Submission to the ERA for exemption from compliance with clause 2.5.2.2 (N-1 criterion) of the Technical Rules for an 11.65 MVA increase in supply to the Geraldton Port Authority

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Version Control

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Glossary

Acronym / term	Meaning
Authority	Economic Regulation Authority
CMD	Contracted Maximum Demand
ENB	Eneabba Substation
GPA	the Geraldton Port Authority
GTN	Geraldton 132/33 kV Substation
MGA	Mungarra Substation
MGTs	Mungarra Gas Turbines
MOR	Moora 132/33 kV Substation
MUC	Muchea 132/33 kV Substation
MWEP	Mid West Energy Project
NCS	Network Control Service
RAN	Rangeway 132/11 kV Substation
TNDP	Transmission Network Development Plan
TS	Three Springs Substation
UVLS	Under voltage load shedding

Executive Summary

This submission requests that the Economic Regulation Authority (*Authority) grant Western Power a temporary exemption from compliance with clause 2.5.2.2 (N-1 criterion) of the Technical Rules to provide the Geraldton Port Authority's (*GPA's) load increase of 11.65 MVA with a supply from the North Country transmission system that meets the N-0 reliability criterion. The exemption sought is to apply only until the Mid West Energy Project (*MWEP) Southern Section is in service. The need for an exemption beyond this date would be the subject of a separate future submission to the Authority.

GPA has submitted a connection application to increase their contracted maximum demand from Rangeway Substation by 11.65 MVA in 2012. System studies have been undertaken by Western Power to assess the impact of GPA's requested load increase on the North Country transmission system which is designed to an N-1 planning criterion in accordance with the Technical Rules. The following constraints were identified until the MWEP Southern Section is in service:

Table 1 GPA Load Increase North Country Transmission Constraints

#	Constraint Description	Constraint Year	Network Solution
1	Insufficient voltage recovery in Geraldton area	2012	Additional reactive support
2	Muchea – Moora 132 kV line rating	2012	MWEP Southern Section
3	Three Springs – Eneabba 132 kV line rating	2012	MWEP Southern Section
4	Rangeway transformer capacity	2012	Geraldton transmission system reinforcement

In requesting this exemption, it is assumed that the Mungarra gas turbines (*MGTs) will not be dispatched to provide network support to the North Country transmission system as a result of GPA's load increase given that additional dispatch of the MGTs would result in significant additional dispatch costs being incurred.

The network reinforcements required to remove these constraints are listed in Table 1. It is not possible to have any of these projects in service before 2014 and approval has only been received to proceed with the MWEP Southern Section at this stage. Therefore, it is not possible for Western Power to provide GPA's load increase with a supply that meets the N-1 reliability criterion in the timeframe requested by reinforcing the network. The only alternative option to providing GPA with a supply that meets the N-1 reliability criterion is to procure North Country generation support via a Network Control Service (*NCS) arrangement. The cost for NCS for GPA is expected to be significant. It is also expected that there will be insufficient generation capacity available at Rangeway Substation (*RAN) for an NCS supply to remove the transformer capacity constraint at that substation.

Non compliant Technical Rules' solutions were investigated to provide GPA an interim curtailable supply for their additional load until the transmission system could be reinforced. System studies undertaken confirmed that a post contingency curtailment solution, which involves installing low cost fast acting load shedding schemes to reduce GPA's additional load after a network outage occurs, was technically acceptable and did not adversely impact other network users' quality and reliability of supply. This provides GPA with a supply that meets an N-0 reliability criterion.

Following consultation with GPA, they have advised that a non-compliant N-0 reliability of supply with post contingency curtailment is acceptable for their operations and is their preferred

connection option. GPA has advised that the expected cost to receive a compliant supply via NCS does not reflect the financial benefit of an increased reliability of supply. GPA has provided a letter confirming this and has formally requested a non-compliant N-0 reliability of supply to be provided (see Appendix 3).

Providing GPA an interim non-compliant supply is conditional upon the Authority granting this exemption to Western Power.

1 Introduction

1.1 Purpose

This submission requests that the Economic Regulation Authority (*Authority) grant Western Power an exemption from compliance with clause 2.5.2.2 (N-1 criterion) of the Technical Rules to provide the Geraldton Port Authority's (*GPA's) load increase of 11.65 MVA with a supply from the North Country transmission system that meets the N-0 reliability criterion.

