Regulatory Investment Test for Distribution (RIT-D)

Addressing Reliability Requirements in the Cranbrook Network Area

Notice of No Non-Network Options

3 May 2023

Part of Energy Queensland

EXECUTIVE SUMMARY

About Ergon Energy

Ergon Energy Corporation Limited (Ergon Energy) is part of Energy Queensland and manages an electricity distribution network which supplies electricity to more than 765,000 customers. Our vast operating area covers over one million square kilometres (around 97% of the state of Queensland) from the expanding coastal and rural population centres to the remote communities of outback Queensland and the Torres Strait.

Our electricity network consists of approximately 160,000 kilometres of powerlines and one million power poles, along with associated infrastructure such as major substations and power transformers.

We also own and operate 33 stand-alone power stations that provide supply to isolated communities across Queensland which are not connected to the main electricity grid.

Identified Need

Cranbrook 66/11kV Substation (CRAN) provides electricity supply to approximately 4,929 predominantly residential customers in the Townsville area, of which 91% are residential and 9% are commercial and industrial.

A recent condition assessment has highlighted that a number of critical assets are at end of life and are in poor condition. The condition of these assets presents a considerable safety and reliability risk.

Condition data indicates that the South Wales 11kV switchboard, the 66kV bus VT, one of the RTU's and a majority of the protection relays at CRAN are reaching end of life.

The deterioration of these primary and secondary system assets poses safety risks to staff working within the switchyard. It also poses a safety risk to the general public, though the increased likelihood of protection relay or 11kV CB mal-operation. Additionally, the poor condition of these assets significantly increases the likelihood of outages, resulting in a reduction in the level of reliability experienced by the customers supplied from CRAN.

Approach

The National Electricity Rules (NER) require that, subject to certain exclusion criteria, network business investments for meeting service standards for a distribution business are subject to a Regulatory Investment Test for Distribution (RIT-D). Ergon Energy has determined that network investment is essential in this case for it to continue to provide electricity to the consumers in the CRAN supply area in a reliable, safe and cost-effective manner. Accordingly, this investment is subject to a RIT-D. An internal assessment has been conducted and it has been determined that there is not a non-network option that is potentially credible, or that forms a significant part of a potential credible option that will meet the identified need or form a significant part of the solution.

This Notice has hence been prepared by Ergon Energy in accordance with the requirements of clause 5.17.4(d) of the NER.

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1. BACKGROUND

1.1. Geographic Region

Cranbrook 66/11kV Substation (CRAN) provides electricity supply to approximately 4,929 predominantly residential customers in the Townsville area, of which 91% are residential and 9% are commercial and industrial.

The geographical location of Ergon Energy's sub-transmission network and substations in the area is shown in Figure 1.

