National Grid UK Electricity Transmission plc

NATIONAL SAFETY INSTRUCTION 1
and
Guidance

OPERATIONAL AND SAFETY SWITCHING

DOCUMENT HISTORY

Issue	Date	Summary of Changes / Reason	Author(s)	Approved By (Title)
1	Oct 2009	New Guidance Document to follow 3rd edition Electricity Safety Rules layout. Safety bulletins, 22/2006, 32/2005, 26/2005, 155 incorporated.	NSI Working Group	MDE Manager Les Adams 
2	March 2010	Document reviewed and changes made in line with NSI 2 and NSI 30.	Safety Rules Assurance	MDE Manager Les Adams 
3	April 2011	Annual review; document amended as detailed below and minor text changes as highlighted in yellow.	NSI Review Group	MDE Manager Les Adams 
4	April 2012	Annual review; document amended as detailed below and minor text changes as highlighted in yellow. NSI 1 issue 6 incorporated into this document.	NSI Review Group	MDE Manager Les Adams 
5	April 2014	Renamed as “National Safety Instruction and Guidance” which now incorporates and replaces NSI 1 Issue 7 and NSI 1 Guidance Issue 4.	NSI Review Group	ETAM Operations North Manager Mike Dean
6	April 2016	Annual review; document amended as detailed below and minor text changes as highlighted in yellow.	NSI Review Group	ETAM Operations North Manager Matt Staley
7	Dec 2020	Reformatted and significant changes highlighted Key Changes.	Electricity Transmission Safety Rules Team	Head of ET Operations Matt Staley
8	Nov 2021	Reviewed and Reformatted	Safety Rules Team	Director of Asset Operations Matt Staley
9	March 2022	Minor update	Safety Rules Team	Director of Asset Operations Matt Staley
10	Jan 2023	Minor update	Safety Rules Team	Director of Asset Operations Matt Staley
11	Feb 2023	Minor update	Safety Rules Team	Director of Asset Operations Matt Staley

KEY CHANGE

Section	Amendments
1 - Purpose & Scope	Authorisation Boundary established between NSI 1 switching authorisation and NSI 26 switching authorisation.

OPERATIONAL AND SAFETY SWITCHING

CONTENTS

1 Purpose and Scope

To apply the principles established by the Safety Rules and provide guidance on National Safety Instruction 1, when carrying out operational and safety *Switching* operations on **Equipment**.

These procedures have been developed to minimise human error incidents by ensuring that:

- The requirements of the **Control Person(s)** are accurately and unambiguously conveyed to the recipient of the *Switching* Instruction.
- The recipient executes the *Switching* instruction exactly as instructed, without distraction or undue delay.be

National Grid **Authorised Person(s)** and **Senior Authorised Person(s)** may receive National Grid switching instructions from a 3rd Party Safety Controller, and conversely 3rd Party equivalently authorised switching staff may receive switching instructions from a National Grid **Control Person**. The principles within this document shall be maintained.

The following conditions are not within the scope of this NSI

Switching for the purpose of site routines on **LV** and Mechanical **Equipment** is not subject to the requirements of this NSI and shall be covered by site specific Risk Assessments & Method Statements (RAMS).

The *Authorisation* boundary between NSI 1 and NSI 26 is at the first connection **HV** side of the Transformer Bushing. NSI 1 *Authorisation* is required for switching on **Equipment** the **HV** side of this connection.

NSI 26 *Authorisation* is required on **Equipment** from the **HV** Bushing to all associated Railway Connection **Equipment**. All *Safety Switching* on **Equipment** subject to NSI 26, is covered in NSI 26 – 'Railway Connection Circuits'.

All *Safety Switching* associated with NSI 27 – 'Work On or Near to High Voltage Direct Current (HVDC) Equipment' shall be carried out by appropriately authorised **Personnel** as detailed in NSI 30 – 'Appointment of Persons'.

The layout of this guidance note reflects that of legislative codes of practice, where the rule (or mandatory obligation) is identified by a green panel on the left-hand side. The guidance follows after the rule and is identified by a blue panel.

Within National Grid, guidance notes hold equivalent status of an Approved Code of Practice (ACOP) in law. If not followed, you will be required to demonstrate that your safe system of work is of an equal or higher standard.

2 Definitions

Terms printed in bold type are as defined in the Safety Rules.

Title	Definition	
Switching	Being one of the following:	
	Operational Switching	Operation of **Equipment** under the instructions of a **Control Person (Operation)** to ensure safe operation of the **System**.
	Safety Switching	Operation of **Equipment** under the instructions of a **Control Person (Safety)** to achieve **Safety from the System**.

The term isolator also includes disconnector.

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3.1 to 3.7

3 Preparation for Switching

3.1 When *Switching* on **HV Equipment** the identification shall be as shown on the appropriate Operations Diagram.

3.2 All *Switching*, except for emergency, shall be carried out to the instructions of the appropriate **Control Person(s)**.

3.3 Before issuing *Switching* instructions, the **Control Person(s)** shall:

- Consult with the **Control Person(s)** of other **System(s)** that may be affected by the proposed *Switching*
- Ensure **HV Equipment** is not showing "Do Not Believe Indication" status due to **Isolated** indication supplies
- Confirm with the **Authorised Person** or **Senior Authorised Person** that no Technical Limitations / Safety Comments or restrictions will affect the **Equipment** being switched

3.4 *Switching* instructions shall be given direct to an **Authorised Person**, except when:

a. Operating non-interlocked **Equipment** from the local position.
b. Defeating the function of interlocks.
c. Application / removal of portable **Primary Earth(s)**.

In these cases, the *Switching* instruction shall be given direct to a **Senior Authorised Person.** When not in a zone created by **Point(s) of Isolation** the **Senior Authorised Person** shall be authorised to Operational Authority OA1.

3.5 The standard *Switching* Log Book shall where practicable be used. A new *Switching* sheet shall be used for each new set of instructions.

3.6 When *Switching* is carried out as part of a training process, **Personal Supervision** shall be given by the appropriate **Authorised Person** or **Senior Authorised Person**.

3.7 When *Switching* instructions are issued by an individual training, they shall be under **Personal Supervision** of a **Control Person**.

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3.1 to 3.3

3 Preparation for Switching

3.1 If discrepancies exist between Site Labels & Operational Diagrams, then an agreement shall be made between all parties, this may include a National Grid **Senior Authorised Person** attaching temporary labels to **Equipment**. The Operational Diagrams and permanent Site Labels will need updating to reflect the agreement.

3.3 Indication supplies shall not be **Isolated**, by any **Control Person** or Operational Field Staff, on any **HV Equipment** that is to be used for *Operational Switching* or *Safety Switching* until after the *Switching* has been completed.

If an **Authorised Person** is unsure as to the origin of the "Do Not Believe Indications" (DBI) then they can refer to a **Control Person** or **Senior Authorised Person** for further guidance. Utilising an 'Operate as Required' *Switching* instruction is allowable to rectify a DBI indication fault.

It is acceptable to switch on **Equipment** that has Technical Limitations / Safety Comments or Restrictions if safe to do so.

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NSI 1
3.4 to 3.7

3.4 Management Procedure NSI 30 – "Appointment of Persons" provides additional requirements in the application of Operational Authorities OA1 and OA2 for managing higher risk activities.

An **Authorised Person** in receipt of a S*witching* instruction(s) is responsible for performing the instruction(s). Where necessary an **Authorised Person** in receipt of *Switching* instruction(s) may require physical assistance to complete the instruction e.g. opening or closing 400 kV manually operated earth switch. In such circumstances the **Authorised Person** in receipt of the *Switching* instruction shall provide **Personal Supervision** to any **Person(s)** providing physical assistance.

3.5 Refer to Appendix A for the format of a standard *Switching* Log Book. When undertaking Emergency *Switching* or when no switching log book supplies are available, it is permissible to utilise A4 paper to record the notes and store until they can be transferred to the correct materials.

3.6 When *Switching* is carried out by a **Person** under training, they shall be under the **Personal Supervision** of an **Authorised Person**, who will take full responsibility for the correct completion of the *Switching* instruction. The **Control Person** shall be made aware and record both names.

The *Switching* instruction shall be given to the trainee direct from the **Control Person**. Then using the trainees' original instruction, the supervising **Authorised Person** shall then read the *Switching* instruction back to the **Control Person**. Having checked and confirmed the instruction is correct, the supervising **Authorised Person** shall then countersign the trainees' instruction.

On completion of the *Switching* instruction the trainee shall give the instruction back to the **Control Person**. Then using the trainees' original instruction, the supervising **Authorised Person** shall also give the *Switching* instruction back to the **Control Person**.

For a trainee **Senior Authorised Person** receiving an instruction to apply / remove portable **Primary Earth(s),** the **Personal Supervision** shall be carried out by a **Senior Authorised Person**.

