Draft 2023-24 GenCost Webinar

31 January 2024

This webinar will be recorded and published online

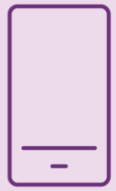
We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.

We pay respect to Elders past and present.

Agenda

- Welcome
- Introduction to GenCost
- Draft 2023-24 GenCost Overview
- Q&A

How to interact today



www.sli.do
#GenCost

- Please ask question using Slido www.sli.do #GenCost
- Upvote the questions you'd like to hear answered
- Written replies may be provided through Slido if appropriate
- Responses will not be provided to unanswered questions

Today's objectives

Provide an overview of the GenCost project.

Present key insights and updates from the *Draft 2023-24 GenCost*, which is now open for consultation.

After the presentation, you will have the opportunity to ask AEMO and CSIRO questions, using Slido.

Read the report and associated material

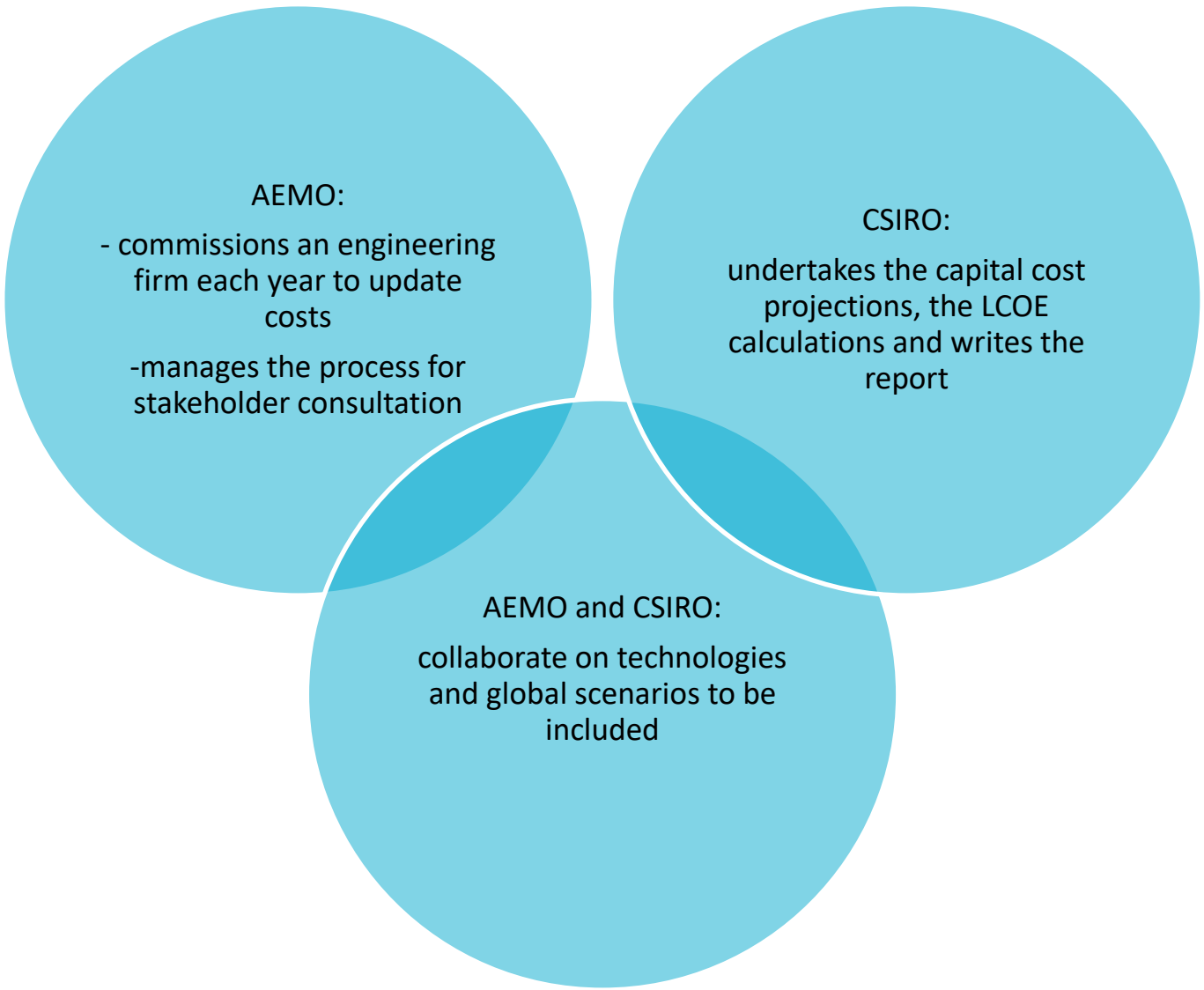
GenCost 2023-24: Consultation draft

31 January 2024

GenCost context – purpose and history

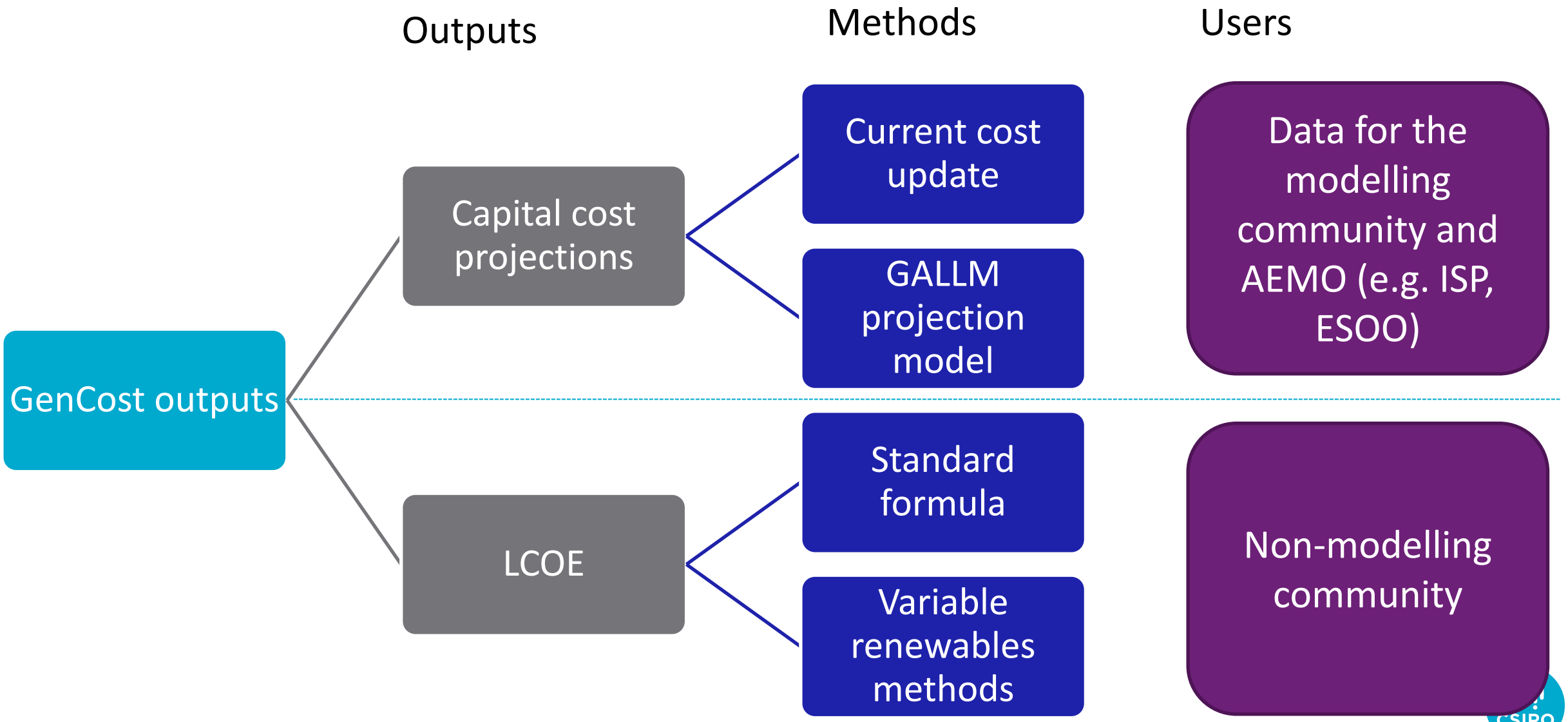
- Delivered since 2018 in partnership with AEMO.
- The purpose is to provide consistent annual update of current and projected electricity generation, storage and hydrogen technology costs.
- The purpose is not to be comprehensive, but rather repeatable, cost effective and targeted at the most important information
  - Appendix C of the report provides information on criteria for technology inclusion