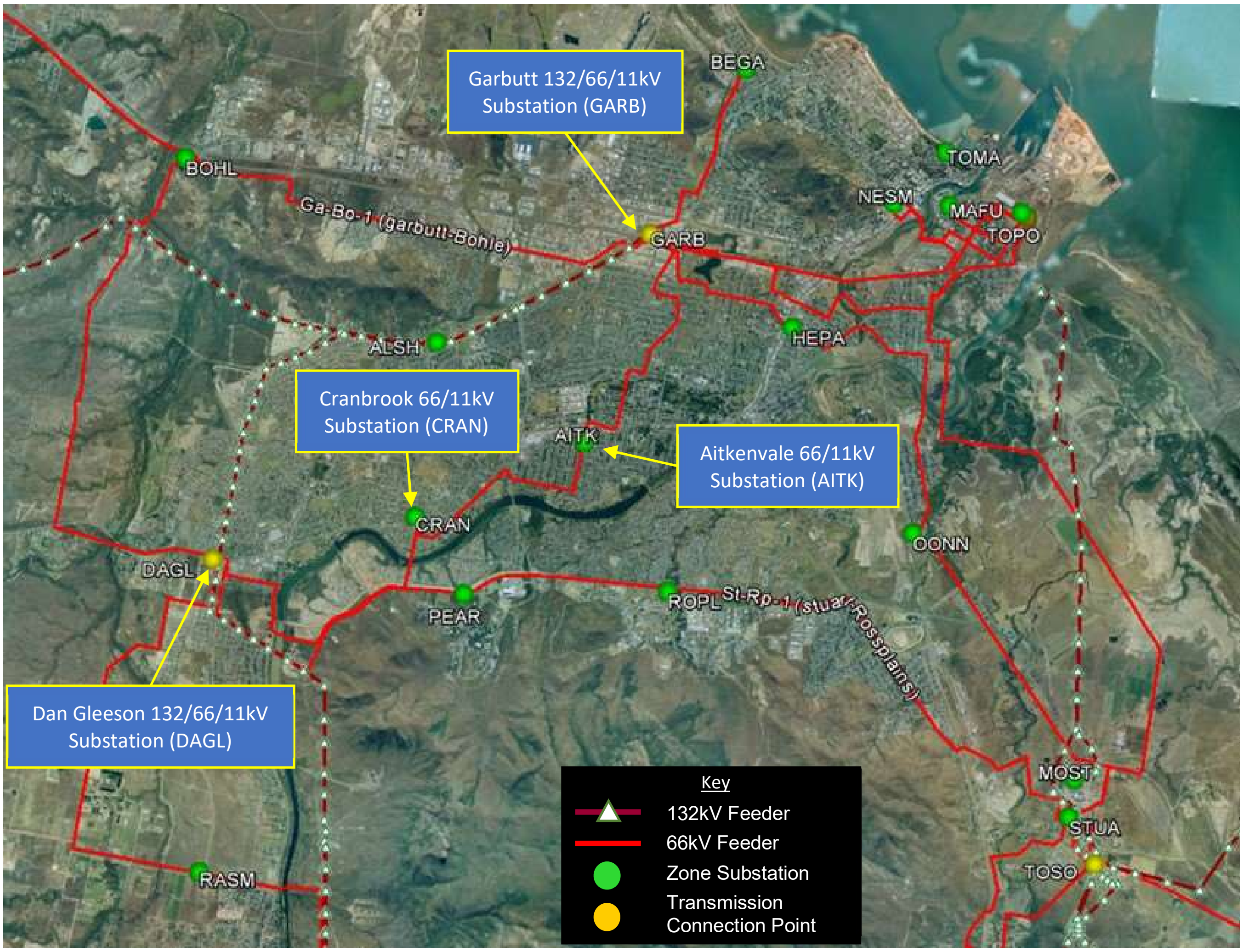


Figure 1: Existing network arrangement (geographic view)

1.2. Existing Supply System

CRAN is located in Townsville and is supplied via two incoming 66kV feeders from T092 Dan Gleeson 132/66kV Substation and T046 Garbutt 132/66kV Substation.

CRAN was established in 1972 according to applicable design and construction standards during that time. CRAN consists of two incoming 66kV feeder bays (with no CBs), a 66kV bus section bay, 2 x 66/11kV 15/20/25MVA (ONAN/ONAF/OFDAF) power transformers and an indoor 11kV switchboard with 8 outgoing 11kV feeders (CB-02, CB-03, CB-04, CB-05, CB-06, CB-07, CB-08 & CB-10).

A schematic view of the existing sub-transmission network arrangement is shown in Figure 2 and the geographic view of CRAN is illustrated in Figure 3.

