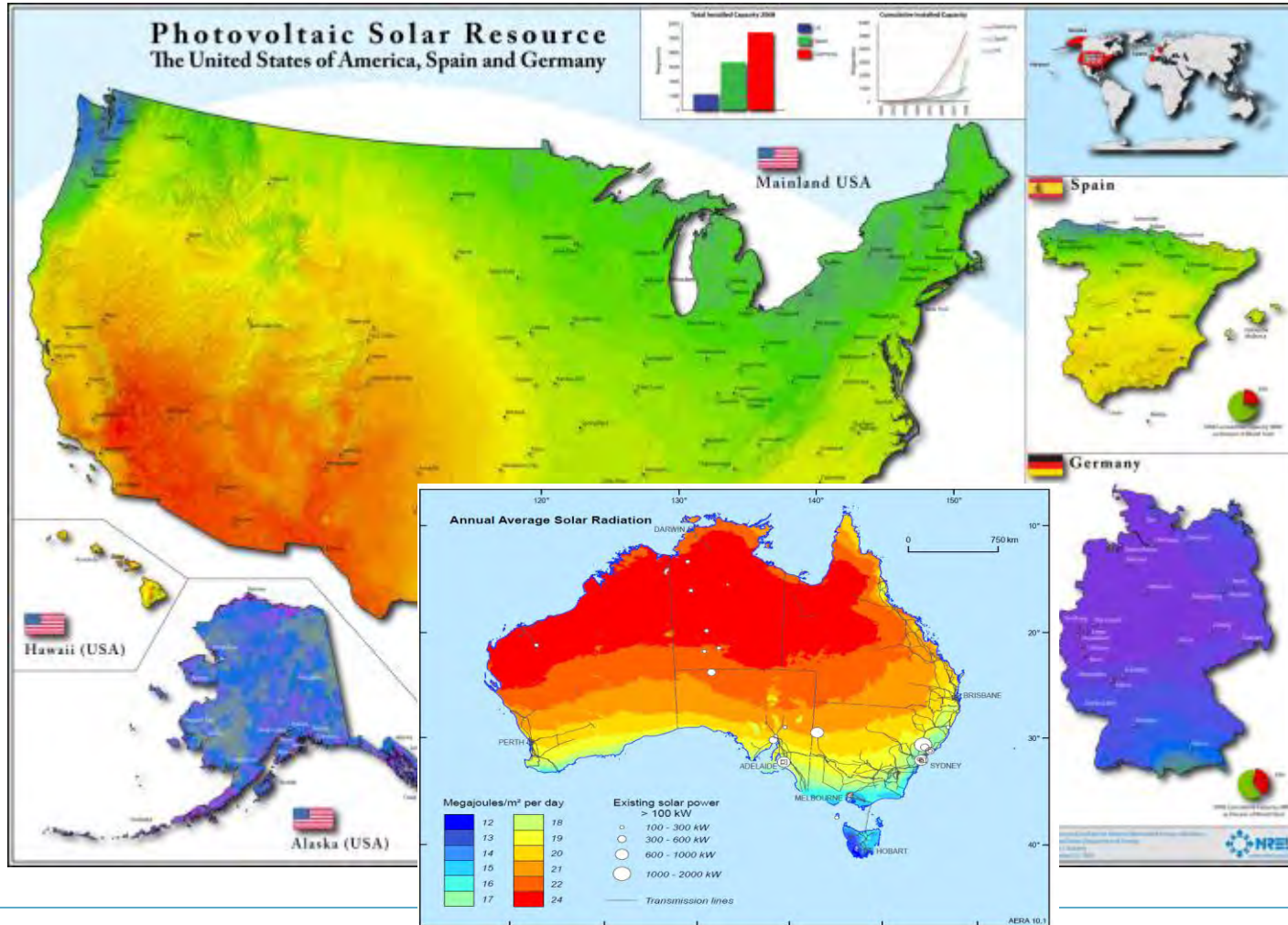
Globally private sector investor driven with high percentage of spend local to deployment.

