

Carbon Zero

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The dream



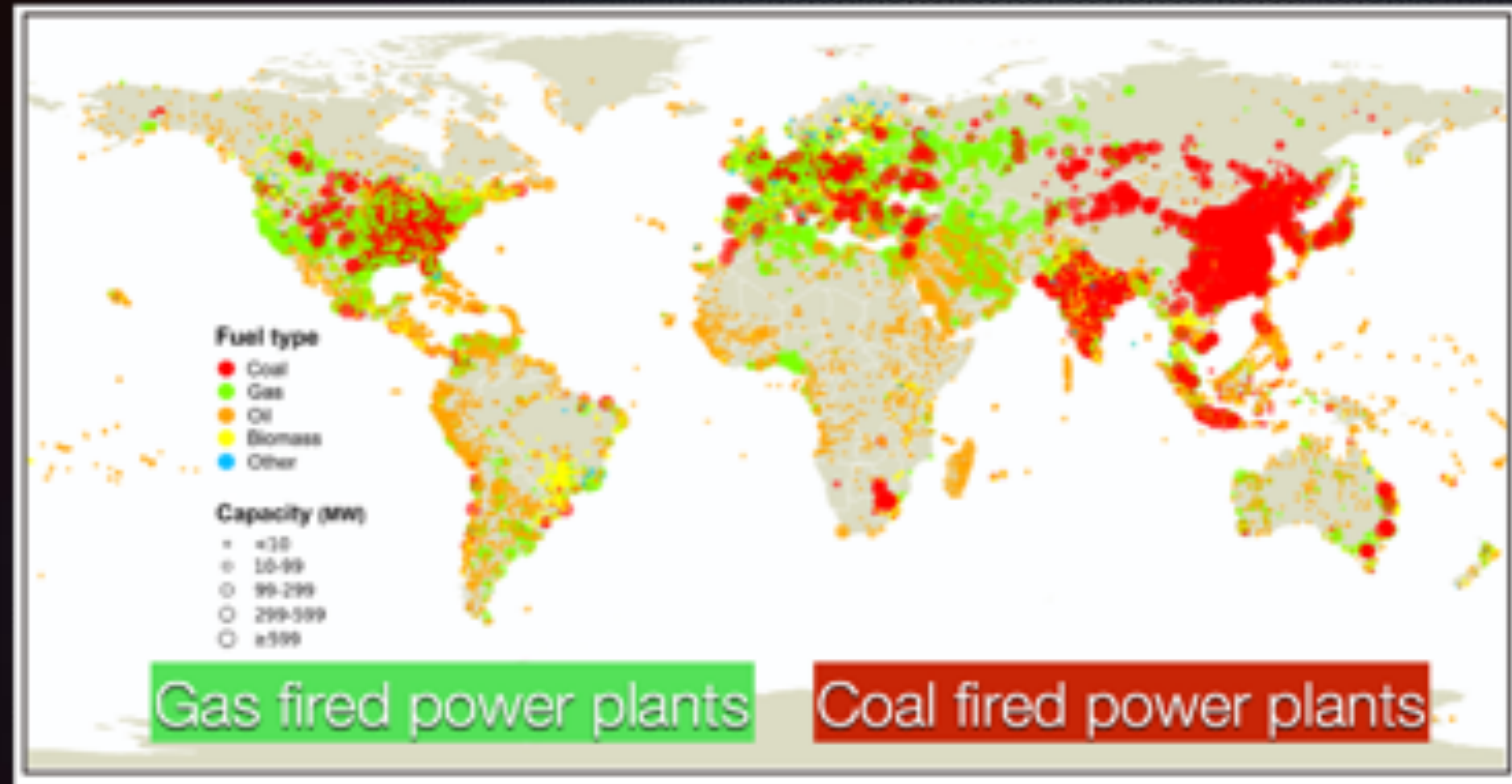
The reality



The Government's Dream

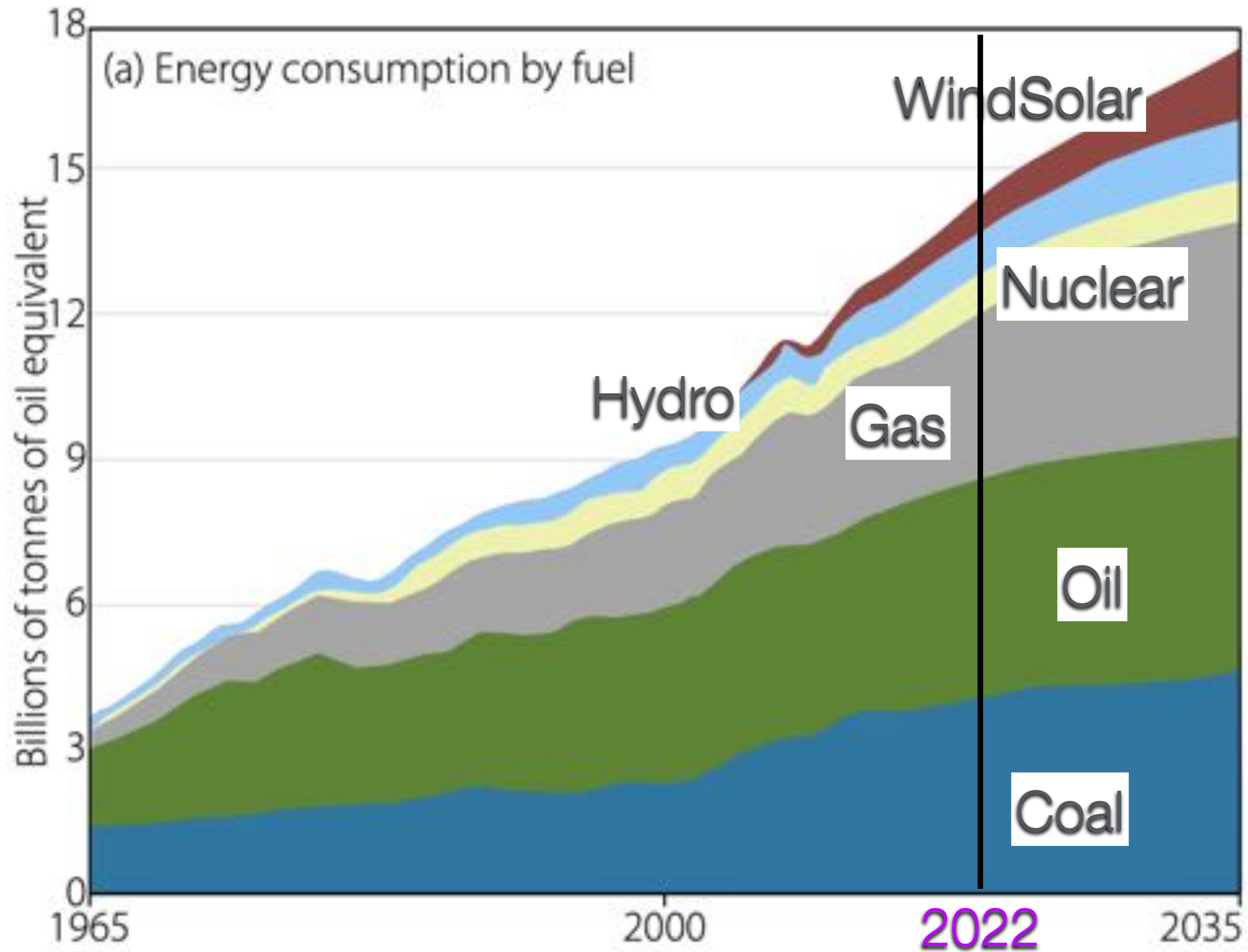
- We must achieve net zero by 2050 by:
 - Electrifying transport
 - Electrifying heating
 - Massive increases in wind and solar power
- This implies
 - Increasing generating capacity from 9000 MW to 26,000 MW
 - Commissioning ~4000 MW of short and long term energy storage
- ***Can do we do it? Can we afford it?***

