



# **Regulatory Investment Test for Distribution (RIT-D)**

## **Addressing Reliability Requirements in the Geebung Network Area**

### **Final Project Assessment Report**

11 June 2024

# Addressing Reliability Requirements in the Geebung Network Area

## Final Project Assessment Report

---

### 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

Geebung 33/11kV zone substation (SSGBG) is supplied from Nudgee bulk supply substation (SSNGE BSP). SSGBG provides electricity supply to approximately 5622 customers, of which 85% are commercial and 15% are residential in the Geebung, Virginia, Nudgee and Boondall areas.

SSGBG has a 33kV ring bus configuration and is supplied via 3 x 33kV feeders from SSNGE BSP. There is an 11kV auto change over scheme (ACO) for 3 x 33/11kV transformers in the substation.

According to Energex condition-based assessment (CBRM) report, it has been identified that 11 x 33kV circuit breakers, 8 x 33kV isolators 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 SSGBG.

#### 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 Geebung supply area in a reliable, safe and cost-effective manner. Accordingly, this investment is subject to a RIT-D.

Energex published a Notice-of-Screening-for-Options Report for the above described network constraint on 4 June 2024.

One potentially feasible option has been investigated:

- Option 1: Replace 33kV outdoor circuit breakers, 33kV isolators and protection relays.



## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

This Final Project Assessment Report (FPAR), where Energex provides both technical and economic information about possible solutions, has been prepared in accordance with the requirements of clause 5.17.4(o) of the NER.

Energex's preferred solution to address the identified need is to recover 3 x 33kV circuit breakers, replace 8 x 33kV circuit breakers, 33kV isolators and protection relays.

# Addressing Reliability Requirements in the Geebung Network Area

## Final Project Assessment Report

---

## CONTENTS

Executive Summary .....	2
About Energex.....	2
Identified Need .....	2
Approach .....	2
1 Introduction .....	6
1.1 Notice of Screening for Options Report .....	6
1.2 Structure of the Report.....	6
1.3 Dispute Resolution Process.....	7
1.4 Contact Details.....	7
2 Background .....	8
2.1 Geographic Region .....	8
2.2 Existing Supply System .....	8
2.3 Load Profiles / Forecasts .....	11
2.3.1 Full Annual Load Profile .....	11
2.3.2 Load Duration Curve .....	12
2.3.3 Average Peak Weekday Load Profile (Summer) .....	13
2.3.4 Base Case Load Forecast.....	14
2.3.5 High Growth Load Forecast .....	15
2.3.6 Low Growth Load Forecast .....	16
3 Identified Need .....	17
3.1 Description of the Identified Need .....	17
3.1.1 Aged and Poor Condition Assets .....	17
3.1.2 Reliability .....	17
3.2 Quantification of the Identified Need .....	18
3.2.1 Aged and Poor Condition Assets .....	18
3.2.2 Reliability .....	18
3.2.3 Risk Quantification Summary .....	19
3.3 Assumptions in Relation to Identified Need .....	19
3.3.1 Forecast Maximum Demand .....	19
3.3.2 Load Profile .....	20
4 Credible Options Assessed .....	21
4.1 Assessment of Network Solutions .....	21

# Addressing Reliability Requirements in the Geebung Network Area

## Final Project Assessment Report

---

4.1.1	Option 1: Replace 33kV outdoor circuit breakers, isolators and protection relays .....	21
4.2	Assessment of SAPS and Non-Network Solutions .....	24
4.2.1	Consideration of SAPS Options .....	24
4.2.2	Demand Management (Demand Reduction) .....	24
4.2.3	SAPS and Non-Network Solution Summary .....	25
4.3	Preferred Network Option .....	26
5	Market Benefit Assessment Methodology .....	27
5.1	Classes of Market Benefits Considered and Quantified .....	27
5.1.1	Changes in Involuntary Load Shedding and Customer Interruptions caused by Network Outages .....	27
5.2	Classes of Market Benefits not Expected to be Material .....	28
5.2.1	Changes in Voluntary Load Curtailment .....	28
5.2.2	Changes in Costs to Other Parties .....	28
5.2.3	Differences in Timing of Expenditure .....	28
5.2.4	Changes in Load Transfer Capacity and the capacity of Embedded Generators to take up load .....	28
5.2.5	Changes in Network Losses .....	28
5.2.6	Option Value .....	29
5.2.7	Changes in Greenhouse Gas Emissions .....	29
5.2.8	Other Class of Market Benefit .....	29
6	Detailed Economic Assessment .....	30
6.1	Methodology .....	30
6.2	Key Variables and Assumptions .....	30
6.3	Quantification of Benefits for Option 1 .....	31
6.4	Net Present Value (NPV) Results .....	31
7	Conclusion .....	32
7.1	Preferred Option .....	32
7.2	Satisfaction of RIT-D .....	32
8	Compliance Statement .....	32
	Appendix A – The Rit-D Process .....	34

# Addressing Reliability Requirements in the Geebung Network Area

## Final Project Assessment Report

---

## 1 INTRODUCTION

This Final Project Assessment Report has been prepared by Energex in accordance with the requirements of clause 5.17.4(o) of the NER.

This report represents the final stage of the consultation process in relation to the application of the RIT-D on potential credible options to address the identified need for the Geebung network area.

In preparing this RIT-D, Energex is required to consider reasonable future scenarios. With respect to major customer loads and generation, Energex has, in good faith, included as much detail as possible while maintaining necessary customer confidentiality. Potential large future connections that Energex is aware of are in different stages of progress and are subject to change (including outcomes where none or all proceed). These and other customer activity can occur over the consultation period and may change the timing and/or scope of any proposed solutions.

### 1.1 Notice of Screening for Options Report

Energex determines on reasonable grounds that there will not be a non-network option or a SAPS option that is a potential credible option, or that forms a significant part of a potential credible option, to address the identified need. In accordance with clause 5.17.4(d) of the NER, Energex published a Notice of Screening for Options Report for the identified need in the Geebung network area on the 4<sup>th</sup> June 2024.

### 1.2 Structure of the Report

This report:

- Provides background information on the network capability limitations of the distribution network supplying the Geebung area.
- Identifies the need which Energex is seeking to address, together with the assumptions used in identifying and quantifying that need.
- Describes the credible options that are considered in this RIT-D assessment.
- Quantifies costs and classes of material market benefits for each of the credible options.
- Describes the methods used in quantifying each class of market benefit.
- Provides details of classes of market benefits that are not considered material to this RIT-D assessment and provides explanations as to why these classes of market benefits are not considered material.
- Provides the results of Net Present Value (NPV) analysis of each credible option and accompanying explanatory statements regarding the results.
- Identifies the proposed preferred option, including detailed characteristics, estimated commissioning date, indicative costs, and noting that it satisfies the RIT-D.
- Provides contact details for queries on this RIT-D.



## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 1.3 Dispute Resolution Process

In accordance with the provisions set out in clause 5.17.5(a) of the NER, Registered Participants or Interested Parties may, within 30 days after the publication of this report, dispute the conclusions made by Energex in this report with the Australian Energy Regulator. Accordingly, Registered Participants and Interested Parties who wish to dispute the conclusions outlined in this report based on a manifest error in the calculations or application of the RIT-D must do so within 30 days of the publication date of this report. Any parties raising a dispute are also required to notify Energex. Dispute notifications should be sent to [demandmanagement@energex.com.au](mailto:demandmanagement@energex.com.au)

If no formal dispute is raised, Energex will proceed with the preferred option to replace the 33kV circuit breakers, 33kV isolators and protection relays at SSGBG.

### 1.4 Contact Details

For further information and inquiries please contact:

E: [demandmanagement@energex.com.au](mailto:demandmanagement@energex.com.au)

P: 13 74 66

# Addressing Reliability Requirements in the Geebung Network Area

## Final Project Assessment Report

## 2 BACKGROUND

### 2.1 Geographic Region

Geebung 33/11kV zone substation (SSGBG) is supplied from Nudgee bulk supply substation (SSNGE BSP). SSGBG provides electricity supply to approximately 5622 customers, of which 85% are a mix of commercial and industrial, and 15% are residential in the Geebung, Virginia, Nudgee and Boondall areas.

