1. SCOPE

This document details SPEN's technical requirements for the interface with Independent Distribution Network Operators (IDNOs), at voltage levels up to and including 132 kV.

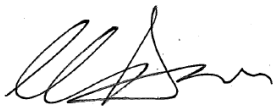
2. ISSUE RECORD

This is a Controlled document. The current version is held on the EN Document Library.

It is your responsibility to ensure you work to the current version.

Issue Date	Issue No.	Author	Amendment Details
Sept 2006	1	A Graham	Initial Issue
Jan 2007	2	A Graham	Protection requirements added section 13.6
Oct 2007	3	A Graham	Revised in line with ENA guidance document.
Sept 2015	4	N Evans	Revised in line with Ofgem CoP – removal of link boxes at interface.
Mar 2019	5	M Jones M Plecas	Document updated throughout. Clarity in descriptions of IDNO connections in SPD and SPM for varying connection sizes.
Apr 2024	6	P Dynes J Dowell	Document updated in line with latest issues of ENA ER G88.

3. ISSUE AUTHORITY

Author	Owner	Issue Authority
Paul Dynes Lead Engineer Jack Dowell Frazer-Nash Consultancy	Kailash Singh Connections Design Manager	Iain Divers Head of Distribution Networks  Date 28/05/2024

4. REVIEW

This is a Controlled document and shall be reviewed as dictated by business / legislative change but at a period of no greater than 3 years from the last issue date.

5. DISTRIBUTION

This document is part of the Construction Virtual, SPD and SPM System Design Virtual Manuals maintained by Document Control but does not have a maintained distribution list. This document is also published to the SP Energy Networks website.

6. CONTENTS

7. DEFINITIONS

Company:	Refers to SP Distribution plc, SP Transmission plc and SP Manweb plc
SPEN:	SP Energy Networks, operator of network assets on behalf of the Company
SP Distribution plc:	The Distribution Licence Holder for the distribution service area formerly known as ScottishPower
SP Transmission plc:	The Transmission Licence Holder for the transmission service area formerly known as ScottishPower
SP Manweb plc:	The Distribution Licence Holder for the distribution service is formerly known as Manweb
High Voltage:	An AC voltage exceeding 1000 Volts measured between the phase conductors
Low Voltage:	An AC voltage not exceeding 1000 Volts measured between the phase conductors
DNO:	Distribution Network Operator
IDNO:	Independent Distribution Network Operator
ICP:	Independent Connections Provider
Controlled:	Demarcated area with controlled access
Uncontrolled:	An area with no controlled access
DCRP:	The Distribution Code Review Panel of Great Britain
POC:	Point of Connection – The point where an IDNO network is connected to the DNO network
BCA:	Bilateral Connection Agreement
BSP:	Bulk Supply Point
GSP:	Grid Supply Point
SRS:	Site Responsibility Schedule
ENA:	Energy Networks Association
LMS:	Load Management Scheme
ANM:	Active Network Management
LoM:	Loss of Mains

8. RELATED DOCUMENTS

It is important that users of listed documents ensure that they are in possession of the latest issue together with any amendments.

Statutory Legislation

The Electricity Safety, Quality and Continuity Regulations (ESQCR) 2002

The Electricity Act 1989

The Utilities Act 2000

The Fire Precaution (Workplace) Regulations 1997

The Distribution Code of Great Britain

CDM Regulations 2015

Energy Networks Association Engineering Recommendations

G88	Principles for the Planning, Connection and Operation of Electricity Distribution Networks at the Interface between Distribution Network Operators (DNOs) and Independent Distribution Network Operators (IDNOs)
G12	Requirements for the Application of Protective Multiple Earthing to Low Voltage Networks
P2	Security of Supply
TS 12-24	Plastic Ducts for buried Electric Cables
TS 43-94	Earth Rods and their Connectors
TS 09-23	Link Boxes
TS 41-24	Guidelines for the Design, Installation, Testing and Maintenance of Main Earthing Systems in Substations

ScottishPower Documents

ScottishPower Safety Rules – Electrical & Mechanical

SPEN Documents

ESDD-01-001	Design Philosophy & Principles
ESDD-01-005	Distributed Generation Connection Requirements
ESDD-01-011	Load Management Schemes Distribution Policy
ESDD-02-012	Framework for design & planning of LV housing developments, including u/g networks and associated HV/LV s/s
ASSET-01-021	Asset Inspection and Condition Assessment Policy
SUB-02-006	Secondary Substation Installation and Commissioning Specification

SUB-03-017	General Specification for the Civil Engineering and Building Design and Construction of Secondary Substations
OPSAF-02-003	Independent Distribution Network Operator Warning Label
ESDD-01-006	Standard Low Voltage Connection Arrangements
BUPR-22-015	Recording of Electrical Assets by Contractors
CAB-04-009	Policy and Application Guide for 11kV Polymeric Cables
EART-01-002	Low Voltage Earthing Policy and Application Guide
EART-03-003	Technical Specification for Earthing and Bonding at Secondary Substations
EART-03-004	Technical Specification for Earthing and Bonding at Primary Substations
CON-04-005	Register of Adopted Asset Requests (RAdAR) Process for Contestable Connection Projects
PROT-03-020	Technical Specification for 33kV Protection and Control Equipment

SPEN Approved Equipment Register
https://www.spenergynetworks.co.uk/userfiles/file/Approved_Equipment_Register.xlsx

SP Distribution, Long Term Development Statement
https://www.spenergynetworks.co.uk/pages/long_term_development_statement.aspx

SP Manweb, Long Term Development Statement
https://www.spenergynetworks.co.uk/pages/long_term_development_statement.aspx

9. INTRODUCTION

The Utilities Act 2000 introduced regulatory changes allowing the Gas and Electricity Markets Authority to grant distribution licensees to suitable organisations to distribute electricity for the purpose of giving a supply. This has enabled the established Distribution Network Operators (DNOs) to build, own and operate distribution networks out of area within the UK. It has also facilitated other network operators to enter the market, creating private networks – typically embedded within the regional DNOs network. Licensed companies operating in the described manner are classed as Independent Distribution Network Operators (IDNOs).

This document details SPEN technical requirements when the Company network interfaces with an IDNO network and should be read in conjunction with "*Principles for the Planning, Connection and Operation of Electricity Distribution Networks at the Interface between Distribution Network Operators (DNOs) and Independent Distribution Network Operators (IDNOs)"* issued by the ENA.

SPENs online website offers additional information to that listed in this document in relation to ICPs and IDNOs which can be found under the following link.

https://www.spenergynetworks.co.uk/pages/information_for_icps_and_idnos.aspx

This document should also be read in conjunction with all referenced SPEN documents including SUB-02-006.

10. PRINCIPLES

This document summarises the principles for boundary arrangements and ownership. The standardised designs proposed in this policy have been created to be fully compatible with ENA ER G88. Where reasonably practicable, the IDNO is to be treated as an extension of the DNO network and thus no additional redundant protection is to be included beyond that which would be included in a standard DNO owned design.

Examples are provided in the subsequent sections of the most common arrangements. Protection and operation of the interface with an IDNO shall be agreed in the Bilateral Connection Agreement (BCA) or Site Responsibility Schedule (SRS).

10.1 Design

SPEN and the IDNO shall in accordance with section 4(b) of the ESQCR co-operate to ensure that section 9(2)a of The Electricity Act is complied with.

It is the responsibility of IDNOs to ensure that they comply with their license obligations. When designing networks, it is the responsibility of IDNOs to ensure compliance with the Distribution Code and all referenced Standards, in particular compliance with ENA Engineering Recommendation P2.

10.2 Safety

Where the Company Network interfaces with an IDNO, the IDNO shall ensure that their network is designed, built, operated, and maintained in a safe manner, in compliance with the ESQCR.

Only suitably SPEN authorised persons shall undertake work on Company Equipment. ScottishPower Safety Rules – Electrical and Mechanical shall apply at the point of interface when working on Company Equipment.

10.3 Costing

The following rules shall be applied for the attribution of costs between SPEN and the IDNO:

- Any services, equipment or land purchases that would be required if SPEN were providing the connection will be chargeable.
- Any services, equipment, or land purchases to facilitate an interface or boundary between the two networks shall be chargeable.
- Any services, equipment, or land purchases outside of the above shall be at SPEN's cost. For the avoidance of doubt, this includes metering for SPEN's sole purposes.

10.4 Recording Specifics

Where a choice exists within policy or specific details need to be recorded (e.g. for protection or operational issues), the most appropriate of either the BCA or the SRS shall be used.

10.5 Disconnection

SPEN will retain the right to disconnect the IDNO should their actions or inactions threaten the stability of the wider network. ENA ER G88 requires the IDNO to pay compensation should their actions or inactions cause an upstream failure on the SPEN network.

This right includes, but is not limited to, concerns over protection cascades and communication faults.

10.6 Metering

If metering for SPEN's sole purpose is required, then SPEN is responsible for specifying and funding this. If SPEN metering is installed the IDNO ownership boundary will be downstream of it.

The IDNO must allow space at their boundary substation for subsequent installation of SPEN metering equipment if not installed initially.

10.7 Landlocked customers

There is no definitive guidance on how to address this situation as it is a very rare occurrence. All parties involved should endeavour to resolve the situation in a manner satisfactory to the customer and lowest overall cost.

11. CONNECTIONS INTO A GSP / BSP / PRIMARY

Assets at a Grid Supply Point (GSP), Bulk Supply Point (BSP) or Primary should be owned, designed, installed, commissioned, maintained, and replaced by SPEN. The design, functional specification, and settings of the protection on the feeders and the cables supplying the IDNO will be the responsibility of the IDNO and can be addressed in the two options outlined.

11.1 Protection and Control Architecture Options

11.1.1 Overview

To cater for differing network requirements and to provide maximum flexibility to IDNOs connecting to SPEN's system, two options are provided for the protection and telecoms interfaces. These are designated as *Option A* and *Option B* configurations.

Option A: IDNO owned source end telecoms and protection. The IDNO is provided with a powered freestanding panel in which to install their telecoms and the main protection relay. An asset boundary is created on a terminal block within the SPEN substation.

The SPEN feeder circuit breaker at the interface shall be SPEN owned and SPEN operated for all non-protection functions as per Section 6.2 of ENA ER G88. SPEN shall also install backup protection on this feeder. The IDNO will send signals to operate the SPEN owned feeder circuit breaker for main protection and intertrip operations only.

Option B: SPEN owned source end telecoms and protection. SPEN own all the equipment within the SPEN switchroom and an asset boundary is created on the direct fibre running to the IDNO site.

SPEN shall operate the feeder circuit breaker for all operation types.

For both options, the ownership boundary for the main power system assets shall be at the cable termination associated with the SPEN feeder circuit breaker directly supplying the IDNO.

Please refer to APPENDIX 1: Generic Option A Protection and APPENDIX 2: Generic Option B Protection for detailed examples of the ownership boundaries for the connectivity of telecoms and protection systems.

11.2 Selection of Option

At 132 kV, the solution shall always be *Option A* unless specifically agreed between SPEN and the IDNO.

At 11 kV, the solution shall always be *Option B* unless specifically agreed between SPEN and the IDNO.

At 33 kV, the following principles of solution selection apply:

- *Option A* is the default option where sufficient space exists within the 33 kV switchroom.
- Where sufficient space does not exist within the SPEN switchroom, *Option B* shall be the default option.
- The IDNO may specifically request either Option A or Option B. Should this lead to the requirement to establish a kiosk or any additional expenses, the additional costs shall be added to the connection expenses.

11.3 Protection and Configuration (All Schemes)

11.3.1 Load Management Schemes (LMS)

This sub-system is only applicable to sites within the SPD licence area as LMS is an SPT specific system.

The SPT LMS shall exchange signals with an IDNO owned panel at the generator site. These signals shall be routed via an SPD LMS Relay. Downstream of the ownership boundary at the SPEN substation, it is the responsibility of the IDNO to route these signals to the IDNO owned panel(s).

