Please note that this webinar will be recorded and published online

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Draft 2023 Transmission Expansion Options Report webinar

18 May 2023

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

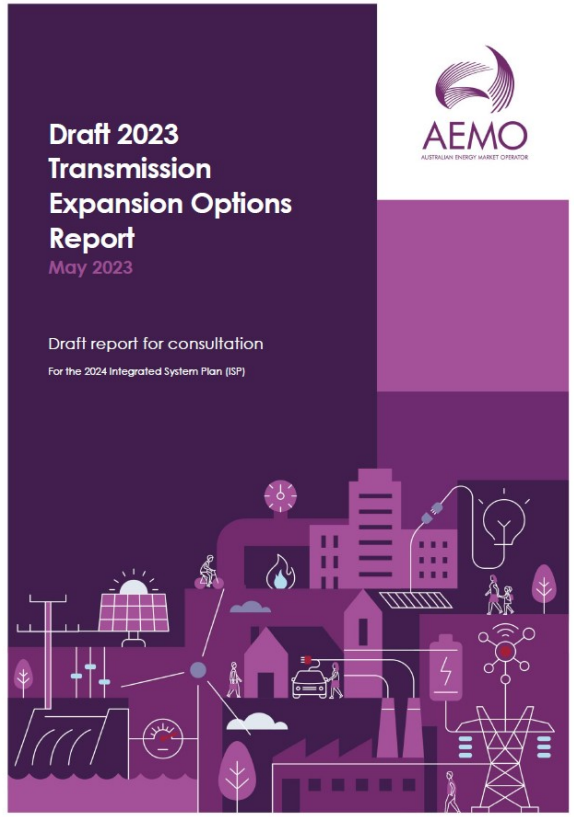
We pay respect to their Elders past and present.

Today's agenda

1. Welcome and objective (2 min)
2. Introduction and consultation overview (6 min)
3. Draft 2023 Transmission Expansion Options Report (40 min)
4. Questions and comments (40 min)
5. Next Steps (2 min)

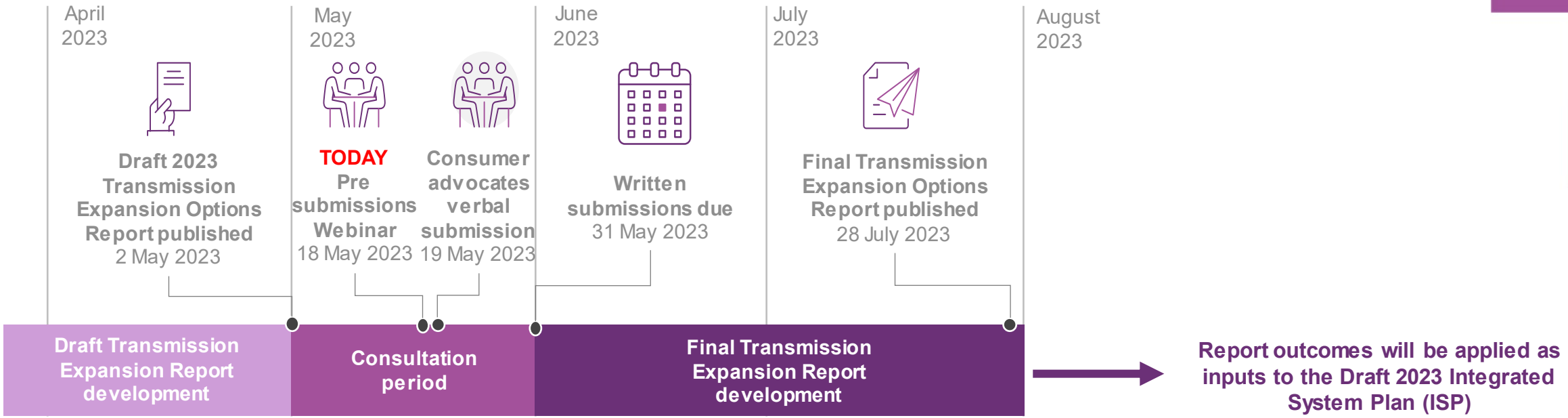
Objective

The purpose of this webinar is to summarise elements of the report, outline consultation questions and discuss the Draft Transmission Expansion Options Report.



The report and its appendices are available here

AEMO has released the Draft 2023 Transmission Expansion Options Report for consultation



