



Regulatory Investment Test for Distribution (RIT-D)

Biloela Asset Replacement Notice of No Non-Network Options

20 December 2021



Part of Energy Queensland

Biloela Network Limitation Notice of No Non-Network Options

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

Biloela 132/66/11kV (BILO) combined bulk supply and zone substation is located on the western edge of Biloela Township. BILO supplies the township of Biloela, Callide and Boundary Hill Mine, as well as the surrounding communities via Wowan and Monto substations. Powerlink own and operate the 132/66kV transformer, while Ergon Energy own and operate downstream of the 66kV bus. The substation supplies 4,080 residential, industrial, commercial and rural customers; with a peak load of 18.25MVA.

Biloela zone substation has two power transformers: WILSON 66/11kV (25/32MVA); and TYREE 66/11kV (15/20MVA). The substation was established circa 1965 and has had a number of individual replacement projects to address high risk poor condition assets over the past 10 years. The 11kV switchboard and several 66kV secondary plant items are still original and at end of life.

In order to maintain continuity of supply to its' customers, the end-of life 66kV and 11kV assets at BILO require replacement.

There are access issues due to limitations of the 11kV Bus 1, where it is only possible to access during light load periods and weekends, in conjunction with the use of LV generation.

The ongoing operation of these assets beyond 2027 presents a significant risk to safety and customer reliability.

Biloela Network Limitation Notice of No Non-Network Options

Preferred Network Option

Ergon Energy have only identified one feasible option, which is to replace the individual assets.

The completion of these work will provide the greatest reliability benefit for customers, whilst also reducing expenditure on obsolete, high maintenance assets. The estimated capital cost of this option inclusive of interest, risk, contingencies, and overheads is \$12.062M. Annual operating and maintenance costs are anticipated to be 1.5% of the capital cost. The estimated project delivery timeframe has design commencing in September 2022 and construction completed by March 2027.

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 Biloela 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.

Biloela Network Limitation Notice of No Non-Network Options

CONTENTS

Executive Summary	2
About Ergon Energy	2
Identified Need	2
Preferred Network Option	3
Approach	3
1. Background.....	5
1.1. Geographic Region	5
1.2. Existing Supply System	7
1.3. Load Profiles / Forecasts	11
1.3.1. Full Annual Load Profile	11
1.3.2. Load Duration Curve	13
1.3.3. Average and Peak Weekday Load Profile (Summer)	14
1.3.4. Base Case Load Forecast.....	16
1.3.5. High Growth Load Forecast	17
1.3.6. Low Growth Load Forecast	18
2. Identified Need	19
2.1. Description of the Identified Need	19
2.1.1. Poor Condition Assets	19
3. Internal Options Considered.....	20
3.1. Non-Network Options Identified	20
3.2. Network Options Identified	20
3.2.1. Option A: BILO Asset Replacement	20
3.3. Preferred Network Option	21
4. Assessment of Non-Network Solutions.....	22
5. Conclusion and Next Steps	22
Appendix A – The Rit-D Process.....	23

Biloela Network Limitation Notice of No Non-Network Options

1. BACKGROUND

1.1. Geographic Region

Biloela 66/11kV Zone substation (BILO) is located on the western edge of the township of Biloela. The substation and associated 66kV feeders is shown in Figure 1 and the 11kV feeders are shown in Figure 2.

Biloela Network Limitation Notice of No Non-Network Options



Figure 1: Biloela 66/11kV Zone substation and 66kV Feeders, Existing Network Arrangement (Geographic View)

Biloela Network Limitation Notice of No Non-Network Options

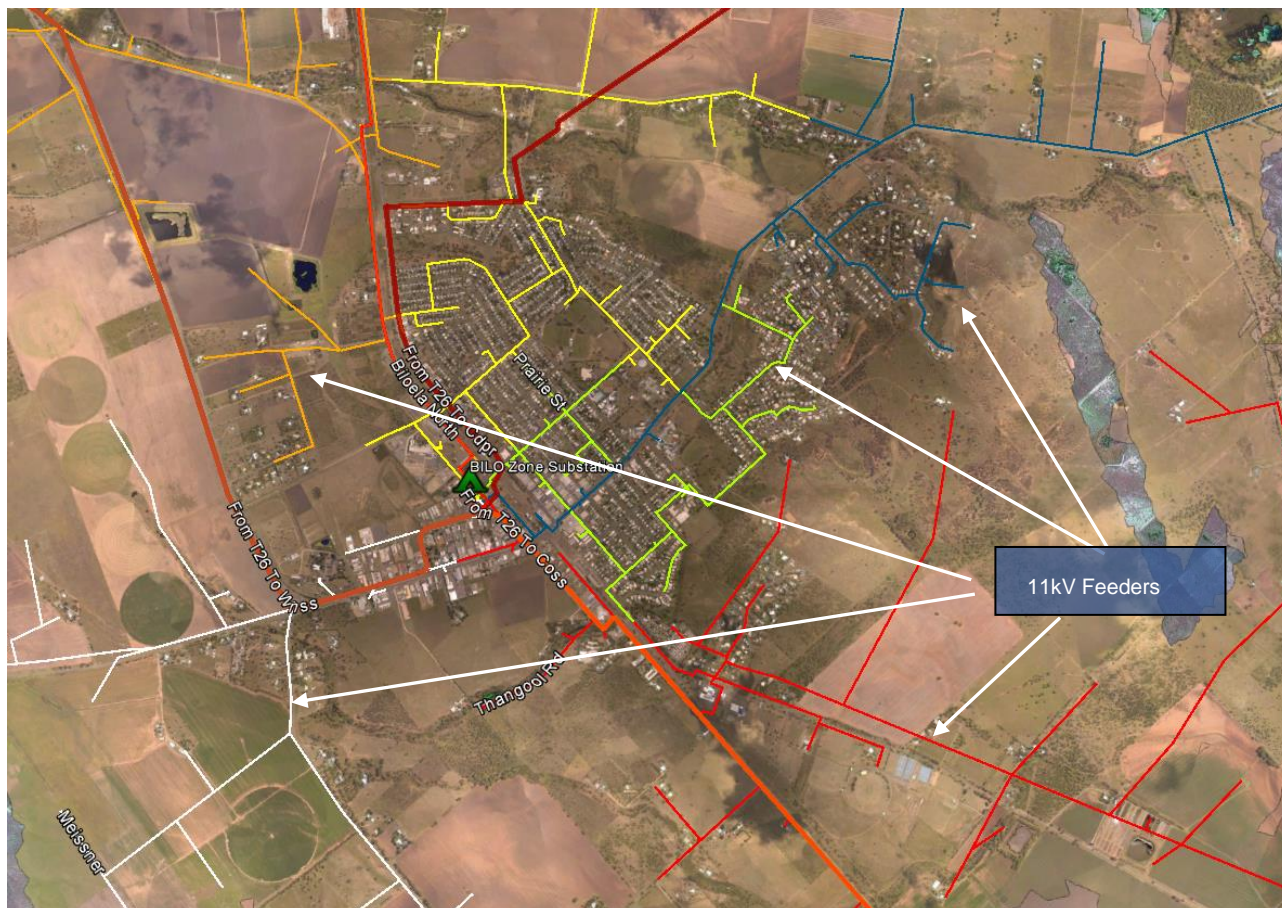


Figure 2: Biloela 66/11kV locality map and associated 11kV feeders

1.2. Existing Supply System

BILO is supplied from Powerlink owned feeders 71109 and 7110, with the 132kV bus and 132/66kV transformers also owned and operated by Powerlink. Ergon Energy owns and operates downstream of the 66kV bus. The 66kV bus has four feeders which supplies two mines and two 66/11kV nearby substations, Monto and Wowan. The combined peak loading on the 66kV and 11kV bus is 34.17MVA. BILO has two power transformers: WILSON 66/11kV (25/32MVA); and TYREE 66/11kV (15/20MVA) which supplies a total of 4,080 residential, industrial, commercial and rural customers, with a peak of 18.25MVA. BILO also has an AFLC injection unit which services load control signal to the Biloela area.

