Electricity Distribution

nationalgrid

Company Directive

ENGINEERING SPECIFICATION
EE SPEC : 2/7

12kV Cable Connected Outdoor Extensible and Non-Extensible Secondary Type Switchgear and Metering Units

Policy Summary

This specification details requirements for 12kV outdoor cable connected distribution secondary type switchgear. In addition to conventional ring main units and free-standing switchgear, it includes 12kV metering units.

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Implementation Date: **December 2020**

Approved by:

Carl Ketley-Lowe

Engineering Policy Manager

Date: **9th December 2020**

Target Staff Group	**Network Services Districts, Plant Workshops and Purchasing**
Impact of Change	**Green – No impact on current working practices**
Planned Assurance Checks	**Nil**

All references to Western Power Distribution or WPD must be read as National Grid Electricity Distribution or NGED

IMPLEMENTATION PLAN

Introduction

This document specifies the requirement for 12kV cable connected secondary distribution secondary type switchgear. It also includes the specification for RMU mounted metering units.

Main Changes

The specification has been updated following the issue of ENA Technical Specification 41-41 (2020) to replace the parts in ENA Technical Specification 41-36 (v3) 2012 relevant to 12kV cable connected secondary distribution type switchgear.

The document also contains a statement on the progress towards implementation of equipment having low or no GWP by the replacement of SF6 gas within the unit by an alternative technology or gas.

Clauses are included to cover permitted options and combinations of busbar selector and earth switch where a three position device is not available.

Rationalisation of options has also been made so as to reduce and simplify the build and stocking variants, and to incorporate revisions required to meet SD4OA.

Impact of Changes

No significant impact anticipated for Network Services Teams.

In the event of the introduction of new technology or revised operational requirements, then briefing / awareness documents will be prepared for communication to operators and trainers.

Implementation Actions

WPD DNO Engineering Policy Team and Procurement will tender the revised specification and award new contract.

Implementation Timetable

This revised version of WPD EESPEC 2 shall be implemented immediately for the purposes of tendering and award of new contracts.

There is no change to any equipment currently purchased by WPD under existing contracts.

ICPs will be expected to comply with this new specification by 30 June 2021.

Items currently on order/under an active quotation by an ICP, to the existing specification shall continue to be acceptable to WPD. New orders placed by an ICP after the date of issue of this revised specification, will need to comply with this specification.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
December 2020	• Updates to reflect new ENATS 41-41. • Inclusion of statement on the progress towards implementation of low or no GWP by the replacement of SF6 gas within the unit by an alternative technology or gas. • Make, type and colours of gas filling points specified to allow for different gas or gas mixtures. • Rationalization of variants to reduce stock options. • Some variants will be special order.	Anthony Smith / Stephen Hennell
12 January 2015	• Minor updates to incorporate revisions to ENATS 41-36 (2012)	R Lang

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1.0 INTRODUCTION

1.1 This specification covers the manufacture and supply of 12kV cable connected outdoor distribution switchgear for use on 11kV and 6.6kV distribution networks. It includes ring main units, extensible switches and circuit breakers, and metering units. All equipment shall be of a non-oil type.

1.2 All equipment supplied under this specification shall meet the technical requirements of ENA Technical Specification 41-41 Issue 1 2020: "*Ground Mounted Distribution Substation 12 to 24 kV Rated RMU & Extensible Switchgear*".

1.3 WPD options, changes or additions to the ENATS requirements are stated in this WPD document.

1.4 Additional clauses contained within this specification are in addition to the requirements of the standards outlined in ENA Technical Specification 41-41. Where there is any conflict between ENA Technical Specification 41-41 and this document, then EE:SPEC 2/7 shall take precedence.

1.5 WPD has a preference for equipment which holds an Energy Networks Association (ENA) Notice of Conformity (NoC) to the current version or a previous version of an ENA Technical Specification (TS).

Where equipment offered does not have an ENA NoC then the manufacturer will be required to provide WPD with details and test data for review that will be equivalent to completing an ENA NoC Assessment. [Manufacturers should use Self-Certification Conformance Declaration sheets from ENATS 41-41 Annex B. WPD will provide a blank copy of self-certification conformance declaration sheets on request.]

Supplier declarations and test data will be required for each type/model of switchgear offered at time of tender.

There is no guarantee that following WPD assessment of the equipment that it will be accepted for use by WPD.

1.6 The requirements of this document are not intended to restrict or inhibit the introduction of new forms of switchgear provided that such designs comply with those requirements in respect of safety, security and operation which are generally understood by manufacturers and users.

1.7 Equipment that would require major changes to the WPD Distribution Safety Rules and associated safe operating procedures, changes to the Electrical Network Management System software, and any consequential re-training of switchgear operators, may be considered however costs and timescales are highly likely to be a significant limiting factor in the selection and adoption of such equipment.

2.0 GENERAL REQUIREMENTS

2.1 General

2.1.1 Suppliers and Manufacturers shall satisfy the requirements of BS EN ISO 9000 and BS EN ISO 9001 for all products supplied.

2.1.2 Details of failure analysis studies for the products being offered shall be included with any tender.

2.1.3 Accepting that this is an early period with the technology and availability of products in an initial phase of market readiness, WPD is looking to move to purchasing equipment that has a Global Warming Potential (GWP) of 1 or less, however equipment utilizing SF6 may be offered in the event that manufacturer is not yet able to offer a low GWP unit. Where both are available then the supplier shall offer both as an option to WPD during a tender.

2.2 Guarantee

2.2.1 The supplier of the plant / equipment covered by this specification shall provide a guarantee for that equipment. The guarantee period that the supplier warrants will be a minimum of 60 months (five years) from the date of delivery.

2.2.2 Note, this requirement applies to plant / equipment purchased by Independent Connection Providers (to be adopted by WPD) as well as equipment purchased directly by WPD.