3.7 When *Switching* instructions are given or received back by an individual under training, they shall be under the **Personal Supervision** of the appropriate **Control Person**, who will check and countersign the written instructions before they are issued and take full responsibility for the accuracy of the *Switching* instruction. The recipient of the *Switching* instruction shall be made aware and note both names on their instruction.

Trainee **Control Person(s)** shall not work with other trainee **Control Person(s)** for Delegation of Authority.

Where the preference for Trainee to Trainee conversations should be avoided where possible; Trainee **Control Person(s)** can work with trainee **Authorised Person(s) or Senior Authorised Person(s)**. However, the already fully authorised **Control Person(s), Authorised Person(s)** or **Senior Authorised Person(s)** supervising; shall be part of the acknowledgement / approval / counter signing process for the *Switching* instruction.

NSI 1
4.1 to 4.7

4 High Voltage Switching – Other than for Emergency Purposes

4.1 **HV** *Switching* instructions shall be recorded. All recorded entries shall be written legibly and indelibly. *Switching* instructions involving **Point(s) of Isolation** and **Primary Earth(s)** shall not be given on the same instruction, except in special circumstances.

4.2 **HV** *Switching* instructions shall be given to the appropriate recipient in two parts:

a An informal pre-amble between the **Control Person** and the recipient of the *Switching* instruction

Followed by:

b Formal written instruction

4.3 The recipient of the *Switching* instruction shall fully understand the full content of the instruction before proceeding. The *Switching* instruction shall then be carried out in its given sequence, without undue delay.

4.4 On completion of the application of safety precautions under the instructions of a **Control Person (Safety)** the recipient of the **HV** *Switching* instruction shall secure the **Safety Key(s)** inside a **Key Safe**.

The **Key Safe** shall be **Locked** and a **Key Safe Key** secured in safe custody by being placed inside the Operational Key Cabinet.

On restoration of safety precautions under the instructions of a **Control Person (Safety)** the recipient of the **HV** *Switching* instruction shall return the **Key Safe Key** to the **Key Safe** and **Safety Key(s)** to the Operational Key Cabinet.

4.5 On completion of the **HV** *Switching* the recipient shall confirm to the appropriate **Control Person(s)** that the *Switching* instruction has been completed.

4.6 When Safety Precautions have **Point(s) of Isolation** dependent on SF_6 the **Control Person (Safety)** will identify the Gas Zone containing the **Point(s) of Isolation** and the associated gas zone monitoring alarms.

4.7 To maintain the integrity of the **System**, when undertaking Protection Trip testing, the **Authorised Person** (OA6) shall assess the impact of testing and establish suitable precautions for any related **Equipment** which may remain in service. The Protection Trip precautions shall be established in accordance with the hierarchy described in the associated Guidance.

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NSI 1
4.1 to 4.2

4 High Voltage Switching – Other than for Emergency Purposes

HV *Switching* instructions shall be recorded giving the name of the **Location(s)** at which the instructions are to be carried out, the identification and nomenclature of the **Equipment** involved and the operations required.

Special circumstances include:

- Gas Insulated Switchgear (GIS) 3 position switches
- *Switching* within a zone where **Point(s) of Isolation** have been established
- Where agreed with the TNCC

Standard terminology and abbreviations to be used in the *Switching* instruction are shown in Appendix B, C and D.

Where there is no standard terminology, agreement shall be reached between the **Control Person(s)** issuing the **HV** S*witching* instruction and the recipient carrying out the S*witching* instruction as to the wording.

Prior to contacting the **Control Person**, the **Authorised Person** or **Senior Authorised Person** shall familiarise themselves with the status of the **HV Equipment** e.g. substation status board for technical limitations, risk management zones, SCS screen etc.

4.2(a) The pre-amble is an explanation of the objective of the subsequent operations including the identification and **Location** of the **Equipment** involved. It is not necessary to record this in writing.

4.2(b) The formal written instruction begins when the **Control Person** states ‘time of message is’, they record the name of the recipient of the *Switching* instruction and shall follow the standard pattern below:

- Time and date of message.
- Name of the **Control Person(s)** giving the instruction which shall be printed.
- Name and nominal voltage of the **Location** at which the *Switching* is to take place. The location can be abbreviated to the standard 4 letter code for the site as per TP 169.
- Name and number of circuit.
- Actual operational requirement.
- Name of the recipient receiving the instruction which shall be printed.

The recipient of the **HV** *Switching* instructions shall write them down and repeat them back phrase by phrase, as received from the **Control Person(s)**.

The **Control Person(s)** shall conclude the formal instruction with ‘end of message’

At the end of the message the complete *Switching* instruction shall be read back in full to the **Control Person(s)** to ensure that it has been accurately received. An example of a completed *Switching* instruction is contained in Appendix A.

Completed switching sheets shall be retained at the location for 6 months and switching Log Books retained at the location for 3 years.

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4.3

4.3 When carrying out **HV** *Switching* instructions the recipient shall observe the following requirements:

a. Concentrate on the task;
- avoid distraction (mobile phone may be answered for *Switching* Control related calls only),
- be deliberate - neither rushing nor causing undue delay,
- take nothing for granted,
- carry out the *Switching* instructions in the sequence given.

b. Where reasonably practicable the recipient shall undertake the switching operations on his own to avoid distractions. The exception to this shall include training, OA1 & OA2 operation or where physical assistance is required to operate the equipment.

c. Take the *Switching* instruction sheet, consulting it to ensure the correct **Equipment** is identified before taking any action.

d. When a piece of **Equipment** shows any sign of distress, it shall not be operated and the **Control Person(s)** informed immediately. All **Personnel** in the vicinity shall be warned that a potential hazard exists and withdrawn from that area.

e. Before taking any action, pause and recheck the proposed action against the *Switching* instruction before carrying it out.

f. **Locked Equipment** shall only be unlocked immediately before being operated, then **Locked** again after it has been operated.

g. Check by all means readily available that the *Switching* instruction has been satisfactorily completed.

h. After each individual operation is completed it shall be ticked off on the written *Switching* instruction to indicate completion.

If for any reason an individual operation cannot be completed, the recipient of the *Switching* instruction shall where reasonably practicable restore the **Equipment** back to its original position and the **Control Person(s)** informed. The **Control Person(s)** will then decide if the *Switching* instruction can continue or whether it is to be cancelled.

i. If interrupted or distracted the recipient of the **HV** *Switching* instruction shall review the previous part of the *Switching* instruction to ensure that the next step is valid.

j. When a line end earth switch has been closed the **Circuit Identification** shall be recorded on the *Switching* instruction sheet.

k. The recipient of the **HV** *Switching* instruction shall record the time of the completion of the operation or sequence of operations. For *Safety Switching* this time will be the time when all keys have been placed in safe custody.

l. Where access may be prevented; interlock / maintenance keys required for further switching or key exchange purposes shall be removed, then either retained in safe custody or placed within the relevant key exchange box. On restoration of safety precautions, interlock / maintenance keys shall be returned to the appropriate **Equipment** in readiness for **Operational Service**. This may include **Equipment** on which safety precautions were not established.

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NSI 1
4.4

4.4 Once safety precautions have been completed details of what **Safety Key(s)** are secured in the **Key Safe** shall be recorded by attaching a label to the **Key Safe -** refer to Appendix F.

Once safety precautions have been established to the instruction of a **Control Person (Safety)**, neither **Authorised Person(s)** nor **Senior Authorised Person(s)**, shall interfere with or rearrange the locking arrangements unless it is confirmed by the **Control Person (Safety)** that no **Safety Document(s)** are in force.

To avoid the unnecessary cancelation and reissuing of **Safety Document(s)**, as a result of trapped keys, it is important to;

- Effectively pre-plan the locking arrangements before the start of the *Switching* activity,
- Liaise between circuit ends,
- Minimise **Point(s) of Isolation** changes during outages.

Figure 4.4A – Example of a **Key Safe** and safety precautions applied

An Apricot coloured T card shall be filled in with the appropriate details and placed in the POI / Earthing / RISSP section of the Substation Status Board. There is no requirement to record **HV** safety precautions which are remote to the **Location** as these are the responsibility of the **Control Person (Safety)**.

External Companies, e.g. Power Companies, may require an exchange of **Key Safe Key(s)** to satisfy their local safety precautions. **Authorised Person(s)** may therefore be required to take a **Key Safe Key** from the appropriate **Key Safe** to the Power Station Safety Document Officer. A record of such action and the name of the person provided with the **Key Safe Key** shall be recorded on the **Key Safe** contents card.

When safety precautions have been established by another company for use by National Grid or by National Grid for use by another company (across control boundaries) they shall, where reasonably practical, exchange **Key(s).** Any **Key(s)** received by National Grid from other companies shall be secured in a **Key Safe** and recorded on the **Key Safe** contents card. If an external company issues a proof of isolation and earthing certificate when they have completed safety precautions, this certificate is to be recorded on an apricot T Card.

