Equipment Strategy for Substation High Voltage Surge Arresters - Strategy

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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 High Voltage Surge Arrester 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 Surge Arresters.

This equipment Strategy has been developed in consultation with the relevant stakeholders within Powerlink.

1.2 Scope

This equipment strategy covers high voltage surge arresters in substations in the range from 12.5kV to 550kV for use in new and existing air insulated substations (AIS) for replacement, refurbishment and augmentation projects. Surge arresters operated at other nominal voltages may be procured on an ad hoc basis as required following the same principles.

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

1.3 Defined Terms

Terms	Definition
AIS	Air Insulated Switchgear
BIL	Basic Insulation Level
GIS	Gas Insulated Switchgear
SAP	Software package used for computerised maintenance management system and asset register
ZnO	Zinc Oxide

1.4 Monitoring and compliance

This equipment strategy will guide development of the technical specification. 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 Surge Arrestors.

1.5 Risk management

The risks considered in the development of this strategy are:

- **Network Operations Risk** – risk related to the increased probability of network outages caused by equipment failure due to lightning or switching voltage surges and their impact on customers and stakeholders.
- **Safety Risk** – risk associated with the malfunction of surge arrester resulting in its catastrophic failure – can result in serious injuries of personnel.
- **Financial and Contractual Risk** – risk associated with inability to make insurance claims due to inadequate protection of equipment (if surge arresters are either not installed or non-functional).

2. Strategy

2.1 Projected use of equipment

All surge arresters unless otherwise specified are used in conventional air-insulated switchgear (AIS) substations to provide protection from switching and lightning overvoltages allowing BIL for other major equipment to be reduced through insulation coordination process. Reduced BIL results in equipment cost savings most of the time. Separate equipment strategies covers surge arresters used in gas insulated switchgear (GIS) and on transmission lines.

2.2 Strategy Requirements

The primary use of surge arresters is to protect the important substation or network equipment such as power transformers, capacitor banks, circuit breakers, underground cables, etc. from transient lightning and switching overvoltages within the network, sometimes sacrificing itself in the process

The following are the main features of Powerlink's vision for high voltage surge arresters to be used in AIS:

General

- Suitable for protection from both lightning and switching overvoltages (made with metal oxide varistors with adequate non-linear characteristic).
- Installation costs are kept to minimal based on adequate equipment design (avoiding a number of adjustments required to be made on site).
- Easily replaceable (standard dimensions).
- High availability and reliability and cost competitive on a whole of life basis.

Safety and Environmental

- Failure modes should be non-life threatening and safe to the greatest possible extent for personnel working in the yard (non-ceramic housing).
- The design of the unit must comply with all required electrical safety and maintenance clearances.

Maintenance Level

Powerlink's preference is to procure equipment which has:

- No maintenance requirements.
- Simple, reliable and proven design.

2.3 Technologies available now

Since the use of metal oxide (MO), predominantly zinc oxide (ZnO) varistors in surge arrester technology, the use of gapped silicon carbide surge arresters almost ceased. The main progress since moving to MO varistors is the use of polymer housing for surge arresters and improvement in the test of surge arresters. These have resulted in consistent improvements in terms of increasing the safety and compactness of the surge arresters.

2.4 Additional Requirements

Surge arresters should include the following main features:

- Operating service life of 40 years in Queensland climatic conditions.
- Polymer housing with high cantilever strength.
- Gapless with use of metal oxide varistors with adequate non-linear characteristic.
- Simple, safe, easy, reliable and proven operation.
- Not equipped and not relying on operation of surge counters.

2.5 Concurrent investigations

In view of continuous technological improvement, it is important that close examination of the available technologies be made to ensure that they meet Powerlink's requirements and adopt the most appropriate technology. Prior to commencement of a new contract cycle, a review of the surge arresters' fleet performance and maintenance costs is undertaken.