2.2.3 Manufacturers shall state at time of tender how a population of the equipment offered would be checked and cleared of any potential type defect occurring in the future. This information shall also detail any cost implications to WPD.

2.3 Safety Labels

Safety labels, warning signs and notices shall be compliant with UK standards in terms of colours, pictograms and layout. [BS 5499]

2.4 Training

Current versions of the operational and maintenance manuals relevant to the equipment to be supplied shall be provided at the start of contract.

If deemed necessary by WPD then the manufacturer (or their UK supplier or agent) shall provide suitable training on installation and operational procedures with the first units supplied.

3.0 SPECIFIC REQUIREMENTS

3.1 System Earthing

The equipment shall be suitable for use on three phase systems at 11kV and 6.6kV in which the neutral is impedance or ASC earthed.

3.2 Facilities for disconnecting and earthing the circuit [ENAST 41-41 Clauses 6.103.202.2 & 6.103.202.4]

3.2.1 Vacuum devices rated as disconnectors to BS EN 62271-102, are acceptable to provide electrical isolating distance, but are not acceptable to provide safety isolation for work, or testing, on the circuit.

3.2.2 WPD would strongly prefer that the selection between busbar, isolated and earthed is provided by a three position device. Where an alternative is proposed then it shall meet the additional requirements in clauses 3.2.3 to 3.2.8 below. Outlines of the various arrangements acceptable to WPD are contained in Appendix B.

3.2.3 Operation of the isolating device from busbar selected to the isolated position shall be by a switch disconnector or alternatively via a disconnector in series with a suitable current interrupting device. It shall not be possible to operate the isolating device without the current interrupting device being open.

3.2.4 Where operation of the isolating device is from busbar selected to earth selected without an intermediate position, then this shall be in series with a suitable current interrupting device. It shall not be possible to operate the isolating device without the current interrupting device being open.

3.2.5 Circuit earthing shall be provided by a make-proof device. This shall either be applied directly via a rated earth switch, a rated switch disconnector or via a circuit breaker.

3.2.6 Interlocks and locking provision shall be as prescribed in ENATS 41-41.

3.2.7 Locking and interlocking provision shall be compatible with normal WPD operational practice and allow full compliance with the WPD Distribution Safety Rules.

3.2.8 Where indication of the isolating device position is provided from the driving mechanism and not from a driven shaft, then suitable means shall be provided to allow the operator to readily visually establish the position of all phases of the isolating device.

3.3 Test Facilities

3.3.1 WPD would prefer that cable test facilities are achieved by means of 3 phase integral device.

3.3.2 Cable test access shall be interlocked as per ENATS 41-41 Clause 6.12.201.3.

3.3.3 Where cable test devices are required to be used then these shall be as per ENATS 41-41 Clause 6.12.201.4.

3.4 Cable Terminations (Section 1.5.103.1.101 - 41-36)

3.4.1 Cable connection compartments shall be to ENATS 12-11 and shall be of the dry termination design. WPD has a preference for "C" profile bushings.

In the event that "C" profile bushings cannot be provided then the bushings shall be suitable for the installation of offset palm lugs and a "shrink type" cable termination.

Manufacturer specific bushing profiles requiring the use of specific bespoke connectors shall not be offered.

3.4.2 Cable connection compartments shall be fitted with gland plates suitable for cable size up to 400mm single core EPR.

Gland plates shall be of the "three single core" type.

A single-hole gland plate shall be available as an optional accessory for tee off and metering unit cable boxes.

3.4.3 Cover plates shall be provided with vandal resistant fixings.

3.5 Padlocking

3.5.1 Wherever padlocking facilities are provided, provision shall be made for a padlock with 38mm square body and with a 7mm diameter shackle having a clear inside width of 20mm and an inside length of 16mm to 30mm. The holes provided for the shackle shall not be less than 8mm diameter.

3.5.2 Safety padlocking provision shall meet the requirements of ENATS 41-41 Clause 6.12.202.1

3.6 Auxiliary enclosures / terminal boxes

Any auxiliary enclosures and terminal boxes where access is required for work on secondary wiring of the RMU or of any automation equipment fitted, then these a shall be readily accessible when a RMU is transformer mounted along with an LV cabinet.

3.7 Transformer mounting units shall not foul the LV cabinet when fitted on a transformer with same side HV and LV couplings as ENATS 35-1 Part 3 Clause 4.1(d) (including figures 3, 4, 6 and 8).

3.8 Ratings

Rated values shall be as in ENATS 41-41 and the Schedules contained within this EESPEC.

4.0 GAS SYSTEM

4.1 Closed pressure systems for gas [ENATS 41-41 Clause 6.16(a)]
The leakage rate F_{rel} of the gas of a closed pressure system shall be such that it shall not require replenishment during its expected minimum operating life of 30 years.

4.2 Sealed pressure systems for gas
The tightness of sealed pressure systems is specified by their expected operating life. The standard value is 30 years.

4.3 The leakage rate shall not exceed 0.1% per year at 20 °C.

4.4 Gas systems shall be fitted with a pressure or density switch with volt-free contacts that provides indication that the internal pressure is below the minimum functional pressure for the device. This shall be wired to a readily accessible terminal block that can be accessed without requiring the removal of fixed covers.

4.5 Gas filling points

4.5.1 Where gas filling points are readily accessible then they shall be fitted with self-sealing valves with a padlockable cover or closure that can be secured using a WPD standard operational padlock. [See 3.5.1 above.]

4.5.2 Where gas filling points are behind covers requiring a WPD Safety Document and/or the application of tools, then these would be considered not readily accessible and the requirements of 4.5.1 above shall not apply.

