PR-NET-OSM-020

MANUAL RECLOSING OF HIGH VOLTAGE CIRCUITS POST TRIP, SEQUENCE OPERATION AND LOCKOUT

OPERATIONAL SAFETY MANUAL - SECTION 2.10

Scottish & Southern Electricity Networks

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1 Introduction

1.1 It is acceptable to manually initiate a reclose of **High Voltage** circuits following operation and lockout of automatic reclosing devices providing this does not pose an unacceptable risk of injury to the public. Remote, manual initiation of a reclose operation is commonly referred to “manual reclosing” and for this procedure should not be confused with manually operating equipment on site.

1.2 The risk of injury to the public, who could be in the vicinity of any damaged or accessible **High Voltage** circuit, when the circuit is manually reclosed, needs to be balanced against the risk to the public from the ongoing supply loss.

1.3 Risk assessment of and requirements for manual reclosing of **High Voltage** circuits, following operation and lockout of automatic reclosing devices, are necessary to minimise the risk of **Danger** to the public.

1.4 This **Approved** Procedure is intended to assist **Control Engineers** with assessing the risk of manual reclosing and what steps need to be taken before attempting manual reclosing of **High Voltage** circuits following trip, sequence operation and lockout of automatic reclosing devices. These steps are based on the common framework for manual reclosing of **High Voltage** circuits in ENA SHE Standard 06.

2 Scope

2.1 The scope of this document relates to the manual reclosing of **High Voltage** circuits following a trip, sequence operation and lockout of automatic reclosing devices on the **SSEN-D High Voltage System**.

2.2 The scope of this document applies to **High Voltage** circuits on the Distribution **System**.

2.3 The scope of this document does not include:

- Design or operation of protection or automatic reclosing schemes / equipment
- **Low Voltage Systems**
- Manual reclosing of busbars (see PR-NET-EPR-012).
- Post-fault sectionalising
- Safety requirements for operational staff, who manually reclose circuit-breakers and similar reclosing devices

3 References

The documents detailed in Table 3.1 - Scottish and Southern Electricity Networks Documents, and Table 3.2 - External Documents, should be used in conjunction with this document.

Table 3.1 - Scottish and Southern Electricity Networks Documents

Reference	Title
PR-NET-OSM-006	SSEN Distribution Operational Safety Rules – Operational Safety Manual – Section 1.1
PR-NET-OSM-028	Switching Terminology and Approved Abbreviations - Operational Safety Manual - Section 4.4
PR-NET-OSM-014	Response to System Faults - Operational Safety Manual - Section 2.4
PR-NET-EPR-012	Switching to Restore Supplies on HV Networks
N/A	SSEN SHE Handbook (Held in Safety, Health and Wellbeing SharePoint Site)

Table 3.2 - External Documents

Reference	Title
ENA SHE Standard 06	Post Trip Manual Reclosing of High Voltage Electrical Distribution Circuits

4 Definitions

4.1 The words printed in bold text within this document are either headings or definitions. Definitions used within this **Approved** Procedure are defined within the list presented immediately below, or within section 2 of the **Operational Safety Rules**.

4.2 **Operational Safety Rules (OSR)**

The **SSEN-D** Distribution set of rules, as read with related documents and procedures, that provide generic safe systems of work on the **System** therefore ensuring the health and safety of all who are liable to be affected by any **Danger** that might arise from the **System**.

5 General Responsibilities

This document states the key responsibilities of **Authorised Persons**, in particular **Control Engineers**, who attempt manual reclosing of **High Voltage** circuits following a trip, sequence operation and lockout of automatic reclosing devices on the **SSEN-D High Voltage System**.

6 Dangers from Manual Reclosing

6.1 **Dangers** to the public and third-parties from manual reclosing of **High Voltage** circuits include:

- Re-energising **High Voltage** overhead line **Conductors** that could either be on the ground or below statutory clearance, where the public could come into contact with them
- Re-energising a **High Voltage** cable, which has been damaged by a third-party, where the third-party or public could be in the vicinity of the damage

6.2 There is a particular risk from manual reclosing of **High Voltage** overhead line circuits, where overhead line **Conductors** could be on the ground or below statutory clearance and accessible to the public.

7 General Requirements

7.1 A key principle of this **Approved** Procedure is to allow a minimum time between operation and lockout of the automatic reclosing device and attempting manual reclosing, to allow members of the public or third-parties to report damage and / or a dangerous situation to **SSEN-D**.