Once all relevant **Safety Document(s)** have been cancelled and safety precautions restored the recipient of the **HV** *Switching* instruction shall amend the **Key Safe** content details, remove the T Card from Substation Status Board and return the **Key Safe Key** to the **Key Safe** and **Safety Key(s)** to the Operational Key Cabinet. The Operational Key Cabinet shall be locked with the **Authorised Person** lock provided.

Guidance
NSI 1
4.5 to 4.7

4.5 Following the completion of **HV** *Switching* the recipient of the *Switching* instruction shall:

a Record the time of completion of the operations, together with any **Circuit Identification** noted after closing a line end earth switch, in the *Switching* log book. It is not necessary to re-insert the *Switching* instruction sheet into the Switching log book at this stage.

b Report back to the appropriate **Control Person(s)** the operations carried out, the time of completion and any **Circuit Identification** involved.

c Record the name of the appropriate **Control Person(s)** and the time of confirmation given by the appropriate **Control Person(s)** in the *Switching* log book.

The **Control Person(s)** receiving the message shall:

a Record the time of completion of the **HV** *Switching* and any **Circuit Identification** involved and any other relevant information.

b Inform the sender their name and confirmation of the time of receipt.

c Acknowledge, by repeating back to the sender the **Circuit Identification** if appropriate and any other relevant information.

d Check against the relevant records and displays the accuracy of the **Circuit Identification** involved.

e Dress any relevant diagrams or displays.

Once all **HV** *Switching* has been completed the recipient of the **HV** *Switching* instruction shall confirm with the **Control Person(s)**, that all safety critical information has been received and relevant displays on IEMS screens are reading correctly.

4.6 Where there is any doubt regarding the gas zone and associated alarm, the **Authorised Person** will be asked to confirm the gas zone and alarm legend when establishing the **Point(s) of Isolation**.

The **Authorised Person** shall confirm to the **Control Person (Safety)** that the alarm system monitoring the gas pressure associated with any **Point(s) of Isolation** is in service.

Where reasonably practicable the alarm system monitoring the gas zone shall be tested and proved to the **Control Person(s)** display from the source of alarm or at a point close to the source e.g. shorting at gauge or terminal block.

4.7 In order of preference, the options for implementing precautions from Protection Trip signals are listed below;

1) Dedicated Trip precaution links or test switches should be used in the first instance.

2) Where it is not reasonably practicable to use dedicated links or test switches (e.g. if not fitted), switchgear Auxiliary Contacts may be used subject to the following criteria being met;

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4.7 cont.

- The Auxiliary Contact is confirmed to be in the required state by electrical measurement, and shall, where reasonably practicable checked visually by the **Authorised Person**.

- Precautions must be taken such that the state or integrity of the Auxiliary Contact cannot be compromised during the course of work (e.g. inhibit operation and lock isolator doors).

3) Where Auxiliary Contacts do not achieve the necessary precautions, or the criteria above cannot be met, Trip Relays may be removed or insulating material can be applied around or over the appropriate contacts. Care must be taken when removing / restoring Trip Relays to their dedicated housing to ensure correct alignment and gentle handling. Where this method of precaution is used, any depletions of protection or intertrip functionality affecting equipment in service must be recorded, studied, assessed, booked and agreed with the appropriate **Control Person**.

4) Precautions may be achieved by disconnecting wiring. Any wiring disconnected shall be re-proven under the direction and advice of a TP141 Commissioning Engineer prior to the **Equipment** being declared available for service. The disconnection of commissioned tripping wiring must be considered a last resort option.

Note: All Protection Trip precautions must remain effective throughout the course of the work, by their design the precautions applied are there to prevent a trip or intertrip only and are therefore not defined similar to **Point(s) of Isolation**.

NSI 1
5.1 to 5.4

5 High Voltage Switching – Emergency and Fault Conditions

5.1 When **Equipment** is showing signs of distress it shall not be operated and all **Personnel** shall be kept clear of the **Equipment**. *Operational Switching* shall be carried out as soon as possible so that the **Equipment** concerned can be removed from service without it being subjected to further operations.

5.2 Where **HV** *Switching* has taken place under emergency conditions and without instruction from a **Control Person(s)**, the **Authorised Person** shall inform the appropriate **Control Person(s)** as soon as reasonably practicable after the operation.

5.3 When **Equipment** trips under fault conditions the **Authorised Person** shall record all **Equipment** operations.

5.4 When the **Control Person (Operation)** instructs action to restore **Equipment** which has tripped under fault or emergency conditions, the **Authorised Person** receiving the instruction shall ensure that the trip relays are reset before attempting to close any circuit breaker.

Guidance
NSI 1
5.2 to 5.3

5 High Voltage – Emergency and Fault Conditions

5.1 All **Equipment** showing signs of distress and subsequently removed from service shall have a Technical Limitation raised against it, where applicable. **Location** Managers shall be made aware and the status of the distressed **Equipment** shall be communicated to all relevant parties.

5.2 All relevant details of the emergency *Switching* shall be recorded in the *Switching* log book.

5.3 When **Equipment** trips under fault conditions:

Audible alarms will be silenced and report, as soon as possible, to the **Control Person (Operation)** the time of the operation and details readily available in the Control Room.

If any relay indications are not available in the Control Room, report this to the **Control Person (Operation)** who will decide when these indications are to be obtained.

The **Authorised Person** shall record all protection relay operations. In addition, where an automatic means of recording the alarms and events is not available, the **Authorised Person** shall also record these details. This information shall be in written form and retained for fault investigation.

With agreement from the **Control Person (Operation)**, the **Authorised Person** can then reset any 'manually reset' relays and indications.

NSI 1
6.1 to 6.2

6 Low Voltage and Mechanical Switching

6.1 Notwithstanding the requirements of Section 6.2, *Switching* for **LV** and Mechanical **Equipment** shall be carried out in accordance with the principles specified in Section 4 and Section 5.

6.2 Where the **Senior Authorised Person** acts as an **Authorised Person**, to undertake *Safety Switching* prior to preparation of a **Safety Document**, the detailing of the safety precautions on the **Safety Document** will be the record of the *Safety Switching*.

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NSI 1
6.1

6 Low Voltage and Mechanical Switching

6.1 Once **LV** and / or Mechanical safety precautions have been completed the **Authorised Person** shall enter details of the safety precautions taken on an apricot coloured T Card. The card shall be placed in the POI / Earthing / RISSP Section of the Substation Status Board in line with the associated circuit.

Where there are a large number of **LV** safety precautions e.g. NICAP work, the apricot T Card shall reference the NSI 12 'Low Voltage Equipment' ROADDRAT form, which shall be located adjacent to the Substation Status Board.

Safe custody of **Keys** etc. for **LV** and Mechanical **Equipment** shall be in line with the requirements for **HV** equipment, refer to Section 4.

NSI 1
7.1 to 7.2

7 Defeating the Function of Interlocks

7.1 The **Control Person(s)** shall give a *Switching* instruction to render interlocks inoperative direct to a **Senior Authorised Person**.

7.2 When not within a zone established by **Point(s) of Isolation**, in addition to 7.1 above, the **Senior Authorised Person** shall be authorised to OA1 and a separate *Switching* instruction shall be given to an **Authorised Person** who has Operational Authority OA2 to accompany and check the OA1.

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7.1 to 7.2

7 Defeating the Function of Interlocks

7.1 Defeating the function of interlocks is a potentially high risk *Switching* operation that removes the in-built safeguards. Interlocks prevent the **Equipment** from being operated in an incorrect sequence. This may then give rise to **Danger** to those **Person(s)** carrying out the *Switching* operation.

Therefore, these *Switching* operations require careful consideration and mutual agreement between the **Control Person(s)** and a **Senior Authorised Person**.

7.2 The **Control Person(s)** shall give an identical switching instruction to both the **Senior Authorised Person**, who has Operational Authority OA1 and the **Authorised Person** who has Operational Authority OA2.

However, the switching instruction given to the **Authorised Person** who has Operational Authority OA2 shall be preceded with the phrase "To accompany and check……."

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7.2 Cont.

The **Senior Authorised Person** with OA1 shall ensure that:

- The substation running arrangement is as agreed with the **Control Person(s)**. This shall be established by a visual inspection of the **Equipment**.
- All staff, except for the accompanying **Authorised Person**, shall be clear of the area adjacent to the **Equipment** prior to it being operated.
- They perform the specified switching operation as specified on the *Switching* instruction.

The **Authorised Person** with OA2 shall also ensure that:

- The substation running arrangement is as agreed with the **Control Person(s)**. This shall be established by a visual inspection of the **Equipment**.
- The **Senior Authorised Person** with OA1 has been informed that they are at the correct **Equipment** prior to carrying out the operation. This is not a passive role.
- They witness and check the specified *Switching* operation as specified on the *Switching* instruction.

Both the **Senior Authorised Person** with OA1 and the **Authorised Person** with OA2 shall be sure that the operation can be carried out without **Danger** before proceeding.

NSI 1
8.1 to 8.2

8 Operation of Non-Interlocked Equipment from the Local Control Point

8.1 The **Control Person(s)** shall give a *Switching* instruction to operate non-interlocked **Equipment** from the Local Control Point direct to a **Senior Authorised Person**.

