



Electricity sector market reform and the transition to renewables

Presented by
Tim Nelson

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Energy in
action.



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Some
context.

How will Australia deliver its COP21 commitment?

Current policy will require rethinking to deliver emission reductions

> **Current Australian Government target of 26-28% reduction on 2005 levels**

» Assuming no electricity demand growth, emissions intensity would fall to 0.66 tonnes per MWh in 2030

> **Expanded policy could involve**

» Expansion of the RET beyond 2020 and/or new government funding/support

» Closure (e.g. Canada age based operating limits or US performance based standards)

» New and expanded energy efficiency policies

» Transition of Direct Action 'baselines' into a baseline and credit scheme (similar to the previous NSW Greenhouse Gas Abatement Scheme)

> **But states have their own policies**

» 50% renewable by 2030 in QLD

» 40% renewable by 2025 in Victoria

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Modelling of the NEM – focus on least cost

Economic Modelling of NEM

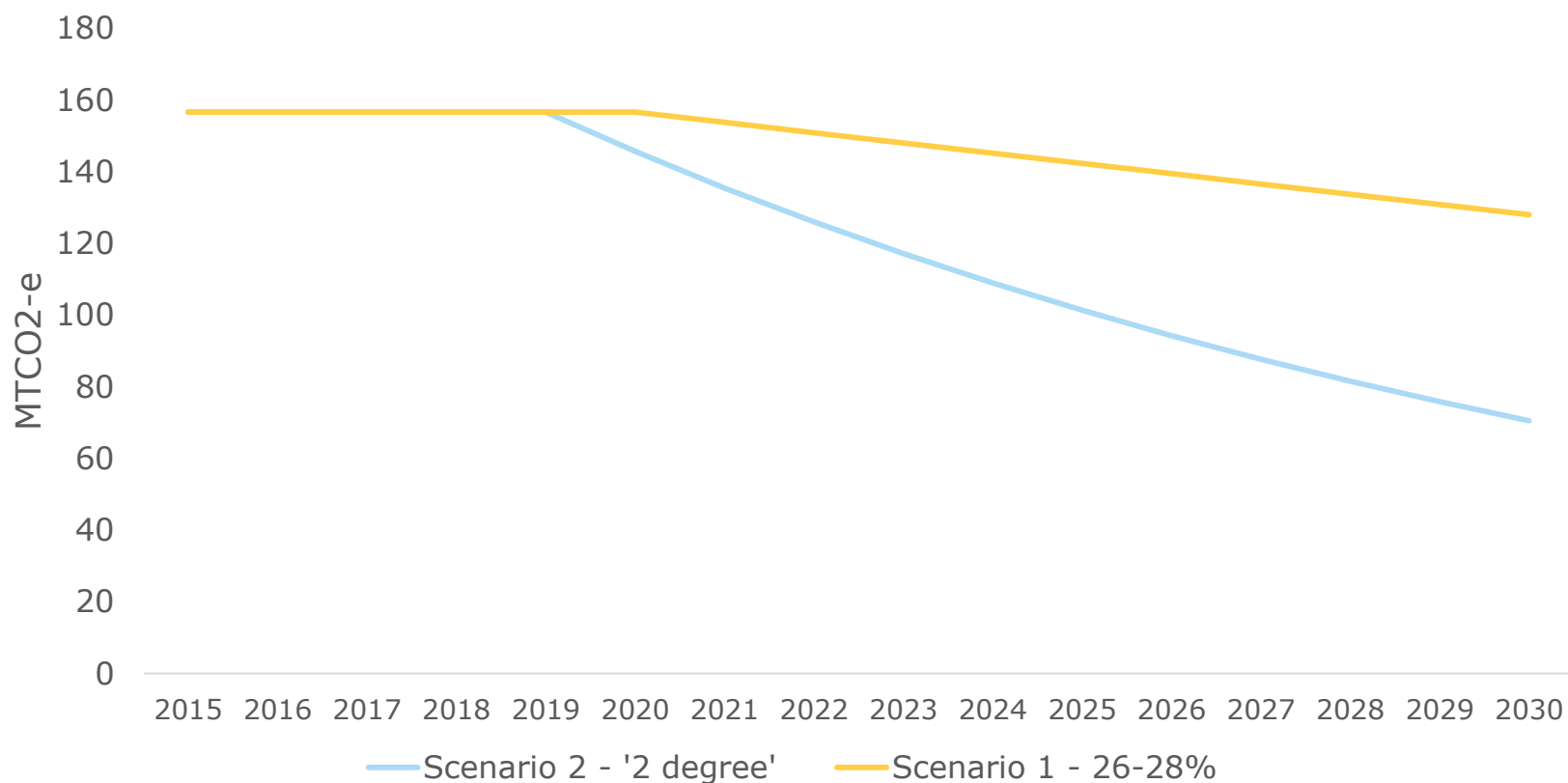
Least cost LP modelling instructive of potential outcomes of emissions constraints