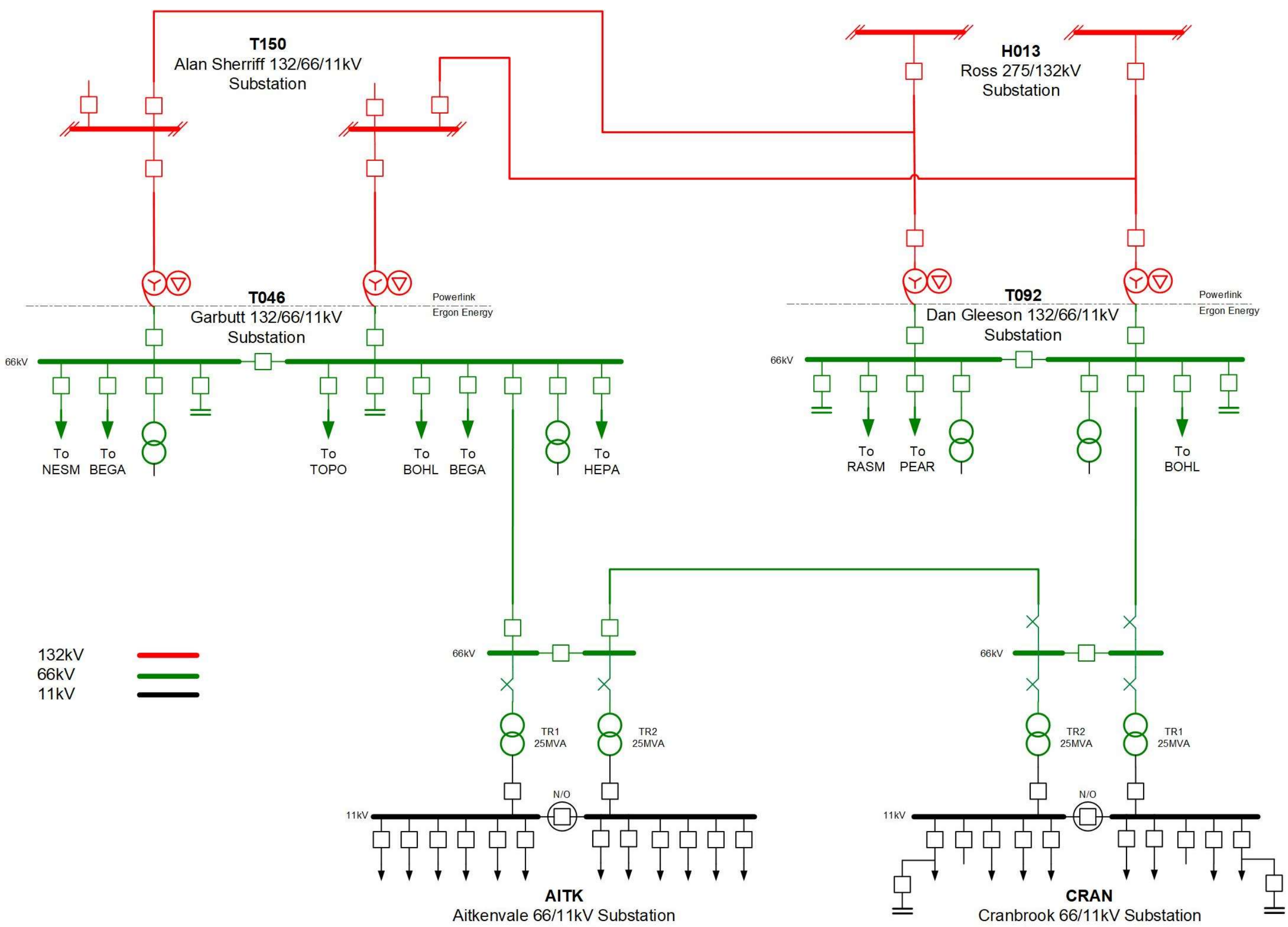


Figure 2: Existing network arrangement (schematic view)

Figure 3: Cranbrook Substation (geographic view)

1.3. Load Profiles / Forecasts

The load at CRAN comprises a mix of residential and commercial customers. The load is summer peaking, and the annual peak loads are predominantly driven by residential load, aged care facilities and shopping centres.

1.3.1. Full Annual Load Profile

The full annual load profile for CRAN over the 2021/22 financial year is shown in Figure 4. It can be noted that the peak load occurs during summer.

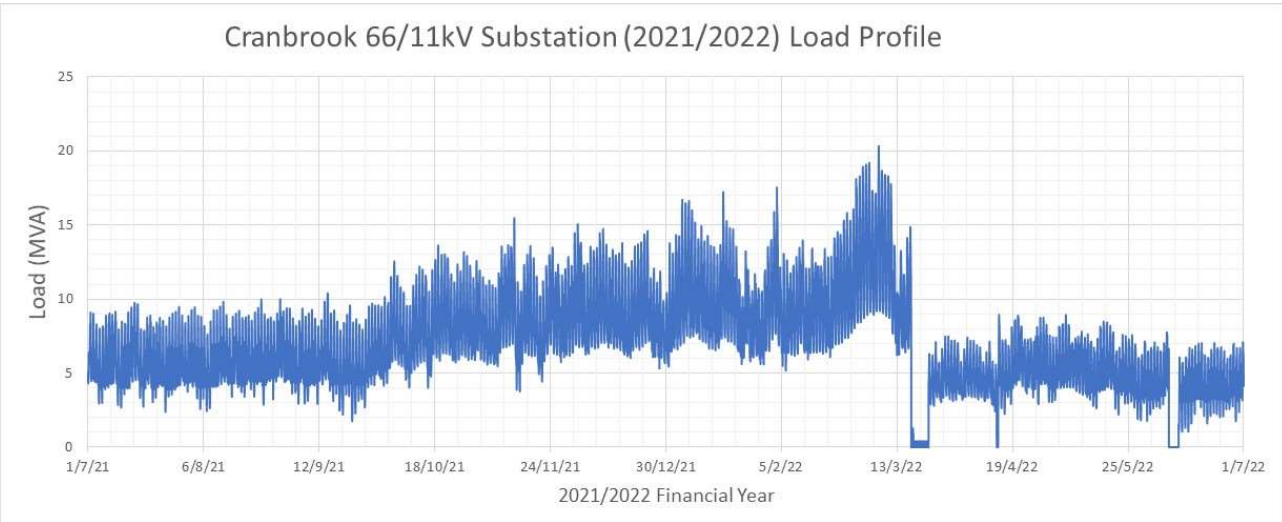


Figure 4: Substation actual annual load profile

1.3.2. Load Duration Curve

The load duration curve for CRAN over the 2021/22 financial year is shown in Figure 5.