8.2 When not in a zone created by **Point(s) of Isolation** the instruction shall be given to a **Senior Authorised Person** with Operational Authority OA1. A separate *Switching* instruction shall be given to an **Authorised Person** who has Operational Authority OA2 to accompany and check the OA1.

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8.2

8 Operation of Non-Interlocked Equipment from the Local Control Point

8.2 Operation of non-interlocked isolators from the local position when outside a zone created by **Point(s) of Isolation** is potentially a high risk *Switching* operation as there are no in-built safeguards to prevent the isolators from being operated in an incorrect sequence. This may then give rise to **Danger** to those **Person(s)** carrying out the *Switching* operation.

Therefore, these *Switching* operations require careful consideration and mutual agreement between the **Control Person(s)** and a **Senior Authorised Person**, who has Operational Authority OA1.

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8.2 Cont.

The **Control Person(s)** shall give an identical *Switching* instruction to both **the Senior Authorised Person**, who has Operational Authority OA1 and the **Authorised Person** who has Operational Authority OA2. However, the switching instruction given to the **Authorised Person** who has Operational Authority OA2 shall be preceded with the phrase "Accompany and check……."

The **Senior Authorised Person** with OA1 shall ensure that:

- The substation running arrangement is as agreed with the **Control Person(s)**. This shall be established by a visual inspection of the **Equipment**.
- All staff, except for the accompanying **Authorised Person**, shall be clear of the area adjacent to the **Equipment** prior to it being operated.
- They perform the specified switching operation as specified on the *Switching* instruction.

The **Authorised Person** with OA2 shall also ensure that:

- The substation running arrangement is as agreed with the **Control Person(s)**. This shall be established by a visual inspection of the **Equipment**.
- The **Senior Authorised Person** with OA1 has been informed that they are at the correct **Equipment** prior to carrying out the operation. This is not a passive role.
- They witness and check the specified switching operation as specified on the switching instruction.

Both the **Senior Authorised Person** with OA1 and the **Authorised Person** with OA2 shall be sure that the operation can be carried out without **Danger** before proceeding.

NSI 1
9.1 to 9.2

9 Operation of Non-Interlocked Equipment from the Substation or Remote Control Point

9.1 The **Control Person(s)** shall give a *Switching* instruction to operate non-interlocked **Equipment** from the Substation Control Point direct to an **Authorised Person** with Operational Authority OA2.

9.2 Prior to the operation of non-interlocked **Equipment**, via telecommand under the direct control of a **Control Person(s)**, the **Control Person(s)** shall confirm with a second **Control Person(s)** the correct configuration of the substation.

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NSI 1
9.1 to 9.2

9 Operation of Non-Interlocked Equipment from the Substation or Remote Control Point

9.1 Operation of non-interlocked **Equipment** from the Substation Control Point is potentially a high risk *Switching* operation as there are no in-built safeguards to prevent the **Equipment** from being operated in an incorrect sequence. This may then give rise to **Danger** to those **Person(s)** carrying out the *Switching* operation.

Therefore, these *Switching* operations require careful consideration and mutual agreement between the **Control Person(s)** and an **Authorised Person**, who has Operational Authority OA2.

The **Authorised Person** with OA2 shall ensure that:

- The substation running arrangement is as agreed with the **Control Person(s)**; this shall always be established by a visual inspection of the **Equipment**.
- All staff shall be clear of the area adjacent to the **Equipment** prior to it being operated.

A control point within a block house is classified the same as the Substation Control Point.

9.2 Prior to the operation of non-interlocked **Equipment**, via telecommand the **Control Person(s)** shall ensure, so far as is reasonably practicable, that all staff are clear of the area adjacent to the **Equipment** prior to being operated.

NSI 1
10.1

10 Point(s) of Isolation on HAM VT / CT Units and Resistor Capacitor Dividers

10.1 Under normal conditions **Danger** will not arise and therefore safety precautions are not required for a National Grid **Safety Document**.

Guidance
NSI 1
10.1

10 Point(s) of Isolation on HAM VT / CT Units and Resistor Capacitor Dividers

10.1 The secondary wiring / circuitry of these devices are dedicated to a purpose, consequently there is no opportunity for **Danger** resulting from the inadvertent back energisation of the instrument transformer. Isolation is therefore not normally required.

Where isolation is required, this shall be done under the control and instruction of a **Control Person (Operation / Safety) 2**. When **Safety From The System** is required by a **Control Person (Safety) 1**, a requesting HV / LV RISSP shall be used.

When carrying out off load diagnostic testing and **Danger** could arise the VT secondary supplies shall be **Isolated** as part of the test procedure.

Note: Some **System** users e.g. Distribution Network Operators require HAM VTCT to be established as a **Point of Isolation**. This will be carried out under instruction from the relevant **Control Person**.

NSI 1
11.1

11 Point(s) of Isolation on Metal Enclosed (with Spouts) Withdrawable Voltage Transformers

11.1 **Point(s) of Isolation** shall be established on VTs by either:

a. VT spout shutters **Locked** shut and a **Caution Notice** attached.

or

b. A fully rated circuit breaker which is designed to earth the circuit via the VT spouts and can be **Locked** in the relevant feeder / Busbar earth position or via designated secondary supplies.
A **Caution Notice** shall be attached to the circuit breaker locking bar or equivalent.

Guidance
NSI 1
11.1

11 Point(s) of Isolation on Metal Enclosed Withdrawable Voltage Transformers

11.1a The **Equipment** is designed so that there is no requirement to isolate the secondary supplies by removal of fuses as the process of withdrawing the VT from the switchgear will break both **HV** and **LV** connections. In this instance the VT spout shutters shall be **Locked** shut and established as a **Point(s) of Isolation**.

11.1b Some designs of Metal Enclosed switchgear require earthing of the feeder to be carried out via the VT spouts. When this is required the VT spouts are made inaccessible by the application of a fully rated circuit breaker in the circuit earth position.

Where isolation of the VT is via a Circuit Breaker that is **Earthed** using Feeder / BB Earth via VT spouts – then this earthing arrangement acts as the valid POI for the VT and shall be quoted on all associated safety documents.

Further information can be found in NSI 3.

Appendix A – Standard Switching Log Book and Example Switching Instructions

OA1 & OA2 Instructions for Defeating Interlocks

Date	Message Sent by	Time of Message	Message		Message Received by	Time of Operation
			At Location	Operation/Instruction		
03/11/15	LEV STROUD	11:23	IRONBRIDGE 132kV SUBSTATION	ON MAIN BUSBAR SECTION 1		
				OPEN, LOCK AND CAUTION ISOLATOR		
				128 BY THE DEFEATING OF INTERLOCKS	RE DAVIES	12:13

Date	Message Sent by	Time of Message	Message		Message Received by	Time of Operation
			At Location	Operation/Instruction		
03/11/15	LEV STROUD	11:28	IRONBRIDGE 132kV SUBSTATION	ON MAIN BUSBAR SECTION 1		
				ACCOMPANY AND CHECK THE OPEN, LOCK AND		
				CAUTION OF ISOLATOR 128 BY THE		
				DEFEATING OF INTERLOCKS	TENZIN KAY	12:13

Operate As Required Instruction

Date	Message Sent by	Time of Message	Message		Message Received by	Time of Operation
			At Location	Operation/Instruction		
11/3/15	LEV STROUD	09:04	St JOHNS WOOD 400kV SUBSTATION	ON SGT7 CIRCUIT		
				OPERATE AS REQUIRED EARTH		
				SWITCH X711A, LEAVE CLOSED		
				AND LOCKED ON COMPLETION AND		
				OPERATE AS REQUIRED ISOLATOR		
				X713, LEAVE OPEN ON COMPLETION	R E DAVIES	15.17

Metal Enclosed Switchgear Instruction

Date	Message Sent by	Time of Message	Message		Message Received by	Time of Operation
			At Location	Operation/Instruction		
16/09/15	LEV STROUD	12:15	LLANWERN 33k SUBSTATION	ON SGT1 CIRCUIT		
				ISOLATE 33kV CB SG1 AND		
				LOCK AND CAUTION THE BUSBAR		
				FEEDER AND VT SHUTTERS	RE DAVIES	13.07

Appendix B – Operational Switching Instructions

To ensure all **HV** *Operational Switching* Instructions are clear and unambiguous standard terminology shall be adopted.

Due to the diversity of **Equipment** on the System, these instructions may be supplemented with Local Switching Procedures, giving additional detail on the steps required to achieve the switching operations.

Some transposition of words is permitted to achieve clear phraseology.
This should be discussed and agreed between all parties.

(-----) Indicates the inclusion of the appropriate terms
* Delete as appropriate
** Delete "to charge" or "to discharge" when quoting an isolator

When **Equipment** has been designed for example as DISCONNECTING CIRCUIT BREAKERS or SWITCH DISCONNECTORS to perform similar functions to that of CIRCUIT BREAKERS or ISOLATORS; it is permissible to transpose that **Equipment's** description into an appropriate *Switching* instruction.

