



Energy Productivity & Pricing

Markets for energy, renewable energy and carbon

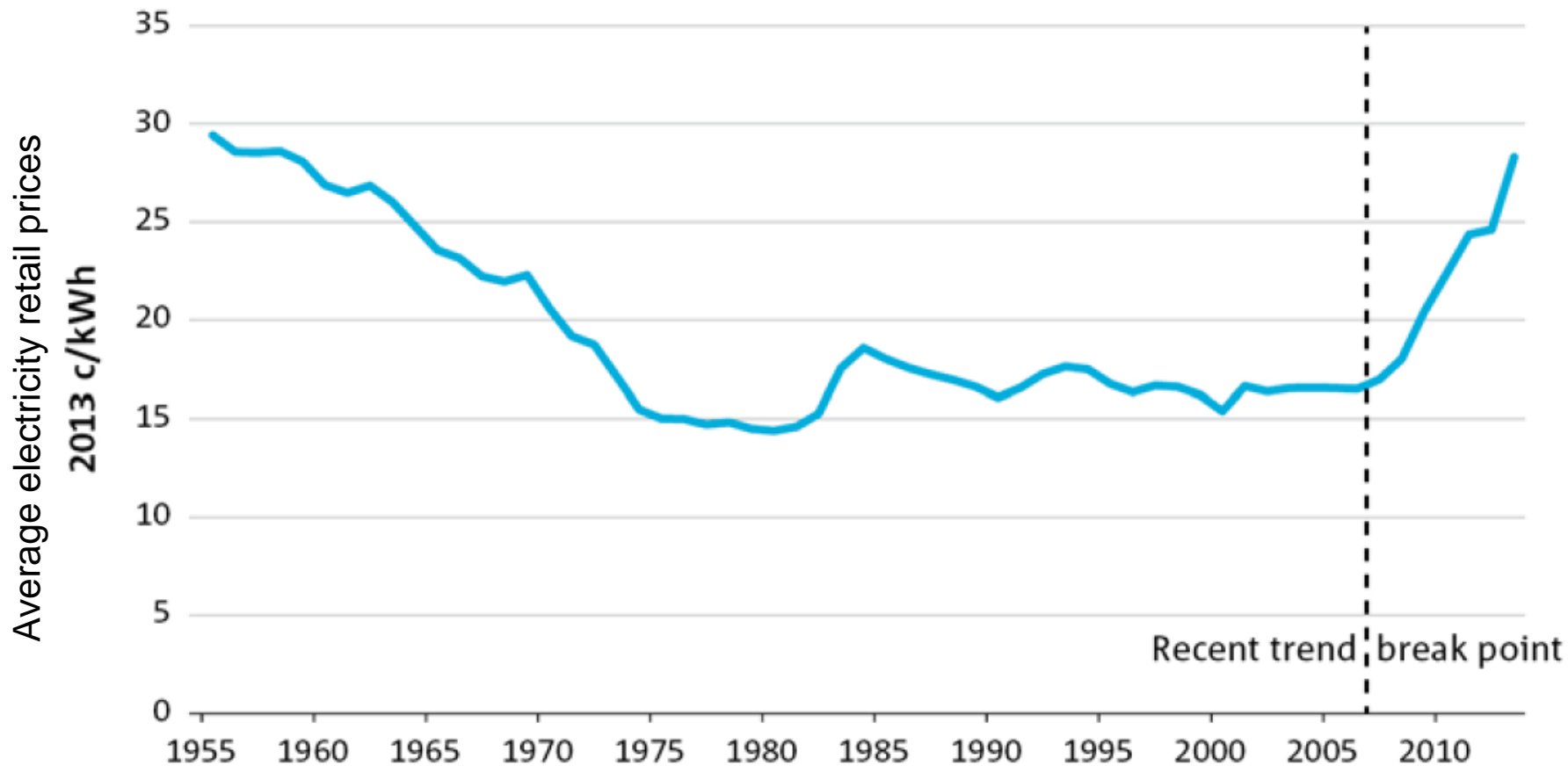
Dr Jenny Riesz
February 2014



Clean Energy Council

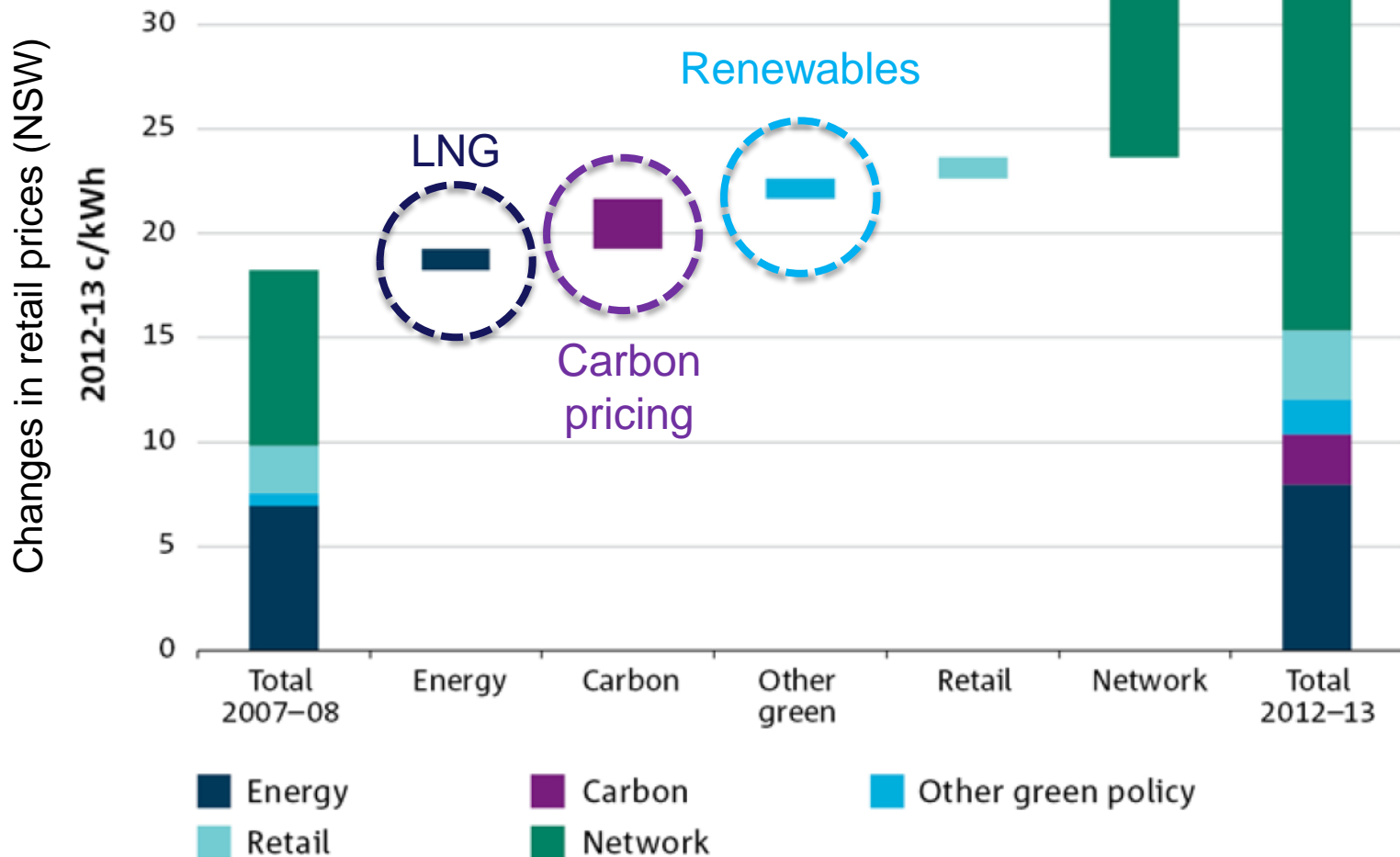


Electricity price rises



Changes in residential retail electricity price components

Causes are complex, various and differ by state, but investment in the electricity distribution system played the largest role.



The market for

RENEWABLES



Renewable Energy Market



Renewables create certificates
(1 MWh = 1 REC)



Clean Energy Regulator sets
Renewable Power Percentage
(RPP) – defines annual liability

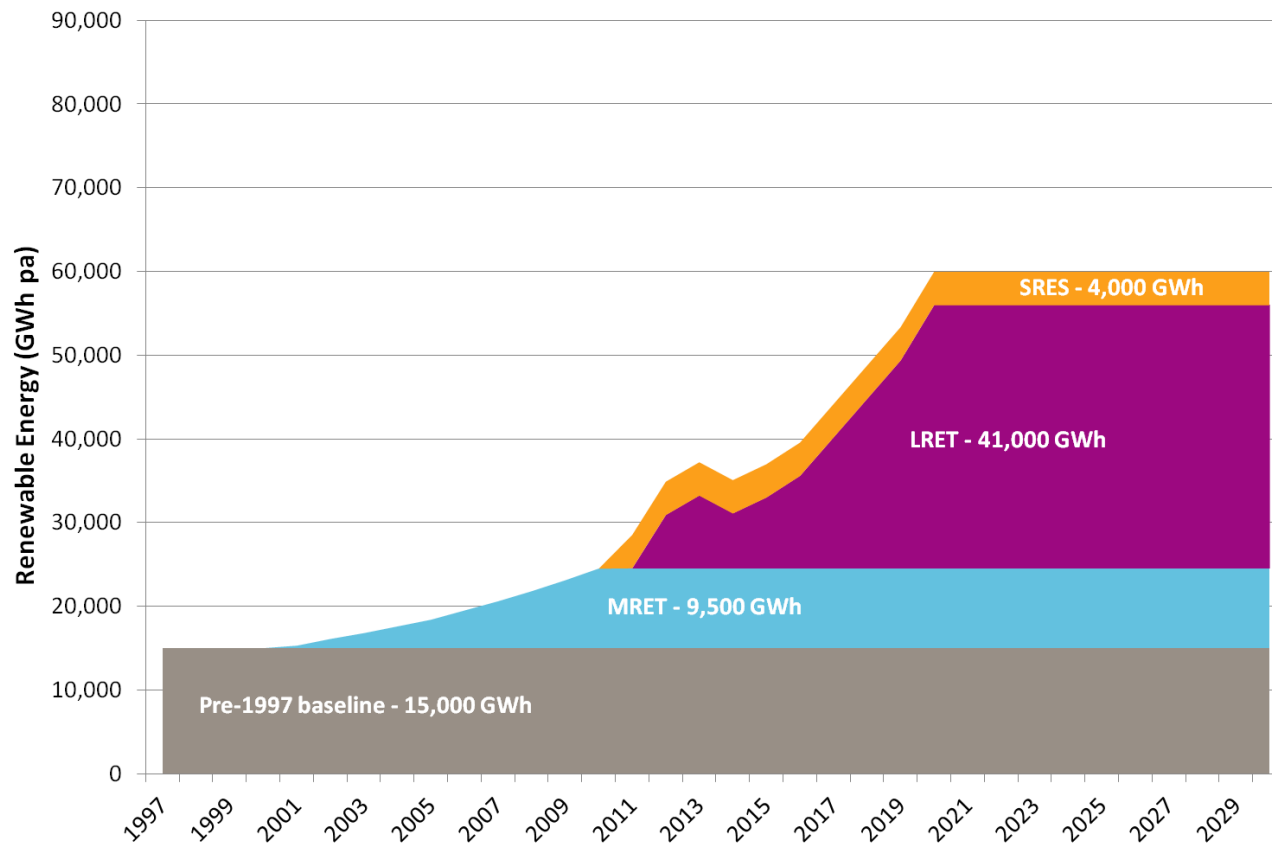


Retailers surrender the RPP of
their electricity sales in RECs

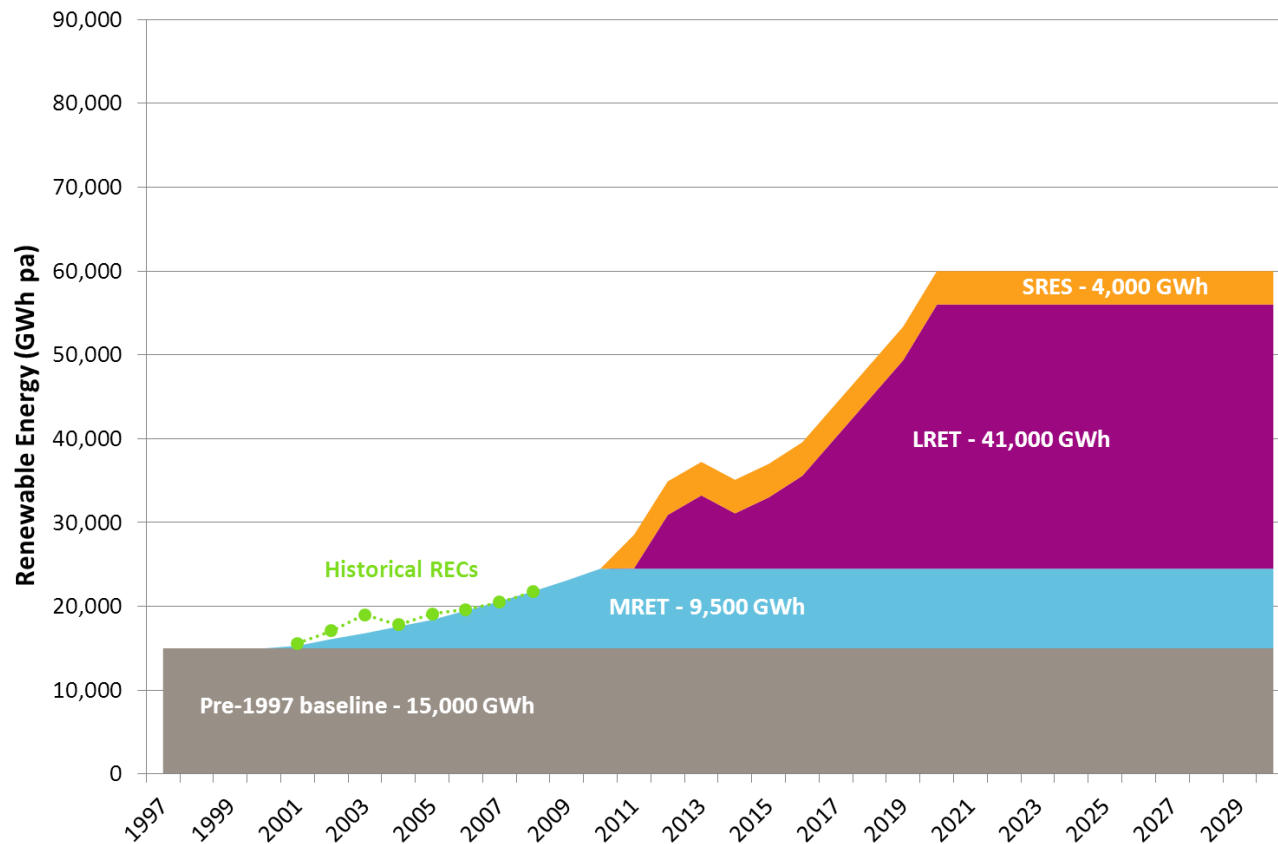
Creates a REC
market



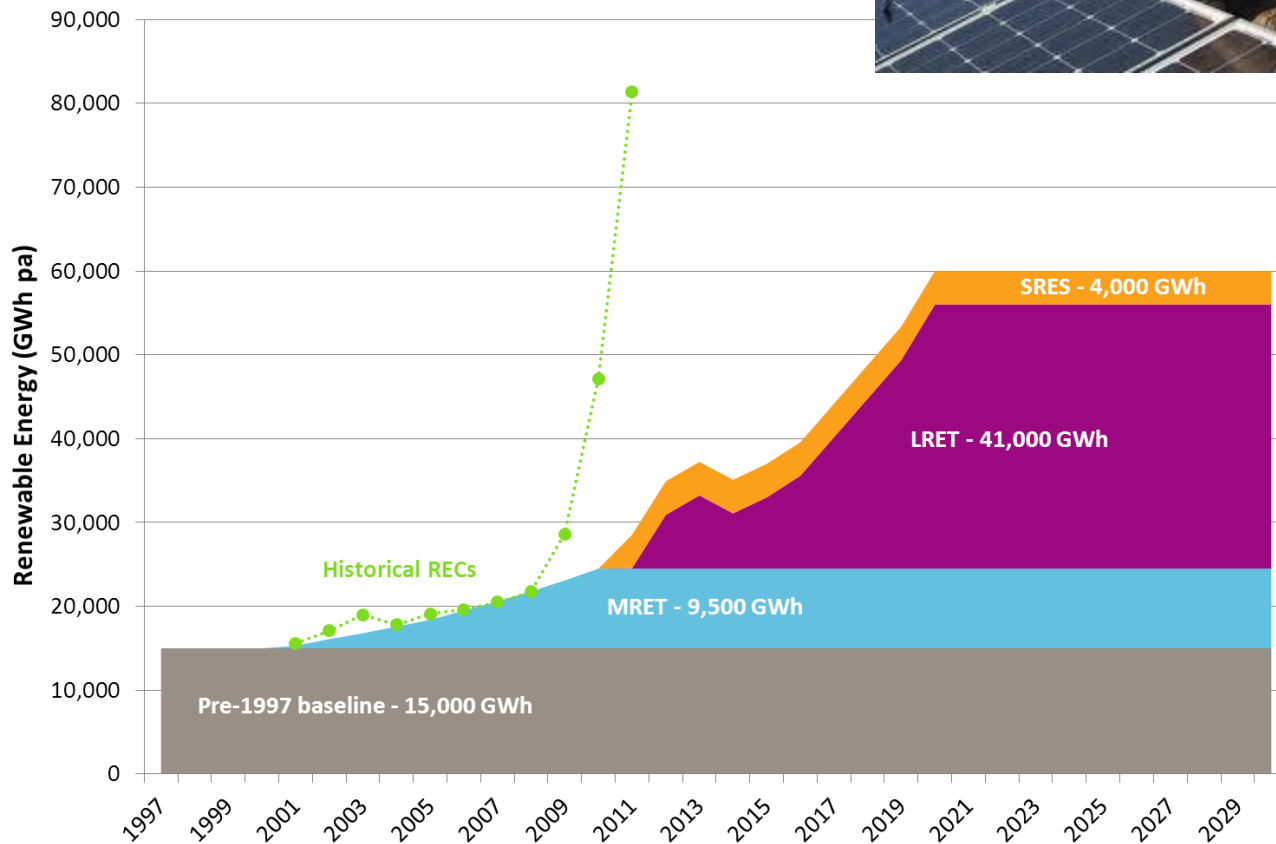
Renewable Energy Target



Renewable Energy Target



Renewable Energy Target



Solar Photovoltaics drivers

International

- Global oversupply of PV modules
- High Australian dollar

Federal

- Solar 5x Multiplier (RET)

