Regulatory Investment Test for Distribution (RIT-D)

Reliability Corrective Action

The Acacia Ridge Network Area

Notice of No Non-network or SAPS Options

24 June 2025

energex
Part of Energy Queensland

EXECUTIVE SUMMARY

Purpose

Energex Limited (Energex) has determined on reasonable grounds, in accordance with clause 5.17.4(c) of the National Electricity Rules (NER), that there is no non-network option or a stand-alone power-system (SAPS) option that is a potential credible option, or that forms a significant part of a potential credible option, for this RIT-D project to address the identified need.

This notice sets out the reasons for this determination, including any methodologies and assumptions used in making the determination. Energex publishes this notice in accordance with clause 5.17.4(d) of the NER.

About Energex

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

Acacia Ridge 33/11kV Substation (SSARG) is located approximately 15km south of the Brisbane CBD. The substation is part of the Energex 33kV sub-transmission network is presently supplied via two incoming 33kV feeders from T161 Algester 110/33kV Bulk Supply Substation (SST161).

Acacia Ridge substation supplies four suburbs of Brisbane - Acacia Ridge, Coopers Plains, Sunnybank, and Sunnybank Hills. Acacia Ridge Zone Substation provides electricity supply to approximately 3,195 residential and 301 commercial customers.

Based on the substation condition assessment of Acacia Ridge, some primary and secondary plant and equipment are recommended for retirement.

The assessment identified that the two 33/11kV power transformers, the eight 11kV oil circuit breakers and fourteen of the protection relays are at the end of their serviceable life. Additionally, a civil assessment of the structures on site also identified that the transformer bunding is inadequate and does not satisfy the current requirements outlined in AS1940 and AS2067.

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 Acacia Ridge Substation. Therefore, the identified need for this RIT-D project is for reliability corrective action, without such

investment, Energex may, in the event of failure of the above identified critical assets, be in breach of regulatory obligations including:

- *Electrical Safety Act 2002* (Qld) – Under Sections 29 and 30, Energex has a duty of care to ensure that its works are electrically safe and are operated in a way that is electrically safe. This duty also extends to ensuring the electrical safety of all persons and property likely to be affected by the electrical work.
- Energex's Distribution Authority issued under the *Electricity Act 1994* – Under its Distribution Authority, the distribution entity must plan and develop its supply network in accordance with good electricity industry practice, having regard to the value that end users of electricity place on the quality and reliability of electricity services.

  The failure of the deteriorated 11kV switchboard can result in approximately 3,500 customers without power and cannot be restored within the timeframes stipulated in the Distribution Authority.

Determination That No Non-network or SAPS Options Can Address the Identified Need

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. Following a review of the Acacia Ridge customer base and consideration of a number of demand management technologies, it has been determined that there are no Non-network or SAPS options that is technically and commercially viable and be able to be implemented in sufficient time to address the asset safety and reliability risks at SSARG Acacia Ridge zone substation.

CONTENTS

1. BACKGROUND

1.1. Geographic Region

Acacia Ridge 33/11kV Substation (SSARG) is located approximately 15km on the south side of the Brisbane CBD. It supplies four suburbs of Brisbane - Acacia Ridge, Coopers Plains, Sunnybank, and Sunnybank Hills. Acacia Ridge Zone Substation provides electricity supply to approximately 3,496 customers, of which 91% are residential and 9% are commercial and industrial.

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

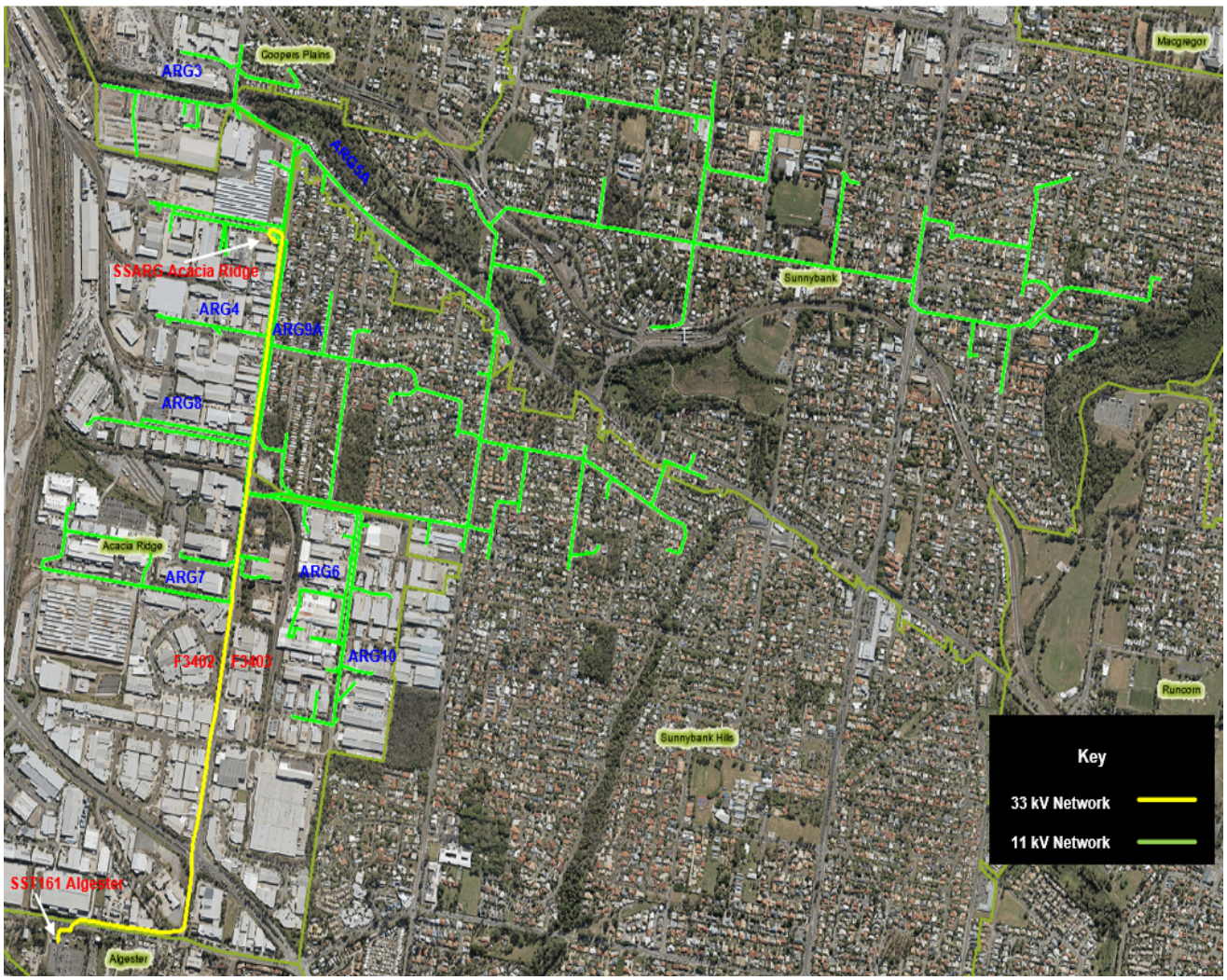

Figure 1: Existing network arrangement (geographic view)

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1.2. Existing Supply System

Acacia Ridge 33/11kV Substation is part of the Energex's 33kV sub-transmission network and is presently supplied radially via two incoming 33kV feeders from T161 Algester 110/33kV Bulk Supply Substation (SST161).