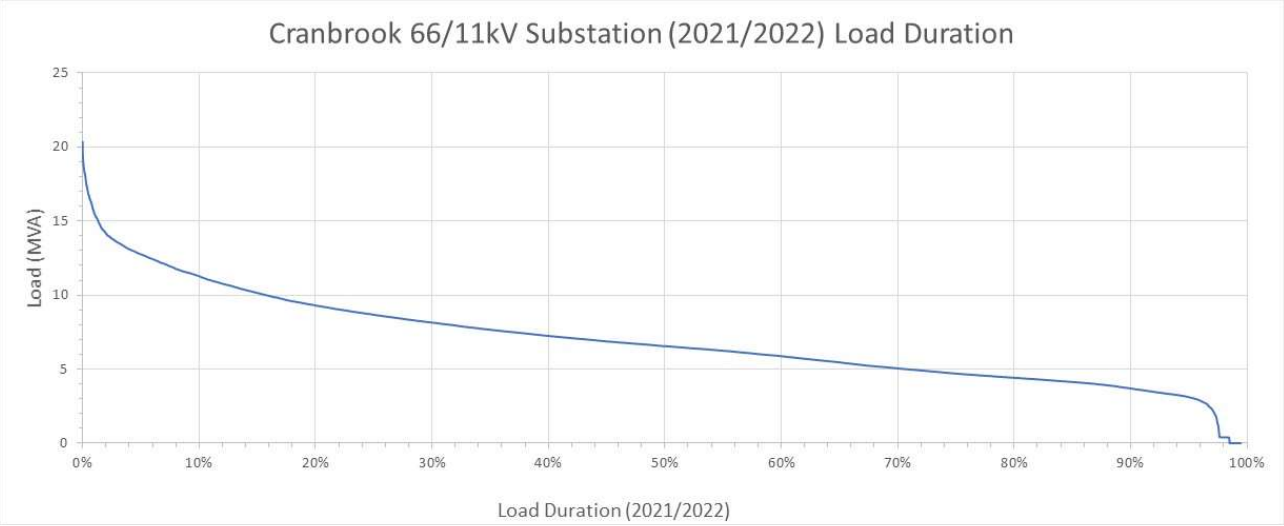


Figure 5: Substation load duration curve

1.3.3. Average Peak Weekday Load Profile (Summer)

The daily load profile for an average peak weekday during summer is illustrated below in Figure 6. It can be noted that the summer peak loads at CRAN are historically experienced in the late afternoon and evening.

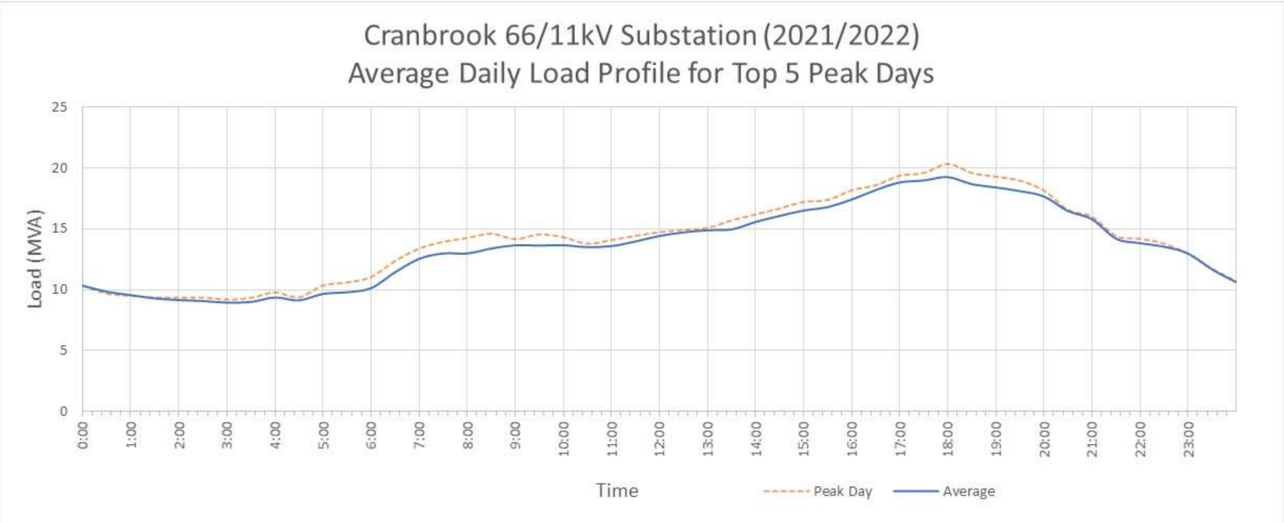


Figure 6: Substation average peak weekday load profile (summer)

1.3.4. Base Case Load Forecast

The 10 PoE and 50 PoE load forecasts for the base case load growth scenario are illustrated in Figure 7. The historical peak load for the past six years has also been included in the graph.