Roles



Stakeholder input on all aspects of the project

GenCost project outputs



Project timeline

Aurecon report and data

Technical parameters and operating costs for new technologies

General Details

Technology	Generation Type	Fuel Type	Construction time (weeks)	Min Stable Generation (% of installed capacity)	Auxiliary load (% of installed capacity)	Auxiliary load for Generators operating in Synchronous Condenser mode (% of installed capacity)
CCGT - With CCS (90%)	Thermal	Natural Gas	78	46.0%	9.2%	
CCGT - With CCS (50%)	Thermal	Natural Gas	78	46.0%	7.3%	
CCGT - Without CCS	Thermal	Natural Gas	78	46.0%	2.5%	
OCGT - Without CCS, Small unit size	Thermal	Natural Gas	65	50.0%	1.7%	
OCGT - Without CCS, Large unit size	Thermal	Natural Gas	58	50.0%	1.1%	
Reciprocating Internal Combustion Engines	Thermal	Natural Gas/Diesel	52	40.0%	1.0%	
Advanced Ultra Supercritical PC - Black coal with CCS (90% capture)	Thermal	Coal	104	30.0%	17.5%	
Advanced Ultra Supercritical PC - Black coal with CCS (50% capture)	Thermal	Coal	104	30.0%	12.5%	
Advanced Ultra Supercritical PC - Black coal without CCS	Thermal	Coal	104	30.0%	4.1%	
Conventional hydro	Renewable		100 - 160	40.0%	1.0%	1.0%
Pumped hydroelectric storage (24 hr)	Storage	N/A	200-400 (total EPC schedule including lead time)	40.0%	1.0%	1.0%
Pumped hydroelectric storage (48 hr)	Storage	N/A	200-400 (total EPC schedule including lead time)	40.0%	1.0%	1.0%
Large Scale Li-ion Battery Storage (1hr)	Storage	N/A	44		0.8%	
Large Scale Li-ion Battery Storage (2hr)	Storage	N/A	52		1.0%	
Large Scale Li ion Battery Storage (4hr)	Storage	N/A	60		1.2%	
Large Scale Li ion Battery Storage (8hr)	Storage	N/A	68		1.8%	
Large Scale Flow Battery Storage (24hr)	Storage	N/A	78		6.0%	
Large Scale Flow Battery Storage (48hr)	Storage	N/A	104		6.0%	
Large Scale Battery Storage (1hr) for hybrid generation	Storage	N/A	44		0.8%	
Large Scale Battery Storage (2hr) for hybrid generation	Storage	N/A	52		1.0%	
Large Scale Battery Storage (4hr) for hybrid generation	Storage	N/A	60		1.2%	
Large Scale Battery Storage (8hr) for hybrid generation	Storage	N/A	68		1.8%	
Large Scale Battery Storage (24hr) for hybrid generation (VRB)	Storage	N/A	78		6.0%	
Large Scale Battery Storage (48hr) for hybrid generation (VRB)	Storage	N/A	104		6.0%	
Residential Battery Storage (2hr)	Storage	N/A			1.0%	

Glossary | Assumptions Summary | WP - New Costs | WP - New Parameters | WP - Capacity Factors | WP - SMR & Liquefaction Plant | WP - Water treatment | WP - Ammonia Facility | Hydrogen storage (geological)

Available at: https://aemo.com.au/consultations/current-and-closed-consultations/2024-forecasting-assumptions-update-consultation

CSIRO

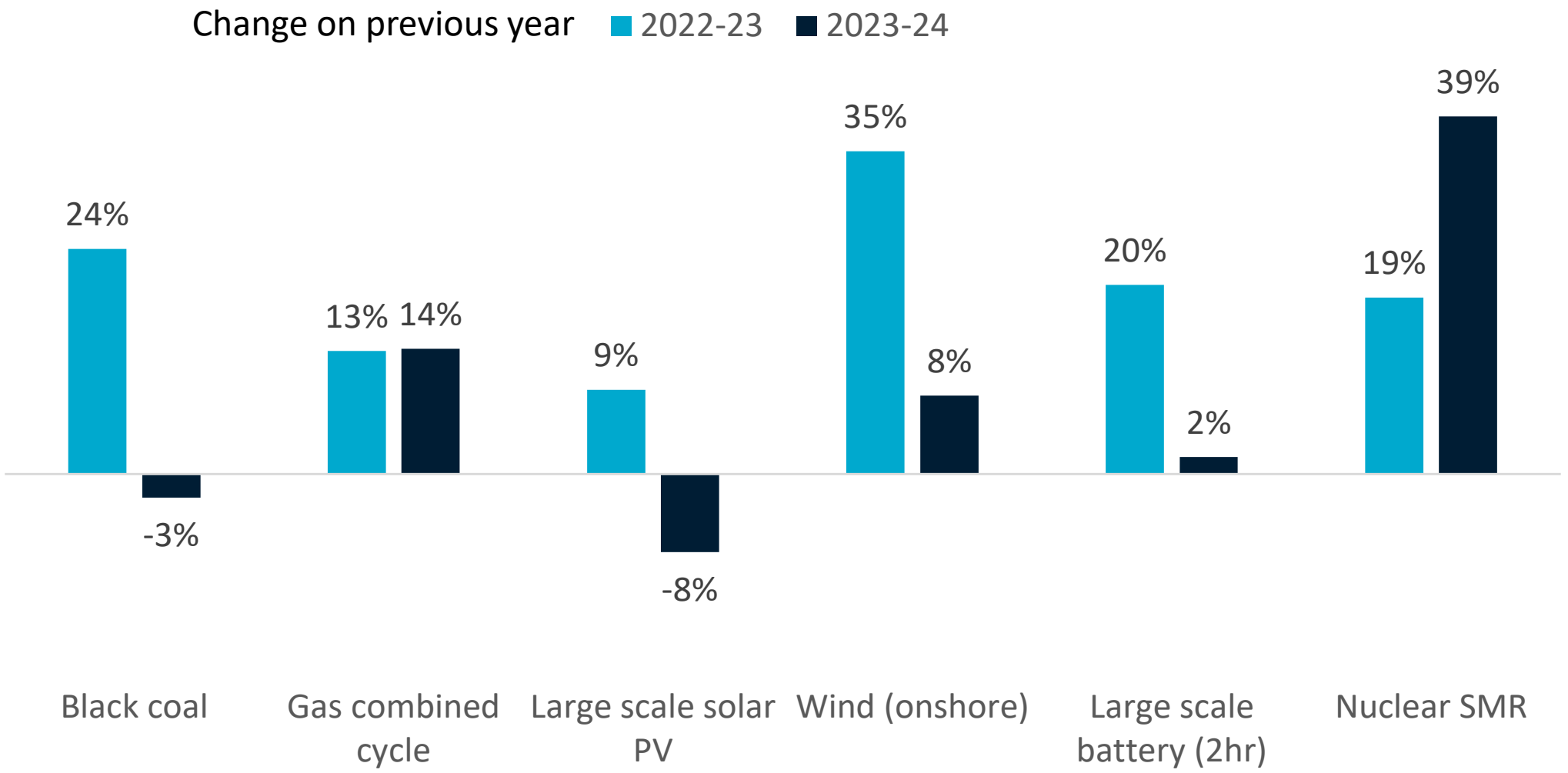
Key changes since GenCost 2022-23: Final report

