The Energy Queensland Group Notice of no non-network options

27 May 2019

PBH Palm Beach – Replace 33/11kV Transformers

Part of the Energy Queensland Group

DISCLAIMER

While care was taken in the preparation of the information in this document, and it is provided in good faith, Energy Queensland accepts no responsibility or liability (including without limitation, liability to any person by reason of negligence or negligent mis-statement) for any loss or damage that may be incurred by any person acting in reliance on this information or assumptions drawn from it, except to the extent that liability under any applicable Queensland or Commonwealth of Australia statute cannot be excluded.

Ergon Energy Corporation Limited ABN 50 087 646 062
Energy Queensland Limited ABN 96 612 535 583
Energex Limited ABN 40 078 849 055

TABLE OF CONTENTS

Ergon Energy Corporation Limited ABN 50 087 646 062
Energy Queensland Limited ABN 96 612 535 583
Energex Limited ABN 40 078 849 055

1.0 SUMMARY

This notice is being issued by Energex to declare that there are no credible non-network options to the proposed works to replace 33/11kV transformers at Palm Beach Zone Substation (SSPBH). This determination is made under *clause 5.17.4(c) of the National Electricity Rules (NER)* and is published according to *clause 5.17.4(d).* In this regard, Energex will not be publishing a non-network options report for the proposed works at SSPBH.

The reasons for this conclusion are as follows:

- This project is to replace substation assets that are reaching their retirement age.
- Only three large demand charged businesses are in the supply area of SSPBH and main demand reduction initiatives that could be undertaken by these have already been undertaken previously under Demand Reduction Initiative.
- The demand reduction opportunities available to the majority of the other businesses supplied by this substation would be relatively small as they are only consumption charged sites and would be limited in demand reduction terms with very small returns in demand reduction per site.
- Hence, the likelihood of non-network opportunities being able to deliver a demand reduction needed is very low .
- Available funding that can be used for a non-network solution to address the load-at-risk is around $82/kVA. Energex typically use a threshold cost of $185/kVA for screening demand response procurement.
- Hence, it is anticipated that there would be no non-network alternatives available.
- In addition, this option leads to a significant reduction in the network reliability at SSPBH that is located in an urban area with high load density.

Energex will publish the final project assessment report as the project cost is below $10 million.

Ergon Energy Corporation Limited ABN 50 087 646 062
Energy Queensland Limited ABN 96 612 535 583
Energex Limited ABN 40 078 849 055

2.0 EXISTING NETWORK

2.1 Introduction

Palm Beach Zone Substation (SSPBH) is equipped with 3 x 10/12.5MVA 33/11kV transformers and provides electricity supply to approximately 9,700 predominantly domestic customers in the Bilinga, Currumbin, Currumbin Waters, Elanora And Palm Beach areas.

It is supplied from Burleigh Heads Bulk Supply Substation (SSBHD) via 33kV feeders 396 and 3756.

Geographic and schematic views of the network area under study are provided in Figure 1 to Figure 2.

Figure 1: Existing 33kV network arrangement (geographic view)