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

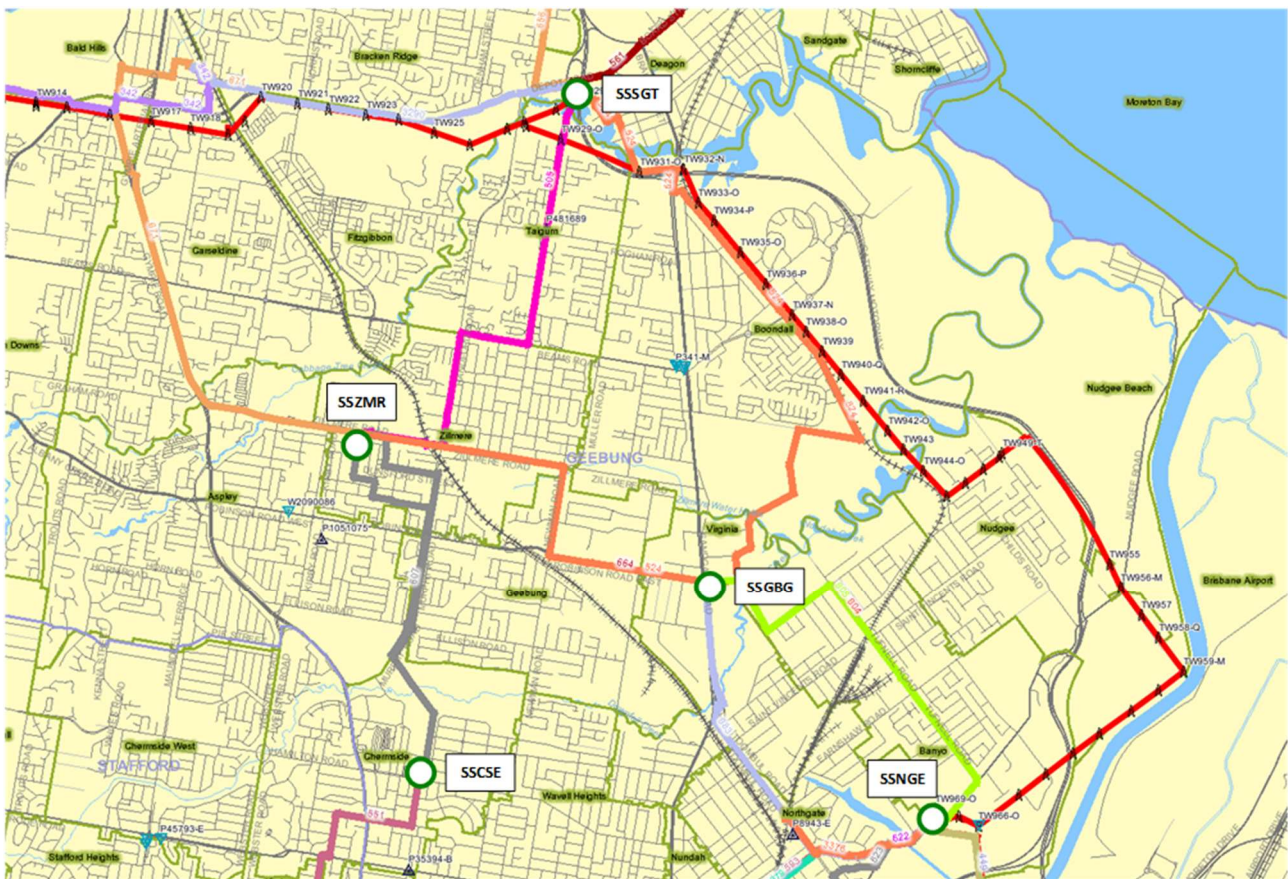


Figure 1: Existing network arrangement (geographic view)

### 2.2 Existing Supply System

SSGBG zone substation is being supplied by three 33kV feeders 604, 683 and 605. There is 1 x normally opened 33kV feeder to Zillmere zone substation (SSZMR) and a normally opened breaker to the 33kV tie between SSZMR and Sandgate bulk supply substation (SSSGT BSP).

SSGBG has a 33kV ring bus configuration with 3 x 33/11kV 25MVA transformers, 3 x bus section breakers, 3 x 33kV transformer circuit breakers, 6 x 33kV feeder circuit breakers and 1 x spare 33kV circuit breaker.



## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

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

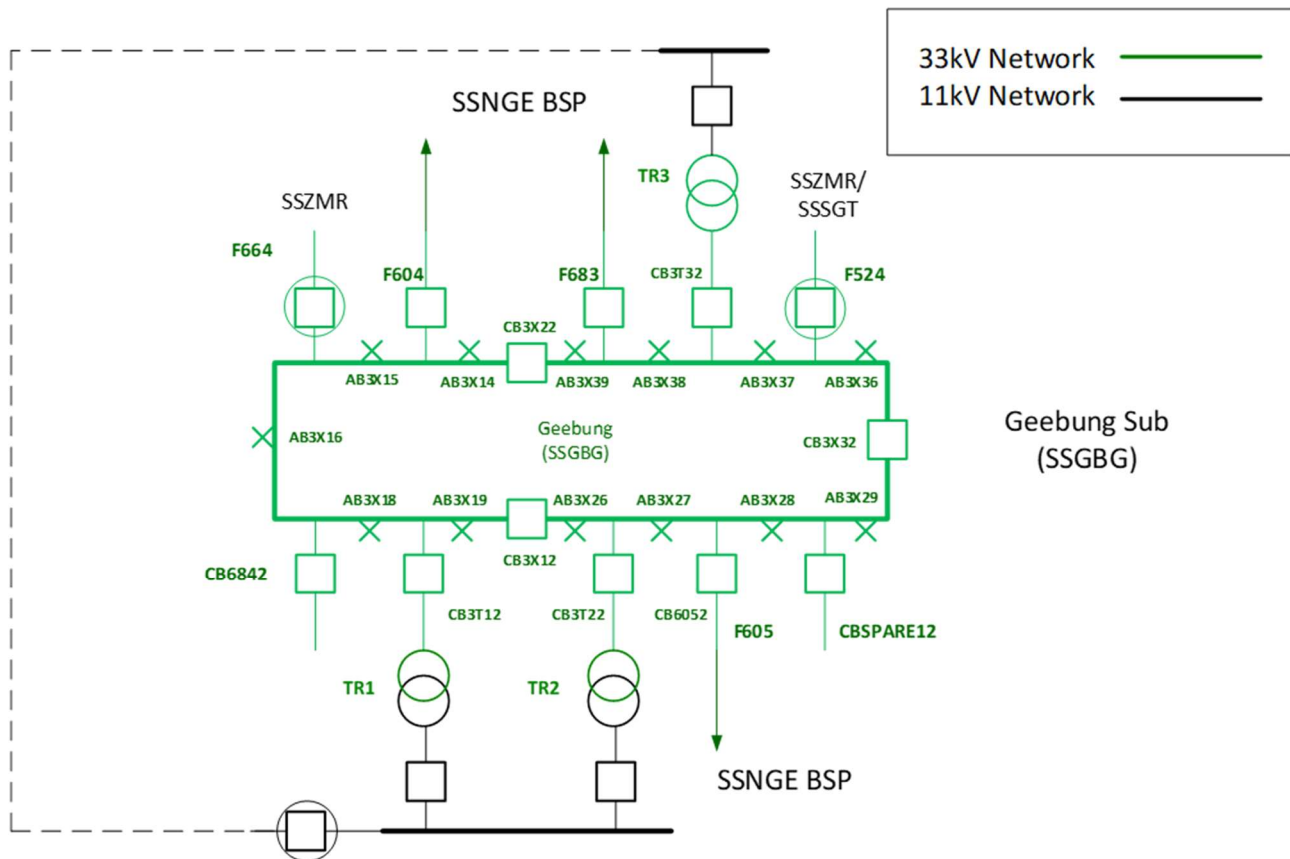


Figure 2: Existing network arrangement (schematic view)

## Addressing Reliability Requirements in the Geebung Network Area

### Final Project Assessment Report

---



Figure 3: Geebung Substation (geographic view)

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

### 2.3 Load Profiles / Forecasts

The load at Geebung 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 load.