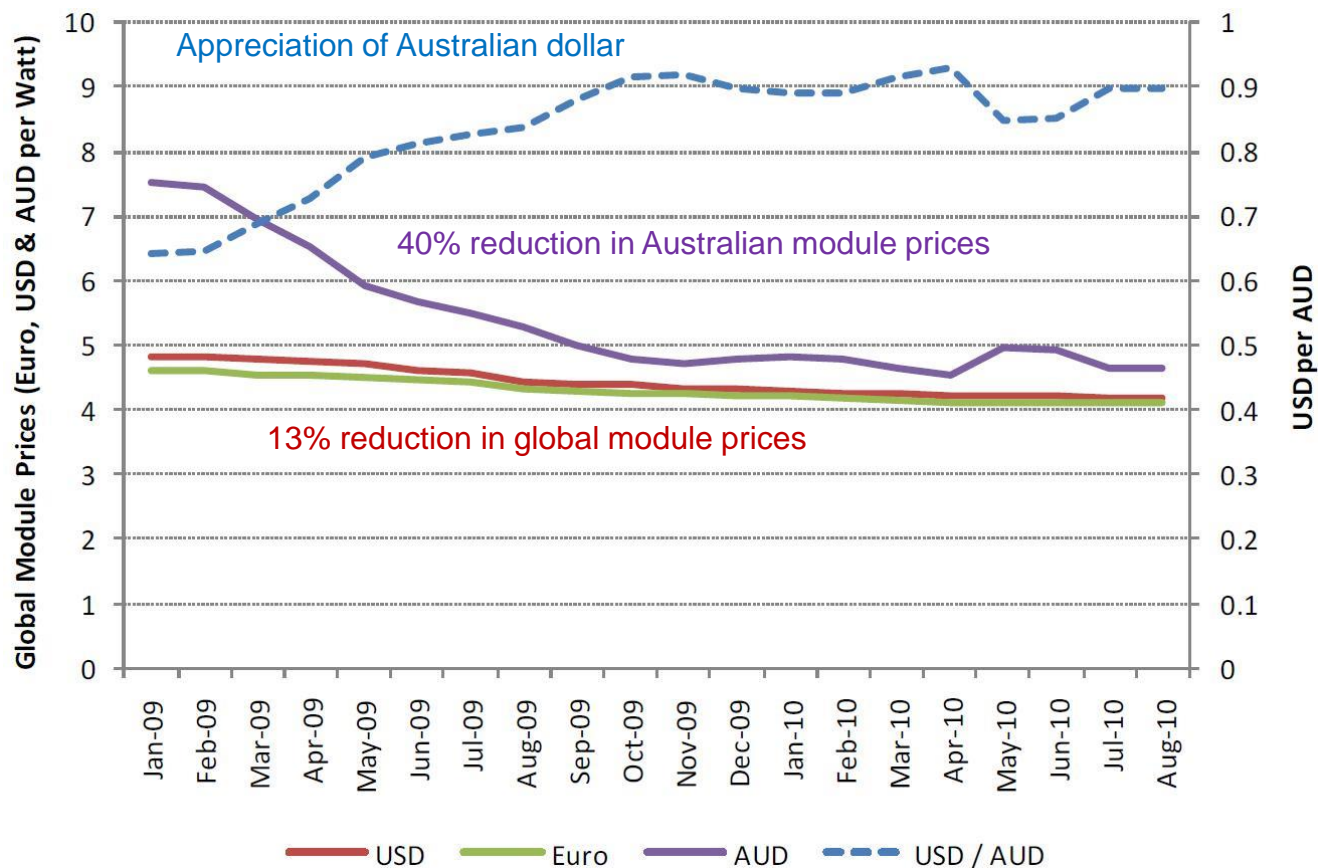
State

- Generous FiTs

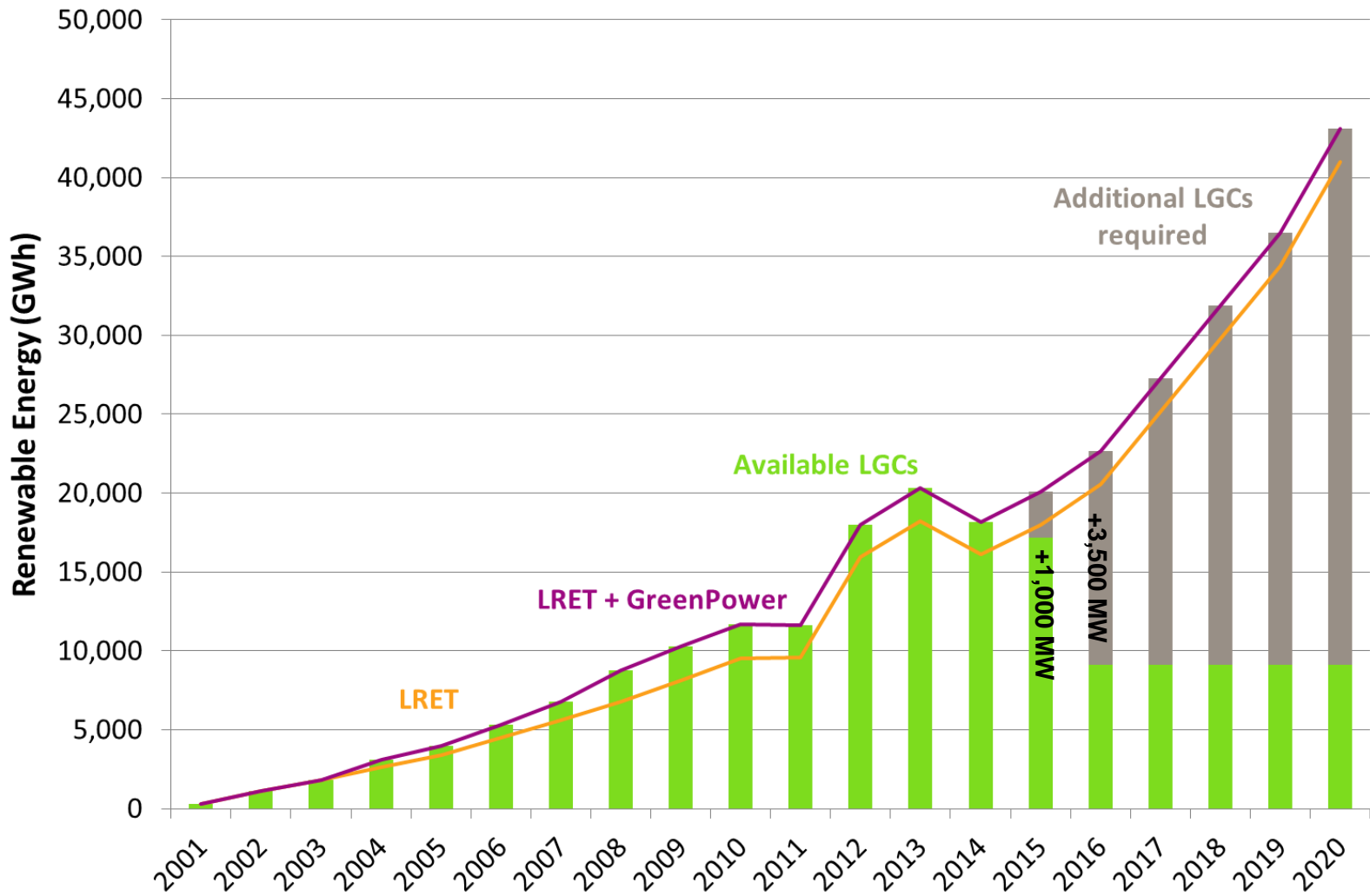
Individual

- Strong support

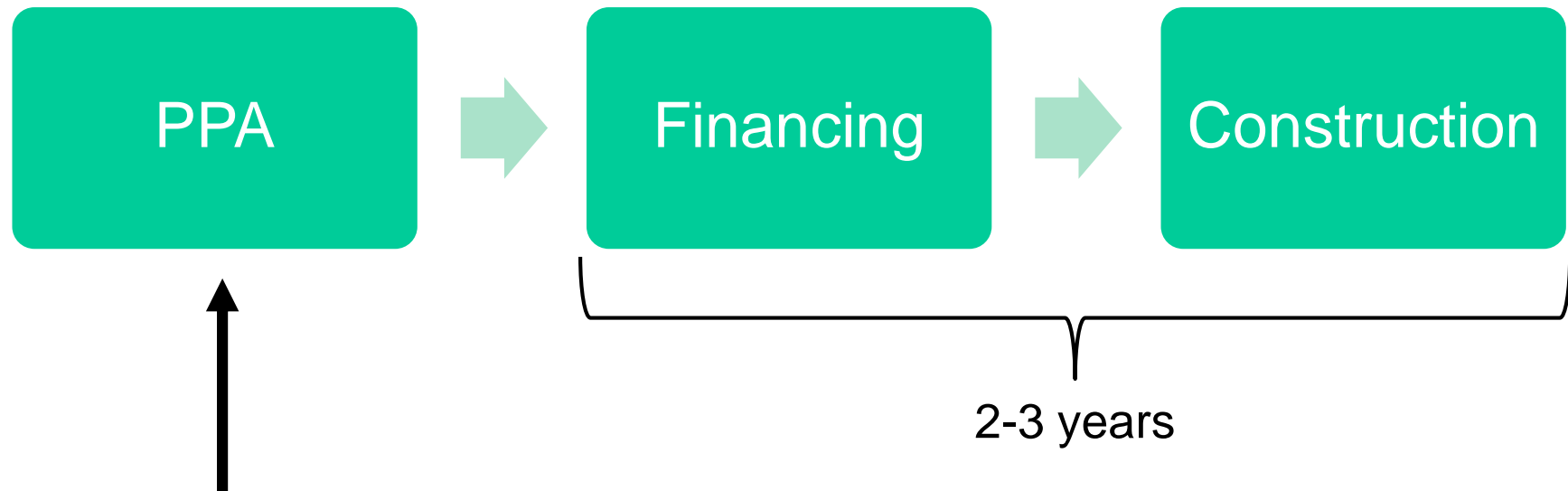
Global PV module retail prices and Australian equivalent



Oversupply until 2015-16?



Renewable project development



Long term PPA
required to secure
project financing
(eg. \$90/MWh for 15yrs)

For project commissioning in 2015-16
need a PPA in 2013-14

RET Review

- RET Legislation requires biannual review

Climate Change Authority Review – Dec 2012

- Operational - is the scheme working?
- Major lobbying – 8700 submissions, many seeking reduction
- But CCA recommended minor changes only

