

# The Energy Queensland Group Notice of no non-network options

24 September 2018

## MCE Mount Crosby East – Establish new substation to replace Mount Crosby Substation (SSMTC)



Part of the Energy Queensland Group



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### 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 establish Mount Crosby East Zone Substation (SSMCE). 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 SSMCE.

The reasons for this conclusion are as follows:

- This project is to replace substation assets that are reaching retirement age.
- This substation is used solely for the supply of a single large customer, Seqwater.
- The Seqwater load at this site comprise of the raw water pumping station and the water treatment plant that supplies 50 percent of the drinking water of South East Queensland.
- Considering the importance of the load to be supplied, Seqwater have specified their requirements for supply. As such, non-network options are not applicable to address the identified limitations and satisfy the customer requirements.
- The proposed substation project is customer-specified according to the requirements of Seqwater.

Energex will publish the final project assessment report as the portion of the project cost that is payable by Energex is below \$10 million.

## 2.0 EXISTING NETWORK

### 2.1 Introduction

Mount Crosby Substation (SSMTC) is a dedicated customer substation providing supply to Seqwater's East Bank Raw Water Pumping Station (RWPS) and East Bank Water Treatment Plant (WTP) via 5 x 5MVA 33/5.5kV Energex owned transformers. The customer is equipped with a 5-section 5.5kV ring bus containing 800A transformer circuit breakers. The ring bus supplies 16 motors, the majority of which are started direct-on-line. This water treatment plant supplies 50 per cent of the drinking water in South East Queensland, benefiting 1.6 million customers.

In March 2016, Energex was ready with the Feasibility Study for the project to replace four 33/5.5kV transformers and two 33kV circuit breakers at SSMTC for an estimated cost of \$9.1M at 2015/16 prices. This was a refurbishment-driven project to replace assets that were deemed to reach retirement age. During this time, a Regulatory Investment Test for Distribution (RIT-D) is not required for refurbishment-driven projects.

In September 2016, Seqwater formally informed Energex of their flood immunity requirement of 1:1,000 AEP for existing infrastructure and 1:10,000 AEP for new critical electrical infrastructure at the Mount Crosby East Bank RWPS. This prompted a complete review of the scope of the project. Seqwater requested Energex to establish a new substation to supply the RWPS and WTP loads at a new site to meet the 1:10,000 AEP flood immunity requirement on the condition that the cost difference between the original replacement project and the new substation will be payable by Seqwater. Energex assisted Seqwater in assessing a number of potential substation sites that satisfies the technical requirements of both organisations.

In October 2017, Seqwater formally informed Energex of their decision to upgrade their supply voltage level at the RWPS and WTP from 5.5kV to 11kV. This allows Energex to use standard equipment for the proposed new substation. It was also at this time that Seqwater finalised the site selection for the proposed substation.

Considering that the 33/5.5kV transformers TR1-TR4 have already reached retirement age and to mitigate the impacts of a failure of one of these transformers, an 8MVA 33/5.5kV transformer was purchased and delivered to the existing SSMTC as part of the contingency plan. This will allow the quick connection of this spare transformer in a contingency event.

Geographic and schematic views of the network area under study are provided in Figure 1 to Figure 3.

