Electricity Distribution

nationalgrid

Company Directive

ENGINEERING SPECIFICATION
EE SPEC: 13/5

12kV and 36 kV Pole Mounted Circuit Breakers and 12kV and 36kV Pole Mounted Enclosed Switch Disconnectors

Summary:

This specification details the requirements for 12kV and 36kV pole mounted circuit breakers and pole mounted enclosed switch disconnectors for installation and use on the National Grid Electricity Distribution (NGED) 11kV and 33kV electricity distribution networks.

Author: **Anthony Smith**

Implementation Date: **February 2025**

Approved by

Andrew Reynolds
Head of Engineering Policy

Date: **29th January 2025**

Target Staff Group	**Anyone involved with the addition, or alteration of, the 11 and 33kV overhead network inclusive of but not limited to Planners, Project Engineers, Technicians, EDS, PSD and Purchasing**
Impact of Change	**Green – No impact on current working practices**
Planned Assurance checks	**Team Managers of target staff group shall be contacted within 3 months to confirm staff have been made aware of the documents reissue with minimal changes. Continuous product conformity checks at Plant Workshops**

IMPLEMENTATION PLAN

Introduction

Revised version of this EESPEC provided for a general update in specification prior to use for future tender and contracts.

Version 5 corrects some minor technical errors and adds clarity in parts.

Main Changes

Changes to recognise the requirement that equipment at 12kV shall not use SF6 as an Interrupting and Isolation Gas (IIG).
At 36kV NGED would prefer to not use apparatus utilising SF6 as an IIG.
Addition of edited section 11 with respect to battery requirements

Details required of manufacturer tests and performance of equipment in the event of an internal arcing failure.

Auto-recloser protection requirements expanded.

Supplier declaration Schedules added.

Impact of Changes

Any new contract will be based on this updated specification.

This specification is not retrospective for current contracts.

Implementation Actions

Purchasing to utilise this revised specification for establishing a new purchasing contract.

Managers shall ensure that all staff and contractors involved in the tendering/ purchase and the design, installation modification and maintenance of NGED 11/33kV systems are aware of this specification.

Implementation Timetable

EESPEC 13/5 will be used as part of the 2025 tender process for 11/33kV Pole Mounted Circuit Breakers (PMCBs) and Pole Mounted Switch Disconnectors (PMSDs).

Equipment ordered from the current Framework Contract shall continue to meet EESPEC 13/4.

ICPs will be expected to comply with this new specification within 6 months of its issue. (eg from 1st July 2025)

Items currently on order/under an active quotation by an ICP or otherwise, to the existing specification shall continue to be acceptable to NGED so long as the order was placed before 1st July 2025 but the unit is to be commissioned after 1st July 2025.

Exception to this may be made by NGED DNO Policy team upon formal request.

REVISION HISTORY

Document Revision & Review Table		
Date	**Comments**	**Author**
February 2025	• General updates to align with the issue of ENATS 41-46 following removal of ENATS 41-36 • Previous section 11 incremented to 12 (along with subsequent sections). “New” section 11 covers battery requirements. • Addition of Schedule 4 following section 11 alterations	Anthony Smith
July 2020	• Minor technical corrections to kA rating • Additional clarity of a few points	Stephen Hennell
April 2020	• Changes to recognise the possibility of gas filled equipment using other than SF6. • Pole mounted auto-reclosers to be non-gas with vacuum interrupters. • Loss of phase detection, indication and trip requirements included. • Requirements for internal arcing performance added. • Clarification on mounting and provision of surge arrestors. • Auto-recloser protection requirements expanded. • Supplier declaration sheets added.	Stephen Hennell / Anthony Smith
September 2014	• Specification generally updated to reflect revisions to EATS 41-46.	Bob Lang

Contents

1.0 SCOPE

This specification details the requirements for 12kV and 36kV pole mounted circuit breakers and pole mounted enclosed switch disconnectors for installation and use on the National Grid Electricity Distribution (NGED) 11kV and 33kV electricity distribution networks.

Pole mounted circuit-breakers are required to be suitable to provide auto-reclosing facilities and any associated control cubicle shall provide this facility.

Equipment is to have a rated voltage of up to 36kV three-phase 50Hz for use on systems with the neutral point earthed solidly, or through a resistor or reactor of low impedance, or through an arc suppression coil.

Pole mounted voltage transformers used to provide secondary supplies to the equipment are not included in this specification and are covered in separate NGED EESPEC documents.

2.0 INTRODUCTION

All equipment supplied under this specification shall meet the relevant technical requirements of Energy Networks Association (ENA) Technical Specification 41-46, Issue 1, 2021 “Switchgear for service up to 36kV Cable and Overhead Conductor Connected”.

Additional clauses contained within this specification are in addition to the requirements of the standards outlined in ENA Technical Specification 41-46. Where there is any conflict between ENA Technical Specification 41-46 and this document, then this specification shall take precedence.

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 United Kingdom users.

NGED has distinct preference for pole mounted circuit breakers and disconnectors to be of a device containing no gas i.e. utilising vacuum interrupters.

NGED recognises that the technology is evolving for pole mounted enclosed switches for all applications and that SF6 gas may be the only reliable and proven option currently available, however consideration will be given to any non-SF6 equipment offered.

Equipment shall be of a “non-oil” type.

3.0 SCHEDULE OF EQUIPMENT

This specification covers pole mounted circuit breakers and pole mounted enclosed switch disconnectors. Ideally the equipment offered will have ENA Notice of Conformity against ENATS 41-46 (Issue 1 – or its predecessor ENATS 41-36 Issue 3), or be in the process of being assessed.

Any control and protection cabinet offered shall have been included in the ENA Assessment process. In addition, any control and protection cabinet will need to be assessed by NGED before acceptance for use on the NGED distribution network.

The technical requirements and ratings for pole mounted circuit breakers are given in Schedule 1 of this specification. Circuit breakers shall be suitable and tested/certified for auto-reclosing duty.

The technical requirements and ratings for pole mounted enclosed switch disconnectors are given in Schedule 2 of this specification.

Ideally the equipment offered will have a current ENA (TS 41-46) Assessment Certificate or be undergoing ENA Assessment, however if that is not the case then the self-certification conformance declaration sheets from ENA TS 41-46 shall be completed.

These self-certification conformance declaration sheets shall be fully completed and returned to NGED at the time of tender. A separate set shall be supplied for each type/model of switchgear offered.

Supplier declarations as in Schedule 3 shall be provided for each type/model of switchgear offered at time of tender.

