

ISP Preparatory Activities – Reinforcing Sydney, Newcastle and Wollongong Supply (Southern Circuit)

High Level Network Augmentation Overview

In accordance with the AEMO ISP 2020 document, TransGrid has undertaken preparatory activities for Reinforcing Sydney, Newcastle and Wollongong Supply (RSNWS) (Southern Circuit). The high level network augmentation description is as follows:

- A new 500kV double circuit from the existing Bannaby substation to a new substation in the locality of South Creek within western Sydney area;
- Cut in existing lines 5A1/5A2, 32 and 38 into the new substation in the locality of South Creek (as above);
- Augmentation of Bannaby substation to accommodate the new 500kV double circuit (as above);
- Augmentation of Sydney West substation to accommodate for additional 330kV incoming feeder;
- Replace a section of existing line 39 to double circuit to connect the new substation in the locality of South Creek to existing Sydney West substation; and
- Upgrading existing line 39 from 85 degrees to 100 degrees Celsius operating temperature.

Reinforcing Sydney, Newcastle and Wollongong Supply Preparatory Activities

1. Cost Estimates

Cost estimate was undertaken as part of the preparatory activities. The inputs to the estimate include areas such as desktop environmental and property assessments, preliminary engineering designs and indicative localities for transmission line and substation. The cost estimates are between the ranges of AACE¹ class 4 and class 5 accuracy.

The cost estimate for Reinforcing Sydney, Newcastle and Wollongong Supply (southern circuit) are shown below, numbers presented are un-escalated 2021 dollars.

Reinforcing Sydney, Newcastle, Wollongong Supply (Southern circuit)	500kV Double Circuit Cost
Lower Range	\$1.45b
Upper Range	\$2.78b

2. Preliminary Engineering Design

Concept engineering designs were undertaken as part of the preparatory activities. The high level development methodology include:

- Desktop transmission line corridor and substation locality identification
- Desktop geotechnical assessment of the identified areas

¹ AACE International: Association for the Advancement of Cost Engineering

- Development of concept engineering designs such as electrical connection diagrams and substation layouts. Desktop assessment of transmission line tower and foundation requirements were also undertaken
- Safety in Design (SiD) Workshops were undertaken to identify and address safety risks of the concept designs

3. Desktop Easement Assessment

Desktop transmission line corridor identification and assessment was undertaken as part of the preparatory activities. The high level methodology of corridor identification and assessment include:

- Options identification;
 - Establish tiered constraints for identification of transmission line corridors
 - Tiered assessments include items such as environment, property and stakeholder criteria
 - Determine options for potential transmission line corridors as per the defined tiered constraints
- Options assessment and evaluation;
 - Assess, evaluate and select corridors for use as part of the preparatory activities

4. Preliminary Assessment of Environmental and Planning Approvals

The primary environmental approval required for the project may include an Environmental Impact Statement (EIS) to be prepared and approved. This may also include:

- Engaging with the community and government agencies, this may include NSW government bodies such as DPIE
- Refine the concept designs of the project to avoid or minimise impacts and to incorporate community feedback
- Assessing the impacts of the project in accordance with any relevant Government legislation, policies and guidelines
- Integrating the findings of any engagement and the assessment of the impacts of the project

It is noted that the planning and approval requirements applicable to the project may change overtime due to:

- General changes in planning and environmental legislation or policy
- Specific changes in planning and environmental legislation or policy that may be targeted at facilitating planning and/or delivery of the project

5. Stakeholder Engagement

Direct community engagement including local government and council have not been undertaken as part of the preparatory works. However, a multitude of stakeholder requirements have been included as in the tiered constraints and used as part of the desktop transmission line corridor identification process based on the available information. Examples of the tiered constraints used include known townships, residential areas, airports, defence owned land, areas of international and national environmental significance, aboriginal and heritage areas, commonwealth land, important agricultural areas, mine sites and zones and existing infrastructure.

