Regulatory Investment Test for Distribution (RIT-D)

Addressing Reliability Requirements in the Maleny Network Area

Final Project Assessment Report

25 August 2021

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

Maleny Zone Substation (SSMLY) is equipped with 2 x 5MVA 33/11kV transformers and provides electricity supply to approximately 4,200 predominantly residential customers in the surrounding suburbs of Bald Knob, Bellthorpe, Booroobin, Conondale, Maleny, Montville, North Maleny, Reesville, Sandy Creek, Witta and Wootha. Approximately 88% of the total number of customers supplied from SSMLY are residential customers amounting to 60% of the total energy supplied, while 12% of the total number of customers supplied are commercial and industrial customers, amounting to 40% of the total energy supplied.

SSMLY is normally supplied from Nambour Bulk Supply Substation (SST16) 33kV network via 33kV feeder F344. Under contingency, it can also be supplied from the Beerwah Bulk Supply Substation (SSBWH) 33kV network via 33kV feeder F477.

Based on a Condition Based Risk Management (CBRM) analysis of the effect of current condition and ageing on the expected life of the assets at SSMLY, the following assets have been identified as reaching their end-of-life:

- 33kV and 11kV disconnectors;
- Crossarm and insulators of 33kV feeder F344;
- Crossarms and surge arresters of 11kV feeders MLY1, MLY3;
- Surge arresters of 11kV feeder MLY6;
- 33kV fuse-switch-disconnector and surge arresters of station service transformer TR8;
- 11kV fuse-switch-disconnector and surge arresters of station service transformer TR9; and
- Protection relays.

In addition, a civil condition assessment has identified a number of further issues including the poor condition of outdoor bus pipework structures due to significant rusting and the poor condition of the control building due to water leaks, deteriorated doors and rusting base frame.

The deterioration of these assets poses safety risks to staff working within the switchyard.

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

Energex published a Notice of no non-network options for the above described network constraint on 13 August 2021 to declare that there are no credible non-network options to the proposed works to meet the identified need of maintaining a safe, sufficient and reliable supply to customers at SSMLY when the identified plant reach their retirement age. This determination was made under clause 5.17.4(c) of the NER and was published according to clause 5.17.4(d).

Since the estimated project cost is below $11M, Energex is exempt from publishing a Draft Project Assessment Report, as per clause 5.17.4(n) of the NER.

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 replace the identified end-of-life plant with indoor switchgear.

CONTENTS

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 Maleny 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. Publication of the Notice

Energex published a Notice of No Non-Network Options for the network constraints of the Maleny supply area on 13 August 2021.

1.2. Structure of the Report

This report:

- Provides background information on the network capability limitations of the distribution network supplying the Maleny 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.
- 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.

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

If no formal dispute is raised, Energex will proceed with the preferred option to replace the identified end-of-life plant with indoor switchgear.

.

1.4. Contact Details

For further information and inquiries please contact:

E: demandmanagement@energex.com.au
P: 13 74 66

2. BACKGROUND

2.1. Geographic Region

Maleny Zone Substation (SSMLY) is equipped with 2 x 5MVA 33/11kV transformers and provides electricity supply to approximately 4,200 predominantly residential customers in the surrounding suburbs of Bald Knob, Bellthorpe, Booroobin, Conondale, Maleny, Montville, North Maleny, Reesville, Sandy Creek, Witta and Wootha. Approximately 88% of the total number of customers supplied from SSMLY are residential customers amounting to 60% of the total energy supplied, while 12% of the total number of customers supplied are commercial and industrial customers, amounting to 40% of the total energy supplied.

SSMLY is normally supplied from the Nambour Buk Supply Substation (SST16) 33kV network via 33kV feeder F344. Under contingency, it can also be supplied from the Beerwah Bulk Supply Substation (SSBWH) 33kV network via 3-ended 33kV feeder F477 (SSBWH- SSMLY-SSWFD, normally open at SSMLY end).

The geographical location of the Energex's sub-transmission network in the area and the areas supplied by SSMLY are shown in Figure 1 and Figure 2 respectively.

