Regulatory Investment Test for Distribution (RIT-D)

Addressing Reliability Requirements in the Capalaba Network Area

Notice of Screening for Options

1 July 2024

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

Capalaba 33/11kV Zone Substation (SSCPB) is located approximately 15km South-East of Brisbane city. The substation is supplied by three 33kV feeders from Cleveland 110/33kV Bulk Supply Substation (SSCVL) via Capalaba South 33/11kV Zone Substation (SSCPS), Birkdale 33/11kV Zone Substation (SSBKD) and Raby Bay 33/11kV Zone Substation (SSRBY). SSCPB provides electricity to approximately 3,300 predominantly residential customers and 700 commercial/industrial customers in the surrounding area.

SSCPB is equipped with two 33/11kV transformers, 33kV outdoor switchgear, 11kV indoor switchgear and control building.

An engineering assessment of Capalaba zone substation has identified that the 33/11kV power transformer TR1, 33kV outdoor type circuit breakers, 33kV outdoor type isolators, 11kV indoor switchgear, protection relays and two station transformers are at the end of their serviceable life.

The deterioration of these primary and secondary system assets poses safety risks to staff working within the substation and the general public, as well as reliability risk to the customers supplied from Capalaba zone 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 Capalaba 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 Energex in accordance with the requirements of clause 5.17.4(d) of the NER.

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1 BACKGROUND

1.1 Geographic Region

Capalaba 33/11kV Zone Substation (SSCPB) is located approximately 15km South-East of Brisbane city. The substation provides electricity supply to approximately 3,300 predominantly residential customers and 700 commercial/industrial customers in the Capalaba, Capalaba West, Chandler and Birkdale areas, the maximum recorded demand was 16.5 MVA in Summer 2022/23.

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

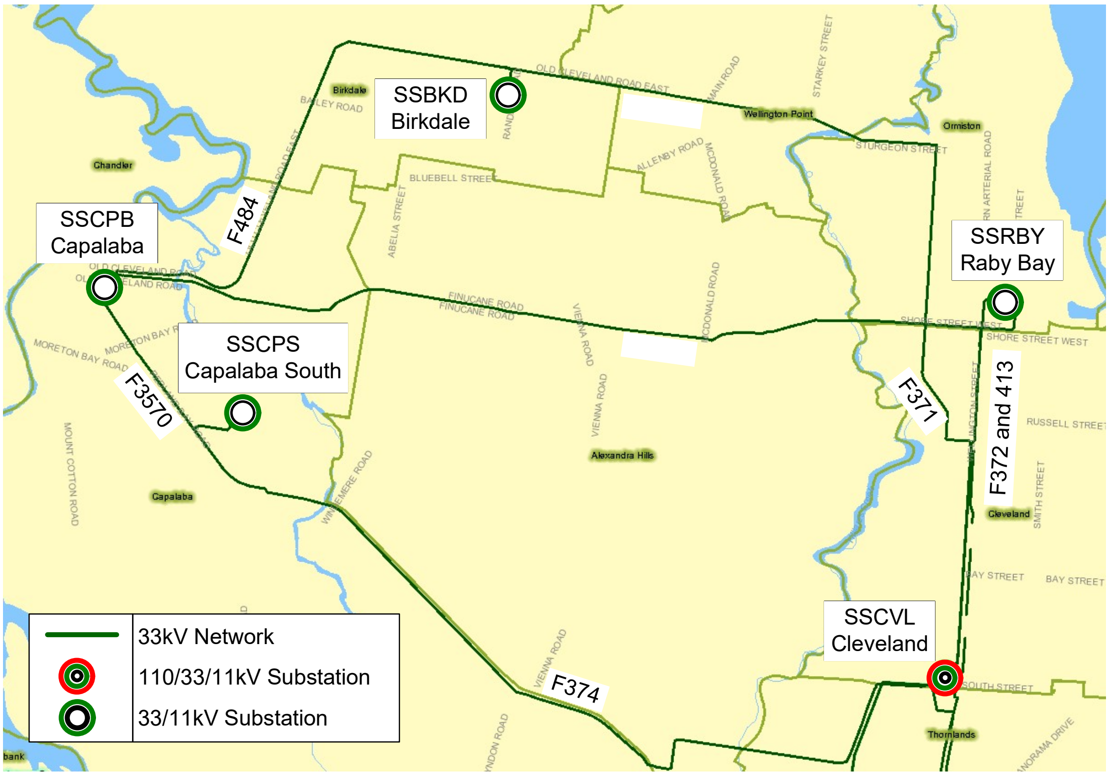


Figure 1: Existing network arrangement (geographic view)

1.2 Existing Supply System

The substation is supplied by Cleveland 110/33kV Bulk Supply Substation (SSCVL) via three 33kV feeders, F373, F484 and F3570 from Raby Bay 33/11kV Zone Substation (SSRBY), Birkdale 33/11kV Zone Substation (SSBKD) and Capalaba South 33/11kV Zone Substation (SSCPS), respectively.

SSCPB is equipped with a 12.5MVA 33/11kV transformer TR1, 25MVA 33/11kV transformer TR3, 33kV outdoor switchyard with steel structures, 11kV indoor switchgears and control building.

33kV outdoor switchyard contains two transformer CBs, three feeder CBs, four VTs and ten isolators. The 11kV indoor switchgear contains three 11kV transformer CBs, nine feeder CBs and two bus section CBs.

There are two 50kVA 33/0.415kV station transformers supplied off the 33kV bus at Capalaba zone substation.