# RIT-D: Notice of no non-network options

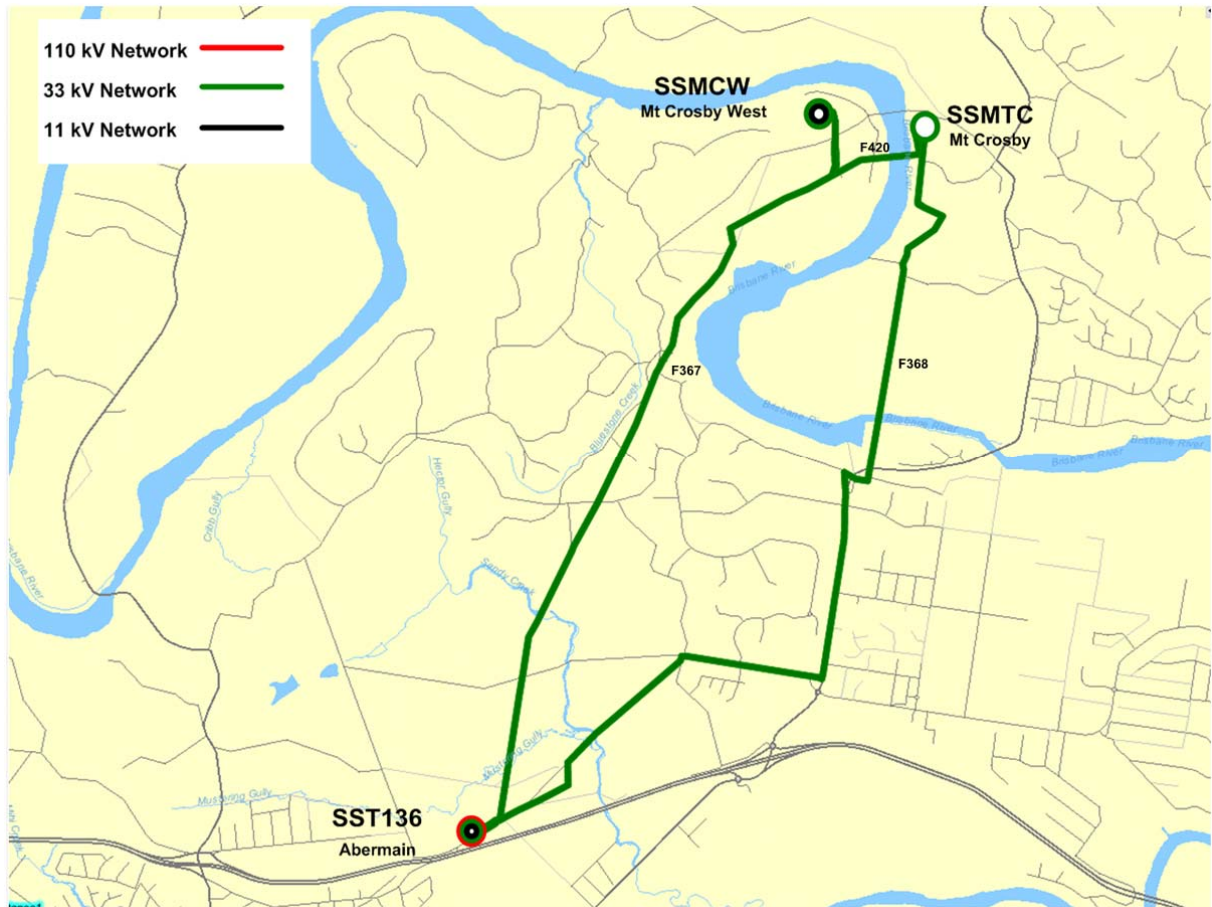


Figure 1: Existing network arrangement (geographic view)

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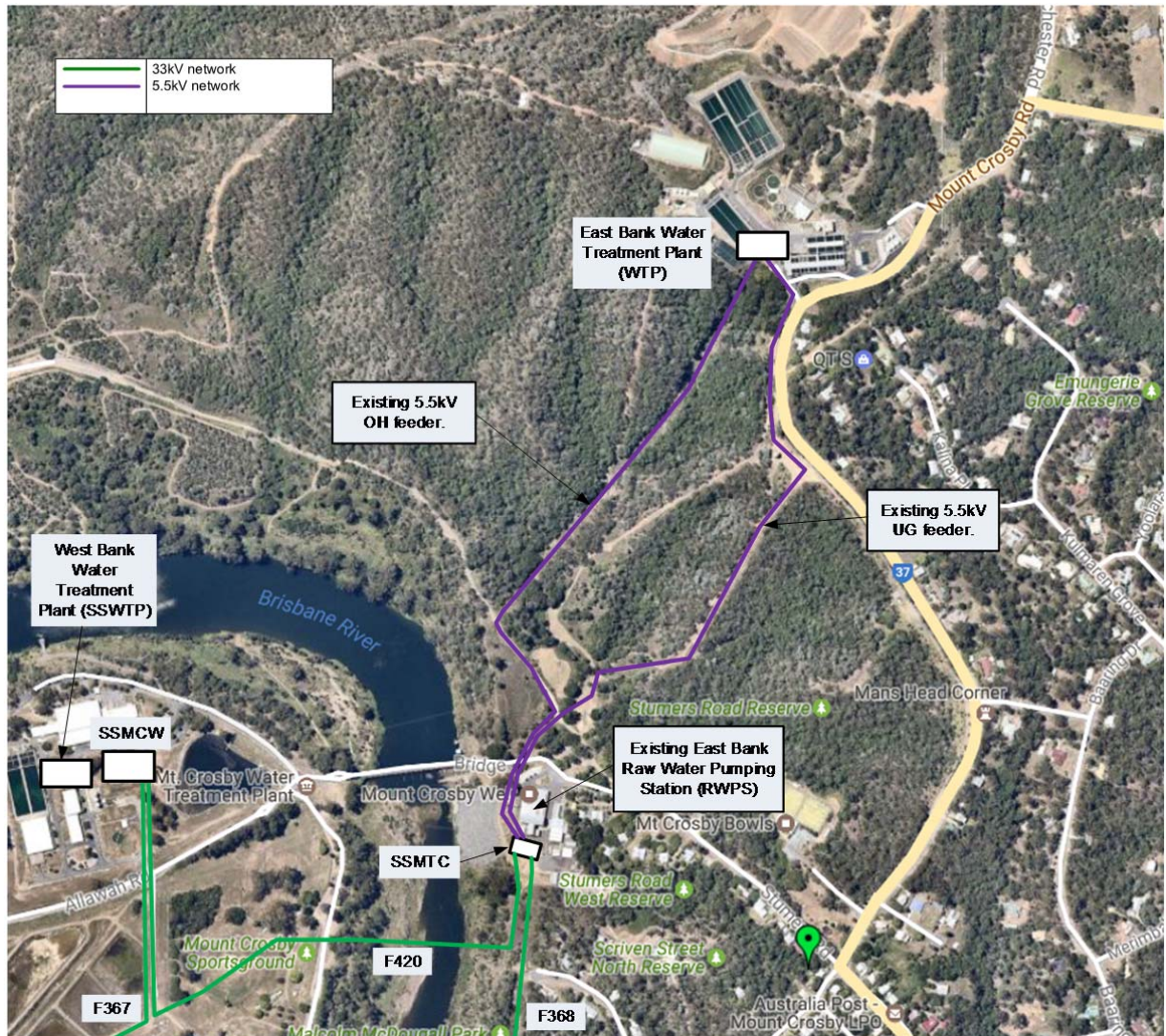