A schematic view of the existing sub-transmission network arrangement is shown in Figure 3 below.

Biloela Network Limitation Notice of No Non-Network Options

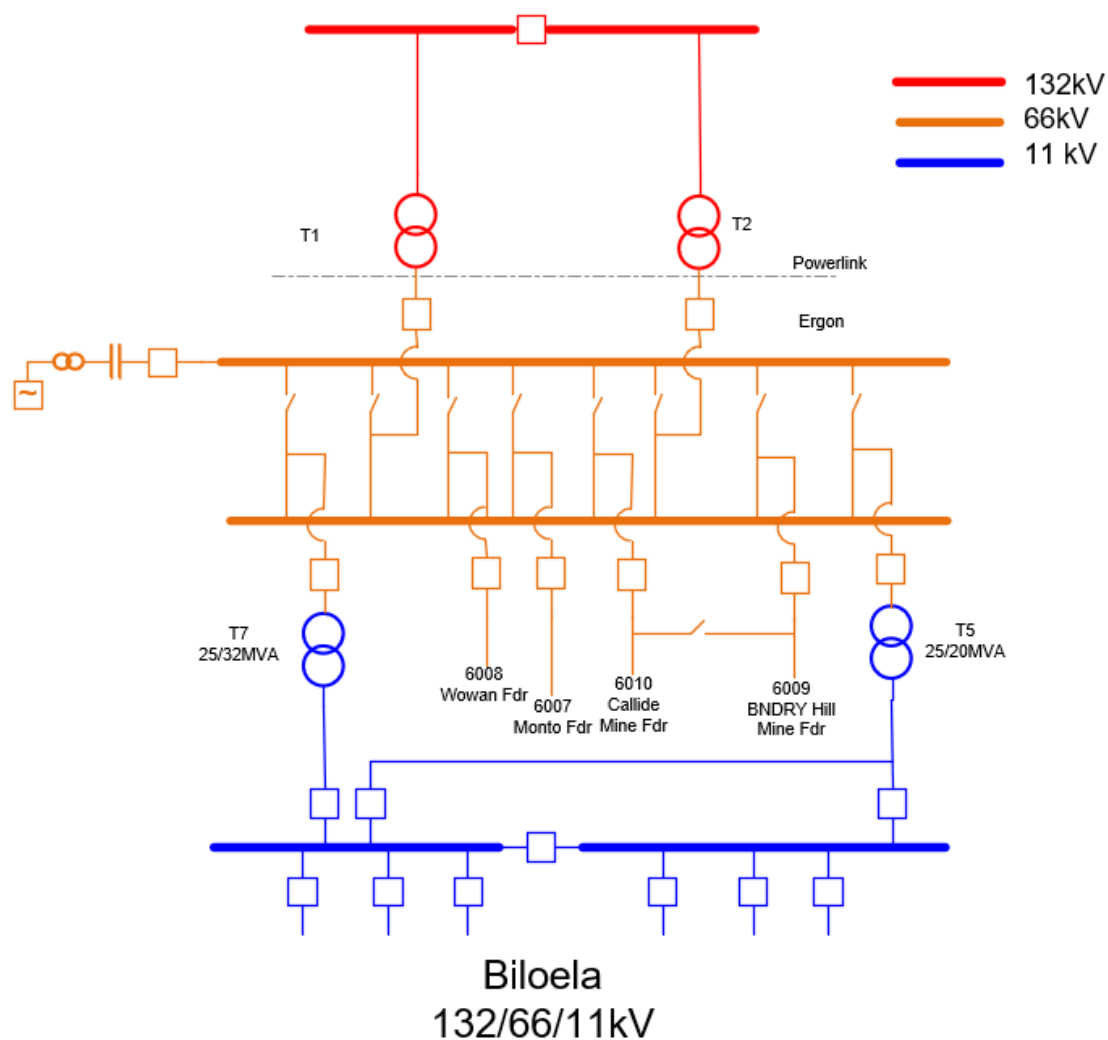


Figure 3: Existing area network arrangement (schematic view)

A schematic view of the area is shown in Figure 4, with an aerial view of the substation in Figure 5.