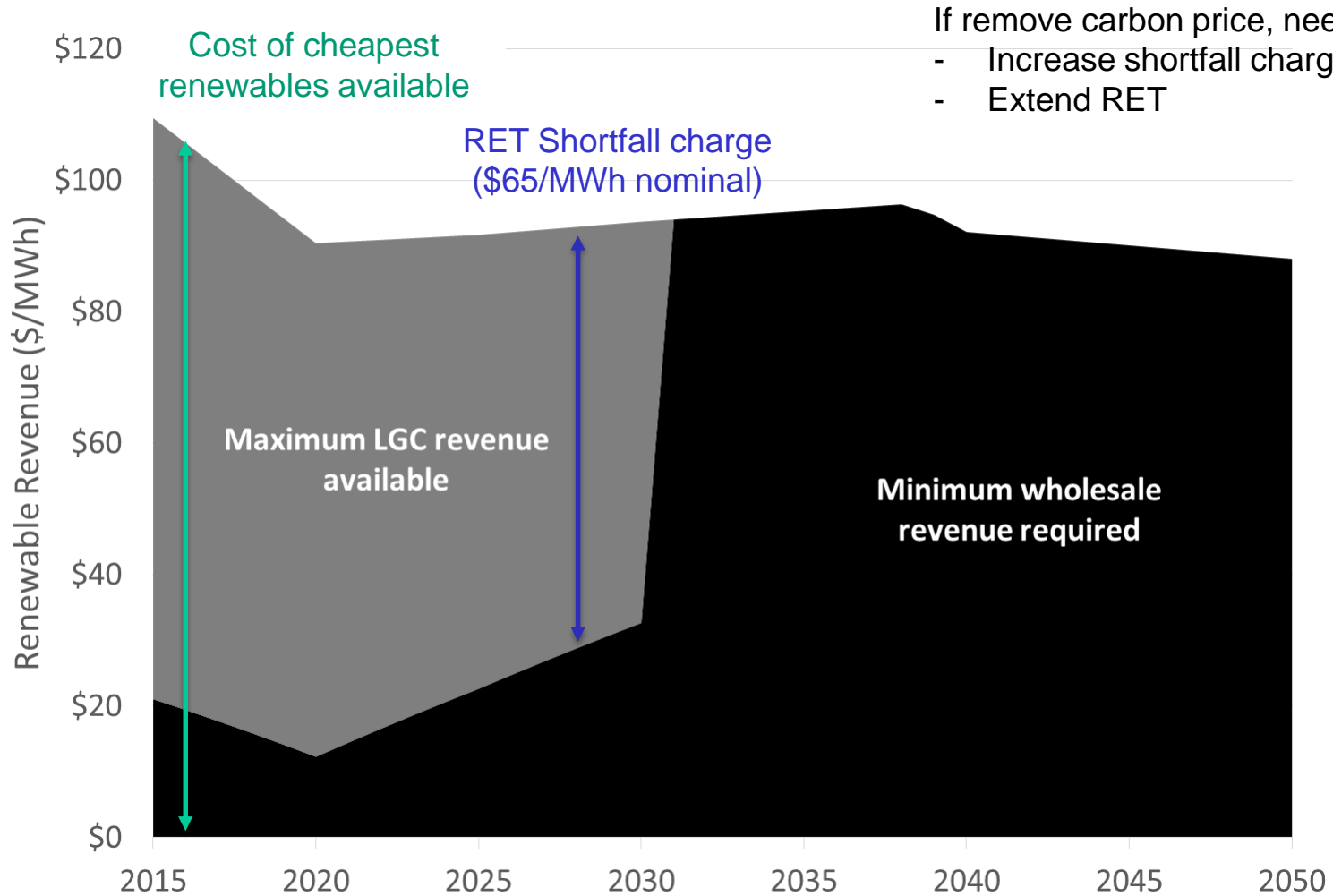
Change of Government

- Initiating another review!
- Terms of reference released soon

Perpetual uncertainty

- Detrimental to investment

RET may not function without the carbon price



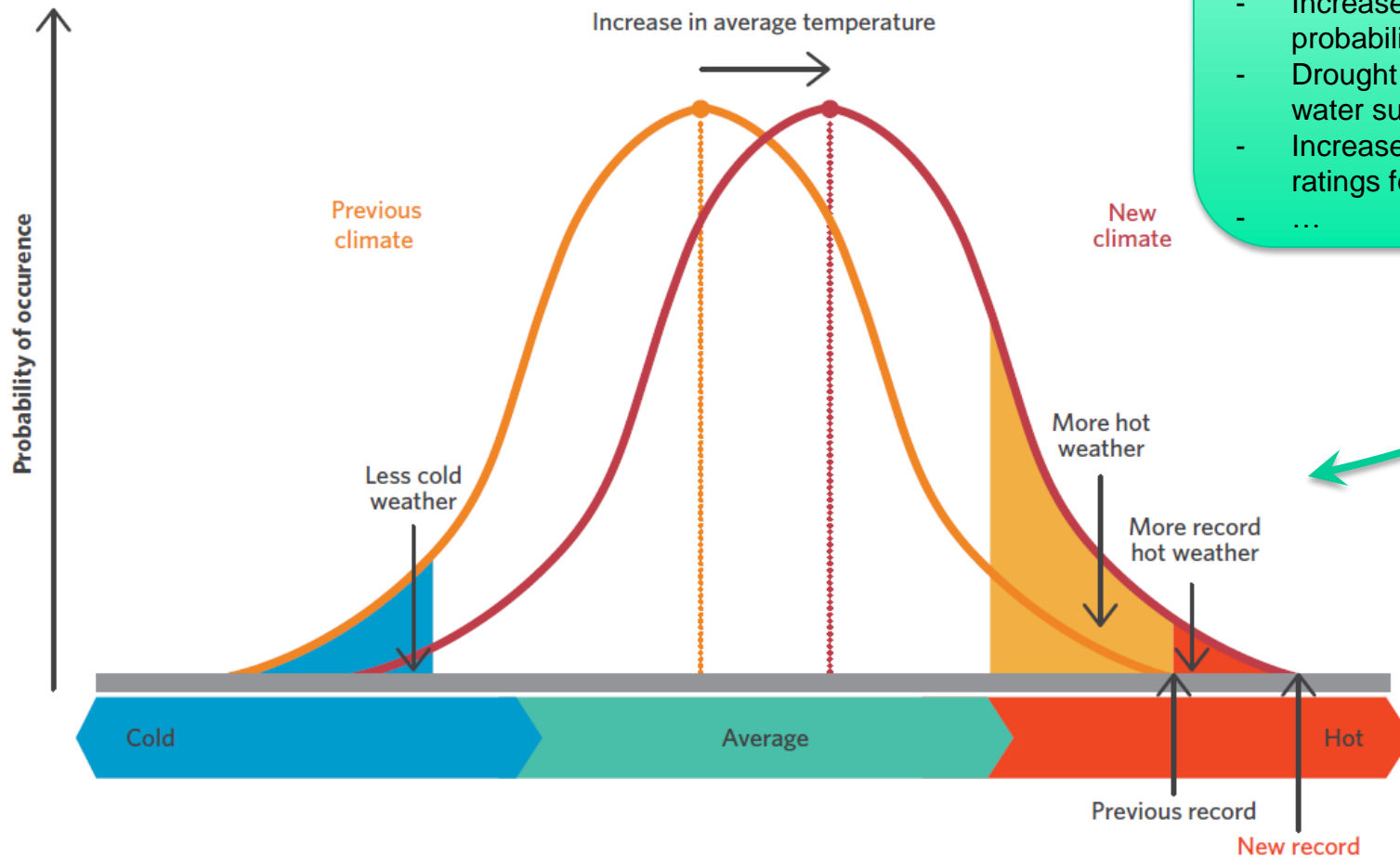
If remove carbon price, need to:

- Increase shortfall charge
- Extend RET

Mechanism and impacts of

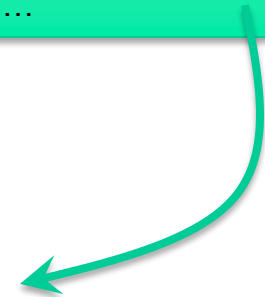
CARBON PRICING

Climate averages vs extreme weather



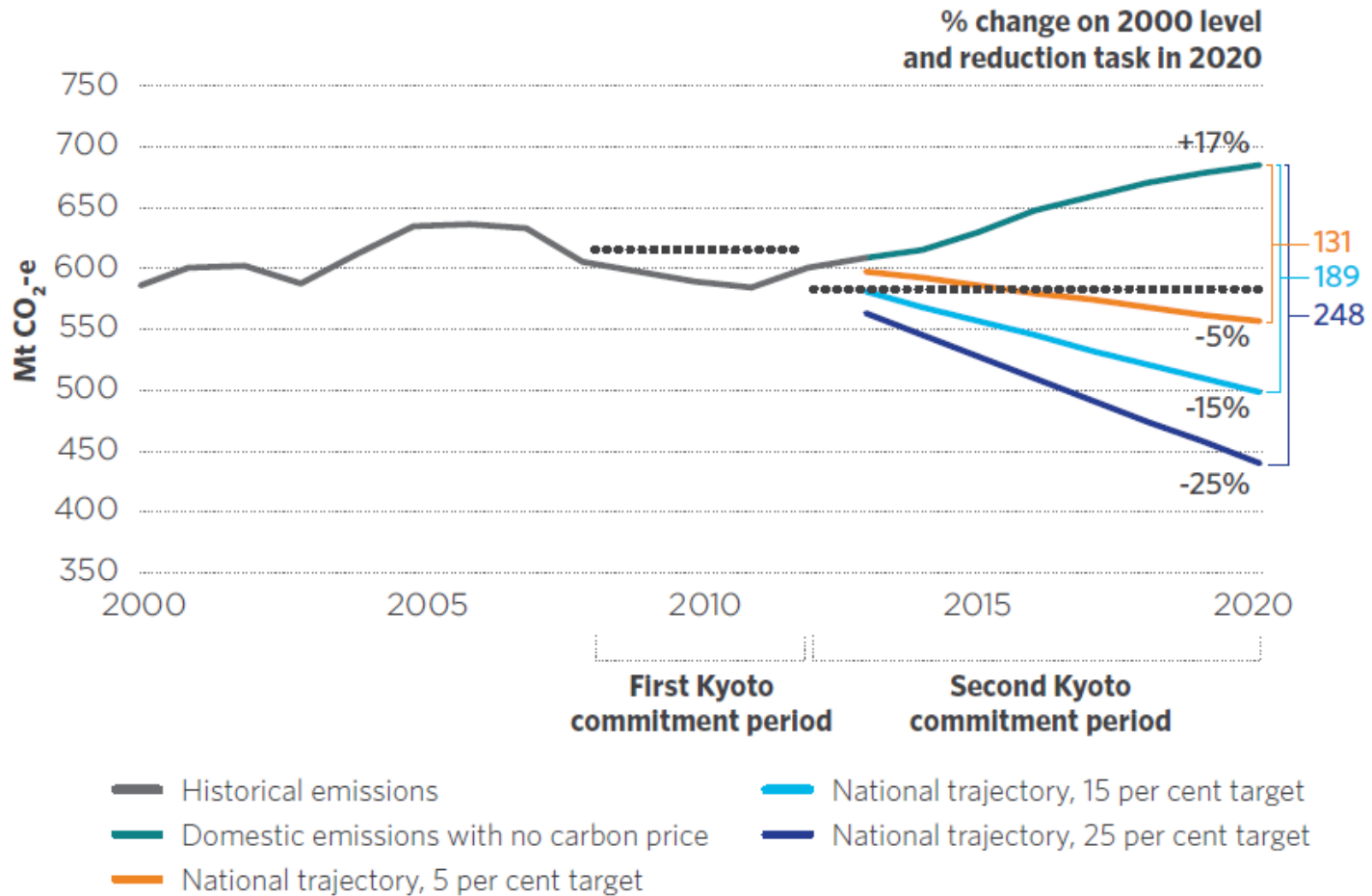
PERFECT STORM impacts on electricity sector:

- Extreme demands
- Power station de-rating
- Transmission lines de-rating
- Increased forced outage probabilities
- Drought reducing cooling water supplies
- Increased temperature ratings for all equipment
- ...



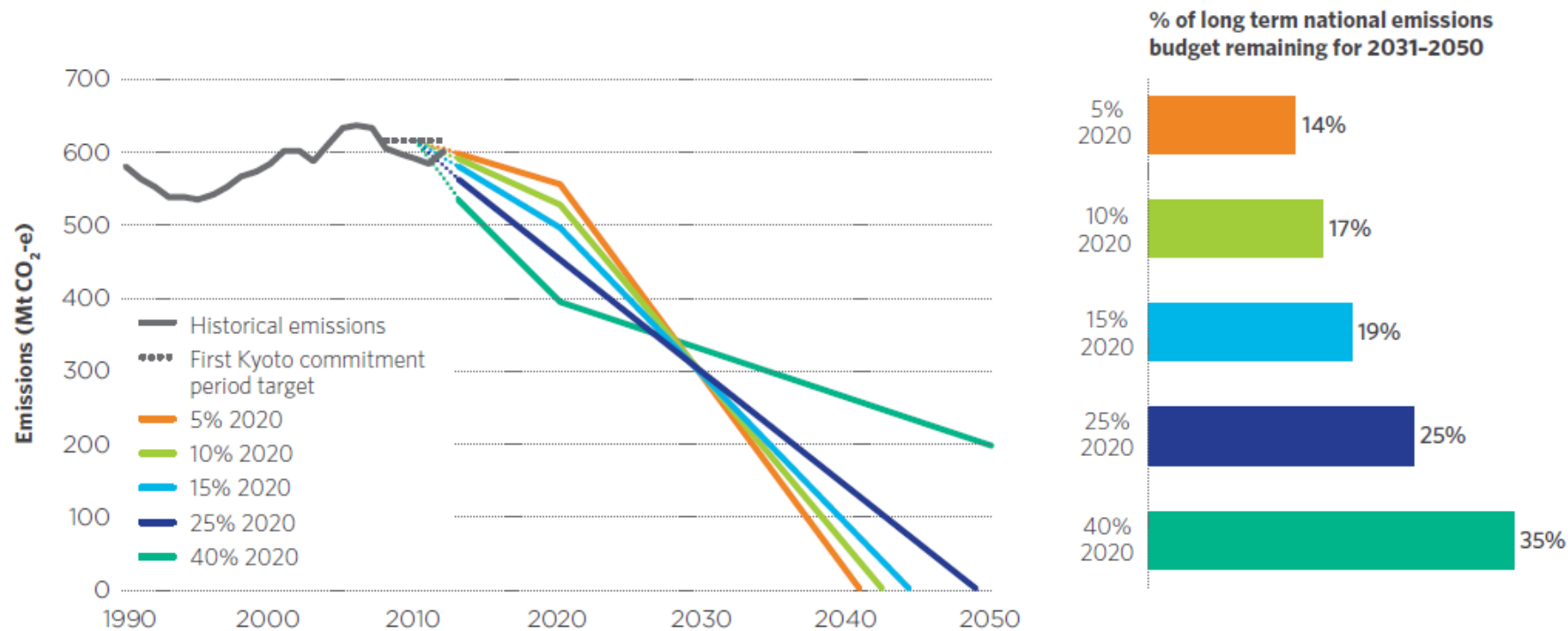
Carbon targets

Bipartisan support for -5% by 2020 target



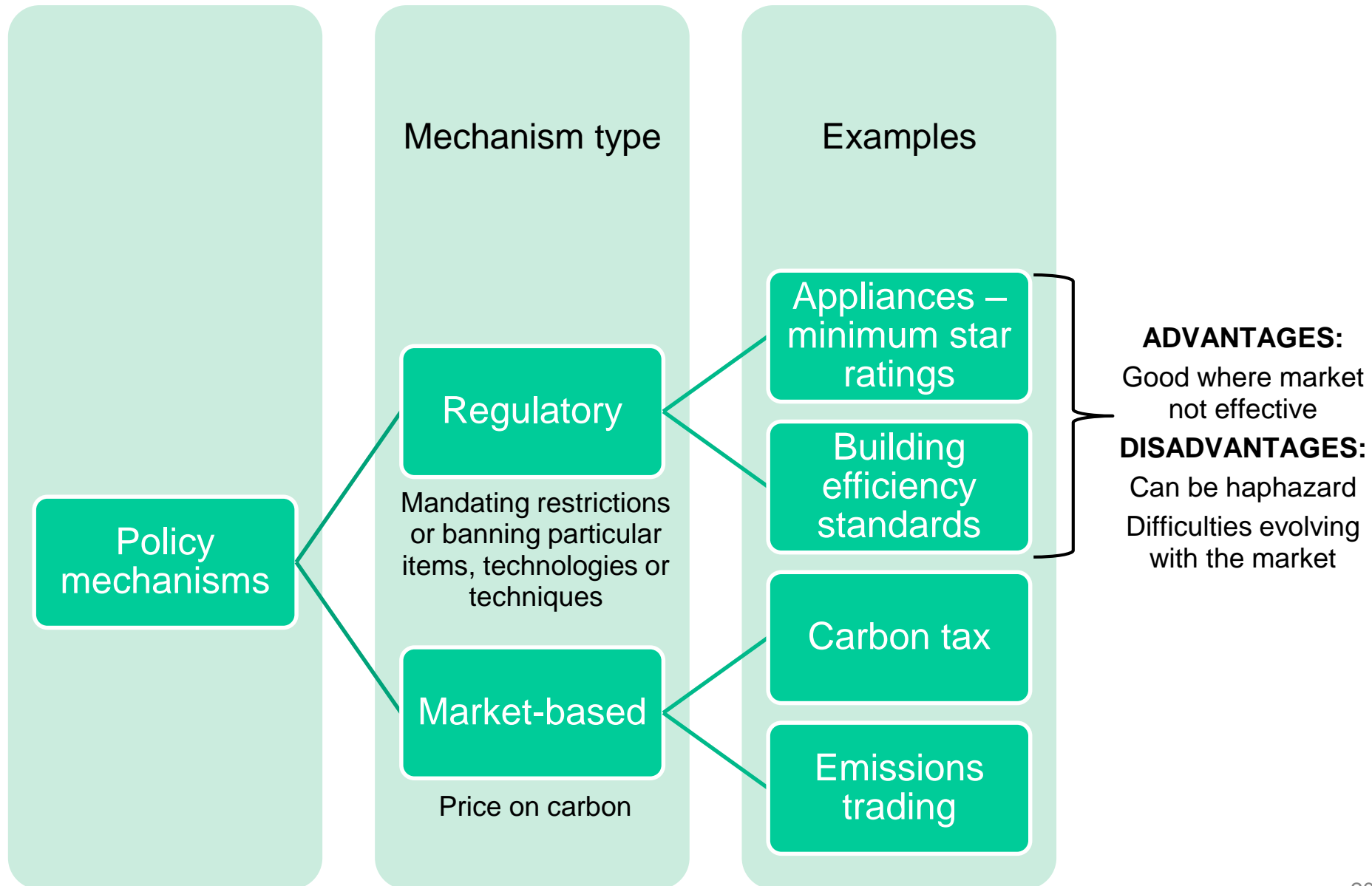
Pathways to 2050 that meet recommended long term emissions budget

-5% by 2020 is likely to be impossibly steep post 2020 to meet recommended budget

