

|                             |     |                        |                        |  |                  |   |           |   |
|-----------------------------|-----|------------------------|------------------------|--|------------------|---|-----------|---|
| <b>Document Reference:-</b> |     | NSP/007/008            | <b>Document Type:-</b> |  | Code of Practice |   |           |   |
| <b>Version:-</b>            | 3.0 | <b>Date of Issue:-</b> | May 2024               |  | <b>Page:-</b>    | 1 | <b>of</b> | 6 |

# NSP/007/008 – Guidance on Substation Design: 33kV Switchgear

## 1. Purpose

The purpose of this document is to provide guidance on the selection and application of 33kV switchgear for use on the Northern Powergrid network

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

| Reference   | Version | Date     | Title  |
|-------------|---------|----------|--|
| NSP/007/008 | 2.0     | Feb 2019 | Guidance on Substation Design: 33kV Switchgear |

## 2. Scope

This document applies to the application of 33kV switchgear in standard primary substation designs for use on the Northern Powergrid network

|                             |     |                        |                        |               |                  |           |   |  |
|-----------------------------|-----|------------------------|------------------------|---------------|------------------|-----------|---|--|
| <b>Document Reference:-</b> |     | NSP/007/008            | <b>Document Type:-</b> |               | Code of Practice |           |   |  |
| <b>Version:-</b>            | 3.0 | <b>Date of Issue:-</b> | May 2024               | <b>Page:-</b> | 2                | <b>of</b> | 6 |  |

## 2.1. Table of Contents

|   |          |
|---|----------|
| <b>1. Purpose.....</b>                        | <b>1</b> |
| <b>2. Scope .....</b>                         | <b>1</b> |
| 2.1. Table of Contents.....                   | 2        |
| <b>3. 33kV Switchgear .....</b>               | <b>3</b> |
| 3.1. 33kV Circuit Breakers.....               | 3        |
| 3.2. Switchroom Design .....                  | 3        |
| 3.3. Switchgear Installation .....            | 3        |
| 3.4. Extensions to Existing Switchboards..... | 3        |
| 3.5. Switchboard Replacements .....           | 4        |
| 3.6. Joggle-Boxes .....                       | 4        |
| <b>4. References .....</b>                    | <b>5</b> |
| 4.1. External Documentation .....             | 5        |
| 4.2. Internal Documentation .....             | 5        |
| 4.3. Amendments from Previous Version.....    | 5        |
| <b>5. Definitions .....</b>                   | <b>5</b> |
| <b>6. Authority for Issue .....</b>           | <b>6</b> |
| 6.1. CDS Assurance .....                      | 6        |
| 6.2. Author .....                             | 6        |
| 6.3. Technical Assurance.....                 | 6        |
| 6.4. Authorisation .....                      | 6        |

|                             |             |                        |                  |               |   |             |
|-----------------------------|-------------|------------------------|------------------|---------------|---|-------------|
| <b>Document Reference:-</b> | NSP/007/008 | <b>Document Type:-</b> | Code of Practice |               |   |             |
| <b>Version:-</b>            | 3.0         | <b>Date of Issue:-</b> | May 2024         | <b>Page:-</b> | 3 | <b>of</b> 6 |

### 3. 33kV Switchgear

#### 3.1. 33kV Circuit Breakers

Circuit breakers shall be approved for use on Northern Powergrid networks and be listed on the company assessed product database. They shall comply with the company product specification NPS/003/004 and be of the form approved for use by Northern Powergrid.

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 project specifications to ensure full technical compliance.

#### 3.2. Switchroom Design

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 3<sup>rd</sup> 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 switch room 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 design shall where applicable take into account any requirements for accommodation of CTs, VTs and cable testing, this could include a ground floor cable basement.

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 and fixed to prevent movement. The civil contractor should not apply switchroom floor top-dressing before 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 switch room drawings.

#### 3.4. Extensions to Existing Switchboards

Extensions to half-switchboards shall be individually engineered. Approved non-oil switchgear should 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 by a maximum of two feeder circuits 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.

Where a switchboard is extended, minimum access and egress clearance around the switchboard must be maintained. If the extended switchboard is longer than 5m, outward opening exit doors shall be provided at each end of the switch room. At some substations it will be necessary to provide additional doors at the rear of

|                             |     |                        |                        |               |                  |           |   |  |
|-----------------------------|-----|------------------------|------------------------|---------------|------------------|-----------|---|--|
| <b>Document Reference:-</b> |     | NSP/007/008            | <b>Document Type:-</b> |               | Code of Practice |           |   |  |
| <b>Version:-</b>            | 3.0 | <b>Date of Issue:-</b> | May 2024               | <b>Page:-</b> | 4                | <b>of</b> | 6 |  |

the switchboard to comply with this guideline. The maximum distance to the nearest exit door shall not exceed 12m for existing substation builds which dependent on age may have been constructed in compliance with the now withdrawn engineering recommendation document S2.4 (1976) and a distance not exceeding 20m for new build substations which are to be constructed in accordance with BSEN 61936-1.

### 3.5. Switchboard Replacements

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 switch room constructed within, or external to the existing building.
- Providing a modular prefabricated building with switchgear pre-installed. This will provide a shorter build time with the potential of reducing overall project costs and increase system security during commissioning of the new 33kV switchboard.

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.

It is essential in all cases that modern clearances around the new switchgear are maintained and where necessary additional exit doors 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 handing of the switchboard as described in 3.2.

### 3.6. Joggle-Boxes

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

|                             |     |                        |                        |  |                  |   |           |   |
|-----------------------------|-----|------------------------|------------------------|--|------------------|---|-----------|---|
| <b>Document Reference:-</b> |     | NSP/007/008            | <b>Document Type:-</b> |  | Code of Practice |   |           |   |
| <b>Version:-</b>            | 3.0 | <b>Date of Issue:-</b> | May 2024               |  | <b>Page:-</b>    | 5 | <b>of</b> | 6 |

## 4. References

### 4.1. External Documentation

| Reference | Title |
|-----------|-------|
| None      |       |

### 4.2. Internal Documentation

| Reference   | Title  |
|-------------|--|
| NPS/003/004 | Technical specification for 33kV circuit breakers and switchgear       |
| NSP/007/019 | Guidance on Substation Design: EHV substation drawing policy (Ref Doc) |

### 4.3. Amendments from Previous Version

| Reference   | Title  |
|-------------|--|
| NSP/007/008 | Guidance on Substation Design: 33kV Switchgear |
| NSP/007/008 | Minor amendments and formatting                |

## 5. Definitions

| Reference | Title |
|-----------|-------|
| None      |       |

|                             |             |                        |                  |
|-----------------------------|-------------|------------------------|------------------|
| <b>Document Reference:-</b> | NSP/007/008 | <b>Document Type:-</b> | Code of Practice |
| <b>Version:-</b>            | 3.0         | <b>Date of Issue:-</b> | May 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 | 08/05/2024  |

### 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  | Major Projects 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> |
| Peter Steadman | Major Projects Specification and Design Engineer | 22/05/2024  |

### 6.4. Authorisation

Authorisation is granted for publication of this document.

|              |                        |             |
|--------------|------------------------|-------------|
|              |                        | <b>Date</b> |
| Dave Sillito | Head of Major Projects | 24/05/2024  |