

Addressing Customer Demand Requirements in Western Grid /Barcaldine: Request for Proposal (RFP)

28 September 2020

Version 1.0

132kV Feeder 7153 Lilyvale to Clermont or
132kV Feeder 7154 Clermont to Barcaldine
Limitation

RFP Period Starts: 29/09/2020

RFP Period Closes: 3/11/2020



Part of the Energy Queensland Group

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While care was taken in preparation of the information in this Request for Demand Management Solutions, and it is provided in good faith, Ergon Energy 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 document 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 proposal.

EXECUTIVE SUMMARY

This Request for Proposal (RFP) document is an invitation to demand management (DM) proponents to submit non-network solutions to address the network constraint identified in the Clermont – Barcaldine Western Grid. This RFP provides:

- Background information on the network capacity limitation;
- The demand reduction required by load quantum and time;
- An invitation to submit credible non-network options; and
- Information on what to include in your submission.

Network Need:

Ergon Energy has an existing contract with a generator proponent providing network support to the Western Grid Clermont - Barcaldine areas. The expiry of this contract on June 30, 2021, will mean that Ergon Energy may not meet its legislated Safety Net planning criteria for an unplanned outage after this date, putting load at risk for a Rural Sub transmission connection.

DM Solutions:

To be considered a feasible option, any DM solution must be technically feasible, commercially feasible; and able to be implemented in enough time for deferral of the network investment. A DM solution may involve one or more DM options that either reduces or fully services a network limitation, for one or more years.

Required:

The required characteristics of any DM solution are summarised in the table below:

Feeder	Maximum Availability	Total Generation Response for Mandated Time Frames			
		within 1 hr	within first 8hrs	within first 18hrs	within 24hrs
132kV 7154 CLER - BARC	All Year	1 MVA Generation	5MVA Generation	15MVA Generation	Feeder restored
132kV 7153 LILY - CLER	All Year	11MVA Generation	16MVA Generation	26MVA Generation	Feeder restored

Submissions:

Ergon Energy is seeking submissions from DM proponents on potential credible options to address the network constraint in the Clermont to Barcaldine area. Only submissions received by November 3, 2020 will be accepted. Submissions will need to address the issues described in the RFP and are to be submitted to demandmanagement@ergon.com.au.

Request for Demand Management Solutions



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Request for Demand Management Solutions



1. Introduction

Ergon Energy is a subsidiary of Energy Queensland Limited, a State government-owned corporation. Ergon Energy distributes electricity to over 761,000 customers.

Ergon Energy is requesting stakeholders' submissions for credible options to address the identified need in the report. The report includes background information about the limitations in this area, highlights the identified need, provides the requirements that a non-network proponent would need to meet, and specifies the process for interested stakeholder submissions.

Submissions in response to this report may be submitted to demandmanagement@ergon.com.au and are due by 3 November 2020.

2. Existing Network

Ergon Energy's 132kV 92km single conductor steel tower radial transmission line from the Powerlink owned Lilyvale Transmission/Bulk Supply substation supplies the Clermont 132/66/22kV bulk supply point and a further 260km of single conductor concrete pole radial transmission line from Clermont substation to the Barcaldine 132/66/22kV bulk supply point. A single line diagram representing the Central Western network is provided in Figure 1 below and a geographical representation in Figure 2. Clermont bulk supply point/zone substation has one major mining customer and solar farm supplied via the 66kV network, as well as 2562 residential, commercial, agricultural and industrial customers fed via the 22kV network. Barcaldine bulk supply point supplies the Longreach and Blackall Zone substations via 66kV sub transmission feeders 112kms and 108kms respectively, as well as local customers via 22kV zone substation and distribution network, for a total customer base of 6097. There is also a number of solar farms that have been commissioned in the last five years connected near Longreach at 66kV and Barcaldine at 22kV. All solar farms are disconnected during a 132kV contingency where their part of the network is isolated from the national grid.