Acacia Ridge Substation was established in 1975 in line with the applicable design and construction standards of that time. It has indoor 33kV and 11kV switchyards, two 20MVA 33/11kV power transformers, two capacitor banks and control buildings. Acacia Ridge substation supplies eight 11kV distribution feeders.

There is one station services transformers at Acacia Ridge substation; local transformer 1 is a 200kVA 11/0.415kV transformer supplied off the 11kV bus.

Based on the substation condition assessment of Acacia Ridge, some primary and secondary plant and equipment are recommended for retirement due to deteriorated conditions.

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

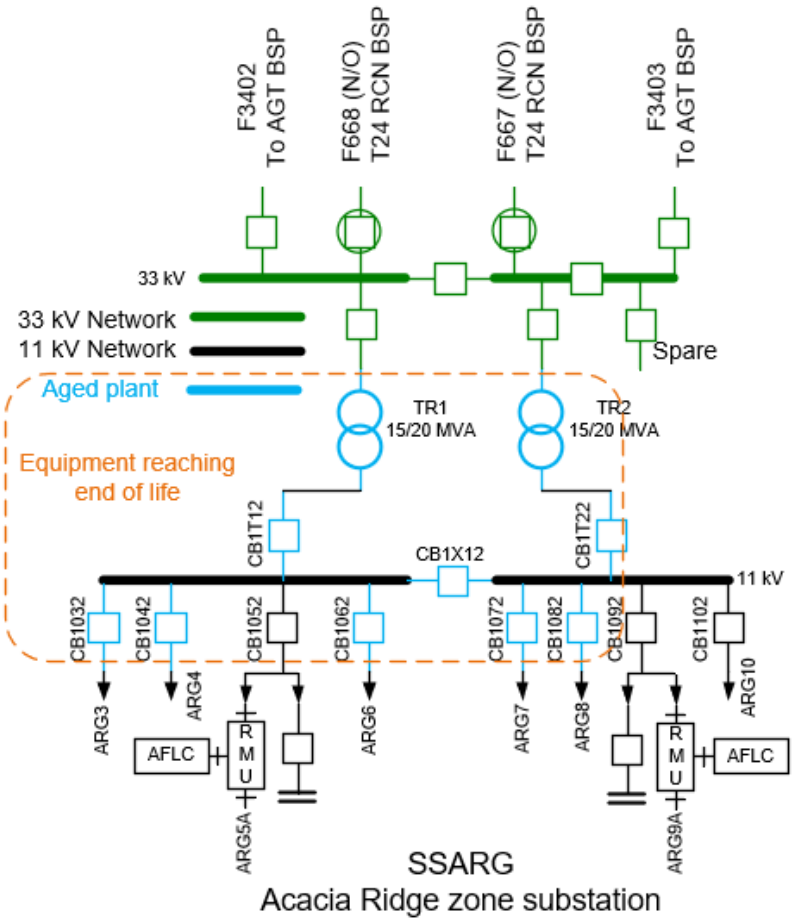

Figure 2: Existing network arrangement (schematic view)

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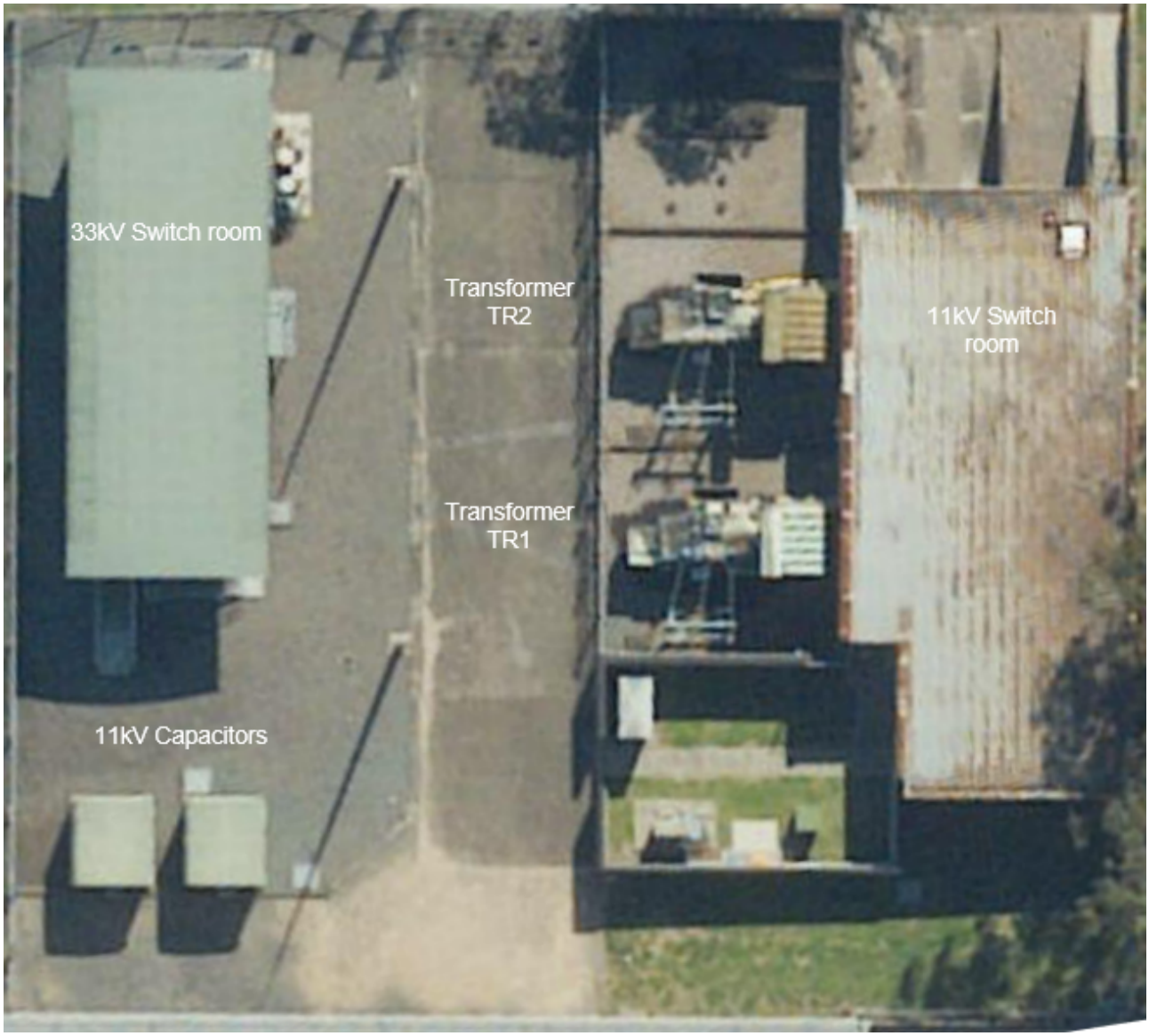

