

SUBSTATION AUXILIARY SUPPLIES

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PURPOSE AND SCOPE

This document defines National Grid's technical requirements for the application of substation auxiliary equipment and is part of a hierarchical structure of documentation comprising three levels of Technical Specifications.

This specification is a level 2 document which describes the functional and performance requirements for both A.C. and D.C. auxiliary power supplies and equipment in National Grid UK Electricity Transmission substations.

PART 1 – PROCEDURAL

1 GENERAL REQUIREMENTS

Informative: The operational security of National Grid substations and the availability of the high voltage plant and secondary equipment within the substation is dependent upon reliable and secure auxiliary supplies.

1.1 Manufacture

1.1.1 Manufacturing facilities shall be certified by a recognised accreditation organisation to BS EN ISO 9001.

1.1.2 Manufacturers shall preferably have in place or be working towards installation of management systems compatible with the international environmental management system standard ISO 14001.

1.2 Equipment

1.2.1 All equipment shall meet statutory requirements for safety as specified in TS 1.

1.2.2 No-break supplies for protection, control, measurements, telecommunications and other electronic equipment shall normally be fed from 48 V D.C. and/or 110 V D.C. supplies.

Informative: The preferred choice of supply for light current equipment is 110 V D.C.

1.2.3 A.C. supplies may be used where a short duration supply interruption is tolerable (typically 0-2 mins arising from the time taken for a supply to change over or for a diesel standby generator to run up to speed). Where a break is not acceptable and the equipment requires a no-break A.C. supply such as for a computer and monitor then it shall be fed from a D.C. supplied inverter or a stand-alone uninterruptible power supply (UPS).

Informative: The use of a UPS to power single items of equipment is not desirable and the preferred option is to provide PC's and monitors powered directly from a D.C. supply.

- 1.2.4 For safety reasons, the use of 230 V A.C. supplies for control systems should be avoided where reasonably practicable. If A.C. supplies must be used for general control purposes, a suitable transformer providing 110 V with centre tapped earth is recommended to derive an acceptable control voltage.

1.3 A.C. Supplies

- 1.3.1 Every substation shall be equipped with an LVAC supply as detailed in TS 3.12.3 Substation LVAC Supplies.
- 1.3.2 The LVAC power supply shall be designed to provide a voltage maintained within the limits of
400/230 V + 10%, - 6% and 50 Hz $\pm$ 1%.
- 1.3.3 All components of the LVAC supply should be capable of operating correctly at the levels of harmonics specified in BS EN 50160.

1.4 D.C. Supplies

- 1.4.1 Both the 48 V and 110 V D.C. supply systems at 400 kV and 275 kV substations shall be provided by two independent D.C. supply systems.
- 1.4.2 Interconnection facilities between the independent D.C. supply systems for each voltage level shall be provided at each substation. Common mode faults shall be minimised wherever possible.
- 1.4.3 Cross connections of D.C. supply systems between adjacent dispersed relay rooms, where the relay rooms belong to primary 400/275 kV circuits carried on the same route, shall be arranged to avoid common mode faults.
- 1.4.4 Each independent system shall be designated for a 6 hour standby period with the maximum load of the associated distribution board.

2 PERFORMANCE REQUIREMENTS

2.1 A.C. Supplies

- 2.1.1 The performance requirements for the LVAC supply are specified in TS 3.12.3 Substation LVAC Supplies.

2.2 D.C. Supplies

- 2.2.1 D.C. systems shall provide no-break supplies at all times up to the end of the specified standby period.
- 2.2.2 The power supply systems and cabling shall be sized to ensure that the battery is capable of supplying the load requirements at the end of the 6-hour standby period.
- 2.2.3 The voltage measured at the distribution board at the end of the 6-hour standby period at 5°C shall not be less than 46 V in the case of 48 V nominal systems and 102 V in the case of centralised 110 V systems and 93 V for dispersed 110 V systems.
- 2.2.4 The 110 V battery shall be capable of supplying the maximum tripping load at the end of the 6 hour standby period. This is defined as the tripping of all the required plant associated with that battery for a primary busbar fault.
- 2.2.5 The battery/charger system shall maintain the voltage on the distribution boards at all times and at the extremes of the A.C. supply voltage to the charger as stated in TS 3.12.4.