

NEED/OPPORTUNITY STATEMENT (NOS)



Multiple 330 kV Cable outages

NOS- 000000001425 revision 3.0

Ellipse project description: P0008204
TRIM file: [TRIM No]

Project reason: Reliability - To meet overall network reliability requirements

Project category: Prescribed - Augmentation

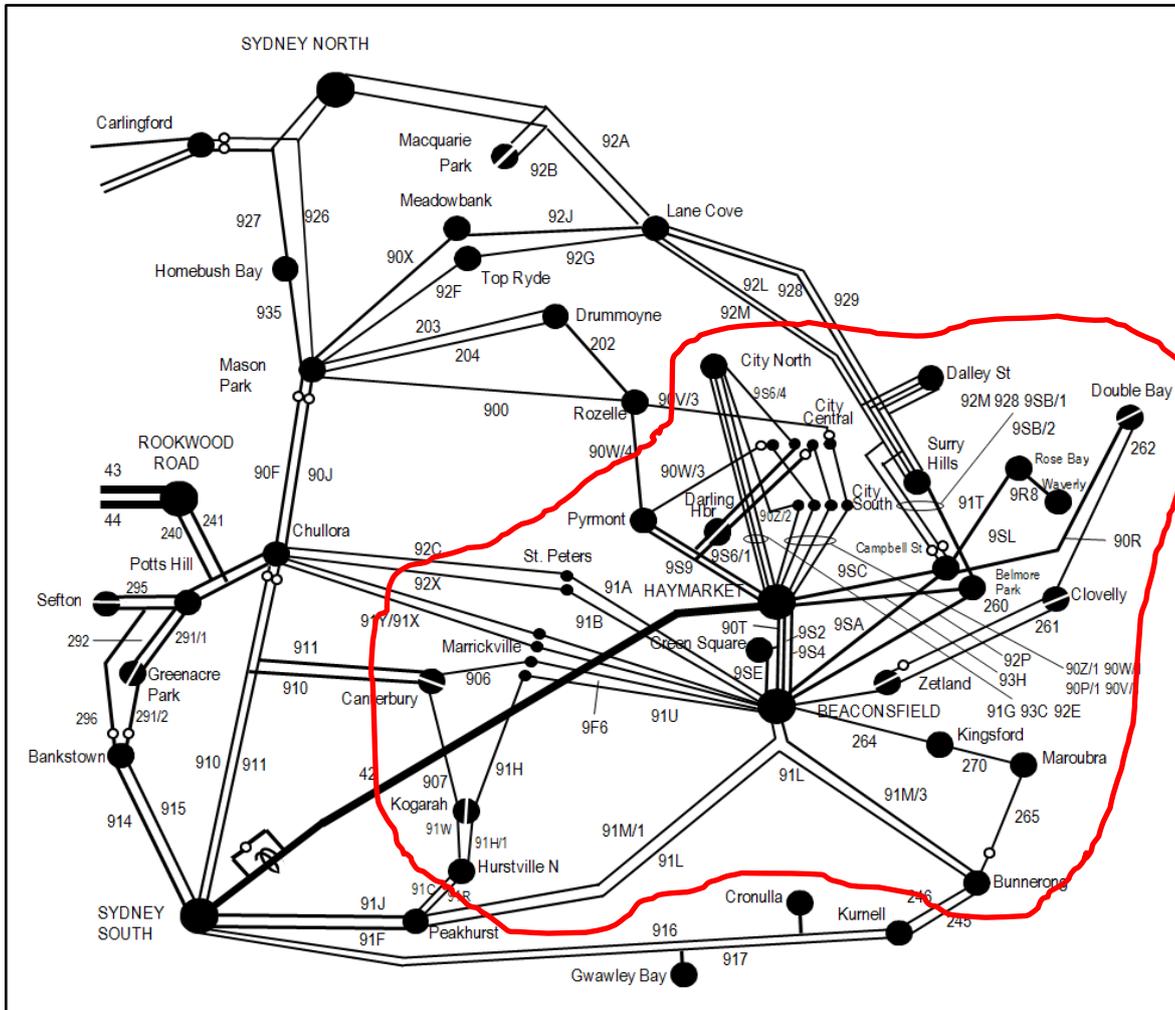
Approvals

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Date submitted for approval	9 January 2017	

1. Background

The Sydney CBD is supplied by the 330 kV Cables 41 and 42, as well as an interconnected 132 kV network as shown in Figure 1. The network is planned to provide supply reliability as per the “modified N-2” criteria as outlined in the NSW planning standard. While the “modified N-2” criteria¹ includes a simultaneous failure of a 330 kV cable and a 132 kV cable, it does not anticipate a simultaneous failure of two 330 kV cables.