INSTRUCTION 1 ON (-----) CIRCUIT CHECK SYNC ON CIRCUIT BREAKER (-----)

ACTION Check all synchronising conditions and report back.

INSTRUCTION 2 ON (-----) CIRCUIT CHECK SYNC AND CLOSE CIRCUIT BREAKER (-----) TO LOAD

ACTION Close circuit breaker using synchronising facilities and report action with load on circuit and amps on each phase if possible.

INSTRUCTION 3 ON (-----) CIRCUIT CLOSE CIRCUIT BREAKER / ISOLATOR* (-----) TO CHARGE**

ACTION Close circuit breaker / isolator using synchronising override if necessary and report back actions with charging current on each phase if appropriate.

INSTRUCTION 4 ON (-----) CIRCUIT MANUALLY OVERRIDE… SYNC AND CLOSE CIRCUIT BREAKER (-----) TO LOAD / CHARGE*

ACTION Use sync override facility and close circuit breaker, report back action with load on circuit and amps on each phase if possible.

INSTRUCTION 5 ON (-----) CIRCUIT OPEN CIRCUIT BREAKER (-----) TO OFFLOAD

ACTION Open circuit breaker.

INSTRUCTION 6 ON (-----) CIRCUIT CHECK LOAD

ACTION Check MW, MVAr and AMPS on each phase, if possible, and report back readings.

INSTRUCTION 7 ON (-----) CIRCUIT CHECK NO LOAD AND OPEN CIRCUIT BREAKER / ISOLATOR * (----) TO DISCHARGE**

ACTION The operator may have been informed in the preamble that some charging current but no MW's should be indicated. If conditions are as expected, the circuit breaker is opened and the action reported back.

INSTRUCTION 8 ON (-----) CIRCUIT OPEN CIRCUIT BREAKER / ISOLATOR * (-----) TO DISCHARGE**

ACTION Open circuit breaker / isolator.

INSTRUCTION 9 ON (-----) CIRCUIT OPEN CIRCUIT BREAKER (-----) TO OFFLOAD / DISCHARGE* AND CHECK (-----) OPENS SEQUENTIALLY

ACTION Open circuit breaker and check sequential isolator opens.

INSTRUCTION 10 ON (-----) CIRCUIT SELECT TO TEST / SWITCH* IN / OUT* FIRST / SECOND* MAIN PROTECTION / INTERTRIPPING* DAR*

ACTION Select control switch to instructed position.

INSTRUCTION 11 ON SGT (-----) TAP FROM POSITION (-----) TO (-----) TO RAISE / LOWER* VOLTS

ACTION Operate tap changer control to move tap position as instructed.

INSTRUCTION 12 ON SGTs (-----) TAP TO MAINTAIN TARGET VOLTAGE OF (-----) kV

ACTION Maintain target volts.

INSTRUCTION 13 ON (-----) CIRCUIT ON LOAD CHANGE OVER
CLOSE ISOLATOR (-----) OPEN ISOLATOR (-----)

ACTION The **Control Person (Operation)** shall check that an electrical parallel path exists between the busbars on the circuit concerned. This information shall be conveyed to the **Authorised Person** in the pre-amble who shall where practicable, visually check that the electrical parallel path exists prior to carrying out the **HV** *Switching* instruction. At the end of the **HV** *Switching* Instruction the **Authorised Person** may also be requested to check and confirm that the busbar is clear of all circuits.

INSTRUCTION 14 ON (-----) CIRCUIT OFF LOAD CHANGE OVER
OPEN ISOLATOR (-----) CLOSE ISOLATOR (-----)

ACTION Check that the circuit breaker on the circuit concerned is open and then carry out the **HV** *Switching* instruction.

INSTRUCTION 15 ON (-----) CIRCUIT CHECK DAR IS SWITCHED OUT OF SERVICE INHIBIT AND CAUTION

ACTION Check that the DAR is out of service and lock in / out switch in / out position and caution (requirement for live line).

INSTRUCTION 16 ON **(-----)** CIRCUIT SWITCH OFF THE POWER LINE CARRIER INTERTRIPPING* / REL352*/TC-10B* / BLOCKING* EQUIPMENT

ACTION Equipment powered down.

INSTRUCTION 17 CHECK OPEN ISOLATORS (-----)
CLOSE EARTH SWITCH (-----) TO DISSIPATE TRAPPED CHARGE
OPEN EARTH SWITCH (-----)

ACTION Where reasonably practicable physically check that all **Live** side isolators are open to confirm an **Isolated** zone has been established. Consideration shall also be given to any relevant Technical Limitations applicable to the fixed **Earthing Device(s)**. Close and then open earth switch.

INSTRUCTION 18 ON SGT (-----) CIRCUIT SELECT SUPERGRID (-----) CB TO MAINTENANCE POSITION, LOCK BUSBAR AND FEEDER SHUTTERS

ACTION Instruction to allow trip testing. There is no need to isolate the VT from the service position.

INSTRUCTION 19 ON (-----) CIRCUIT OPERATE AS REQUIRED / TAKE OPERATIONAL CONTROL* (-----)

ACTION To allow any maintenance, fault investigation or commissioning etc. as required. When taking operational control, the relevant **HV Equipment** shall be selected to either the substation control point or the Local Control Point by the **Authorised Person**.

INSTRUCTION 20 IN CONJUNCTION WITH (NAME) AT (LOCATION) SWITCH THE (CIRCUIT NAME / LEG)* (1st / 2nd)* INTERTRIP CHANNEL TO TEST AT ALL ENDS. CARRY OUT WORK AND RESTORE TO SERVICE ON COMPLETION

ACTION Master Controller (Lead Test Co-ordinator) gives instruction to remote end to switch relevant intertrip channel or protection to test and upon completion of work instructs remote end to switch intertrip channel or protection back into service.

INSTRUCTION 21 AT / ON* (LOCATION / CIRCUIT)* AGREE WORK ON (1st / 2nd) * MAIN PROTECTION

ACTION Carry out work on protection (maintenance, testing or commissioning) as required and restore to normal on completion.

INSTRUCTION 22 ON (CIRCUIT) SELECT BUSBAR PROTECTION INTERTRIPPING TO (DIRECT / SELECTIVE) OPERATION

ACTION The Commissioning Engineer (ET/BP/141) will study circuit diagrams to identify the links which control direct / selective operation of busbar protection intertripping and select the link to the position instructed. Where the position differs from that recorded on the setting sheet, a Technical Limitation shall be issued with the **Control Person**.

INSTRUCTION 23 ON (CIRCUIT) SIMULATE (TRANSIENT / PERSISTENT) FEEDER FAULT WITH (REVERSION / FERRORESONANCE) FROM (-----) PROTECTION

ACTION Simulate the relevant fault on the appropriate protection via test button (preferred) or applying a temporary short to the protection trip output.

INSTRUCTION 24 ON MESH CORNER (-----) (OPEN* / CLOSE*) ISOLATOR (-----) TO (BREAK* / COMPLETE*) MESH

ACTION The **Control Person (Operation)** shall check that an electrical parallel path exists for the isolator concerned. This information shall be conveyed to the **Authorised Person** in the preamble who shall where practicable, visually check that the electrical parallel path exists prior to carrying out the **HV** Switching instruction.

Appendix C – Safety Switching Instructions

To ensure all **HV** *Safety Switching* instructions are clear and unambiguous standard terminology shall be adopted.

Due to the diversity of **Equipment** on the System, these instructions may be supplemented with Local Switching Procedures, giving additional detail on the steps required to achieve the switching operations.

Some transposition of words is permitted to achieve clear phraseology.
This should be discussed and agreed between all parties.

Render Operative is a *Switching* Instruction to remove the **Point of Isolation** elements from an isolator.

(-----) Indicates the inclusion of the appropriate terms
* Delete as appropriate

When **Equipment** has been designed for example as DISCONNECTING CIRCUIT BREAKERS or SWITCH DISCONNECTORS to perform similar functions to that of CIRCUIT BREAKERS or ISOLATORS; it is permissible to transpose that **Equipment's** description into an appropriate *Switching* instruction.

C1 FIXED ISOLATING DEVICES

INSTRUCTION 1	(Check Open / Open)*, Lock, and Caution Isolator* (----)
ENTRY ON SAFETY DOCUMENT	(----)
ENTRY ON RISSP	(----) Open, Locked, and Cautioned

The **Authorised Person** should for:

(1) Manually Operated Isolators

After opening the isolator, return the handle to the inoperative position, attach a **Caution Notice** and secure the isolator and the notice with a safety lock. Where present, remove the Lockout key and place in a **Key Safe** with the identified **Safety Key**.

(2) Manually Operated Soule Disconnectors

After opening the disconnector, remove the Lockout key and place it inside the mechanism box. Secure the mechanism box door closed with a safety lock and attach a **Caution Notice**, identify the **Safety Key(s)** and place it in a **Key Safe**.