Figure 3: Acacia Ridge Substation (geographic view)

1.3. Load Profiles / Forecasts

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

1.3.1. Full Annual Load Profile

The full annual load profile for Acacia Ridge Substation over the 2023/24 financial year is shown in Figure 4. It can be noted that the peak load occurs during summer.

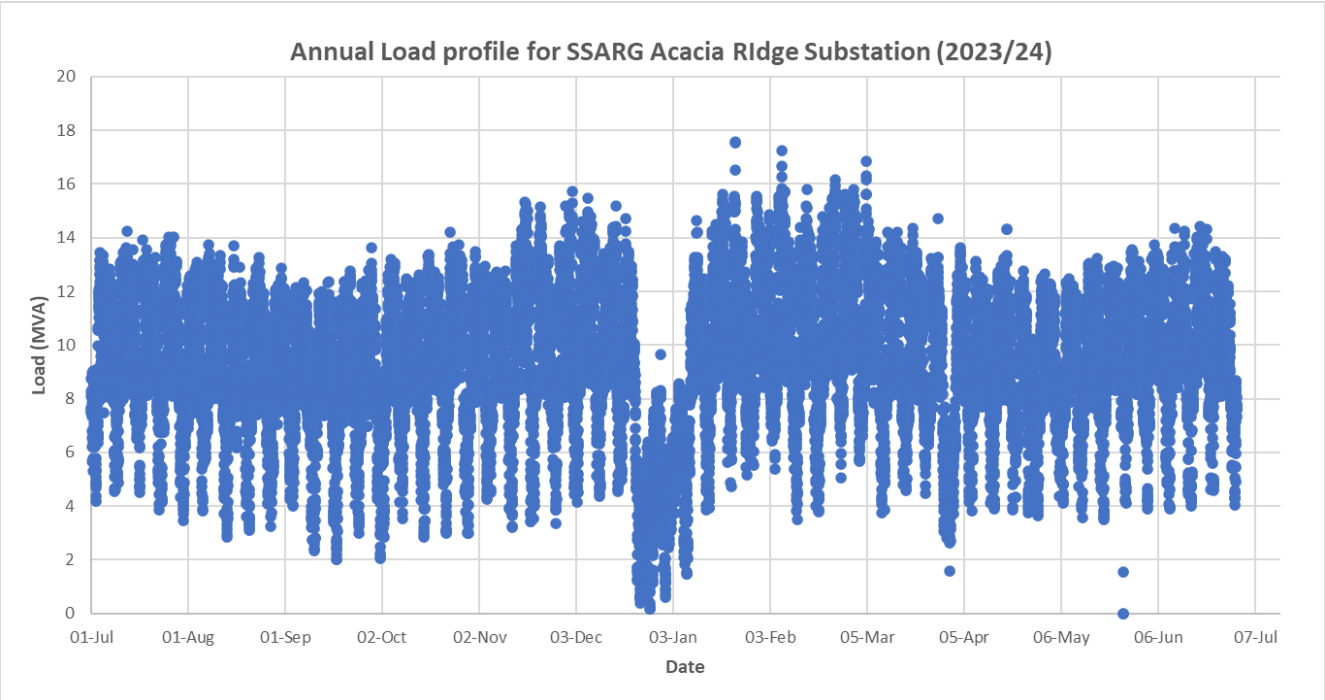

Figure 4: Substation actual annual load profile.

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1.3.2. Load Duration Curve

The load duration curve for Acacia Ridge Substation over the 2023/24 financial year is shown in Figure 5.

