2021-22 Forecasting and Planning IASR - Scenarios Webinar

AEMO Planning and Forecasting

#AEMO2020

We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.
We pay our respects to their Elders past, present and emerging.

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Objectives of this webinar

To inform internal stakeholders of the ongoing IASR process developments

To update on the current scenario narratives that have been designed in conjunction with external stakeholders

To gather your views and feedback on the process and scenarios

Before we begin…

Sli.do

Please access this event in Sli.do with #AEMO2020

Audience Q&A tab: Use this to ask/upvote any questions throughout this session

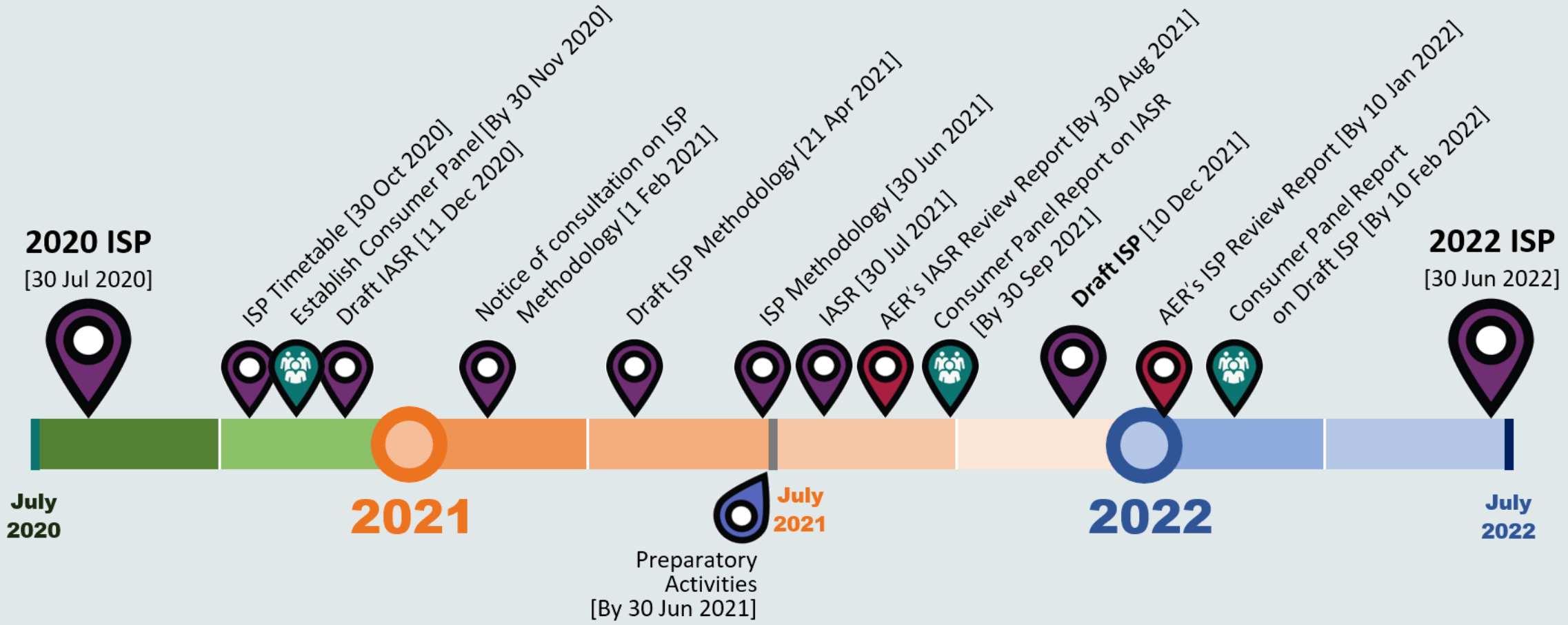
Ideas tab: Use this to provide us with any feedback/comments/suggestions for us to consider after the webinar – these won't be addressed verbally in the session.