(3) Motorised Isolators or Disconnectors

(3.1) Where access to the compartment is not required after safety precautions have been established.

Remove motor supply fuses and links or place miniature circuit breakers (MCB's) into the open position. Fuses and links shall be placed within the compartment.

Where a lockout or equivalent key is provided remove the lockout or equivalent key and place it in the compartment.

If no lockout or equivalent key is provided then the magnetic bolt interlock fuses and links shall be removed or place MCB's into the open position. Fuses and links shall be placed in the compartment with the motor supply fuses and links.

All compartment doors containing removed fuses, links or open MCB's shall be secured with a unique lock and **Caution Notice(s)** attached. Where this action would trap any remaining interlock keys these keys shall be removed to safe custody before securing the compartment door(s).

Where an inner door can secure access to the removed motor supply fuses links or open MCB's, only the inner door needs to be **Locked** and **Caution Notice(s)** attached**.**

Where other doors permit the removed lockout key or motor supply fuses and links or open MCB's to be reached then these doors shall also be locked closed with a safety lock and **Caution Notice(s)** attached.

Identify the **Safety Key(s)** and place them in a **Key Safe**.

Note: Where MCB's are not located within a compartment they shall be secured with a unique lock and **Caution Notice** attached. The **Safety Key(s)** shall be secured in a **Key Safe**.

(3.2) Where access to the compartment is required after safety precautions are applied.

Remove motor supply fuses and links and, where reasonably practicable, locking devices applied from the holders or place MCB's into the open position and, where reasonably practicable, locking devices applied and attach a **Caution Notice**.

Where a Lockout or equivalent key is provided remove the Lockout or equivalent key. If no Lockout or equivalent key is provided then the magnetic bolt interlock fuses and links shall be removed and, where reasonably practicable, locking devices applied or MCB's opened and, where reasonably practicable, locking devices applied and **Caution Notice(s)** attached.

Place the Lockout Key and **Safety Key(s)** [including MCB **Safety Keys(s)**] in a **Key Safe.** Where Fuses & Links holders cannot be locked, the fuses & links shall be locked in a **Key Safe**

If the design of the isolator is such that they are electronically interlocked e.g. SF_6 GIS **Equipment** then the **Equipment** should be **Isolated** in line with the method intended for such equipment on a site by site basis e.g. fuses / links, locking pins etc.

Where newer **Equipment** is installed on the **System** and it is inappropriate to apply the above controls, the principles of locking and cautioning **Equipment** for **Point(s) of Isolation** shall be applied.

(4) For Fixed Pattern Metal Enclosed Circuit Breakers

(4.1) Check the circuit breaker is open via the mechanical indicator, remove the motorised actuator and umbilical cord where applicable, apply a safety lock and **Caution Notice** to the circuit breaker operating mechanism.

(4.2) If earthing of the circuit is confirmed to follow, the operation selector should be moved from CIRCUIT BREAKER to EARTH SWITCH position and a safety lock and **Caution Notice** applied to the operation selector.

INSTRUCTION 2	Render Operative Isolator (-----)

The **Authorised Person** should reverse the actions as required to lock and caution the isolator and, on manually operated isolators, lock the manual operating handle so that it cannot be used.

(1) For Fixed Pattern Metal Enclosed Circuit Breakers

Remove the safety lock and **Caution Notice** from the operation selector or from the circuit breaker operating mechanism and ensure the operation selector is selected to CIRCUIT BREAKER position, reattach the motorised actuator and umbilical cord where applicable.

C2 VOLTAGE TRANSFORMERS (Excluding Metal Enclosed)

Where there is a requirement for work on the VT **LV** fuses e.g. disconnection of wiring, or the need to quote them or other **HV Equipment** as a safety precaution for work on an **LV** system, the TNCC shall be contacted prior to the work being started to establish and agree an **LV** RISSP between both parties.

INSTRUCTION 3	Isolate and Caution (----) VT Secondary Supplies
ENTRY ON SAFETY DOCUMENT	(----) VT Secondary Supplies
ENTRY ON RISSP	(----) VT Secondary Supplies Isolated & Cautioned

Normal Isolation

The **Authorised Person** shall take one of the following actions:

(a) Where the VT Isolation link can be clearly identified.

- Remove the VT **LV** isolation fuses and links from the holders within the VT fuse box as indicated on the label of the box cover or door
- Miniature circuit breakers (MCB's) shall be left in the closed position
- Retain fuses and links within the box, lock the appropriate cover or door and affix a **Caution Notice**

  or if the box can't be **Locked**

  Where reasonably practicable, apply locking devices to the fuse and link holders, affix a **Caution Notice** and place keys in a **Key Safe** or, affix caution tape to the fuse and link holders and remove the fuses and links to a **Key Safe**.

(b) Where there is no VT Isolation link or it cannot be clearly identified.

- Remove all the VT **LV** fuses and links from the holders within the VT fuse box as indicated on the label of the box cover or door
- Miniature circuit breakers (MCB's) shall be placed into the open position
- Retain fuses and links within the box, lock the appropriate cover or door and affix a **Caution Notice**

  or if the box can't be **Locked**

  Where reasonably practicable, apply locking devices to the fuse and link holders, affix a **Caution Notice** and place keys in a **Key Safe** or, affix caution tape to the fuse and link holders and remove the fuses and links to a **Key Safe**.

VT Isolation Where Work is Required in the VT Fuse Box

A **Senior Authorised Person** shall take the following actions:

(i) Where work is required on the Fuse / Link holders:

- Disconnect relevant VT **LV** wiring, fuse, links, MCB's, to create the same situation as removal of VT **LV** fuses, links, MCB's in the VT fuse box apply screening and affix caution tape to wiring.

(ii) Where no work is required on the Fuse / Link holders but access is required in the box:

- Where reasonably practicable, apply locking devices to the fuse and link holders, affix a **Caution Notice** and place keys in a **Key Safe** or, affix caution tape to, fuse and link holders and remove any fuses and links to a **Key Safe**, lock off any MCB's with a suitable locking device and affix a **Caution Notice.**

Notes: Disconnection of **LV** wiring to carried out in accordance with NSI 12.
Guidance on **HV / LV** RISSPs contained within AMBP 101.

INSTRUCTION 4 Restore (----) VT Secondary Supplies

The **Authorised Person** or **Senior Authorised Person** should reverse the precautions taken to isolate and caution (----) VT Secondary Supplies, as detailed above.

C3 EARTHING / AUXILIARY TRANSFORMERS (Transformers providing supplies at **LV**)

INSTRUCTION 5	Isolate and Caution (----) (Earthing / Auxiliary)* Transformer (----) Secondary Supplies
ENTRY ON SAFETY DOCUMENT	(----) (Earthing / Auxiliary)* Transformer (----) Secondary Supplies
ENTRY ON RISSP	(----) (Earthing / Auxiliary)* Transformer (----) Secondary Supplies Isolated & Cautioned

The **Authorised Person** should take one of the following actions:-

(a) Open the **LV** isolating switch at the transformer and lock it in the open position and affix a **Caution Notice**

(b) Remove / open the **LV** isolating fuses at the transformer and lock the fuse box and affix a **Caution Notice**

INSTRUCTION 6 Restore (----) (Earthing / Auxiliary)* Transformer (----) Secondary Supplies

The **Authorised Person** should reverse the actions taken above for isolation of Earthing and/or Auxiliary* Transformer Secondary Supplies.

C4 METAL ENCLOSED SWITCHGEAR (with spouts, as per NSI 3, but not Fixed Pattern Circuit Breakers)

INSTRUCTION 7	Isolate (----) Lock and Caution **(**Busbar / Feeder / VT / etc)* (Shutters, etc)*
ENTRY ON SAFETY DOCUMENT	(----) (Busbar / Feeder / VT / etc)* **(**Shutters / Isolators / Racked out)*
ENTRY ON RISSP	(----) (Busbar / Feeder / VT / etc)* **(**Shutters / Isolators / Racked out)* Locked Closed and Cautioned

The **Authorised Person** should where possible:

(a) Rack out the circuit breaker / VT from the service position
(b) Check the busbar / feeder / VT shutters are shut and **Locked** in position
(b) Affix a **Caution Notice**

INSTRUCTION 8	Restore (BB / Feeder / VT / etc)* shutters then return (----) to service position on (Main Busbar / Front Busbar / etc.*)

The **Authorised Person** should reverse the actions taken to Isolate (-----) Lock and Caution Busbar / Feeder / VT / etc* Shutters etc*).

C5 FIXED EARTHING DEVICES

INSTRUCTION 9	(Close and Lock / Apply and Lock)* (Earth Switch / Maintenance Earth / Fixed Earthing Device)* (----)
ENTRY ON SAFETY DOCUMENT	(----)
ENTRY ON RISSP	(----) (Closed and Locked / Applied and Locked)*

The **Authorised Person** should;

(a) Unlock the fixed **Earthing Device** if appropriate,

(b) Close (or apply) the fixed **Earthing Device** utilising the necessary interlock keys where necessary,

(c) Where appropriate, Lock the fixed **Earthing** Device and place key in a **Key Safe**,

(d) Immobilise electrical drives by removing fuse / links and / or open MCB's and lock. Secure fuse, links and MCB key in a **Key Safe**.