- Inflation pressures have eased but effects are mixed
- Major increase in nuclear small modular reactor (SMR) capital costs
- Additional LCOE data added in response to feedback on approach to variable renewable integration costs

Current costs

Current cost updates

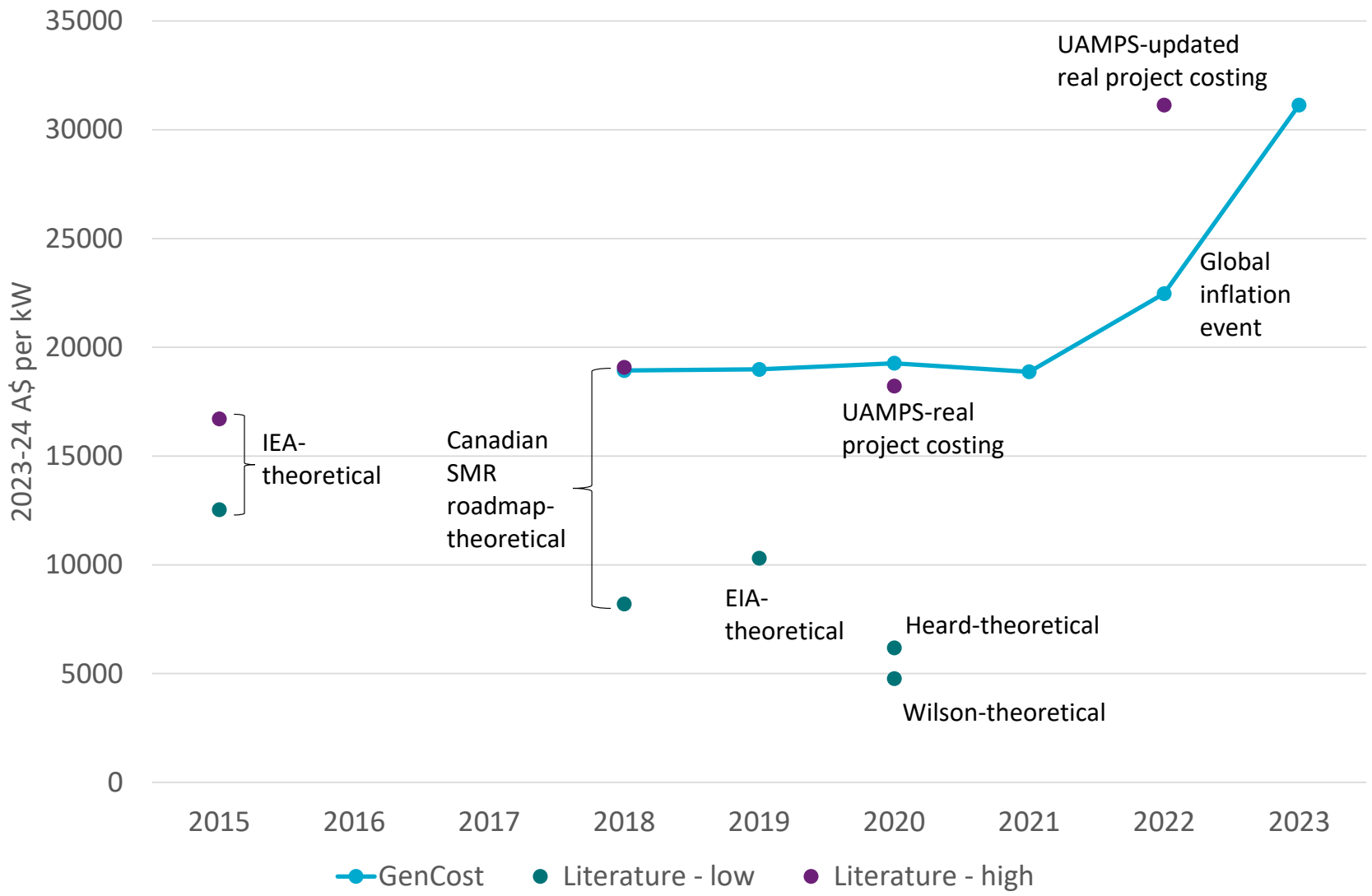
Inflationary pressures on capital costs are easing but pressure remains on gas, wind and nuclear SMR



Nuclear SMR

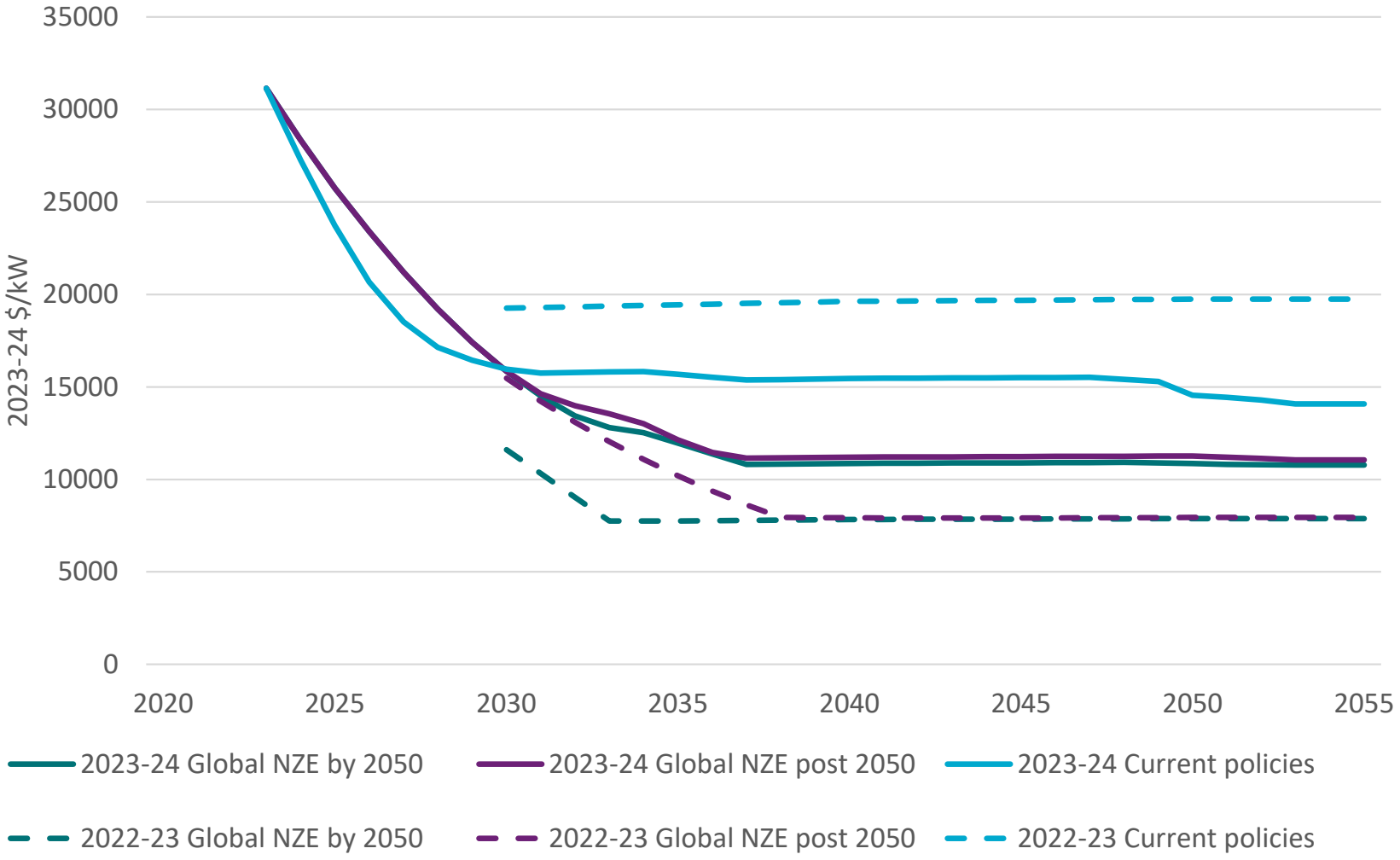
- Nuclear small modular reactors (SMR) capital costs have been contentious.
- UAMP was the developer of a nuclear SMR project called the Carbon Free Power Project (CFPP) with a gross capacity of 462MW, to be fully operational by 2030.
- Project costs were estimated in 2020 to be A$18,200/kW. In late 2022 UAMPS updated their capital cost to A$31,100/kW citing the global inflationary pressures. The project was cancelled in November 2023.
- CFPP was the only SMR project in the US that had received design certification from the Nuclear Regulatory Commission.
- While there have been many vendor estimates provided for SMR. This is the only recent project where there were consequences for a published cost - the developers needed sufficient electricity pre-sold to cover the project costs.

