



Climate Projections for Renewable Energy

Never Stand Still

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Never Stand Still

Science

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Climate Change Impacts on Energy

Average Temperature Rise

- Increased demand for cooling, more frequent power blackouts, reduced efficiency in generation.

Changes in Rainfall

- Water availability, hydropower generation.

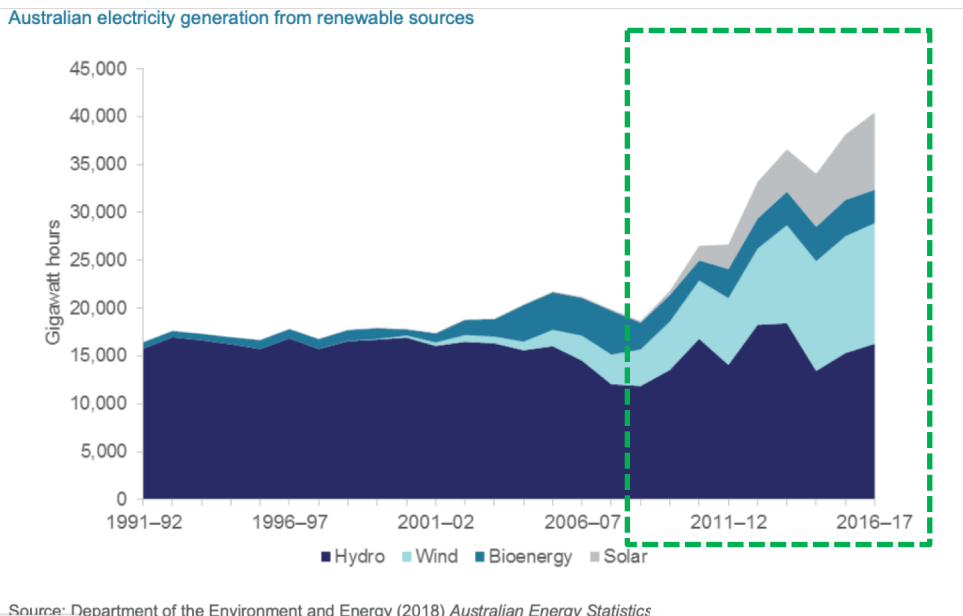
Changes in Extreme Weather

- Disruptions in energy generation and transmission.

Sea Level Rise

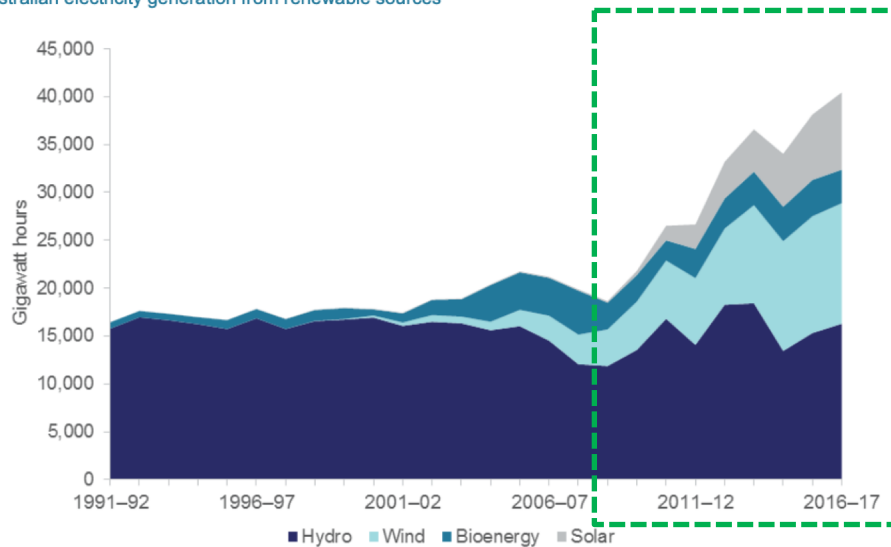
- Risks to infrastructure in vulnerable coastal areas.

Renewable Energy In Australia



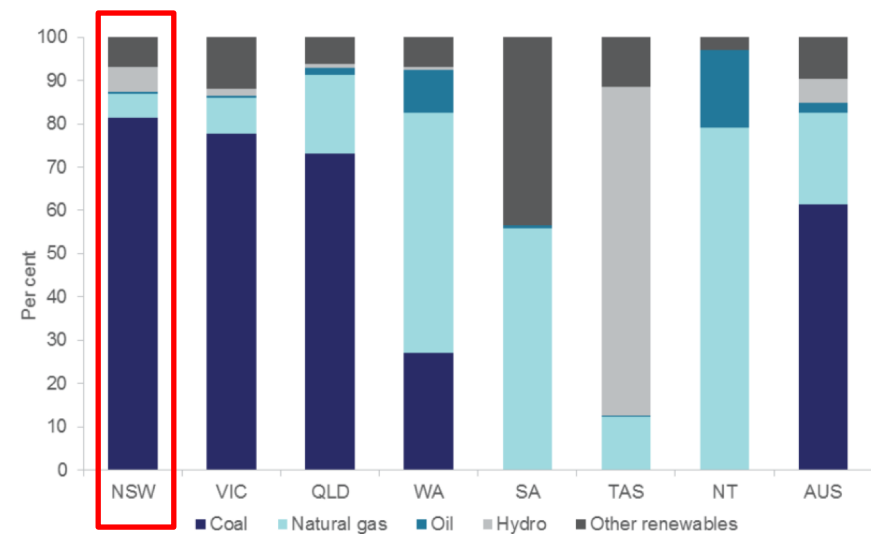
Renewable Energy In Australia

Australian electricity generation from renewable sources



Source: Department of the Environment and Energy (2018) *Australian Energy Statistics*

Australian electricity generation fuel mix, calendar year 2017



Source: Department of the Environment and Energy (2018) *Australian Energy Statistics*

Solar and wind energy have huge potential in NSW

The resilience of Australian wind energy to climate change

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11 September 2017

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Jason P Evans^{1,3} , Merlinde Kay², Abhnil Prasad¹ and Andy Pitman¹¹ ARC Centre of Excellence for Climate Extremes and Climate Change Research Centre, Biological, Earth and Environmental Sciences, University of New South Wales, Sydney, Australia² School of Photovoltaic and Renewable Energy Engineering, University of New South Wales, Sydney, Australia³ Author to whom any correspondence should be addressed.E-mail: jason.evans@unsw.edu.au**Keywords:** wind energy, regional climate change, economic costs, NARClIM regional projections, Australia