- > Modelled within the National Electricity Market
- > PLEXOS modelling software
- > Minimise costs while meeting imposed GHG constraints
- > Optimises the replacement of emissions intensive power stations with low emissions generation capacity
- > Core assumptions
 - » Supply must equal demand at all demand points
 - » New generation cannot be installed instantaneously
 - » The current Renewable Energy Target is met
 - » Emission reduction targets do not apply until 2020
 - » Generation capacity is added in realistic increments
 - » Electricity demand forecasts are derived from AEMO

Carbon constrained

The energy system must decarbonise by 2050 for climate change objectives to be met

NEM emission trajectories



Increasing penetration of renewables

Renewable energy emerges as key provider of energy

Figure 3: National Electricity Market Generation Output – Scenario 1

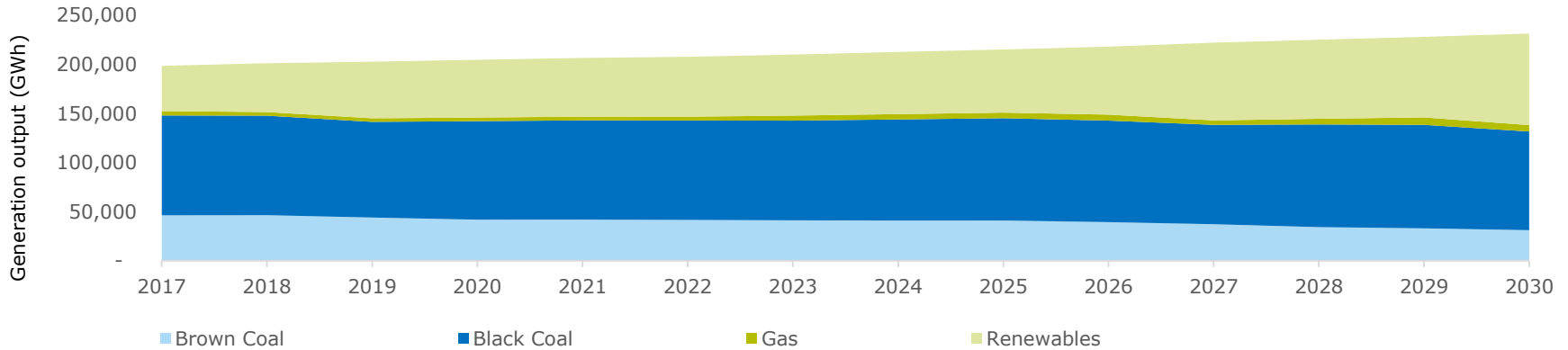
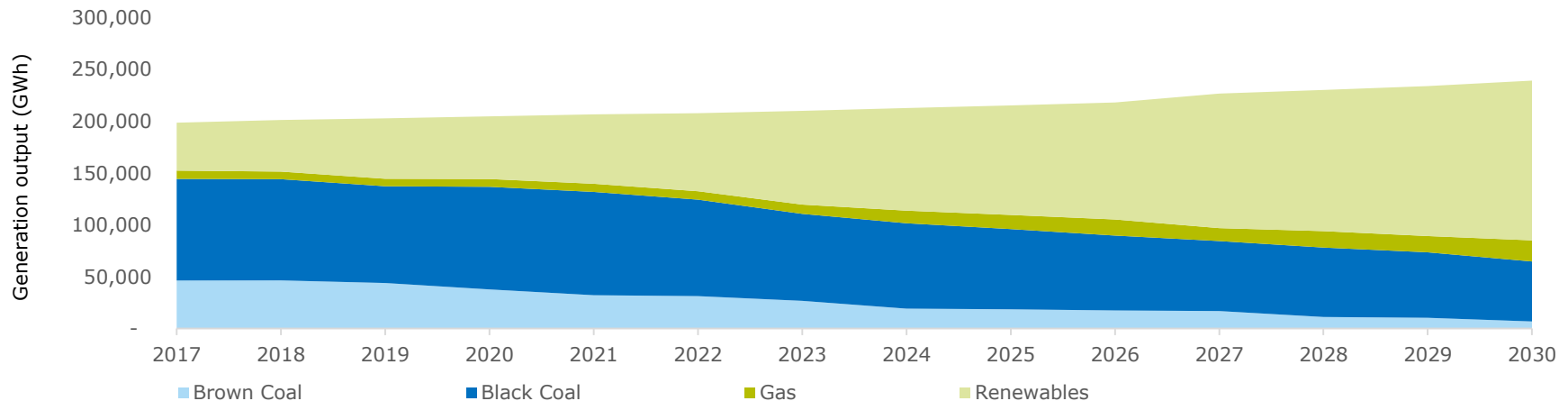


