

Public Meeting, Killcare NSW, 27 February 2020

Climate Mitigation Solutions

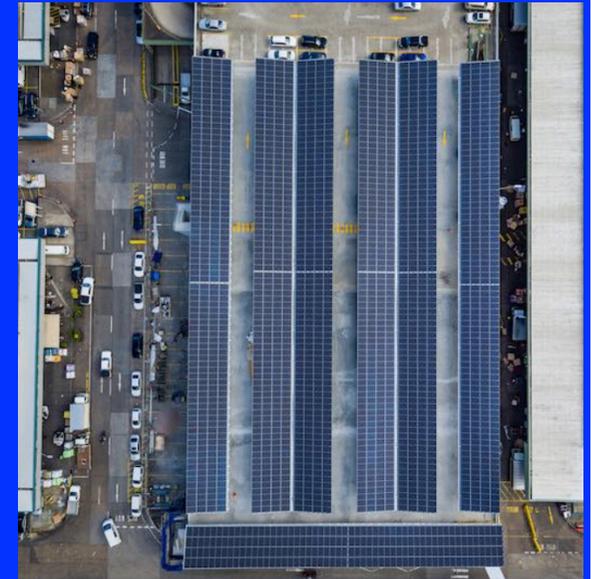


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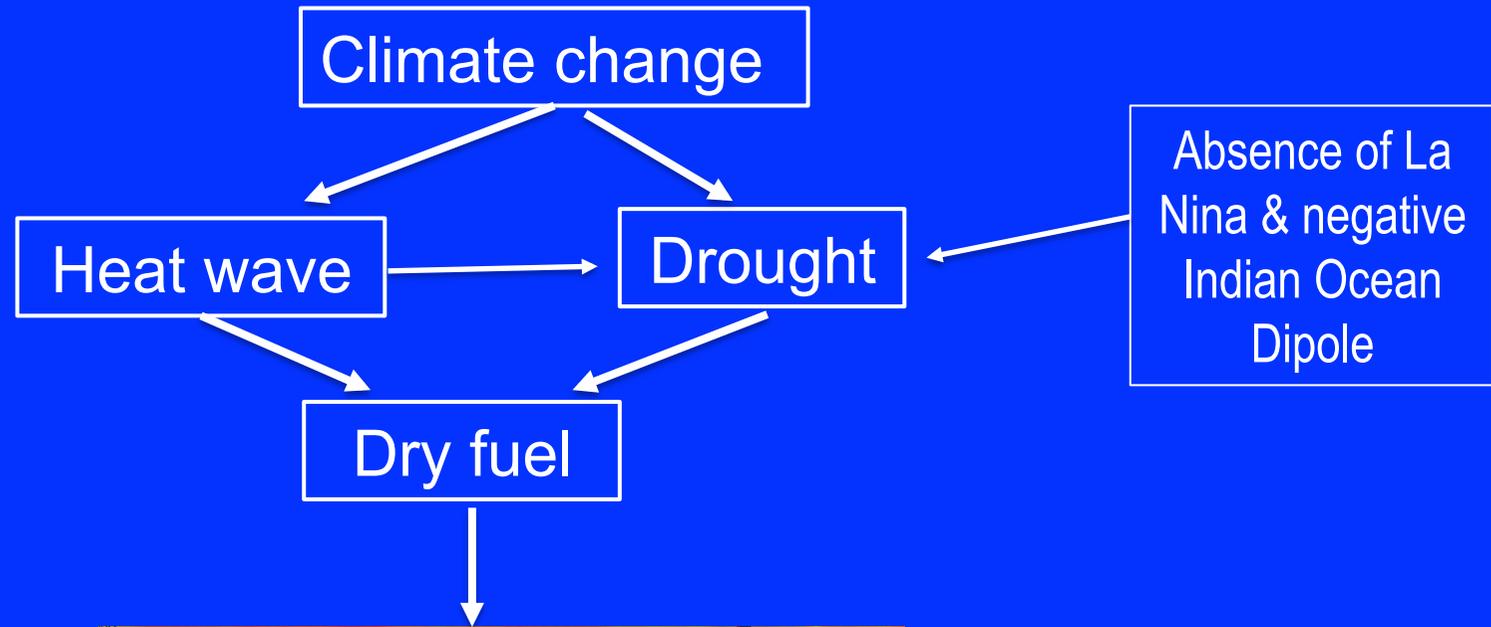




Impacts of Human-Induced Climate Change



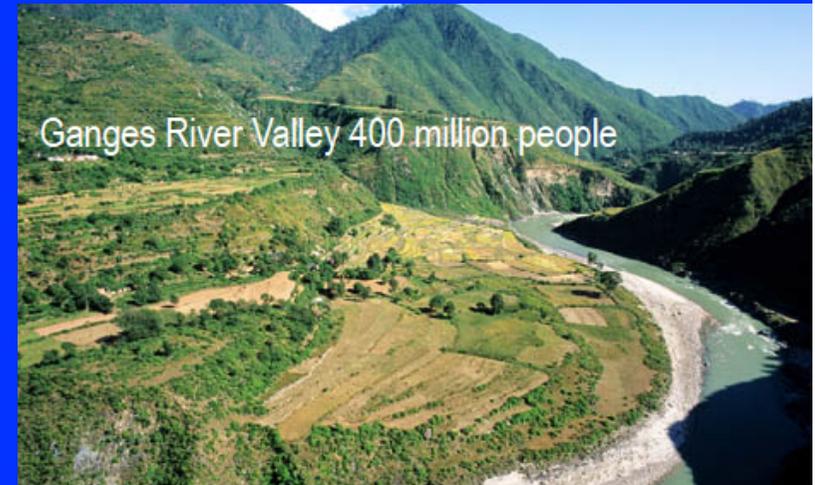
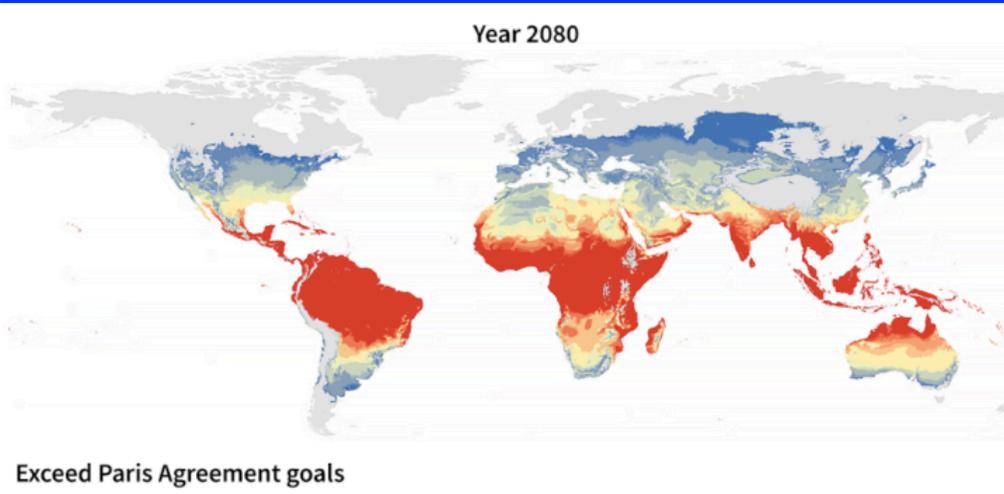
Climate Change causes more intense Bushfires



