



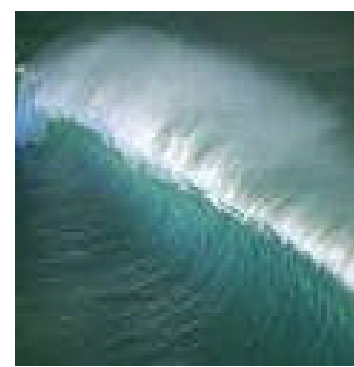
Renewable Energy – An Australian Perspective

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- Introduction
- Market overview
- Policy overview
- Key barriers and opportunities
- Technology overview and challenges



- KPMG is one of the **leading financial advisers** to the Australian energy sector, having advised on over \$40 billion of energy deals over the past decade
- KPMG in Australia has a **dedicated Renewables group**
- Comprises **renewables-focused professionals** providing **Innovative advisory services**, focusing on:
 - Project and corporate advisory
 - Inbound and outbound opportunities
 - Government advisory
- KPMG has a **Global Renewables Network**



- Australia has **world class** wind, solar, hydro, geothermal, and ocean resources
- However, currently **not a top 10** global player in renewables
- Renewables generation capacity of 11GW or 5% of total capacity (but 40% 5-year growth rate is **#3 in G20 countries**)
- 75% of total renewables capacity comes from **Hydro** – wind is growing significantly
- \$1b total renewables investment in 2009 – **ranking #14 in G20**

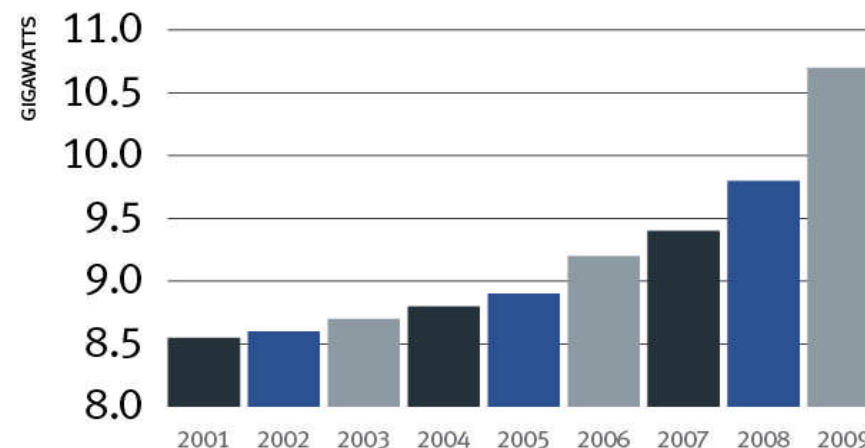


FIGURE 3. TOP 10 IN FIVE-YEAR GROWTH IN INSTALLED CAPACITY

South Korea	249%
China	79%
Australia	40%
France	31%
India	31%
United Kingdom	30%
Turkey	30%
United States	24%
Canada	18%
Rest of EU-27	17%