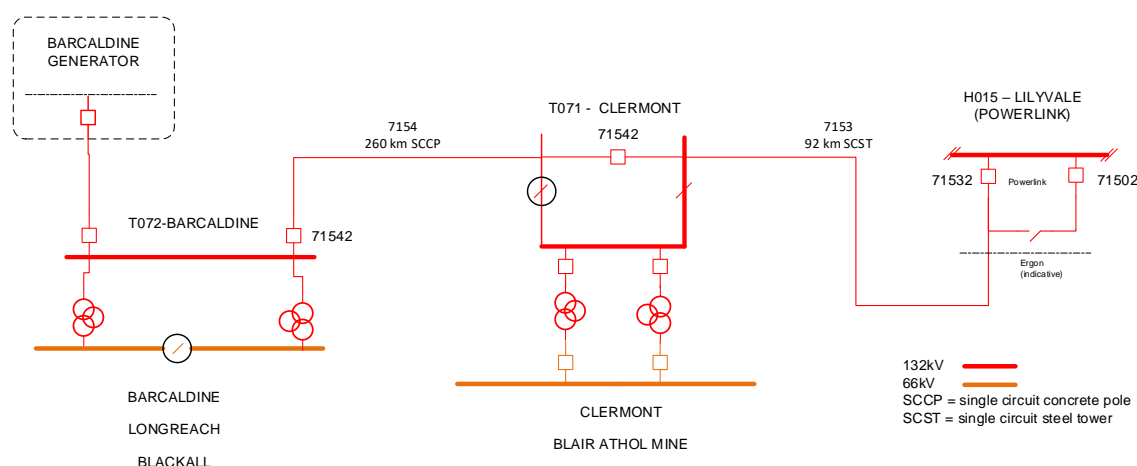


Figure 1: 132kV Single Line Diagram - Central Western Network - Simplified



Figure 2: Existing Network Arrangement (Geographical View)