Clean generation





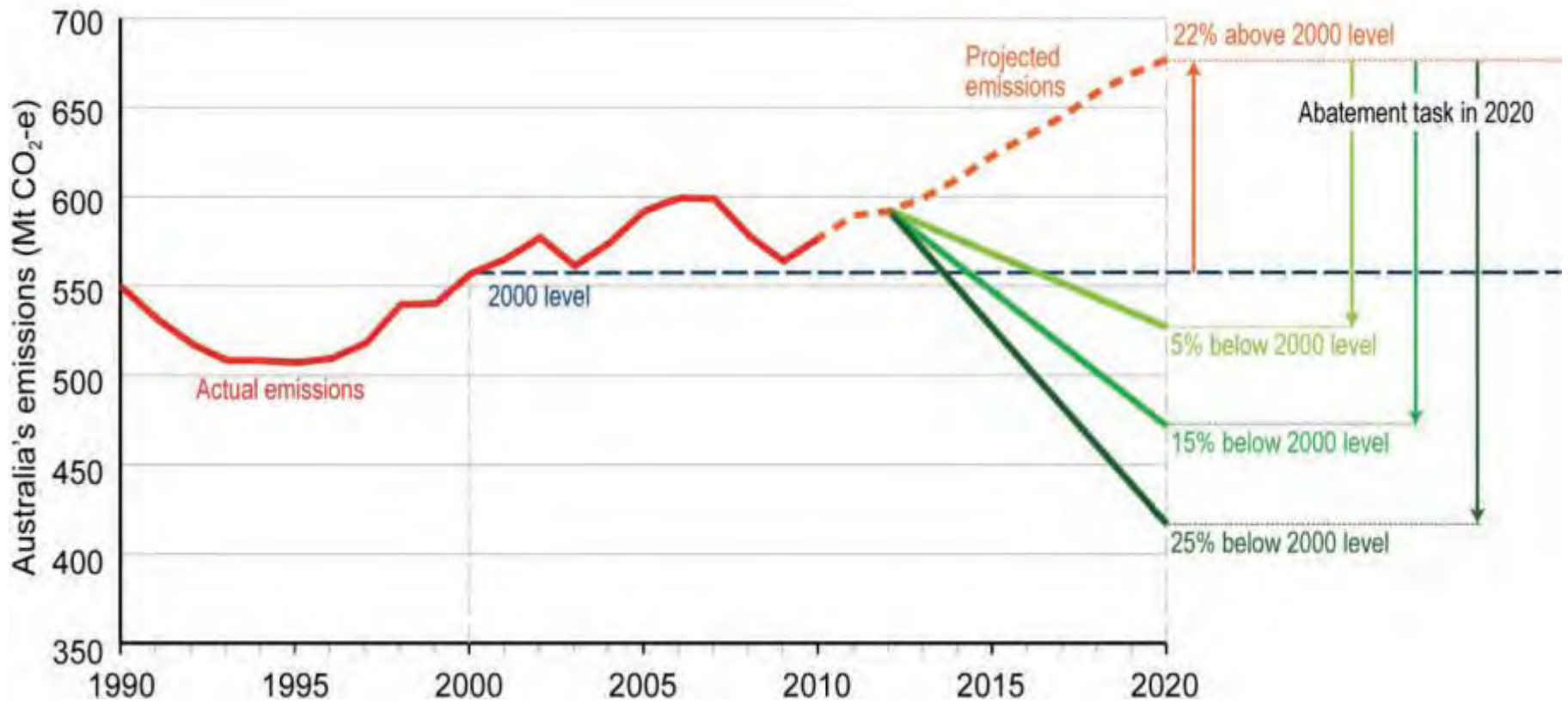
# Compared to major solar markets, Australia is sunny