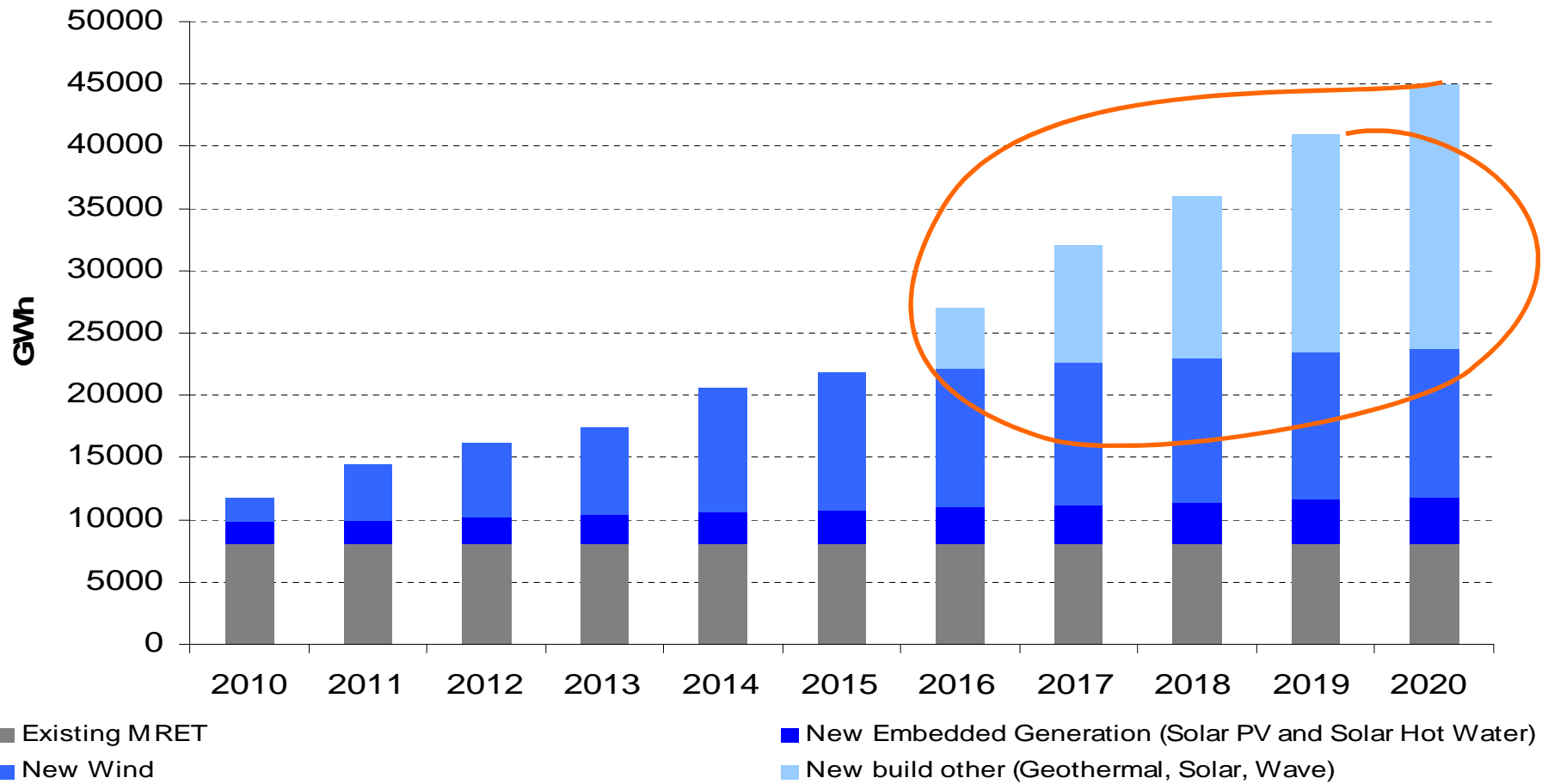
Market overview (2)

FUEL SOURCE	INSTALLED CAPACITY (MW)	NUMBER OF PROJECTS	PERCENTAGE
Hydro	8186	113	77 %
Wind	1668	48	16 %
Biomass:			
– <i>Bagasse Cogeneration</i>	474	29	4.5%
– <i>Black Liquor</i>	77	3	0.7%
– <i>Crop Waste</i>	1.5	1	0.01%
– <i>Food and Agricultural Wet Waste</i>	4	2	0.04%
– <i>Landfill Gas</i>	163	69	1.5%
– <i>Sewage Gas</i>	37	18	0.35%
– <i>Wood Waste</i>	9	3	0.08%
Bioenergy Sub-Total	765.5	125	7.2%
Large Scale Solar PV & Solar Thermal	9	17	0.08%
Wave	0.5	1	0.005%
Geothermal	0.1	1	0.001%
Renewable total:	10,629	305	100%