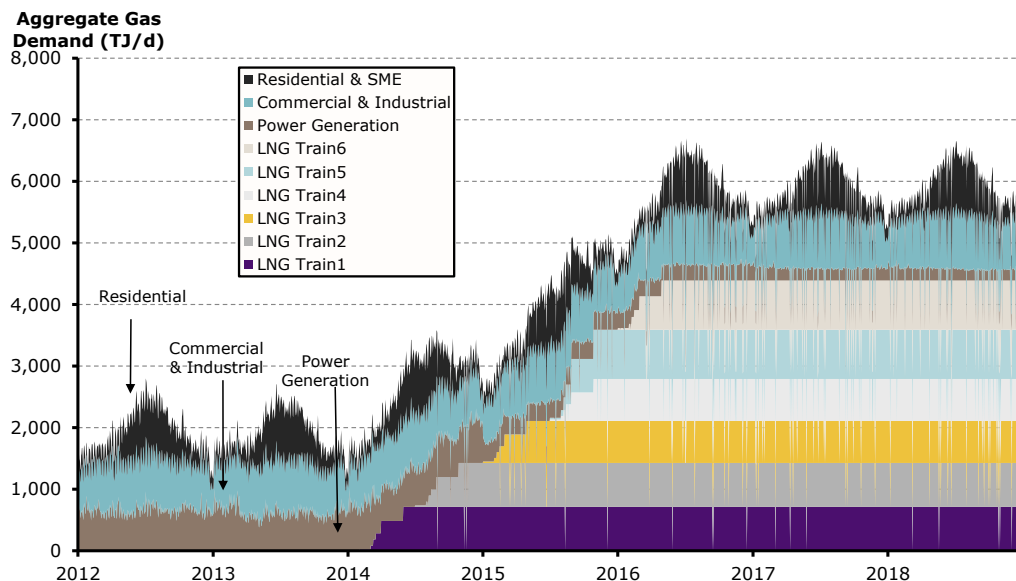
Figure 4: National Electricity Market Generation Output – Scenario 2



Contrast with the US.

Gas market is undergoing significant change which will impact on decarbonisation options

- > Same gas industry technological developments have facilitated very different outcomes in the US
- > LNG and restrictions on gas supply in Australia reducing ability to use gas as a transitional fuel
- > US focus on energy security rather than strict economic criteria an important difference with Australia
- > US electricity generation sourced from coal has declined from 52% to 41% and is projected by the EPA to fall to 30% by 2030
- > Australian power generation from coal is expected to increase with gas-fired electricity to fall



Increasing penetration of renewables

Pricing volatility likely to significantly increase

- Modelling of 26-28% case results in significant increase in ratio of top 30% to bottom 30% of prices

	NSW	QLD	SA	VIC
2017	1.67	1.44	6.85	2.65
2030	7.70	8.27	21.93	9.52

- For very high penetration of renewables, market price cap in the NEM (currently @ \$14k) would need to increase to around \$80,000 per MWh
- Retail markets with high penetration renewables require them to be 'dispatchable' to ensure financial derivatives can be traded

Financing complementary capacity.