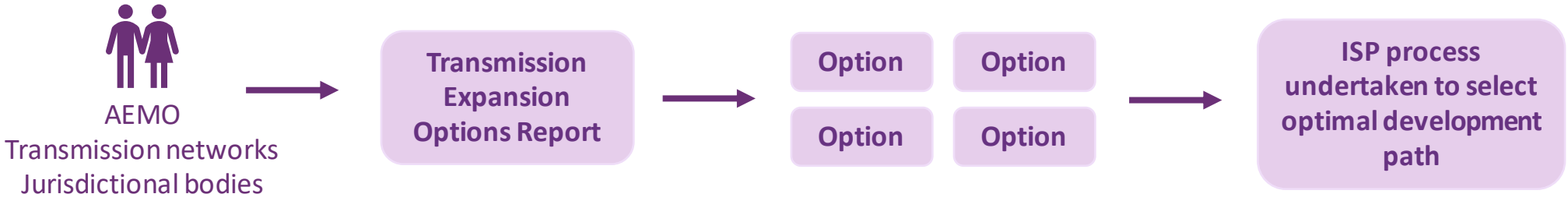
Ask your questions at www.Sli.do #AEMO

Sign in with your name

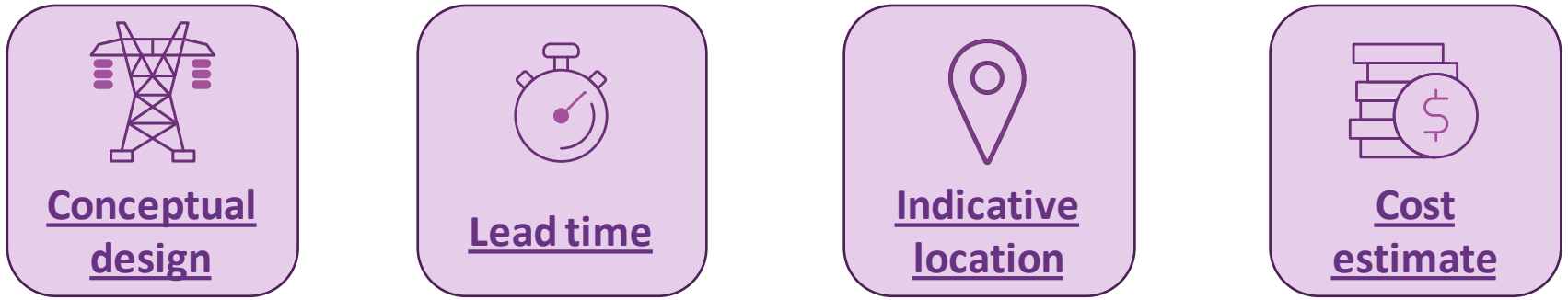
Unmute when you are called to ask your question

Methodology

Role of Draft 2023 Transmission Expansion Options Report in the ISP



Components of an option:



The **conceptual design** of each option outlines the assets required and informs cost estimation

Conceptual designs are produced via joint planning, co-design, and collaboration with TNSPs and jurisdictional bodies.

Examples of factors considered in conceptual design

- Overhead or underground line
- AC or DC connection
- Line voltage rating
- Number of switch bays required
- Is reactive plant required?

Transmission project **lead times** are a key input to the ISP model

AEMO collaborated with transmission networks and jurisdictional bodies to understand project lead times for the augmentation options.

Project lead time categories were re-defined to reflect observed longer lead times arising from supply chain issues and regulatory and environmental approvals processes.

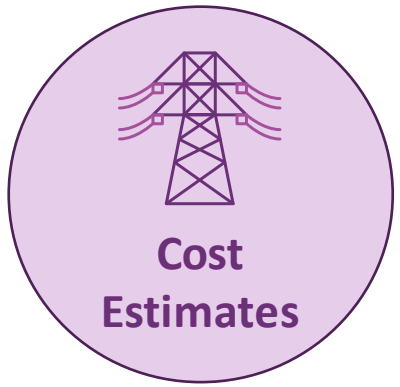
Short	Medium	Long
3-5 years	6-7 years	7+ years

AEMO is currently considering updates to the ISP Methodology to consider how the ISP model can better incorporate the uncertainty associated with transmission project lead time.

Indicative locations are selected through joint planning with TNSPs and jurisdictional bodies

- AEMO engages in extensive joint planning, co-design and collaboration with TNSPs and jurisdictional bodies to determine indicative locations for transmission expansions options.
- Potential REZ locations have been selected through consultation.
- Potential routes and locations are highly indicative, and should not be considered fixed.
- The ultimate design of transmission projects, including location selection, is not within AEMO's responsibility in its role as National Transmission Planner.

Project **cost estimates** are a key input the ISP and are calculated by AEMO or project proponents

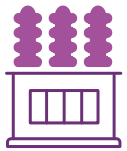


Not re-assessed	Committed and Anticipated Projects	In the ISP, these are assumed to be part of the future network
Provided by TNSP, or jurisdictional body	Actionable ISP projects that undergo the RIT-T	AEMO receives estimates for these projects from TNSPs.
	Future ISP projects with preparatory activities	AEMO requested TNSPs provided estimates for some projects from the 2022 ISP
Calculated by AEMO	Other Projects	Costs estimated using AEMO's transmission cost database

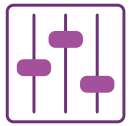
The 'RIT-T' is the regulatory investment test for transmission, applied by transmission network service providers consistent with guidelines set by the Australian Energy Regulator. TNSPs are transmission network service providers.