4.5.3 Gas filling points shall follow the colour scheme and connection type / sizing as specified in the table below:

Gas / Gas Mixture	Colour	RAL	Connection
SF6	Pure Orange	2004	DILO DN8 with M26 thread or DILO DN20 with M45 thread
N_2 / O_2 mixtures	Light Blue	5012	DILO DN12 with M30 thread or DILO DN20 with M50 thread
Mixtures containing C4-FN (C_4F_7N)	Yellow Green	6018	DILO DN8 with M28 thread or DILO DN20 with M48 thread
Mixtures containing C5-FK ($C_4F_{10}N$)	Telemagenta	4010	DILO DN8 with M24 thread or DILO DN20 with M43 thread
CO_2 / O_2 mixtures	Dusty Grey	7037	Malmquist valve with M32 thread

[*Note: Table may be subject to revision to maintain alignment with future ENATS*.]

4.5.4 These requirements shall be achieved without the use of adaptors.

4.5.5 All filling points shall be clearly labelled to indicate the type of gas contained within the equipment.

4.5.6 Labels shall be engraved and mechanically secured such that they cannot be removed other than by disassembly of the equipment filling point.

4.5.7 The same colour coding and sizing shall also be used on monitoring devices and gas handling equipment.

4.6 Bursting discs and explosion vents

4.6.1 Pressurized systems shall be provided with pressure relief devices such as bursting discs.

4.6.2 Bursting disks and explosion vents shall be installed so that exhaust gasses are directed away from the normal local operating position of the equipment.

4.7 Rated Internal Arc Classification

4.7.1 Units should as a minimum have a rated internal arc classification (IAC) of AF.

4.7.2 The IAC requirements for transformer mounting units shall be maintained when installed on a close coupled transformer and with an LV cabinet installed.

4.7.3 Cable boxes shall be able to contain and internal arc at a current equivalent to rated short-time withstand current. In the event that this is not possible then the manufacturer shall state what ratings are available and what alternatives are present in the design in order to prevent injury to an operator stood at the operating position of the switchgear.

5.0 FACILITIES FOR CHECKING VOLTAGE AND PHASE COMPARISON (ENATS 41-41 Clause 6.103.202.10)

5.1 A voltage presence indicating system (VPIS) in accordance with BS EN 62271-206, or a voltage detecting system (VDS) in accordance with BS EN 61243-5, shall be provided, to provide operators with information about the voltage condition of the main circuit in which they are installed, and to allow phase comparison to be carried out between any circuits.

5.2 The complete VPIS and VDS systems, including the detecting and indicating elements shall be integral to the switchgear.

5.3 Indicators meeting these requirements shall be fitted to:

- All switch disconnectors (ring switches) on RMUs,
- Extensible type switch disconnectors.

- Circuit breakers on RMUs where the rating is above 200A,
- Extensible type circuit breakers.

5.4 The socket arrangement at the interface ('connecting point') for plugging in an indicator and/ or a phase comparator, shall be suitable for system HR or LRM to BS EN 1314 61243-5 to accept 4 mm diameter banana type plugs. [ENATS 41-41 Clause 6.103.202.8]

5.5 The VPIS or VDS system outputs shall be compatible with a Pfisterer EPV Phase Comparator.

5.6 The VDS or VPIS system should also provide a separate voltage reference that can be connected into fault flow indicators, relays or automation controllers so as to provide for the detection of directional flow of current and/or indication of the presence of voltage.

Where the VDS or VPIS system is unable to provide a separate voltage reference and a voltage reference is to be provided by other means then it should be derived within the switchgear and not from separable connectors forming part of a cable termination.

This voltage reference shall be wired to a readily accessible terminal block that can be accessed without requiring the removal of fixed covers. The terminal block shall be suitably screened to prevent inadvertent contact or interference with connections.

6.0 CURRENT TRANSFORMERS (ENATS 41-41 Clause 6.201.1)

6.1 Protection Current Transformers

6.1.1 The class and characteristics of protection CTs shall be adequate for the burden and function of the associated protection equipment and wiring, over the full range of available fault current.

6.1.2 Preferred CT ratios are included in the schedules but in all situations the CT ratings should not limit the overall rating of the switchgear.

6.2 Metering Current Transformers

6.2.1 Metering CTs shall be Class 0.5S with a rated burden of 10VA. They shall have independent cores and secondary windings to those used for protection purposes.

6.2.2 Metering CTs shall be tested to conform with BS EN 61869-1 but shall also be error tested on each ratio at 10VA 0.9 power factor lagging burden at 5%, 20%, 100% and 120% test load points.

6.2.3 Electronic copies of the of test certificates in PDF format shall be provided in advance of equipment delivery for each metering CT. These shall be sent to a designated WPD email address by electronic mail.

[*Note: The email address will be advised after the award of a contract.]*

6.2.4 A hard copy of the test certificates shall accompany any unit containing metering CTs.

7.0 VOLTAGE TRANSFORMERS (ENATS 41-41 Clause 6.201.2)

7.1 Ratings

7.1.1 Rated Output
50VA at a power factor of 0.8 lagging.
Residual voltage winding – 20VA at unity power factor.

7.1.2 Rated Accuracy Class
All Star connected windings shall satisfy the rated accuracy class requirements for both Class 3P and Class 0.5 irrespective of their intended use.
Residual voltage windings connected to form a broken delta shall be Class 3P.

7.1.3 Rated Primary Voltage
11000V

7.1.4 Rated Secondary Voltages
110V

7.1.5 Rated Secondary Voltage for Residual Voltage Windings
63.5V

7.2 All windings shall be rated for a voltage factor of 1.9 for 8 hours

7.3 The HV star point of the windings shall be connected to earth.

7.4 The LV star winding shall be earthed on the yellow phase. No facility to allow the user to select neutral point earthing shall be provided.