Investors need access to long-term financing instruments

- > Caplan (2012) and Nelson and Simshauser (2013) have demonstrated that the 'merchant' model is dead
- > *Operating* decisions influenced by evolving spot/derivative markets
- > As an example, FCAS revenue as a proportion of total market revenue is increasing

Region	% of market revenue from FCAS (Sept 2015 to October 2016)	% of market revenue from FCAS (5 years to September 2016)
NSW	0.50	0.20
QLD	0.44	0.20
SA	5.89	1.77
TAS	1.07	1.04
VIC	0.55	0.21

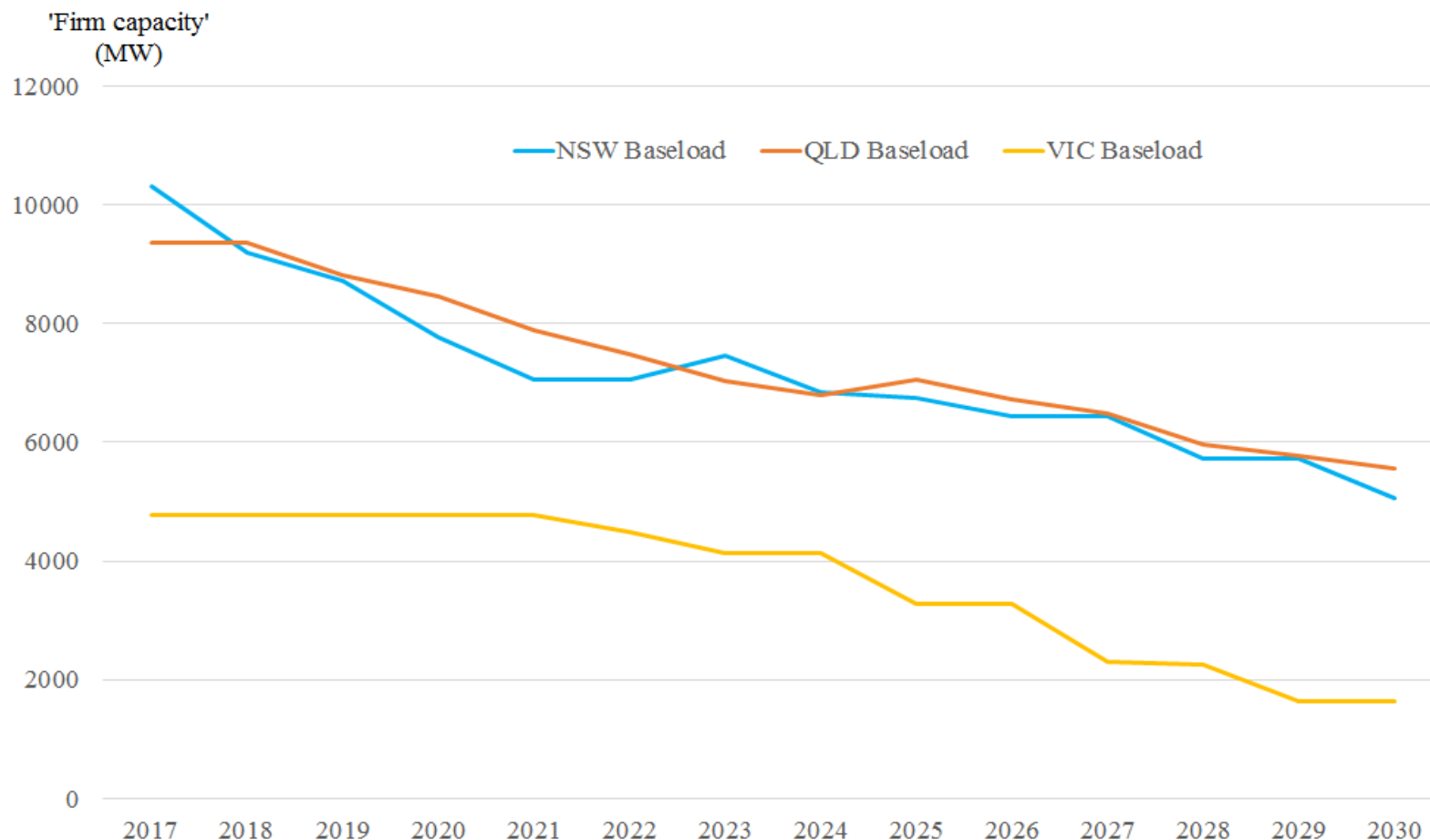
- > But *investment (capital allocation)* decisions require longer-term financial instruments (e.g. LGCs through a PPA)

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But what
about the role
of the states?