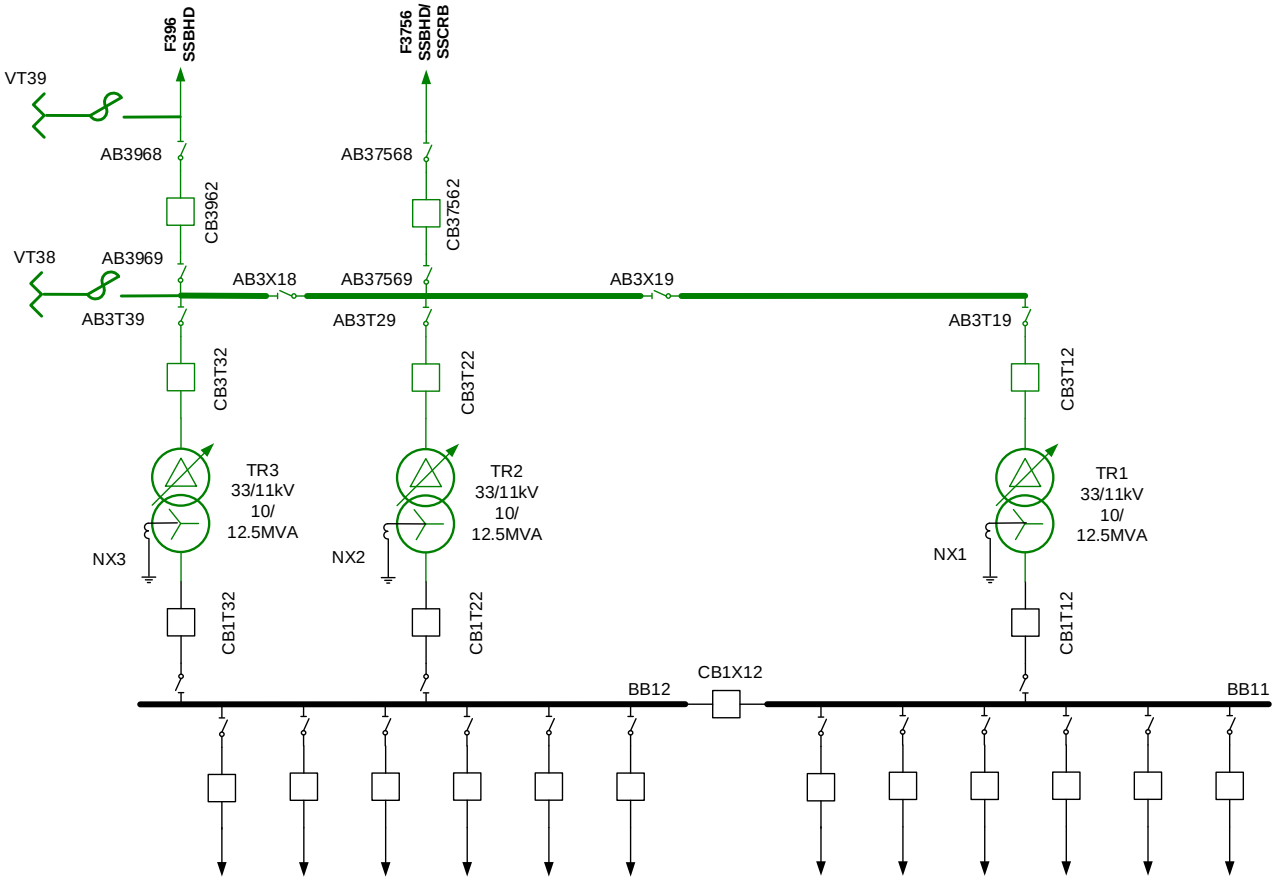


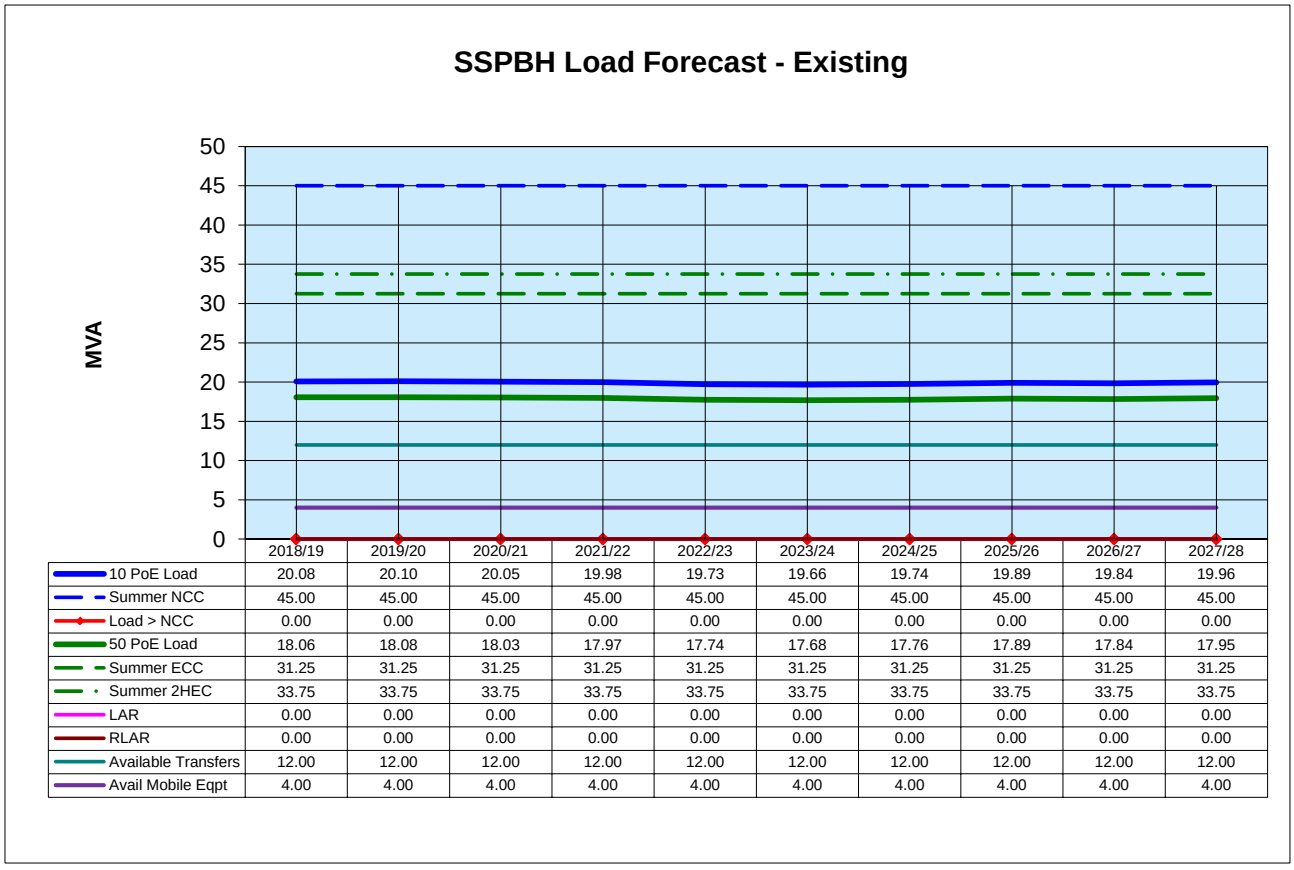
Figure 2: Existing network arrangement at SSPBH (schematic view)

2.2 Identified need of the existing network

2.2.1 Sub-transmission network limitations

Substation capacity

SSPBH is equipped with 3 x 10/12.5MVA 33/11kV transformers. The substation capacity is limited by transformers, providing a Normal Cyclic Capacity of 45MVA. 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), available transfers and available mobile equipment, are shown in Figure 5.



