Regulatory Investment Test for Distribution (RIT-D)

Addressing Reliability Requirements in the Neil Smith Network Area

Notice of Screening for Options

19 February 2025

Part of Energy Queensland

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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

Neil Smith 66/11kV Substation (NESM) provides electricity supply to approximately 2,348 predominantly residential customers in the Townsville City area, of which 79% are residential and 21% are commercial and industrial. NESM supplies 67.5 GWh of energy annually, with 15.4% of this energy consumed by residential customers.

Condition Based Risk Management (CBRM) analysis has identified that the two 15/20/25MVA English Electric 66/11kV transformers (YOM 1970), the South Wales 11kV switchboard (YOM 1967) and a majority of the protection relays at NESM are reaching end of life. The ongoing operation of these assets beyond their estimated retirement date presents significant safety, environmental and customer reliability risks.

The deterioration of these primary and secondary system assets poses safety risks to staff working within the substation. It also poses a safety risk to the general public, through the increased likelihood of protection relay mal-operation. Ergon Energy has obligations under the *Electrical Safety Act 2002* (Qld)[1] to eliminate electrical safety risks so far as is reasonably practicable, and where not reasonably practicable, to minimise the risks so far as is reasonably practicable.

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 NESM. Ergon Energy has obligations to comply with reliability performance standards specified in its

[1] QLD Electrical Safety Act 2002:
Part 2, Subdivision 2, Section 28 - What is reasonably practicable in ensuring electrical Safety
Part 2, Division 2, Section 29 - Duty of electricity entity

Distribution Authority[2] issued under the *Electricity Act 1994* (Qld). Further to these requirements, the *Electricity Act 1994* (Qld)[3] stipulates that distribution entities must comply with the reliability requirements, system standards and performance requirements specified in the National Electricity Rules (NER)[4].

Ergon Energy is seeking to invest in the network to undertake a reliability corrective action in order to continue to meet the service standards in its applicable regulatory instruments (National Electricity Rules, *Electricity Act 1994* (Qld), *Electrical Safety Act 2002* (Qld)).

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 Neil Smith 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 no stand-alone power system (SAPS) or 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.

[2] Ergon Energy Distribution Authority:
Section 7 - Guaranteed Service Levels
Section 8 - Distribution Network Planning
Section 9 - Minimum Service Standards
Section 10 – Safety Net

[3] QLD Electricity Act 1994 Part 5, Division 5, Section 42(a)(i)

[4] NER:
Schedule 5.1a System Standards
Schedule 5.1 Network Performance Requirements

CONTENTS

1. BACKGROUND

1.1. Geographic Region

Neil Smith 66/11kV Substation (NESM) provides electricity supply to approximately 2,348 predominantly residential customers in the Townsville area, of which 79% are residential and 21% are commercial and industrial. NESM supplies 67.5 GWh of energy annually, with 15.4% of this energy consumed by residential customers.

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

NESM is located in the Townsville City area in North Queensland and is supplied via two incoming 66kV feeders from Townsville Port 66/11kV Substation (TOPO) and T046 Garbutt 132/66kV Substation (GARB).

NESM was established in 1970 according to applicable design and construction standards during that time. NESM consists of 2 x 66/11kV 15/20/25MVA (ON/OB/OFB) power transformers and an indoor 11kV switchboard with 11 outgoing 11kV feeders.