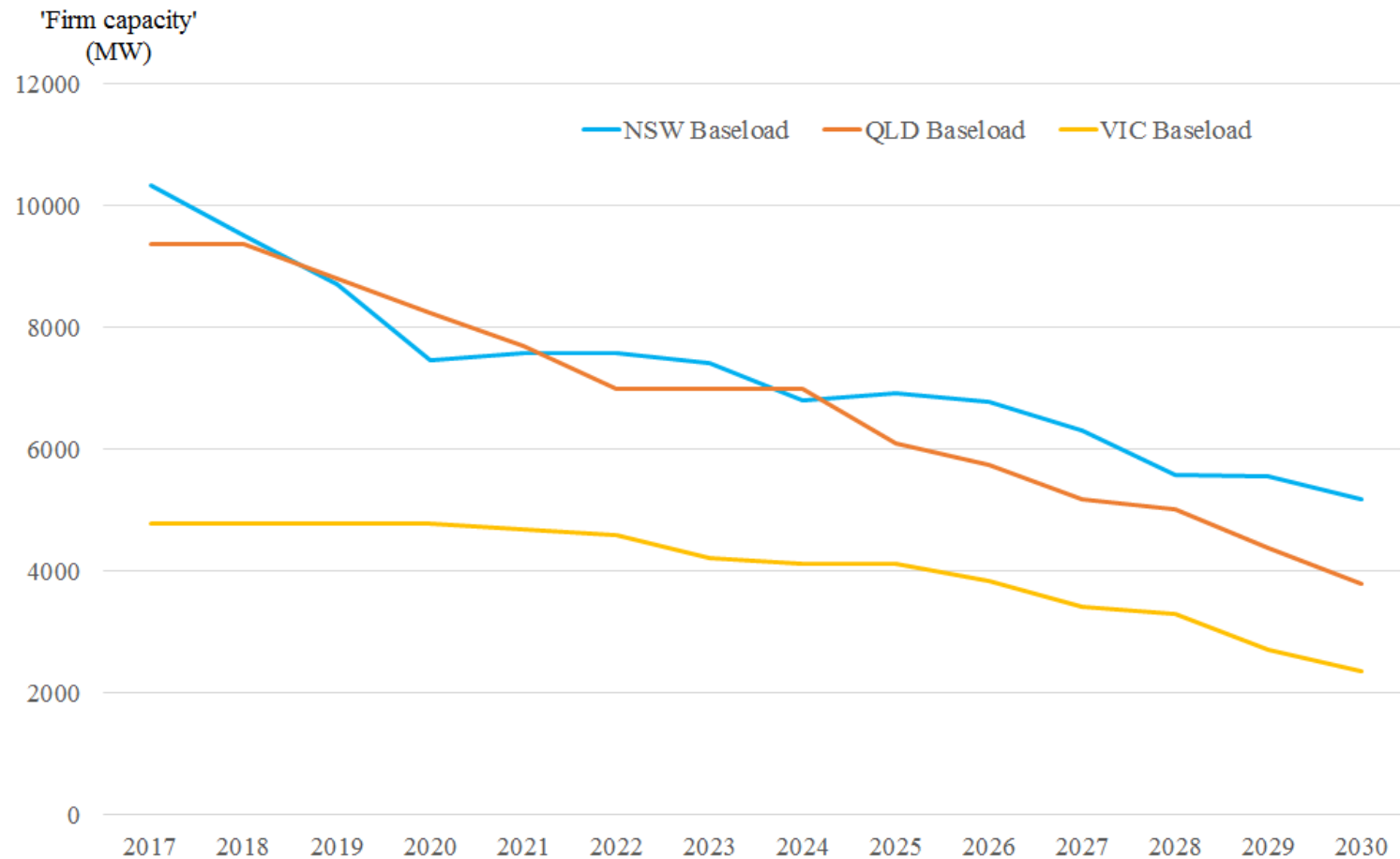
A 'least cost' approach may impact states differently.

