Regulatory Investment Test for Distribution (RIT-D)

Addressing Reliability Requirements in the Caboolture Network Area

Notice of No Non-Network Options

19 December 2022

energex
Part of Energy Queensland

EXECUTIVE SUMMARY

About Energex

Energex Limited (Energex) is a subsidiary of Energy Queensland Limited and manages the electricity distribution network in the growing region of South East Queensland which includes the major urban areas of Brisbane, Gold Coast, Sunshine Coast, Logan, Ipswich, Redlands and Moreton Bay. Our electricity distribution area runs from the NSW border north to Gympie and west to the base of the Great Dividing Range.

Our electricity network consists of approximately 54,200 kilometres of powerlines and 680,000 power poles, along with associated infrastructure such as major substations and power transformers.

Today, we provide distribution services to more than 1.4 million domestic and business connections, delivering electricity to a population base of around 3.4 million people.

Identified Need

Caboolture bulk supply 110/33kV substation (SST11) has six 33kV feeders supplying eight zone substations such as Caboolture West substation (SSCBW), Morayfield substation (SSMFD), Morayfield North substation (SSMFN), Wamuran substation (SSWMR), Caboolture substation (SSCBT), Ningi substation (SSNGI), Toorbul Point substation (SSTPT) and Bribie Island substation (SSBIS). SST11 provides electricity supply to predominantly residential and commercial customers in the Caboolture, Campbells Pocket, Upper Caboolture, Elimbah, Meldale and Bribie Island areas.

According to Energex condition-based assessment (CBRM) report, it has been identified that 4 x 110kV circuit breakers, 6 x 33kV circuit breakers and protection relays are reaching end of life and require replacement.

The deterioration of these primary and secondary system assets poses safety risks to staff working within the switchyard, and reliability risk to the customers supplied from Caboolture Substation.

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). Energex has determined that network investment is essential in this case for it to continue to provide electricity to the consumers in the Caboolture 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 Energex in accordance with the requirements of clause 5.17.4(d) of the NER.

Energex Limited ABN 40 078 849 055

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1. BACKGROUND

1.1. Geographic Region

Caboolture bulk supply 110/33kV substation (SST11) provides electricity supply to predominantly domestic customers in the Caboolture, Campbells Pocket, Upper Caboolture, Elimbah, Meldale and Bribie Island areas, of which 57% are residential and 43% are commercial.

The geographical location of Energex'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

Caboolture bulk supply substation is being supplied by two 110kV feeders 745/3 and 746/3 that are double circuit constructed on a single tower. Feeders 745/3 and 746/3 are teed into the existing double circuit transmission lines which are approximately 73km between Powerlink's South Pine substation (SSH2) and Palmwoods substation (SSH9).

There are 6 x 33kV feeders from SST11 supplying 8 x zone substations such as Caboolture West substation (SSCBW), Morayfield substation (SSMFD), Morayfield North substation (SSMFN), Wamuran substation (SSWMR), Caboolture substation (SSCBT), Ningi substation (SSNGI), Toorbul Point substation (SSTPT) and Bribie Island substation (SSBIS).

There is a normally opened 33kV feeder 3251 between SSMFD and Burpengary (SSBGY) zone substation, which could enable Hays Inlet (SSHIL) bulk supply substation to provide remote transfer supply to around half of SSMFD.

SST11 has 3 x 80MVA 110/33kV transformers, 2 x 33kV bus section breakers, 6 x 33kV feeder breakers, 2 x 110kV bus section breakers and 4 x 110kV feeder breakers. A schematic view of the existing sub-transmission network arrangement is shown in Figure 2 and the geographic view of Caboolture Substation is illustrated in

Figure 3.