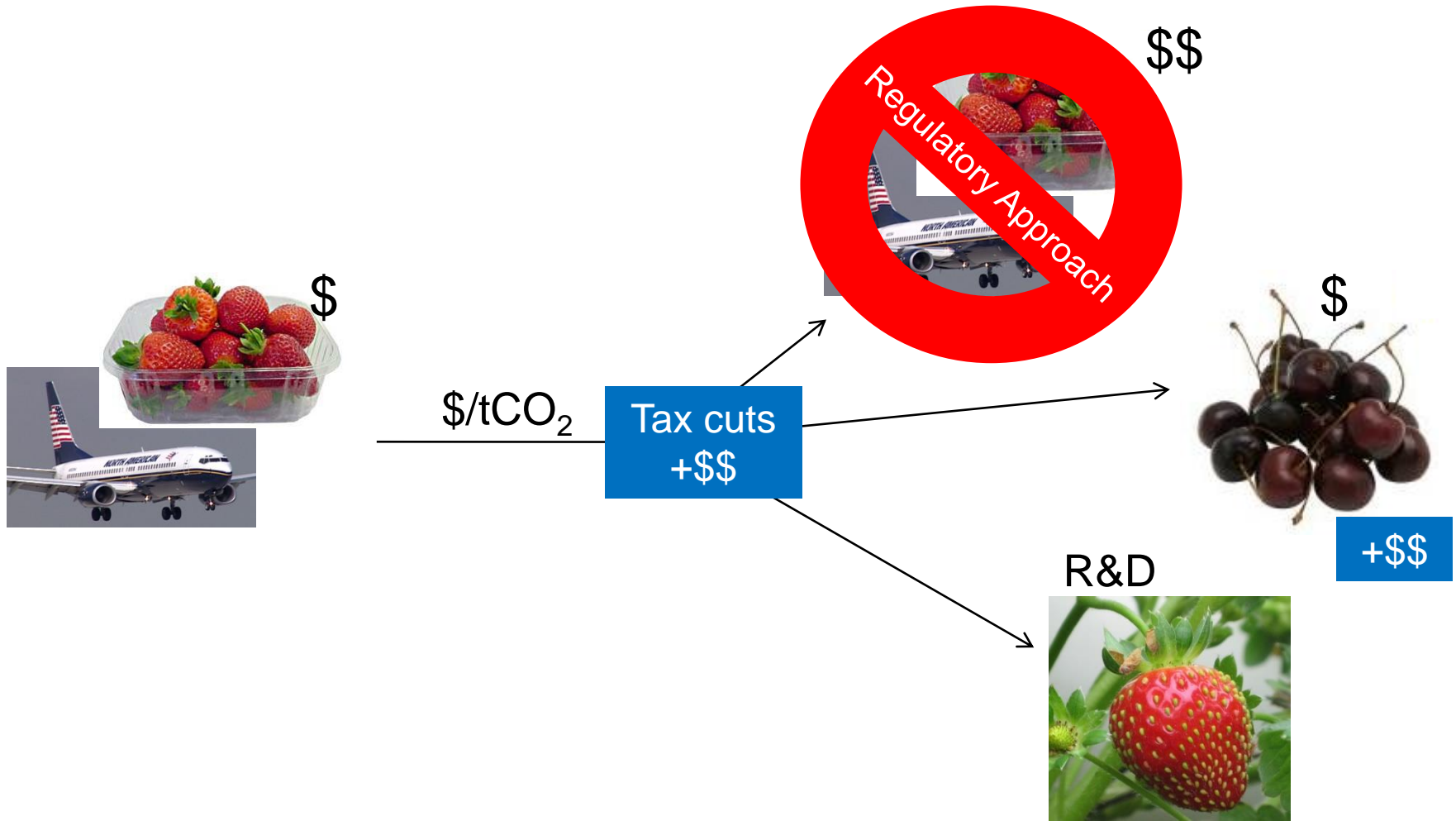


-25% by 2020 or -15% by 2020
recommended by CCA

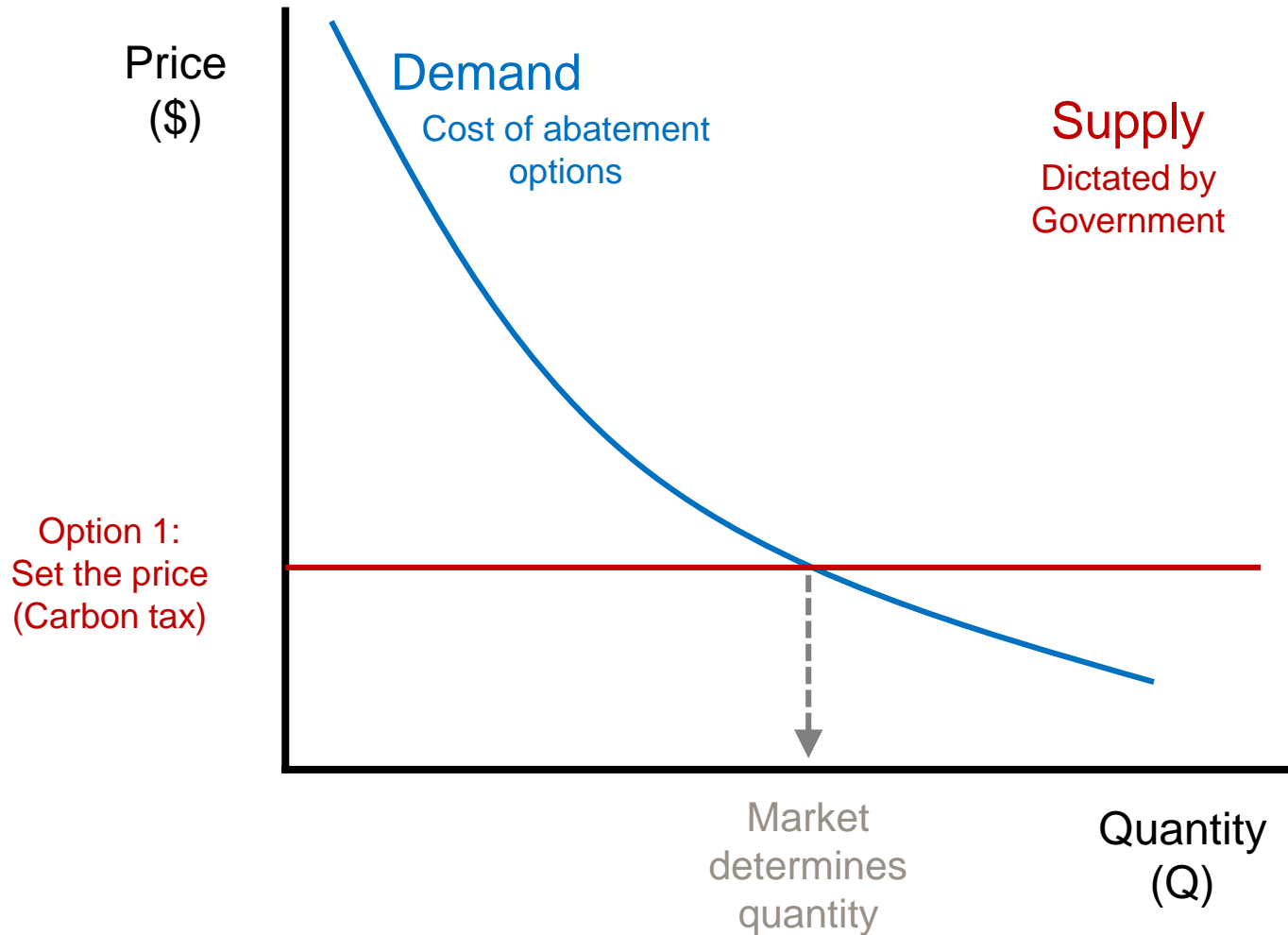
Policy mechanisms



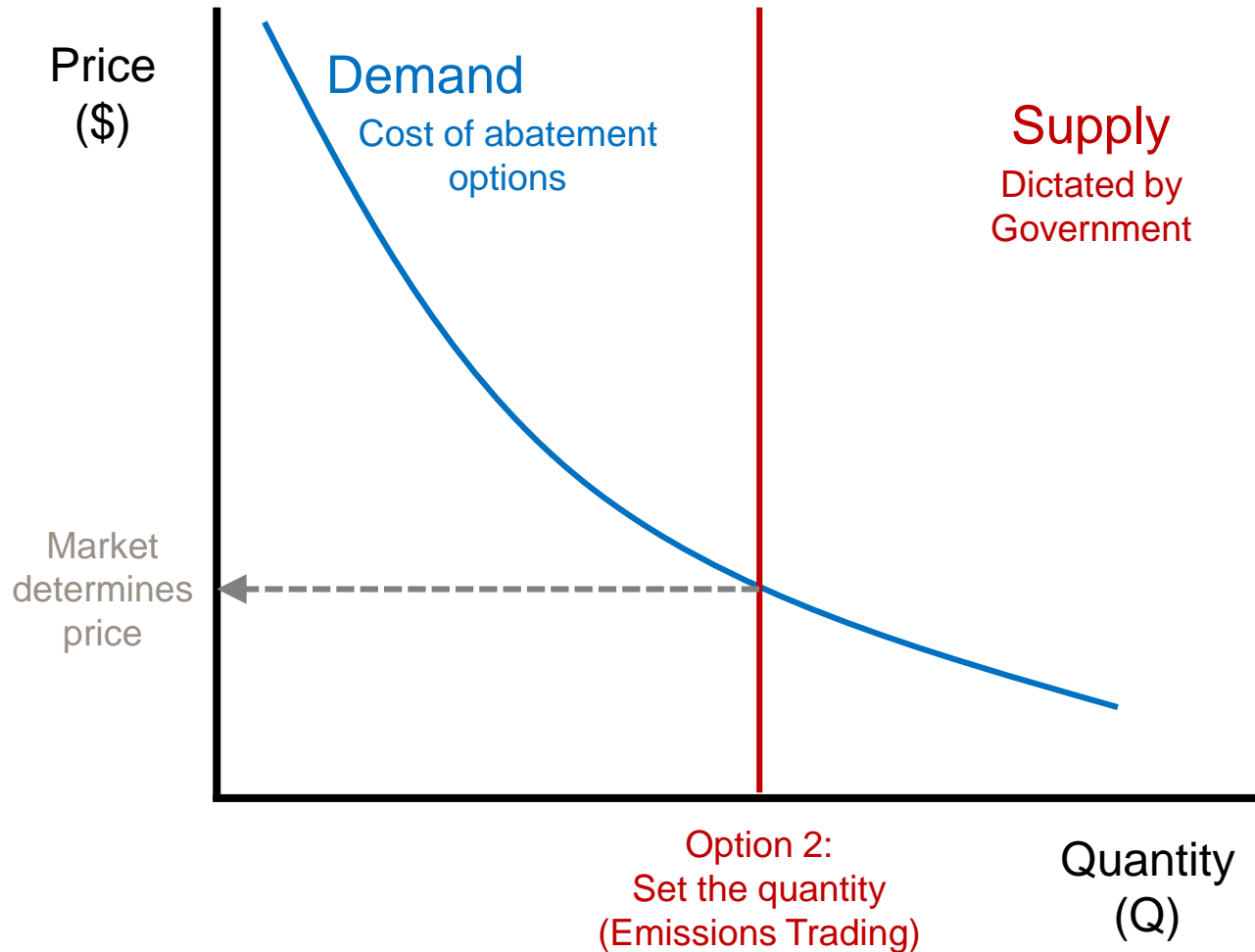
Market based approaches



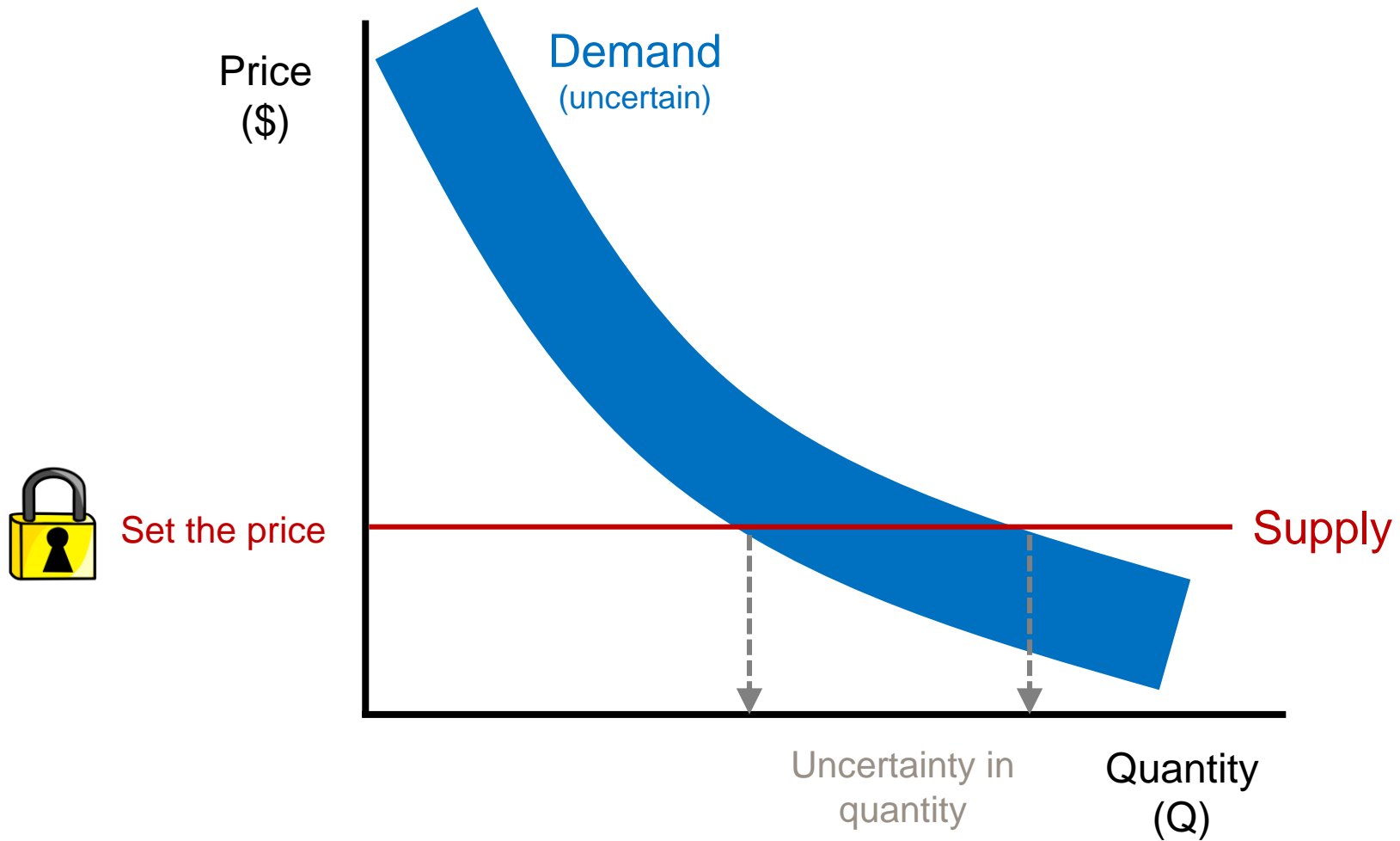
Creating a market for carbon



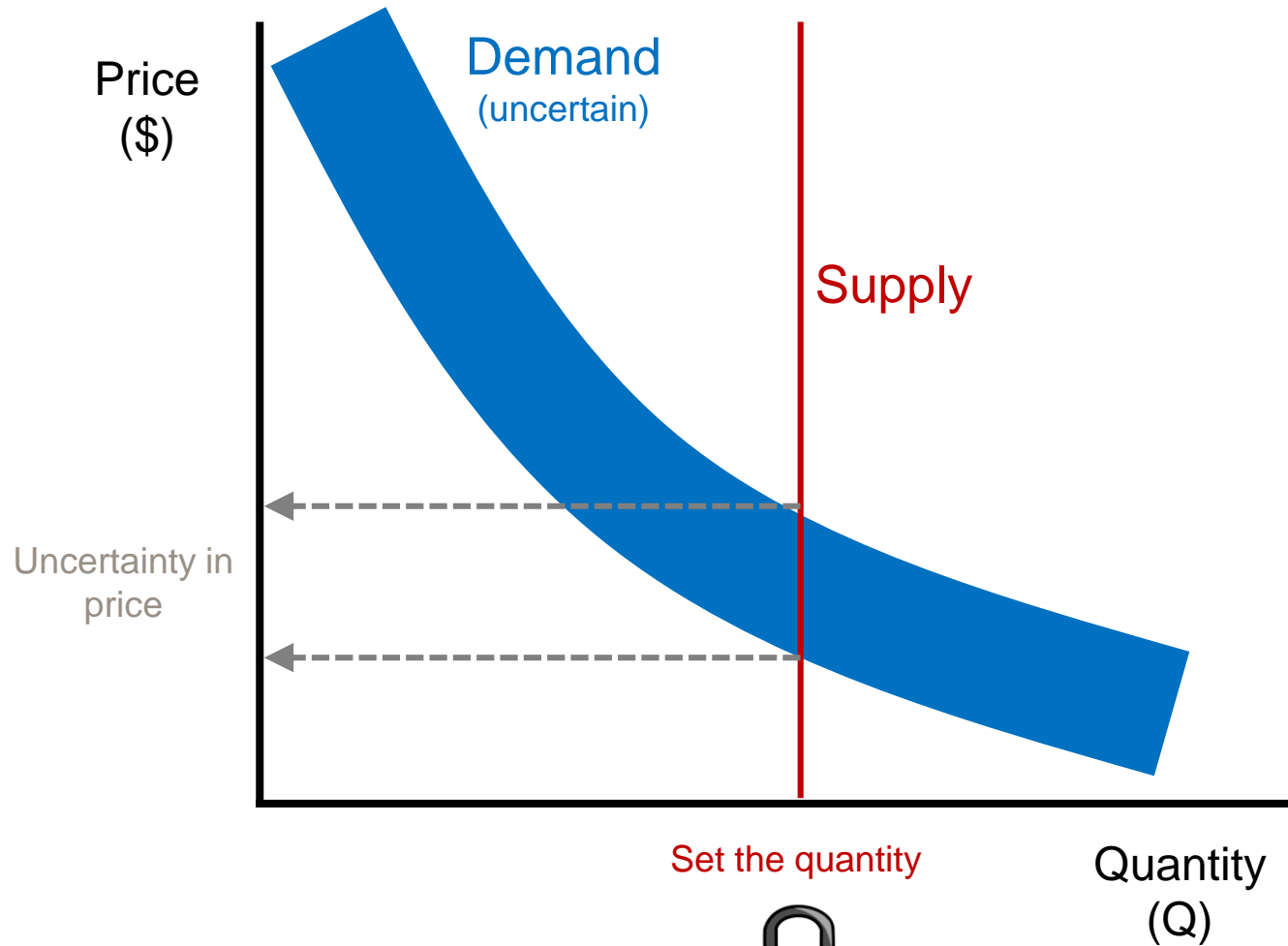
Creating a market for carbon



Creating a market for carbon



Creating a market for carbon



Creating a market for carbon

Which is most important?

