

NEED/OPPORTUNITY STATEMENT & OPTION SCREENING ASSESSMENT (NOSA)



Renewables in North Western NSW

NOSA- 000000001904 revision 2.0

Ellipse project no(s):

TRIM file: [TRIM No]

Project reason: Reliability - To meet connection point reliability requirements and achieve market benefits

Project category: Prescribed - Connection

Approvals

| | | |
|------------------------------------|------------------|----------------------------|
| Author | Jay Esson | Network Planning Engineer |
| Endorsed | Jahan Peiris | Main Grid Planning Manager |
| | Andrew Kingsmill | Manager/Network Planning |
| Approved | Andrew Kingsmill | Manager/Network Planning |
| Date submitted for approval | 1 December 2017 | |

Change history

| Revision | Date | Amendment |
|----------|---------------|--------------------------|
| 0 | November 2017 | Initial issue |
| 1 | December 2017 | Project triggers updated |
| | | |
| | | |

1. Background

Support North Western NSW for Renewables

On 14 July 2017, COAG adopted the majority of recommendations of the *Independent Review into the Future Security of the National Electricity Market*. The adopted recommendations include the development of an integrated grid plan and identification of priority projects to facilitate the efficient development and connection of renewable energy zones.

It is probable that the integrated grid plan will identify renewable energy zones and priority projects in New South Wales. However, the location and scope of the renewable energy zones is not sufficiently certain to be included in the ex-ante capital expenditure forecast in the revenue proposal.

TransGrid has interest from renewable energy proponents seeking to connect to its network in North Western New South Wales. Therefore, it is probable that North Western New South Wales may be identified as a renewable energy zone in the integrated grid plan.

2. Need/opportunity

The network in North Western NSW is a parallel network of 132 kV lines connecting to the 330 kV substations at Tamworth and Armidale (see Figure 1).

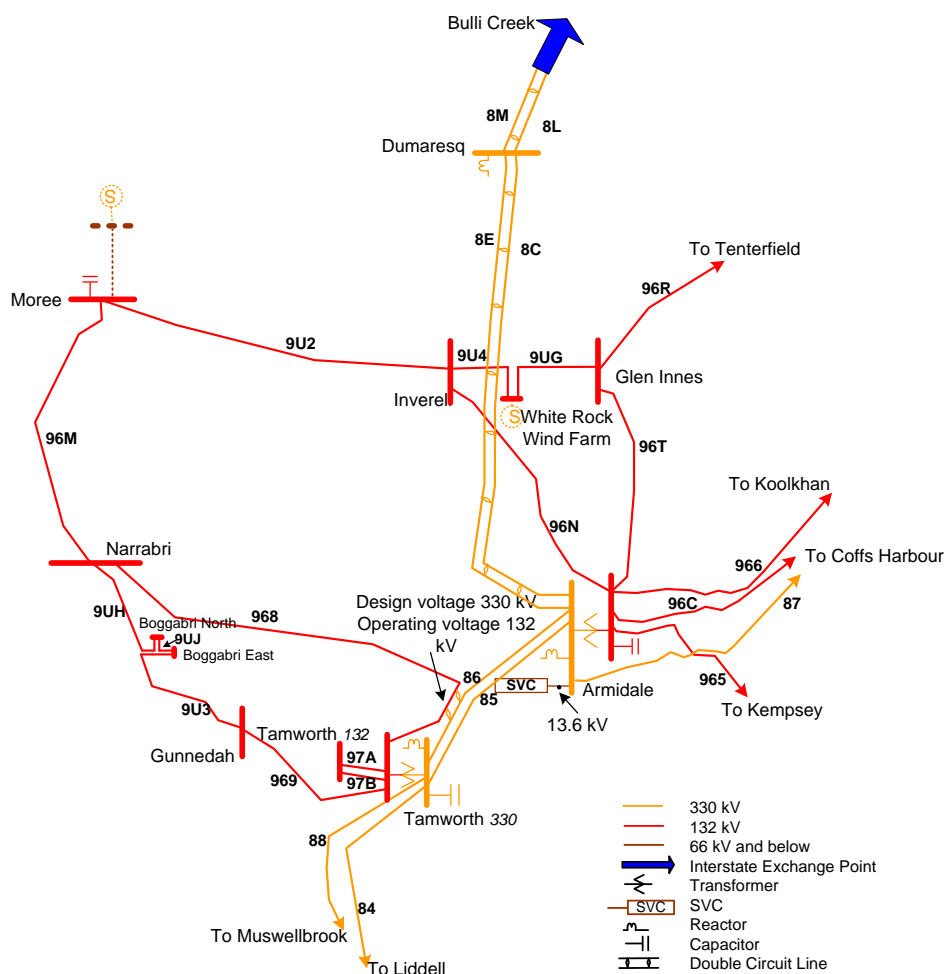


Figure 1 – North Western NSW area network

Table 2 – Generation connection interests – 330 kV

| Project | Capacity | Connection Point | Project Stage |
|------------|------------|------------------|---------------|
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |
| [REDACTED] | [REDACTED] | [REDACTED] | [REDACTED] |

This equates to 330 kV connections of:

- 270 MW of committed generation;
- 220 MW of advanced generation;
- Currently an additional 500 MW of enquiries;
- Plus 2 sites with multiple parties competing for capacity:

- [REDACTED]
- [REDACTED]

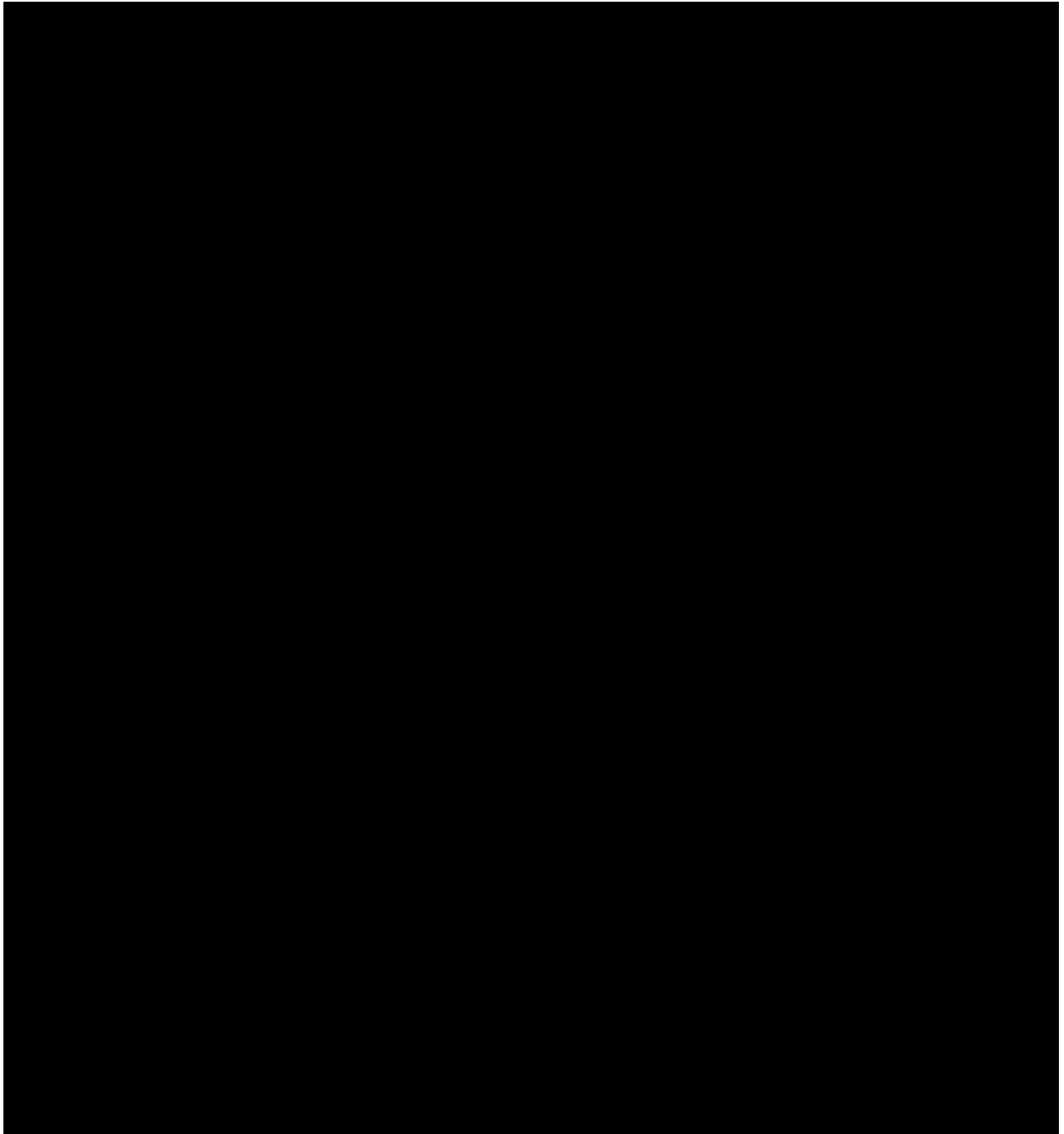


Figure 2 – North Western NSW area network with potential generator connections

It is anticipated that new generator connections in North Western NSW may deliver market benefits with additional augmentations to allow these new connections to generate without constraints placed upon them. The market benefits would be from the following key sources:

- Lower costs associated with meeting the supply reliability standard in New South Wales, through facilitating access to the output from these additional generation connections; and
- Lower market dispatch costs (and hence lower prices for consumers) resulting from the additional output from these additional generator connections.