The resilience of Australian wind energy to climate change

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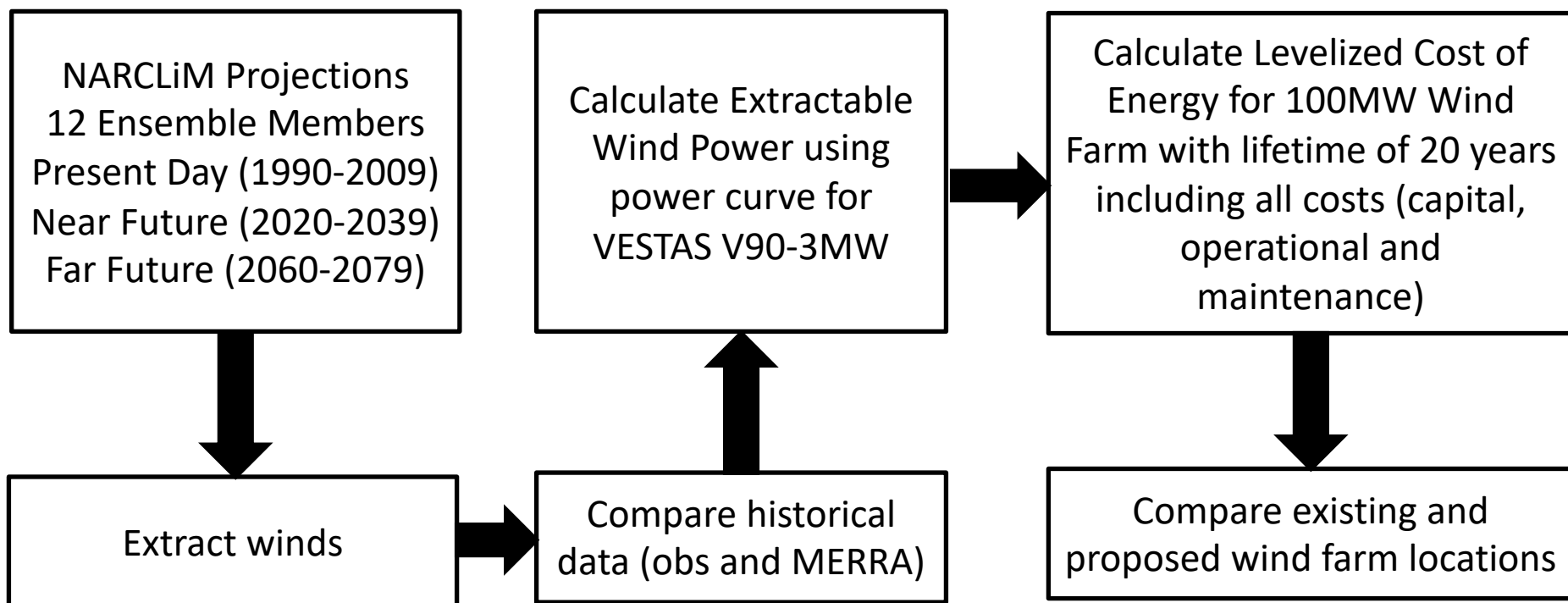
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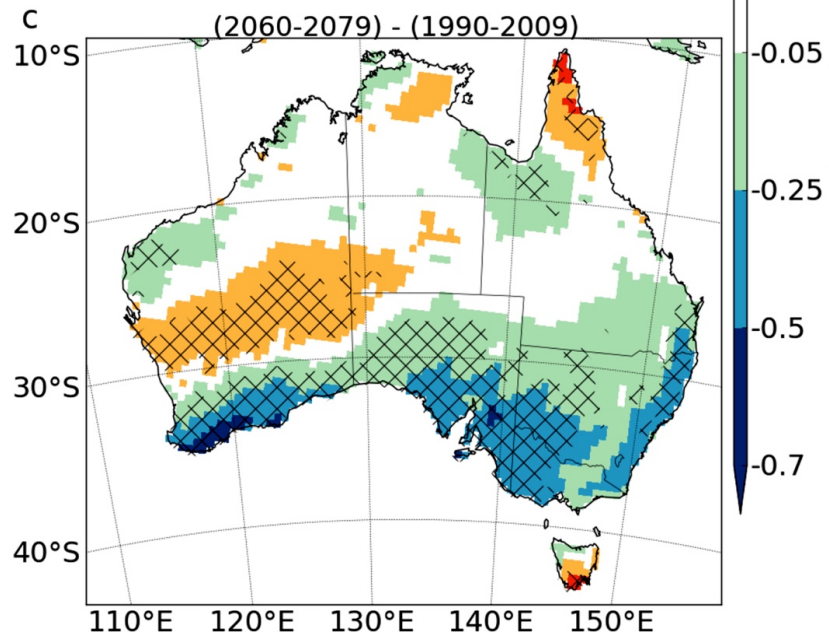
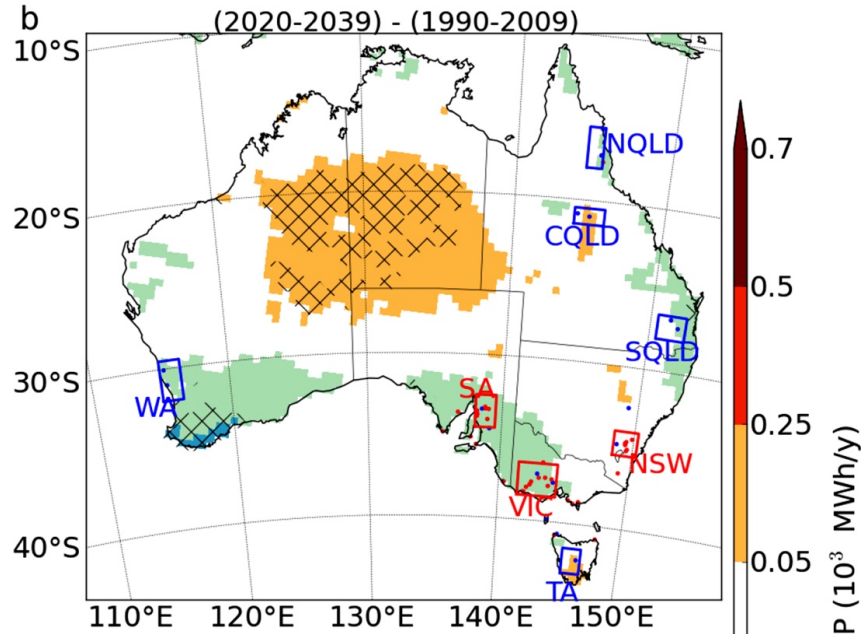
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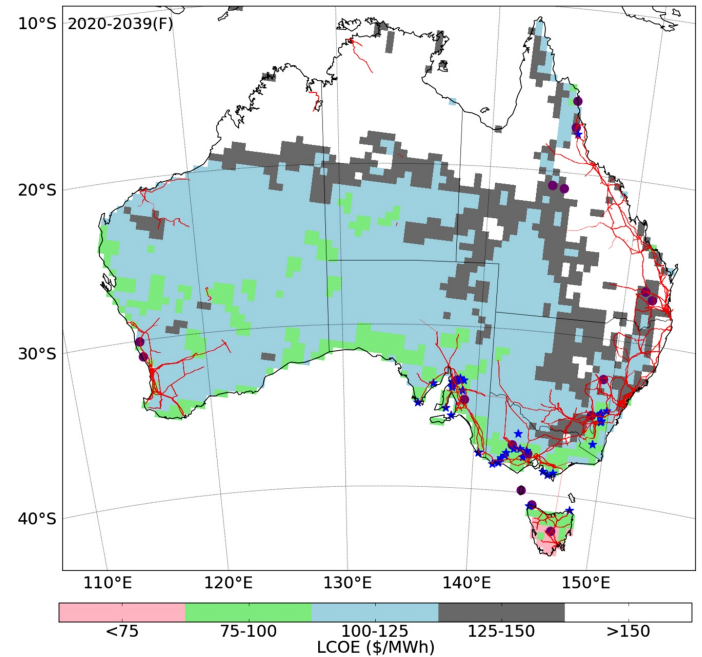
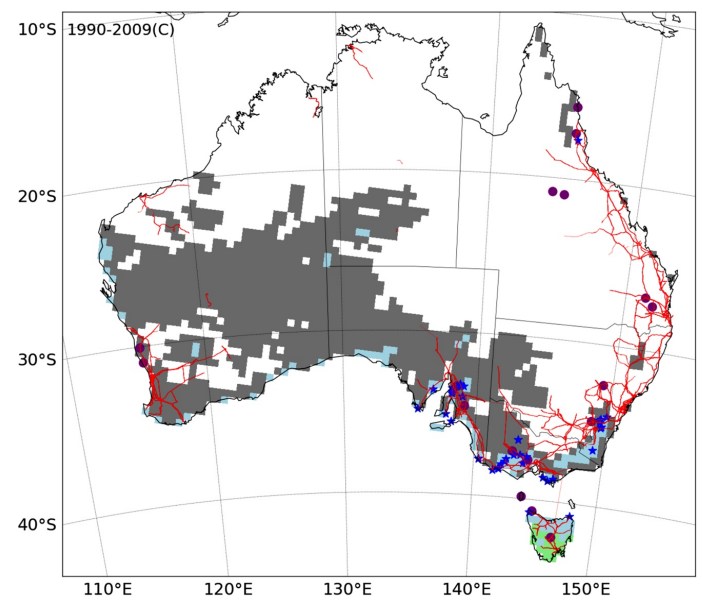
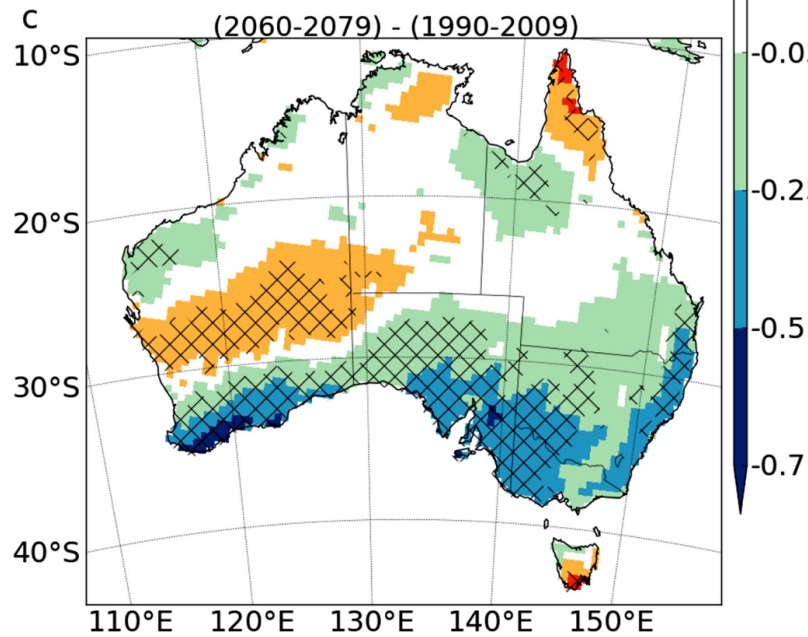
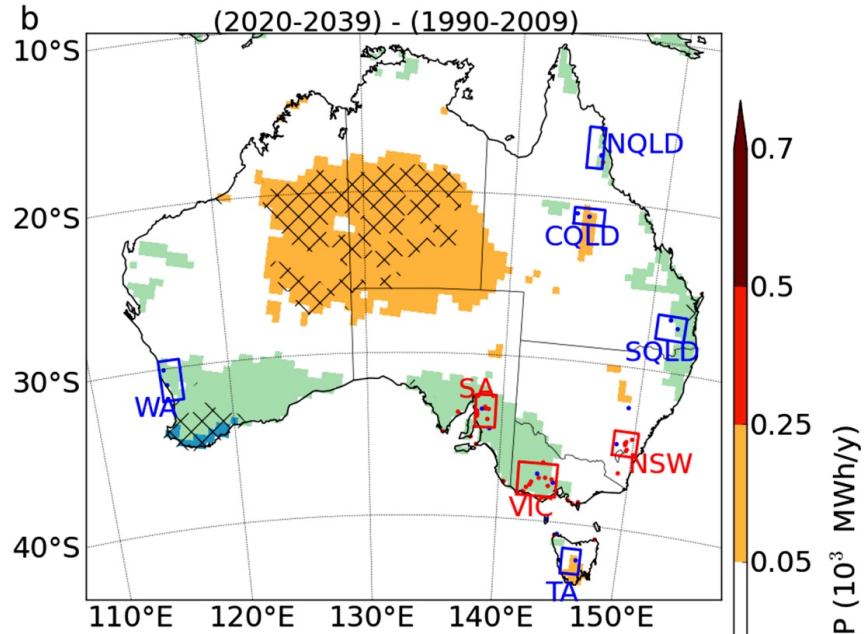
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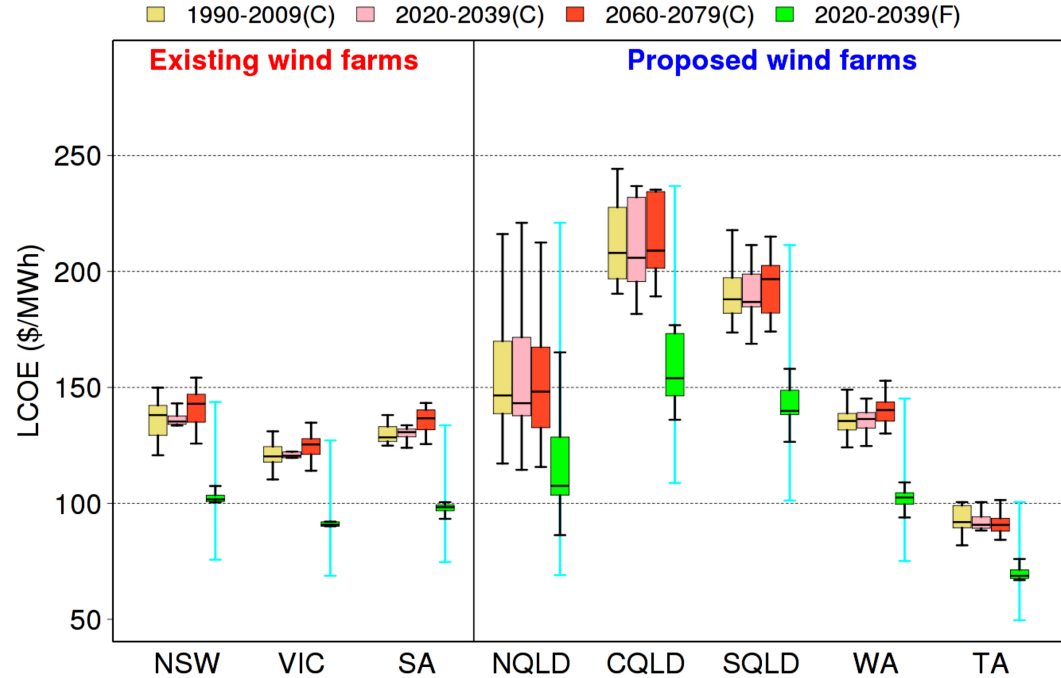