7.5 Voltage transformers shall have their rated transformation ratios and voltages shown on drawings, diagrams and rating plates as shown in the table below:

System Voltage	Primary Winding	Secondary Windings		
		Protection	Metering	Residual
	Voltage (Upn)	Voltage (Usn)	Voltage (Usn)	Voltage (Usn)
11kV	11000/√3	110/√3	110/√3	110/3
6.6kV	11000/6600 /√3	110/√3	110/√3	110/3

7.6 Secondary windings used for protection and metering purposes shall be fused at 6A. VT residual windings shall be connected through removable links.

7.7 VTs for use on the 6.6kV system shall have 11000/6600/110V windings, delivered with 6600/110V selected. It shall be possible to subsequently convert them to 11000/110 by means of internal links with the minimum of operational difficulty.

7.8 Protection Voltage Transformers

7.8.1 VT's used for protection purposes shall consist of either a single 5 limb type or three single phase VTs with a broken delta winding.

7.9 Metering VTs

7.9.1 Metering VTs shall comprise be either 3 single phase star connected VTs or be a 3 phase 5 limb unit.

7.9.2 Metering VTs shall be tested to conform with BS EN 61869-3 but shall also be error tested on red/yellow and yellow/blue at 10VA 0.5 power factor lagging burden.

7.9.3 Whenever possible metering VTs and CTs shall be arranged so that the VT is connected before the CTs, in respect of normal power flow.

7.9.4 Electronic copies of the of test certificates in PDF format shall be provided in advance of equipment delivery for each metering CT. These shall be sent to a designated WPD email address by electronic mail.

[*Note: The email address will be advised after the award of a contract.]*

7.9.5 A hard copy of the test certificates shall accompany any unit containing metering CTs.

8.0 CONNECTIONS FOR METERING CT AND VT OUTPUTS

Metering units, and circuit breakers equipped with metering CTs and VTs, shall be provided with a Harting Socket to facilitate the ready connection of the outputs to a remote metering cabinet. [See ST:SP10P, ST:SP10PC, ST:SP10PD and ST:SP10PE.]

9.0 CONNECTIONS FOR CUSTOMER CONNECTION PANEL

9.1 Metering units, and circuit breakers equipped with metering CTs and VTs, shall be provided with terminals to facilitate the ready connection of a Connection Control Panel. [See EESPEC 143 and ST:TP18A.]

10.0 PROTECTION RELAYS

10.1 Protection relays shall satisfy the requirements of BS EN 60255 and IEC 60255.

10.2 Self-powered protection relays shall as a minimum include the following functions:

- Instantaneous high set overcurrent protection.
- 2 or 3 phase IDMT overcurrent protection (with selectable IEC type characteristics).
- IDMT earth fault protection (with selectable IEC type characteristics).
- Suitable for use with CTs with a 1A secondary rating.

10.3 Sensitive earth fault (SEF) protection relays as minimum include:

- SEF protection (current pick up selectable between 0.03A and 0.4A).
- Definite time characteristic (time setting selectable between 0 to 10s).
- 30Vd.c. auxiliary supply.
- Suitable for use with CTs with a 1A secondary rating.

10.4 Neutral voltage displacement (NVD) protection relays shall include:

- NVD protection (with voltage pick up selectable between 10 and 50V).
- Definite time characteristic (time setting selectable between 0 and 10s).
- 30Vd.c. auxiliary supply.

10.5 A list of WPD assessed protection relays is included in Appendix A.

Other relays with equivalent functions may be acceptable subject to approval of the WPD Policy Team, prior to placement of the contract.

11.0 PROVISION OF CIRCUIT BREAKER TRIP COIL

11.1 All circuit breakers shall be fitted with a trip coil separate to that used with the integral protection device or TLFs.

11.2 The coil shall be rated for both 110V a.c. and 20 to 48V d.c. auxiliary supply. Auxiliary contacts to be incorporated into trip coil circuit.

11.3 The coil shall be pre-wired to a readily accessible terminal block that can be accessed without requiring the removal of fixed covers.

12.0 BATTERY SYSTEMS

12.1 30Vdc battery systems may be required where the following facility is installed:

- Sensitive earth fault (SEF) protection.
- Neutral voltage displacement (NVD) protection.

12.2 The provision of these battery systems is outside of the scope of EE:SPEC 2/7.

13.0 FAULT PASSAGE INDICATOR CTS

13.1 RMU's shall have 500/1 fault passage indicator CTs fitted on the bushings of the left hand cable box.

13.2 Extensible switches shall have 500/1 fault passage indicator CTs fitted to the outgoing cable bushings.

13.3 CT wiring shall be connected back to a junction box/terminal rail within the RMU secondary wiring compartment.

13.4 The CTs shall also be suitable for providing measurement of current flowing in the circuit via a suitable connection to a RTU/controller.

14.0 ACTUATOR UNITS

14.1 All units shall be pre-wired for the provision of the retro-fitment of actuator units, with the exception of a transformer circuit breaker rated at 200A or less that is part of a Ring Main Unit.

14.2 The provision shall include pre-wired auxiliary contacts for switch position indication, with at least 1 spare normally open and 1 spare normally closed auxiliary contact. They shall be rated for 24Vdc.

14.3 They shall be wired to a readily accessible terminal block that can be accessed without requiring the removal of fixed covers.

15.0 ACTUATORS AND CONTROLLERS

The tenderer shall include separately to the tender, details and costs of retrofit actuator units and their associated controller with their submission.

16.0 ACCESSORIES

Accessory kits shall be available to allow fitment of RMU and/or metering units onto other manufacturer legacy equipment. These include:

- Schneider RN2, RN2c, RN2d ring main units
- Lucy VRN2a ring main units
- Schneider metering units MU2, MU6c, MU2d, MU6d
- Long & Crawford metering units T4M, T5M

17.0 MANUALS AND SPARES

A copy of the installation, operation and maintenance manual/s and a list of recommended, priced spares, shall be included with the tender.

18.0 NON CONFORMANCES

All non-conformance with ENATS 41-41 (Issue 1:2020) shall be outlined by the tenderers on return of tenders.