Figure 2: Existing network arrangement at SSMTC (geographic view)

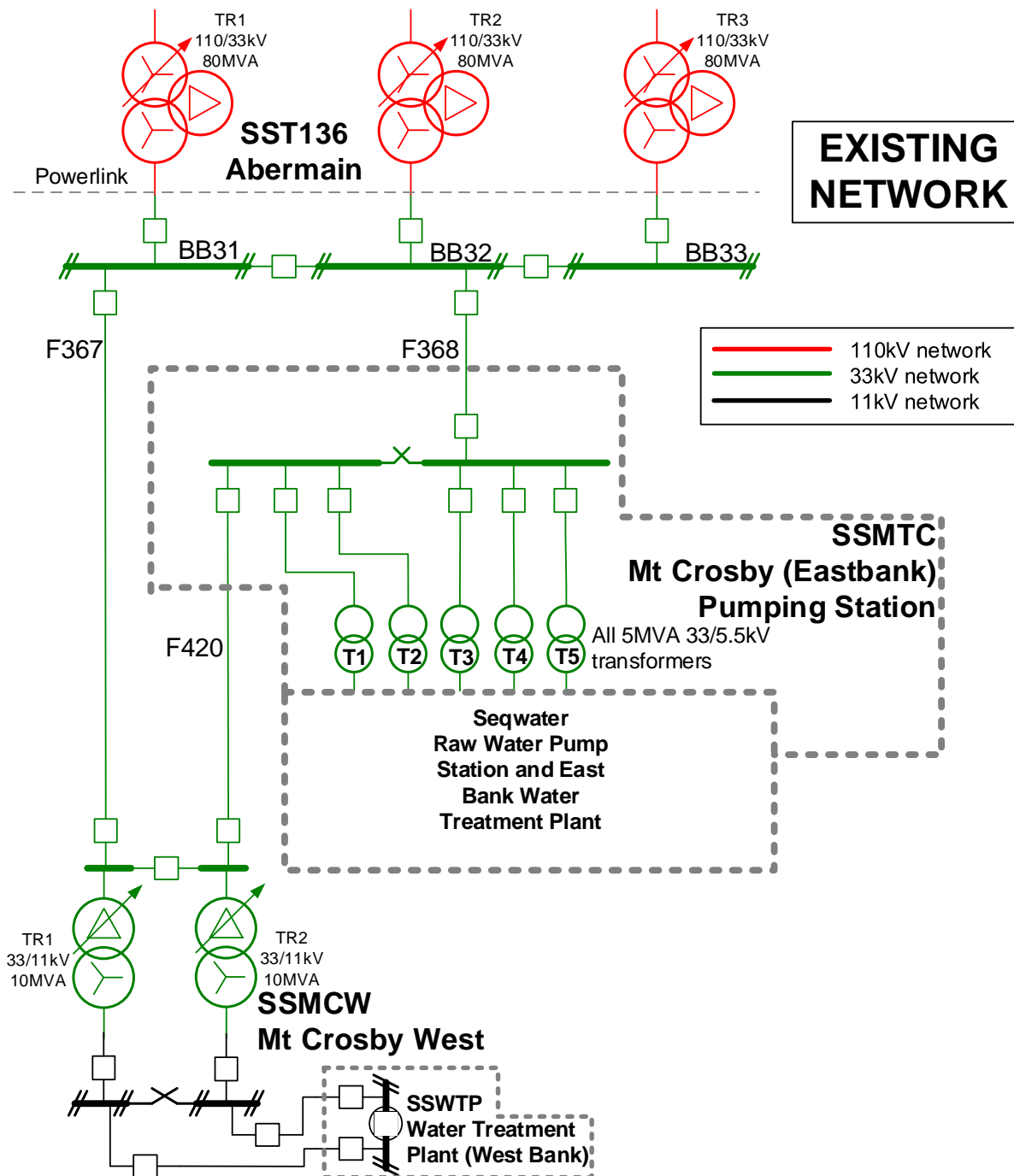


Figure 3: Existing network arrangement (schematic view)