The exemption sought is to apply only until the Mid West Energy Project (*MWEP) Southern Section is in service. The need for an exemption beyond this date would be the subject of a separate future submission to the Authority.

1.2 Background

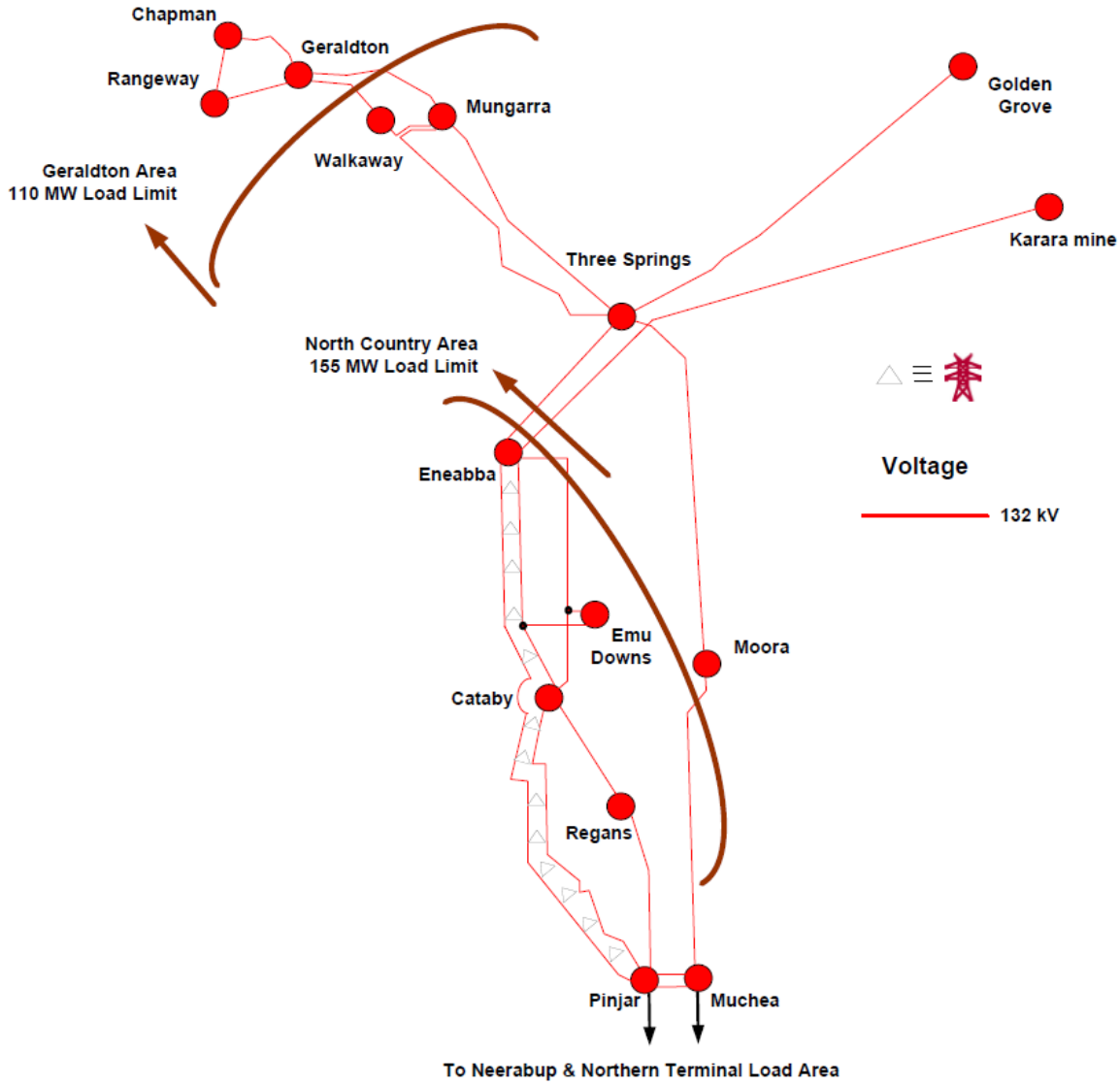
GPA has submitted a connection application to increase their contracted maximum demand (*CMD) from Rangeway Substation (*RAN) by 11.65 MVA by October 2012. GPA has an existing 11 kV supply at RAN. The load increase sought is also to be provided from RAN.