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

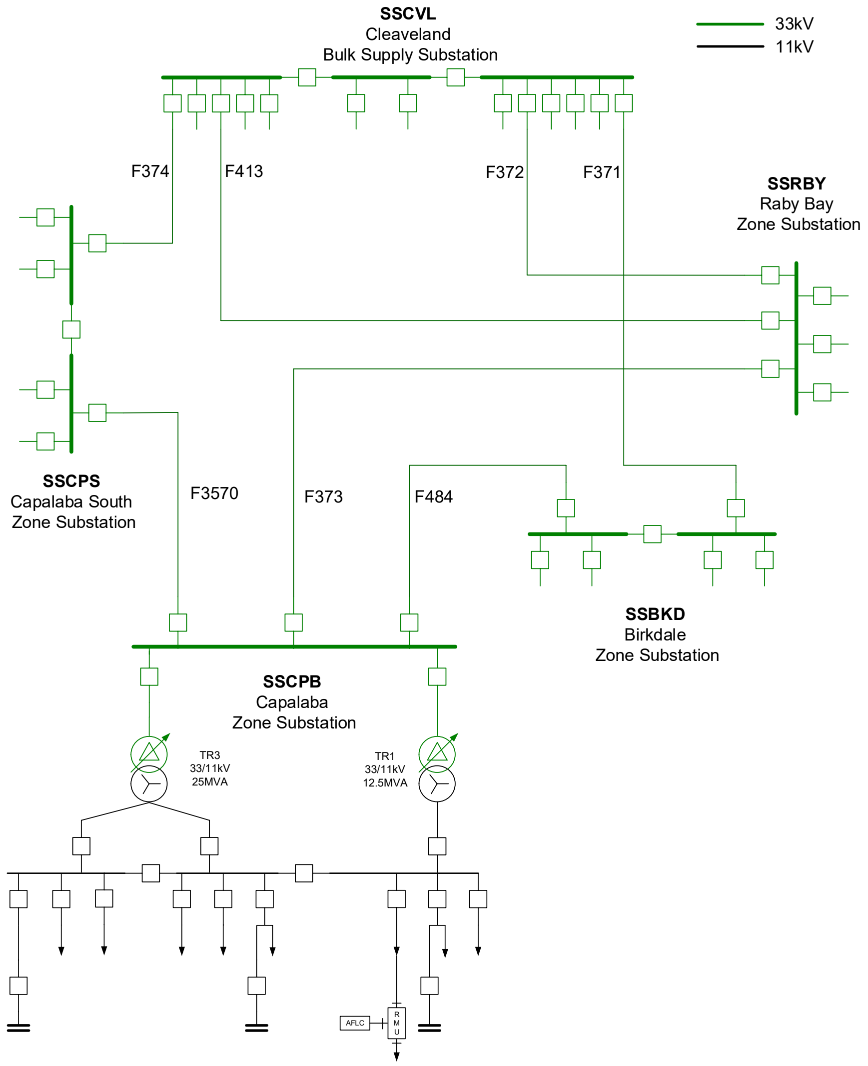


Figure 2: Existing network arrangement (schematic view)

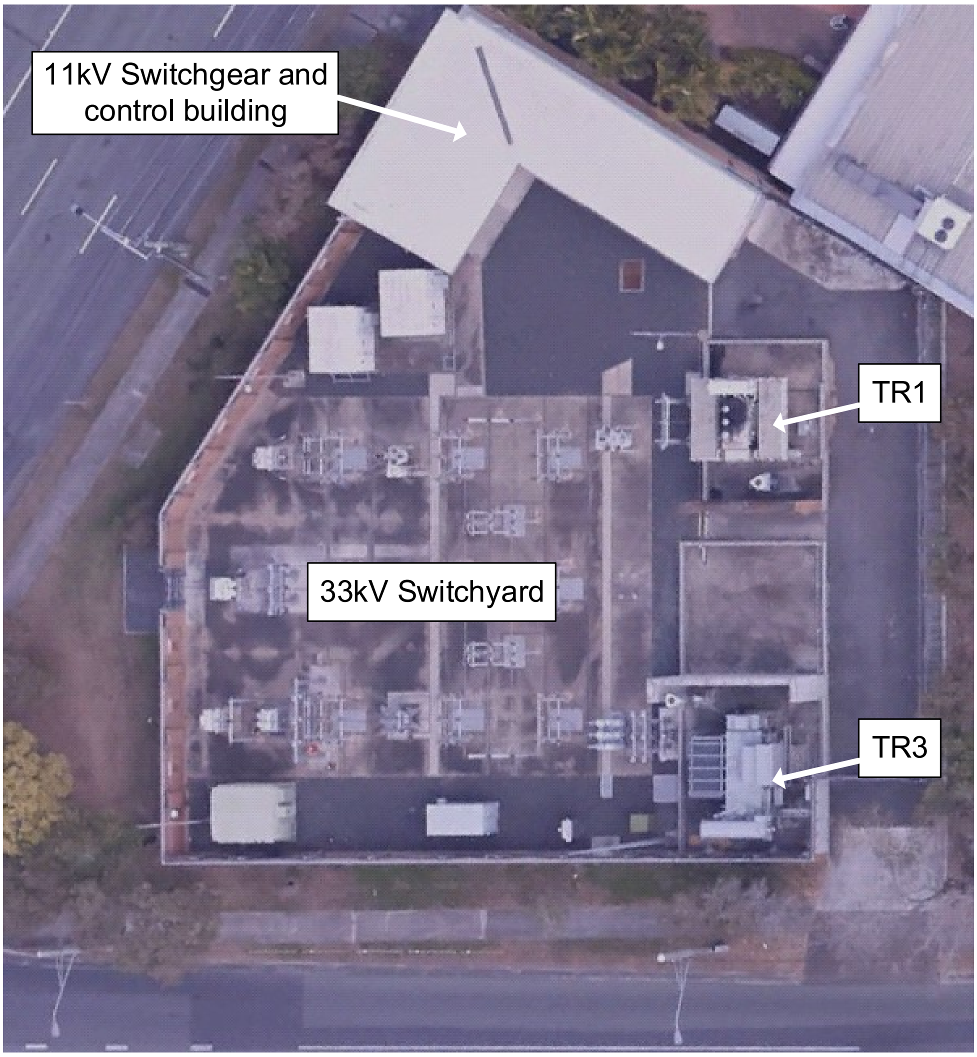


Figure 3: Capalaba zone substation (geographic view)

1.3 Load Profiles / Forecasts

The load at Capalaba zone substation comprises a mix of residential and business customers. The load is summer peaking, and the annual peak loads are predominantly driven by residential loads.

1.3.1 Full Annual Load Profile

The full annual load profile for Capalaba zone substation over the 2022/23 financial year is shown in Figure 4. It can be noted that the peak load occurs during summer.