## 2. Policy drivers



# Australia's targets - projected growth in emissions and the abatement challenge



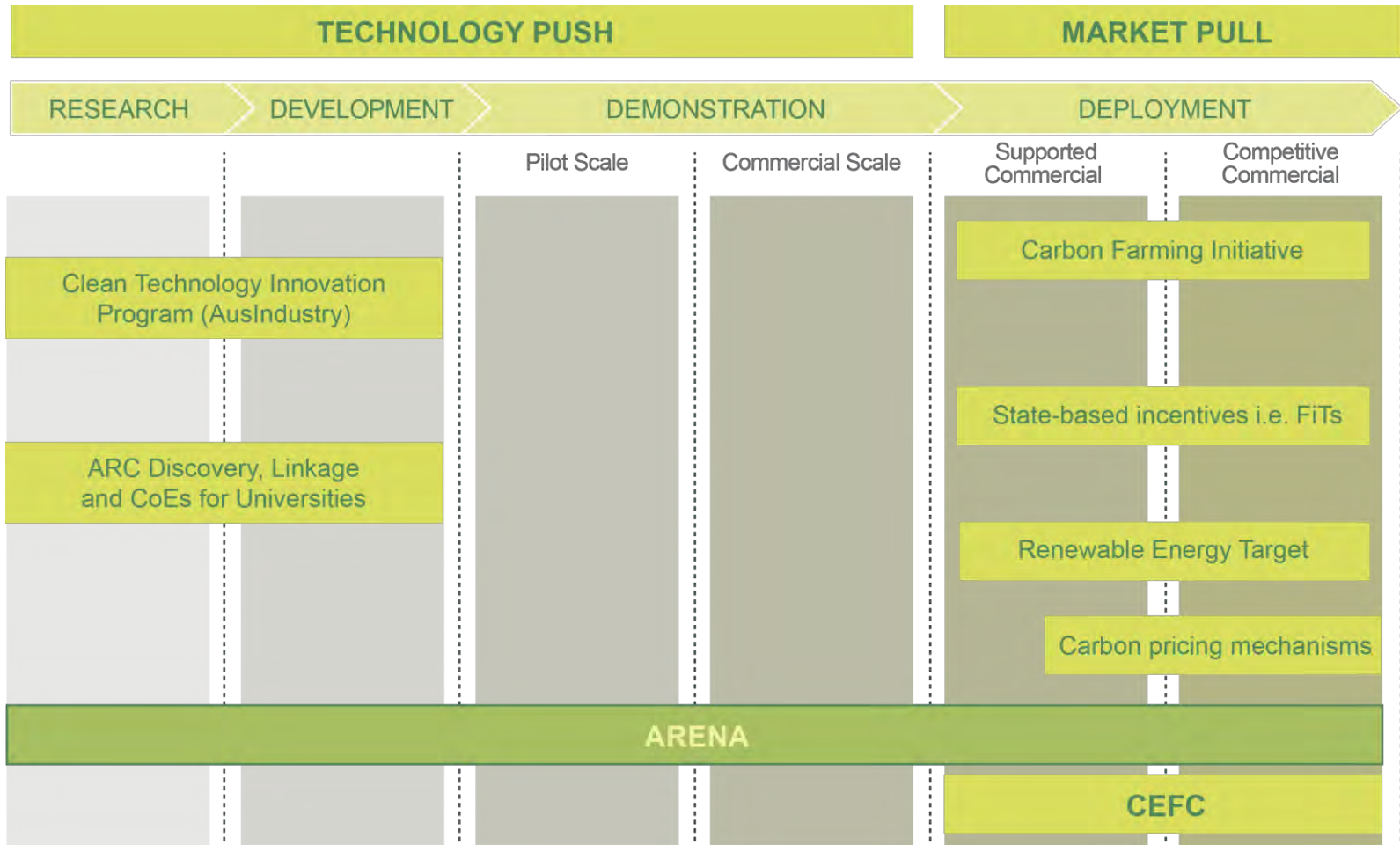
Source: Treasury modelling, 2011 (medium global action scenario)



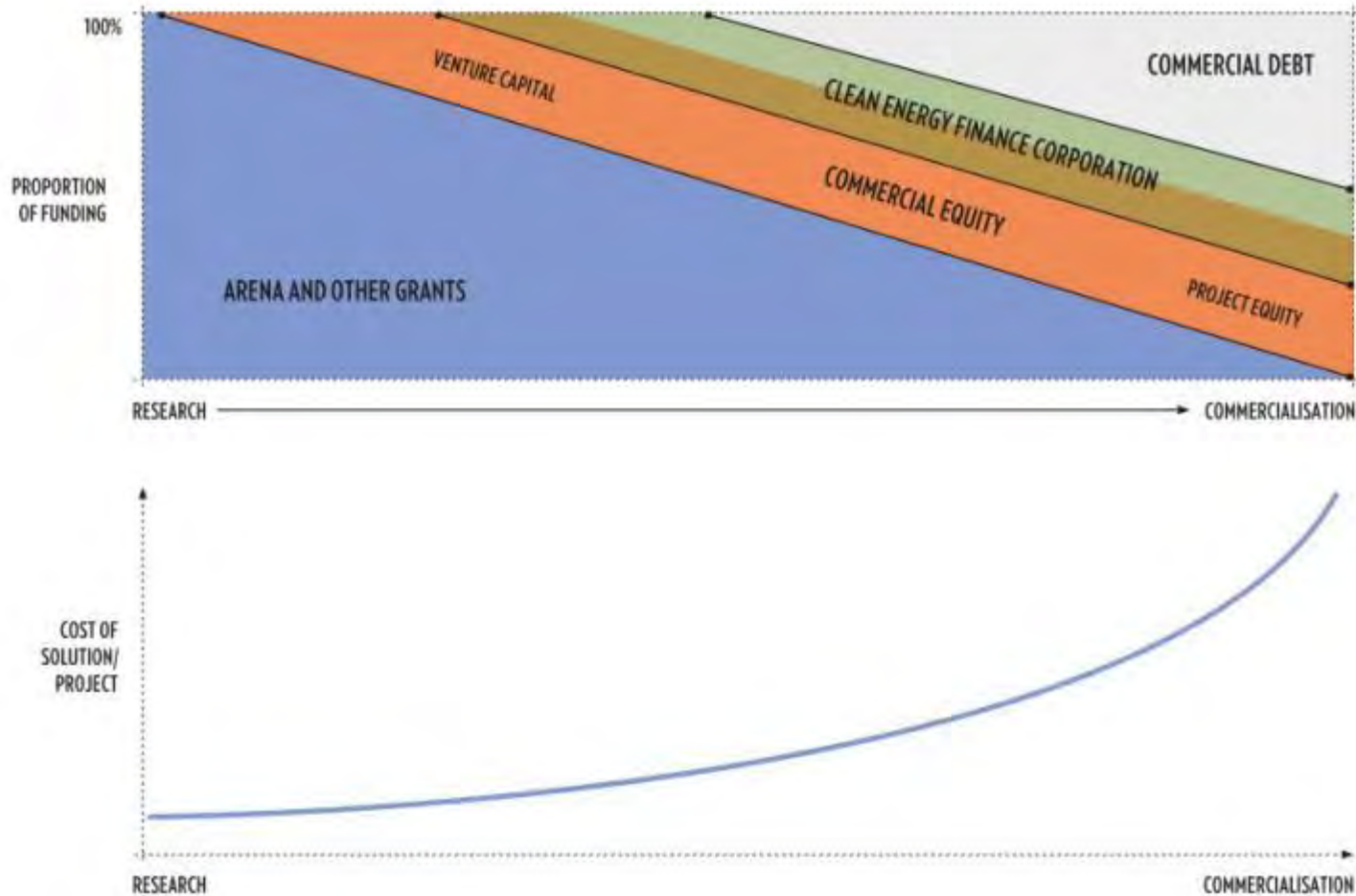
Australian Government  
Australian Renewable  
Energy Agency