New Zealand cannot affect the climate



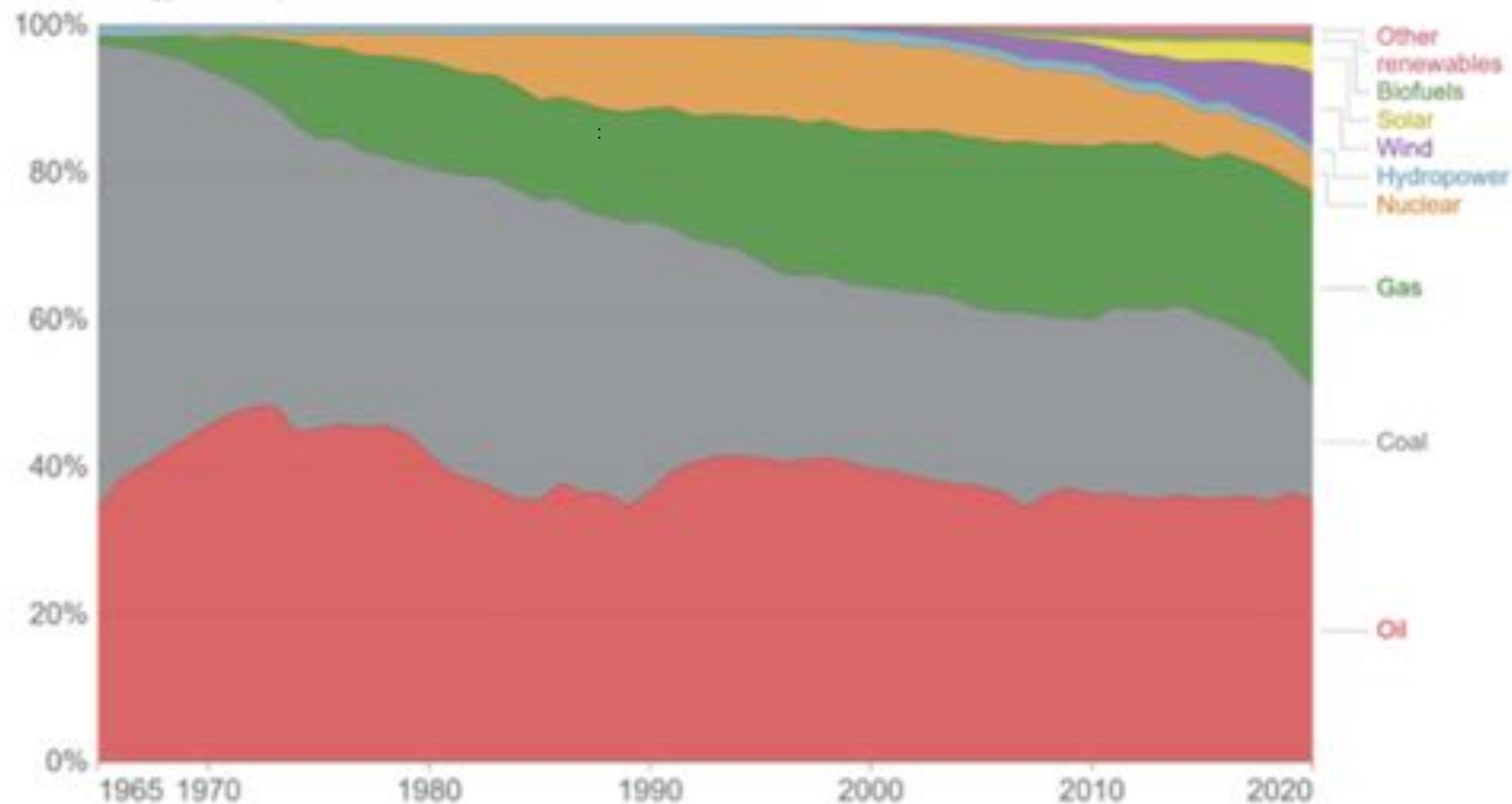
World Energy

Can renewables replace coal, oil and gas by 2050?



Energy consumption by source, Germany

Primary energy consumption is measured in terawatt-hours (TWh). Here an inefficiency factor (the 'substitution' method) has been applied for fossil fuels, meaning the shares by each energy source give a better approximation of final energy consumption.