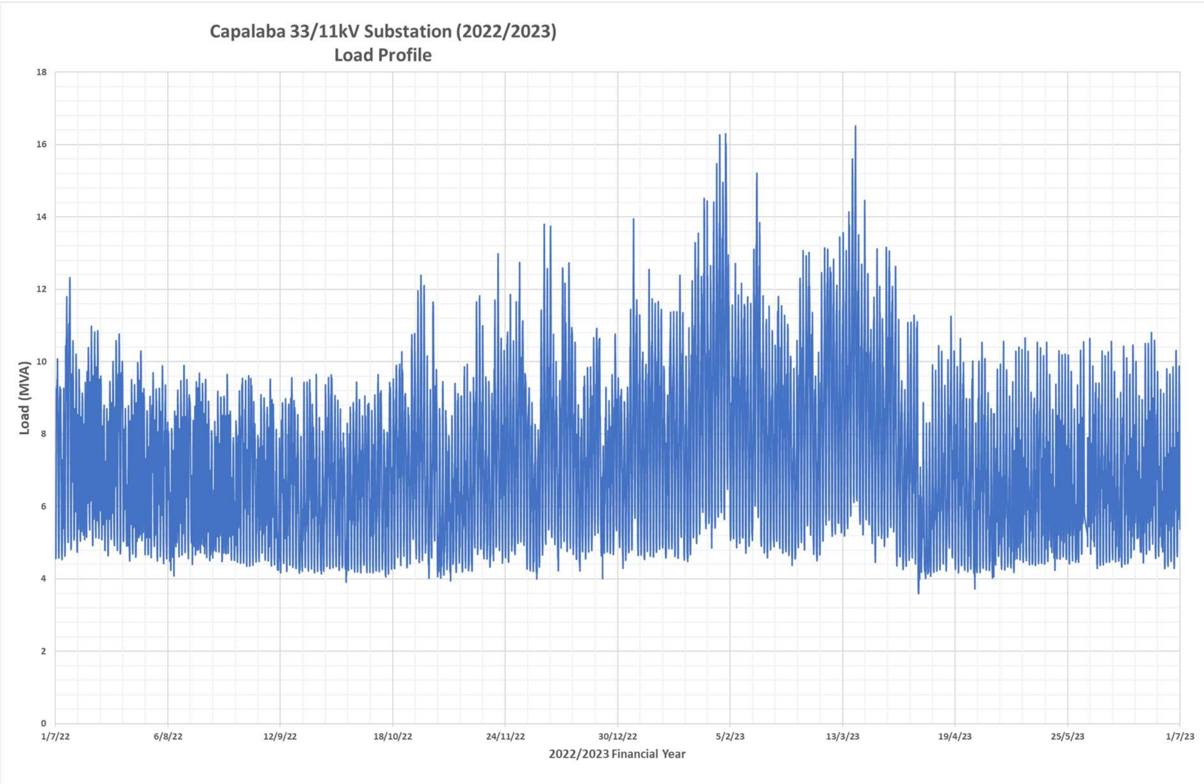


Figure 4: Substation actual annual load profile

1.3.2 Load Duration Curve

The load duration curve for Capalaba zone substation over the 2022/23 financial year is shown in Figure 5.

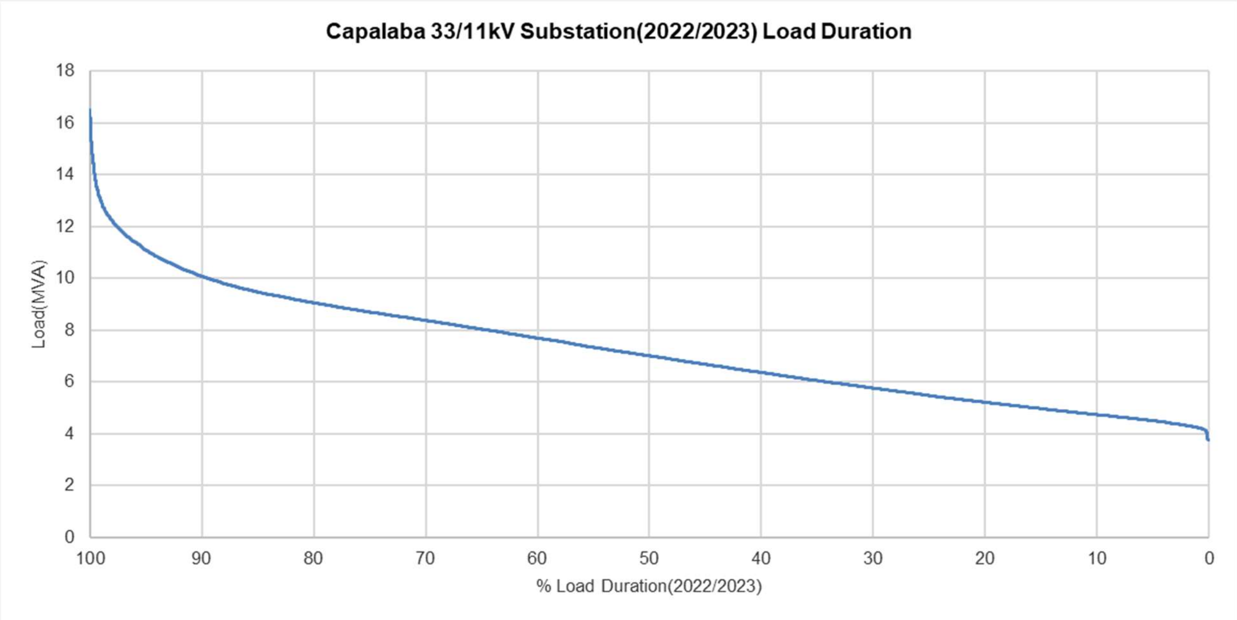


Figure 5: Substation load duration curve

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 Capalaba zone substation are historically experienced in the late afternoon and evening.