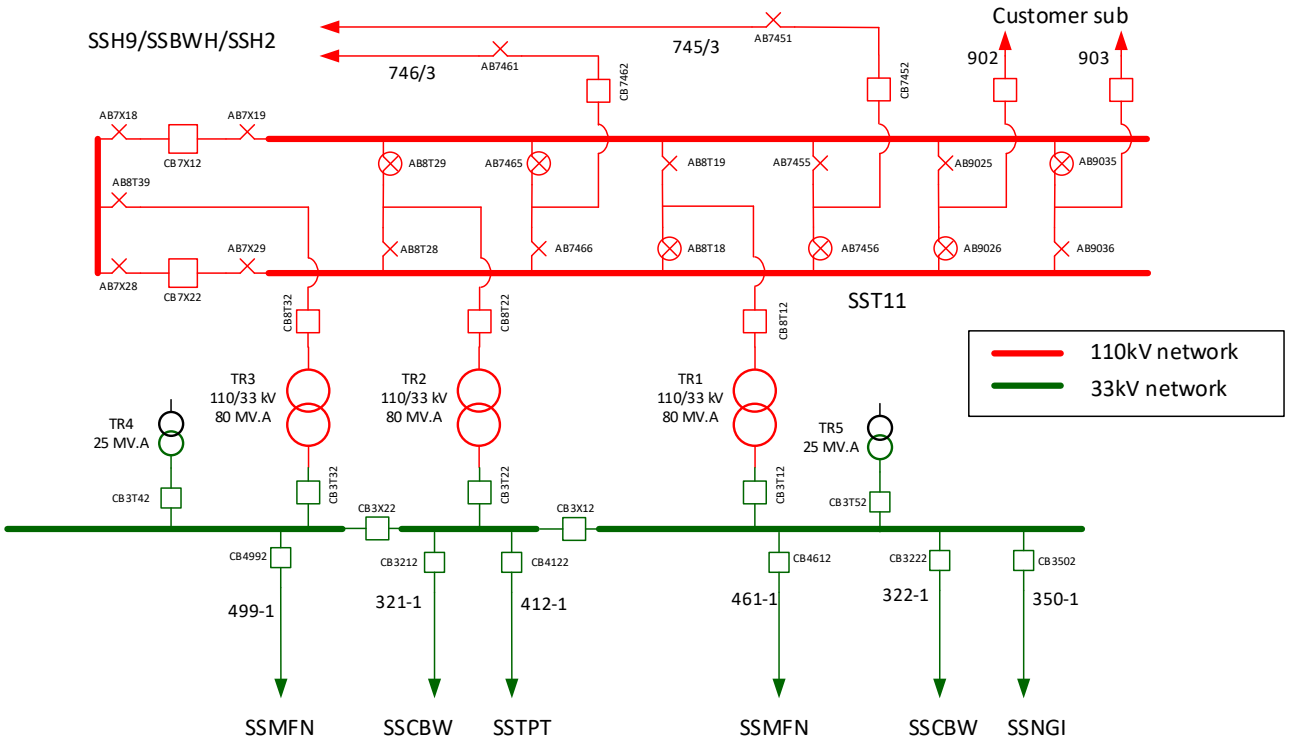


Figure 2: Existing network arrangement (schematic view)

Figure 3: Caboolture Substation (geographic view)

1.3. Load Profiles / Forecasts

The load at Caboolture Substation comprises a mix of residential and commercial/industrial customers. The load is summer peaking, and the annual peak loads are predominantly driven by residential customers.

1.3.1. Full Annual Load Profile

The full annual load profile for Caboolture Substation over the 2021/22 financial year is shown in Figure 4. It can be noted that the peak load occurs during summer; however, it does not exceed the N-1 capacity of 180.4MVA.