For the connection of the additional GPA load, other substations in Geraldton were also considered. However due to proximity to other substations, timing and capacity constraints, RAN is considered the most suitable connection option.

2 North Country Transmission System

The current North Country transmission system is shown in Figure 1. This transmission system is currently designed to the N-1 planning criterion per clause 2.5.2.2 of the Technical Rules. This means for the loss of any single transmission element, supply to this network is maintained and load shedding is avoided.

Figure 1 Existing North Country Layout (as at August 2012)



2.1 Current Network Operation

To meet the N-1 planning criterion for the North Country transmission system, the MGTs are dispatched under the Dispatch Support Deed with Verve Energy once the North Country load exceeds certain thresholds.

Approximately 110 MW of Geraldton area load and 155 MW of North Country area[1] load can be supplied with all MGT units dispatched as shown in Figure 1 and Table 2.

To exceed the 110 MW threshold in the Geraldton area, either further generation must be dispatched or additional voltage support installed for the Geraldton area. Dispatching further North Country generation first requires a Network Control Services (*NCS) arrangement to be in place with nominated generator(s).

Table 2 North Country Load Transfer Limits

#	Constraint	Approx Transfer Limit
1	Geraldton voltage recovery	110 MW of Geraldton area load
2	Muchea – Moora 132 kV line thermal rating	155 MW of North Country area load
3	Three Springs – Eneabba 132 kV line thermal rating	

2.2 Connection of GPA

It is proposed to connect GPA's 11.65 MVA load increase at RAN at 11 kV. RAN has two 132/11 kV transformers installed with an N-1 capacity limit of 34.3 MVA.

Connection of GPA's additional load will result in both the forecast Geraldton area and North Country area load levels marginally exceeding the transfer limits identified with all MGT units dispatched, and the RAN transformer N-1 capacity limit being marginally exceeded, under summer peak contingency conditions by this summer (December 2012).

A summary of the immediate constraints identified for GPA's connection are shown in Table 3.

Table 3 GPA Load Increase North Country Transmission Constraints

#	Constraint Description	Year of Constraint
1	Insufficient voltage recovery in Geraldton area	2012
2	Muchea – Moora 132 kV line thermal rating	2012
3	Three Springs – Eneabba 132 kV line thermal rating	2012
4	RAN transformer capacity	2012

[1] Note – this excludes the Karara mine load, Eneabba Substation load and all loads south of Eneabba and Moora

3 Transmission Network Development Plan

3.1 Reinforcements to Provide GPA an N-1 Supply

Network reinforcements are required in order for Western Power to provide GPA's additional load with an N-1 supply from the North Country transmission system.

Western Power has proposed a number of solutions in its Transmission Network Development Plan (*TNDP) to remove the immediate constraints identified for GPA's connection:

1) MWEP Southern Section
2) Additional reactive support in Geraldton
3) Geraldton transmission system reinforcement

A single line diagram which shows these reinforcements in service can be found in Appendix 1.

Note: Once the MWEP Southern Section is in service, thermal limitations on the Three Springs to Mungarra transmission lines will arise. Within a few years after this, thermal limitations on the Mungarra to Geraldton transmission lines are forecast to arise. Western Power is looking to develop the MWEP Northern Section to remove transfer limitations between Three Springs and Geraldton. The current proposed in service date for this project is 2017 subject to receiving all regulatory and internal approvals.

MWEP Southern Section – Stage 1

The MWEP Southern Section will reinforce the transmission system from Neerabup Terminal up to Three Springs. This project will remove the thermal constraint on the Eneabba – Three Springs (ENB-TS 81) and Muchea – Moora (MUC-MOR 81) 132 kV transmission lines, and provide voltage support to Geraldton, increasing the power transfer limit.

Approval has been received to proceed with this project and construction works have commenced.

Additional Reactive Support in Geraldton

To address the voltage recovery issues, it is proposed to increase the level of available reactive support in the Geraldton area. Detailed studies are currently being undertaken to determine the amount and type of voltage support required. Sources for additional reactive support may include capacitor banks, STATCOMs and network generators through NCS.

An indicative timeframe to increase the level of reactive support in the Geraldton area is about 24 months depending on the complexity of this project. A more accurate timeframe will be identified during the scoping phase of the project.

Geraldton Transmission System Reinforcement

A long term plan is being developed to reinforce the Geraldton transmission system considering capacity and age issues with existing infrastructure.