Any other non-conformity with the requirements of this NGED specification shall also be stated at the time of tender.

4.0 QUALITY ASSURANCE

Quality assurance shall be in accordance with ISO 9000 standards.

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

5.0 GUARANTEE

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 five (5) years (or 60 months) from the date of delivery to NGED of the relevant plant / equipment.

Note this requirement applies equally to equipment purchased directly by NGED as well as any plant / equipment to be adopted by NGED and purchased/provided by Independent Connection Providers.

6.0 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 NGED then the manufacturer (or their UK supplier or agent) shall provide suitable training on installation and operational procedures with the first units supplied.

7.0 COMMUNICATION MEDIUM

Control signals, indications and alarms are relayed from/to the NGED SCADA system using NGED owned and operated radio systems.

7.1 Cyber Security

It will be a requirement of any tenderer to NGED to provide a fully functioning device and any associated software and ancillaries (inclusive of a default config file) for cyber/security assessment.

The cost of this apparatus and any associated software access will be entirely borne by the prospective tenderer without exception nor expectation of any orders.

NGED will happily work with any prospective supplier to support their equipment for an NGED cyber approval where apparatus falls short of requirements however any costs associated with bringing apparatus up to UK/NGED needs is entirely that of the supplier and said supplier needs to recognise that acceptance does not necessarily mean orders will immediately occur as other factors may delay use of any apparatus.

8.0 PADLOCKING

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.

9.0 LIVE LINE INSTALLATION

Manufacturers shall state what special requirements, if any, apply to erection of the equipment supplied, by live line techniques e.g. sequence of making main connections, earthing, battery, switch on, etc.

10.0 CURRENT TRANSFORMERS

Switchgear equipped with current transformers shall be provided with means of shorting the secondary connections, located in the control / communication cabinet.
When the umbilical is unplugged (from either end) any CTs fitted shall have their secondary's automatically shorted to prevent dangerous and damaging high voltages.

11.0 CONTROL CABINET

11.1 General

Power supplies required by the switching device's control and ancillary equipment shall be derived from a continuous charge maintained battery supplied from a pole-mounted power transformer or VT mounted adjacent to the circuit breaker / switch disconnector. (*Clause 6.4.103 of ENATS 41-46 Issue 1 Amendment 1*).

It is preferred that a common battery is used for all functions e.g. radio, RTU, protective relay and switchgear operating mechanism.

The manufacturer shall complete and submit with their tender a completed Schedule 4 for each switching device offered.

11.2 Rated supply voltage of auxiliary and control circuits (Ua)

The nominal supply voltage for AC circuits shall be 110 V. (*Clause 10 of ENATS 41-46 Issue 1 Amendment 1*).

The nominal supply voltage of the battery system to supply control circuits shall be 24 V. (*Clause 5.9 of ENATS 41-46 Issue 1 Amendment 1*).

11.3 Battery

The battery shall employ 12 V valve regulated lead-acid monoblocs complying with BS EN 60896-21 and BS EN 60896-22.

The design life of the monoblocs shall be at least 10 years, which shall be calculated using an average ambient temperature of 20°C.

Monoblocs shall be classified as "10/12 Years – Long Life" according to Eurobat.

Monoblocs shall be manufactured using flame retardant plastic materials and have a flammability classification of V-0 according to BS EN 60695-10-11.

11.4 Battery Duty Cycle

The battery system shall be sized to deliver the following duty cycle using the methodology described in IEEE Standard 485: Recommended Practice for Sizing Lead Acid Batteries for Stationary Applications.

The battery system shall, in the event of a failure of either the charger or its ac supply, be capable of supporting:

- The standing dc load for a period of 24 hours, followed by
- The following switchgear operating sequence:
  Circuit breakers: O - 5s - CO - 5s - CO - 5s - CO
  Switch disconnectors: O - 30s - C - 30s - O - 30s - C

The minimum permissible voltage at the battery terminals at the end of the duty cycle shall be not less than 21.6V (12 cells @ 1.80 volts per cell).

The standing dc load shall include that associated with the radio, RTU and control & protection relays. The following standing load should be assumed for the radio:

- A constant drain of 0.25 A
- A transmit / receive cycle of 2.5 amps for 30 seconds in every 6 hours

11.5 Battery Sizing Margins

Battery Design Margin

A margin shall be provided to allow for unforeseen additional load on the dc system or for ambient temperatures being lower than expected.

A battery design margin of 1.1 shall be applied to the battery sizing calculation.

Battery Temperature Correction Factor

A temperature of 5°C shall be assumed for the purpose of sizing the battery system.

The available capacity in a monobloc is affected by its operating temperature and rated capacity is typically based upon an ambient temperature of 20°C or 25°C.

The following temperature correction factor shall be applied to the battery sizing calculation:

1.32 where rated capacity is based on an ambient temperature of 20°C

1.42 where rated capacity is based on an ambient temperature of 25°C

Battery Aging Factor

End of service life shall be deemed to be the point at which the actual capacity of the battery has reached 80% of the nominal capacity. The battery shall be able to perform the specified discharge duty cycle throughout its service life.

An aging factor of 1.25 shall be applied to the battery sizing calculation.

11.6 Monobloc Approval

The supplier shall arrange, at its own expense, for the battery capacity to be verified by discharge testing at an independent test facility, and for the worst performing monobloc to be subject to a tear-down inspection. A formal written report shall be provided for both the discharge test and the tear-down inspection.

Unless otherwise agreed by NGED in writing, the independent test facility shall be:

Northern Industrial Battery Services Ltd (NIBS)
Four Crosses Business Park
Four Crosses
Llanymynech,
Powys
SY22 6ST

The discharge test shall be carried out in accordance with the following requirements:

- The test shall be performed on a single battery string consisting of six series-connected monoblocs
- The monoblocs shall be selected at random from a batch of new monoblocs which have not previously been subject to any discharge
- The blocs shall be positioned side-by-side at the manufacturer's recommended spacing and with the terminals linked using the manufacturer's recommended interconnects
- The ambient temperature shall be 20°C
- The voltage per monobloc and the overall string voltage shall be automatically recorded at one minute intervals during the test

- The temperature of each bloc shall be periodically measured during the test
- The battery shall be discharged at the three-hour rate
- The test shall be terminated when a string voltage of 61.2V is reached (i.e. 36 cells x 1.70V per cell) or when one of the six monoblocs has reached a voltage 10.2V (6 cells x 1.70V per cell), whichever occurs first
- The monoblocs will have failed the discharge test if the test has to be terminated after less than 180 minutes have elapsed

No change of monobloc is permitted after approval has been granted without prior notice and without agreement in writing from NGED. A precondition for the latter is that the supplier repeats the approval process for the proposed replacement monobloc.

