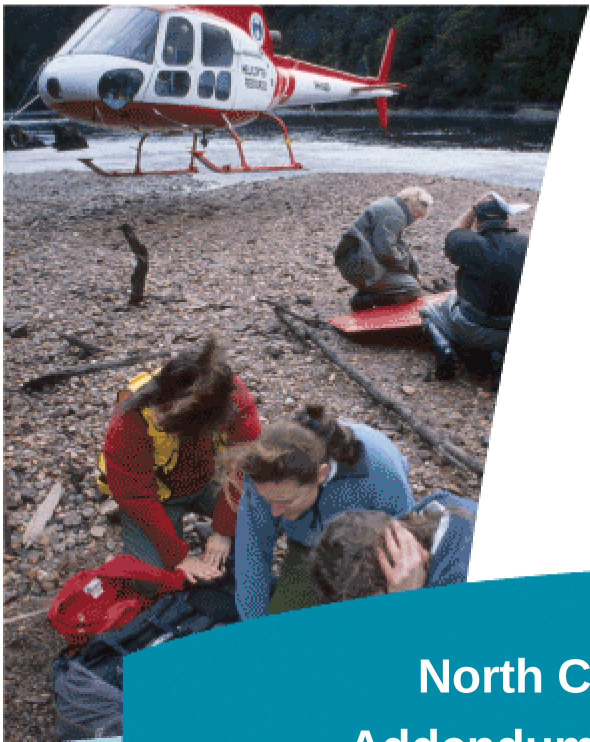
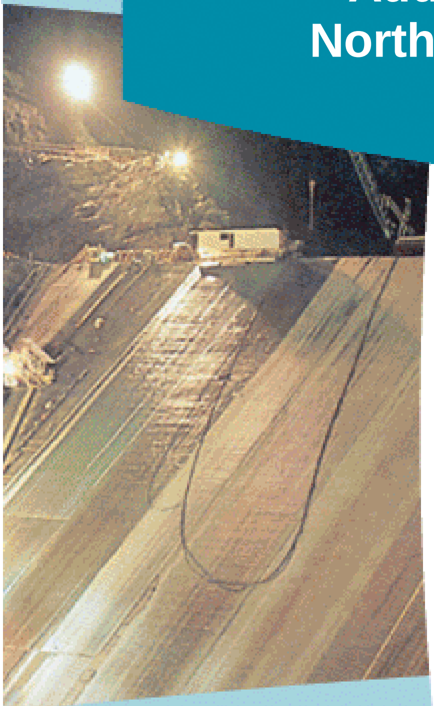
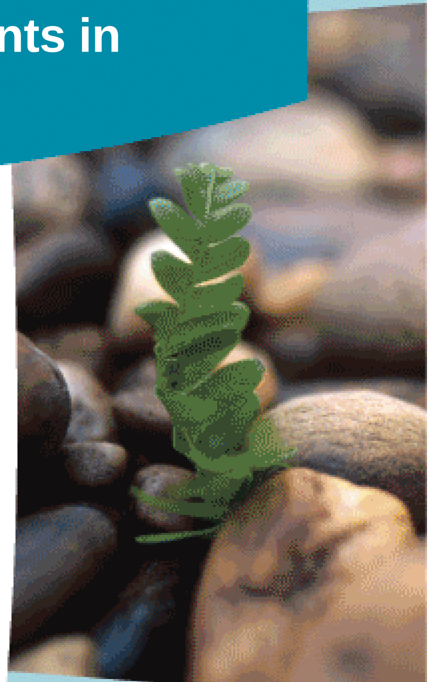


Hydro Tasmania Consulting

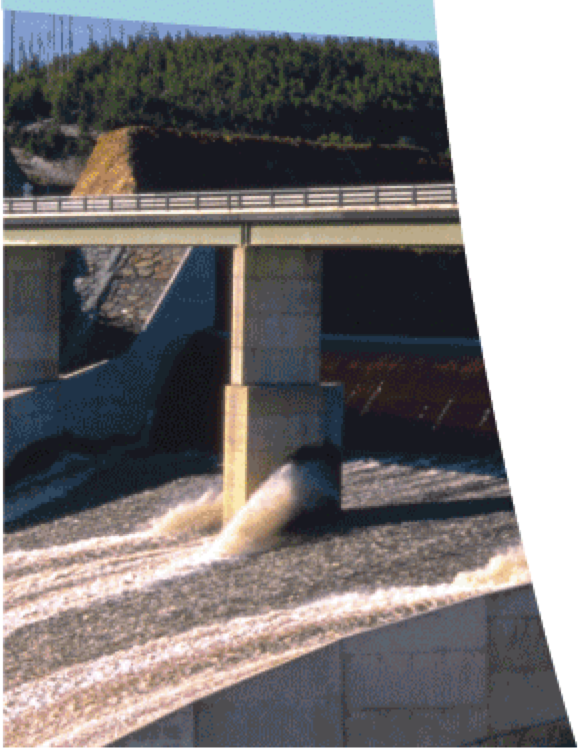
North Country Studies Stage 2a

Addendum to Due Diligence Study for North Country System Reinforcements in 2010, System Studies Review





19 November 2007



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Executive Summary

This short report is an addendum to our report (Due Diligence Study for North Country System Reinforcements - Stage 2, System Studies Review) submitted to WP. The work is limited to determine:

> Whether the 132kV network augmentations with proposed generation at Dongara or Mungarra (4 x 42MW) and Eneabba (2 x 200MW) is able to meet the load growth of North Country System (NCS) by the year 2014.