More Climate Impacts

★ Spread of vector borne diseases: mosquitoes

★ Major rivers drying up
→ starvation



★ Flooding & destruction of coastal infrastructure → forced migration



from Collaroy to Pacific Islands to Netherlands to Bangladesh



Non-Climate Impacts of Fossil Fuel Use



Air & water pollution & land degradation



Respiratory diseases

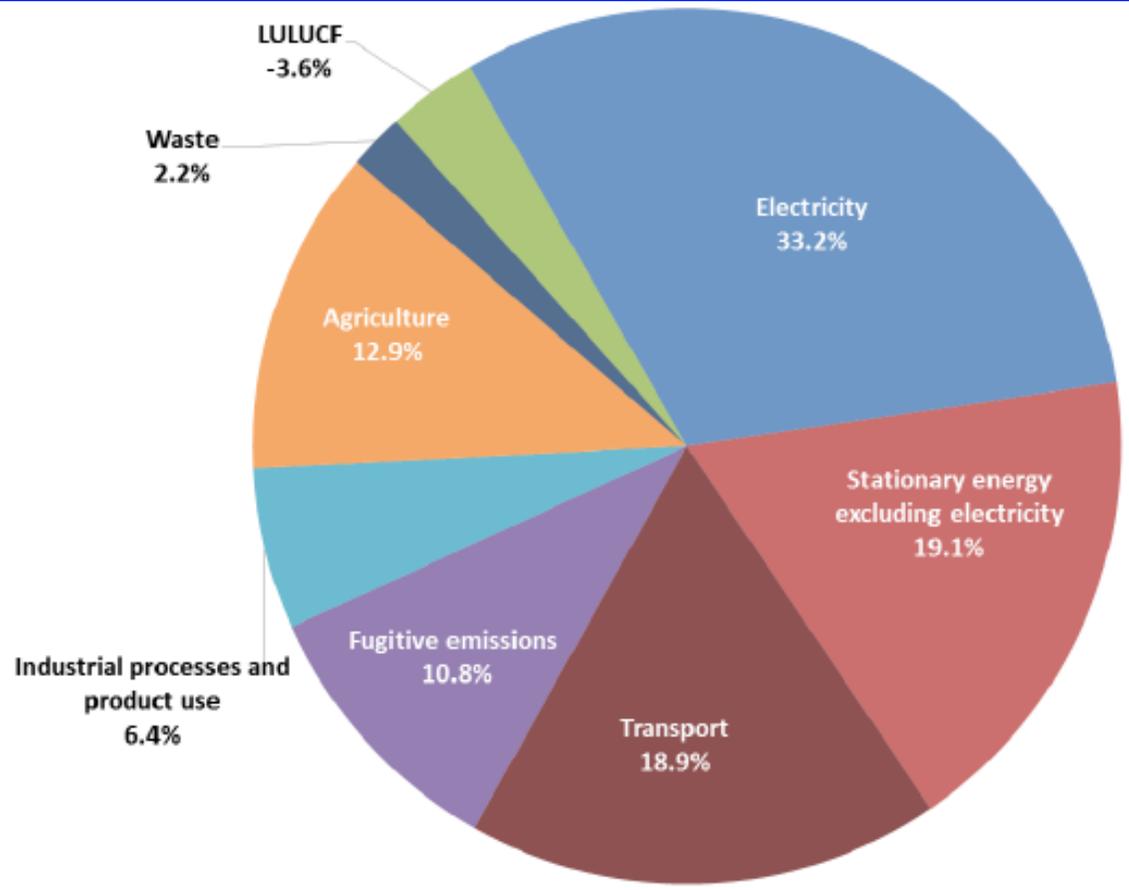


Inland coal-fired power stations use much of Sydney's & Melbourne's drinking water



The Challenge: Australia's GHG Emissions by Sector, 2018

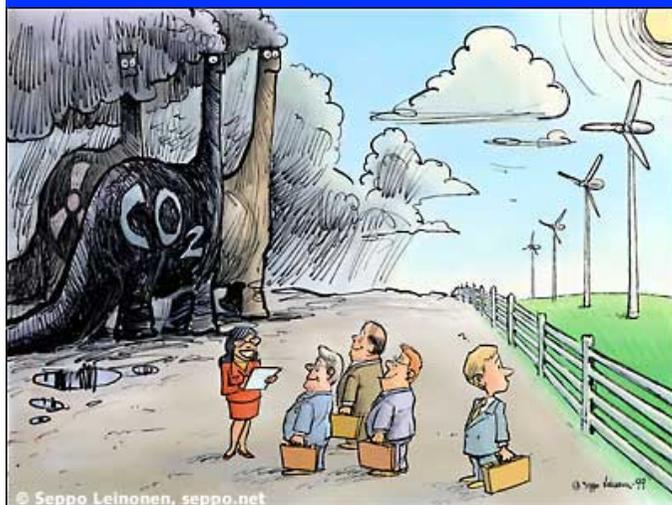
Source: Dept of Environment & Energy



- ★ Although electricity is 33%, it will provide most transport & heat in future
- ★ All energy (electricity, transport, heat) produces 82% of total emissions
- ★ Most energy can be transitioned to renewable electricity
- ★ Air and sea transport (4%) will need fuels produced by using renewable electricity
- ★ Agriculture & industrial processes more difficult than energy sector

Total CO₂-equivalent emissions = 538 Mt; electricity share 33% = 178 Mt

Recommended Energy Transition Strategy



1. Set targets for 5-year periods 2025-2040
2. Rapidly replace fossil fuel electricity with renewable electricity
3. Replace fossil fuels in domestic & industrial heating with renewable electricity
4. Replace petrol/diesel road vehicles with electric
5. Greatly increase energy efficiency of buildings & appliances
6. Social justice: assist disadvantaged workers
7. Develop an Australian industry to export renewable electricity as hydrogen or ammonia
8. Use hydrogen or ammonia for air/sea transport

Jobs in Coal Vs Wind & Solar to supply Bulk Electricity in Oz



Direct jobs in thermal coal mining & coal power stations providing 60% of electricity **≈ 30k**

Direct jobs in coal for burning in Australia to provide 60% of electricity **4–6k**

If phased out over 10 years, job loss << retirement rate



Direct jobs in wind & solar now providing 12% of electricity: **13k**

Direct jobs when wind & solar provide 80% of electricity: **87k**

This doesn't take account of manufacturing components in Oz

Diversity of RE Sources and Siting



CST with thermal storage



Wind, Albany, WA



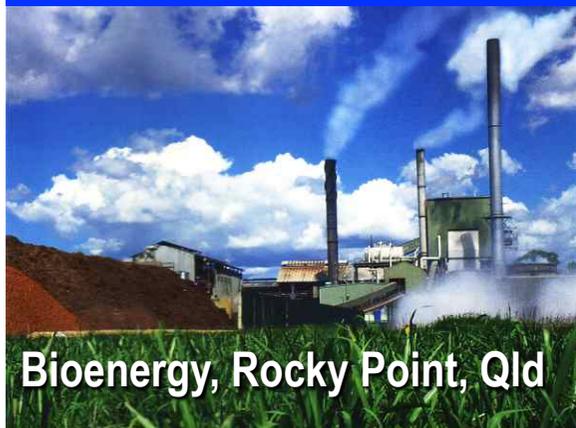
PV solar tiles

- Wind
- Biomass
- Solar PV
- Concentrated solar thermal (CST)
- Hydro
- Wave?
- Tidal current?
- Geothermal electricity?