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

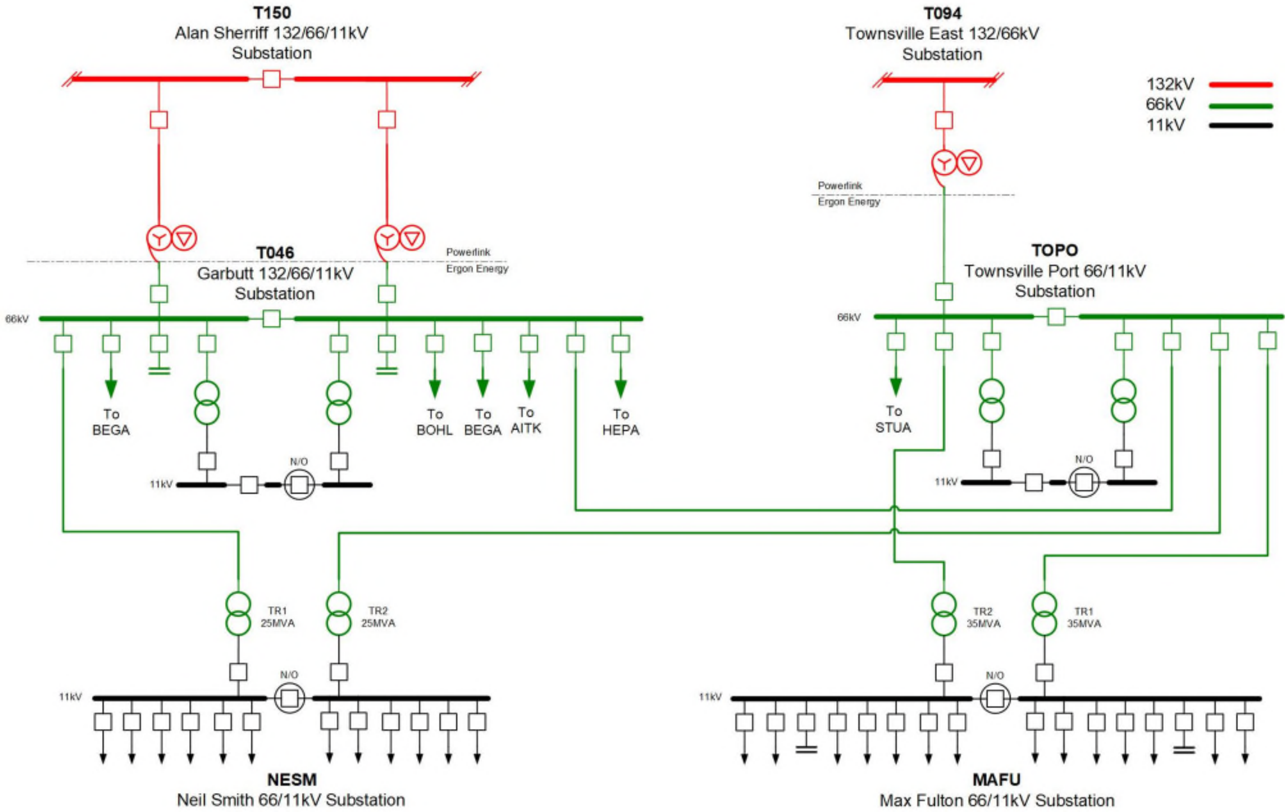


Figure 2: Existing network arrangement (schematic view)

Figure 3: Neil Smith Substation (geographic view)

1.3. Load Profiles / Forecasts

The load at NESM comprises a mix of residential and commercial customers. The load is Summer peaking, and the annual peak loads are predominantly driven by residential and commercial load.

1.3.1. Full Annual Load Profile

The full annual load profile for NESM over the 2022/23 and 2023/24 financial years is shown in Figure 4. It can be noted that the peak load occurs during summer.

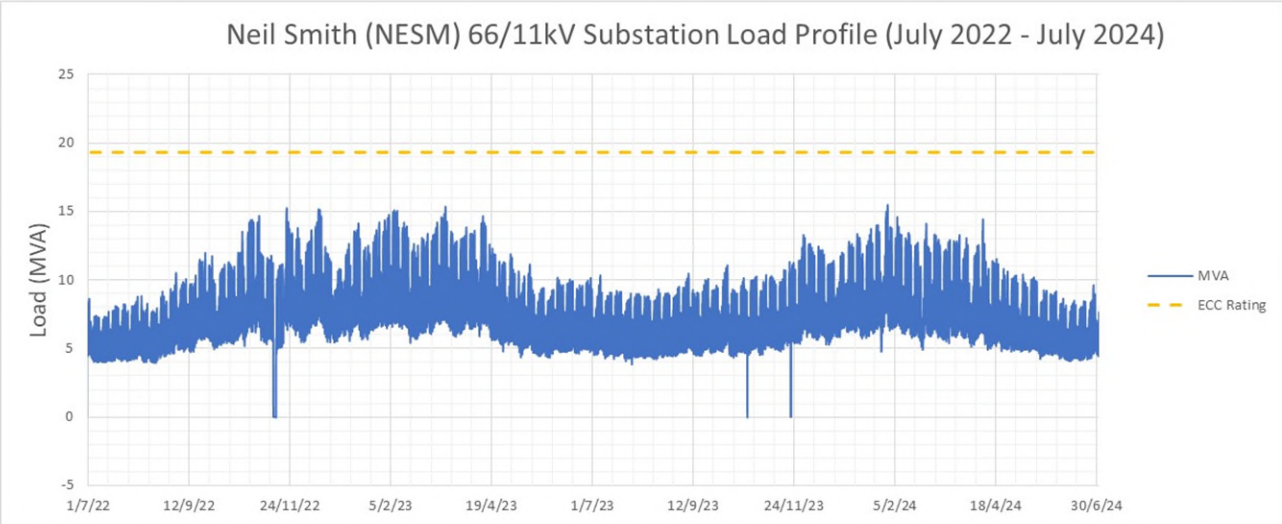


Figure 4: Substation actual annual load profile

1.3.2. Load Duration Curve

The load duration curve for NESM over the 2022/23 and 2023/24 financial years is shown in Figure 5.