7.2 The minimum time period prior to manual reclosing, as stated in Table 7.1, **Shall** be adhered to.

Table 7.1 - Minimum Time Period Prior to Manual Reclosing

Operating Voltage (kV)	Security Level	Normal weather conditions		Abnormal weather conditions, e.g., Gales / Lightning
		22:00 to 06:00	06:00 to 22:00	
6.6 11 22 33	Customer supplies affected and / or **System** at risk from loadings or next fault	After 5 minutes	After 20 minutes	Immediate (with permission from Duty Manager)
	System firm against next fault	Following inspection		
66 132	Customer supplies affected	As soon as practicable following investigation of probable cause by the Distribution Control Engineer		
	All other scenarios including **System** firm against next fault	Following inspection unless system stability issues arise		

NOTES:

- Time delays in table 7.1 above also apply to the first re-energisation attempt when fault sectioning on underground circuits
- See Appendix A for the evidence-based determination of the minimum time period

8 Risk Assessment

8.1 General

8.1.1 The **Control Engineer Shall** conduct a risk assessment before manual reclosing of a **High Voltage** circuit onto a possible fault. The risk assessment **Shall** consider the following criteria in 8.2 and 8.3.

8.1.2 If at any time during the risk assessment and manual reclosing process the **Control Engineer** identifies evidence to suggest that a manual reclose would expose people to a high risk of injury, then the process **Shall** stop and the **Control Engineer Shall** take appropriate action to mitigate this risk in line with this **Approved** Procedure.

8.2 Assessment of Network Information

8.2.1 When lockout of a circuit automatic reclosing device is evident, the **Control Engineer Shall** firstly assess any related network information, which is readily available. Network information to be assessed is listed in Table 8.1.

Table 8.1 - Network Information

Network Information	Assessment
Real-time system data.	Is any real-time system data available that identifies the type of location of the fault?
Telecontrol indications and alarms.	Are the indications and alarms consistent with the correct operation and lockout of the circuit automatic reclosing device?
Nature of network affected (urban/rural and possibly including ESQCR Reg. 3(2) (Risk Assessment).	Is the circuit in a predominantly urban densely populated area where the risk of third-party damage or contact with overhead line **Conductors** is high?
Information about the type of protection that has tripped, e.g., that may provide information as to the type of fault, such as whether it is an **Earth** fault (EF) or sensitive **Earth** fault (SEF).	Has overcurrent or **Earth** fault protection operated? Third-party damage or contact with overhead line **Conductors** is more likely to cause the operation of earth fault protection. Sensitive earth fault protection operation is most likely the result of overhead line **Conductors** being on the ground.
Log of any persons working in the vicinity of the affected circuit.	Could the incident be linked to known work in the area?
Circuit fault history.	Is there a history of recent third-party damage or low **Conductors**?

8.2.2 Prior to manual reclosing, the **Control Engineer Shall**, where reasonably practicable, follow-up on any general information, which suggests an increased risk to the public.

8.2.3 In light of the assessment of network information, the **Control Engineer** should consider whether to allow more time than the minimum stated time period (see Table 7.1) prior to manual reclosing for reporting of any damage or dangerous situation to be received.

8.3 Assessment of General Information

8.3.1 The **Control Engineer Shall** assess any related general information, which is readily available. General information to be assessed is listed in Table 8.2.

Table 8.2 - General Information

General Information	Assessment
Information provided by the general public (via the Customer Contact Centre).	Have reports of damage from third-parties or the public been received? How quickly has is taken for people to contact **SSEN-D** following an incident? Is it probable that any third-party will have had time to move away to a safe distance?
Relevant local knowledge.	Are customers, who report supply loss, able to provide any local knowledge/information about the likely cause of the fault?
Information provided by field staff.	Are field staff able to provide any local knowledge about what could have caused the incident, e.g., temporary arrangements?
Information provided by Control Room colleagues.	Can other **Control Engineers** or Control Centre staff provide any information about the incident based on previous faults?

Information available from Emergency Service(s).	Have the Emergency Services been dispatched? Are there any reports from Emergency Services suggesting they are in attendance at an incident?
Weather conditions.	Are the weather conditions likely to have caused a transient fault, e.g., storms or lightning at night? Are the weather conditions good and is it unlikely the fault is weather related?
Time of day.	Does the time of day mean it is unlikely the public are involved in the incident?
Time of year.	Could the time of year make it more likely the fault has been caused by the public or greater numbers of the public could be exposed, e.g., harvest time etc?
Known public activities.	Are there any known public events or activities, e.g., carnivals, in the vicinity of the circuit?
Land use in vicinity of tripped circuit.	Could the land use be a factor or could it present a low risk for the public, e.g., pasture.
Information on domestic / commercial customers with special needs.	Are there any customers with special needs where there is an increased risk of leaving them off supply?