Live polls tab: At the end of the presentation, we will launch a number of polls to gather your views on a range of aspects of the scenarios

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

The Input, Assumptions and Scenarios Report (IASR) development process

2022 ISP Timetable



2020/21 IASR relevant milestones

Publication	Timing	Responsibility
ISP Timetable	30 October 2020	AEMO
Establish ISP Consumer Panel	By 30 November 2020	AEMO & ISP Consumer Panel
Draft IASR	**11 December 2020**	**AEMO**
Notice of Consultation on ISP Methodology	1 February 2021	AEMO
Draft ISP Methodology	21 April 2021	AEMO
ISP Methodology	30 June 2021	AEMO
Preparatory Activity Reports	By 30 June 2021	TNSPs
IASR	**30 July 2021**	**AEMO**
AER's IASR Review Report	By 30 August 2021	AER
Consumer Panel Report on IASR	By 30 September 2021	ISP Consumer Panel

Draft ISP to be published December 2021

Key input assumptions - updates

	Update Status	Anticipated timing of review
Policy Settings	As announced / legislated	-
Electricity consumption and Max/Min demands	Forecast in Q2 2021	Q2 2021 – FRG
Generator commitments (new plant and closure schedule), anticipated projects	Normal quarterly updates	-
Generator technology costs (GenCost 2020-21)	Part of this IASR / GenCost consultation	-
Generator technical capabilities, reliability and maintenance settings	As per 2020 ESOO, to be updated	Q2 2021 - FRG
Transmission credible options and costs	As per 2020 ISP, or latest public TNSP update	Q2 2021 - FRG
Renewable energy zone development limits, augmentations, costs	As per 2020 ISP, with possible REZ additions	
Fuel prices (coal and gas)	Currently being updated through consultancies	-
Hydrogen development trajectories	To be provided in scenario definition.	-
Distributed Energy Resources (distributed PV, embedded batteries, electric vehicles)	Forecast in Q1 / Q2 2021	Q1+Q2 2021 - FRG
Economic activity	Updated for 2020 Fed Budget, to be updated next year	-

Stakeholder input is being sought throughout

Scenario Development Workshop	14 October 2020 - Complete
Scenario Development Webinar (I)	22 October 2020 - Complete
Scenario Development Webinar (II)	11 November 2020
IASR Workshop	20 November 2020
Formal IASR Consultation	December 2020 – February 2021
Subsequent webinars, working groups, etc.	January 2020 – February 2021

Developing scenario narratives

What is the value of scenario planning?

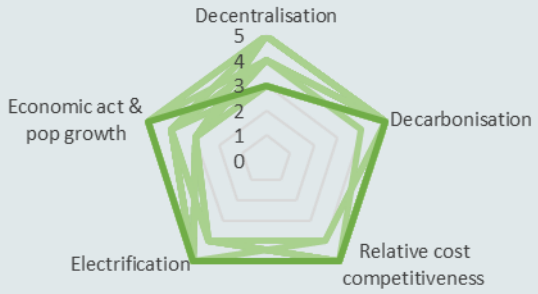
Scenarios, developed as narratives, allow us to:

- Imagine possible future worlds
- Recognise uncertainties, risks and opportunities
- Collect multiple, diverse perspectives and challenge the conventional thinking
- Consider adaptation strategies to build resilience

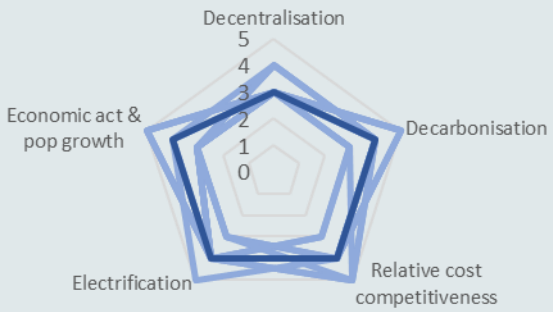
The set of scenarios should be:

