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# IMP/009 – Policy for the Enclosure of Ground Mounted Distribution Substations

## 1. Purpose

The purpose of this document is to state the Northern Powergrid (the Company) policy for the enclosure of ground mounted distribution substations. It provides guidance on the generic type of enclosure to be adopted in relation to the risk of vandalism, trespass and the nature of the surrounding environment at the substation site.

This policy also helps to ensure the company achieves its requirements with respect to:

- The Electricity Safety, Quality, and Continuity Regulations 2002 (ESQCR),
- The Health and Safety at Work Act 1974, and,
- The Electricity at Work Regulations 1989.

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

Document Reference	Document Title	Version	Published Date
IMP/009	Policy for the Enclosure of Ground Mounted Distribution Substations	3.1	July 2019

## 2. Scope

This document covers ground mounted, distribution substations in Northern Powergrid; defined as a ground-mounted substation operating with a primary voltage from 6.6kV to 20kV inclusive, with any of the following assets: HV switchgear, LV switchgear and HV transformer. The primary intention of this policy is to determine the appropriate enclosure to be adopted with respect to the risks presented at the substation site.

This document **does not** provide detailed specifications for the different types of enclosures but describes them in general terms only and **does not** cover the specification of any electrical apparatus that may be installed within it. Further guidance on the detailed standards for substation enclosures can be found in Northern Powergrid specification NPS/006/002 – ‘Technical Specification for Distribution Substation Enclosures’.

Additionally, this document **does not** provide guidance on the measures for enhancing security on **existing operational sites** following trespass, vandalism and interference including metal theft.

In terms of this document ‘enclosure’ can mean either an:

- ‘Indoor’ enclosure. i.e. full encapsulation of all electrical assets which form part of the distribution substation; e.g. brick or GRP housing.
- ‘Outdoor’ enclosure i.e. secure perimeter around all electrical assets which form part of the distribution substation; e.g. steel or wooden fence, brick wall.

Where a specific enclosure is required, the document will state ‘Indoor’ or ‘Outdoor’.

In some instances it will be necessary to produce individual designs, e.g. for substations that form part of third party buildings such as offices, car parks, or flats. Substations of this type shall be treated on a case by case basis dependant on the specific requirements at the site in question, but should follow the requirements of this policy wherever possible.

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## 2.2. Assessment of Relevant Drivers

Berkshire Hathaway Energy has made a commitment within its corporate goal statements to be the best safety performer within our industry sector. In addition, by the application of a robust process that identifies and assesses ground mounted substation sites that are subject to specific risks such as third party interference, trespass and vandalism, this policy will make a positive contribution to the following business values:

- Employee Commitment,
- Operational Excellence, and,
- Regulatory Integrity.

There are approximately 28,100 ground-mounted distribution substations on the Yorkshire and Northeast networks, and approximately 3,800 of these are classified as outdoor.

Ground mounted distribution substations may be subject to vandalism, trespass and theft dependent on their location and in particular, children who may enter these substations are vulnerable to the risk of injury through inadvertent contact with live electricity equipment. The protection of ground mounted substations against such activity is of key importance when determining the appropriate level of security to be adopted at a new or rebuilt ground mounted distribution substation. Additionally an unforeseen failure of equipment contained within the substation may give rise to danger due to fire or explosion. The appropriate selection of the substation enclosure will determine the level of containment / control of such instances.

The Electricity Safety, Quality and Continuity Regulations 2002, regulation 11(a), requires us to enclose all substations where necessary to minimise the risk of danger of unauthorised access. The type of enclosure selected is determined by the level of risk of danger from trespass or interference by unauthorised persons. Also, regulation 11(d) requires us to take reasonable precautions to protect against the risk of fire, with consideration given to the risk of fire or explosion and the impact of such an event. Factors to be considered with respect to this with regard to the type of enclosure to be adopted will include the type of switchgear installed and the nature of the surrounding environment. The guidance provided in this policy shall be the primary method of ensuring that the Company complies with these requirements.

Additionally to these key safety drivers, the enclosure of new and replacement ground mounted distributions substations are required to be the most cost effective solution for the situation presented, with considerations given to the initial cost of the enclosure and its ongoing maintenance requirements. Other influences may also dictate a specific standard of enclosure such as local planning authorities with respect to the outward appearance of the substation enclosure.