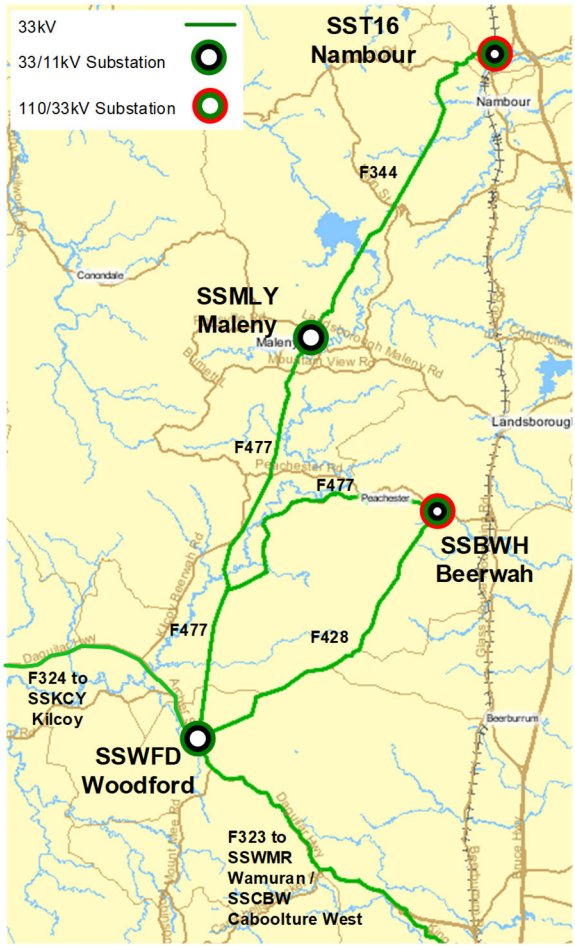


Figure 1: Existing network arrangement (geographic view)