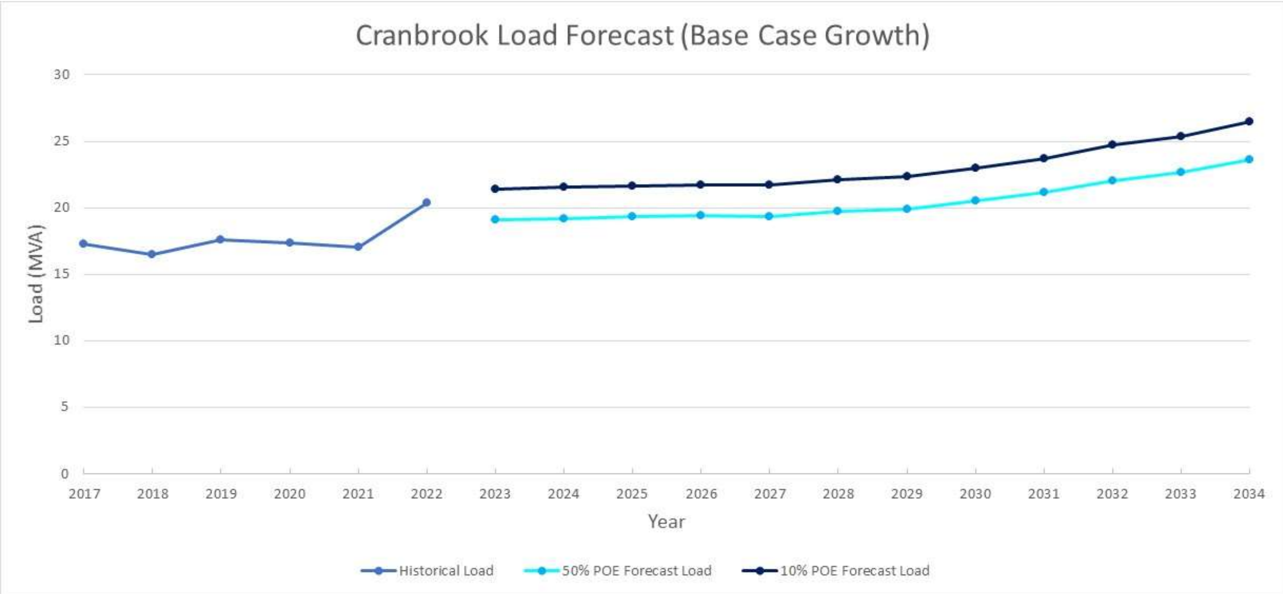


Figure 7: Substation base case load forecast

1.3.5. High Growth Load Forecast

The 10 PoE and 50 PoE load forecasts for the high load growth scenario are illustrated in Figure 8. With the high growth scenario, the peak load is forecast to increase over the next 10 years.

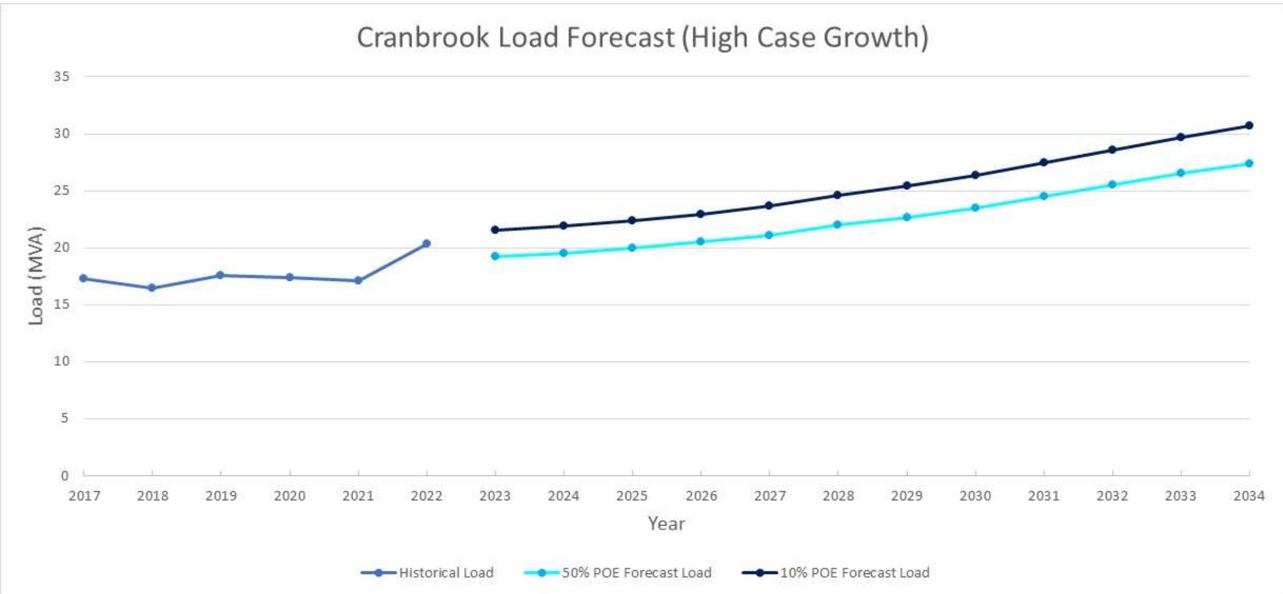


Figure 8: Substation high growth load forecast

1.3.6. Low Growth Load Forecast

The 10 PoE and 50 PoE load forecasts for the low load growth scenario are illustrated in Figure 9. With the low growth scenario, the peak load is forecast to remain relatively steady over the next 10 years.