#### 2.3.1 Full Annual Load Profile

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

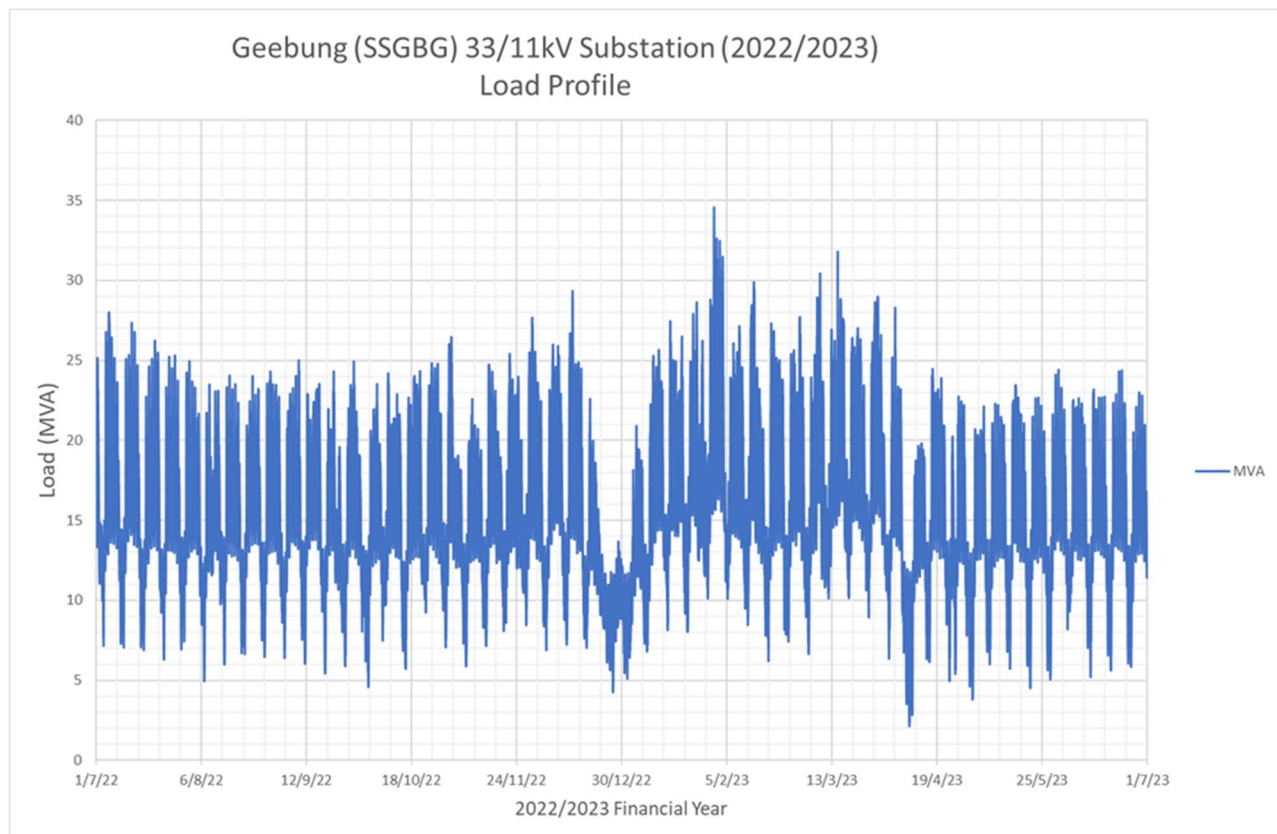


Figure 4: Substation actual annual load profile

# Addressing Reliability Requirements in the Geebung Network Area

## Final Project Assessment Report

### 2.3.2 Load Duration Curve

The load duration curve for Geebung Substation over the 2022/23 financial year is shown in Figure 5.

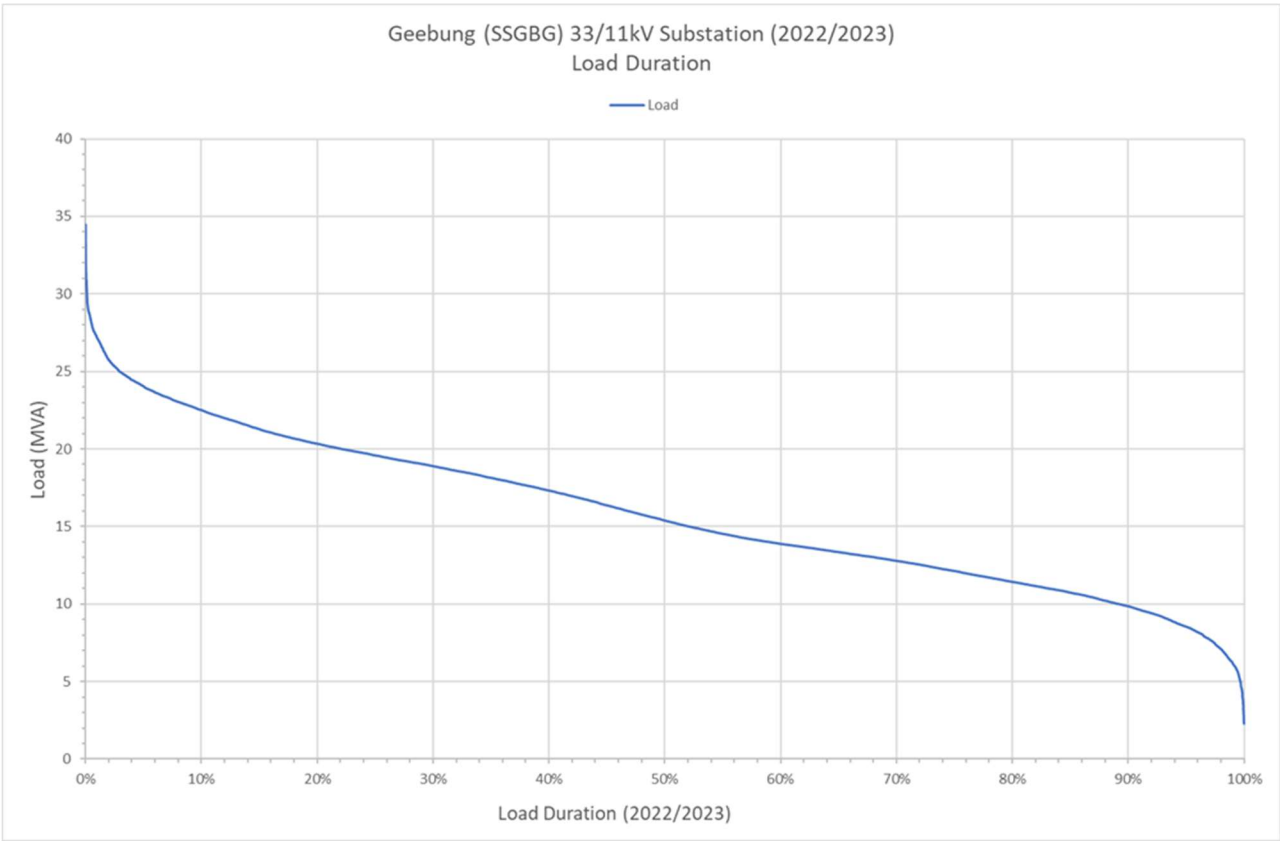


Figure 5: Substation load duration curve

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

### 2.3.3 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 Geebung Substation are historically experienced in the late afternoon.