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

# Australian Government support for renewable energy technology development



# Funding technology through the development process



## 4. Price and non-price barriers and challenges to build investor confidence





# Progress across the full set of costs is required to increase commercial viability and deployment

## LCOE Drivers

Finance  
Channel  
Margins

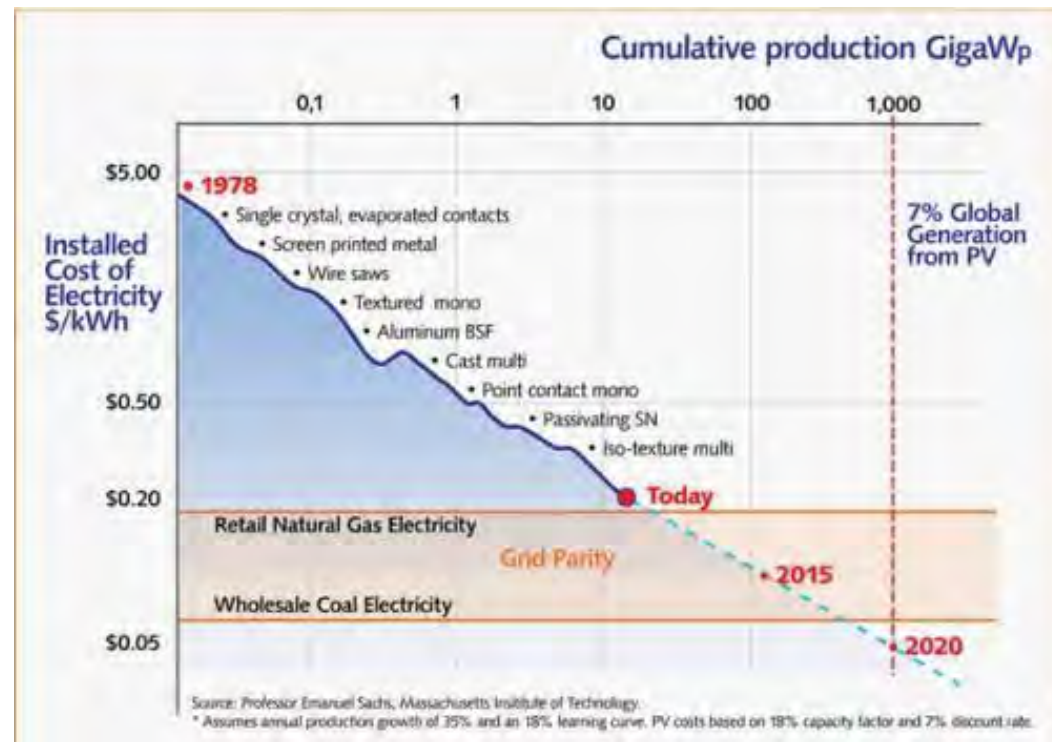
Other  
Hardware,  
Civils, Install,  
Land, O&M