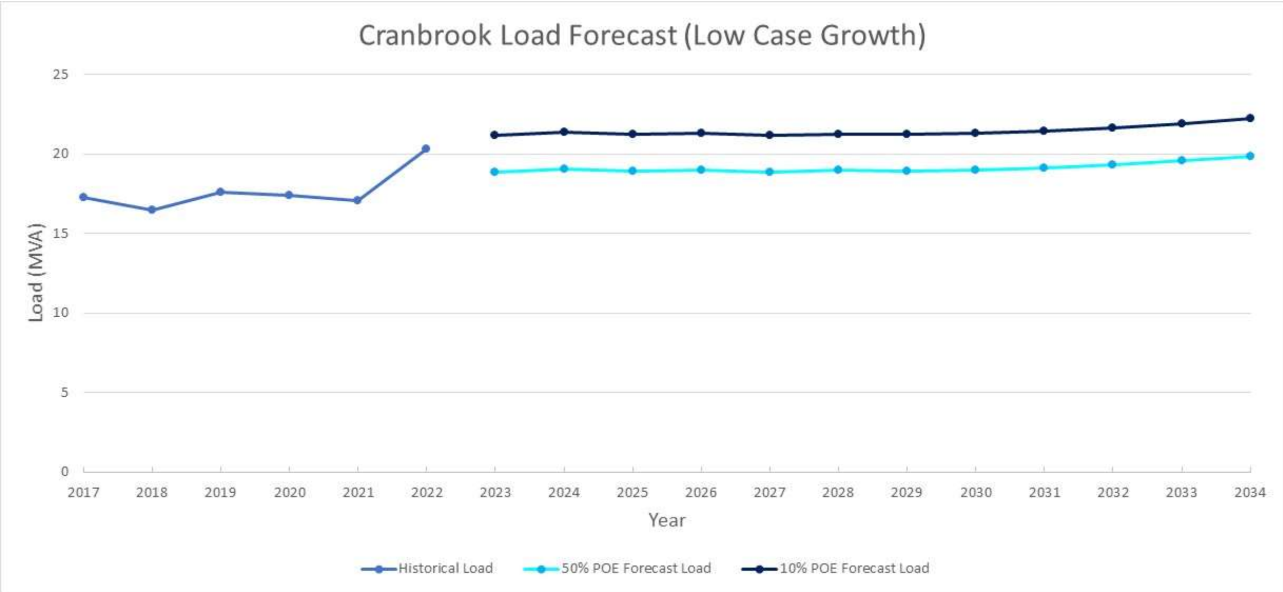


Figure 9: Substation low growth load forecast

2. IDENTIFIED NEED

2.1. Description of the Identified Need

2.1.1. Aged and Poor Condition Assets

A recent condition assessment has highlighted that a number of critical assets are at end of life and are in poor condition. The condition of these assets presents a considerable safety and reliability risk.

Condition data indicates that the South Wales 11kV switchboard, the 66kV bus VT, one of the RTU's and a majority of the protection relays at CRAN are reaching end of life.

The deterioration of these primary and secondary system assets poses safety risks to staff working within the switchyard. It also poses a safety risk to the general public, though the increased likelihood of protection relay or 11kV CB mal-operation. Additionally, the poor condition of these assets significantly increases the likelihood of outages, resulting in a reduction in the level of reliability experienced by the customers supplied from CRAN.

Where Ergon Energy identifies an imminent asset safety risk, immediate temporary measures are put in place to ensure safety of staff and public until permanent remediation can be performed.

3. INTERNAL OPTIONS CONSIDERED

3.1. Non-Network Options Identified

Ergon Energy has not identified any viable non-network solutions internally that will provide a complete or a hybrid (combined network and non-network) solution to provide the magnitude of network support required in the CRAN supply area to address the identified need.

3.2. Network Options Identified

Ergon Energy has identified one credible network option that would address the identified need.

3.2.1. Option A: Replace the 11kV switchboard, 66kV bus VT, RTU and protection relays

This option involves the replacement of the 11kV switchboard at CRAN with a new standard switchboard in a new control building, replacement of the 66kV bus VT, replacement of the C2025 RTU and replacement of protection relays in order to address the identified need.

A schematic diagram of the proposed network arrangement for Option A is shown in Figure 10.