Nuclear SMR – history of estimates



Ask your question at www.Sli.do #GenCost

Nuclear SMR – impact on projections



Like all technologies nuclear SMR gets back to normal by 2027 in *Current policies* and by 2030 in the Global NZE scenarios.

New builds drive costs reductions in the early 2030s in the Global NZE scenarios

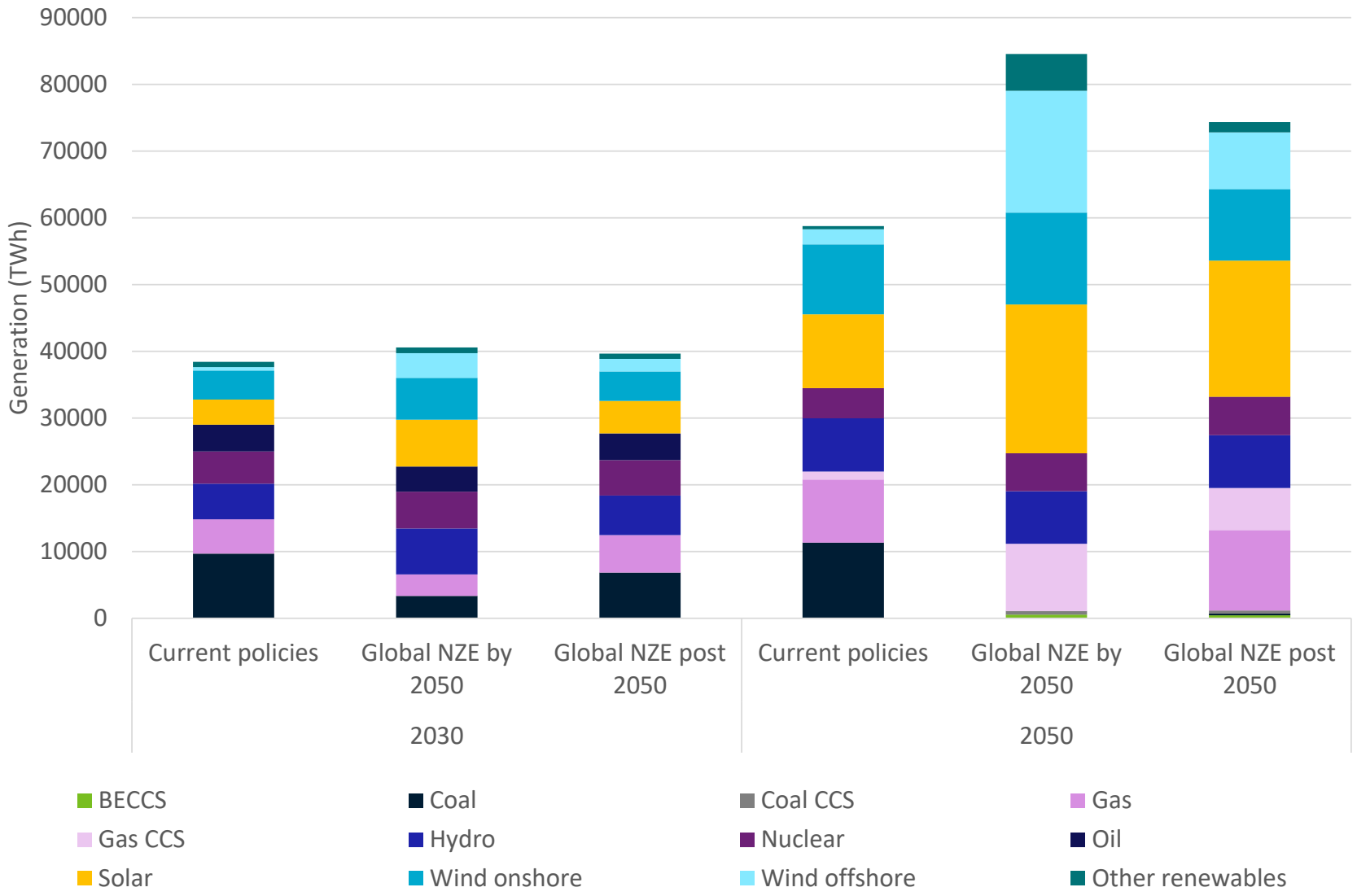
Ask your question at www.Sli.do #GenCost

Capital cost projections

Scenarios

Key drivers	Global NZE by 2050	Global NZE post 2050	Current policies
IEA WEO scenario alignment	Net zero emission by 2050	Announced pledges scenario	Stated policies scenario
Climate policy	Consistent with 1.5^{o}C world	Consistent with 1.7^{o}C world	Consistent with 2.5^{o}C world
Demand / Electrification	High	Medium-high	Medium
Learning rates	Stronger	Normal maturity path	Weaker

Projected global technology mix

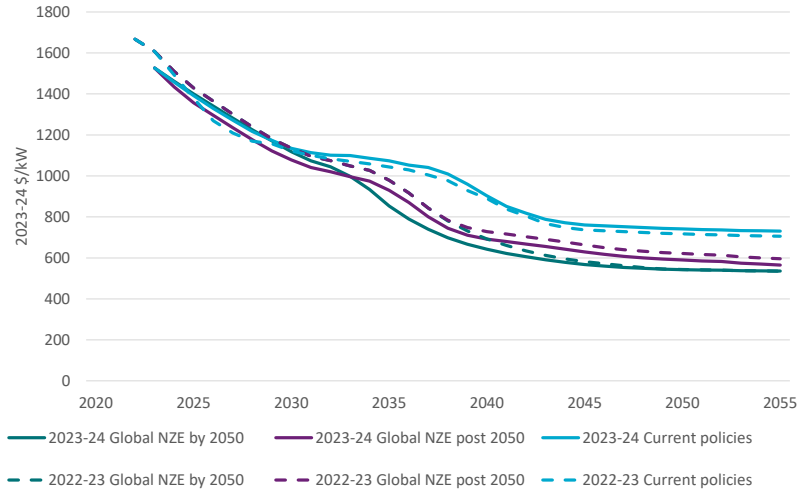


The global technology mix and capital cost reductions are simultaneously projected