	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28
10 PoE Load	20.08	20.10	20.05	19.98	19.73	19.66	19.74	19.89	19.84	19.96
Summer NCC	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
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	18.06	18.08	18.03	17.97	17.74	17.68	17.76	17.89	17.84	17.95
Summer ECC	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25	31.25
Summer 2HEC	33.75	33.75	33.75	33.75	33.75	33.75	33.75	33.75	33.75	33.75
LAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RLAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Available Transfers	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
Avail Mobile Eqpt	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00

Figure 3: Substation load forecast (existing network)

As outlined above:

- There are no capacity limitations at SSPBH within the planning horizon.

Note: Several residential apartment complexes have been proposed in the suburbs served by SSPBH. These have not been considered in the load forecast given above.

A Plant Overload Protection Software (POPS) scheme is installed at SSPBH to

automatically reduce load to below 2HEC in the event of a contingency condition.

Substation Load

The load duration and actual load curves for SSMTC are shown in Figure 4 and Figure 5.

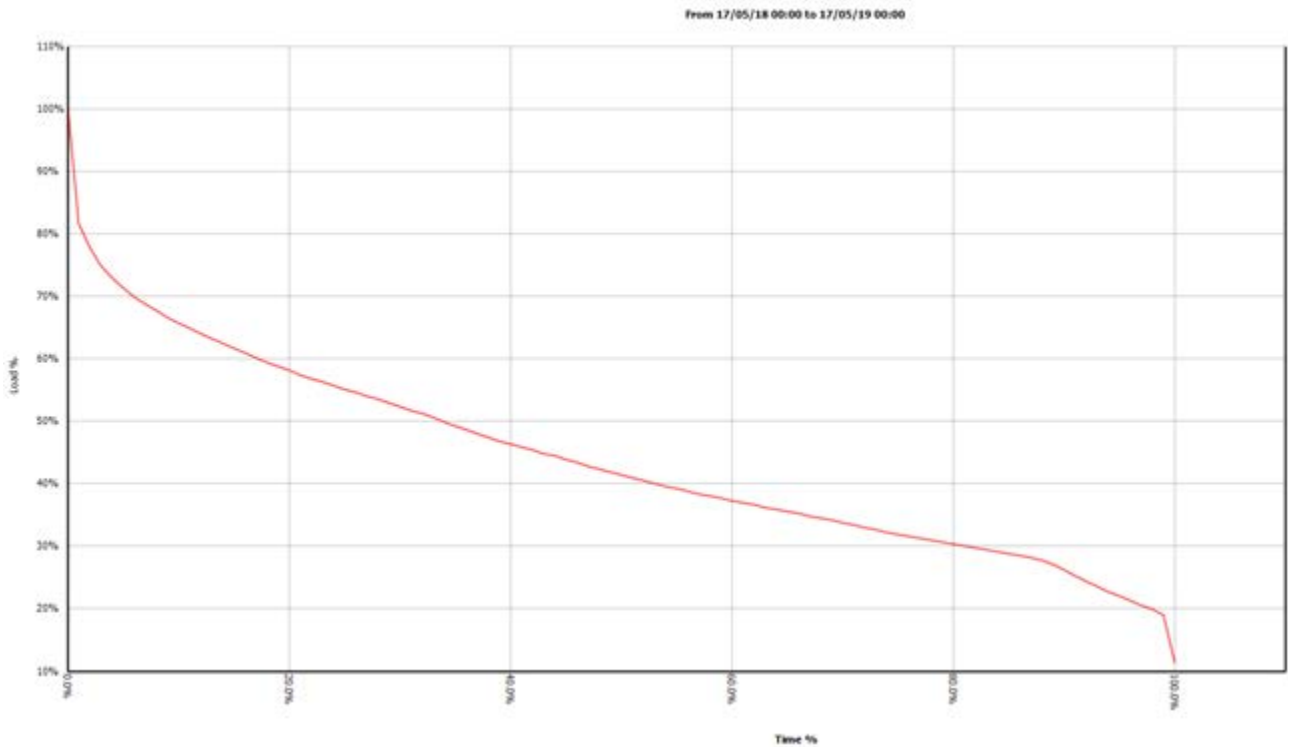


Figure 4: Substation load duration curve

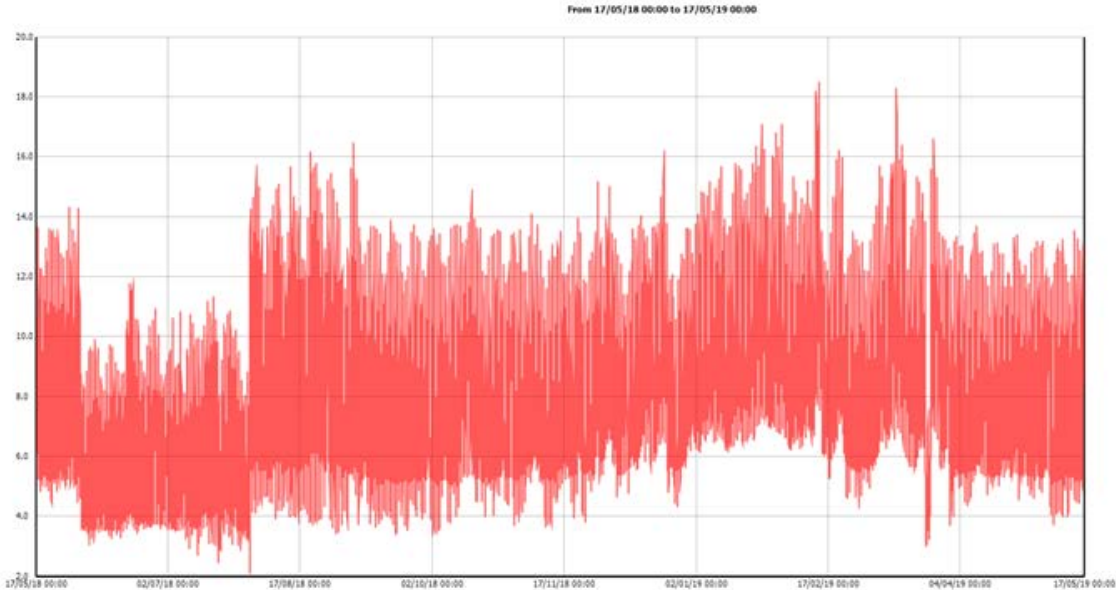


Figure 5: Substation load curve

Substation condition

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 SSPBH, the following have been deemed to reach retirement ages as follows:

- 33/11kV transformers TR1, TR2 and TR3 in 2022;
- 33kV VT39 in 2022; and
- 33kV isolators AB3T19, AB3T29 and AB3T39 in 2024.
-

33/11kV transformers

TR1 has been manufactured in 1977 while the other two units have been manufactured in 1971. All three units are fitted with problematic Fuller tap changers with known operational and maintenance issues. All the units have oil leaks and leakages from the oil-containment bund to the ground. Dissolved gas analysis indicate that the transformers are wet. Furan analyses suggest that the transformers are in an advanced state of insulation degradation. All these units have been recommended to be replaced by 2022.

33kV Voltage Transformer VT39

