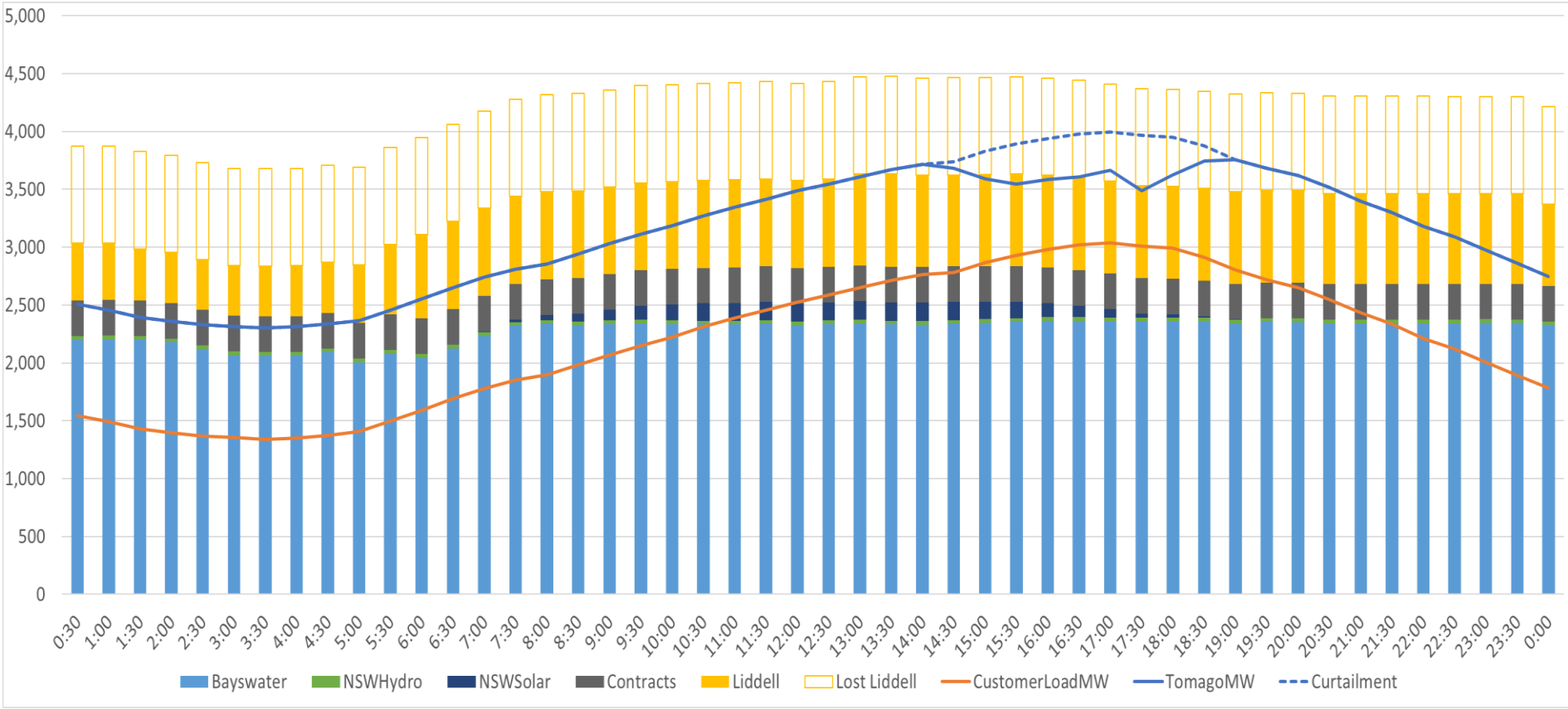
The future of generation

Tim Nelson, Chief Economist, AGL Energy

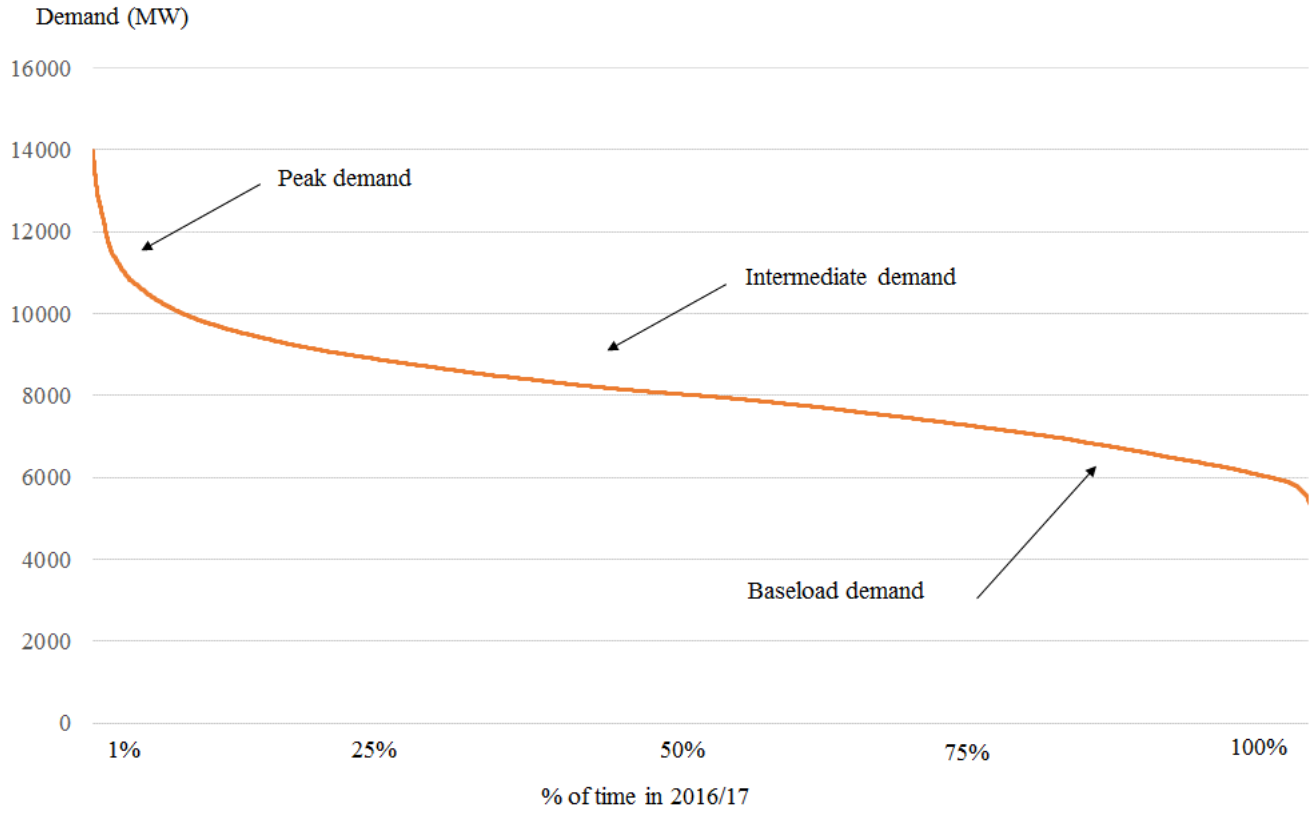
Liddell and summer 2016/17

Liddell was partially unavailable during