(1) <u>For Fixed Pattern Metal Enclosed Circuit Breakers</u>

Ensure the operation selector is selected to EARTH SWITCH position, insert the operating lever into the circuit breaker operating mechanism, operate the circuit breaker to EARTH ON position, apply a lock to the circuit breaker operating mechanism.

INSTRUCTION 10	(Open / Remove)* (Earth Switch / Maintenance Earth / Fixed Earthing Device)* (-----)

The **Authorised Person** should reverse the actions taken to Close / Apply* Earth Switch / Maintenance Earth / Fixed **Earthing Device*** (-----) and lock*. The fixed **Earthing Device** shall be independently locked in the open/removed position if it is not fully interlocked.

(1) For Fixed Pattern Metal Enclosed Circuit Breakers

Remove the lock from the circuit breaker operating mechanism, insert the operating lever into the circuit breaker operating mechanism, operate the circuit breaker to OFF position.

C6 EARTHING VIA METAL ENCLOSED SWITCHGEAR
(with spouts, as per NSI 3, but not Fixed Pattern Circuit Breakers)

INSTRUCTION 11	(Restore BB / Feeder / VT etc)* shutters Then select CB (----) to (BB / Feeder / VT / etc)* Earth position (via VT Spouts)* And Close to Earth
ENTRY ON SAFETY DOCUMENT	(-----) in (Busbar / Feeder / etc)* Earth Position (via VT Spouts)* (-----) (Busbar / Feeder / VT / etc)* shutters
ENTRY ON RISSP	CB (-----) Closed and Locked in (Busbar / Feeder / VT / etc)* Earth Position via (VT / etc)* (shutters / spouts)*

The **Authorised Person** should where possible;

(a) Remove the relevant lock **Caution Notice** from the Busbar / Feeder / VT etc* shutters,
(b) Rack in the circuit breaker to the relevant earth position and close to earth,
(c) Re-attach **Caution Notice** to the circuit breaker locking bar or equivalent.

Note: When the Circuit Breaker is selected to Feeder or busbar earth position via the VT Spouts it serves the purpose of both a **Primary earth** and a **Point of Isolation.**

"VT racked out" shall be quoted as the **Point(s) of Isolation** and "Circuit Breaker closed to feeder earth position via VT spouts" shall be quoted as the **Primary Earth(s)** quoted in Section 2 of the **Safety Document** and this will also serve as the **Point of Isolation**.

INSTRUCTION 12	Open CB (-----) And remove from (BB / Feeder / etc)* Earth (via VT Spouts)* Position, Then Lock & Caution (BB / Feeder / VT / etc)* Shutters

The **Authorised Person** should where possible;

(a) Reverse the actions taken for the instruction to close Circuit Breaker (-----) to Busbar / Feeder / Cable / Voltage Transformer etc.* earth position and close to earth,
(b) Re-attach the **Caution Notice** to the Busbar / Feeder / Cable / VT etc* shutters.

C7 EARTHING VIA PORTABLE EARTHING DEVICES

INSTRUCTION 13	Apply (----) earths per (phase / sub-conductor)* (description of position)
ENTRY ON SAFETY DOCUMENT	Earths Applied (description of position)
ENTRY ON RISSP	Earths Applied (description of position)

The **Senior Authorised Person** shall ensure that all portable earths are applied in accordance with NSI 2.

INSTRUCTION 14	Remove earths (description of position)

The **Senior Authorised Person** shall ensure that all portable earths are removed in accordance with NSI 2.

C8 EARTHING VIA METAL ENCLOSED MOVEABLE EARTHS (with spouts as per NSI 3, but not Fixed Pattern Circuit Breakers)

INSTRUCTION 15	Apply Metal Enclosed Switchgear Moveable Earths to (-----) (Busbar / Feeder / Cable / VT spouts / etc)*
ENTRY ON SAFETY DOCUMENT	Description of position
ENTRY ON RISSP	Earths applied (description of position)

The **Senior Authorised Person** shall where practicable;

(a) Remove the relevant lock & **Caution Notice** from the Busbar / Feeder / Cable / VT etc* shutters,
(b) Confirm spouts are not **Live** by the use of a Potential Indicator. Refer to NSI 3,
(c) Apply Metal Enclosed Movable earths to the spouts.

INSTRUCTION 16	Remove Metal Enclosed Switchgear Moveable Earths from (-----) (Busbar / Feeder / Cable / VT spouts / etc)*

The **Senior Authorised Person** shall where practicable;

(a) Remove Metal Enclosed Switchgear Moveable Earths,
(b) Reattach the lock and **Caution Notice** to the Busbar / Feeder / Cable / VT etc* shutters.

C9 GIS EQUIPMENT

Wherever possible the principles above should be applied to GIS **Equipment**. However, due to the complexities of this type of **Equipment** this cannot always be achieved. These site related differences will be covered in **Authorised Person** site training and / or if deemed necessary a Local Procedure held on site.

Technical Guidance note TGN(E) 210 identifies, historically, the GIS disconnectors and Earthing Switches, for which the position indicating devices have been demonstrated to fulfil the requirements for reliable indication and those for which the contact position shall be checked by means of windows. The satisfactory completion of each switching operation shall be checked as required by the TGN. The revised process for the means of indication should be agreed as part of the Type Registration process, including gaining information where applicable from the Asset Lifecycle Engineer responsible, and is then added directly to the new format Operations Diagram Technical Data Sheet for each new install. Reference to manufacturers manuals is advised also.

A standard switching instruction can be used for both types of 3 Position Switches: those with Isolation and Earth Switch Functions that operate independently of each other and those which operate direct to the Earth Position.

Where a 3 position switchgear device is operated direct to the **Earthed** position, all other required **Point(s) of Isolation** shall first be in place. Further **Earth(s)** should not be applied until this operation has confirmed that a zone created by **Point(s) of Isolation** has been completed. This will be coordinated in conjunction with a **Control Person (Safety)** working to the relevant control room procedures.

When operating the 3 Position Switch directly into the **Earthed** position the following switching instructions may be used.

INSTRUCTION 17	Check Isolator (----) Open Close and Lock Earth Switch (----ED) Caution Isolator (---)

This sequence recognises that the Motor Supplies and the Mechanism have to remain free for the operation of the Earthing part of the 3 Position Switch.

ENTRY ON SAFETY DOCUMENT	(----)
ENTRY ON RISSP	(----) Open, Locked & Cautioned (----ED) Closed and Locked

The **Authorised Person** shall follow any Local Procedure held on site due to site related differences.

INSTRUCTION 18	Render Operative Isolator (----) Open Earth Switch (----ED)

The **Authorised Person** should reverse the actions as required to lock and caution the isolator and on manually operated isolators, lock the manual operating handle so that it cannot be used.

C10 OPERATE AS REQUIRED (OAR) (Can be an *Operational* or *Safety Switching* Instruction)

An Operate As Required (OAR) instruction may be granted by Control.

OAR instructions are subject to the same requirements as other *Safety Switching* instructions, except the instruction may remain in progress for a prolonged period of time. e.g. for the duration of a **Safety Document** it is being used in conjunction with. When the instruction is in progress for more than a day, the date as well as the time shall be recorded under “Time of Operation” when the OAR is complete.

An Operate As Required may not be given in combination with other safety switching instructions, (e.g. to Render Operative an Isolator before operating it)

More than one OAR can be part of the same instruction.

INSTRUCTION 19	Operate As Required (Isolator / Circuit Breaker / Earth Switch / Tap Changer / etc)* (----) Leave (Open / Closed / etc)* on completion

C11 LOCKING CLOSED AS AN HV SAFETY PRECAUTION

An item of **Equipment** can be **Locked** in the closed position, which is often done to ensure an earth pathway; when existing earths are not directly connected to an **HV** conductor.
(e.g. because an **Earthing Device** has a Technical Limitation / Restriction or is inoperable).

Commonly this is used to:

a. Earth high level busbars prior to the application of Portable **Primary Earths**.
b. Earth a busbar via a bus coupler circuit.
c. Maintain a solidly connected Earth pathway for Overhead Line work.

Locking a device closed can be done as part of a wider instruction.

INSTRUCTION 20	(Check Closed & Lock / Close & Lock / Lock Closed)* (Isolator / Circuit Breaker / etc)* (----) (Reason)

*The reason does not always need to be stated in the instruction, particularly if there is more than one, but needs to be noted on the **Safety Document**.

ENTRY ON SAFETY DOCUMENT	(----) Locked Closed (Reason)
ENTRY ON RISSP	(----) Locked Closed (Reason)

The **Authorised Person** should for:

(1) Manually Operated Isolators

After ensuring the isolator is in the closed position, return the handle to the inoperative position, and secure the isolator with a safety lock. Where present and practicable, remove the Lockout key and place in a **Key Safe** with the identified **Safety Key**.