For sites where a directional LMS is required, the signals shall be grouped into “Import” and “Export” signals. For each of these groups, Stage 1 (Warning), Stage 2 (Sequential Trip) and Stage 3 (Global Trip) signals shall be provided.

11.3.2 Active Network Management (ANM)

Should a customer connected to an IDNO’s network require to participate in a SPEN owned Active Network Management (ANM) system, the proposed design shall be submitted for cybersecurity approval.

The IDNO shall be responsible for enabling the transport of any ANM signals within their internal telecoms network, as required by the scheme design.

11.3.3 Loss of Mains (LoM) and Other Operational Intertrips.

The unit protection relays may be used to send operational intertrips between SPEN and the IDNO. These intertrips may originate from SPD, SPM or SPT sources. As per ESDD-01-011, it is expressly prohibited for the SPEN owned main protection relays to send or receive Load Management Scheme (LMS) signals.

Loss of Mains (LoM) is the IDNO’s responsibility and the IDNO should route any LoM intertrips to the generator / battery feeder circuit breaker, as specified in the technical specification for their site. Where a LoM intertrip is not specified in the BCA, it is the IDNO’s responsibility to implement appropriate LoM protection.

SPEN shall provide an “intertrip send” signal for both *Options*.

11.3.4 Grid Code ECC6.4.4. Signals

Grid Code clause ECC6.4.4. requires certain signals to be sent to National Grid ESO (NG ESO) for control and visibility purposes. The IDNO may choose to send these signals directly to NG ESO. However, they may request that SPEN carry these signals via their Inter-Control Centre Communications (ICCP) link.

The specific signals to be sent to NG ESO are stated in the battery / generator's Bilateral Connection Agreement (BCA). Typical signals are outlined in Table 1.

Quantity	Units	Technology Type
Active Power	MW	All
Reactive Power	MVAr	All
User System Entry Point Voltage	kV	All
Controlling Breaker Position	Open/Closed	All
Tap Position	Value	All
Stage of Charge (Energy) (Import)	%	BESS
Stage of Charge (Energy) (Export)	%	BESS
Energy Available (Import)	MWh	BESS
Energy Available (Export)	MWh	BESS
Power Available	MW	Solar / Wind
Global Radiation	W/m²	Solar
Ambient Temperature	°C	Solar
Wind Speed	m/s	Wind
Wind direction	°	Wind

Table 1 – Typical Grid Code ECC6.4.4. signals

Current loop signals will be used within the SPEN substation to eliminate certain cyber security vulnerabilities arising from the connection of SPEN's SCADA system to the IDNO's SCADA system. The high-level architecture of this solution for all 2024 connection sites is provided in Figure 1. The 2024 sites will not be upgraded to the enduring 2025 solution which will be included in the future updates of this policy.

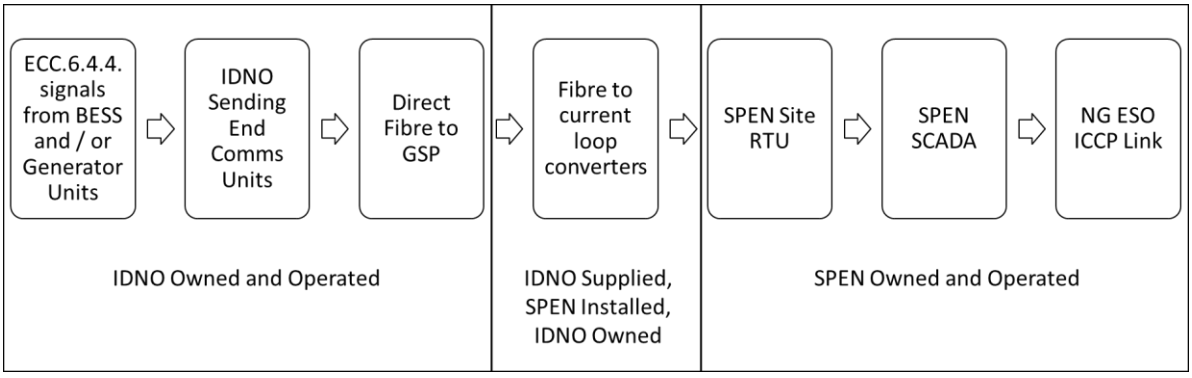


Figure 1 – Telecoms Configuration for 2024 connections

Fibre to current loop converters will be mounted within a wall box in SPEN's substation and will be wired by SPEN into the Site RTU. The converters shall be procured by the IDNO for SPEN to install and will be IDNO owned. SPEN will still need to receive MW and MVAr signals if the IDNO chooses to send ECC6.4.4 signals directly to NG ESO.

11.3.5 G99 / G100 Protection

The implementation and testing of G99 and G100 protection for generators and electrical storage systems shall be the responsibility of the IDNO.

11.3.6 Underfrequency Protection

Underfrequency protection for IDNO connected customers shall be the responsibility of the IDNO.

11.3.7 Circuit Breaker Indications

SPEN will not provide signals for circuit breaker indication, disconnector position or earth switch position to the IDNO. These shall be communicated through the existing RISSP processes.

11.3.8 Loss of Communications

Any unit protection relays chosen should have the functionality to alarm at both ends of the unit protection scheme.

Relays with Operational Intertrips (including LMS) or Loss of Mains functions should immediately trip the IDNO owned incoming circuit breaker after 20 seconds of a Loss of Communications.

The IDNO will monitor the health of the protection and communication systems and provide a signal to SPEN to confirm the health of these systems.

First response to Loss of Communication alarms will be by the IDNO. SPEN reserve the right to disconnect supply if the Loss of Communication alarm is not rectified within 24 hours.

11.3.9 Relay Addresses

SPEN shall specify the relay addresses for all directly connected relays.

11.3.10 Protection Settings

SPEN shall be responsible for the production of protection settings and associated relay configuration files for backup protection (*Option A* & *Option B*) and main protection (*Option B*).

SPEN shall share the relevant protection settings with the IDNO, where required, to ensure effective cooperation between the respective systems. Where required, the IDNO shall implement these settings and update them as requested by SPEN. An SLA of 30 working days shall be imposed for any protection change requests.

11.3.11 Fault Recorders

SPEN owned fault recorders shall be installed on each IDNO feeder fed from a SPEN substation and specified in line with existing policy (including ESDD-01-005 and ESDD-01-001) based upon the size of any connected generation. Should a busbar VT exist on the SPEN switchboard, it shall be used for fault recording purposes subject to VT output capacity. Otherwise, a VT shall be installed alongside the feeder CB for the IDNO for this purpose.

11.3.12 IDNO with Multiple SPEN Feeds

A grid parallel can be made with reference to SPEN but the IDNO site can only be fed from one feed so that the normally open point can't be on their network.
Requests for multiple connections can be accommodated but needs to consider for example transformer configuration in the area, so that both feeds are then compatible.

11.4 Option A Specifics

11.4.1 Protection and Telecoms Hardware

The IDNO are responsible for the specification, installation, operation and maintenance of the unit protection relay and telecoms equipment.

The systems installed must be compatible with PROT-03-020. This compliance is required for compatibility and grading with existing SPEN equipment.

As the telecoms shall be IDNO owned and operated, the IDNO is enabled to implement communications methods including direct fibre and Ethernet Access Direct (EAD) from a third-party provider.

11.4.2 Provision of Space at SPEN Substation

The IDNO shall be provided with a suitably sized space in which they can install their own equipment within the SPEN substation feu. Where this is on existing land owned by SPD or SPM, the use of the space will be provided to them at zero cost for the service life of their connection.

If adequate room is available, the provided space shall be within a freestanding panel within the SPEN substation switchroom. The cost of providing this panel and associated ancillaries shall be covered by the connection expenses.

Where adequate room is not available, or where the IDNO has requested access to be external to the SPEN substation (for example, due to a lack of suitably authorised staff), SPEN will provide a kiosk on the perimeter of the substation, if deemed reasonably practicable.

Should it be required, the provision of a kiosk shall be subject to the following requirements:

- The cost of creating the kiosk shall be passed to the IDNO via the connection expenses.
- If a land purchase is required to create the kiosk, this shall also be passed to the IDNO via the connection expenses.
- Any land between the kiosk and the SPEN substation must either be owned by SPEN or the IDNO.

Should the IDNO require access to their equipment within a SPEN substation but not have a member of suitably authorised staff available, the IDNO shall cover the cost associated with the SPEN provision of a standby person. SPEN shall require 72 hours notice for provision of a standby person for non-emergency access and 24 hours for emergency access.

11.4.3 Provision of Power Supplies, CTs and VTs

The IDNO will be supplied with Current Transformer (CT) and Voltage Transformer (VT) outputs from the GP5 panel. No voltages or wiring related to these shall leave the SPEN substation feu.

If an existing GP3 circuit breaker is to be re-used for the connection, it is permissible to provide a connection to the main busbar VT to the IDNO, provided that no voltages or related wiring leave the SPEN substation feu.

SPEN will supply 110 VDC and positively earthed 48 VDC, neither of which voltages or related wiring are to leave the SPEN substation feu. The maximum standing load of the IDNO's equipment connected to the provided DC supplies shall be agreed and recorded within the BCA. SPEN will specify the size of the incoming fuse for grading with other equipment.

11.5 Option B Specifics

11.5.1 Unit Protection Relays

The unit protection relays used by the IDNO at the IDNO incomer must be of identical model and firmware version to those present at the SPEN 33 kV substation. An SLA of 30 days will be imposed upon the IDNO for any required setting or firmware updates during the operational life of the connection.

The SPEN and IDNO unit protection relays will be connected to each other via a direct fibre connection.

11.5.2 Fibre Specification

Single mode or multimode fibre will be specified by SPEN based upon the route length and types of relays specified. SPEN should consult the IDNO to understand their relay preferences and if they are compatible within SPEN's design. SPEN shall use the manufacturer's guidelines plus a 10% margin of safety when determining whether multimode or single mode fibre is required. For example, if the IDNO provided route length is 1.0 km, SPEN will compare 1.1 km to the manufacturer's guidelines.

Should the IDNO's fibre route length change post design approval, the cost of any modifications to the fibre or relays will be the responsibility of the IDNO.

The IDNO may, optionally, install a second direct fibre in a diverse route to provide redundancy within the system.

12. CONNECTIONS INTO WIDER 132 KV OR 33 KV NETWORK

12.1 EHV Connections

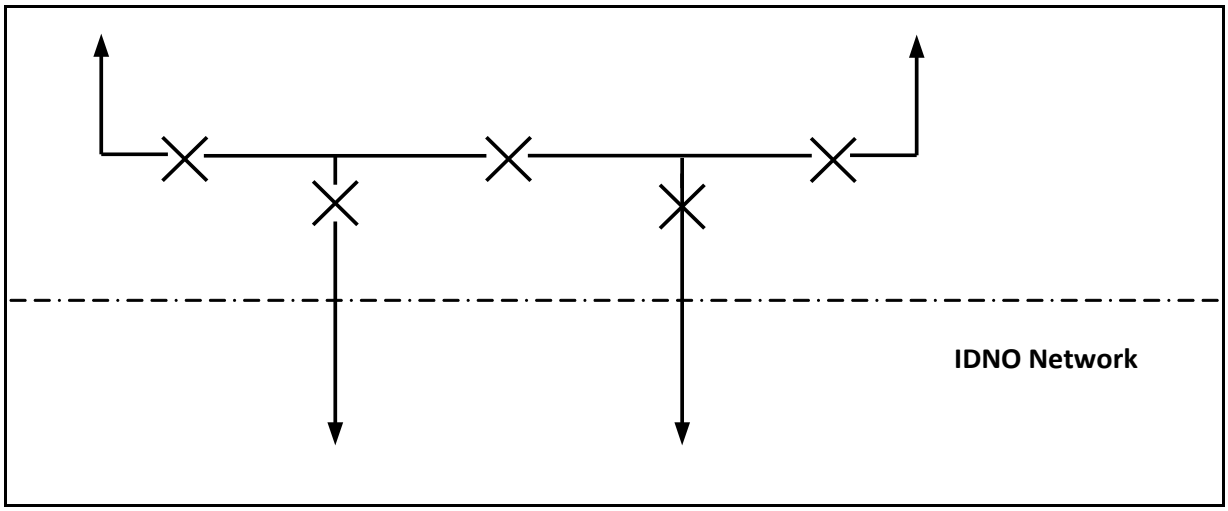


Figure 2 – Example EHV Connection Arrangement

Notes:

- The number of panels will depend on specific site requirements.
- A double feeder connection is illustrated in Figure 2, though single feeders are also permissible.
- If required for SPEN's IDNO metering purposes, metering is to be installed as specified by SPEN and at full cost to SPEN.
- Specific requirements are detailed in SPEN Drawing SP4008844.
- EHV cables interfacing between the IDNO and the Company network shall be installed by the IDNO to the satisfaction of SPEN. The cables shall remain the property of the IDNO.
- EHV termination kit for terminating IDNO EHV cables into the Company switchgear shall be of an SPEN approved type supplied by the IDNO and installed by SPEN.