More abatement may occur in emissions intensive states



A 'least cost' approach may impact states differently.

Assuming each state achieves 26-28% produces different results



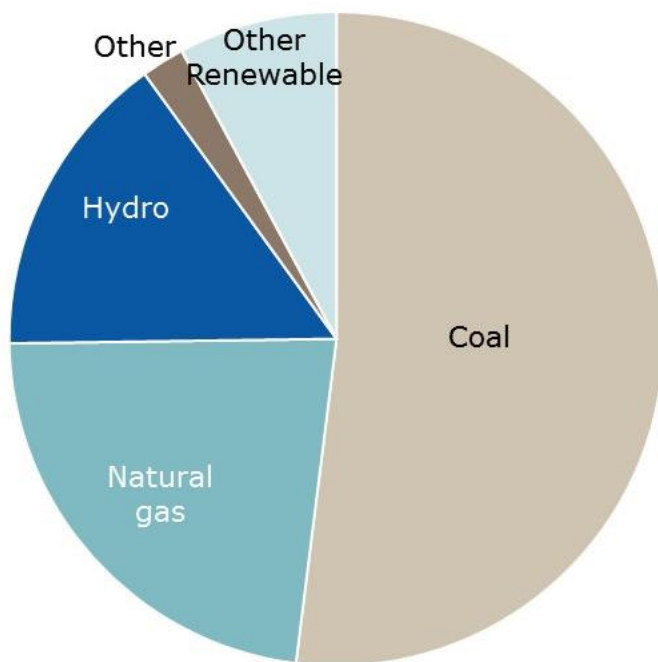
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Energy market reform to support the transition

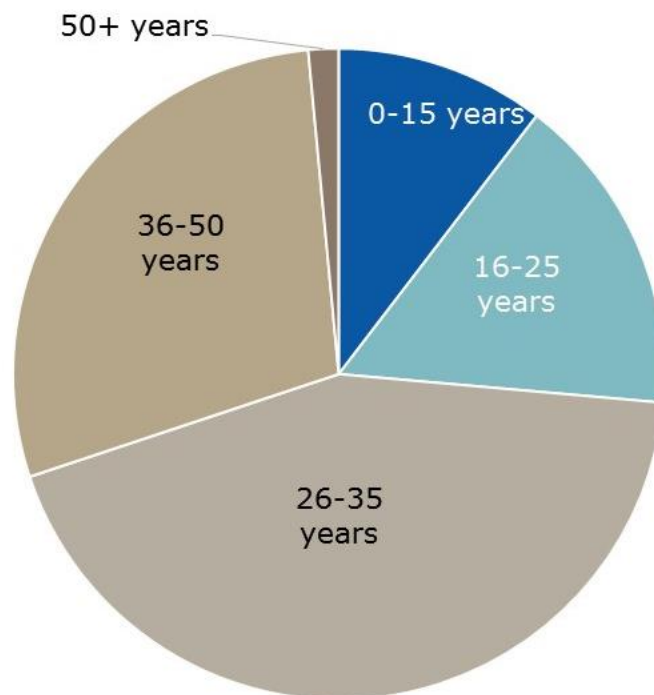
The National Electricity Market needs to be refreshed.

