

# Ergon Energy Corporation Limited

## Consultation & Draft Recommendation

### Emerging Distribution Network Limitations in the Charleville Area 5 June 2013

#### **Disclaimer**

*While care was taken in preparation of the information in this paper, and it is provided in good faith, Ergon Energy Corporation Limited accepts no responsibility or liability for any loss or damage that may be incurred by any person acting in reliance on this information or assumptions drawn from it. This paper has been prepared for the purpose of inviting information, comment and discussion from interested parties. The document has been prepared using information provided by a number of third parties. It contains assumptions regarding, among other things, economic growth and load forecasts which may or may not prove to be correct. All information should be independently verified to the extent possible before assessing any investment proposals.*

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## 1. EXECUTIVE SUMMARY

Ergon Energy is responsible (under its Distribution Authority) for electricity supply to the Charleville area in Southwest Queensland. Ergon Energy has identified emerging limitations in the electricity distribution network supplying the Charleville area. The peak load on the Roma – Charleville 66kV line is above the Security of Supply Criteria threshold of 15MVA, which triggers work to enhance security of supply. The Charleville area is supplied via a single 276km 66kV sub-transmission feeder from Roma Bulk Supply Point. With regards to Charleville's performance against the security criteria, during the 2010/11 financial year the load was above 15MVA for a total of 56 hours, spread out over 6 days.

**Ergon Energy published a Request For Information (RFI) relating to this emerging network constraint on 23 May 2012 - 11 submissions were received by the closing date of 18 July 2012.**

The evaluation process eliminated options that presented "battery only" or "solar and battery" solutions due to their inability to meet the partial contingency / risk management definition.

The other proposals were evaluated and scored with the proponents of the top three diesel/hybrid options, a solar thermal option and a renewable power station option invited to present to the evaluation panel.

Following the presentations and financial evaluations of each proposal, the recommended solution was identified as a diesel generation solution with potential for renewable integration.

**This is now a Consultation & Draft Recommendation where Ergon Energy provides both economic and technical information about possible solutions, and our recommended solution to establish a diesel generation solution.**

Submissions (electronic preferably) are due by 3 July 2013 and should be lodged to:

Ergon Energy Corporation Limited  
PO Box 264  
Fortitude Valley  
QLD 4006  
Attention: Network Strategy & Planning  
Email: [regulatory.tests@ergon.com.au](mailto:regulatory.tests@ergon.com.au)

Updated information will be provided on our website:

<http://www.ergon.com.au/community--and--our-network/network-management-and-projects/regulatory-test-consultations>

## 2. INTRODUCTION

Ergon Energy Corporation Limited (Ergon Energy) has identified emerging limitations in the electricity distribution network supplying the Charleville area of Southwest Queensland.

When a distribution network service provider proposes to establish a new large distribution network asset to address such limitations, it is required under the National Electricity Rules (the "Rules") Clause 5.6.2(f) to consult with affected Rules Participants, AEMO and Interested Parties on possible options to address the limitations. These options may include, but are not limited to, demand side options, generation options and market network service provider options.

Under Clause 5.6.2(g) of the Rules the consultation must include an economic cost effective analysis of possible options to identify options that satisfy the Australian Energy Regulator's (AER) Regulatory Test, while meeting the technical requirements of Schedule 5.1 of the Code.

The Consultation and Draft Recommendation in this Paper is based on:

- The assessment that the load on Ergon Energy's Charleville supply network is above the Security of Supply Criteria threshold of 15MVA, which triggers augmentation work to enhance security levels;
- The Request for Information consultation undertaken by Ergon Energy to identify potential solutions to address the emerging distribution network limitations: and
- An analysis of feasible options in accordance with the AER's Regulatory Test.