12.2 Cables

Cables and cable terminations connecting to Company Equipment shall be SPEN approved and shall comply with the requirements detailed in CAB-04-009. Cables shall be segregated and marker tiles detailing ownership placed over all cables.

IDNO underground cables shall be segregated as far as reasonably practicable from SPEN cables.

12.3 Protection & Metering

It shall be the responsibility of the IDNO to approach SPEN to agree the protection and metering system requirements prior to energisation. SPEN reserves the right to witness the protection and metering commissioning where appropriate.

SPEN is responsible for funding any agreed metering arrangements. The IDNO shall undertake appropriate metering commissioning to the satisfaction of SPEN.

Protection Commissioning shall be undertaken with reference to SUB-02-006.

12.4 Earthing

The IDNO shall be responsible for ensuring compliance with the ESQCR, in particular section 8. The IDNO shall install an independent EHV earth in accordance with ENA specification TS 41-24 and carry out a site-specific study by an earthing specialist as per EART-03-004.

13. CONNECTIONS INTO WIDER 11 KV NETWORK

13.1 HV Enclosures ≤1 MW

Company Equipment shall be installed in an enclosure installed, owned, operated, designed, risk assessed and maintained by the IDNO, which shall facilitate independent controlled access to Company Equipment. Access/Egress to Company Equipment shall be provided by an approved SPEN padlock, utilising a standard SPEN key and shall be as detailed in SUB-02-006. The enclosure/civil structure protecting Company equipment should be installed in an appropriate manner, in particular, due regard shall be taken of SUB-02-006. The failure mode of company equipment and consequential risks associated with the failure mode shall be considered by the IDNO as part of the design and shall be mitigated as appropriate and to the satisfaction of SPEN.

The materials and components used in the construction of the enclosure shall be suitable for their purpose, taking due consideration of the type of Equipment installed within, correctly used or applied and sufficiently durable, taking account of normal maintenance practises, to ensure the health and safety of people. The enclosure shall be designed to prevent, so far as is reasonably practicable, third parties gaining access to the enclosed Company equipment. It shall provide protection of the enclosed Company equipment against ingress of solid foreign objects and water to a minimum of IP23 for outdoor equipment and IP54 for indoor equipment, in accordance with IEC 60529. Evidence of type testing for ingress protection shall be provided.

Where emergency exit doors are present on site, they shall open in the direction of escape as per The Fire Precaution (Workplace) Regulations 1997.

A minimum distance maintained between switchgear and other equipment or boundaries where a person could reasonably be expected to stand shall be as per SUB-03-017. Where equipment is fitted with doors which are to be opened, a minimum clearance between the end of the door and any other equipment or boundaries when the door is in the open position shall be as per SUB-03-017. Switchgear shall be located in a position such that internal arc protection equipment shall operate correctly.

13.2 Cables

Cables and cable terminations connecting to Company Equipment shall be SPEN approved and shall comply with the requirements detailed in CAB-04-009. Cables shall be segregated and marker tiles detailing ownership placed over all cables.

IDNO underground cables shall be segregated as far as reasonably practicable from SPEN cables.

13.3 Protection & Metering

It shall be the responsibility of the IDNO to approach SPEN to agree the protection and metering system requirements prior to energisation. SPEN reserves the right to witness the protection and metering commissioning where appropriate.

SPEN is responsible for funding any agreed metering arrangements. The IDNO shall undertake appropriate metering commissioning to the satisfaction of SPEN.

Protection Commissioning shall be undertaken as detailed below, with reference to SUB-02-006.

HV Connection ≤1 MW

SPEN shall typically provide time lag fuse (TLF) protection on the RMU circuit breaker. Protection Commissioning shall be undertaken in accordance with the Protection Commissioning protocol as detailed in SUB-02-006.

To determine if 'Standard' or 'Enhanced' Protection Commissioning is required, the Enhanced Protection Commissioning flow chart in SUB-02-006 shall be used.

HV Connections >1 MW – SP Distribution and SP Manweb 'Y' Type RMU Solution

SPEN shall typically provide 'VIP relay' protection on the RMU circuit breaker. Protection Commissioning shall be undertaken in accordance with the Protection Commissioning protocol as detailed in SUB-02-006.

HV Connections >1 MW – SP Distribution and SP Manweb 'Y' Type Switchgear Panel Board Solution

SPEN shall provide bespoke protection for the 11 kV primary switchgear. Protection Commissioning shall be undertaken in accordance with the 'Enhanced' Protection Commissioning protocol as detailed in SUB-02-006.

13.4 Earthing

The IDNO shall be responsible for ensuring compliance with the ESQCR, in particular section 8.2(b). The IDNO shall install an independent HV earth, in accordance with ENA specification TS 41-24 and the latest issue of G12. In addition, EART-03-003 should be observed when designing earthing arrangements for secondary substations.

The risk assessment and subsequent segregation and/or bonding of HV and LV earths shall be the responsibility of the IDNO.

13.5 HV Connections for SP Distribution

13.5.1 HV Connections ≤1 MW

The standard configuration for a single point of connection to the Company network is as detailed in Figure 3 below.

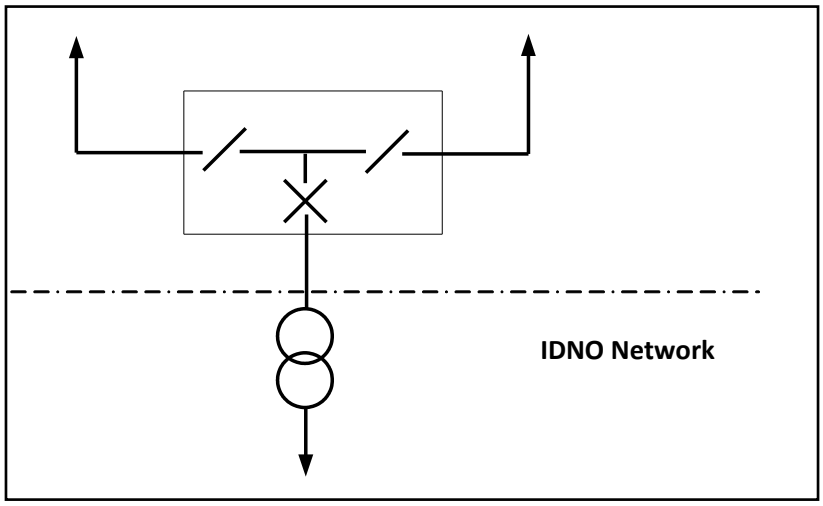


Figure 3 – SP Distribution HV Connection ≤1 MW

Notes:

- Specific requirements are detailed in SPEN Drawings SP4008847 and SP4030839.
- HV Equipment interfacing between the IDNO and the Company network shall be installed by the IDNO to the satisfaction of SPEN.
- The company RMU shall be of an approved type as detailed in SPEN Approved Equipment Register.
- If required for SPEN's IDNO metering purposes. Metering is to be installed as specified by SPEN and at full cost to SPEN.
- The ownership boundary should be at the cable termination of the feeder circuit breaker and before IDNO metering.

Where two points of supply are required, located at one geographic location, SPEN connection arrangements shall be as detailed in 13.5.2 and 13.5.3. The IDNO shall be connected to a common Company primary substation.

13.5.2 HV Connections >1 MW – RMU Solution

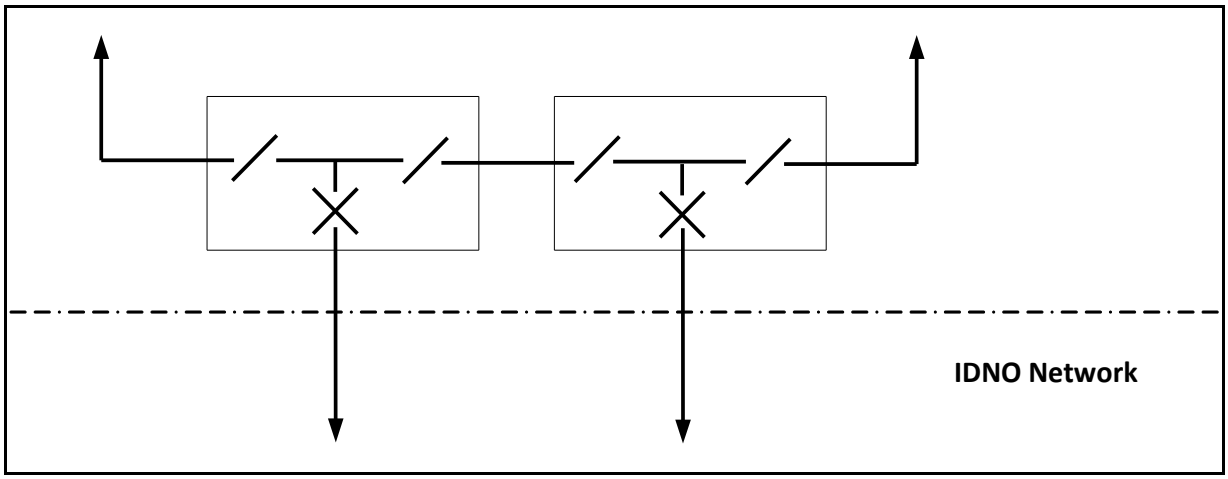


Figure 4 – SP Distribution RMU Solution

Notes:

- This solution is to be employed where RMU rating is sufficient for connection capacity.
- If required for SPEN's IDNO metering purposes. Metering is to be installed as specified by SPEN and at full cost to SPEN.
- Specific requirements are detailed in SPEN Drawing SP4008846.
- HV cables interfacing between the IDNO and the Company network shall be installed by the IDNO to the satisfaction of SPEN. The cables shall remain the property of the IDNO.
- HV termination kit for terminating IDNO HV cables into the Company RMU shall be of an SPEN approved type supplied by the IDNO and installed by SPEN.
- The ownership boundary should be at the cable termination of the feeder circuit breaker and before IDNO metering.
- The company RMU shall be of an approved type as detailed in SPEN Approved Equipment Register and shall have a fully rated circuit breaker earth switch capable of 13.1 kA.