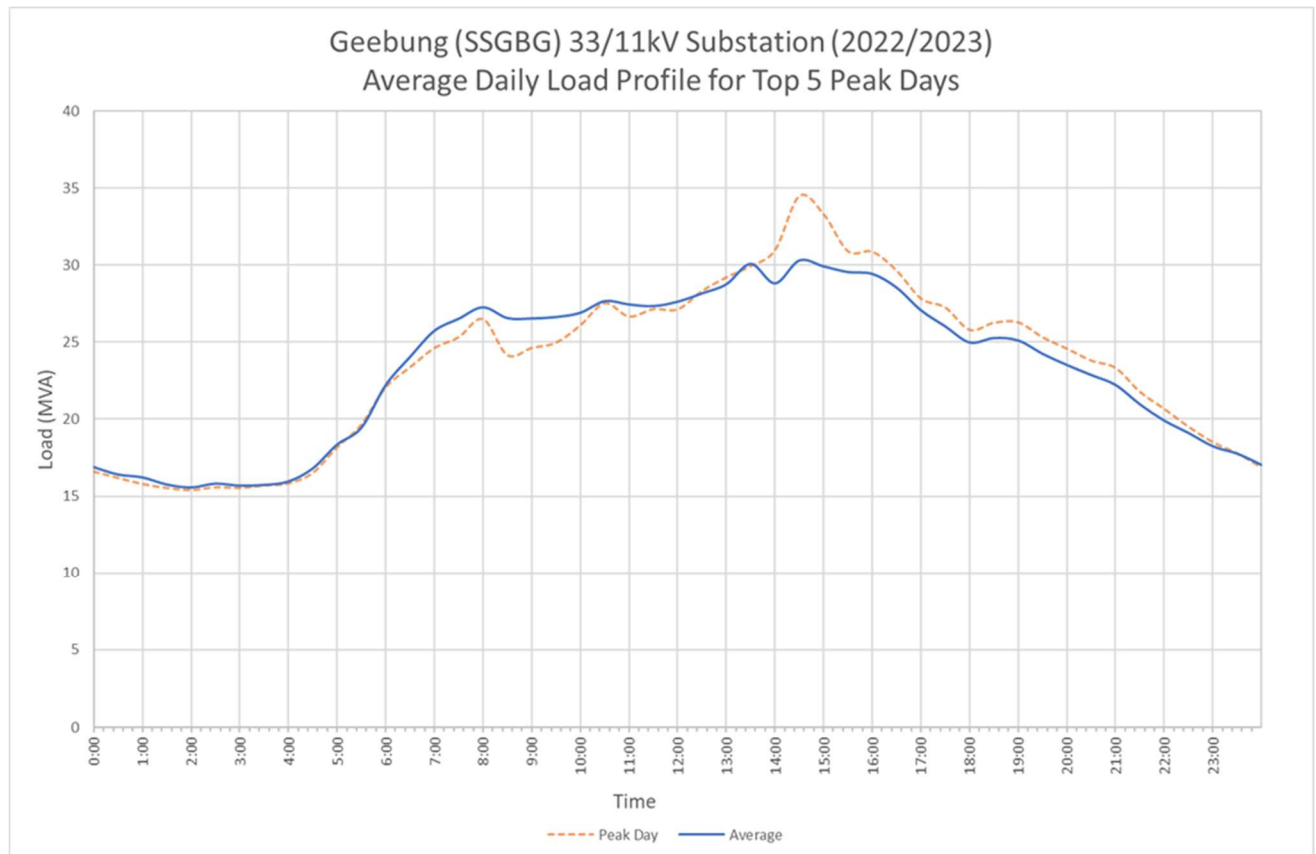


Figure 6: Substation average peak weekday load profile (summer)



## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

### 2.3.4 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 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 NCC rating. 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.

