

<b>Document Reference:-</b>		NSP/007/007	<b>Document Type:-</b>		Code of Practice			
<b>Version:-</b>	3.0	<b>Date of Issue:-</b>	June 2024		<b>Page</b>	1	<b>of</b>	6

# NSP/007/007 – Guidance on Substation Design: 11kV and 20kV Switchgear

## 1. Purpose

The purpose of this document is to provide guidance on the selection and application of 11kV and 20kV metalclad switchgear at primary substations for use on the Northern Powergrid network.

This document supersedes the following documents, all copies of which should be destroyed.

This document supersedes the following documents, all copies of which should be destroyed.

Reference	Date	Version	Title
NSP/007/007	March 2018	2.0	Guidance on Substation Design: 11kV and 20kV Switchgear

## 2. Scope

This document covers the application of 11kV and 20kV metalclad switchgear in substation design for use on the Northern Powergrid network.

<b>Document Reference:-</b>		NSP/007/007	<b>Document Type:-</b>		Code of Practice			
<b>Version:-</b>	3.0	<b>Date of Issue:-</b>	June 2024		<b>Page</b>	2	<b>of</b>	6

## 2.1. Table of Contents

1. Purpose.....	1
2. Scope .....	1
2.1. Table of Contents .....	2
3. 11kV and 20kV Switchgear .....	3
3.1. Switchgear Type .....	3
3.2. Switch Room Design.....	3
3.3. Switchgear Installation.....	3
3.4. Extensions to Existing Switchboards.....	3
3.5. Switchboard Replacement .....	4
3.6. Through-Wall Busbar Connectors.....	4
3.7. Busbar Adaptors .....	4
4. References .....	5
4.1. External Documentation .....	5
4.2. Internal Documentation.....	5
4.3. Amendments from Previous Version.....	5
5. Definitions .....	5
6. Authority for Issue .....	6
6.1. CDS Assurance.....	6
6.2. Author.....	6
6.3. Technical Assurance .....	6
6.4. Authorisation .....	6

<b>Document Reference:-</b>		NSP/007/007	<b>Document Type:-</b>		Code of Practice			
<b>Version:-</b>	3.0	<b>Date of Issue:-</b>	June 2024	<b>Page</b>	3	<b>of</b>	6	

### 3. 11kV and 20kV Switchgear

#### 3.1. Switchgear Type

Switchgear shall be of a type and form assessed and approved for use on the Northern Powergrid network and listed on the company assessed product database. Switchgear shall comply with the Technical Standard NPS/003/006 and shall be supplied in the form approved for use by Northern Powergrid.

Switch-room layout drawings cover standard switchgear types currently being procured by Northern Powergrid. Where alternative types are to be used the switch-room design shall be amended accordingly.

It will be necessary to analyse the manufacturer's switchgear drawings to ensure that the dimensions of the switchgear offered comply with the dimensions used in the production of the standard layout drawings and that switchgear outlines have not been amended by the manufacturer. The technical specification of the switchgear offered must be checked against the Northern Powergrid specification and project specifications to ensure full technical compliance.

#### 3.2. Switch Room Design

The switch room design must incorporate any arc-venting requirements of the particular circuit breaker type to be installed. Confirmation of such should be made as part of the project-specific Designer's Risk Assessment

Switchgear shall be orientated so that when facing the front of the switchboard, the T1 circuit breaker is on the left and T2 circuit breaker is on the right. The incoming transformer circuit breakers shall be located in the 3rd bay out either side from the Bus Section circuit breaker. If economically practical, half-switchboards should be orientated so that future extension to full switchboard would result in T1 on the left and T2 on the right. It is important that the design of the switchroom including cable ducts and floor fixings, are such as to allow for future switchboard extension. Floor fixings should be installed for either full or half switchboards irrespective of the number of feeder units to be installed.

Switchroom layout drawings showing floor-fixing steelwork should be sent to the switchgear supplier and civil contractor for comment and reference. Floor fixings (e.g. Unistrut) should be installed by the civil contractor in accordance with tolerances specified by the switchgear manufacturer. The switch room floor top-dressing shall be laid after the precise alignment of floor fixings have been checked by the switchgear installer.

#### 3.3. Switchgear Installation

During installation care should be taken to ensure that any unplugged holes such as those left by lifting lugs are sealed to prevent vermin access.

Power cable ducts should be spaced to ensure alignment with the particular switchgear type. It is therefore essential that the switchgear is positioned in accordance with the setting out detail on the switchroom drawings.

#### 3.4. Extensions to Existing Switchboards

Approved non-oil switchgear shall normally be used where possible but where this is not practical special approval shall be obtained to use an alternative type.