Subject to commitment of over 800 MW of generation in North Western NSW, there may be an opportunity to expand the transmission network to realise the market and economic benefits of increased transmission capacity from the new generator connections in North Western NSW to the rest of the NEM.

3. Related needs/opportunities

Connections of new generation in North Western New South Wales will continue to be monitored.

4. Options Summary

Table 1 — Options

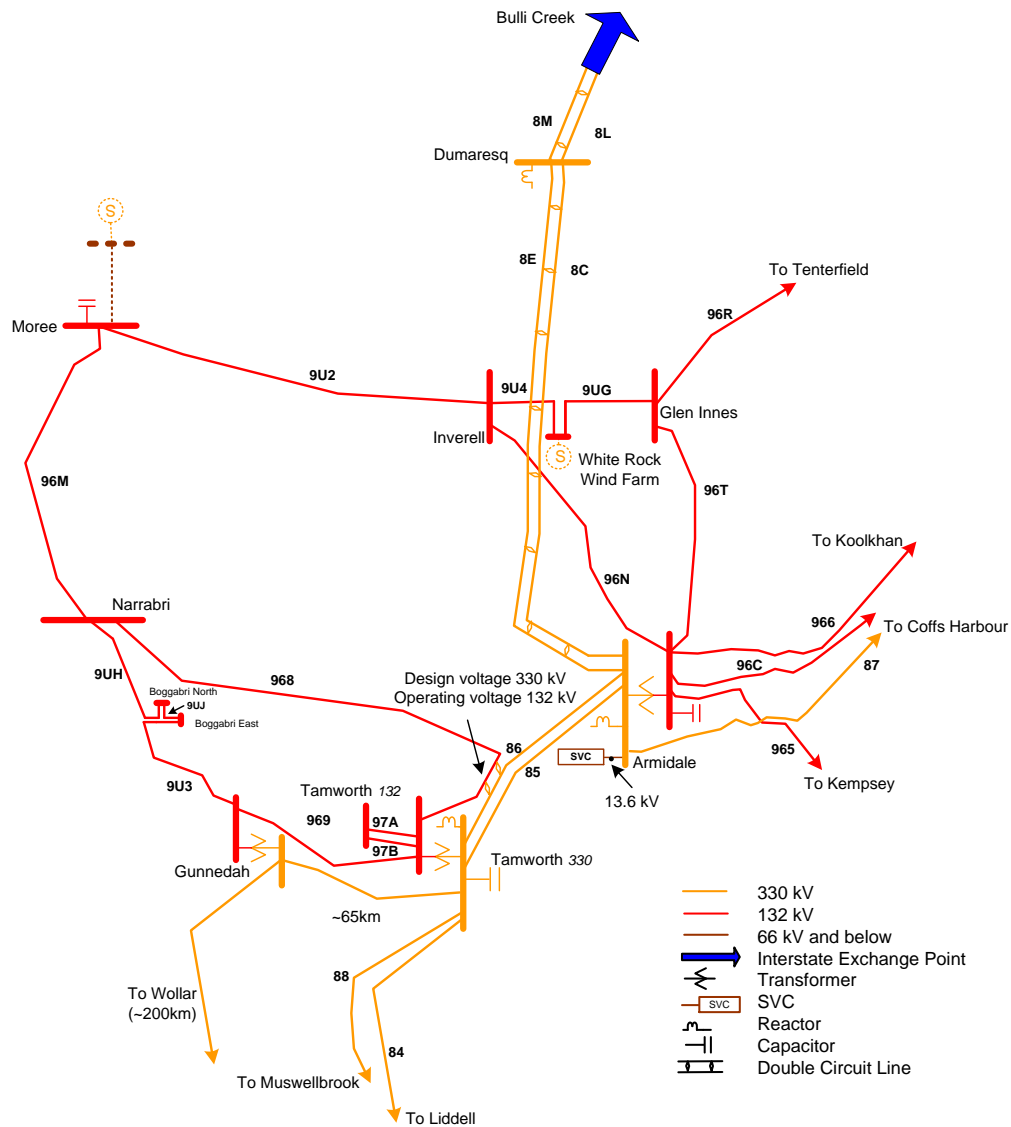
| Option | Short description | OFS required | Technically feasible |
|--------|--|--------------|----------------------|
| A | Wollar – Gunnedah – Tamworth 330 kV single circuit transmission line (+ 330 kV substations) | Yes | Yes |
| B | Wollar – Narrabri - Armidale 330 kV double circuit transmission line (+ 330 kV substations) | Yes | Yes |
| C | Liddell – Tamworth – Gunnedah – Wollar and Tamworth - Tenterfield – Armidale 330 kV single circuit transmission line (+ 330 kV substations) | Yes | Yes |
| D | Wollar – Gunnedah – Narrabri – Moree – Sapphire 330 kV double circuit transmission lines (+ 330 kV substations + 969 upgrade to 330 kV) | Yes | Yes |
| E | Wollar – Gunnedah, Gunnedah – Tamworth, Gunnedah – Armidale East, Tamworth – Armidale East, Armidale East – Sapphire 330 kV single circuit transmission lines (+ 330 kV substations) | Yes | Yes |

NP&O/Project Development shall undertake Options Feasibility Studies for the options as indicated in Table 1 above. The assessments shall include consideration of the cost, timing of activities, risk analysis and practicality of being able to carry out the works.

The Option Feasibility Study for Option E is required by 31 October 2017. The studies for the other options are required 30 April 2018, and high level costings to be provided by February 2018.

5. Options

5.1 Option A: Wollar – Gunnedah – Tamworth 330 kV single circuit transmission line (+ Gunnedah 330 kV substation)



Tentative ultimate possible with this option:

- Gunnedah – Narrabri – Moree – Mid-South Queensland 330 kV transmission lines (+ Moree – Sapphire 330 kV transmission line) OR
- Armidale – Glen Innes – Tenterfield – South-East Queensland 330 kV transmission lines
- Future: duplicate Wollar - Gunnedah, turn 5A3 into Wollar

Transmission line works:

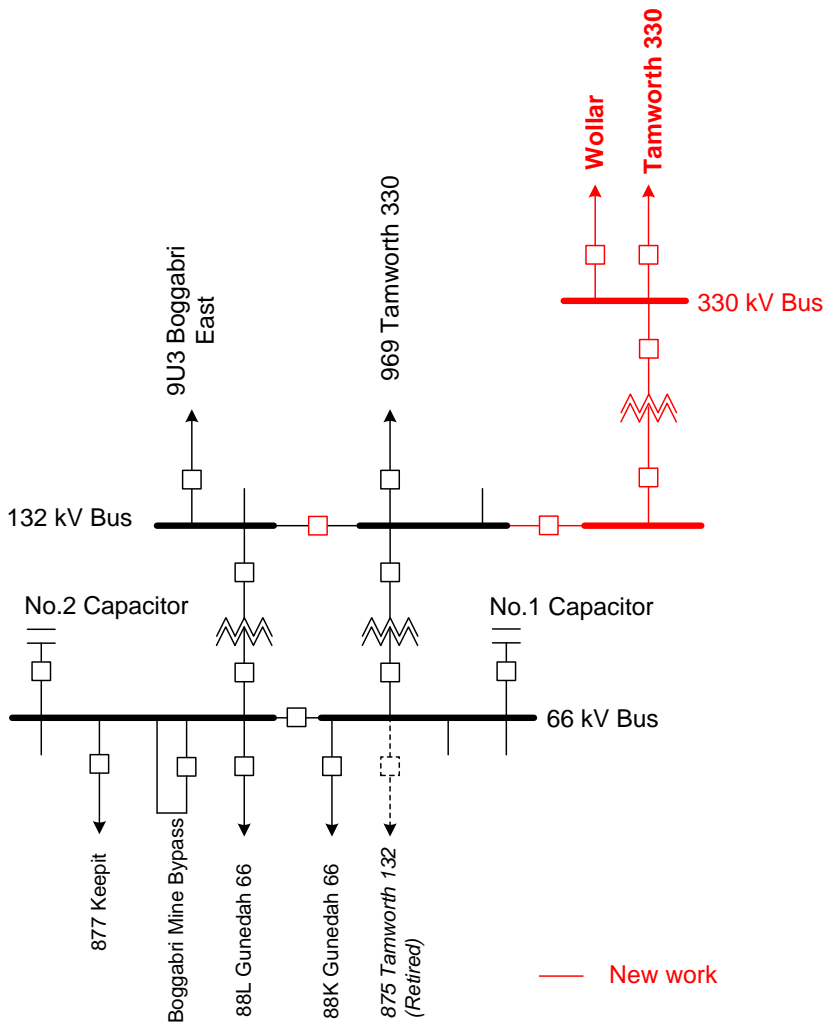
All transmission lines are to be single circuit, 330 kV, strung with twin olive conductor:

- ~200km Wollar – Gunnedah

- ~65km Gunnedah – Tamworth

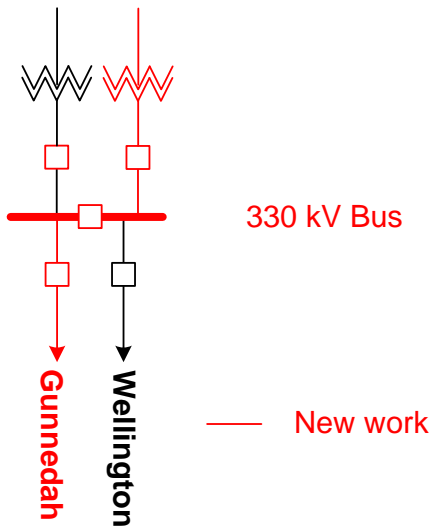
Substation works:

Gunnedah 330/132/66 kV Substation

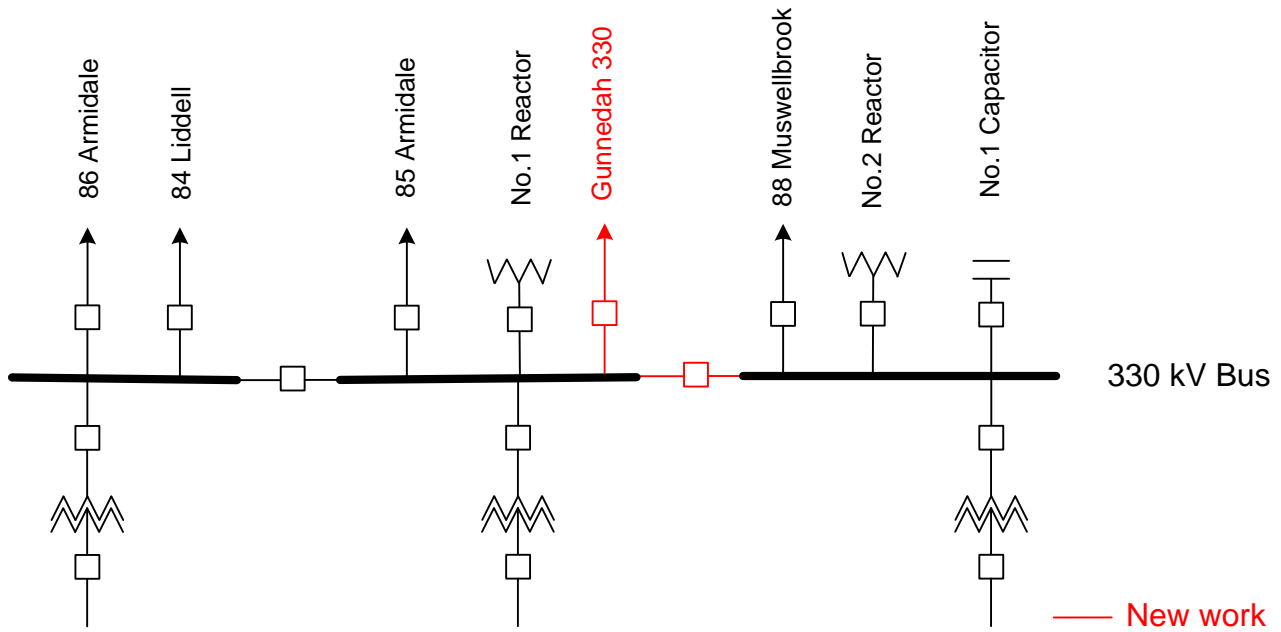


New connection at Wollar 330

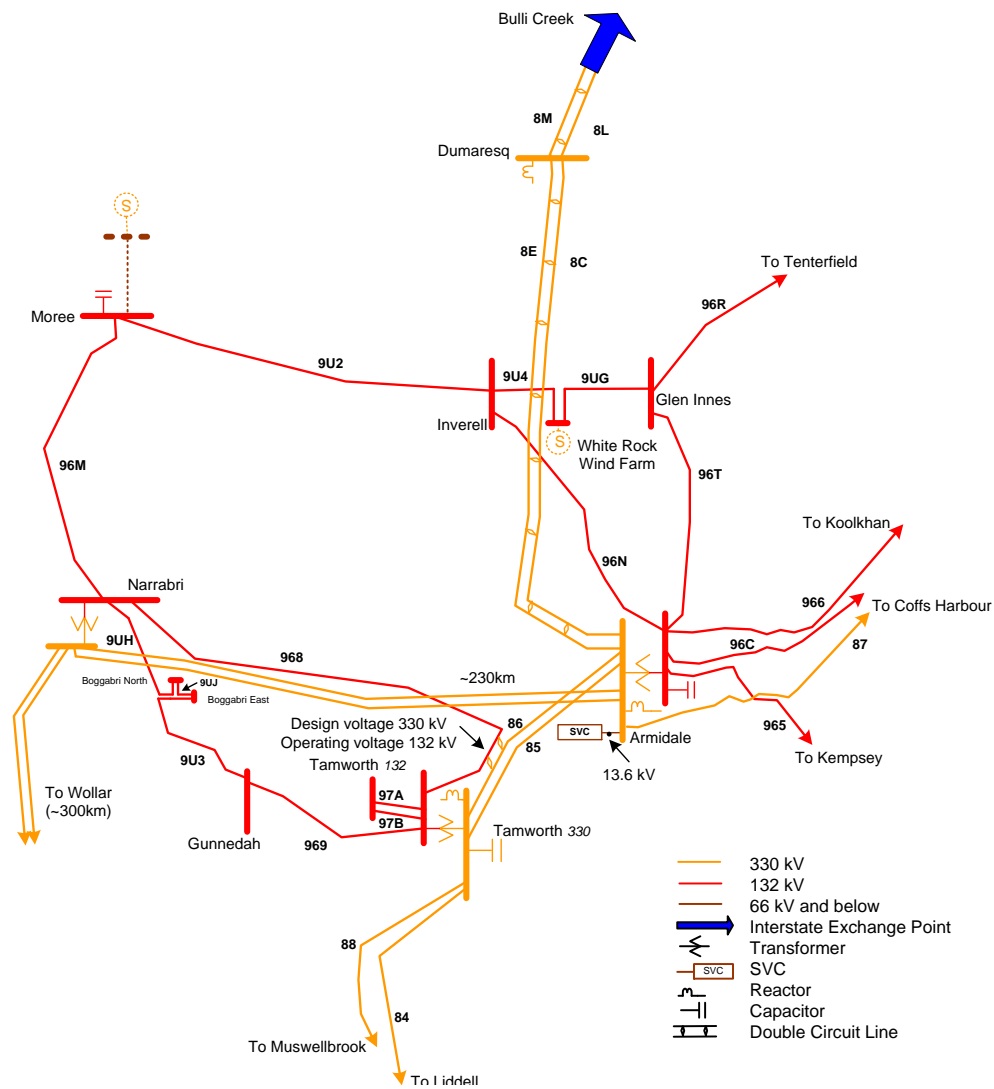
To 500 kV Bus



New connection at Tamworth 330



5.2 Option B: Wollar – Narrabri - Armidale 330 kV double circuit transmission line (+ 330 kV substations)



Tentative ultimate possible with this option:

- Narrabri – Moree – Mid-South Queensland 330 kV transmission lines OR
- Armidale – Glen Innes – Tenterfield – South-East Queensland 330 kV transmission lines
- Future: duplicate Wollar - Narrabri, turn 5A3 into Wollar

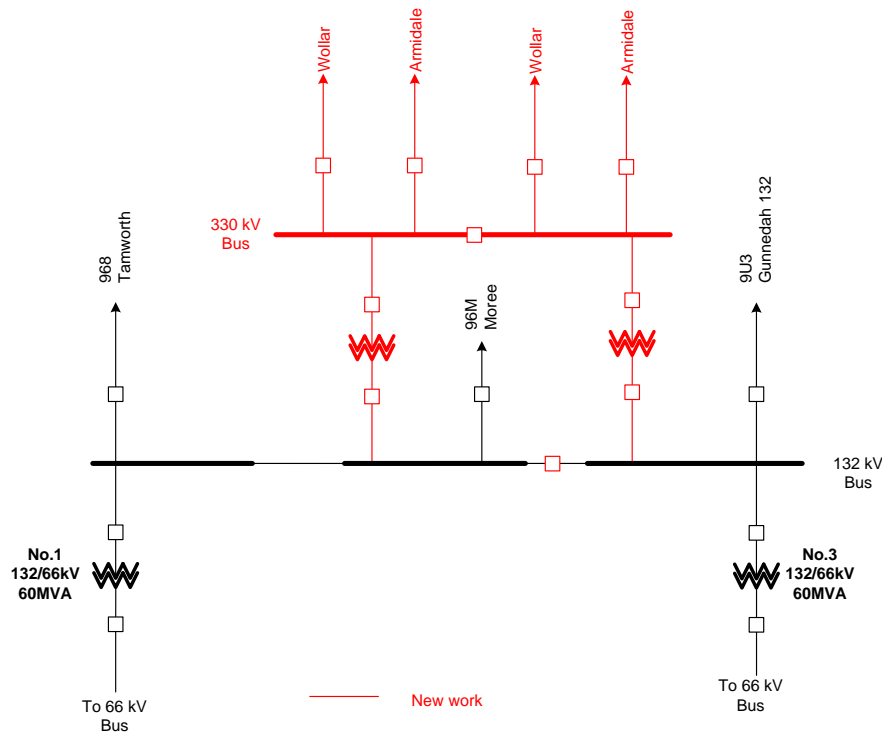
Transmission line works:

All transmission lines are to be constructed as double circuit with twin olive conductor.