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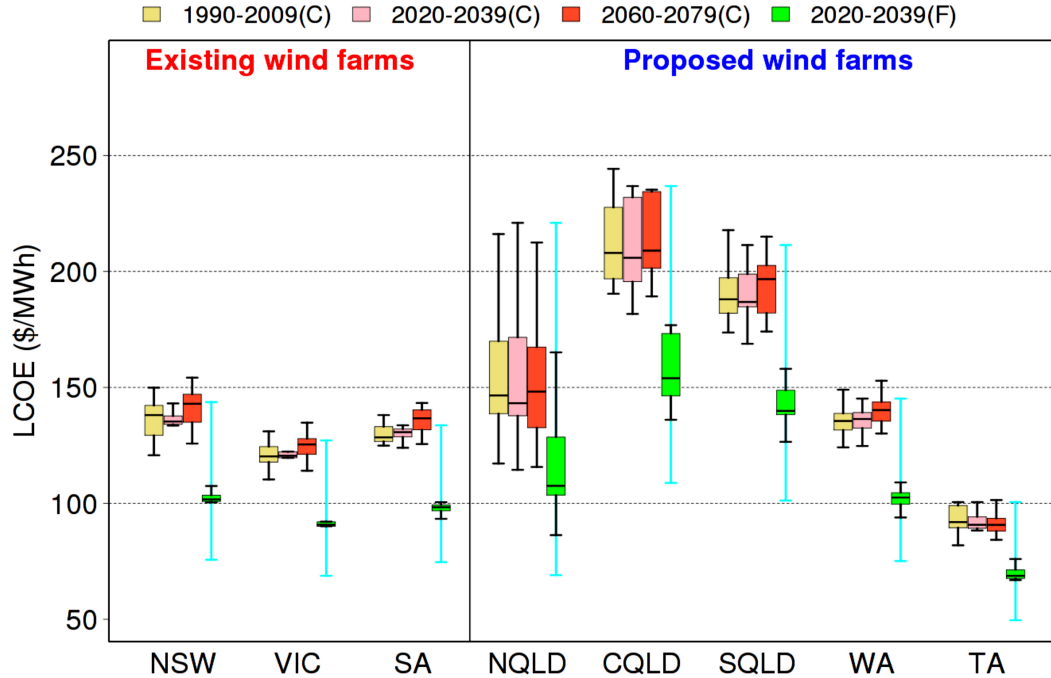
Jason P Evans^{1,3} , Merlinde Kay², Abhnil Prasad¹ and Andy Pitman¹¹ ARC Centre of Excellence for Climate Extremes and Climate Change Research Centre, Biological, Earth and Environmental Sciences, University of New South Wales, Sydney, Australia² School of Photovoltaic and Renewable Energy Engineering, University of New South Wales, Sydney, Australia³ Author to whom any correspondence should be addressed.E-mail: jason.evans@unsw.edu.au**Keywords:** wind energy, regional climate change, economic costs, NARCLiM regional projections, Australia