Source: BP Statistical Review of World Energy

Note: 'Other renewables' includes geothermal, biomass and waste energy.

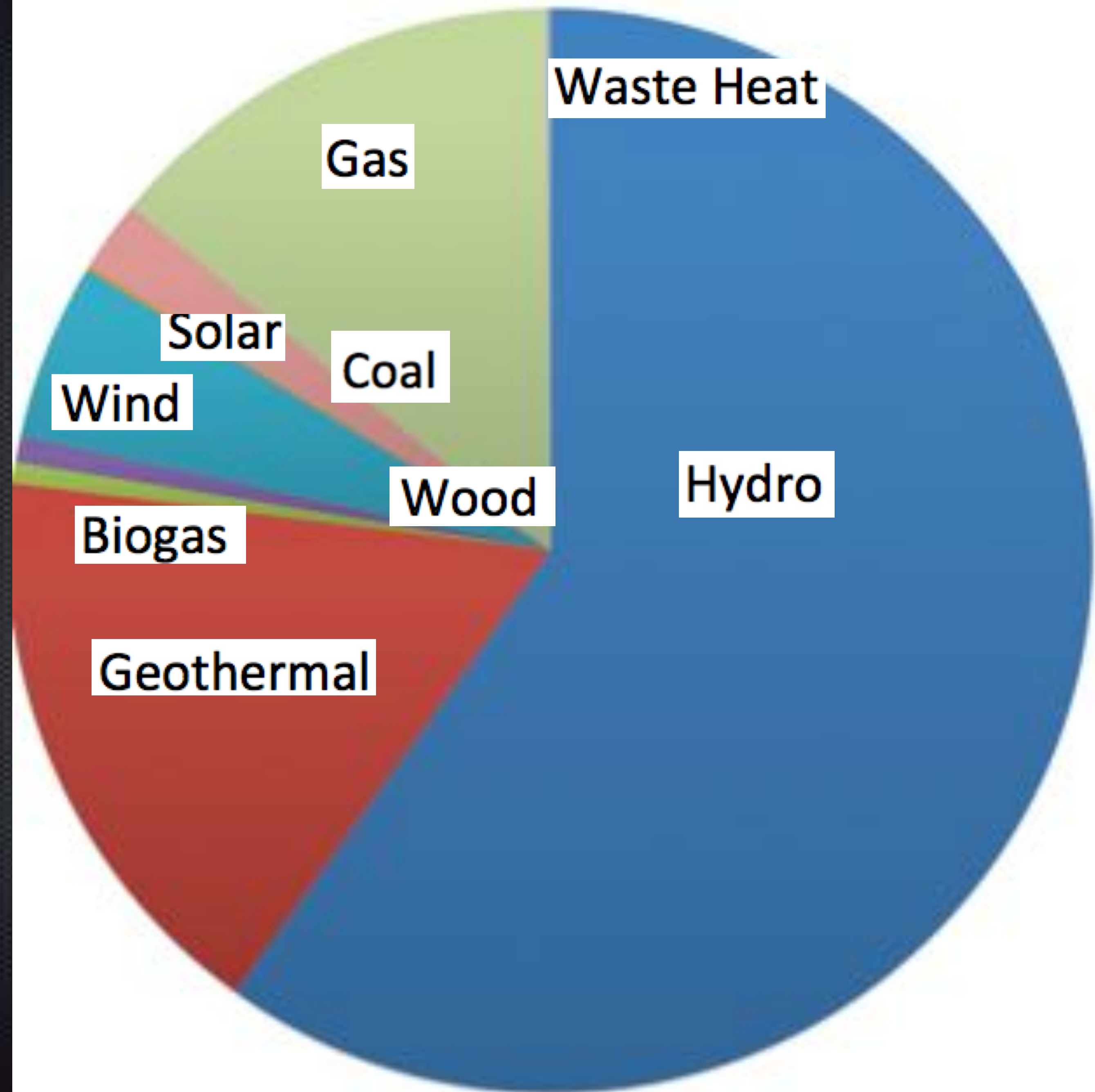
OurWorldinData.org/energy • CC BY

Where NZ electricity comes from

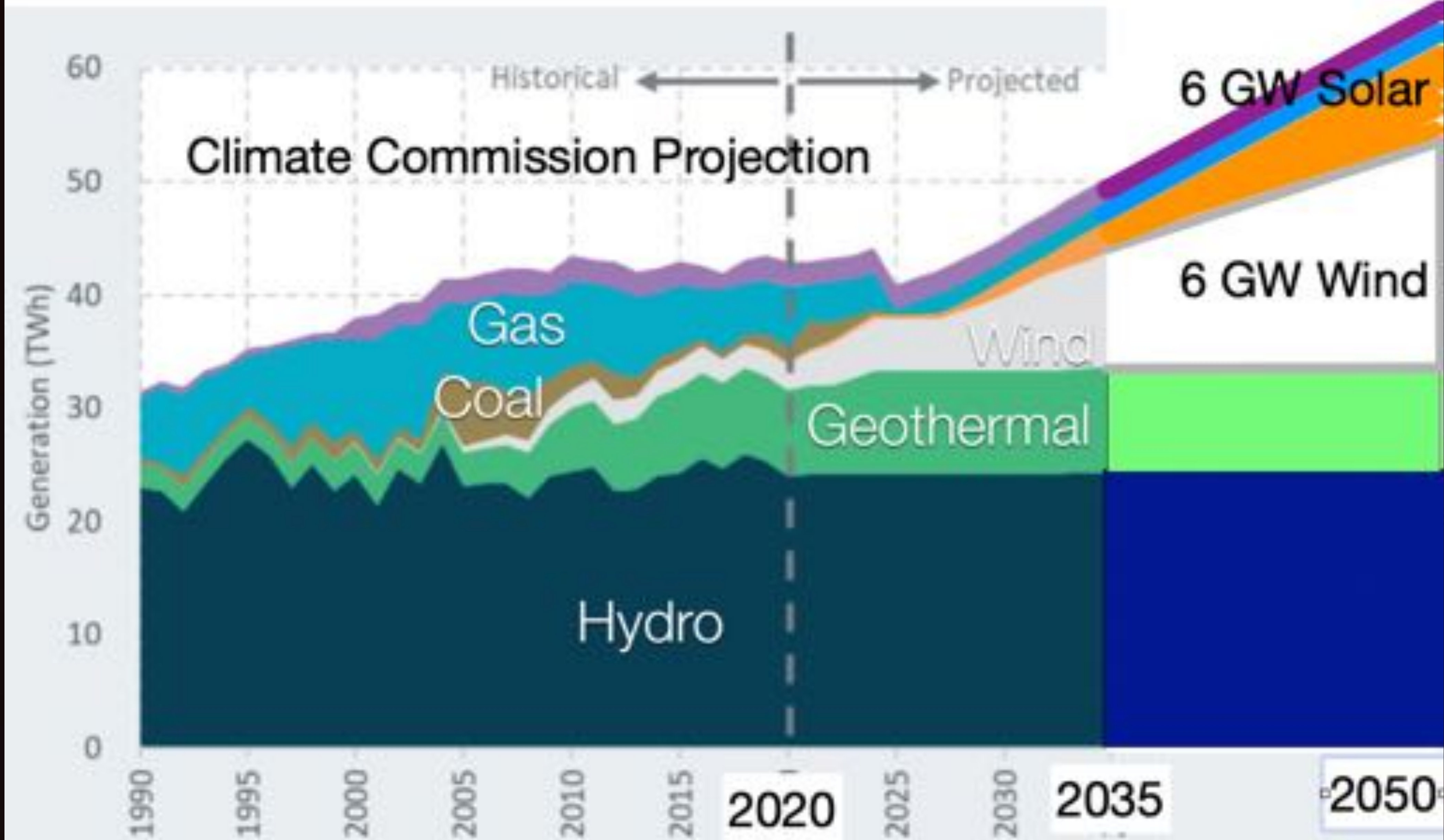
978 MW of geothermal = 18%

1040 MW of wind = 6%

In 2020
Coal 4%
Gas 12%
Hydro 65%



The dream



Prof Kelly's report

Just for New Zealand

- The cost to 2050 will comfortably exceed \$550 billion
- A workforce comparable in size to the health sector will be required for 30 years
- A doubling of the present number of electrical engineers
- About 10% of the global annual production of lithium, cobalt, neodymium and other materials.



Wind and Solar must have backup

- 12,000 MW of wind and solar farms will need 4000 MW of backup
- technologically and economically impossible
 - Lake Onslow storage - 10+ years away and only 1500 MW
 - also in the wrong place
 - major environmental implications – years to get approvals
 - hugely expensive – more than nuclear power would cost
 - will need massive changes to the electricity market - will take many years

Crazy beyond belief

- It would cripple our economy
 - electricity will become expensive and unreliable
 - agricultural income will decrease
 - forest industries will close down
 - steel mill will close down
 - poor people will suffer most
- Regardless of your belief in man-made global warming
 - it cannot make ANY difference to New Zealand's climate

All virtue signalling: NO reward

- ***Simply accepting that we adapt to climate change as and when it happens would virtually eliminate any climate problem!***