Geothermal

Australia has the lot!



Bioenergy, Rocky Point, Qld



Hydro



Wave power, near Fremantle

Barriers to Climate Mitigation

Denial of Climate Science in Media & Parliament

The Sydney Morning Herald

January 15, 2020

James Murdoch breaks ranks over 'climate change denial'

Washington: James Murdoch has accused his family's global media empire of promoting climate denialism in a stunning attack on News Corporation's climate coverage.



The Guardian

10 January 2020

News Corp employee lashes climate 'misinformation' in bushfire coverage with blistering email

Emily Townsend's reply-all email to executive chairman calls the company's coverage 'irresponsible' and 'dangerous'

A senior News Corp employee has accused the company of "misinformation" and diverting attention from climate change during the bushfire crisis in an explosive all-staff email addressed to executive chairman Michael Miller.

Barriers to Climate Mitigation ctd

Vested Interests are spreading False Myths about Renewable Energy

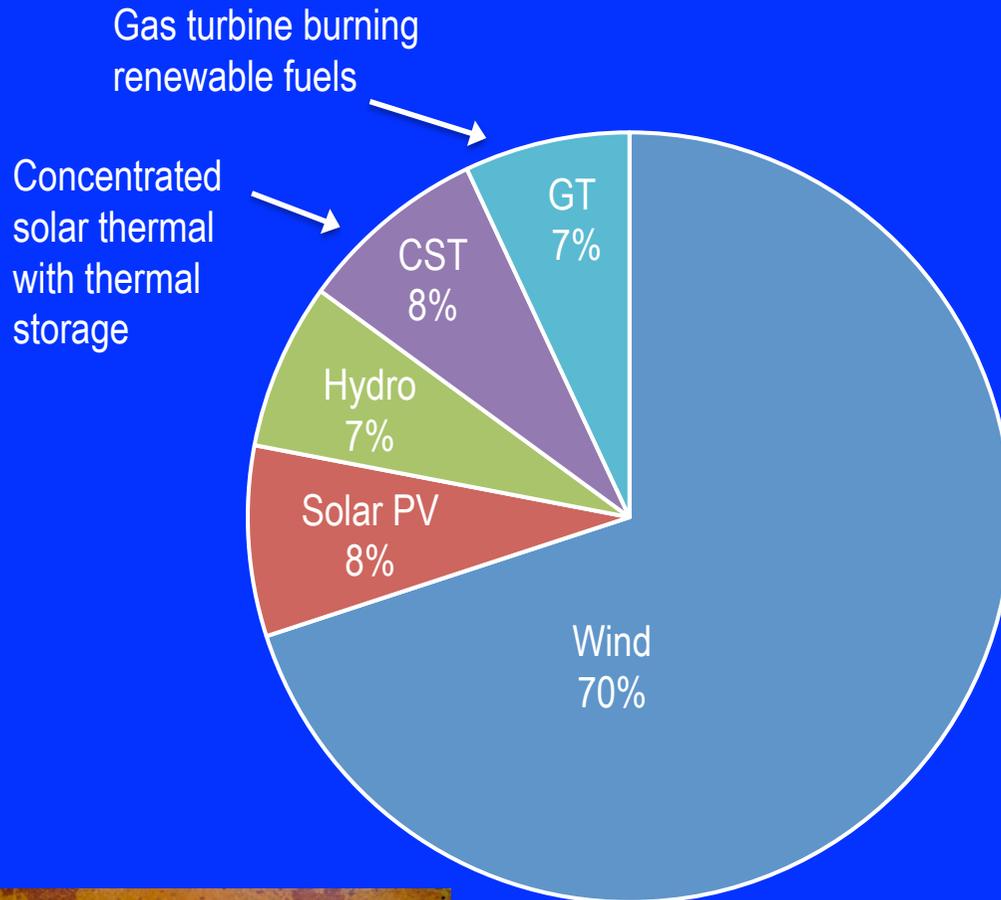
The Principal Myth (2 versions)

1. **Myth:** 'Base-load (operate 24/7) power stations, either coal or nuclear, are necessary, and RE cannot provide them'
2. **Myth:** 'Base-load power stations must run continuously as backup for RE'

This & other misinformation is refuted by:

- (1) practical experience in Denmark, Germany, Scotland, South Australia
- (2) computer simulations balancing supply & demand every hour

UNSW Simulation Modelling of National Electricity Market with 100% Renewables

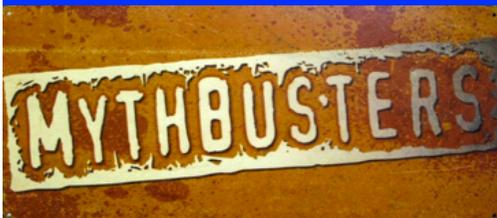


Research by UNSW group: Elliston, MacGill, Diesendorf & Riesz

Pie shows a **reliable** optimal mix of variable (78%) and dispatchable (22%) renewable electricity sources in annual electricity generation in NEM.

Blakers et al. obtain a **reliable** system with 90% variable renewables, but need much more storage in the form of pumped hydro & bioenergy

Conclusion: We don't need base-load power stations (coal or nuclear) or large amounts of storage