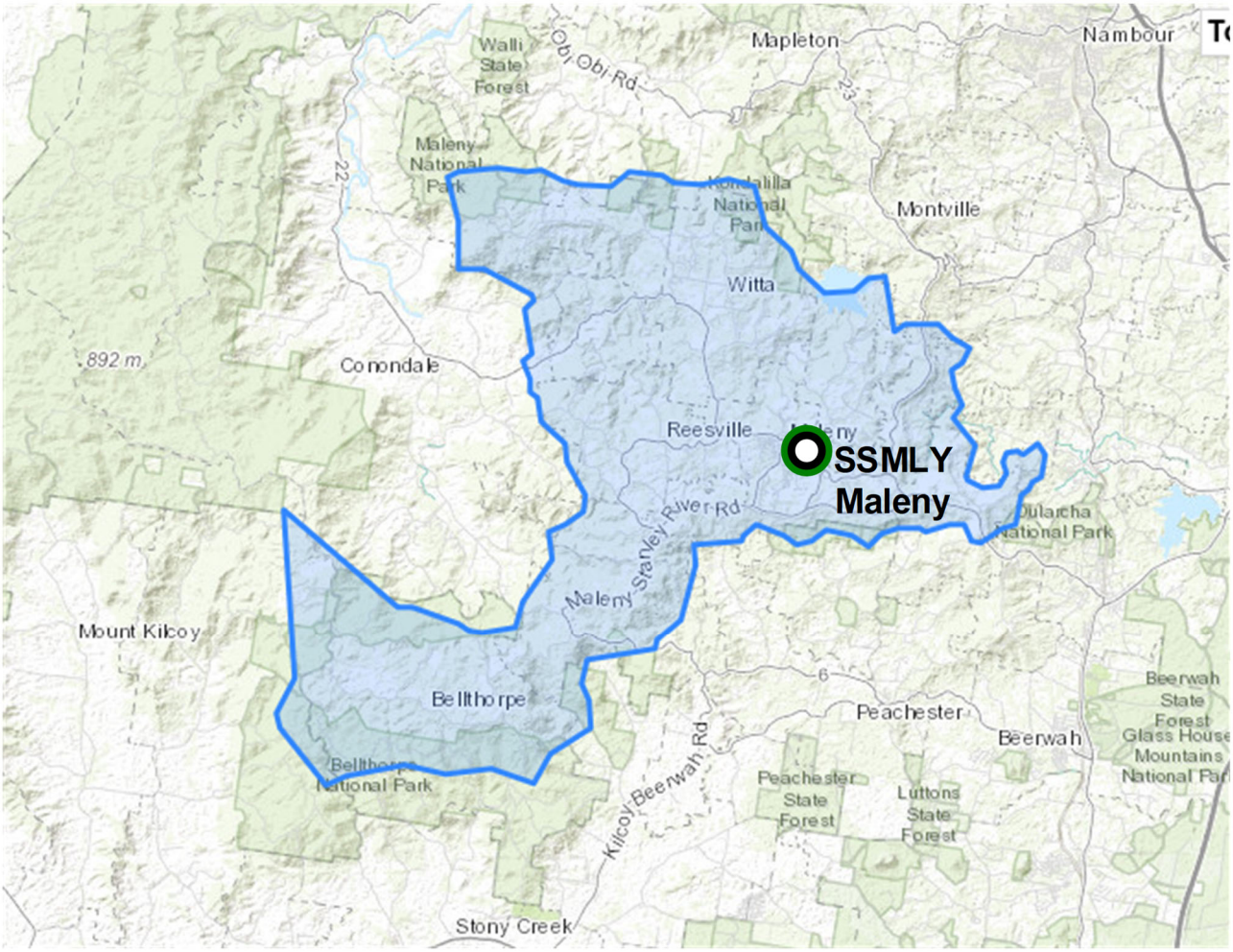


Figure 2: Areas supplied by SSMLY (geographic view)

2.2. Existing Supply System

SSMLY is located approximately 90km north of Brisbane in the Sunshine Coast hinterland township of Maleny.

It has outdoor 33kV and 11kV switchyards, 2 x 5MVA 33/11kV power transformers and a small protection and control building. SSMLY supplies four 11kV distribution feeders at present and it has been proposed establish two new 11kV feeders from SSMLY.

A schematic view and a geographic view of SSMLY are provided in Figure 3 and Figure 4 respectively.

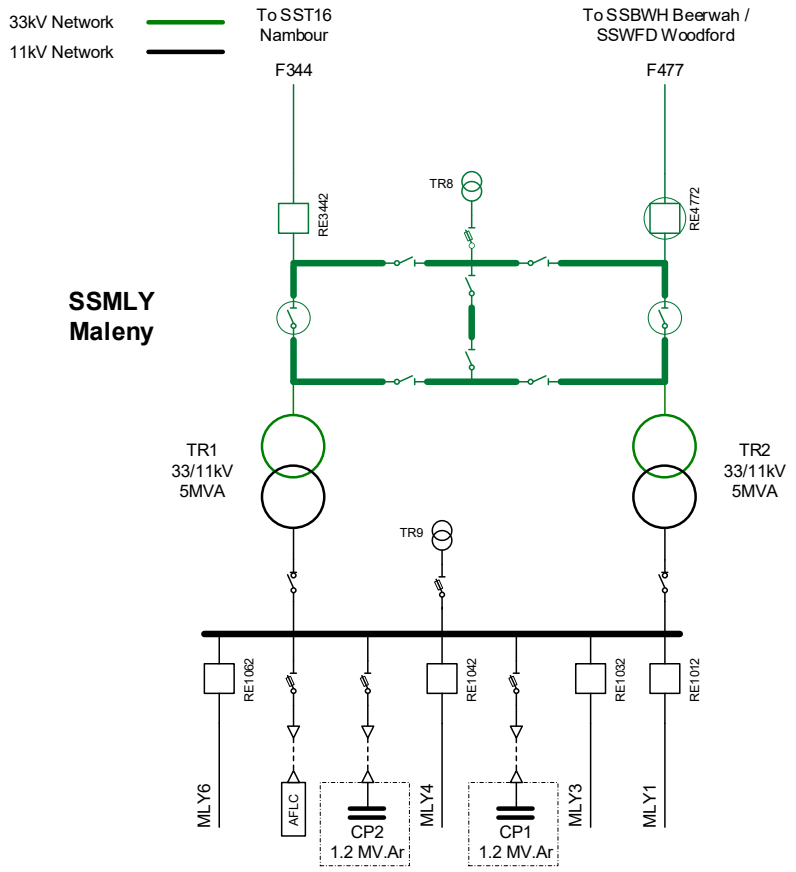


Figure 3: Existing network arrangement (schematic view)