Electrify transport and heating

- ✦ The Government wants to start NOW. Why?
- ✦ For as long as Huntly is generating....
 - ✦ Replacing a coal fired boiler with an electric boiler results in Huntly burning **two and a half** tonnes of coal for *every* tonne of coal saved by industry
 - ✦ Electric cars will be fuelled by coal fired electricity!

*Renewable power system **FIRST**
THEN convert transport and heating to electric!*

Transport cost - 14,000 km pa

- ✧ Electric car
 - ✧ \$60,000 + \$3000 for home charger - Power + RUC 14 c/km
 - ✧ Commercial charging 24 c/km
 - ✧ + Depreciation 15% (\$9000pa) ~\$1/km
- ✧ Diesel car
 - ✧ \$40,000 - Fuel + RUC 20 c/km
 - ✧ + Depreciation 15% pa 60 c/km

Electric costs 50% more and has refuelling problems!

Electric Cars Worldwide

- ✦ Cost of CO2 reduction is \$300 – \$1000/tonne
 - ✦ Current CO2 (carbon) price in NZ is about \$65/tonne
- ✦ Electric cars are heavily subsidised yet they are only 2% of all cars worldwide
- ✦ Batteries need lithium and cobalt – both are scarce and increasingly expensive
 - ✦ Unsustainable??
- ✦ Are not a “must have” item like a Model T Ford or iPhone
 - ✦ Electric car = expensive conventional car with a small fuel tank that takes 30+ minutes to fill

Will enough people want to buy one?

Electric heating

- ✧ Converting heating to electricity would increase electricity demand by ~20%
- ✧ We must abandon perfectly good
 - ✧ Coal and gas fired boilers
 - ✧ Gas water heaters
 - ✧ Gas home heating
 - ✧ Gas distribution system
- ✧ The cost will be huge
 - ✧ Who pays??

