



Equipment Strategy For High Voltage Disconnectors and Earthing Switches

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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 Equipment Strategy for Disconnectors and Earth Switches has been developed with input from relevant teams in Powerlink.

1.2 Scope

This document covers the equipment requirements ranging from 145kV to 362kV disconnectors and earthing switches for use in new and existing air insulated substations (AIS) for replacement, refurbishment and augmentation projects. Disconnectors and earth switches that are operated at other nominal voltages may be procured on an ad hoc basis as required following the same principles.

It is intended that the equipment strategy will be reviewed on a regular basis so that changes can be incorporated at the most opportune time.

It is envisaged that the Equipment Strategy for disconnectors and earthing switches will have a life of ten (10) years with a significant review in the fifth (5th) year and eighth (8th) year. During the review, technologies which have matured and service experience during the life of the strategy will be incorporated if they have merit.

1.3 Defined terms

Terms	Definition
SAP	Software package used for computerised maintenance management system and asset register.

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.

The success of this strategy is measured by monitoring life cycle costs as well as availability and service history associated with this equipment.

The minimum records required are:

- Technical specification
- Tender evaluation report
- Period contract
- Purchase orders
- SAP equipment records
- Operation and Manufacturer Manual
- Nameplate details

1.5 Risk management

The risks considered in the development of this strategy are:

- **Safety Risk** – risk associated with the need for visual f isolation without introduction of additional risks associated with failure modes of disconnectors and earth switches.

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- **Network Operations Risk** – risk related to the increased duration of planned and unplanned network outages and their impact on customers and stakeholders due to inoperability of disconnectors and earth switches.
- **Financial and Contractual Risk** – risk associated with increased costs associated with project delays caused by inoperability of disconnectors and earth switches and need to use alternative more expensive work methods for high voltage isolation. Risks associated with inability to make warranty claims, request access to adequate technical support and spares, increased maintenance costs, additional capital and refurbishment investment costs.

2. Strategy

The following are the main features of Powerlink's vision for outdoor air insulated high voltage disconnectors and earthing switches:

The Vision

- Evaluation and Assessment through life cycle cost analysis (LCCA)
- Annual operation and maintenance cost less than 0.5% of the equipment value.
- Installation costs are kept to minimal based on adequate equipment design (reducing the number of adjustments required to be made on site).
- High availability and reliability and cost competitive on a whole of life basis.
- Minimum service life of 40 years without need for major refurbishment.
- Possibility to extend service life to 80 years by undertaking refurbishment.
- Minimal maintenance.

Safety and Environmental

- Failure modes should be non-life threatening and safe to the greatest possible extent for personnel working in the yard.
- The design of the unit must comply with all required electrical safety and maintenance clearances.
- Operator's safety shall be considered as critical during equipment design.
- Ergonomic design reducing opportunities for operators' injuries.

Maintenance Level

Powerlink's preference is to procure equipment which has:

- Minimal maintenance requirements.
- Least number of parts.
- Simple, reliable and proven design.
- Robust construction.

2.1 Projected use of equipment

All disconnectors and earthing switches are used in conventional air-insulated switchgear (AIS) substations to provide isolation and earthing, allowing for work to be carried out safely on the high voltage system and to isolate circuits for operational reasons. A separate equipment strategy covers disconnectors and earthing switches incorporated in gas insulated switchgear (GIS).

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2.2 Technologies available now

Disconnectors with single break (centre break) and double break contacts are well established products. Earthing switches can be mounted on either or both sides of disconnectors or be independent of disconnectors. Either manual or motorized operation, depending upon the application, can be chosen.

A careful selection of equipment is essential so that the minimum whole of life cost is achieved while attaining benefits such as ease of commissioning, simple and reliable operation, and low maintenance costs.

2.3 Equipment strategy elements

Disconnectors and earthing switches should include the following main features:

- Operating service life of 40 years without need for refurbishment.
- Current carrying pivot joints with sliding contacts are not permitted (pivot joints with shunts are acceptable).
- Simple, safe, easy, reliable and proven operation.
- Main contacts to operate reliably following long periods between successive operations with minimal or no maintenance.
- No change in contact alignment during normal operational sequence.
- Minimum whole of life cost as determined by Life Cycle Cost Analysis (LCCA)
- Spare parts and other technical support (root cause failure investigation, design modifications) for the complete life of the equipment.
- Designed to have minimal inspection and/or corrective maintenance requirements.
- Preference is given to disconnectors and earth switches with no additional heat sinks around contacts to enable easy detection of contacts overheating by thermo-scanning devices.

2.4 Concurrent investigations

In view of continuous technological improvement, it is important to closely examine available technologies 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 disconnector and earth switch fleet performance and maintenance costs is undertaken.

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