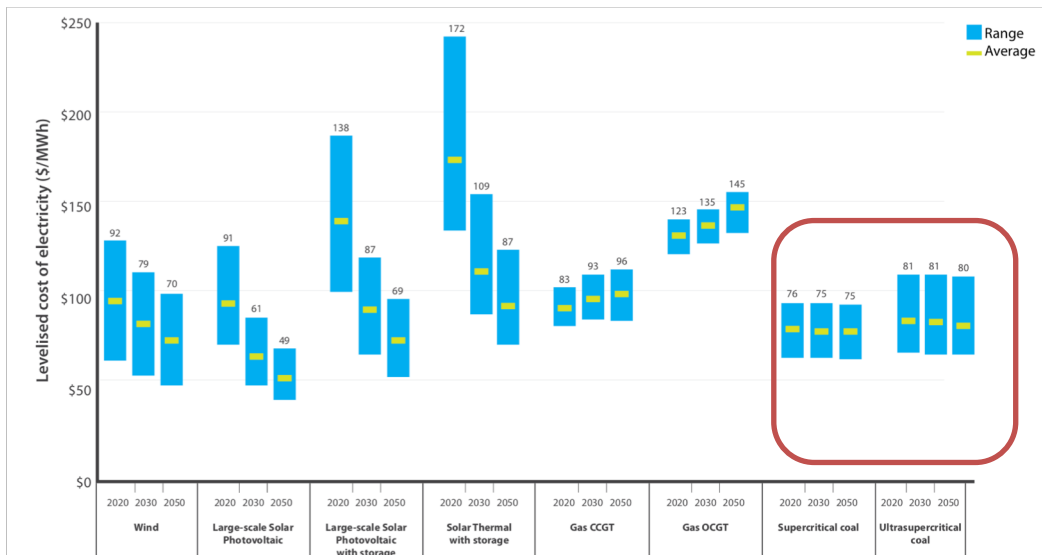




- The cost of future wind energy generation increases negligibly in the future in regions with significant existing installed capacity.
- Technological developments in wind energy generation more than compensate for projected small reductions in wind, decreasing the LCOE by around 30%.