13.5.3 HV Connections >1 MW – Panel Board Solution

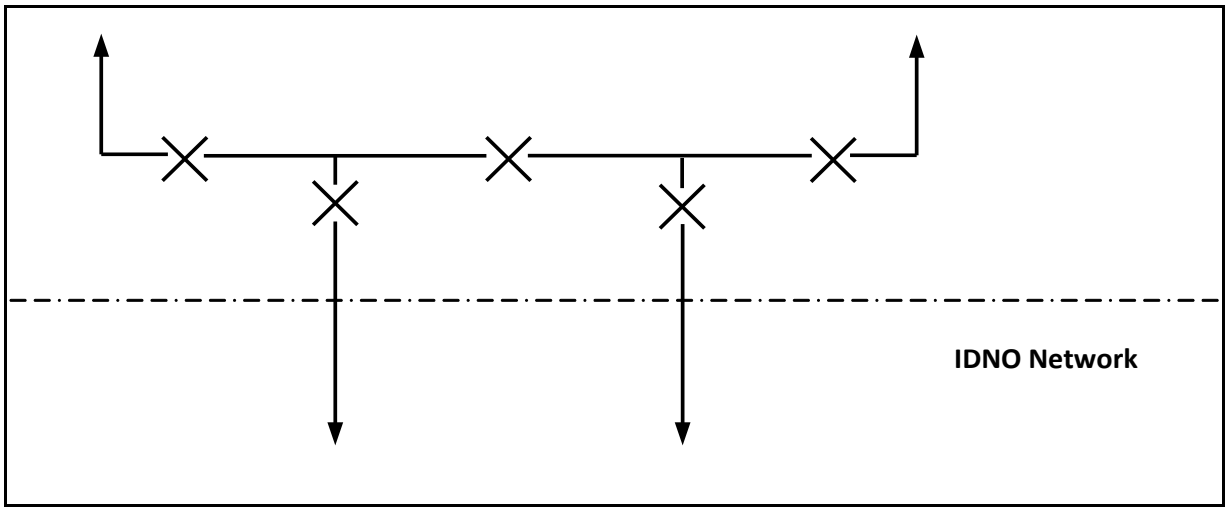


Figure 5 – SP Distribution Panel Board Solution

Notes:

- This solution is to be employed where RMU rating is insufficient for connection capacity.
- If required for SPEN's IDNO metering purposes. Metering is to be installed as specified by SPEN and at full cost to SPEN.
- Specific requirements are detailed in SPEN Drawing SP4008844.
- HV cables interfacing between the IDNO and the Company network shall be installed by the IDNO to the satisfaction of SPEN. The cables shall remain the property of the IDNO.
- HV termination kit for terminating IDNO HV cables into the Company switchgear shall be of an SPEN approved type supplied by the IDNO and installed by SPEN.
- The ownership boundary should be at the cable termination of the feeder circuit breaker and before IDNO metering.

13.6 HV Connections for SP Manweb

Large areas of the SP Manweb network, particularly in urban areas, are operated interconnected at HV with full LV interconnection. This style of interconnection differs from the radial design of HV networks found elsewhere in GB and offers enhanced network reliability, and increased utilisation of electrical assets. This network design avoids future reinforcement costs by allowing for increased utilisation and also allows for supplies to be maintained under most LV or HV fault conditions.

SP Manweb operate this network due to the historically applied network design philosophy of unit protected HV schemes and whilst it offers exceptional quality of service it also presents design challenges different to those of other networks. A full description of the design principles and philosophy of the SPM HV network is provided in ESDD-01-001.

SP Manweb 'X' Type Network

The 'X' Type network makes use of pilot wires and voltage/current imbalance to detect and isolate faults within a HV protection zone; unit protection is provided by SOLKOR relays. LV circuits are able to interconnect between secondary substations on HV feeders within the same HV group as well as along the HV feeder. An 'X' Type secondary substation configuration is shown in Figure 6 below.

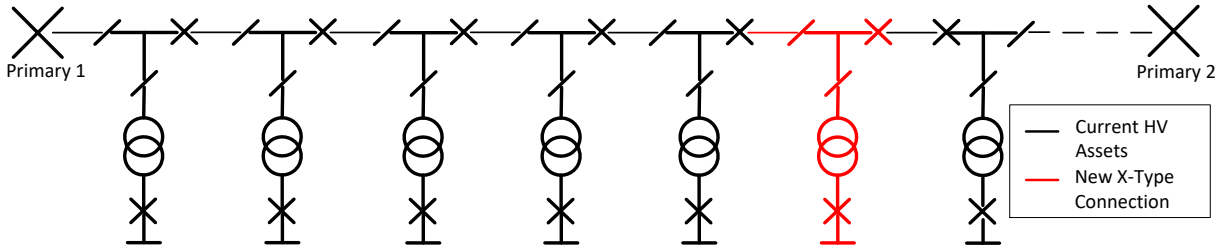


Figure 6 – 'X' Type Feeder Configuration

The 'X' Type network is operated with full LV interconnection, however no LV interconnection is permissible to SPEN's LV network under any of the following IDNO connection arrangements.

13.6.1 HV Connections ≤500 kVA – 'Bleed-off' within 'X' Type Networks

The sensitivity of the unit protection employed in 'X' Type networks allows a single 'Y' Type substation (capacity limited to 500 kVA) to be connected in-zone ('Bleed-off'), as shown in Figure 7. This is limited to 11 kV feeders. It should also be noted that 6.6 kV can have 300 kVA.

LV interconnection between the bleed-off substation and the wider LV network is not permissible in this arrangement. The equipment required is as per Section 13.5.1.

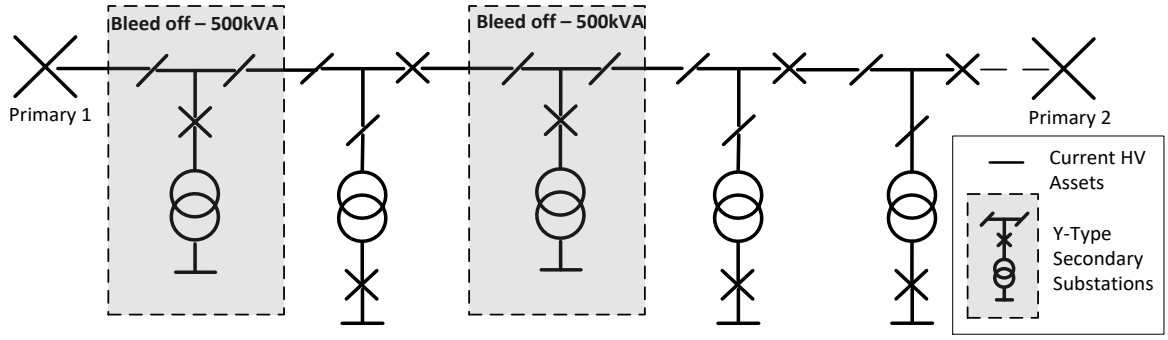


Figure 7 – 'Bleed-off' within an 'X' Type Network

13.6.2 HV Connections >500 kVA – IDNO 'Branch Feeder' in 'X' Type Networks

In order to accommodate low-cost network connections involving IDNOs in urban areas with unit protection, SPEN has approved the following connection design.

The approved design involves two 'X' Type RMUs in a 'Branch Feeder' arrangement and allows the IDNO to avoid installing a conventional 3-panel switchboard.

This is a variation of the standard 'network branch feeder' design which makes use of a conventional 3-panel switchboard. Unit protection within the HV zone is maintained by SOLKOR UP (SK UP) & DOWN (SK DN) zones at the new substation; DOWN zone CTs in RMU1 are summated with CTs in RMU2 as shown below. The IDNO transformer shall be within the same building and supplied via the CB of RMU2 protected by Over Current Earth Fault (OCEF) relays.

This arrangement ensures that operation of RMU2 CB for faults on the IDNO network will NOT lead to loss of connectivity on the main HV interconnector. Protection on the IDNO network is not compromised by pilot faults or abnormal network running arrangements. The ring switch of RMU1 is unused and shall not be used for future network expansion.

The IDNO transformer is not associated with the UP zone protection therefore no additional inter-trip relay or transformer OCEF is required. All protection shall be installed within a single panel enclosure as per SPM approved equipment documents.

This type of arrangement is limited to a single IDNO feeder.

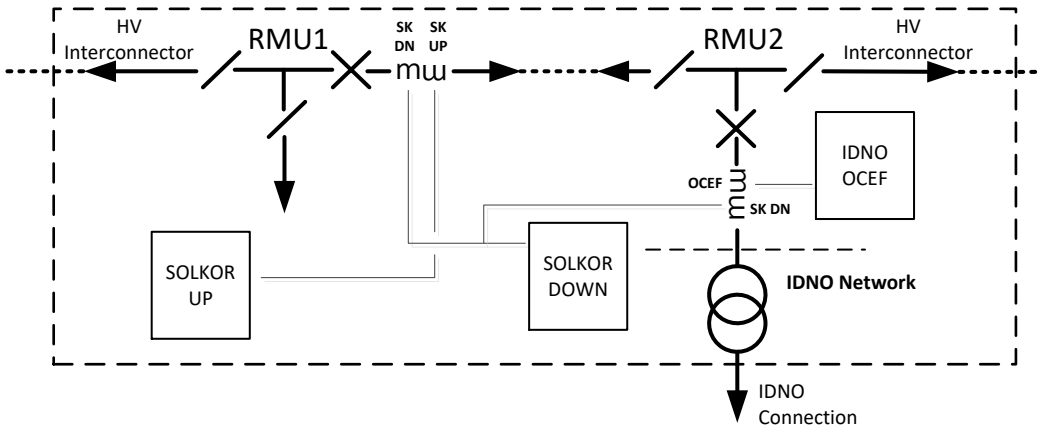


Figure 8 – IDNO 'Branch Feeder' Arrangement in 'X' Type and mixed Networks

Notes:

- This solution is to be employed where the required connection capacity is greater than 500 kVA, or 300 kVA on a 6.6 kV network, or there is a pre-existing 'Y' type bleed off in the zone.
- HV cables interfacing between the IDNO and the Company network shall be installed by the IDNO to the satisfaction of SPEN. The cables shall remain the property of the IDNO.
- HV termination kit for terminating IDNO HV cables into the Company switchgear shall be of an SPEN approved type.
- If required for SPEN's IDNO metering purposes. Metering is to be installed as specified by SPEN and at full cost to SPEN.
- Specific requirements for this installation should be sought from SPEN.

13.6.3 HV Connections – Panel board in 'X' Type Networks

Where an increased security of supply is required, the connection can be accommodated through a multi-panel board.

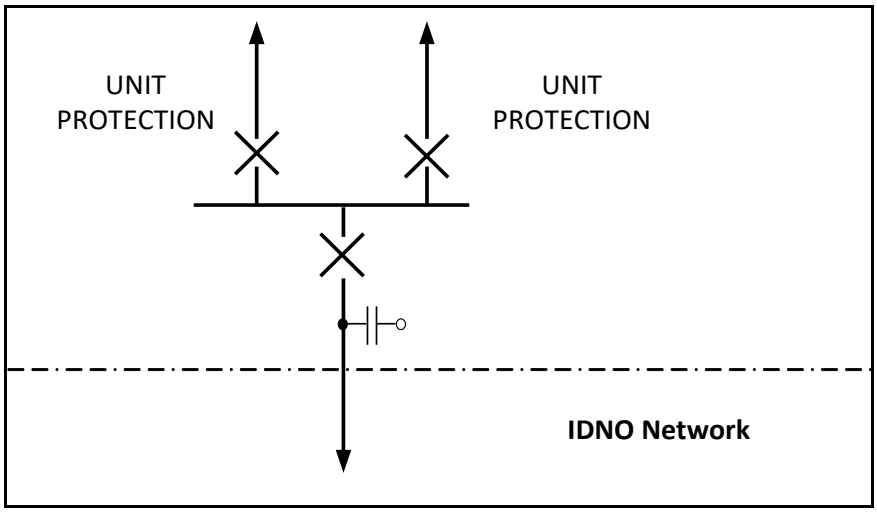


Figure 9 – Panel board within 'X' Type Network

Notes:

- This solution is to be employed where the required connection capacity is greater than 500 kVA and an increased security of supply is required.
- The number of panels will depend on site specific requirements.
- If required for SPEN's IDNO metering purposes. Metering is to be installed as specified by SPEN and at full cost to SPEN.
- Specific requirements are detailed in SPEN Drawing SP4008844.
- HV cables interfacing between the IDNO and the Company network shall be installed by the IDNO to the satisfaction of SPEN. The cables shall remain the property of the IDNO.
- HV termination kit for terminating IDNO HV cables into the Company switchgear shall be of an SPEN approved type.