It is estimated that this unit has been manufactured in 1970. It has oil leaks. Furthermore, it is near the property boundary and does not meet the boundary clearance requirements. Catastrophic failure of this unit will have a safety impact on the adjacent residential property. This unit has been recommended to be replaced in 2022.

33kV isolators AB3T19, AB3T29 and AB3T39

Braid type isolators AB3T19, AB3T29 and AB3T39 are assumed to have been installed around 1970. This braided type, vertical break isolator model is known to be a problematic one, potentially resulting in cracked insulators supporting the female contacts when closed. All these units have been recommended to be replaced by 2024.

Other Identified Issues

Other identified issues at SSPBH include ageing 33kV bus support insulators, non-availability of surge arresters on the 33kV feeder cable terminations, non-availability of a feeder VT on feeder 3756 bay and ageing 33kV horizontal double-break type isolators.

2.3 Impact of doing nothing

The “do nothing” option is not acceptable as the following do not comply with the applied service standards:

- Continuous operation of the existing 33/11kV transformers poses an ongoing low-level risk to the safety of Energex personnel due to the potential for in-service failure of the asset.
- Continuous operation of the existing 33/11kV transformers poses an ongoing low-level risk to the environment due to the potential for in-service failure of the asset causing an oil spill.
- The level of risk will increase over time, particularly as these assets continue to age and deteriorate.

Ergon Energy Corporation Limited ABN 50 087 646 062
Energy Queensland Limited ABN 96 612 535 583
Energex Limited ABN 40 078 849 055

3.0 OPTIONS ANALYSIS

In the process of determining the most cost-effective solution to address the identified network limitations, Energex has sought to identify a practicable range of technically feasible, alternative options that could satisfy the network requirements in a timely and efficient manner. As a result of this process, Energex has identified a range of options that represent practical alternatives to address the network limitations in the required timeframe.

3.1 Alternative options rejected

For clarity, the following alternative options were considered but rejected as they were not practicable alternatives for the reasons indicated in Table 1.