Price

Quantity

Carbon tax

Emissions Trading



Price certainty



No guarantee of meeting emissions targets



Price may require adjustment (removes price certainty benefits)



Simpler



Guaranteed to meet targets



No price certainty



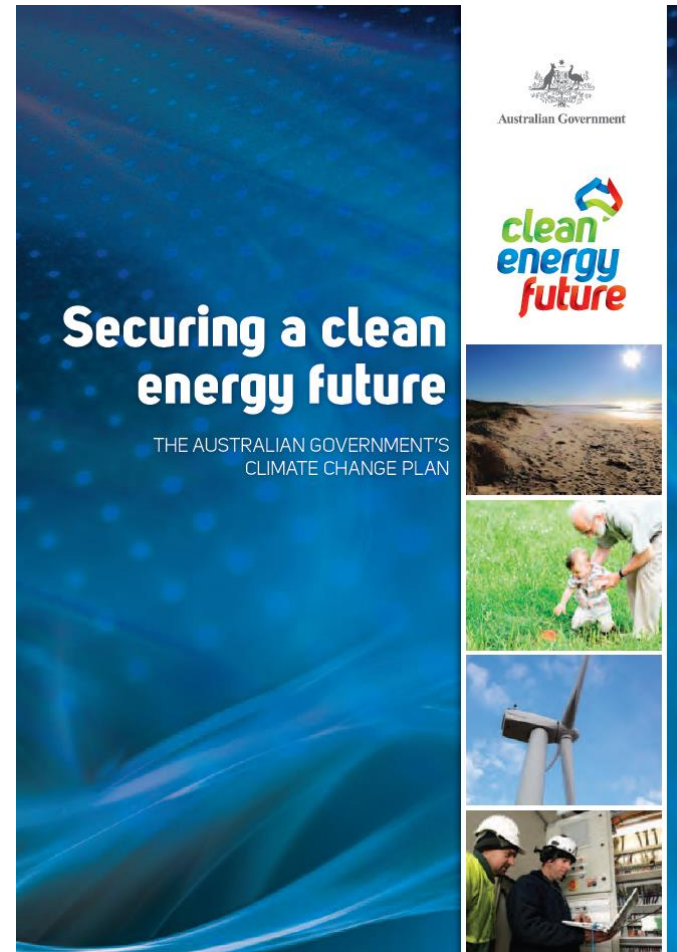
Can experience price volatility (especially at market start)



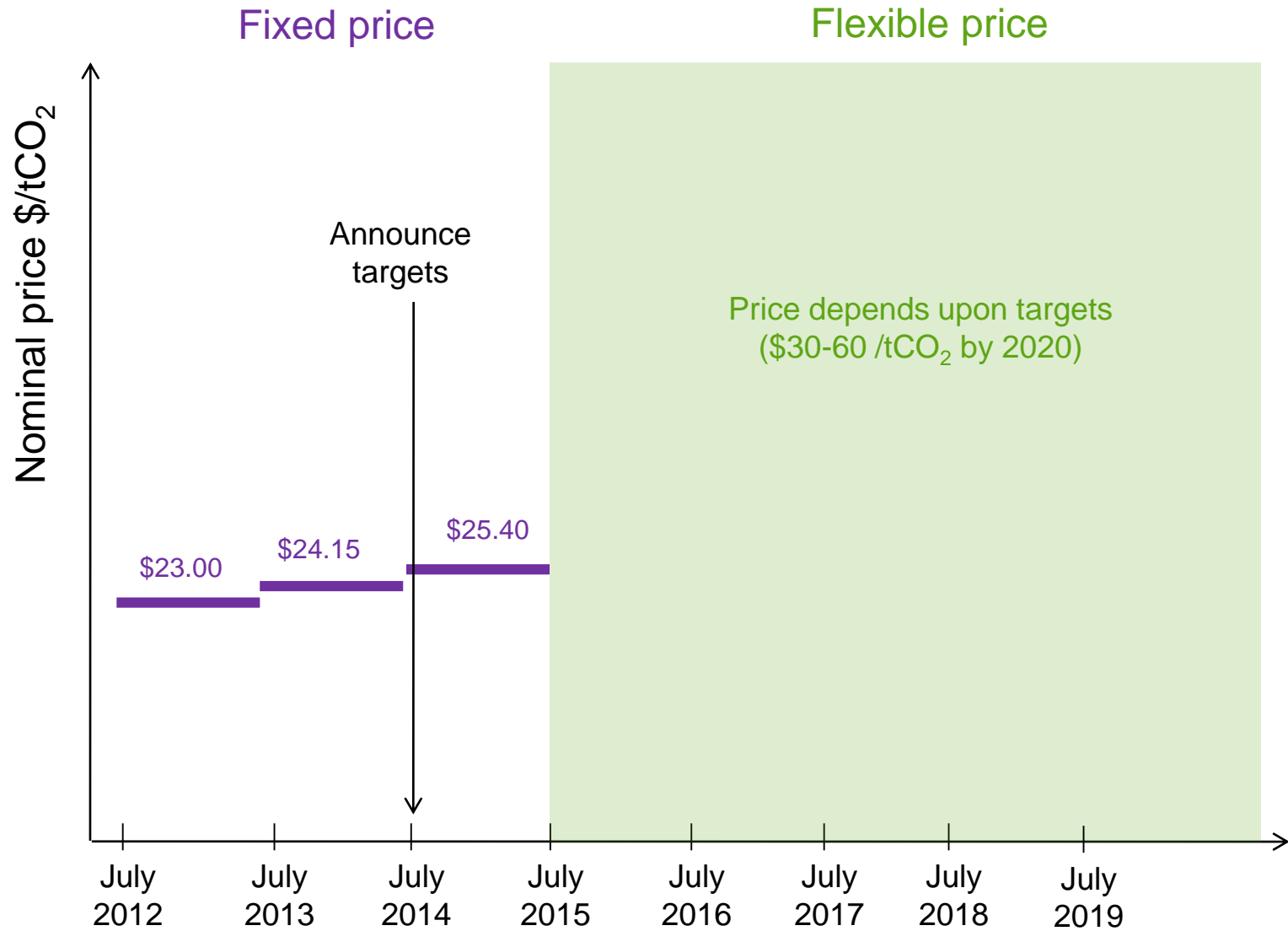
Can link internationally

Clean Energy Future

- Emissions trading with initial fixed price period
- Commenced 1st July 2012
- (note that it's not actually a tax...)



Price of carbon



Can Abbott repeal the carbon price?

1

- Waiting for Senate to change over in July 2014

2

- Abbott likely to have numbers in the Senate to repeal (needs support of minor parties – Clive Palmer, Motoring Party)

3

- Carbon tax removed from July 2014 (retroactive)

4

- Emissions Reduction Fund?

UNCERTAINTY

- Inhibiting investment
- Sensible businesses factoring in a carbon price anyway

Emissions Reduction Fund

Abatement buy-back (specific abatement projects)

- Reverse auction/tender
 - Businesses submit tenders to reduce emissions
 - Govt selects lowest cost
 - Forward contracts
 - Commence July 2014
- Funds allocated in budget
 - \$300 million, \$500 million, \$750 million to 2020
 - Long term this mechanism implies significant tax increases

“Safeguard mechanism” (large facilities)

- Mechanism to provide incentives not to exceed historical emissions baselines
- No Govt revenue
- Commence 1 July 2015
- New entrants?
- Non-compliance penalties?
- Electricity sector?

Impacts of the carbon price on electricity sector



+\$



Impacts of carbon price on electricity sector

SUNK

Capital cost (\$)

- Initial installation cost

Fixed costs (\$ pa)

- Fixed operations and maintenance

Long Run
Marginal
Cost
(LRMC)

**Investment
decisions**

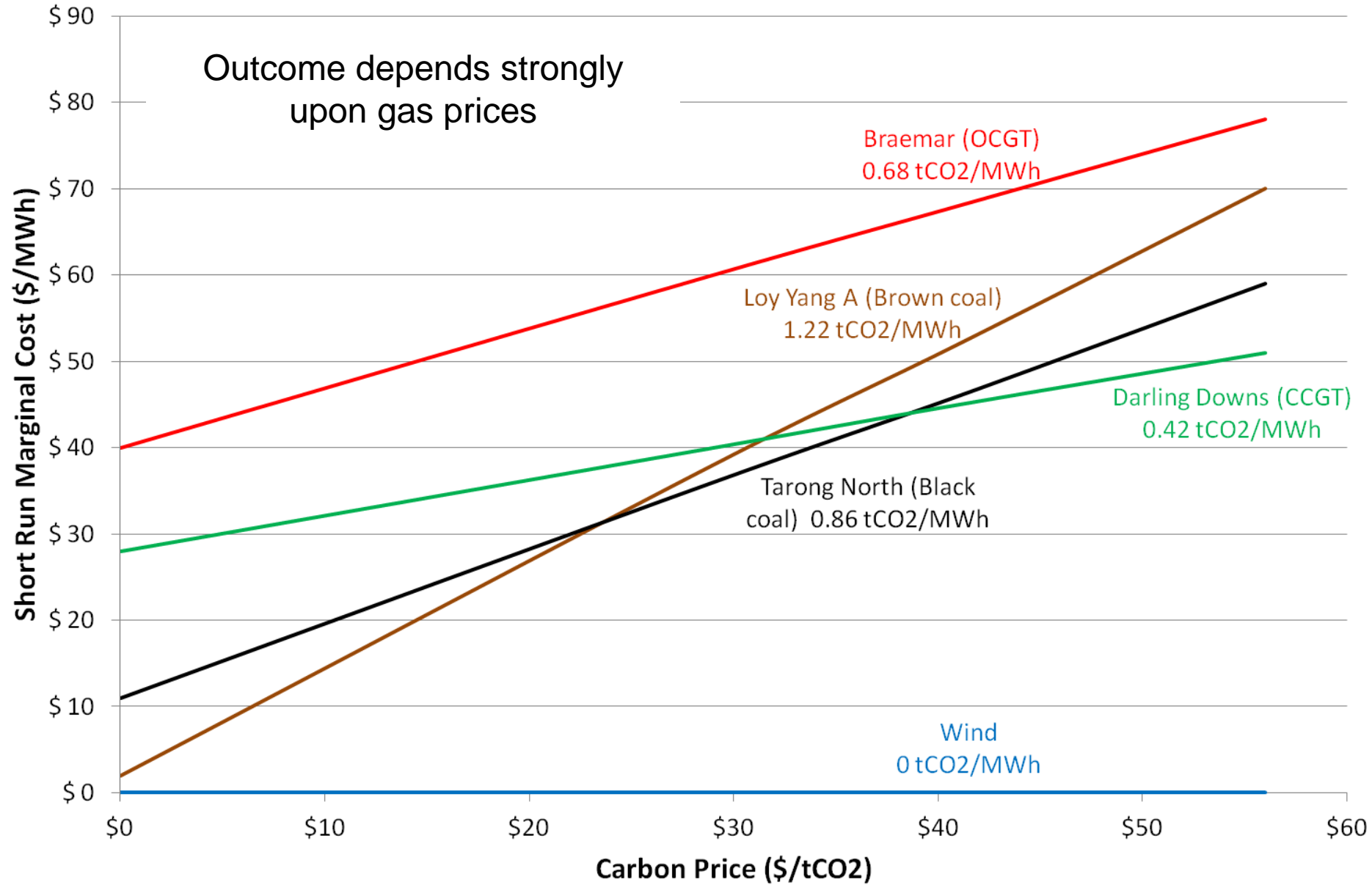
Operating costs (\$/MWh)

- Fuel
- Variable operations and maintenance
- Carbon

Short Run
Marginal
Cost
(SRMC)