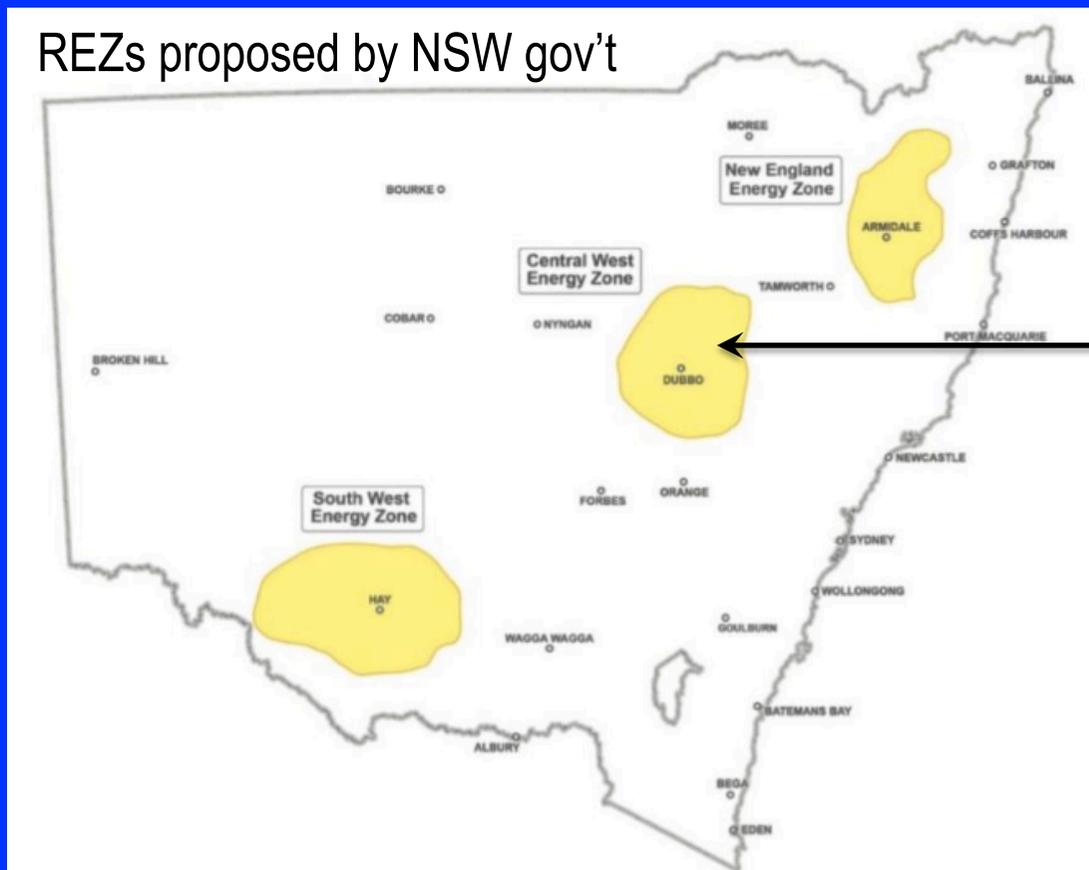
Action-Takers for Climate Mitigation

- ★ Households: see handout
- ★ Businesses
- ★ Communities & precincts
- ★ Industries, including electricity industry
- ★ Schools, universities & TAFEs
- ★ Governments: local, state & future federal



Government Action Needed 1 (Federal & States)

- ★ Transmission lines are becoming congested; key links and Renewable Energy Zones (REZs) are needed urgently
- ★ Key links needed include new SA-NSW, upgrade NSW-Qld, northern tablelands to Hunter Valley, south-west NSW & north-west Vic.



NSW & Federal governments negotiating funding for Central West Zone

In return, Federal Gov't wants fracking for gas and extended life for a coal power station.

Government Action Needed 2 (States)

Incentives for storage/dispatchable renewables

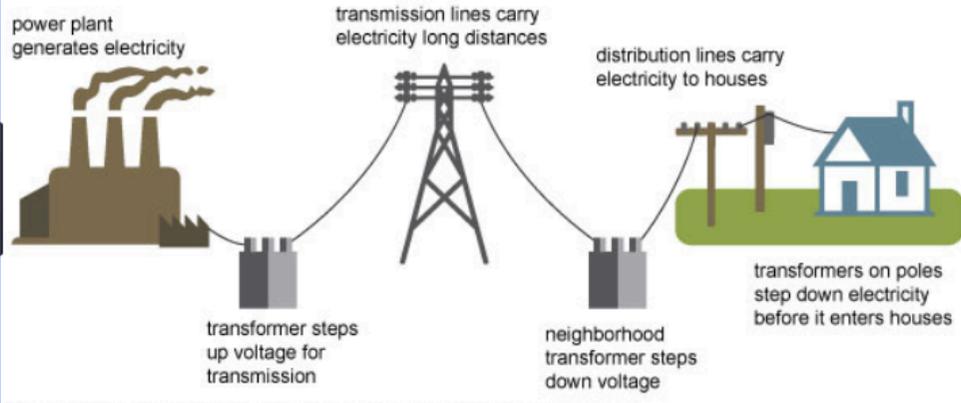
Storage needs dedicated funding from ARENA & CEFC and reverse auctions in NSW:



Gov't Action Needed 3 (States + Federal)

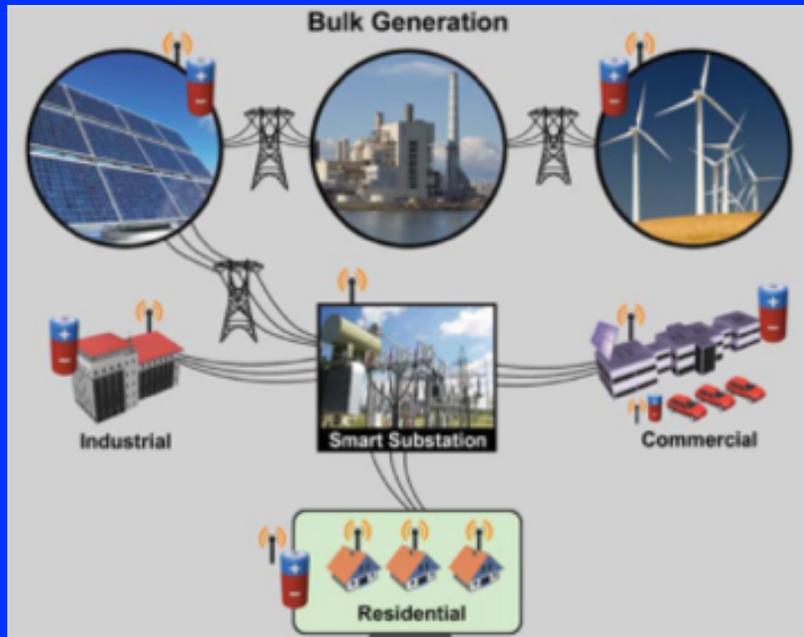
Revise National Electricity Market Objective & Rules

Electricity generation, transmission, and distribution



Original system

- Large central power stations sending electricity one way to consumers
- Wholesale electricity prices determined by bids from generators with significant fuel costs



New system

- A much more distributed system with 2-way flows
- Consumers become prosumers
- Feed-in on small, medium & large scales
- Wholesale prices reduced to economically unsustainable levels by generators with zero fuel costs