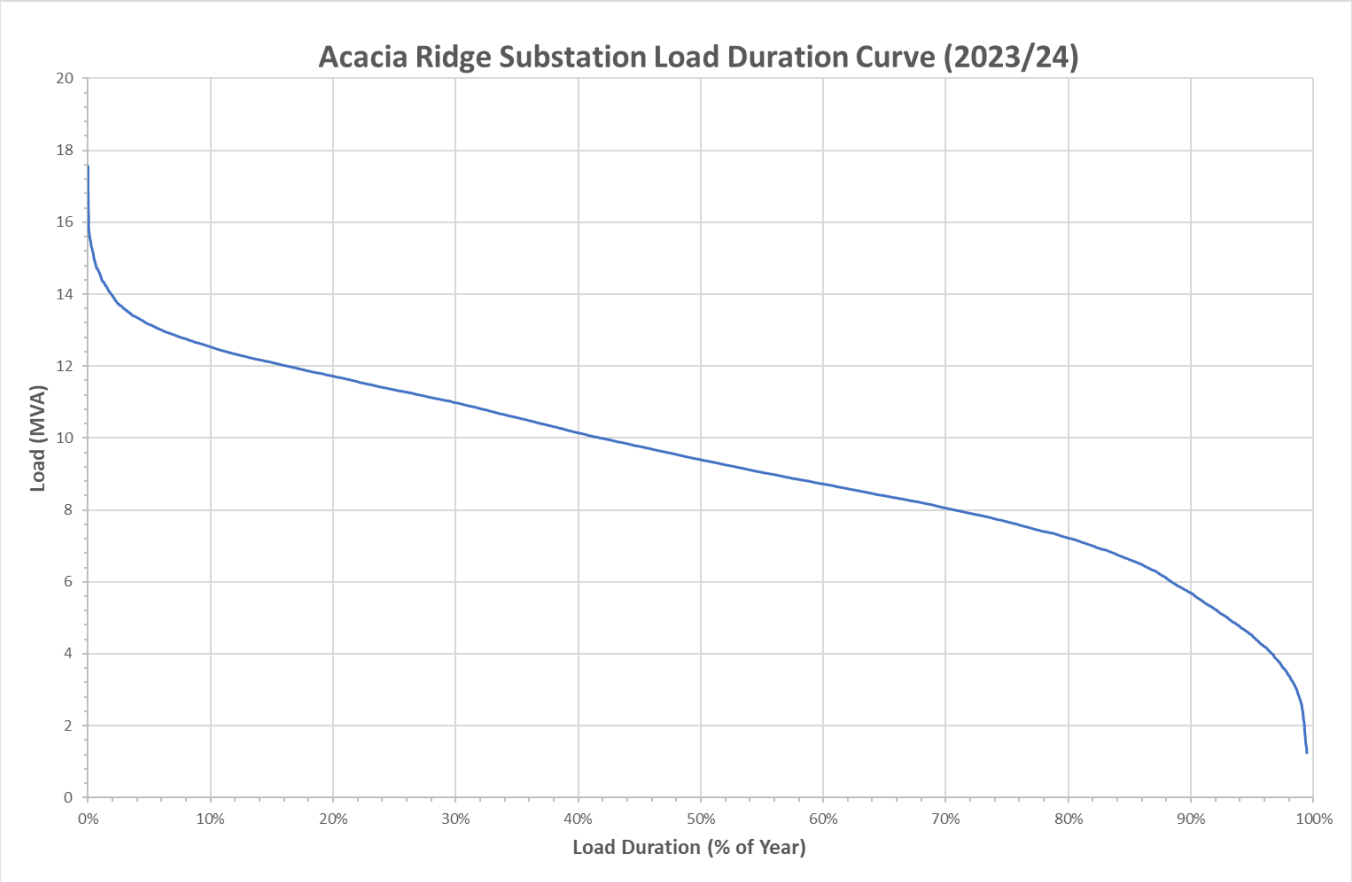

Figure 5: Substation load duration curve

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 Acacia Ridge Substation are historically experienced in the late afternoon and evening.

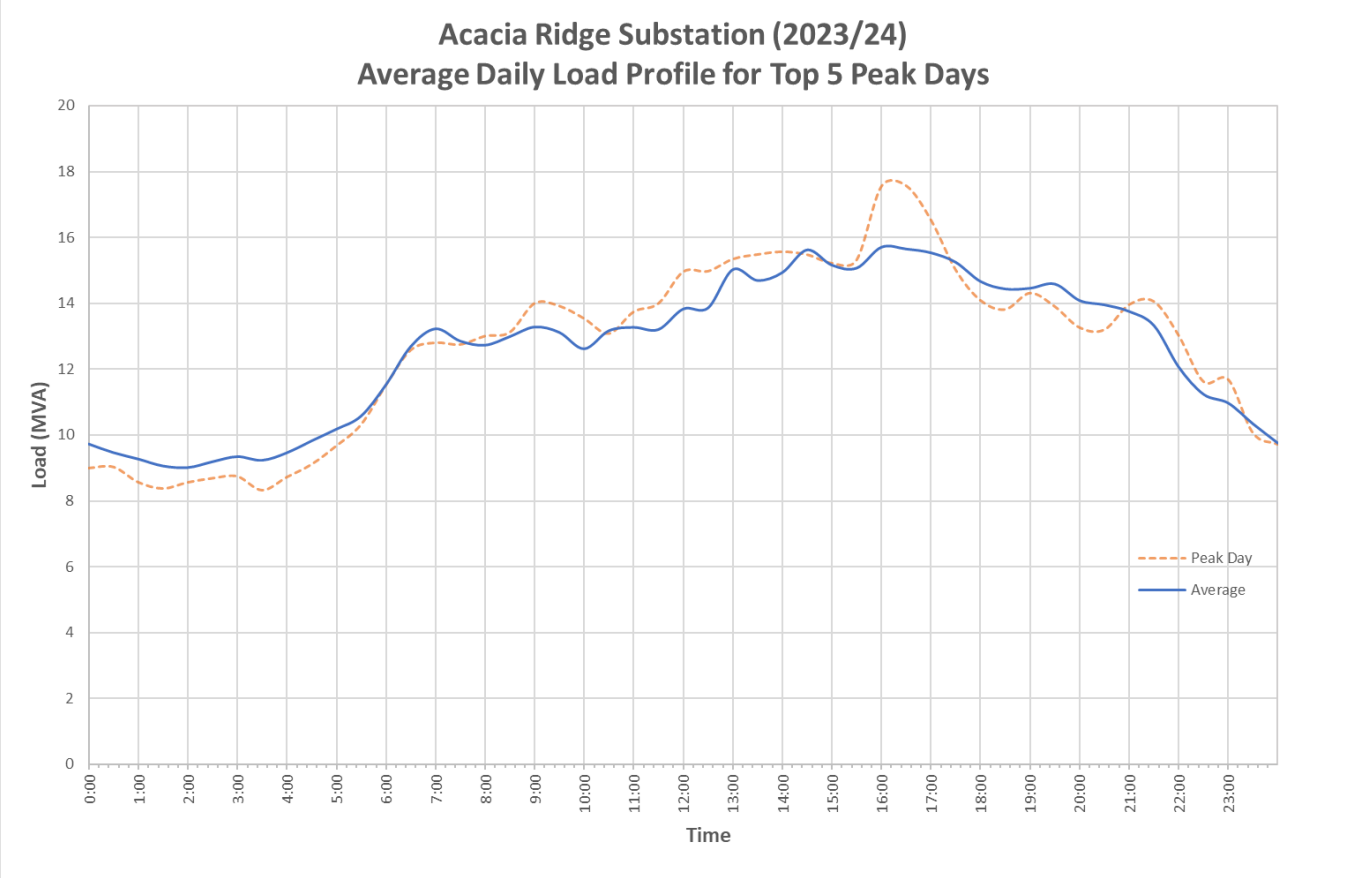

Figure 6: Substation average peak weekday load profile (summer)

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 fluctuated over the past five years, primarily due to seasonal variation in commercial/industrial load. It can also be noted that the peak load is forecast to decrease slightly over the next 10 years under the base case scenario.

