

Sustainable Energy

Implications for the Sydney Region

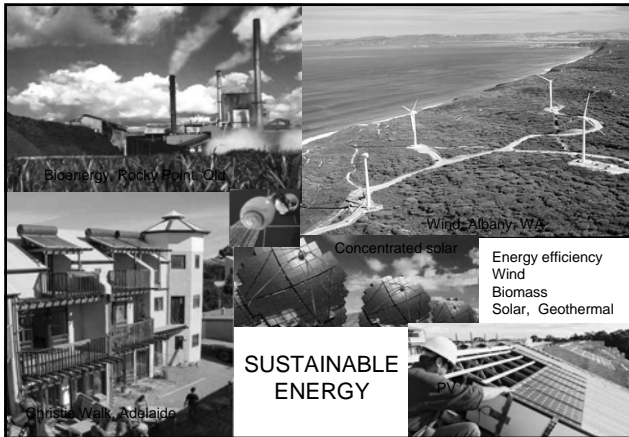
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Ecologically Sustainable Energy

- * Efficient energy use and energy conservation (EE)
- * Renewable energy (RE)

Backed up temporarily with:

- * Gas (the cleanest fossil fuel) during the transition to renewable energy



Sustainable Energy Systems

(discussed in *Greenhouse Solutions with Sustainable Energy*)

- * A mixture of different technologies with different properties
- * Together can provide an energy system just as reliable as fossil fuels
- * Generation on scales ranging from residential to national
- * Can be ecologically sustainable
- * More local employment too!

4

Cleaner Energy Mix

Direct Local Jobs per Unit of Electricity Generated

Source of electricity	Relative number of job-years per kWh 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

Principal source: MacGill, Watt & Passey (2002)

5

Types of Jobs in Sustainable Energy Both New Jobs and Retraining in Existing Jobs

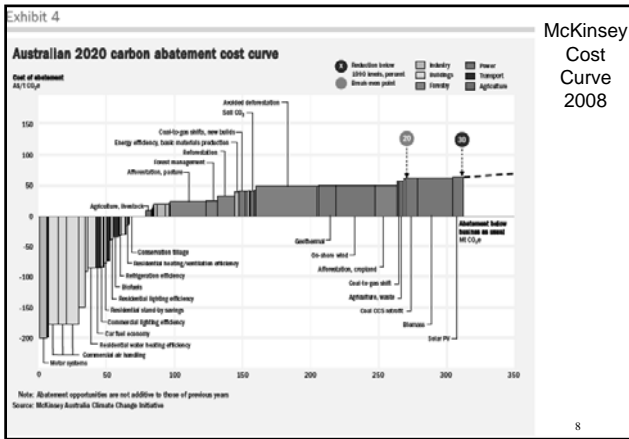
- * Electricians, plumbers, energy auditors, building managers
- * Installers of insulation, solar hot water, solar electricity
- * Metalworkers
- * Electrical and mechanical engineers
- * Life-cycle analysts
- * Educators: TAFE and university
- * Etc



Sustainable Energy Jobs: Recent Studies

- * ACF-ACTU study: Green Gold Rush

- * CSIRO study: Green Collar Jobs
 - Macroeconomic model
 - Model of physical economy



Package of Energy Efficiency & Renewable Energy

- * Economic savings from energy efficiency can pay for most of additional costs of renewable energy

- * This is true on national, local government and individual household scales

- * No 'rebound' effect

Residential Energy Efficiency Cheapest and Fastest Technologies

- * Solar efficient design in new buildings & retrofits
- * Insulation of buildings
- * Efficient heating & cooling
- * Efficient appliances, equipment & lighting
- * Solar hot water with efficient shower heads & taps



Christie Walk, Adelaide City
10

Solar Hot Water

- * Solar-gas has lowest GHG emissions and highest price
- * Solar-electric hot water, gas hot water and electric heat pump have next lowest emissions
- * Potential savings from replacing electric off-peak hot water in Aust: 4600 MW of coal power and 7 Mt p.a net of CO₂



Energy Supply

Wind could generate 10% of Australia's electricity in 2020 and 20% in 2030

- * 20% of electricity achieved in Denmark, 25% planned for 2010
- * Changes to transmission network are needed
- * Large-scale dispersed wind + gas turbines can substitute for coal in grid = base-load
- * Suitable for community and utility scales



Albany wind farm, W.A.

Large-Scale, Dispersed Wind is *not* 'Intermittent'

- * Single wind turbines are intermittent (they switch on and off frequently in low winds)
- * Multiple wind farms, located in geographically separated locations, are not intermittent. In general, their total output varies slowly.
- * At windy sites, about 2600 MW of wind power can substitute for the electricity generation of a 1000 MW coal power station, which can be retired.
- * The wind farms can be made as reliable as coal, by adding a little peak-load plant, such as gas turbines.
- * Since the peak-load plant has low capital cost and is operated infrequently, it provides reliability insurance with a low premium.