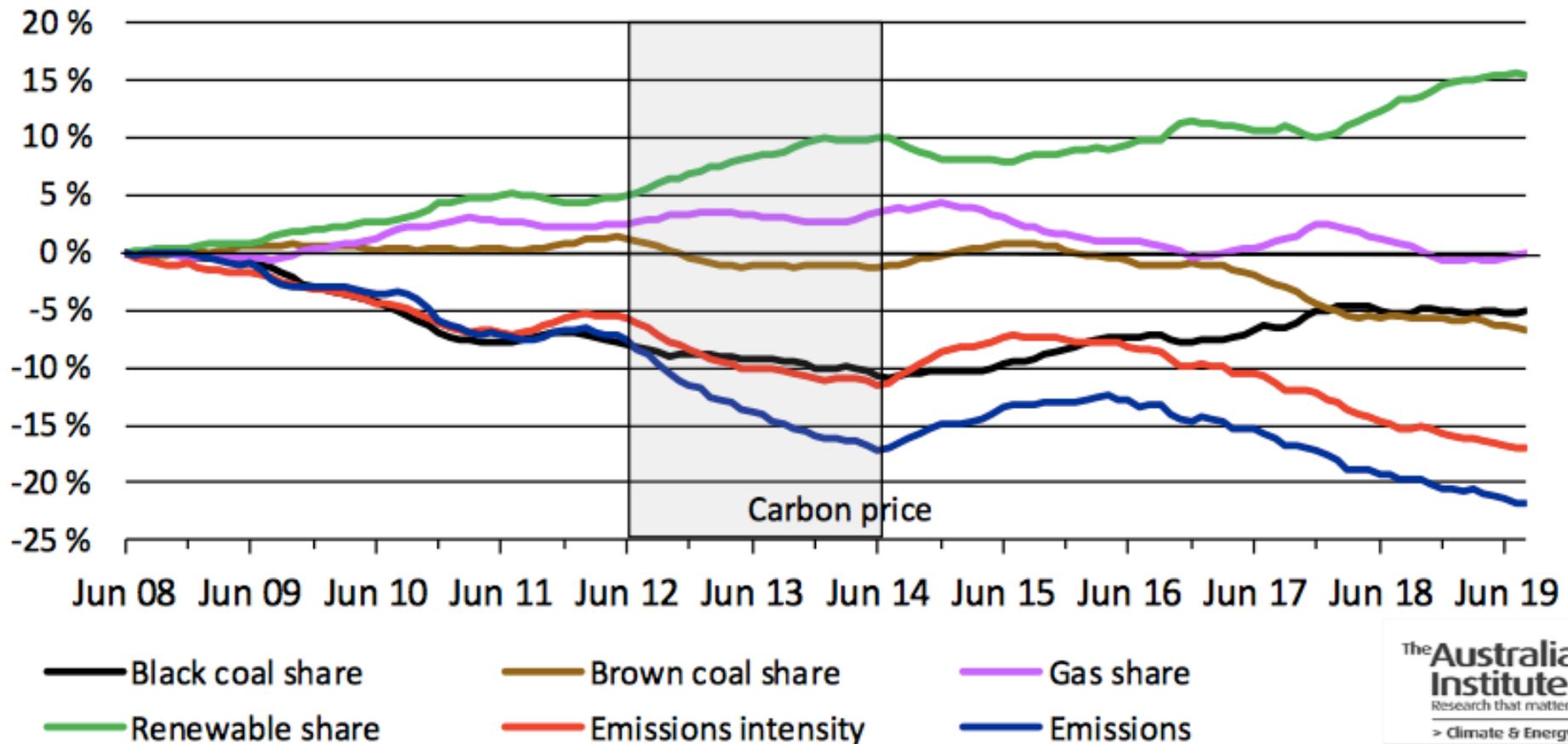
Gov't Action Needed 4

Restore Carbon Tax and return it as Dividend

Australia's Electricity Emissions, 2008-2018

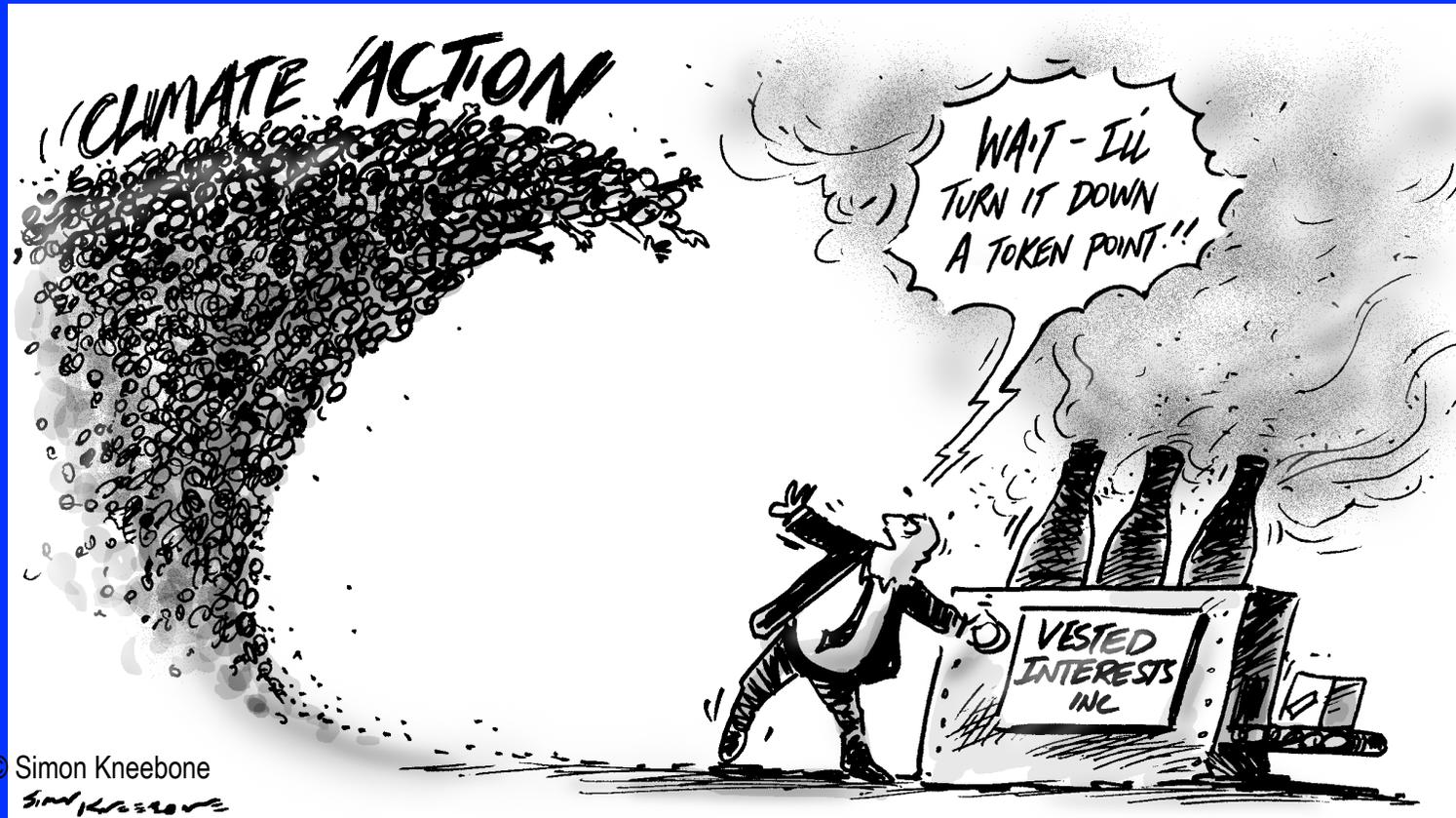
Changes in fuel shares of generation, emissions and emissions intensity

