NEED/OPPORTUNITY STATEMENT (NOS)

Making the Grid More Flexible - Rapid Restoration following Busbar Trips

NOS- 000000001422 revision 4.0

Ellipse project no(s):
TRIM file: [TRIM No]

Project reason: Reliability - To meet connection point reliability requirements
Project category: Prescribed - NCIPAP

Approvals

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Date submitted for approval	12 July 2016	

1. Background

This proposal forms part of the Network Capability Incentive Parameter Action Plan (NCIPAP), for the 2018/19 to 2022/23 regulatory control period. The NCIPAP portion of the STPIS described in section 5 of the STPIS guideline[1] is a plan consisting of a suite of small projects aimed at improving the capability of transmission assets through operational expenditure and minor capital expenditure on the transmission network which results in:

- Improved capability of those elements of the transmission system most important to determining spot prices; OR
- Improved capability of the transmission system at times when Transmission Network Users place greatest value on the reliability of the transmission system.

This project proposes a *priority project* to improve the limit of the injection point for the benefit of the Transmission Network Users. This *priority project* is consistent with the requirements of the clause 5.2(a)(2) in section 5 of the STPIS guideline and is consistent with the objectives of the NCIPAP scheme[2].

Busbar trips are rare, high consequence outages. Protection operation is most commonly initiated by: human error, a stuck or slow CB, debris or HV plant failure. Short circuits faults occurring at a busbar are low impedance / high energy that may damage HV equipment (for example welding disconnector contacts closed).

In metropolitan areas a bus trip is unlikely to result in loss of load due to meshed networks and diversity of supplies. However, in country areas, radial feeders are the norm and a bus trip will often result in a supply interruption, and injection point constraints. Given their rarity and close association with plant failure, busbar protections are designed to latch and must be reset at site before the busbar may be re-energised. Following the protection operation, TransGrid must call-out staff, have them travel to site, inspect the equipment and investigate the fault source before attempting restoration. Though the load interrupted is small, the duration of such outages results in a significant unserved energy.

During bus outages, the connection points' supply capacities are limited to 0 MW.

2. Opportunity

Leveraging off the rollout of modern control systems and availability of broadband communications it is proposed to provide the Asset Monitoring Centre with high definition Closed Circuit Television (CCTV) of busbar areas in the switchyard and facility to reset busbar protections via SCADA at selected sites.

Provision of these facilities would enable rapid assessment of the situation and, if warranted, resetting of the protections and restoration of supplies. Bus bars would be targeted where there is a single bus bar protection zone and the amount of radial load and typical response time combine to make it likely that a bus trip would result in significant supply interruptions.

For example Deniliquin, which is three hours from Wagga Wagga, supplies a peak of 40MW and has a single 132kV bus zone and two 66kV bus zones. With a four hour response time, a trip of the 132kV bus would result in unserved energy of 61MWh even if demand was 40% of peak. Therefore, with the proposed CCTV surveillance, the post contingency capacity at the supply point can be improved as follows:

[1] AER, Final Electricity Transmission Network Service Providers Service Target Performance Incentive Scheme, Version 5 October 2015.

[2] Explanatory statement section 5.3.1 - AER, Draft Electricity Transmission Network Service Providers Service Target Performance Incentive Scheme, Version 5 June 2015.

Option	Post contingency capacity	Duration
Do nothing	0 MW	4 hrs
CCTV Surveillance	48 MW	2 hrs

The more remote a location, the longer the response time and the more valuable such a tool might be but such sites typically have no broadband TransGrid communications and would rely on public infrastructure to carry the CCTV imagery. Since a bus trip will result in a loss of supply to the area there is a limited time window where communication may be relied upon for taking the remedial actions.

TransGrid has identified 22 sites (shown in Attachment 2) where CCTV Surveillance will improve the capacity of the supply points.

3. Recommendation

It is recommended that CCTV imagery and protection reset facilities over SCADA be provided at the substations listed in Attachment 2 and the project be classified as a *priority* project in TransGrid NCIPAP for the regulatory period 2018 – 2023.

Attachment 1 Risk costs summary

Current Option Assessment - Risk Summary

Project Name: Rapid Restoration following Busbar Trips

Option Name: 1422 - Base Case

Option Assessment Name: 1422 - 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)
132kV Busbar Fault	1	Busbar	Unplanned Outage - HV (132kV Busbar Fault)	$38.00	Structural Failure	$38.00	7.00%	$2.66	$2.64		$0.00			$0.01
33 kV Busbar Fault	1	Busbar	Unplanned Outage - HV (33 kV Busbar Fault)	$6.07	Structural Failure	$6.07	12.00%	$0.73	$0.72		$0.00			$0.01
66kV Busbar Fault	1	Busbar	Unplanned Outage - HV (66kV Busbar Fault)	$8.99	Structural Failure	$8.99	5.00%	$0.45	$0.45		$0.00			$0.00
				$53.07		$53.07		$3.84	$3.81		$0.01			$0.03

Total VCR Risk: $3.80 **Total ENS Risk:** $0.00

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Page 1 of 1

Attachment 2 Sites with significant load at Risk

Location	Bus Contingency	Current limit (MW)	Current Restoration Time (hours)	Target limit (MW)	Target Restoration time (hours)
ANM	Entire 132kV Bus	0	2.5	106	1.25
Taree	Entire 132kV Bus	0	3	80	1.5
Griffith	Entire 132kV Bus	0	3	77	1.5
Beryl	Entire 132kV Bus	0	3	77	1.5
Deniliquin	Entire 132kV Bus	0	4	48	2
Moree	Entire 132kV Bus	0	4	39	2
Narrabri	Entire 132kV Bus	0	3	49	1.5
Munyang	Entire 132kV Bus	0	4.5	30	2.25
Inverell	Entire 132kV Bus	0	3.5	31	1.75
Griffith	33kV Bus Sec 2	0	3	35	1.5
Yanco	Entire 132kV Bus	0	2.5	39	1.25
Armidale	Entire 66kV Bus	0	2.5	38	1.25
Pt Macquarie	33kV Bus Sec 3	0	4.5	20	2.25
Cowra	Entire 132kV Bus	0	2.5	32	1.25
Cowra	Entire 66kV Bus	0	2.5	32	1.25
Forbes	Entire 132kV Bus	0	2.5	29	1.25
Forbes	Entire 66kV Bus	0	2.5	29	1.25
Boambee South	Entire 132kV Bus	0	4.5	16	2.25
Moree	66kV Bus Sec 1	0	4	17	2
Griffith	33kV Bus Sec 3	0	3	23	1.5
Finley	Entire 132kV Bus	0	3.5	20	1.75
Orange 132	Entire 132kV Bus	0	1	61	0.5