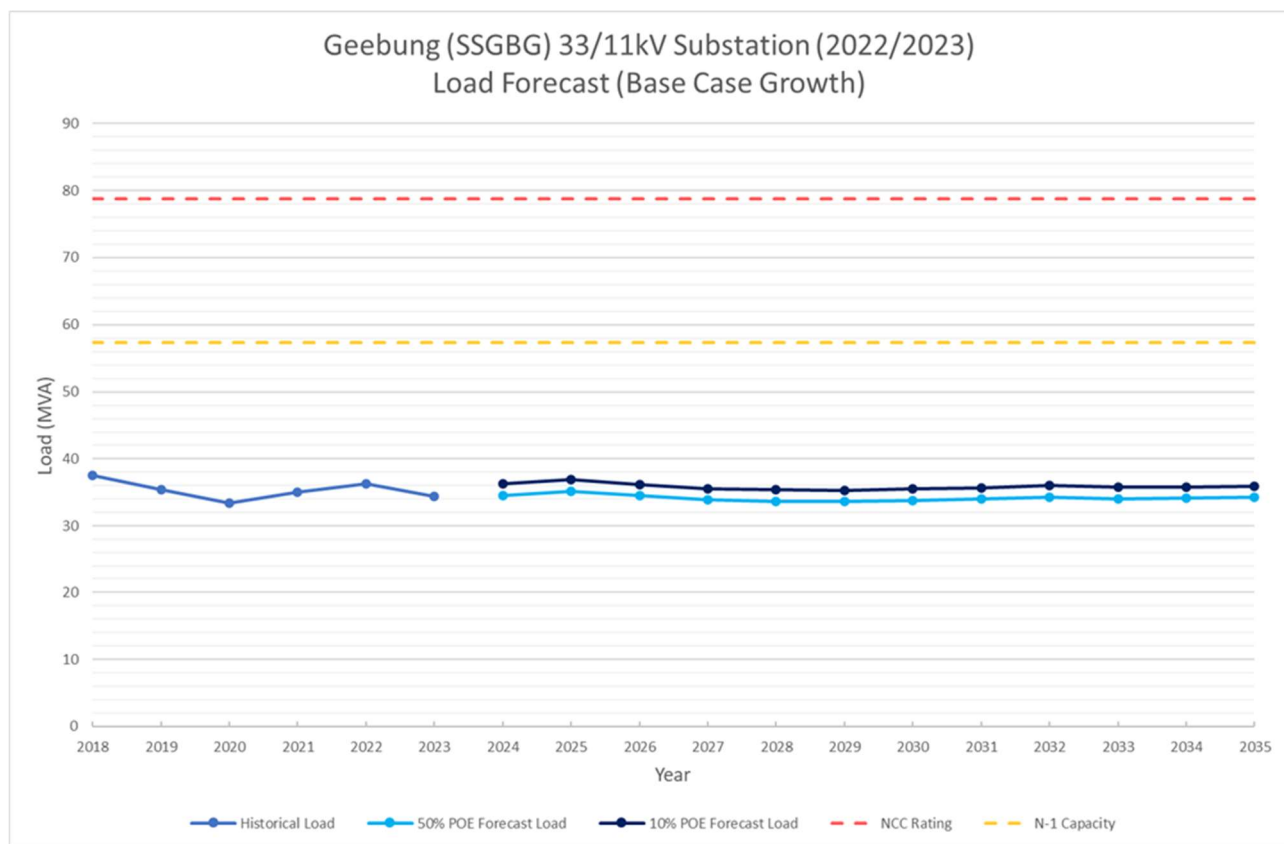


Figure 7: Substation base case load forecast

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

### 2.3.5 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 slightly over the next 10 years.

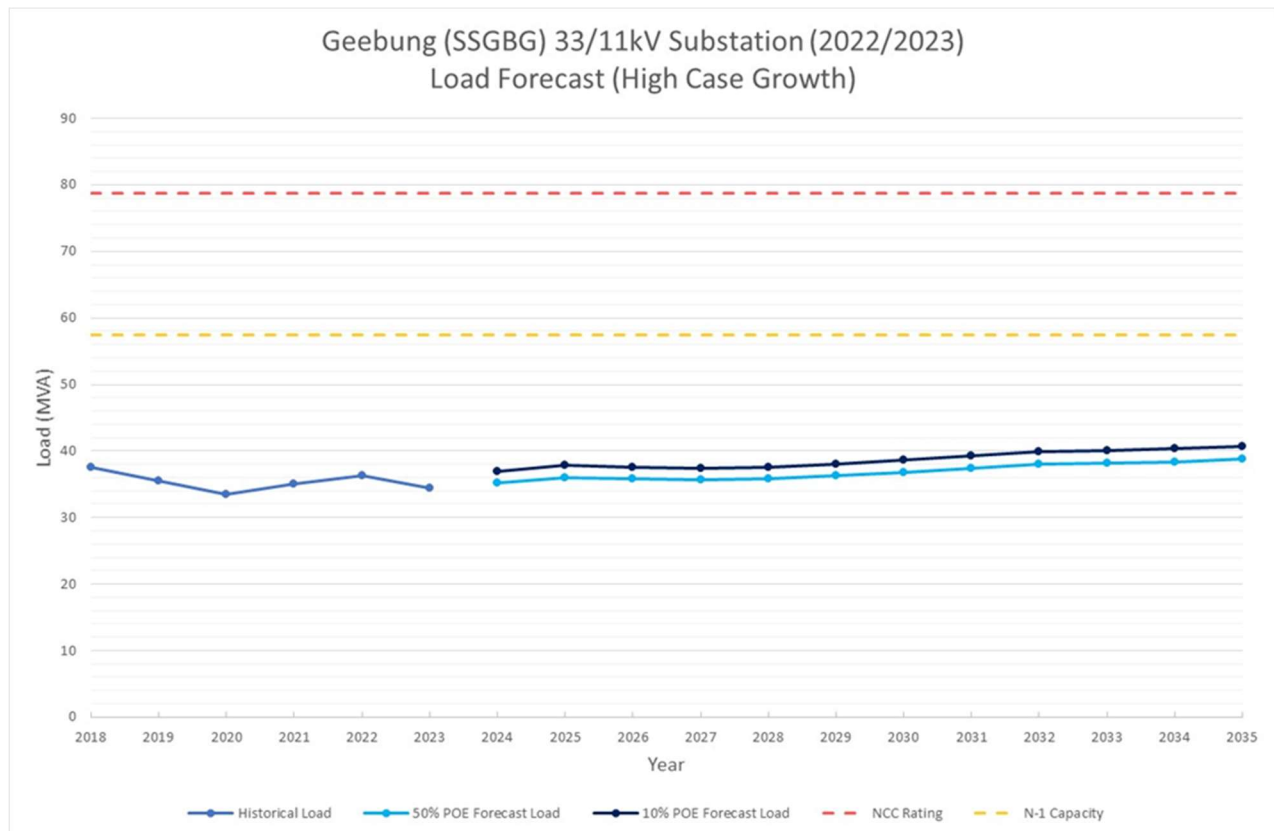


Figure 8: Substation high growth load forecast

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

### 2.3.6 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 slightly over the next 10 years.

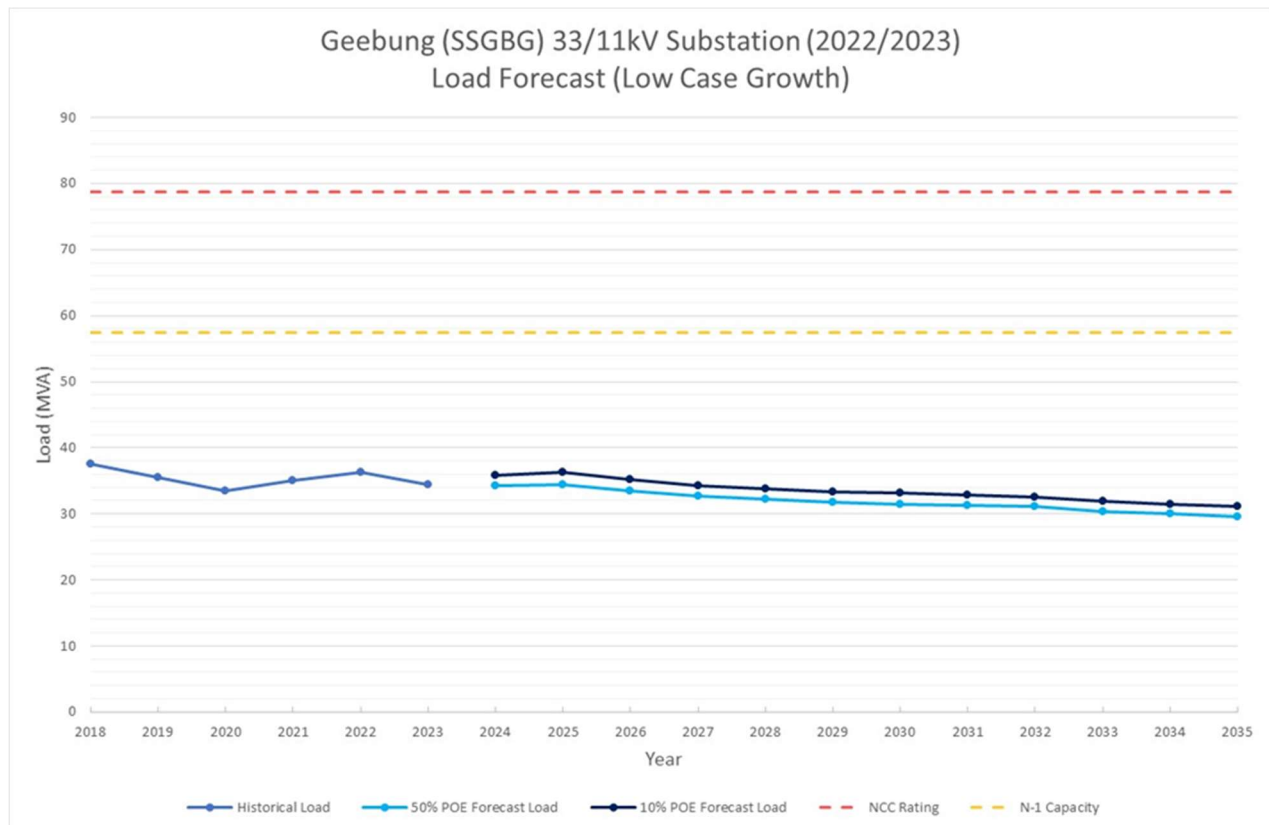


Figure 9: Substation low growth load forecast

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 3 IDENTIFIED NEED

#### 3.1 Description of the Identified Need

##### 3.1.1 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. These assets include:

- 11 x 33kV circuit breakers
- 8 x 33kV isolators
- 31 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 relays mal-operation and failure of the circuit breakers. There is also a considerable risk of environmental harm due to tank rupture and oil spill from the circuit breakers, 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 Geebung 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.

##### 3.1.2 Reliability

Due to the existing network configuration and deteriorated conditions of the existing substation equipment, any singular failure of the 33kV circuit breaker or isolator will result in outage to majority of customers supplied from SSGBG.

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 3.2 Quantification of the Identified Need

#### 3.2.1 Aged and Poor Condition Assets

A recent condition assessment indicates that:

- 33kV circuit breakers are operating beyond their expected life. CB3X22 has a history of poor timing. Visible corrosion can be found on the base and around the tap of the circuit breakers. Slight oil leaks are found near the circuit breaker taps.
- 33kV isolators are assessed historically by the operators as being problematic with latching mechanism issues. These isolators require excessive force to operate due to the stick mechanism which causes hairline cracks to the porcelain insulators.
- Protection relays have experienced multiple failures historically and it is envisaged that they will not be manufactured in the future and there are limited spares exist for these 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 as well as the failure of the circuit breakers and isolators. 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 SSGBG.

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.

#### 3.2.2 Reliability

Currently, the aged assets present a risk to the reliability of supply at SSGBG. Due to the existing condition and configuration of the substation, the following reliability risk scenarios are identified:

- 33kV isolator failure - a failure of any of these items of plant would result in a loss of a 33kV bus; however, it was assumed that the 11kV ACO will operate to restore some load and 12 MVA load could be supplied by transfers within 3 hours.
- 33kV bus section circuit breaker and feeder circuit breaker failure – a failure of any of the bus section breaker would result in a loss of two 33kV buses. With the remaining feeder circuit breaker failure, it would result in a loss of all load at SSGBG; however, it was assumed that the 11kV ACO will operate to restore some load and 12 MVA load could be supplied by transfers within 3 hours.
- 33kV transformer circuit breaker – a failure of any of these items of plant would result in a loss of a 33kV bus; however, it was assumed that the 11kV ACO will operate to restore some load and 12 MVA load could be supplied by transfers within 3 hours.



## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

### 3.2.3 Risk Quantification Summary

Risk quantification analysis has been completed on the existing network, which includes the value of customer reliability and cost of emergency replacement. Figure 10 shows the risk of continuing the use of the existing circuit breakers with ongoing maintenance and replacement on failure.

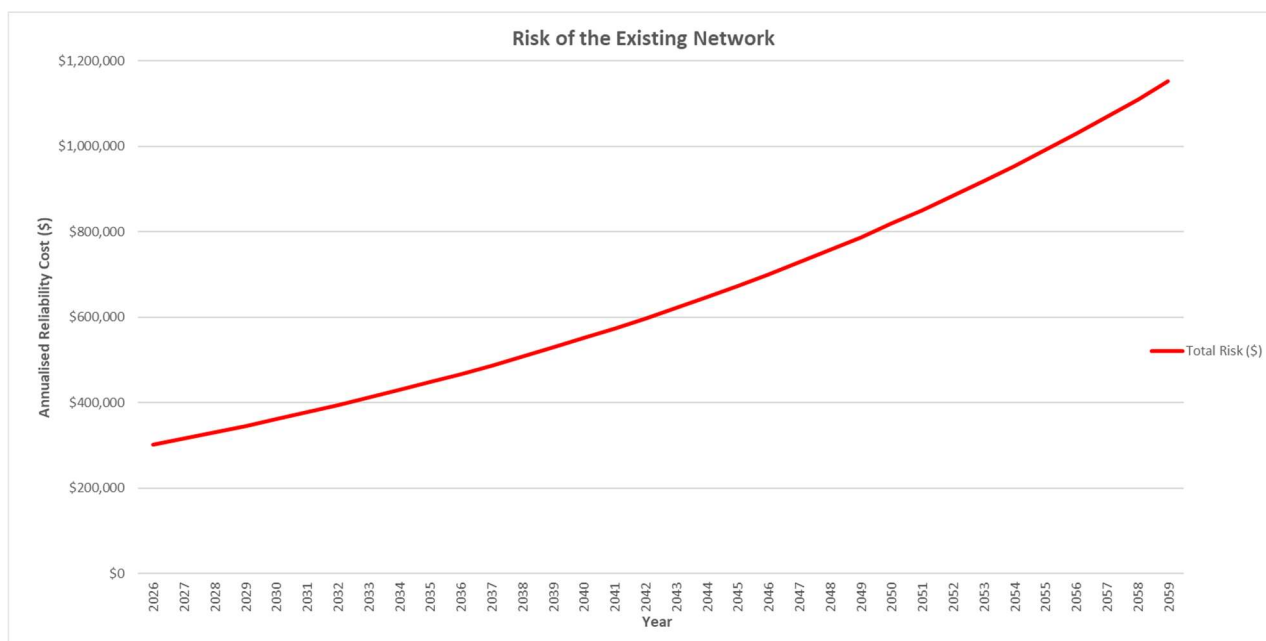


Figure 10: Risk of the Existing Network

### 3.3 Assumptions in Relation to Identified Need

Below is a summary of key assumptions that have been made when the identified need has been analysed and quantified.