NATIONAL ENERGY EMISSIONS AUDIT



Citizens' Democratic Responsibility beyond Elections

Community Action and Pressure on Government & Business



- ★ **Join** a group: climate action, environmental, social justice, professional, business, trade union, faith, buyers
- ★ **Talk** with family, friends, neighbours, colleagues
- ★ **Donate**, if that's feasible

Further Information

Handout on how to make your home more energy efficient and save money

Research papers & non-technical articles

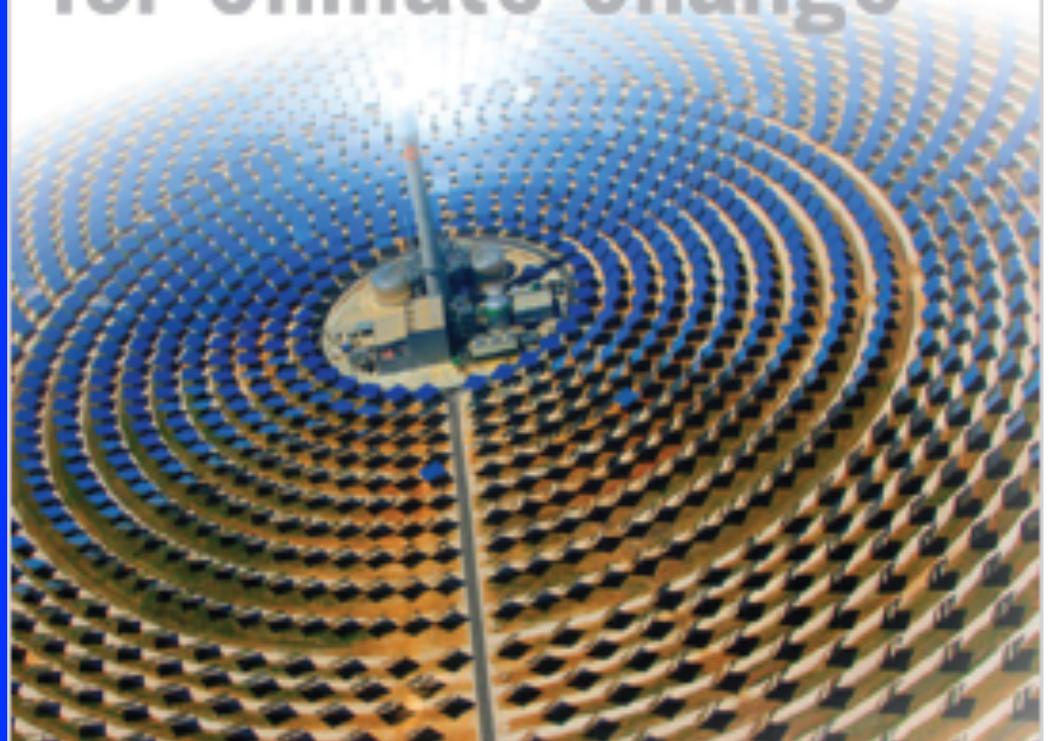
<https://research.unsw.edu.au/people/associate-professor-mark-diesendorf>

Book

Sustainable Energy Solutions for Climate Change,
Routledge, 2014

Mark Diesendorf

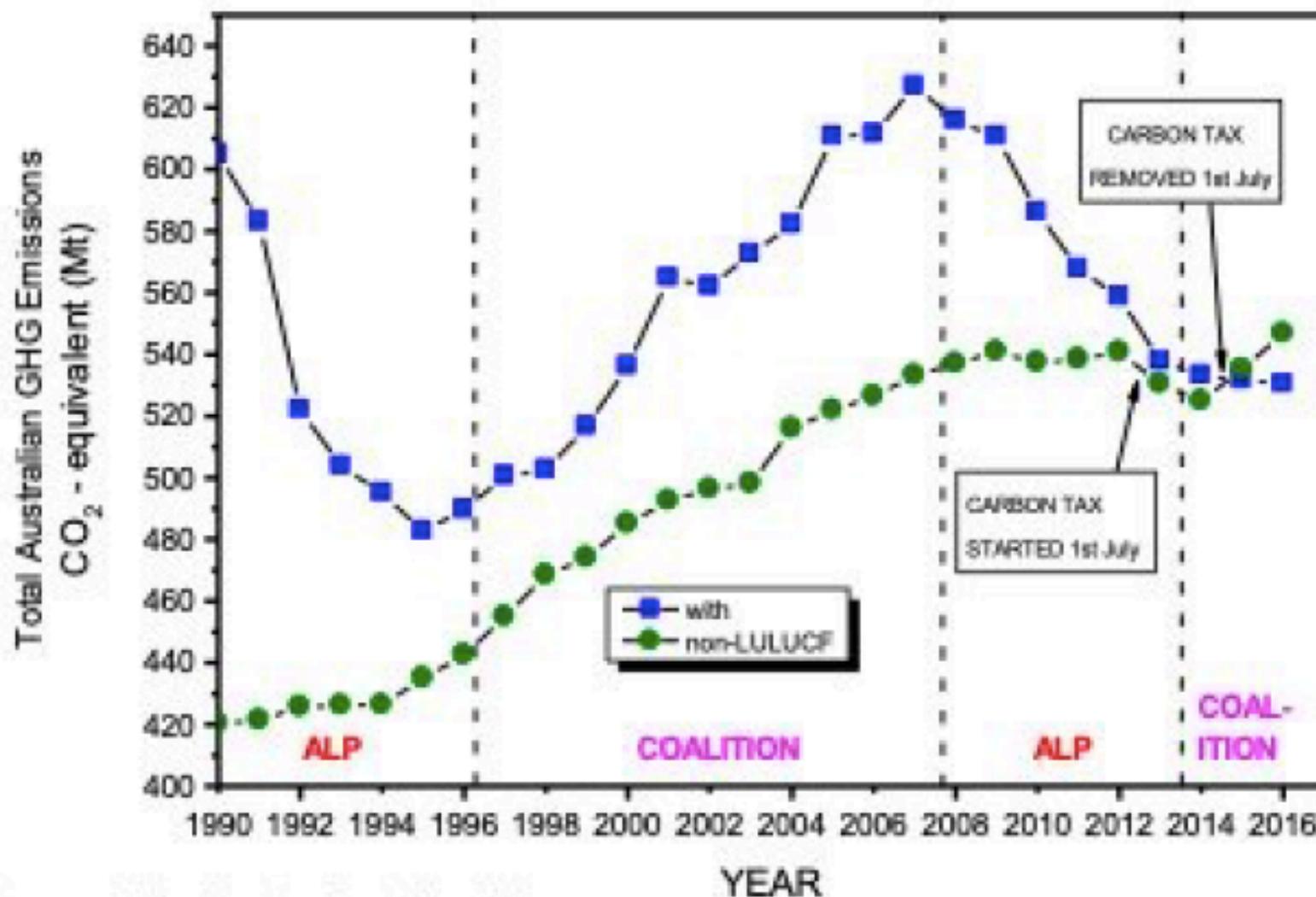
SUSTAINABLE ENERGY SOLUTIONS for climate change



Appendix

Australia's Emissions 1990-2016

with & without Land Use Emissions



Data source: National Inventory Report; May 2019

What is a Fair Carbon Budget for Australia?