8.3.2 The considerations detailed in 8.2.2 and 8.2.3 **Shall** also apply.

9 Disablement of Automatic Reclosing Facilities

9.1 Prior to attempting a manual reclose of a **High Voltage** circuit, the **Control Engineer Shall**, where practicable, ensure that any associated automatic reclose facilities are disabled.

NOTE: This is to ensure that re-energisation of the circuit does not initiate a second automatic reclosing sequence.

9.2 A **Switching** instruction **Shall** be issued for any points where automatic reclosing facilities are to be disabled or enabled.

10 Protection Settings & Fault Level

10.1 Where reasonably practicable and appropriate, the **Control Engineer** should select more sensitive protection settings to limit the operating time of the circuit protection prior to manual reclosing of the circuit.

10.2 The **Control Engineer** may also reconfigure the **System** to reduce the prospective fault current should this be deemed appropriate to the risk of manual reclosing.

11 Sectionalising

The **Control Engineer** may sectionalise the circuit in order to restore supplies to sections of the circuit believed to be healthy. Refer to PR-NET-OSM-014 Response to System Faults - Operational Safety Manual – Section 2.4 for further requirements for sectionalising.

12 Manual Reclosing

12.1 If the risk assessment justifies manual reclosing, i.e., there is no reported damage or other relevant information, the **Control Engineer** may attempt one manual reclose operation, in line with the guidance in Table 7.1.

12.2 If the manual reclosing operation is unsuccessful then the **Control Engineer** should:

- restore supplies to the healthy sections of the circuit
- initiate a post-fault patrol of the faulted section of circuit

12.3 No further manual reclosures should be attempted unless the post-fault patrol or other evidence confirms there is no risk to the public or third-parties.

12.4 Circuit-breakers and similar reclosing devices that have reached the maximum number of permitted fault clearance operations **Shall** not be manually closed onto a possible fault until post-fault maintenance has been completed on the affected **Apparatus**.

13 Revision History

No	Overview of Amendments	Previous Document	Revision	Authorisation
01	New document created	NA	1.00	Richard Gough
02	Minor revisions completed	PR-NET-OSM-020 (Rev1.00)	1.01	Richard Gough
03				

Appendix A SSEN-D Analysis of Third-Party Incident Reports

1. The Energy Networks Association SHE Standard 06, entitled 'Post Trip Manual Reclosing of **High Voltage** Electrical Distribution Circuits', requires network operators to allow a 'reasonable' time delay for any incoming call(s) from third-parties reporting an incident or for anyone involved in an incident to move clear of any hazard before re-energisation. ENA SHE Standard 06 does not recommend a universal time delay, rather it requires network operators to establish independent evidence-based time delay by formal analysis of historic data on their own network and to write this into their 'post trip' manual reclosing procedure (this **Approved** procedure).

2. To meet the requirements of the ENA SHE Standard 06, **SSEN-D** surveyed all third-party damage faults involving **High Voltage Apparatus** on both the Scottish Hydro Electric Power Distribution (SHEPD) and Southern Electric Power Distribution (SEPD) licence areas over the 4-year period to April 2012. This Appendix A captures **SSEN-D**'s analysis and the basis for the minimum time period prior to manual reclosing, as stated in Table 7.1.

3. All calls over 60 minutes were discounted on the basis that **SSEN-D** staff would be on site carrying out manual **Switching** and investigations by this time.

4. Of the 20,400 recorded fault events during the 4-year survey period, 823 were third-party incidents and 313 of these involved **High Voltage** overhead lines where a manual (post lockout) reclose would be attempted before sectioning.

5. Of the 313 overhead line incidents, 118 emergency calls were received post-trip time. The remaining **High Voltage** overhead line incidents were either not reported by the third-party or the report received was the first notification of the incident.

6. Increasing the **SSEN-D** post-fault manual closure time delay to 20 minutes would cover 65% of all damage calls received within the 60 minute period and the majority of emergency calls. The remaining 35% of damage calls are evenly spread over the remaining 40 minutes and are normally less urgent reports.

7. **Setting a post-fault manual reclose time delay will relate to all High Voltage faults on the SSEN-D System**, including sectioning on underground circuits. This affects some 2.3 million customers annually who are exposed to risk whilst their power supply is not available.

8. The damage calls received after 20 minutes represent only 0.2% of total faults.

9. Only 3 damage calls were made over the 4-year period between 22:00 hrs and 06:00 hrs.

10. **SSEN-D** conclude that the optimum time delay before attempting a manual reclosure between the hours of 06:00 hrs and 22:00 hrs is 20 minutes, otherwise (overnight) it will be 5 minutes. **SSEN-D**'s analysis indicates that this allows the majority of those reporting an incident sufficient time to contact **SSEN-D** or to move clear of any hazard, whilst minimising exposure to those customers without power.