the peak demand event – capacity is 'dispatchable' but not 'flexible'



What does demand look like in NSW?

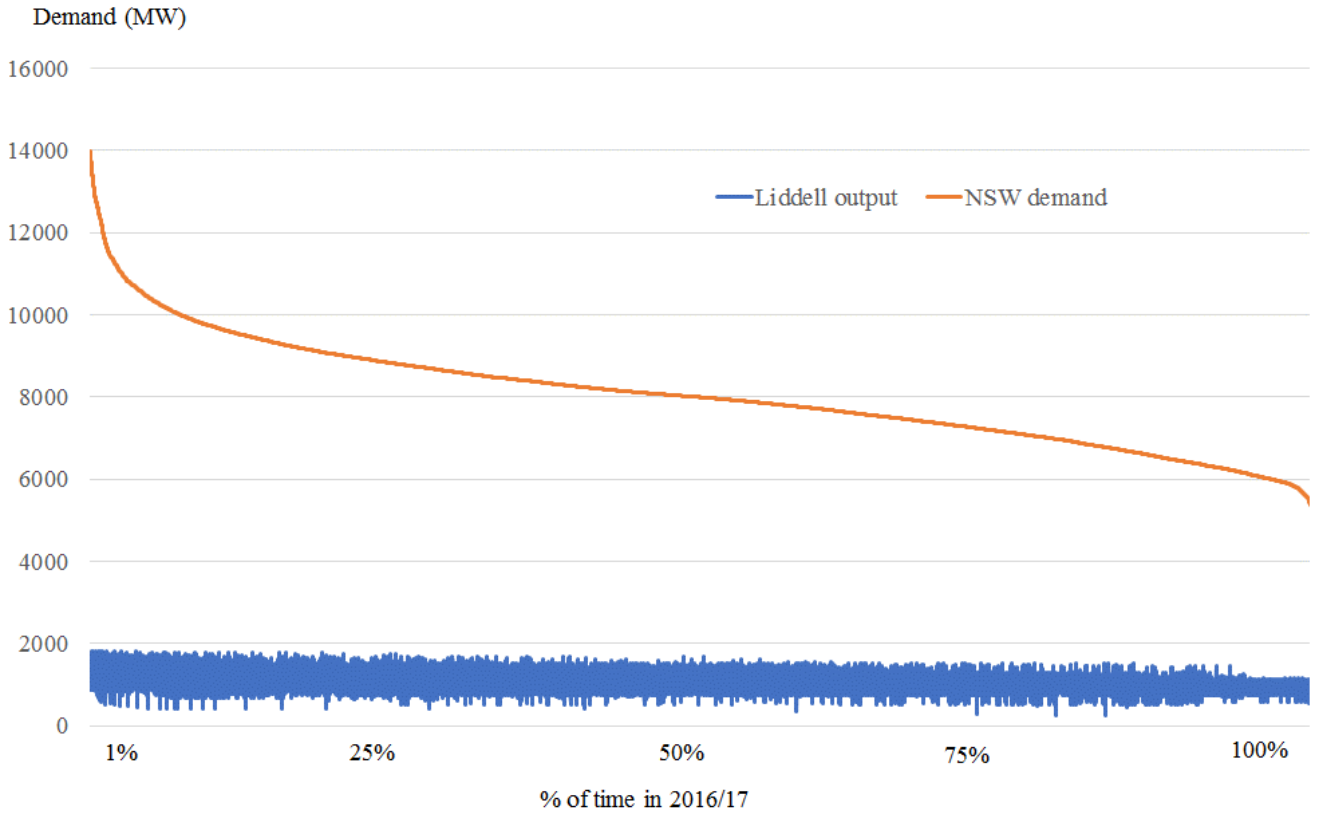
Three broad types of demand: baseload, intermediate and peaking