One option currently being considered is constructing a new 132 kV substation at Geraldton Port between 2015 and 2018 depending on load growth at the port. GPA load supplied from RAN would be transferred to this new port substation once constructed. It will not be possible to construct the new port substation before 2015.

There is currently no requirement to install a new transformer at RAN to meet natural growth until around 2025.

A new transformer at RAN or Geraldton Port zone substation is required to provide GPA with an N-1 supply. The current lead time for a new transformer and 132 kV bay at RAN is about 24 months. The decision to install a new transformer at RAN will only be made once the longer term development of the Geraldton transmission network is finalised. Installing a transformer at this stage just to meet the load increment for GPA is not appropriate recognising that the requirement for the transformer may disappear if a new substation is to be built at the port.

3.2 Impact on GPA

Therefore, due to timing constraints, it is not possible for Western Power to provide GPA a Technical Rules compliant supply for their load increase by reinforcing the transmission system if GPA requires connection in 2012.

Table 4 GPA Transmission Constraints and TNDP Reinforcements Required

#	Constraint	Year	Reinforcement Required	Earliest Expected In-service Date
1	Geraldton voltage recovery	2012	Additional Geraldton reactive support	Late 2014
2	MUC – MOR 81 rating	2012	MWEP Southern Section	May 2014
3	TS – ENB 81 rating	2012	MWEP Southern Section	May 2014
4	RAN transformer capacity	2012	Geraldton transmission system reinforcement	Late 2014/2015

If GPA's load increase is to be connected in 2012, then interim solutions such as NCS or an N-0 curtailable supply are required for GPA until the proposed network reinforcements can be constructed.

4 GPA Interim Connection Options

4.1 Options Considered

Two supply options were investigated to connect GPA until the required TNDP projects are in-service:

Table 5 GPA Interim Supply Options

Option	Description	Technical Rules Compliant Supply
1	NCS (via generation)	Yes
2	N-0 Curtailable Supply	No

The first option requires the dispatch of the MGTs to be increased to meet the GPA additional load which will result in significant additional out of merit dispatch costs being incurred. These additional costs should be borne by GPA. An NCS arrangement is required for additional MGT dispatch costs to be passed through to GPA.

As an alternative, the supply to GPA can be arranged so that no additional MGTs generation is dispatched out of merit. For this option to function, a load curtailment scheme whereby GPA is excluded from the MGTs dispatch is required. Providing GPA's additional load without additional MGTs dispatch means that GPA would be subject to a greater number of curtailable events. The curtailable events relate to the constraints #1-3 in Table 3.

4.1.1 Option #1 – NCS (Compliant Supply)

An NCS solution using North Country generation may be used to provide GPA an N-1 supply providing sufficient generation[2] is dispatched before the network contingency occurs.

NCS is required from the MGTs as well as other North Country generation. Dispatching all MGTs units will increase the load transfer limits to the levels listed in Table 2. Prior to the load reaching either of these limits, further generation north of Three Springs must be dispatched to provide GPA an N-1 supply. The cost of NCS for GPA is expected to be significant. It is also expected that there will be insufficient generation capacity available at RAN for an NCS supply to remove the transformer capacity constraint at that substation.

Note: Demand side management in Geraldton may also be used instead of dispatching generation in Geraldton. However this would not be deemed to be a Technical Rules compliant supply option.

4.1.2 Option #2 – N-0 Curtailable Supply (Non Compliant Supply)

A curtailable supply, which would involve installing fast acting load shedding schemes to reduce GPA's additional load, is not deemed to comply with the Technical Rules' planning criteria. Providing such a supply is conditional upon the Authority granting a Technical Rules exemption to Western Power.

System studies undertaken confirmed that a post contingency curtailment solution for GPA's load increase was technically acceptable and did not adversely impact the supply reliability and quality of other network users. Existing North Country load users, with the exception of the

[2] System studies may be required to confirm this is technically acceptable depending on the proposed arrangement

Karara mine whose connection is subject to a Technical Rules exemption, will continue to receive N-1 reliability of supply. This solution also facilitates GPA's load increase to be excluded from the MGTs dispatch calculations, thereby avoiding any additional dispatch costs being incurred due to GPA's connection.