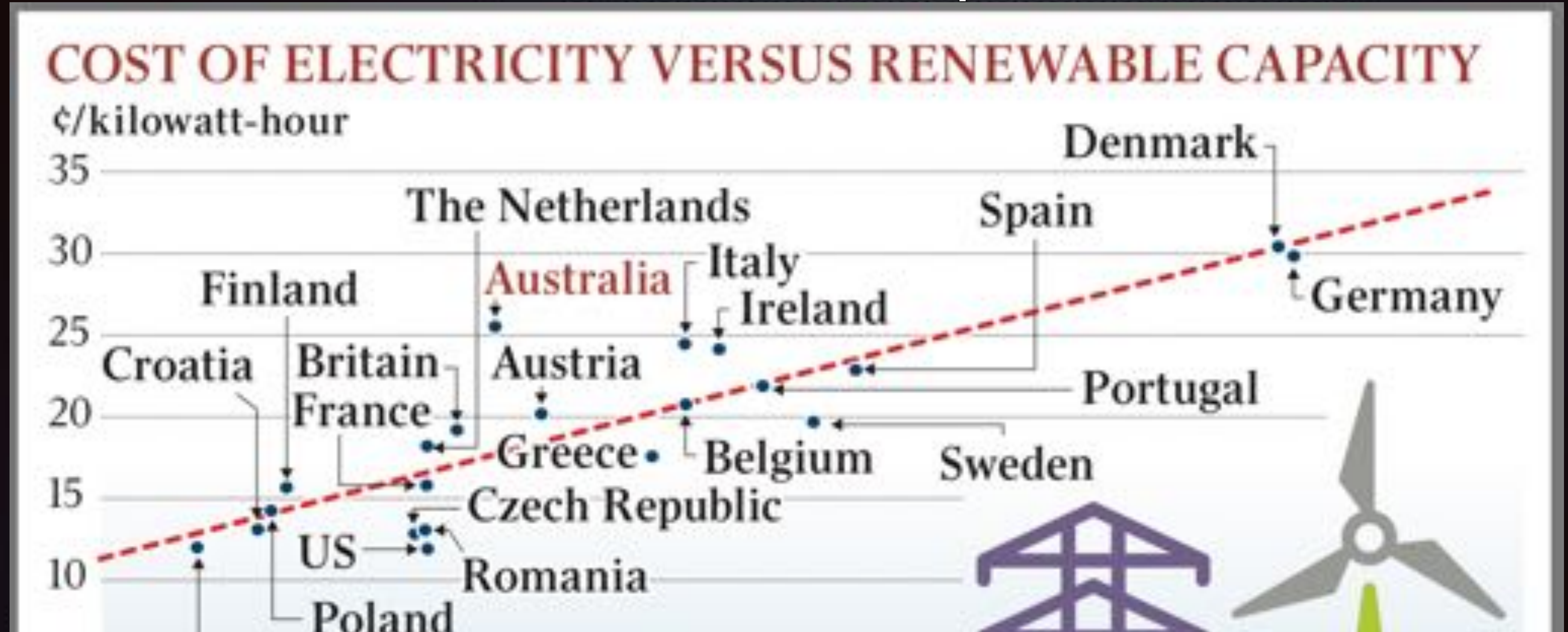
You do!

Characteristics of renewable energy

- ✦ In a 1:20 dry year hydro generation drops by 15% over a 4 month period
- ✦ Wind power can drop to less than 15% for days on end
- ✦ Solar power generates for about six hours per day and drops to 25% on cloudy days
- ✦ Capacity factors for wind and solar power in New Zealand are 36% and 18%
- ✦ We need to store energy to keep the lights on when the wind isn't blowing and the sun isn't shining
- ✦ We need to store the equivalent of 10% of annual generation for a dry year

How about 1m tonnes of coal at Huntly @ \$200 m?

Wind and solar *increase* power costs



South of Scotland Electricity: “Most wind farms in Britain will not be economically viable when existing subsidies end and will close prematurely without further revenue support.”

Storage options

- ✦ The 12,000 MW of wind and solar power postulated for 2050 would need at least 4000 MW and 4000 GWh of storage
- ✦ Batteries are impossibly expensive
 - ✦ Storage cost is about 50 ¢/kWh
 - ✦ Five days backup for a wind farm would cost about 3x the cost of the wind farm
- ✦ Other options are
 - ✦ Pumped storage schemes
 - ✦ Upgrading the smelter with new technology so that it can reduce load to help with dry years and fluctuations in wind and solar power

But none come near to the 4000 MW we need

What is Carbon Zero going to cost?

Total cost estimated to be at least...

\$ 500 billion

- ✧ **Reduces emission by 30 M tonne pa?**

- ✧ **Cost**

\$1700/tonne

CC claim that it will cost no more than \$250/tonne

- ✧ ***Makes no difference to the climate!***

The government could consider...

- ✦ Replace coal with more hydropower, geothermal and gas
 - ✦ Reduced emissions and cheaper power
- ✦ Accelerate switch to modern efficient conventional vehicles
- ✦ Consider safe, reliable and emissions free nuclear power
- ✦ Initiate research into whether or not man-made greenhouse gases do cause dangerous global warming