Where two points of supply are required, located at one geographic location, SPEN connection arrangements shall be as below.

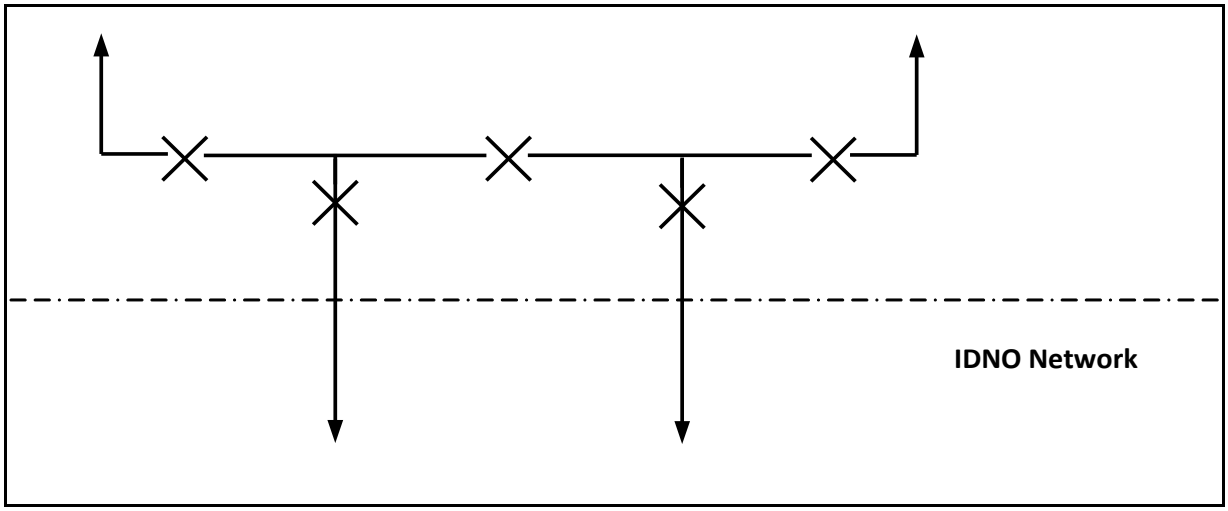


Figure 10 – SP Manweb Panel Board Solution

Notes:

- This solution is to be employed where two points of supply are required.
- The number of panels will depend on site specific requirements.
- If required for SPEN's IDNO metering purposes. Metering is to be installed as specified by SPEN and at full cost to SPEN.
- Specific requirements are detailed in SPEN Drawing SP4008844.
- HV cables interfacing between the IDNO and the Company network shall be installed by the IDNO to the satisfaction of SPEN. The cables shall remain the property of the IDNO.
- HV joints for terminating IDNO HV cables into the Company switchgear shall be of an SPEN approved type.

SP Manweb 'Y' Type Network

The 'Y' Type network is a non-unit protected section of network. 'Y' Type RMUs may have LV interconnection at secondary substations along their HV feeder, though most faults will result in a loss of supply until switching occurs. A 'Y' Type secondary substation configuration is shown in Figure 11 below:

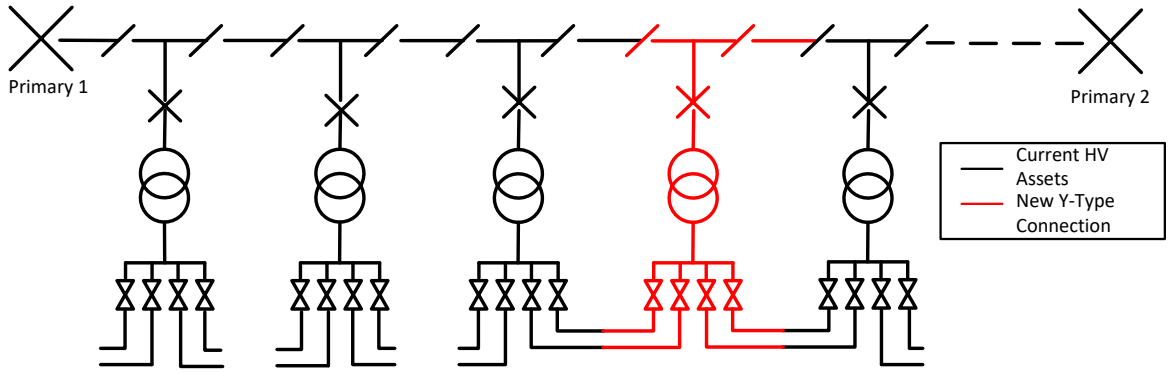


Figure 11 – 'Y' Type Feeder Configuration

For IDNO connections, LV interconnection to SPEN's LV network is not permissible under any arrangement.

13.6.4 HV Connections – RMU Solution

The standard configuration for a single point of connection to the Company's network is detailed in Figure 12 below.

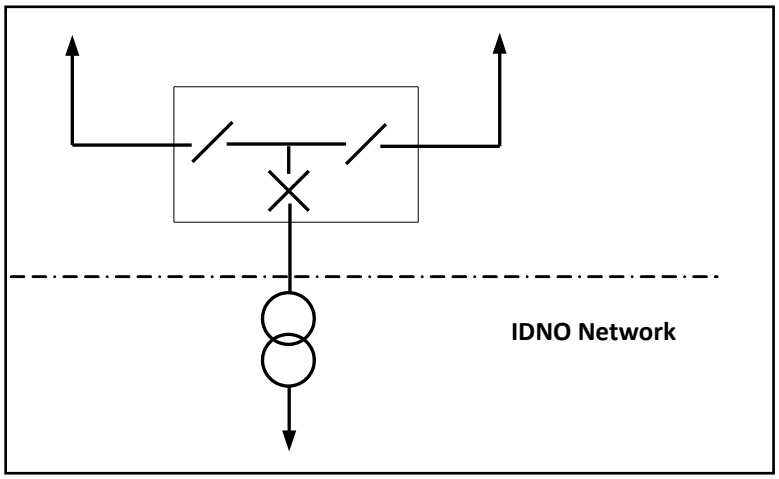


Figure 12 – SP Manweb HV Connection – single RMU

The equipment required is as per Section 13.5.1. Where two points of supply are required, located at one geographic location, SPEN connection arrangements shall be as detailed in Figure 13 below:

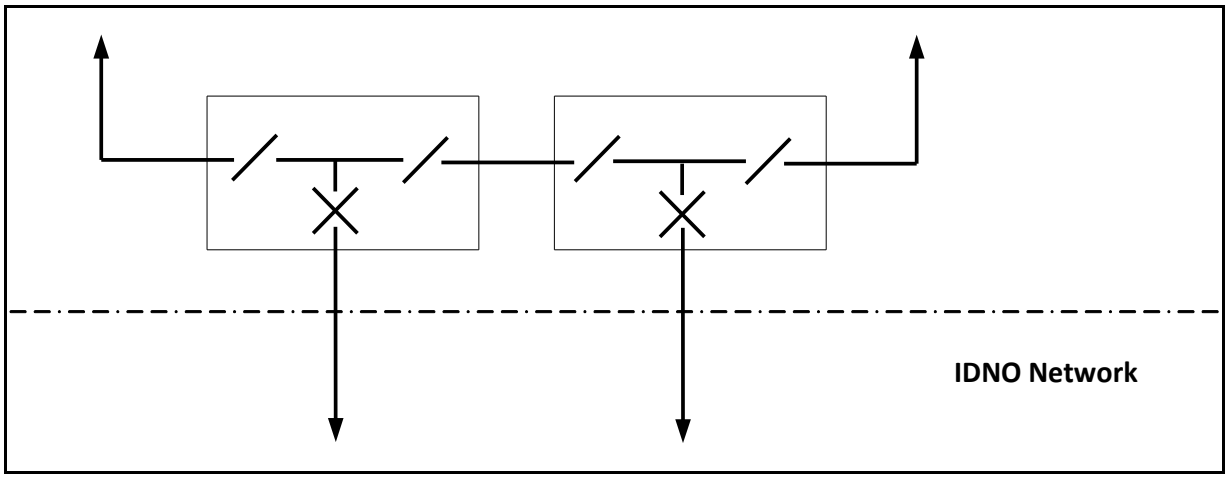


Figure 13 – SP Manweb HV Connection – multiple RMUs

Notes:

- If required for SPEN's IDNO metering purposes. Metering is to be installed as specified by SPEN and at full cost to SPEN.
- Specific requirements are detailed in SPEN Drawing SP4008846.
- HV cables interfacing between the IDNO and the Company network shall be installed by the IDNO to the satisfaction of SPEN. The cables shall remain the property of the IDNO.
- HV termination kit for terminating IDNO HV cables into the Company RMU shall be of an SPEN approved type.
- The ownership boundary should be at the cable termination of the feeder circuit breaker and before IDNO metering.
- The company RMU shall be of an approved type as detailed in SPEN Approved Equipment Register and shall have a fully rated circuit breaker earth switch capable of 13.1 kA.

14. CONNECTIONS INTO LV NETWORK

There shall only be one point of connection to an IDNO's network unless otherwise agreed in writing by SPEN. The point of connection is defined under the connection agreement, an example is provided as the outgoing terminals of the Company switchgear (cut out) as detailed in SPEN Drawing SP4008852.

All LV generation connections will comply with the latest version of the corresponding ENA Engineering Recommendation documentation.

At an industry level (DCRP – Distribution Code Review Panel), it has been agreed that a link box or disconnection point is not needed at the POC for IDNO connections to DNO low voltage cables. In this case, the IDNO will adopt and own the assets up to and including the POC joint.

The IDNO shall match the phase rotation on the local SPEN network.

14.1 Direct Connection to Network

Where it is agreed that a link box is not deemed necessary by either party, then the IDNO will adopt and own the asset up to and including the POC joint as shown in Figure 14. The POC joint will be completed to SPEN specification. The IDNO will give details to SP Data Management as per CON-04-005 sections 15/16 with: a plan of the position and dimensions, cable type and size, owner operator. This will be recorded in GIS within the POC symbol that already exists.

If a fault is identified as being on an IDNO network where there is no clear separation via a link box or enclosure, SPEN reserves the right to disconnect the IDNO network at a convenient and safe location. This will be done with full communication with the IDNO. All work carried out to disconnect the IDNO network and subsequently restore supplies will be funded by the IDNO.

14.2 Link Boxes Connection to Network

In certain circumstances SPEN may wish to have a link box installed where operationally they consider it necessary; where this occurs SPEN will pay the cost of the installation of the link box. The link box will be installed by the IDNO's chosen ICP, to SPEN specification as per SPEN Approved Equipment Register and owned by SPEN.

In contrast to the above, there will be circumstances where an IDNO may require a link box to be installed. This will be at the IDNO's expense and to ENA specification TS 09-23. SPEN will take ownership of the network 5m from the link box towards the POC as shown in Figure 14.

