

A future of storable renewable energy

Brett Redman, CFO, AGL Energy Limited



Shaping a sustainable energy future for Australia

AGL's new brand campaign makes our position clear



Two strategic imperatives drive AGL's agenda

Supported by three key objectives



Strategic imperatives driving our agenda



Prosper in a carbon constrained future



Build customer advocacy

Key objectives for strategy and decision-making



From: mass retailing
To: personalised retailing



From: operator of large assets
To: orchestrator of large and small assets



From: high emissions technology
To: lower emissions technology

Strategic framework to enable delivery

Embrace transformation

Drive productivity

Unlock growth

Electricity is headed for a low carbon future

Current Australian market conditions and foreseeable technology suggest the following potential scenario



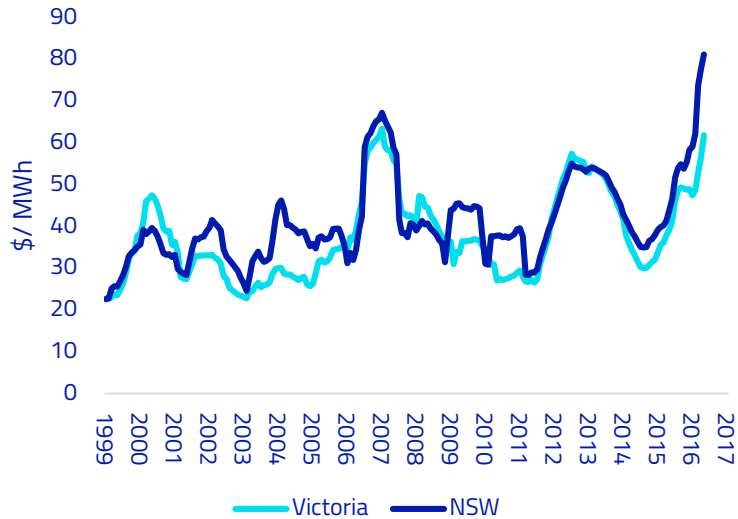
1. Growth in renewables long-term depends upon growth in storage
Initial need to firm capacity eventually overtaken by larger need to time shift energy
2. Transition will be from big coal to big renewables, skipping big baseload gas
3. Rooftop solar is limited by area so grid-scale solutions are required
4. Big renewables plus big storage will dominate our energy landscape
5. New market rules needed once electricity is storable

Structural drivers of electricity price

How did we arrive at today's wholesale market?