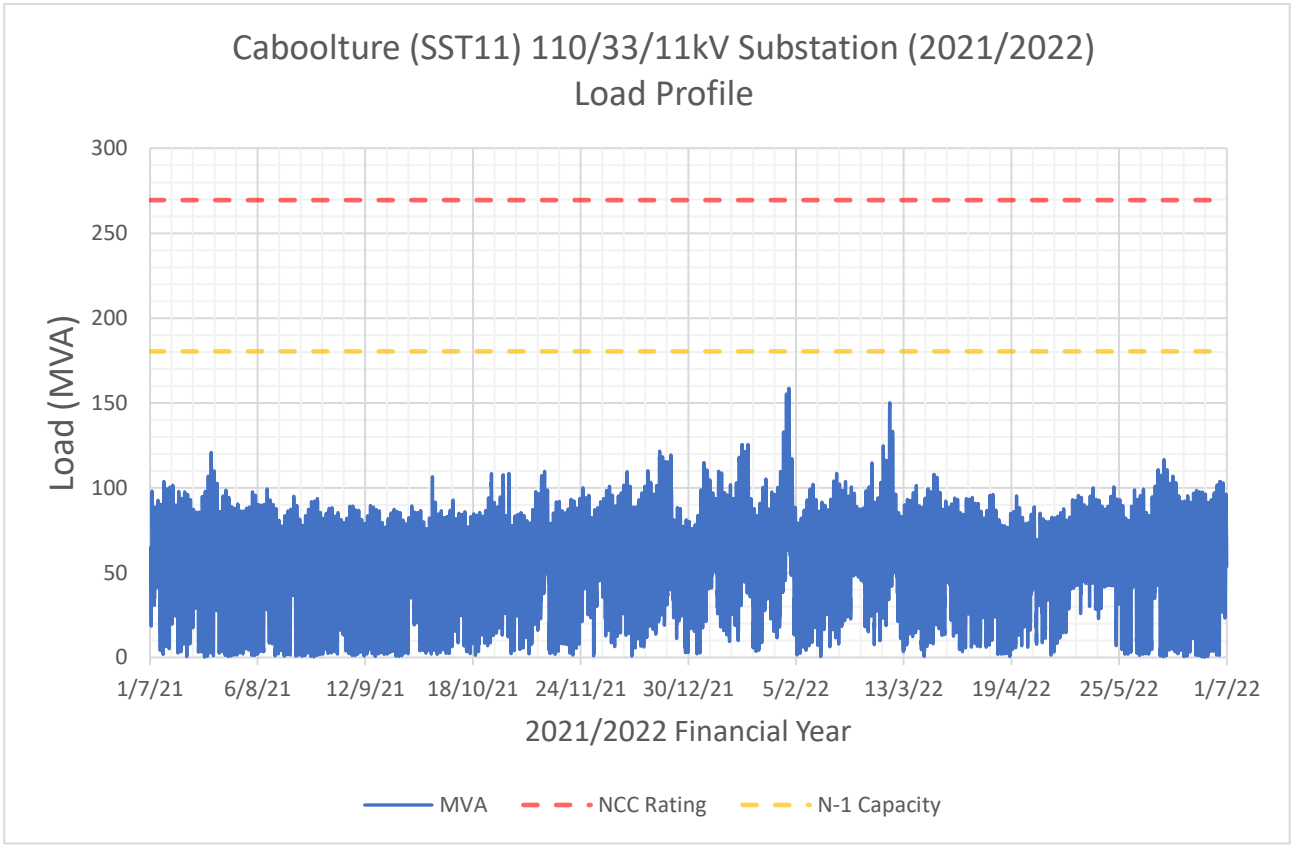


Figure 4: Substation actual annual load profile

1.3.2. Load Duration Curve

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

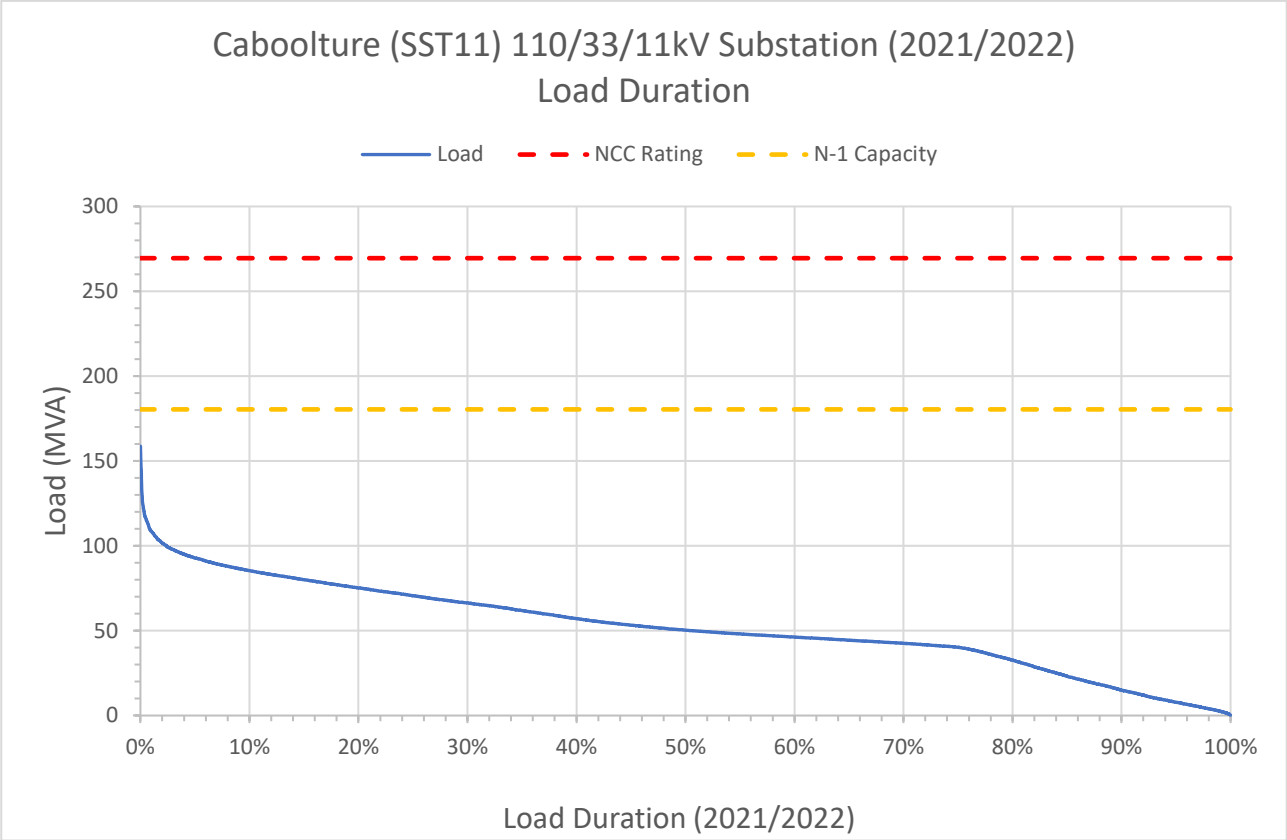


Figure 5: Substation load duration curve

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 Caboolture Substation are historically experienced in the late afternoon and evening.