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### **3. BACKGROUND & PURPOSE FOR THIS CONSULTATION AND DRAFT RECOMMENDATION**

#### **3.1. Background**

If technical limits of the distribution system will be exceeded and the rectification options are likely to exceed \$10M, Ergon Energy is required under the National Electricity Rules<sup>1</sup> to notify Rules Participants<sup>2</sup> and Interested Parties<sup>3</sup> within the time required for corrective action and meet the following regulatory requirements:

- Consult with Rules Participants and Interested Parties regarding possible solutions that may include local generation, demand side management and market network service provider options<sup>4</sup>.
- Demonstrate proper consideration of various scenarios, including reasonable forecasts of electricity demand, efficient operating costs, avoidable costs, costs of ancillary services and the ability of alternative options to satisfy emerging network limitations under these scenarios.
- Ensure the recommended solution meets reliability requirements while minimising the present value of costs when compared to alternative solutions<sup>5</sup>.

Ergon Energy is responsible for electricity supply to Roma & Western area (under its Distribution Authority) and has identified emerging limitations in the electricity network supplying Charleville. In accordance with Security of Supply Criteria described in the joint Ergon Energy/Energex Standard for Transmission and Distribution Planning, the load on Ergon Energy's Charleville supply network is above the Security of Supply Criteria threshold of 15MVA, which triggers augmentation work to enhance security levels.

#### **3.2. Purpose**

The purpose of this Consultation and Draft Recommendation is to:

- Provide information about the existing distribution network in the Charleville area.
- Provide information about emerging distribution network limitations and the expected time by which action must be taken to maintain the reliability of the distribution system.
- Provide information about options identified and considered.
- Explain the process (including approach and assumptions) to be used to evaluate alternative solutions, including distribution options that are currently being investigated by Ergon Energy.
- Recommend Ergon Energy's preferred solution.

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1 Clause 5.6.2(f)

2 As defined in the National Electricity Rules.

3 As defined in the National Electricity Rules.

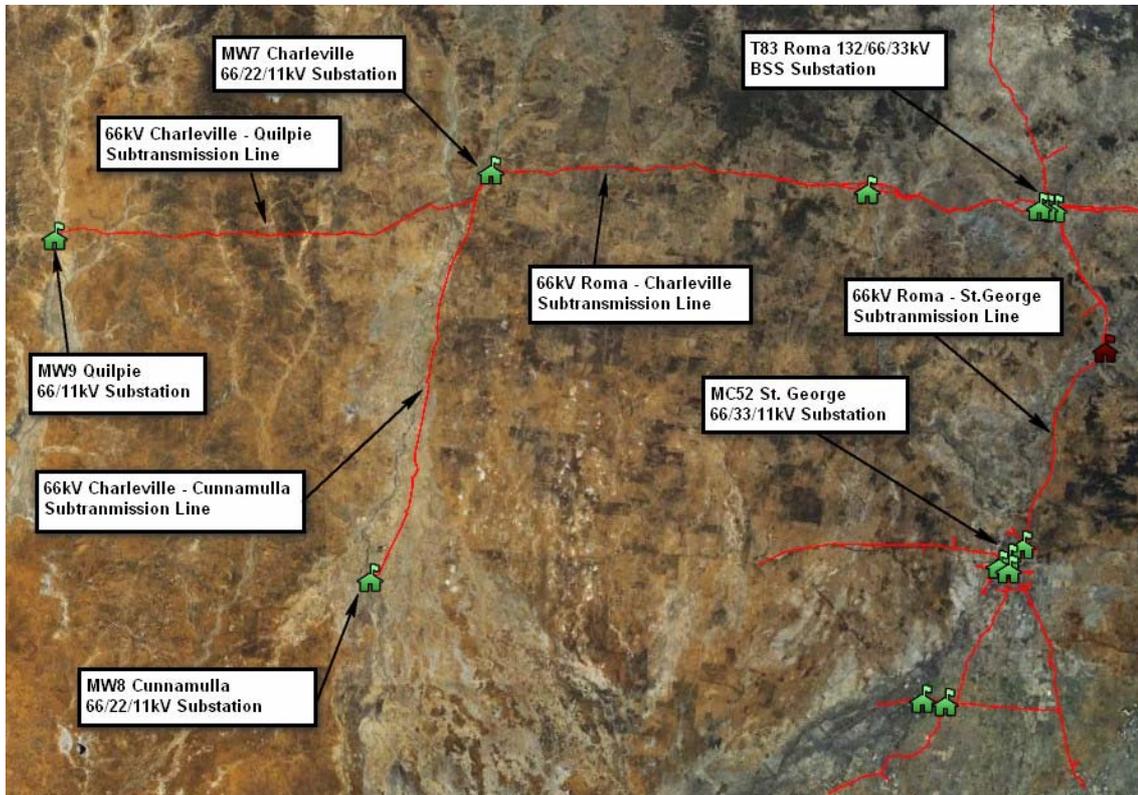
4 National Electricity Rules clause 5.6.2(f)