Source: AEMO

What does demand look like in NSW?

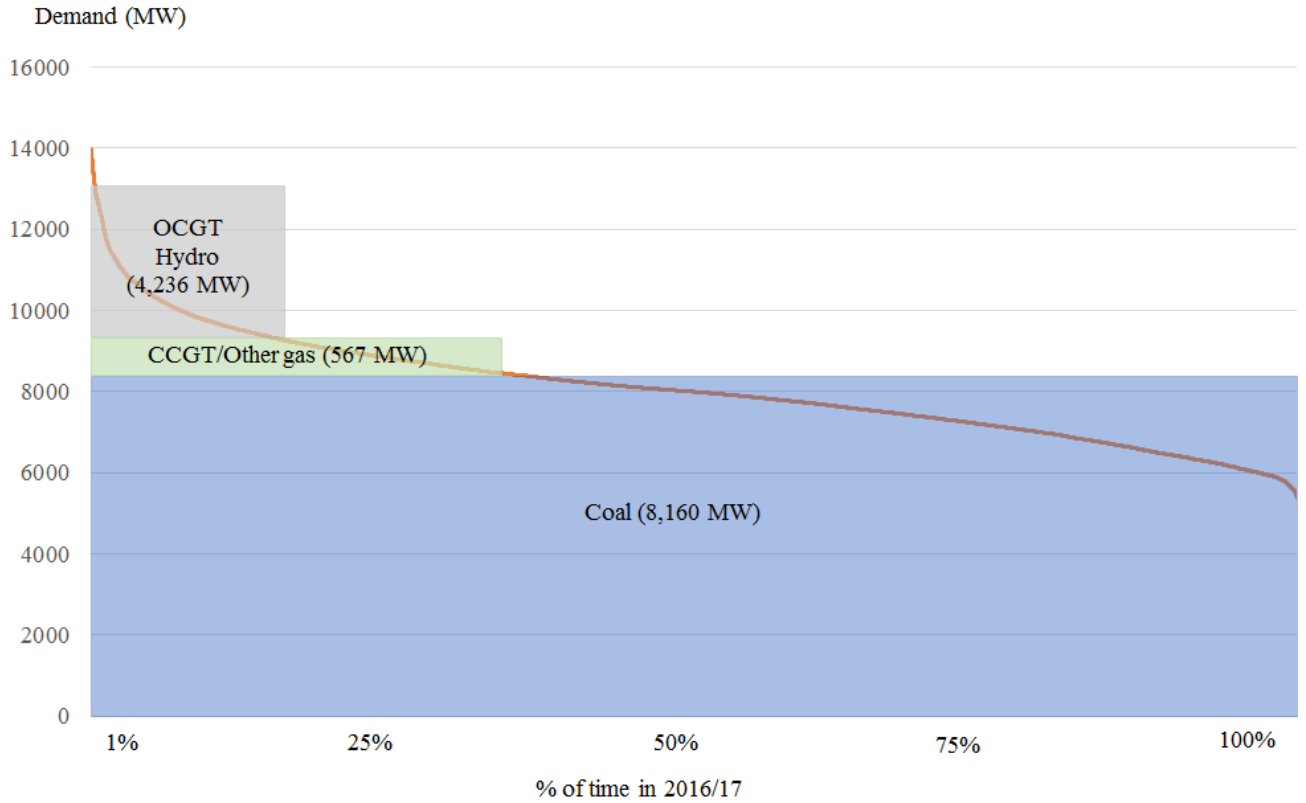
How does Liddell contribute to meeting demand