~75% of thermal capacity is beyond its original design life

NEM installed capacity by type



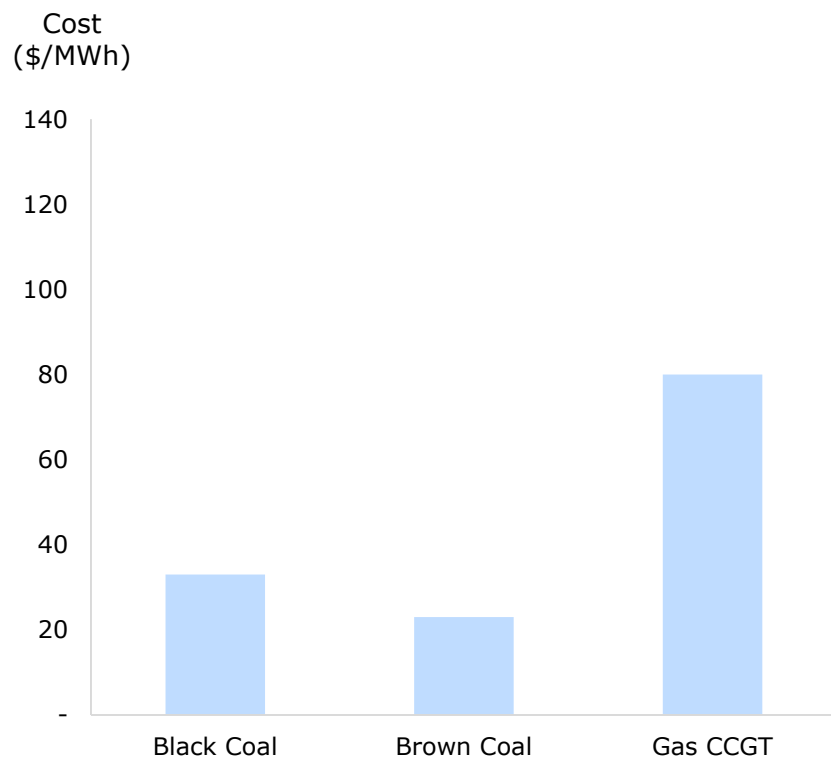
NEM thermal generation by age



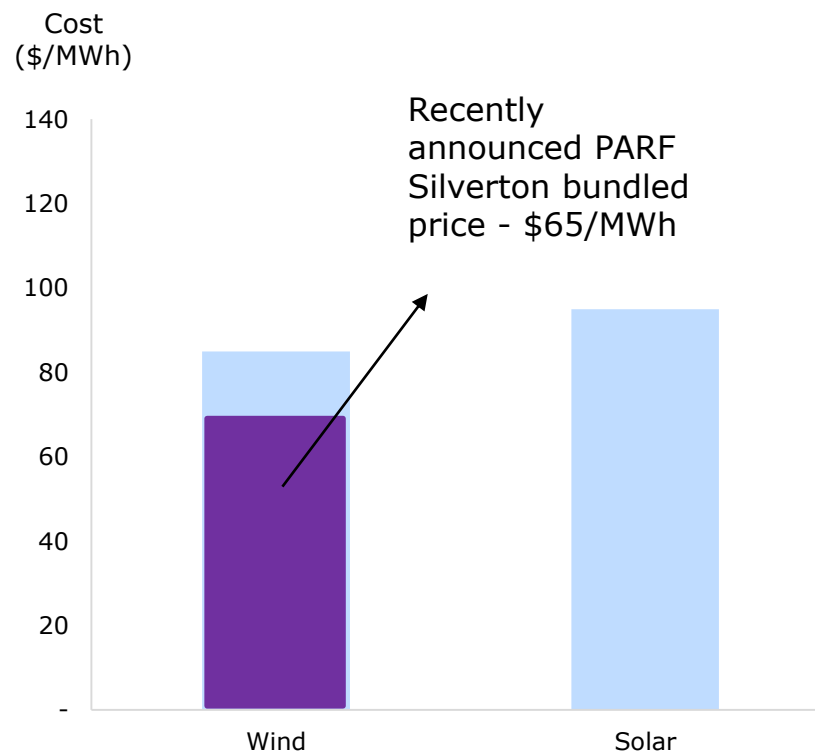
Very low SRMC of existing generation.

But new build cost of renewables is falling

Thermal generation cash running costs



Renewable generation long run cost



Energy market reform

Policy 'trilemma': Emissions reductions of 26-28% of 2005 levels by 2030; competitive pricing; security of supply

- Assuming a robust climate change policy.....
- Four criteria for assessing long-term wholesale market design: allocative efficient dispatch of existing generators; new investment; reliability and security; and achievement of acceptable political economy pricing
- Energy-only market can work but.....
 - Mechanism required for making renewables 'dispatchable' such as a 'firm capacity right'
 - ensures robustness of retail markets and enhances system security
 - Increased use of ancillary services style markets
 - Regulated closure or 'notice of availability'
 - ERCOT style reserve generator market worth considering



For more information:

AGL Blog – aglblog.com.au

Twitter - @tanelsonaus

Thank you.