5 In accordance with the Australian Energy Regulator's Regulatory Test Version 3, November 2007

## 4. EXISTING SUPPLY SYSTEM TO THE CHARLEVILLE AREA

### 4.1. Geographic Region

The geographic region covered by this Consultation and Draft Recommendation is broadly described as the Charleville area as shown on the map below.



### 4.2. Existing Supply System

Charleville is located in the Maranoa area of the South West Region of Ergon Energy's network. The Charleville area is supplied via a single 276km 66kV sub-transmission feeder from T83 Roma Bulk Supply Point. Customers in Quilpie and Cunnamulla are supplied via separate 200km long 66kV feeders from Charleville. Distribution supply from Charleville and Cunnamulla is at 11kV for urban, and 22kV for rural customers. Supply from Quilpie zone substation is exclusively 11kV.

Charleville substation contains 1 x 66/11kV transformer, 1 x 66/22kV transformer, and also a 22/11kV transformer to link the 22kV and 11kV busbars and hence provide backup for each of the 66kV transformers. The MW07 Charleville zone substation contains a Static VAR Compensator (SVC) which is connected to its 11kV bus. The SVC is set up to control the 66kV bus voltage and has a range of 7MVAR inductive to 10MVAR capacitive. Cunnamulla substation has a similar arrangement to that of Charleville substation, but without an SVC.

The Charleville customer base is mainly domestic, with some commercial and rural customers. The residential base is the main driver of the network peak.

## 5. EMERGING DISTRIBUTION NETWORK LIMITATIONS

The measured and forecasted peak loads on the receiving end of the Roma – Charleville 66kV line are shown below for a 20 year period, and have been provided by Network Forecasting. Peak loads beyond 2019/2020 have been calculated by extrapolating the 6 -10 year growth rate.

**TABLE 1 – Charleville – Supply Substation Load History & Forecast**

Zone Substation	Maximum Annual Demand Actual				Maximum Annual Demand Forecast					Compound Growth Factor		
	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	1-5 Year	6-10 year	
CHAR Summation of Charleville LV and Quilpie and Cunnamulla 66kV Feeders (i.e. receiving end of Charleville 66kV Feeder)	(MW)	16.64	16.52	16.27	15.07	17.28	17.61	17.93	18.26	18.58	1.87%	1.71%
	(MVA)	16.67	17.55	18.10	17.31	19.22	19.58	19.94	20.31	20.67	1.87%	1.71%

Zone Substation	Maximum Annual Demand Forecast									Compound Growth Factor		
	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	1-5 Year	6-10 year	
CHAR Summation of Charleville LV and Quilpie and Cunnamulla 66kV Feeders (i.e. receiving end of Charleville 66kV Feeder)	(MW)	18.91	19.23	19.56	19.88	20.22	20.57	20.92	21.28	21.64	1.87%	1.71%
	(MVA)	21.03	21.39	21.75	22.11	22.49	22.88	23.27	23.67	24.07	1.87%	1.71%

*\*Note: A more recent load forecast has been developed by Ergon Energy after the Request For Information was released, but is not presented within this document. The above load forecast was chosen for consistency with the Request For Information, and is considered adequate for the purpose of this Draft Recommendation.*

With regards to Charleville's performance against the security criteria, during the 2010/2011 financial year load was above the security of supply criteria threshold of 15MVA for a total of 56 hours, spread out over 6 days.