Ergon Energy Corporation Limited ABN 50 087 646 062
Energy Queensland Limited ABN 96 612 535 583
Energex Limited ABN 40 078 849 055

Alternative option	Reasons for being rejected
Repair of oil leaks on power transformers to extend their life	– Only a short-term reactive solution. – Does not address the major age related issues such as advanced state of insulation degradation.
Decommission SSPBH, transfer load from SSPBH to SSBHD and convert the 33kV feeder F393 to 11kV to supply the remaining load	– Not feasible due to the significant voltage drop across the 11kV energised feeder. – SSPBH is optimally configured (under the previous project) to accommodate the transformer replacement and associated works.
Replace the existing transformers with 1 x 25MVA transformer and invest in demand management to reduce the load on SSPBH	– Only 3 large demand charged businesses are in the supply footprint of SSPBH and main demand reduction initiatives that could be undertaken by these have already been undertaken previously under Demand Reduction Initiative. – The demand reduction opportunities available to the majority of the other businesses supplied off this substation would be relatively small as they are only consumption charged sites and would be limited in demand reduction terms with very small returns in demand reduction per site. – Hence, Incentives Delivery Dept. has confirmed the likelihood of non-network opportunities being able to deliver a demand reduction needed is very low. – In addition, this option leads to a significant reduction in the network reliability at SSPBH that is located in an urban are with high load density.
Non-network asset solution	– Available funding that can be used for a non-network solution to address the load-at-risk is around $82/kVA. Energex typically use a threshold cost of $185/kVA for screening demand response procurement. Hence, it is anticipated that there would be no non-network alternatives available.

Table 1: Alternative options rejected

Ergon Energy Corporation Limited ABN 50 087 646 062
Energy Queensland Limited ABN 96 612 535 583
Energex Limited ABN 40 078 849 055

3.2 Network options

The options below have been assessed as meeting the applied service standards. .

3.2.1 Option 1: Replace existing transformers with 2 x 15/25MVA transformers

This option involves replacing the existing 3 x 10/12.5MVA 33/11kV transformers with 2 x 15/25MVA 33/11kV transformers, replacing the identified 33kV isolators and voltage transformer VT39 and reconfiguring the 33kV bus at SSPBH.

Instead of procuring two new 33/11kV transformers, this option proposes to use the third 25MVA transformer unit this is redundant at Meeandah Zone Substation (SSMDH) and an existing 25MVA strategic spare transformer currently in stock at Larapinta. Details of Option 1 are discussed in greater detail in latter sections of this report.

Figure 6 provides a schematic diagram for Option 1.