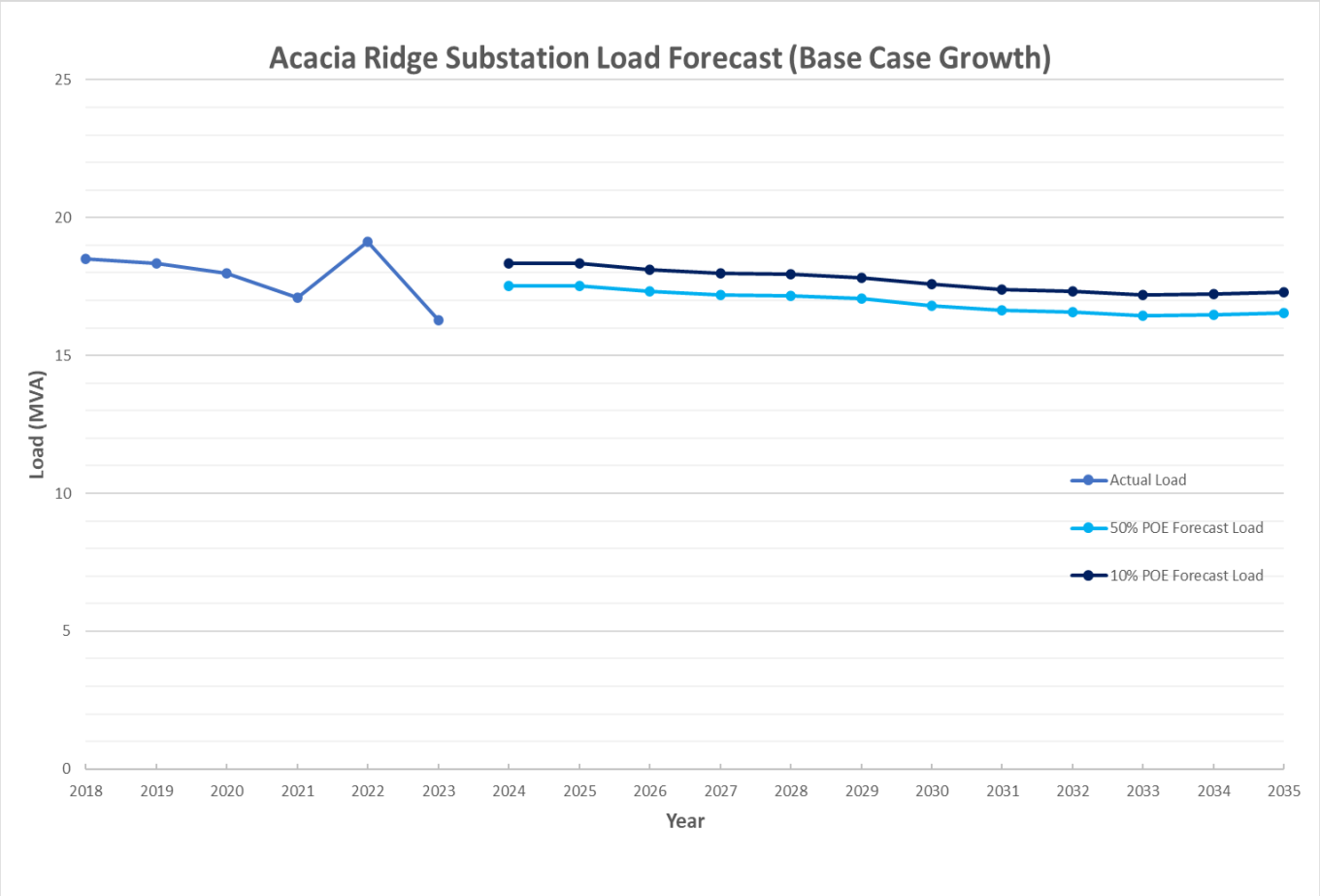

Figure 7: Substation base case load forecast.

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.

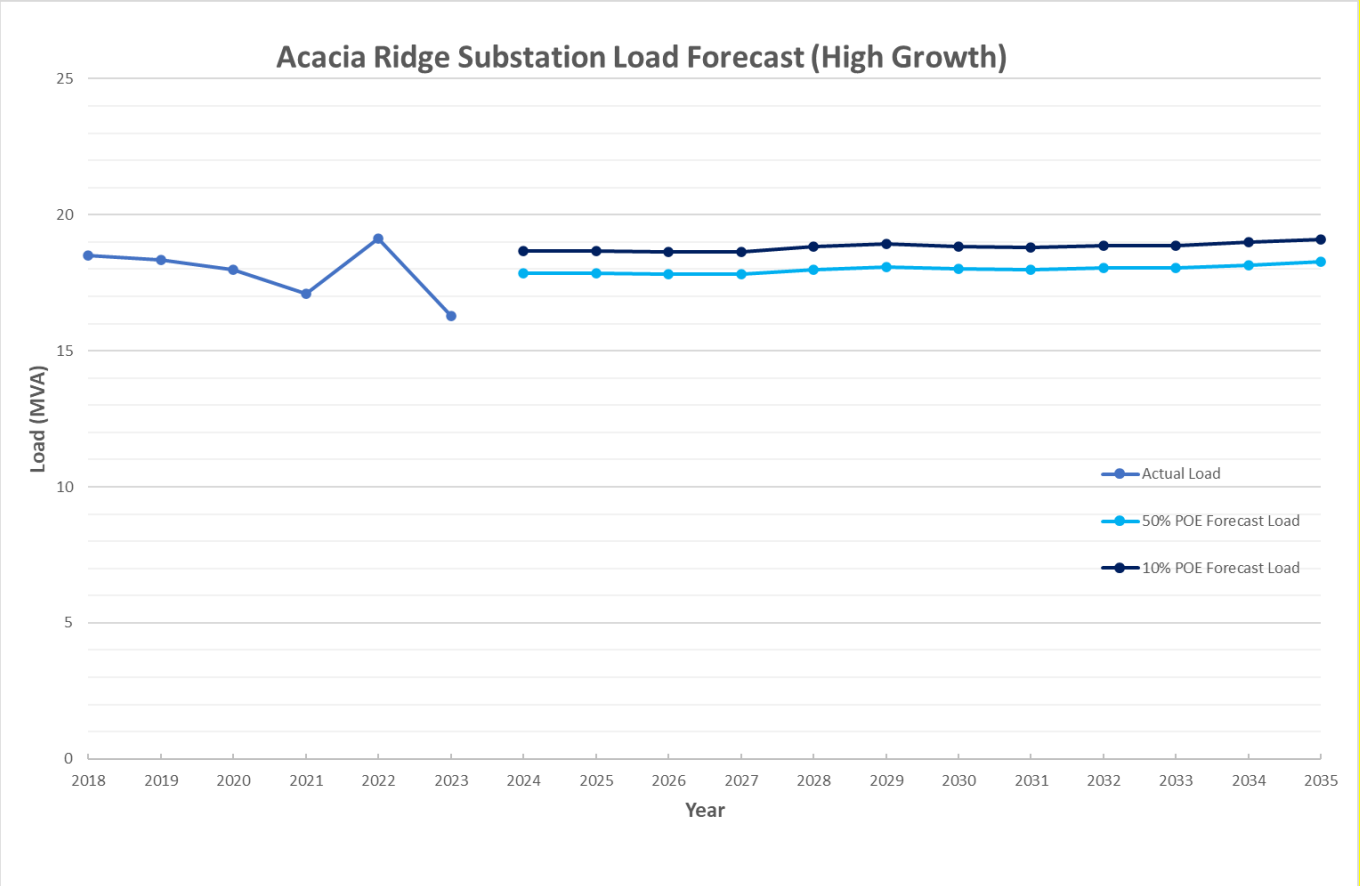

Figure 8: Substation high growth load forecast

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 decrease over the next 10 years.