11.7 Battery Enclosure

Whilst the volume of gas emitted by valve-regulated lead-acid cells or monoblocs is very small under normal charging conditions, it increases significantly in the event of overcharging. Sufficient natural ventilation shall be provided to prevent the formation of an explosive hydrogen concentration within the enclosure under fault conditions, specifically, in the event of an overvoltage condition of 2.40V per cell.

Ventilation requirements shall be calculated in accordance with BS EN 50272-2.

11.8 Battery Charger

The charger shall be an automatic, temperature-compensated, constant-current / constant-voltage charger which shall operate from the 110 Vac single phase 50Hz supply i.e. shall charge initially using constant-current charging (to prevent overcurrent charge conditions) and then switch to constant-voltage charging (to prevent overvoltage charge conditions).

DC Output Current

The charger dc output current rating shall be not less than:

C_{10} current for the battery + (Charger Design Margin x Standing Load Current)

A charger design margin of 1.1 shall be employed in the charger sizing calculation.

The charger output current shall be adjustable between 50% and 100% of the current rated output current.

DC Output Voltage

The float voltage setting shall be adjustable about the set value, accommodating the range of float voltages recommended by the battery manufacturer.

Boost charging facilities shall not be provided.

On float charge, the output voltage shall not vary by more than ±1% under the following conditions:

a) Frequency varying between ±1 % of 50 Hz

b) AC input voltage varying between ±6 % of 110 V

c) Charger DC current output varying between 0 % and 100 % of the nominal rating

The AC ripple permitted on the battery system output shall not exceed 2% of rated voltage and shall not exceed levels that have an adverse effect on battery life.

11.9 Battery & Charger Monitoring Requirements

The following battery and charger monitoring functions shall be provided:

a) AC supply monitoring

b) Charger monitoring

c) Low voltage monitoring

d) High voltage monitoring

e) Battery impedance monitoring

AC Supply Monitoring

The status of the incoming 110Vac supply shall be continuously monitored and an alarm shall be triggered in the event the supply fails.

The alarm shall self-reset on restoration of the incoming supply.

Charger Monitoring

The status of the charger shall be continuously monitored and an alarm shall be triggered in the event the charger becomes faulty.

The charger monitoring function shall be hand-reset i.e. latches once operated.

Low Voltage Monitoring

The charger output / battery voltage shall be continually monitored and an alarm shall be triggered in the event the DC voltage falls below a user-settable limit.

The user-settable voltage limit shall be adjustable between 19.2 V and 21.6 V (i.e. between 1.60 and 1.80 volts per cell). The limit shall normally be set to operate at 21.0 V (i.e. 1.75 volts per cell).

The low voltage monitoring function shall self-reset. Once operated, the alarm shall not reset until the voltage is at least 0.6 V higher than the operate value.

High Voltage Monitoring

The charger output / battery voltage shall be continually monitored and an alarm shall be triggered in the event the DC voltage rises above a user-settable limit.

The user-settable voltage limit shall be adjustable between 27.6 V and 28.8 V (i.e. between 2.30 and 2.40 volts per cell). The limit shall normally be set to operate at 28.2 V (i.e. 2.35 volts per cell).

The high voltage monitoring function shall self-reset. Once operated, the alarm shall not reset until the voltage is at least 0.6 V lower than the operate value.

Battery High Impedance Monitoring

At least once in each 7 day period the battery shall be actively tested (using an automatic routine) to detect faulty cells and poor connections. The test should, where at all possible, be carried out in the morning (say 8:00am) so that in the event a problem is detected any remedial work can be carried out during normal working hours.

The test method shall not adversely affect the life of the battery.

The preferred method of carrying out this test is to temporarily disconnect the charging supply, apply a known load to the battery and monitor the battery voltage. If the drop in battery voltage is above appropriate limits a possible high impedance condition is indicated. An alarm shall be triggered in the event high impedance conditions are detected during two consecutive tests.

Details of their test method / routine shall be submitted to NGED for approval.

The battery impedance monitoring function shall be hand-reset i.e. latches once operated.

11.10 Battery Low Voltage Disconnect

The charger output / battery voltage shall be continually monitored and battery shall be automatically disconnected from the load in the event the voltage falls below 19.2 V (i.e. below 1.60 volts per cell) in order to safeguard it against damage from deep discharge.

11.11 The battery shall be automatically re-connected once the charger output voltage is above 19.8 V (i.e. above 1.65 volts per cell)

12.0 CONTROL CABINET

12.1 The control cabinet must be suitable for mounting mid pole (clause 6.0.3 of ENATS 41-46 refers). The umbilical shall be a minimum of 3m long and be suitable for coiling up and attaching to the pole for when it is mounted mid pole.

12.2 Ideally, to prevent the need for two control cabinets, the control cabinet supplied shall be large enough to house the radio equipment (supplied by others) and all battery needs. Suppliers shall detail size and weight of cabinet however it is accepted that the current nominal standard space of 300mm (width) x 200mm (depth) x 1000mm (height) may change, however it is for the supplier to verify how this complies with CDM etc for installation.

12.3 A 12Vdc regulated supply at 2A shall be provided for the radio/outstation. This shall not be provided from a tapping off the battery. The radio will earth the negative of this supply.

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

12.5 The ‘degree of protection by enclosures’ rating for the control cabinet shall be the same as for the pole mounted enclosed switchgear as detailed in clause 6.14.2 of ENATS 41-46.

12.6 External connections to the control cabinet shall preferably be on the base of the box and preferably recessed, but with sufficient access to easily make of the cables. The following connections are needed:-

a) External supply to the control cabinet shall be 110Vac, via a glanded entrance and shall include UK standard protection and isolation requirements.

b) A 16mm diameter hole shall be provided to mount an N type bulkhead aerial fitting.

c) The umbilical cable to the switch. This umbilical shall be fitted with a plug and socket arrangement on both ends and must be secured to prevent removal by vandals.

13.0 INSULATING AND/OR INTERRUPTING GAS (IIG) PRESSURE

When an insulating and/or interrupting gas medium is used then as an alternative to a continuously visible gas pressure gauge, the gas pressure (or density) shall be measurable from the control cabinet when requested without breaking the integrity of the gas filled chamber.