Biloela Network Limitation Notice of No Non-Network Options

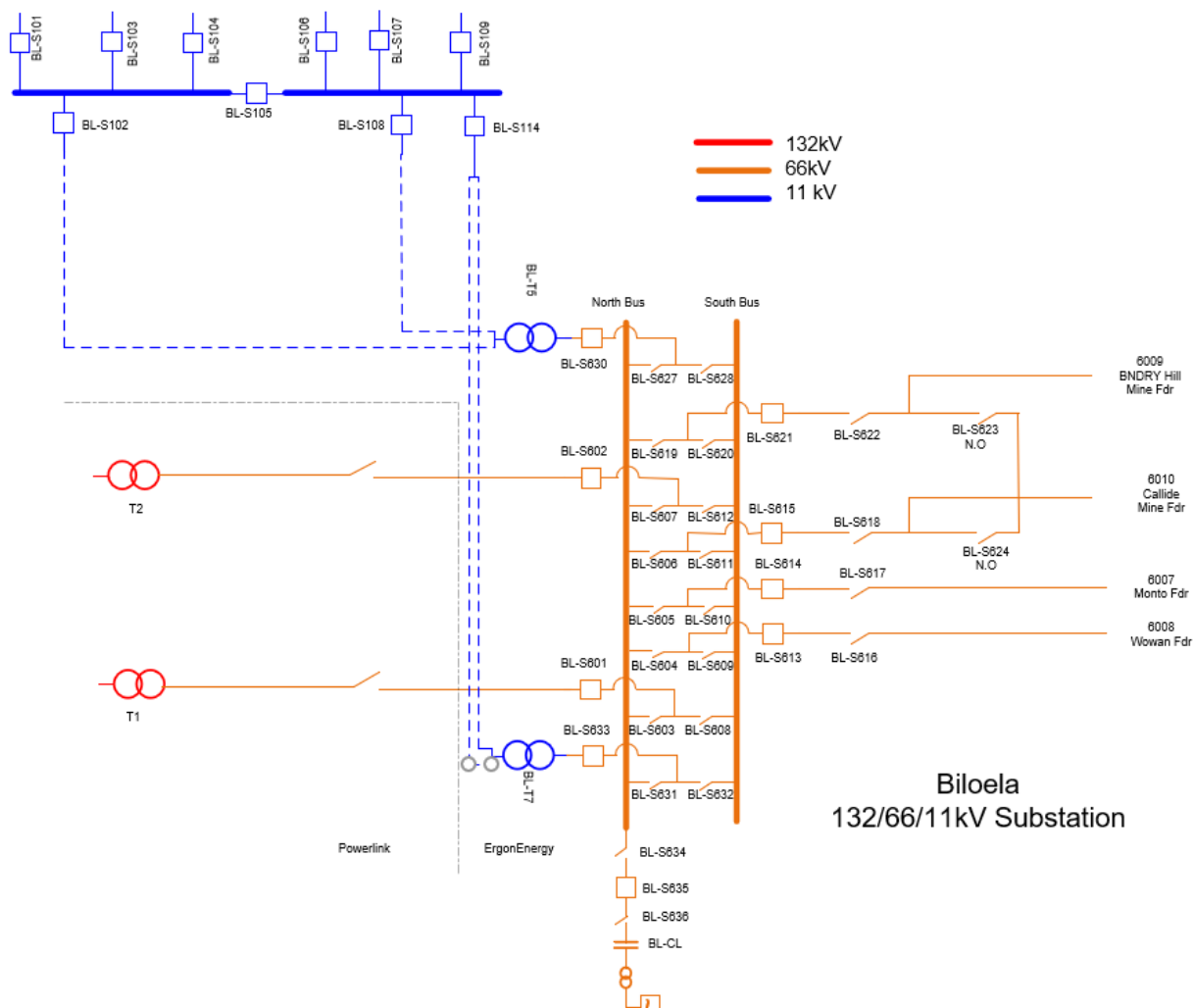


Figure 4: Existing BILO (schematic view)

Biloela Network Limitation Notice of No Non-Network Options

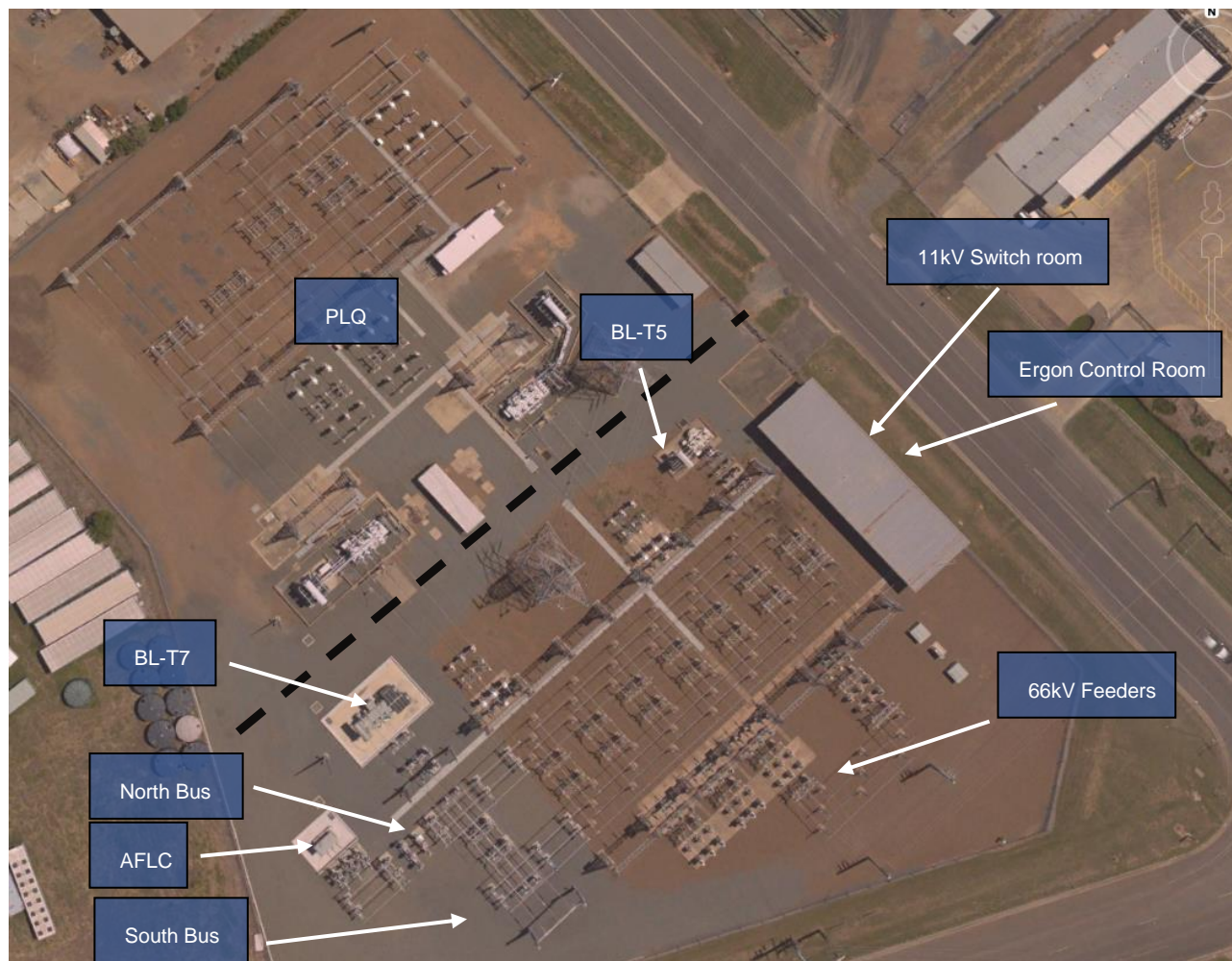


Figure 5: BILO (Aerial View)

Biloela Network Limitation Notice of No Non-Network Options

1.3. Load Profiles / Forecasts

The primary limitation at BILO is the condition of the 11kV equipment. The load profiles and forecasts presented here will focus on the 11kV load. However, the combined 66kV load has also been provided.

1.3.1. Full Annual Load Profile

The full annual load profile for Biloela 66/11kV zone substation for 2020/21 financial year is shown in Figure 7 and the combined 66kV feeder load is shown in Figure 6. The peak on the 11kV occurs through the summer period, however it does not exceed the N-1 capacity of 27.25MVA.

