



Equipment Strategy for Post Type High Voltage Current Transformers and Metering Units

Policy stream	Asset Management	
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Equipment Strategy for Post Type High Voltage Current Transformers and Metering Units

Version history

Version	Date	Section(s)	Summary of amendment
1.0	17/07/2015	All	New document
2.0	18/06/2018	1.3 to 1.7	New template and new sections 1.3 to 1.7 and small content changes in all other sections. New template and updates to Section 1.
3.0	01/08/2023	All	Complete format and content update with inclusion of 500kV

Note: highlighted sections within this document indicate parts removed for external connection rule publication

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Table of contents

Version history.....2
1. Introduction3
1.1 Purpose3
1.2 Scope.....3
1.3 References.....4
1.4 Defined terms4
1.5 Roles and responsibilities4
1.6 Monitoring and compliance.....5
1.7 Risk management.....5
2. Strategy5
2.1 Projected use of equipment.....5
2.2 Technologies available now6
2.3 Equipment strategy elements.....Error! Bookmark not defined.
2.4 Concurrent investigations7
2.5 Summary.....Error! Bookmark not defined.
3. Distribution list.....7

1. Introduction

1.1 Purpose

Equipment Strategies document Powerlink’s vision for equipment technologies, to provide both Powerlink and Suppliers with consistent planning and project management platforms for the life of the Strategy. The document expresses Powerlink’s vision in terms of the equipment performance requirements. It is not a detailed contract specification.

The intent of this Current Transformers and Metering Units strategy is to specify the Powerlink preference of the equipment type to be used in both regulated and non-regulated applications. This document will direct the development of detailed technical and procurement specifications for Current Transformers.

It is envisaged that the Equipment Strategy for Current Transformers will have a life of ten (10) years. Review of this equipment strategy is required in the fifth (5th) and the eighth (8th) years to enable inclusion of new technologies that have matured or a business need that triggers a review whichever comes first.

Equipment Strategy for post type high voltage current transformers and metering units has been developed in consultation with relevant stakeholders within Powerlink.

1.2 Scope

This document covers post type high voltage current transformers and metering units ranging from 72.5kV to 550kV for use in new and existing air insulated substations (AIS) for replacement, refurbishment and augmentation projects.

Table with 3 columns: Current version: 6/11/2023, POWERLINK WEBSITE/INTERNAL USE, Page 3 of 8; Next revision due: 31/10/2028, HARDCOPY IS UNCONTROLLED, © Powerlink Queensland

Equipment Strategy for Post Type High Voltage Current Transformers and Metering Units

It is envisaged that the Equipment Strategy for post type high voltage current transformers and metering units will have a life of ten years. A review of the equipment strategy is required in the fifth and the eighth year to enable inclusion of technologies which have matured and show merit or a business need that triggers a review whichever comes first.

1.3 References

Document code	Document title
FIN-STD-A2076059	Procurement Standard
FIN-PRO-A1968547	Procurement Matrix
AM-POL-1015	Lifecycle Policy
HSE-POL-A2720172	Health, Safety and Environment Policy
SM-STD	SMS03 Electrical Safety Management System
SM-FRA	SMS00 Safety Management System Framework
IEC 61850	IEC (2013) <i>Communication networks and systems for power utility automation</i>
ISO/IEC 17025	ISO (2005) <i>General requirements for the competence of testing and calibration laboratories</i>
NER	National Electricity Rules

1.4 Defined terms

Terms	Definition
AEMO	Australian Energy Market Operator
APLAC	Asia Pacific Laboratory Accreditation Cooperation
ILAC	International Laboratory Accreditation Cooperation
Metering unit	Combined current transformer and voltage transformer in a single unit. Typically is produced using gas as main insulation medium.
NATA	National Association of Testing Authorities
NCIT	Non-Conventional Instrument Transformers
NER	National Electricity Rules
SAP	Software package used for computerised maintenance management system and asset register

1.5 Roles and responsibilities

Who	What
Substation Strategies Team	Is responsible for setting strategies that meet Powerlink's technical requirements.
Primary Systems Material Manager	Responsible for full implementation of this strategy, supplier interfaces, market intelligence and for provision of relevant inputs for this document.
Principal Engineer	Review, endorse and ensure technical data meets Powerlink's requirements and is responsible for developing supporting Technical Specifications.
Manager Asset Strategies	Is responsible for reviewing this Equipment Strategy



Equipment Strategy for Post Type High Voltage Current Transformers and Metering Units

Who	What
General Manager Asset Strategies & Planning	Is responsible for approving this Equipment Strategy

1.6 Monitoring and compliance

. The success is monitored through regulatory information notice, annual reporting and SAP records review of installed equipment. In addition, the success of this strategy is measured by monitoring life cycle costs as well as reliability, availability and service history associated with Current Transformers and metering units.

The minimum records required are:

- Technical Specification
- Tender evaluation report
- Period contract
- Equipment Drawings
- Operation and maintenance manual
- SAP equipment records

1.7 Risk management

The risks considered in the development of this strategy are:

- **Network Operations Risk** – risk related to the increased probability of network outages and their impact on customers and stakeholders.
- **Safety Risk** – risk associated with the malfunction of current transformers or metering units resulting in the prolonged or lack of protection operation exposing personnel and public to fault conditions – this can result in serious injuries and fatalities due to electrocution. There is a safety risk to personnel associated with catastrophic failures of current transformers and metering units.
- **Environmental Risk** – related to gas or oil leaks.
- **Compliance risk** – associated with non-compliance of accuracy requirements as set up by National Electricity Rules.
- **Financial and Contractual Risk** – risk associated with the inability to make warranty claims, request access to adequate technical support and spares, increased maintenance costs, and additional capital investment costs.