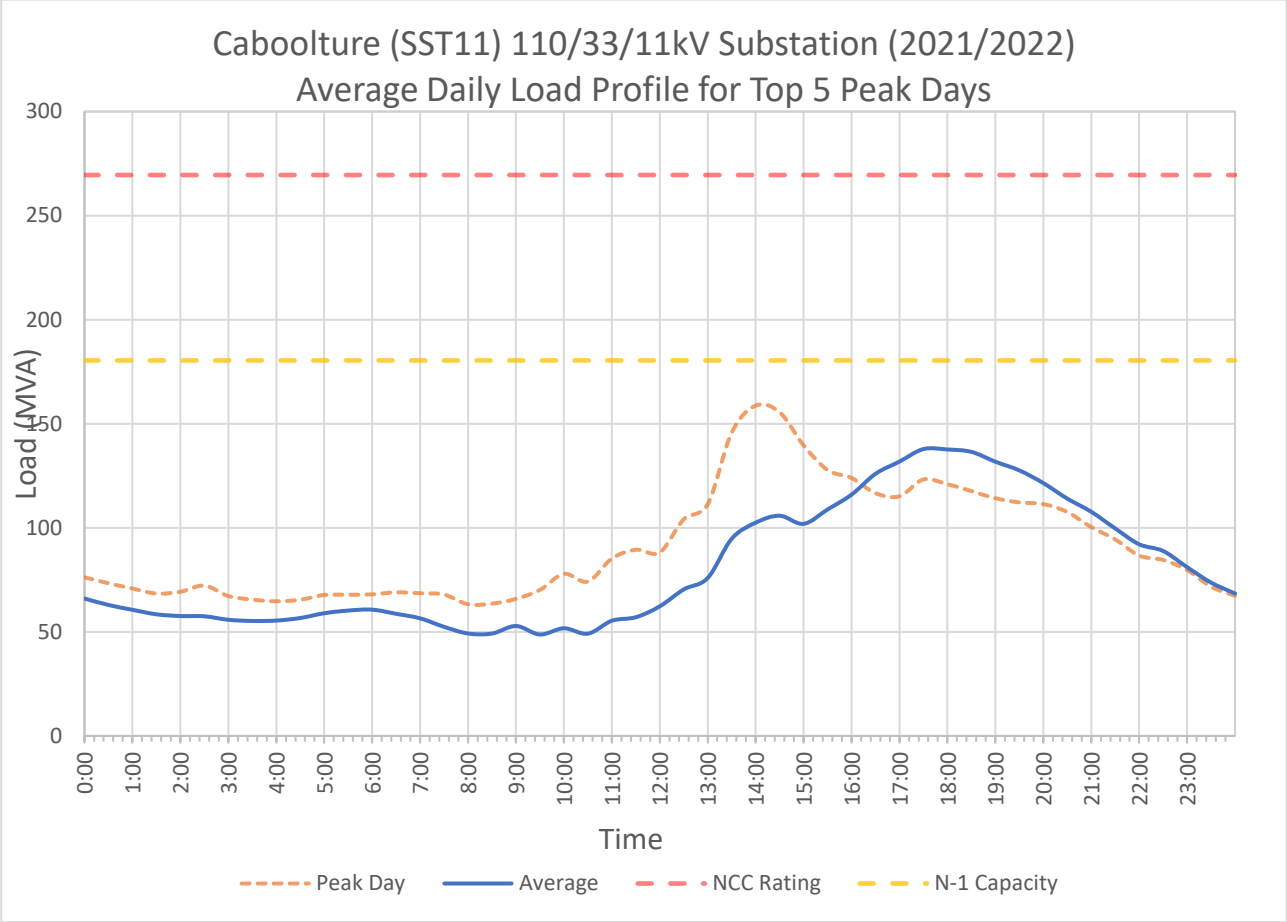


Figure 6: Substation average peak weekday load profile (summer)

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. It can be seen that the 50% POE forecast load growth in the base case scenario does not exceed the N-1 rating and the 10% POE forecast load growth in the base case scenario does not exceed the Normal Cyclic Capacity (NCC) rating. It can also be noted that the peak load is forecast to increase over the next 10 years under the base case scenario.