**Operational
decisions**

Dispatch impacts



Impact of carbon price on electricity market

Generator costs increase

- Proportional to emissions intensity

Increase bid prices

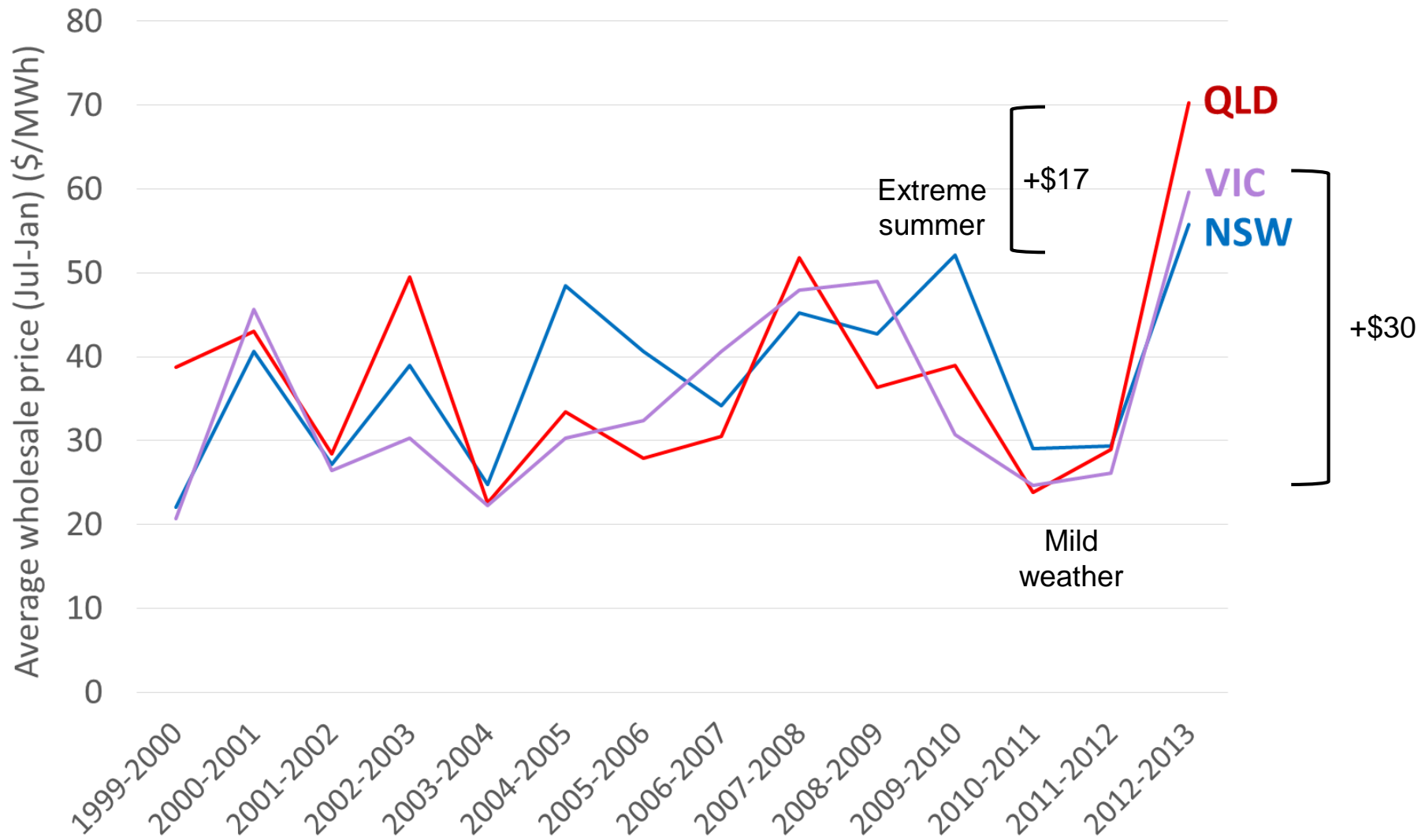
- Assuming a competitive market

Wholesale electricity prices increase

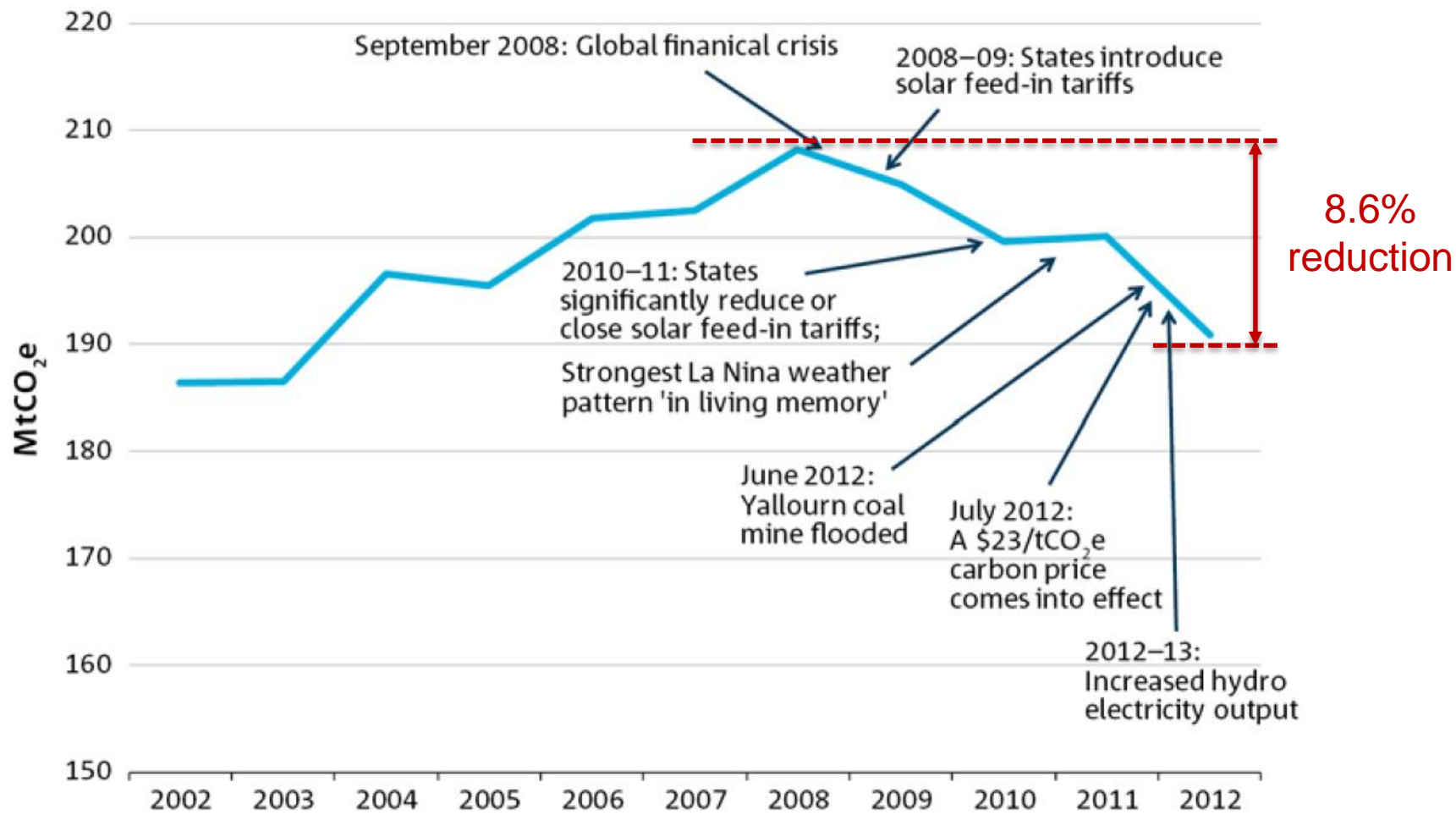
- Average emissions intensity $\sim 1\text{tCO}_2/\text{MWh}$, anticipate $\sim 1:1$ pass through of $\$23/\text{tCO}_2$ carbon price

Cost passed through to consumers

Impact of carbon price on electricity market



Electricity sector emissions

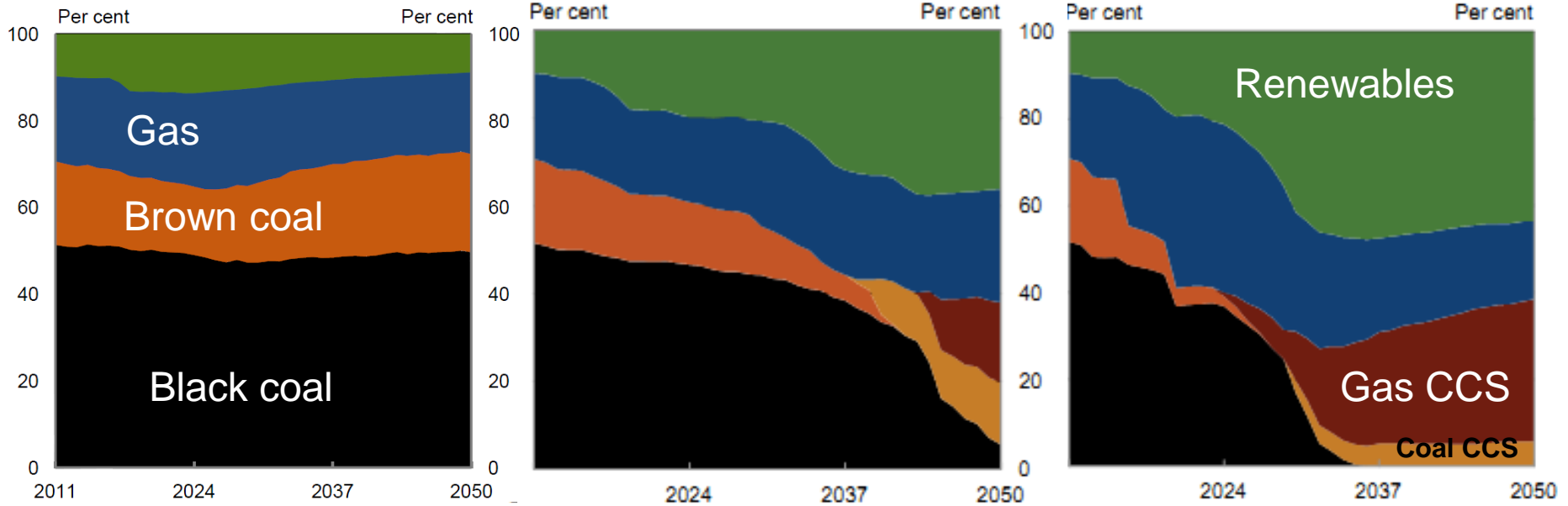


Investment decisions

No carbon price

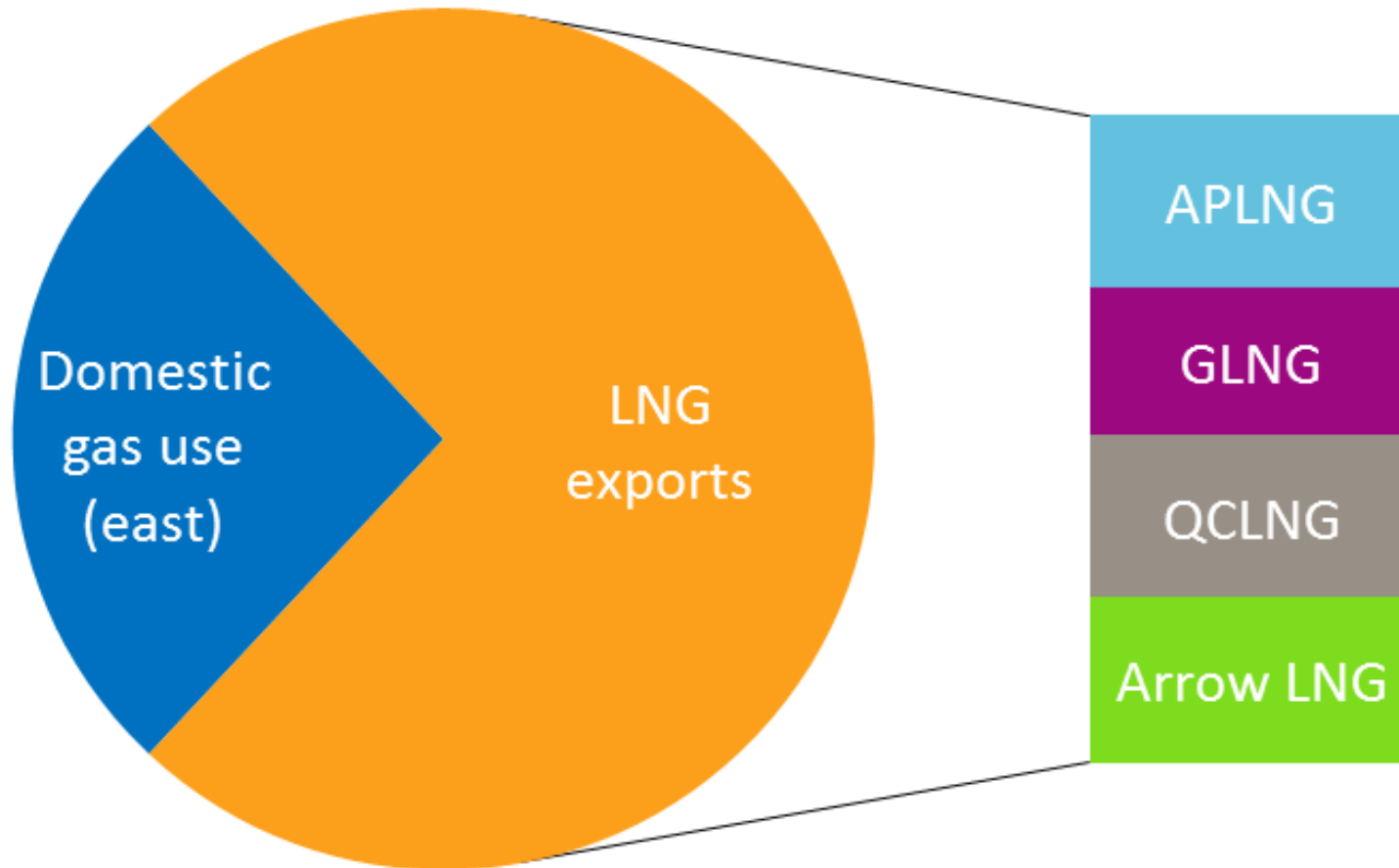
-5% by 2020

-25% by 2020

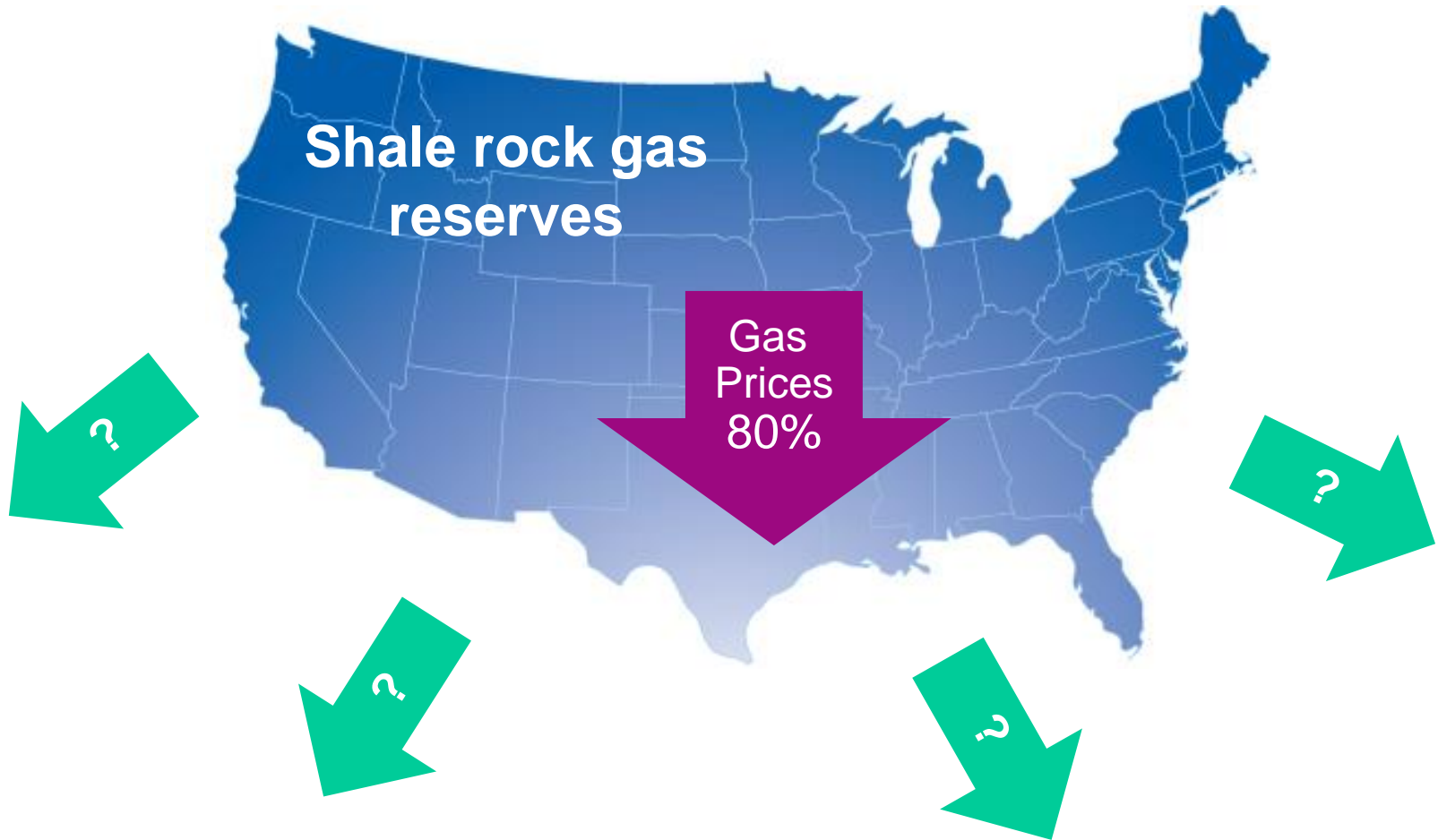


Impacts of **LNG**

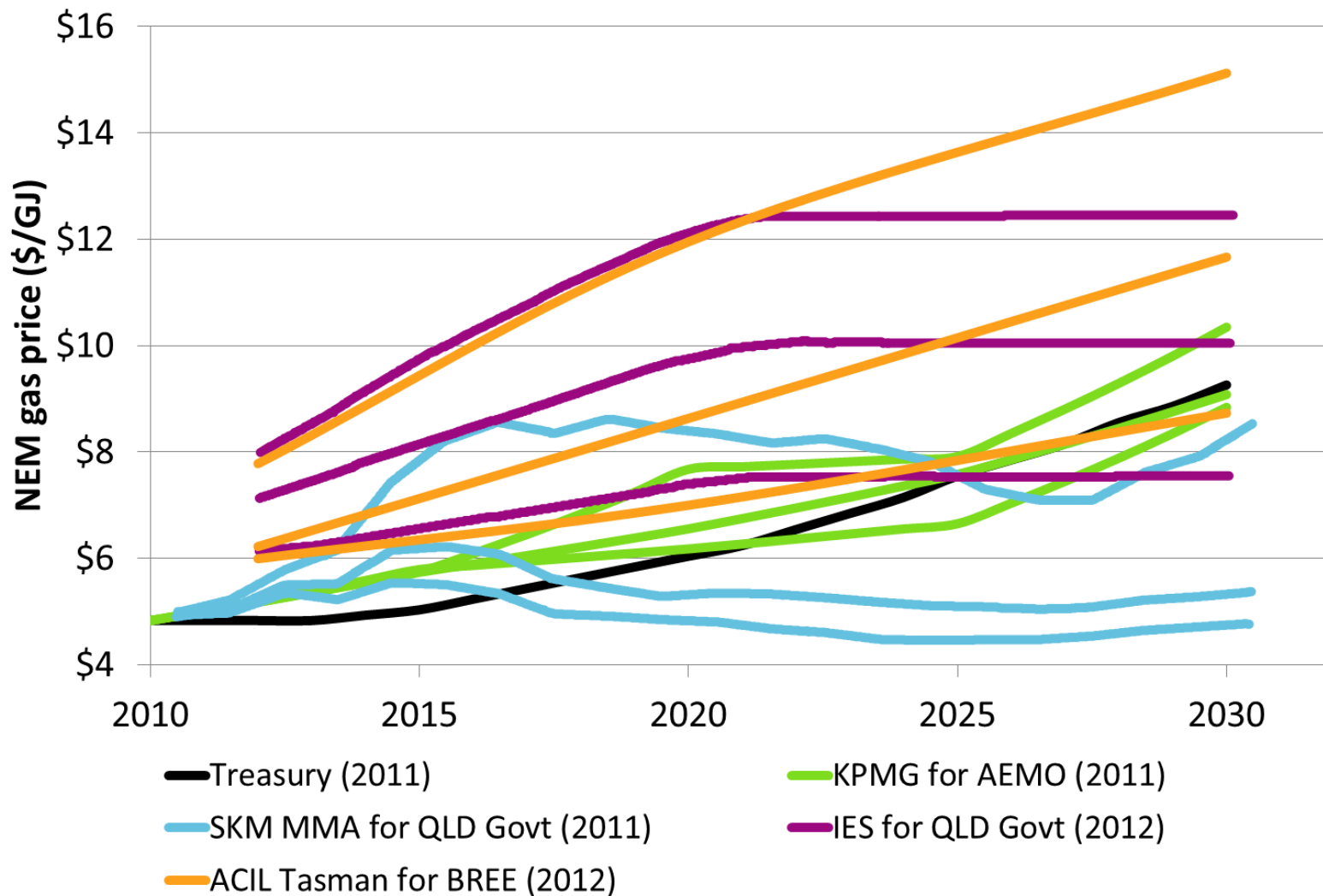
Anticipated LNG exports compared to domestic market