A visual indication on the device shall clearly show when the gas pressure is below the minimum functional pressure for the safe operation of the device.

14.0 MATERIAL

The material used for the construction of the tank of a pole mounted circuit breaker, pole mounted enclosed switch and pole mounted control cubicle shall be inherently corrosion resistant. Stainless steel is the NGED preferred option for fabricated enclosures.

Tenderers shall demonstrate that what is offered has suitable properties so as to provide a maintenance free operating life with the environmental conditions that can be experienced within NGED at coastal and near coastal locations.

15.0 BATTERY

See 11.3 to 11.10

16.0 PARTICULAR REQUIREMENTS FOR POLE MOUNTED CIRCUIT BREAKERS

16.1 SCADA Requirements

Pole mounted circuit breakers shall be provided with at least the following SCADA functions.

Operation:

- Open, Close
- Auto reclose In/Out
- Protection Enable/Disable
- SEF protection Enable/Disable
- Instantaneous Protection Enable/Disable

Indication:

- Local/Supervisory
- Open/Closed
- Auto Reclose In/Out
- Protection In/Out
- SEF Protection In/Out
- Instantaneous Protection In/Out
- Successful reclosure completed
- SEF Trip
- Voltage monitoring on both sides of the unit
- Loss of phase
- Loss of phase trip
- Low gas pressure alarm
- Low battery alarm
- Battery test failure

The system shall be capable of responding to an Integrity Poll on demand which will check the availability of the controls (Binary output status reporting) and the status of the indications.

16.2 **Loss of Source Voltage**

As outlined in ENATS 41-46 (issue 1) clause 7.2.4 the circuit breaker shall be “latched to close” when supplies are restored, if the unit is left in a closed position.

16.3 **Protection**

16.3.1 Auto-reclosers shall be provided with a NGED assessed multi-characteristic protection and control relay (preferably ENA assessed) that satisfies the requirements of ENATS 48-5, ENATS 48-6-6 and ENATS 48-6-5, as applicable, and includes the following functions and characteristics:

- Instantaneous phase fault protection (3 elements)
- Instantaneous earth fault protection (1 element)
- IDMTL phase fault protection with IEC standard Inverse, very inverse, extremely inverse and definite time characteristics (3 elements)
- IDMTL earth fault protection with IEC standard Inverse, very inverse, extremely inverse and definite time characteristics (1 element)
- Sensitive earth fault (SEF) protection (1 element)
- Loss of phase protection and loss of phase alarm functions
- Auto-reclose configurable for up to 4 shots
- Auto-sectionalising settings configurable for 1, 2 and 3 passages of fault current
- Sequence coordination (for connecting auto-reclosers and automatic sectionalisers in series)
- Configurable dead times and reclaim/reset times
- Optional voltage check facility (may be configured to block reclosure if volts are present on both sides of the recloser)
- 1 shot to lock out setting options
- Cold load pick up setting options

16.3.2 A list of NGED assessed relays is included in EE SPEC: 98. Alternative relays may be submitted to NGED for assessment.

16.3.3 Instantaneous and IDMTL / Definite Time phase fault and earth fault protection and the SEF protection shall be adjustable and independent from each other. It shall be possible for the instantaneous earth fault protection to be set with a lower pick-up current than the IDMT earth fault pick up current. Configurable minimum trip/response time settings shall be provided for both phase fault and earth fault elements.

16.3.4 The minimum range of settings shall be:

- Instantaneous Phase Fault = 50 to 960A
- IDMT Earth Fault = 30 to 480A
- IDMTL Phase Fault = 50 to 960A
- Instantaneous Earth Fault = 30 to 480A
- Sensitive Earth Fault = 4 to 48A

16.3.5 With auto reclose sequence selected out (i.e. selection of "one trip to lockout") it must be possible to set overcurrent and earth fault protection to instantaneous and SEF protection to a delayed operation.

16.3.6 A control to lock the auto recloser in the closed state shall be provided.

16.3.7 Auto recloser dead time settings shall be selectable from at least 1 to 30 seconds.

16.3.8 Reclaim times shall be selectable from at least 5 to 30 seconds.

16.3.9 Loss of phase tripping and loss of phase alarm facilities shall be capable of being switched in and out via discrete tele-control functions (e.g. loss of phase tripping in/out and loss of phase alarm in/out) and capable of being switched in/out by the local operator.

16.4 DNP 3 Protocol

16.4.1 In addition to the telecontrol methods detailed in ENATS 41-46 Clause 6.4.105.3 the facility to use DNP3 protocol (minimum Level 2 device) via an RS 232 serial port shall be provided.

17.0 PARTICULAR REQUIREMENTS FOR POLE MOUNTED ENCLOSED SWITCH DISCONNECTORS

17.1 SCADA Requirements

Pole mounted enclosed switches shall be provided with the following SCADA functions:-

Operation:

- Open, Close

Indication:

- Local / Supervisory
- Open, Closed
- Voltage monitoring on both sides of the unit
- Loss of phase
- Fault Passage Indicator operated
- Low gas pressure alarm
- Low battery alarm
- Battery test failure

17.2 It shall be possible to physically render pole mounted enclosed switch disconnectors into an inoperative state when open. This shall be achievable from ground level by the use of NGED standard insulated operating rods.

17.3 The means of rendering the pole mounted enclosed switch disconnector inoperative shall be achieved by mechanical interference in the device operating mechanism, and shall make the operation of the device by electrical actuation or physical operation of the normal manual means of operation not possible.

17.4 Preferably the means of rendering a pole mounted switch disconnector inoperative, as above, shall be physically separate from the normal manual operating lever/s.

17.5 There shall be clear visual indication on the means of rendering the device inoperative that it is in the “locked open” state.

18.0 ALARMS, STATUSES AND CONTROLS

Where the protection and control cubicle or the equipment has accessible contacts to provide alarms, statuses and controls then these shall be provided as volt free contacts.

19.0 PERFORMANCE IN THE EVENT OF INTERNAL ARCING FAILURE

Suppliers shall provide details on how the enclosure of a gas filled pole mounted circuit breaker and pole mounted switch disconnector performs in the event of an internal arcing failure so as to prevent or reduce the potential for any injury to an operator or the public in the vicinity of the device.

Ideally equipment will be able to demonstrate compliance with the requirements of IEC 62271-200 Annex AA and be Internal Arc Classified (IAC) Accessibility Type C.