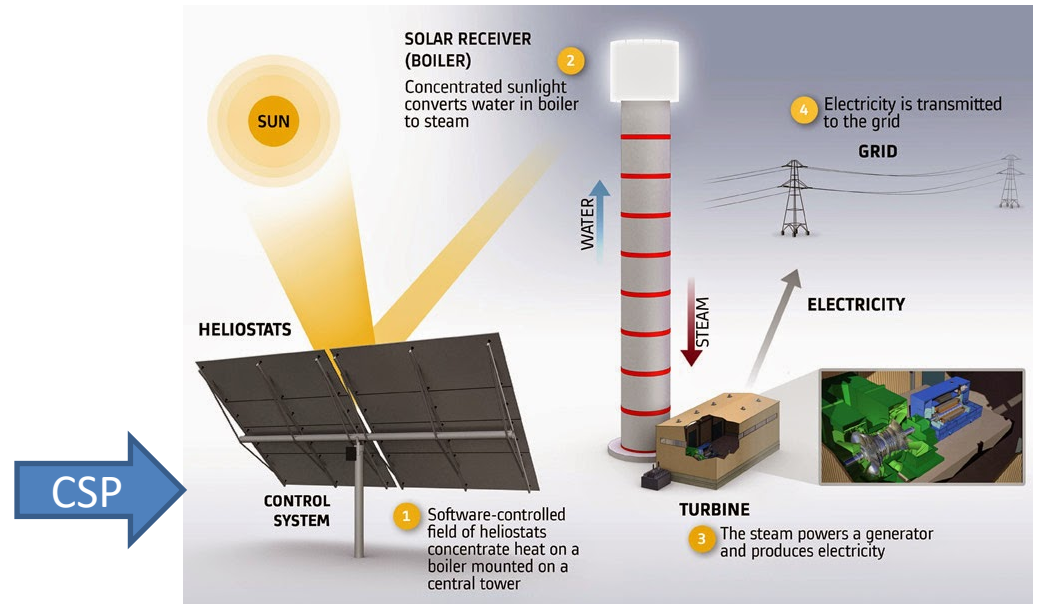
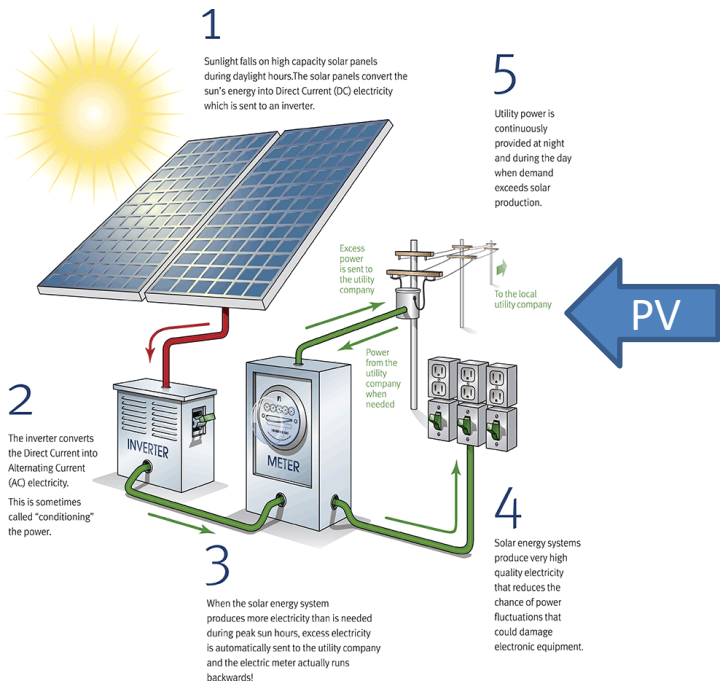
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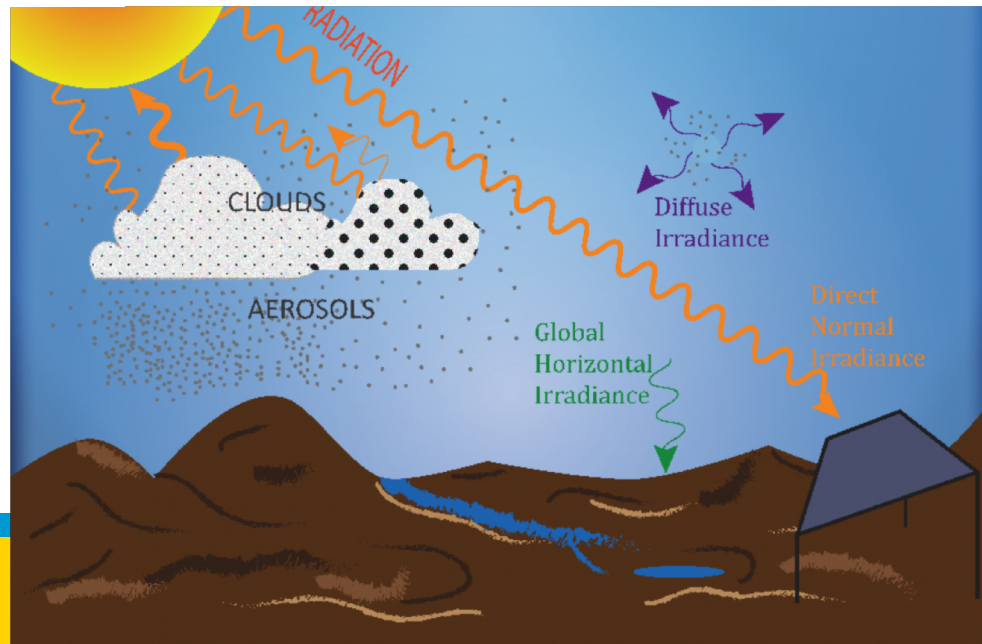
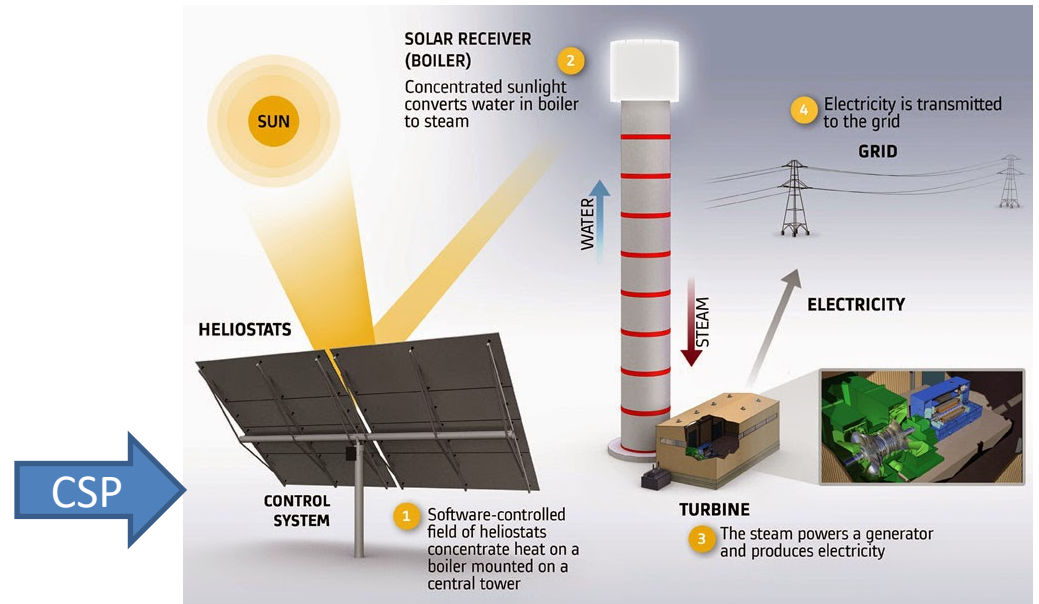
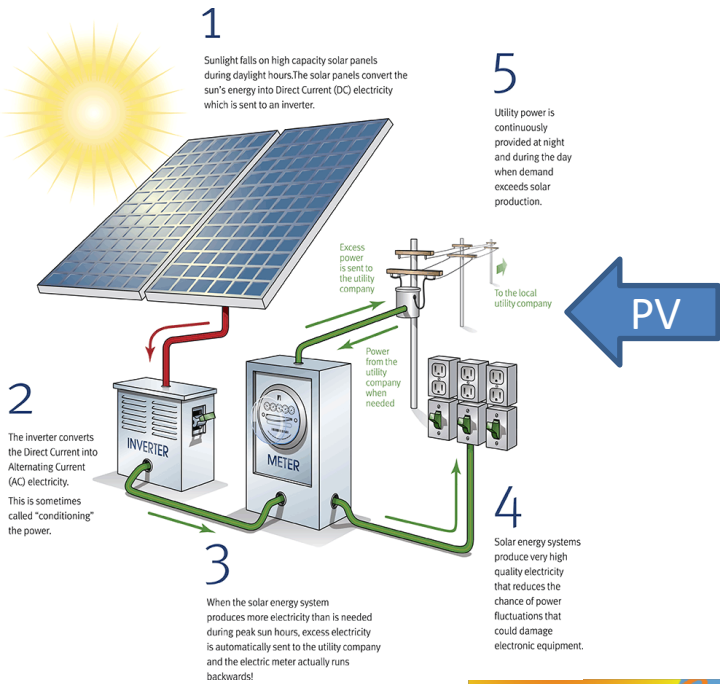
- \$20/MWh carbon tax on coal would make renewables more desirable and feasible in terms of LCOE

Source: Independent Review into the Future Security of the National Electricity Market