It is recognised that the below assumptions may prove to have various levels of correctness, and they merely represent a 'best endeavours' approach to predict the future identified need.

#### 3.3.1 Forecast Maximum Demand

It has been assumed that forecast peak demand at Geebung Zone Substation will be consistent with the base case forecast outlined in Section 2.3.4.

Factors that have been taken into account when the load forecast has been developed include the following:

- load history;
- known future developments (new major customers, network augmentation, etc.);
- temperature corrected start values (historical peak demands); and
- forecast growth rates for organic growth.



## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 3.3.2 Load Profile

Characteristic peak day load profiles shown in Section 2.3.3 are unlikely to change significantly from year to year and the shape of the load profile is assumed to remain virtually the same with increasing maximum demand.

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 4 CREDIBLE OPTIONS ASSESSED

#### 4.1 Assessment of Network Solutions

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

##### 4.1.1 Option 1: Replace 33kV outdoor circuit breakers, isolators and protection relays

This option involves the following works:

###### Geebung Zone Substation (SSGBG):

- Replace & scrap obsolete 33kV feeder circuit breakers CB6642 & CB6042 with current contract CB.
- Decommission corresponding obsolete panel and relays reaching end of life. Replace with current contract feeder protection relays and panel. Install new multicore run for current protection.
- Replace & scrap obsolete 33kV bus section circuit breakers CB3X12 & CB3X22 with current contract CB.
- Decommission corresponding obsolete panel and relays reaching end of life. Replace with current contract bus zone protection relays and panel. Install new multicore run for current protection.
- Replace & scrap obsolete 33kV transformer circuit breaker CB3T12 with current contract CB.
- Decommission corresponding obsolete panel and relays reaching end of life. Replace with current contract transformer diff protection relays and panel. Install new multicore run for current protection.
- Recover & scrap obsolete 33kV feeder circuit breaker CBSPARE22, and decommission corresponding obsolete panel and relays reaching end of life.
- Replace 33kV Isolators on BB31; AB3X14, AB3X15, AB3X16, AB3X18 and AB3X19 on a new foundation and support structure.
- Replace & scrap obsolete 33kV feeder circuit breaker CB6052 with current contract CB.
- Decommission corresponding obsolete panel and relays reaching end of life. Replace with current contract feeder protection relays and panel. Install new multicore run for current protection.
- Replace & scrap obsolete 33kV transformer circuit breaker CB3T22 with current contract CB.

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

- Decommission corresponding obsolete panel and relays reaching end of life. Replace with current contract transformer diff protection relays and panel. Install new multicore run for current protection.
- Recover & scrap obsolete 33kV feeder circuit breaker CBSPARE12 and decommission corresponding obsolete panel and relays reaching end of life.
- Replace 33kV obsolete Isolators on BB32; AB3X26, and AB3X27 on a new foundation and support structure.
- Replace & scrap obsolete 33kV feeder circuit breaker CB6832 with current contract CB.
- Decommission corresponding obsolete panel and relays reaching end of life. Replace with current contract feeder protection relays and panel. Install new multicore run for current protection.
- Upgrade existing TR3 protection scheme current standard dual diff protection.
- Replace 33kV obsolete Isolators on BB32; AB3X39 on a new foundation and support structure. (Replace foundation and support structures for AB3X38 & AB3X36)
- Replace 12 x aged 11kV feeder relays with new current relay contract.

### Nudgee Zone Substation (SSNGE):

- Replace end of life relay in existing panel with current contract relay and establish fibre comms to SSGBG for 33kV feeders F604, F605 and F683.

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

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

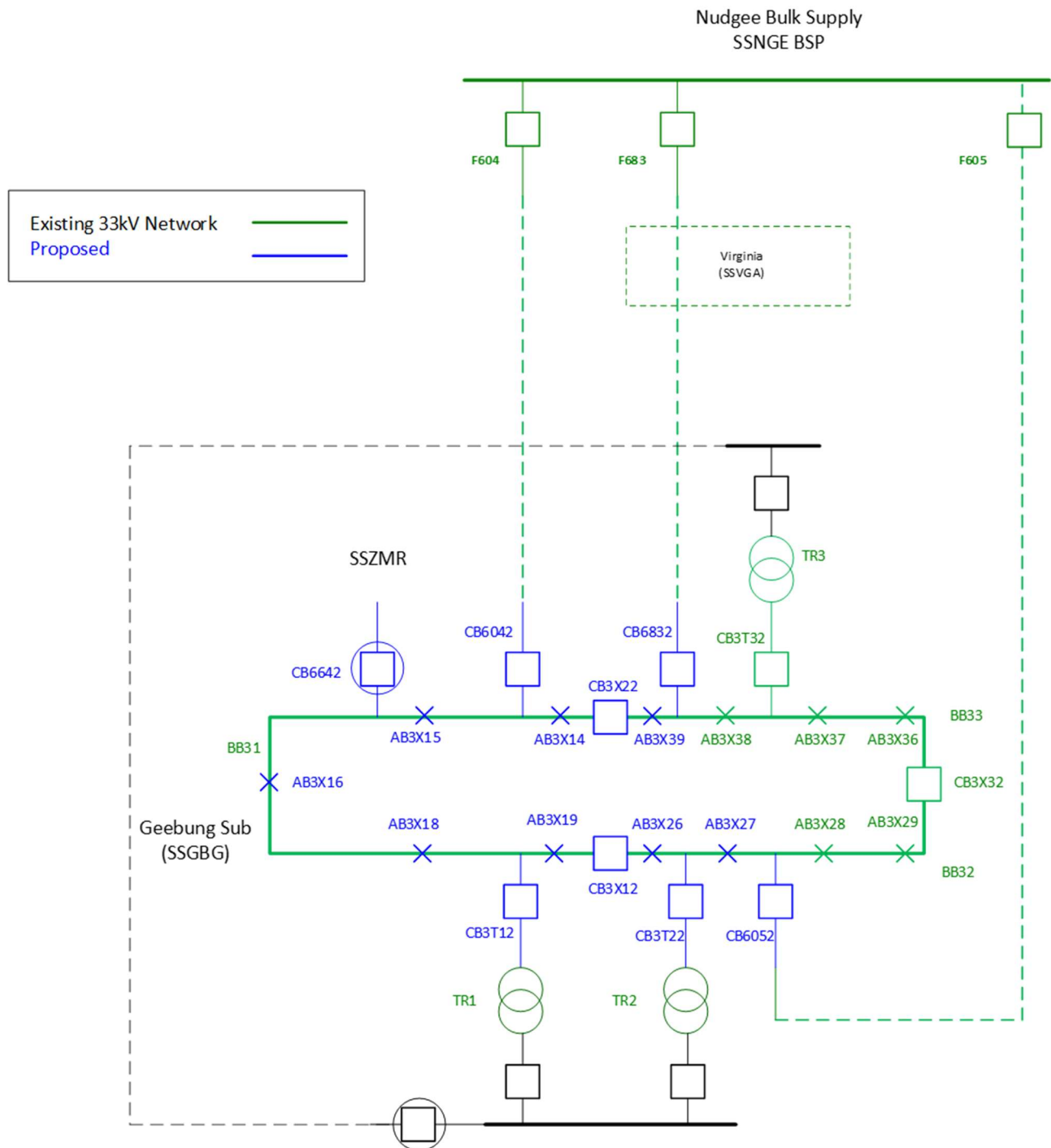


Figure 11: Option 1 proposed network arrangement (schematic view)



## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 4.2 Assessment of SAPS and Non-Network Solutions

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

#### 4.2.1 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 Geebung region could not be supported by a network that is not part of the interconnected national electricity system.