- Plausible
- Distinctive
- Internally consistent
- Cover the breadth of possible futures
- Explore the risks of over- and under-investment

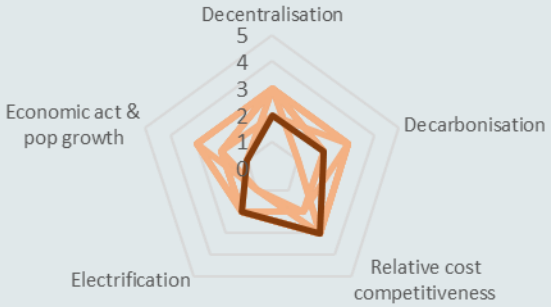
100+ stakeholder scenarios underpinned the initial set of scenarios going into the Workshop



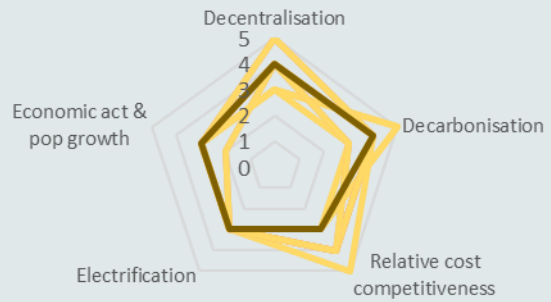
Scenario 1



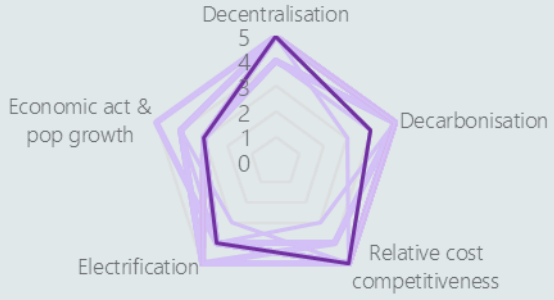
Scenario 2



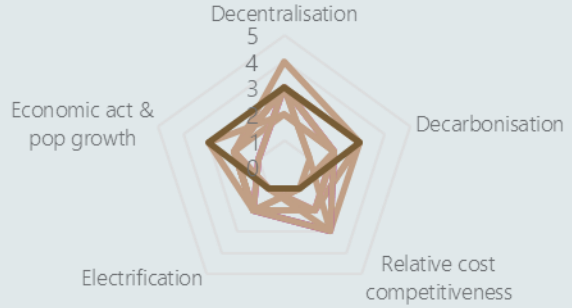
Scenario 3



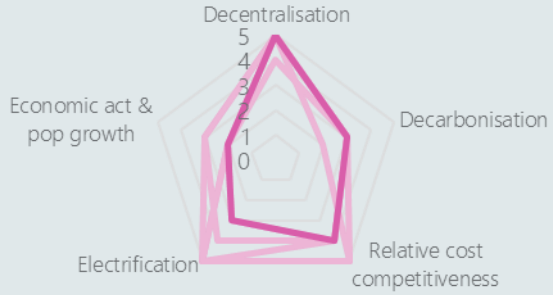
Scenario 4



Scenario 5



Scenario 6



Scenario 7

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

#AEMO2020

Scenario consolidation – current view

- Scenario feedback during the workshop and post-workshop survey suggested a degree of overlap between scenarios. We also considered that there may have been a lack of internal consistency in some scenarios

- We have consolidated the seven scenarios into four, by:
  - Merging two consumer-led scenarios (Scenarios 4 and 5) that had a focus on decarbonisation into a Sustainable Growth scenario;
  - Dropping a scenario (Scenario 2) that overlapped with this new Sustainable Growth scenario;
  - Reducing the level of decentralisation in a technology-centric scenario (Scenario 6) to be below Central in response to workshop feedback.
  - Merging two scenarios (Scenarios 3 and 7) into a Slow Growth scenario, which maintains low economic activity and assumes a higher rooftop PV uptake than Central (to avoid energy costs).