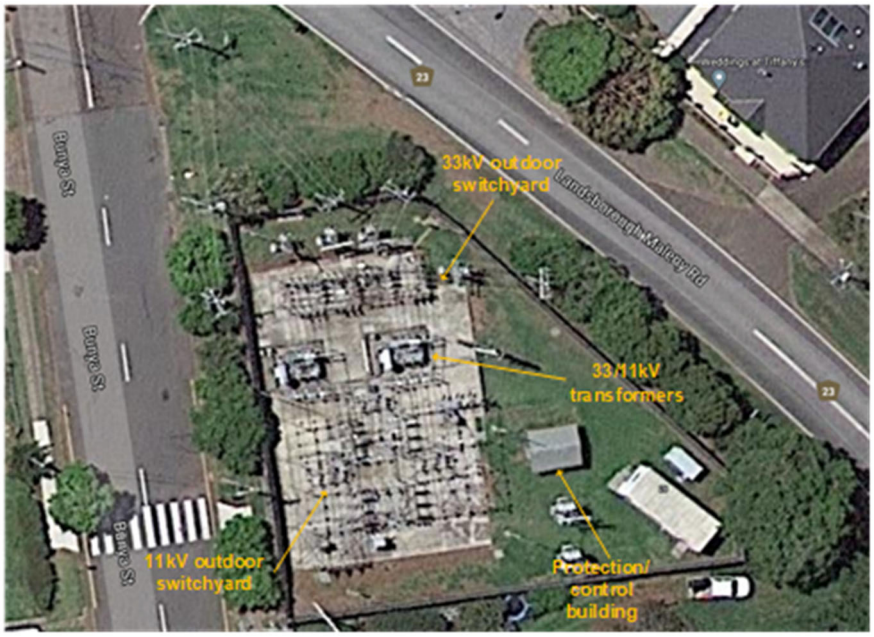


Figure 4: SSMLY Substation (geographic view)

2.3. Load Profiles / Forecasts

The load at SSMLY comprises a mix of residential and commercial/industrial customers. The load is winter peaking.

2.3.1. Full Annual Load Profile

The annual load profile of SSMLY for 2020 is shown in Figure 5.

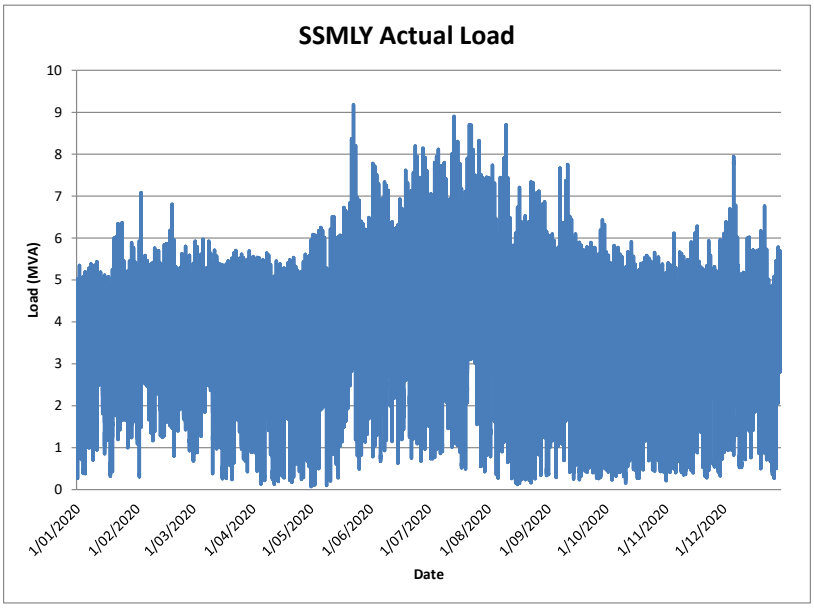


Figure 5: Substation actual annual load profile

2.3.2. Load Duration Curve

The load duration curve of SSMLY for 2020 is shown in Figure 6.

