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Ten Years to Transition: Risks & Rewards for Queensland's Economic Sectors under Climate Change

Sustainable Energy:

Can it be scaled up?

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Status of Low-Carbon Electricity Supply Techs

Market penetration →

			Energy efficiency; GenII nuclear
			On-shore wind; CHP
			Biomass combustion
		Micro CHP	PV
		Off-shore wind	Conventional geothermal
Novel PV, IFR, CCS	Marine, hot rocks, fast reactor (GenIV)	Solar thermal, GenIII nuclear	Conventional tidal
R&D	**Demonstration**	**Pre-commercial**	**Commercial**

Modified from Foxon et al. (2005).

Technology status →

The Only Short-Term Solution to Climate Change & Peak Oil: Ecologically Sustainable Energy

= the efficient use of renewable energy sources.

Only sustainable energy, assisted by gas during a transitional period, can achieve a large reduction in greenhouse gas emissions from energy before 2020, given the political will. Neither coal with CCS nor nuclear energy could make a significant contribution in Australia before 2030

A Bonus: Direct Job Creation in Australia

Source of electricity	Relative number of job-years per unit of electricity in Australia*
Coal electricity + coal mining	1
Wind power with 50% Australian content	2–3
Bio-electricity with 50% Australian content	Approx. 3.5 (mostly rural)
Wind power with 80% Australian content	3.5–5

Units: 64 job-years/TWh; principal source: MacGill, Watt & Passey (2002)

Sustainable Energy Systems

- A mixture of different technologies with different properties
- Together can provide an energy system just as reliable as fossil fuels
- Can be ecologically sustainable
- Can create more local employment

Concentrated Solar Thermal Electricity

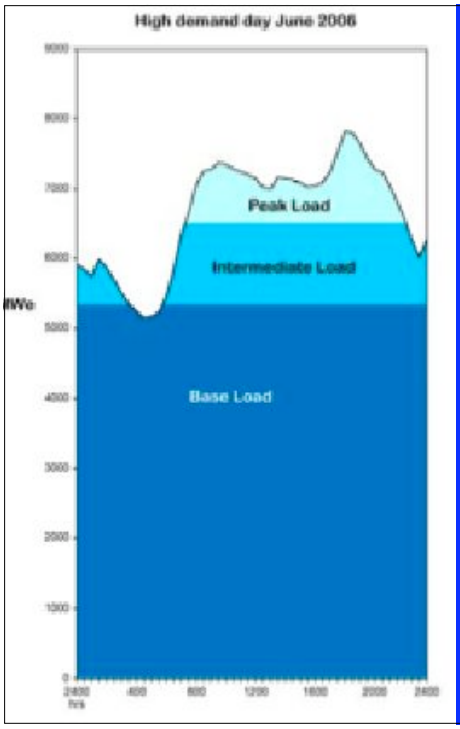
- Revival post-2004 in Spain and USA
- 600 MW operating; 800 MW under construction; 8000 MW advanced planning
- Thermal storage in molten salts, water, concrete, graphite, ammonia
- Thermal storage much cheaper than electrical storage
- Can generate either peak-load or base-load (24-hour) power
- Now is semi-commercial technology

'Old' 354 MW system in California

New Solar Thermal Power with Thermal Storage

Andasol 1, Spain, 50 MW, 7.5 hr storage

eSolar 5 MW
California



Daily Demand met by 100% RElec Supply by 2050

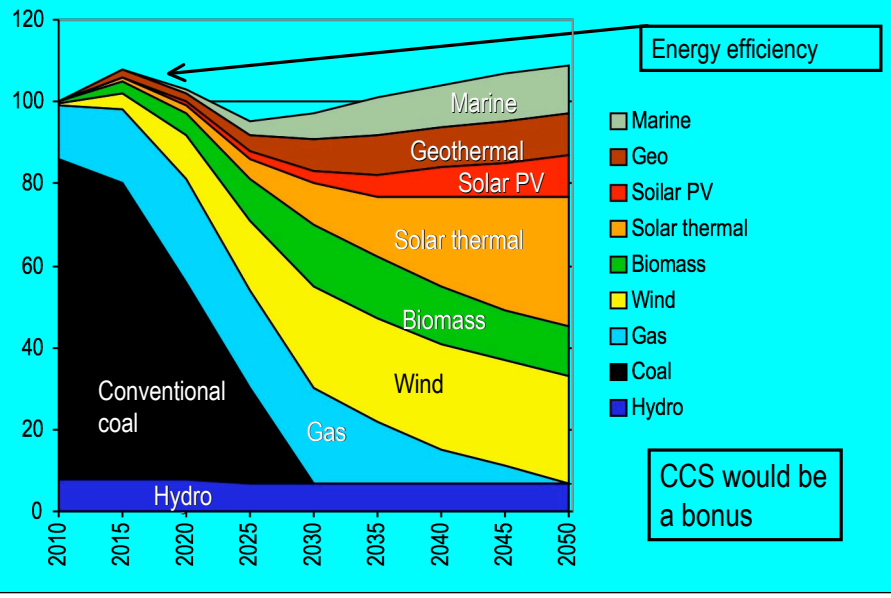
Peak-load: Hydro; CST + thermal storage; biofuelled gas turbines; PV