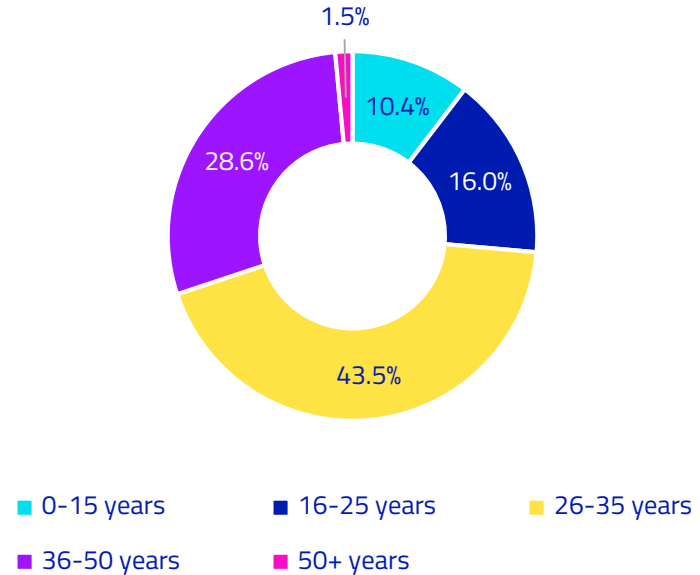


Rolling 12-month average electricity price since NEM formation



Source: AEMO

NEM thermal generation fleet by age



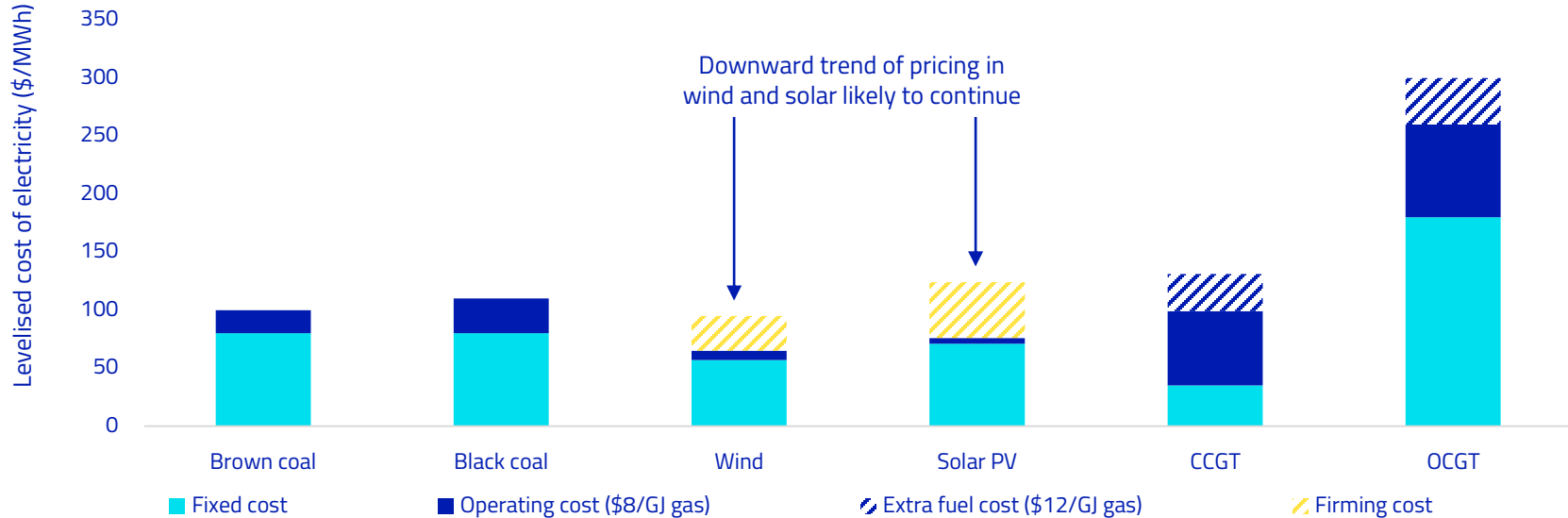
Source: University of Melbourne, 2014

Cost of new development favours renewables

A major program of new build baseload thermal development in Australia is unlikely



Implied cost of new generation



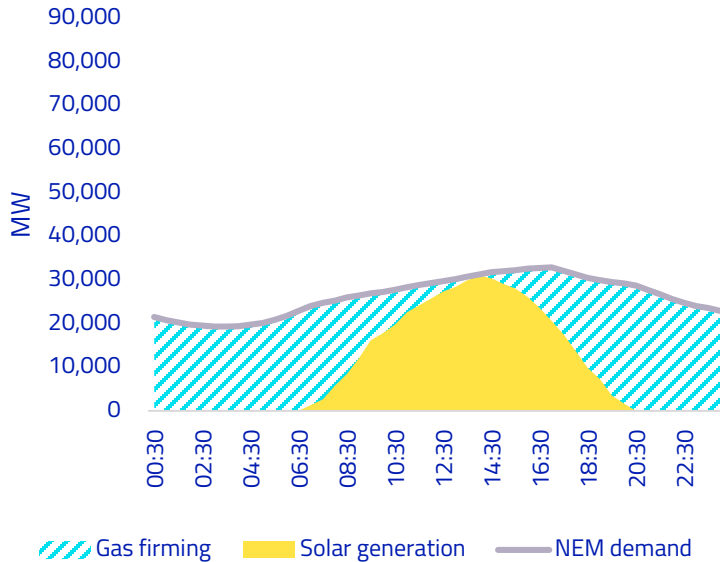
Source: AGL estimates; assumes capacity factors of 40% for wind, 25% for solar, 75% for CCGT and 10% for OCGT; heat rates of 8 for CCGT and 10 for OCGT.