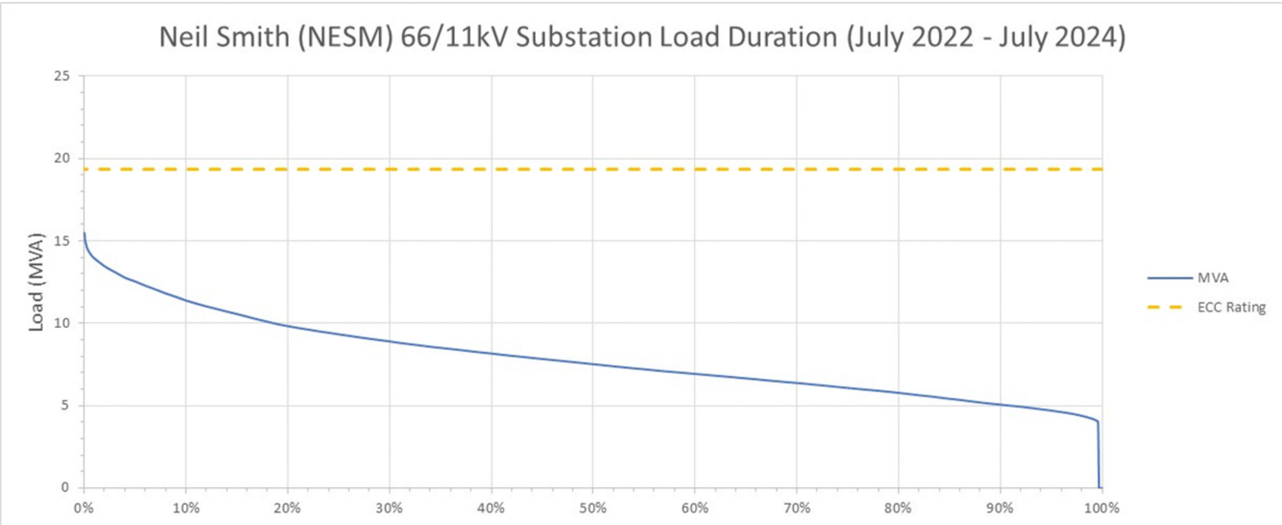


Figure 5: Substation load duration curve

1.3.3. Average Peak Day Load Profile (Summer)

The daily load profile for an average peak day during Summer is illustrated below in Figure 6. It can be noted that the Summer peak loads at NESM are historically experienced during the day.

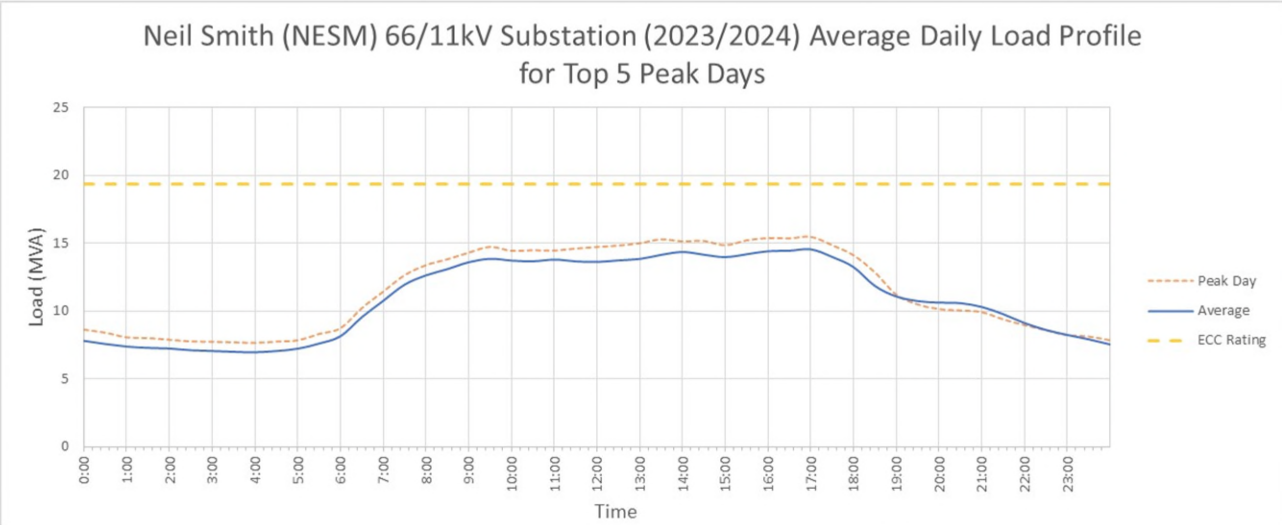


Figure 6: Substation average peak day load profile (summer)

1.3.4. Base Case Load Forecast

The 10 PoE (10% probability of exceedance) and 50 PoE (50% probability of exceedance) 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.