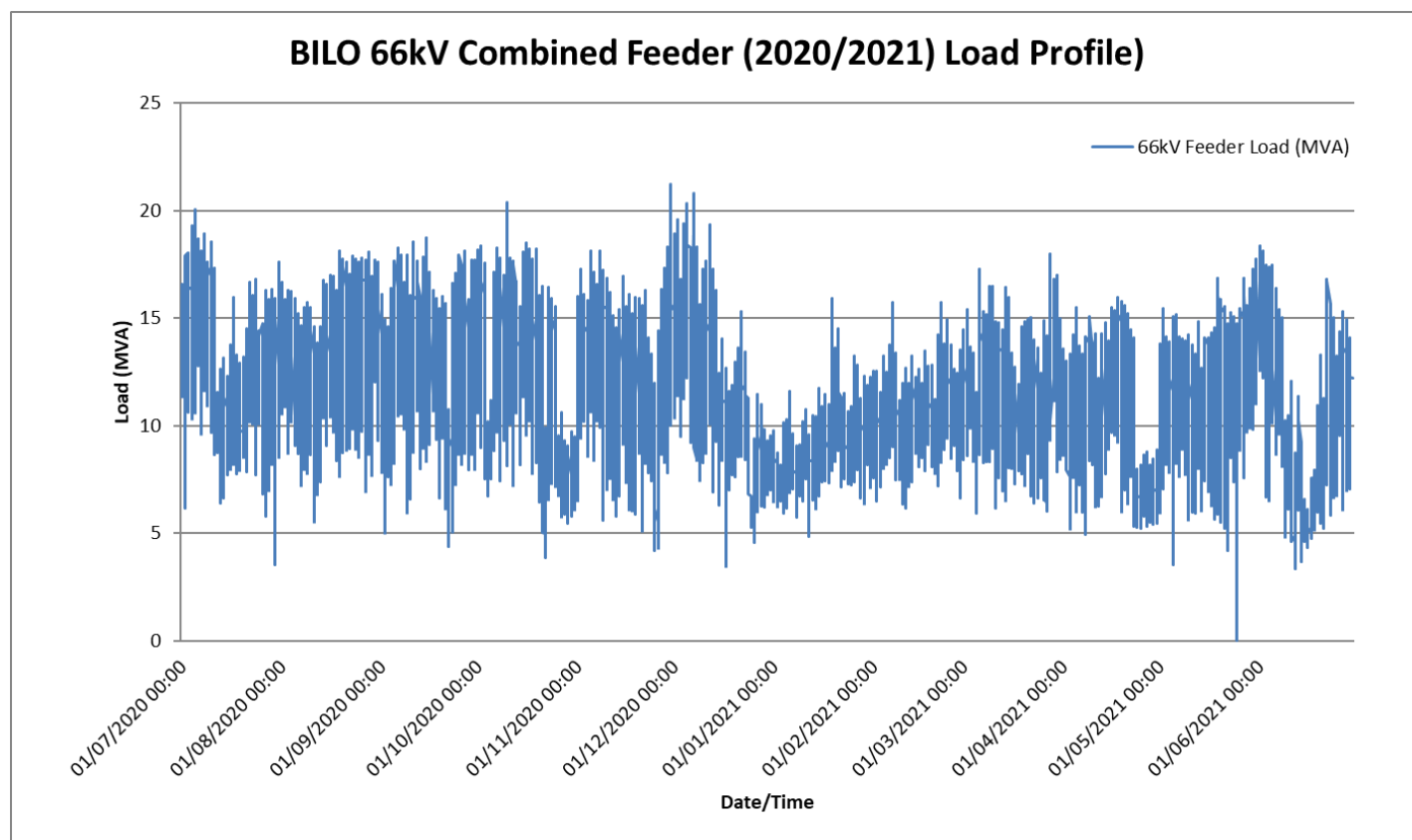


Figure 6: Biloela 66kV combined Feeder annual load profile

Biloela Network Limitation Notice of No Non-Network Options

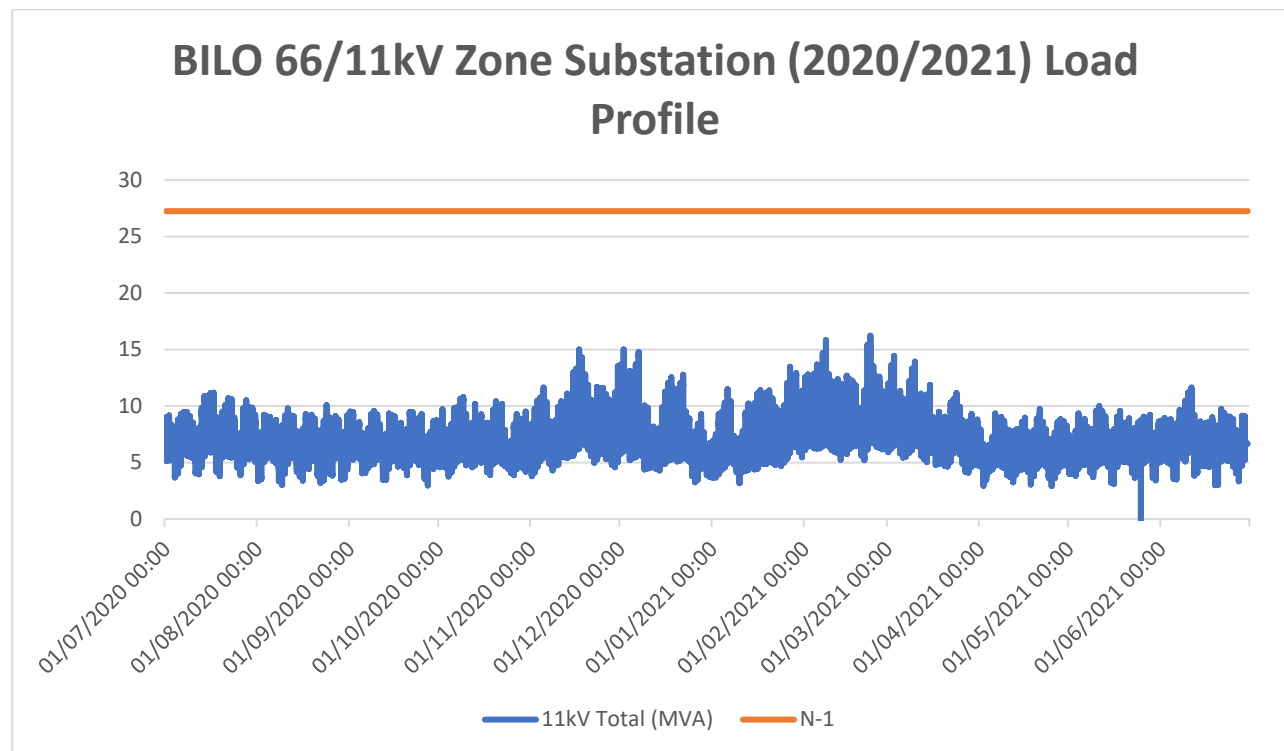


Figure 7: BILO 11kV loading

Biloela Network Limitation

Notice of No Non-Network Options

1.3.2. Load Duration Curve

The load duration curve for the 66kV combined feeder load for 2020/21 is shown in Figure 8 and the 11kV load duration is shown in Figure 9. The load does not exceed the N-1 capacity of 27.25MVA.

