

1 Scope/Application

This procedure covers operating procedures for the Peterson Coil System (Arc Suppression Coil).

2 Safety Information

	WARNING: Use Live Work Techniques/Procedures/PPE for those activities carried out on or near equipment that could be live.			
	Work shall be carried out in accordance with General Requirements in Section 1. Approved mandatory PPE and work wear shall be in accordance with General Requirements in Section 1. Additional Approved PPE and work wear required to complete this task are specified below.			
	The task covered by this procedure has significant hazards associated with it identified by the symbol and text WARNING:  This procedure details the risk control measures that shall be applied when carrying out the task. If the risk control measures in this procedure are implemented the risks will be controlled. This procedure also forms the method statement for the task.			

3 Preliminary Operations

Refer to Section 1 of this manual.

NOTE : The meaning of all bold capitalized words used in the body text of this procedure are as set out in the Electricity North West - Distribution Safety Rules, 2013 edition, Section 2, Definitions'

A POWRA Shall always be carried out prior to the commencement of any activities on site

4 General

A Petersen coil is a non-linear device inserted in the **Earth** return to the star point on the low voltage side of a Primary Transformer. It is designed to act as a tuned circuit with the capacitance of the network to limit **Earth** fault currents to a minimum during **Earth** faults. If the fault condition persists, detected by CT and VT transducers then, a bypass circuit breaker is closed after a definite time allowing the circuit to be **Earthed** conventionally and allowing normal 11 or 6.6 kV protection devices to operate as designed. This earthing can be direct or indirect dependent upon existing design of the site.

5 Operating Procedures

The bypass circuit breaker **Shall** be monitored by a Scada system that **Shall** also allow the opening and closing of the device regardless of the operational state of the network - a legal requirement under the ESQCR.

The closing of the circuit breaker **Shall** generate an alarm within the Scada system which **Shall**, in turn, generate an audible alarm within the switch room. The auto tuning feature of the scheme **Shall** be switched out when closed either by Scada or locally on instruction.

The ASC **Shall** be diagrammatically displayed on the Control Room **HV** diagram and all links and devices within the ASC system **Shall** be operated in accordance with the Distribution Safety Rules under the control or instruction of the **Control Engineer**.

Operations of and on the ASC system are not considered suitable for local or field control.

Operations of and on the ASC system **Shall** be part of a formal **Switching** programme.

Unless otherwise stated below the ASC **Shall** normally be selected to service.

6 Situations when ASC should be bypassed

There are numerous scenarios under which an ASC can operate. This section details a series of general principles and specific requirements when operating either within a substation or on a network operating with ASC.

When operating with the network the decision to leave the ASC in or out of circuit has to be made. The following tables provide guidance. However, the Control and Field staff may exercise discretion where appropriate.

It is very important that whenever reconfiguration of the ASC Neutral earthing arrangements take place that the transformer star point is always connected to **Earth** via an appropriate earthing device, unless the transformer is **Dead** and **Isolated** at both **HV** and **LV**.

NOTE : for 11 kV also read 6.6kV

Basic Operations

General

Operation	ASC in Service	ASC out of Service	Notes
No operational activity on network connected to the ASC.	Yes		
Make system parallel on same busbar, same substation.	Yes		
Make system parallel on different busbar with or without ASC.		Yes	
Live Line and Hot Glove work.		Yes	
Cable Spiking (both Redundant and Cables which will be returned to service)		Yes	Where cable being spiked is fed from a site with ASC. [Note: Where cable spiking is being carried out on a cable fed from a site with no ASC BUT cables exist within the spiking vicinity which are fed from an ASC, then all appropriate ASCs Shall be by-passed. This is in case a Live cable is spiked in error. The decisions on this matter Shall be taken by the Field Engineer and form part of the Switching programme.]
Proximity Work where Auto-reclosing equipment switched off.		Yes	Examples: Where supports are being erected into a line or Work from ground level Shall be risk assessed prior to commencement and the ASC set accordingly. Note: Where construction work by Electricity North West or third parties is on going in proximity to the line and the provisions of HSE Notes of Guidance GS6 are being complied with the ASC may be left in service. Also can be left in service where work up to a red band is in progress.

At Substation fitted with ASC

Operation	ASC in Service	ASC out of Service	Notes
Transformer 11kV CB open one transformer feeding, one transformer Live only.		Yes	Ensure normal and rapid operation of Restricted Earth Fault protection on the open circuit transformer cable, Earth faults.
Transformer Dead i.e. both HV and LV control devices open.	Yes	Yes	Shall be switched out of service (bypassed) if single transformer site. Transformer LV aux. fuses or isolator may be in service but Shall be managed in accordance with the Distribution Safety Rules prior to the issue of safety documentation for work.
11kV Bus Section CB open.	Yes		
Open 11 kV feeder CB.	Yes		
Close 11 kV feeder CB.	Yes		
11 kV busbar out of service, associated Transformer Live		Yes	
11 kV busbar out of service, associated Transformer Dead .	Yes	Yes	Shall be bypassed on single transformer sites.
Tapping off transformer reactive power	Yes		Unless design parameters require scheme to be switched out because of tuning difficulties, this is therefore site specific.
11kV Sensitive Earth Fault (SEF) repeated trips no fault found		Yes	Where the setting of an SEF is greater than the setting of the ASC trigger setting then the ASC may operate for an SEF condition. During Fault hunting to minimise the possible duration of a fault on the network, the ASC Shall normally be switched out of service. This requirement Shall be carried out in conjunction with other existing policies for managing SEF trips.
Neutral Alarm - Reoccurring		Yes	Where the ASC continually triggers and resets a fault condition may exist which needs to be removed from the system. The ASC Shall be switched out to increase the chances of the fault operating main protection. CP606 S33 Section 2 still applies.

Faults and Suspect Equipment

Operation	ASC in Service	ASC out of Service	Notes
Fault Sectionalising		Yes	
Fault Proving		Yes	Deliberate closure onto fault of a fault-making device. The by-passing of the ASC will potentially minimise the duration the fault is energised. This is especially important if staff are in the vicinity of operational equipment. This does not preclude the use of system or network automation in an automated mode from closing onto a fault.
Re-energising after repair of Underground Cable	Yes		Cable Shall have been proven healthy by continuity and pressure testing. Note. This includes the energisation of cables from overhead lines where there is no overhead line beyond the cable section, or where the overhead line to be made Live was previously Live and healthy prior to the cable being energised.
Re-energising after repair of overhead line or mixed network where a continuity and pressure test is not possible.		Yes	Overhead lines and mixed configuration networks may have a second fault, which has not been detected prior to the first fault being repaired. In order to minimise the time it takes to isolate the fault, the ASC Shall be switched out.
Report of suspect equipment etc. on circuit		Yes	

Routine Network Operations

Operation	ASC in Service	ASC out of Service	Notes
Open 11 kV device down circuit.	Yes		
Close 11 kV device down circuit.	Yes		
All LV work and switching.	Yes		ASCs are designed to counter the effects of HV earth faults. Providing normal LV procedures are followed there should be no effects on the LV network, which would endanger staff.

7 Documents Referenced

ENW Distribution Safety Rules

Electricity Supply Quality and Continuity Regulations (ESQCR)

HSE Notes of Guidance GS6

CP606 - Operations Manual, Procedure S33

8 Keywords

Busbar; Control; Earthing; Fault; Overhead; Protection; Transformer.