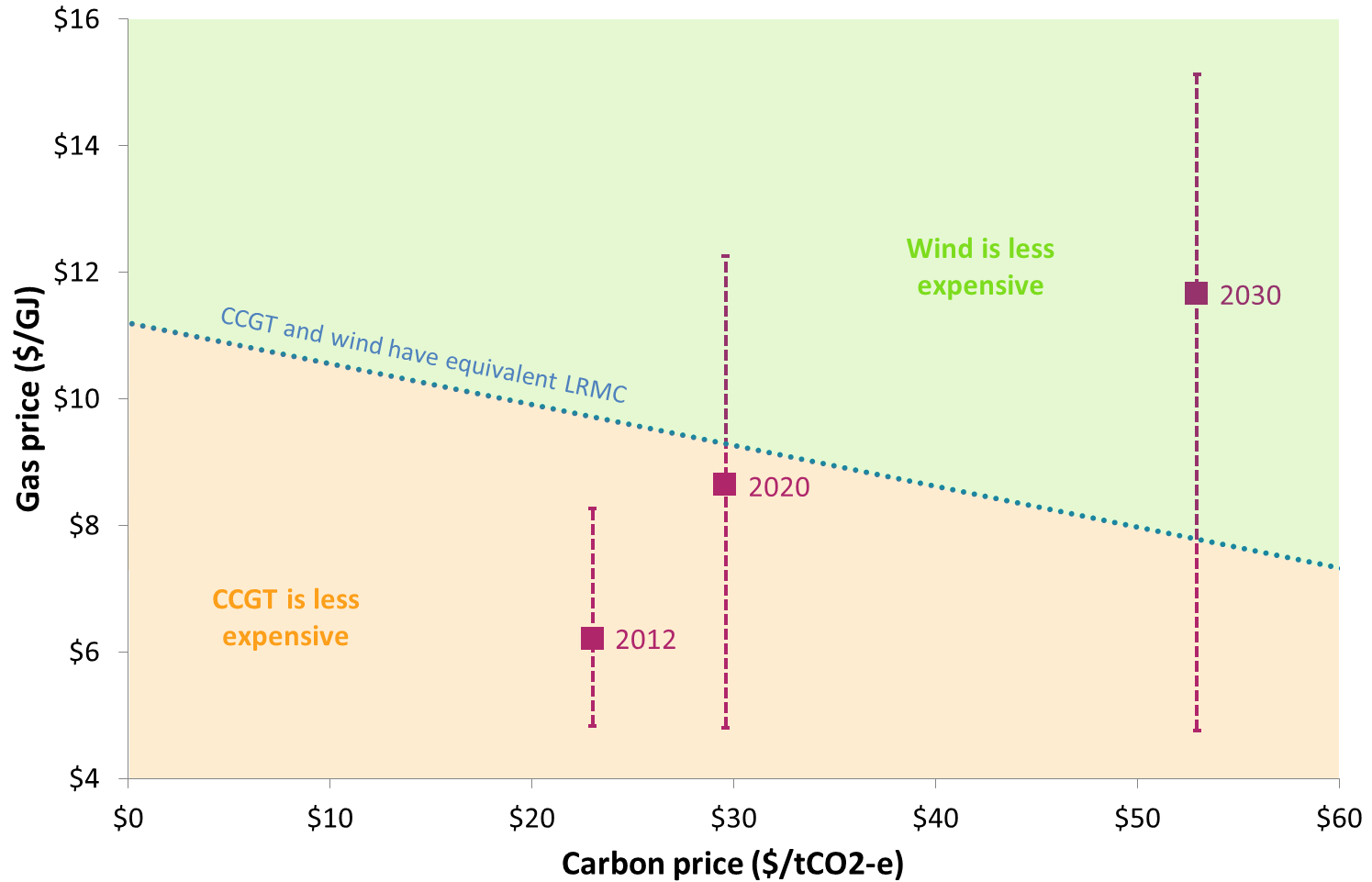
USA and Canada



Significant uncertainty over future gas prices

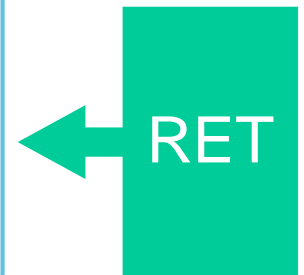
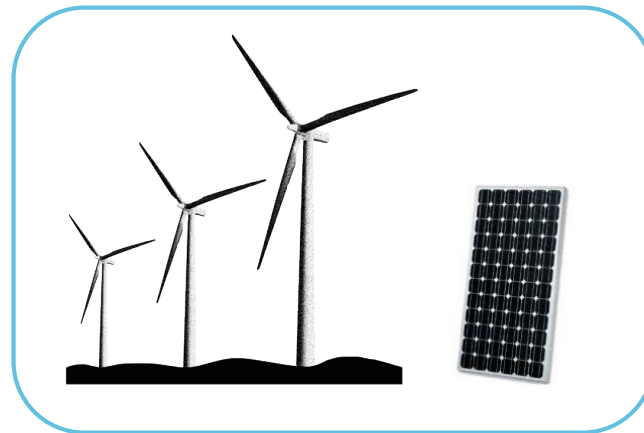


The uncertainty is material



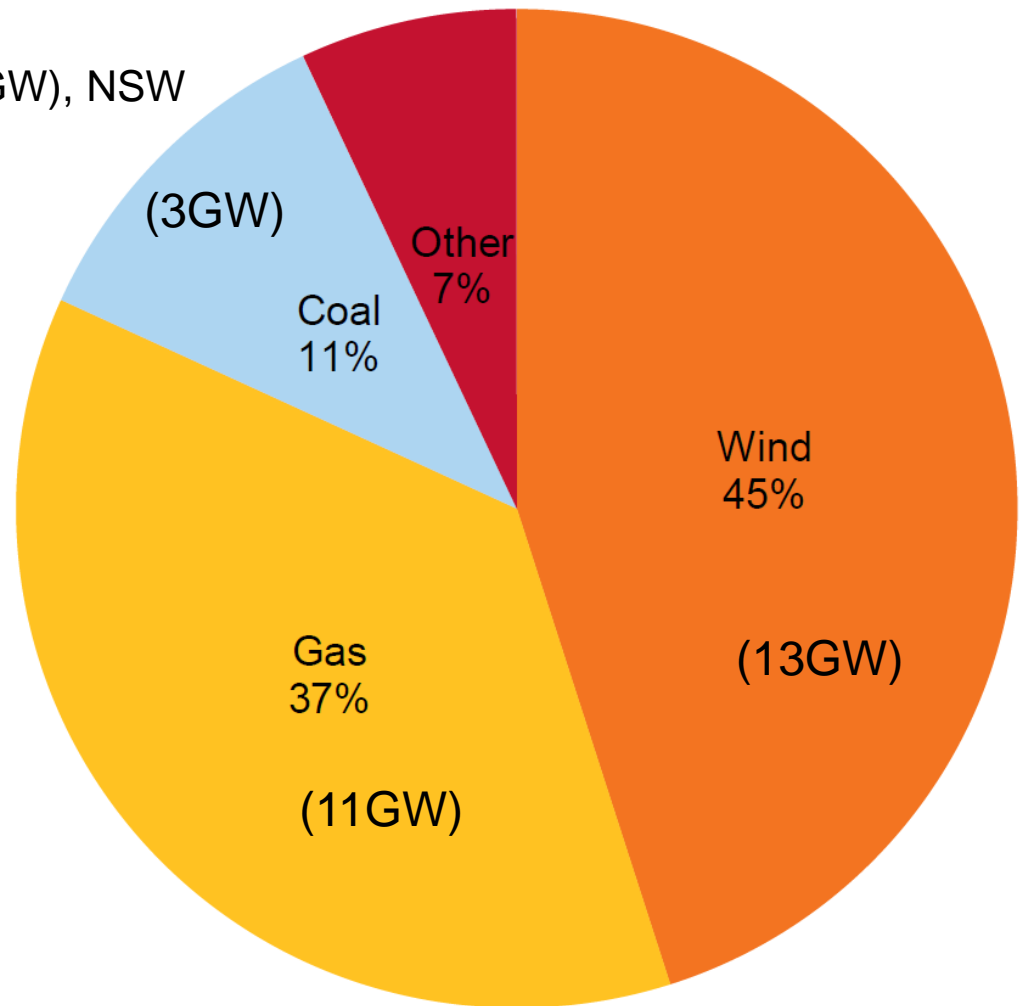
New generation options

Generation technology	Challenges
Coal	High investment capital risk
Nuclear	Highly politically sensitive
Hydro & Biomass	Resource limitations
Geothermal, tidal, wave, CCS	Not commercially viable prior to 2030
Solar thermal	High cost

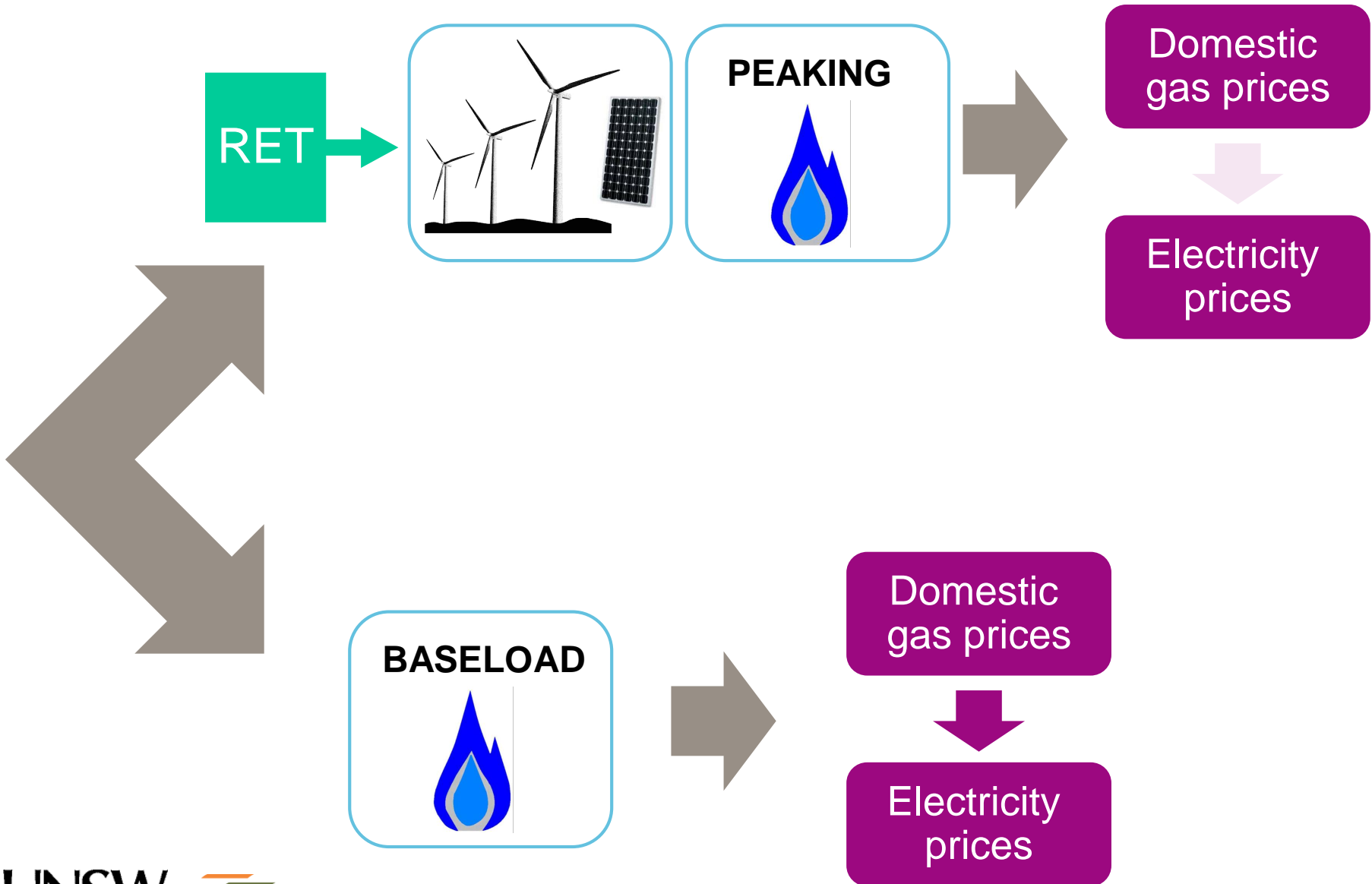


Proposed new capacity

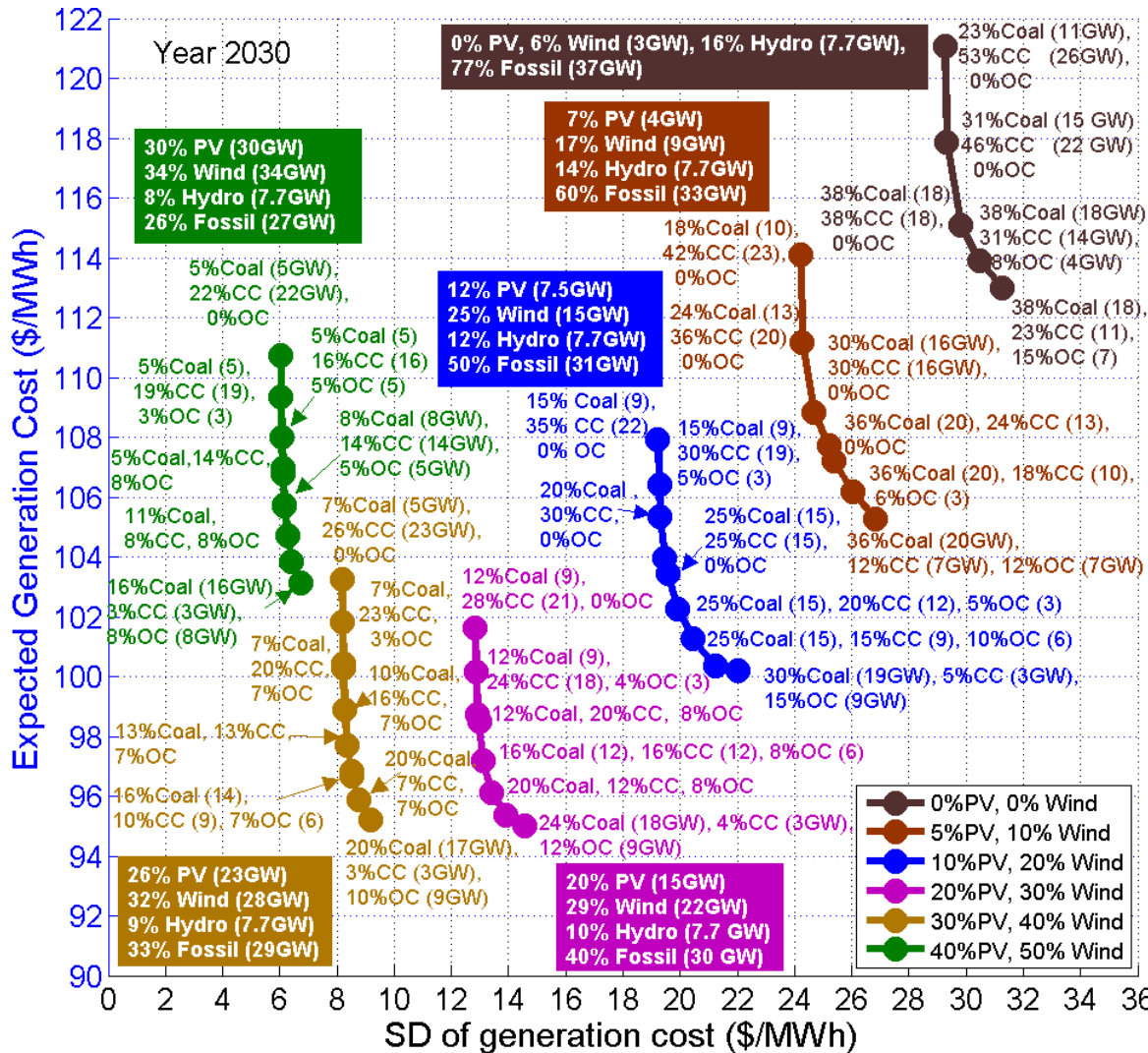
- Bayswater B (2GW), NSW
- Munmorah Rehabilitation (0.7 GW), NSW
- Arckaringa IGCC (0.6 GW), SA