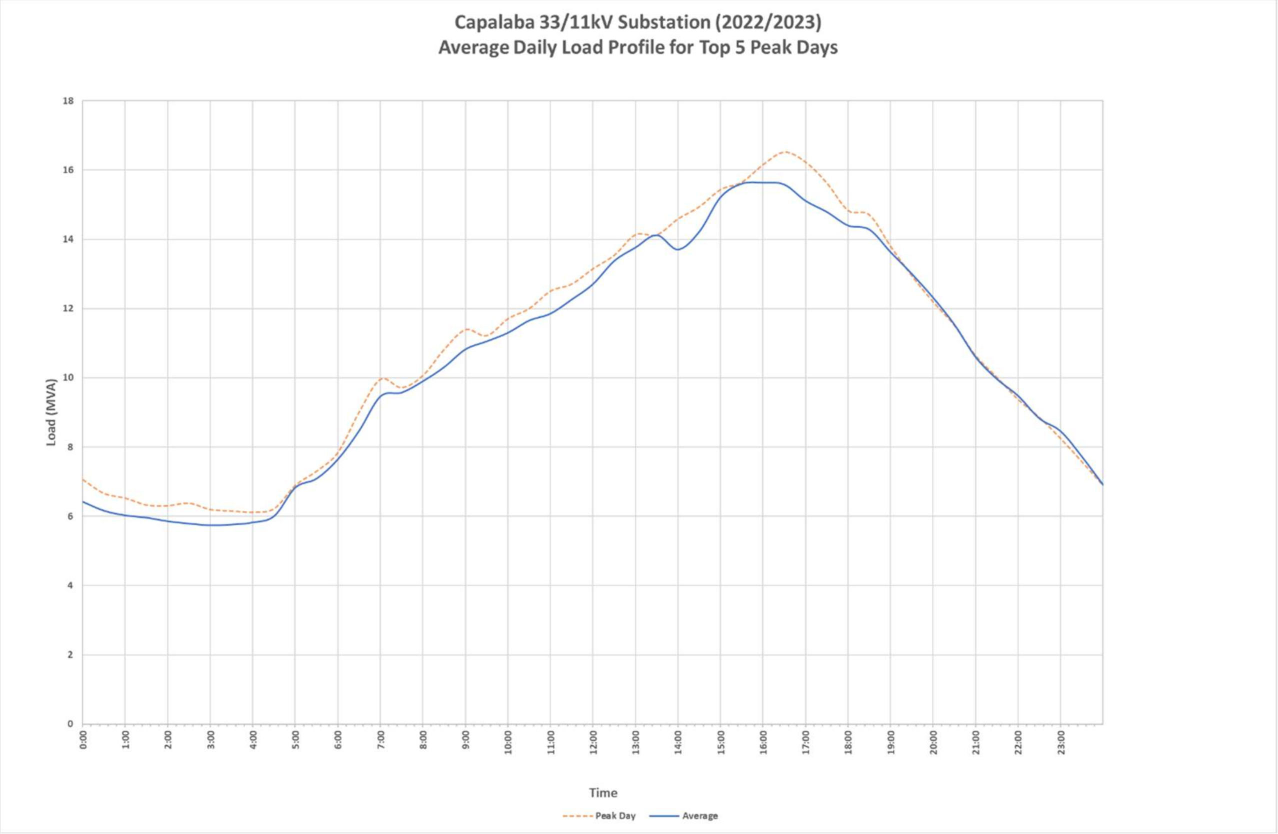


Figure 6: Substation average peak weekday load profile (summer)

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 noted that the historical annual peak loads have remained relatively steady over the past six years. It can also be noted that the peak load is forecast to remain relatively steady over the next 10 years under the base case scenario.

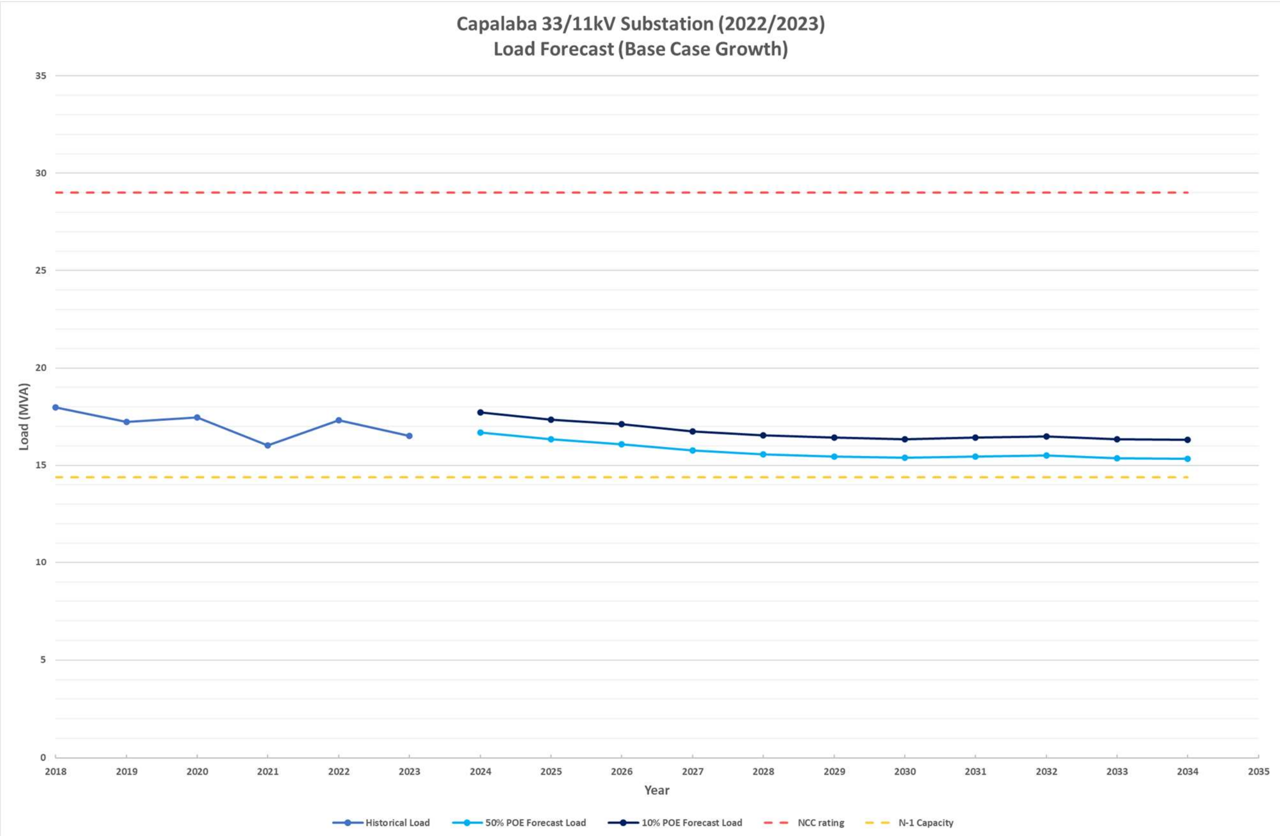


Figure 7: Substation base case load forecast

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 remain relatively steady over the next 10 years.