Solar Energy



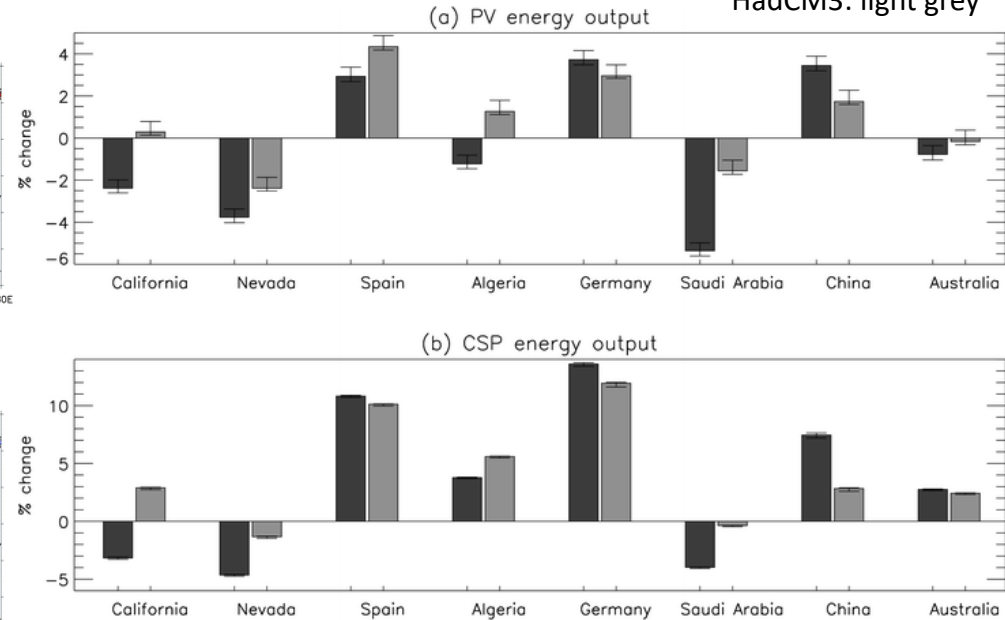
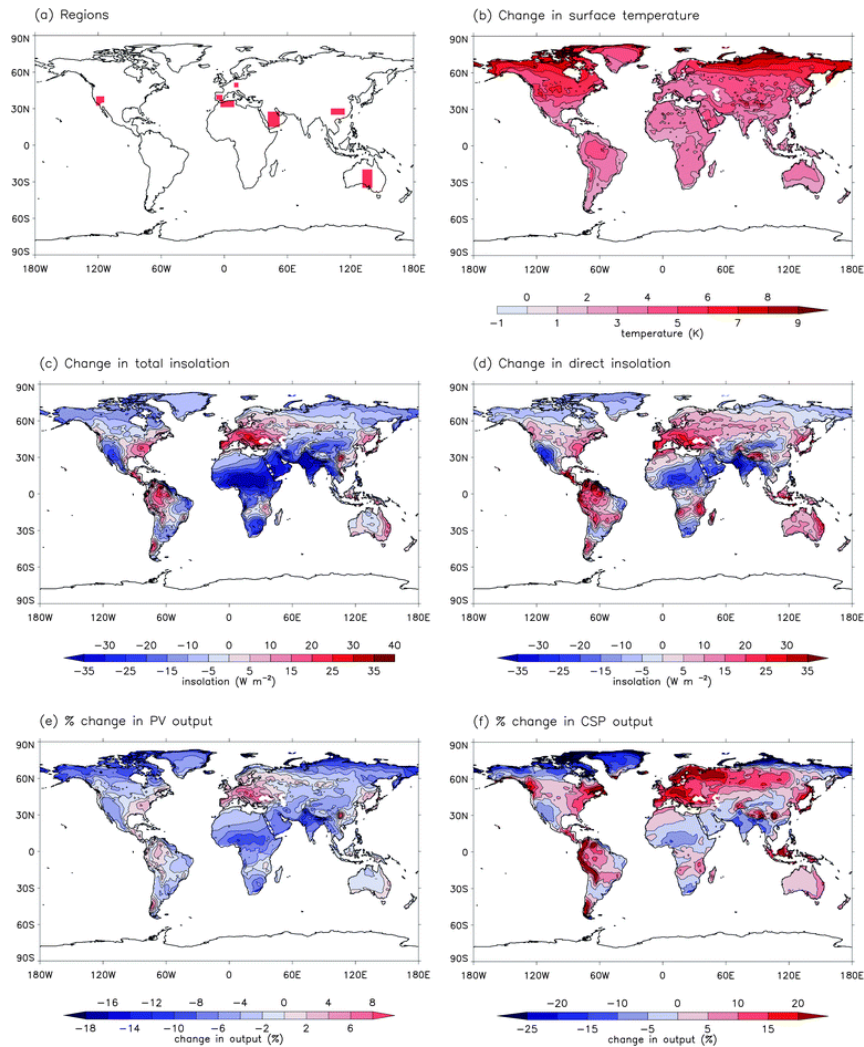
Solar Energy



CMIP Projections for PV and CSP

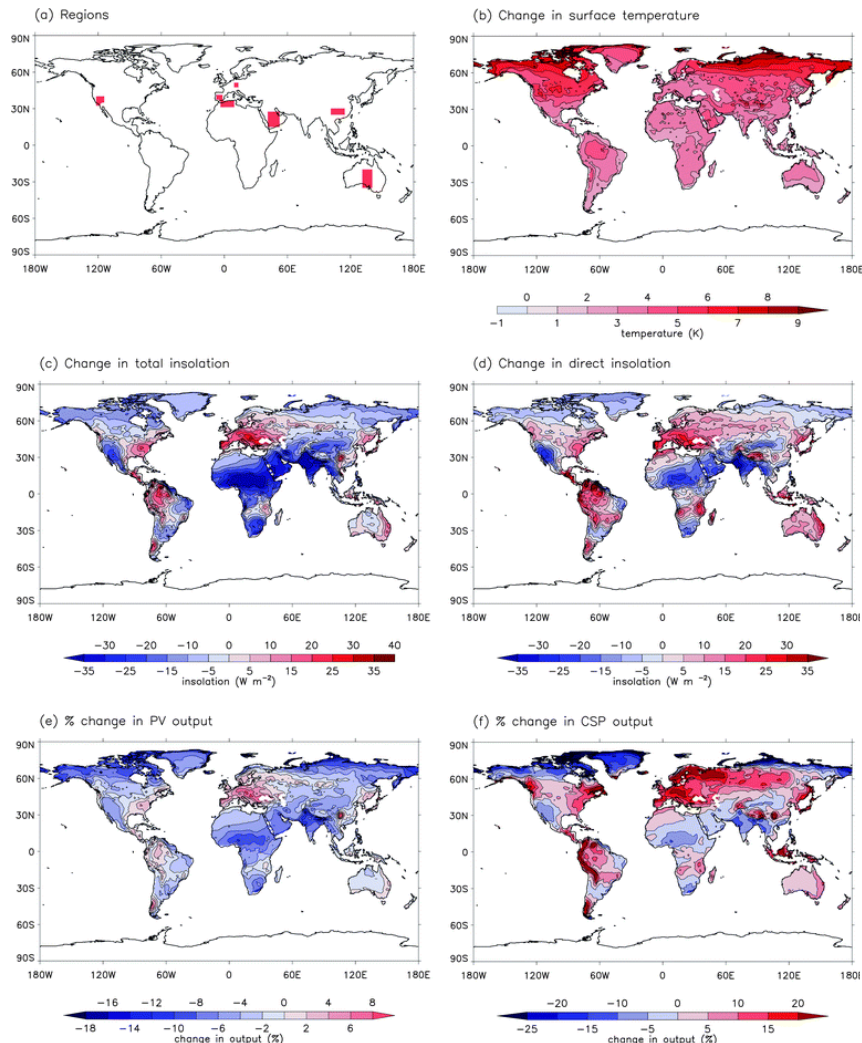
CMIP3 HadGEM1; Cook et al. (2011)