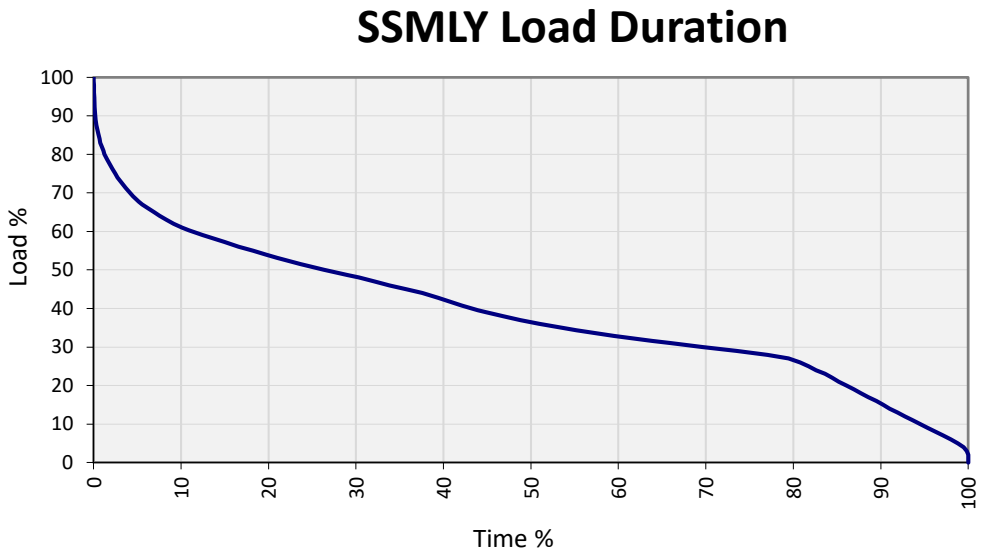


Figure 6: Substation load duration curve

2.3.3. Peak Day Load Profile

The daily load profile of SSMLY for the peak day during 2020 is shown in Figure 7.

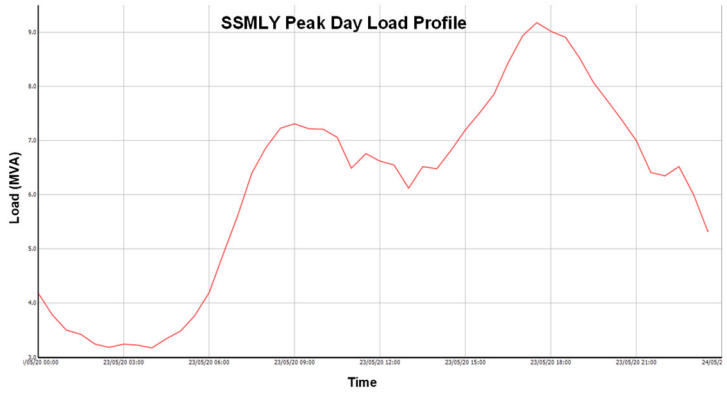
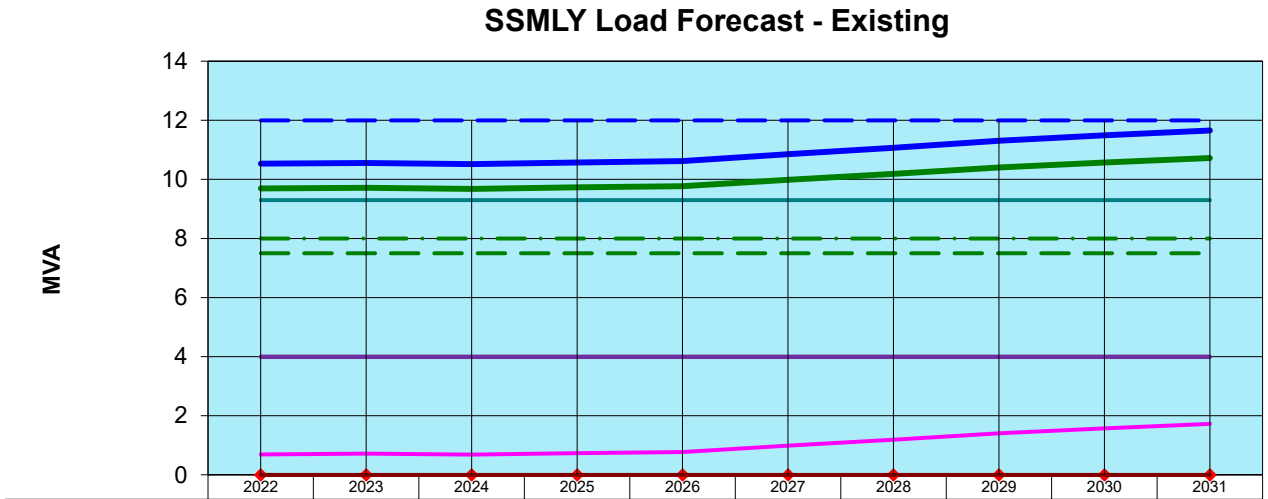


Figure 7: Substation peak day load profile

2.3.4. Base Case Load Forecast

SSMLY is equipped with 2 x 5MVA 33/11kV transformers. The substation capacity is limited by transformers, providing a Normal Cyclic Capacity of 12MVA. The 10 year 10 PoE and 50 PoE load forecasts, and the existing Normal Cyclic Capacity (NCC), Emergency Cyclic Capacity (ECC), Two Hour Emergency Capacity (2HEC), Residual Load at Risk (RLAR) and available mobile equipment, are shown in Figure 8.



