

# OPTIONS EVALUATION REPORT (OER)



Substation Capital Spares

OER 000000001457 revision 3.0

**Ellipse project no.:** P0008480

**TRIM file:** [TRIM No]

**Project reason:** Substation Capital Spares Procurement

**Project category:** Prescribed - Asset Renewal Strategies

## Approvals

Author	Robert Li	Substations Asset Strategist
Endorsed	Tony Gray	Substations Asset Manager
Approved	Tony Gray	Acting Manager / Asset Strategy
Date submitted for approval	5 January 2017	

## Change history

Revision	Date	Amendment
0	24 June 2016	Initial issue
1	27 October 2016	Update to 2016/17 dollars and SFAIRP/ALARP data
2	1 December 2016	Update to format
3	5 January 2017	Updated total value in the body of the text (missed previously)

## 1. Need/opportunity

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The Substation Spares Policy (GM AS S1 012) determines spares holdings to minimise total cost whilst maintaining required levels of system reliability. Capital Spares are those spares that are required by the spares policy and that meet the criteria set down in the Asset Recording and Control Procedure. They are recorded and valued with TransGrid's financial systems. Plant items such as circuit breakers, auxiliary transformers, current transformers, voltage transformers, or major components such as bushings, circuit breaker interrupters and poles may be classified as capital spares.

There is a need to provide funding to cover capital spares purchases that are anticipated to be required over the 2019–2023 regulatory period.

## 2. Related Needs/opportunities

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New works can result in the need to hold additional spares when equipment is purchased that cannot be supported with existing spares holdings.

The Voltage Transformer (VT) renewal program for the 2019–2023 period (Need 1442) may also recommend the purchase of the spare Capacity Voltage Transformers (CVTs) as the preferred option for the managing with the risk of CVT failures. The CVTs recommended under the VT renewal program will be in addition to the spares which are recommended under this Need.

## 3. Options

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All dollar values in this document are expressed in un-escalated 2016/17 dollars.

### Base Case

Operation of the transmission network relies on safe and effective high voltage plant within substations. Failure of equipment and delay in the restoration due to the non-availability of spares can lead to shut down of portions of the network and a cost to TransGrid's reputation and standing. Inability to respond appropriately to developing plant issues is certain to increase the failure rate dramatically over time.

The 'do nothing' option – i.e.: no future purchase of plant spares is not consistent with the operation of the electricity network.

### **Option A — Purchase appropriate capital spares to allow effective management of equipment [[OFR 1442A](#), [OFS 1442A](#)]**

Capital spares are required to respond effectively to equipment failure or impending failure as indicated by condition monitoring results. Asset management programmes, refurbishment programmes for equipment such as circuit breakers and emergency plant replacement due to failure or breakdown depend on the availability of spare major assemblies and plant. To continue effective management of equipment, appropriate capital spares will need to be purchased in the 2019 to 2023 period in accordance with GM AS S1 012 – Substation Spares Policy.

The purchasing program will target spares required for new plant items being installed on TransGrid's high voltage network and replacement spares where these have been used on existing installations during maintenance refurbishment or emergency replacement.

Based on past spares replacements and the initial spares requirements from cyclic period agreements established for the supply of new high voltage plant, it is estimated that the total cost of the program during the 2019–2023 period would be \$3.82m.

## 4. Evaluation

The Substation Spares Policy GM AS S1 012 provides guidelines in establishing appropriate minimum spares requirements for TransGrid to provide a High Voltage (HV) network that meets the required reliability standards. Option A is the only option that meets the guidelines stated in GM AS S1 012.

It is estimated that the procurement of substation capital spares for the 2019–2023 period would cost \$3.82m  $\pm$  25% in \$2016-17 as per Table 1.

**Table 1 – Procurement of substation capital spares (\$ thousand)**

Item	Unit Cost	Quantity	Total Cost
Aux Transformer 11kV, 500/1000kVA	112.1	1	112
Bushing 132kV	18.0	4	72
Bushing 330kV	75.0	3	225
Bushing 500kV	90.0	2	180
Bushing Wall 132kV	20.0	1	20
Bushing Wall 330kV	110.0	1	110
CB 132kV Interrupter/Pole	48.0	2	96
CB 330kV Interrupter/Pole	88.0	2	176
CB 500kV Interrupter/Pole	117.0	2	234
CB 66kV Interrupter/Pole	18.0	2	36
Condition Monitoring Devices (Bushing Monitors)	71.0	5	355
Condition Monitoring Devices (Circuit Breaker Monitors)	56.0	5	280
Condition Monitoring Devices (Network Switches)	3.45	3	10
Condition Monitoring Devices (Tx & Rx gas/moisture in oil monitor)	58.0	2	116
Current Transformer 132kV	21.2	6	127
Current Transformer 330kV	29.3	6	176
Current Transformer 500kV	75.3	3	226
Current Transformer 66kV	14.0	6	84
CVT 132kV	12.8	4	51
CVT 330kV	18.8	6	113
CVT 500kV	31.0	3	93
Dead Tank Circuit Breaker (DTCB) 132kV Interrupter	48.0	2	96
DTCB 330kV Interrupter	147.0	3	441

Item	Unit Cost	Quantity	Total Cost
DTCB 66kV Interrupter	52.0	2	104
Magnetic Voltage Transformer (MVT) 132kV	11.3	4	45
MVT 330kV	38.2	2	76
Power System Equipment Procurement Labour	0.16	1,045	169
<b>Total estimated cost for the procurement of substation capital spares for 2019-2023</b>			<b>3,823</b>

The expected expenditure profile for this project (excluding capitalised interest) based on a standard spending curve distribution is as follows:

**Table 2 – Expected expenditure profile (\$ million)**

	Total Project Base Cost	Year -4	Year -3	Year -2	Year -1	Year 0
Estimated Cost	3.82	0.59	0.76	0.64	0.59	1.24

## 4.1 Preferred option

Option A is the preferred option and the only option which meets the guidelines of the Substation Spares Policy (GM AS S1 012). The Substation Spares Policy has been developed to provide a minimum level of substation spares to allow response to equipment failure over the expected life of the equipment. The levels chosen balance factors including:

- > Substation component criticality
- > Numbers of a particular plant item
- > The likelihood of failure of particular equipment components
- > Minimising stores inventory and upfront costs
- > The possibility/feasibility of component part repair
- > The need to support the equipment over a life of around 40 years, recognising that parts are cheaper when plant is originally purchased and may not be even available near end of life.

### Regulatory Investment Test

A Regulatory Investment Test for Transmission (RIT-T) is not required as the spares will related to asset replacement projects with no augmentation component.

## 5. Recommendation

It is recommended that Option A be implemented.