But big growth in renewables depends on storage

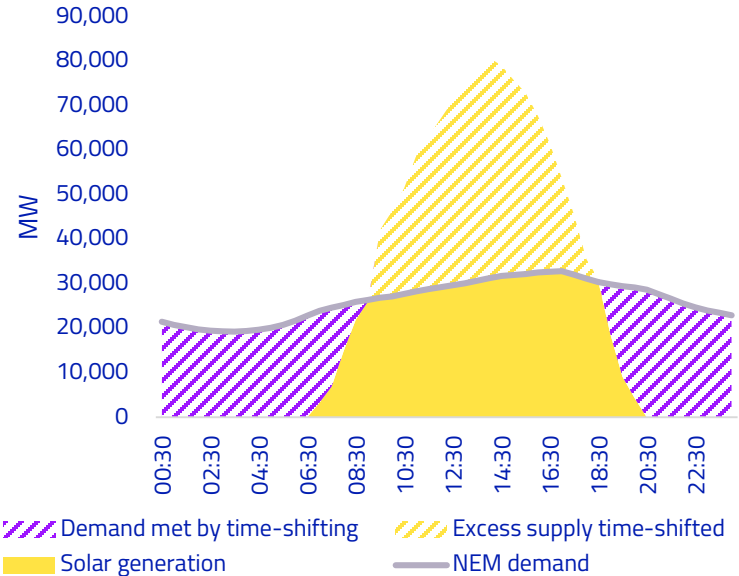
Without storage, renewables capacity will always be limited



Gas firming example



Time-shifted solar example



Source: AGL estimates; AEMO

Potential development need is colossal

~\$250 billion of renewables and storage investment could be required across the NEM



		Today (~15% renewables)	2050 (if 100% renewables)
National Electricity Market demand		170 TWh	200 TWh
Thermal capacity		45 GW	Backup only
Renewables capacity (25% capacity factor)	Rooftop	5 GW	15 GW
	Grid-scale	10 GW	75 GW
Implied load-shift requirement (i.e. implied battery demand): 90 GW x 24 hours x 25% capacity factor x 65% time-shifted			350 GWh battery storage
@ \$2m real per MW construction cost – 75 GW new renewables			~\$150 billion
@ \$300k estimated real per MWh construction cost – new batteries			~\$100 billion