Solar Device

**Local costs**  
70-80% of  
employment  
in these  
areas

**Global costs**  
Technology  
IP key value

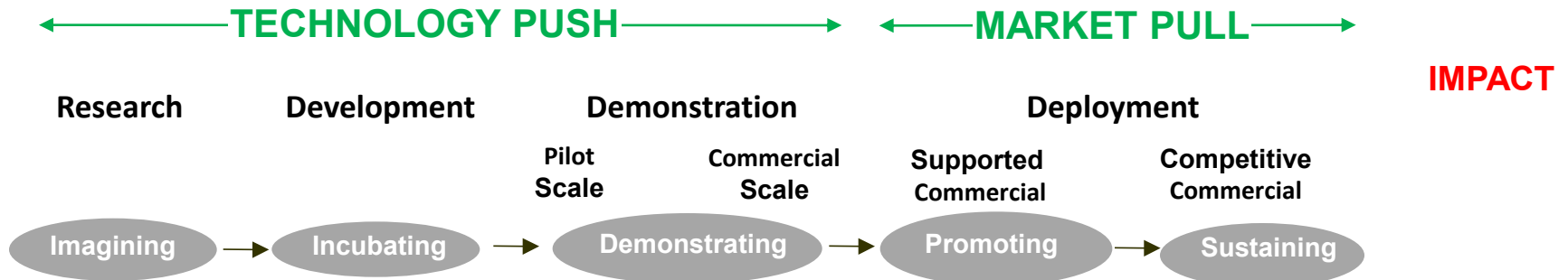
**PV LCOE now <\$200MWhr**



Australian Government  
Australian Renewable  
Energy Agency



# Innovation chain – key challenges



<u>Proving it Works</u>	<u>Securing Capital</u>	<u>Project Finance &amp; Revenue Certainty</u>
Higher Efficiency	Lower Technology Risk	Maximising NPV
Lower Cost Materials & Components	Proof of Cost Supply Chain Development	Forecasting, storage, PPA terms
Thermal & Chemical Storage	System Integration – improving capacity factors & Yields	Capturing PPA value in uncertain markets – carbon, regulation, ownership structures etc
Control Strategies – Demand side management, resource forecasting	Manufacturing Process Improvement	Cost of ownership, permitting, social acceptance, skills availability etc
	O&M track record	
	Proving cash flows	

# Unlocking the capital

## Commercial viability

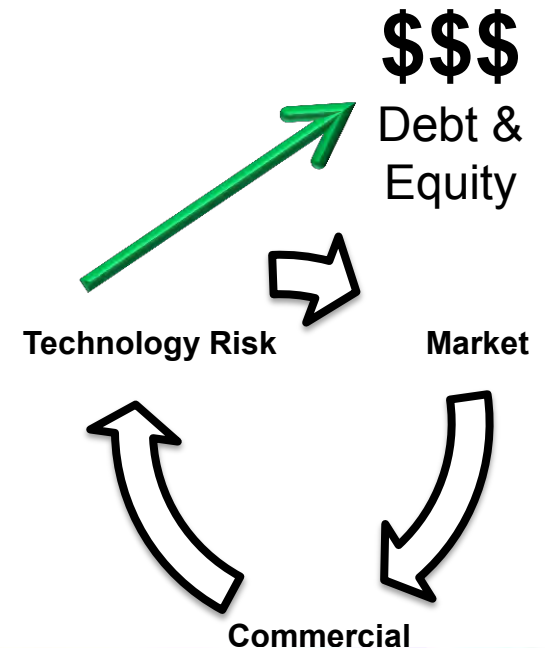
- Upfront costs vs. long-term revenues
- Highly sensitive to cost of finance
- Bankable PPAs at market value