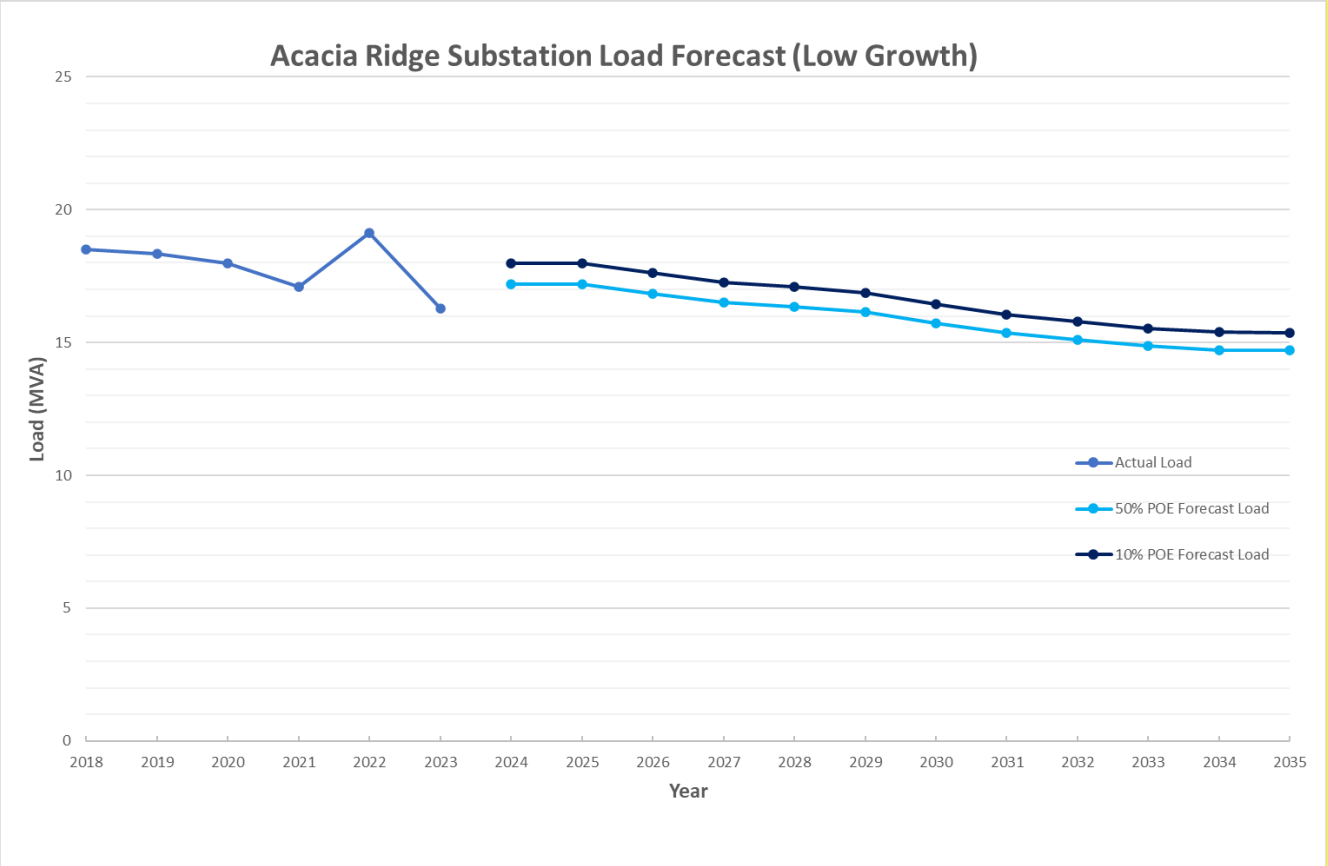

Figure 9: Substation low growth load forecast

2. IDENTIFIED NEED

2.1. Reliability Corrective Action

A recent condition assessment has highlighted that several critical assets at SSARG are at end of life and are in poor condition. The condition of these assets presents a considerable safety, environmental and reliability risk. These assets include:

- 11kV switchboard
- Two 33/11kV transformers, TR1 and TR2
- Various protection relays

Condition data indicates that the two 33/11kV power transformers, eight 11kV indoor circuit breakers and most of the protection relays at Acacia Ridge Substation are reaching end of life. Additionally, the transformer bunding is inadequate and does not satisfy the current requirements outlined in AS1940 and AS2067.

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 public, through 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 Acacia Ridge 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.

Energex has identified a need to invest in the network for reliability corrective action to continue to meet safety standards and reliability service standards as required under applicable regulatory instruments:

- *Electrical Safety Act 2002* (Qld) – Under Sections 29 and 30, Energex has a duty of care to ensure that its works are electrically safe and are operated in a way that is electrically safe. This duty also extends to ensuring the electrical safety of all persons and property likely to be affected by the electrical work.
- Energex's Distribution Authority issued under the *Electricity Act 1994* – Under its Distribution Authority, the distribution entity must plan and develop its supply network in accordance with good electricity industry practice, having regard to the value that end users of electricity place on the quality and reliability of electricity services. The failure of the deteriorated 11kV switchboard can result in approximately 3,500 customers without power and cannot be restored within the timeframes stipulated in the Distribution Authority.

Without such investment, Energex may, in the event of failure of the above identified critical assets, be in breach of these regulatory obligations.

3. POTENTIAL CREDIBLE OPTIONS

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 address the identified need. Further reasoning as to how Energex came to this determination is provided below in section 5.

3.2. Network Options Identified

Energex has identified two potential credible network options that would address the identified need.

3.2.1. Option 1: Replace two 33/11kV transformers, 11kV switchboard and secondary systems

This option is commercially and technically feasible, can be implemented in the timeframe identified, June 2029, and would address the identified need by replacing deteriorated assets at SSARG ensuring Energex continues to adhere to the applicable regulatory instruments.

This option involves recovering the two existing transformers and installing two new 25MVA 33/11kV transformers with compliant bunding, replacing the 11kV switchboard, replacing secondary systems and upgrading the substation physical security to address the identified need.

Due to the scope of works being entirely contained within the existing SSARG 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.

Energex has prepared an engineering-based cost estimate for this option. The estimated capital cost of this option is $14.24 million, with an estimated completion of June 2029.

The estimated capital cost comprises the following components:

- De-commission and recover existing 11kV switchboard and replace with new 11kV switchboard in a new building.
- Recover and scrap the existing relays on CB34022, CB34032, CB3T12, CB3T22, CB1T12, CB1T22, CB1032, CB1052, CB1062, CB1082, CP11, CP12, NR1, CB3X12, and CB3X22. Install new equivalent relays in their place.
- Decommission and recover existing 33/11kV TR1 and TR2 and replace with new transformers with compliant bunding.