AEMO estimates costs using its transmission cost database

- AEMO estimates costs where transmission networks or jurisdictional bodies have not developed cost estimates.
- AEMO's Transmission Cost Database has been updated and released alongside the Draft 2023 Transmission Expansion Options Report.
- The update includes cost updates based on recent projects, and improvements in line with best practice in conceptual cost estimates to improve accuracy.
- Cost estimates are broken down into several components:



Building blocks & baseline costs



Adjustments for specific project attributes

Risk factors

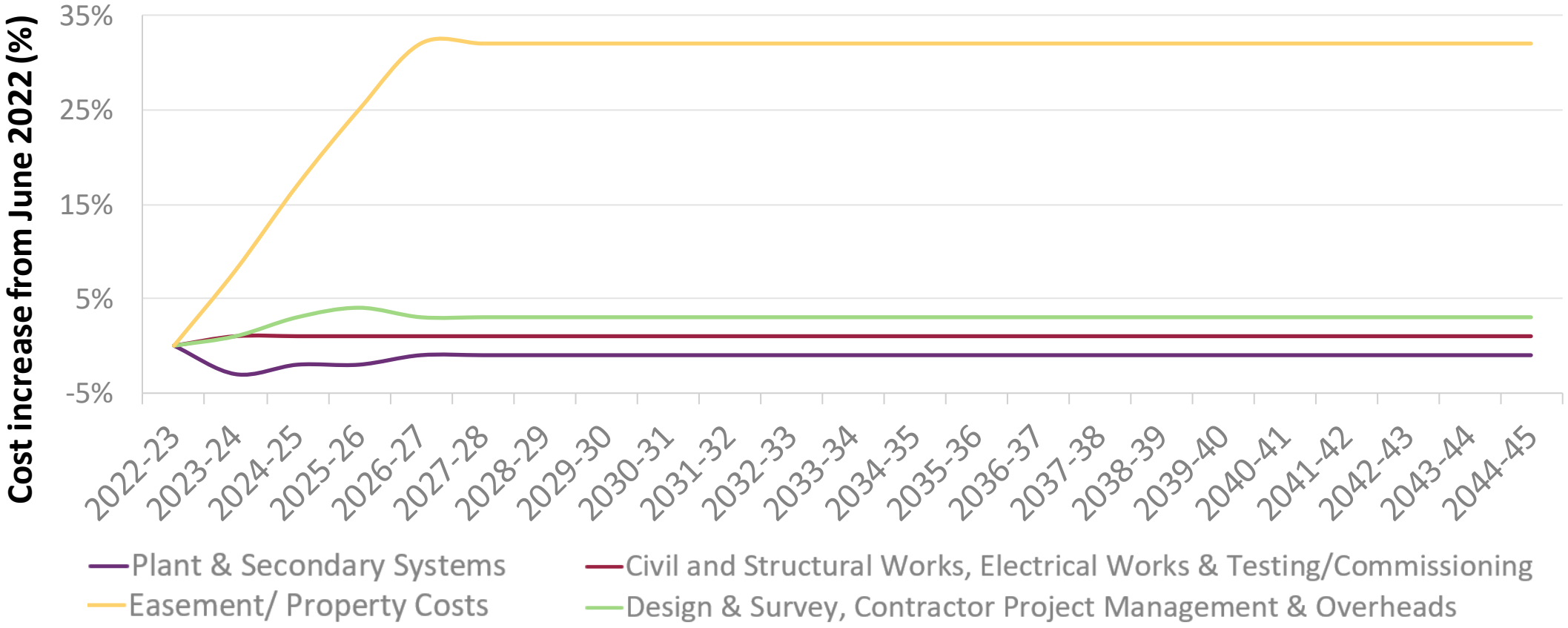
Indirect costs

Cost estimation process

1. Define project scope for the option via joint planning with relevant body.
2. Identify level of risk across several factors including land use biodiversity offsets.
3. Select infrastructure building blocks and risks adjustments in the transmission cost database tool.
4. Produce cost report.

AEMO is using cost increase forecasts out to 2027, and assuming cost changes settle beyond that

- Forecasts of transmission project costs haven been proposed by Mott MacDonald, and AEMO proposes to assume that increases settle beyond 2027 to ensure a consistent approach for like parameters in the ISP.



Social licence for transmission projects is considered in several aspects of the ISP

Social licence is a key consideration in:

1. Selection of forecasting and planning scenarios
2. Selection of sensitivity analyses
3. Selection of land use and resource use limits in ISP Modelling
4. Selection of transmission augmentation options
5. Consideration of community engagement in project lead times
6. Selection of locations for potential REZs through consultation

Other methodology items in the Draft 2023 Transmission Expansion Options Report

- Estimating operational expenditure
- Economic, social and environment costs and benefits
- Market impacts on transmission costs