Adopt nuclear power

- Nuclear power has proved to be safe, reliable and emissions free

Mass
produced
small
modular
reactors will
soon be
available

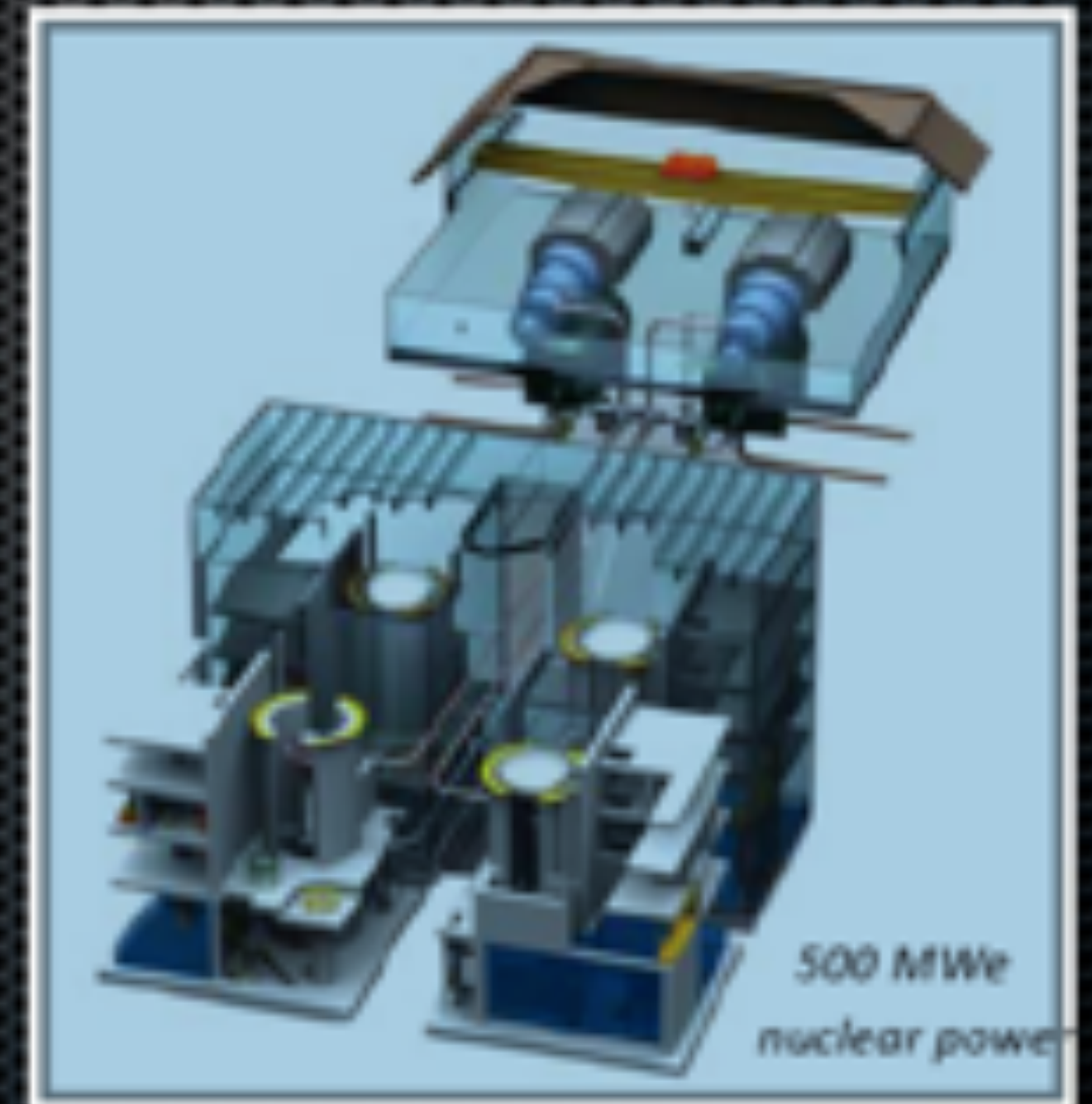
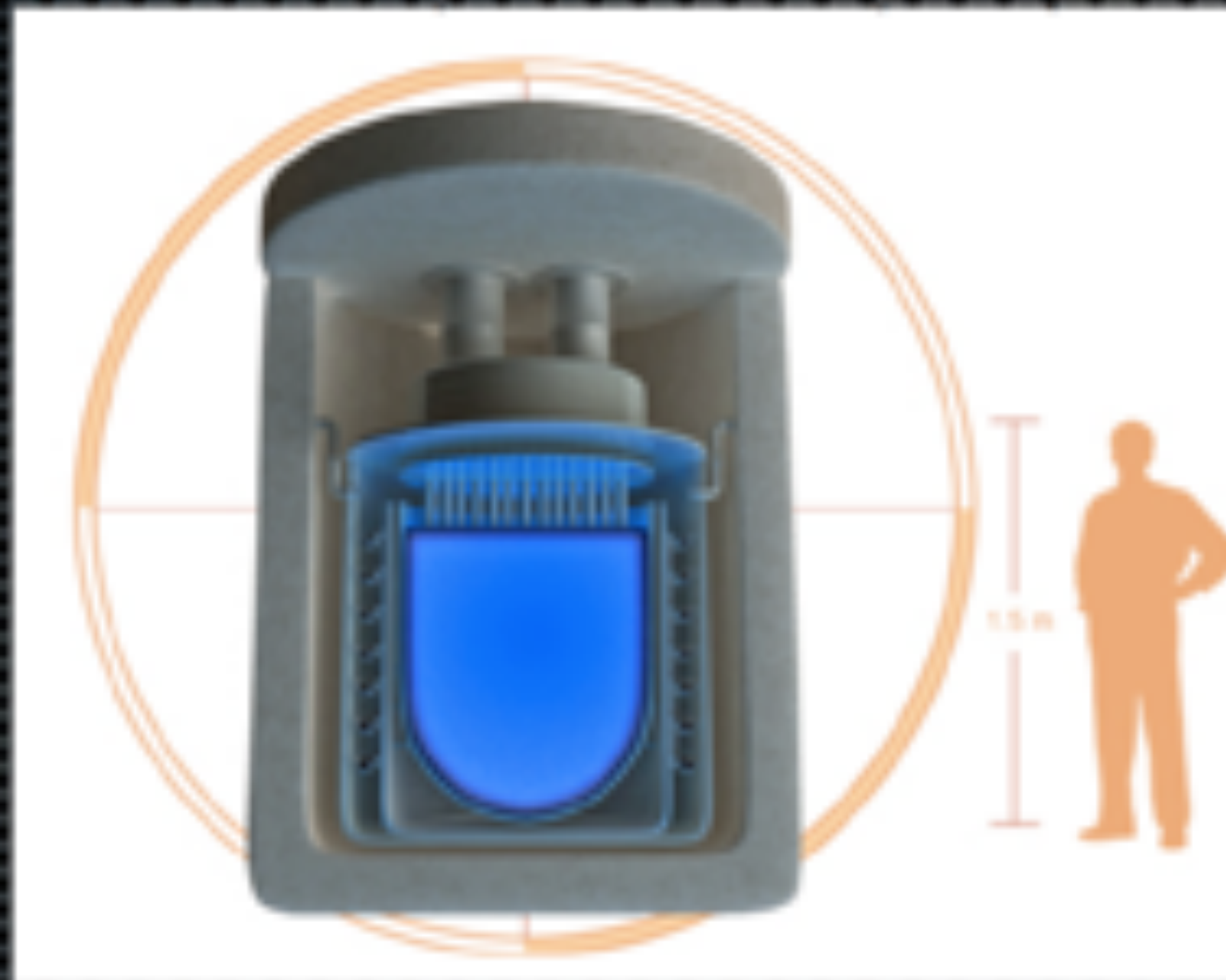
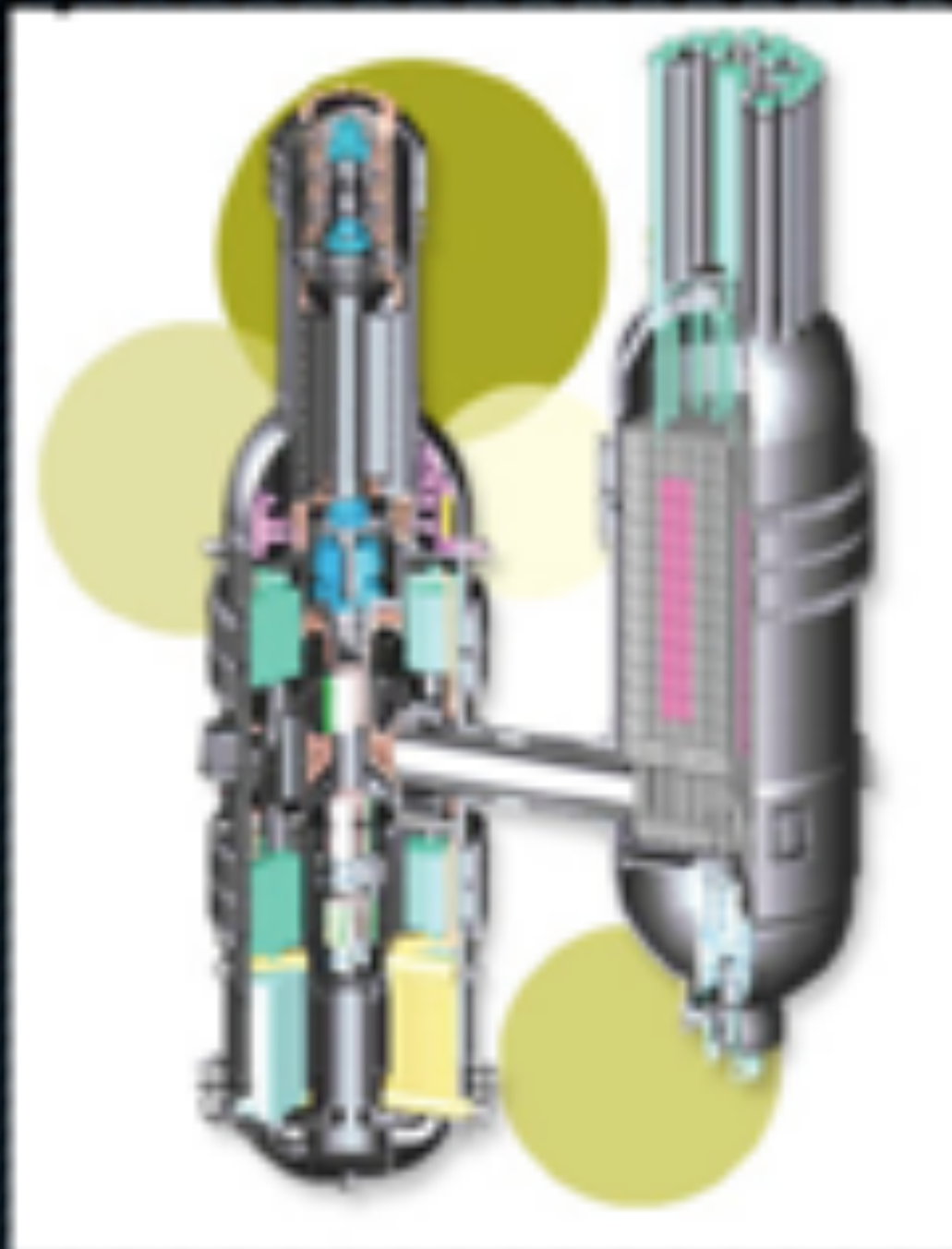
Not banned
in NZ!