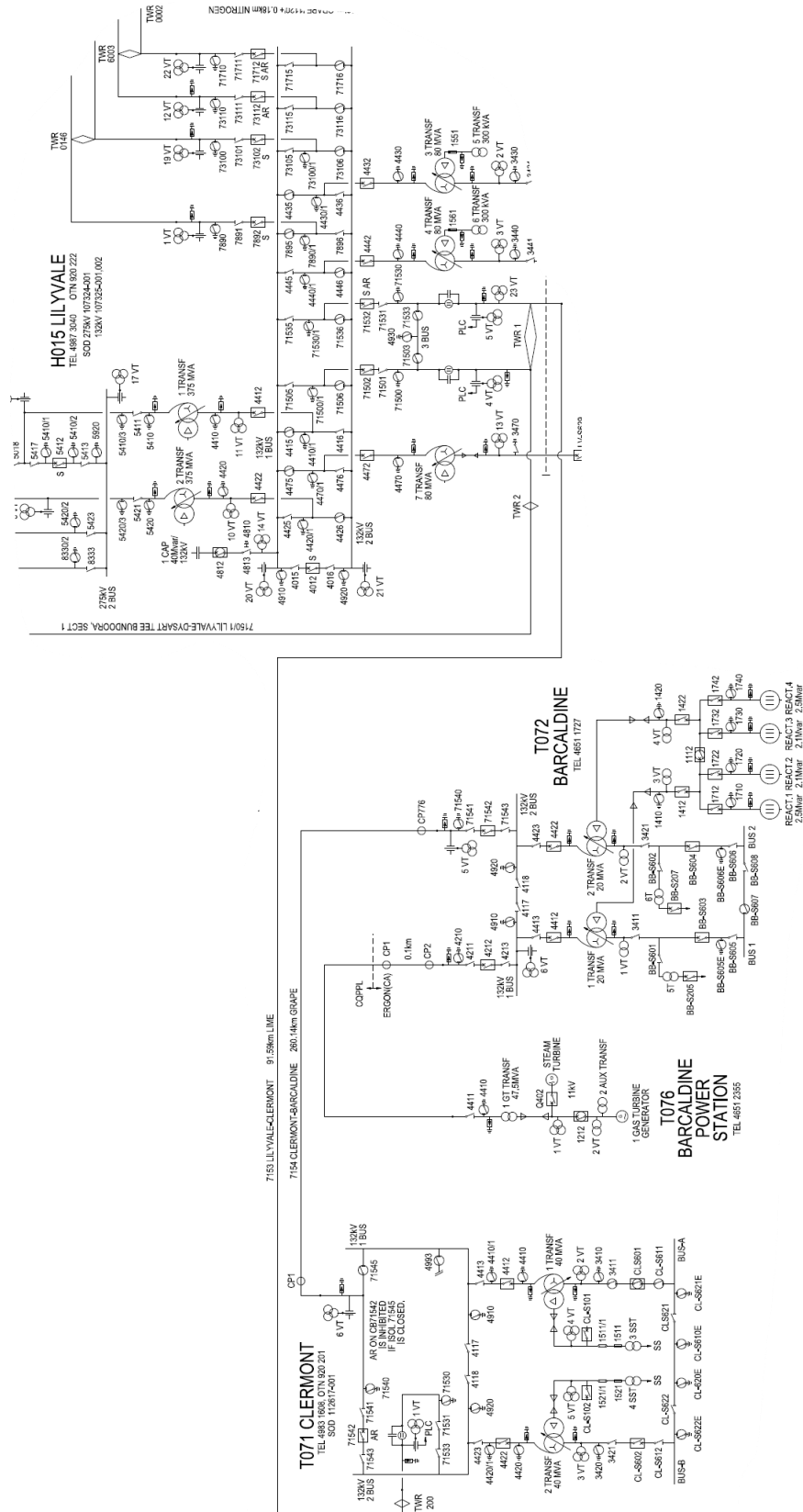


Figure 3: Existing Network Arrangement (Schematic View)

3. Applied Service Standards

Under its Distribution Authority, Ergon Energy must adhere to the Safety Net which identifies the principles for the operation of network assets under network contingency conditions. System contingency related capability is assessed against a 50% probability of exceedance (PoE) forecast load, available load transfers, emergency cyclic capacity (ECC) ratings, non-network response, mobile plant, mobile generators, and any short-term ratings of plant and equipment that are available. Ergon Energy Distribution Authority can be accessed by the following link:

https://www.dnrme.qld.gov.au/_data/assets/pdf_file/0004/219487/distribution-authority-d0199-Ergon-Energy.pdf

The Safety Net defines the security of supply criteria for Urban and Rural sub transmission feeders and substations. For the Lilyvale - Clermont – Barcaldine network, the following service standards apply:

Safety Net Restoration Targets	
RURAL/REMOTE	
1.	Less than 20MVA after 1 hour
2.	Less than 15MVA after 8 hours
3.	Less than 5MVA after 18 hours
4.	Fully restored within 48 hours*
* No customer is to be without supply for more than 24 hours	

4. Identified Need

The existing supply to the western sub-transmission grid - Barcaldine, Longreach and Blackall via the 132kV single conductor radial transmission feeder from Lilyvale and Clermont does not meet the Safety Net for an unplanned outage of 7153 or 7154. While future load growth would result in increased load at risk for an outage of 7153 and 7154, the current forecast is not predicting any load growth in this region within the next ten years. The following section outlines the substation and feeder limitations of the existing network. The system normal condition is assessed against 10% PoE load forecast for feeder 7153 and 7154. The 50% PoE load forecast is used for N-1 contingency analysis.

4.1. Sub-Transmission Network Limitation

Locations	Peak Load ¹ (MVA)
BARCADDINE 22kV Bus	7.3
LONGREACH 22kV Bus	9.3
BLACKALL 22kV Bus	4.2
Feeder 7154 Total	20.8
CLERMONT 22kV Bus	10.1
Feeder 7153 Total	30.9

Note 1: not including curtailable loads

Table 1: Load at Risk and Supply Response for Nominated Feeders Out of Service

Feeder	Maximum Load at Risk (MVA)	Restoration of Feeder	Total Generation Response for Mandated Time Frames				Safety Net Compliance
			within 1 hr	within first 8hrs	within first 18hrs	within 48hrs	
66kV 6080 BARC - BLAK	4.2	12 hours	Nil Required	Nil Required	Feeder restored		Compliant
66kV 6079 BARC - LONG	9.3	12 Hours	Nil Required	1 MVA Generation	Feeder restored		Compliant
132kV 7154 CLER - BARC	20.8	24 Hours	1 MVA Generation	5MVA Generation	15MVA Generation	Feeder restored	Compliant
132kV 7153 LILY - CLER	30.9	24 Hour	11MVA Generation	16MVA Generation	26MVA Generation	Feeder restored	Compliant