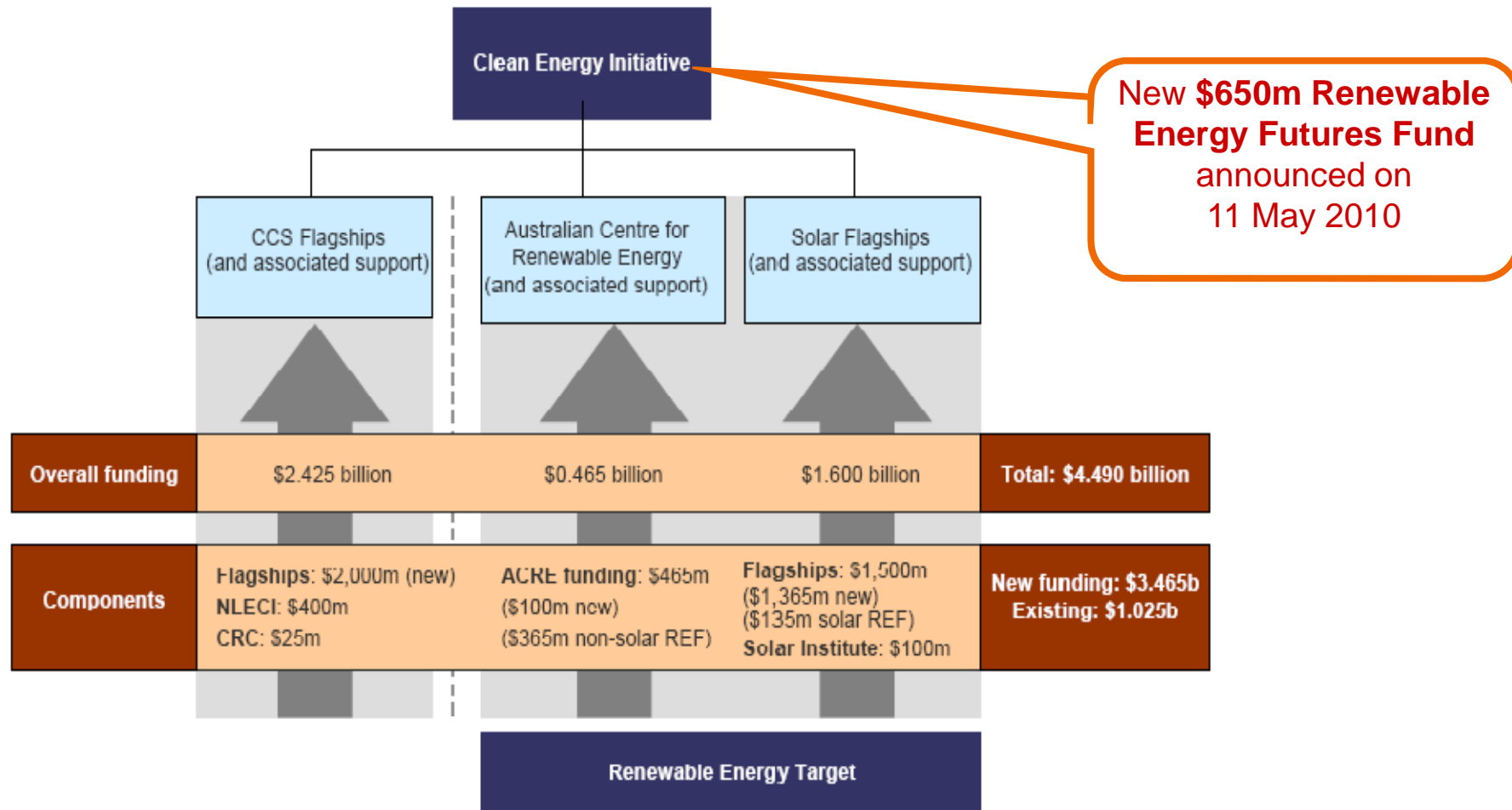
- Renewables **development has lagged** due to abundance of coal, low electricity prices, unsupportive government policy, lack of focus and general inertia
- However, the market is changing and Australia is **increasingly becoming an attractive** investment candidate for renewable energy projects owing to:
 - the quality of our resources
 - the early stage of industry development
 - improving regulatory/policy environment
 - minimal jurisdiction risk
 - increasing electricity prices

- Australia is **traditionally a very attractive investment destination**, in part due to political stability and low sovereign risk
- Government policy is **increasingly focusing** on renewables
- From 1 January 2011 the **Renewable Energy Target (RET) guarantees 20%** of Australia's energy (41,000GWh) in 2020 will come from renewable sources
- However, the **Emissions Trading Scheme** ("Carbon Pollution Reduction Scheme") is now delayed (to 2013?) which has caused further uncertainty in the market
- **Direct action funding provided** in May 2010 budget – further \$650m funding available
- Other programs exist but there is still a long way to go – **optimal policy regime** not yet designed

● Meeting RET requires **significant geothermal, solar, wave**



- A range of grant programs – eg the Climate Energy Initiative – have been implemented



