

# Future of generation – case study of NSW

Tim Nelson, Chief Economist, AGL Energy

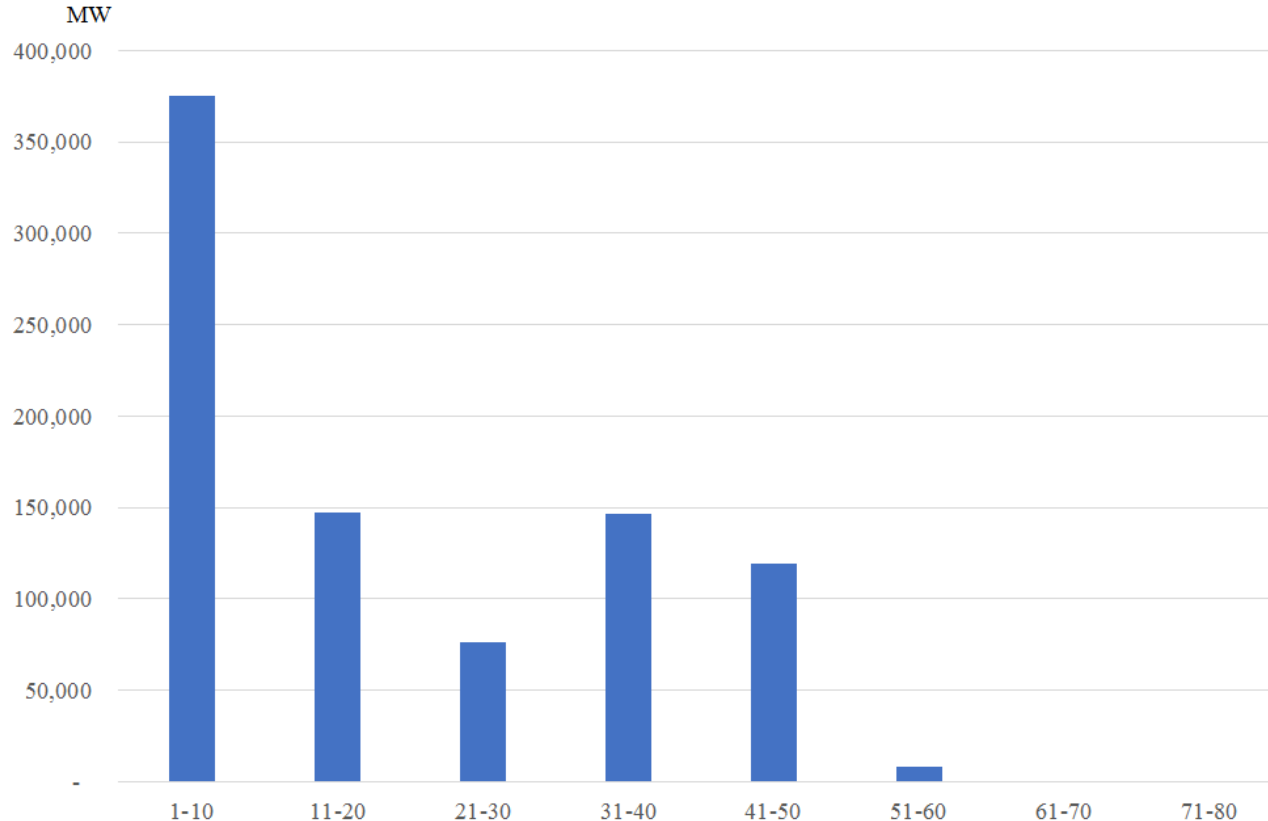


# Background



# Not many power stations operate beyond 50<sup>th</sup> year

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



Source: EPRI (2017) –  
excludes China and Russia

# Exit and entry – Australia and the US

Australian exit has exceeded entry of 'firm' dispatchable capacity since 2013



Year of Exit/Entry	Coal Retirements		Gas Plant Entry			Renewables Entry	
	No. of plant	Capacity (MW)	No. of plant	Total (MW)	CCGT (MW)	No. of plant	Capacity (MW)
2005-2012	2	740	31	8,674	2,546	112	2,640
2013+	9	4,656	4	218	52	49	2,422
<b>Total</b>	<b>11</b>	<b>5,396</b>	<b>35</b>	<b>8,892</b>	<b>2,598</b>	<b>161</b>	<b>5,062</b>
<b>Av. Age</b>		<b>42 years</b>					