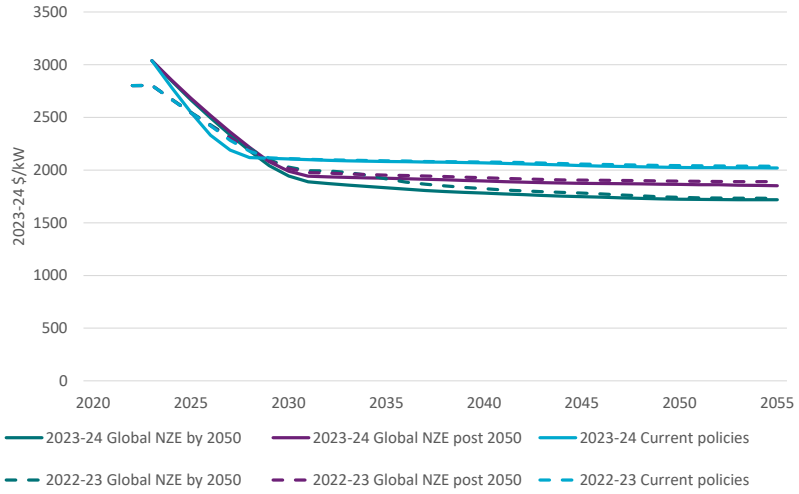
Ask your question at www.Sli.do #GenCost

Highlights

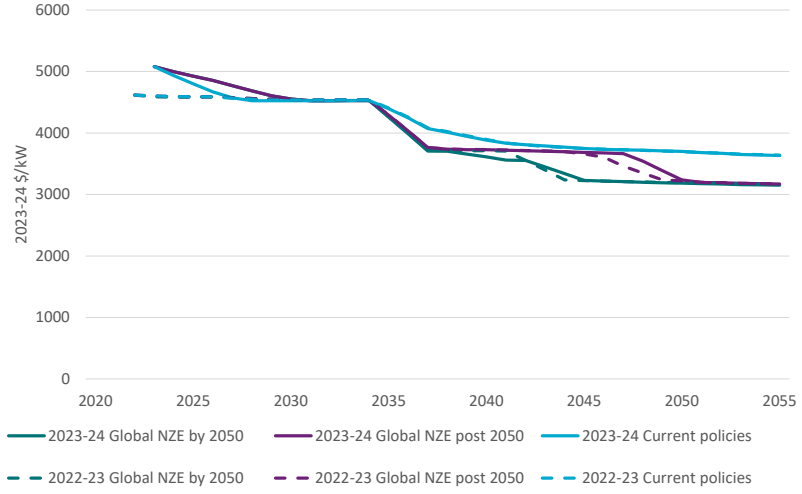
Large-scale solar PV



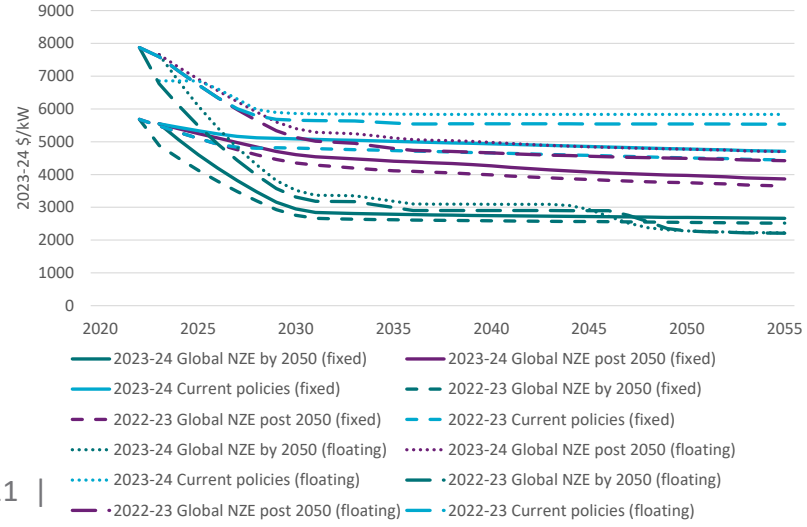
Onshore wind



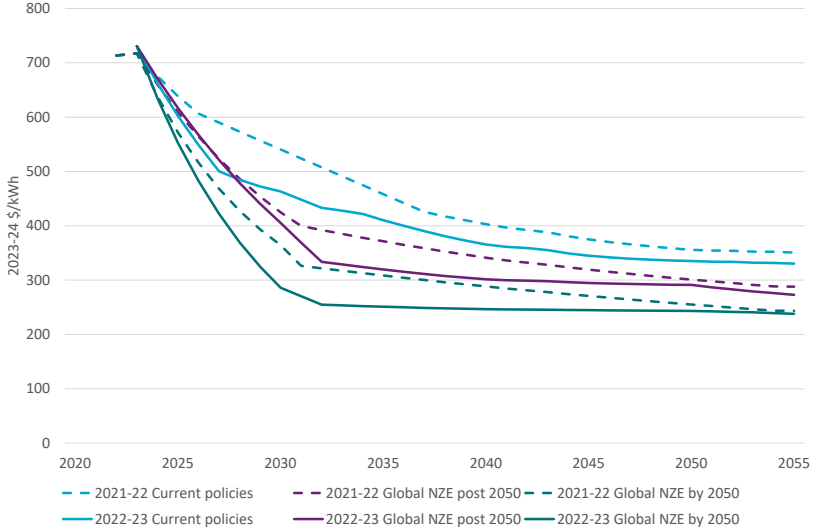
Gas with CCS



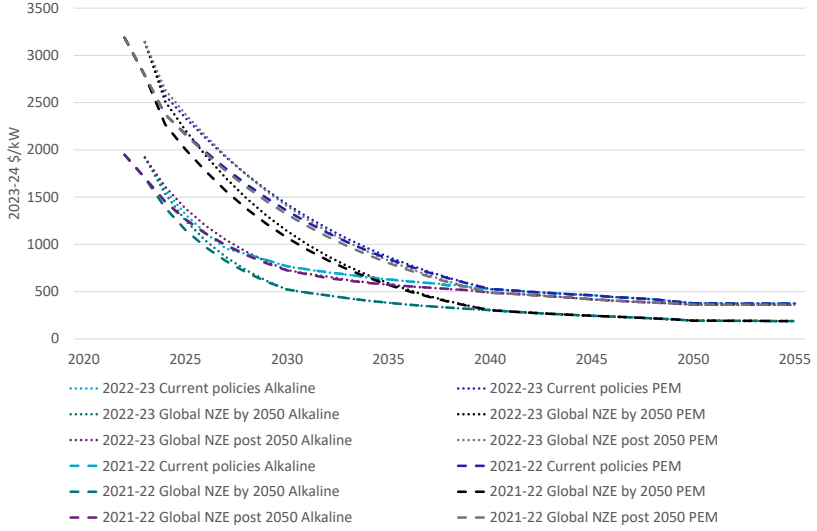
Offshore wind



Batteries (2 hrs)