APPENDIX A

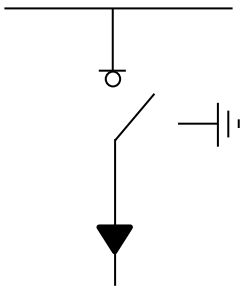
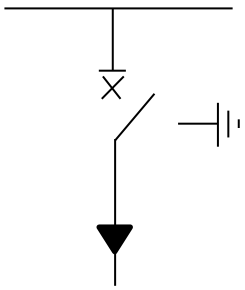
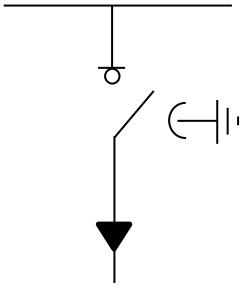
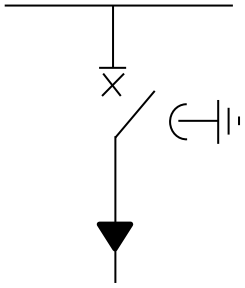
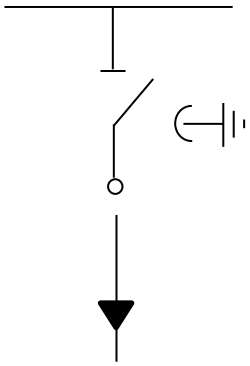
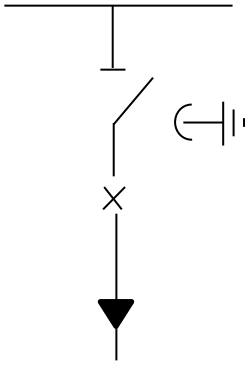
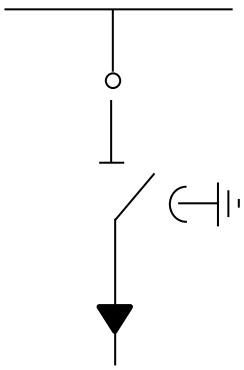
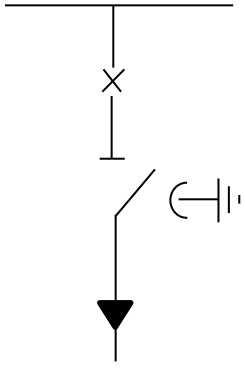
ASSESSED PROTECTION RELAYS

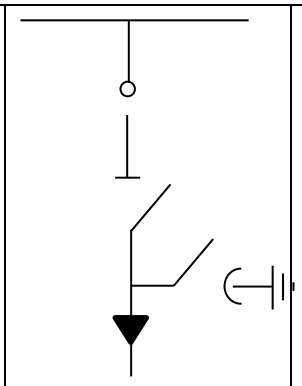
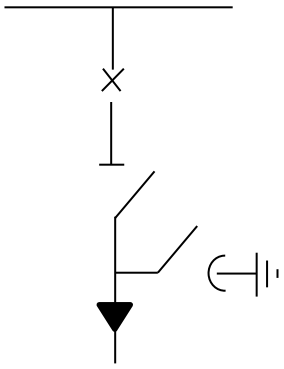
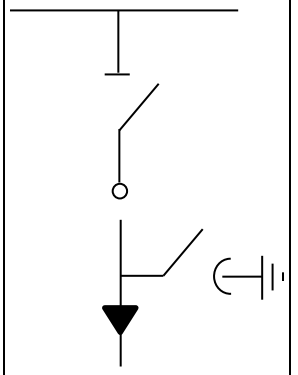
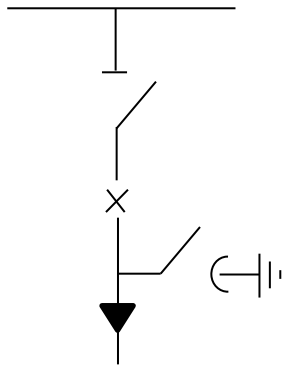
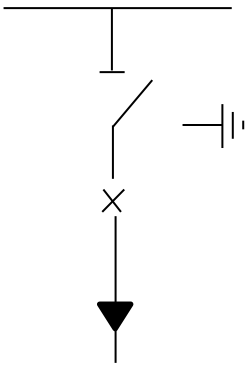
The following protection relays are assessed for use within Western Power Distribution. Other relays may be acceptable, subject to WPD assessment and approval by the WPD Policy Team, prior to placing the contract.

Manufacturer	**Type**	**Function/s**
Schneider	VIP400	Self-powered overcurrent and earth fault relay
Fanox	SAI-C	Self-powered overcurrent and earth fault relay
Schneider	Micom P125	Sensitive earth fault Neutral Voltage Displacement
Schneider	Sepam S40	Sensitive earth fault and Neutral Voltage Displacement

APPENDIX B

ARRANGEMENTS OF DISCONNECTORS, SWITCHES, CIRCUIT BREAKERS AND EARTH SWITCHES

	A	B	
	Switch Disconnector	**Circuit Breaker**	**Notes**
1			• Combined switch disconnector or circuit breaker-disconnector and earthing switch. • Disconnector is a three position device. • Make-proof earthing switch. • Cable testing via cable connecting chamber. • Cable connecting chamber cover to be two-way interlocked with three position device.
2			• Combined switch disconnector or circuit breaker-disconnector and earthing switch. • Disconnector is a three position device. • Make-proof earthing switch. • Cable testing via earth star-bar arrangement. • Star-bar or star-bar access cover to be two-way interlocked with three position device.
3			• Circuit breaker or switch with separate disconnector. • Disconnector is a three position device. • Earthing achieved via circuit breaker or switch • Cable testing via earth star-bar arrangement. • Star-bar or star-bar access cover to be two-way interlocked with three position device. OR • Cable testing via cable connecting chamber. • Cable connecting chamber cover to be two-way interlocked with three position device.
4			• Circuit breaker or switch with separate disconnector. • Disconnector is a three position device. • Make-proof earthing switch. • Cable testing via earth star-bar arrangement. • Star-bar or star-bar access cover to be two-way interlocked with three position device. OR • Cable testing via cable connecting chamber. • Cable connecting chamber cover to be two-way interlocked with three position device.