6. Risks

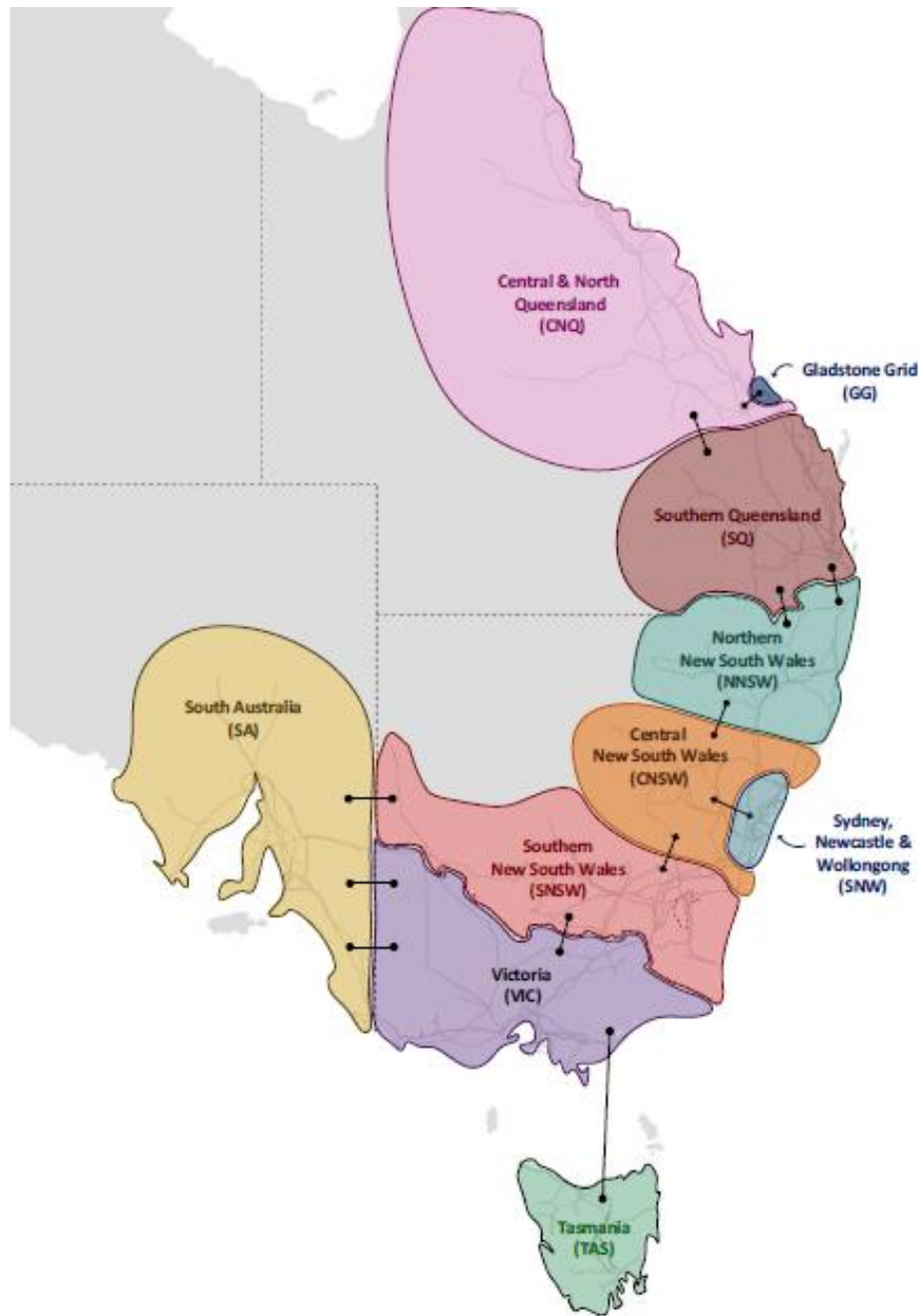
Risk assessments were undertaken as part of the preparatory activities. The risk assessment process identified a number of risks and an extract of these risks are as follows:

- The scope of RSNWS (Southern Circuit) can be impacted by current and future major projects, regulatory approval processes, and community feedback. These issues are to be closely monitored to ensure successful project delivery
- Uncertainty surrounding sizing and location of future generation developments, both known and unknown. Corridors may be constrained due to generation development growth leading to increase project cost

- Community feedback and sentiment may impact on the project including but not limited to the locality of the transmission lines, substations, project duration and cost estimate
- All works were based on available desktop information only. Future site investigation and verification works may impact on the outcomes identified as part of the feasibility works. These include but not limited to cost estimates, transmission route locations and substation localities

7. Cut-Set Limits

AEMO ISP Node Map is shown below and there are 4 nodes defined in NSW: Northern NSW (NNSW), Central NSW (CNSW), Southern NSW (SNSW) and Sydney, Newcastle & Wollongong (SNW).