Where the equipment has a higher rated short-circuit withstand current or short-circuit breaking current than the tested IAC value, then the supplier shall provide detail of both values in the Supplier Declaration.

20.0 SURGE ARRESTORS

Equipment shall be provided with mounting brackets such that Approved NGED specification surge arrestors can be connected to the bushings on both sides of the device.

Additional mounting steelwork separate to the device is not a NGED preferred option as NGED prefer the unit to be capable of being installed utilising live line techniques as a “single and complete” unit.

Surge arrestors will be provided and installed by others unless agreed in writing at the time of tender.

21.0 TENDER INFORMATION

When tendering the following schedules of this NGED specification apply:

Pole mounted circuit breakers	12kV	Schedules 1a and 1b
	36kV	Schedules 1a and 1c

Pole mounted enclosed switch disconnectors	12kV	Schedules 2a and 2b
	36kV	Schedules 2a and 2c

22.0 INFORMATION TO BE PROVIDED AT TIME OF TENDER

The manufacturer shall complete and submit with their tender completed Schedule4 and 3a or 3b (as appropriate) for each device offered.
They shall also complete a comparison version of the other schedules showing their offer for each device offered against the NGED requested values.

In following additional items shall be provided by the manufacturer at time of tender:-

a) Outline drawing of unit and control cabinet.
b) Details of pole mounting and earthing arrangements, including mountings for surge arresters.
c) Details of current counting arrangements.
d) A copy of the Operation and Maintenance manual including details of protection and control, and recommended maintenance intervals.
e) Type of operating mechanism.
f) Facilities for sampling and refilling any gas filled chambers.
g) List of recommended, priced spares.
h) Numbers of permitted operations at various fault levels before maintenance is required.
i) Materials and surface coating systems, including surface preparation, coating system and dry film thickness.
j) Surface coating type tests.
k) Electrical type tests.
l) The delay from receiving a signal to open or close at the control box (via DNP3 unlicensed/licenced radio, supplied by others) to the switch actually opening or closing.
m) The delay from the switch opening or closing to the open/closed status being available at the control box for further relay via DNP3 unlicensed/licenced radio.
n) A battery sizing calculation using the methodology described in IEEE Standard 485: Recommended Practice for Sizing Lead Acid Batteries for Stationary Applications
o) Any non-conformity with this specification.

Schedule 1a - Type tests required for pole mounted circuit-breakers with auto-reclosing duty

Test Requirement	Specifications and Standards
Dielectric. Partial discharge. ≤ 10pC	IEC 62271-1. Sub-clause 6.2, IEC 62271-100. Sub-clause 6.2, IEC 62271-200. Sub-clause 6.2. Tables 1a and 1b of this specification. IEC 62271-200. Sub-clause 6.2.9 and annex BB, ENATS 41-18 Sub-clause 7.1.1 of this specification
Measurement of the resistance of main circuit.	IEC 62271-1. Sub-clause 6.4, IEC 62271-100. Sub-clause 6.4, IEC 62271-200. Sub-clause 6.4
Temperature Rise.	IEC 62271-1. Sub-clause 6.5, IEC 62271-100. Sub-clause 6.5, IEC 62271-200. Sub-clause 6.5
Short-time withstand current and peak withstand current tests -	IEC 62271-1.Sub-clause 6.6, IEC 62271-100. Sub-clause 6.6, IEC 62271-200. Sub-clause 6.6.
Verification of protection- Minimum of IP44D for control box & IP34 for pole top mounted equipment Mechanical impact. (outdoor – IK10 (20J)).	IEC 62271-1.Sub-clause 6.7, IEC 62271-100. Sub-clause 6.7, IEC 62271-200. Sub-clause 6.7. IEC 60529 Sub-clause 1.5.13 of this specification.
Tightness test.	IEC 62271-1.Sub-clause 6.8, IEC 62271-100. Sub-clause 6.8, IEC 62271-200. Sub-clause 6.8.
EMC tests.	IEC 62271-1.Sub-clause 6.9, IEC 62271-100. Sub-clause 6.9.
Mechanical operations - Circuit-breaker and interlocks. a) Auto-reclosing circuit-breaker - class M2 - 10,000 operating cycles, auto- reclosing sequences - Table 8, IEC 62271-100). 50 operating cycles with manual handle If disconnector incorporated - interlocks (mechanical - 50 ops).	IEC 62271-100. Sub-clause 6.101.2.4, IEC 62271-200. Sub-clause 6.102. Sub-clause 1.6 of this specification
If disconnector incorporated -mechanical operations - Disconnectors operating in conjunction with circuit-breaker - 10,000 operating cycles. 50 operating cycles with manual handle Mechanical strength of kinematic chain between movable contacts and the position indicating device.	IEC 62271-102. Sub-clause 6.102. IEC 62271-200. Sub-clause 6.102. Sub-clause 1.6 of this specification IEC 62271-102. Sub-clause 6.105 and Annex A.
Low temperature tests.	IEC 62271-100. Sub-clause 6.101.3.
High temperature tests-subject to design.	IEC 62271-100. Sub-clause 6.101.3, Clause 1.6 of this specification.
Operation under severe ice conditions (10mm thickness).	IEC 62271-100. Sub-clause 6.101.5. IEC 62271-102. Sub-clause 6.103.
Short-circuit making and breaking tests.	IEC 62271-111 Sub-clauses 6.3, 6.4 [ANSI / IEEE C37.60 - Table 4 - line 6 (12kV), line 9 (24kV), line 10 (36kV)].
Cable-charging breaking current tests.	IEC 62271-100. Sub-clause 6.111.
Line-charging breaking current tests.	IEC 62271-100. Sub-clause 6.111.
Simulated surge arrestor operation	Sub-clause 6.13.2 of IEC 62271-111 [ANSI / IEEE C37.60]
Internal Arc -	IEC62271-200.Sub-clause 6.106 and Annex A. Sub-clause 1.5.101 of this specification.
Gas-filled Compartment. Pressure Withstand.	IEC 62271-200. Sub-clause 6.103.
Ageing test for outdoor composite bushings and insulation materials – minimum of 5,000 hours duration	IEC 61109 Sub-clause
Operation at extremes of voltage of auxiliary and control circuits specified in sub-clause 1.4.8	
Finish.	Performance to ENATS 98-1.
Process Control.	ISO 9001.

Schedule 1b - NGED REQUIREMENTS -: 12kV Pole Mounted Circuit Breaker

Table of technical requirements and ratings for pole-mounted auto reclosing circuit-breaker for use on NGED 11kV distribution network and based on ENATS 41-46 Issue 1.