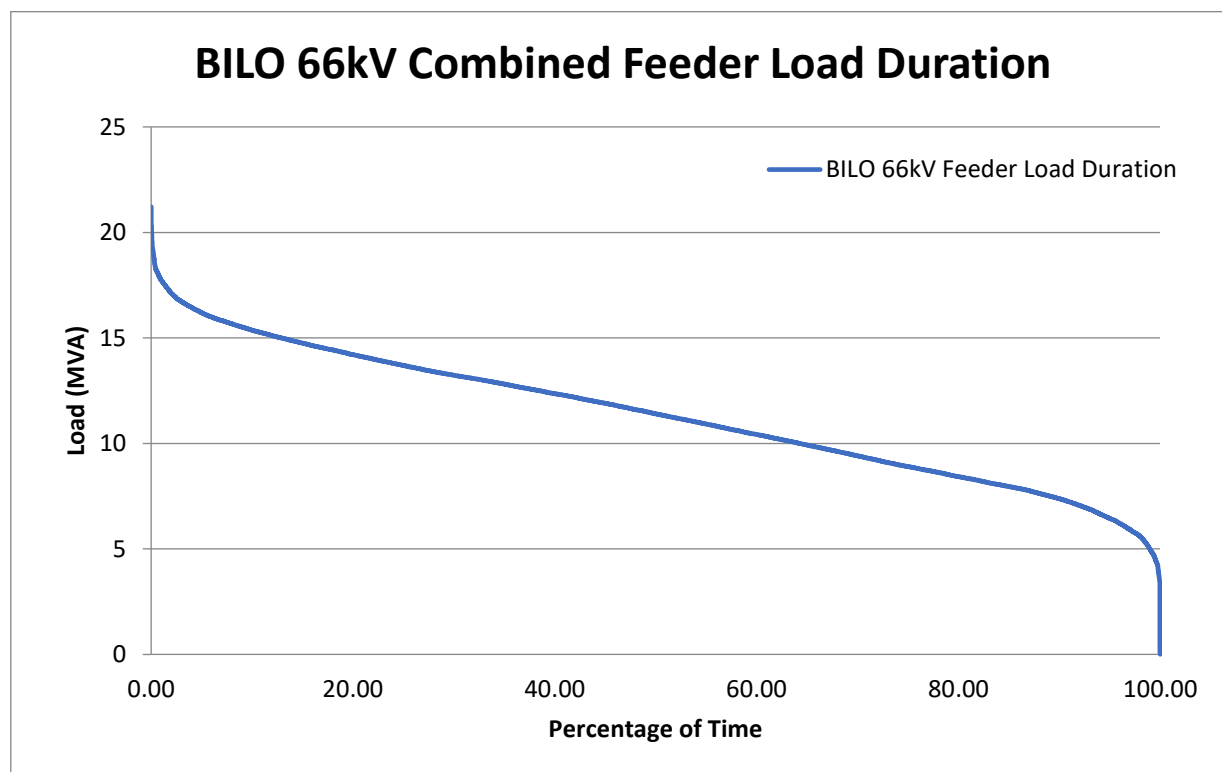


Figure 8: BILO 66kV Combined Feeder Load Duration

Biloela Network Limitation Notice of No Non-Network Options

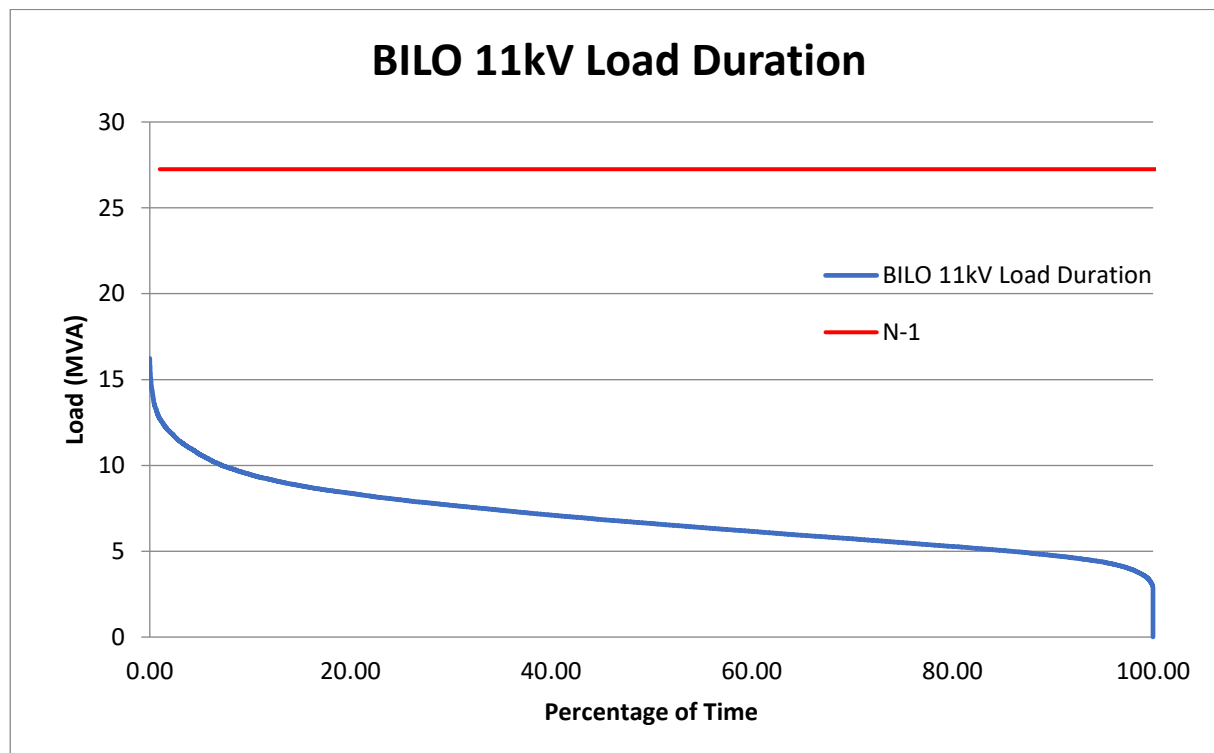


Figure 9: BILO 11kV Load Duration

1.3.3. Average and Peak Weekday Load Profile (Summer)

The daily load profile for the average and peak weekday during summer is illustrated below in Figure 10 and Figure 11. The summer peak loads for Biloela 11kV are historically experienced in the late afternoon and evening. As two of the 66kV feeders supply a mine, the load profile is more constant.

Biloela Network Limitation

Notice of No Non-Network Options

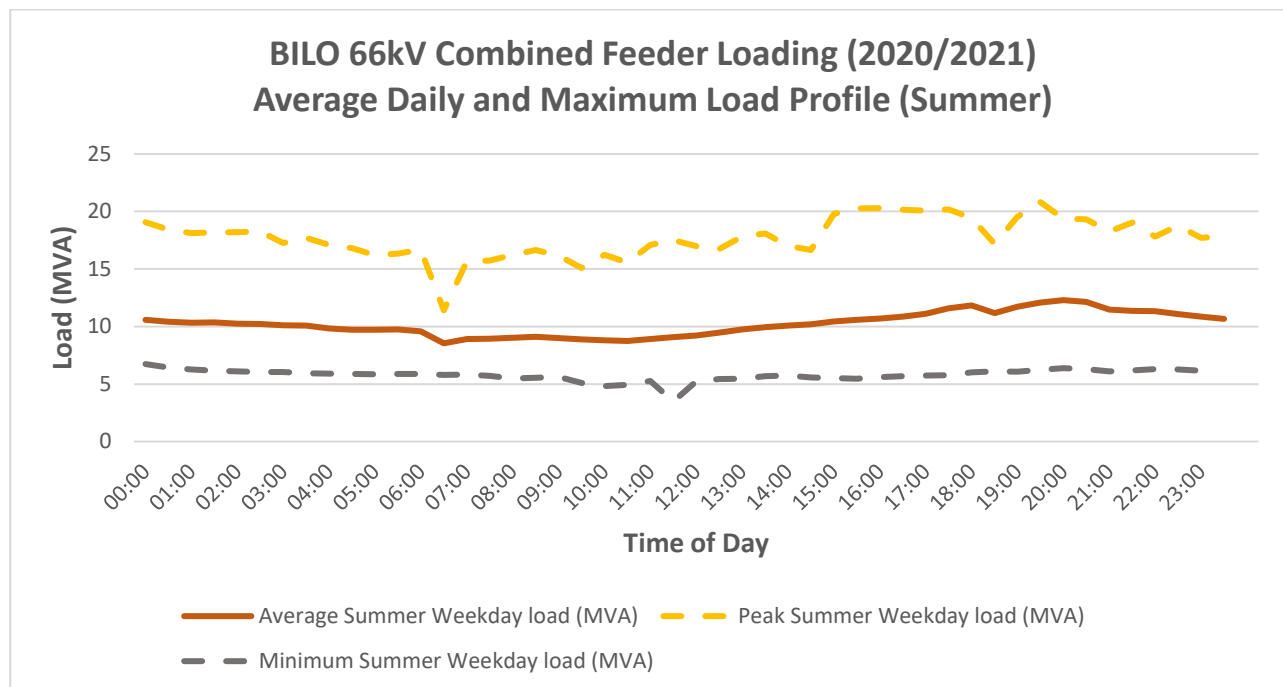


Figure 10: 66kV Average Daily and Maximum Load Profiles (Summer)