(2) Manually Operated Soule Disconnectors

After ensuring the disconnector is in the closed position, remove the Lockout key, where practicable and place it inside the mechanism box. Secure the mechanism box door closed with a safety lock and identify the **Safety Key(s)** and place it in a **Key Safe**.

(3) Motorised Isolators or Disconnectors

Ensure the Isolator or Disconnector is in the closed position.

Remove motor supply fuses and links or place miniature circuit breakers (MCB's) into the open position. Fuses and links shall be placed within the compartment.

Where a lockout or equivalent key is provided remove the lockout or equivalent key, where practicable and place it in the compartment.

If no lockout or equivalent key is provided then the magnetic bolt interlock fuses and links shall be removed or place MCB's into the open position. Fuses and links shall be placed in the compartment with the motor supply fuses and links.

All compartment doors containing removed fuses, links or open MCB's shall be secured with a unique lock. Where this action would trap any remaining interlock keys these keys shall be removed to safe custody before securing the compartment door(s), should they be required.

Where an inner door can secure access to the removed motor supply fuses links or open MCB's, only the inner door needs to be **Locked.**

Where other doors permit the removed lockout key or motor supply fuses and links or open MCB's to be reached then these doors shall also be locked closed with a safety lock.

Identify the **Safety Key(s)** and place them in a **Key Safe**.

Note: Where MCB's are not located within a compartment they shall be secured with a unique lock. The **Safety Key(s)** shall be secured in a **Key Safe**.

If the design of the isolator is such that they are electronically interlocked e.g. SF_6 GIS **Equipment** then the **Equipment** should be **Isolated** in line with the method intended for such equipment on a site by site basis e.g. fuses / links, locking pins etc.

Where newer **Equipment** is installed on the **System** and it is inappropriate to apply the above controls, the principles of locking **Equipment** shall be applied.

(4) Circuit Breakers

Ensure the circuit breaker is in the closed position.

Remove the Trip Fuses and Links or place miniature circuit breakers (MCB's) into the open position. Fuses and links shall be placed within the compartment.

Where a lockout or equivalent key is provided remove the lockout or equivalent key, where practicable and place it in the compartment.

All compartment doors containing removed fuses, links or open MCB's shall be secured with a unique lock

Identify the **Safety Key(s)** and place them in a **Key Safe**.

If the design of the circuit breaker is such that they are electronically interlocked e.g. SF_6 GIS **Equipment** then the **Equipment** should be immobilised in line with the method intended for such equipment on a site by site basis e.g. fuses / links, locking pins etc.

Where newer **Equipment** is installed on the **System** and it is inappropriate to apply the above controls, the principles of locking **Equipment** shall be applied.

Appendix D – Standard Terminology for Switching Abreviations

Location names can be abbreviated to the 4 letter site code as per TP 169 on the *Switching* instruction.

ADJ	Adjacent
ABCB	Air Blast Circuit Breaker
AC	Alternating Current
AUX T	Auxiliary Transformer
AUX/ETX	Auxiliary and Earthing Transformer
BET	Between
BB	Busbar
BC	Bus Coupler
BS	Bus Section
CS	Check Sync
CNL	Check no Load
CSE	Cable Sealing Ends
CAP	Capacitor
CVT	Capacitor Voltage Transformer
C02	Carbon Dioxide
CLLVW	Certificate for Live LV Work
COLC	Check Open Lock and Caution
CCT	Circuit
CB	Circuit Breaker
CONN	Connections
CT	Current Transformer
COMP T	Compensator Transformer
DAR	Delayed Auto Reclose
DC	Direct Current
DCB	Disconnecting Circuit Breaker
DISC	Disconnector
DS	Disconnection
DTC	Dissipate Trapped Charge
E SW	Earth Switch
ET	Earthing Transformer
ED	Earthing Device associated with isolator/disconnector
FED	Fixed Earthing Device
FME	Fixed Maintenance Earth
GCB	Gas Circuit Breaker
GIS	Gas Insulated Switchgear
GEN	Generator
GEN T	Generator Transformer
GRID T	Grid Transformer
HV	High Voltage
INST	Instantaneous
I/CON	Interconnector
IGDD	Isolation Gas Density Dependent
IND	Inductor
ISOL	Isolator
I/T	Intertrip
JUNC	Junction
KV	Kilo Volt
LAC	Limited Access Certificate
LLWC	Live Line Working Certificate
(L)NER	(Liquid) Neutral Earthing Resistor
LV	Low Voltage
MBB	Main Busbar
MC	Mesh Corner

MOS	Manual Override Sync
MPR	Multiple Permit Record
MSC	Mechanically Switched Capacitor
NCT	Neutral Current Transformer
No.	Number
OCB	Oil Circuit Breaker
OLC	Open Lock and Caution
OAR	Operate as Required
OOC	Out of Commission
OH	Overhead
OHL	Overhead Line
PFW	Permit for Work
PH	Phase
PMED	Portable Maintenance Earthing Device
PPE	Portable Primary Earths
PSI	Pounds per Square Inch
PE	Primary Earth
QB	Quadrature Booster
RISSP	Record of Inter-System Safety Precautions
RO	Render Operative
RES	Reserve
RBB	Reserve Busbar
RCT	Reactor
RSVC	Relocatable Static Var Compensator
SFW	Sanction for Work
SE	Sealing End
SS	Secondary Supplies
SECT	Section
SAP	Senior Authorised Person
SEQ	Sequential
S/BY	Standby
SSSC	Static Synchronous Series Compensator
SVC	Static VAR Compensator
STN T	Station Transformer
S/S	Substation
SF6	Sulphur Hexafluoride
SGT	Super Grid Transformer
SW DISC	Switch Disconnector
SW ISOL	Switching Isolator
SCT	Synchronous Compensator Transformer
SYNCH COMP	Synchronous Compensator
T	Transformer
TL	Technical Limitation
TSC	Thyristor Switched Capacitor
TSR	Thyristor Switched Reactor
VT	Voltage Transformer
VT/CT	Combined Voltage/Current Transformer
WVT	Wound VT
1 MP	1st Main Protection
2 MP	2nd Main Protection

Appendix E – Safety Notices

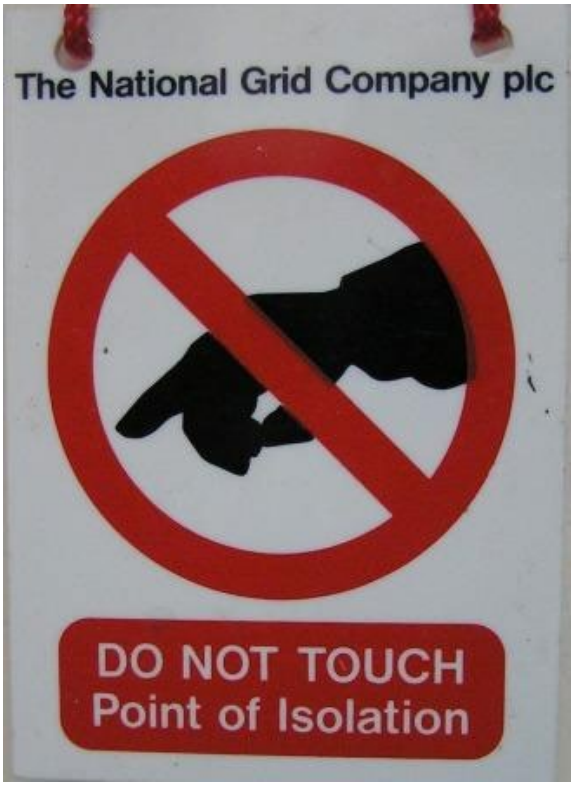

Figure E1 – Caution Notice

Appendix F – Key Safe Contents Card

National Grid

Control Lock Operated: Yes / No

KEY SAFE CONTENTS CARD

KEY SAFE NUMBER: _____

CIRCUIT: _____

Key A	…….....	**Key B**	……..
Key C	……	**Key D**	……..
Key E	…….	**Key F**	……
Key G	…….	**Key H**	……

Key Safe Contents

Signed ……..	
Print Name ……..	Date ……

Appendix G – Operational Authority Matrix for OA1 and OA2 Roles

	Authorisation required	
	Within Points of Isolation	Not within Points of Isolation
Non-interlocked equipment from the **Local Control Point**	SAP	OA1 and OA2
Non-interlocked equipment from the **Substation Control Point**	OA2	OA2
Rendering interlocks inoperative **(Defeating of interlocks)**	SAP	OA1 and OA2

Appendix H - Authorisation Matrix for Contractors Personnel

Contractors appointment under this NSI shall be limited to the following sections.

Contractor **Personnel**	**Person**	**Competent Person**	**Authorised Person**	**Senior Authorised Person**
Sections			All Sections	