The capacity of the Roma – Charleville 66kV sub-transmission feeder is limited to well below its thermal capacity of 51.3MVA by its voltage regulation. Network modelling indicates that the maximum load that can be supplied to the Charleville area is approximately 16.5MW. There are some operational changes which can increase this by up to a further 1MW.

### 5.1. Timeframes for Taking Corrective Action

As mentioned above the load is above the levels recommended in the security of supply criteria stated in Ergon Energy/Energex Standards for Transmission and Distribution from 2010/2011, and options to enhance security of supply are to be investigated and implemented as soon as practical.

### 5.2. Known Future Network and Generation Development

(i.e. projects that have been approved and are firm to proceed)

Ergon Energy is not aware of any other network augmentations or generation developments in the Charleville area that could relieve the emerging network limitations described in section 4 above.

## **6. OPTIONS CONSIDERED**

### **6.1. Consultation Summary**

During its planning process Ergon Energy identified that action would be required to address emerging limitations in the electricity distribution network supplying the Charleville area of Southwest Queensland.

On 23 May 2012 Ergon Energy released a Request for Information providing details of the emerging network limitations in the Charleville area. That paper sought information from Rules Participants, AEMO and Interested Parties regarding potential solutions to address the emerging limitations.

Ergon Energy received 11 submissions by 18 July 2012, being the closing date for submissions to the Request for Information.

An evaluation team of 8 representatives from across the business was formed to evaluate the submissions.

### **6.2. Non-Distribution Options Identified**

All 11 submissions received through the RFI process were identified as non-distribution options and can be categorised as follows:

- 5 options comprised of battery only or battery combined with solar solutions.
- 4 options comprised of diesel only or diesel combined with solar and battery solutions.
- 1 option comprised a solar thermal solution with diesel and battery contingency.
- 1 option comprised a geothermal power station.

### **6.3. Distribution Options Identified**

In addition to the consultation process to identify possible non-network solutions, Ergon Energy carried out studies to determine the most appropriate distribution network solution – it was considered that a ‘do nothing’ approach was unacceptable.

The distribution network option identified was to construct a duplicate 66kV sub-transmission feeder from Roma Bulk Supply Point to Charleville. The distribution non-network option considered was the development of a network support power-station in conjunction with localised network demand management.

## **7. FEASIBLE SOLUTIONS**

This section provides an overview of the feasible solutions identified, with full details of the financial analysis contained in section 8.

### **7.1. Non Feasible Solutions**

The distribution option identified internally to construct a duplicate 66kV sub-transmission feeder from Roma Bulk Supply Point to Charleville was eliminated on the basis that it was not economically viable. The capital cost of the feeder alone was

estimated at \$52.7 million and the net present cost of the distribution option is estimated at \$54.4 million, which is inclusive of operation and maintenance.

From the RFI respondents' proposals:

- The 5 options which comprised of battery only or battery and solar solutions were eliminated on the basis of their inability to meet the partial contingency / risk management requirements.