Hydrogen electrolysers



LCOE

LCOE, variable renewable electricity (VRE) and the existing system

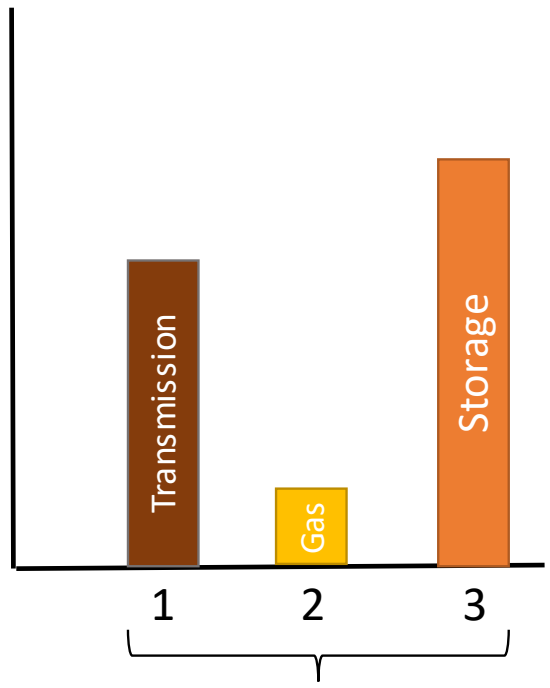
- The LCOE is estimated on a common basis for all technologies.
- All new-build technologies rely on the combined capability of the existing system to some extent to provide reliable power
- However, as the VRE share increases, forcing the retirement of existing flexible capacity, the system will find it increasingly difficult to provide reliable supply without additional investments.