The 2021/22 IASR Scenarios

Consolidated set of scenarios

1. The **Central** scenario reflects a future energy system based around current government policies and best estimates of all key drivers.

2. **Export Superpower** scenario: Paradigm shift, with very high levels of electrification and significant hydrogen export opportunities, fuelled by strong growth and strong decarbonisation ambitions.

3. In the **Sustainable Growth** scenario, higher decarbonisation ambitions are supported by rapidly falling costs for battery storage which drive consumers action and higher levels of electrification of other sectors. These ambitions are supported by strong economic and population growth.

4. The **Slow Growth** scenario represents a sustained economic decline following the global pandemic which increases the likelihood of industrial load closures. Decarbonisation at a policy level takes a back seat, but the strong uptake of rooftop PV continues.

5. The **Gas-led Recovery** scenario reflects a world of targeted stimulus to aid the COVID-19 economic recovery, with low gas prices lowering consumer energy costs in the next decade. In the long-term, reductions in the cost of carbon capture and storage (CCS) provides further technology alternatives.

Scenario names subject to change.

1 Central Scenario

Moderate growth in the global and domestic economy, in line with current best estimates

Moderate levels of decentralisation within the power system

The cost of VRE remains competitive relative to fossil fuels

Broader energy efficiency and DER development continues, with customers seeking to lower their energy cost exposure

Electrification levels (both EV uptake rates and fuel switching) are consistent with current trajectory

Emission reductions and energy policy settings are in line with current government policies

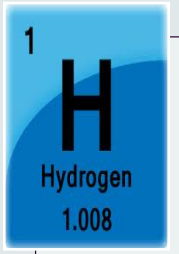
Purpose: A middle-of-the-road baseline for all other scenarios, reflecting current policy settings.

Export Superpower

2

- Meets a desire for the scenarios to "go beyond Step Change"
- Explores the potential for a hydrogen future as proposed by stakeholders

#AEMO2020



Hydrogen, produced via electrolysis from low-cost VRE, plays a significant role in the domestic and international energy system.

The Australian economy grows strongly on the back of productivity improvements and increased manufacturing capabilities, as well as through new export markets.

Australia establishes strong hydrogen export partnerships to meet international demand for clean energy.

Strong political pressure, domestic and abroad, results in significant political action to reduce emissions (focused on meeting the 1.5ºC increase by 2100 Paris Agreement goal).

There is pervasive fuel switching to electricity/hydrogen, with substantial increases in electricity demand. There is an increase in both EV and fuel cell vehicle uptake.

Consumers endorse the energy transition, seeking clean energy and reaping its benefits by adopting more energy efficient homes and vehicles.

Purpose: To explore the impact of a scenario that significantly increases the size of the electricity system as a means of achieving ambitious decarbonisation objectives

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

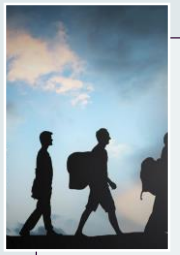
2 Export Superpower

Key settings	Significant development of hydrogen for export via grid-connected electrolysis	Questions and uncertainties	Level of EV uptake relative to central outlook? Are charging patterns different to a world without hydrogen?
	Strong decarbonisation ambition, nationally and internationally		Potentially signals for high PV uptake, but a reduced role for residential battery storage?
	High levels of economic growth		Would fuel price settings from similar scenarios with high decarbonisation ambitions be appropriate?

Sustainable Growth

- In line with widespread stakeholder support for the previous Step Change scenario
- Represents a frequently proposed set of drivers

This world sees higher economic growth than Central and falling levels of inequality, helping to enable funding of rapid DER uptake.



Increased regional population growth, with remote working becoming commonplace.