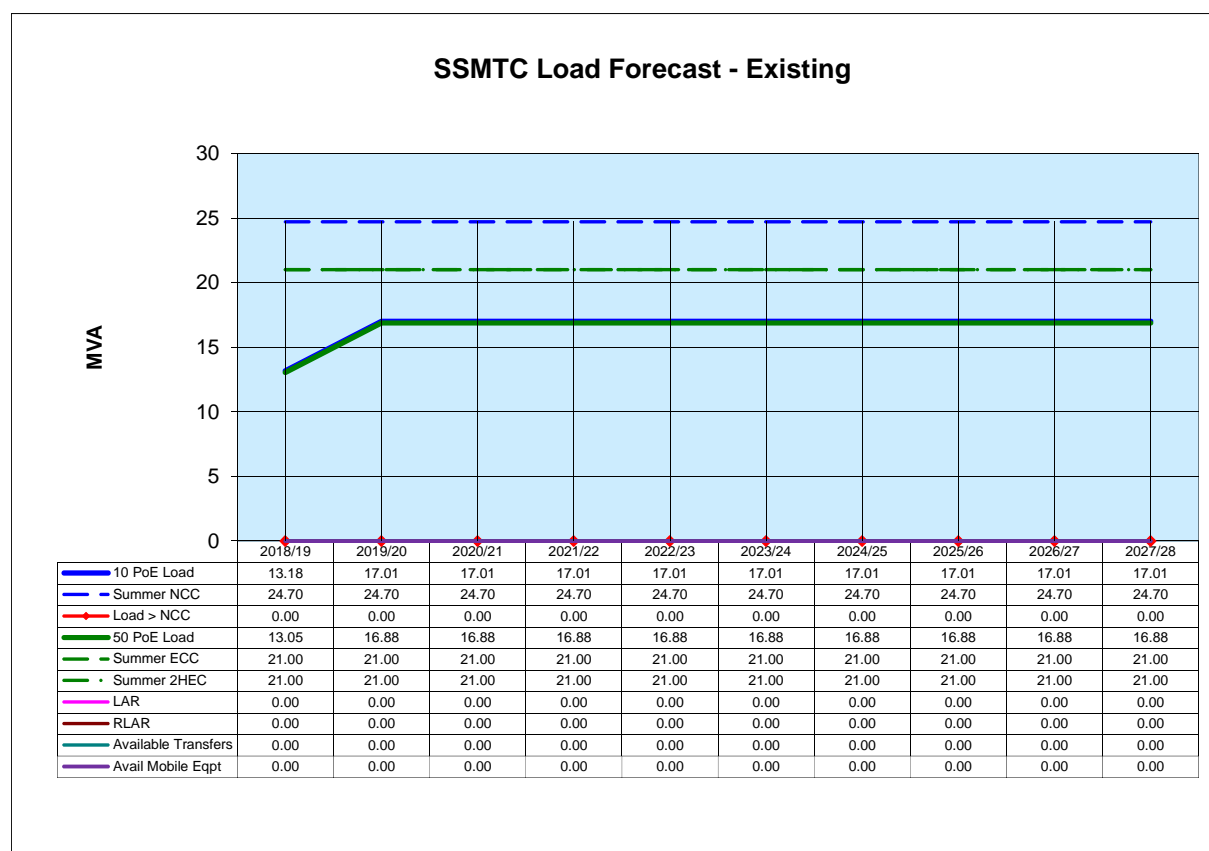


## 2.2 Identified need of the existing network

### 2.2.1 Subtransmission network limitations

#### Substation capacity

SSMTC is equipped with 5 x 5MVA 33/5.5kV transformers. The substation capacity is limited by the transformers, providing a Normal Cyclic Capacity of 24.7MVA. 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 4.



**Figure 4: Substation load forecast (existing network)**

As outlined above:

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

A Plant Overload Protection Software (POPS) scheme is not installed at SSMTC 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 5 and Figure 6. The peak load at SSMTC for 2017 was 12.2MVA. This is the load supplied at RWPS and WTP.