Int.-load: CST+ thermal storage, bioenergy; PV

Base-load:

- Demand reduction by solar hot water and energy efficiency;
- CST + long-term thermal storage;
- Wind with supplementary peak-load
- Geothermal (when commercially available)

Scenario for Australian Electricity, 2010–2050

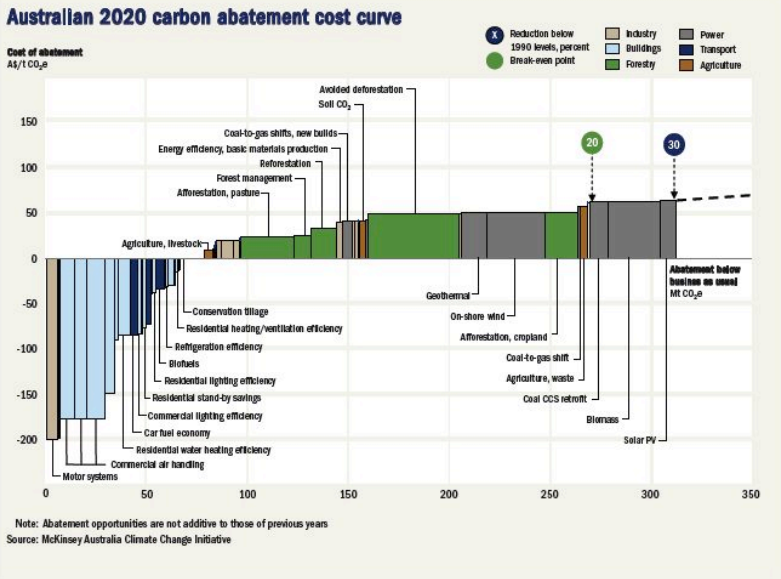


CCS would be a bonus

Queensland Sustainable Energy Potential

Technology	Potential in sector	Cost in 2020 in Qld given C price $40/t
Demand reduction by EE, EC & SHW	High	Very cost effective
Demand reduction solar heating & cooling	Medium	Medium
Wind	Medium	Medium
Solar PV	Medium	Low at point of use
Concentrated solar thermal power + thermal storage	Very high	Medium
Biomass cogeneration & trigeneration	Low-medium	Low for residues
Geothermal	Medium	Medium, declining

Exhibit 4



McKinsey Cost Curve 2008

Economic savings from EE can pay for large fraction of additional costs of RE,

Principal Federal Gov't Policies Needed to Drive Sustainable Energy

- Stronger greenhouse targets
- Implement promised revisions to Renewable Energy Target to assist large-scale wind and bioenergy
- Introduce feed-in tariffs for large renewable energy power stations not benefiting from RET: large-scale solar, wave, geothermal
- Implement carbon price with no exemptions apart from border adjustments
- Meanwhile, ban new conventional coal-fired power stations
- Upgrade transmission system for renewable electricity
- Mandatory Energy Performance Standards, ratings and labelling for ALL buildings and appliances
- Just transition programs for workers and others disadvantaged

Principal Qld Government Policies Needed

- Set a stronger renewable electricity target (at least 30% by 2020) and renewable heating & cooling targets
- Ban totally new conventional coal-fired power stations
- Revise Solar Bonus Scheme to provide ***gross*** feed-in tariffs and extend to commercial & large-scale solar power stations
- Give incentives for renewable energy manufacturing in coal regions
- Fund more detailed solar & wind resource assessment & publish them
- Expand education & training for sustainable energy
- Fund new & upgraded transmission for large-scale solar & wind
- Cooperate with federal gov't on stronger energy efficiency standards

Further Reading

- Trevor Berrill (2010) *Submission to Queensland Government's Environment & Resources committee. Part 2: Growing Queensland's Renewable Electricity Sector.* Prepared on behalf of Sustainable Energy Policy Queensland. July.
- Mark Diesendorf (2007) *Greenhouse Solutions with Sustainable Energy.* UNSW Press.
- Mark Diesendorf (2009) *Climate Action.* UNSW Press.