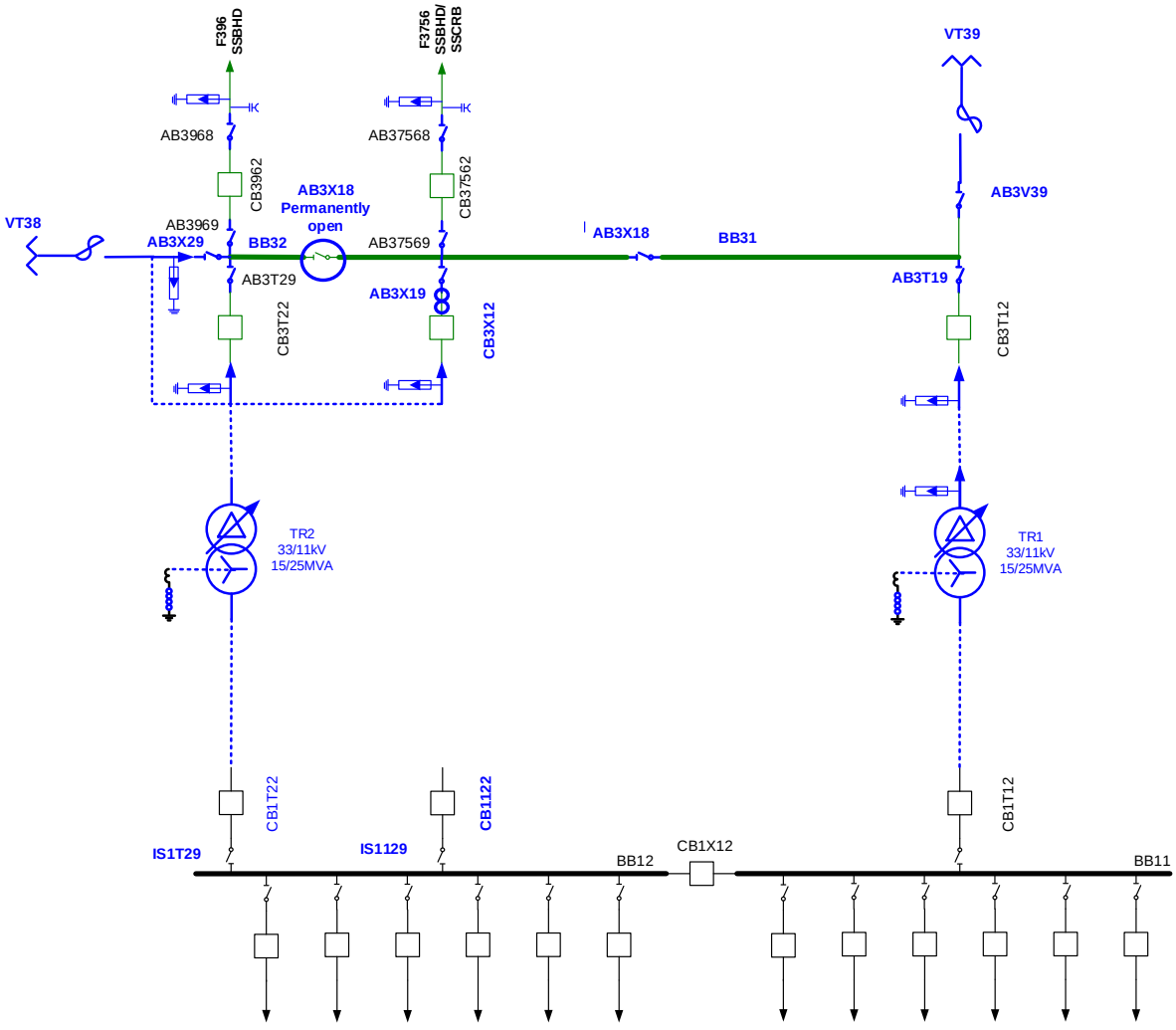


Figure 6: Proposed network arrangement (schematic view)

3.2.1 Option 2: Replace the existing transformers with 1 x 25MVA transformer and convert the existing 33kV feeder F396 to 11kV to provide a backup supply

This option involves replacing the existing 3 x 33/11kV transformers with a single 15/25MVA transformer and converting 33kV feeder F396 to 11kV to provide backup supply for a contingency at SSPBH which will be supplied via a single 33kV feeder F3756.

In the event of an outage, 11kV transfers to SSCRB and SSBHD will be utilised to ensure compliance with the Safety Net.

Figure 7 provides a schematic diagram for Option 2.

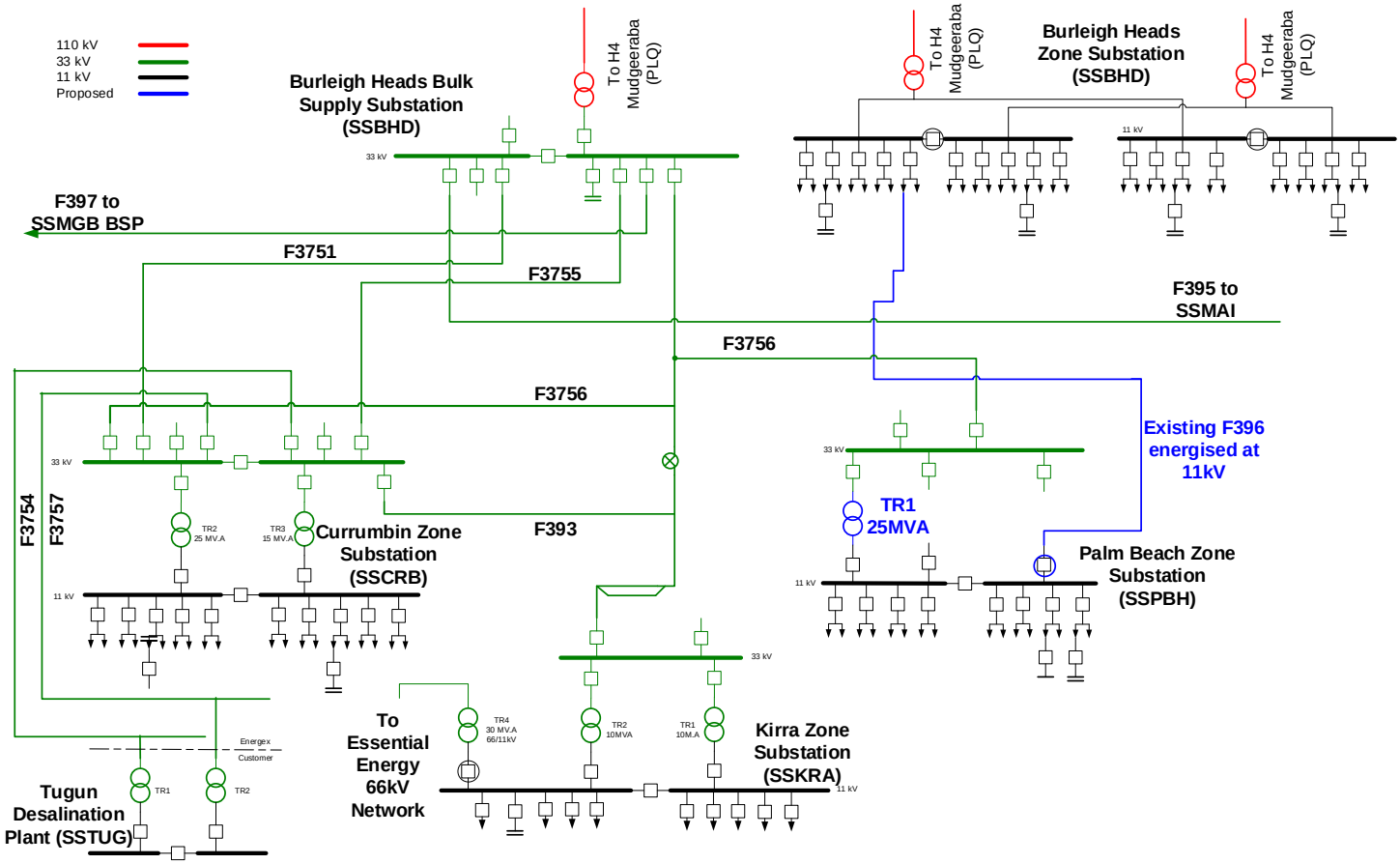


Figure 7: Proposed network arrangement (schematic view)