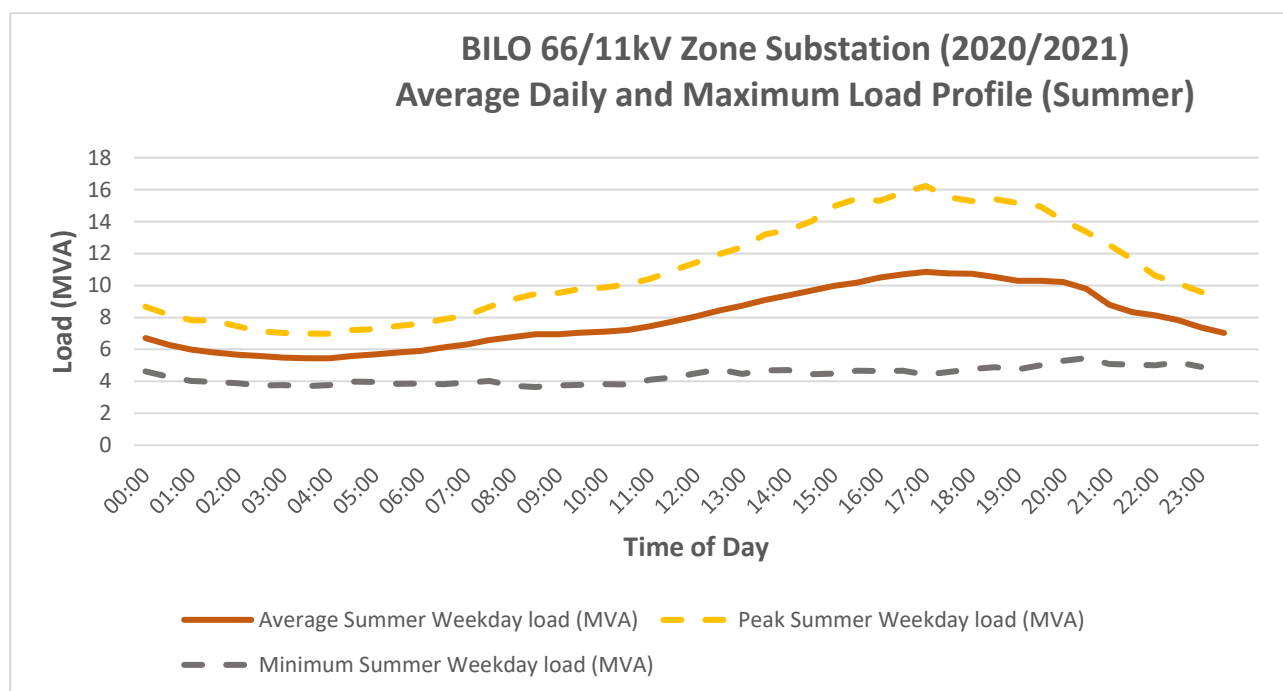


Figure 11: Average Daily and Maximum Load Profiles (Summer)

Biloela Network Limitation

Notice of No Non-Network Options

1.3.4. Base Case Load Forecast

The 10 PoE and 50 PoE load forecasts for the base case load growth scenario are illustrated Figure 12. The historical peak load for the past five years has also been included in the graph. It can be seen the forecast load growth in the base case scenario does not exceed the N-1 rating of 27.25MVA.

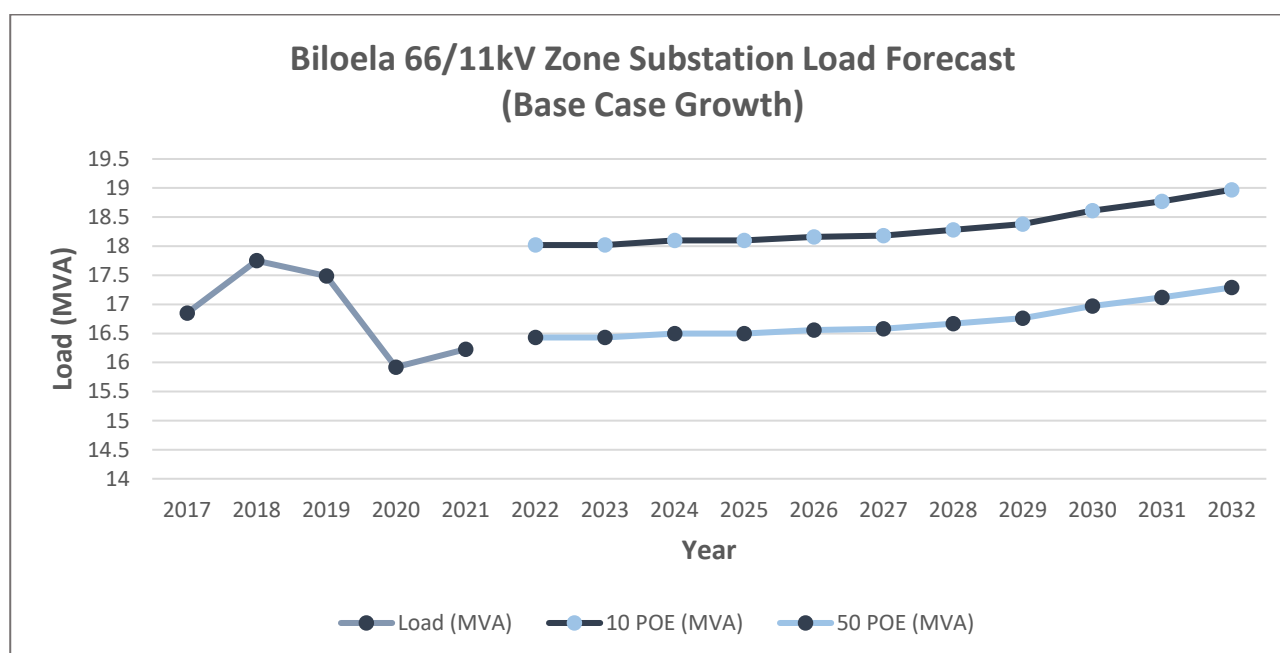


Figure 12: Network Base case load forecast

Biloela Network Limitation

Notice of No Non-Network Options

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 13. With the high growth scenario, the peak load is forecast to increase over the next 10 years. It can be seen that the forecast load growth in the base case scenario does not exceed the N-1 rating of 27.25MVA.