4.2. Demand Characteristics

Load at Risk

The Barcaldine 66kV annual load profile (kVA) minus any solar farm generation to simulate a 132kV contingency requirement, is shown in Figure 4, and

Figure 5 illustrates the load duration curve.

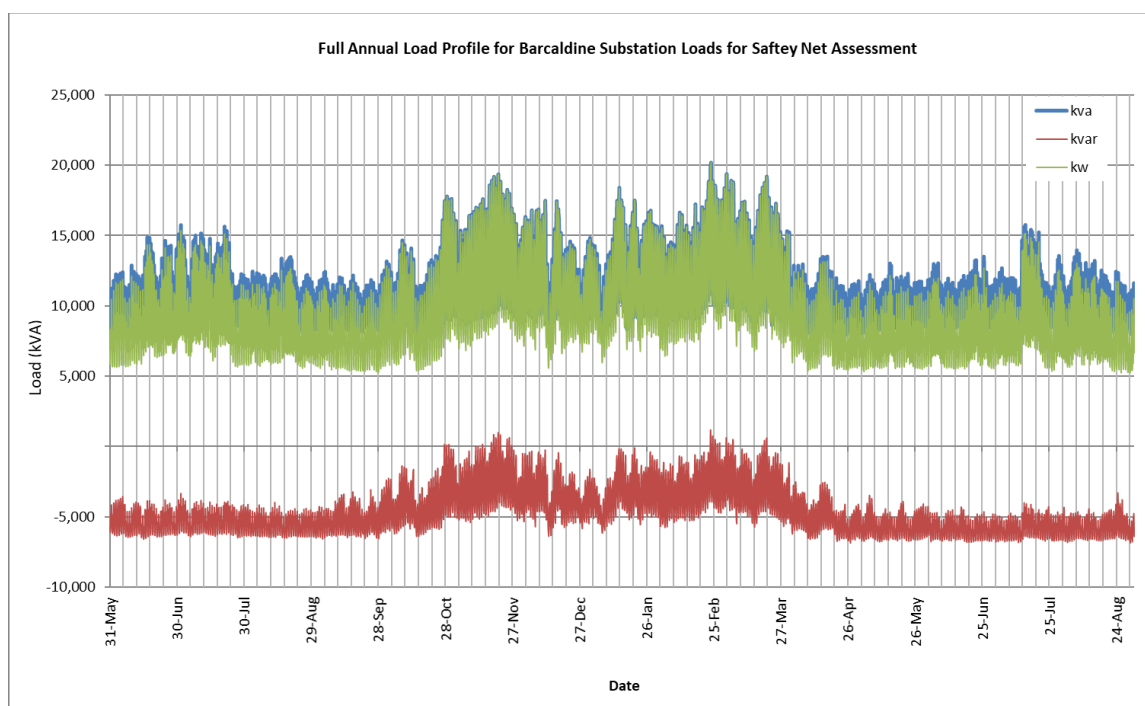


Figure 4: Barcaldine 66kV Load Daily Maxima Profile Curve (kVA)