Three load shedding schemes are required to be implemented for post contingency curtailment of GPA's additional load:

1. New dedicated under voltage load shedding scheme (*UVLS) for GPA's additional load only. Following detection of an under voltage event in Geraldton after a single transmission contingency, GPA's additional load will be automatically disconnected to avoid the general UVLS in the Geraldton area from operating;

2. Modify the existing line overload load shedding scheme in service for the MUC – MOR 81 and TS – ENB 81 transmission lines for the Karara mine connection to include GPA on this scheme. Following detection of a line overload, a signal will be sent to curtail GPA's additional load in order to remove the overload; and

3. New transformer overload load shedding scheme at RAN. Following detection of a transformer overload, a signal will be sent to curtail GPA's additional load in order to remove the overload.

Table 6 GPA N-0 Supply Interim Solutions

#	Constraint	N-0 Supply Interim Solution
1	Geraldton Voltage Recovery	New GPA UVLS
2	MUC – MOR 81 rating	Modify existing Karara load shedding scheme to include GPA
3	TS – ENB 81 rating	
4	RAN Transformer capacity	New transformer overload load shedding scheme

These control schemes can be installed in a relatively short timeframe and at low cost (expected to be less than $0.5 million). However, it must be emphasised that these are interim solutions only until the network can be reinforced.

GPA may also opt to proceed with NCS, at their cost, after load shedding occurs to receive an increased reliability of supply.

4.2 GPA's Preferred Connection Option

Western Power has provided GPA the indicative number of curtailable events and unserved energy per annum that may be associated with a post contingency N-0 curtailable supply until the transmission system is reinforced.

Following consultation with GPA, they have advised that a non-compliant N-0 reliability of supply with post contingency curtailment is acceptable for their operations and is their preferred connection option. GPA has also advised that the expected cost to receive a compliant supply via NCS does not reflect the financial benefit associated with the increased reliability of supply provided to them. GPA has provided a letter confirming this and has formally requested a non-compliant supply to be provided for the load increase sought (see Appendix 3 for a copy of this letter).

4.3 Connection of Future North Country Loads

Similar load shedding schemes are expected to be required for all new North Country block loads until the MWEP Southern Section and additional reactive support in Geraldton are in service. System studies are required to confirm that installing any further under voltage load shedding schemes is technically acceptable. Any Technical Rules exemption requirements for connection of these new block loads will be addressed in separate submissions to the Authority.

5 Summary of Basis for Exemption

Western Power has taken reasonable steps to comply with the Technical Rules in providing a connection proposal to meet GPA's requirements. After consultation with GPA, Western Power considers that the exemption from compliance with clause 2.5.2.2 of the Technical Rules it is requesting, as stated in section 6 of this document, is justified on the basis that:

- Western Power cannot reinforce the transmission system in the timeframe requested for connection by GPA;
- The alternative option cost to provide GPA an N-1 supply by procuring generation via NCS is likely to be significant. There are also no suitable generators currently installed that could provide an NCS service to remove the RAN transformer capacity constraint;
- An N-0 reliability of supply is acceptable for GPA's operations. This is their preferred connection option and facilitates connection to supply the additional load in the timeframe requested;
- A post contingency curtailment solution for GPA's load increase, which involves installing low cost fast acting load shedding schemes, is technically acceptable and does not adversely impact the supply reliability and quality for other network users; and
- The exemption will be temporary until the MWEP Southern Section is in service. The need for an exemptions beyond this would be the date subject of a separate future submission to the Authority.

Subject to the exemption being granted by the Authority, the operational constraints will be enforced through relevant provisions in the commercial arrangements between Western Power and GPA.

6 Statement of Technical Rules Exemption

Under section 12.40 of the *Electricity Networks Access Code 2004*, Western Power as the *Service Provider* for the *Western Power Covered Network* hereby applies to the Authority for exemption from a specific requirement of the Technical Rules, as follows:

"Western Power is exempted from complying with clause 2.5.2.2 *N-1 Criterion* of the Technical Rules, insofar as it applies to the Geraldton Port Authority's (GPA's) additional load of 11.65 MVA such that this additional load will be provided as an N-0 supply from the North Country transmission sub-network.