## 7.2. Feasible Solutions

Of the 6 feasible solutions identified, 4 were to design and construct generation solutions with a diesel component, 1 was a solar thermal power station and 1 was a geothermal power station option as follows:

Generation Components	Capital Cost
6 X 1MW Diesel	\$4.2M
3 X 2.25MW Diesel	\$5.4M
6MW Solar / 4MW Battery / 6 X 1MW Diesel	\$27.1M
6MW Solar / 4MW Battery / 5.6MW Diesel <i>*Note: Proponent specified a unit scaling and costing of proposed solution, which has been upscaled to satisfy Ergon Energy's requirements. Specified unit costs of \$9.05M were still higher than the lower cost alternatives.</i>	\$42.3M
24MW Solar Thermal Power Station / 144MWh Battery / 6MW Diesel (owned and operated)	\$Nil
10MW Geothermal Power Station (owned and operated)	\$Nil

The 6 feasible solutions were evaluated by the panel based on the following criteria:

- Scope & technical validity
- Financial and management capability
- Experience and corporate culture
- Network compatibility / customer & stakeholder impacts

The power station proponents and the top 3 highest scoring diesel/hybrid proposals were short-listed and invited to present their solutions to the evaluation panel.

## 8. FINANCIAL ANALYSIS & RESULTS

### 8.1. Format and Inputs to Analysis

#### 8.1.1 Regulatory Test Requirements

The requirements for the comparison of options to address an identified network limitation are contained in the Regulatory Test prescribed by the AER.

The Regulatory Test requires that, for reliability augmentations, the recommended option be the one that “**minimises the present value of costs, compared with a number of alternative options in a majority of reasonable scenarios**”. To satisfy

the Regulatory Test, the proposed solution must achieve the lowest cost in the majority (but not necessarily all) credible scenarios.

The Regulatory Test contains guidelines for the methodology to be used to identify the lowest cost option. Information to be considered includes construction, operating and maintenance costs and the costs of complying with existing and anticipated laws and regulations.

### 8.1.2 Inputs to Analysis

A solution to address the future supply requirements for the Charleville area as outlined in this document is required to satisfy reliability requirements as defined in the National Electricity Rules.

According to the requirements of the Regulatory Test, the costs of all options must be compared and the least cost solution (in the majority of cases) is considered to satisfy the Regulatory Test. The results of this evaluation, carried out using a discounted cash flow model to determine the net present costs of the various options, are shown in Section 8.2 below.

In addition to the RFI proponents' submissions, a quote for a 6MW diesel generation unit was sourced internally to act as a benchmark for the external quotes.

## 8.2. Financial Analysis

The economic analysis undertaken considered the net present value of the cost of alternative options over the 20 year period from 2013 to 2033. A discount rate of 9.99% was selected as a relevant commercial discount rate.

The following table is a summary of the economic analysis. It shows the net present cost of each alternative and identifies the best ranked option for the range of scenarios considered.

CHARLEVILLE ECONOMIC ANALYSIS NPV SUMMARIES		Internal Diesel \$M	Option A Diesel \$M	Option B Diesel \$M	Option C Hybrid \$M	24MW Solartherm \$M	10MW Geotherm \$M
Present Cost of Capex		\$4.45	\$3.77	\$4.80	\$24.08	\$0.00	\$0.00
Present Cost of Opex		\$2.73	\$2.73	\$3.51	\$0.79	\$25.32	\$93.55
Present Value of Benefits		-\$0.93	-\$0.88	-\$1.09	-\$12.03	\$0.00	-\$4.08
NET PRESENT COST		\$6.25	\$5.62	\$7.22	\$12.83	\$25.32	\$89.46
Sensitivity Analysis excl Overheads (\$M)							
Scenario - Base Case		Internal	Option A	Option B	Option C		
		-\$6.25	-\$5.62	-\$7.22	-\$12.83		
		2	1	3	4		
Scenario - Escalation Opex -High	+20%	-\$6.80	-\$6.17	-\$7.92	-\$12.99		
		2	1	3	4		
Scenario - Escalation Opex -Low	-20%	-\$5.70	-\$5.07	-\$6.52	-\$12.67		
		2	1	3	4		
Scenario - Discount Rate - High	12.00%	-\$5.65	-\$5.03	-\$6.48	-\$13.94		
		2	1	3	4		
Scenario - Discount Rate - Low [REG]	9.72%	-\$6.34	-\$5.71	-\$7.33	-\$12.64		
		2	1	3	4		
Scenario - Increased Capital costs	+20%	-\$7.14	-\$6.37	-\$8.18	-\$17.65		
		2	1	3	4		
Scenario - Decreased Capital costs	-20%	-\$5.36	-\$4.87	-\$6.26	-\$8.02		
		2	1	3	4		
Scenario - Commercial Benefits	-20%	-\$6.44	-\$5.79	-\$7.44	-\$15.24		
		2	1	3	4		