HadGEM1: dark grey
HadCM3: light grey

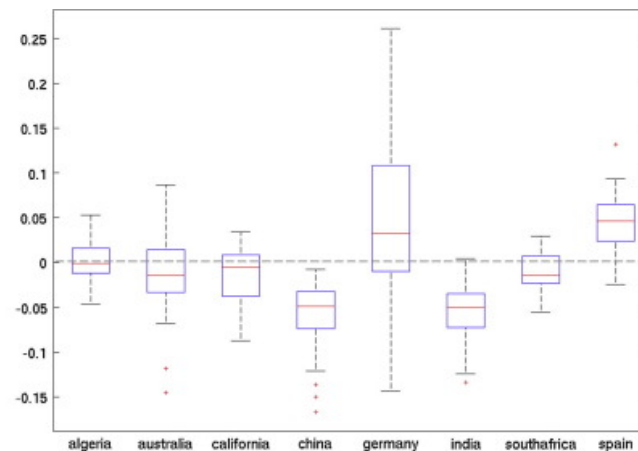
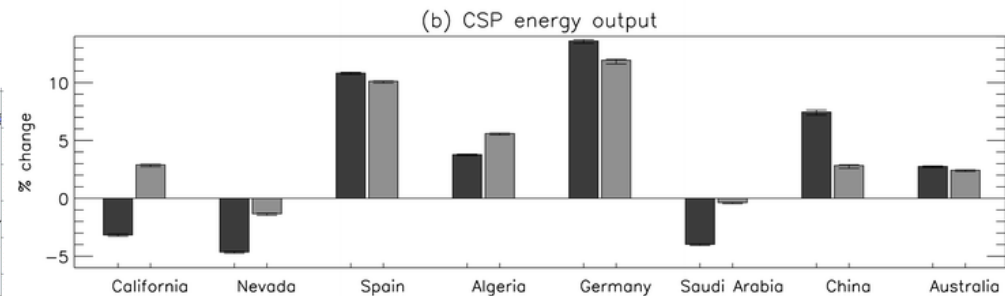
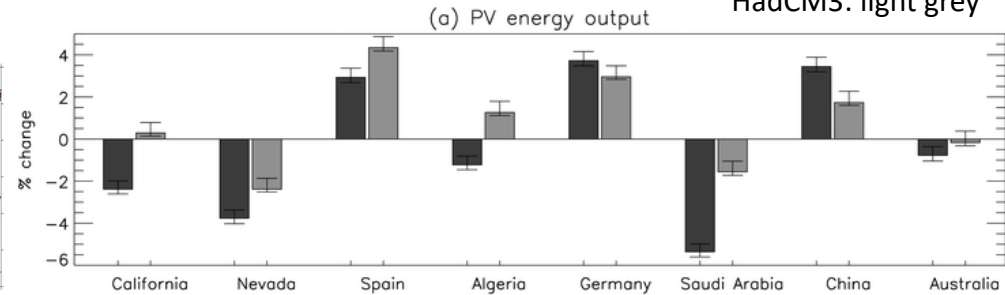


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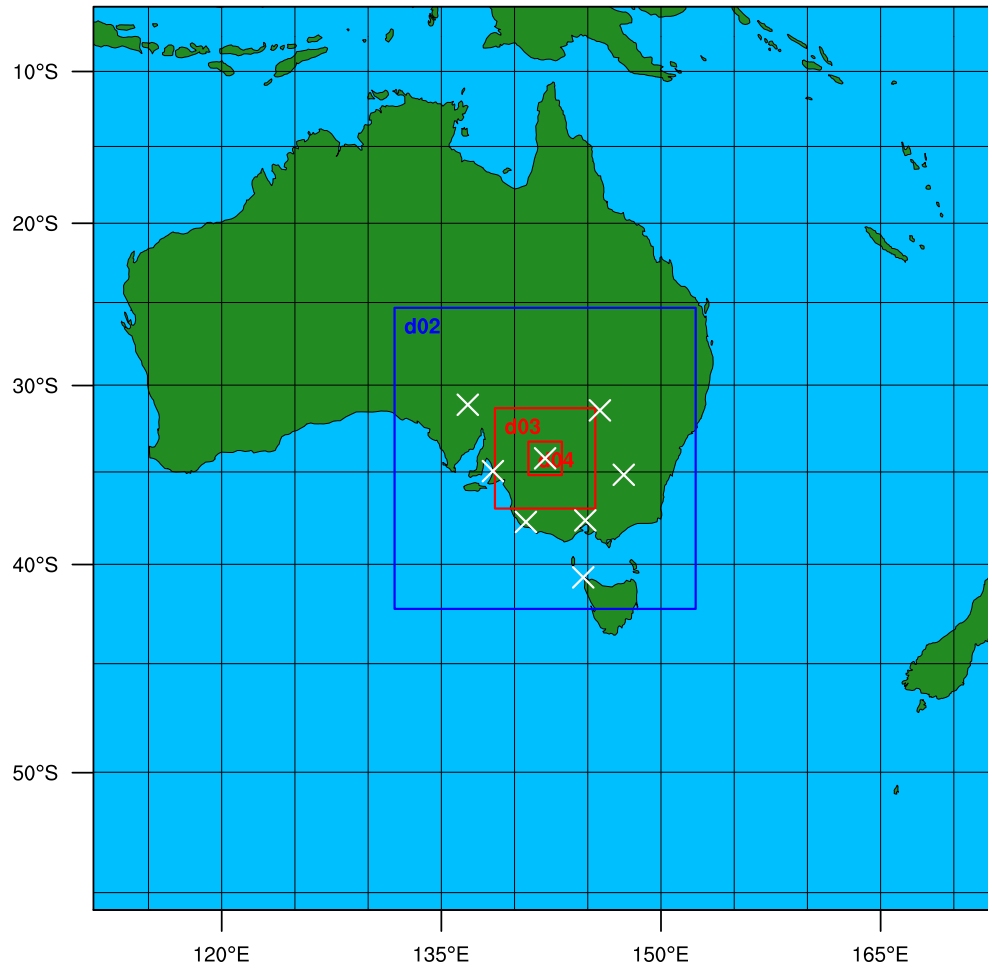