**Coal-fired generation closure – 18% of fleet**

Source: Simshauser (2017)

CGT column is a subset of the total gas capacity column.

# Exit and entry – Australia and the US

US entry has significantly exceeded exit – largely a function of low cost gas



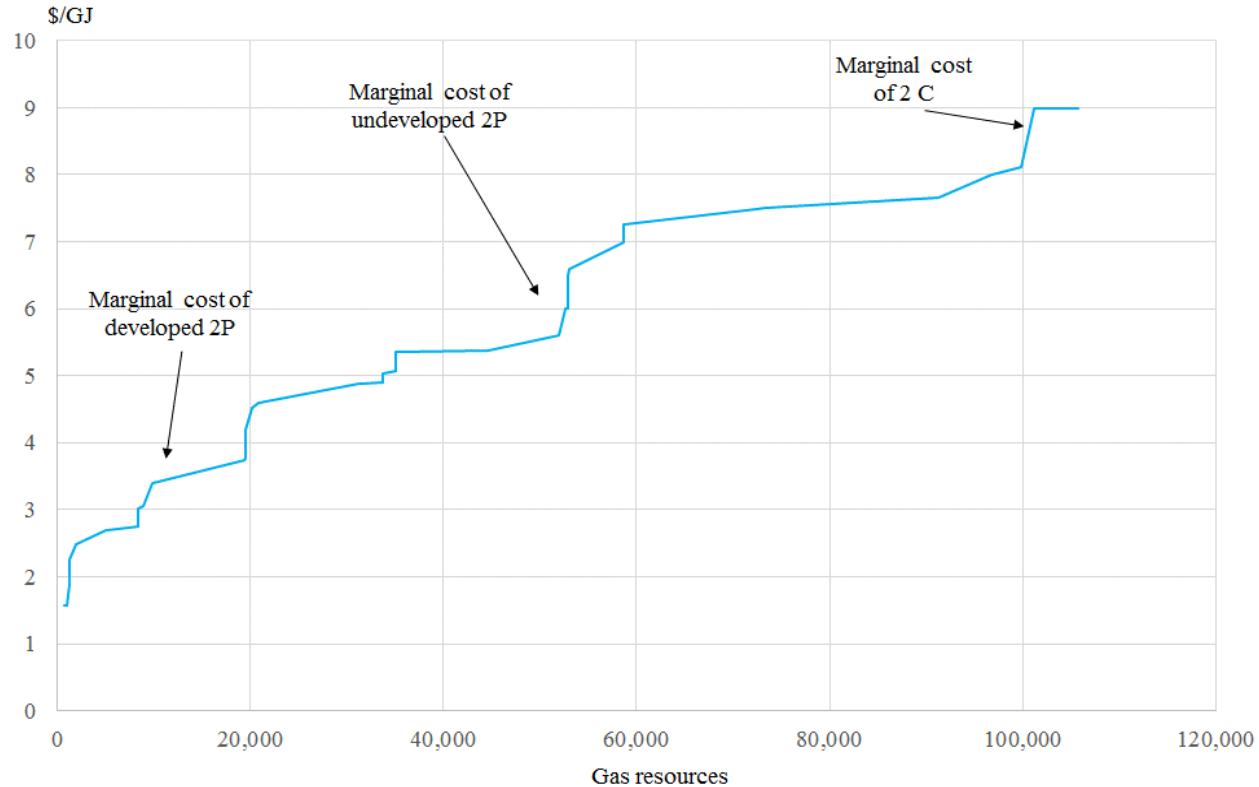
Year of Exit/Entry	Coal Retirements		Gas Plant Entry			Renewables Entry	
	No. of plant	Capacity (MW)	No. of plant	Capacity (MW)	CCGT (MW)	No. of plant	Capacity (MW)
2005-2012	245	11,257	648	81,775	72,925	1,500	57,449
2013+	384	50,367	241	36,183	14,490	2,042	44,998
Total	629	61,624	889	117,958	87,416	3,542	102,447
Av. Age		52 years					
Coal-fired generation closure – 18% of fleet							