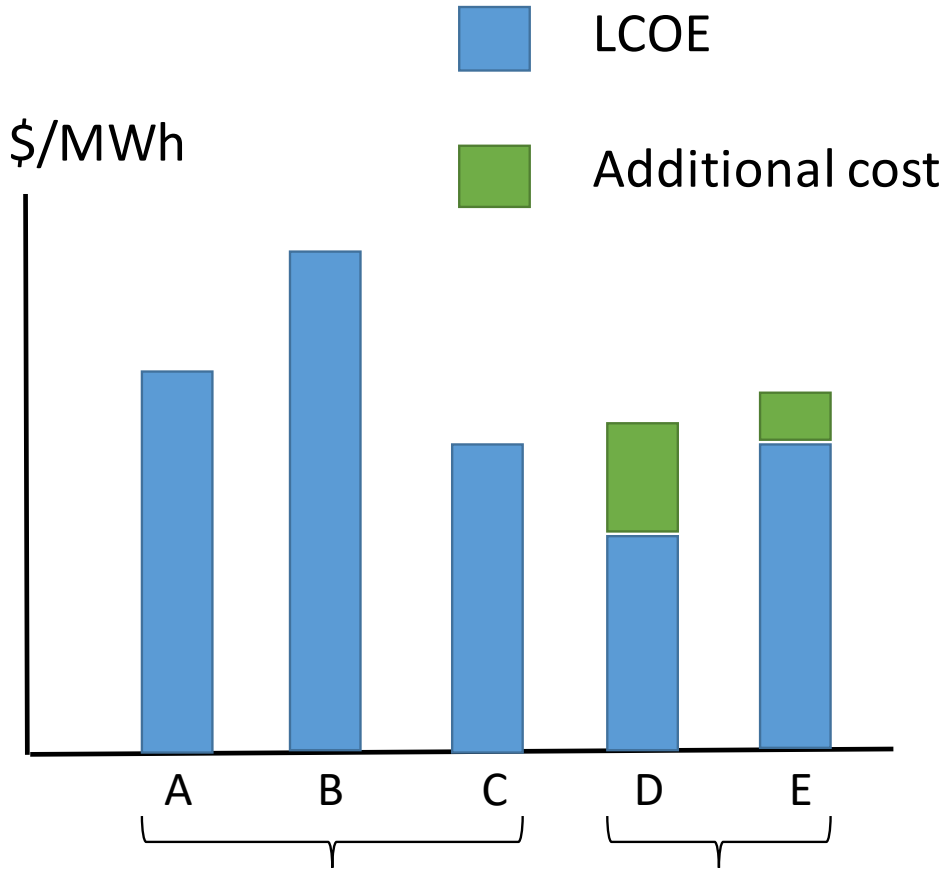
Method for adding VRE integration costs

Context and assumptions

New method/tool

Find least cost amount of additional investment relative to a BAU

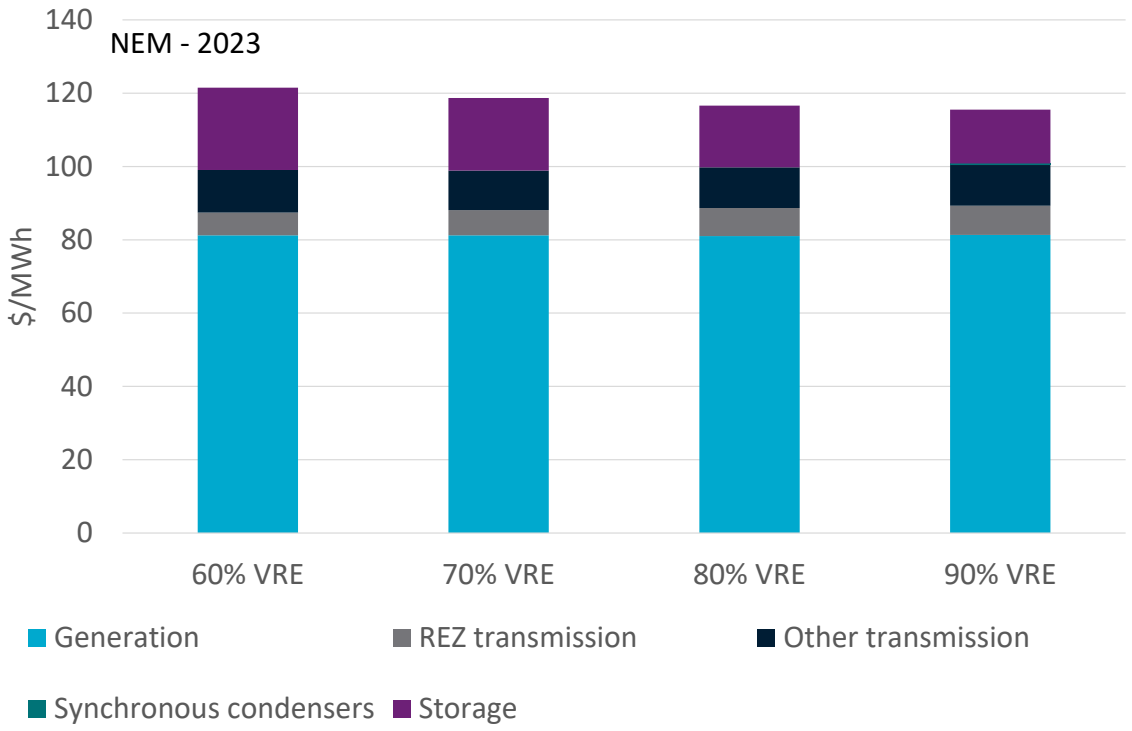


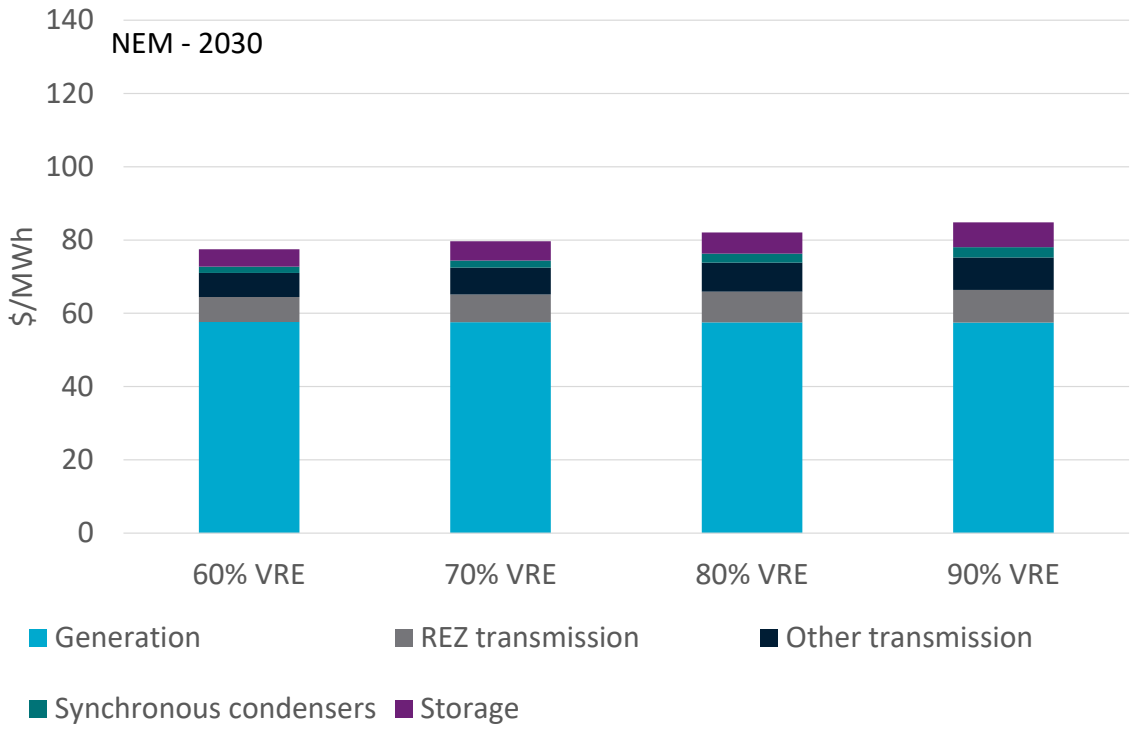


Addressing feedback

- Our 2030 estimates of the variable renewable integration costs took the existing system capacity in 2030 at no cost and calculated any additional costs
- While technically correct, some stakeholders interpreted this approach as hiding the cost of creating the existing system in 2030.
    - They were particularly concerned with the cost of storage and transmission projects committed or under construction pre-2030
    - They also dislike use of consumer energy resources (CER) as storage with no cost added
- To address the issue:
    - We calculate variable renewable integration costs in 2023
    - The 2023 LCOE must include the cost of the pre-2030 committed and under construction storage and transmission projects (unless they have become operational). Storage from CER in 2023 is negligible.