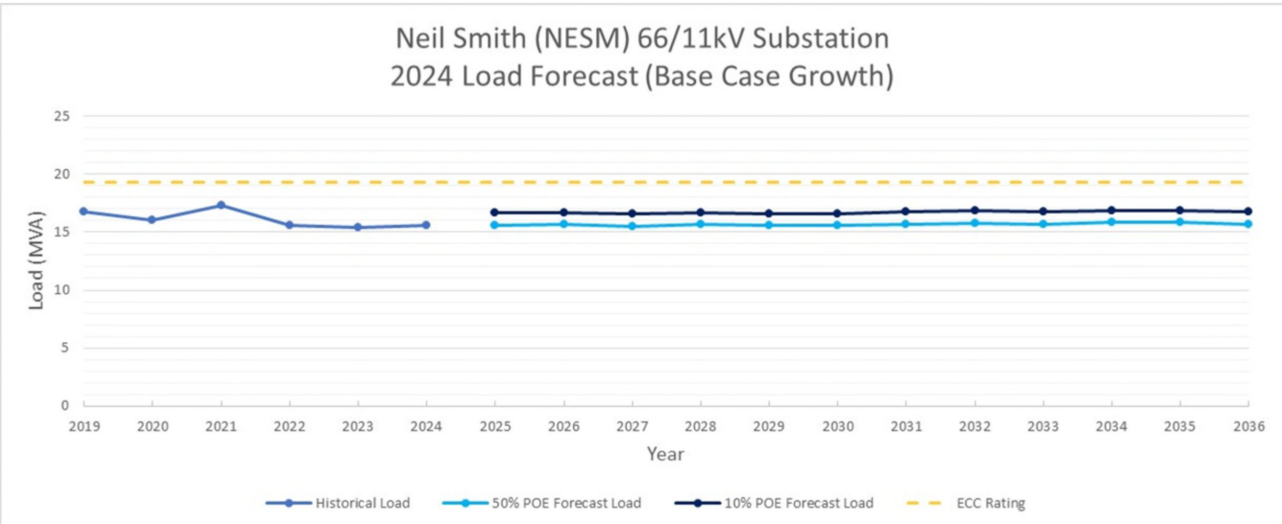


Figure 7: Substation base case load forecast

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.

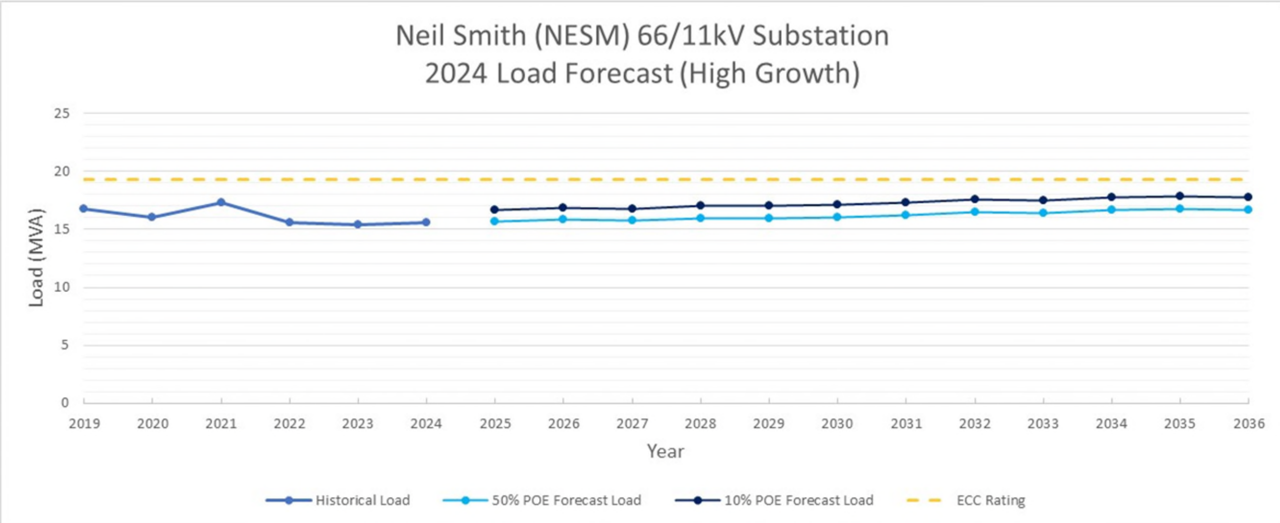


Figure 8: Substation high growth load forecast

1.3.6. Low Growth Load Forecast

The 10 PoE and 50 PoE 11kV 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.