5			• Circuit breaker or switch with separate disconnector. • Disconnector is a two position device. • Separate make-proof earth switch. • Cable testing via earth star-bar arrangement. • Star-bar or star-bar access cover to be two-way interlocked with three position device. OR • Cable testing via cable connecting chamber. • Cable connecting chamber cover to be two-way interlocked with three position device.
6			• Circuit breaker or switch with separate disconnector. • Disconnector is a two position device. • Disconnector shall be make-proof or interlocked with switch or circuit breaker. • Separate make-proof earth switch. • Cable testing via earth star-bar arrangement. • Star-bar or star-bar access cover to be two-way interlocked with three position device. OR • Cable testing via cable connecting chamber. • Cable connecting chamber cover to be two-way interlocked with three position device.
7	**N/A**		<u>This option limited to circuit breakers directly connected to a unit substation distribution transformer</u> • Circuit breaker with separate disconnector. • Disconnector is a two position device. • Earthing achieved via circuit breaker. • Disconnector shall be make-proof or interlocked with circuit breaker.
			Additional Notes
			• Separate switch may be either in gas or as a vacuum device. • Switch disconnector may be either in gas or as a moving/rotating vacuum device.

APPENDIX C

SUPERSEDED DOCUMENTATION

This document supersedes EE:SPEC 2/6 dated January 2015 which has now been withdrawn.

APPENDIX D

RECORD OF COMMENT DURING CONSULTATION

No comments received.

APPENDIX E

ASSOCIATED DOCUMENTATION

EESPEC 24	"*Substation 30V Battery Systems for Protection and/or Circuit Breaker Tripping*"
EESPEC 98	"*Approved Protection, Voltage Control and Alarm Relays and Test Access Blocks*"
EESPEC 136	"*Ancillary Electrical Equipment for Use in Conjunction with Switchgear and Protection/Control Panels*"
EESPEC 143	*"Functional Specification for WPD's Connection Control Panels (CCPs)"*
ST:SP10P	*"'Plug-In' Remote Meter Cabinet Installations"*
ST:SP10PC	*"Procedure for Fabricating A 'Plug-In' Remote Meter Cabinet For An HV Metering Unit"*
ST:SP10PD	*"Procedure For Modifying An HV Metering Unit For Use With A 'Plug-In' Remote Meter Cabinet"*
ST:SD10PE	*"Alternative Procedure For Fitting Constraint Panels Onto 11kV Switchgear (RMUs etc.) When 'Plug-In' Remote Meter Cabinets Are Employed"*
ST:TP18A	*"Application of Connection Control Panels for Soft Intertrip and/or Voltage Constraint Schemes"*

APPENDIX F

KEY WORDS

Switchgear, Ring Main Unit, RMU, Circuit Breaker, Metering Unit

SCHEDULE 1

NON-EXTENSIBLE RING MAIN UNIT (RMU)

Equipment	Further Details	Type RMUF12A	Type RMUF12B	Type RMUF12C	Type RMUT12A (See Note 1)	Type RMUT12B (See Note 1)	Type RMUT12C (See Note 1)	Type RMUT12D (See Note 1)	Type RMUT12E (See Note 1)
General	Normal rated voltage: 12kV Rated short time current: 20kA	Free standing, non-extensible RMU with TLF protection	Free standing, with self-powered protection relay	Free standing, with self-powered protection relay	Transformer mounted with TLF protection	Transformer mounted with self-powered protection relay	Transformer mounted with DC-powered protection relay	Transformer mounted with self-powered protection relay	Transformer mounted with DC-powered protection relay
Busbars	Nominal rating: 630A	1 set	1 set	1 set	1 set	1 set	1 set	1 set	1 set
Ring switches	Nominal rating: 630A	2	2	2	2	2	2	2	2
Ring cable earth switch	Fitted with built in test facilities	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch
Tee off circuit breaker	Nominal rating:	200A	200A	630A	200A	200A	200A	630A	630A
Tee off earth switch	Short time (3s) withstand:	≥13.1kA	≥13.1kA	20kA	≥13.1kA	≥13.1kA	≥13.1kA	20kA	20kA
Tee off test facility	Fitted with built in test facilities	-	-	Y	-	-	-	Y	Y
Ring Switch cable termination chamber	Suitable for 3 single core cables up to 400 mm^2 with interface "C" outer cone separable connectors, or suitable for shear bolt connection.	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch	1 per ring switch
Transformer tee off cable termination chamber	Suitable for 3 single core cables terminated with interface "C" outer cone separable connector, or suitable for shear bolt connection.	185 $mm^{2\ (Max)}$	185 $mm^{2\ (Max)}$	400 $mm^{2\ (Max)}$	N/A	N/A	N/A	N/A	N/A

Equipment	Further Details	Type RMUF12A	Type RMUF12B	Type RMUF12C	Type RMUT12A (See Note 1)	Type RMUT12B (See Note 1)	Type RMUT12C (See Note 1)	Type RMUT12D (See Note 1)	Type RMUT12E (See Note 1)
Protection on Transformer tee off circuit breaker	2 overcurrent and 1 earth fault, time limit fuse protection utilising XF type TLFs and suitable a.c. trip coils.	1 set	-	-	1 set	-	-	-	-
	Self-powered protection relay and suitable circuit breaker release.	-	1	1	-	1	-	1	-
	DC-powered protection relay and suitable circuit release	-	-	-	-	-	1	-	1
Protection CTs	100/50/5 CTs for TLF protection	3	-	-	3	-	-	-	-
	CTs for self-powered protection relay (set of 3)	-	200/1	800/1	-	200/1	-	800/1	-
	CTs for DC-powered protection relay (set of 3)	-	-	-	-	-	200/1	-	800/1
Shunt trip coil	Rated for both 110V a.c. and 20 to 48V d.c. auxiliary supply	1	1	1	1	1	1	1	1
Multicore Box		1	1	1	1	1	1	1	1
Terminals, fuses and links		As required	As required	As required	As required	As required	As required	As required	As required

Note 1: Transformer mounted equipment shall also be suitable for connection to TM type metering units included in Schedule 4.