Source: AEMO

Existing ‘firm’ supply to meet demand

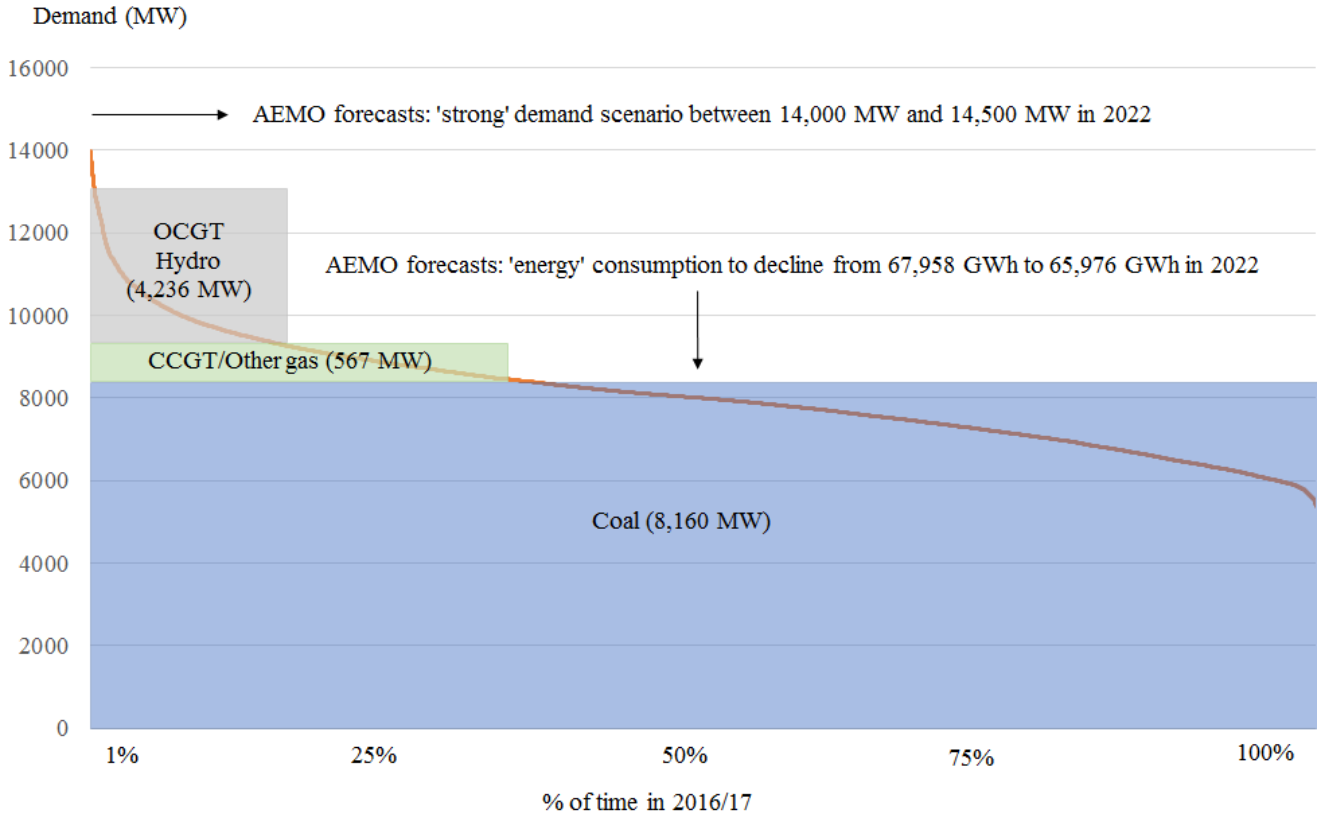
Without Liddell, existing ‘baseload’ and ‘intermediate’ plant is adequate but more peaking plant is required



Source: AEMO

Existing ‘firm’ supply to meet demand

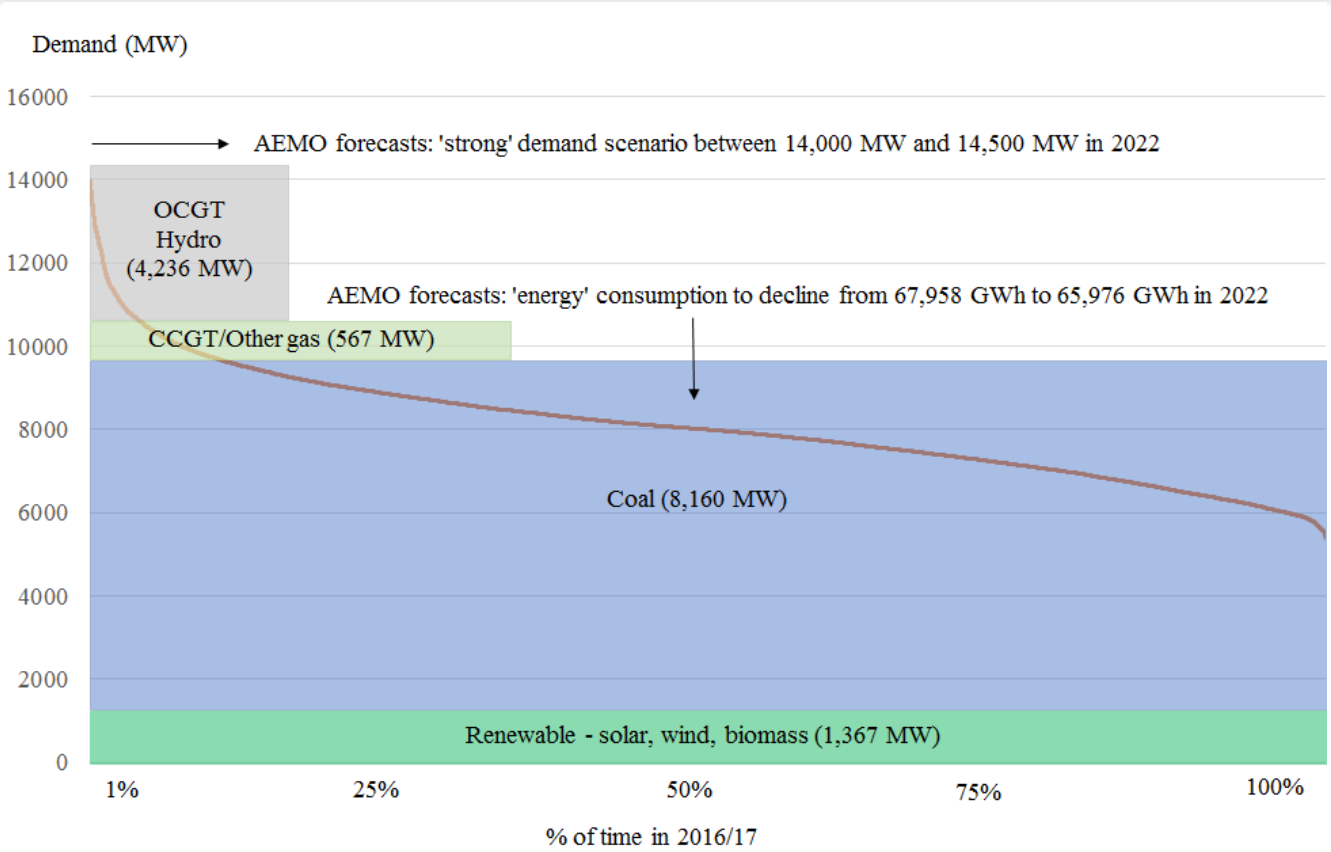
With peak demand growth and underlying consumption declining, still mainly a requirement for ‘peaking’ capacity