Storable electricity changes everything

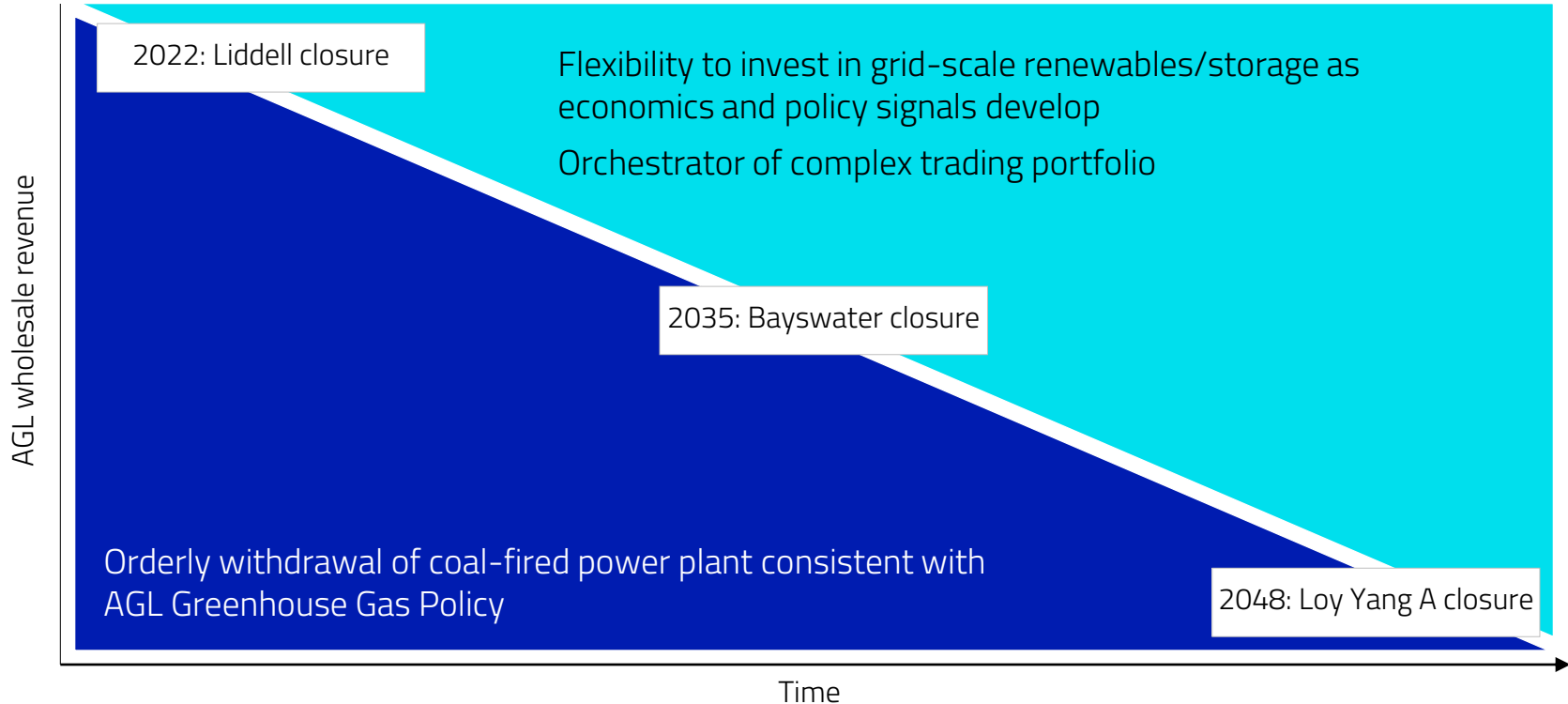
We need to reimagine the fundamentals of the NEM



1	Storage cost is lead indicator	Lower storage cost = more storage = more renewables = less coal Outlook for storage becomes key to predicting long-term change
2	Firm capacity needed	Short term, we need to solve for intermittency and incentivise storage investment
3	Orderly closure will reduce transition cost	Medium term, coal withdrawal must be predictable or transition will be more painful Building new infrastructure needs long-term advance signals
4	Network configuration changes	From few to many sources of generation, networks' role must evolve with new investment likely needed to manage different energy flows
5	Looking ahead, shape reverses	Supply, not demand, will define "peak": more solar means off-peak price will be daytime Load will shift to when renewables are produced, increasing % renewables used without storage Tariff reform, particularly time of use, critical to smoothing physical change

AGL is uniquely placed to lead this transition

AGL wholesale business will lead the shift to renewables and storage



Underlying Profit after tax expected to be in the upper half of \$720-800m guidance range, subject to normal trading conditions

Electricity: impact of rising wholesale prices expected to continue

- Forward curve points to sustained improvement
- Impact phased over time due to competition, customer affordability and timing of contracted positions

Gas: headwinds as previously flagged

- Lower margin on rollover of Queensland wholesale contracts, mild July/August weather and supply issues
- Resulting in \$84m lower first-half gas margin; at least \$100m lower margin FY17 vs. FY16

Discipline around cost and price management to continue

Rising wholesale electricity prices continue to drive-up short term margin calls; impact on FY17 cash flow will reverse in following years

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