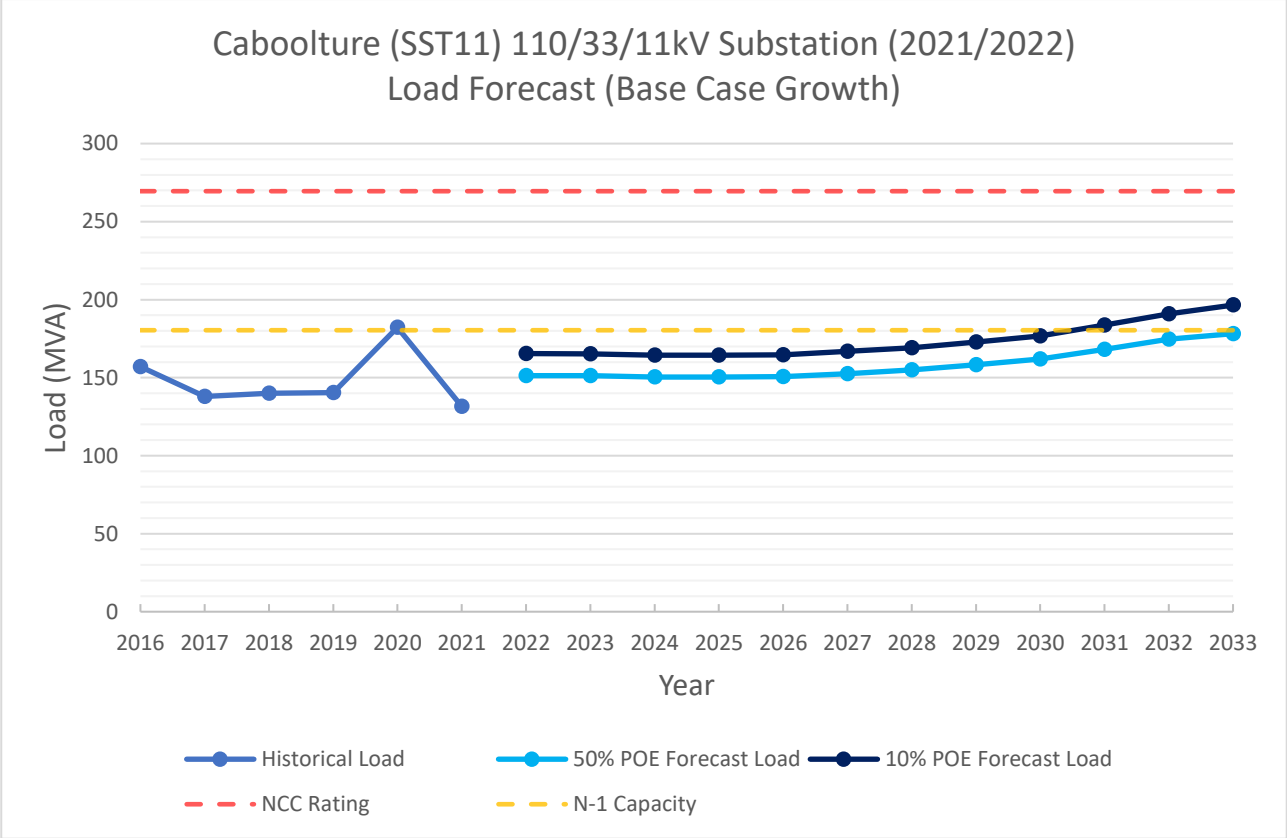


Figure 7: Substation base case load forecast

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. The 50POE forecast will exceed the N-1 rating in 2029, however the 10POE forecast does not exceed the NCC rating.

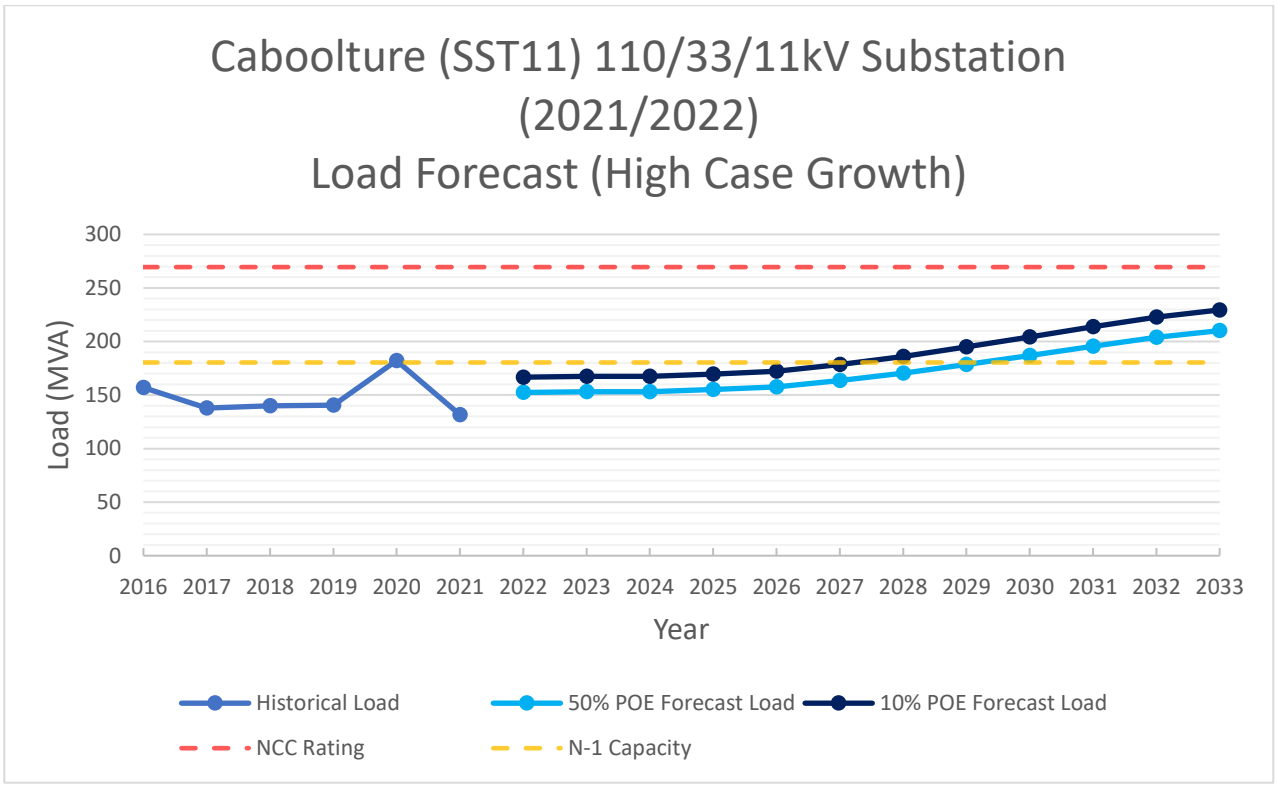


Figure 8: Substation high growth load forecast

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.

