Network Consultation Conclusions Report

Maintain reliability of electricity supply to Kalkallo zone substation customers.

SP AusNet
A member of Singapore Power Group

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Table of Contents

1 INTRODUCTION

1.1 Purpose

This network conclusions report documents the outcome of consultations with Registered Participants, AEMO and interested parties on the possible options, including but not limited to demand side options, generation options and market network service options investigated to address the network constraint identified for the electricity supply to Kalkallo zone substation, consistent with the requirements of chapter 5.6.2 (h) of the National Electricity Rules Version 53.

It details the conclusion of the investigation into options to address the network constraint identified for the supply to Kalkallo zone substation as detailed in the Network Consultation Paper[1] and provides information on the following aspects of the planning investigation:

- Assessment of all options,
- Details of the preferred proposal including its economic cost effectiveness,
- Summary of submissions received,
- Actions to be taken.

1.2 Consultation

The consultations took place between 6th August and 6th November 2013 following the publication of the consultation paper on the SP AusNet website and after sending the consultation paper to all registered providers of network support. The network consultation paper provided the following details:-

- Details of the supply risks to Kalkallo zone substation,
- Network and non-network options being considered,
- Requirements for network support options to meet.

1.3 Outcome

No feasible proposal for network support has been received in response to SP AusNet's consultation. Two registered providers of network support did give detailed consideration to the proposal but ultimately found that there was not an economic way for network support to replace the network options for this constraint.

In the absence of alternative network support proposals SP AusNet is proceeding with the construction of a new 66kV line between Kalkallo (KLO) and Doreen (DRN) zone substations at a cost of $14.3 M (nominal) to reinforce the existing radial 66kV line from South Morang terminal station (SMTS) to Kalkallo zone substation. This project is provisionally scheduled for construction in 2015 and 2016 with commissioning expected by November 2016. This project was first foreshadowed in the 2010 edition of SP AusNet's annual Distribution System Planning Report which covered the period from 2011 to 2015.

[1] Network Consultation Paper – Maintain reliability of supply to Kalkallo zone substation customer's

2 OPTIONS CONSIDERED

Several alternatives including both network augmentation and network support options were considered by SP AusNet to address the supply risks at Kalkallo. The options are summarised below together with the findings on the suitability of each option:

2.1 Option 1 - Do nothing

Doing nothing was found to be inconsistent with the obligations of the National Electricity Rules to

- meet or manage the expected demand; and
- maintain the quality, reliability and security of supply.

Doing nothing was found to be inconsistent with the obligations of the Electricity Distribution Code to

- to minimise the risks associated with the failure or reduced performance of assets;

Doing nothing was found to be uneconomic as:-

The existing radial 66kV network cannot provide an adequate 66kV supply for the customers of this area. The radial SMTS-KLO/KMS (Kilmore South) 66kV line configuration will result in loss of supply to increasing numbers of customers each time this 66kV line has an outage. Economic studies considering the probability of a line outage indicate that KLO customers could expect to face annual losses amounting to $1,141,000 due to unplanned outages by 2016.

2.2 Option 2 - New KLO-DRN 66kV line

The preferred network option to secure 66 kV supplies to Kalkallo zone substation involves the construction of a new 66kV line between Kalkallo and Doreen zone substations along a route as shown on the following diagram and associated station work to connect the new 66kV line within each zone substation:

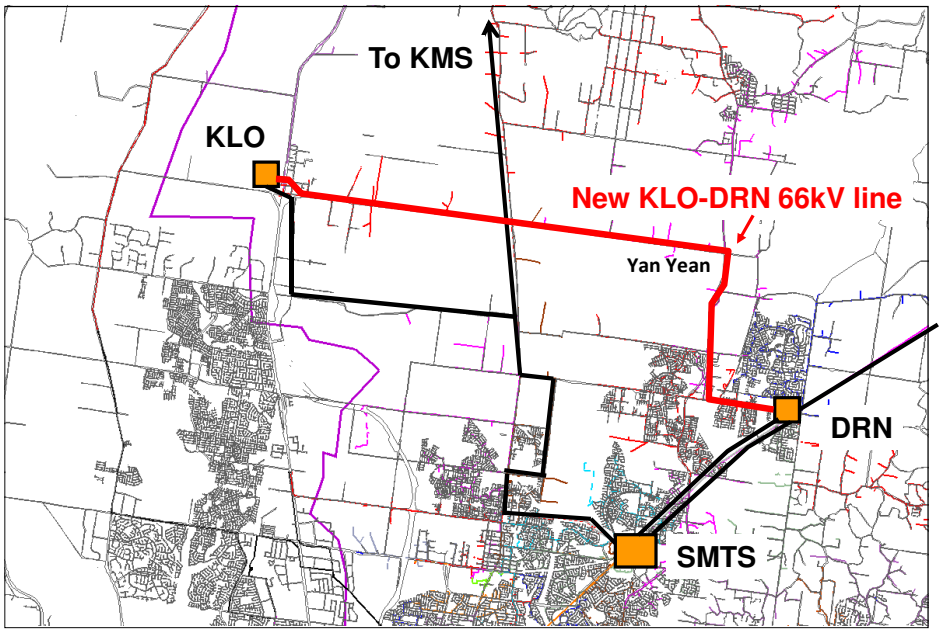

Figure 1 – New KLO-DRN 66kV line

This option was found to deliver the lowest present value cost of all options considered including a do nothing option. This is the preferred network option.

2.3 Option 3 - New SMTS-KLO No. 2 66kV line

A second alternative 66kV line route was identified to secure electricity supplies to KLO customers as shown on the following diagram:

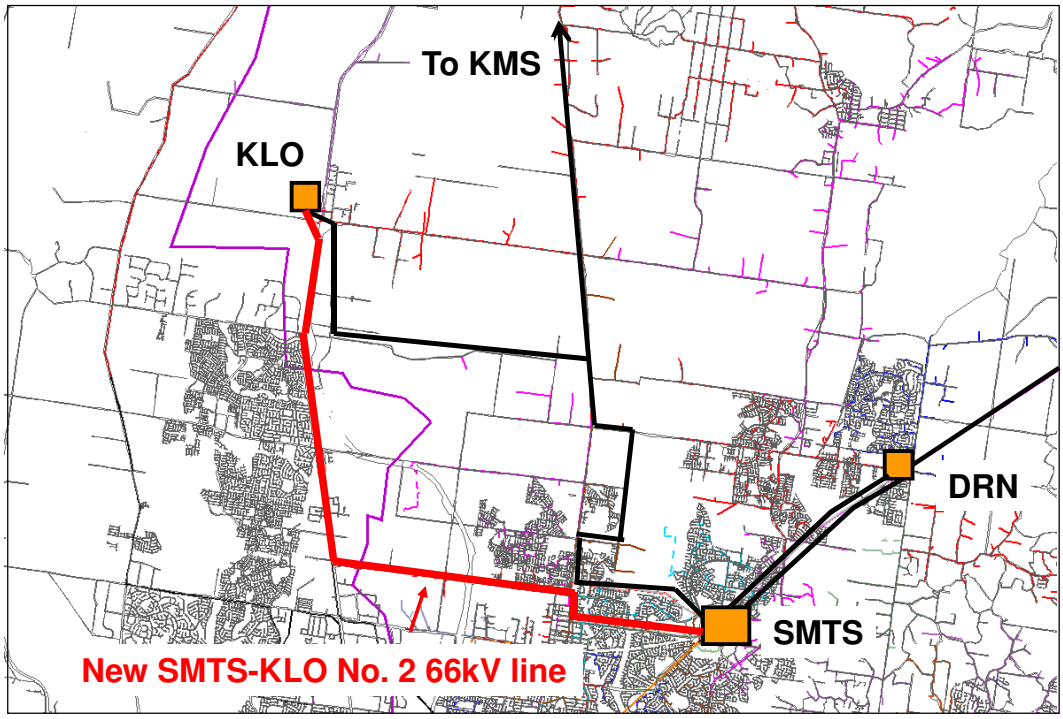

Figure 2 – SMTS-KLO/KMS No. 2 66kV line alternative route.

This alternative route was found to have several disadvantages:

- A route along McDonalds Rd could be achieved with the duplication of the existing SMTS-EPG No. 1 66kV line via double circuit construction but at a high construction cost,
- The section north along Epping Rd would then be required though an established commercial area, also at a high cost of construction,
- The section in O'Hern's Rd would require a duplication of the existing SMTS-ST 66kV line which would also require the rebuild of an existing 66kV line to double circuit construction. An alternative route along Cooper St could avoid Epping Rd and O'Hern's Rd but this area is already served by underground electricity circuits and it would be difficult to acquire permits to establish the 66kV line as overhead construction within the timeframe to address this constraint.