- Small, sealed intrinsically safe nuclear reactors

• GT-MHR 325 MW

Hyperion 25 MW

B&W 4x125



Low levels of radiation are NOT dangerous!



Outcome

- ✧ If the government pursues Carbon Zero
 - ✧ Electricity prices will increase rapidly
 - ✧ Frequent blackouts will be inevitable
 - ✧ Heavy industry will close down
 - ✧ The economy will nosedive
 - ✧ Poor people will suffer most
 - ✧ The climate won't change
- ✧ *The government will lose the next election*

***The government needs to
consider realistic options***

The implications of Ukraine

- ✦ Gas, oil, coal and electricity
 - ✦ increasingly scarce and expensive
 - ✦ Risk of food shortages
 - ✦ Russia and Ukraine will export less wheat
 - ✦ Expensive gas will reduce fertiliser production
 - ✦ Poor people will suffer the most
- ✦ ***Simply accepting that the climate changes naturally would make a huge difference!***

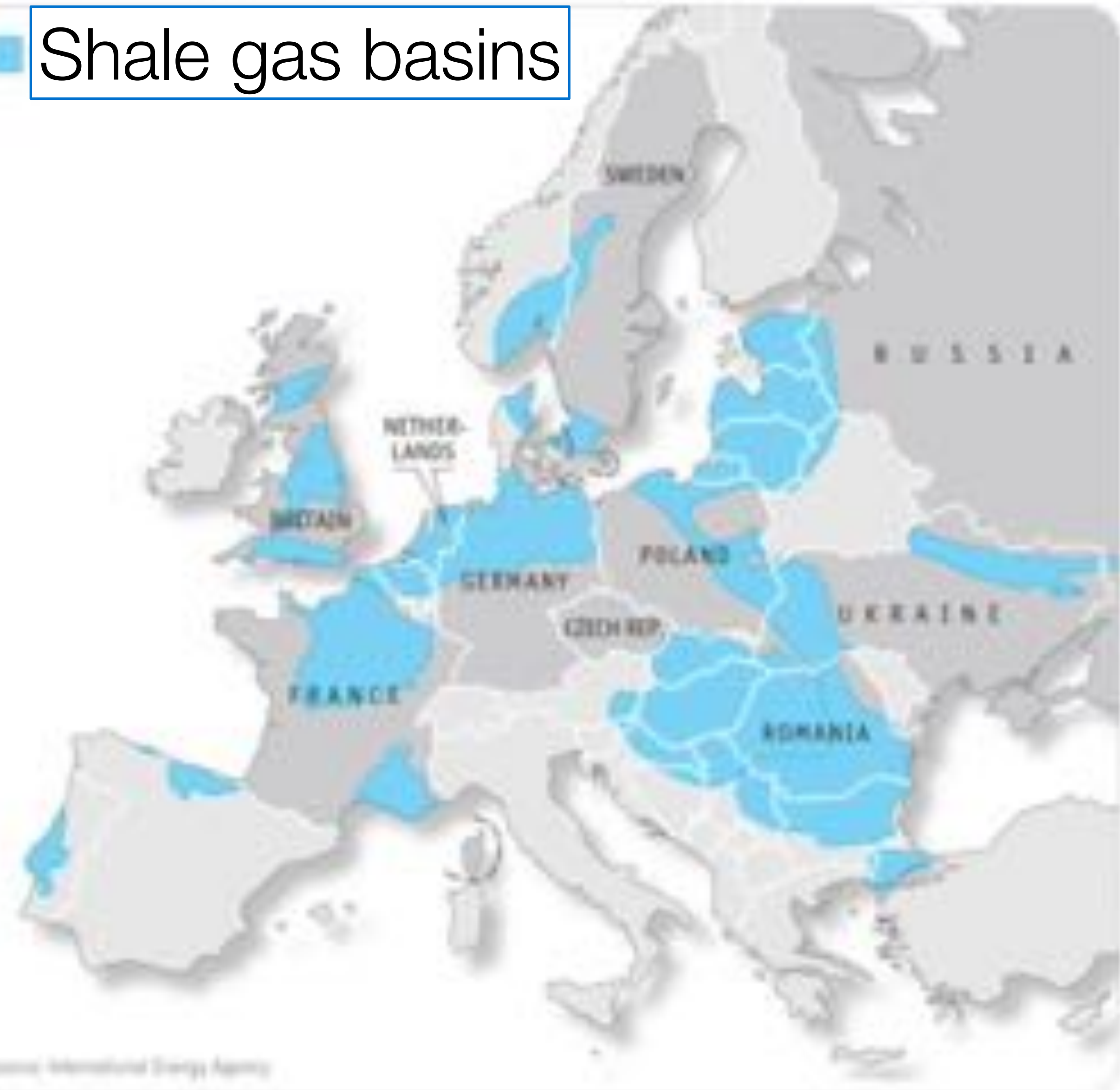
Europe and the UK
have plenty of shale gas

The Russian government
secretly funded opposition to
fracking in the UK, Europe and
USA

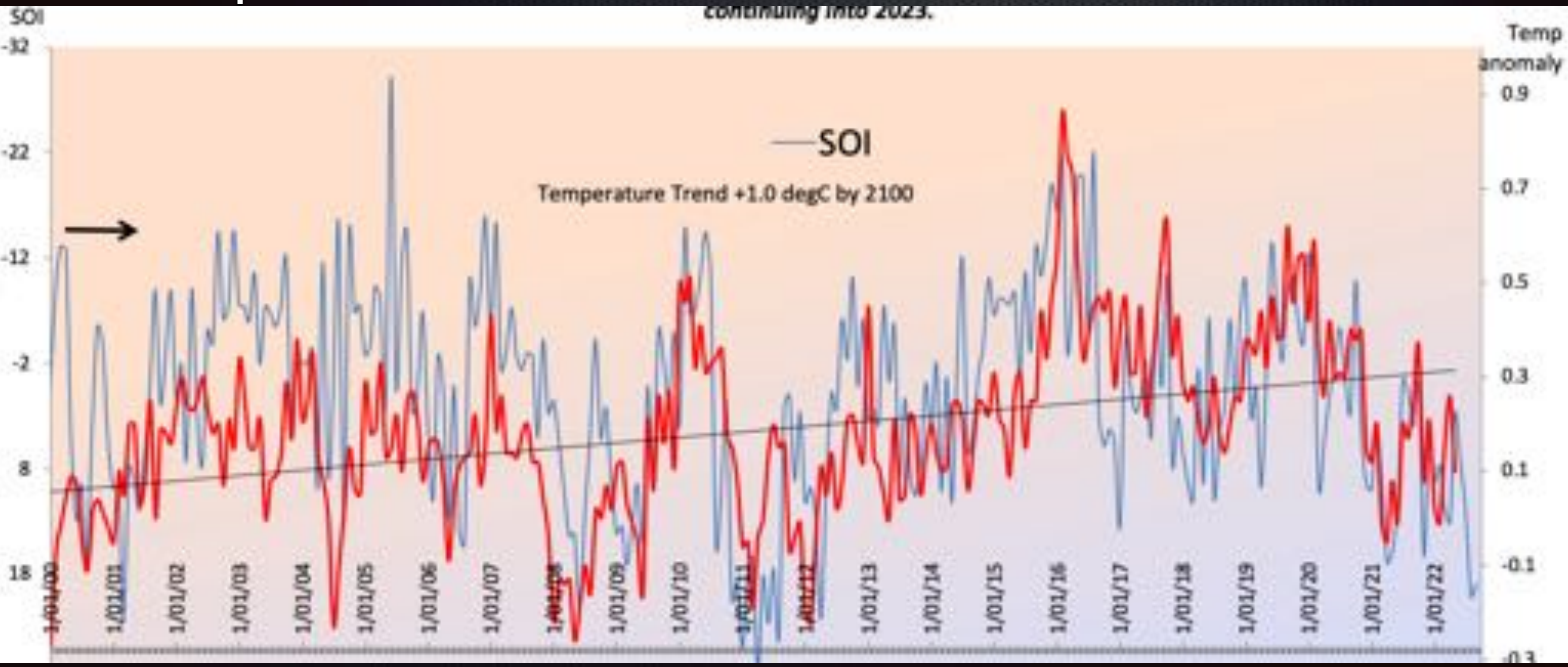
This made western countries
dependent on Russia for energy
and boosted the Russian
economy

Had Russian-funded Greens not stopped fracking, we
would be self sufficient and Putin would not have had
the money to fund his war.

■ Shale gas basins



Does the La Nina effect control world temperatures?



From Bjorn Lomborg..

WE ARE NOT on the brink of imminent extinction.

In fact, quite the opposite.

The rhetoric of impending doom belies an absolutely essential point:

in almost every way we can measure,

life on earth is better now than it was at any time in history.

Bjorn believes that man-made global warming
is real but not dangerous

Questions