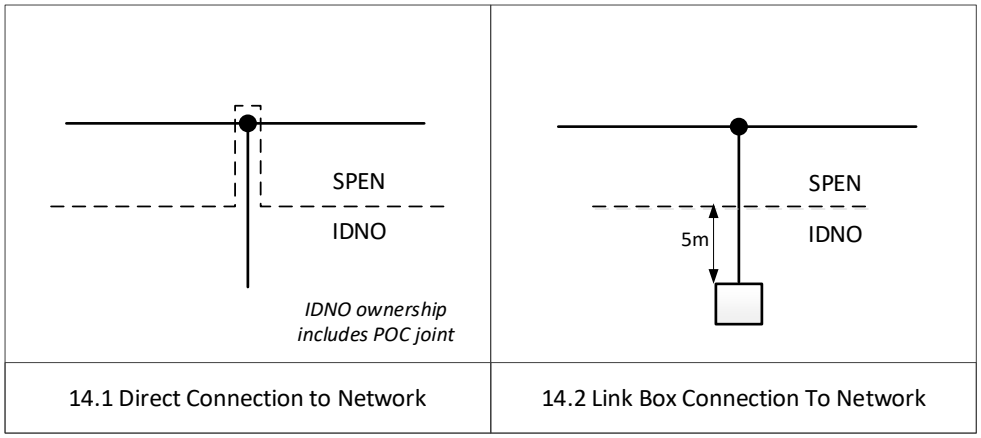


Figure 14 – LV Point of Connection Ownership Boundaries

14.3 Enclosures

Where IDNO networks interface with SPEN network via a common enclosure, owned, operated and maintained by the IDNO, the enclosure shall be of a robust construction housing Company Equipment and IDNO equipment as detailed in SPEN Drawing SP4008852.

It is the responsibility of the IDNO to ensure that the materials and components used in the construction of the enclosure are suitable for their purpose, correctly used or applied and sufficiently durable, taking account of normal maintenance practises, to ensure the health and safety of people. The enclosure shall be designed to prevent, so far as is reasonably practicable, third parties gaining access to the enclosed Company equipment. It shall provide protection of the enclosed Company equipment against ingress of solid foreign objects and water to a minimum of IP54, in accordance with IEC 60529. Evidence of type testing for ingress protection shall be provided, where requested.

Where the enclosure is of metallic construction, the IDNO shall ensure the appropriate bonding in accordance with the latest issue of ENA Engineering Recommendation G12, to an independent IDNO earth.

Enclosures shall be appropriate to the area in which they are to be located, taking cognisance of the Vandalism risk classification, as detailed within SUB-02-006.

The minimum internal dimensions required by SPEN for Company equipment are detailed in SPEN Drawing SP4008852. Where the IDNO proposes dimensions less than those specified, formal written approval shall be obtained from the Engineering Services Manager or his nominated representative on a site by site basis prior to acceptance by SPEN.

14.4 Cables and Tails

The IDNO shall provide suitable cables (meter tails) to connect their Network to the Company cut out. Due consideration shall be given to the minimum bending radius of the meter tails. Meter tails shall not exceed 3m in length and shall normally be single core, stranded copper conductor, PVC insulated and sheathed. Meter tails shall be rated appropriately and terminated by a cable lug with an M12 fixing hole. IDNO underground cables shall be segregated as far as reasonably practicable from SPEN cables.

14.5 Protection

The Company owned cut out shall be installed with fuses as shown in Table 2, which shall subsequently be replaced by links as and when the IDNO's fused cut out has been installed. The cost of the installation of the fuse will be SPENs responsibility.

Cut out rating (A)	Min Fuse rating (A)	Max Fuse Rating (A)
100	63	100
200	160	200
400	315	400

Table 2 – Fuse Ratings

14.6 Earthing

Earthing should be designed in accordance with EART-01-002 and G12.

15. GENERAL REQUIREMENTS FOR ALL VOLTAGE LEVELS

15.1 Access

Access to shared enclosures will be specified in the BCA with the IDNO. SPEN and the IDNO have a joint responsibility to communicate safety issues to all operational staff in the same general timescale.

15.2 LV Access and Egress

Access and egress provisions shall be made in accordance with SUB-03-017. Dual access shall be provided using an approved SPEN padlock or by a pillar key. SPEN will not accept bespoke access provided by a non-standard key issued by the IDNO.

The enclosure shall have 24-hour unrestricted access/egress and shall be sited on a level drained site with the doors opening on to a footpath or common ground.

It is the responsibility of the IDNO to have ground ownership documentation and wayleaves. Any assets which are to be adopted by SPEN shall be held under easements and servitudes.

15.3 Working Across Boundaries

SPEN and IDNOs will use the RISSP system when working at the interfaces of their networks. This should be confirmed with the IDNO.

When isolation and earthing is required, a RISSP issue procedure should be in place.

15.4 External Labelling

The IDNO shall ensure that the enclosure is fitted with a suitable property notice – detailing operator name, emergency contact telephone number and plant identifier – and Danger of Death signs as detailed and required by the ESQCR 2002. The SPEN substation name should be used by the IDNO.

A SPEN IDNO warning label, as detailed in OPSAF-02-003 and Appendix 3, shall be attached to the exterior of the enclosure in a position which is readily visible to a person approaching the main site entrance, preferably attached to the enclosure entrance.

15.5 LV Internal Labelling

A SPEN Incoming Supply label, and a SPEN IDNO warning label, as detailed in Appendix 3, shall be attached to the fixed portion of the Company owned cut out.

IDNO Equipment shall be suitably identified.

Where IDNO operation of a DNO owned circuit breaker has been authorised, and therefore dual operation applies, a suitable label on all relevant apparatus should indicate this status.

15.6 HV Internal Labelling

The standard labelling requirements for a secondary substation shall apply with the addition of a SPEN IDNO warning label, as detailed in OPSAF-02-003 and Appendix 3, mounted beside the circuit breaker which feeds the IDNO.

16. SITE RESPONSIBILITY SCHEDULE

Inside a SPEN owned substation all plant will be owned, operated, and controlled by SPEN other than the plant inside the designated IDNO cabinet. Ownership of plant should be clearly specified in the Site Responsibility Schedule and labelled within the substation accordingly.

Each party is responsible for their own assets. If an asset fails and causes loss of supply or an unacceptable reduction of network security of supply to the other party, repair work should be undertaken by the owner as soon as reasonably practicable.

16.1 Site Responsibility Agreements & Certification

Prior to energisation, an Electrical Installation Certificate as detailed in Appendix 4 shall be submitted to SPEN by the IDNO, certifying that the IDNO network has been designed and built in compliance with the ESQCR and is safe to be energised.

Where certification has not been provided SPEN shall consider the IDNO network to be non-compliant with the ESQCR and shall not energise the network.

16.2 Data Management

The IDNO shall submit a drawing of their network when returning the Connection and Use of Supply Agreement in accordance with BUPR-22-015.

16.3 Common Arrangements at HV

Situation	Asset owner	Safety rules applicable	Responsibility for switching	Responsibility for isolation, earthing and safety documentation
Entire grid or primary substation	SPEN	SPEN	SPEN Switching operation by SPEN at the request of the IDNO	Asset owner
Entire grid or primary substation	IDNO	IDNO	IDNO	IDNO
Feeder from primary substation	SPEN	SPEN	SPEN Switching operation by SPEN at the request of the IDNO	Asset owner Asset owners isolate and earth respective assets, with exchange of appropriate documents across control boundary
HV switching station	SPEN owns all switchgear IDNO owns circuits and metering unit	SPEN	Asset owner	Asset owner Asset owners isolate and earth respective assets, with exchange of appropriate documents across control boundary
HV / LV distribution substation	SPEN owns RMU IDNO owns transformer and LV switchgear	By asset owner	Asset owner	Asset owner Asset owners isolate and earth respective assets, with exchange of appropriate documents across control boundary

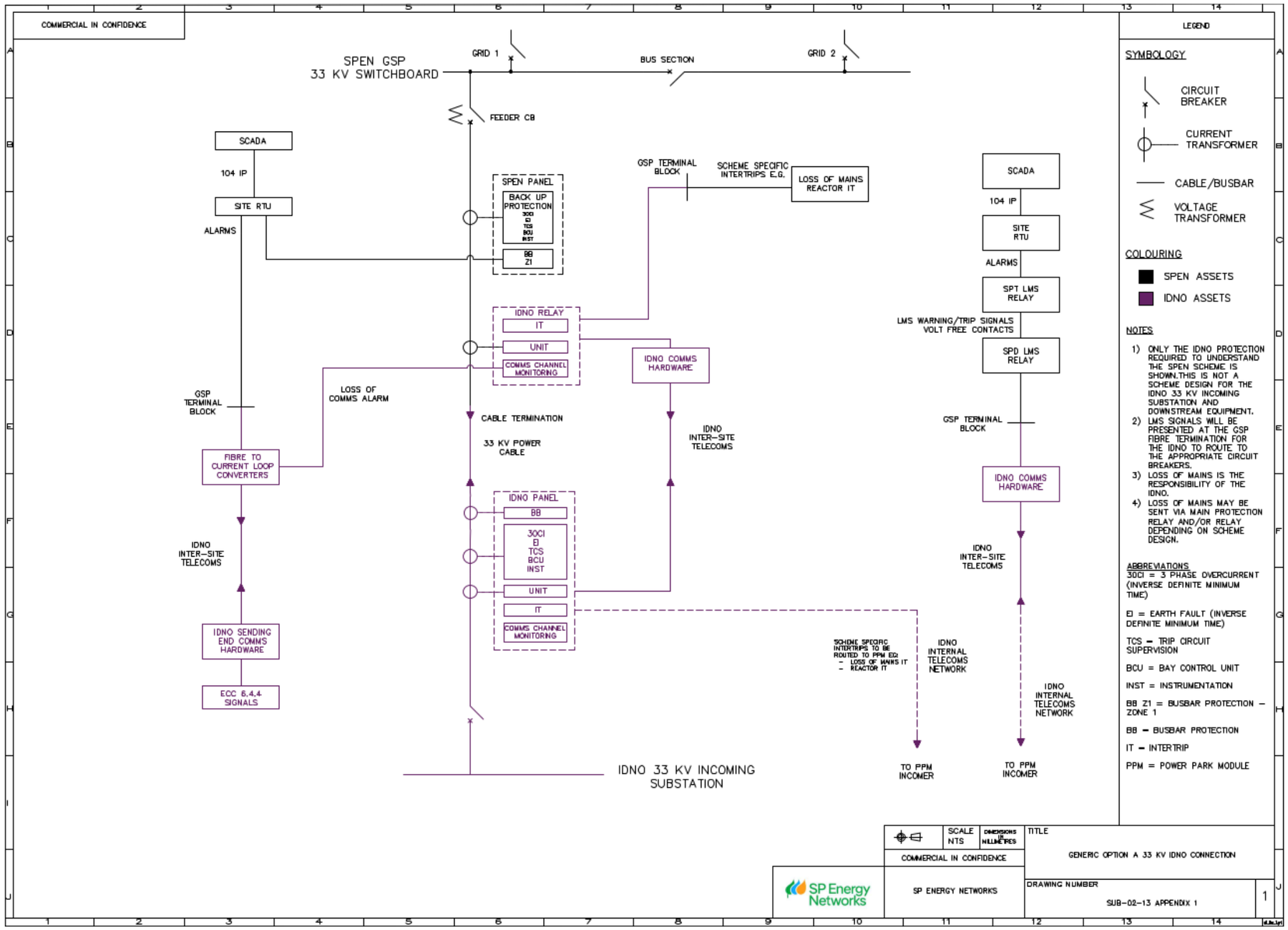
Table 3 – Summary of common arrangements at high voltage