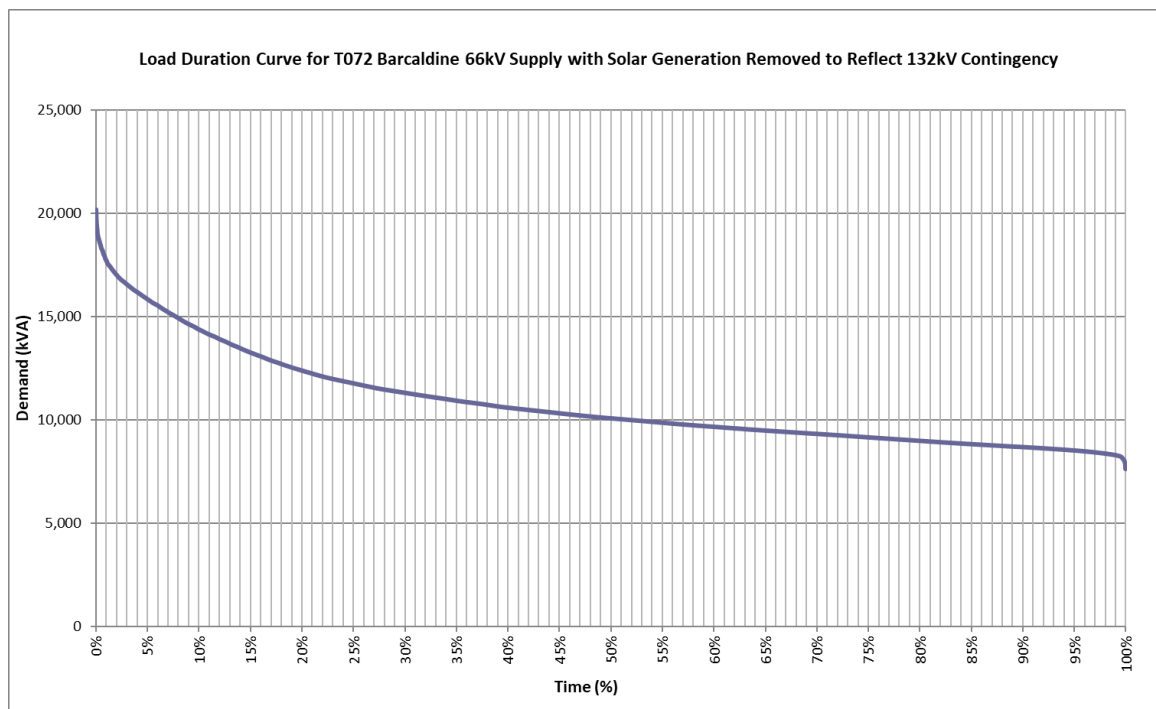


Figure 5: Barcaldine 66kV Load Duration Curve

The Clermont Substation annual load profile (kVA) minus any Major Customers to simulate a 132kV Contingency requirement, is shown in Figure 4, and

Figure 5 illustrates the load duration curve.