### 8.3. Discussion of Results

The following conclusions have been drawn from the analysis presented in this report:

- There is no acceptable 'do nothing' option. The load is already above the levels recommended in Ergon Energy's security of supply criteria.
- The power station options were 'own and operate' proposals which although required no capital outlay, required substantial ongoing network support payments from Ergon Energy for a minimum of 10 years – which was determined to be not economically viable in both cases.
- The economic analysis carried out indicates a diesel generation solution has the lowest net present cost. This is primarily due to the solution required being for security (back-up supply) rather than for base load purposes. Consequently, expected run times (and the resulting operational costs) are low, so proposals minimising the capital costs will be the most cost effective.
- Costings provided by the RFI proponents were high-level in nature. The external diesel generation quotes were consistent with the internal benchmark. Option A has marginally the lowest net present cost.
- Sensitivity analysis indicates that Option A has the lowest net present cost in all scenarios.
- As diesel generation options provide the lowest cost options in all scenarios, they are considered to satisfy the Regulatory Test.

## 9. DRAFT RECOMMENDATION

Based on the conclusions drawn from the analysis in Sections 7 and 8, **it is recommended that Ergon Energy proceeds to a closed tender to optimise a diesel generation solution for the Charleville area** to address its security of supply requirements.

## 10. CONSULTATION

In accordance with the Rules provisions<sup>6</sup> Ergon Energy invites submissions from affected Rules Participants, AEMO and Interested Parties on this Consultation and Draft Recommendation Paper.

### 10.1. Timetable for Submissions

Submissions (electronic preferably) are due by 3 July 2013 and should be lodged to:

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PO Box 264  
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Attention: Network Strategy & Planning  
Email: [regulatory.tests@ergon.com.au](mailto:regulatory.tests@ergon.com.au)

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<sup>6</sup> National Electricity Rules clause 5.6.2(f)

## 10.2. Assessment and Decision Timetable

Ergon Energy intends to carry out the following process to assess what action should be taken to address the identified distribution network limitations:

Step 1	Request For Information (RFI) - <b>Complete</b>	Released: <b>23 May 2012</b>
Step 2	Submissions in response to the RFI - <b>Complete</b>	Due Date: <b>18 July 2012</b>
Step 3	Review and analysis by Ergon Energy - <b>Complete</b>	Completed by: <b>5 April 2013</b>
Step 4	Release of Ergon Energy's Consultation and draft Recommendation Paper of solution which satisfies the Regulatory Test – <b>This Document</b>	Released by: <b>5 June 2013</b>
Step 5	Submissions in response to the Consultation and Draft Recommendation Paper	Due Date: <b>3 July 2013</b>
Step 6	Release of Final Recommendation (including summary of submissions received)	Released by: <b>31 July 2013</b>
Ergon Energy will use its reasonable endeavours to maintain this consultation program. However, Ergon Energy reserves the right to revise this timetable at any time. The revised timetable will be made available on the Ergon Energy website: <a href="http://www.ergon.com.au/community--and--our-network/network-management-and-projects/regulatory-test-consultations">http://www.ergon.com.au/community--and--our-network/network-management-and-projects/regulatory-test-consultations</a>		

At the conclusion of the decision process, Ergon Energy intends to take immediate steps to implement the recommended solution to ensure system reliability is maintained.