## Technology risk (CSP)

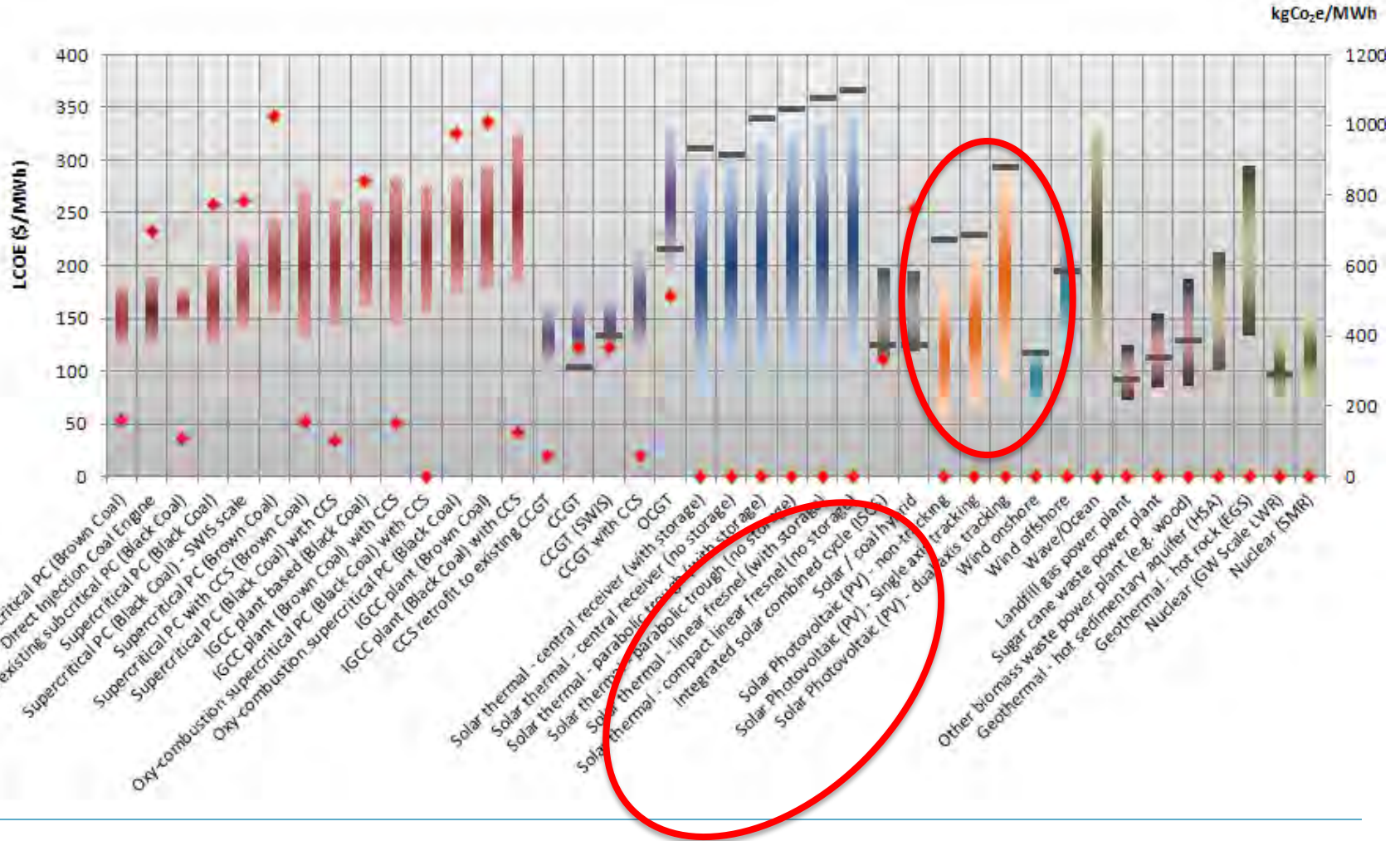
- Long-term nature of R&D
- Funding the cost of proving its “bankability”