Questions to consider in your submission

Methodology

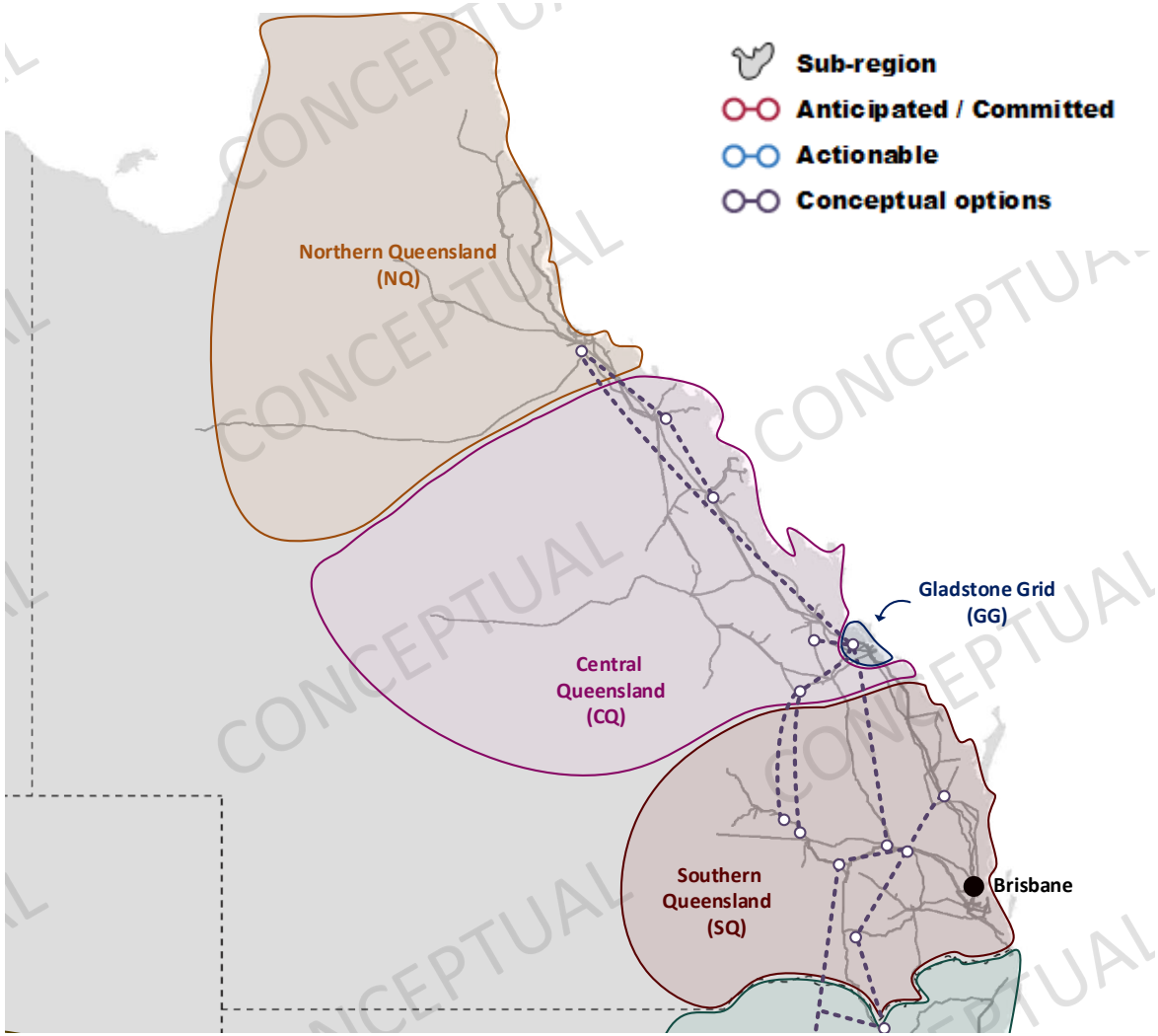
1. Do you have any feedback on the update to the AEMO Transmission Cost Database? If yes, please provide data and evidence for any suggested enhancements.
2. Do you have any feedback on the proposed approach to forecasting future transmission cost increases? If yes, please provide data and evidence for any suggested enhancements.
3. Do you have any suggested alternatives to AEMO's approach to considering social licence for transmission projects for the ISP? If yes, what are the alternatives? Please provide information or evidence supporting the use of any alternative approach.
4. Do you have any specific feedback on social licence considerations for the flow paths, REZs or group constraints considered in this report? If yes, please provide information or evidence to support the feedback, where possible.