Information	Sub-clause of ENATS 41-46 Issue 1	NGED requirement
Particulars of system		
Voltage kV		11
Frequency Hz		50
Number of phases		3
Neutral earthing		Resistor. Reactor, ASC or Solid
Circuit-breaker characteristics		
Number of poles		3
Class	4.1.101	Outdoor
Equipped with disconnector Yes/No	4.1.101	No
Mounting arrangements a) Pole-top, b) Mid pole, c) Down poles	6.0.3	b) Mid Pole
Auxiliary power supply	6.4.103	110Vac
Rated voltage (U_r) 7.2kV/12kV, 24kV, 36kV	5.2	12kV
Rated insulation level (lightning impulse withstand voltage) (U_p) 75kV, 95kV, 125kV, 170kV	5.3	125kV
Rated frequency (f_r)	5.4	50Hz
Rated normal current (I_r) 400, 630A, 800A,	5.5	630A
Rated short-time withstand current (I_k) 12.5kA / 16kA / 20kA	5.5	≥12.5kA
Rated duration of short circuit (t_k)	5.8	3sec
Rated supply voltage of closing and opening devices and auxiliary and control circuits (U_a) 24V, 30V, 48V, 110V d.c, 110V a.c. a) Closing and Tripping b) Indication c) Control	5.9	24Vdc
Rated supply frequency of closing and opening and of auxiliary circuits d.c. or 50Hz	5.10	dc
Rated short-circuit breaking current (I_{sc}) - Equal to rated short-time withstand current	5.300.101	45ms or 120ms Time constant
Rated short-circuit making current (I_p)	5.300.103	2.5 times rated short-circuit breaking current
Rated operating sequence	5.300.104	Supplier to declare
Rated capacitive switching currents (Class C1) (I_c) - Rated cable-charge breaking current	5.300.107	≥10A
Rated capacitive switching currents (Class C1) (I_l) - Rated line-charging breaking current	5.300.107	≥2A
Classification of mechanical operations	5.300.110	Class M2-10000ops
Gas monitoring a) Pressure / density gauge / indicator b) Single stage pressure switch c) Two stage pressure switch d) Other monitoring device	6.10	c) Two stage pressure switch Alarm Lock out
Mechanism type	6.6	Stored energy or solenoid
Insulation medium		Solid
Arc extinction medium		Vacuum
Colour of paint		Dark Admiralty Grey or Colour agreed at tender
Additional information		

Schedule 1c - NGED REQUIREMENTS -: 36kV Pole Mounted Circuit Breaker

Table of technical requirements and ratings for pole-mounted auto reclosing circuit-breaker for use on NGED 33kV distribution network and based on ENATS 41-46 Issue 1.

Information	Sub-clause of ENATS 41-46 Issue 1	NGED requirement
Particulars of system		
Voltage kV		33
Frequency Hz		50
Number of phases		3
Neutral earthing		Resistor, Reactor, ASC or Solid
Circuit-breaker characteristics		
Number of poles		3
Class	4.1.101	Outdoor
Equipped with disconnector Yes/No	4.1.101	No
Mounting arrangements a) Pole-top, b) Mid pole, c) Down poles	6.0.3	b) Mid Pole
Auxiliary power supply	6.4.103	110Vac
Rated voltage (U_r) 7.2kV/12kV, 24kV, 36kV	5.2	36kV
Rated insulation level (lightning impulse withstand voltage) 75kV, 95kV,125kV, 170kV	5.3	170kV
Rated frequency (f_r)	5.4	50Hz
Rated normal current (I_r) 400, 630A, 800A,	5.5	800A
Rated short-time withstand current (I_k) 12.5kA / 16kA / 20kA	5.5	≥12.5kA
Rated duration of short circuit (t_k)	5.8	3sec
Rated supply voltage of closing and opening devices and auxiliary and control circuits (U_a) 24V, 30V, 48V, 110V d.c, 110V a.c. a) Closing and Tripping b) Indication c) Control	5.9	24Vdc
Rated supply frequency of closing and opening and of auxiliary circuits d.c. or 50Hz	5.10	dc
Rated short-circuit breaking current (I_{sc}) - Equal to rated short-time withstand current	5.3.101	45ms or 120ms Time constant
Rated short-circuit making current (I_p)	5.3.103	2.5 times rated short-circuit breaking current
Rated operating sequence	5.3.104	Supplier to declare
Rated capacitive switching currents (Class C1) (I_c) - Rated cable-charge breaking current	5.3.107	≥25A
Rated capacitive switching currents (Class C1) (I_l) - Rated line-charging breaking current	5.3.107	≥5A
Classification of mechanical operations	5.3.110	Class M2-10000ops
Gas monitoring a) Pressure / density gauge / indicator b) Single stage pressure switch c) Two stage pressure switch d) Other monitoring device	6.10	b) Two stage pressure switch Alarm Lock out
Mechanism type	6.6	Stored energy or solenoid
Insulation medium		Solid
Arc extinction medium		Vacuum
Colour of paint		Dark Admiralty Grey or Colour agreed at tender
Additional information		

Schedule 2a - Type tests for pole mounted enclosed switches and switch-disconnectors