A portfolio approach to risk management



Comparing portfolios of renewables vs gas (2030)



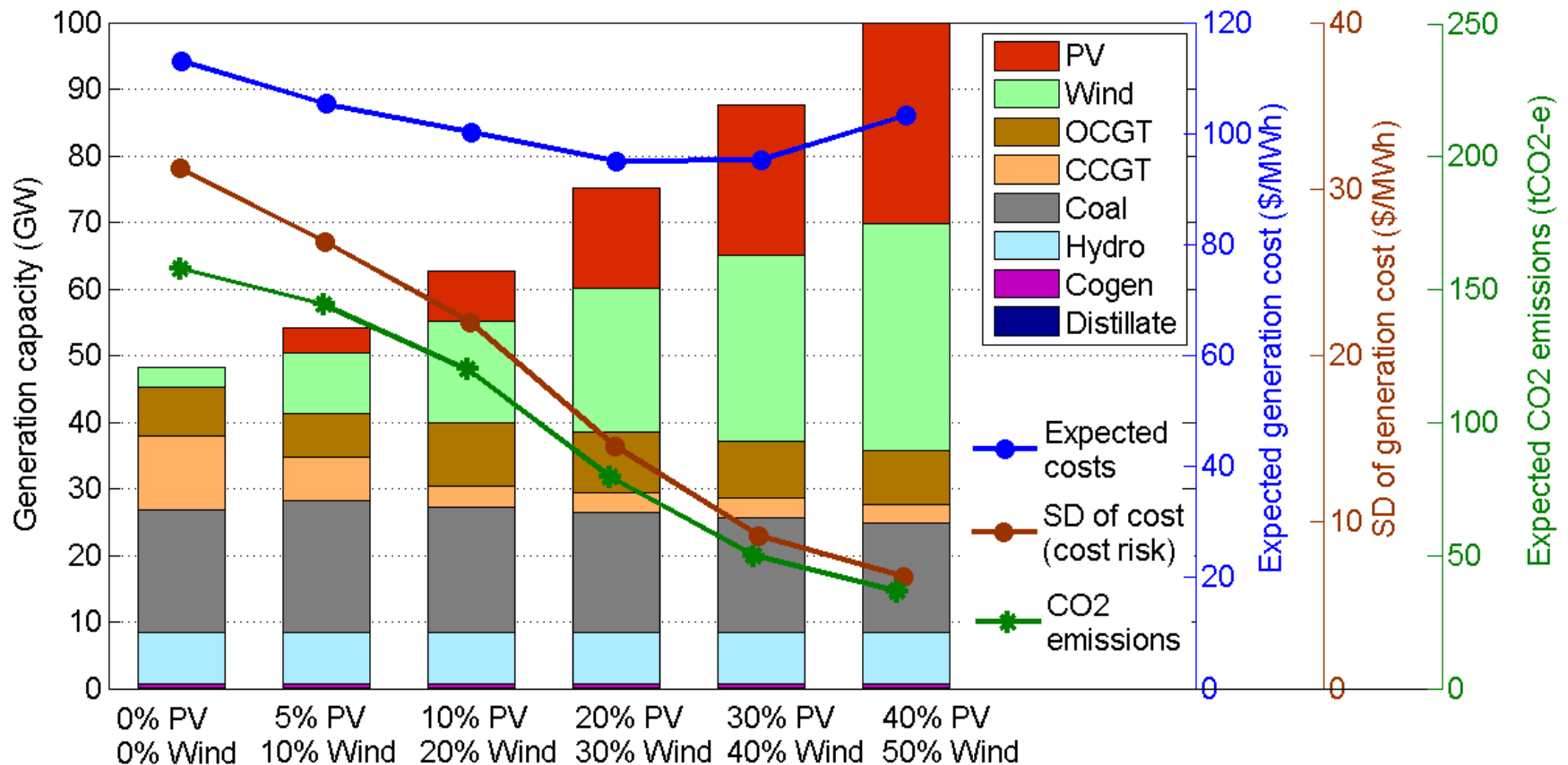
Renewables reduce cost risk

(and also reduce total cost up to a point, depending upon CO₂ and gas prices)

Percentage variable renewables:

- 0%
- 15%
- 30%
- 50%
- 70%
- 90%

Comparing portfolios of renewables vs gas (2030)



International experiences

California

33%
Renewable Energy
by 2020

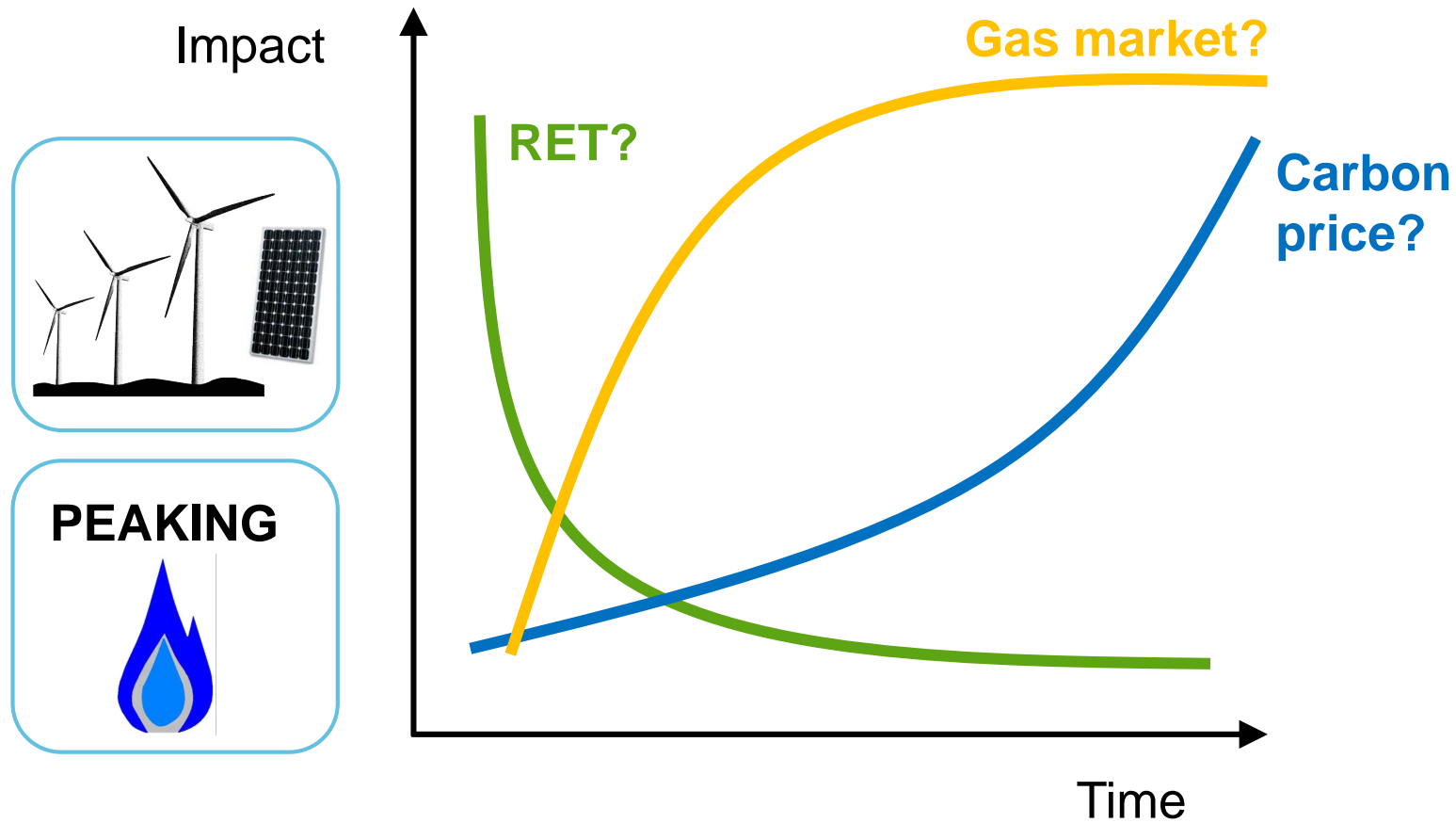
“promoting stable electricity prices by hedging against volatile natural gas prices”

UK

15%
Renewable Energy
by 2020

“[Renewables] will be crucial to help protect consumers from fossil fuel price fluctuations”

Conclusions – Outlook for the electricity sector





Centre for Energy and
Environmental Markets

UNSW
THE UNIVERSITY OF NEW SOUTH WALES
SYDNEY • AUSTRALIA

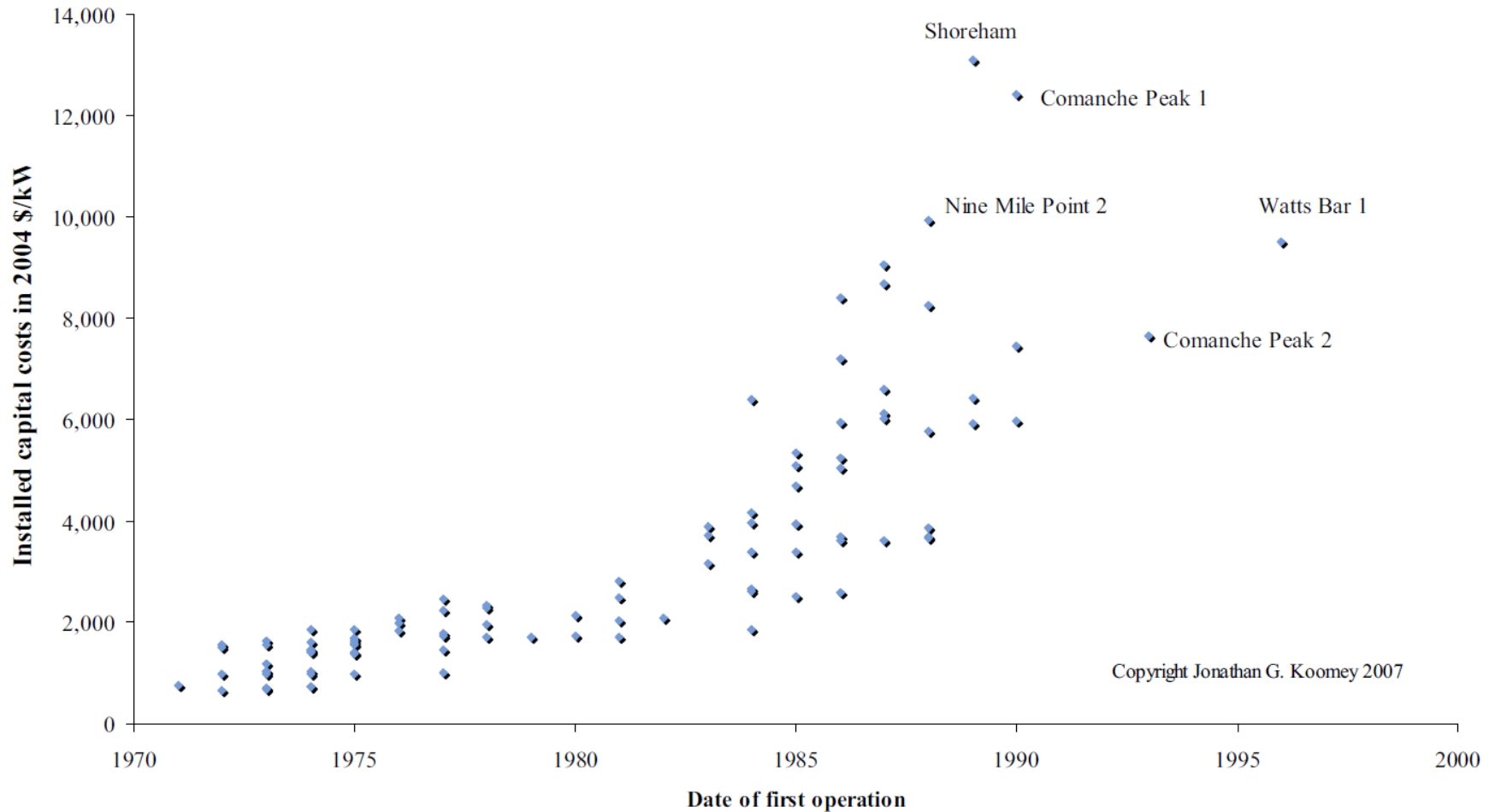
Thank you

www.ceem.unsw.edu.au

What about nuclear?

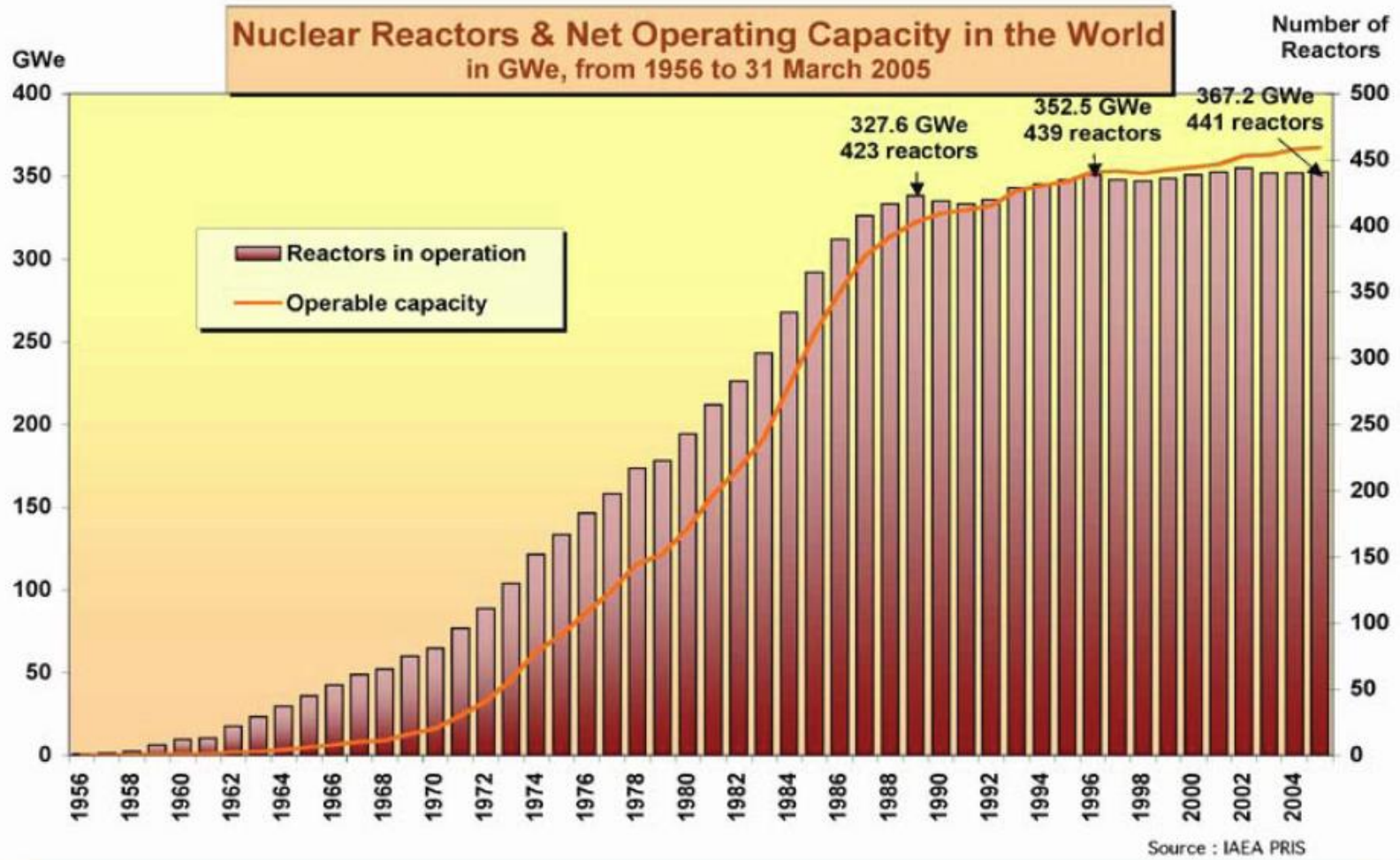


Nuclear costs are increasing



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Investment in nuclear has slowed



Levelised cost of nuclear is high

	Levelised cost (\$/MWh)
Nuclear (UK)	\$154 (£92.50) (Hinkley C, 35yr PPA)
Wind (Australia)	\$80 - \$100 (10-15yr PPA)

- Cost of establishing a nuclear industry?
- Also:
 - No export industry in renewable technologies
 - Inflexible – poor partner with variable renewables