Remaining global CO₂ emissions budget for 2°C target = 1100 Gt
for 1.5°C target = 340 Gt

Annual global CO₂ emissions = 37.5 Gt (47-55 Gt including other greenhouse gases)

Australia's share for 1.5°C target: 2 methods

Australia's 2017 CO₂ emissions 381 Mt/yr (530 Mt/yr incl. other GHG)

Grandfathering

1% of emissions → 3.4 Gt = 9 years of current emissions

Straight line reduction from present 381 Mt of annual CO₂ emissions to zero gives us 18 years

Equal emissions per person on Earth

0.33% of emissions → 1.1 Gt = 3 years of current emissions

Straight line reduction from present 381 Mt to zero gives us 6 years

Snapshot of State/Territory Policies Supporting Renewable Electricity (RE) Transition in Oz

in descending order of substance

Jurisdiction	Policies
ACT	Reached 100% RE <i>net</i> , mainly driven by reverse auctions; plans to improve public transport & facilities for EVs, walking & cycling
SA	Reached 55% RE (wind & solar); target of 100% by about 2030; support for home and grid batteries & a virtual power plant; R&D on hydrogen
Vic	RE targets: 25% by 2025, 50% RE by 2030, backed by reverse auctions; subsidies for household battery storage
Qld	50% RE target by 2050, but reverse auction for 400MW is token
Tas	Almost 100%, mostly hydro supplemented by wind; proposed 2 nd Bass Strait link; failing to foster the state's huge potential for EVs
NSW	Partial support for 1 st RE Zone; verbal support for RE from Minister
NT	Target 50% RE by 2030, but no policies for implementation
Federal	No new policies of substance; Renewable Energy Target ends in 2020; Clean Energy Finance Corporation continues; ARENA funding finished

Example of Denier Myth about Climate Science

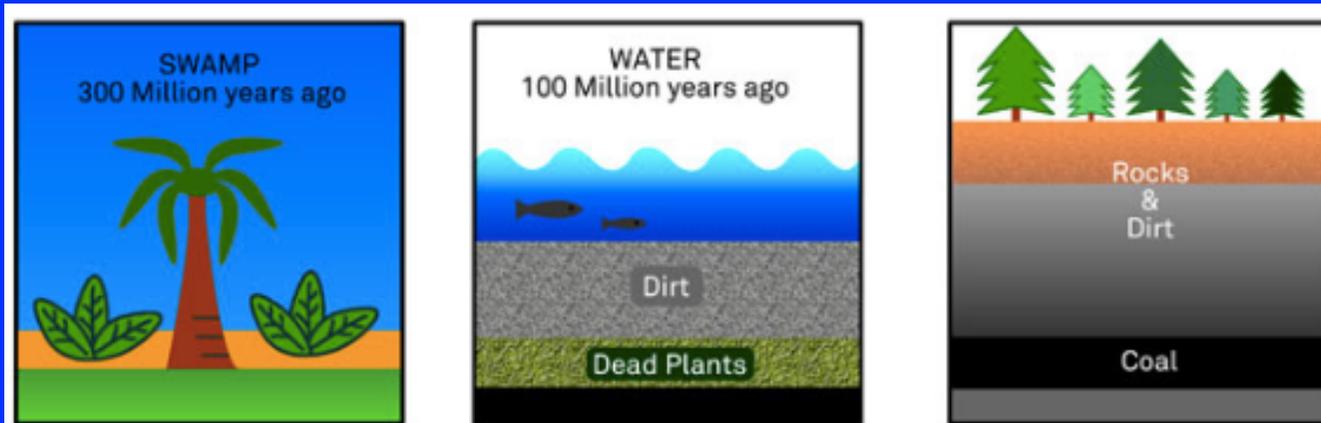
- ★ Myth: “Natural flows of CO₂ are much greater than human-induced flows, so human-induced flows don’t matter.”
- ★ First line is true but conclusion in second line is **false**. Bathtub analogy



In nature, CO₂ emissions are balanced by CO₂ absorption; human intervention by burning fossil fuels upsets the balance.

Carbon Isotope Evidence that most Carbon Emissions come from Fossil Fuel Combustion

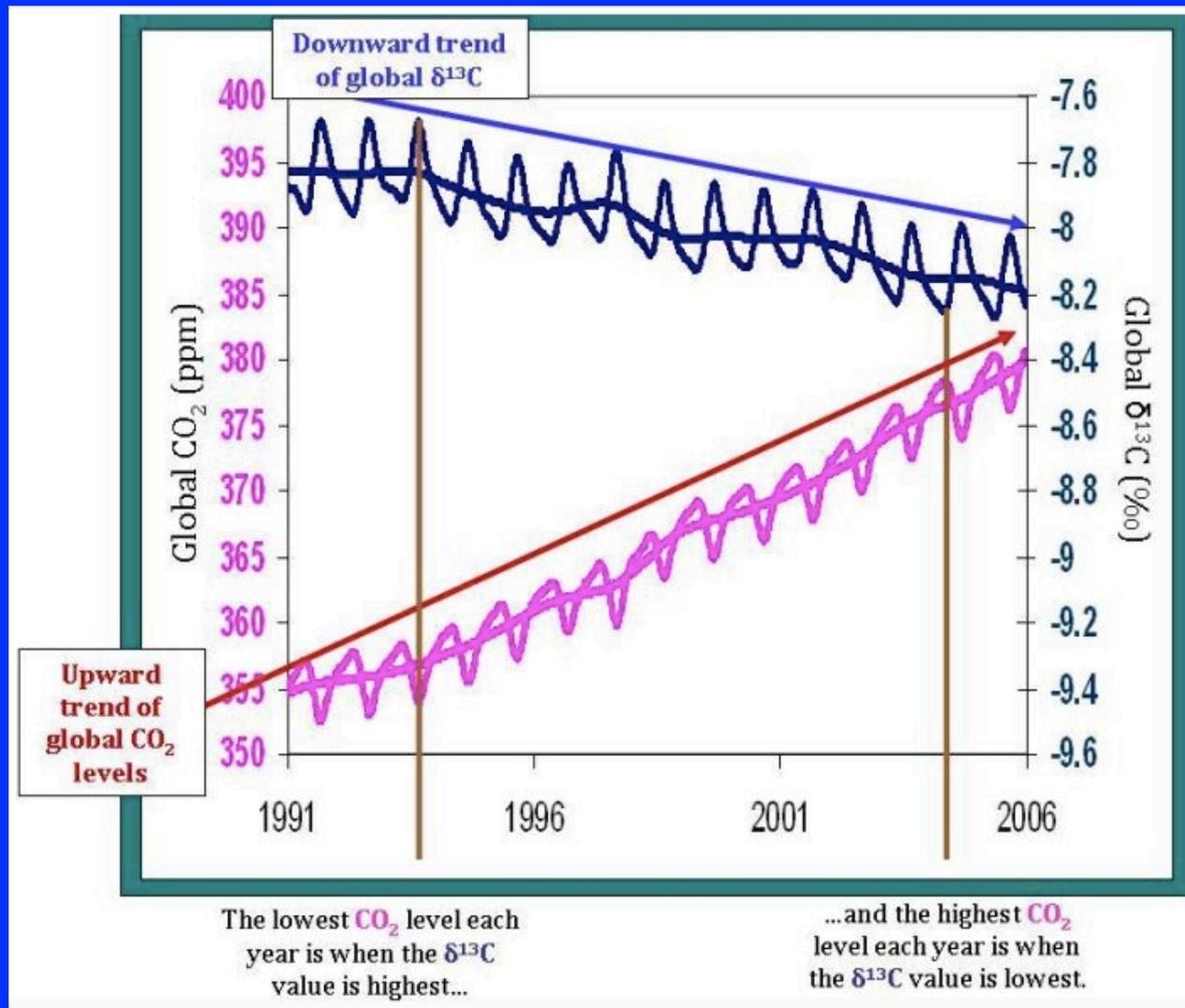
- ★ Carbon has 3 isotopes: C^{12} (stable), C^{13} (stable) & C^{14} (radioactive)
- ★ During photosynthesis, plants take up less C^{13} and so have relatively less C^{13} than C^{12} compared with the atmosphere