Flow paths and Renewable Energy Zones

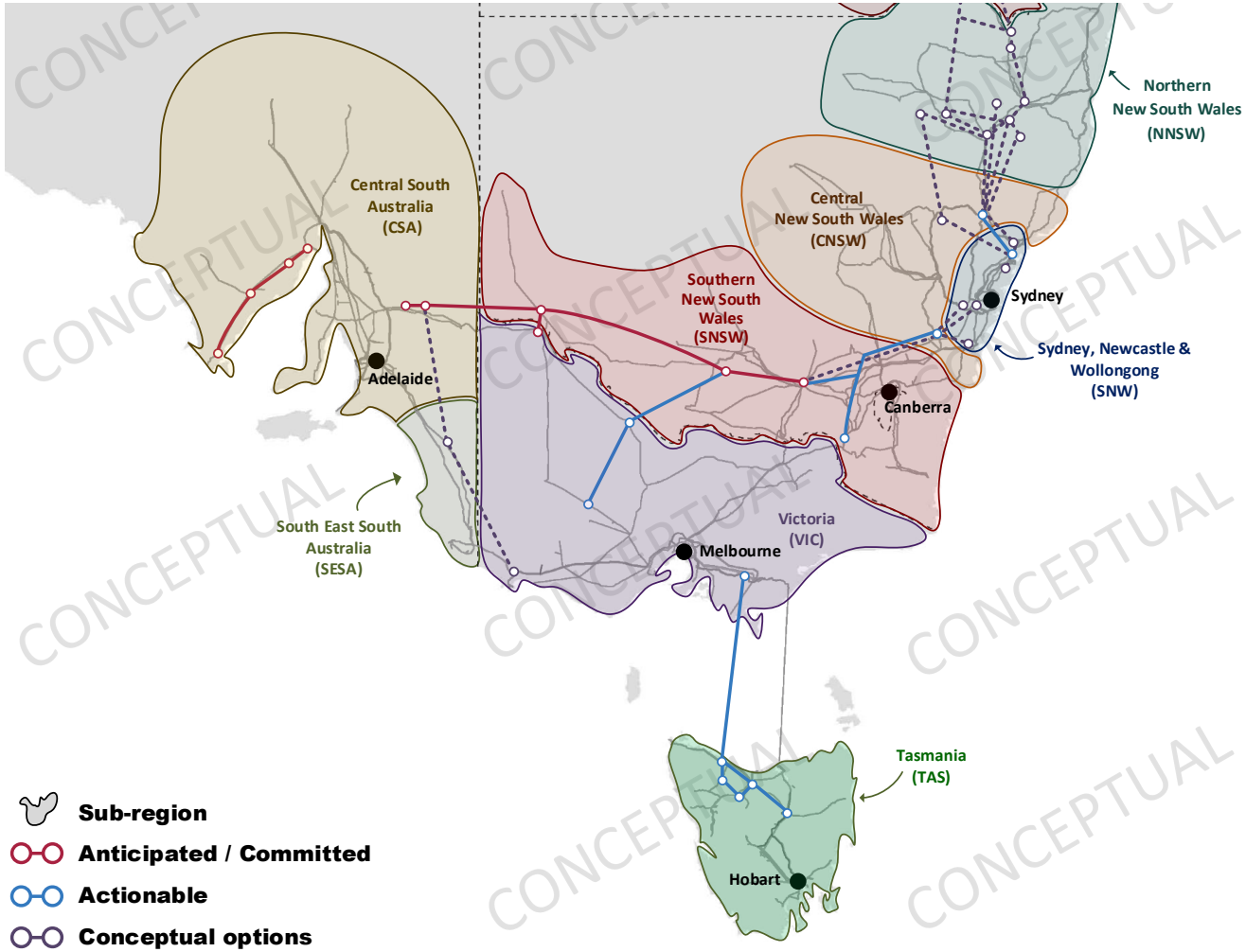
Flow paths for Queensland

Purpose of flow paths

- Transport significant amounts of electricity across the backbone of the network.



Flow paths for New South Wales, Victoria, South Australia and Tasmania



Purpose of flow paths

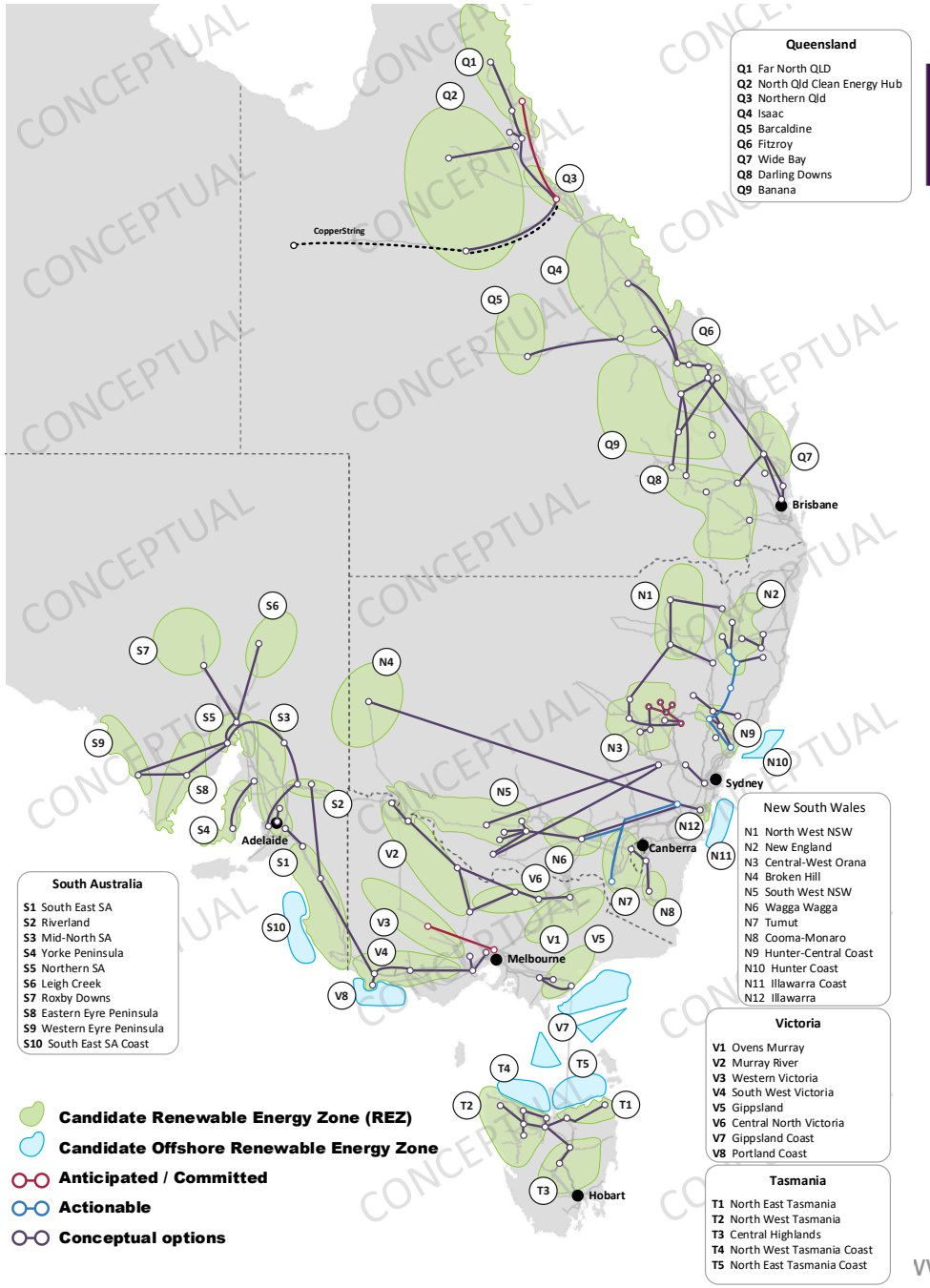
- Transport significant amounts of electricity across the backbone of the network.