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### 2.3. Key Policy Requirements

The key requirements of the policy for the enclosure of ground mounted HV distribution substations are:

- To provide guidance for the selection of an appropriate enclosure type to minimise the risk of danger of unauthorised access that has been determined at the site in question.
- To describe the general requirements for the design of enclosures to provide reasonable precautions to protect against the risk of fire and explosion. Further guidance on the mitigation against the risk of fire and explosions can be found in IMP/011 - 'Policy for Fire Mitigation at Operational Premises'.
- To describe the requirements of ancillary items such as locking arrangements and doors to be sufficient for the level of risk identified at the substation in question.
- To consider the duty of care required by law to a trespasser, in particular with respect to any unauthorised access by children, for the installation of specific injurious devices such as barbed wire or barbed tape.
- The selection of any new or rebuilt ground mounted distribution substation enclosure to be indoor type as the preferred option. IMP/005 – 'Policy for the Renewal of Outdoor HV Distribution Substations' enables a rebuilt substation to remain outdoor in certain circumstances, i.e. ESQCR medium or low risk exposure. It should be noted however, that certain types of HV switchgear may be designed for indoor application only.
- The drafting of this policy document has given consideration to the Electricity Council's publication entitled 'Child Trespassers in Electricity Substations' (published in 1986) in relation to the selection of substation enclosure with respect to the risk of trespass and vandalism associated with it.
- To consider IMP/001/012 – 'Code of Practice for Flood Mitigation at Operational Premises', when determining the appropriate substation enclosure selection and construction.

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### 3. Substation Enclosure Selection and Construction

#### 3.1. New Substation Company Standard

- The company standard for **new** ground mounted HV distribution substations is to install an **indoor enclosure** should the ESQCR risk assessment or environment deem appropriate, since this:
- Provides protection of the equipment to minimise the risk of vandalism or trespass,
- Reduces the risk to public safety from inadvertent access to site,
- Reduces the risk to public safety by containing the energy expelled should there be any failure of installed assets,
- Provides protection to equipment from the effects of extreme weather conditions,
- Leads to the extension of the life of the electrical apparatus,
- Reduces the likelihood of noise complaints, and,
- Reduces the maintenance requirement of the apparatus.

#### 3.2. Risk Assessment for New Substation Sites and Replacement of Existing Substation Sites

Prior to the new construction or rebuild/replacement/relocation of a ground mounted distribution substation, Northern Powergrid's project designer shall determine the ESQCR risk rating (High, Medium, or Low risk) in each case.

Details for the completion of this assessment are covered in MNT/006/001 – 'Code of Practice for the Risk Assessment of Ground Mounted Substations', Section 3.5 - Risk Assessment for New Substation Sites and Replacement of Existing Substation Sites.

For rebuild, replacement or relocation of existing outdoor HV distribution sites IMP/005 – 'Policy for the Renewal of Outdoor HV Distribution Substations' shall be referenced for guidance on whether that site will remain outdoor or changed to an indoor construction.

#### 3.3. Risk Classification and Enclosure Security

The enclosure shall be designed and constructed in compliance with the technical requirements of Northern Powergrid specification NPS/006/002 – 'Technical Specification for Distribution Substation Enclosures'. The table below summarises the security levels specified in NPS/006/002.

ESQCR Risk Classification	Housing Security Level	Classification in accordance with BRE Loss Prevention Standard PS 1175
High Risk	High	LPS 1175 Class 2
Medium Risk	Enhanced	LPS 1175 Class 1
Low Risk	Standard	In accordance with NPS/006/002 and preferably classified to LPS 1175

**Please note:-** In situations where the level of vandalism/trespass/theft is assessed as exceptionally high combined with the associated safety risk to the public and staff, then the application of security measures or enclosure construction designed to Security Rating Classification 3 of Loss Prevention Certification Board LPS 1175 shall be considered.

The standard of locking arrangement shall provide security against unauthorised access commensurate with that provided by the enclosure as described in section 3.7 Application of Locking Arrangements.

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### 3.4. Indoor Substation Requirements

The following general requirements for enclosures shall apply for all new and rebuilt indoor ground mounted distribution substations:

- Where practicable, the design of the enclosure with a Housing Security Level of 'Standard' shall provide the capacity to vent any explosion to atmosphere away (preferably upwards) from the potential location that staff or the public may be in the event of unforeseen failure of equipment. Substation enclosures with a Housing Security Level of either 'Enhanced' or 'High' **is not required** to include explosion relief within the design.
- Suitable provision for the security of the substation enclosure shall be provided. The level of security required shall be dictated by the risk of vandalism, trespass or theft at the site and is detailed in the following sections.
- The design of the enclosure shall be free of any footholds or climbing aids in order to minimise the risk of unauthorised individuals scaling the substation.
- The substation enclosure should be designed so that where possible, the majority of materials are maintenance free for the nominal life of the substation.
- The substation shall be so designed to conform to the current building regulations and reflect additional local planning authority requirements in order to blend with the surrounding environment.
- New distribution substations forming part of a new development may be of a masonry construction to match that development.

### 3.5. Outdoor Substation Requirements

Substations that have been classified as **high risk** shall be replaced with an indoor substation arrangement. The following requirements shall apply to those outdoor substations that have been assessed as **medium or low risk**.