Figure 1: City area loads at risk for the loss of the remaining 330 kV cable.



In securely operating the power system, as defined by Clause 4.2.6 of the National Electricity Rule (NER), following a contingent trip of either 330kV cables in the Sydney CBD, it may be necessary to radialise a significant block of CBD load (approximately 400 MW), within 30 minutes of the contingency taking place, to cater for the next contingency. While the power system is planned to avoid any loss of load as a result of a subsequent failure of a 132 kV cable, a subsequent failure of the another 330 kV cable will result in the loss of all the radialised loads. The current transmission limitations is therefore the contingent ratings of Ausgrid 132 kV cables in Sydney area that does not cater for the loss of a 330kV cable.

¹ IPART, Electricity Transmission Reliability Standards – An Economic Assessment

2. Need/opportunity

There is an opportunity to improve the contingent capability of the Ausgrid 132 kV network in Sydney area by reducing the amount of load at risk following a trip either 330kV cables within the CBD.

The amount of energy not served in the event of a simultaneous failure of two 330 kV cables can be approximated from the historical cable failure rate, the cable repair time and the expected annual load cycle. This has been assessed as follows:

- > Load at risk assessed for Summer 2019/20²
- > 330 kV cable failure rate = 0.11 / unit / annum with a cable repair time of 788 hours per event³
- > 132 kV Ausgrid cable failure rate = 0.29 / unit / annum^{2,4}
- > 132 kV Ausgrid overhead (OH) line failure rate = 0.05 / unit / annum^{2,4}

$$\text{Unserved Energy} = \sum_{\substack{\text{for all} \\ \text{Ausgrid} \\ \text{feeders}}} \left[\text{MW at risk} * \text{Cable 41 failure rate} * \text{Cable 42 failure rate} * \right. \\ \left. \text{Ausgrid feeder failure rate} * \text{cable outage duration} \right]$$

$$\text{Unserved Energy} = 11\% * 11\% * 788 \text{ hrs} \sum_{\substack{\text{for all} \\ \text{Ausgrid} \\ \text{feeders}}} [\text{MW at risk} * \text{Ausgrid feeder failure rate}]$$

$$\therefore \text{Unserved Energy} = 521.68 \text{ MWh}^5$$

In addition, there are financial and reputational risk costs of \$0.02m per annum.

Therefore the total risk cost = \$20.02m per annum

3. Related needs/opportunities

- > Need DCN43 – Supply to Sydney Inner Metropolitan Area and CBD
Need 1425 is independent of Need 43. These Needs are related only in that they apply to the same geographical area.

4. Recommendation

It is recommended that the potential loss of radial load in the Sydney CBD following the first credible contingent trip of either 330kV cable at times of high CBD demand be addressed before 2020.

² This is deemed a reasonable estimate of the average load at risk over the 2018-23 regulatory period.

³ IPART, *Electricity Transmission Reliability Standards – An Economic Assessment*.

⁴ If Ausgrid feeder is also out of service, the load at risk will be higher

⁵ Refer to the attached file "1425- Unserved Energy.xlsx"

Attachment 1 Risk costs summary

Current Option Assessment - Risk Summary



Project Name: Cables41 & 42 SCADA Transfer Loads Trip

Option Name: 1425 - Base Case

Option Assessment Name: 1425 - Base Case - Assessment 1

Rev Reset Period: Next (2018-23)

Major Component	No.	Minor Component	Sel. Hazardous Event	LoC x CoF (\$M)	Failure Mechanism	NoxLoC xCoF (\$M)	PoF (Yr 1)	Total Risk (\$M)	Risk (\$M) (Rel)	Risk (\$M) (Op)	Risk (\$M) (Fin)	Risk (\$M) (Peo)	Risk (\$M) (Env)	Risk (\$M) (Rep)
Cable 41 and 42 failure	1	High Voltage Cable	Unplanned Outage - HV (Cable 41 and 42 failure)	\$20.02	Infrastructure Failure	\$20.02	100.00%	\$20.02	\$20.01		\$0.00			\$0.01
				\$20.02		\$20.02		\$20.02	\$20.01		\$0.00			\$0.01

Total VCR Risk: \$20.01

Total ENS Risk: \$0.00