SCHEDULE 2

NON EXTENSIBLE CIRCUIT BREAKER TEE OFF

Equipment	Further Details	NFCB12	NTC12A (See Note 1)	NTC12B (See Note 1)
General	Normal rated voltage: 12kV Rated short time current: 20kA Nominal current rating: (TEE) 200A Ring switches 630A	Free standing, non-extensible circuit breaker with TLF protection	Transformer mounted circuit breaker with TLF protection	Transformer mounted circuit breaker with self-powered protection relay
Incoming cable earth Switch	Fitted with built in test facilities Short time (3s) withstand: 20kA	1	1	1
Transformer tee off earth switch	Short time (3s) withstand: 3.15kA	1	1	1
Incoming cable termination chamber	Suitable for 3 single core cables up to 400 mm^2 with interface "C" outer cone separable connectors, or suitable for shear bolt connection.	1	1	1
Transformer tee off cable termination chamber	Suitable for 3 single core cables up to 185 mm^2 fitted with interface "C" outer cone separable connectors, or suitable for shear bolt connection.	1	-	-
Protection on Transformer tee off circuit breaker	2 overcurrent and 1 earth fault, time limit fuse protection utilising XF type TLFs and suitable a.c. trip coils.	1 set	1 set	-
	Self-powered protection relay with suitable circuit breaker release.	-	-	1
Protection CTs	100/50/5 CTs for TLF protection	3	3	-
	200/1 CTs for self-powered protection relay	-	-	3
Multicore Box		1	1	1
Terminals, fuses and links		As required	As required	As required

Note 1: Transformer mounted equipment shall also be suitable for connection to TM type metering units included in Schedule 4

SCHEDULE 3 A

EXTENSIBLE SWITCHGEAR – NON METERING UNITS

Equipment	**Further Details**	EFS12	EFC12A	EFC12B	EFC12C	EFBS12	EFBES12
General	Normal rated voltage: 12kV Rated short time current: 20kA	Free standing extensible switch disconnector	200A Free standing extensible circuit breaker with TLF protection	200A Free standing extensible circuit breaker with self-powered protection relay	630A Free standing extensible circuit breaker with self-powered protection relay	630A Free standing bus-section circuit breaker with self-powered protection relay	Free standing busbar earth switch
Busbars	Nominal rating: 630A	1 set	1 set	1 set	1 set	1 set	1 set
Switch disconnector	Nominal rating: 630A	1	N/A	N/A	N/A	N/A	N/A
Switch disconnector earth switch	Fitted with built in test facilities Short time (3s) withstand: 20kA	1	N/A	N/A	N/A	N/A	N/A
Circuit breaker	Nominal rating:	N/A	200A	200A	630A	630A	N/A
Circuit breaker earth switch	Fitted with built in test facilities. Short time (3s) withstand: 20kA	N/A	1	1	1	1	N/A
Busbar earth switch	Make proof earth switch Short time (3s) withstand: 20kA	N/A	N/A	N/A	N/A	N/A	1
Switch disconnector unit cable termination chamber	Suitable for 3 single core cables up to 400 mm^2 with interface "C" outer cone separable connectors, or suitable for shear bolt connection.	1	N/A	N/A	N/A	N/A	N/A
Circuit breaker cable termination chamber	Suitable for 3 single core cables up to 400 mm^2 with interface "C" outer cone separable connectors, or suitable for shear bolt connection.	N/A	1	1	1	N/A	N/A

Equipment	**Further Details**	EFS12	EFC12A	EFC12B	EFC12C	EFBS12	EFBES12
Circuit breaker Protection	2 overcurrent and 1 earth fault, time limit fuse protection utilising XF type TLFs and suitable a.c. trip coils.	N/A	1 set	-	-	N/A	N/A
	Self-powered protection relay (clause 13) and suitable circuit breaker release.	N/A	-	1	1	1	N/A
CTs (Clause 8)	100/50/5 CTs for TLF protection	N/A	3	-	-	-	N/A
	200/1 CTs for self-powered protection relay	N/A	-	3	-	-	N/A
	800/1 CTs for self-powered protection relay	N/A	-	-	3	3	N/A
	400/200/5 CTs for metering	N/A	N/A	N/A	N/A	N/A	N/A
VT (Clause 9)	11000/110V winding for metering	N/A	N/A	N/A	N/A	N/A	N/A
Multicore Box		1	1	1	1	1	-
Terminals, fuses and links		As required	As required	As required	As required	As required	As required