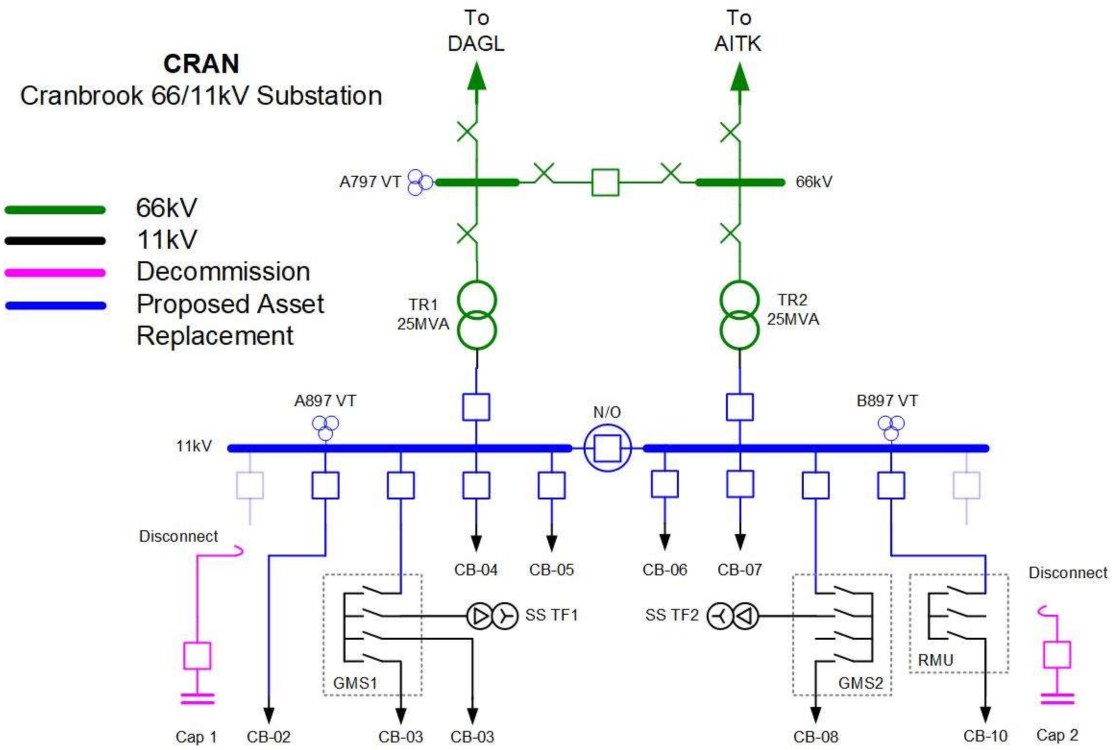


Figure 10: Option A proposed network arrangement (schematic view)

3.3. Preferred Network Option

Ergon Energy's preferred internal network option is Option A, to replace the 11kV switchboard at CRAN with a new standard switchboard in a new control building, replacement of the 66kV bus VT, replacement of the C2025 RTU and replacement of protection relays.

Upon completion of these works, the asset safety and reliability risks at CRAN will be addressed. The preferred option will provide the greatest reliability benefit for customers, whilst also reducing expenditure on obsolete and non-compliant assets while ensuring more efficient use of design and construction resources.

The estimated capital cost of this option inclusive of interest, risk, contingencies and overheads is $6.8 million. Annual operating and maintenance costs are anticipated to be 1.5% of the capital cost. The estimated project delivery timeframe has design commencing in late-2023 and construction completed by mid-2026.

4. ASSSESSMENT OF NON-NETWORK SOLUTIONS

Ergon Energy's Demand & Energy Management (DEM) team has assessed the potential non-network alternative (NNA) options required to defer the network option and determine if there is a viable demand management (DM) option to replace or reduce the need for the network options proposed.

Credible options must be technically and commercially viable and must be able to be implemented in sufficient time to satisfy the identified risk to the public and/or the network due to the identified constraints.

4.1. Demand Management (Demand Reduction)

The DEM team has completed a review of the CRAN customer base and considered a number of demand management technologies. Asset safety and performance risks are the key project drivers (i.e. the need) at CRAN. It has been determined that most demand management options will not be viable propositions and have been explored in the following sections.

4.1.1. Network Load Control

The residential and commercial customer loads appear to drive the daily peak demand which generally occurs between 6:00pm and 10:00pm.

There are 3335 customers on tariff T31 and T33 hot water load control (LC). An estimated demand reduction value of 2001kVA[1] is available.

CRAN LC signals are controlled from T046 Garbutt 132/66kV Substation (GARB). The Tariff 33 and 31 hot water LC channels are dynamic (that is, it responds to exceedance settings not on a timetable) and the current control strategy only calls LC when the T046 Garbutt 132/66kV Substation 66kV load exceeds 91MW or the T092 Dan Gleeson 132/66kV Substation 66kV load exceeds 110MW or the Stuart Substation 66kV load exceeds 100MW. This strategy does not directly address demand peaks experienced at CRAN. Tariff 33 air-conditioning channels are under manual control of the operational control centre and are used as required. Therefore, network load control would not sufficiently address the identified need.

4.2. Demand Response

Four methods utilising demand response technology for deferring network investment are: Call Off Load (COL), Customer Embedded Generation (CEG), Large Scale Customer Generation (LSG) and customer solar power systems.

[1] Hot water diversified demand saving estimated at 0.6kVA per system

4.2.1. Customer Call Off Load (COL)

COL is an effective technique for deferring network investment where the need is for a short time period. However, in this instance, the need is required on a long-term permanent basis. There are a small number of large customers in the catchment area but the $/kVA funding available for demand reduction is low therefore customer call off load has been assessed as not a viable proposition as it will not address the identified need, nor benefit the community.

4.2.2. Customer Embedded Generation (CEG)

CEG is an effective technique for deferring network investment where the need is for a short time period. The primary driver for investment in this instance is asset safety and performance. A short-term deferral of network investment by using CEG is not a technically or financially feasible option (due to the number of contracts required to be negotiated and managed).

This option has been assessed as technically not viable as it will not address the identified network requirement.

4.2.3. Large-Scale Customer Generation (LSG)

LSG sites such as renewable energy generation, solar or wind farms of multiple MW's capacity constitute an opportunity to support substation investment by reducing demand on, and potentially providing reactive power support for substation assets.

This option could potentially address the identified need, however, has been assessed as technically not viable as there is no known existing or proposed LSG demand response available.

4.2.4. Customer Solar Power Systems

A total of 1645 customers have solar photo voltaic (PV) systems for a connected inverter capacity of 9652kVA.

The daily peak demand is driven by residential and commercial customer demand and the peak generally occurs between 6:00pm and 10:00pm. As such customer solar generation does not coincide with the peak load period.

Business customers with large solar arrays are deemed to present a significant opportunity for targeted load control or load curtailment if coupled with a Battery Energy Storage System (BESS). Contracting such customers is attractive as they represent a larger load across fewer customers and therefore are cheaper and easier to engage and contract.