Results for 2023 and 2030

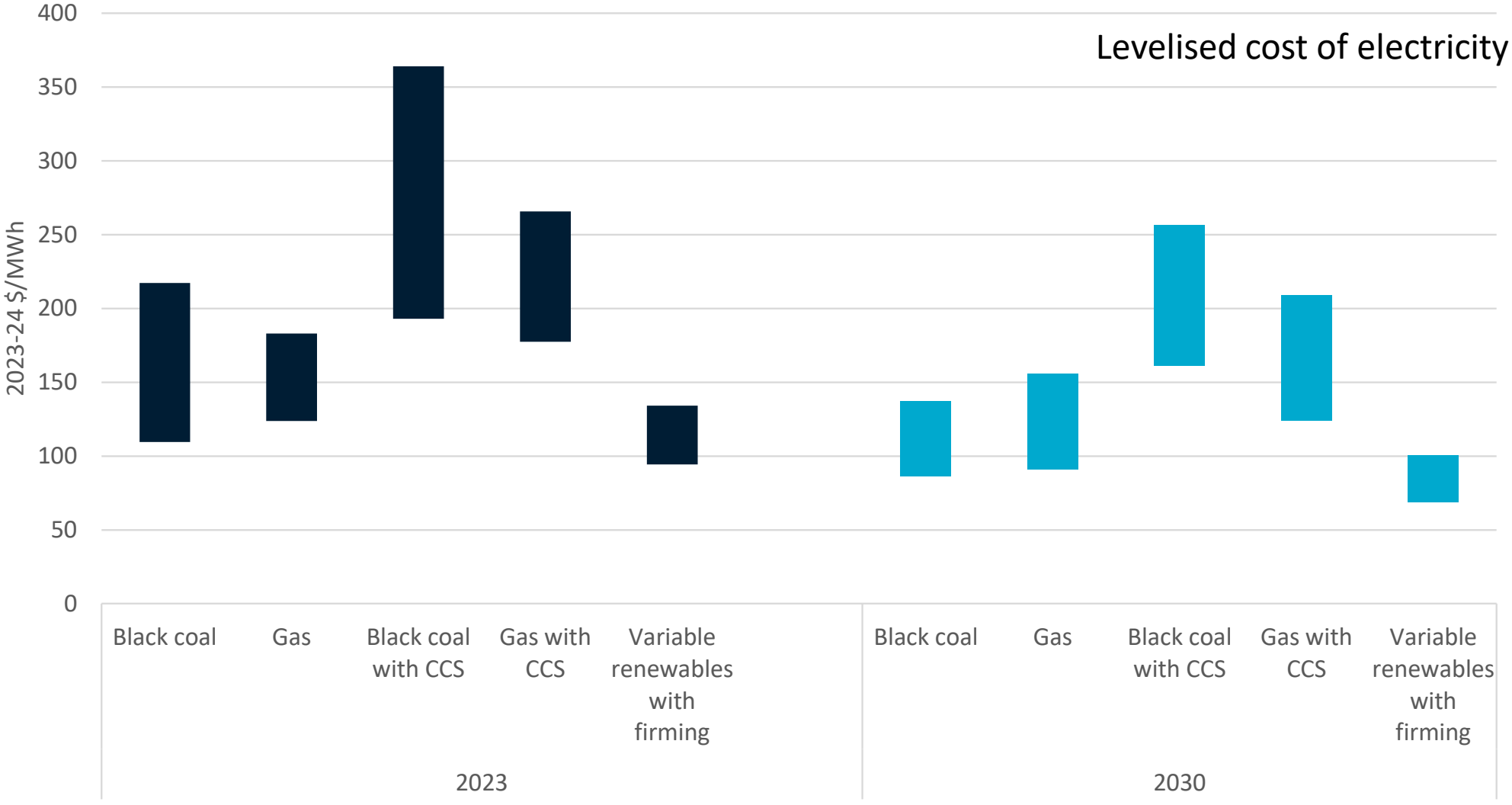




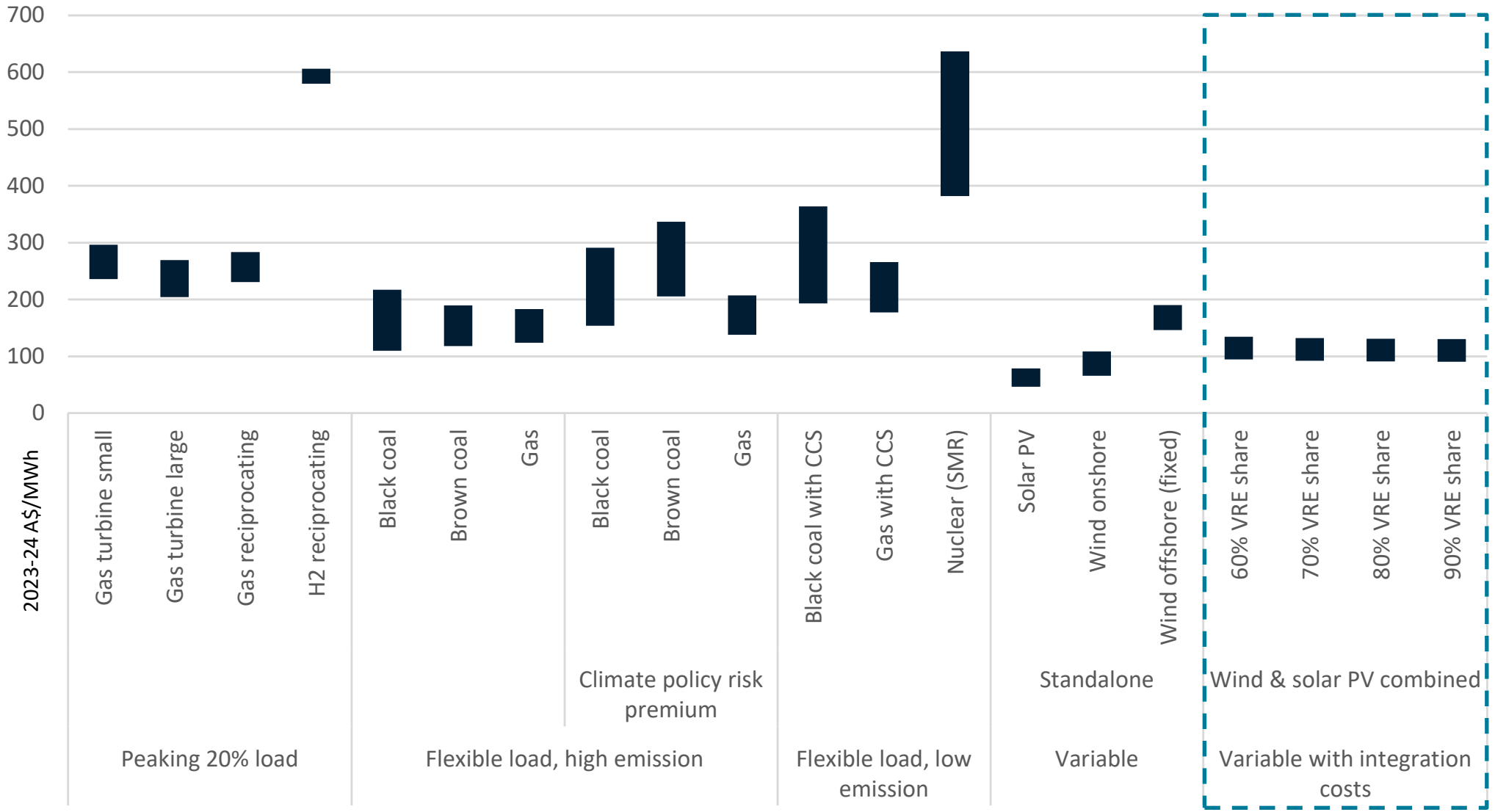
- Costs decrease in 2023 with higher VRE share as it has more generation to spread per MWh costs
- Half to three quarters (depending on the VRE share) of the higher costs in 2023 are due to investors having to pay 2023, instead of 2030, technology prices.
- The remainder is due to the cost of the pre-2030 committed projects which must be paid for in the 2023 analysis, but are considered existing capacity at no cost in 2030.

Comparison results for 2023 and 2030

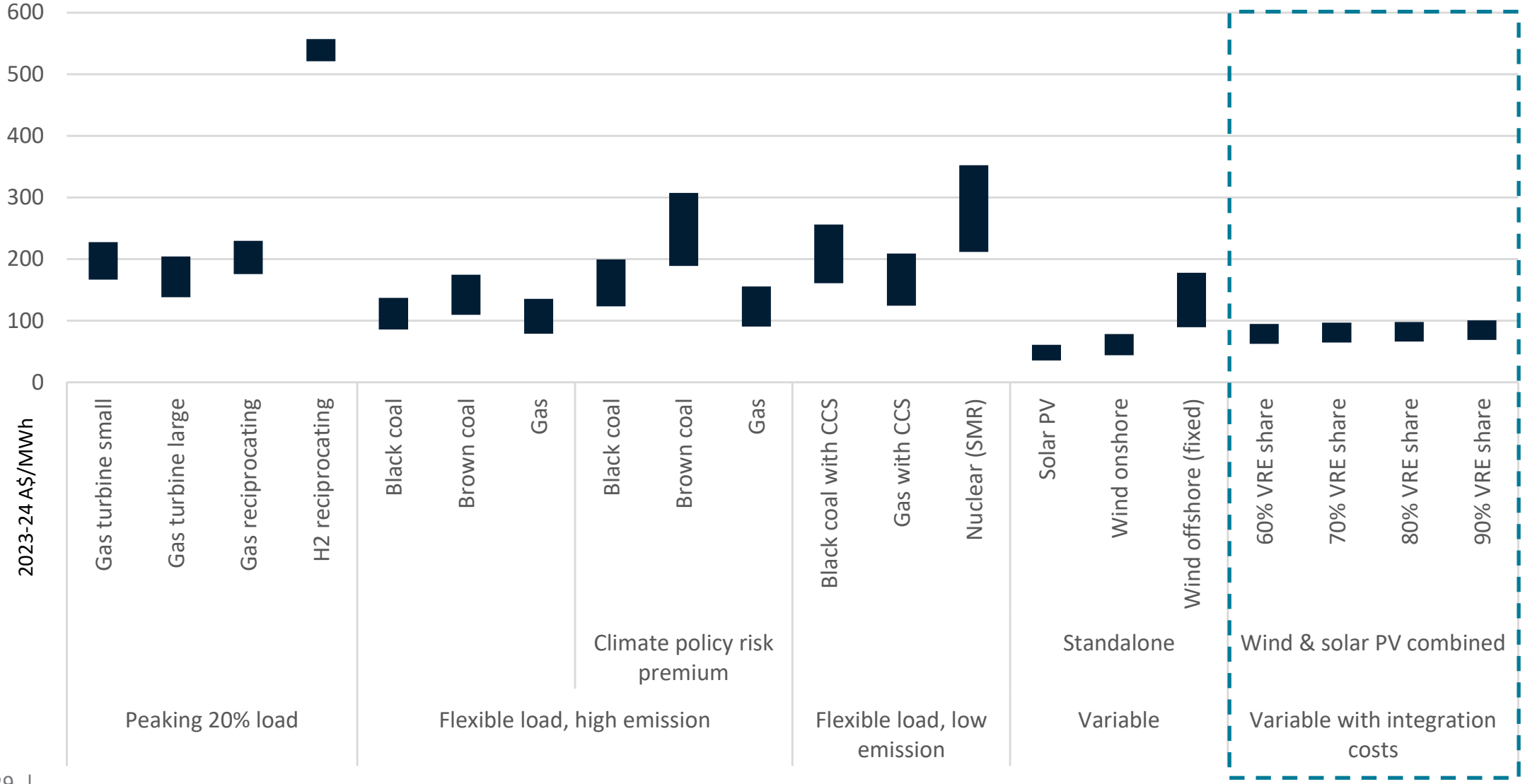
Variable renewables have the lowest cost range in either year



Extended comparison results for 2023



Extended comparison results for 2030



Questions and discussion

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Next steps

Share your feedback at https://forms.office.com/r/mmHpRhEq5T

The recording and presentation will be published on the 2023-24 GenCost page

2024 Forecasting Assumptions Update consultation submissions close 9 February 2024

For more information visit

aemo.com.au