Source: Simshauser (2017)

ⓘ CCGT column is a subset of the total gas capacity column.

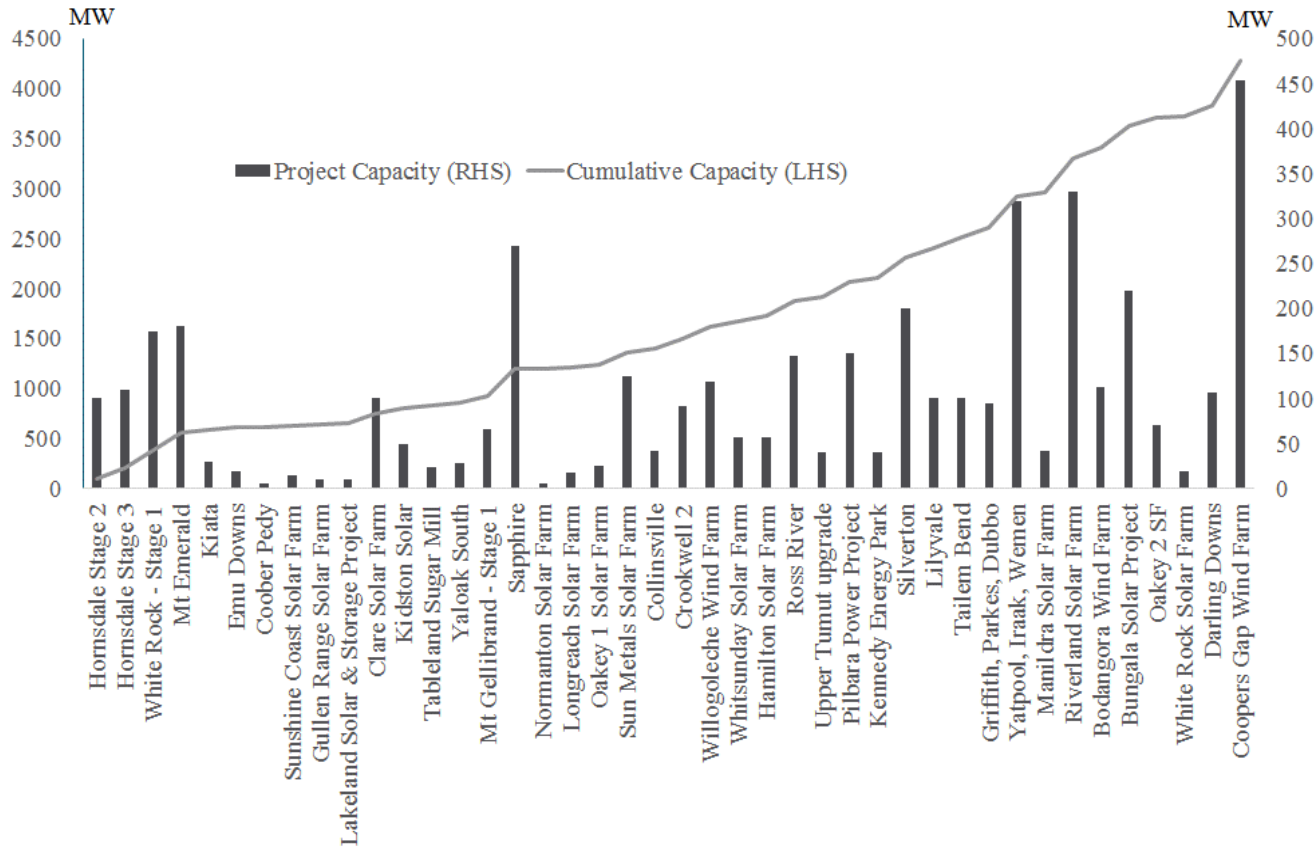
# Issues in Australia

Policy uncertainty in relation to climate change objectives and issues related to gas supply