Key barriers

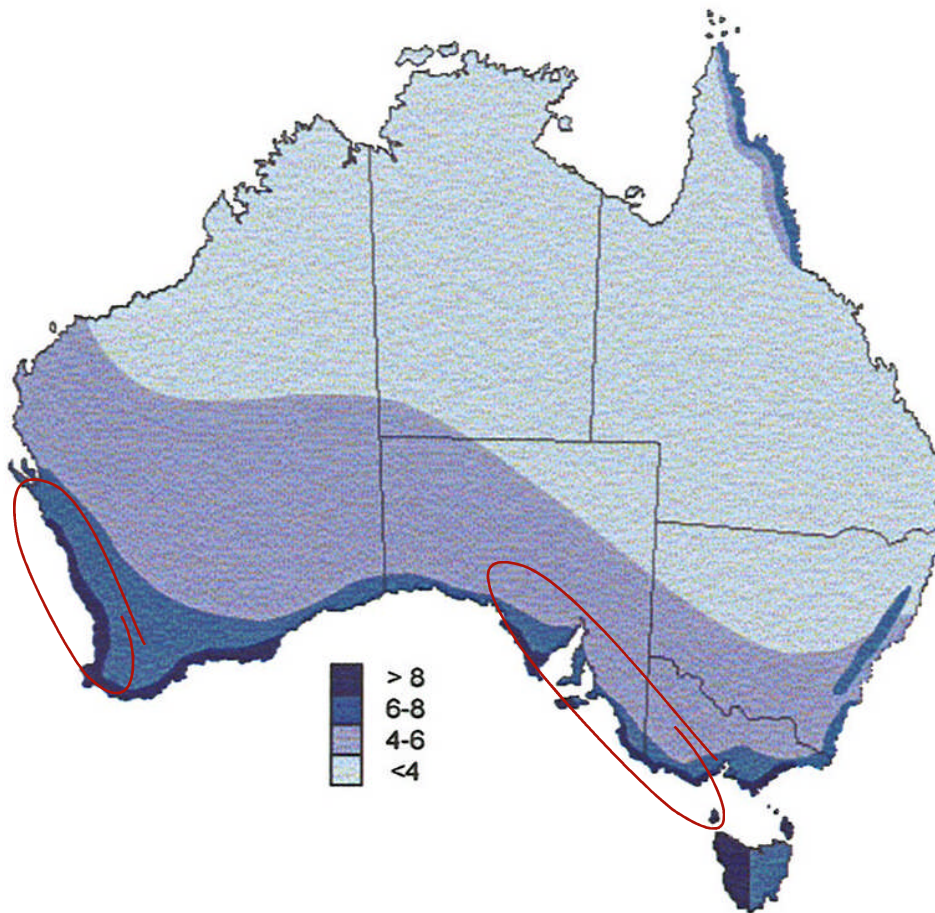
- Australia not significantly impacted by the GFC, but **access to debt and equity** is an issue for all infrastructure - in particular renewables (perceived as higher risk) - projects
- **RET price still very low** - Large scale renewable energy developers rely on long-term fixed price REC contracts to underpin investment decisions and financing
- Continued **uncertainty around ETS legislation**
- **Transmission challenges** – eg distances, aged assets, congestion
- Securing **long-term PPAs** is very difficult
- Australian **banks are yet to finance large scale projects** other than wind and therefore lack knowledge and understanding

But momentum is building...

- Despite a difficult lending environment, there remains **strong interest in financing** renewable projects in lower risk sectors
- Strong **appetite for wind**, given low construction risk and stable long-term revenues
- Growing **R&D capabilities**, particular in solar and geothermal
- **Excellent test bed** for projects given strength of resource base
- Ready **access to Asian markets** – inbound and outbound
- Lending environment reasonable – **strong banking system**
- **Policy regime** is slowly improving and there is **economic stability**
- The **long-term opportunity** in Australia is significant: **\$30-40 Billion required** in investment over the next 10 years to meet legislated RET

Wind energy (1)

- Australia has some of the **world's best wind resources** in the south with capacity factors in excess of 30% not uncommon



Australian wind projects – status as at October 2009

Stage of development	Operating	Proposed	Under construction
No. of projects	51	159	6
Capacity (MW)	1,819	14,232	579

Source: ABARE.

- Currently **17% of all renewables capacity**
- Australia's **geography is particularly suitable** to wind energy generation with nearly 200,000 square kilometres of land which can be utilised for wind farms
- Wind energy is the **fastest growing renewable energy source**, although its current share of total energy generation is less than 2%
- **Capacity has doubled** in two years to more than 1,800MW
- The majority of the operational capacity is located in **South Australia**; however around half of the capacity under development is in Victoria
- Currently **51 operating wind farms**
- **No offshore projects** and no real incentive in the short-term given available land mass