REZs

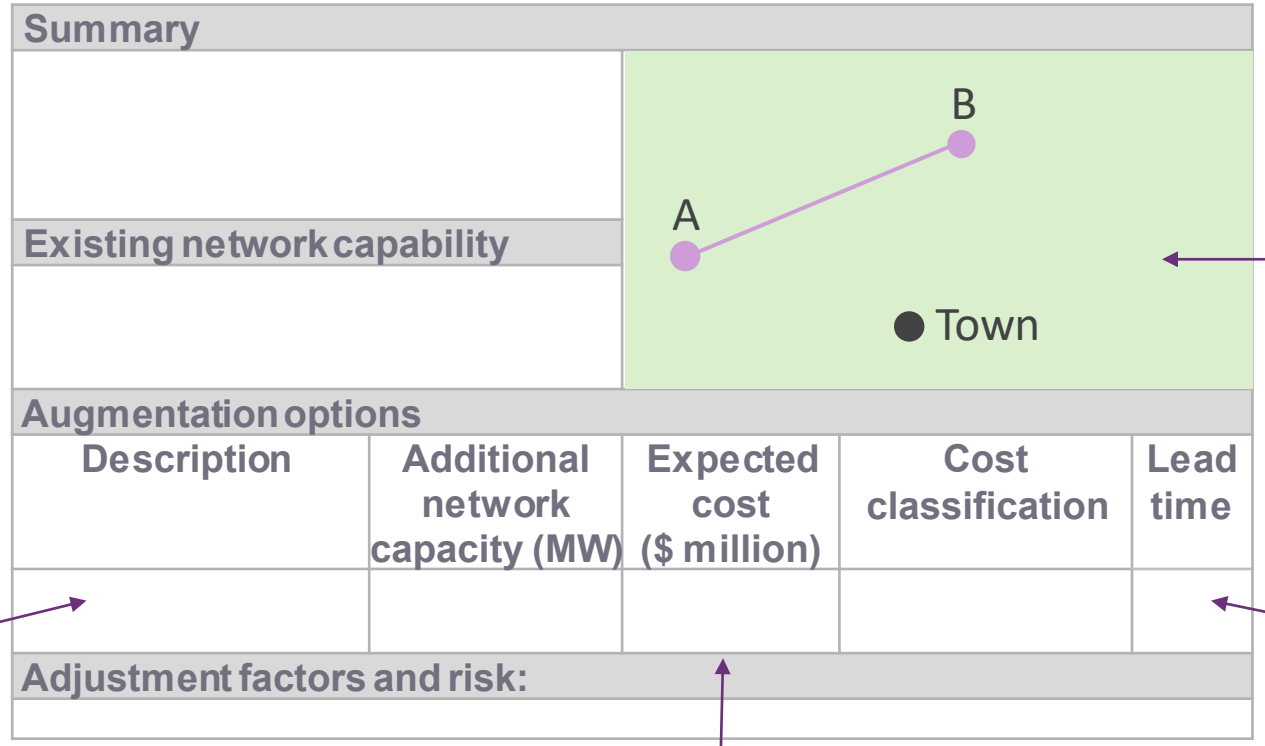
Purpose of REZ options

Connect renewable generation in areas where clusters of large-scale renewable energy can be developed using economies of scale.

Some of the options are designed to transfer power from more than one REZ through to a big load centre.



The methodology produces a 'report card' for each flow path and REZ, including augmentation options