	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
10 PoE Load	10.53	10.56	10.52	10.58	10.62	10.85	11.07	11.31	11.49	11.65
Winter NCC	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Load > NCC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
50 PoE Load	9.69	9.72	9.68	9.73	9.78	9.99	10.19	10.41	10.58	10.72
Winter ECC	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
Winter 2HEC	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
LAR	0.69	0.72	0.68	0.73	0.78	0.99	1.19	1.41	1.58	1.72
RLAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Available Transfers	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30	9.30
Avail Mobile Eqpt	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Figure 8: Substation base case load forecast

3. IDENTIFIED NEED

3.1. Description of the Identified Need

3.1.1. End-of-Life 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 risk.

Based on a CBRM analysis of the effect of current condition and ageing on the expected life of the assets at SSMLY, the following assets have been identified as reaching their end-of-life:

- 33kV and 11kV disconnectors;
- Crossarm and insulators of 33kV feeder F344;
- Crossarms and surge arresters of 11kV feeders MLY1, MLY3;
- Surge arresters of 11kV feeder MLY6;
- 33kV fuse-switch-disconnector and surge arresters of station service transformer TR8;
- 11kV fuse-switch-disconnector and surge arresters of station service transformer TR9; and
- Protection relays.

In addition, a civil condition assessment has identified a number of further issues including the poor condition of outdoor bus pipework structures due to significant rusting and the poor condition of the control building due to water leaks, deteriorated doors and rusting base frame.

3.2. Quantification of the Identified Need

3.2.1. End-of-Life and Poor Condition Assets

The objective of this investment is to address the safety risk to staff working within the switchyard from operating plant which are reaching their end-of-life and are in a poor condition.

Energex considers that without rectification, this safety risk would not be reduced So Far as Is Reasonably Practicable.

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 Maleny 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.

3.3.2. Load Profile

Characteristic peak day load profile shown in Section 2.3.3 is 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.

4. CREDIBLE OPTIONS ASSESSED

4.1. Assessment of Network Solutions

In addition to the following option that has been assessed as meeting the identified need, no other practically feasible and economically equivalent option has been identified in this analysis.

4.1.1. Replace end-of-life 33kV and 11kV outdoor buses/switchgear at SSMLY with indoor switchgear

This option involves establishing two new masonry buildings for the new 33kV and 11kV switchgear and recovering and scrapping the end-of-life 33kV and 11kV outdoor pipework buses at SSMLY in order to address the identified need.

A schematic diagram of the proposed network arrangement for this option is shown in Figure 9.