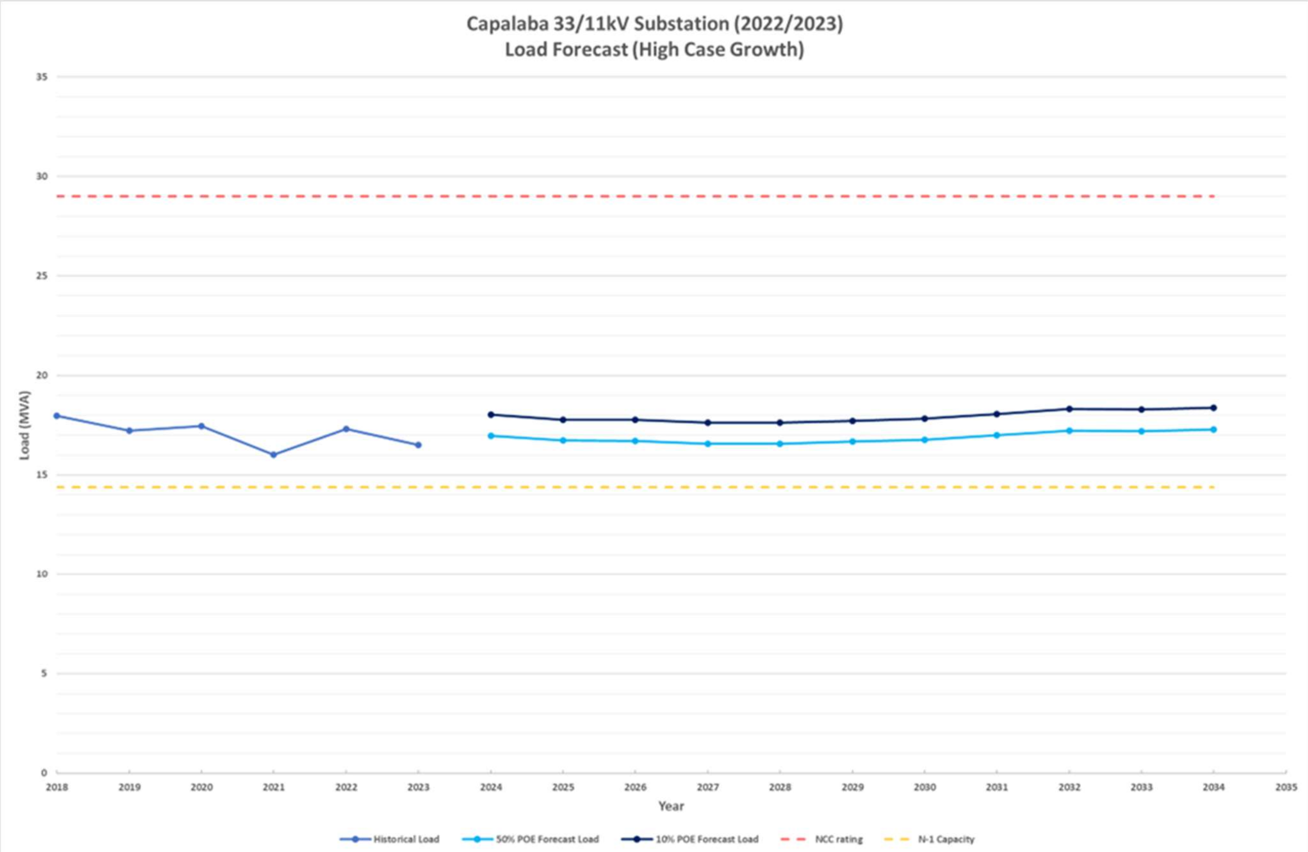


Figure 8: Substation high growth load forecast

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 slightly decrease over the next 10 years.

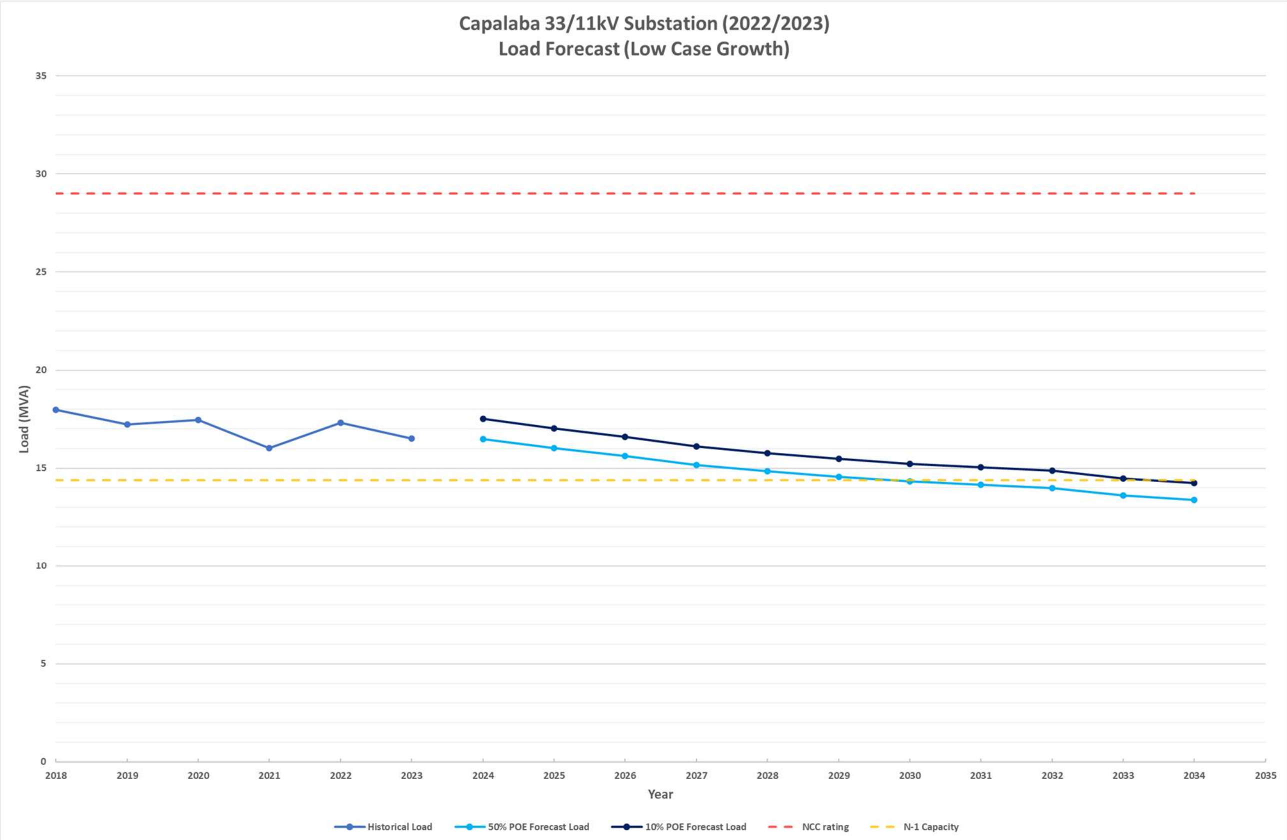


Figure 9: Substation low growth load forecast

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, environmental and reliability risk.