Significant improvements in the cost and performance of solar and batteries take place, as the latter become commonplace. Coal closures take place earlier than currently anticipated.

Great awareness and action on climate change results in higher levels of global decarbonisation, consistent with the Paris Agreement goal of limiting temperature increases well below 2ºC by 2100.

Consumer attitudes are also driven by consumer desires to increasingly choose when and how they consume energy. This is aided by significant technological advances, resulting in rapid DER uptake.

Electric vehicle uptake increases rapidly, while the rate of fuel switching to electricity in other sectors intensifies.

Purpose: Understand the needs of the power system in delivering ambitious decarbonisation as well as high levels of DER, EV and growth.

#AEMO2020

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

3 Sustainable Growth

Key Settings	Decarbonisation in line with the Paris Agreement goal of keeping the increase in temperature to well below 2°C.	Questions and uncertainties	Should this scenario assume earlier than announced coal retirements or rely entirely on modelled economic drivers?
	High levels of DER (both PV and batteries), EV uptake and fuel switching to electricity.		Appropriate settings for fuel switching, level of energy efficiency, demand side participation, etc.?
	No material impact of hydrogen on the NEM.		EV uptake is higher than in the Hydrogen scenario, as both energy sources are in competition to decarbonise heavy transport?

Slow Growth

- In line with workshop feedback, we have increased the level of PV of the low growth scenario
- Given suggestions of potential inconsistency between low growth and high DER, this does not have increased battery uptake

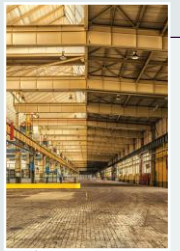
#AEMO2020

Australia's population and economic growth declines due to both domestic and international drivers, with a slow COVID-19 recovery. The risk of load closures increases.

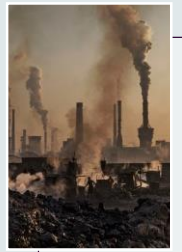
Migration levels are low. Depressed economic conditions result in higher levels of unemployment, which results in declining consumption growth rates.

Technological developments stagnate, limited only to private investment. Further government decarbonisation policies take a back seat.

The PV uptake rate increases, as consumers search for increased cost savings and limit their exposure to high prices.



Industrial closures also result in emission reductions over the period. The 2030 carbon abatement and state based targets remain.



With policies focused on supporting an ailing economy, and no increases in decarbonisation ambitions, the level of EV adoption and fuel switching to electricity in other sectors is limited.

Purpose: Test risks of over-investment and to explore potential system security issues associated with low demand.

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

4 Slow Growth

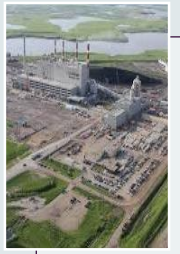
Key Settings	Lowest economic activity / population growth assumptions across all scenarios	Questions and uncertainties	Should this scenario maintain the same assumptions around decarbonisation, state-based VRE targets, etc.?
	High PV uptake		Though PV uptake rates are high, other forms of DER/EV?
	Increased likelihood of industrial closures		Should this scenario allow coal refurbishments and delays in fossil fuel generation retirements?

Gas-led Recovery

- DER uptake has been reduced, reflecting workshop stakeholder feedback.
- Focuses on low gas prices in the short-term and potential cost improvements from CCS in the long-term.

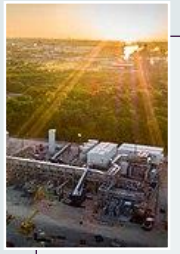
#AEMO2020

The world is in economic recovery from the impacts of COVID-19.



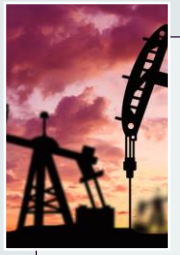
Fossil fuel generation has a greater cost competitive advantage. Federal policy support for CCS drives significant technological advances and cost reductions.

Globally investment in VRE is more limited than in other scenarios and cost reductions are more muted.