# But new supply is on the way.....

Around 4.5 GW of new renewables and some low capacity factor gas is being built



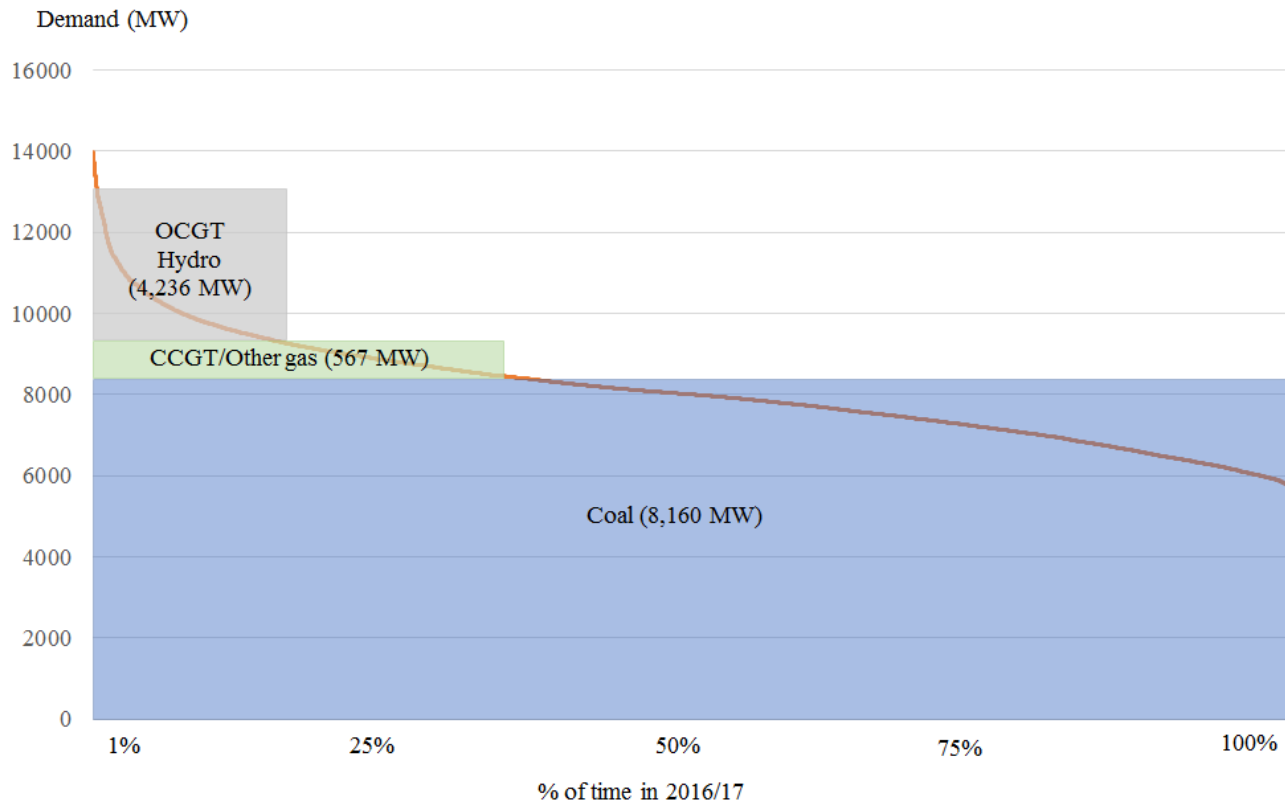
# Quick overview of NSW market