Network Condition:

- Summer Day Demand (14059 MW) for Base Case and with north ring case;
- 3200 MW from Eraring/Vales Pt in Base Case;
- 0MW from Eraring and Vale Pt in with south ring case;
- High generation from Northern NSW (~1300MW);
- 480 MW from QNI import;
- Low Southern GEN kept around ~1200 MW in Base Case;
- High Southern NSW generation around 4500 MW with South Ring;
- 3000 MW from CWOREZ;

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Scenarios	Cut-set Name	Cut-set Definition	Notional Limit (MW)	
			Forward	Reverse
Present Network	CNSW - SNW	Wallerawang – Ingleburn 330 kV (1 circuit) Wallerawang – Sydney South 330 kV (1 circuit) Bayswater – Sydney West 330 kV (1 circuit) Bayswater – Regentville 330 kV (1 circuit) Liddell – Newcastle 330 kV (1 circuit) Liddell – Tomago 330 kV (1 circuit) Bannaby – Sydney West 330 kV (1 circuit) Marulan – Avon 330 kV (1 circuit) Marulan – Dapto 330 kV (1 circuit) Kangaroo Valley – Dapto 330 kV (1 circuit) Stroud – Brandy Hill 132 kV (1 circuit) Stroud – Tomago 132 kV (1 circuit) Hawks Nest tee – Tomago 132 kV (1 circuit)	7,525 (LIDD-NEWC) ²	N/A
Post 500 kV South Ring	CNSW - SNW	Wallerawang – Ingleburn 330 kV (1 circuit) Wallerawang – Sydney South 330 kV (1 circuit) Bayswater – Sydney West 330 kV (1 circuit) Bayswater – Regentville 330 kV (1 circuit) Liddell – Newcastle 330 kV (1 circuit) Liddell – Tomago 330 kV (1 circuit) Bannaby – Sydney West 330 kV (1 circuit) Marulan – Avon 330 kV (1 circuit) Marulan – Dapto 330 kV (1 circuit) Kangaroo Valley – Dapto 330 kV (1 circuit) Stroud – Brandy Hill 132 kV (1 circuit) Stroud – Tomago 132 kV (1 circuit) Hawks Nest tee – Tomago 132 kV (1 circuit) Bannaby – South Creek 500 kV (2 circuits)	10,640 (BNBY – SYDW)	N/A

² The critical overloaded line is given in the brackets

Combination of both North and South Ring

Scenarios	Cut-set Name	Cut-set Definition	Notional Limit (MW)	
			Forward	Reverse
Present Network	CNSW - SNW	Wallerawang – Ingleburn 330 kV (1 circuit) Wallerawang – Sydney South 330 kV (1 circuit) Bayswater – Sydney West 330 kV (1 circuit) Bayswater – Regentville 330 kV (1 circuit) Liddell – Newcastle 330 kV (1 circuit) Liddell – Tomago 330 kV (1 circuit) Bannaby – Sydney West 330 kV (1 circuit) Marulan – Avon 330 kV (1 circuit) Marulan – Dapto 330 kV (1 circuit) Kangaroo Valley – Dapto 330 kV (1 circuit) Stroud – Brandy Hill 132 kV (1 circuit) Stroud – Tomago 132 kV (1 circuit) Hawks Nest tee – Tomago 132 kV (1 circuit)	7,525 (LIDD-NEWC) ³	N/A
Post 500 kV South Ring and North Ring	CNSW - SNW	Wallerawang – Ingleburn 330 kV (1 circuit) Wallerawang – Sydney South 330 kV (1 circuit) Bayswater – Sydney West 330 kV (1 circuit) Bayswater – Regentville 330 kV (1 circuit) Liddell – Newcastle 330 kV (1 circuit) Liddell – Tomago 330 kV (1 circuit) Bannaby – Sydney West 330 kV (1 circuit) Marulan – Avon 330 kV (1 circuit) Marulan – Dapto 330 kV (1 circuit)	10690 (BNBY – SYDW)*	N/A

³ The critical overloaded line is given in the brackets

		Kangaroo Valley – Dapto 330 kV (1 circuit) Stroud – Brandy Hill 132 kV (1 circuit) Stroud – Tomago 132 kV (1 circuit) Hawks Nest tee – Tomago 132 kV (1 circuit) Bannaby – South Creek 500 kV (2 circuits) Bayswater – Eraring 500 kV (2 circuits)		
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**When total NSW demand increases to 15,465MW, the cutset limit will increase to 11,735MW (South Creek – Sydney West 330). Beyond this additional reactive support will be required as well.*