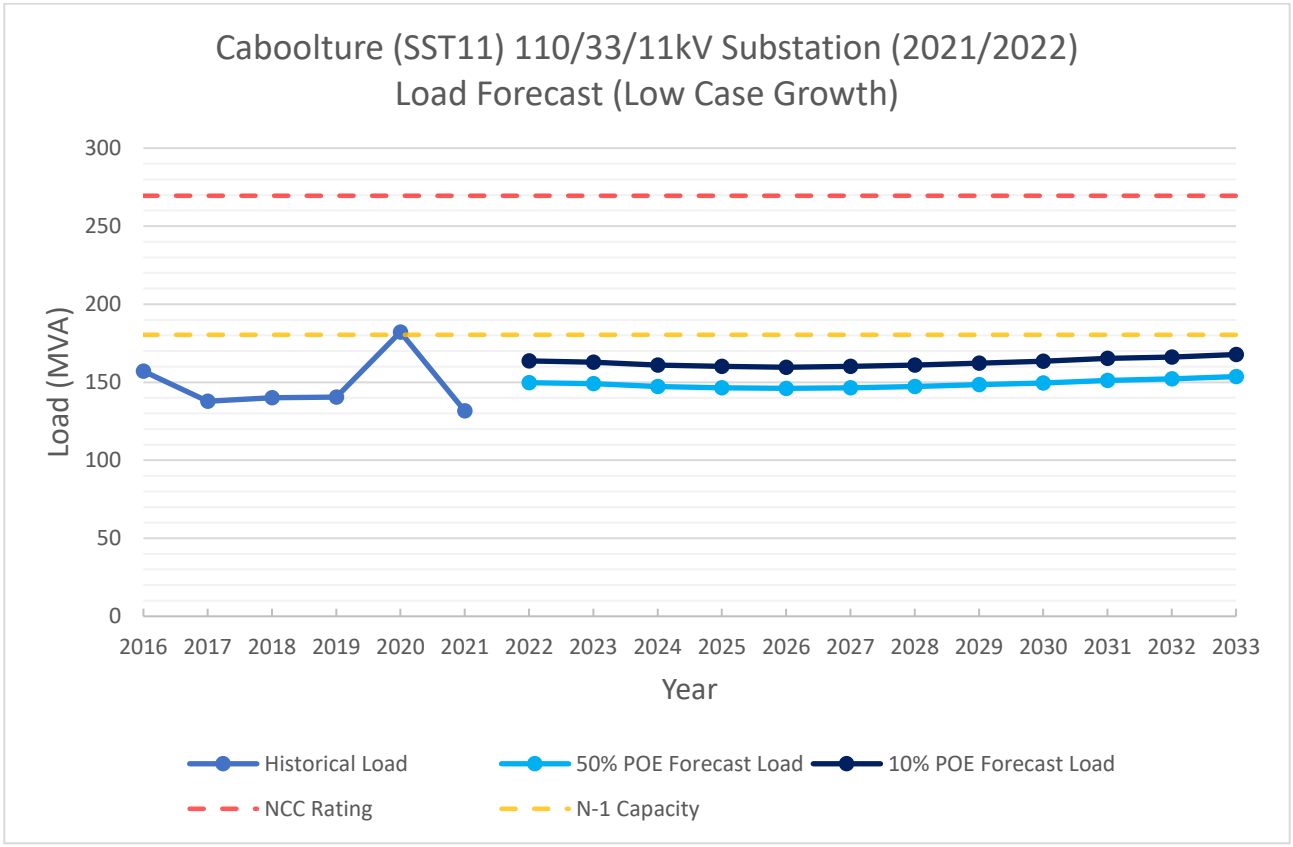


Figure 9: Substation low growth load forecast

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. These assets include:

- 4 x 110kV circuit breakers
- 6 x 33kV circuit breakers
- 29 x 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 the general public, through the increased likelihood of protection relay mal operation and failure of circuit breakers. Without remediation, Energex views that the safety risk to the public and its staff to not be reduced to 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 Caboolture Substation.

3. INTERNAL OPTIONS CONSIDERED

3.1. Non-Network Options Identified

Energex 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 Caboolture area to address the identified need.

3.2. Network Options Identified

Energex has identified one credible network options that will address the identified need.