#### 4.2.2 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 Geebung 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 Geebung. It has been determined that most demand management options will not be viable propositions and have been explored in the following sections.

##### Network Load Control

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

There are 2134 customers on tariff T31 and T33 hot water load control (LC). An estimated demand reduction value of 790kVA<sup>1</sup> is available.

##### 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.

##### 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

---

<sup>1</sup> Hot water diversified demand saving estimated at 0.6kVA per system

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

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.

### **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.

### **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.

### **Customer Solar Power Systems**

A total of 1833 customers have solar photo voltaic (PV) systems for a connected inverter capacity of 13,170kVA.

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.

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.

### **4.2.3 SAPS and Non-Network Solution Summary**

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 Geebung area to address the identified need.

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 4.3 Preferred Network Option

Energex's preferred internal network option is Option 1, replace 33kV outdoor circuit breakers, isolators and protection relays at Geebung zone substation.

Upon completion of these works, the asset safety and reliability risks at Geebung 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 direct cost of this option is \$6.2 million. Annual operating and maintenance costs are anticipated to be the same as the existing network as a result of this option. The estimated project delivery timeframe has design commencing in September 2024 and construction completed by July 2027.

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 5 MARKET BENEFIT ASSESSMENT METHODOLOGY

The purpose of the RIT-D is to identify the option that maximises the present value of net market benefits to all those who produce, consume and transport electricity in the National Electricity Market (NEM).

In order to measure the increase in net market benefit, Energex has analysed the classes of market benefits required to be considered by the RIT-D.

#### 5.1 Classes of Market Benefits Considered and Quantified

The following classes of market benefits are considered material, and have been included in this RIT-D assessment:

- Changes in involuntary load shedding and Customer Interruptions caused by Network Outages

##### 5.1.1 Changes in Involuntary Load Shedding and Customer Interruptions caused by Network Outages

Involuntary load shedding is where a customer's load is interrupted from the network without their agreement or prior warning. Energex has forecast load over the assessment period and has quantified the expected unserved energy by comparing forecast load to network capabilities under system normal and network outage conditions. A reduction in involuntary load shedding expected from an option, relative to the base case, results in a positive contribution to the market benefits of the credible option being assessed.

Involuntary load shedding of a credible option is derived by the quantity in MWh of involuntary load shedding required assuming the credible option is completed multiplied by the Value of Customer Reliability (VCR). The VCR is measured in dollars per MWh and is used as a proxy to evaluate the economic impact of unserved energy on customers under the RIT-D.

Customer export curtailment value (CECV) represents the detriment to all customers from the curtailment of DER export (e.g. rooftop solar PV systems). A reduction in curtailment due to implementing a credible option results in a positive contribution to the market benefits of that option. These benefits have been calculated according to the AER CECV methodology based on the capacity of DER currently installed and forecast to be installed within the Geebung supply area.

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 5.2 Classes of Market Benefits not Expected to be Material

The following classes of market benefits are not considered to be material for this RIT-D, and have not been included in this RIT-D assessment:

- Changes in voluntary load curtailment
- Changes in costs to other parties
- Differences in timing of expenditure
- Changes in load transfer capacity and the capacity of Embedded Generators to take up load
- Changes in network losses
- Option value
- Changes in Greenhouse gas emissions
- Other Classes of Market Benefit

#### 5.2.1 Changes in Voluntary Load Curtailment

The credible options presented in this RIT-D assessment do not include any voluntary load curtailment as there are no customers on voluntary load curtailment agreements in the Geebung zone substation supply area. Therefore, market benefits associated with changes in voluntary load curtailment have not been considered.

#### 5.2.2 Changes in Costs to Other Parties

Energex does not anticipate that any of the credible options included in this RIT-D assessment will affect costs incurred by other parties.

#### 5.2.3 Differences in Timing of Expenditure

The credible options included in this RIT-D assessment is/are not expected to affect the timing of other distribution investments for unrelated identified needs.

#### 5.2.4 Changes in Load Transfer Capacity and the capacity of Embedded Generators to take up load

The credible options included in this RIT-D assessment are not expected to have an impact on the load transfer capacity or the capacity of embedded generators to take up load between the zone substations in the Geebung zone substation supply area.

#### 5.2.5 Changes in Network Losses

Energex does not anticipate that any of the credible options included in the RIT-D assessment will lead to any significant change in network losses.



## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 5.2.6 Option Value

The AER's view is that option value is likely to arise where there is uncertainty regarding future outcomes, the information that is available in the future is likely to change, and the credible options considered by the RIT-D proponent are sufficiently flexible to respond to that change<sup>2</sup>.

Energex does not consider that the identified need for the options included in this RIT-D would be affected by uncertain factors about which there may be more clarity in future.

### 5.2.7 Changes in Greenhouse Gas Emissions

Energex does not anticipate that the credible option included in the RIT-D assessment, which involves replacing network switches and maintaining the same network configuration, will lead to any changes in greenhouse gas emissions.

### 5.2.8 Other Class of Market Benefit

Energex has not identified any other relevant class of market benefit for this RIT-D.

---

<sup>2</sup> AER "Regulatory Investment Test for Distribution Application Guidelines", Section A6.  
Available at: <http://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/regulatory-investment-test-for-distribution-rit-d-and-application-guidelines>

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 6 DETAILED ECONOMIC ASSESSMENT

#### 6.1 Methodology

The Regulatory Investment Test for Distribution requires Energex to identify the credible option that maximises the present value of net economic benefit to all who produce, consume and transport electricity in the National Electricity Market.

Accordingly, a base case Net Present Value (NPV) comparison of the alternative development options has been undertaken. A sensitivity analysis was then conducted on this base case to establish the option that remained the lowest cost option in the scenarios considered.

#### 6.2 Key Variables and Assumptions

The economic assessment contains anticipated costs of providing, operating and maintaining the options as well as expected costs of compliance and administration associated with each option.

The present value comparison summary includes all costs directly associated with constructing and providing the option. This includes the cost of land and easements currently owned or to be acquired for network augmentation.

Interest on borrowings is not included as a cost in the comparison of options as it represents a cost of project financing, and as such is accounted for in present value calculations through the discounting of the project cash flows at the regulated WACC.

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

### 6.3 Quantification of Benefits for Option 1

Risk quantification analysis has been completed for option 1 which includes the value of customer reliability and cost of emergency replacement. Figure 12 shows the benefits of Option 1 in comparison to the counter-factual, which in this case is continuing the use of the existing circuit breakers with ongoing maintenance and replacement on failure. The benefit of this option is greater than \$370,000 by 2032.

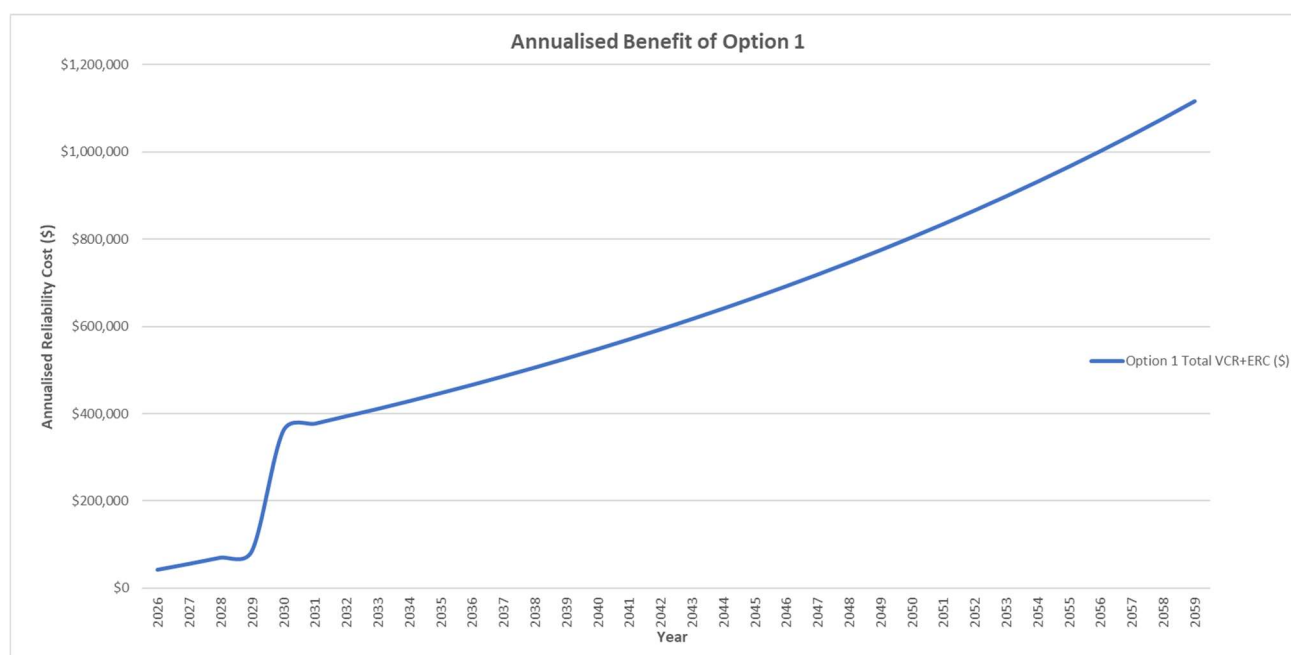


Figure 12: Annualised Benefits of Option 1 compared with Counter Factual

### 6.4 Net Present Value (NPV) Results

An overview of the initial capital cost and the base case NPV results are provided in Table 1.