Construction of the final section along the Hume Hwy is considered straight forward.

At around 26 kilometres the overall route length is slightly longer than that for Option 2, and the construction is more complex. The estimated overall cost was found to be higher for this option when compared with the preferred option, Option 2.

2.4 Option 4 - SMTS-KLO/KMS No. 2 66kV line.

A third network augmentation option was identified to bring a second 66kV line into KLO from the existing SMTS-KMS 66kV line to create a second SMTS-KLO/KMS 66kV line as shown in the following diagram:

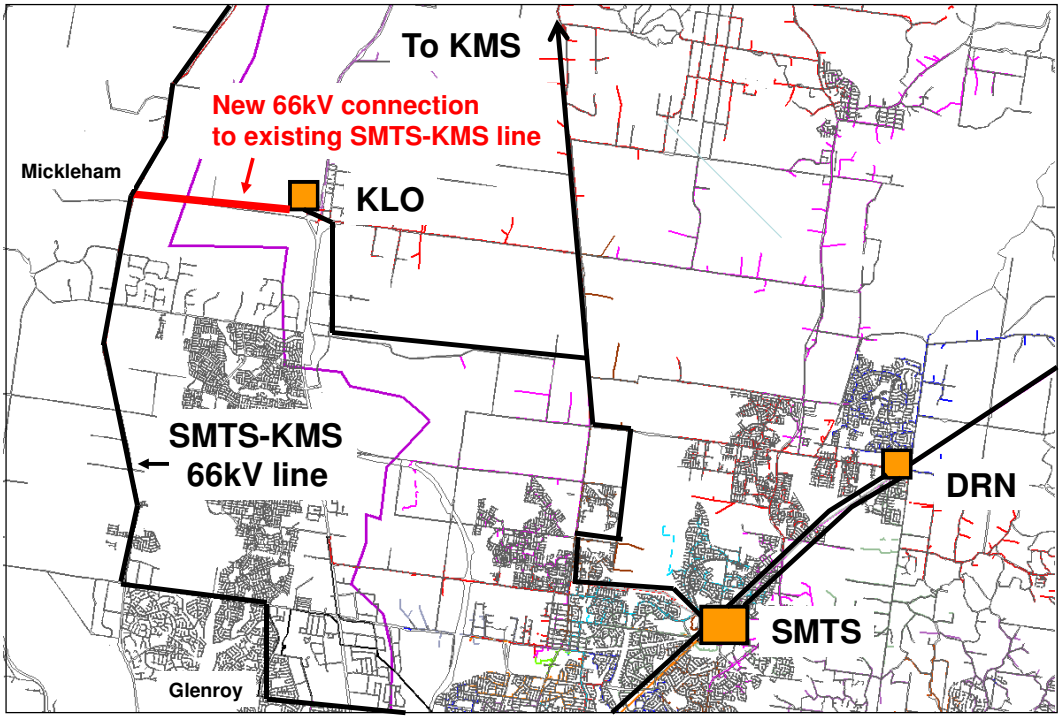

Figure 3 – Connect into existing SMTS-KMS 66kV line to secure second 66kV supply to KLO.

This option was found to require 25 kilometres of the existing SMTS-KMS 66kV line between Glenroy and Mickleham to be re-conductored to 37/3.75 AAC to provide sufficient capacity to support the KLO load under an outage of the existing SMTS-KLO/KMS 66kV line. The re-conductoring would require a complete line rebuild involving additional and taller poles as the existing SMTS-KMS 66kV conductor (6/1/.186 ACSR) has insufficient rating.

The overall route length of new and re-constructed 66kV lines is around 30 kilometres and the estimated overall cost was found to be higher for this option when compared with the preferred option; option 2.