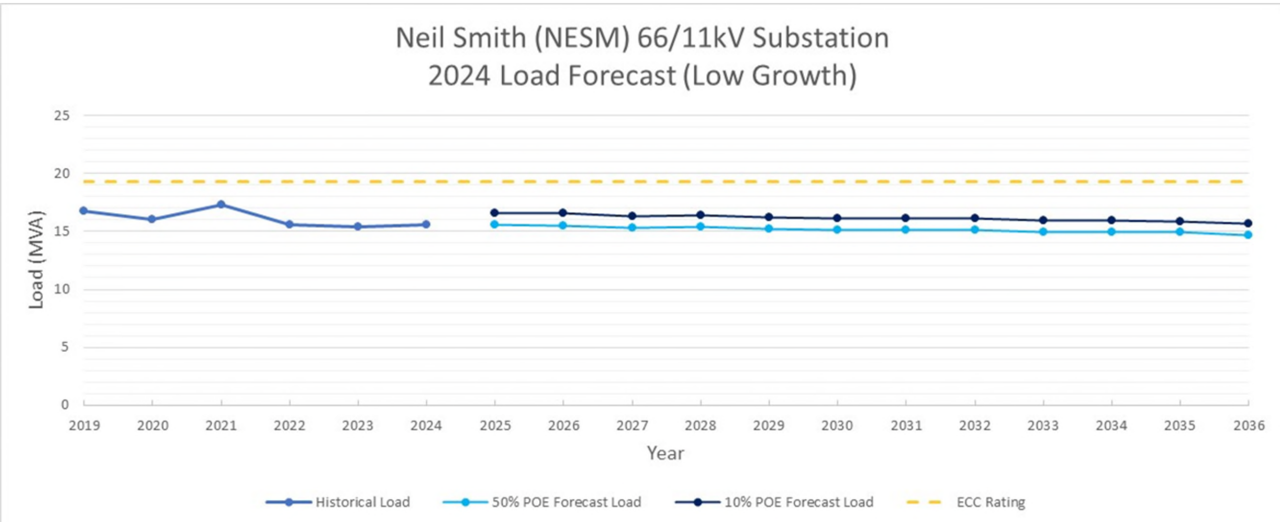


Figure 9: Substation low growth load forecast

2. IDENTIFIED NEED

2.1. Description of the Identified Need

2.1.1. Reliability Corrective Action

Condition Based Risk Management (CBRM) analysis has identified that the two 15/20/25MVA English Electric 66/11kV transformers (YOM 1970), the South Wales 11kV switchboard (YOM 1967) and a majority of the protection relays at NESM are reaching end of life. The ongoing operation of these assets beyond their estimated retirement date presents significant safety, environmental and customer reliability risks.

The deterioration of these primary and secondary system assets poses safety risks to staff working within the substation. It also poses a safety risk to the general public, through the increased likelihood of protection relay mal-operation. Ergon Energy has obligations under the Electrical Safety Act 2002 (Qld)[5] to eliminate electrical safety risks so far as is reasonably practicable, and where not reasonably practicable, to minimise the risks so far as is reasonably practicable.

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 NESM. Ergon Energy has obligations to comply with reliability performance standards specified in its Distribution Authority[6] issued under the *Electricity Act 1994* (Qld). Further to these requirements, the *Electricity Act 1994* (Qld)[7] stipulates that distribution entities must comply with the reliability requirements, system standards and performance requirements specified in the National Electricity Rules (NER)[8].

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.

[5] QLD Electrical Safety Act 2002:
Part 2, Subdivision 2, Section 28 - What is reasonably practicable in ensuring electrical Safety
Part 2, Division 2, Section 29 - Duty of electricity entity

[6] Ergon Energy Distribution Authority:
Section 7 - Guaranteed Service Levels
Section 8 - Distribution Network Planning
Section 9 - Minimum Service Standards
Section 10 – Safety Net

[7] QLD Electricity Act 1994 Part 5, Division 5, Section 42(a)(i)

[8] NER:
Schedule 5.1a System Standards
Schedule 5.1 Network Performance Requirements

3. POTENTIAL CREDIBLE OPTIONS

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 address the identified need. Further discussion of non-network options is included at section 4.

3.2. Network Options Identified

Ergon Energy has identified three potential credible network options that would address the identified need.

3.2.1. Option A: Replace the 66/11kV transformers and replace the 11kV switchboard in a new building at NESM

This option is commercially and technically feasible, can be implemented in the timeframe identified, mid-2028 and would address the identified need by replacing deteriorated assets at NESM ensuring Ergon Energy continues to adhere to the applicable regulatory instruments.

This option involves the replacement of the 66/11kV transformers and replacement of the 11kV switchboard in a new control building at NESM in order to address the identified need.

Due to the scope of works being entirely contained within the existing NESM site, as well as the expected reliability and safety benefits of this option to the local community, there are not expected to be any social licence issues that would require additional costs to manage or increase the delivery timeline. While Ergon Energy does not anticipate any community stakeholder concerns, should any be identified, these would be addressed as part of the Ergon Energy Community Engagement Framework which is integrated into the project workflow.

The estimated capital cost of this option is $28.4 million, which has been factored into the NPV to be incurred in 2028.

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

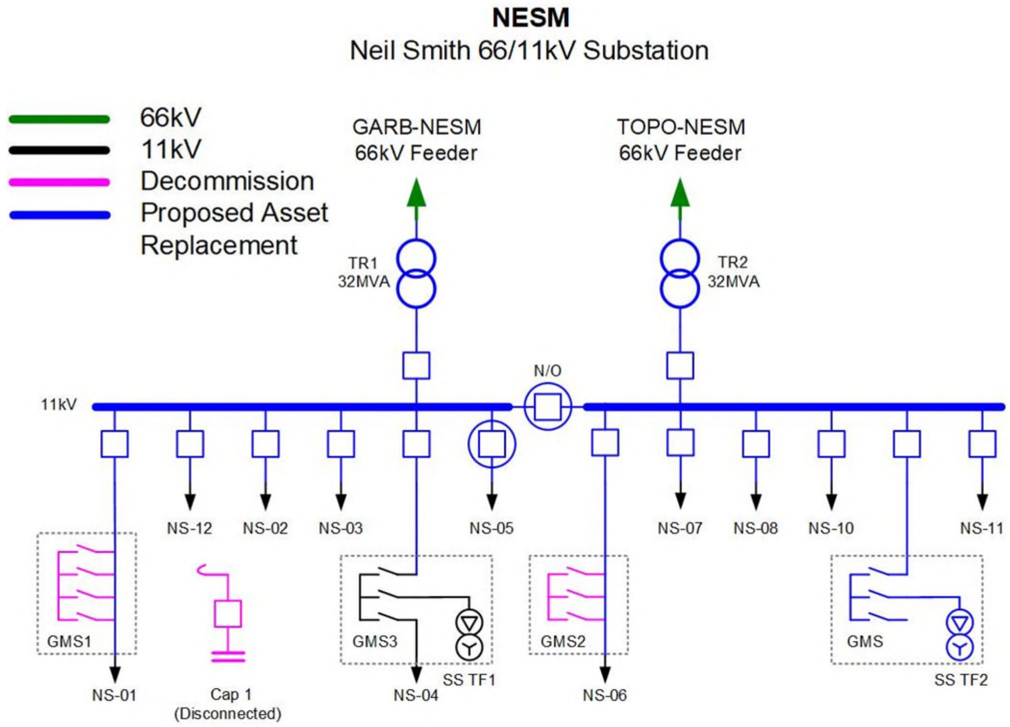


Figure 10: Option A proposed network arrangement (schematic view)