Source: AEMO

And then there is renewable energy

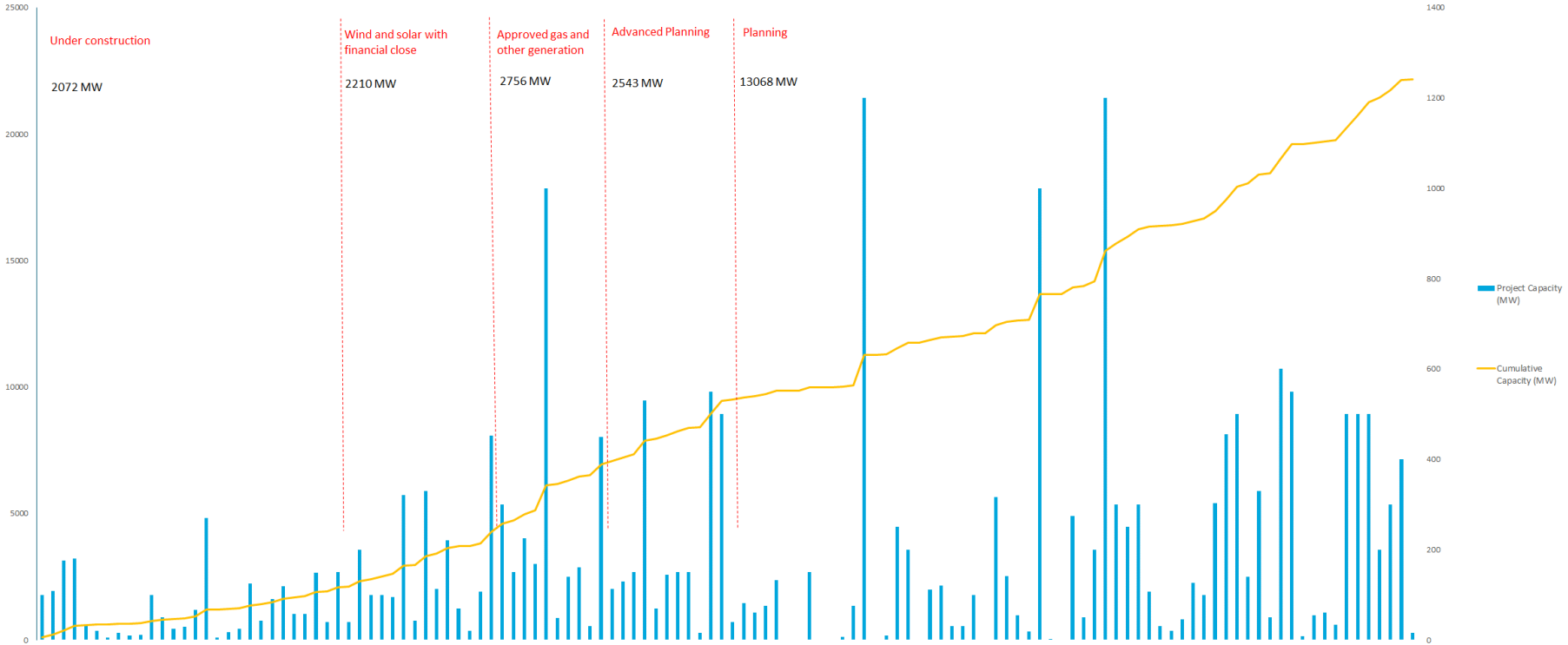
Renewable energy is not 'firm' but still provides energy (in a market with declining *energy* consumption)



Source: AEMO

How much new supply is being built?