#### 3.5.1. Medium and Low Risk Outdoor Sites

For all new or existing outdoor substations classified as **medium risk** as described in MNT/006/001 – 'Code of Practice for the Risk Assessment of Ground Mounted Substations', the minimum requirement of a secure boundary shall be provided and prioritised in the following order:

1. Metal palisade fence of 1.8m in height with a triple pointed top.
2. Where there are objections to such a design (generally due to visual amenity) then the application of a slatted wood (vertical open boarded timber fencing) alternative of 1.8m in height shall be considered.

For all new or existing outdoor substations classified as **low risk** as described in MNT/006/001 – 'Code of Practice for the Risk Assessment of Ground Mounted Substations', the minimum requirement of a secure boundary shall be provided and prioritised in the following order:

1. Metal palisade fence of 1.5m in height with a 'D' top design.
2. Where there are objections to such a design generally due to visual amenity then the application of a slatted wood (vertical open boarded timber fencing) alternative of 1.5m in height shall be considered.

Metal palisade option 1 shall comply with the requirements of BS 1722-12:2016 'Fences – Part 12: Specification for steel palisade fences'.

Wood option 2 shall comply with the requirements of BS 1722-5:2006+A1:2018 'Fences – Part 5: Specification for close-boarded fences and wooden palisade fences'.

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### 3.5.2. Secure / Site Boundary Construction Restrictions

There are a number of sites where the application of either a metal or wood fence boundary is not possible due to their location and surroundings or the site employs a secure boundary and/or site boundary that is the property and responsibility of a third party as described in section 3.5.1 of this document. In such circumstances engineering discretion shall be employed to provide the most appropriate alternative while continuing to consider the key driver of public safety.

Where the existing site boundary owned by the company is beyond economic repair/ remediation then this shall be removed from site, but only if service access is not compromised, does not create ownership conflicts or create the likelihood of loitering or fly-tipping. Where there is potential for the creation of any of these issues at new or existing outdoor substations, then consider the inclusion of a suitable site boundary structure. If a site boundary structure is to be installed, it shall be at least 2m from the secure site boundary so as not to create a potential climbing aid.

### 3.5.3. General Construction/Specification

The following general requirements for outdoor substation perimeters shall apply for all new and rebuilt outdoor ground mounted distribution substations:

- Suitable provision for the security of the outdoor substation shall be provided. The level of security required shall be dictated by the risk of vandalism, trespass or theft at the site and is detailed in the following sections.
- Consideration should be given for the substation to be converted to an indoor arrangement at a future date, should the risk assessment or environmental conditions dictate this change. This could be achieved by ensuring that the electrical assets are located as close as possible based upon the design requirements.
- The design of the boundary structure shall be free of any footholds or climbing aids in order to minimise the risk of unauthorised individuals scaling the structure. All overhanging trees to be cut back 1.5m away from the boundary to stop unauthorised access or prevent children falling on to the secure or site boundary fence.
- The secure and site boundary structure must not be so designed that trespassers can be hidden from view.
- The boundary structure should be designed so that where practicable, the majority of materials are maintenance free for the nominal life of the substation,

The secure and site boundary structure shall be so designed to conform to the current building regulations, European standards and reflect additional local planning authority and land owner requirements in order to blend with the surrounding environment.

## 3.6. Management of Outdoor HV Substations with a Third Party Security Boundary

For those outdoor distribution substations where the secure boundary is the property and responsibility of a third party, a suitable management process shall be implemented to ensure the integrity of the boundary is maintained.

Any outdoor HV substation that is identified with a breached secure boundary should be addressed in accordance with the following general guidance:

- Where there is deemed to be an immediate risk to the general public due to the location of the substation or due to other environmental factors, an immediate repair to the boundary shall be initiated to remove the identified risk. If the party responsible for the up-keep of the boundary element cannot carry out this work with immediate effect, the repairs will be arranged through the normal procedure for company-owned property. All costs associated with repair work undertaken by the company on behalf of a third party shall be recouped from that third party.

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- Where a substation is not assessed to present an immediate danger to the public, the responsible owner shall be determined and requested to carry out the repair to an appropriate standard. The owner's obligation to provide a fit for purpose boundary should be indicated as part of this request. An appropriate timescale shall be communicated to the owner for these repairs to be completed dependant on the perceived level of risk evident at the substation location. In the event that the work is not completed within the required timescale, the repair will be arranged through the normal procedure for company-owned property. All costs associated with repair work undertaken by the company on behalf of a third party shall be recouped from that third party.

### 3.7. Application of Locking Arrangements

The Northern Powergrid master / sub master cylinder and pad locks fitted at operational buildings on gates or doors shall meet the requirements of NPS/006/003 – 'Technical Specification for Locks for use on Operational Sites and Apparatus'.