Test Requirement	Specifications and Standards
Dielectric. Partial discharge. ≤ 10pC	IEC 62271-1. Sub-clause 6.2, IEC 62271-103. Sub-clause 6.2, IEC 62271-200. Sub-clause 6.2. IEC 62271-102. Sub-clause 6.2 Tables 1a and 1b of this specification. Sub-clause 7.1.1 of this specification IEC 62271-200. Sub-clause 6.2.9 and Annex BB ENATS 41-18
Insulation level - electrically stressed gap due to possible movement of earthing switch contacts.	Sub-clause 1.5.6 of this specification
Measurement of the resistance of main circuit.	IEC 62271-1. Sub-clause 6.4, IEC 62271-103. Sub-clause 6.4, IEC 62271-200. Sub-clause 6.4
Temperature Rise.	IEC 62271-1. Sub-clause 6.5, IEC 62271-103. Sub-clause 6.5, IEC 62271-200. Sub-clause 6.5
Short-time withstand current and peak withstand current tests.	IEC 62271-1.Sub-clause 6.6, IEC 62271-103. Sub-clause 6.6, IEC 62271-200. Sub-clause 6.6.
Verification of protection- Minimum of IP44D for control box & IP34 for pole top mounted equipment Mechanical impact. (Outdoor – IK10 (20J)).	IEC 62271-1.Sub-clause 6.7, IEC 62271-103. Sub-clause 6.7, IEC 62271-200. Sub-clause 6.7. IEC 60529 Sub-clause 1.5.13 of this specification.
Tightness test	IEC 62271-1.Sub-clause 6.8, IEC 62271-103. Sub-clause 6.8, IEC 62271-200. Sub-clause 6.8.
EMC tests	IEC 62271-1.Sub-clause 6.9, IEC 62271-10362271-103. Sub-clause 6.9,
Mechanical operations - (Class M2 General purpose switch - 5,000 operations). 50 operating cycles with manual handle Including mechanical strength of kinematic chain between moveable contacts and position indicating device. If earthing switch incorporated - interlocks (mechanical -50 ops).	IEC 62271-103. Sub-clause 6.102, IEC 62271-200. Sub-clause 6.102 Sub-clause 1.6 of this specification IEC 62271-102. Sub-clause 6.105 and Annex A
If earthing switch incorporated -Mechanical operations - Earthing switch. 50 operating cycles with manual handle (Including mechanical strength of kinematic chain between movable contacts and the position indicating device).	IEC 62271-102. Sub-clause 6.102 IEC 62271-200. Sub-clause 6.102 Sub-clause 1.6 of this specification IEC 62271-102. Sub-clause 6.105 and Annex A
Low temperature tests.	IEC 62271-100. Sub-clause 6.101.3
High temperature tests-subject to design.	IEC 62271-100. Sub-clause 6.101.3, Clause 1.6 of this specification
Operation under severe ice conditions (10mm thickness).	IEC 62271-103. Sub-clause 6.103. IEC 62271-102. Sub-clause 6.103
Short-circuit making and breaking tests (Switch class E3) For 7.2kV, 12kV, 24kV switch test duty 5 = 5 operations. For 36kV switch test duty 5 = 5 operations.	IEC 62271-103. Sub-clauses 6.101.1, (TD_{load}, TD_{loop}, TD_{cc}, TD_{lc}, & TD_{ma},, Table 3) IEC 62271-200. Sub-clause 6.101 Sub-clause 7.3.1 of this specification
If earthing switch incorporated - Short-circuit making tests - Earthing switch - class E2. Test duty 5 of IEC 62271-103 sub-clause 6.101.10 - 5 making operations.	IEC 62271-102. Sub-clause 6.101, IEC 62271-103. Sub-clause 6.101.1.2 Sub-clause 7.3.1 of this specification
Cable-charging breaking current tests.	IEC 62271-103. Sub-clause 6.101.7.3
Line-charging breaking current tests.	IEC 62271-103. Sub-clause 6.101.7.3
Simulated surge arrestor operation	Sub-clause 6.13.2 of IEC 62271-111 [ANSI / IEEE C37.60]
Internal Arc --	IEC 62271-200. Sub-clause 6.106 and Annex A Sub-clause 1.5.101 of this specification
Gas-filled Compartment. Pressure Withstand.	IEC 62271-200. Sub-clause 6.103
Ageing test for outdoor composite bushings and insulation materials – minimum of 5,000 hours duration	IEC 61109 Sub-clause
Operation at extremes of voltage of auxiliary and control circuits specified in sub-clause 1.4.8	
Finish.	Performance to ENATS 98-1
Process Control.	ISO 9001

Schedule 2b - NGED REQUIREMENTS -: 12kV Pole Mounted Enclosed Switch Disconnector

Table of technical requirements and ratings for pole-mounted enclosed switch disconnector for use on NGED 11kV distribution network and based on ENATS 41-46 Issue 1.

Information	Sub-clause of ENATS 41-46 Issue 1	NGED requirement
Particulars of system		
Voltage kV		11
Frequency Hz		50
Number of phases		3
Neutral earthing		Resistor, Reactor, ASC or Solid
Switch characteristics		
Number of poles		3
Class	4.1.102	Class E3, TD5=10 operations Class M1, 1000 mechanical operations.
Outdoor	4.1.3	
Equipped with earthing switch Yes/No	6.0.2	No
Mounting arrangements a) Pole-top, b) Mid pole, c) Down poles	6.0.3	Mid Pole
Auxiliary power supply	6.4.103	110Vac
Rated voltage (U_r) 7.2kV/12kV, 24kV, 36kV	5.2	12kV
Rated insulation level (lightning impulse withstand voltage) (U_p) 75kV, 95kV,125kV, 170kV	5.3	125kV
Rated frequency (f_r)	5.3	50Hz
Rated normal current (I_r) 400A, 630A, 800A	5.5	630A
Rated short-time withstand current (I_k) 12.5kA / 16kA / 20kA	5.5	≥12.5kA
Rated duration of short circuit (t_k)	5.8	3sec
Rated supply voltage of closing and opening devices. (U_a) 24V, 30V, 48V, 110V d.c., 110V ac	5.9	24Vdc
Rated supply frequency of closing and opening and of auxiliary circuits d.c. or 50Hz	5.10	dc
Rated mainly active load-breaking current	5.303.101	630A (Load Current)
Rated closed-loop breaking current	5.303.102	2.5 times rated short circuit current
Rated cable-charge breaking current (I_c) 10A, 16A,20A	5.303.103	≥20A
Rated line-charging breaking current (I_l) 1A, 1.5A, 2A	5.303.104	≥1A
Rated short-circuit making current (I_p)	5.303.111	Equal to 2.5 times rated short-time withstand current
Gas monitoring a) Pressure / density gauge / indicator b) Single stage pressure switch c) Two stage pressure switch d) Other monitoring device	6.10	Two stage pressure switch Alarm Lock out
Mechanism type	6.6	Stored Energy or Solenoid
Colour of paint		Dark Admiralty Grey or Colour agreed at tender
Insulation medium		Gas / SF_6
Additional information		

Schedule 2c - NGED REQUIREMENTS -: 36kV Pole Mounted Enclosed Switch Disconnector

Table of technical requirements and ratings for pole-mounted enclosed switch disconnector for use on NGED 33kV distribution network and based on ENATS 41-46 Issue 1.