Condition data indicates that the following assets are reaching the end of their life.

- One 33/11kV transformer
- Three 33kV circuit breaker
- Seven 33kV isolators
- Six 11kV circuit breakers
- Two station service transformers
- Twenty-one protection relays
- One battery charger

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 relays mal-operation and catastrophic failure of the power transformers. There is also a considerable risk of environmental harm due to loss of oil from the power transformers, which would require clean up and rectification. 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 Capalaba zone substation.

Where Energex 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

Energex has not identified any viable SAPS or 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 Capalaba area to address the identified need.

3.2 Network Options Identified

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

3.2.1 Option A: Replace end of life TR1, 33kV and 11kV switchgear

This option includes the following works to address the identified need:

- Recover the existing 12.5MVA 33/11kV transformer
- Recover the existing 33kV outdoor oil circuit breakers, isolators and bus
- Recover the existing 11kV indoor switchgear
- Recover the existing two station transformers
- Establish a new switchgear and control building
- Install a new 25MVA 33/11kV transformer
- Install new 33kV and 11kV indoor switchgear
- Install a 33/0.4kV station transformer and 11/0.4kV station transformer

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

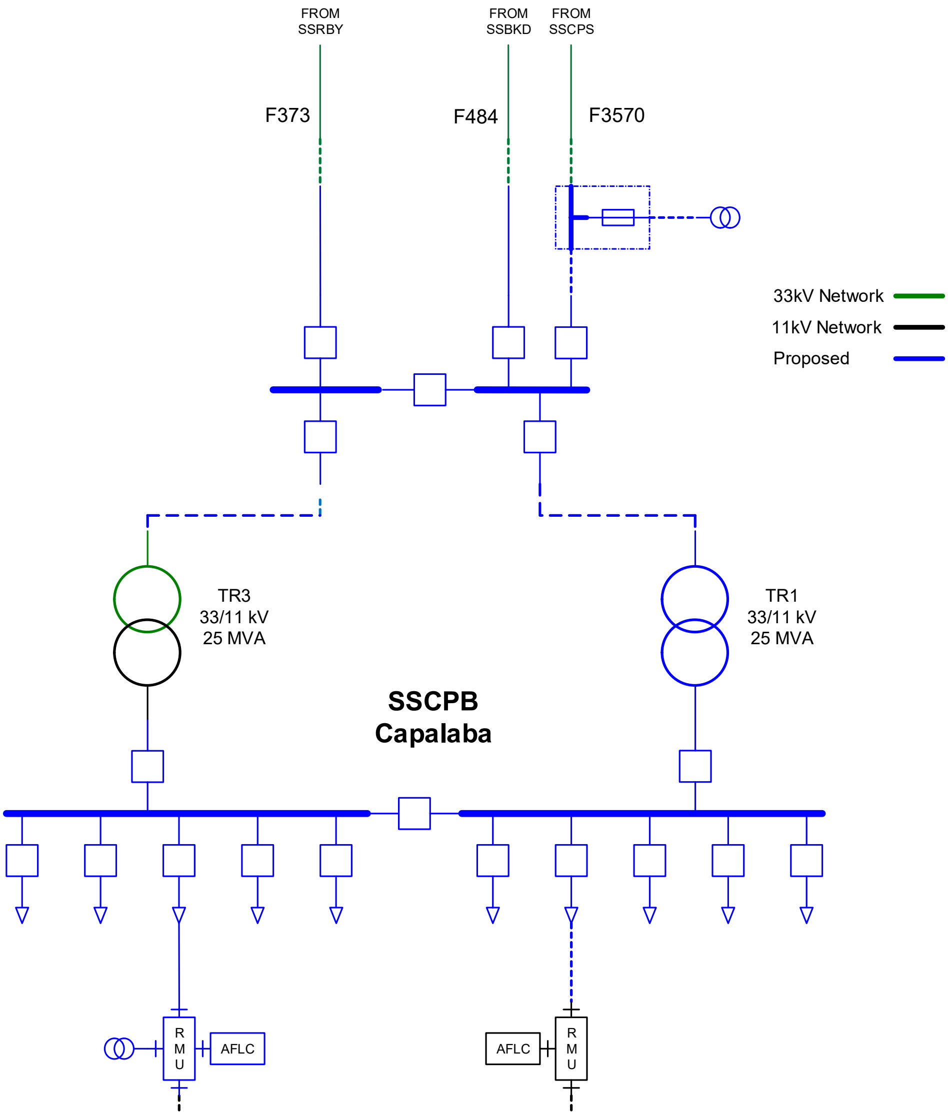


Figure 10: Option A proposed network arrangement (schematic view)

3.2.2 Option B: Recover TR1, replace 33kV and 11kV switchgear with new indoor switchgear and establish new 11kV tie to SSCPS

This option includes the following works to address the identified need:

- Recover the existing 12.5MVA 33/11kV transformer
- Recover the existing 33kV outdoor oil circuit breakers and bus
- Recover the existing 11kV indoor switchgear
- Recover the existing two station transformers
- Establish a new switchgear and control building
- Install new 33kV and 11kV indoor switchgear
- Install a mobile substation connection kiosk
- Install a 33/0.4kV station transformer and 11/0.4kV station transformer
- Install an AFLC.
- Establish a new 11kV feeder from SSCPS