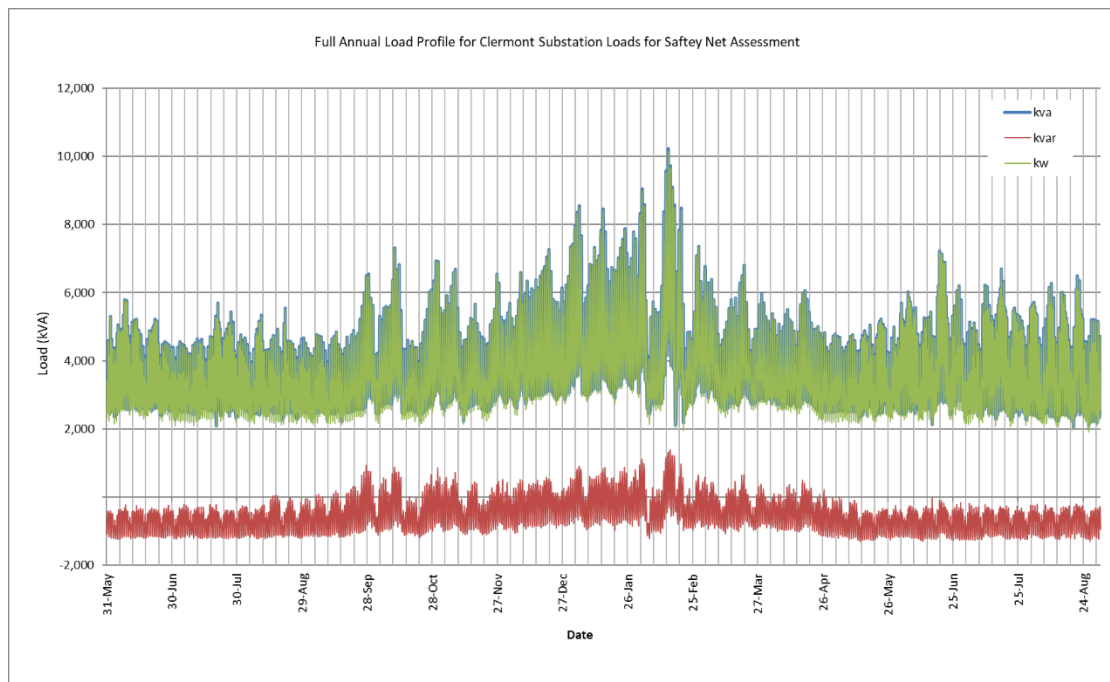


Figure 6: Clermont Safety Net Load Daily Maxima Profile Curve (kVA)

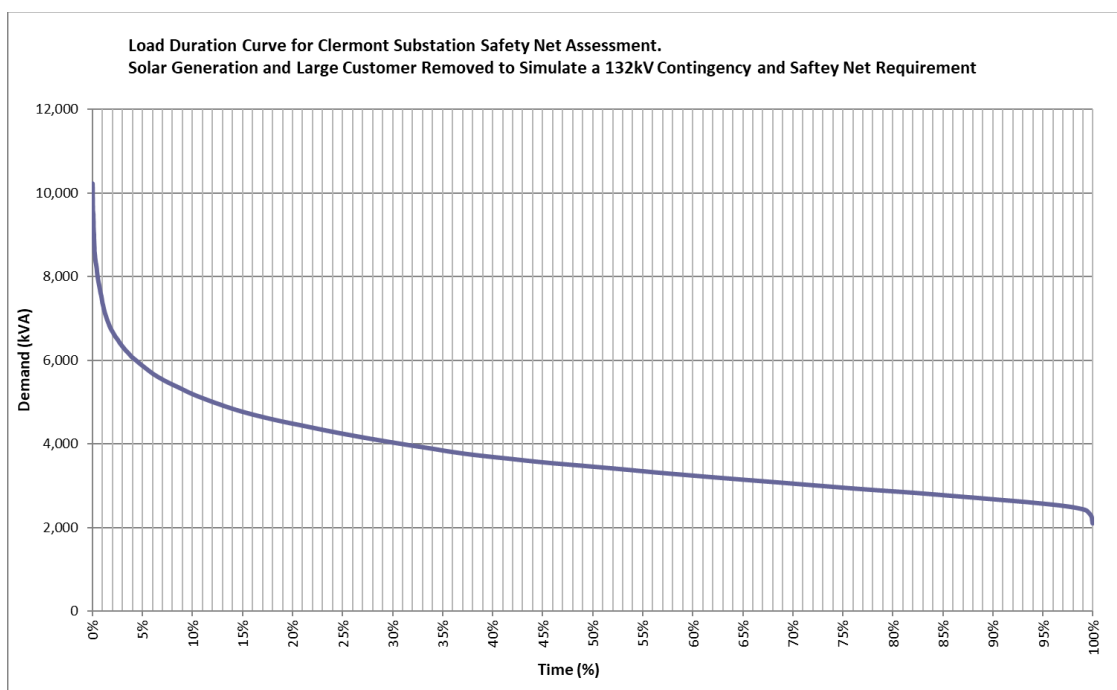


Figure 7: Clermont Safety Net Load Duration Curve

The typical load profile for feeders 7153 and 7154 is provided in Figure 8. The western region loads are highly dependent on air-conditioning with peaks occurring into the early hours of the evening.