Climate change policy in this scenario is consistent with that of Central, targeting similar emission reductions.

The electrification of transport in this scenario is in line with that of Central, as the global forces that drive the reduction in EV costs are unaffected by gas developments in Australia.



The level of DER uptake and sector coupling of other sectors is more limited.

Purpose: Explore the impact of low gas prices in the short-term and in the long-term, understand the potential for CCS and its implications on the system.

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Gas-led Recovery

Key Settings	Low gas prices
	Slower reductions in storage/VRE costs early on, increased after
	Costs improvements in CCS technologies
	2030 climate change target remains in place

Questions and uncertainties	Should this scenario have state-based VRE targets?
	Should fossil fuel generator retirements be allowed to be pushed back beyond announced dates?
	Should this scenario instead explore a strong decarbonisation objective (e.g. consistent with Sustainable Growth)

Consolidated set of scenarios

1. The **Central** scenario reflects a future energy system based around current government policies and best estimates of all key drivers.

2. **Export Superpower** scenario: Paradigm shift, with very high levels of electrification and significant hydrogen export opportunities, fuelled by strong growth and strong decarbonisation ambitions.

3. In the **Sustainable Growth** scenario, higher decarbonisation ambitions are supported by rapidly falling costs for battery storage which drive consumers action and higher levels of electrification of other sectors. These ambitions are supported by strong economic and population growth.

4. The **Slow Growth** scenario represents a sustained economic decline following the global pandemic which increases the likelihood of industrial load closures. Decarbonisation at a policy level takes a back seat, but the strong uptake of rooftop PV continues.

5. The **Gas-led Recovery** scenario reflects a world of targeted stimulus to aid the COVID-19 economic recovery, with low gas prices lowering consumer energy costs in the next decade. In the long-term, reductions in the cost of carbon capture and storage (CCS) provides further technology alternatives.

Scenario names subject to change.