A schematic diagram of the proposed network arrangement for Option 1 is shown in Figure 11.

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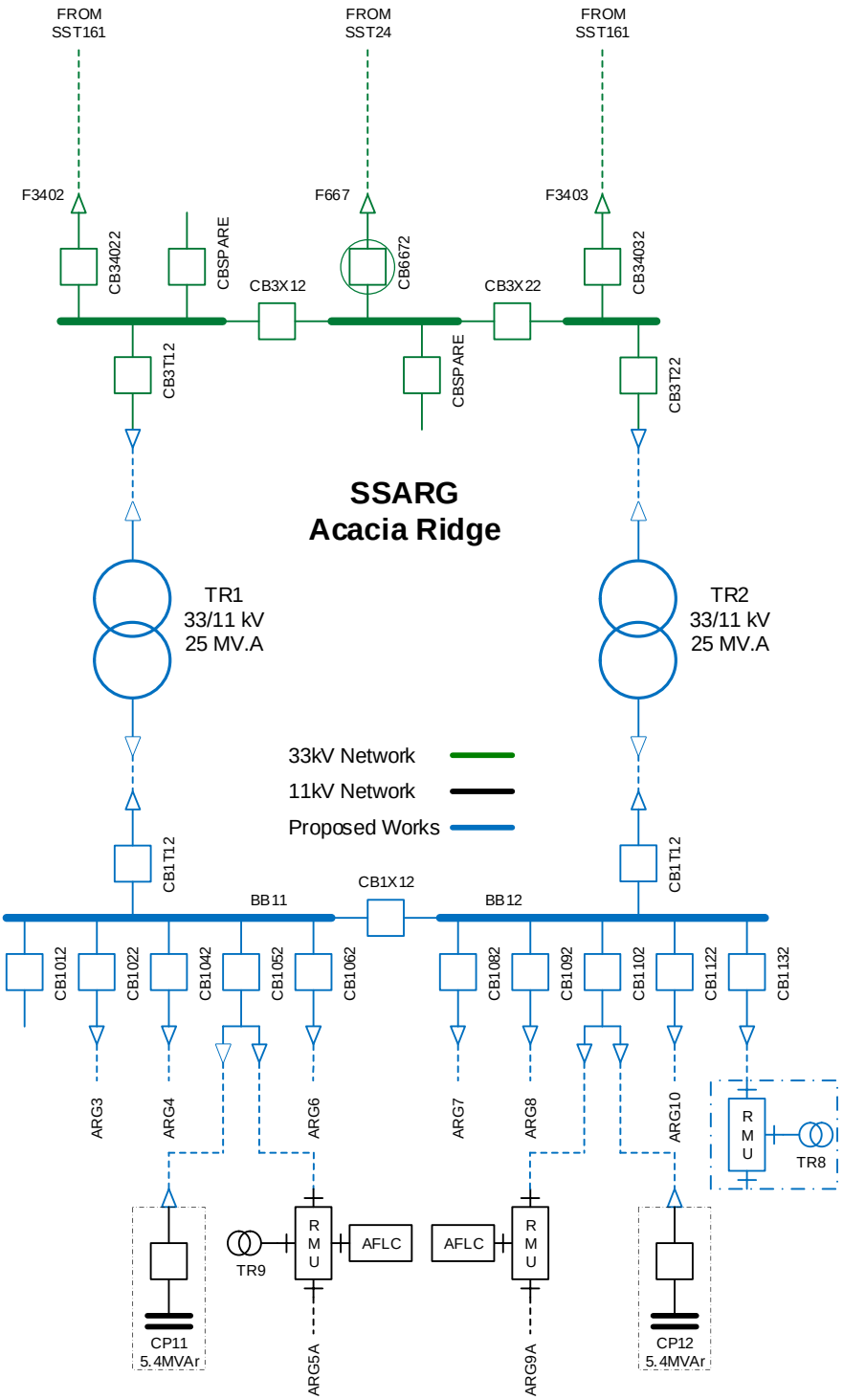

Figure 10: Option 1 proposed network arrangement (schematic view)

3.2.2. Option 2: Replace one 33/11kV Transformer, 11kV circuit breakers and upgrade 11kV feeders

This option is commercially and technically feasible, can be implemented in the timeframe identified, June 2029, and would address the identified need by replacing deteriorated assets at SSARG ensuring Energex continues to adhere to the applicable regulatory instruments.

This option involves replacing the 11kV switchboard, various protection relays, and upgrading two existing 11kV feeders to allow for more load transfers and replacing only one transformer.

The scope of works is not entirely contained within the existing SSARG site, however, due to the presence of existing distribution feeders and asset in the area, there are not expected to be social licence issues that would require additional costs to manage or increase the delivery timeline.

Energex has prepared an engineering-based cost estimate for this option. The estimated capital cost of this option is $13.89 million, with an estimated completion of June 2029.

The estimated capital cost comprises the following components:

- De-commission and recover existing 11kV switchboard and replace with new current contract equivalents 11kV switchboard.
- Recover and scrap the existing relays on CB34022, CB34032, CB3T12, CB3T22, CB1T12, CB1T22, CB1032, CB1052, CB1062, CB1082, CP11, CP12, NR1, CB3X12, and CB3X22. Install current contract equivalents in their place.
- Decommission and recover existing 33/11kV TR1 and replace with a new transformer with compliant bunding.
- Upgrade two 11kV feeder SBK21 and SBK24.
- Decommission and recover existing 33/11kV TR2.

A schematic diagram with the proposed network arrangement for Option 2 is shown in Figure 12.