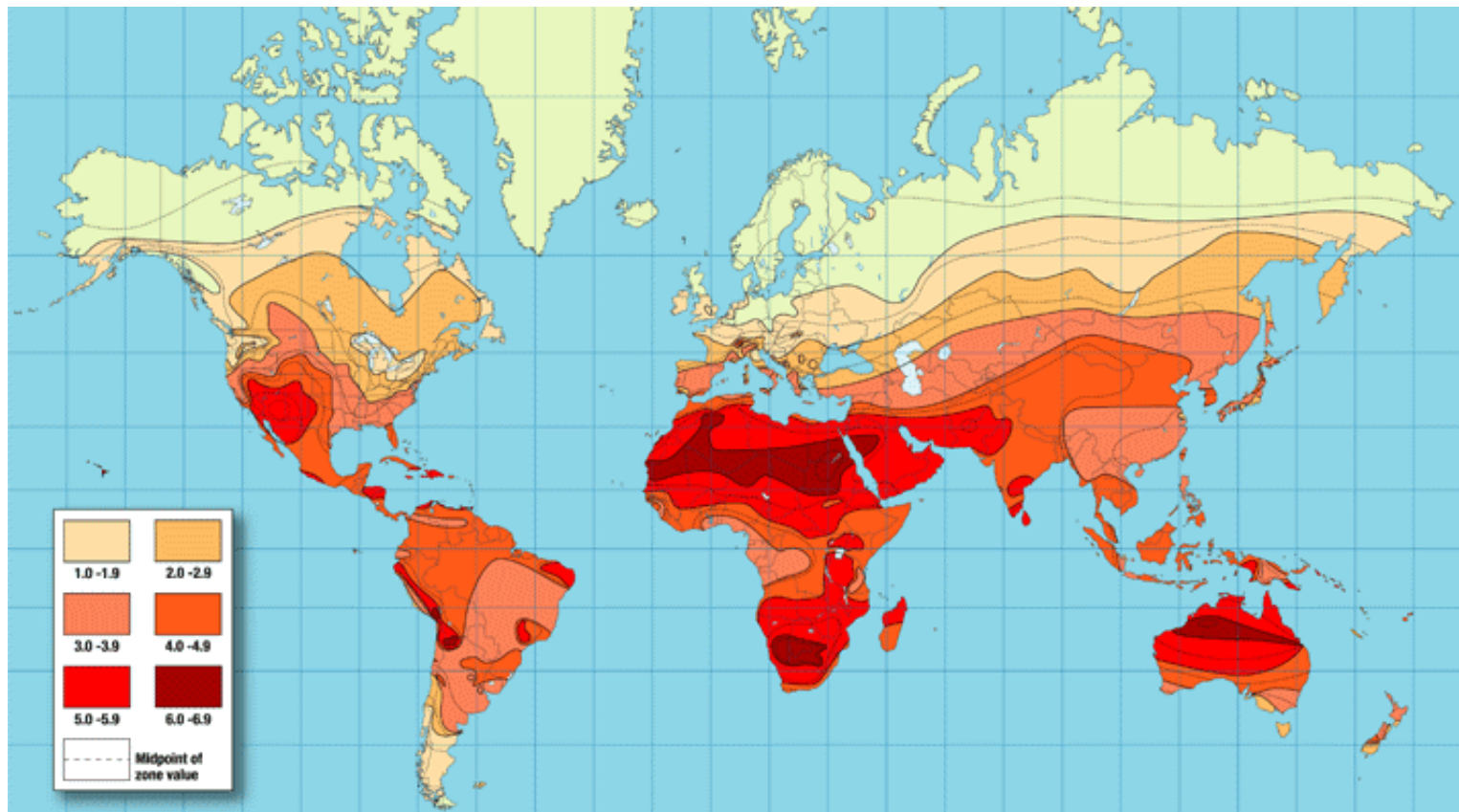
- Wind energy is an **increasingly cost-competitive** using proven technology
- However wind projects in Australia are not without their **challenges**, including:
 - Grid integration and transmission infrastructure
 - Social, environmental, policy and finance issues
- The **best wind sites are already taken** in Tasmania, SA and WA
- A number of good wind sites are in remote locations requiring **investment in transmission**



Starfish Hill Wind Farm, SA

Solar energy (1)

- Australia has the **highest average solar radiation** per square metre of any continent in the world, yet its solar potential remains untapped



- Currently **7% of all renewables capacity**
- Installations to date are **mainly small direct-use** application such as water heating
- Currently 145MW of installed capacity from Solar PV – **increasing rapidly**
- **No large-scale plants >4MW** - however, **potential is vast.....**
- **\$1.5 billion Solar Flagships program** underway to help fund the development of four (2 x PV and 2 x thermal) large-scale plants to an overall total of 1,000MW
- Has created **significant interest from global players** in the market
- Short-listed consortiums announced 11 May 2010
- Various other incentives for R&D