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

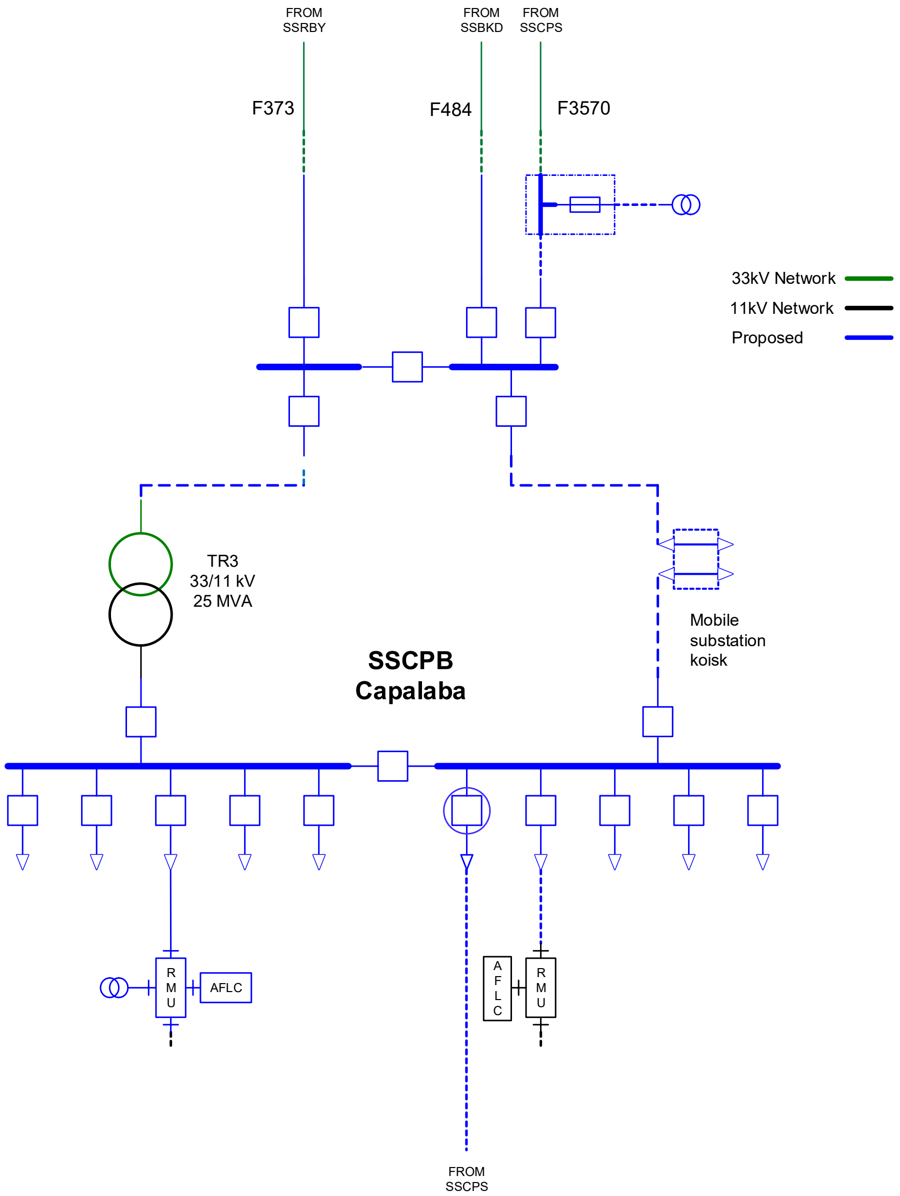


Figure 11: Option B proposed network arrangement (schematic view)

3.2.3 Option C: Establish four new 11kV feeders from SSCPS to feed SSCPB 11kV area and recover SSCPB

This option includes the following works to address the identified need:

- Recover the existing 12.5MVA 33/11kV transformer
- Recover the existing 33kV outdoor oil circuit breakers and bus
- Recover the existing 11kV indoor switchgear
- Recover the existing two station transformers
- Establish new 33kV bus work to tie F373, F484, F3570 together at SSCPB to form a 3-ended tee-feeder.
- Establish four new 11kV feeders from SSCPS

This option will require the re-establishment of SSCPB in the future due to load growth.

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

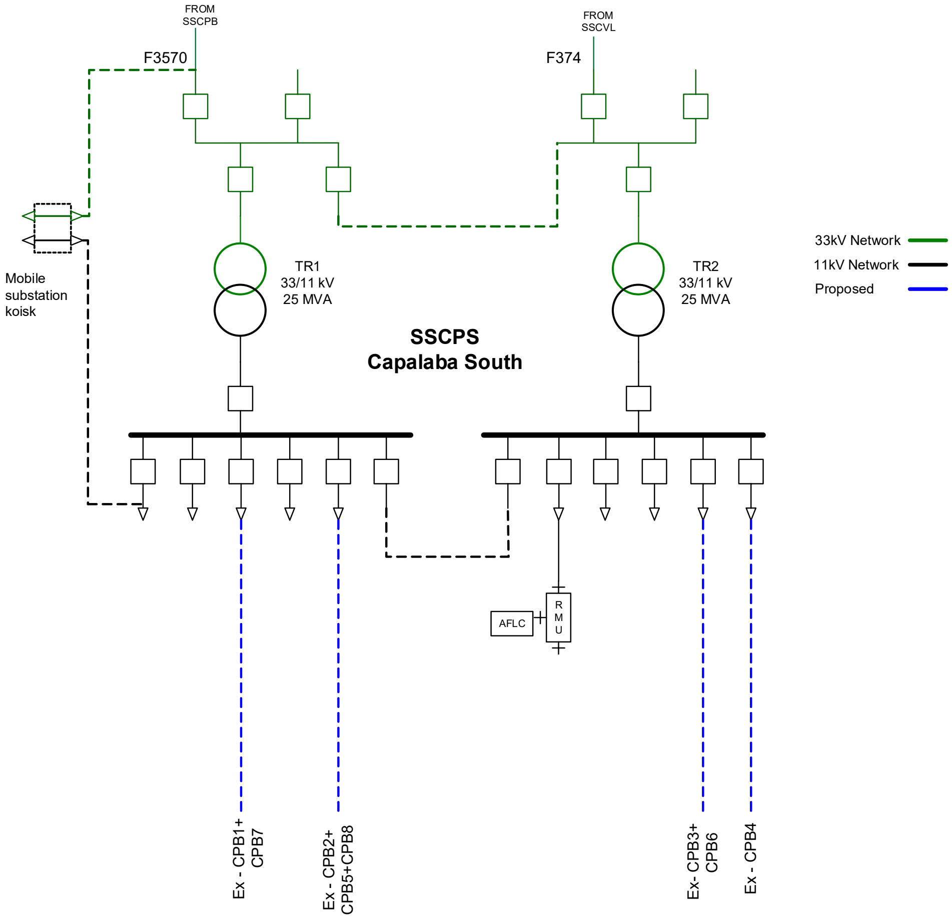


Figure 12: Option C proposed network arrangement (schematic view)

3.3 Preferred Network Option

Energex's preferred internal network option is Option A, to replace existing end of life transformers, 33kV and 11kV switchgear at Capalaba zone substation.