16.4 Common Arrangements at LV

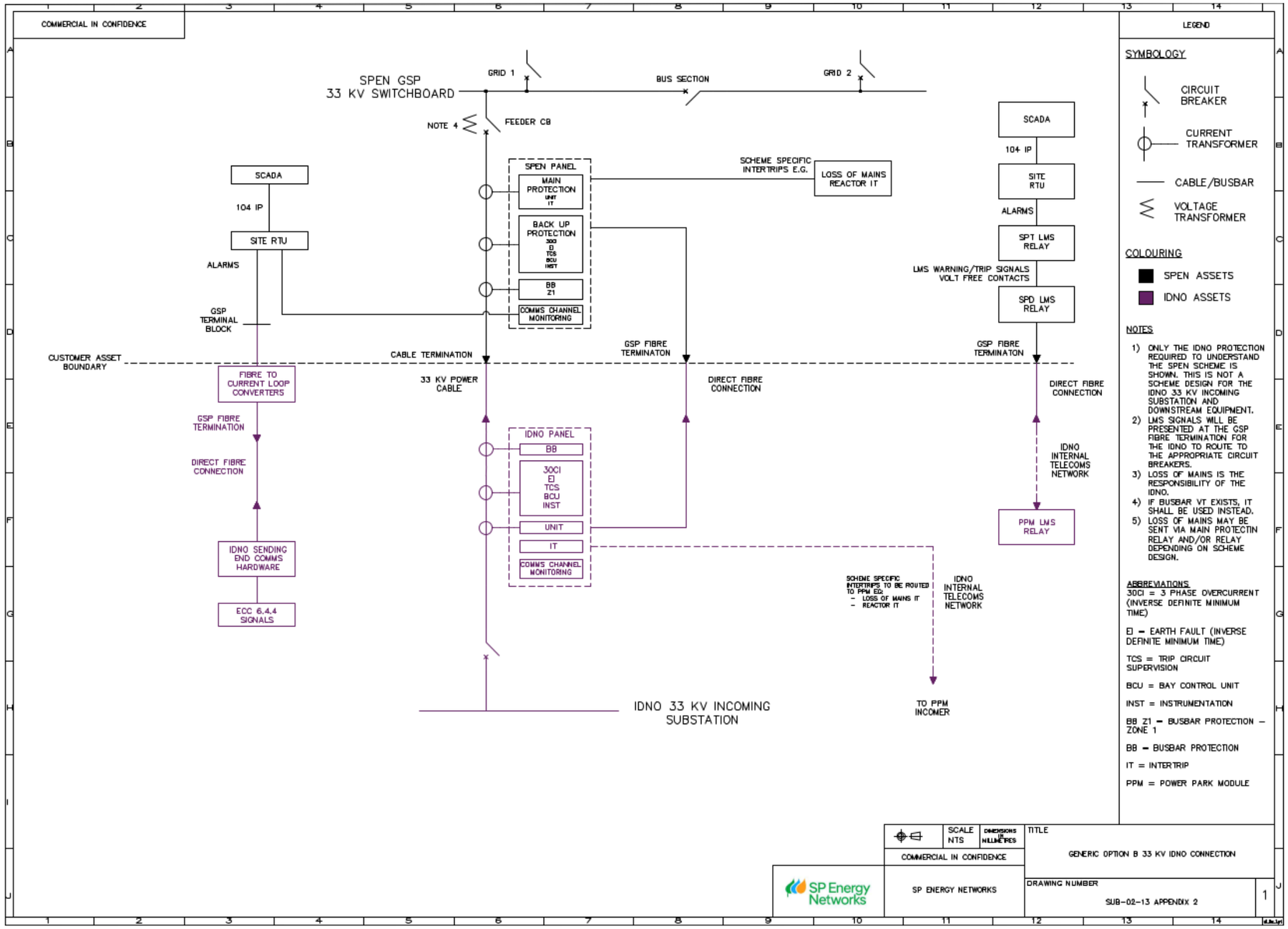
Situation	Asset owner	Safety rules applicable	Responsibility for switching	Responsibility for isolation, earthing and safety documentation
Secondary substation	SPEN	SPEN	SPEN	Asset owner Asset owners isolate and earth respective assets, with exchange of appropriate documents across control boundary
LV network Existing or new SPEN link-box and new IDNO link-box	SPEN Where an IDNO requires a new link-box, SPEN shall take ownership of it as shown in Figure 14.	SPEN	SPEN	SPEN
LV network Existing or new SPEN feeder-pillar and new IDNO link-box	SPEN Where an IDNO requires a new feeder-pillar, SPEN shall take ownership of it as shown in Figure 14.	SPEN	SPEN	SPEN

Table 4 – Summary of common arrangements at low voltage

APPENDIX 1: Generic Option A Protection



APPENDIX 2: Generic Option B Protection



APPENDIX 3: IDNO WARNING LABEL

APPENDIX 4: ELECTRICAL INSTALLATION CERTIFICATE

S Certificate No: .....…… **PPS/Radar Ref:** .....……

I hereby confirm that the following installation/work has been carried out for: -

IDNO Name: .....

Site Address: .....

.....

Details of Installation/Work:

.....

.....

Point of Connection Location inc. 12 figure grid reference:

.....

The installation complies in every respect with the requirements of The Electricity Safety, Quality and Continuity Regulations 2002 and is suitable to be connected to the SP Distribution Ltd network and energised by SPEN personnel.

Date required to energise connection:..... ……..
(NOTE: SPEN personnel will not energise the connection unless the IDNO network has been confirmed as isolated on site)

Signed: .....

Print Name: ..... **Designation**: .....
(IDNO/Contractor's Authorised Representative)

IDNO/Contractor:

.....

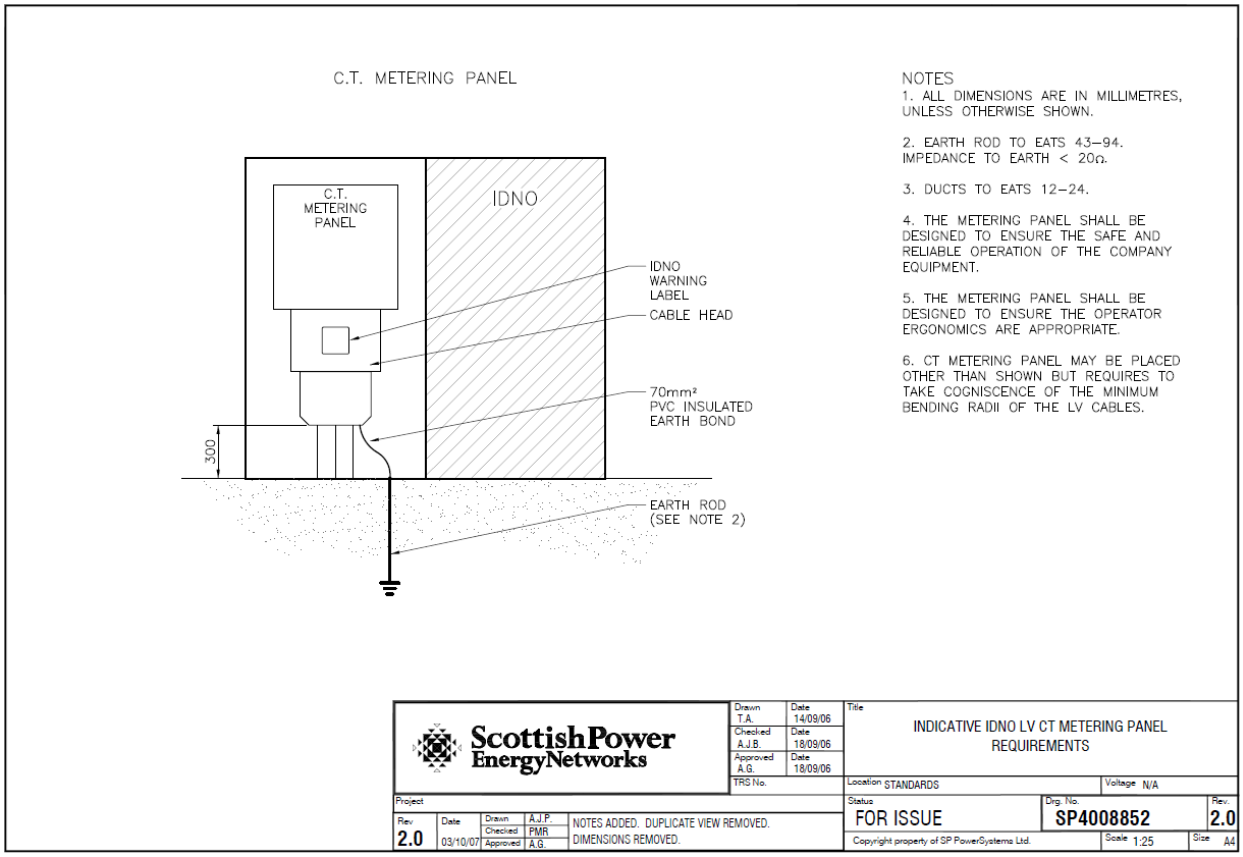
Address: .....

.....

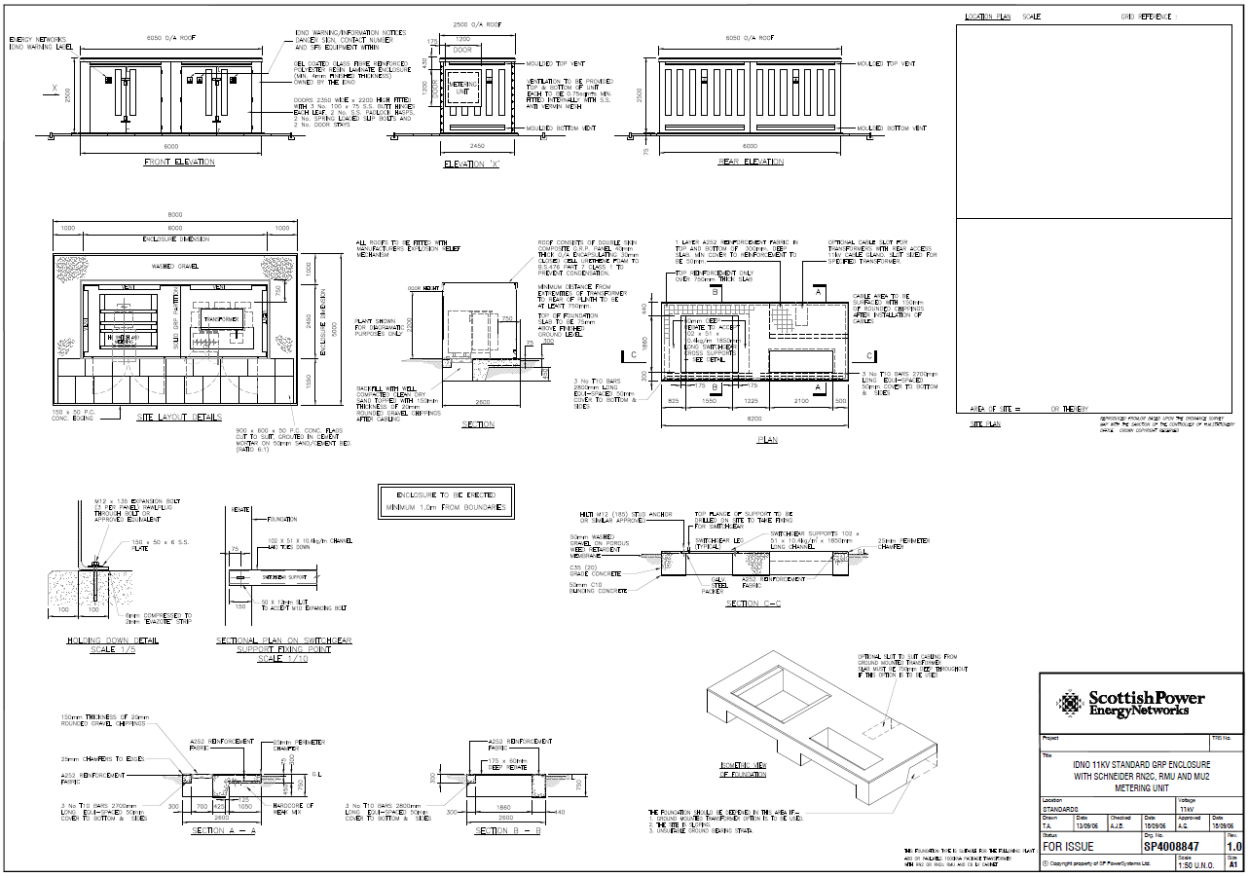
Energised by SPEN on: **Date:**..... **Time:**