- **Still not proven** technically or commercially in Australia
- **Competing against wind**, and at some point geothermal (base load)
- Access to **debt and equity funding**
- **Transmission** and location of supply
- Obtaining **PPAs**
- **Lack of EPC expertise** specific to solar
- **No Federal feed-in tariff**

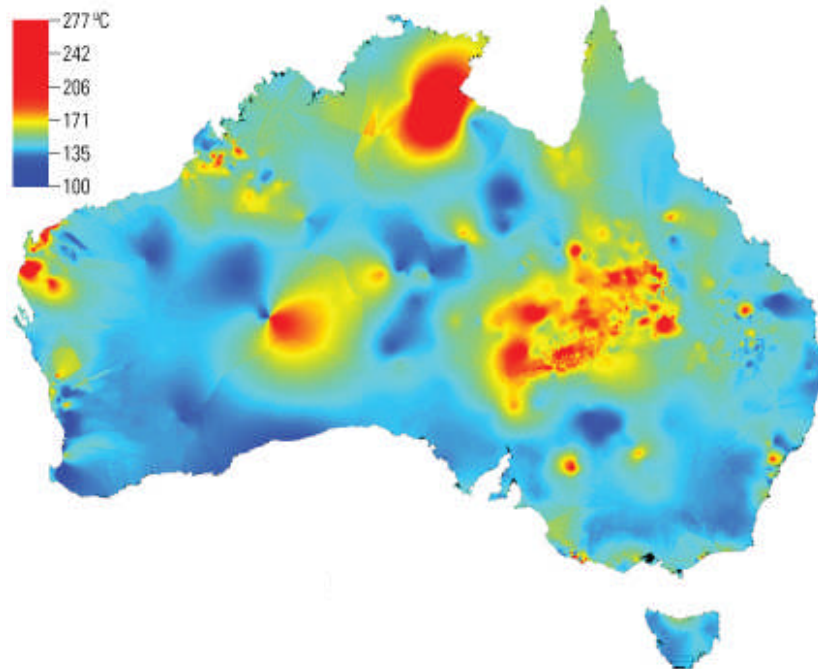


Liddell Power Station, NSW

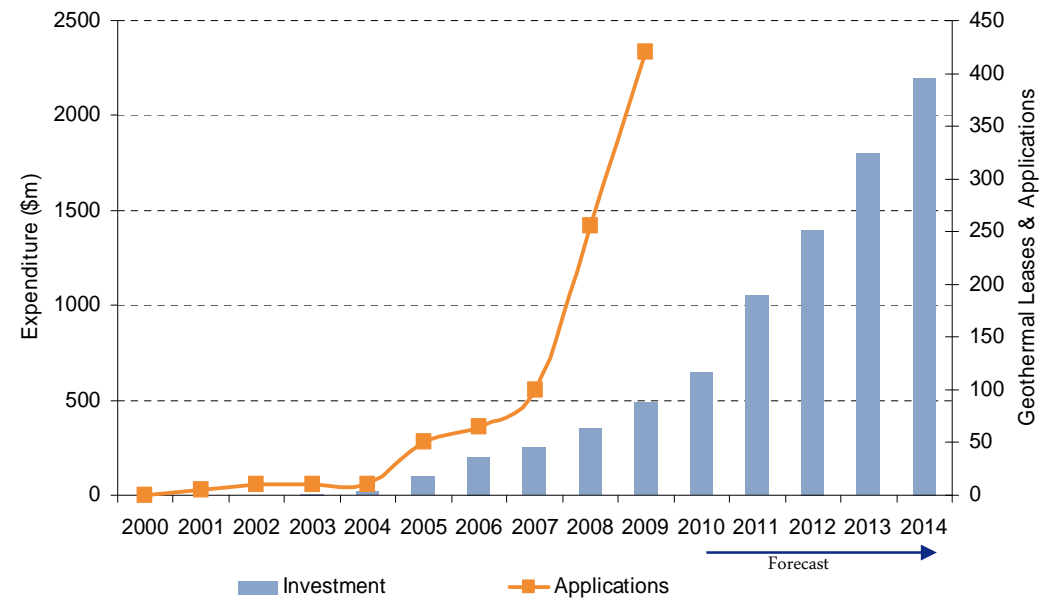
Geothermal energy (1)

- Australia's geothermal resources represent a potentially **large-scale base load** opportunity. However the industry is in an **embryonic stage of development** and the technology is yet to be proven commercially or technically in Australia