Location
Conceptual location and path are shown on a localised map

Conceptual design is described

Lead time category

Cost estimate

Questions to consider in your submission

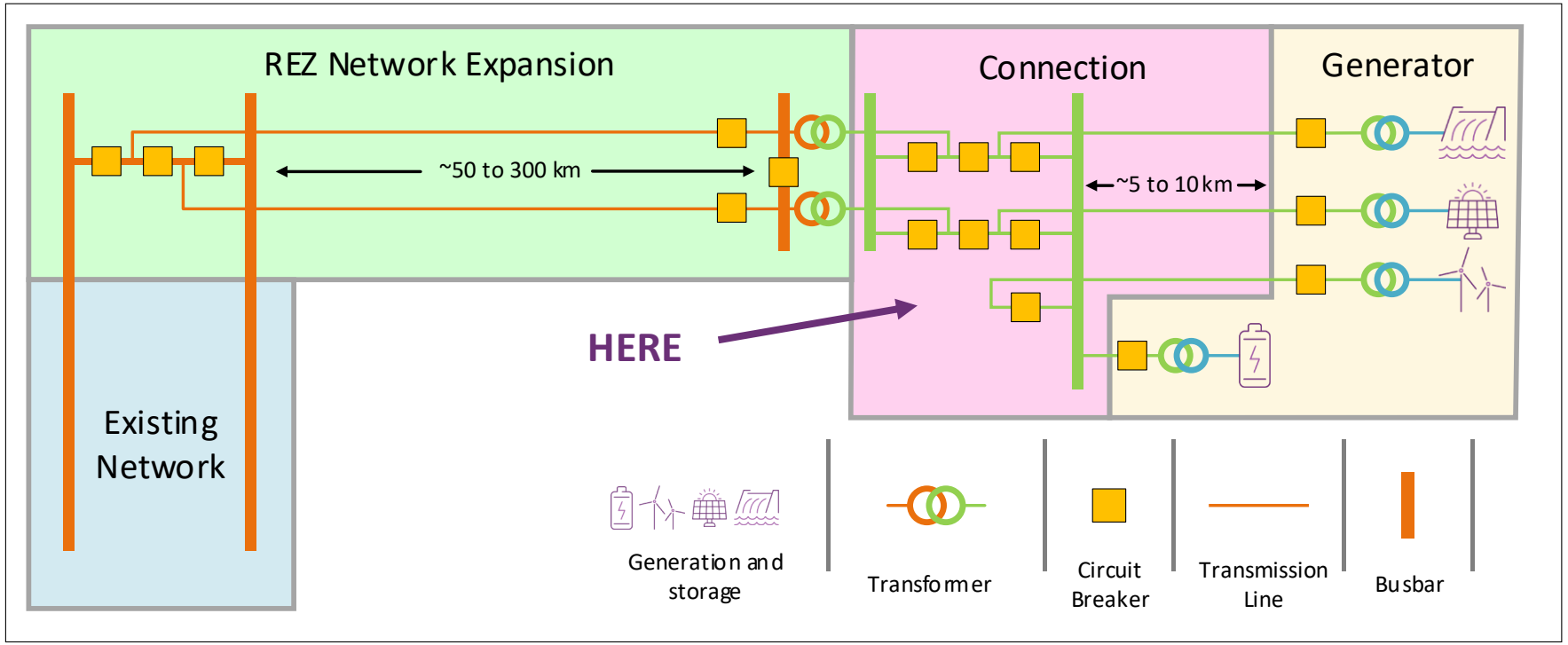
Flow paths & Renewable Energy Zones (REZs)

5. Do you have any feedback on the flow path augmentation options provided in this report, including their conceptual design, lead time, location and cost estimates? Please provide evidence to support your feedback.
6. Do you have any feedback on the REZ augmentation options provided in this report, including their conceptual design, lead time, location and cost estimates? Please provide evidence to support your feedback.

Connection costs

Network assets required to connect a generator are not considered to be a REZ expansion option

The costs associated with connecting an individual generator to the broader network are considered as generator connection costs in the ISP Model.