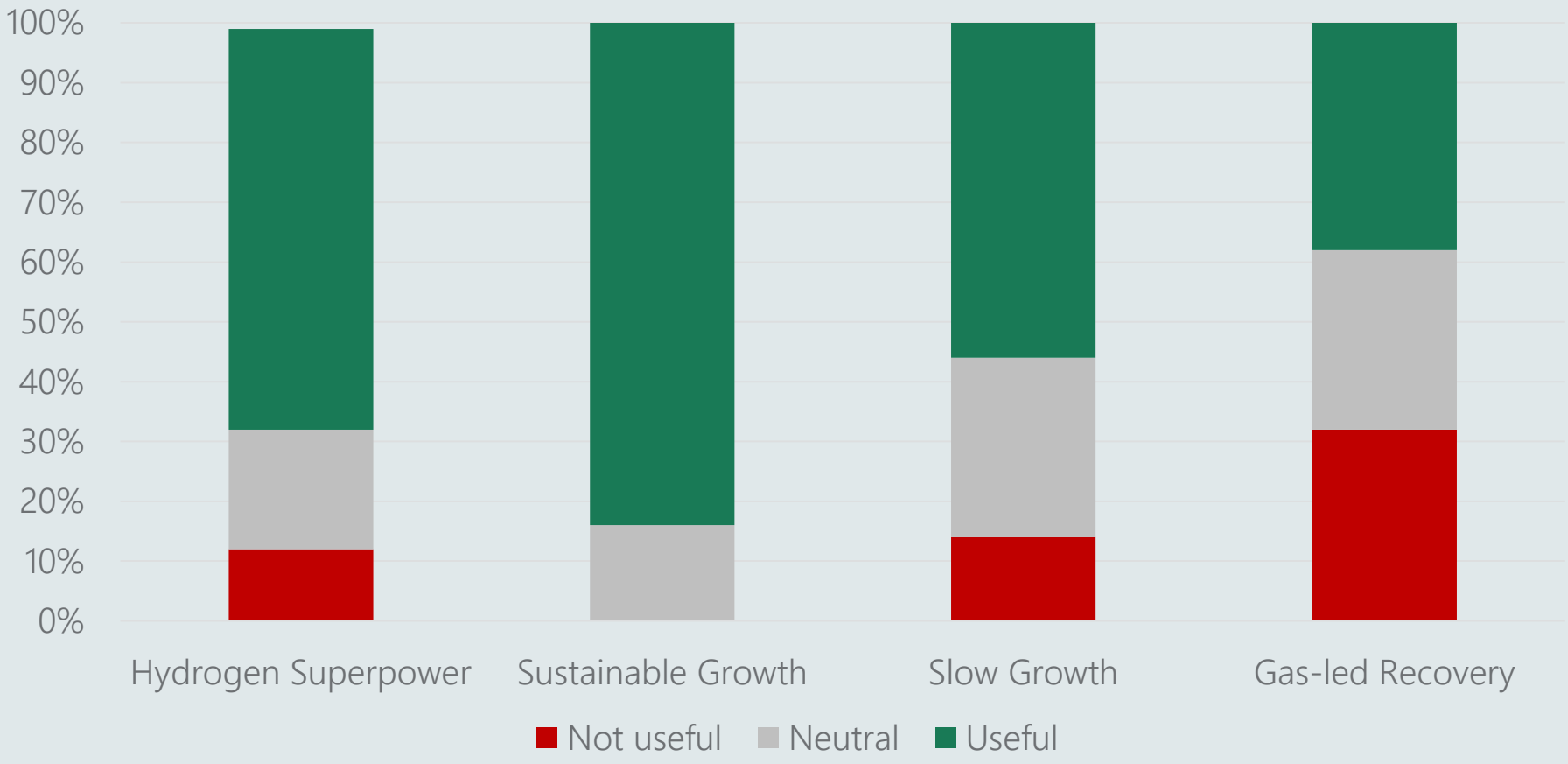
Slido polling

Sli.do

#AEMO2020

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Scenarios poll results



Number of votes:49-50 (depending on the scenario)

Exploring risks through scenarios

Risk scenarios

- In addition to the narrative scenarios described above, the IASR will also present a set of risk-based scenarios which aim to understand the sensitivity of investment decisions to changes in a single input parameter, or to an unexpected event.

- More scenarios are presented here than are likely to be used to get your feedback on which are considered to be most important.

Additional proposed risk scenarios

6. Central with early Victorian coal closure, and no timely firm capacity replacement
   To explore the risks of a delay in replacing lost firm capacity.
7. Central with delayed Snowy and/or Humelink
   To assess reliability impacts in NSW of delays in expected investment.
8. Central with early northern NSW coal closures
   To assess reliability impacts on NSW of a reduction in capacity north of Sydney.
9. Central with the expanded TRET legislated
   To explore value of Marinus, flow-on impacts in the Mainland
10. Sustainable Growth scenario with Central DER uptake
    Compare the impact of a more transmission-focused decarbonising system.
11. Sensitivity to explore QLD specific risks
    Other sensitivities have stronger impacts in other regions, possible QLD issues?

Sensitivity analysis

- As well as the risk scenarios proposed above, more generalised sensitivity analysis will also be used to help determine the robustness of the optimal development plan in the ISP.
- This may take into account factors such as higher and/or lower:
  - Generation costs
  - Storage costs
  - Transmission costs
  - Discount rates
  - Etc.