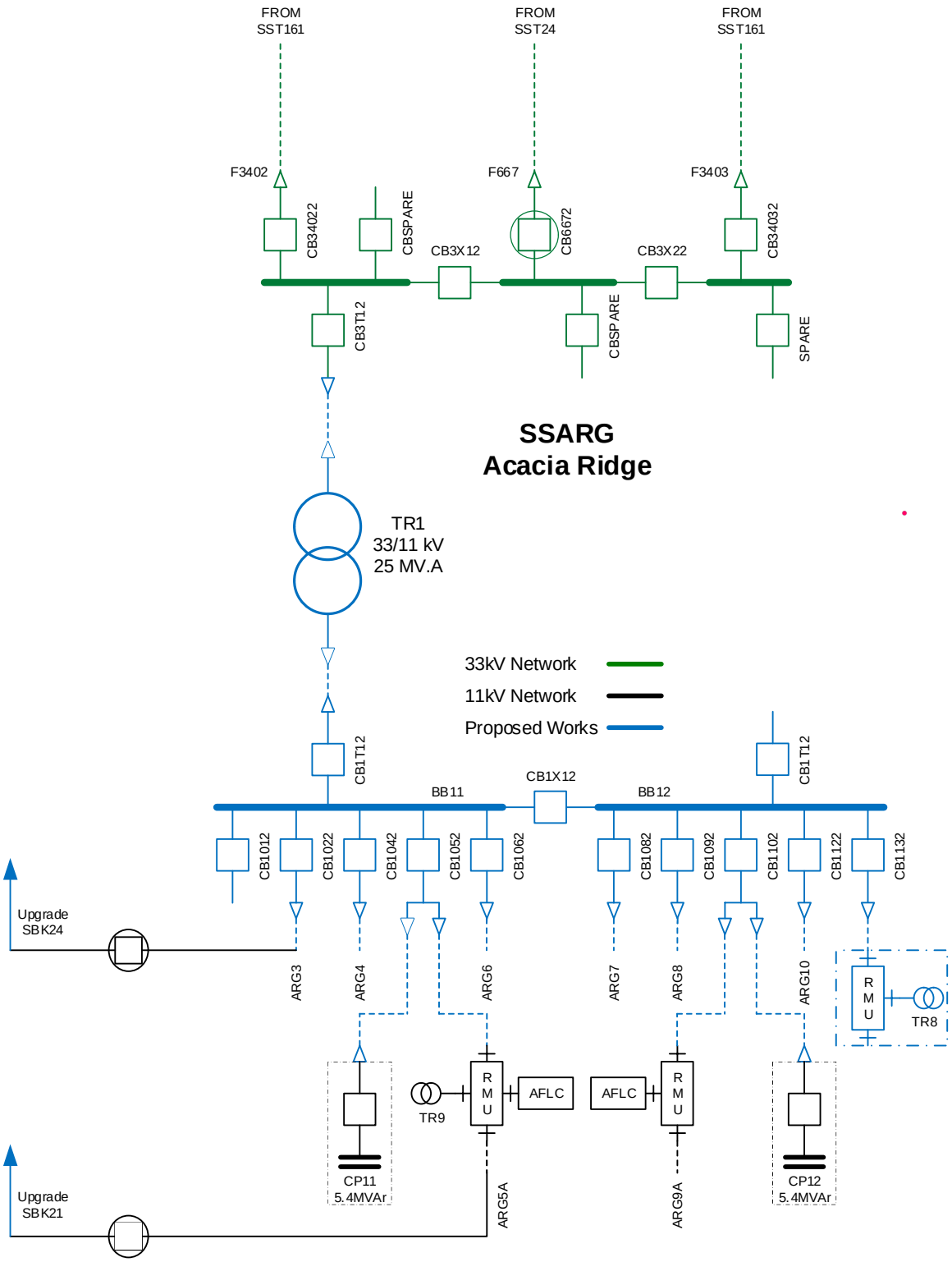

Figure 11: Option 2 proposed network arrangement (schematic view)

3.3. Preferred Network Option

Energex's preferred option is Option 1, to replace 11kV circuit breakers, TR1 and TR2 transformers, and upgrade secondary systems.

Upon completion of these works, the identified need would be addressed by replacing deteriorated assets at SSARG ensuring asset safety and reliability risks are 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 direct cost of this option is $14.24 million. Annual operating and maintenance costs are estimated to be $71,209 as a result of this option. The estimated project delivery timeframe has design commencing in November 2025 and construction completed by June 2029.

4. SOCIAL LICENCE AND COMMUNITY ENGAGEMENT

4.1. Social Licence

Energex has not identified any social licence considerations that have affected the identification and selection of credible options to address the identified need.

4.2. Community Engagement

As the scope of works for the preferred option will not extend into new areas of the community and will be entirely contained within the existing site owned by Energex, it is not expected to cause any disruption to the community at large. As a result, we have not identified any community stakeholders who might reasonably be expected to be affected by the development of this project. While Energex does not anticipate any community stakeholder concerns, should any be identified, these would be addressed as part of the Energex Community Engagement Framework which is integrated into the project workflow.

5. RATIONAL THAT THERE IS NO VIABLE NON-NETWORK OR SAPS OPTIONS

Energex has assessed potential non network options to address the identified need. Credible options must be technically and commercially viable and must be able to be implemented in sufficient time to address the identified need. It has been determined, for the following reasons, that no non-network options would be suitable to address the identified need or form part of the identified need.

5.1. Demand Management and Demand Response

5.1.1. Network Load Control

The residential customers and commercial/industrial load appear to drive the daily peak demand which generally occurs between 2:00pm and 5:00pm.

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There are 1988 customers on tariff T31 and T33 hot water load control (LC). An estimated demand reduction value of 1193kVA[1] is available.

The need at Acacia Ridge is to address asset safety and reliability risks, any demand reduction needs to be permanently available. Therefore, this option has been assessed as technically not viable as it will not address the identified network requirement.

5.1.1. 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.

5.1.2. 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.

5.1.3. 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.

5.1.4. Customer Solar Power Systems

A total of 1,400 customers has solar photo voltaic (PV) systems for a connected inverter capacity of 9.941MVA.

The daily peak demand is driven by residential and commercial customer demand and the peak generally occurs between 2:00pm and 5:00pm. As such customer solar generation does not coincide with the peak load period. The impact of the customer solar power systems is already included in the load profile and forecast.

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

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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 business 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.

5.2. Consideration of Generation and Storage Options

Energex considers there is no generation and/or storage 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 reliability and load requirements, per the forecast of Acacia Ridge zone substation would require a system that cannot be physically installed in an urbanised area due to size, noise and emissions considerations. Furthermore, the capital and ongoing operating cost of such system is uneconomical. Therefore, a generation and/or storage option is not technically and economically viable.

5.3. Consideration of SAPS Options

Stand-alone Power Systems are off-grid systems that operate independently from the main network. It typically includes solar panels for electricity generation, a battery energy storage system (BESS) to store excess energy, and a backup generator (often a diesel generator).

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 reliability and load requirements, per the forecast of Acacia Ridge zone substation would require a system that cannot be physically installed in an urbanised area due to size, noise and emissions considerations. Furthermore, the capital and ongoing operating cost of such system is uneconomical. Therefore, a SAPS option is not technically and economically viable.

6. CONCLUSION AND NEXT STEPS

Energex has determined that there would not be a non-network or SAPS option that is a potential credible option, or that forms a significant part of a potential credible option, to address the identified need. As required, Energex publishes this Notice of No Non-network or SAPS as per NER clause 5.17.4 (d).

Energex will be publishing a Draft Project Assessment Report shortly.

APPENDIX A – THE RIT-D PROCESS