Option	Option Name	Rank	Initial Cost	Net Present Value (\$ real)	PV of Economic Benefit (\$ real)	PV of Capex (\$ real)	PV of Opex (\$ real)
1	Replace 33kV Outdoor Circuit Breakers	1	\$6,200,000	\$20,140,000	\$26,087,000	-\$5,875,000	-\$72,000

Table 1: Base case NPV ranking table

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

---

### 7 CONCLUSION

The Final Project Assessment Report (FPAR) represents the final stage of the consultation process in relation to the application of the RIT-D.

Energex intends to take steps to progress the proposed preferred option to ensure any statutory non-compliance is addressed and undertake appropriately justified network reliability improvements, as necessary.

#### 7.1 Preferred Option

Energex's preferred option is Option 1, to replace 33kV outdoor circuit breakers, isolators and protection relays at Geebung Zone Substation.

Upon completion of these works, the asset safety and reliability risks at Geebung Zone Substation will be addressed. The preferred option will provide the greatest reliability benefit for customers, improves safety to staff and the public, 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 \$6.2 million. Annual operating and maintenance costs are anticipated to be the same as the existing network as a result of this option. The estimated project delivery timeframe has design commencing in September 2024 and construction completed by July 2027.

#### 7.2 Satisfaction of RIT-D

The proposed preferred option satisfies the RIT-D.

This statement is made on the basis of the detailed analysis set out in this report. The proposed preferred option is the credible option that has the highest net economic benefit under the most likely reasonable scenarios.

### 8 COMPLIANCE STATEMENT

This Final Project Assessment Report complies with the requirements of NER section 5.17.4(j) as demonstrated below:

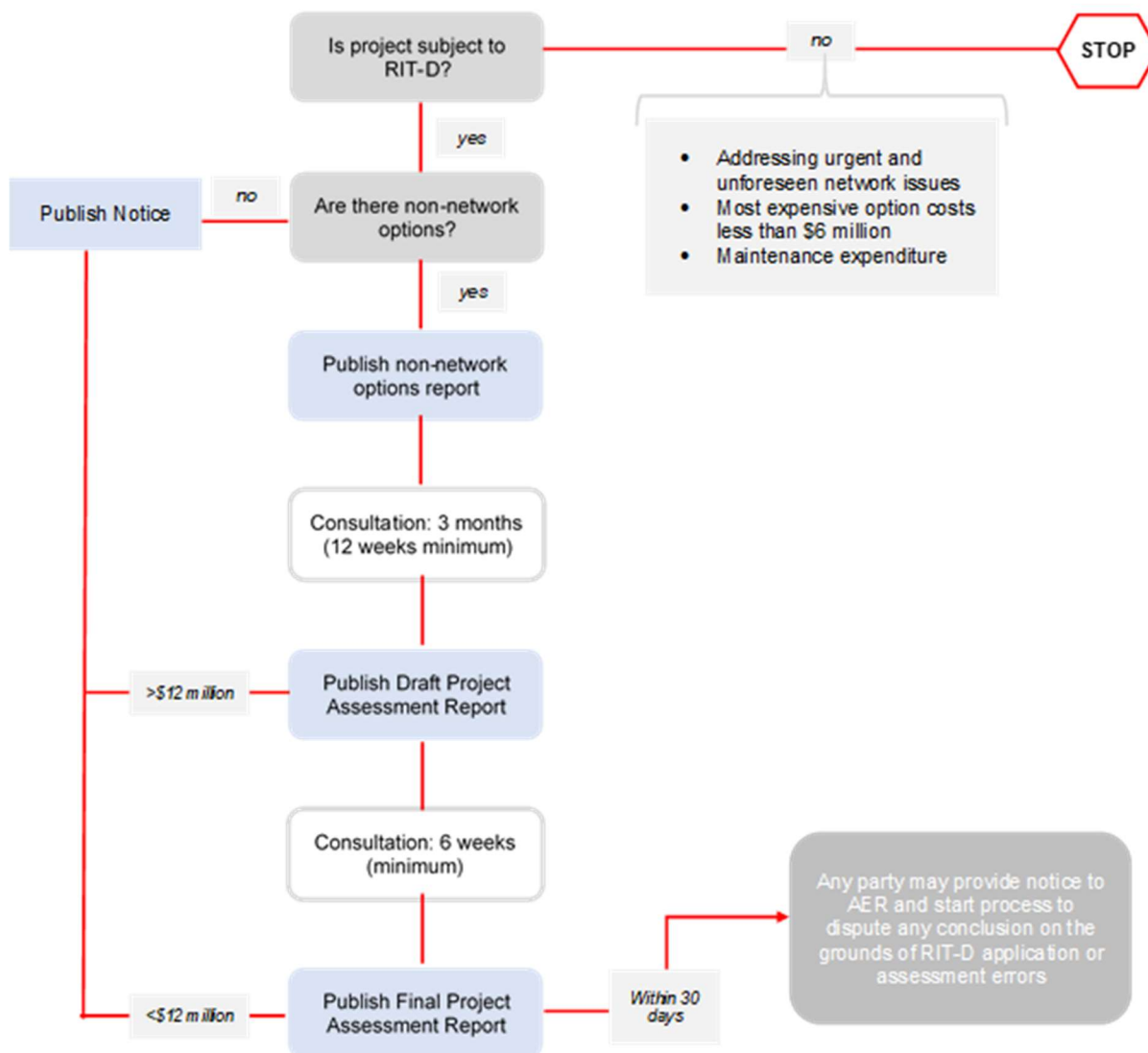
Requirement	Report Section
(1) a description of the identified need for investment;	3
(2) the assumptions used in identifying the identified need (including, in the case of proposed reliability corrective action, why the RIT-D proponent considers reliability corrective action is necessary;	3.3
(3) if applicable, a summary of, and commentary on, the submissions received on the Options Screening Report	Not applicable
(4) a description of each credible option assessed	4

## Addressing Reliability Requirements in the Geebung Network Area Final Project Assessment Report

(5) where a <i>Distribution Network Service Provider</i> has quantified market benefits in accordance with clause 5.17.1(d), a quantification of each applicable market benefit of each credible option	5
(6) a quantification of each applicable cost for each credible option, including a breakdown of operating and capital expenditure	6
(7) a detailed description of the methodologies used in quantifying each class of costs or market benefit	5
(8) where relevant, the reasons why the RIT-D proponent has determined that a class or classes of market benefits or costs do not apply to a credible option	5.2
(9) the results of a NPV analysis of each credible option and accompanying explanatory statements regarding the results	6.4
(10) the identification of the proposed preferred option	7.1
(11) for the proposed preferred option, the RIT-D proponent must provide: <ul style="list-style-type: none"> <li>(i) details of the technical characteristics;</li> <li>(ii) the estimated construction timetable and commissioning date (where relevant);</li> <li>(ii) the indicative capital and operating costs (where relevant);</li> <li>(iv) a statement and accompanying analysis that the proposed preferred option satisfied the RIT-D; and</li> <li>(v) if the proposed preferred option is for reliability corrective action and that option has a proponent, the name of the proponent</li> </ul>	7.1 & 7.2
(12) contact details for a suitably qualified staff member of the RIT-D proponent to whom queries on the final report may be directed.	1.4

## Addressing Reliability Requirements in the Geebung Network Area 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.