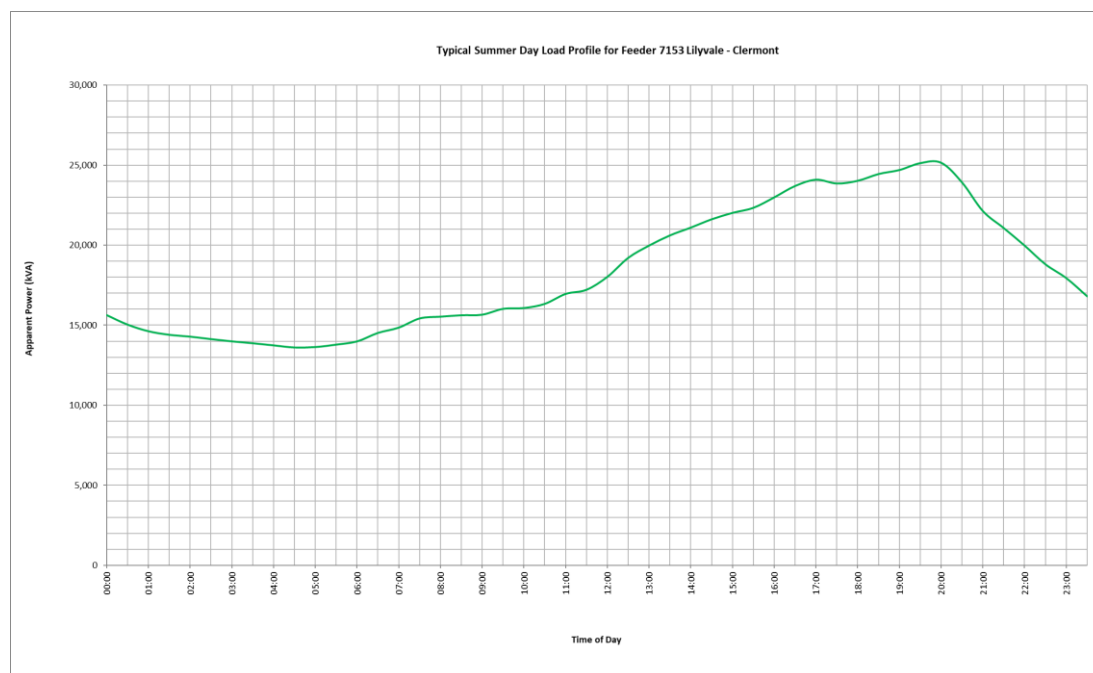


Figure 8: Typical Summer Day Load Profile for 132kV Feeder 7153 Lilyvale - Clermont

Due to no forecast load growth in the area in the next 10 years, proponents are only required to consider the current load at risk as highlighted by the Annual Load Profiles. As the 132kV feeder from Lilyvale to Clermont FDR7153 and from Clermont to Barcaldine FDR7154 is single circuit radial network, then all load is at risk respectively when considering Safety Net.

Energy at Risk

Energy Queensland utilises the AER 2019 Value of Customer Reliability (VCR) values as part of its investment and project planning process. VCR is an economic value applied to customers' unserved energy for any particular year and is intended to represent customers' willingness to pay for their reliability of electricity supply. VCR is used to supplement Ergon Energy's Jurisdictional Security Criteria requirements by helping compare project options in a project business case or RiT-D, where reliability is assessed to have a material impact. VCR analysis can also be used to demonstrate the customer benefits of investment above mandatory requirements, to achieve an improved, efficient customer reliability outcome, but in practice this application is very rare. Detail about how VCR is applied in investment analysis is included in each DNSP's Distribution Annual Planning Report (DAPR) under section 6.4 on Network Planning Criteria.

The likelihood of an outage on either feeder 7153 or 7154 resulting in a loss of energy is very low, however, Ergon Energy has identified a Safety Net risk which requires rectification. The Value of Customer Reliability cost for the case of supplying the Clermont, Barcaldine, Longreach and Blackall via feeders 7153 and 7154 has been modelled using the below assumptions:

- **VCR rate of \$36.18/kWh** – on the basis the mix of domestic, commercial and agricultural customers.
- **From historic unplanned and forced outage data for the past 10 years** – Feeders 7153 and 7154 VCR equates to \$556,000 / annum VCR value.

- **Load Transfers** – As the system is radial, there is no load transfers.
- **Repair Time** – The repair time for a rural 132kV feeder is assumed 24 hours.

It should be noted that the network limitation is based on the forecast load exceeding Ergon Energy's Safety Net obligations, rather than on the basis of the forecast value of energy at risk. The above information is included for completeness.