Studies show that the 132kV system would not able to meet the growing NCS central forecast demand (combined load of 523MW) even with the additional generation at Eneabba and/or Mungarra.

The following summarises the study results:

1. The option of providing additional 132kV double-circuit from Eneabba to Rangeway, with proposed generation at Eneabba and Mungarra, is not adequate due to failure to meet synchronous stability test (option 2b).
2. The option of rebuilding of existing 132kV Pinjar – Regan – Cataby – Eneabba line to a double circuit, with new Eneabba - Rangeway double circuit lines and proposed generation at Eneabba and Mungarra also fails due to transient voltage recovery (TVR) criterion of WP Technical Rules (option 2c).
3. Both these upgrades are also not adequate to remove the thermal constraints associated with a light North Country load (with major mine load being out of service) and high Northern (Eneabba) generation.
4. Rebuilding of existing 132kV Northern Terminal - Muchea – Moora – Three Spring circuit to a double-circuit with other upgrades as per item 2 above also fails to meet the transient voltage recovery criterion of the Technical Rules (option 2d).
5. It would be possible that providing dynamic reactive support (by SVC or STATCOM) may improve the transient voltage recovery but actual size of such device has not been technically evaluated.

We can conclude, based on the evidence provided that upgrading of the 132kV network with reinforcements as described in the various options above would not meet the 2014 central forecast load.

STUDY RESULTS

Western Power requested Hydro Tasmania Consulting to conduct a verification study to check the feasibility of running the North Country System (NCS) by the year 2014 with connection of 2 x 200MW generation at Eneabba and 4 x 42MW at Mungarra as per following 132kV reinforcement options.

2 b) A 132kV double circuit from Eneabba (ENB) to Rangeway (RAN)

2 c) Option (2b) plus an rebuilding of existing 132kV Pinjar (PJR) – Regan (RGN) – Cataby (CTB) – ENB line to a double circuit

2 d) Option (2c) plus a rebuilding another 132kV line from Northern Terminal - Muchea (MUC) - Moora (MOR) – Three Springs (TS) make double circuit of MUC – MOR – TS lines.

Latest load forecast and system models, provided by Western Power, are used in the studies.

According to Western Power's information, based on Eneabba gas website data, LM6000 gas turbine is only able to supply 32MW during maximum summer temperatures. Therefore studies assumed 32MW generation capability instead of 42MW during the studies. Major mine loads of 220MW are connected to Eneabba terminal station in these studies, again, as advised by Western Power.

Results of the studies conducted are summarized in Table 1.

Table 1 Dynamic study results for central load case (2014)

Transmission option	Generation at Eneabba	Generation at Mungarra	Fault	Transient Stability	TVR criterion
Option (2 b)	2 x 200MW	3 x 32MW	ENB on ENB – PJR line	Failed	Failed
Option (2 b)	2 x 200MW	4 x 32MW	ENB on ENB – PJR line	Failed	Failed
Option (2 c)	2 x 200MW	3 x 32MW	ENB on ENB – PJR line	Failed	Failed
Option (2 c)	2 x 200MW	4 x 32MW	ENB on ENB – PJR line	OK	Failed
Option (2 d)	2 x 200MW	3 x 32MW	ENB on ENB – PJR line	OK	Failed
Option (2 d)	2 x 200MW	4 x 32MW	ENB on ENB – PJR line	OK	Failed
Option (2 d)	1 x 200MW	4 x 32MW	ENB on ENB – PJR line	OK	OK

Based on these studies Hydro Tasmania Consulting expects that transient post-fault voltage recovery would be worse if Mungarra generation is isolated from Western Power's system. This is concluded on the basis of the reduction in the reactive capability of local generation.

Table 2 shows the steady state thermal constraints under a low load scenario (assumed 60% of the central forecast) with Eneabba and wind farm generation at full output. We further assume that the main mine load feed from Eneabba is out of service.

Table 2 Thermal constraints under light load (2014)

Transmission option	**'N-0'**	**'N-1' Outage of PJR - ENB**	**'N-1' Outage of MUC - MOR**	**'N-1' Outage of ENB - RAN**
Option (2 b)	Overload of: • ENB – CTB	Overload of: • ENB – CTB • CTB – RGN • RGN – PJR • TS - MOR	-	-
Option (2 c)	Overload of: • CTB - ENB	Overload of: • CTB - ENB	Overload of: • CTB - ENB	Overload of: • CTB - ENB
Option (2 d)	OK	Overload of: • CTB - ENB	OK	OK

Table 2 shows that 132kV augmentation may have thermal constraints imposed on the Eneabba generation under certain conditions.

Based on the above results 132kV reinforcement is not adequate to supply 2014 central forecast demand. Operation of transmission reinforcements with additional generation at Eneabba (2 x 200MW) and Mungarra (4 x 42MW) will still not satisfy the full range of operating modes and the full range of generation dispatch. However it may be possible that additional SVC or STATCOMS may be able to satisfy the 2014 condition but WP central load forecast shows that by 2016 load would increase by another 125MW necessitating further system re-enforcement and stranding the SVC.