2.5 Option 5 - Install a 66kV switching station at Wollert

An option to install a 66kV switching station that allows faults between the tee at Wollert and KMS on the existing SMTS-KLO/KMS line to be cleared without interruption to the supply to KLO could also improve the security of supply to Kalkallo as shown in the following diagrams:

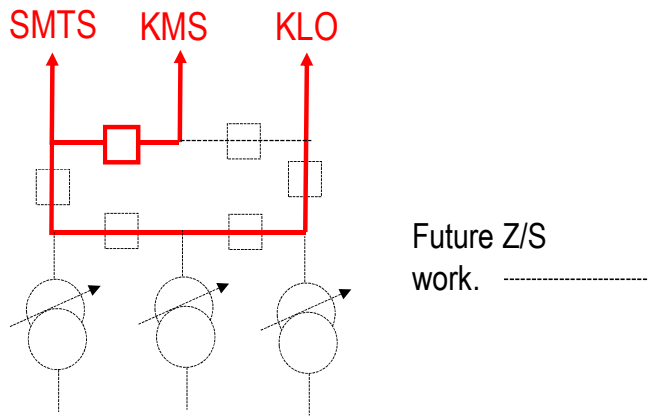

Figure 4 – WLT site works

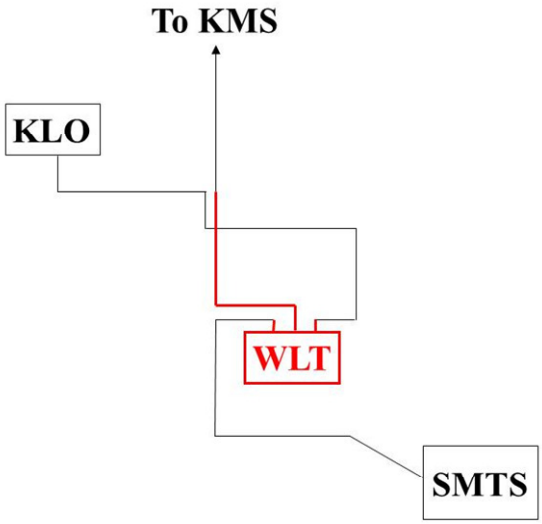

Figure 5 – Single line diagram

However, faults in the line section directly between SMTS and KLO would still cause customer outages at KLO and loading and customer numbers at KLO are growing steadily.

This option was found to have a loading limitation as load flow studies confirmed that only 6 MW of load can be supported at KLO via the KMS-KLO line during an outage of the SMTS-WLT line. The proposed switching at WLT cannot allow the KLO load to be supported via KMS limiting the benefit achievable with this option.

This option was found to have a lower economic benefit than the preferred option.

2.6 Option 6 - Install a new power station

The operation of a power station or stations connected into the 66kV or 22kV network at a suitable node or nodes could provide an electricity supply for KLO customers in the event of a failure of the existing radial SMTS – KLO/KMS 66kV line. In the case of an outage of this line in the year 2020; up to 40 MVA of customer load would require support.

To provide equivalent supply reliability to the preferred network augmentation option a power station would need to operate continuously and be capable of operating in an islanded mode to address the possible sudden loss of the radial 66kV line. SP AusNet found that whilst there are considerable cost and technical challenges in achieving this outcome this option is technically viable. The two proponents of network support generation that considered our consultation paper also concurred that it is uneconomic to operate a power station continuously in this way to provide a network support alternative to the proposed new 66kV line.

Generation could also be operated in standby mode with a rapid start immediately after a 66kV line fault has occurred, which allows restoration of supply to some or all of the lost customer load following a short outage. This generation could connect into the 66kV network and operate in an islanded mode or it could connect into the 22kV network at a number of points to directly support the 22kV feeder loads in conjunction with ties to adjacent zone substations. This alternative has lower value as all KLO customers still endure momentary outages and shorter duration outages whilst the generation is started following sustained line outages. SP AusNet was only able to offer lower network support payments to a network support generator that operated in this way. The two proponents of network support that considered this alternative also concluded that this alternative was not an economic option.

2.7 Option 7 - Demand management

Given the nature of the constraint which involves a single radial 66kV line that can easily supply all load under system normal but results in loss of supply to all customers under outage a demand side management option is not considered viable. A demand side management option would require all customers to accept sudden loss of all supplies.

SP AusNet's internal demand side management group recognises this is unrealistic and there was also no proposal from the demand side management proponent registered with SP AusNet in response to the consultation paper.

3 ECONOMIC EFFECTIVENESS OF OPTIONS

This section provides information on the economic cost effectiveness of the options considered.