Significant amount of new supply is being built with material number of projects also 'shovel ready'



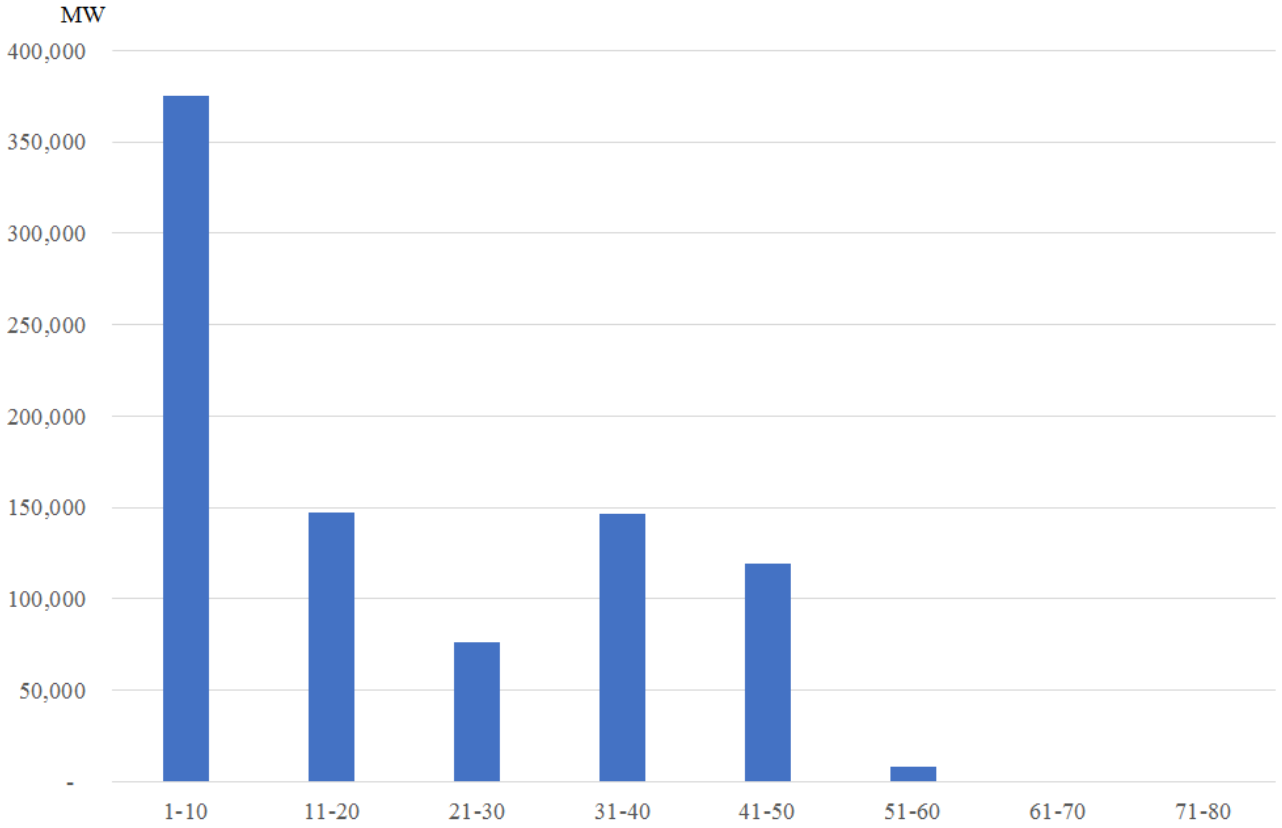
Source: Compiled from industry announcements

