PROPOSED ENEABBA–MOONYOONOOKA 330KV TRANSMISSION LINE

SUMMARY TECHNICAL EVALUATION OF ADDITIONAL ALTERNATIVE REINFORCEMENT OPTIONS

Option 2b: New ENB-GTN 132 kV line with local generation

This sub-option includes construction of a 132 kV line between Eneabba and Geraldton by November 2010 and operation with additional local generation (3 x LM6000 at MGA and 2 x 200 MW coal base units at Eneabba PS (EPS)). Further reinforcement of the system is included in Option 2c. This option represents the use of local generation with a minimum 132 kV reinforcement.

System synchronous stability simulation studies for this option were performed. Cases with 3 x LM6000 at MGA and 2 x 200 MW units at EPS were simulated for the central load forecast of 2012 and 2014.

The results of the system fault simulation show that local generation will be synchronously unstable for this network configuration.

This option was also simulated by Load Flow study to confirm thermal and voltage performance. The results of the load flow study for the central load forecast for the year 2014 show that without line outages (N-0 conditions) TS-MOR and ENB-CTB lines would be overloaded. To comply with the technical rules the reliability of the system was also checked for N-1 line conditions and the following lines TS-MOR ENB-TS, ENB-CT and CTB-RGN will be overloaded under light load conditions. These results indicate that under system light conditions and especially during shut down of the mining operations for maintenance or should the mines not proceed the 400 MW capacity of the EPS base load station cannot be dispatched because of thermal limitations in the 132 kV network. The analysis is based on the assumption that there will not be a net contribution to the operation and capital cost of the power stations and that the coal station will be competitive against the existing SWIN power plant without additional funding. As a result this means that the network must be capable of permitting unconstrained operation of this base load coal station. To remove this network constraint would require further reinforcement. Further network reinforcement is considered in Option 2c.

Conclusion: This option is not technically viable without further reinforcement. Therefore an alternative solution with more 132 kV reinforcements is required this is included in Option 2c.

Option 2c: New ENB-GTN line and the re-build of the4PJR-RGN-CTB-ENB 132 kV lines with the connection of local generation.

This sub-option includes construction of a 132 kV line between Eneabba and Geraldton and re-building of the existing PJR-RGN-CTB-ENB 132 kV line to D-cct construction by November 2010 and operation with additional local generation. The rebuild of the PJR-RGN-CTB-ENB line to 132 kV instead of a rebuild to 330 kV. Further reinforcement to the system is considered in Option 2d. Option 2d has more 132 kV reinforcements.

The synchronous stability simulation studies for this option were performed with 3 x LM6000 at MGA and 2 x 200 MW units at EPS for the central load forecast of 2014.

The system simulation results show that the local generation would be synchronously unstable.

This option with 2 x 200 MW units at Eneabba PS (EPS) was also simulated with a load flow study. Cases with only 2 x 200 MW units at EPS and wind-farms *(with 3 x LM6000 units MGA being switched off)* were simulated for 60% of the central load forecast of 2014. Light load conditions with 60% of the substation peak were simulated. To comply with the technical rules the reliability of the system was also checked for N-1 conditions. The TS-MOR line would be overloaded. These results indicate that under system light conditions and especially during shut down of the mining operations for maintenance or should the mines not proceed the 400 MW capacity of the EPS base load station cannot be dispatched because of thermal limitations in the existing 132 kV network. The analysis is based on the assumption that there will not be a net contribution to the operation and capital cost of the station and that the coal station will be competitive against the existing SWIN power plant. As a result this means that the network must be capable of permitting unconstrained operation of this base load station. To remove this constraint would require further reinforcement to the system. Further reinforcement is considered in Option 2d.

Conclusion: This option 2c is not technically viable without further reinforcement. Therefore, a further alternative solution with more 132 kV line reinforcements has been considered in Option 2d.

Option 2d: New ENB-GTN 132kV line with rebuilds of PJR-RGN-CTB-ENB, and NT-MUC-MOR-TS 132 kV lines with local generation.

This sub-option includes:

- **Stage 1** *(as per Option 2c)***:** Construction of a 132 kV line between Eneabba and Geraldton and re-building of the existing PJR-RGN-CTB-ENB 132 kV line to D-cct construction by November 2010 and operation with additional local generation.
- **Stage 2**: Re-building of the existing NT-MUC-MOR-TS 132 kV line to D-cct construction by November 2011 and operation with additional local generation.
- Provision of an SVC which is needed to comply with voltage recovery, due to the poor transient performance of this option resulting from the high loading on the 132 kV system.

System synchronous stability simulation studies for this option were performed. The cases include 3 x LM6000 at MGA and 2 x 200 MW units at EPS. This network was simulated for the central load forecast at year 2014.

The results of the system simulation show that the local generation would be synchronously stable, but there is a problem with post-fault voltage recovery. Therefore, provision of SVC to ensure adequate voltage recovery is needed in this option.

Conclusion: The results of the system simulation studies indicate that this option with the addition of an SVC will satisfy the power demand for the central forecast for 2014. However, the studies also indicate a weakness of the 132 kV system. This option may also not accommodate additional wind-farm generators in the Mid West region. It is also unlikely that this option will be able to provide for future central load forecast beyond summer 2015. The simulation studies were limited in scope and it is recommended that further more wide ranging studies be performed to ensure that network performance would be adequate and that additional reinforcements are not required.

It should be noted that this 132 kV option would require further 132 kV line reinforcements beyond 2015 to accommodate load growth.