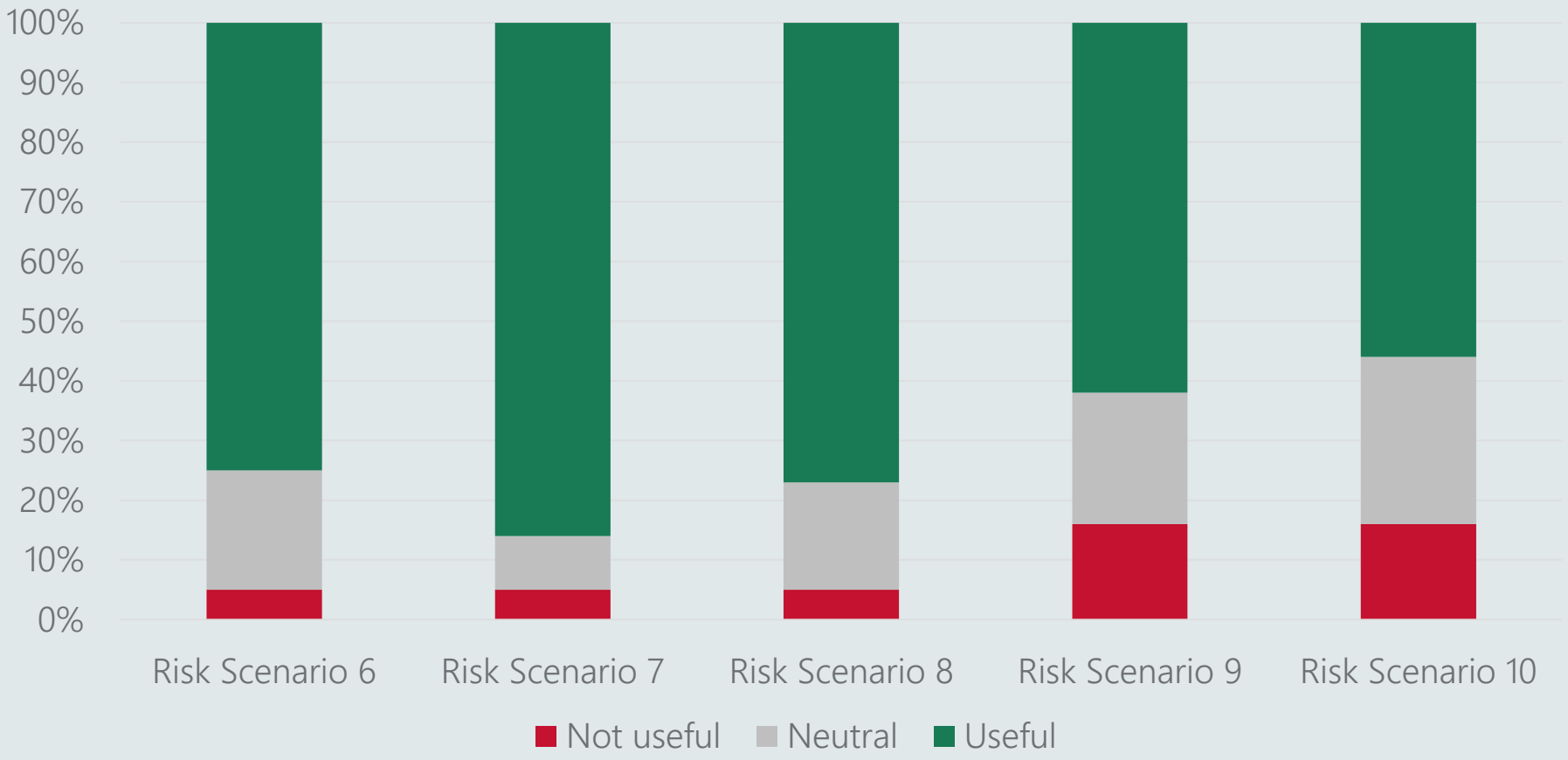
Slido polling

Sli.do

#AEMO2020

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Risk scenarios poll results



Number of votes:43-45 (depending on the scenario)

Next steps

IASR Workshop (20 Nov 2020)

Establishment of ISP Consumer Panel (by 30 Nov 2020)

Draft IASR release (11 December 2020)

Additional contributions?

- We encourage any additional contributions to the narratives discussed today to be sent to forecasting.planning@aemo.com.au