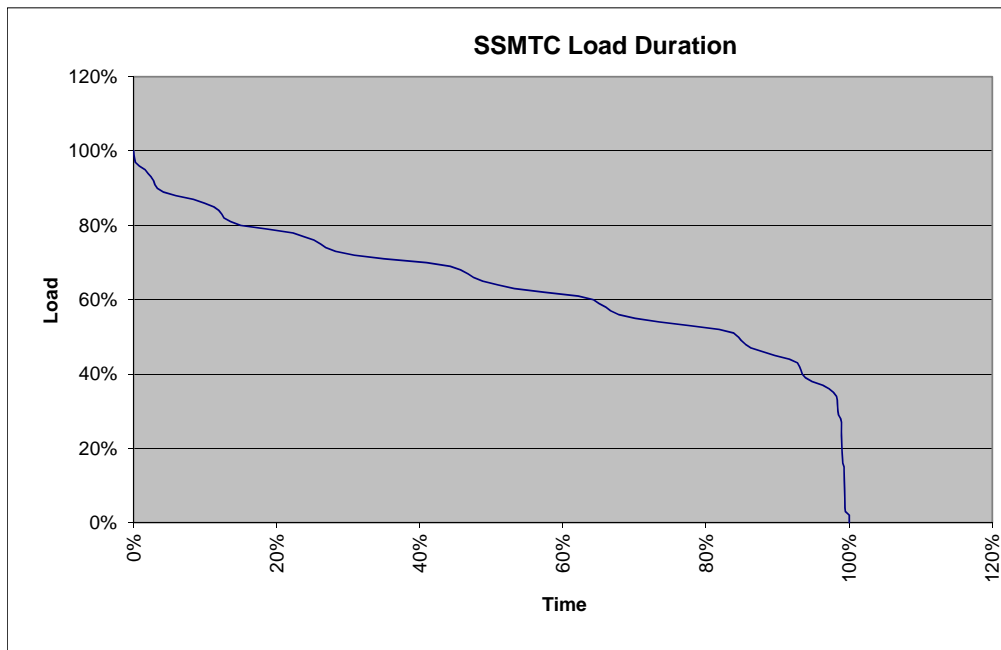


Figure 5: Substation load duration curve

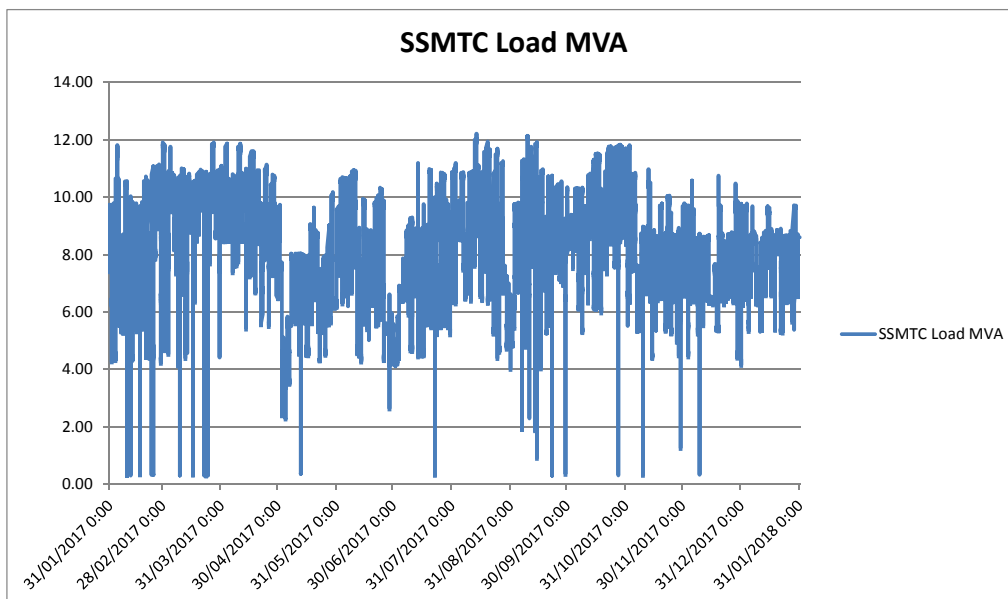


Figure 6: Substation actual load curve – SSMTC

### 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 asset, the following have been deemed to reach retirement age as follows:

- 33/5.5kV transformers TR1 to TR4 due to transformer condition; and
- 33kV CBs CB3682 and CB4202 due to mal-operation and potential bushing failures;

#### 33/11kV transformers

The 33/5.5kV transformer TR1 was manufactured in 1966, while transformers TR2 to TR4 were manufactured in 1947. These transformers have been consistently in the moderate to extremely wet insulation range and having reached retirement age in 2014 to 2016.

Transformer TR5 is relatively young, with a year of manufacture of 1979. The CBRM states that this transformer is expected to reach retirement age in 2039.

#### 33kV circuit breakers

The 33kV circuit breakers CB3682 and CB4202 were manufactured in 1962 and 1952, respectively. Bulk oil circuit breakers of this type of circuit breaker is known to be slow to operate, which can lead to protection issues during faults. This type of CB is no longer being manufactured. They are maintenance intensive, requiring an intrusive maintenance following six fault operations, as per the Energex Maintenance Policy. As per the CBRM analysis, the 33kV circuit breakers CB3682 and CB4202 are deemed to have reached retirement age in 2016 and 2020, respectively.

### 2.3 Customer requirements

Seqwater is the sole customer being supplied by the existing substation SSMTC. The substation supplies the load at the East Bank RWPS and WTP. In addressing the identified limitations at SSMTC, Seqwater have the following requirements:

- Establish a new substation to meet flood immunity requirement of 1:10,000 AEP for the new critical electrical infrastructure.
- Full N-1 capacity to supply the full load of the RWPS and WTP during contingency conditions.
- Added security with the provision of a mobile substation connection.
- Supply voltage at 11kV.
- All 11kV feeder reticulation to be owned and maintained by Energex.
- Provision for a third 25MVA 33/11kV transformer in the future.