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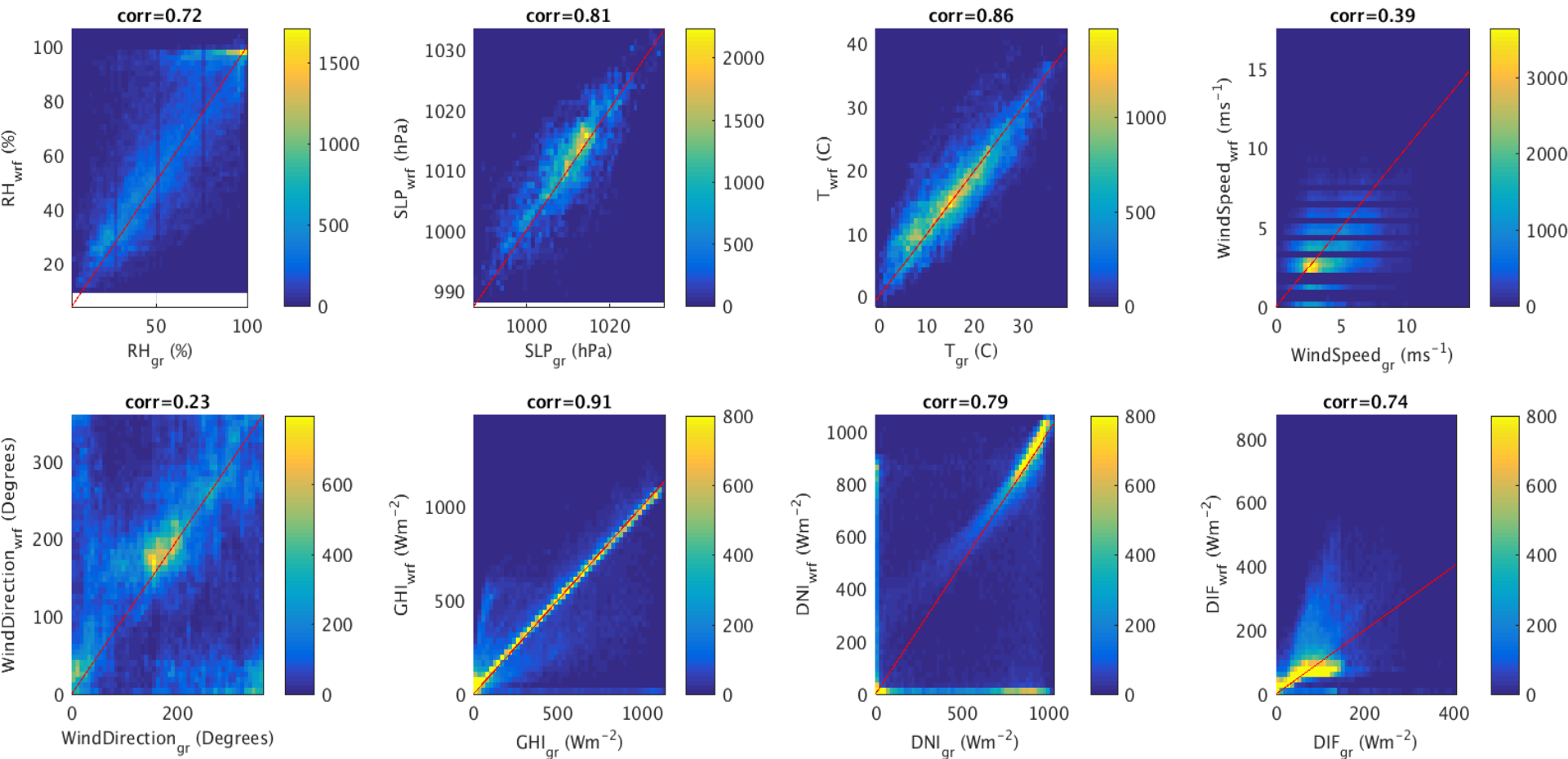
How about regional changes?

WRF Setup

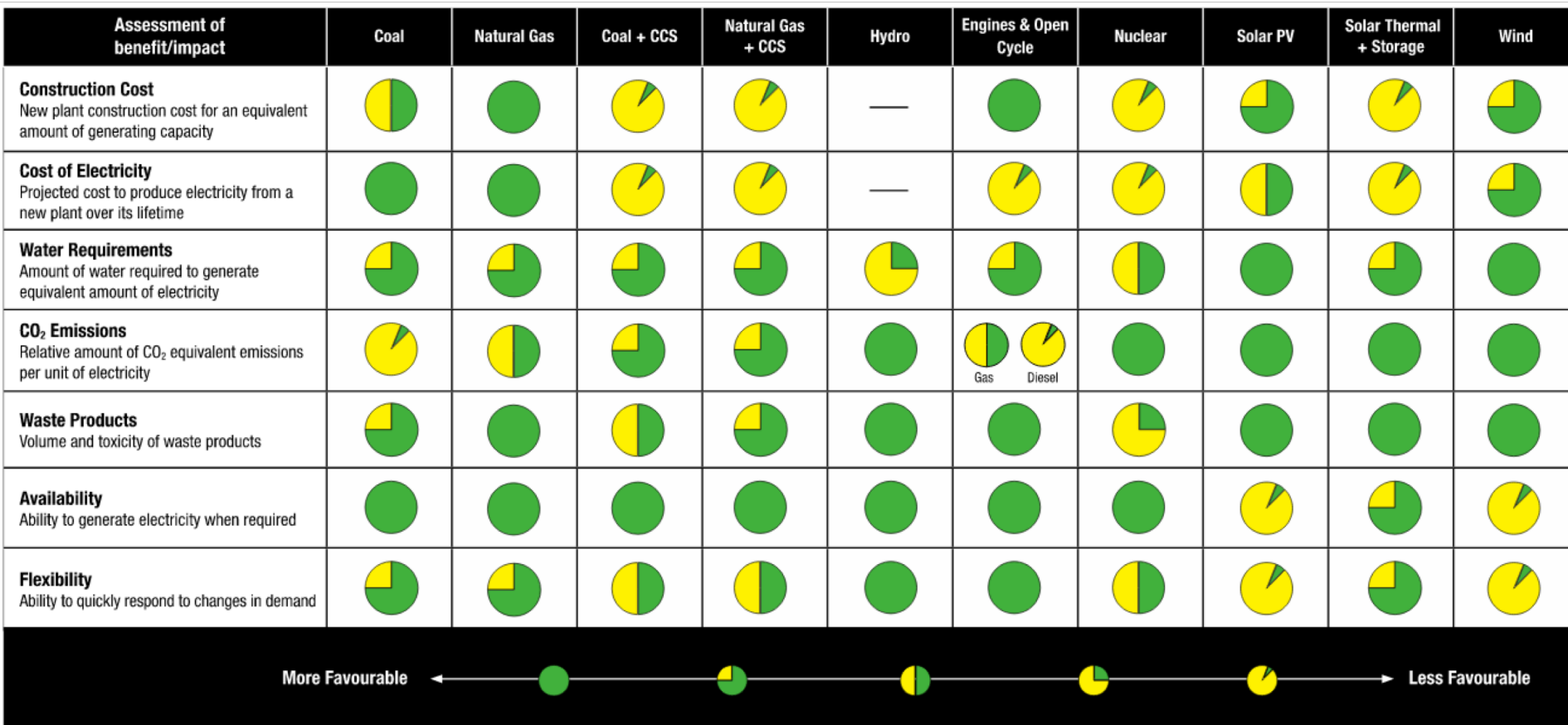


- WRF-SOLAR
- 4 domain set up
 - 45km, 15km, 5km, 1.67 km
- MP: WDM5
- SW: Dudhia
- LW: RRTM
- PBL: MYJ
- CU: KF (45km, 15km)
- BC: ERA-Interim
- Aerosol Option: ON
- SST Update
- Full year run (2005)
- Spectral Nudging

45 km



Conclusion



Thank You