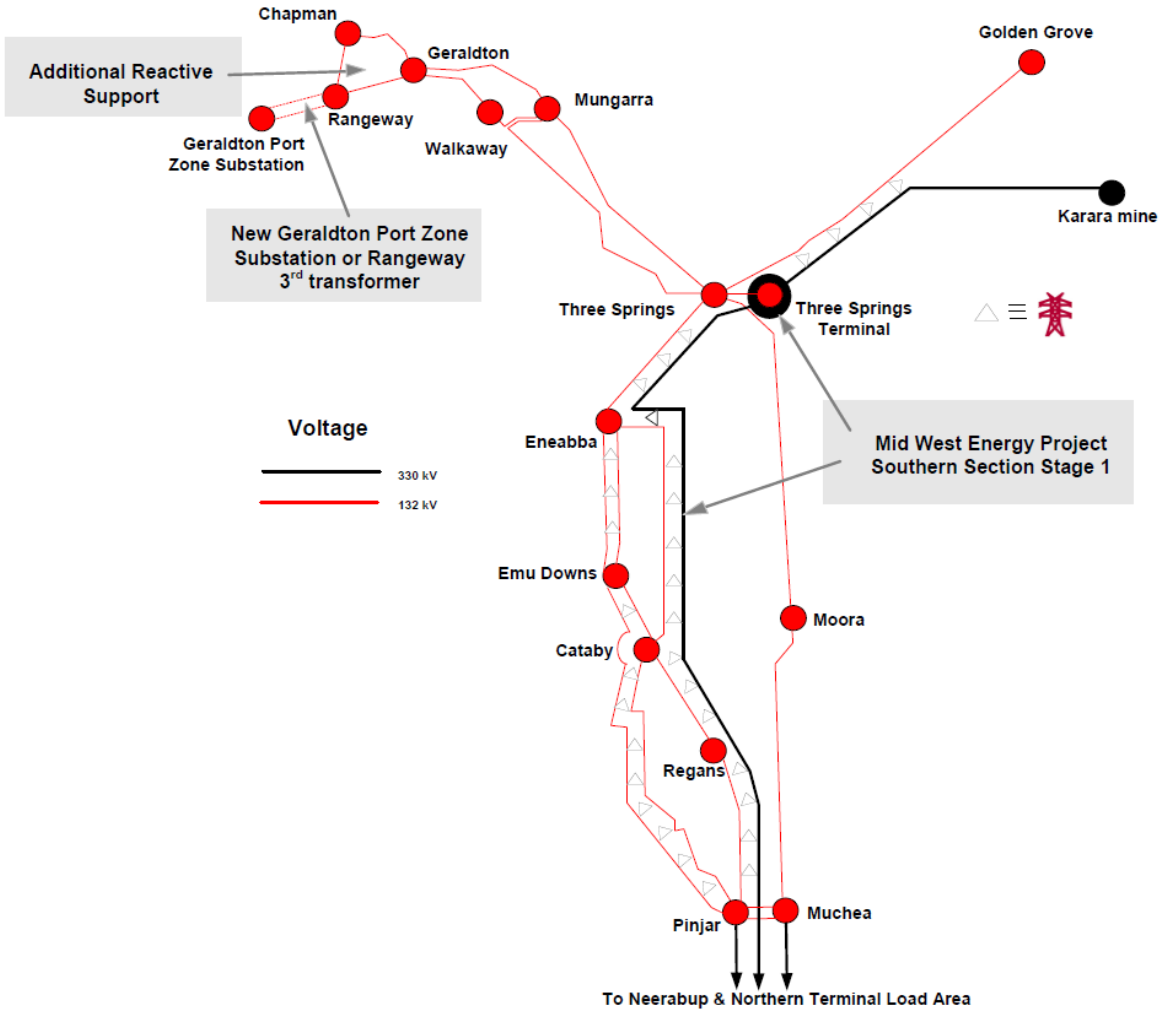
This exemption is granted on the provision that:

A. GPA's additional load of 11.65 MVA is supplied on a curtailable basis; and

B. The N-1 supply reliability provided to existing network users in the North Country, including those supplied from the Rangeway Substation, is not adversely affected as a result of GPA's additional load of 11.65 MVA.

This exemption is granted until the Mid West Energy Project Southern Section is in service."

Appendix 1: Reinforced Transmission System to Provide GPA an N-1 Supply



Appendix 2: References

Table 7 List of relevant supporting documents

Doc Ref #	Title
DM 9803805	Connection Options Assessment for Geraldton Port Authority CMD Increase – Customer Report
DM 8991079	Geraldton Port Authority CMD Increase - System Study Report
DM 6800863	Technical Rules http://www.westernpower.com.au/documents/aboutus/accessarrangement/2011/WE_n6800863_v9E_TECHNICAL_RULES_OF_23_DECEMBER_2011.pdf

Appendix 3: GPA Letter Requesting Non-Compliant Supply