2. Strategy

2.1 Projected use of equipment

All post type high voltage current transformer and metering units to be purchased will be used for protection and metering of transmission lines, transformers, generators, capacitors/reactors, SVCs or for bus-coupling.

2.2 Strategy Requirements

The vision that drives equipment strategy documents is based on historical experience, research and investigations into new products available on the market, reliability centred maintenance analysis and lifecycle cost experience over the expected service life of the equipment.

The main features of the vision for post type high voltage current transformers and metering units are as follows:

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Next revision due: 31/10/2028	HARDCOPY IS UNCONTROLLED	© Powerlink Queensland

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- Preference is to adopting standardized equipment in accordance with the power industry standards to eliminate the necessity for customization.
- Annual Operation and Maintenance cost less than 0.5% of the asset value.
- Designed for an operating life of 40 years in Queensland climate conditions.
- Safe operation, availability and reliability to meet network requirement.
- Appropriate monitoring and remote interrogation facilities to allow maintenance staff to optimise site visits.
- Standard variants to cover operational requirements.
- Service and spare parts support during the complete life of equipment with preference for Australian based support.
- Designed to have minimal routine inspection/maintenance.
- Minimal site assembly and installation time.
- Evaluation and assessment through Life Cycle Cost Analysis (LCCA)

Safety and Environmental

- The risk of explosive failure is to be kept low, so far as is reasonably practicable.
- Failure modes should be non-life threatening and as safe as reasonably practicable for personnel working in the yard.
- The design of the unit allows for safe and environmentally appropriate disposal.
- Minimum leakage rates to meet or exceed environment standards and reduce operational costs.
- Gas used in equipment should be recyclable and/or recoverable.
- Meeting standard requirements for noise and radio interference voltage (RIV).
- Only Polymer insulators shall be used for housing.
- Minimal leakage rates in case of insulating gas with the aim of being less than 0.1% per annum, with a maximum guaranteed of less than 0.5% per annum.

Maintenance

- Minimal maintenance requirement:
 - Minimal routine inspections, no more than once a year.
 - Long service intervals, being at least 12 years between services.
 - Services should be non-intrusive as far as possible and achieved while the equipment is in operation.
 - Enables addition of online condition monitoring.
 - for dew point measurement for gas ad oil sampling Provisions to allow use of modern accuracy testing methods.

2.3 Technologies available now

Currently available technologies are SF6 gas, alternate gas and Oil insulated Current Transformers and metering units with mix of Polymer and Porcelain insulators having both live tank and dead tank designs.

Non-Conventional Instrument transformers (NCIT) are yet to be considered a commercially viable solution for Powerlink. A number of trials are being conducted in order to gain service experience with various construction types of NCITs. National Electricity Rules do not have provisions for accuracy testing and requirements for NCITs.

Current version: 6/11/2023	POWERLINK WEBSITE/INTERNAL USE	Page 6 of 8
Next revision due: 31/10/2028	HARDCOPY IS UNCONTROLLED	© Powerlink Queensland

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However development is ongoing and it is expected for NCITs to become viable during the life of this equipment strategy.

2.4 Additional Requirements

The future post type high voltage current transformers and metering units specification shall include the following main features:

- Live tank Design with Composite Insulators and insulating medium using SF6 gas, Biodegradable Oil or an alternative gas .
- Hermitically sealed or provision for gas / oil sampling.
- Inclusion of overpressure devices (for example, rupture disks).
- Analog on-line density monitoring of gas available to be fed into the substation automation system.
- Where equipments are not hermetically sealed ,Oil Insulated equipment shall have 10% extra oil to allow for DGA measurement for entire service life of 40 years.
- Preference will be given to design which actively minimises the chance of corrosion in all aspects. Anti-corrosion measures applied especially in areas of known corrosion e.g. unprotected flanges, rupture disks, gas ports, gas pipes, etc. and/or external weather sealant on all flange joints will be well regarded.
- Demonstrate the calibration of measuring / testing equipment used by NATA certified laboratory or by facilities accredited to ISO/IEC 17025 and has mutual recognition through ILAC or APLAC. Evidence of this shall be provided with routine test reports.
- Equipment shall be designed and constructed, packaged and transported to withstand transport shocks, and to ensure and demonstrate the equipment is delivered in good condition.
- The manufacturer's ability to be able to provide support for the whole of life of the equipment .

2.5 Concurrent investigations

The market position for Non-Conventional Instrument Transformers / Circuit breaker with Fibre Optic Current Sensors (FOCS) and Electronic Current Transformer (ECT) / Electronic Voltage Transformer (EVT) with merging units integrating with IEC 61850 secondary systems will continue to be monitored. Powerlink will continue to collaborate with AEMO to modify NER to allow for their use for metering and protection.

3. Distribution list

Divisional Distribution	Contact details
Group/Team Distribution	Contact details
Technical Services	Manager
Maintenance Services	Manager
Warehousing & Logistics	Manager
Works Delivery	Manager
Primary Systems Delivery	Manager
Network Performance	Manager
Design Solutions	General Manager
Infrastructure Delivery	General Manager

Current version: 6/11/2023	POWERLINK WEBSITE/INTERNAL USE	Page 7 of 8
Next revision due: 31/10/2028	HARDCOPY IS UNCONTROLLED	© Powerlink Queensland



Equipment Strategy for Post Type High Voltage Current Transformers and Metering Units

Divisional Distribution	Contact details
Asset Strategies & Planning	General Manager
Technical & Network Solutions	General Manager
Supply Chain Services	General Manager
Materials Procurement	General Manager
External Distribution	Contact details