APPENDIX 5: DRAWING REGISTER

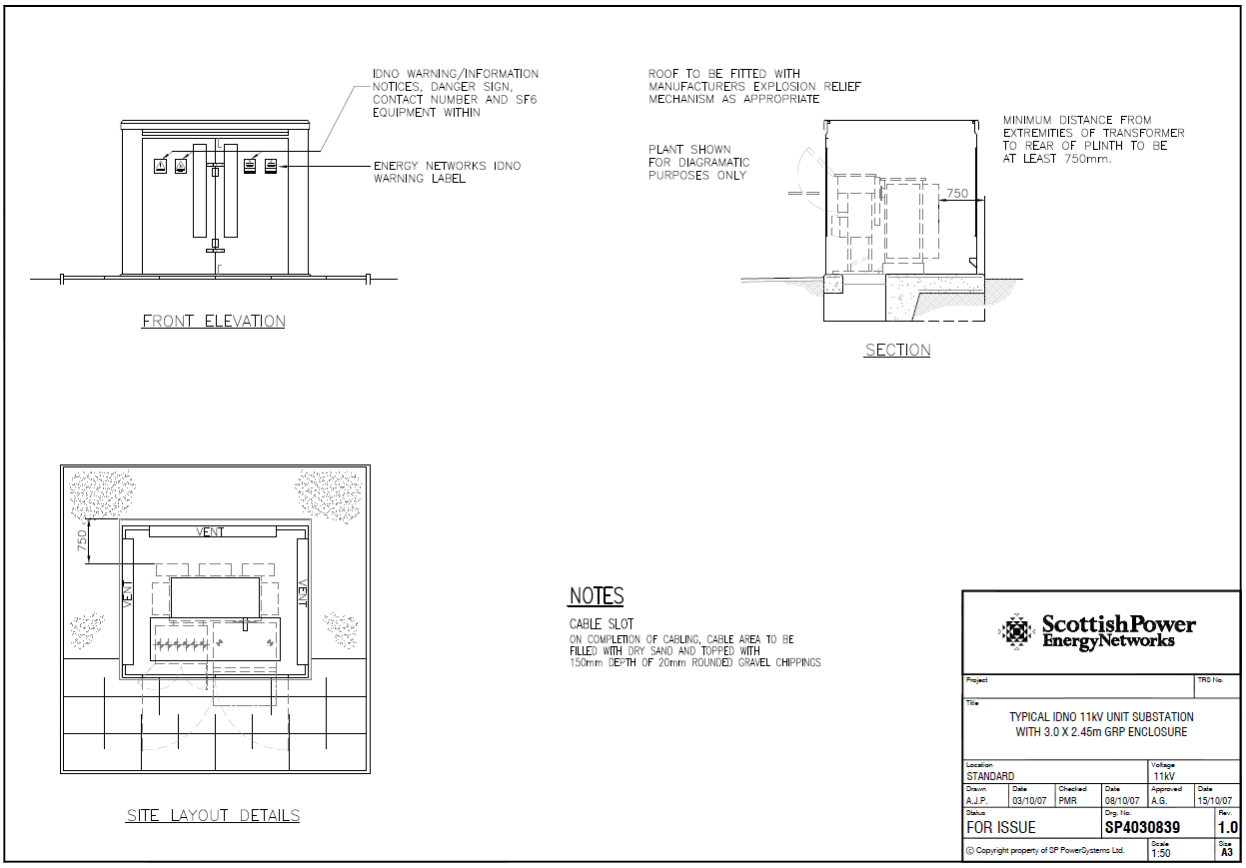
Indicative IDNO LV CT Metering Panel Requirements	
Drawing Number	Date of Issue
SP4008852	October 07
IDNO 11kV Standard GRP Enclosure with Schneider RN2C, RMU and MU2 Metering Unit	
Drawing Number	Date of Issue
SP4008847	September 06
Typical IDNO 11kV Unit Substation with 3.0 x 2.45m GRP Enclosure	
Drawing Number	Date of Issue
SP4030839	October 07
6.0m x 2.5m Kinpars Enclosure for IDNO Double RMU Connections	
Drawing Number	Date of Issue
SP4008846	September 06
IDNO – Free-standing Type E031 Customer Substation Guidance Details	
Drawing Number	Date of Issue
SP4008844	September 06



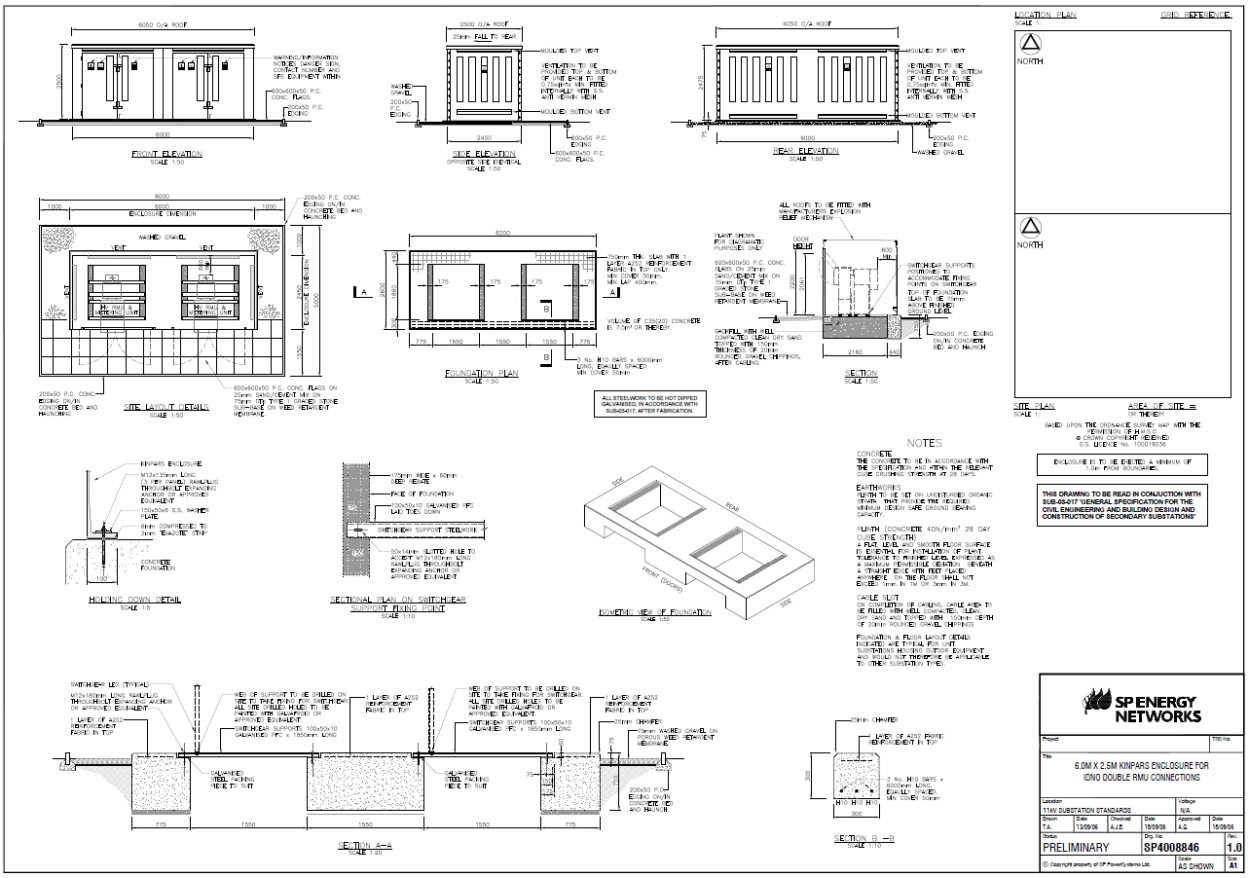
Drawing SP4008852 – Indicative IDNO LV CT Metering Panel Requirements



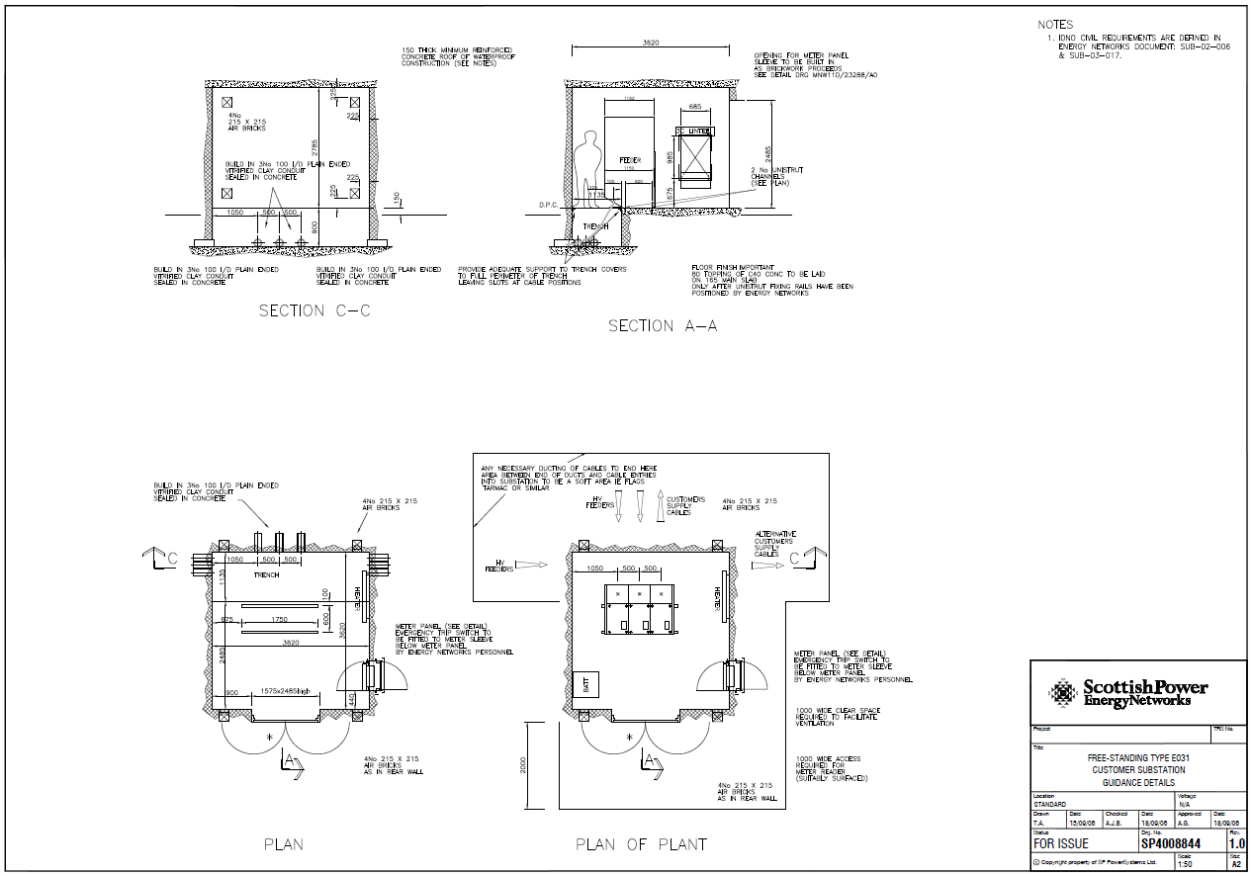
Drawing SP4008847 – IDNO 11kV Standard GRP Enclosure with Schneider RN2C, RMU and MU2 Metering Unit



Drawing SP4030839 – Typical IDNO 11kV Unit Substation with 3.0 x 2.45m GRP Enclosure



Drawing SP4008846 – 6.0m x 2.5m Kinpars Enclosure for IDNO Double RMU Connections



Drawing SP4008844 – Free-standing Type E031 Customer Substation Guidance Details