3.2.1. Option 1: Replace 4 x 110kV circuit breakers and 6 x 33kV circuit breakers

This option involves the following works:

Caboolture Substation (SST11)

- Replace existing 110kV outdoor circuit breakers (2 x feeder CBs and 2 x transformer CBs).
- Replace existing 33kV outdoor circuit breakers (2 x transformer CBs, 1 x bus section CB and 3 x feeder CBs).
- Recover existing TR1, TR2 and TR3 protection relays, and scrap the existing protection panels.
- Install new protection panels for TR1, TR2 and TR3 containing IPAC relays to establish new dual transformer differential protection schemes.
- Recover existing 33kV bus zone protection relays and scrap the existing protection panels.
- Establish new protection panels for dual 33kV bus zone protection for BB31, BB32 and BB33.
- Recover and scrap F350 existing protection relays and install a new F350 protection panel containing IPAC relays to establish standard protection on F350.
- Recover and scrap F499 existing protection relays and install a new F499 protection panel containing IPAC relays to establish standard protection on F499.
- Recover and scrap F412 existing protection relay and install a new F412 protection panel containing IPAC relays to establish standard protection on F412.
- Recover and scrap CP31 protection relays and replace them like for like in the existing protection panel.
- Recover CP11 protection relays and replace them like for like in the existing panel.
- Recover existing TR4 and TR5 protection relays and install new protection panels for TR4 and TR5 to establish new dual transformer differential protection schemes.
- Recover existing 11kV NX4 protection relay and replace with a relay as per current standard.

Ningi Substation (SSNGI)

- Recover and scrap F350 existing protection relay and replace with a relay as per current standard.

Morayfield North Substation (SSMFN)

- Recover and scrap F499 existing protection relay and replace with a relay as per current standard.

Toorbul Point Substation (SSTPT)

- Recover F412 existing protection relay SEL351-6 and replace with a relay as per current standard.

A schematic diagram of the proposed network arrangement for Option 1 is shown in Figure 10.

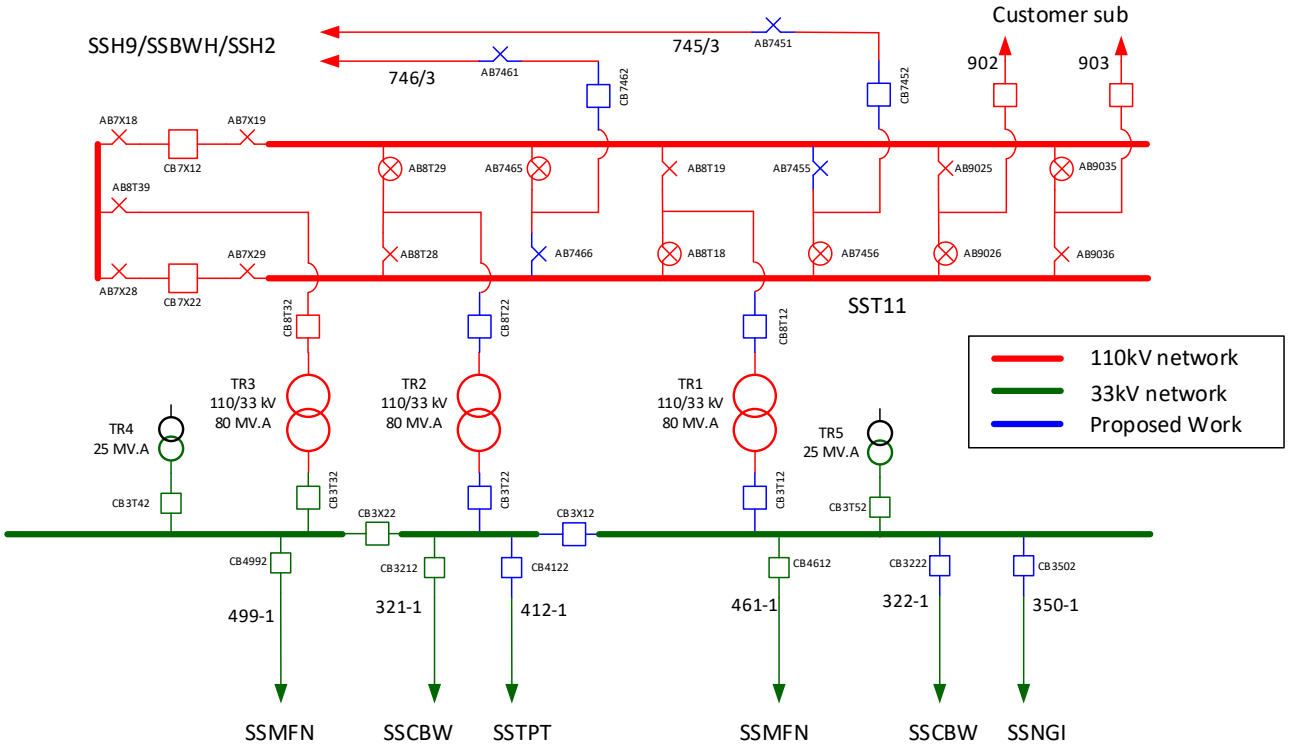


Figure 10: Option 1 proposed network arrangement (schematic view)

3.3. Preferred Network Option

Energex's preferred internal network option is Option 1, to replace 4 x 110kV circuit breakers and 6 x 33kV circuit breakers.