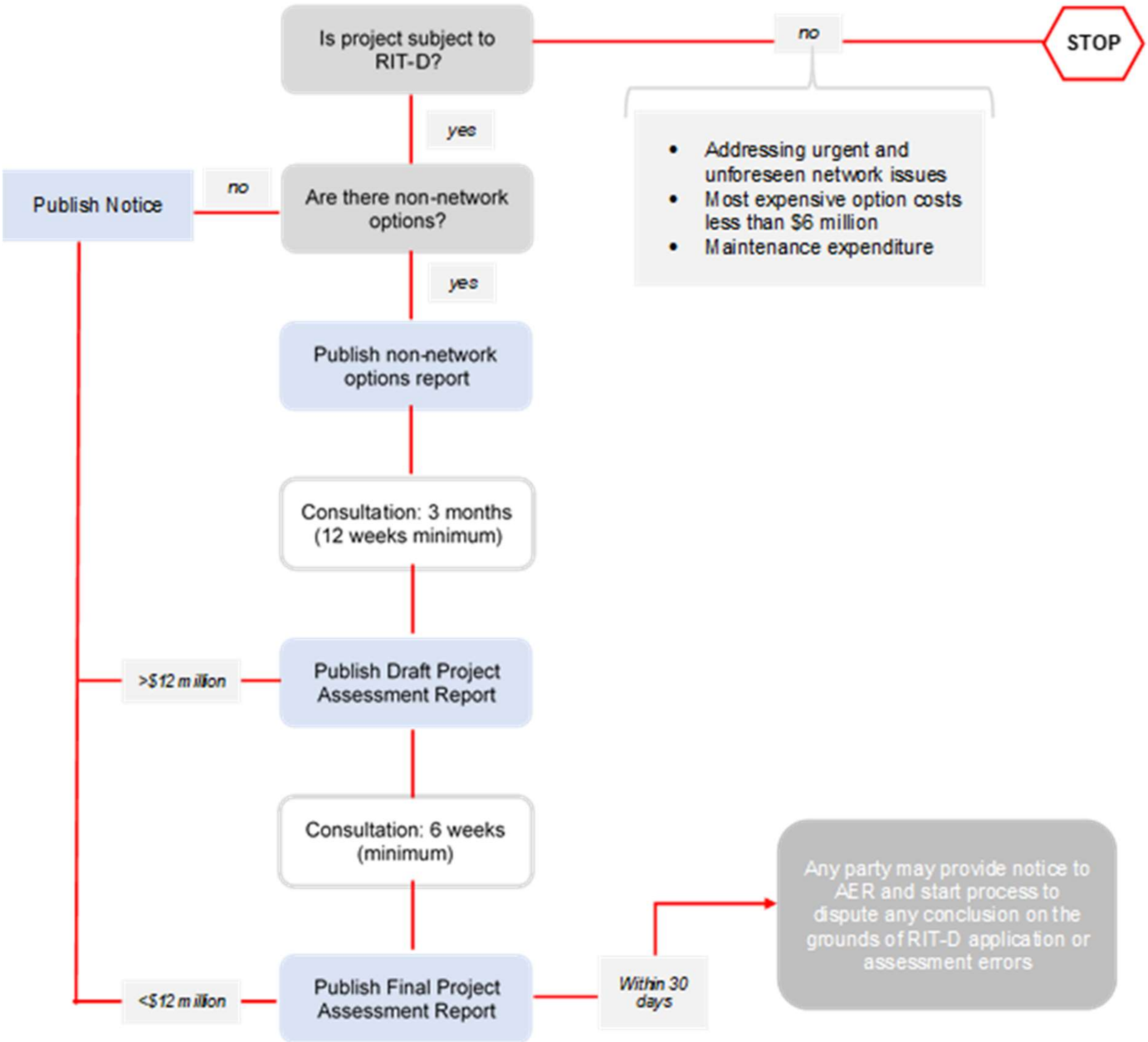
PV systems with BESS present a future portfolio opportunity for potential demand response but currently this supply area has a very limited solar/BESS. Solar customers without a BESS will not meet the technical needs of the demand reduction as their solar contribution may not be available when the network un-met need is required.

5. CONCLUSION AND NEXT STEPS

The internal investigations undertaken on the feasibility of the non-network solutions revealed that it is unlikely to find a complete non-network solution or a hybrid (combined network and non-network) solution to provide the magnitude of network support required in the CRAN supply area to address the identified need.

The preferred network option is Option A - to replace the 11kV switchboard at CRAN with a new standard switchboard in a new control building, replacement of the 66kV bus VT, replacement of the C2025 RTU and replacement of protection relays. This Notice of No Non-Network Options is therefore published in accordance with rule 5.17.4(d) of the National Electricity Rules. As the next step in the RIT-D process, Ergon Energy will now proceed to publish a Final Project Assessment Report.

APPENDIX A – THE RIT-D PROCESS



Source: AEMC, *Rule determination: National Electricity Amendment (Replacement expenditure planning arrangements) Rule 2017*, July 2017, p. 64.