4.3. Summary of Non-Network Requirements

It should be noted that Ergon Energy has an existing Non-Network contract with a synchronous generator proponent for network support, which will expire in 2021.

Ergon Energy expects that the agreed network support will be available for the entire year, and that Ergon Energy may only be required to call on support following a contingency. As part of its operational strategy following a contingency, Ergon Energy normally deploys LV generation using its fleet of mobile generators and hired generators.

The load at risk could be supplied via a combination of generation and/or load curtailment and the load will follow a typical daily profile as per Figure 8. Even though solar generation is capable of supplying the western grid network during normal network configuration, when the connection to the national grid is out of service, solar farms cannot be utilised due to system strength and power system stability.

As noted in **Figure 4** and Table 1, the non-network solution will need to support up to 26MVA of capability in call off -load and generation. Ergon Energy would be interested in any network support solutions that provide a cost-effective alternative to this requirement.

5. Credible Options

The identified need presented in this report is driven by Ergon Energy not meeting its Safety Net obligations. Specifically, an outage of the existing 132 kV rural feeder 7153 or 7154 that leads to a security standard load at risk of up to 26MVA under the current load forecast. Solutions that prudently and efficiently address these constraints will be considered. Any potential option may be determined not credible if it does not meet any of the following criteria:

- Address the identified need;
- Be technically and commercially feasible;
- Be implemented in a sufficient time to meet the identified need; or
- Satisfy all the above requirements when forming a significant part of a credible option.

A non-exhaustive list of potentially feasible options includes:

- Embedded dispatchable network generation
- Embedded energy storage systems
- Embedded energy storage systems combined with generation (possibly dispatchable or non-dispatchable)
- Load curtailment agreements with customers to disconnect from the network following a contingency.

It should be noted that the above options may be aggregated across a number of substations in the network. For example, embedded solutions or load curtailment options could be partially be implemented in the supply areas of Barcaldine, Longreach, Blackall and Clermont to provide the required network support. For a singular generation supply, a connection at Barcaldine substation would be ideal.

Although the constraints of 26MVA must be addressed; solutions that are able to provide greater capacity to the network and improved reliability and security of supply may be considered. Furthermore, if a proponent is unable to support the total load required, Ergon Energy still encourages the submission of any solutions to reduce the constraints as it may be possible to aggregate multiple proposals to address the limitation.

Without attempting to limit a potential proponent's ability to innovate, unproven, experimental or undemonstrated technologies are unlikely to be considered as feasible options to address the identified limitation.

Please Note: It is preferred that any proposed option is available by July 2021, however if this time frame is not feasible, Ergon Energy still encourages submissions that will meet the required need to be submitted for consideration.

6. Submission Steps

6.1. Submission from Proponents

Ergon Energy invites written submissions on this report from registered participants and interested parties. All submissions should include sufficient technical and financial information to enable Ergon Energy to undertake comparative analysis of the proposed solutions against the alternative options presented in this report. The proposals should include:

- Description of proposed demand management solution to address the identified need.
- Project execution strategy including design, testing and commissioning plans.
- Engineering network system studies and study reports.
- If the proposed solution is part of a credible option – a description of the other elements of the credible option are required.
- Reasonable estimate of:
 - Proposed solution's expected outputs, including amount of network demand (kVA per year) expected to be managed.
 - Full costs of completed works including delivery and installation where applicable.
 - Forecast life expectancy of proposal.
 - Whole of life costs include operational costs.
 - Expected payments that would be required to be made to the proponent if contracted.
- Any other information relevant to determining whether a proposed solution would be a credible option, or part of a credible option, to address the identified need.

Ergon Energy will not be legally bound or otherwise obligated to any person who may receive this report or to any person who may submit a proposal. At no time will Ergon Energy be liable for any costs incurred by a proponent in the assessment of this report, any site visits, obtainment of further information from Ergon Energy or the preparation by a proponent of a proposal to address the identified need specified in this report.

Submissions in response to this report may be submitted to demandmanagement@ergon.com.au and are due by 3 November 2020.