SCHEDULE 3 B

EXTENSIBLE SWITCHGEAR – METERING CIRCUIT BREAKERS

Equipment	**Further Details**	EFC12AM	EFC12BM	EFC12CM	EFBS12M
General	Normal rated voltage: 12kV Rated short time current: 20kA	200A Free standing extensible metering circuit breaker with TLF protection	200A Free standing extensible metering circuit breaker with self-powered protection relay	630A Free standing extensible metering circuit breaker with self-powered protection relay	630A Free standing metering bus-section circuit breaker with self-powered protection relay
Busbars	Nominal rating: 630A	1 set	1 set	1 set	1 set
Switch disconnector	Nominal rating: 630A	N/A	N/A	N/A	N/A
Switch disconnector earth switch	Fitted with built in test facilities Short time (3s) withstand: 20kA	N/A	N/A	N/A	N/A
Circuit breaker	Nominal rating:	200A	200A	630A	630A
Circuit breaker earth switch	Fitted with built in test facilities. Short time (3s) withstand: 20kA	1	-	-	1
Switch disconnector unit cable termination chamber	Suitable for 3 single core cables up to 400 mm^2 with interface “C” outer cone separable connectors, or suitable for shear bolt connection.	N/A	N/A	N/A	N/A
Circuit breaker cable termination chamber	Suitable for 3 single core cables up to 400 mm^2 with interface “C” outer cone separable connectors, or suitable for shear bolt connection.	1	-	-	N/A
Circuit breaker Protection	2 overcurrent and 1 earth fault, time limit fuse protection utilising XF type TLFs and suitable a.c. trip coils.	1 set	-	-	N/A
	Self-powered protection relay (clause 13) and suitable circuit breaker release.	-	1	1	1

Equipment	**Further Details**	EFC12AM	EFC12BM	EFC12CM	EFBS12M
CTs (Clause 8)	100/50/5 CTs for TLF protection	3	-	-	-
	200/1 CTs for self-powered protection relay	-	3		
	800/1 CTs for self-powered protection relay	-	-	3	3
	100/50/5 CTs for metering	3	3	-	-
	400/200/5 CTs for metering	-	-	3	3
VT (Clause 9)	11000/110V winding for metering	1	1	1	1
Multicore Box		1	1	1	1
Terminals, fuses and links		As required	As required	As required	As required
Additional requirements for 6.6kv system		**EFC6AM** As EFC12AM except VT has a dual winding 11000/6600/110 for use on 6.6kV system	**EFC6AM** As EFC12AM except VT has a dual winding 11000/6600/110 for use on 6.6kV system	**EFC6AM** As EFC12AM except VT has a dual winding 11000/6600/110 for use on 6.6kV system	**EFBS6M** As EFBS12M except VT has a dual winding 11000/6600/110 for use on 6.6kV system

SCHEDULE 4

TM TYPE METERING UNITS

Description	Further Details	TM12A/1	TM12B/1	TM12C/1
General requirements	Normal rated voltage: 12kV Rated short time (3s) current: 16kA	Non-extensible metering unit for direct coupling to transformer circuit flange of switchgear	Non-extensible metering unit for direct coupling to transformer circuit flange of switchgear	Non-extensible metering unit for direct coupling to transformer circuit flange of switchgear
	Nominal Rating	200A	200A	400A
Supporting Steelwork for metering unit and switchgear		√	√	√
Incoming circuit flange and bushings	Suitable for mounting on Transformer mounted type RMU and tee off circuit breakers in Schedule 1 and 2	√	√	√
Outgoing circuit cable box	Suitable for 3 single core cables up to 185 mm^2 fitted with shear bolt connections.	√	√	√
CTs	Metering CTs	100/5	200/5	400/5
VT	11000/110V winding for metering	√	√	√
	11000/63.5V broken delta winding for NVD protection	√	√	√
Multicore Box		√	√	√
Terminals, fuses and links		√	√	√
Additional requirements for 6.6kV system		**TM12A/1A** As TM12A/1 except VT has a dual winding 11000/6600/110 for use on 6.6kV system	**TM12B/1A** As TM12B/1 except VT has a dual winding 11000/6600/110 for use on 6.6kV system	**TM12C/1A** As TM12C/1 except VT has a dual winding 11000/6600/110 for use on 6.6kV system

ACTUATORS & CONTROLLERS

Actuators

Shall be able to be readily removed and re-attached to the unit so as to facilitate manual operation of the circuit breaker or ring switch so as to provide a point of isolation and to apply an earth to the circuit.

Controllers

Shall be able to control both circuit breakers and switch disconnectors. These shall be able to control either 2 or 4 devices.

The controller shall be able to be mounted onto the support framework of an RMU or freestanding circuit breaker or switch disconnector.

The control cabinet shall be vented and provided with a thermostatically controlled heater fed from the 110Vac supply to prevent condensation within the cabinet.

There shall be sufficient room within the controller cabinet so as to be able to accommodate the WPD communications interface and radio. A minimum space of 300mm (width) x 200mm (depth) x 100mm (height) shall be provided.

The controller battery shall be able to provide a supply to the WPD communications interface and radio without the need to install a separate battery and/or charger. A 12Vdc regulated supply at 2A is required for the radio/outstation. This shall not be provided from a tapping off the battery. The radio will earth the negative of this supply.

Any rechargeable battery supplied shall have a programmable automatic load test carried out periodically which will include disconnecting the charging supply and applying a known load for a known time and measuring the voltage drop across the battery.

Detail shall be provided in the supplier declaration as to the capacity (Ah) of the battery and the maximum time this will support the device in the event of a prolonged loss of the power to the charger.

Detail shall also be provided in the supplier declaration as to what means is included in the equipment to prevent deep discharge damage to the battery in the event of a prolonged loss of the power to the charger.

The controller should be able to provide the following functions and indications listed in the tables below:

Circuit Breaker	**Operation**	**Indication**
	Open. Close	Local/Supervisory
	Protection Enable/Disable	Open/Closed
	SEF protection Enable/Disable	Protection In/Out
	Instantaneous protection Enable/Disable	SEF protection In/Out
		Instantaneous protection In/Out
		SEF Trip
		Directional fault flow
		Voltage monitoring on incoming cable
		Loss of phase
		Loss of phase trip
		Low gas pressure alarm

Ring Switch	**Operation**	**Indication**
	Open/Close	Local/Supervisory
		Open/Closed
		Voltage monitoring on incoming cable
		Directional fault flow
		Loss of phase
		Low gas pressure alarm

Controller	**Operation**	**Indication**
		Loss of charging supply/mains
		Low battery alarm
		Battery test failure