3.2.2. Option B: Establish Townsville Central 66/11kV Substation and de-commission NESM

This option is commercially and technically feasible, can be implemented in the timeframe identified, mid-2028 and would address the identified need by establishing a new substation to replace the deteriorated assets at NESM ensuring Ergon Energy continues to adhere to the applicable regulatory instruments.

This option involves establishing a new 66/11kV substation with 2 x 66/11kV transformers on a site owned by Ergon Energy on Sturt Street (Lot 2 on SP229803) including the installation of approximately 1km of 2 x 66kV underground cables to connect to the existing 66kV cables at NESM and the installation of new 11kV feeders from the new substation to tie into the existing NESM 11kV network in order to address the identified need.

Due to the scope of works being entirely contained within the existing substation sites, as well as the expected reliability and safety benefits of this option to the local community, there are not expected to be any social licence issues that would require additional costs to manage or increase the delivery timeline. While Ergon Energy does not anticipate any community stakeholder concerns, should any be identified, these would be addressed as part of the Ergon Energy Community Engagement Framework which is integrated into the project workflow.

The estimated capital cost of this option is $62.8 million, which has been factored into the NPV to be incurred in 2028.

A schematic diagram with the proposed network arrangement for Option B is shown in Figure 11.

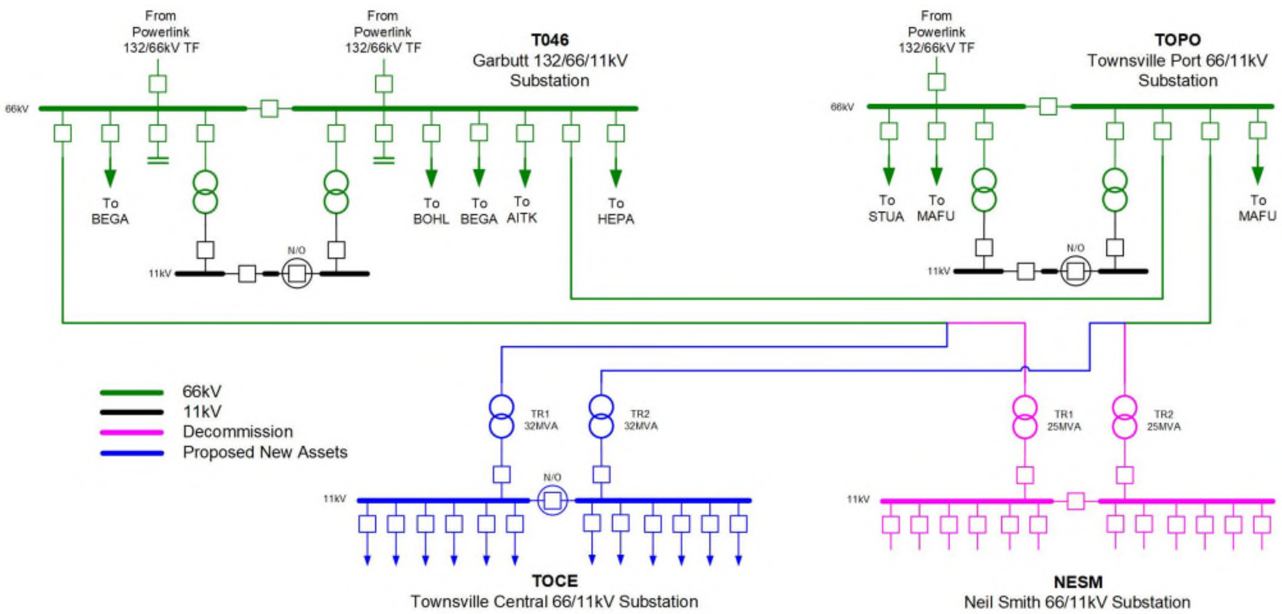


Figure 11: Option B proposed network arrangement (schematic view)

3.2.3. Option C: Transfer load from NESM onto adjacent zone substations, temporarily decommission NESM and rebuild NESM after 2035

This option is commercially and technically feasible, can be implemented in the timeframe identified, mid-2028 and would address the identified need by replacing deteriorated assets at NESM ensuring Ergon Energy continues to adhere to the applicable regulatory instruments.