# Existing 'firm' supply to meet demand

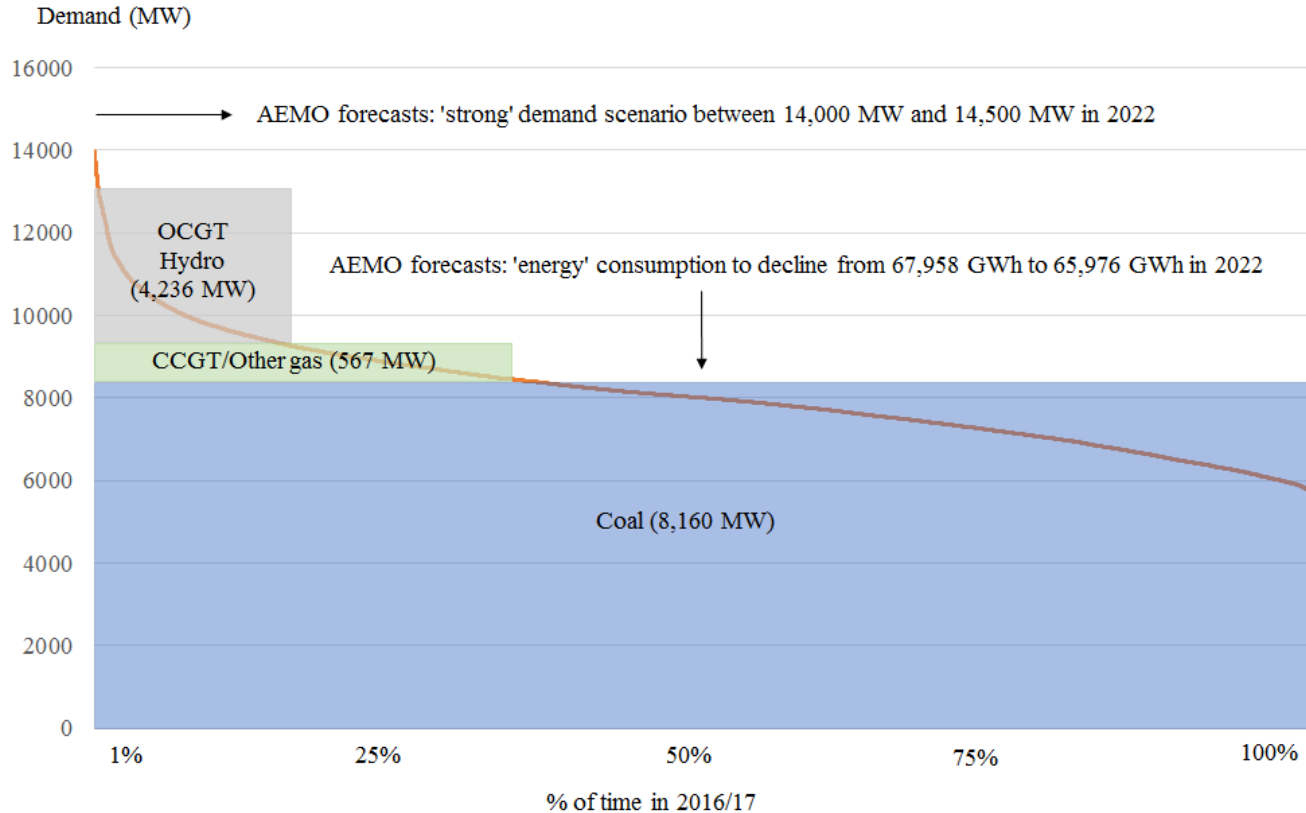
Without Liddell, existing 'baseload' and 'intermediate' plant is adequate but more peaking plant is required