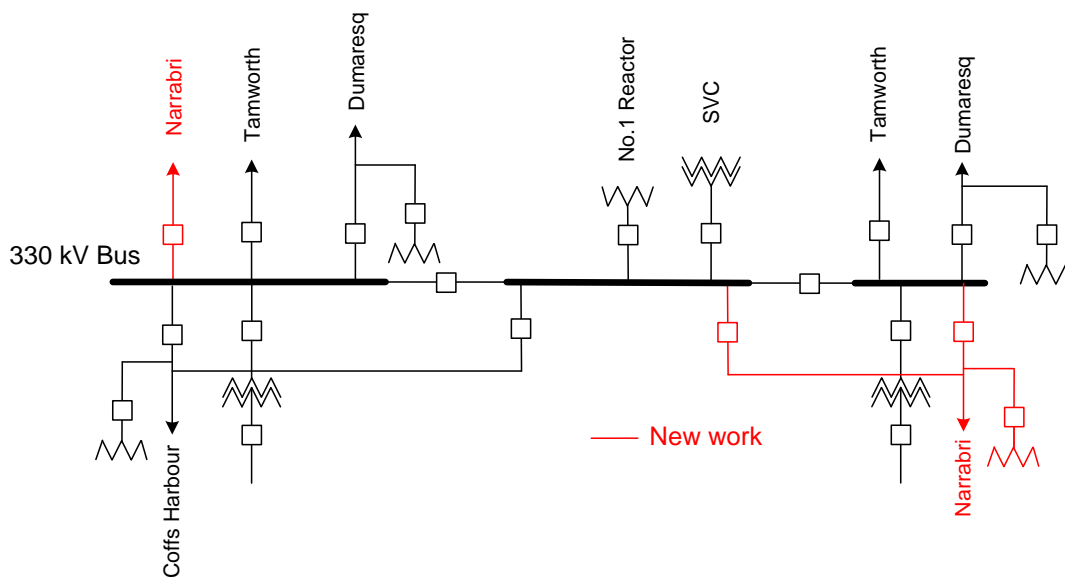
- ~200km Wollar – Narrabri
- ~230km Narrabri – Tamworth

Substation works:

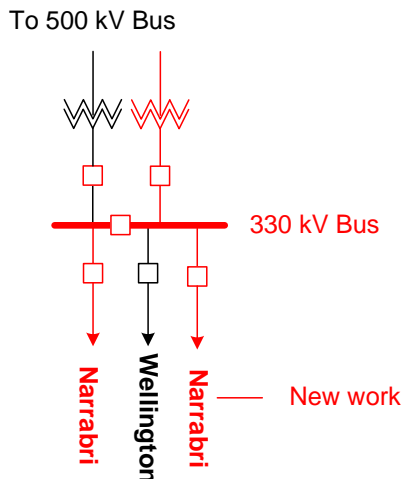
New Narrabri 330/132/66 kV station



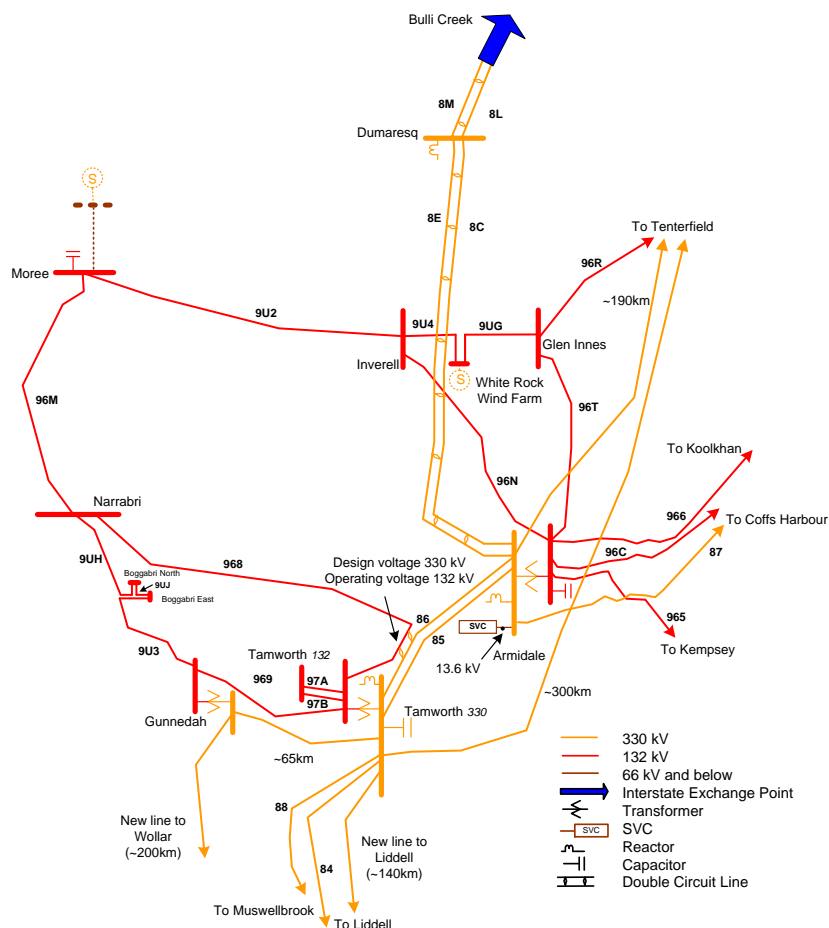
New connection at Armidale 330



New connection at Wollar 330



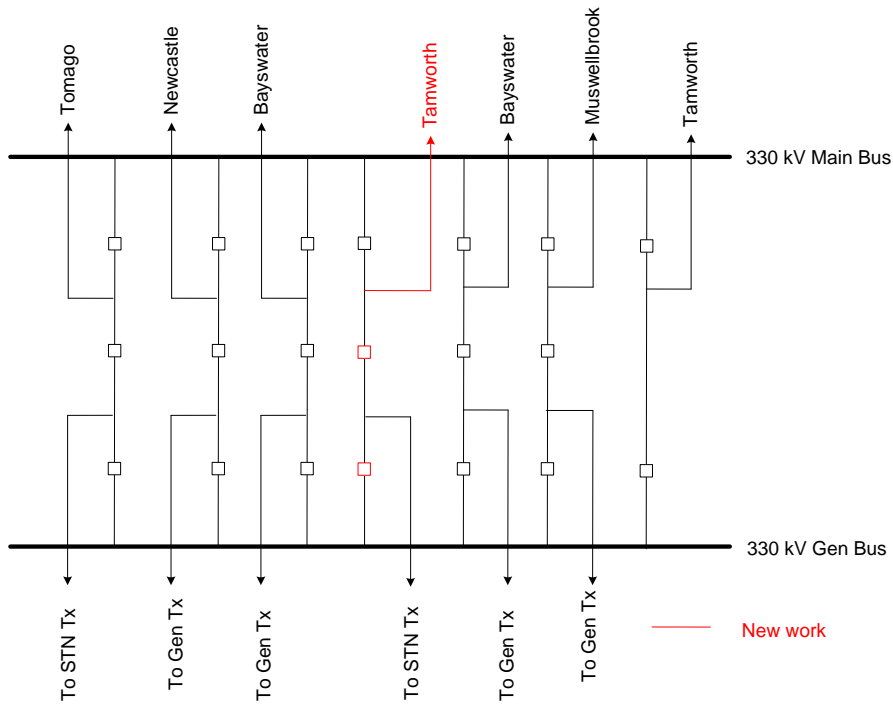
5.3 Option C: Liddell – Tamworth – Gunnedah – Wollar and Tamworth - Tenterfield – Armidale 330 kV single circuit transmission line (+ 330 kV substations)



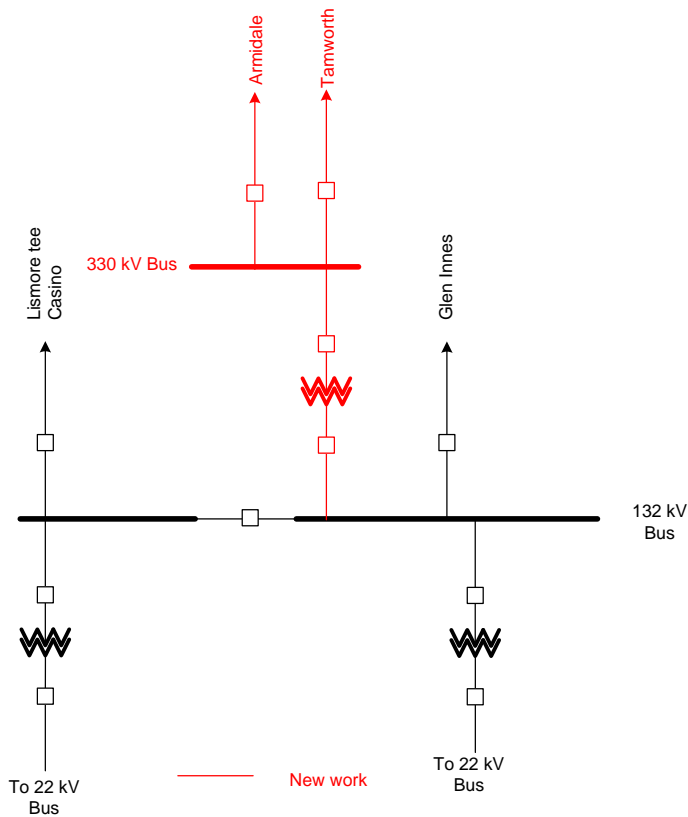
Tentative ultimate possible with this option:

- a) Tenterfield – South-East Queensland 330 kV transmission line

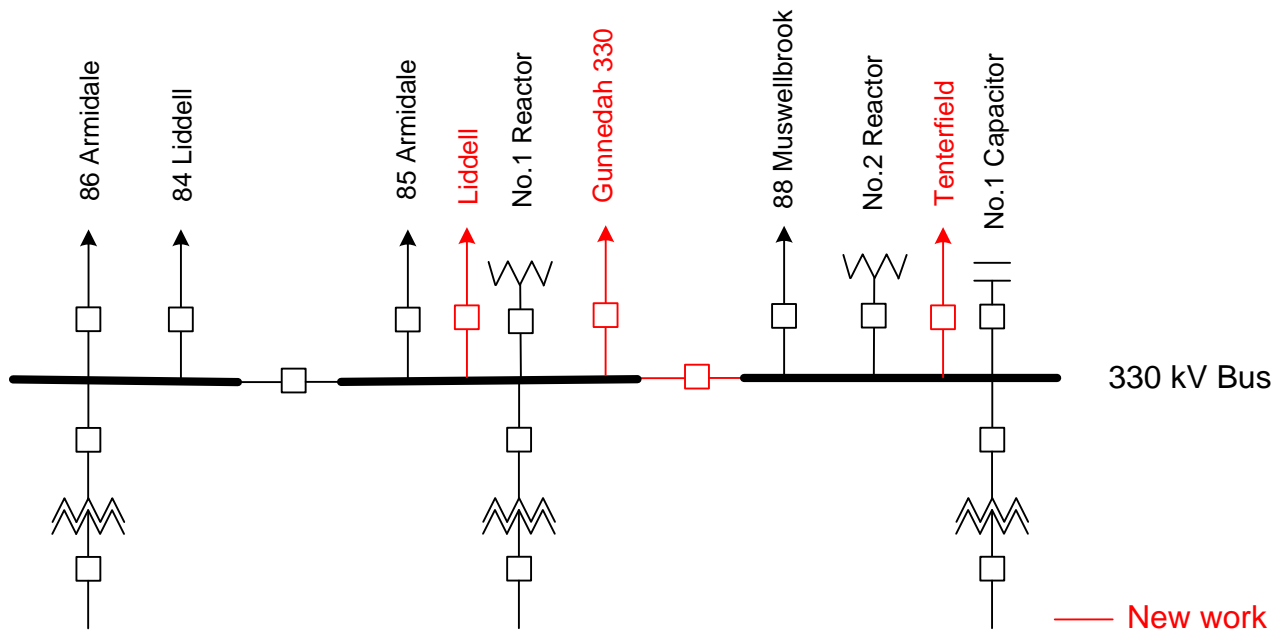
New connection at Liddell 330



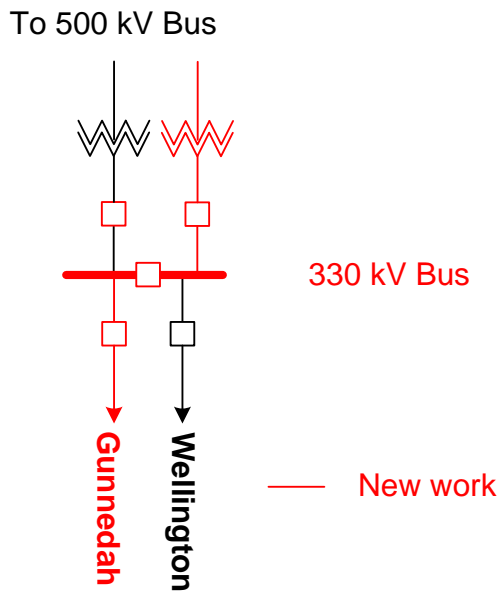
Tenterfield 330/132/66 kV Substation



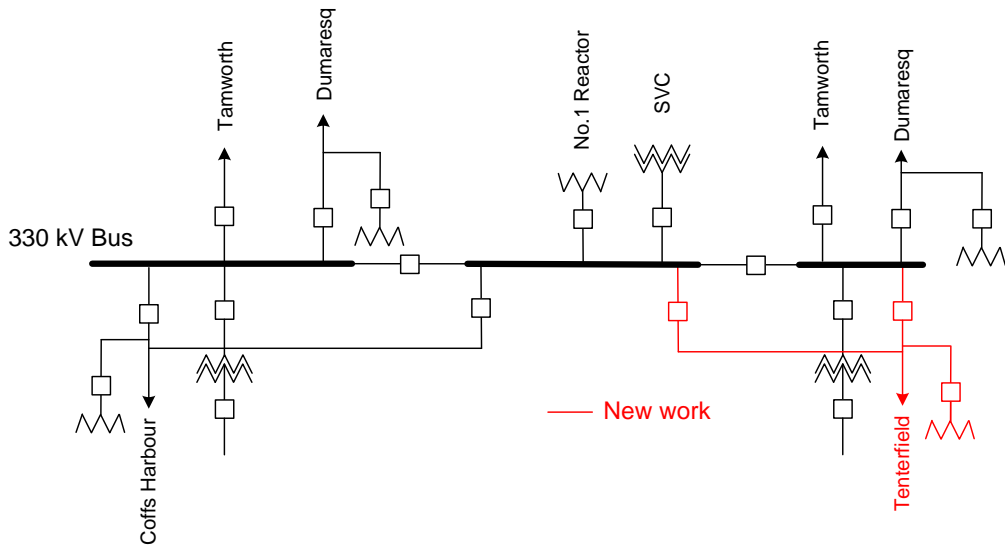
New connections at Tamworth 330



New connection at Wollar 330

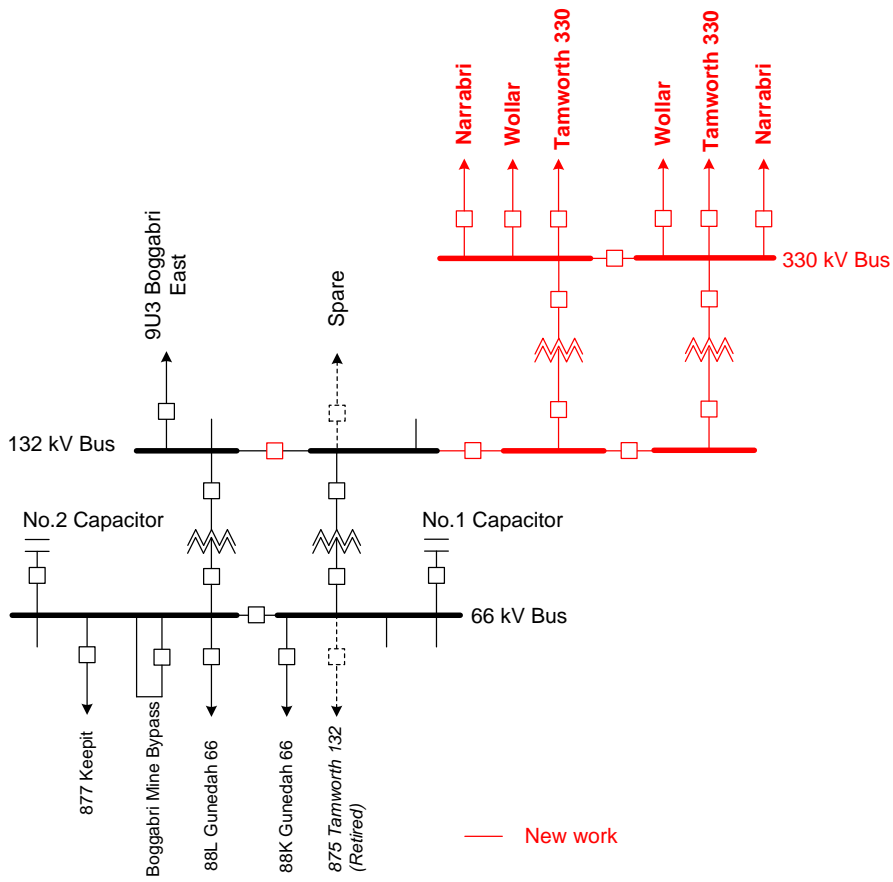


New connection at Armidale 330

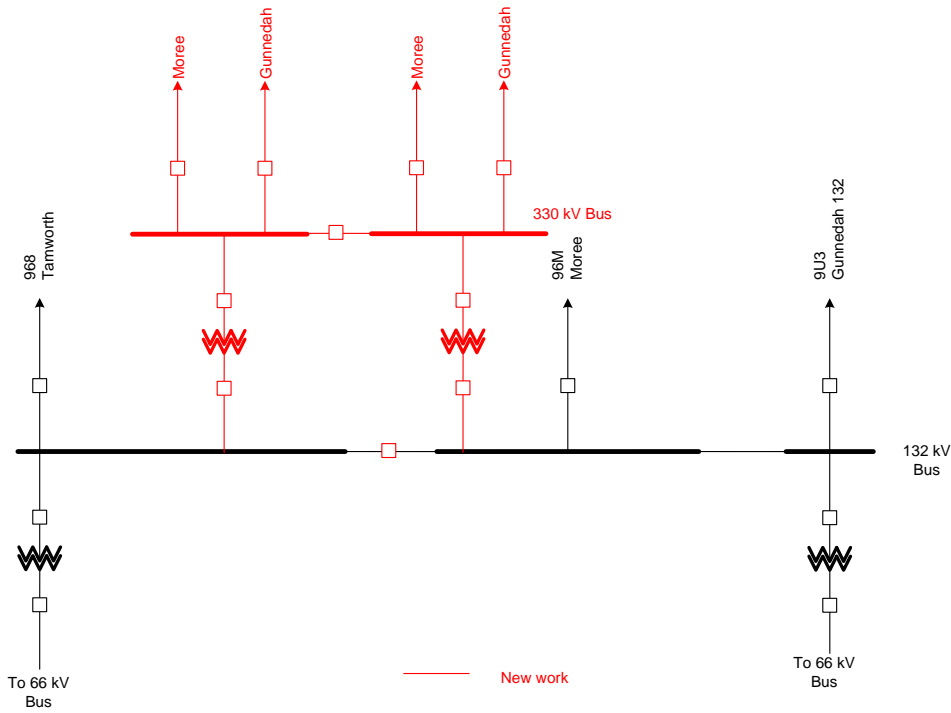


Substation works:

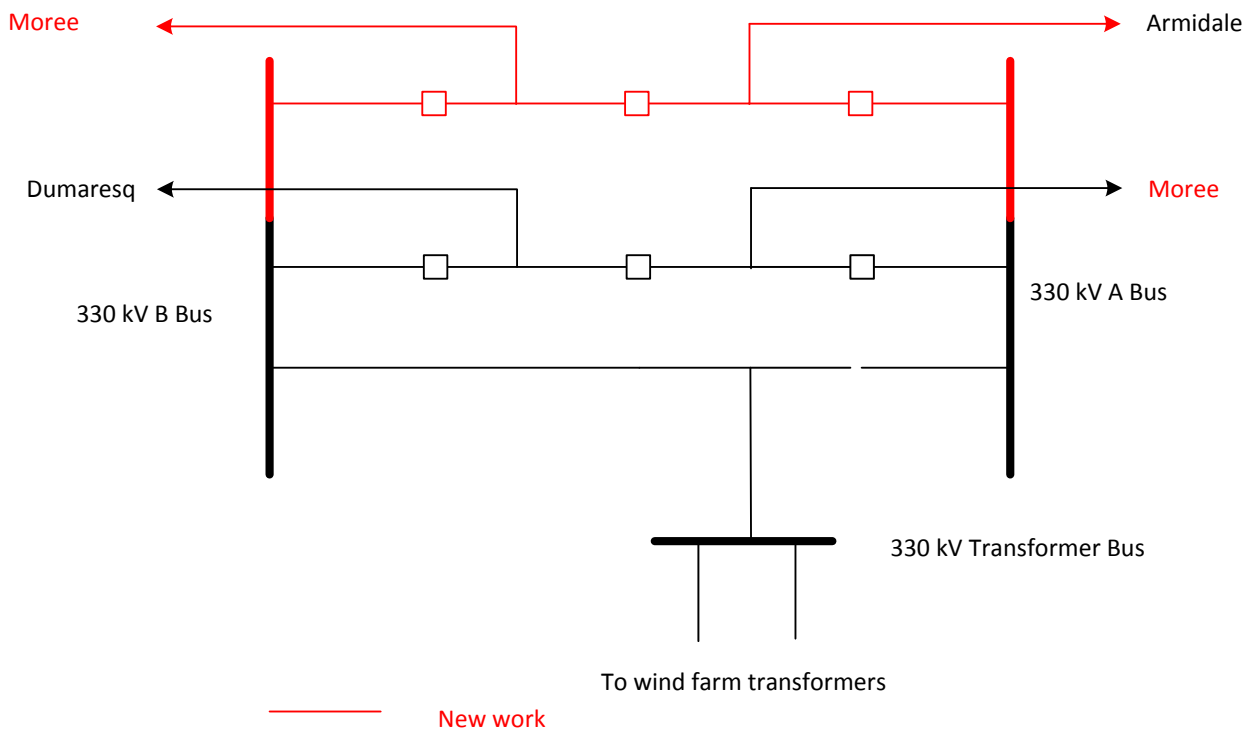
New Gunnedah 330/132/66 kV station



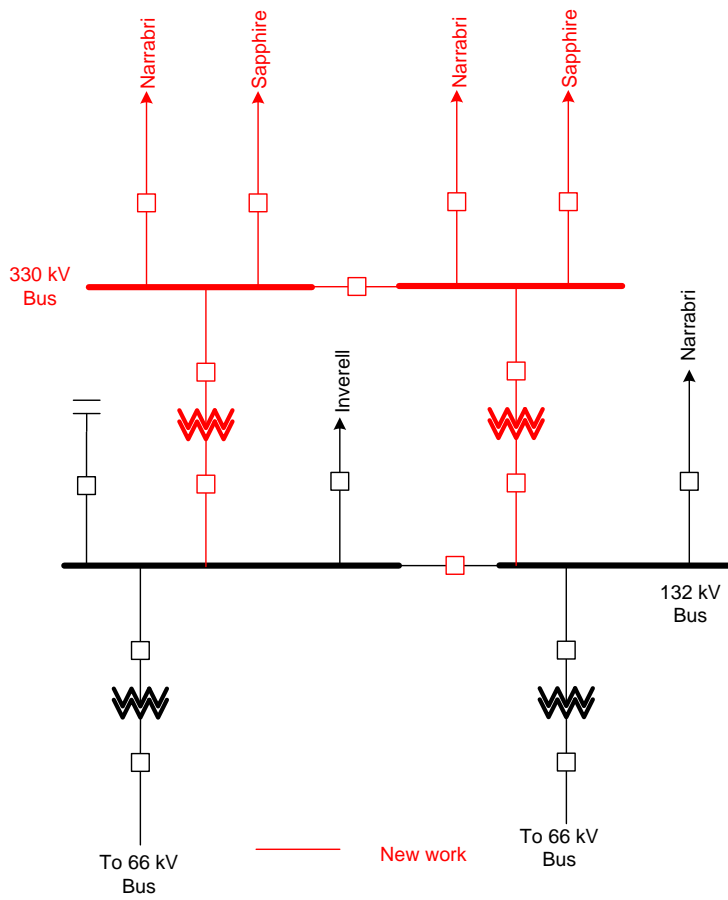
New Narrabri 330/132/66 kV station



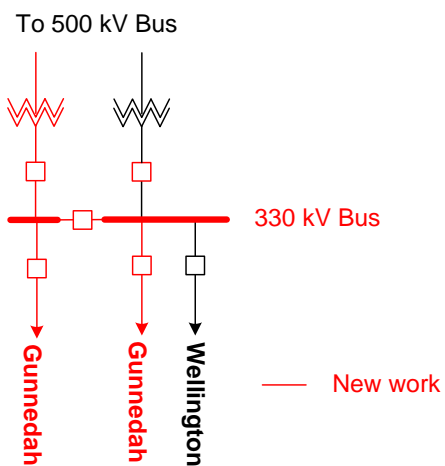
Sapphire 330 kV switching station



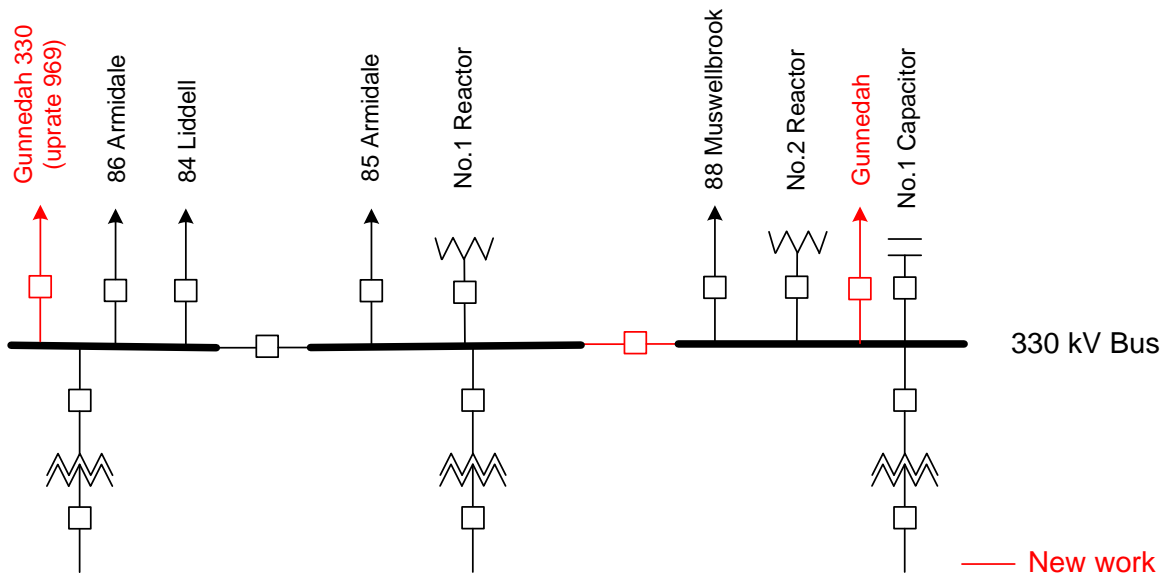
New Moree 330/132/66 kV station



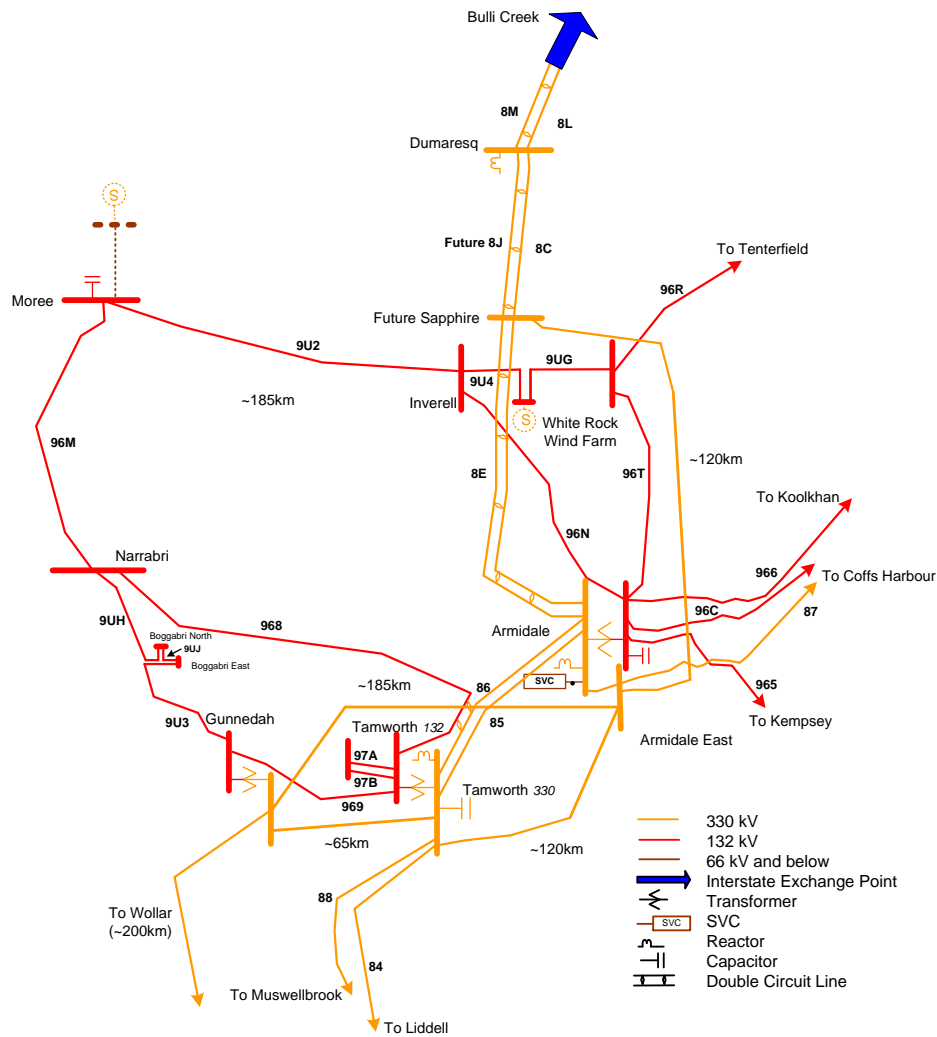
New connection at Wollar 330



New connection at Tamworth 330



5.5 Option E: Wollar – Gunnedah, Gunnedah – Tamworth, Gunnedah – Armidale East, Tamworth – Armidale East, Armidale East – Sapphire 330 kV single circuit transmission lines (+ 330 kV substations)