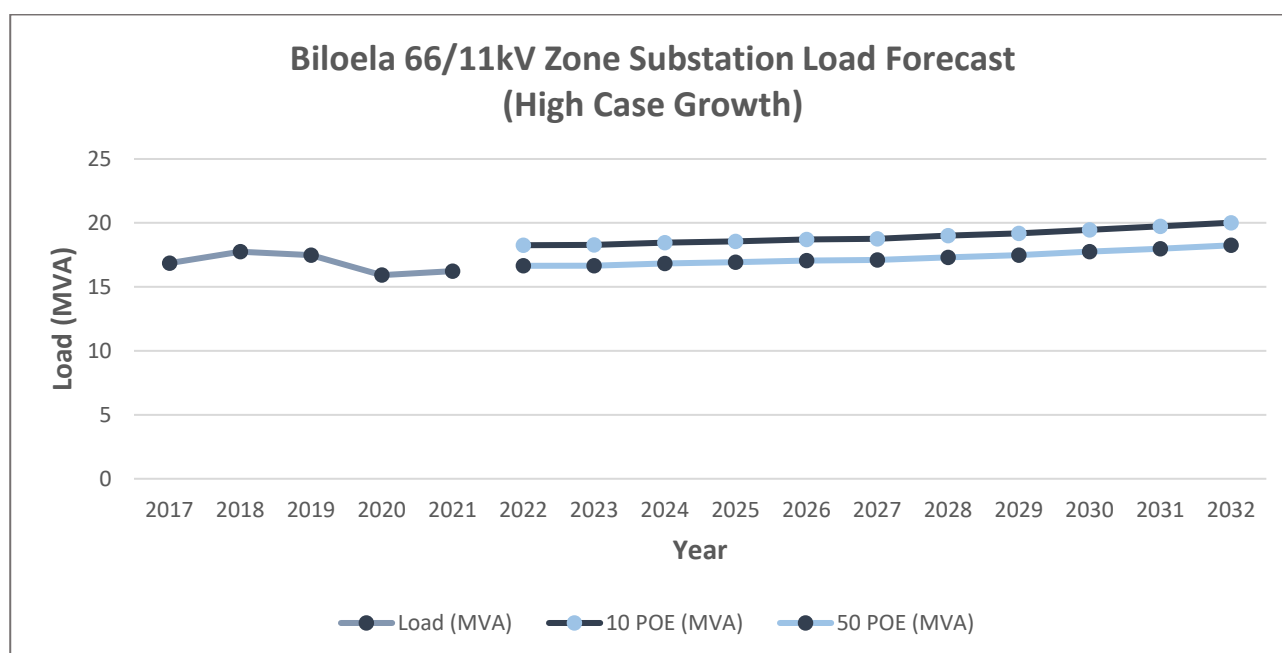


Figure 13: Network High Growth Load Forecast

Biloela Network Limitation Notice of No Non-Network Options

1.3.6. Low Growth Load Forecast

The 10 PoE and 50 PoE load forecasts for the low load growth scenario are illustrated Figure 14. With the low growth scenario, the peak load is forecast to remain relatively steady over the next 10 years.

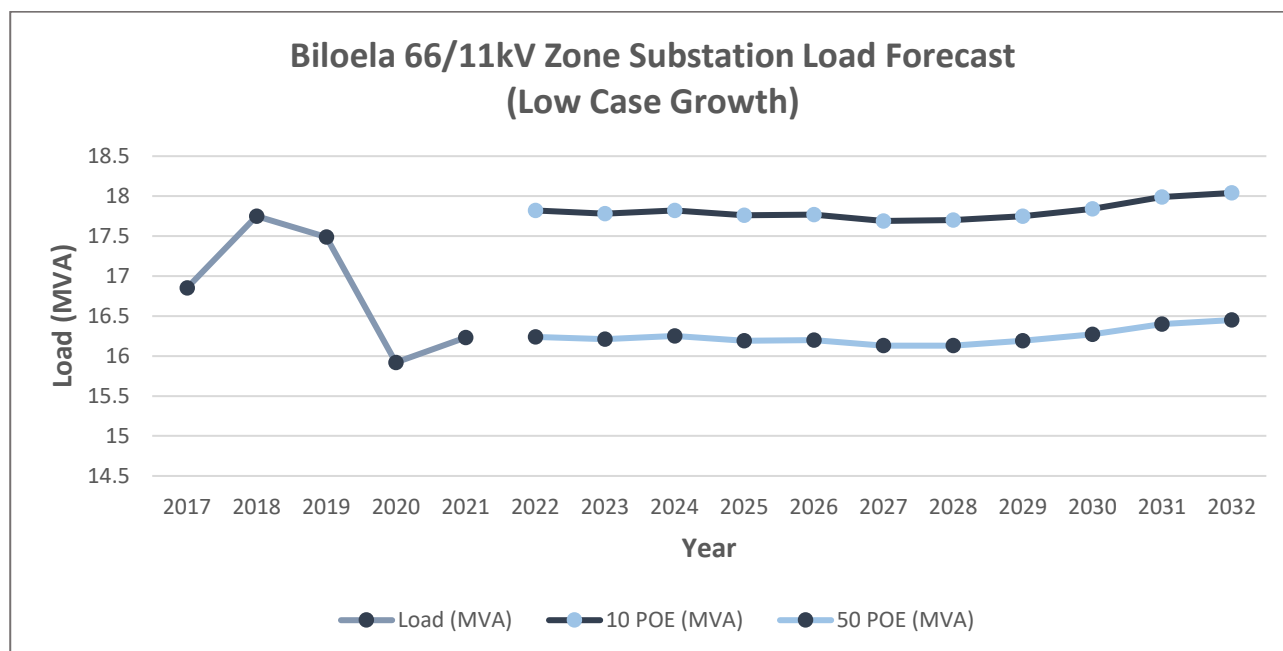


Figure 14: Network Low Growth Load Forecast

Biloela Network Limitation

Notice of No Non-Network Options

2. IDENTIFIED NEED

2.1. Description of the Identified Need

2.1.1. Poor Condition Assets

BILO substation was established circa 1965 to standards applicable at the time. A recent condition assessment and substation works have highlighted a number of critical assets are at the end of their serviceable life, are in poor condition or are targeted for removal. The condition of these assets presents considerable safety and customer reliability risk. These assets include:

- Replace 11kV switchboard and six (6) outgoing bays in new switch room
- Six (6) 11kV Feeder Circuit Breakers
- One (1) 11kV Bus Breaker
- Two (2) 11kV Transformer Circuit Breakers
- Two (2) 11kV Voltage transformer set
- Remove one (1) 11kV surge arrestor
- One (1) 66kV Circuit Breakers
- One (1) 66kV Current Transformer
- One (1) 66kV Voltage transformer set
- One (1) 66kV Surge Arrestor set
- One (1) 66kV Air Break Switch
- One (1) 66kV Marshalling Box
- Thirty (30) Protection Relays

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, through the increased likelihood of protection relay mal-operation. Without remediation, Ergon Energy views that the safety risk to the public and its staff to not be reduced 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 Biloela Substation.

Biloela Network Limitation

Notice of No Non-Network Options

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 Biloela area to address the identified need.

3.2. Network Options Identified

Ergon Energy has identified one (1) credible network option that will address the identified need.