Oil-filled switchboards may be extended using the original switchgear type to maintain a consistent operating regime within a substation. If the original switchgear is not available, switchboards must be extended with modern approved switchgear.

Where possible, existing busbar protection schemes should be extended to cover the new circuit breakers. Where the switchboard extension renders an existing frame-leakage protection un-usable, a protection report should identify changes to the existing SBEF protection scheme to maintain acceptable protection coverage.

<b>Document Reference:-</b>		NSP/007/007	<b>Document Type:-</b>		Code of Practice			
<b>Version:-</b>	3.0	<b>Date of Issue:-</b>	June 2024		<b>Page</b>	4	<b>of</b>	6

Where a switchboard is extended, minimum access and egress clearance around the switchboard must be maintained. These clearances are specified in design guidance document NSP/007/010. If the extended switchboard is longer than 5m, outward opening exit doors shall be provided at each end of the switchroom. At some substations it will be necessary to provide additional doors at the rear of the switchboard to comply with this guideline. The maximum distance to the nearest exit door shall not exceed 12m.

### 3.5. Switchboard Replacement

Savings in time and cost can be achieved by ensuring that building and electrical work is completed in one visit. System security should be maintained by retaining supply to as many circuits as possible during the installation of a new switchboard. In an effort to achieve these practical and economic benefits consideration should be given to:

- Installing the new switchboard in a new switchroom constructed within or external to the existing building.
- Installing the new switchboard in the space made available by removing one section of the existing switchboard and the associated Bus Section circuit breaker. This may require the existing switchroom to be the extended.

Where the above is not economic or practicable then replacement in situ will have to be considered.

The need to reduce the building and civil cost may determine the switchgear used. Additional building costs for each make of switchgear may have to be considered when analysing switchgear tenders.

At some older sites, clearances may not comply with the current standards. It is essential in all cases that clearances defined in ER S2/4 are maintained around the switchgear and where necessary additional exit doors should be provided in order to achieve the appropriate standard of access/egress.

Where a single transformer switchboard is being replaced, the primacy of maintaining supplies during the installation of the new switchgear may dictate the substation design. If this is the case, the opportunity should be taken to ensure the correct handling of the switchboard as described in 3.3

### 3.6. Through-Wall Busbar Connectors

Only approved type-tested through-wall busbar connector systems shall be used. Where it is necessary to separate the different sections of the switchboard by firewalls and no approved connector is available, the Bus Section circuit breaker may be replaced by a section of cable and two interconnector circuit breakers. The implications of this must be considered in the protection report.

### 3.7. Busbar Adaptors

Only Northern Powergrid approved, type tested joggle-boxes shall be used to connect switchgear of different types.

<b>Document Reference:-</b>		NSP/007/007	<b>Document Type:-</b>		Code of Practice			
<b>Version:-</b>	3.0	<b>Date of Issue:-</b>	June 2024		<b>Page</b>	5	<b>of</b>	6

## 4. References

### 4.1. External Documentation

Reference	Title
n/a	n/a

### 4.2. Internal Documentation

Reference	Title
NPS/003/006	Technical specification for primary 11kV and 20kV circuit breakers
NSP/007/010	Guidance on Substation Design: Fire hazards and precautions (Draft)
NSP/007/019	Guidance on Substation Design: EHV substation drawing policy

### 4.3. Amendments from Previous Version

Reference	Description
Document Review	

## 5. Definitions

Reference	Definition
n/a	

<b>Document Reference:-</b>		NSP/007/007	<b>Document Type:-</b>		Code of Practice			
<b>Version:-</b>	3.0	<b>Date of Issue:-</b>	June 2024		<b>Page</b>	6	<b>of</b>	6

## 6. Authority for Issue

### 6.1. CDS Assurance

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

		<b>Date</b>
Liz Beat	Governance Administrator	29/05/2024

### 6.2. Author

I sign to confirm that I have completed and checked this document and I am satisfied with its content and submit it for approval and authorisation.

**Review Period** - This document should be reviewed within the following time period.

<b>Standard CDS review of 3 years</b>	<b>Non Standard Review Period &amp; Reason</b>	
Yes	Period: n/a	Reason: n/a
<b>Should this document be displayed on the Northern Powergrid external website?</b>		Yes
		<b>Date</b>
Mark Thompson	Specification and Design Manager	30/05/2024

### 6.3. Technical Assurance

I sign to confirm that I am satisfied with all aspects of the content and preparation of this document and submit it for approval and authorisation.

		<b>Date</b>
Joe Helm	Lead Policy and Standards Engineer	17/06/2024

### 6.4. Authorisation

Authorisation is granted for publication of this document.

		<b>Date</b>
Dave Sillito	Head of Major Projects	30/05/2024