Tentative ultimate possible with this option:

- a) Glen Innes –South-East Queensland 330 kV transmission lines
- b) Future: turn 5A3 into Wollar

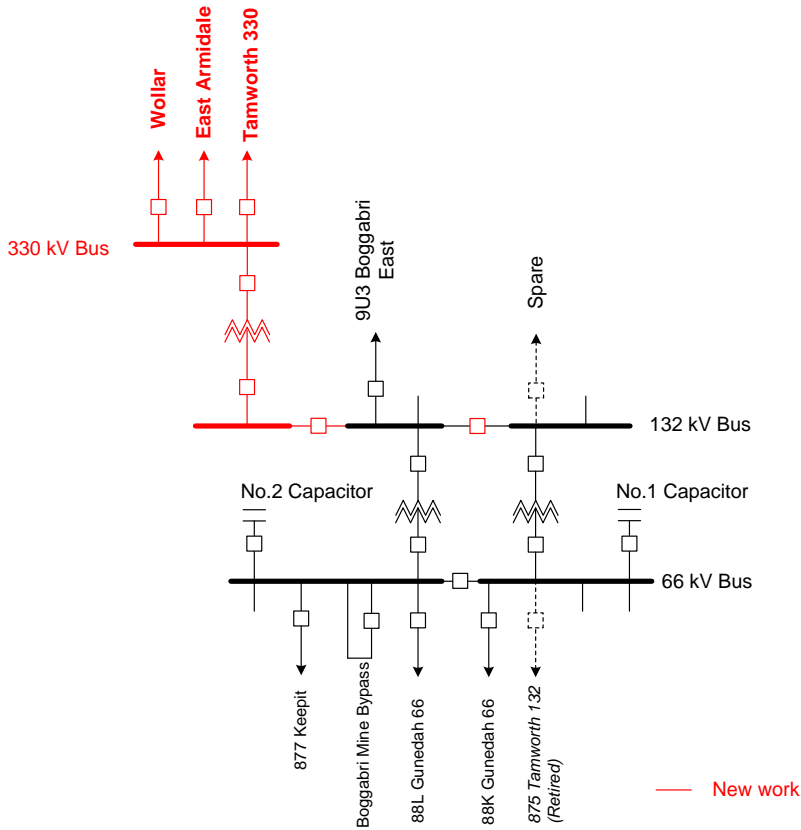
Transmission line works:

All transmission lines are to be single circuit, 330 kV, strung with twin olive conductor:

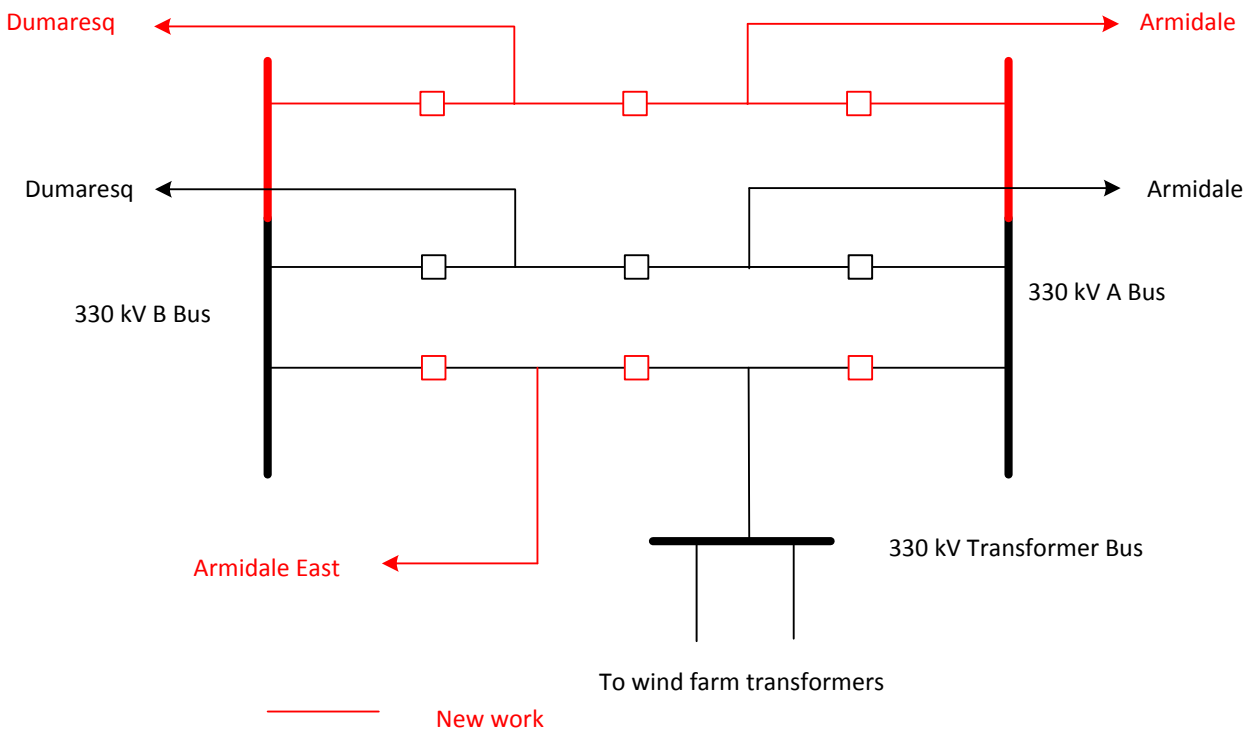
- ~200km Wollar – Gunnedah
- ~65km Gunnedah – Tamworth
- ~185km Gunnedah to Armidale East
- ~120km Tamworth – Armidale East
- ~120km Armidale East – Sapphire

Substation works:

New Gunnedah 330/132/66 kV station

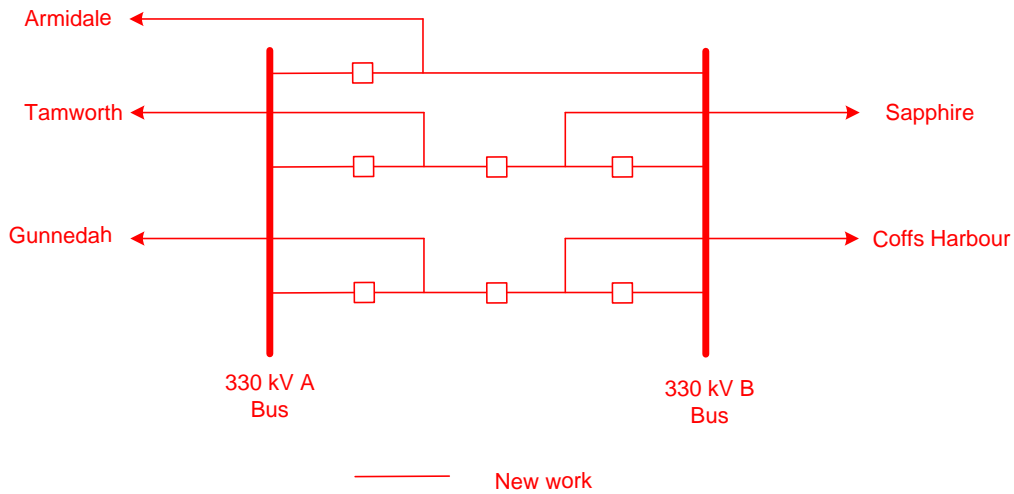


Sapphire 330 kV switching station

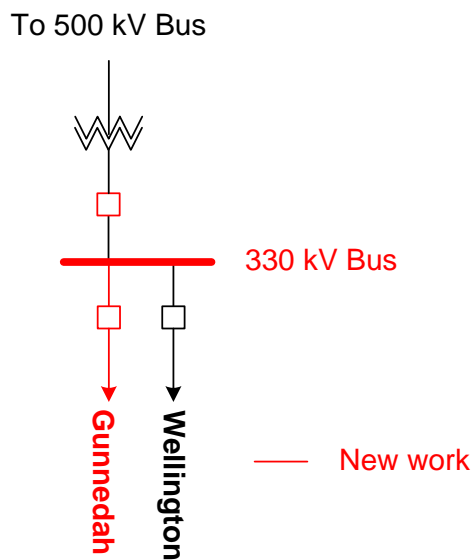


New Armidale East 330 kV switching station

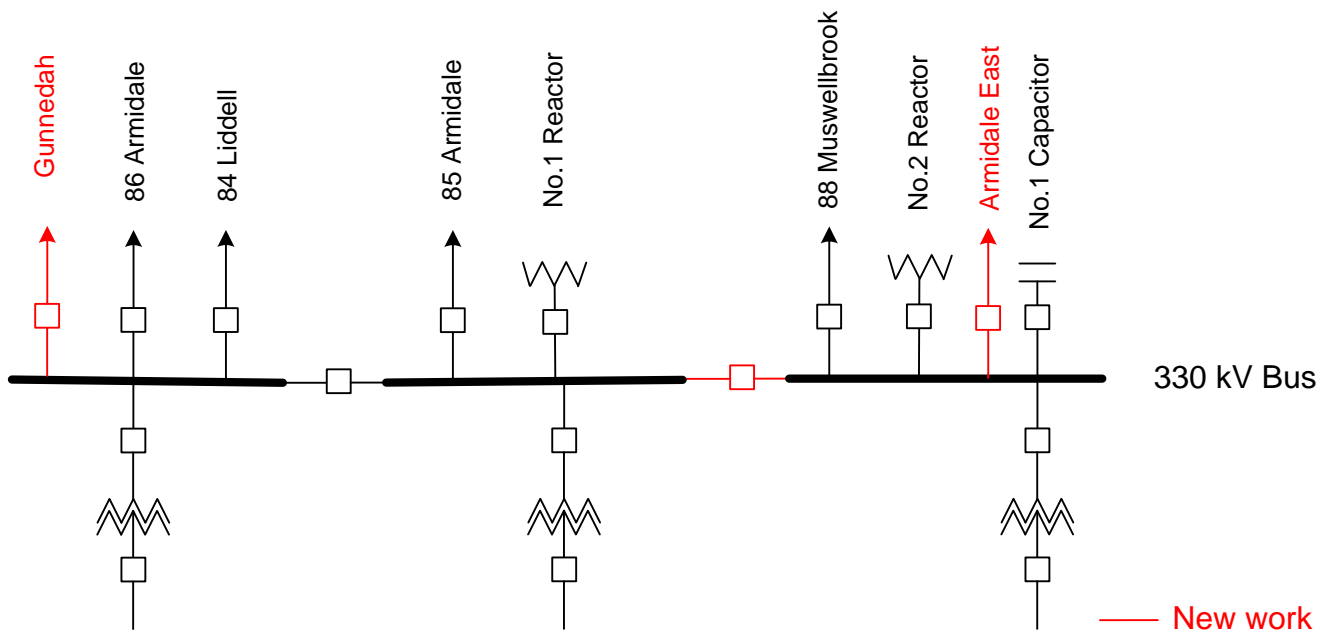
Armidale East 330 kV switching station is to be established somewhere along 87 transmission line, close to existing Armidale substation. It could be adjacent to the existing substation or further away if a short section of 330 kV transmission line is not preferred.



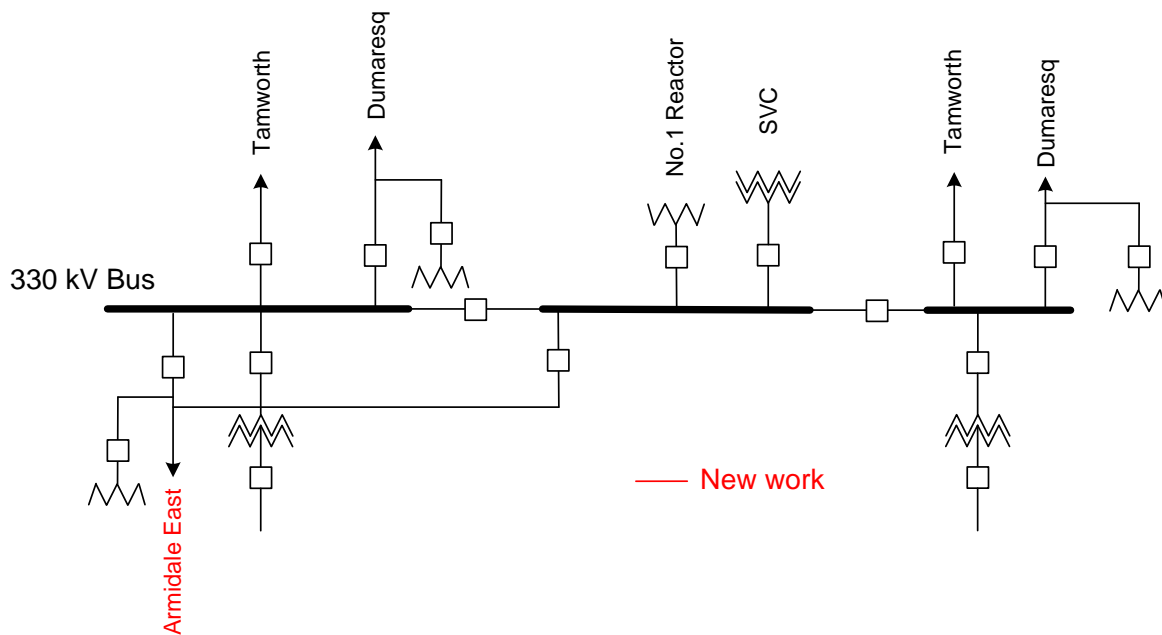
New connection at Wollar 330



New connections at Tamworth 330



Bay rename at Armidale 330



The same bay rename will also be required at Coffs Harbour substation.

6. Recommendation

It is recommended that options be considered to address the identified need/opportunity and further progressed to undertake Option Feasibility Studies.

It is also recommended that TransGrid propose a contingent project for the transmission network developments in New South Wales north western area in the revised revenue proposal for 2018-2023. The contingent project would have the following triggers:

- (a) New generation more than 800 MW is committed in North Western NSW (north of Bayswater and Liddell)
- (b) Two or more of the following:
 - (i) Inclusion of renewable energy zones in North Western NSW in AEMO's Integrated Grid Plan or similar plan as recommended by the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council
 - (ii) Notification to TransGrid by the Federal Government, COAG Energy Council, NSW Government or the Energy Security Board that it considers that augmentation of the transmission network to deliver increased capacity from North Western NSW is required in order to meet or manage the expected demand for prescribed transmission services or comply with an applicable regulatory obligation or requirement associated with the provision of prescribed transmission services
 - (iii) Successful completion of a RIT-T or alternate framework introduced in response to the recommendation of the Independent Review in to the Future Security of the National Electricity Market by Professor Alan Finkel and accepted by the COAG Energy Council (including comprehensive assessment of credible options) demonstrating that increasing capacity of the network in North Western NSW at 330/132kV or other voltages used in future is the option that maximises the positive net economic benefits
 - (iv) Determination by the AER that the proposed investment satisfies the RIT-T or abovementioned alternate framework
- (c) TransGrid Board commitment to proceed with the project subject to the AER amending the revenue determination pursuant to the Rules.

The trigger is specific and capable of objective verification, relates to a specific location or locations, and is probable but too uncertain to include the proposed contingent project in the forecast capital expenditure in this proposal.