Over millions of years, fossil fuels are formed from plants

- ★ When fossil fuels are burned, they release less C^{13} and no C^{14} into the atmosphere
- ★ So, if most carbon emissions come from burning fossil fuels, we expect the amount of C^{13} and C^{14} in the atmosphere relative to C^{12} to be declining as we burn more and more fossil fuels

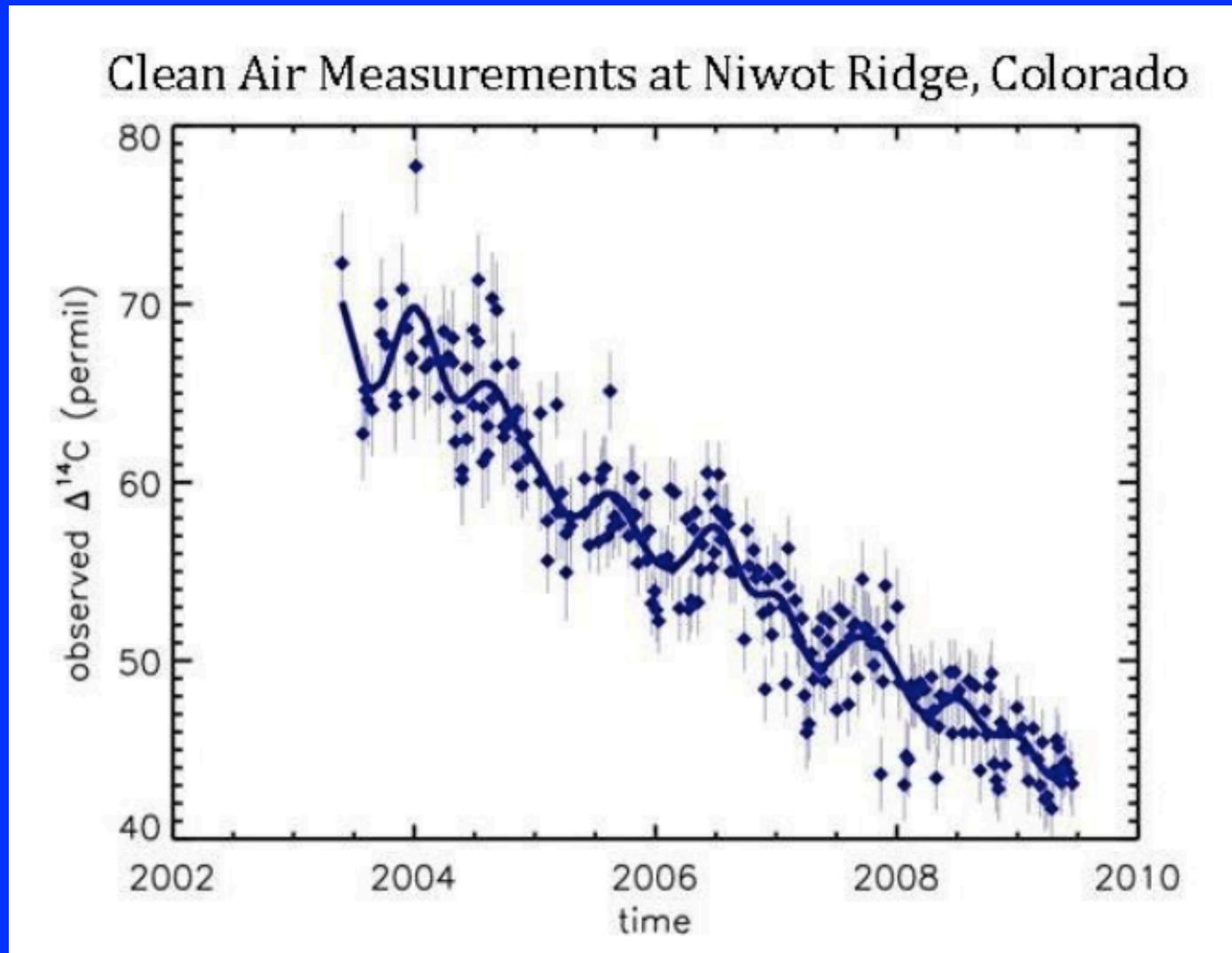
As expected, Carbon Isotope C^{13} trends down in Atmosphere, while total CO_2 trends up



Source: NOAA, <https://www.esrl.noaa.gov/gmd/outreach/isotopes/c13tellsus.html>

As expected, Carbon Isotope C^{14} trends down

Source: NOAA



Additional Key Policies & Actions Needed from NSW Gov't

(see Handout)

- ★ Set greenhouse targets, renewable energy targets and energy efficiency targets for 2025, 2030 & 2035
- ★ Mandate fair feed-in tariffs for small-scale renewables such as rooftop solar
- ★ Mandate energy audits for all homes for sale or for rent, with energy ratings on sale and rental documents
- ★ Extend Basix scheme to *all* homes
- ★ Improve public transport
- ★ Fund fast-charge stations for electric vehicles
- ★ Set up and industry-funded incentive for retirement of the most polluting coal-fired power stations

Policies to cut Support for Fossil Fuels in the Political-Socio-Economic System

- ✦ Ban political donations & introduce publicly funded elections
- ✦ Create federal integrity commission or ICAC
- ✦ Review and reduce powers of corporations
- ✦ Remove mining industry's legal right to access land against wishes of owners & traditional custodians
- ✦ Stop the revolving door between vested interests and politicians/political advisers
- ✦ Transition to steady-state economy:
i.e. no global increase in population or consumption of energy, materials & land