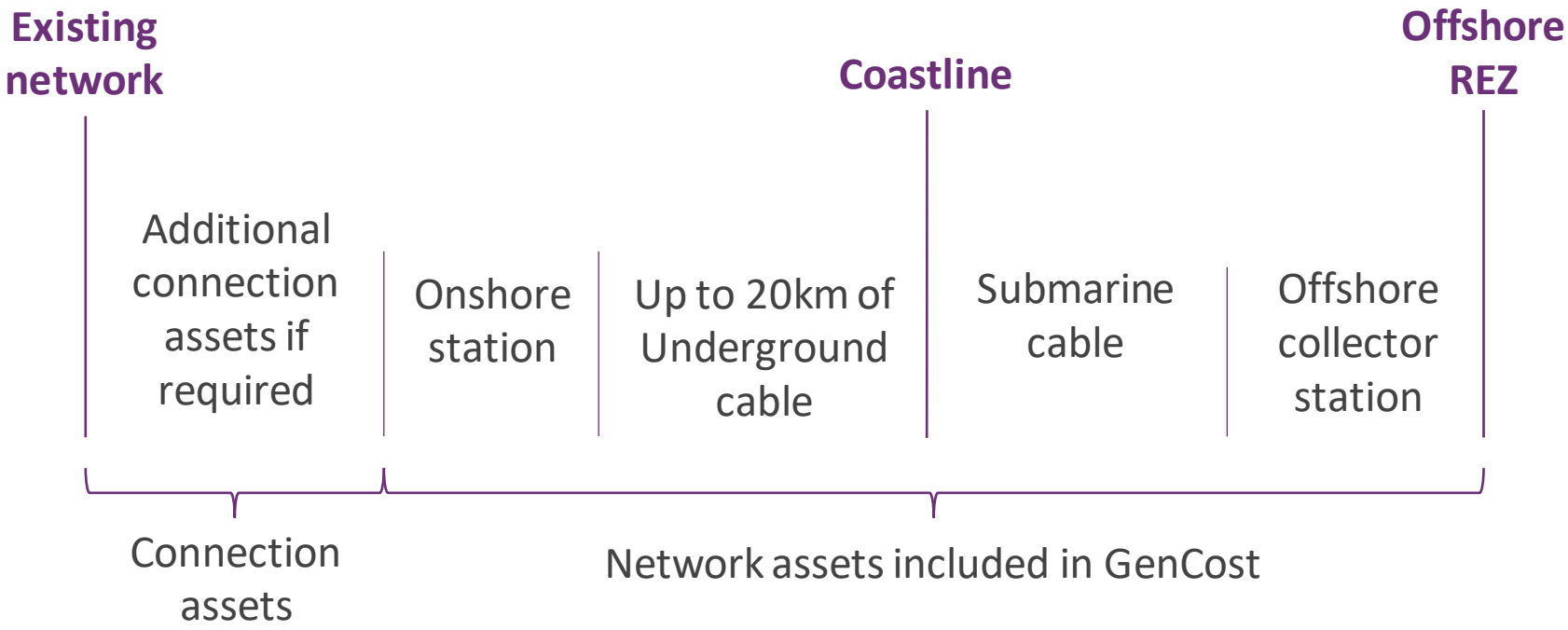


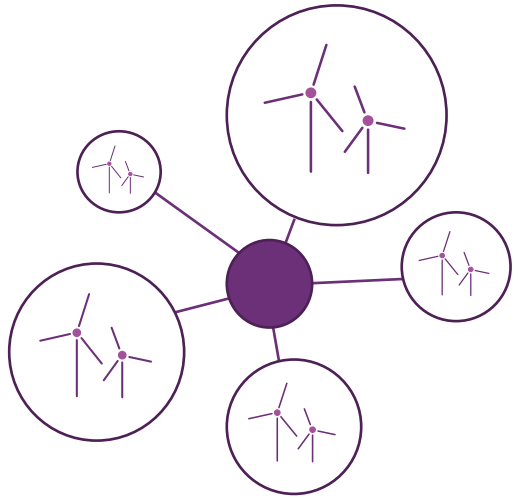
System strength services are required to facilitate the operation of renewable energy generation

- The ISP will include cost estimates of the system strength services required to support stable operation of inverter-based resources, in line with the 'efficient' level of the system strength standard.
- AEMO proposes to use synchronous condenser costs as a proxy for potential system strength services.

Network assets required to connect offshore REZs are not considered REZ expansion options

Generator cost assets include up to 20km of onshore underground cable. Any further network assets required to reach the existing network are considered connection assets.





Questions to consider in your submission

Generator connection costs

7. Do you agree with the proposed cost estimation process and outcomes for generator connections in the ISP? If not, why not? Please provide evidence to support your feedback.
8. Do you agree with the proposed cost estimation process and outcomes for system strength costs in the ISP? If not, why not? Please provide evidence to support your feedback.
9. Do you agree with the proposed cost estimation process and outcomes for offshore REZ connections in the ISP? If not, why not? Please provide evidence to support your feedback.

Discussion and next steps

Pre-submitted questions

- In terms of cost estimate for each project, when can the cost estimate can be confirmed by the Government?
- Is there any data that can be made public to understand existing constraints on the current 330kV network in the New England REZ?
- How have things changed since the 2021 TCR please, and what the possible implications may be for the upcoming draft 2024 ISP?
- Social licence (and related costs) is currently very hard to forecast. Environmental offsets and current Govt social license allowances provide limited insights. Can sensitivity be incorporated in the least costs generation planning studies for costs increases of say 30% to 50% higher costs for transmission? This will then favour more local renewables/storage solutions as opposed to transmission projects.

Pre-submitted questions

- Why is there a 140% difference in the average cost/km of 500kV DCST projects (e.g. REZ V6 Option 3 $6.6/km, CQ-NQ Option 2 $m4.6/km and HumeLink $m10.3/km?
- How is it environmentally acceptable (i.e. audible noise and interference) for 500kV lines to have only twin conductor bundles? eg in Queensland and South Australia.
- Please clarify the design of CQ-SQ option 4 HVDC VSC bipole - Why is the line voltage 320kV but the inverters 500kV?
- Why are the inverters at the Calvale end rated at 1,000MW each but the inverters at the Wandoan end rated at 750MW?
- How many and what type and size of line conductor has been costed? Are the towers free standing lattice towers or guyed masts, What technology has been assumed for the inverters? Why aren't these details included in the spreadsheet?
- Why are the HVDC circuits rated at only 750MW when the HVAC 500kv circuits are rated at 1,675MW? Must compare like with like.
- Why are the adjustments and risk allowances for Q9 REZ option 1 500kv line costs only 22% of the total cost but are almost 50% for other 500kV lines interstate. This is much more difficult country than elsewhere.
- Why is that 500kV line strung with quad orange whereas the 500kV lines to Borumba PHES are strung with twin olive?
- How could SQ option 3, a greenfield 500kV/275kV substation at Borumba, possibly cost only $60m?
- SQ option 2: Why build a DCST line from Woolooga to south pine taking new easements when there is a spare easement already in place for a SC or DC line?
- Where have you hidden the cost estimate for the 500kv line from Haly's to Calvale - its impossible to find so must be hiding something?

Questions and comments

www.sli.do

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Sign in with your name

Next steps

- Please provide feedback on today's webinar.
- Consumer advocates can register here for tomorrow's 11.00am verbal comment session
- Written submissions due to ISP@AEMO.com.au by 5.00pm AEST 31 May 2023