The following table provides details of the economic analysis of the options considered:-

Economic analysis - $k

Option		2017	2018	2019	2020	2020 to 2030	Present Value
Do Nothing	EUE valued at VCR	-$ 1,446	-$ 1,659	-$ 1,687	-$ 2,014	-$ 35,487	-$ 21,458
	Opex costs	-$ 25	-$ 29	-$ 33	-$ 38	-$ 1,010	-$ 540
	TOTAL						**-$ 21,998**
Build KLO-DRN 66kV line (preferred option)	Capital Cost						-$ 10,596
	EUE valued at VCR	$ -	$ -	$ -	$ -	$ -	$ -
	Opex costs	$ -	$ -	$ -	$ -	$ -	$ -
	Network losses reduction	$ 32	$ 35	$ 33	$ 40	$ 740	$ 401
	TOTAL						**-$ 10,195**
Build SMTS-KLO/KMS No. 2 66kV line	Capital Cost						-$ 15,777
	EUE valued at VCR	$ -	$ -	$ -	$ -	$ -	$ -
	Opex costs	$ -	$ -	$ -	$ -	$ -	$ -
	Network losses reduction	$ 16	$ 17	$ 16	$ 20	$ 370	$ 201
	TOTAL						**-$ 15,576**
Build Wollert Switching Station	Capital Cost						-$ 8,363
	EUE valued at VCR	-$ 622	-$ 713	-$ 725	-$ 866	-$ 15,260	-$ 9,227
	Opex costs	-$ 7	-$ 9	-$ 11	-$ 13	-$ 400	-$ 225
	Network losses reduction	$ -	$ -	$ -	$ -	$ -	$ -
	TOTAL						**-$ 17,815**

EUE = Expected Unserved Energy VCR = Value of Customer Reliability

Table 1 – Economic assessment of options

The analysis shows that the preferred option has the lowest present value cost and delivers the highest net economic outcome of +$11,803k relative to the do nothing option.

A formal assessment of the economic effectiveness of the SMTS-KLO No. 2 66kV line option was not carried out as this option was clearly more costly than the preferred option, does not offer greater benefits and involves significantly higher delivery risks associated with the route through built up commercial areas in Epping..

A network support generation or demand side management option was also not evaluated in the economic analysis as the consultation process showed these options to be un-economic and registered proponents chose not to submit proposals.

The costs and benefits provided in Table 1 have been sourced from SP AusNet's internal business case model with discounting to 2014 and are calculated as follows:-

- The Capital Cost: The present value of the capital cost for each option.
- Expected Unserved Energy (EUE) valued at Value of Customer Reliability (VCR): The cost of outages to customer's supplied from Kalkallo zone substation with the existing radial line configuration is calculated as detailed in section 3 of the Network Consultation Paper,
- Opex costs: These costs are associated with higher operating costs associated with the existing radial line configuration and lease costs for a 22kV line voltage regulator site that will not be required after the proposed 66kV line is built,
- Network loss reduction: Reduced network losses is a market benefit calculated at $45 per MWhr.

4 DETAILS OF SUBMISSIONS RECIEVED

Ultimately SP AusNet did not receive any formal submissions to the consultation paper.

Two providers of network support thoroughly considered the proposal but ultimately found that there was not an economic way for network support to replace the network options for this constraint.

The first provider was an experienced provider of network support who currently has a contract to provide network support generation into the SP AusNet distribution network. They had two meetings with SP AusNet staff to clarify the requirements for a network support alternative as outlined in the Network Consultation paper. They also committed significant time to develop costs for the establishment of the required generation.

The challenge for network support generation is that it needs to be operated continuously to provide an equivalent service level compared with the network option and hence be able to receive network support payments consistent with the deferral value of the network augmentation project. This would be a very costly generation solution to implement. An option where generation was only started after an outage occurred provides an inferior service level as customer still experiences outages and the lower network support payments involved were not sufficient to make this alternative generation option economic either.

A second provider of network support also considered SP AusNet's proposals and also concluded that network support was not viable.

SP AusNet appreciates the time and effort invested by the two network support providers who diligently considered this opportunity and thanks them for their work. Further opportunities for network support will be made available in future.

5 RECOMMENDED ACTION

SP AusNet intends to proceed with the implementation of the preferred network option which is the construction of a new KLO-DRN 66kV line. Internal approval has now been given for this project and it is expected that this new 66 kV line will be commissioned by November 2016.