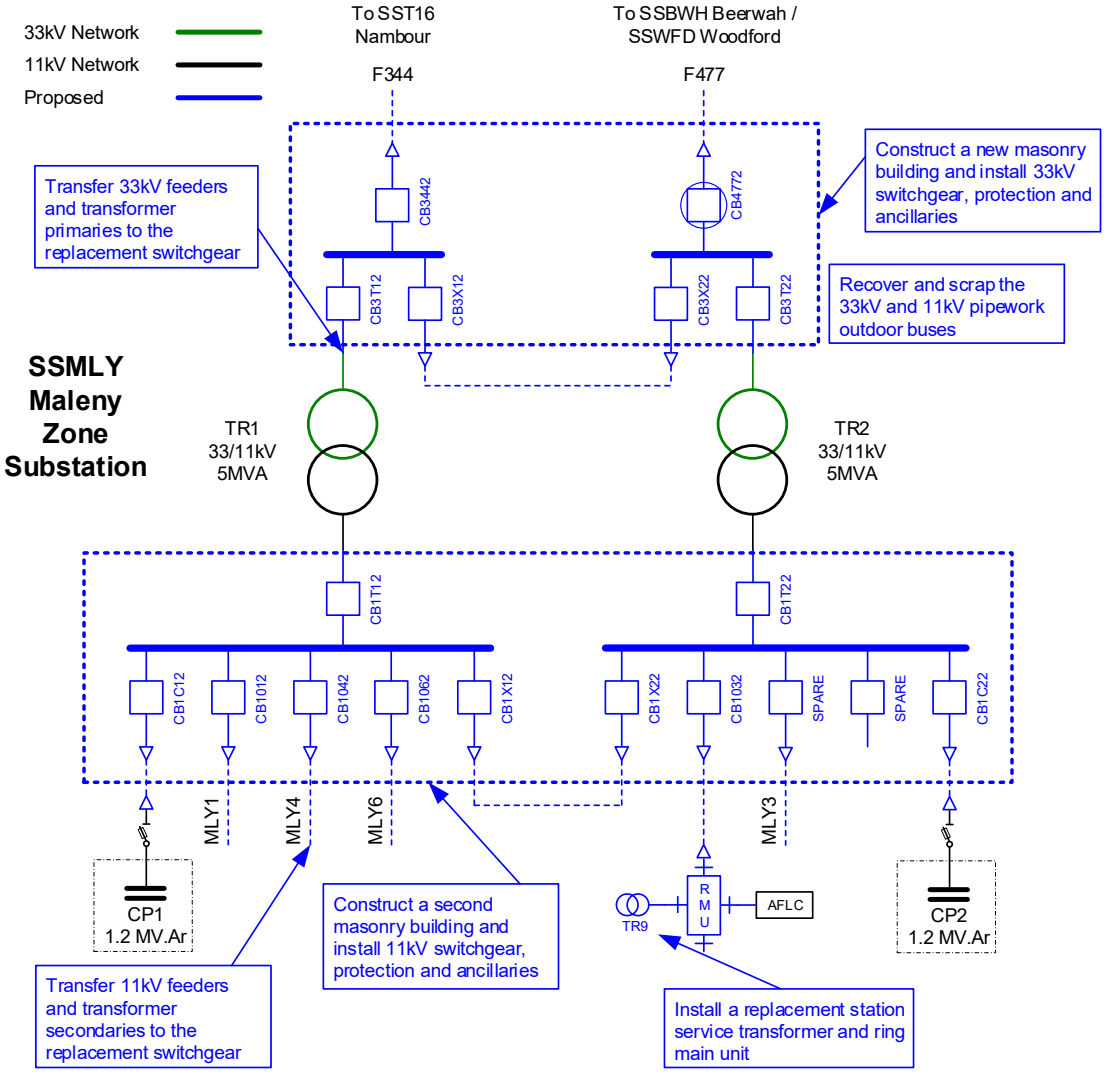


Figure 9: Proposed network arrangement (schematic view)

4.2. Assessment 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 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 identified 33kV and 11kV assets at SSMLY reach their retirement age and can no longer be safely operated, the existing load must be supplied via non-network alternative solutions while satisfying the Service Safety Net Targets as specified in the Distribution Authority issued to Energex.

4.2.1. Non-Network Solution Summary

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 Maleny area to address the identified need.

4.3. Preferred Network Option

Energex's preferred internal network option is to establish two new masonry buildings for the new 33kV and 11kV switchgear and recover and scrap the end-of-life 33kV and 11kV outdoor pipework buses at SSMLY.

Upon completion of these works, the asset safety risks at Maleny 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 and overheads is $10.4 million. Annual operating and maintenance costs are anticipated to be 0.5% of the capital cost. The estimated project delivery timeframe is for the design and construction to be completed by May 2022 and November 2023 respectively.

5. MARKET BENEFIT ASSESSMENT

The identified need is to reduce the safety risk associated with the condition of the identified primary and secondary system assets at SSMLY to So Far as Is Reasonably Practicable. As such, the assessment methodology is a lowest cost process among the credible options that have been assessed to address the identified need, rather than a cost/benefit analysis based on market benefits.

6. DETAILED ECONOMIC ASSESSMENT

Since there were no other technically feasible options established to address the identified need, a Net Present Value (NPV) assessment was not conducted.

7. CONCLUSION

The 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 to establish two new masonry buildings for the new 33kV and 11kV switchgear and recover and scrap the end-of-life 33kV and 11kV outdoor pipework buses at SSMLY.

Upon completion of these works, the asset safety risks at Maleny 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 and overheads is $10.4 million. Annual operating and maintenance costs are anticipated to be 0.5% of the capital cost. The estimated project delivery timeframe is for the design and construction to be completed by May 2022 and November 2023 respectively.

7.2. Satisfaction of RIT-D

The proposed preferred option satisfies the RIT-D.