## Market

- Policy stability
- Variation between jurisdictions
- People and skills



# Levelised energy costs in 2030

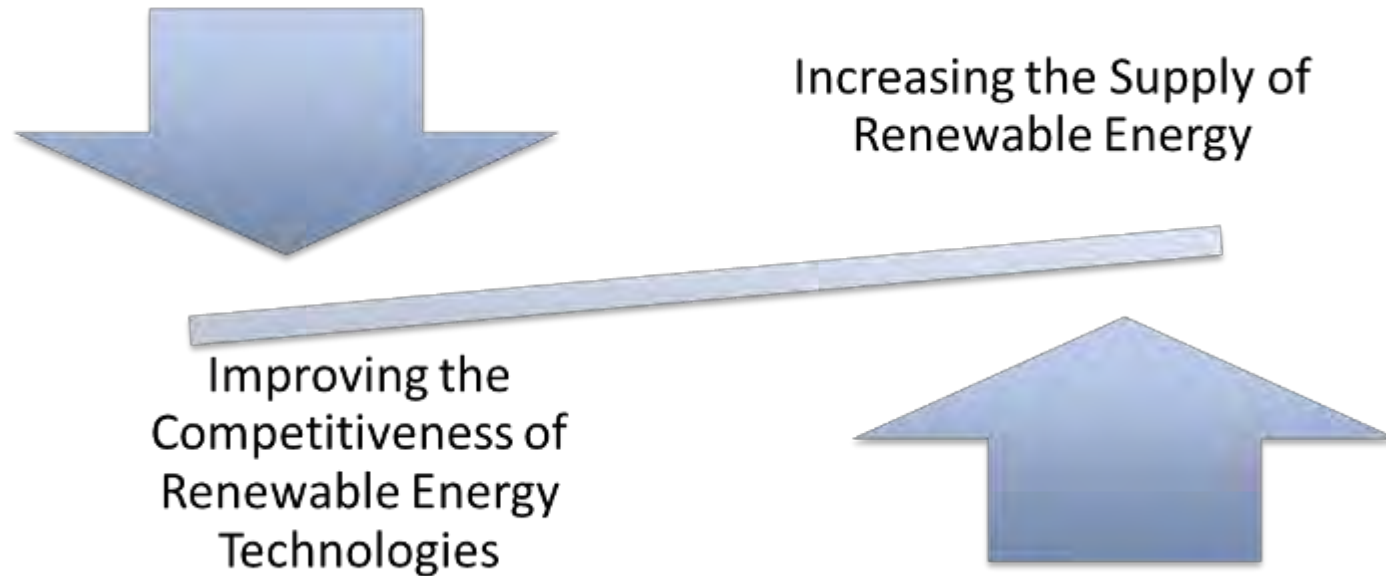


## 4. ARENA's Strategy and Investment Plan



# The basics

\$3.2 billion in funding



# 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
- 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 ERP and REVCF





## 4. Opportunities through ARENA



# Current Opportunities



Current funding opportunities through ARENA:

- \$126 million Emerging Renewables program
- \$200 million Southern Cross Renewable Energy Fund

Coming up:

- PhD Scholarships and Postdoctoral Fellowships
- Regional Australia's Renewables program