13

Energy Supply

Biomass residues could supply 5–8% Australia's electricity in 2020; 30% in 2040

- * Fuels include wheat stubble, sugar cane residues & plantation forest residues.
- * Residues & organic wastes cheapest & fastest, but resource limited.
- * Generates base-load power
- * Biomass residues don't compete with food



Burning sawmill & sugar cane residues at Rocky Point, Qld

14

Gas as a Transitional Fuel

Especially for:

- * Cogeneration of electricity and heat in industrial & commercial sectors
- * Back-up for solar hot water, solar space heating & solar thermal electricity
- * Back-up for wind power with peak-load gas turbines
- * Post-2030, gas gradually replaced by solar (both PV and STE) and biofuels produced sustainably

15

Solar Photovoltaic (PV)

- * Electrical storage is still expensive
- * So PV is daytime power: intermediate- & peak-load
- * Just as important as base-load
- * Technological advances will reduce cost of PV panels
- * Needs R&D funding and market stimulus



Solar Thermal Electricity with Thermal Storage

- * Thermal storage in water, graphite, molten salts or thermo-chemical system
- * Thermal much cheaper than electrical storage
- * Needs additional collectors
- * Base-load (24-hour) power
- * Will be commercially available before 'clean coal' & 'new generation' nuclear



17

Hot Rock Geothermal Power

- * Under development in France and Australia
- * In Australia, huge potential in n-e S.A and s-w Qld
- * Base-load power in 2009?
- * Low water use and low pollution



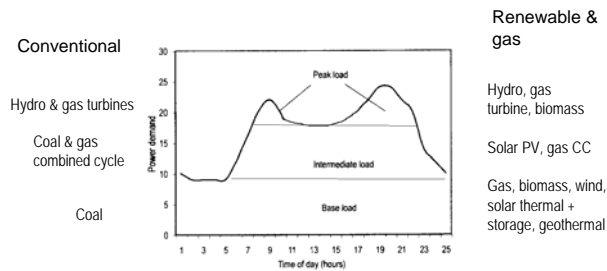
18

Hydro and Marine Power

Technology	Status	Additional potential in Australia
Hydro	Commercial, 8% of electricity	Low (conservation areas, drought)
Tidal barrage	Commercial	Only in north-west.
Ocean current (water turbine)	Experimental	Low-medium?
Wave	Several different prototypes	Medium-high, but long-term

19

Matching Demand and Supply for daily Electricity Demand in 2030



20

What can Local Government do?

- * Lobby Federal & State governments for stronger policies: eg to tighten EE & solar hot water requirements in development approvals
- * Waive planning approvals for solar hot water and solar electricity (DONE?)
- * Hold public training workshops on EE & RE in the home
- * Support community wind and solar farm projects and facilitate bulk purchases of residential renewable energy by community groups
- * Make Council's own operations more energy efficient, addressing buildings, vehicles, street-lighting, swimming pool heating, wastes, etc.
- * Set RE and EE targets for its own operations
- * Plan subdivisions and check DAs to facilitate passive solar design and protect solar access

21

Types of Policy Instruments Needed on State and National Scales

- * Targets
- * Pricing
- * Regulations and standards for buildings and appliances
- * Education, training and information
- * Institutional change
- * Population policy
- * Industry policy, where 'industry' includes agriculture and forestry

Status of Rudd's 2007 Election Promises on RE

- * Ratified Kyoto Protocol immediately, but failed to support strong international target at Bali. THE ONLY PROMISE IMPLEMENTED SO FAR.
- * Promised \$500M to renewable energy deployment over 6 years, but only geothermal drilling received an allocation (\$50M) in 2008-09 budget
- * Promised \$150M for renewable energy research, including \$100M for solar, but allocated zero in 2008-09 budget
- * Promised to increase Mandatory Renewable Energy Target to 20% of electricity by 2020, but implementation delayed until 2009 at earliest.
- * Limited residential solar electricity market with a \$100,000 means test for the \$8000 rebate ending 30 June 2009. To be replaced 1 July with 5 RECs/MWh.
- * Distanced itself from key recommendations of its own Garnaut Climate Change Review on emissions trading: eg, no 'compensation' for coal power

Federal Government Policies Still Needed for Sustainable Energy

- * Fix shortcomings in existing policies and stop delays, including targets.
- * Ensure forthcoming emissions trading scheme is effective, by setting tight cap on emissions, auctioning 100% of permits and denying 'compensation'
- * Ban new conventional coal-fired power stations (with States)
- * Fund a more geographically distributed transmission system (with States)
- * Incentives (eg, feed-in tariff) for large solar power stations
- * Remove subsidies to production & use of fossil fuels
- * Assist low-income earners to reduce their emissions (with States)

Additional Key State Gov't Policies Needed

- ✳ Set energy ratings & minimum energy performance standards for all buildings (subject to BASIX), appliances & equipment
- ✳ Charge realistic prices for fresh water used by power stations
- ✳ Charge users of air conditioners realistic prices for infrastructure
- ✳ Ban off-peak electric hot water tariffs and new electric resistance hot water systems (pending federal implementation)
- ✳ Foster solar energy for hot water, clothes drying, space heating and low-temperature industrial process heat

25

Conclusion

- ✳ Australia could have an energy system based on 100% renewable energy used efficiently by 2040, possibly even 2030,...
- ✳ ... provided federal, state and local governments implement effective policies
- ✳ This sustainable energy system can provide MORE local jobs than the existing fossil-fuelled system
- ✳ There are important roles for local government in this transformation.

26

Further Reading

- ✳ Mark Diesendorf (2007) *Greenhouse Solutions with Sustainable Energy*, UNSW Press

27