Some other things

Tim Nelson, Chief Economist, AGL Energy

Not many power stations operate beyond 50th year

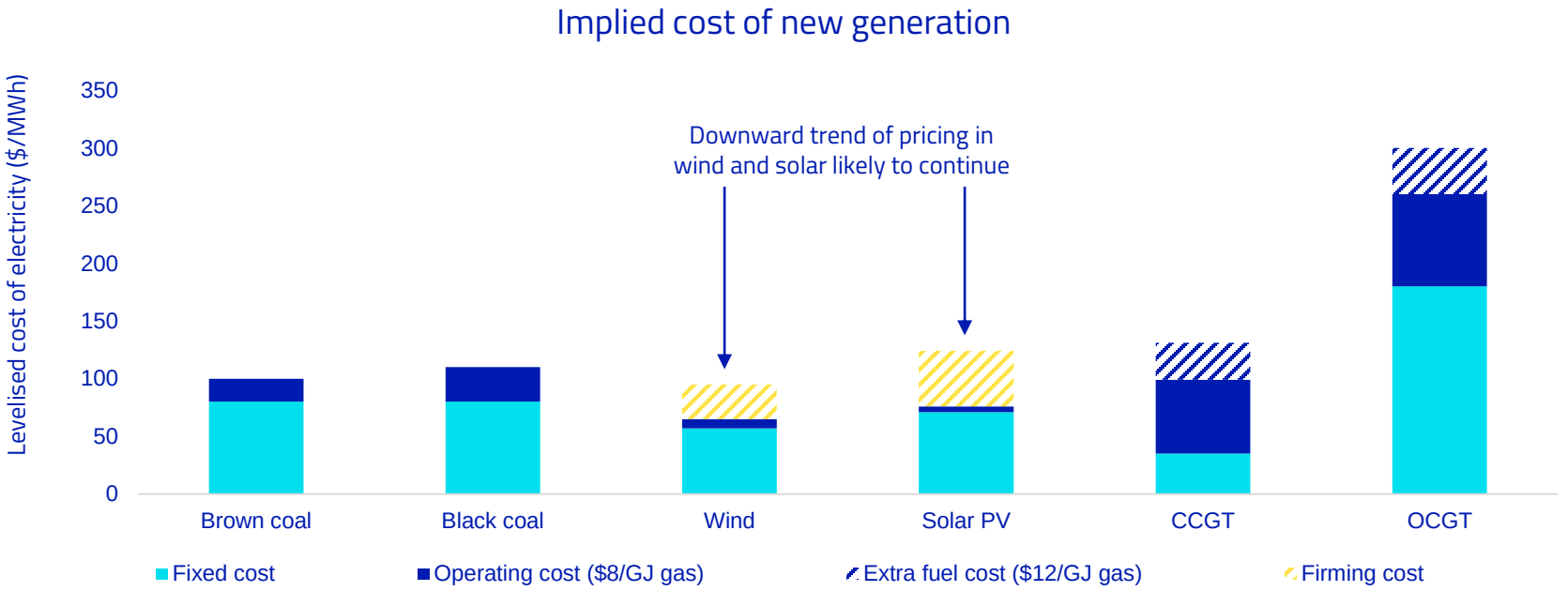
Internationally, only 1% of power stations in operation are older than 50 years



Source: EPRI (2017) – excludes China and Russia

Cost of building and operating power stations

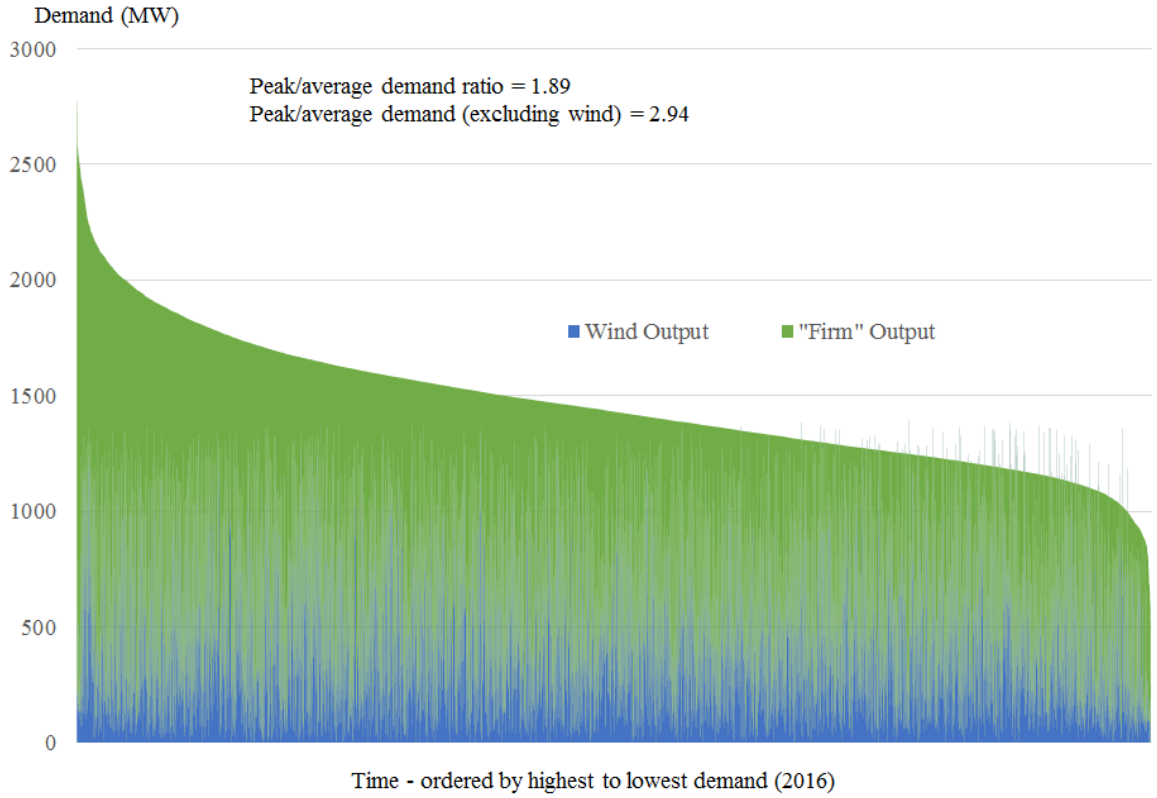
Renewables are increasingly cost-competitive with traditional 'thermal' sources such as coal and gas



Source: AGL estimates; assumes capacity factors of 40% for wind, 25% for solar, 75% for CCGT and 10% for OCGT; heat rates of 8 for CCGT and 10 for OCGT.