Source: AEMO

# Existing 'firm' supply to meet demand

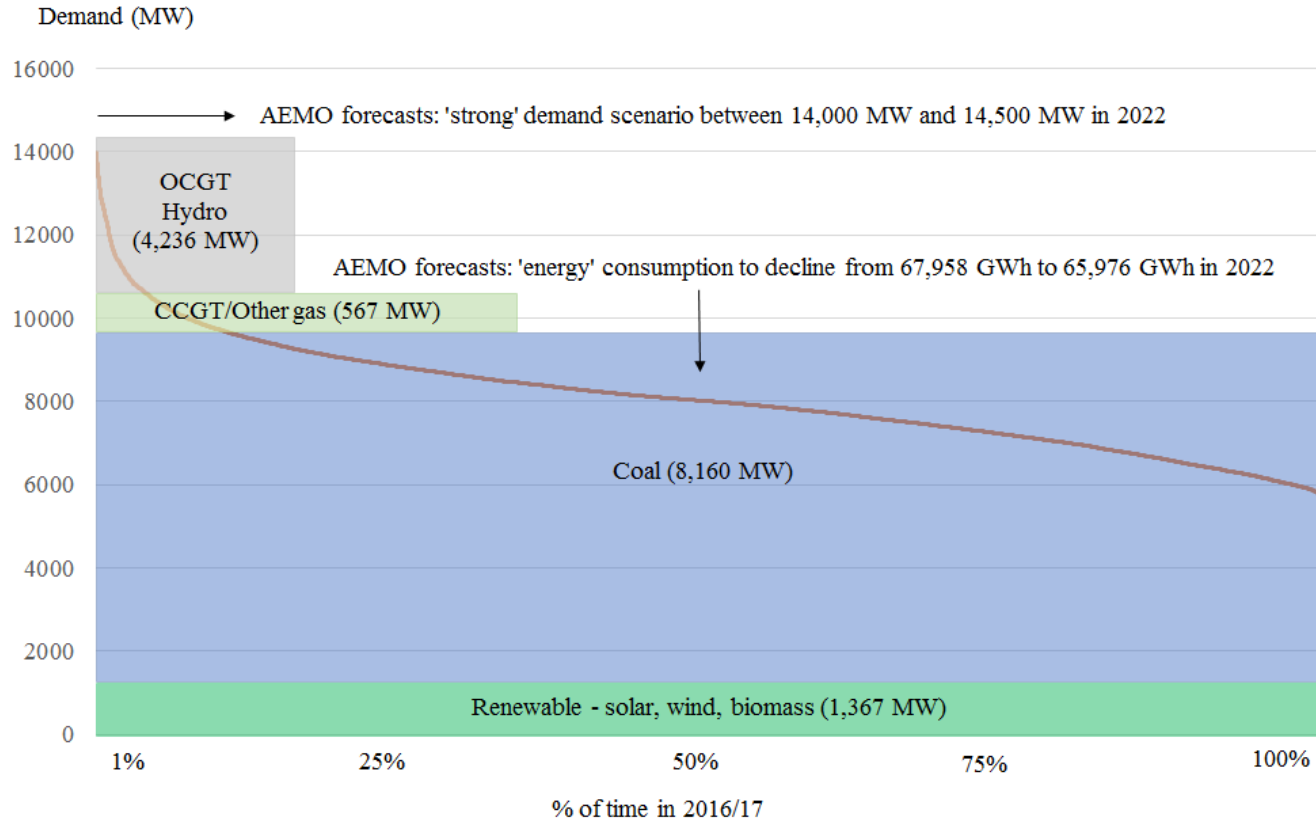
With peak demand growth and underlying consumption declining, still mainly a requirement for 'peaking' capacity