This option involves decommissioning the 11kV capacitor banks at Max Fulton 66/11kV Substation (MAFU), establishing new 11kV feeders from MAFU to connect into the NESM 11kV network and reconfiguration of the Townsville City 11kV feeders to shift the NESM load onto the adjacent substations. This option also requires uprating the sections of Dog 6/1/.186+7/.062 ACSR/GZ conductor on the MAFU 66kV feeders to allow the conductors to operate up to 75degC. NESM substation would initially be decommissioned, aged plant removed from the site and the NESM 66kV feeders connected using the tie point near Dean Street carpark to form a second GARB-TOPO feeder. NESM would then be rebuilt on the existing site when the Townsville City load can no longer be supplied from the adjacent substation 11kV feeders.

Due to the scope of works being entirely contained within the existing substation sites, as well as the expected reliability and safety benefits of this option to the local community, there are not expected to be any social licence issues that would require additional costs to manage or increase the delivery timeline. While Ergon Energy does not anticipate any community stakeholder concerns, should any be identified, these would be addressed as part of the Ergon Energy Community Engagement Framework which is integrated into the project workflow.

The estimated capital cost of stage 1 of this option is $10.8 million, which has been factored into the NPV to be incurred in 2028. The stage 2 estimated capital cost of $27.4 million to rebuild NESM has been factored into NPV calculations to be incurred in 2038.

A schematic diagram of the proposed network arrangement for Option C is shown in Figure 12.

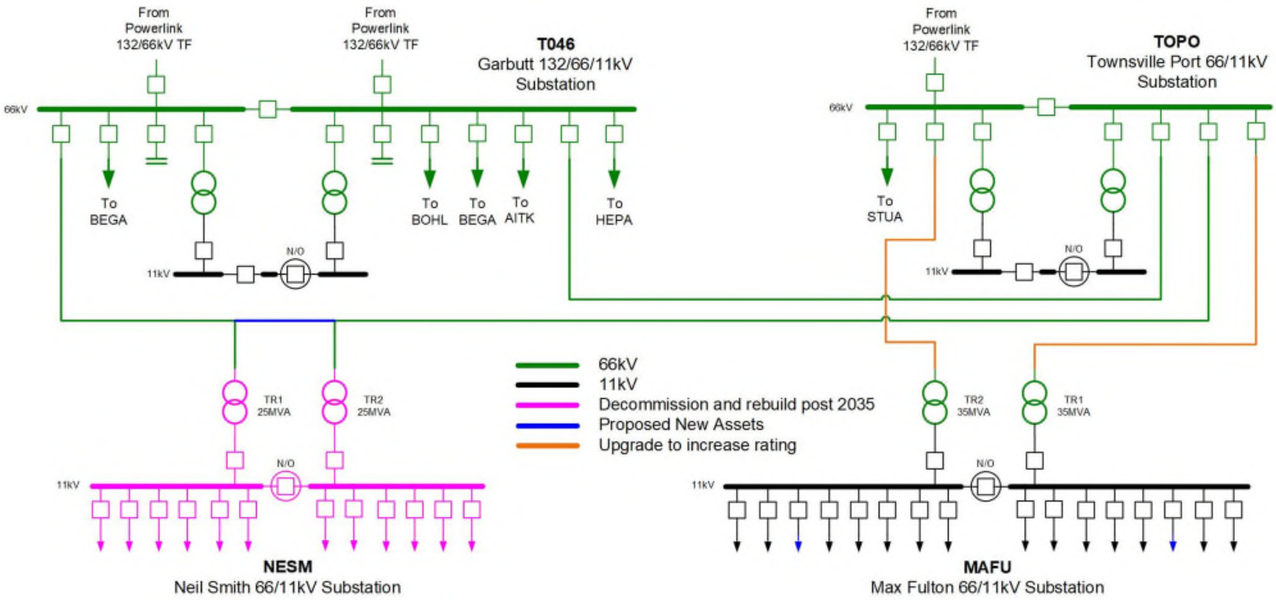


Figure 12: Option C proposed network arrangement – Stage 1 (schematic view)

3.3. Preferred Network Option

Ergon Energy's preferred option is Option A, to replace the 66/11kV transformers and replace the 11kV switchboard in a new control building at NESM.

Upon completion of these works the identified need would be addressed by replacing deteriorated assets at NESM ensuring Ergon Energy continues to adhere to the applicable regulatory instruments. 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. This option will address the identified need, is commercially and technically feasible and can be implemented in sufficient time to meet the identified need.

The estimated capital cost of this option is $28.4 million. Annual operating and maintenance costs are anticipated to be 0.5% of the capital cost. The estimated project delivery timeframe has design commencing in early-2026 and construction completed by May 2028.

4. ASSESSMENT OF SAPS AND NON-NETWORK SOLUTIONS

Ergon Energy has considered SAPS and demand management solutions. Each of these are considered below.

4.1. Consideration of SAPS Options

Ergon Energy considers there is no SAPS option that could form a potential credible option on a standalone basis, or that could form a significant part of the credible option. In particular the load requirements, per the forecast in the Townsville City area could not be supported by a network that is not part of the interconnected national electricity system. Therefore, a SAPS option is not technically feasible.

4.2. Demand Management (Demand Reduction)

Ergon Energy's Demand & Energy Management (DEM) team has assessed the potential non-network alternative (NNA) options required to address the identified need.

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.

The DEM team has completed a review of the NESM customer base and considered the suitability of a number of demand management technologies. However, as the identified need is for reliability corrective action, it has been determined that demand management options would not be viable propositions for the following reasons.