3.3 Non-Network options assessment

In order for a non-network solution to address the identified limitations, it should be able to maintain supply to the customers supplied by SSPBH as the existing network assets reach their retirement age.

There are no other substations in the area that can supply the existing/forecast load at SSPBH when the existing substation assets reach retirement age. Embedded generation to supply the load continuously and provide reliable and secure supply is not practicable. The likelihood of non-network opportunities being able to deliver a demand reduction needed is very low. Available funding that can be used for a non-network solution to address the load-at-risk is well below the typical value used by Energex for demand response procurement. Hence, it is anticipated that there would be no non-network alternatives available.

Ergon Energy Corporation Limited ABN 50 087 646 062
Energy Queensland Limited ABN 96 612 535 583
Energex Limited ABN 40 078 849 055

4.0 RECOMMENDED DEVELOPMENT

4.1 Scope of proposed works

To address the limitations at Palm Beach, it is proposed to replace the existing 3 x 10/12.5MVA 33/11kV transformers with 2 x 15/25MVA 33/11kV transformers. Works include:

At SSPBH

- Installation of 2 x 15/25MVA 33/11kV transformers (ex-MDH TR2 and strategic spare ex-Larapinta) and 33kV and 11kV cables to suit.
- Relocation of NEX recovered from ex-MDH TR2 for new TR2.
- Installation of surge arresters and voltage sensors on 33kV feeders 396 and 3756.
- Replacement of existing 33kV isolators AB3969, AB3968, AB37569, AB37568, AB3T19, AB3T29, AB3T39, AB3X19 with current contact items.
- Installation of new cable termination structures near existing CB3T12, CB3T22, CB3T32, VT38, new TR1 and installation of surge arresters.
- Installation of a new 33KV bus VT (VT39) with in-line fuses and a new 33KV isolator (AB3V39).
- Demolishing existing TR3, TR1, TR2 foundations, storage shed foundation and old control building.
- Removal of oil-contaminated soil.
- Construction of foundations (taking the flood resilience requirements into account) for 2 x 25MVA transformers.
- Construction of masonry walls ~~for noise reduction~~ on the west and north sides of proposed TR1 and on the north side of proposed TR2 and a ~~fire~~wall between the transformers. Architectural treatment to be provided as required.

  Note: A noise assessment has been carried out for the new transformer locations. Based on this it has been proposed to construct masonry walls.
- Renaming existing CB3T22 to CB3X12 and replacement of 2 x CTs with new CTs to suit high-impedance and low-impedance bus zone protection schemes.
- Removal of existing VT38, rebuild bay for a new 33KV isolator (AB3X29) and re-install VT38 on a new structure.
- Permanently opening isolator AB3X18.

- Establishment 3 x lightning masts.
- Re-configuring of the existing 33kV bus zone protection scheme BB31 (renamed to BB32) to exclude CB37562, CB3T12 and to include CB3X12.
- Installation of a second bus zone protection scheme (comprising of high-impedance and low-impedance scheme similar to the existing in a new bus zone protection panel) to include CB37562, CB3T12 and CB3X12 and name it BB31.
- Re-wiring of the existing TR2 protection panel on site for the new bus-section CB CB3X12 control/protection.
- Recovery and scraping of existing 33kV line VT39.
- Rewiring of SEL351-7 protection relay in existing CB1T22 to provide 3OC EF CBF protection to CB1122.
- Rewiring of CT connections to provide BOC BEF protection on SEL351-7 in CB1T22 (new).
- Installation of a 33kV VT ACO scheme.
- SACS builds required at each stage (3 stages and clean-up) to incorporate standard alarms/controls and new 33kV bus arrangement.
- Relocation and cutover of the fibres (PBH-BHD and PBH-CRB) in the old control building shed to the new communications pits and running fibres to panel in control room.

At SSMDH

- De-commissioning, refurbishment and transportation of ex-MDH TR2 to SSPBH;

Note: Meeandah Zone Substation (SSMDH) is equipped with 3 x 15/25MVA 33/11kV transformers. Based on the current load forecast and the Customer Outcome Standards (COS), only two transformers are required at this substation. Hence, it is proposed to recover TR2 at SSMDH to be installed at SSPBH, in the process improving asset utilisation within Energex.

- Decommission 33kV Hawker Siddeley Horizon circuit breaker CB3T22 and return to stores as a spare.
- Recovery of panel and relays on the panel for transformer TR2 protection (Reyrolle Duobias), CB3T22 protection (SEL351) and NEF protection (Reyrolle TJM11) from the panel.
- Sealing all floor penetrations in the TR2 transformer compound.