Upon completion of these works, the asset safety and reliability risks at Capalaba zone 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 is $13.6 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 February 2025 and construction completed by February 2029.

4 ASSSESSMENT OF SAPS AND NON-NETWORK SOLUTIONS

Energex has considered SAPS and demand management solutions to determine their feasibility to meet the identified need. Each of these are considered below.

4.1 Consideration of SAPS Options

Energex 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 Capalaba supply area could not be supported by a network that is not part of the interconnected national electricity system.

4.2 Demand Management (Demand Reduction)

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.

The DEM team has completed a review of the Capalaba 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 Capalaba. It has been determined that most demand management options will not be viable propositions and have been explored in the following sections.

4.2.1 Network Load Control

The residential customers load appears to drive the daily peak demand which generally occurs between 3:00pm and 8:00pm.

There are 2,117 customers on tariff T31 and T33 hot water load control (LC). An estimated demand reduction value of 1,270kVA[1] is available.

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.

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

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 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 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.

4.3.4 Customer Solar Power Systems

A total of 1,283 customers have solar photo voltaic (PV) systems for a connected inverter capacity of 7,995kVA.

The daily peak demand is driven by residential customer demand and the peak generally occurs between 3:00pm and 8:00pm. 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.

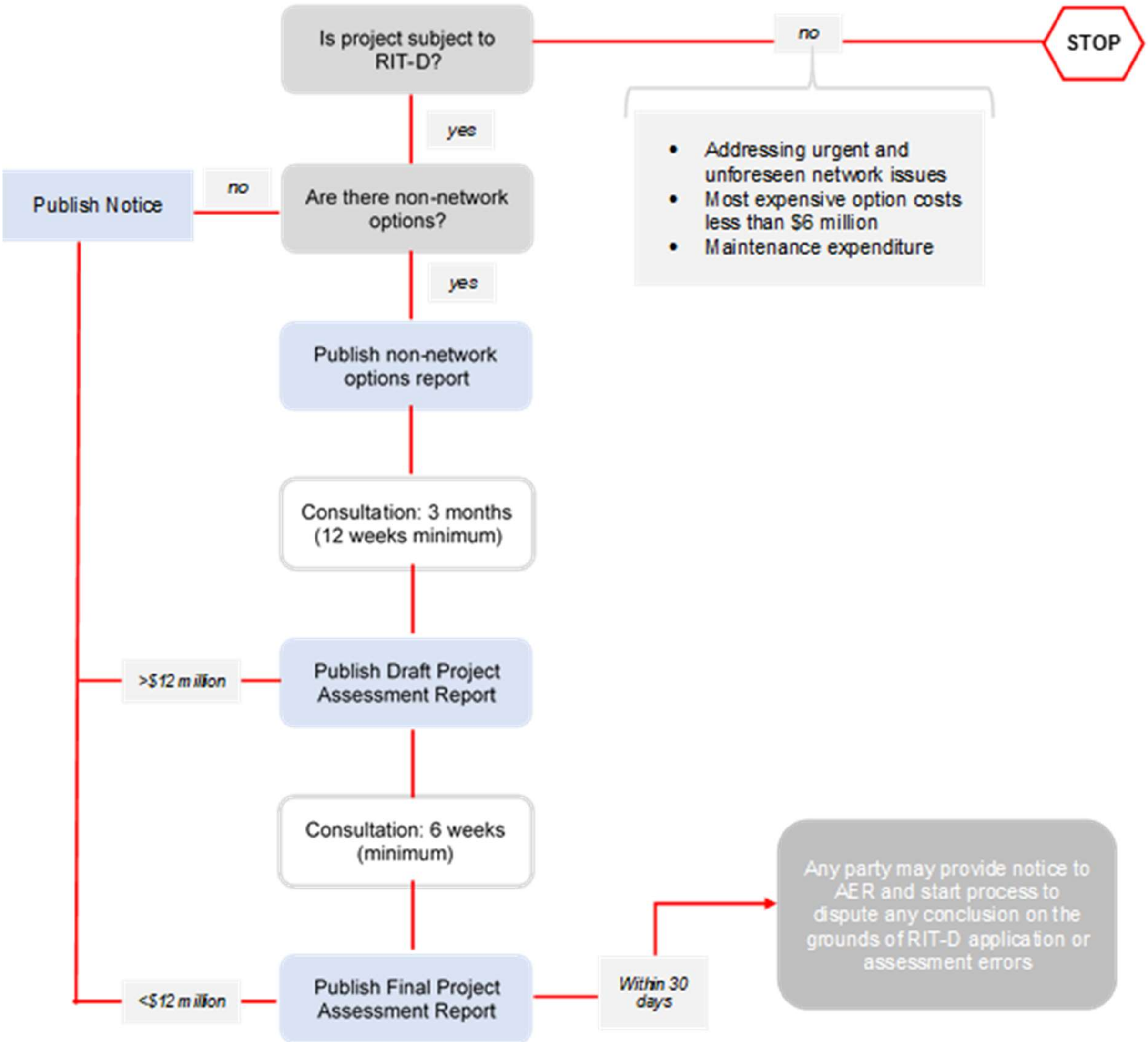
However, only a small percentage of customers in this supply area have solar PV systems and possibly none have a BESS. PV systems with BESS present a future portfolio opportunity for potential demand response but currently this supply area has a very limited solar/BESS. Solar customers without a BESS 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 Capalaba area to address the identified need.

The preferred network option is Option A - replace end of life transformer, 33kV and 11kV switchgear at Capalaba zone substation. 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 Draft Project Assessment Report.

6 APPENDIX A – THE RIT-D PROCESS



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