4.2.1. Network Load Control

The residential customers and commercial load appear to drive the daily peak demand which generally occurs between 9:00am and 6:00pm.

There are 435 customers on tariff T31 and T33 hot water load control (LC). An estimated demand reduction value of 261kVA[9] is available.

NESM 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 NESM. 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.

4.3. 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.

4.3.1. 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

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

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.

4.3.2. 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.

4.3.3. 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 has been assessed as technically not viable as there is no known existing LSG or proposed LSG that could address the identified network requirement.

4.3.4. Customer Solar Power Systems

A total of 238 customers with solar photo voltaic (PV) systems for a connected inverter capacity of 3,255kVA.

The daily peak demand is driven by residential customers and commercial load and the peak generally occurs between 9:00am and 6:00pm. As such customer solar generation coincides 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.

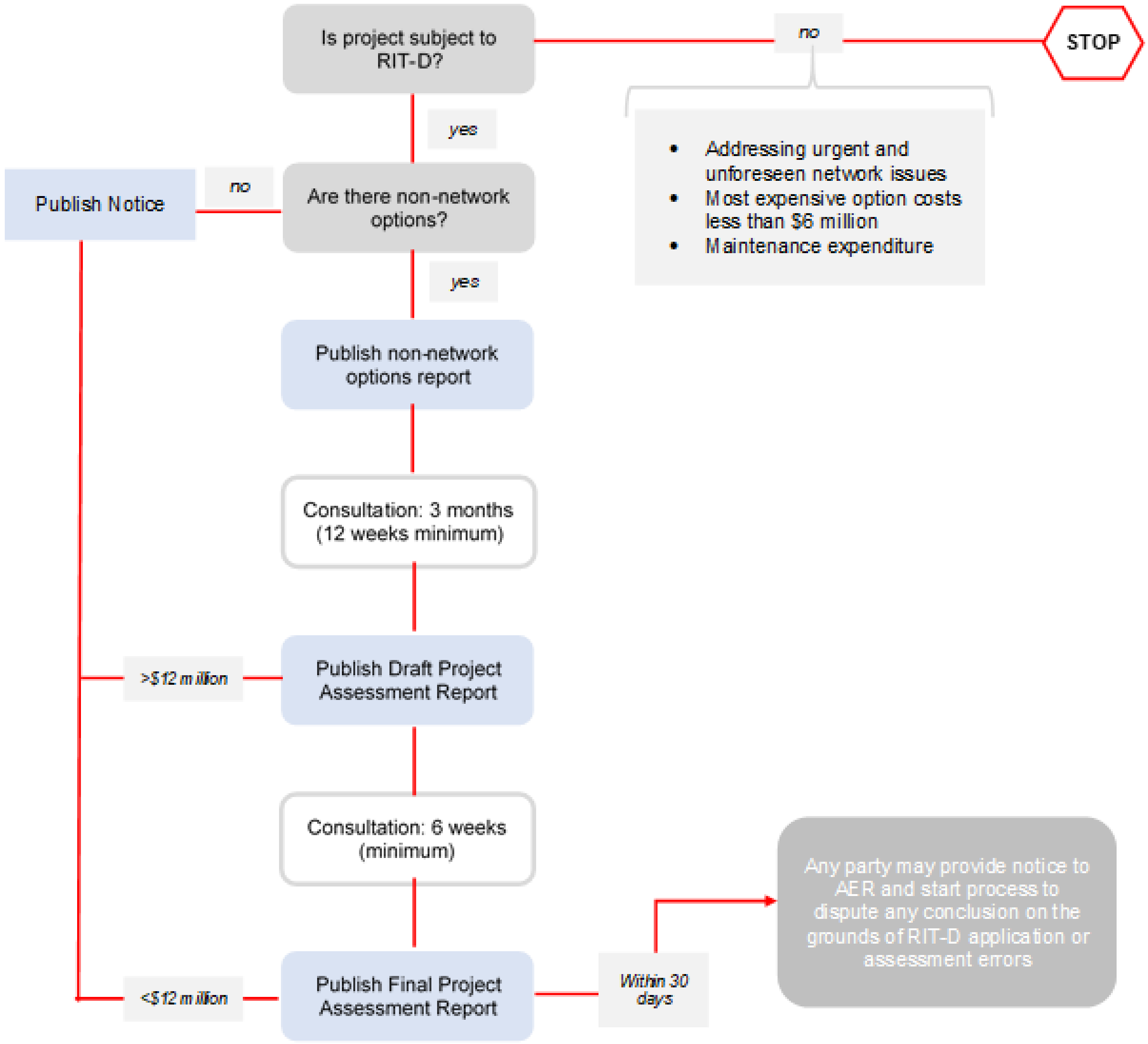
5. CONCLUSION AND NEXT STEPS

Ergon Energy has determined that there would not be a non-network option or SAPS option that is a potential credible option, or that forms a significant part or a potential credible option, to address the identified need.

The preferred credible option is network Option A, to replace the 66/11kV transformers and replace the 11kV switchboard in a new control building at NESM.

This Notice of Screening for Options is 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 publish a Draft 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.