### 2.4 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 existing 33kV bulk oil CBs that have been deemed to reach retirement age at SSMTC poses an ongoing low level risk to Energex personnel safety due to the potential for in service failure of the assets.
- Continuous operation of existing 33kV bulk oil CBs that have been deemed to reach retirement age at SSMTC poses an ongoing low level risk to customer supplied by SSMTC (major customer, large scale business).
- Continuous operation of existing 33/5.5kV transformers that have been deemed to reach retirement age at SSMTC poses an ongoing moderate level risk to the customer due to the reduced capacity and reliability of supply for an extended duration in the event of transformer failure contingency scenario.
- Continuous operation of existing 33/5.5kV transformers that have been deemed to reach retirement age at SSMTC poses an ongoing low level business risk to Energex personnel safety due to the potential for in service failure of the assets.
- Continuous operation of existing 33/5.5kV transformers that have been deemed to reach retirement age at SSMTC poses an ongoing moderate level risk to the environment due to the potential for in service failure of the assets.
- Large customer requirements for supply will not be met.

## 3.0 OPTIONS ANALYSIS

Considering the customer requirement for a new substation that satisfies their flood immunity criteria, Energex was involved in the assessment of possible sites for the proposed substation.

### 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.

Replace 33/5.5kV TRs and 33kV CBs at existing SSMTc	<ul style="list-style-type: none"> <li>– Does not meet the flood immunity requirements of the customer of 1:1,000 AEP for existing infrastructure and 1:10,000 AEP for new critical electrical infrastructure.</li> <li>– Does not meet the requirement of the customer for supply voltage of 11kV.</li> </ul>
Establish a new 33/11kV substation with 3 x 25MVA transformers	<ul style="list-style-type: none"> <li>– The customer requested this network arrangement. However, as explained to the customer, this would not achieve their idea of N-2 reliability as there are only two 33kV feeders supplying the substation. This would not be a cost-effective option.</li> </ul>
Non-regulated asset solution	<ul style="list-style-type: none"> <li>– The project refurbishes/replaces existing assets. No capacity limits occur for non-network options to address.</li> <li>– The proposed solution results in an incidental augmentation using standard building blocks or a modern day equivalent. A non-network solution for this incidental increase in capacity is not economically viable.</li> <li>– Due to the importance of the load to be supplied, Seqwater have specified their requirements for supply. As such, non-network options are not applicable to address the identified limitations and satisfy the customer requirements.</li> </ul>

**Table 1: Alternative options rejected**

## 3.2 Network options

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

### 3.2.1 Option 1: Establish new Mount Crosby East Zone Substation

This option involves establishing a new zone substation at Mount Crosby with 2 x 33kV feeder bays, 2 x 33kV transformer bays, 2 x 25MVA 33/11kV transformers, 3-bus x 11kV switchboard, establishment of 4 x 11kV feeders to the new RWPS customer substation (SSWPT) and 2 x 11kV feeders to the WTP substation (SSETP) and provision for a mobile substation connection. Details of Option 1 are discussed in greater detail in latter sections of this report.

Figure 7 and Figure 8 provide geographic and schematic diagrams for Option 1.