Upon completion of these works, the asset safety and reliability risks at Caboolture Substation 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 $11.77 million. Annual operating and maintenance costs are anticipated to be to be the same as the existing network as a result of this option. The estimated project delivery timeframe has design commencing in June 2023 and construction completed by May 2027.

4. ASSSESSMENT OF NON-NETWORK SOLUTIONS

Energex'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.

Once the aged assets at Caboolture substation 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 Energex.

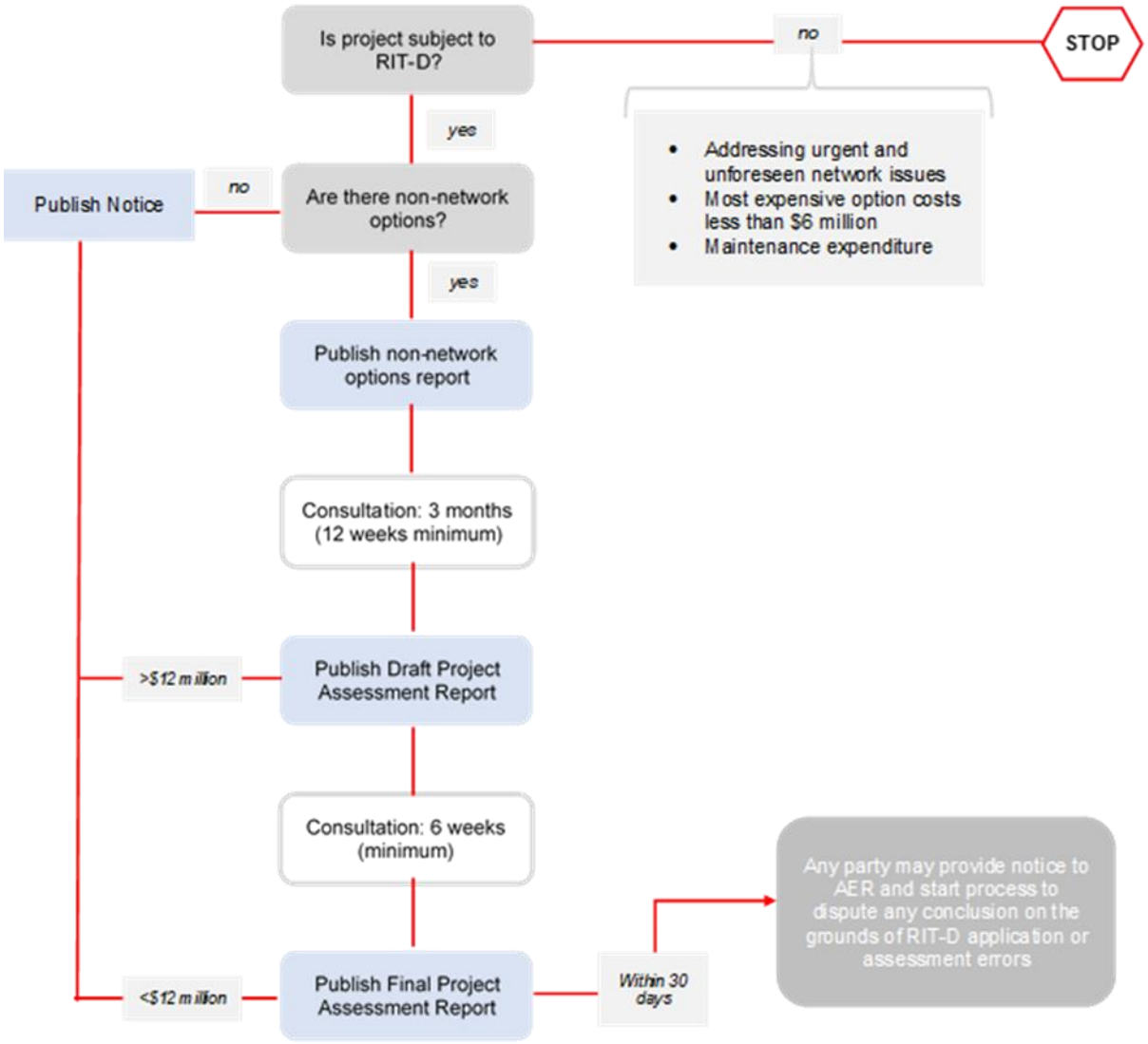
It is considered that no available demand management products or strategies can provide sufficient demand support at Caboolture substation to address the identified need. It is evident that an economically feasible non-network option would not be available to defer or eliminate the requirement to remove and replace the 110kV and 33kV circuit breakers and continue to provide a safe, sufficient, and reliable supply to customers in the Caboolture area.

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 Caboolture area to address the identified need.

The preferred network option is Option 1, to replace 4 x 110kV circuit breakers and 6 x 33kV circuit breakers. 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, Energex 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.