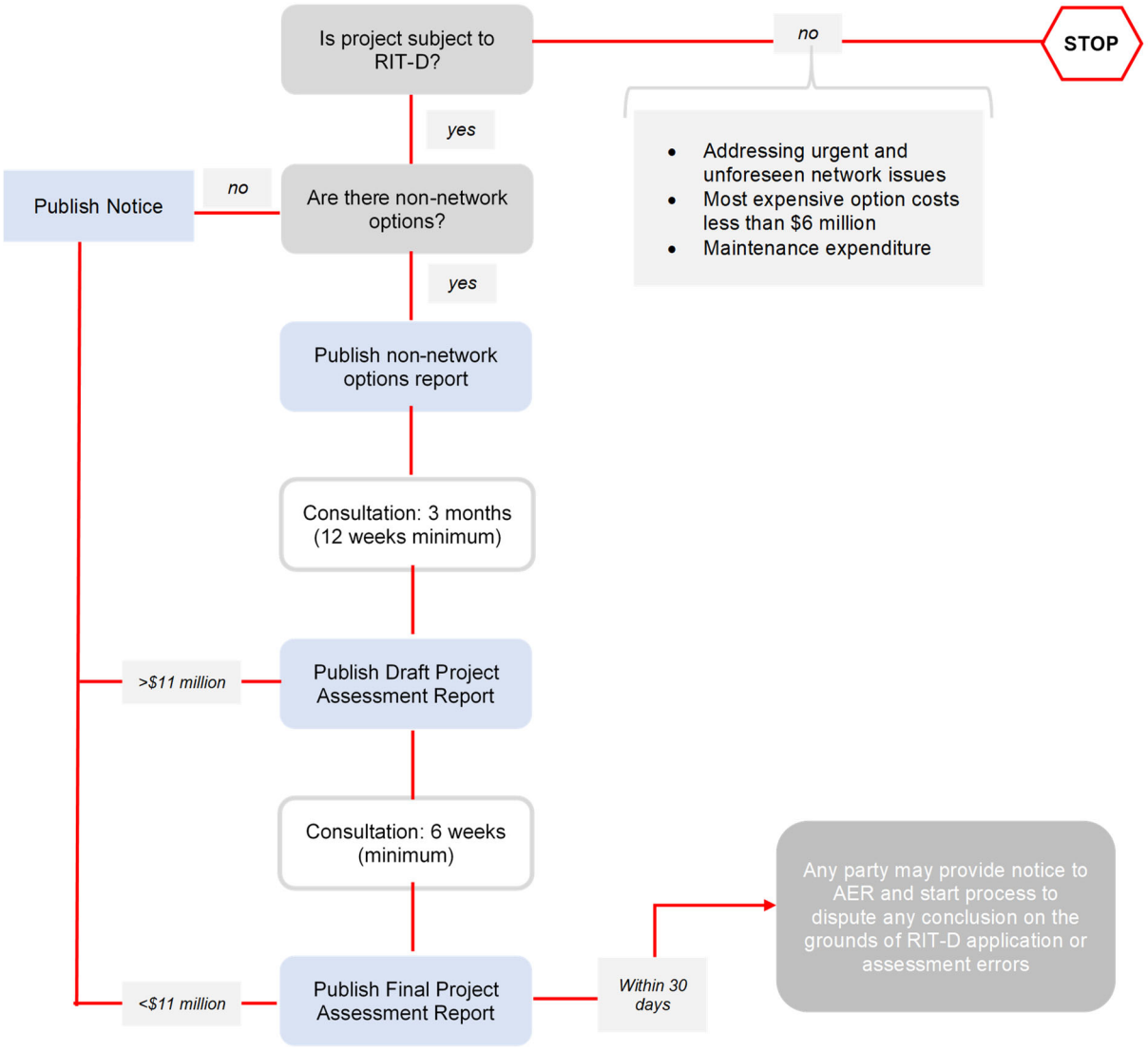
This statement is made on the basis of the detailed analysis set out in this report. The proposed option is the only credible option that has been identified.

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 DPAR;	Not applicable
(4) a description of each credible option assessed	4
(5) where a *Distribution Network Service Provider* 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	4 & 7
(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
(9) the results of a NPV analysis of each credible option and accompanying explanatory statements regarding the results	6
(10) the identification of the proposed preferred option	7.1
(11) for the proposed preferred option, the RIT-D proponent must provide: (i) details of the technical characteristics; (ii) the estimated construction timetable and commissioning date (where relevant); (ii) the indicative capital and operating costs (where relevant); (iv) a statement and accompanying analysis that the proposed preferred option satisfied the RIT-D; and (v) if the proposed preferred option is for reliability corrective action and that option has a proponent, the name of the proponent	4.1.1, 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

APPENDIX A – THE RIT-D PROCESS



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