# Regional Australia's Renewables

## PROPOSED OUTCOMES



At least 50 MW of renewable energy capacity installed by 2020

2 x

10 MW or more renewable energy systems by 2018

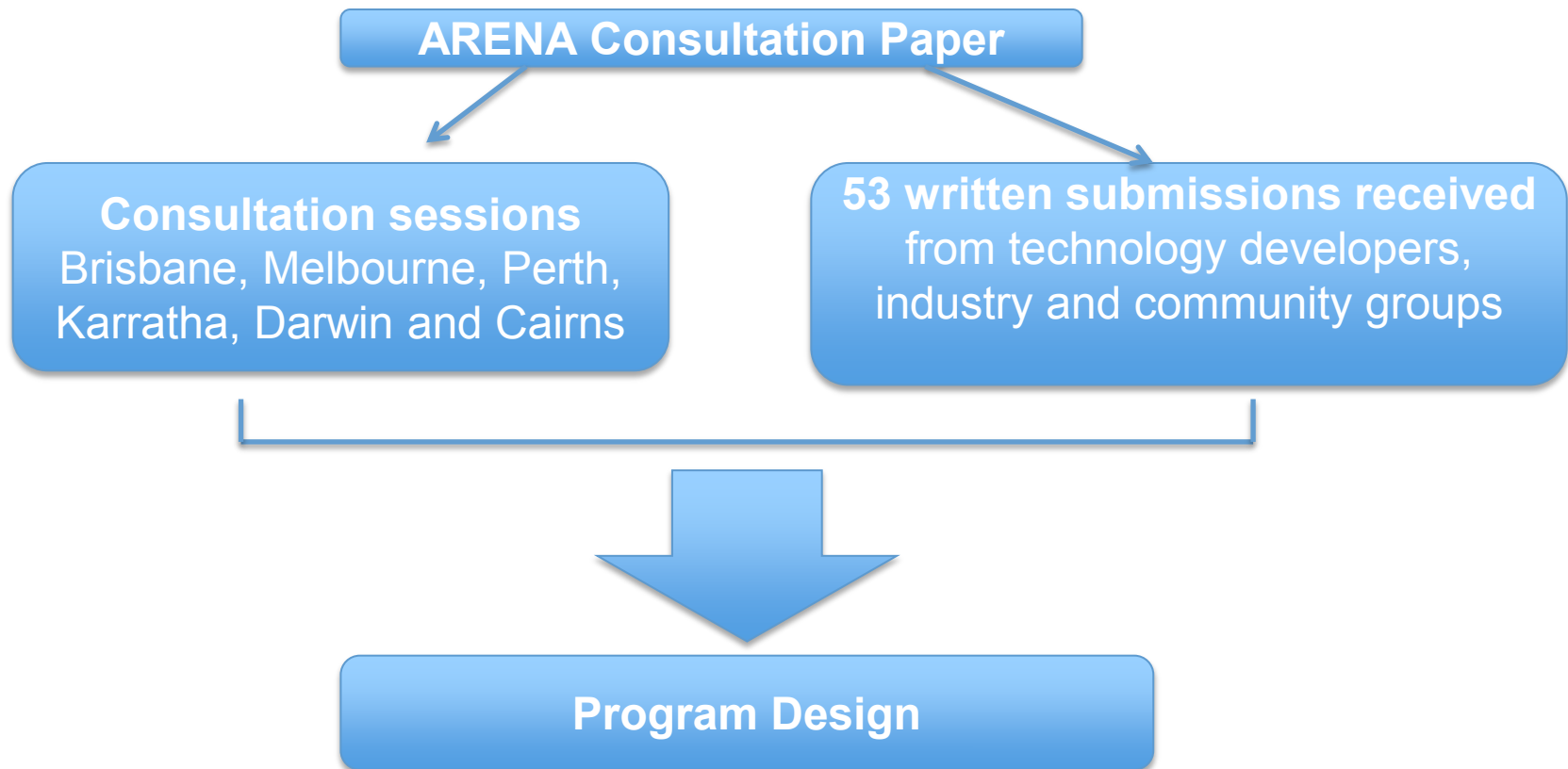


Roadblocks removed. Trained operators of renewables

	Industry	Community	Roadblocks
Size	1MW or more	100kW – 1MW	No size
Type of Support	Grants - capital / or revenue subsidy	Grants - capital subsidy	Grants – project costs
Location of projects	Off-grid or fringe-of-grid	Off-grid	Focus on - system issues, demand management, control systems, storage optimisation etc



# Regional Australia's Renewables – Consultation Process



## 5. Investment highlights



# \$650 million in investments



Australian Government  
Australian Renewable  
Energy Agency

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

# CS Energy Kogan Creek Solar Boost Project



\$34.9m funding for \$104.9m project

- The project will be the world's largest solar integration with a coal fired power station.
- 44 MW solar thermal addition to the existing 750MW Kogan Creek Power Station in South West Queensland.
- AREVA Solar's CLFR technology.
- 30 hectare solar field.
- Operational in 2013.



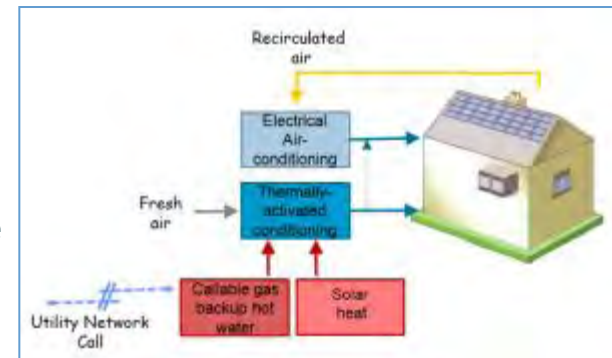
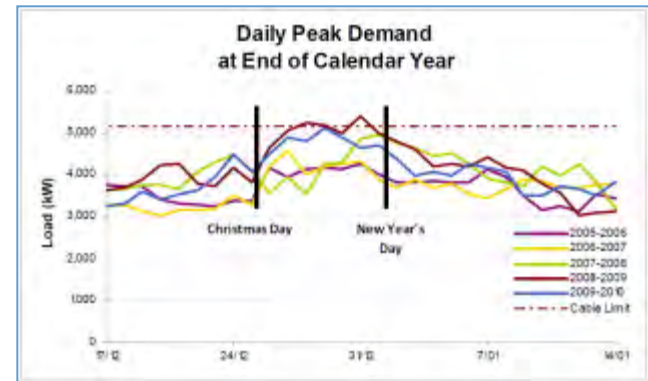


# Solar Energy Management (SEM) system for utilities

CSIRO, Ergon Energy, GWA Group  
\$0.2m funding for \$0.6m project

Combines CSIRO's thermally-driven residential desiccant solar cooling technology with a novel SEM system and natural gas-powered back-up to reduce peak electrical consumption from the grid with certainty while providing continuous operation of air-conditioning.

The SEM technology will be tested in 3 residential buildings to verify its ability to address grid stability issues and test customer acceptance as “winx3” for the consumers and utilities.



# Increasing the skills and capacity of the solar sector

- ARENA supports 50 PhD Scholars and Postdoctoral Fellows at universities across Australia
- Supporting a career pathway for the next generation of solar leaders
- Building the capacity of the solar sector for Australia to maintain its global leadership position in the R&D space
- Dr Xiaojing Hao says her Postdoctoral Fellowship has allowed her to take a lead role in setting up a new group at UNSW dedicated to developing terrawatt level applications of PV using CZTS thin film solar cells



# Summary

- Market drivers for renewable deployment maturing.
- Technology globally and locally progressing through the commercialisation process.
- Opportunities in the near term in Regional Australia.
- ARENA Funding strategy in place with programs open and under development.