3.2.1. Option 1: BILO Asset Replacement

This option involves replacement of primary plant and secondary systems works

- Summary of Primary Plant Works
 - Replace 11kV switchboard in new switch room
 - Replace six (6) 11kV feeder CBs
 - Replace one (1) 11kV bus CB
 - Replace two (2) 11kV transformer CBs
 - Replace two (2) 11kV voltage transformer sets
 - Remove one (1) 11kV surge arrestors
 - Replace one (1) 66kV CB
 - Replace one (1) 66kV CT
 - Replace one (1) 66kV VT set
 - Replace one (1) 66kV surge arrestor set
 - Replace one (1) 66kV ABS
 - Replace one (1) Marshalling box
- Summary of Secondary Systems Works
 - Replace the 11kV Bus Zone 1 and Bus Zone 2 protection relay.
 - Replace Monto 66kV distance relay and OC/EF relay with duplicate X & Y protection relay
 - Replace Monto 66kV statical metering relay
 - Replace Wowan 66kV distance relay and OC/EF relay with duplicate X & Y protection relay
 - Replace Wowan 66kV statical metering relay
 - Replace Boundary Mine 66kV distance relay and OC/EF relay with duplicate X & Y protection relay

Biloela Network Limitation

Notice of No Non-Network Options

- Replace Boundary Mine 66kV statical metering relay
- Replace Callide Mine 66kV distance relay and OC/EF relay with duplicate X & Y protection relay
- Replace Callide Mine 66kV statical metering relay
- Replace two (2) electro-mechanical high impedance bus zone relays with two (2) high impedance or low impedance relays (pending detailed design)
- Replace 66kV bus zone protection relay
- Replace right and left 11kV bus protection schemes and neutral check scheme with current standard protection relays
- Replace three (3) 11kV electro-mechanical protection relays with single MICOM P142 (or equivalent) for Biloela North feeder
- Replace three (3) 11kV electro-mechanical protection relays with single MICOM P142 (or equivalent) for Callide
- Replace three (3) 11kV electro-mechanical protection relays with single MICOM P142 (or equivalent) for Meissner
- Replace three (3) 11kV electro-mechanical protection relays with single MICOM P142 (or equivalent) for Prairie St
- Replace three (3) 11kV electro-mechanical protection relays with single MICOM P142 (or equivalent) for Washpool St
- Perform a HVAC study for the control room and install HVAC systems to ensure the longevity of all equipment therein, including modern electronic protection, comms and SCADA equipment, batteries and the 11kV switchgear
- Install duplicate DC system and associated distribution

3.3. Preferred Network Option

Ergon Energy's preferred internal network option is Option A: BILO Asset Replacement.

Upon completion of these works, the asset safety and reliability risks at BILO Substation will be addressed. The preferred option will provide the greatest reliability benefit for customers, whilst also reducing expenditure on obsolete, non-compliant and high maintenance 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 \$12.062 million. Annual operating and maintenance costs are anticipated to be 0.5% of the capital cost. The estimated project delivery timeframe has detailed design commencing in September 2022 and construction completed by March 2027.

Biloela Network Limitation

Notice of No Non-Network Options

4. ASSESSMENT OF NON-NETWORK SOLUTIONS

Ergon Energy has assessed the potential non-network alternative options required to defer the network option and determine if there is a viable 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.

Once the aged, identified 11kV and 66kV assets at BILO reach their retirement age and can no longer be safely operated, the existing load would need to be supplied via non-network alternative solutions while satisfying the Service Safety Net Targets as specified in the Distribution Authority issued to Ergon Energy.

It is considered that no available demand management products or strategies can provide sufficient demand support at BILO to address the identified need. It is evident that an economically feasible non-network option would not be available to defer or eliminate the requirement to replace the aged 11kV switchgear at BILO and continue to provide a safe, sufficient and reliable supply to customers in the Biloela Area.

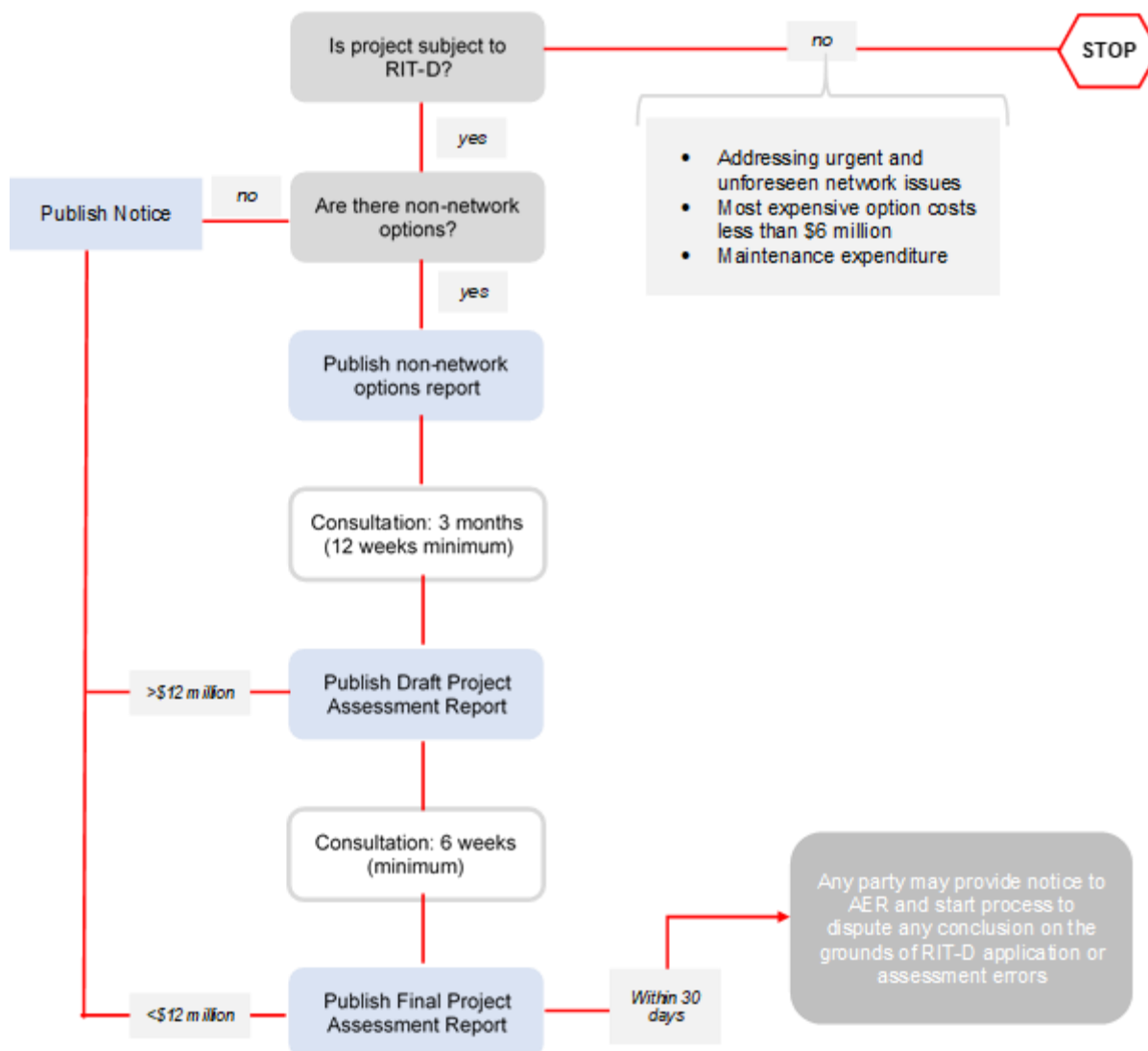
5. CONCLUSION AND NEXT STEPS

Considering the nature of the project, being the safety risk from failure of aged assets and as per clause 5.17.4(c) of the NER, Ergon Energy has determined that there are no credible non-network options to address the identified need at BILO.

The preferred network option is Option A - to replace the assets in poor condition. This Notice of No Non-Network Options is therefore published in accordance with rule 5.17.4(d) of the NER. As the next step in the RIT-D process, Ergon Energy will now proceed to publish a Draft Project Assessment Report.

Biloela Network Limitation Notice of No Non-Network Options

APPENDIX A – THE RIT-D PROCESS



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