Australian geothermal resource

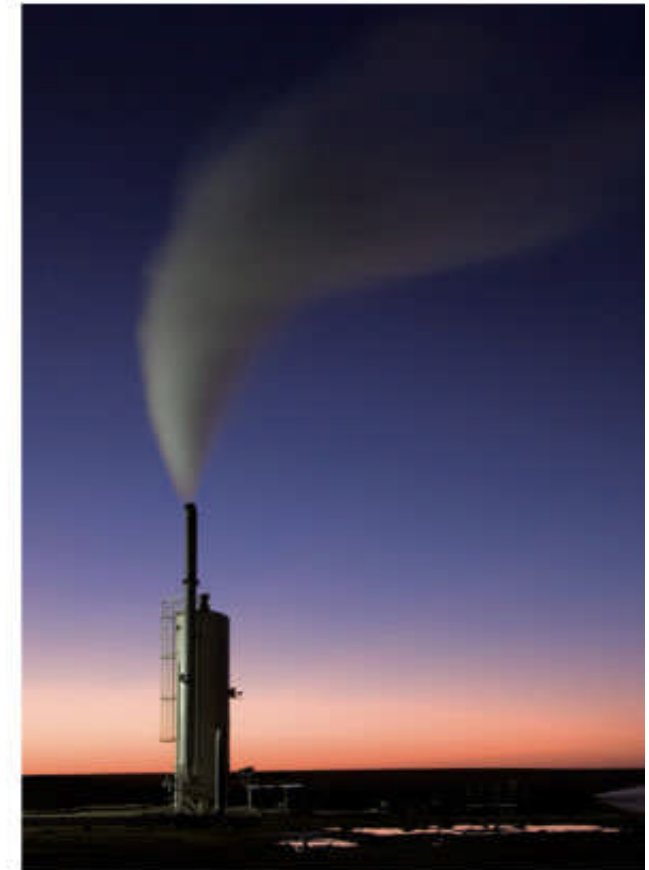


Australian geothermal investment



- Australia has no active volcanoes and relatively few hot springs or geysers, but does have some of the **best reserves of hot dry rocks** in the world
- Both **HSA and EGS** are prospective – particularly in South Australia
- Expectation to build between **1,500MWs and 2,500MW by 2020**
- Direct investment required between **\$14 billion and \$17.5 billion** by 2020, with the marginal cost of additional capacity expected to fall significantly after 2020
- Geothermal likely to represent **30.3% to 43.3% of the RET** by 2020
- **Potential for innovation** to reduce the cost of geothermal by ~30%
- The **economics of geothermal power** in Australia are favourable and analysis to date suggests a price sub \$100/MWh by 2020

- Australia requires the use of **unproven HSA and EGS**
- Significant **upfront capital** requirements
- **No debt financing** available at ‘proof of concept’ stage
- **Proximity to consumer markets** and infrastructure
- **Rig availability**
- High **mobilisation and demobilisation costs** of rigs
- EGS still perceived as **high risk**
- **Fierce competition** for scarce development capital
- Highly **fragmented** industry – race for first demonstration



Steam flow from Habanero 3 in March 2008

- Hydro electricity is currently Australia's **major source of renewable** energy (4.5% of total electricity generation and 75% of renewables capacity)
- But there is **limited potential for future development** given water constraints
- Future growth in hydro electricity is likely to be underpinned by **small scale hydro** developments and **efficiency/capacity gains** through upgrading and refurbishing ageing infrastructure