They will have an attack resistance grading to match the stated LPS of the enclosure as detailed in section 3.3 of this document. The cylinder will achieve the attack resistance grading required in BS EN 1303:2015 'Building hardware - Cylinders for locks - Requirements and test methods' with the pad locks meeting the required security requirements of BS EN 12320:2012 'Building hardware - Padlocks and padlock fittings - Requirements and test methods'.

### 3.8. Assumptions

The following assumptions are made in the drafting of this policy document:

- The determination of the enclosure to be adopted shall be based on the result of a risk assessment that is completed in line with MNT/006/001 – 'Code of Practice for the Risk Assessment of Ground Mounted Substations'.
- IMP/011 - 'Policy for Fire Mitigation at Operational Premises' exists for fire mitigation at operational premises that describes the appropriate requirements to minimise the impact of equipment failure that may lead to explosion or fire.
- Substations where the specified level of security is found to be insufficient due to extreme acts of vandalism or trespass shall be referred to the Vulnerable Sites Manager to determine appropriate response to the elevated risk.
- The 'Selston' Report that followed a child fatality at an outdoor substation in another DNO raised the industry's awareness of vandalism and child trespass associated with outdoor electricity substations. To exercise the appropriate duty of care to public and staff, the company embarked upon a programme of site identification and removal or replacement of outdoor distribution substations with indoor equipment. Outdoor substations that are adjacent to schools, children's playgrounds and recreational areas present a higher risk to members of the public in instances of damage or plant failure. Electrical equipment at outdoor substations are more prone to damage from vandal attack than indoor substations and the vandals face a risk of electrocution from the equipment located within them. This method of assessment has now been overtaken by the ESQCR risk assessment process detailed in section 3.1 which more than adequately assesses and addresses the same risks covered by the 'Selston' assessment process.



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## 4. References

### 4.1. External Documentation

Reference	Title
BS 1722-12:2016	Fences – Part 12: Specification for steel palisade fences
BS 1722-5:2006+A1:2018	Fences – Part 5: Specification for close-boarded fences and wooden palisade fences
BS EN 12320:2012	Building hardware - Padlocks and padlock fittings - Requirements and test methods
BS EN 1303:2015	Building hardware - Cylinders for locks - Requirements and test methods
Building Research Establishment	Loss Prevention Standard LPS 1175, Specification for Testing and Classifying the Burglary Resistance of Building Components, Strongpoints and Security Enclosures
Department for Energy Security and Net Zero	DTI – Guidance on the Electricity Safety, Quality and Continuity Regulations 2002
Statutory Instrument 1974 No. 37	Electricity at Work Act 1974
Statutory Instrument 1989 No. 635	The Electricity at Work Regulations 1989
Statutory Instrument 2002 No. 2665	The Electricity Safety, Quality and Continuity Regulations 2002
The Building Regulations Approved Documents	General guidance on the performance expected of materials and building work in order to comply with the building regulations
The Electricity Council	Child Trespassers in Electricity Substations

### 4.2. Internal Documentation

Reference	Title
IMP/001/012	Code of Practice for Flood Mitigation at Operational Premises
IMP/005	Policy for the Renewal of Outdoor HV Distribution Substations.
IMP/011	Policy for Fire Mitigation at Operational Premises
MNT/006	Policy for Site Inspections of Ground Mounted Substations
MNT/006/001	Code of Practice for the Risk Assessment of Ground Mounted Substations
NPS/006/002	Technical Specification for Prefabricated Distribution Substation Enclosures
NPS/006/003	Technical Specification for Operational Locks

### 4.3. Amendments from Previous Version

Reference	Description
Whole Document	Updated to current CDS Document Template, incl. Information Classification
Whole Document	Document reviewed - no update or content change required – Republished as version 3.1 with a new 3 year review period set

## 5. Definitions

Term	Definition
Distribution Substation	Substation where the infeed voltage is high voltage
ESQCR	The Electricity Safety, Quality and Continuity Regulations 2002
HV	High Voltage – in excess of 1,000V and less than 22,000V
LV	Low Voltage – up to 1,000V
The Company	Northern Powergrid

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## 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	13/03/2024

### 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>	
<b>No</b>	<b>Period:</b> 5 years	<b>Reason:</b> This is a document of which the content won't change on a regular basis. A review will be carried out if any of the overarching legislation changes.
<b>Should this document be displayed on the Northern Powergrid external website?</b>		Yes
		<b>Date</b>
Paul McAdoo	Lead Policy & Standards Engineer	19/03/2024

### 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>
David Sillito	Head of Major Projects	19/03/2024
Simon Keightley	Safety Manager	23/03/2024
Paul Buttery	Building and Civil Manager	13/03/2024
Paul Black	Head of System Engineering	20/03/2024

### 6.4. Authorisation

Authorisation is granted for publication of this document.

		<b>Date</b>
Mark Nicholson	Director of Engineering	25/03/2024