# RIT-D: Notice of no non-network options

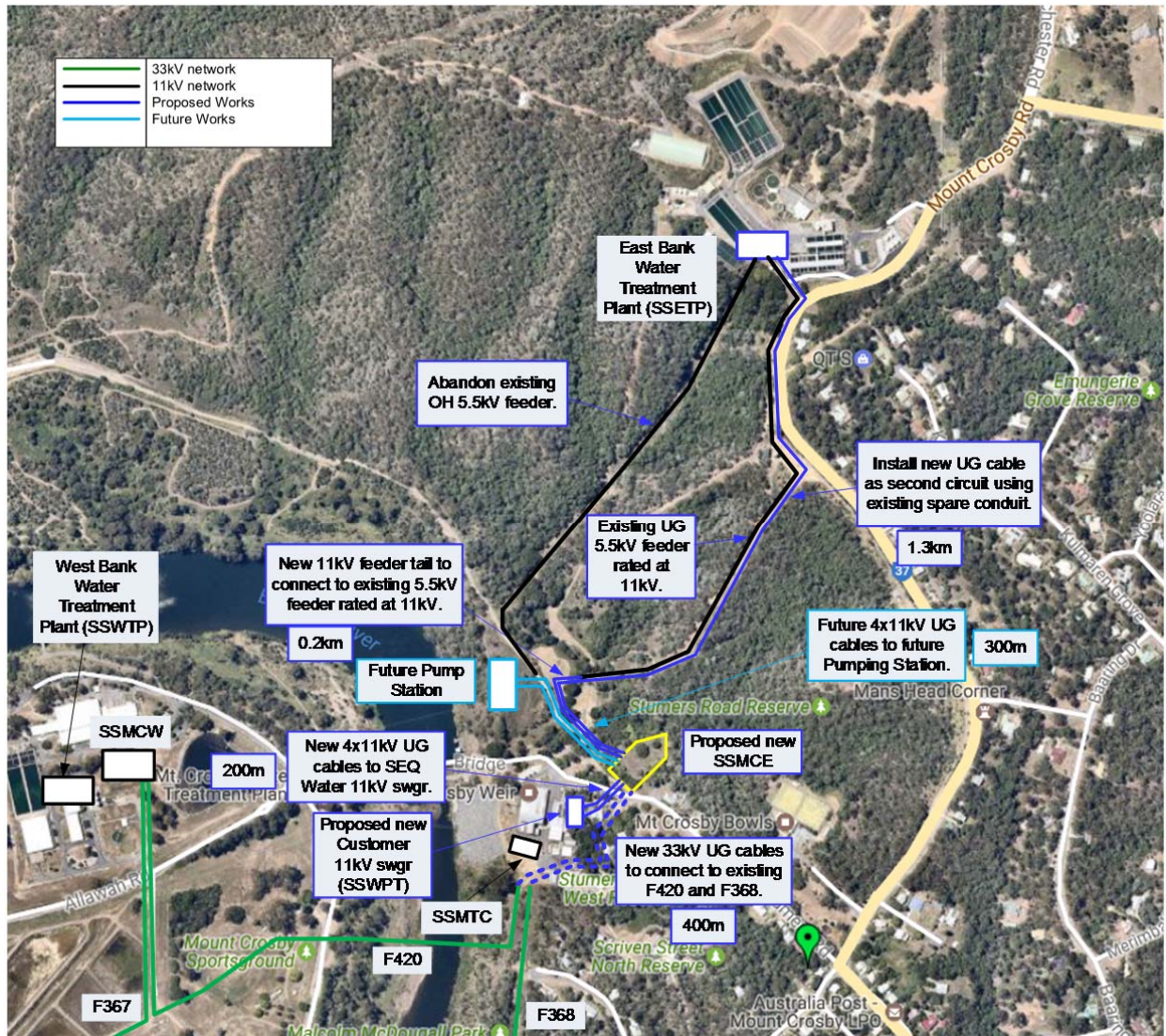


Figure 7: Proposed network arrangement (geographic view)