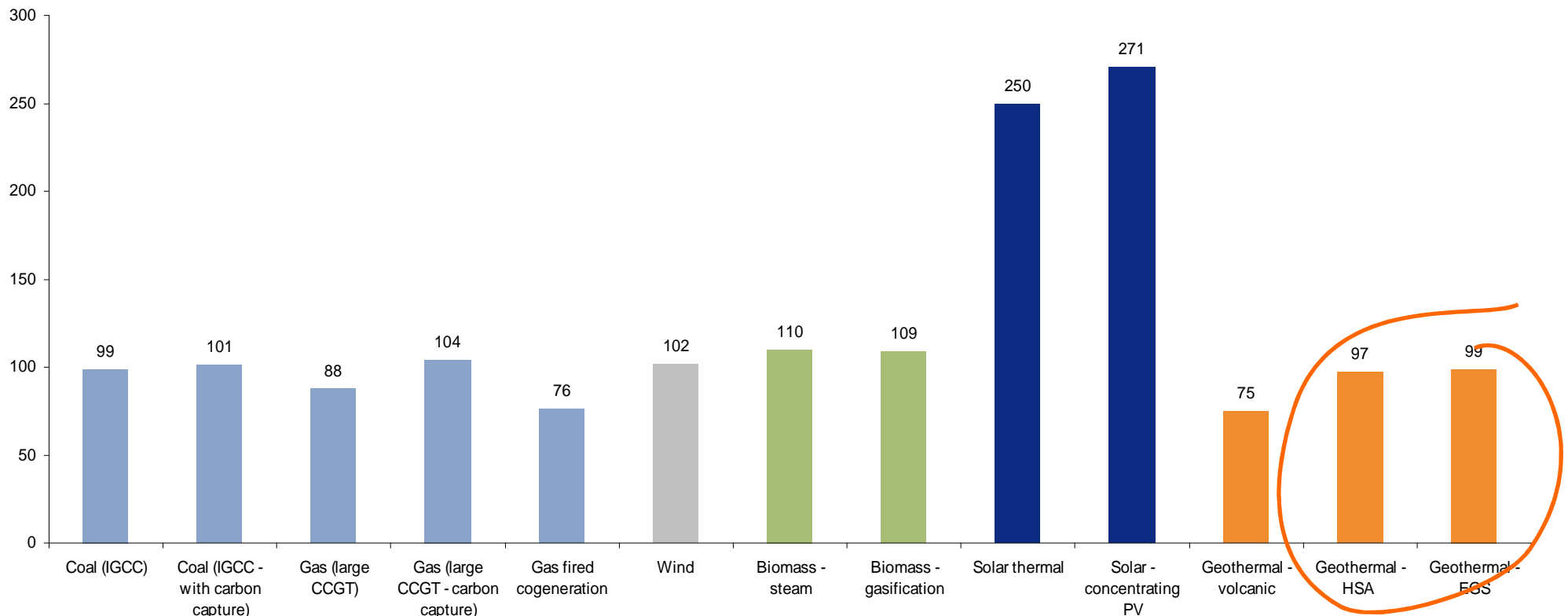
- Currently Australia's bioenergy is sourced mainly from sugar cane residue, wood waste and capture of gas from landfill and sewerage facilities
- Current installed capacity of 765MW – **7% of total renewables capacity**
- **Fuel source** is an issue
- **Potential to increase significantly**, estimated to 1,845MW by 2020
- But **not as 'popular'** as other sources
- **Small-scale solutions** are required which **assist with grid amelioration**
- **Opportunity for global developers to invest**

- Near shore **wave energy resources are significant** – estimated at four times current power needs of Australia
- However, relatively new technology and **not proven** technically or commercially
- Australia has **4 pilot and demonstration plants** with a combined capacity less than 1MW
- **Key challenges** facing ocean energy in Australia include proximity to the grid and the greater short-term prospects of more mature technologies
- **Potential to work with European companies** to develop projects – particularly R&D and pilot projects

- Australia has **vast brown and black coal reserves**
- CCS is therefore a **significant opportunity** and one that is supported by the Federal Government
- There are a **number of pilot projects in the pipeline**
- Federal Government has allocated \$2 billion to the **Carbon Capture and Storage Flagships program** to help fund the cost of demonstration projects
- Still significant concerns however, relating to **cost and environmental impact**

Cost comparison

- Numerous studies have calculated the long-run, marginal cost of various fossil fuel and renewable generation technologies to 2020
- **Geothermal was very competitive**, especially as a base load alternative



- Wind investment rebounding
- Significant international interest in solar
- Influx of global investors/developers
- Geothermal floundering – access to capital is a problem

“Vestas Australian Wind Technology has placed an order with NASDAQ-listed global power technologies company American Superconductor Corporation (AMSC) for a large grid interconnection system under construction in western Australia that will connect renewable energy to the grid”

New Energy World Network, 1 April 2010

“Australia’s largest electricity retailer AGL told NewNet that changes to the government’s renewable energy policy will mean a U-turn in its earlier announcement today that it was to put its wind development projects on hold”

New Energy World Network, 26 February 2010

“The Australian Government’s Solar Flagships program has received 52 “Round One” proposals for the construction of large-scale solar plants. The proposals covered a wide range of technologies including thin film and concentrating photovoltaic plants and solar thermal troughs, towers and dishes”

Aussie Renewables News, 18 March 2010

- Australia has **abundant renewable energy resources**
- The industry has been **slow to move** but this is changing
- A combination of factors – including the immaturity of the industry – has created a clear **long-term opportunity** in Australia
- **Wind, solar, geothermal and biomass most obvious**
- **Opportunities** for international developers, technology providers and investors
- Australian Government is **very supportive** of attracting investment
- **Be part of the next big thing!**