Information	Sub-clause of ENATS 41-46 Issue 1	NGED requirement
Particulars of system		
Voltage kV		33
Frequency Hz		50
Number of phases		3
Neutral earthing		Resistor, Reactor, ASC or Solid
Switch characteristics		
Number of poles		3
Class	4.1.102	Class E3, TD5=10 operations Class M1, 1000 mechanical operations.
Outdoor	4.1.3	
Equipped with earthing switch Yes/No	6.0.2	No
Mounting arrangements a) Pole-top, b) Mid pole, c) Down poles	6.0.3	Mid Pole
Auxiliary power supply	6.4.103	110Vac
Rated voltage (U_r) 7.2kV/12kV, 24kV, 36kV	5.2	36kV
Rated insulation level (lightning impulse withstand voltage) 75kV, 95kV,125kV, 170kV	5.3	170kV
Rated frequency (f_r)	5.3	50Hz
Rated normal current (I_r) 400A, 630A, 800A	5.5	≥630A
Rated short-time withstand current (I_k) 12kA/16kA/20kA	5.5	≥12.5kA
Rated duration of short circuit (t_k)	5.8	3sec
Rated supply voltage of closing and opening devices. (U_a) 24V, 30V, 48V, 110V d.c., 110V ac	5.9	24Vdc
Rated supply frequency of closing and opening and of auxiliary circuits d.c. or 50Hz	5.10	dc
Rated mainly active load-breaking current	5.303.101	≥630A (Load Current)
Rated closed-loop breaking current	5.303.102	2.5 times rated short circuit current
Rated cable-charge breaking current (I_c) 10A, 16A,20A	5.303.103	≥20A
Rated line-charging breaking current (I_l) 1A, 1.5A, 2A	5.303.104	≥1A
Rated short-circuit making current (I_p)	5.303.111	Equal to 2.5 times rated short-time withstand current
Gas monitoring a) Pressure / density gauge / indicator b) Single stage pressure switch c) Two stage pressure switch d) Other monitoring device	6.10	Two stage pressure switch Alarm Lock out
Mechanism type	6.6	Stored Energy or Solenoid
Colour of paint		Dark Admiralty Grey or Colour agreed at tender
Insulation medium		Gas / SF_6
Additional information		

Schedule 3a - Supplier Declaration – Non Gas Filled Equipment

Supplier To Declare		
		Sub-clause of ENATS 41-46 Issue 1
Mechanism type (give details)		6.6 to 6.8
Closing mechanism power consumption (mA) and duration of consumption (s)		
Operating time – Close operation (ms)		
Operating Time – Open operation (ms)		
Rated operating sequence		
Noise (during operation and/or activity) (dB)		
Arc interruption medium		
Insulation medium		
Mass of complete unit (kg)		
Dimensions (m)		
AIS bushing details		
Tank material		
Controller enclosure material		
Colour of paint		
Internal battery capacity (Ah)		
Battery maximum functioning period (hrs)		
Means to prevent battery deep discharge damage		

Schedule 3b - Supplier Declaration -: Gas Filled Equipment

Supplier To Declare		
		Sub-clause of ENATS 41-46 Issue 1
Mechanism type (give details)		6.6 to 6.8
Closing mechanism power consumption (mA) and duration of consumption (s)		
Operating time – Close operation (ms)		
Operating Time – Open operation (ms)		
Rated operating sequence		
Noise (during operation and/or activity) (dB)		
Arc interruption medium		
Insulation medium		
Type of gas		
Mass of Gas (kg)		
Volume of Compartment (m^3)		
Mass of gas (kg) that would be lost if gas leaked until compartment pressure equals the standard atmospheric conditions (+20°C and 101,3 kPa), without air entering the chamber.		
Method(s) of monitoring pressure and achieving temperature compensation		
Gas monitoring indicator		6.10
Rated filling pressure p_{re} (or density ρ_{re}) for insulation and/or switching [kPa and BAR(G)]		
Alarm pressure p_{ae} (or density ρ_{ae}) for insulation and/or switching [kPa and BAR(G)]		
Minimum functional pressure pme (or density ρme) for insulation and/or switching [kPa and BAR(G)]		
Alarm pressure for operation p_{am} (or density ρ_{am}) [kPa AND Bar(g)]		
Minimum functional pressure for operation p_{mm} (or density ρ_{mm}) [kPa AND Bar(g)]		
Mass of complete unit (kg)		
Dimensions (m)		
AIS bushing details		
Tank material		
Controller enclosure material		
Colour of paint		
Internal battery capacity (Ah)		
Battery maximum functioning period (hrs)		
Means to prevent battery deep discharge damage		

Schedule 4 - Supplier Declaration: Auxiliary Power Supply

Supplier To Declare			
			Sub-clause of EE SPEC 13/5
Common battery used for all functions e.g. radio, RTU, protective relay and switchgear operating mechanism	[Yes/No]		11.1
Monobloc chemistry			11.3
Monobloc manufacturer			
Monobloc model			
Monobloc rated capacity: 10 hour rate to 1.80V per cell @ 20°C	[Ah]		
Monobloc Eurobat Classification: "10/12 years – Long Life"	[Yes/No]		11.3
Monobloc flammability classification: V-0 according to BS EN 60695-10-11	[Yes/No]		11.3
Battery enclosure ventilation: In accordance with BS EN 50272-2	[Yes/No]		11.7
Battery charging characteristic: Constant-Current then Constant-Voltage	[Yes/No]		11.8
Battery charging temperature compensated	[Yes/No]		11.8
Battery charger DC output current rating	[Amps]		11.8
Charger AC supply monitoring	[Yes/No]		11.9
Charger failure monitoring	[Yes/No]		11.9
Battery low volts monitoring	[Yes/No]		11.9
Battery high volts monitoring	[Yes/No]		11.9
Battery impedance monitoring	[Yes/No]		11.9
Frequency of battery impedance testing	[Days]		11.9
Battery low voltage disconnect	[Yes/No]		11.10

APPENDIX A

SUPERSEEDED DOCUMENTATION

This document supersedes: EE SPEC: 13/4 dated July 2020 which has now been withdrawn.

The specification is based on ENATS 41-46 (Issue 1) dated 2021.

APPENDIX B

RECORD OF COMMENTS DURING CONSULATION

No comment required as minor update.

APPENDIX C

IMPACT ON COMPANY POLICY

The updates to this specification have no impact on company policy.

APPENDIX D

IMPLEMENTATION OF POLICY

This document may be implemented on issue for new tenders and contracts.
This specification is not retrospective for current contracts based on EEPSEC 13/4.

APPENDIX E

ASSOCIATED DOCUMENTATION

None

APPENDIX F

KEY WORDS

Pole mounted, circuit breaker, PMAR, switchgear, load switches, switch disconnector, gas, SF6, GBSD