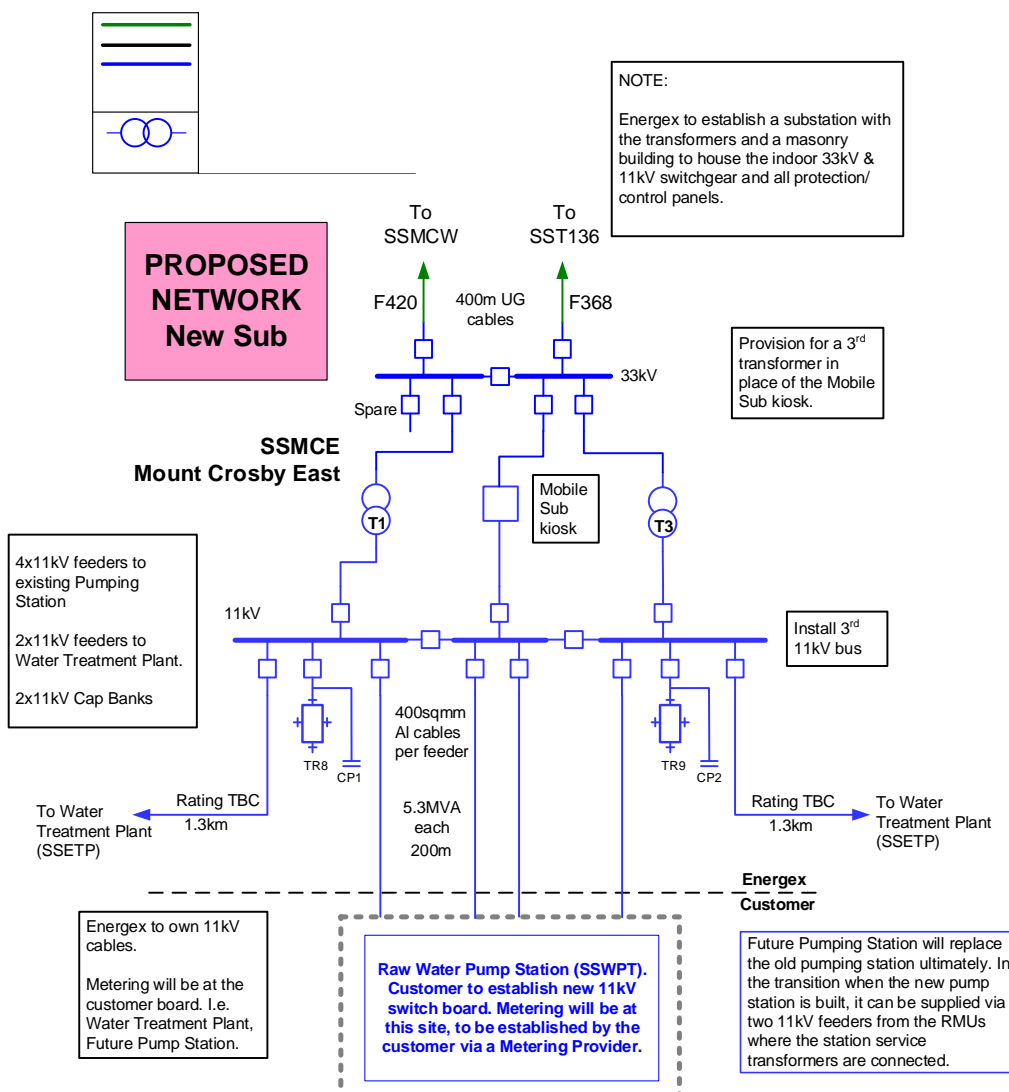


Figure 8: Proposed network arrangement (schematic view)

### 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 pumping station and water treatment plant load of Seqwater as the existing network assets reach retirement age. It should also be able to meet the requirements of Seqwater for the reliability and security of supply to these loads.

There are no other substations in the area that can supply the Seqwater load at the East Bank when the existing substation assets reach retirement age. Embedded generation to supply the load continuously and provide reliable and secure supply is not practicable. Seqwater will not entertain a load curtailment agreement at this site due to its importance.

### 4.0 RECOMMENDED DEVELOPMENT

#### 4.1 Scope of proposed works

To address the limitations at Mount Crosby, it is proposed to establish the new Mount Crosby East Zone Substation (SSMCE). Works include:

- installation of a masonry building to house the 33kV indoor switchgear including 2 x bus sections with 1 x bus section CB, 2 x transformer CBs, 2 x 33kV feeder CBs, 1 x 33kV CB for the mobile substation kiosk and 1 x spare 33kV CB;
- installation of an 11kV indoor switchgear inside the masonry building including 3 x bus sections with 2 x bus section CBs, 3 x transformer CBs, 8 x feeder CBs;
- installation of 2 x 25MVA 33/11kV transformers;
- installation of 2 x 4.4MVAR capacitor banks;
- establishing 4 x 11kV UG feeders to the new customer switchboard at the RWPS;
- establishing a second 11kV UG feeder to the existing customer board at the WTP;
- establishing 2 x 33kV UG feeder tails to connect the OH 33kV feeders from SSMTTC to the new SSMCE substation;
- upgrading protection at SST136 and SSMCW;
- recovering and scrapping of 33/5.5kV transformers TR1 to TR5 and the spare 33/5.5kV transformer used for contingency;
- recovering and scrapping of 7 x 33kV CBs and 10 x 33kV disconnectors, outdoor bus structures; and
- remediation of the old SSMTTC site.

With the proposed works to establish the new SSMCE Zone Substation, Seqwater has committed to the following:

- Provision and preparation of a site suitable and ready for the construction of the proposed substation, according to Energex requirements.
- Civil works to upgrade Stumers Road to be suitable for access to the proposed substation and crossing of the 33kV and 11kV UG cables.
- Civil works for the conduits for the 33kV and 11kV UG cables.
- Civil works to upgrade the driveway on the east side of the RWPS into a heavy haulage road.



- Engage a metering provider to establish metering at the new RWPS (SSWPT) 11kV switchgear building and the existing WTP (SSETP).
- Transfer ownership of the existing 5.5kV cable, rated at 11kV, from Seqwater to Energex.
- Payment of the cost difference between the original project to replace transformers and CBs in situ and the actual cost of the establishment of the new substation.

Seqwater will establish a new 11kV substation at the RWPS (SSWPT) where the 4 x 11kV feeders from the new SSMCE substation will be terminated.

Due to the criticality of the RWPS and WTP loads, Seqwater requires the higher reliability and security of supply. The proposed substation will have 2 x 25MVA 33/11kV transformers. There will be no interruption of supply for a contingency condition where one transformer is out of service. Furthermore, Seqwater required a connection kiosk for the deployment of a mobile substation for a prolonged outage of one of the 25MVA transformers and provision for a third 25MVA transformer in the future.

The cost of the original refurbishment-driven project was estimated at \$9.1 million. The estimated cost of the project to establish a new substation as per the requirements of Seqwater is approximately \$20.86 million. The difference in the actual project cost and the \$9.1 million will be payable by Seqwater as capital contribution to the cost of the connection project. The \$9.1 million, that is initially being paid for by Energex, is the subject of the RIT-D consultation. This expense by Energex will be incorporated to the network charges of Seqwater and will not be included in the Regulated Asset Base for the calculation of the network tariff.

## 5.0 CONCLUSION

Considering the nature of the project, being refurbishment-driven and customer-specified, 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 SSMTc. 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 establish SSMCE to replace SSMTc.

Since the Energex component of 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*.