- Recovery of 11kV cables (from CB1T22 to TR2) and 33kV cables (from CB3T22 to TR2).
- SACS rebuild to reflect recovery of transformer TR2 and CB3T22.

Figure 8 shows the proposed network on completion of the recommended works.

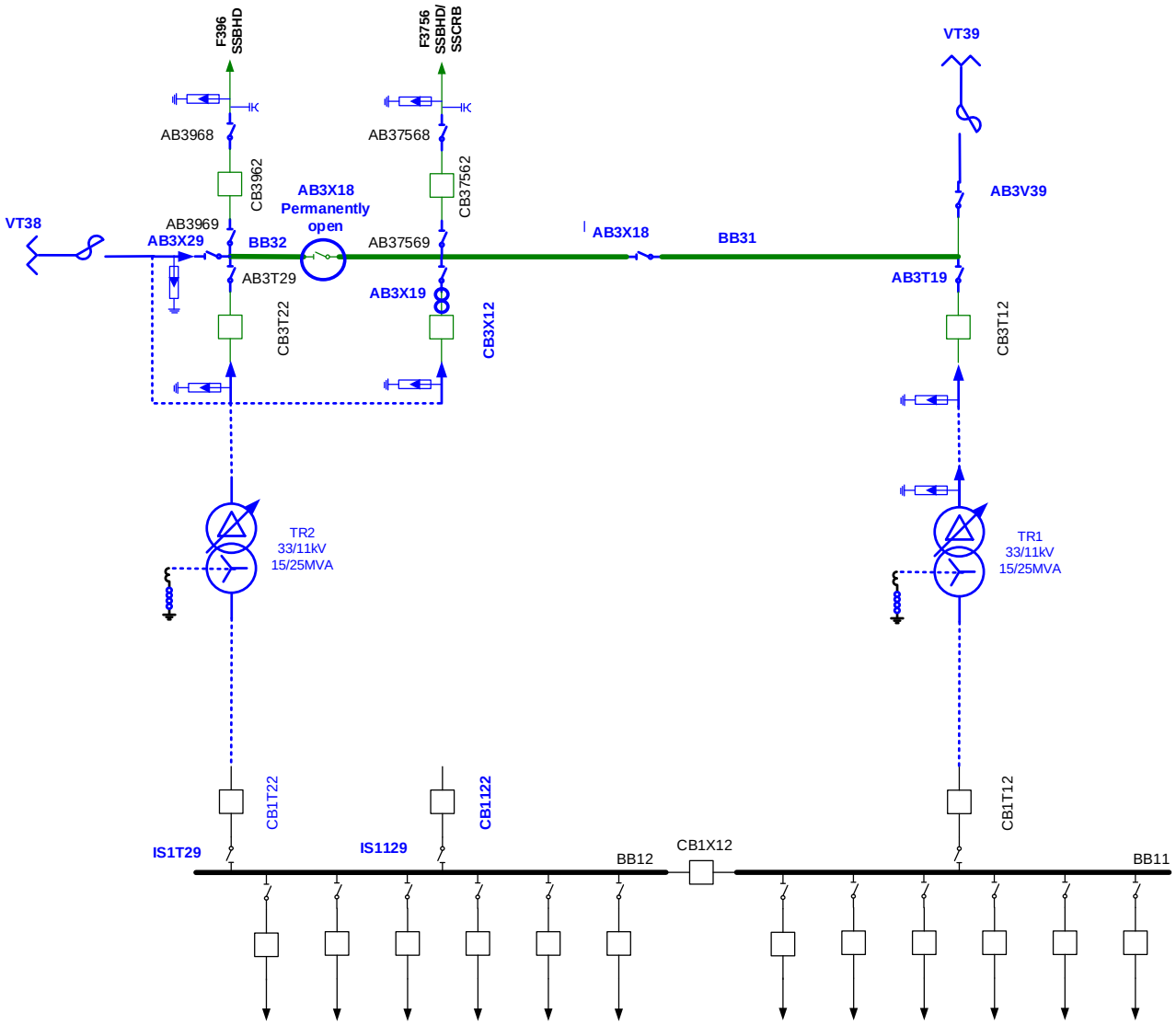


Figure 8: Proposed network arrangement (schematic view)

5.0 CONCLUSION

Considering the nature of the project, being refurbishment-driven, and as per *clause 5.17.4(c) of the NER* Energex has determined that there are no credible non-network options to address the identified need at SSPBH. Thus, with reference to *clauses 5.17.4(c) and 5.17.4(d) of the NER,* Energex will not publish a non-network options report for the proposed project to replace 33/11kV transformers at SSPBH.

Since the project cost is below $10 million, Energex is exempt from publishing a draft project assessment report, as per *clause 5.17.4(n) of the NER,* and will therefore publish the final project assessment report in accordance to *clause 5.17.4(p) of the NER*.

Ergon Energy Corporation Limited ABN 50 087 646 062
Energy Queensland Limited ABN 96 612 535 583
Energex Limited ABN 40 078 849 055