Renewables have the lowest cost of 'energy'

But being 'variable' in nature requires investment in 'lower capacity factor' capital stock (e.g. hydro, OCGT)



Source: Nelson et al (2017)

Dispatchable and flexible

Not all dispatchable plant is also flexible

1. Renewable energy provides the lowest *long-run marginal cost* of 'energy'
2. But as renewables begin production, they require complementary firm 'capacity'
3. In the short-term, existing coal-fired units can provide some 'flex'
4. But while dispatchable, coal is not as 'flexible' as gas or hydro
5. In the medium-term, an 'optimal plant mix' is likely to transition to gas-fired peaking units and demand response
6. Gas-fired peaking units provide 'capacity' but not significant volumes of 'energy'
7. In the long-term, renewable energy is likely to be complemented by pumped hydro and battery storage to allow energy to be consumed at times when it is needed

Policy recommendations

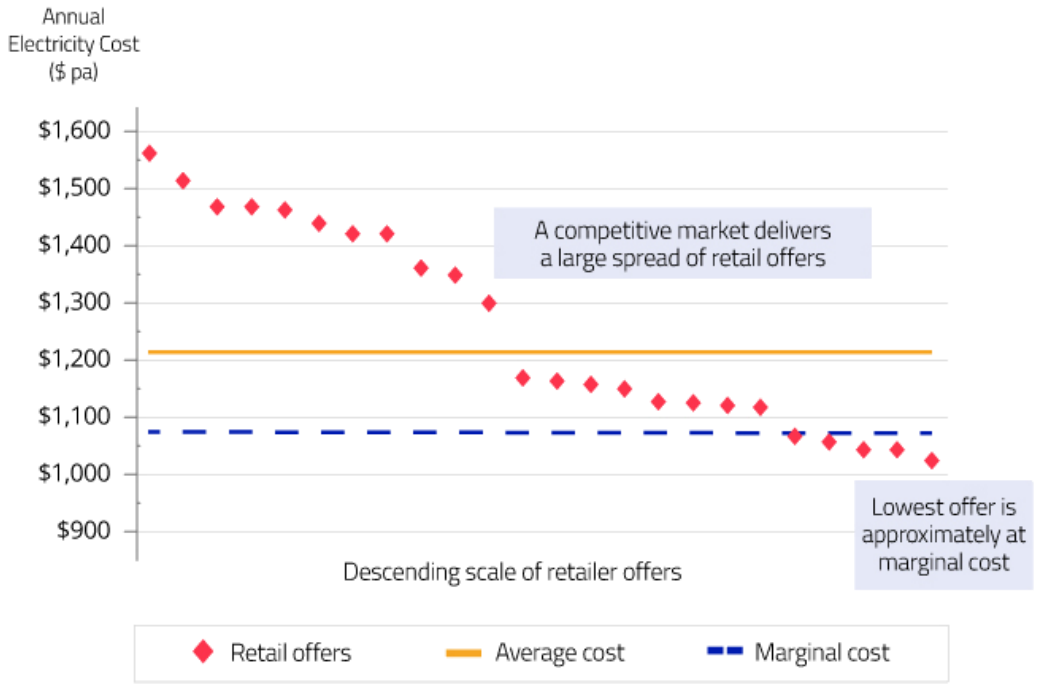
Assuming climate change policy drives investment, what else is required to achieve wholesale market policy objectives?

Criteria	Achieved by current NEM 'energy-only' market	Policy recommendation
Efficient dispatch	Yes	None
New investment	No	Ensure climate policy incentivises complementary 'firm' capacity
Security and reliability	No	Establish supplementary markets (e.g. inertia, reserve generator)
Real political economy of pricing	No	Rule-based mechanism for ensuring advanced knowledge of impending generator closure

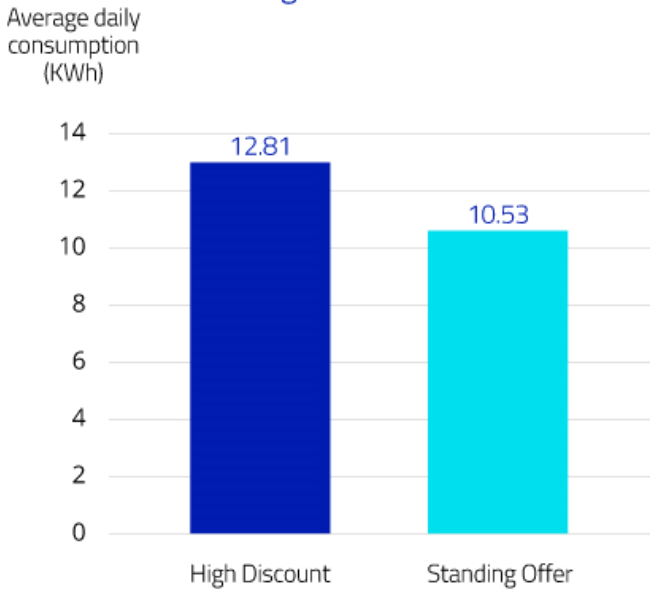
The importance of retail competition

Retail competition is providing significant benefits to consumers who engage in the market

Retail offers in the Victorian electricity market



High usage customers are accessing high discounts



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