Source: AEMO

# And then there is renewable energy

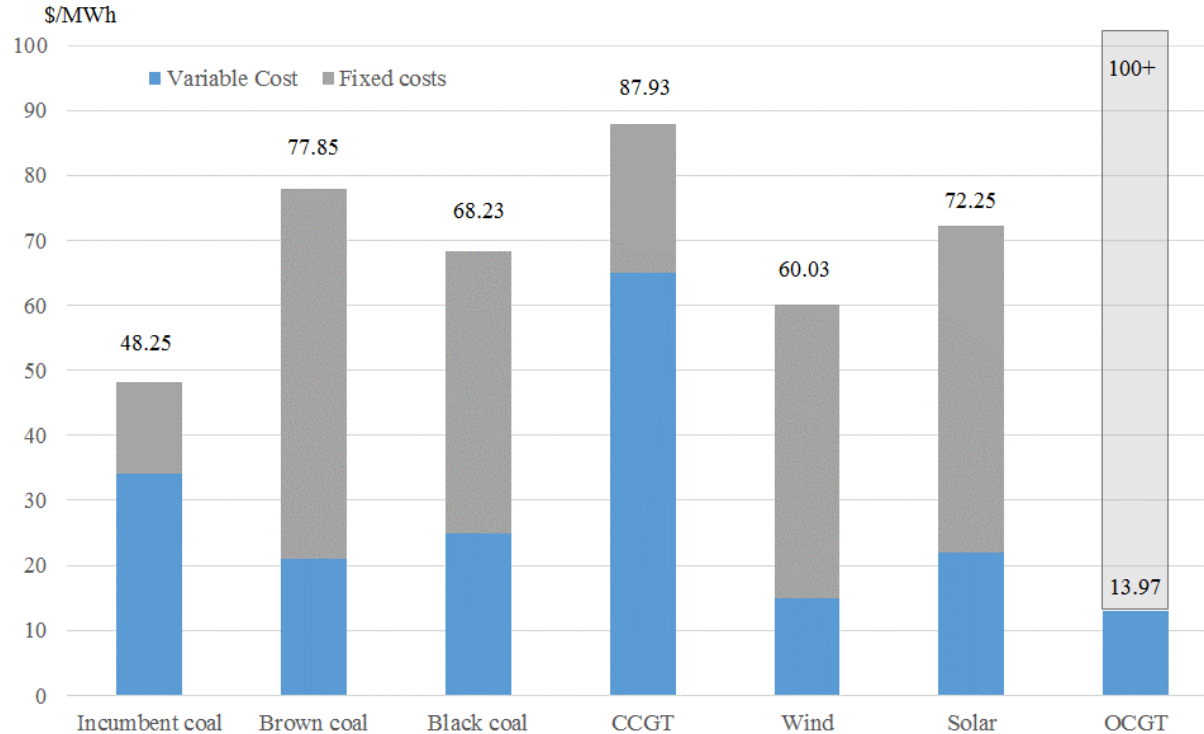
Renewable energy is not 'firm' but still provides energy (in a market with declining *energy* consumption)



Source: AEMO

# Cost of building and operating power stations

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



Source: Simshauser (2017)

# Optimal plant mix results

Given *energy* consumption forecast to decline and new renewables providing more energy, peaking capacity required



Category	Optimal	Actual (2022)	Imbalance	Weighting
Baseload	7,295	8,160	865	overweight
Intermediate	1,669	567	-1,102	underweight
Peaking	5,022	4,236	-786	underweight
	13,986	12,963	-1,023	

This assumes no new investment apart from plant under construction. It also assumes Liddell power station is closed.

So what can we  
conclude?



# Some observations....

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

# Contact

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Tim Nelson  
Chief Economist  
[tanelson@agl.com.au](mailto:tanelson@agl.com.au)  
[@tanelsonaus](https://twitter.com/tanelsonaus)



[agl.com.au](http://agl.com.au)



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