Document Reference: OFS-SSS-403-R1
Functional Specification
Auxiliary Power Supplies

Revision	Date	Description	Originator	Reviewer	Checker	Approver
R0	14/04/2022	First Issue	Vitali Garon	Daniele Giustini Niall McMahon	Leon Notkevich Neil Cowap	Aidan Corcoran, Richard Blanchfield
R1	6/10/2022	Issued for use after industry feedback	Vitali Garon	Daniele Giustini James Staunton	Leon Notkevich Neil Cowap	Louise O'Flanagan

1 SCOPE

This Functional Specification is applicable for use in offshore wind transmission links delivered by the Customer as Contestable Works, to be owned and operated by EirGrid. The specification relates to the Onshore Compensation Compound.
This specification should be read in association with the project specific contestable works pack and project documentation and all other relevant functional specifications as issued by EirGrid.
For the purpose of this specification the term Customer shall refer to Offshore Wind Power Developers, Independent Power Producers responsible for the design and build of assets to be handed over to EirGrid.
The specification covers AC supply, DC supply, DC charging facilities, backup power provision and the monitoring of each.

The following auxiliary power supplies shall be provided.

1. 400 V / 230 V AC supply
2. 220V DC Supply
3. 400V / 230V AC UPS supply

The supplies shall be sized considering 20% of station future requirements.

All critical, essential and emergency loads shall be fed from battery backed uninterruptible power supplies (UPS). Electrical load list shall include load classification (normal, emergency, essential).

Design Drawings should also be voltage specific and refrain from simply referring to Comms '+ve' or Comms '-ve'

220 V DC power supply equipment shall be provided for the operation of protection and control equipment including plant operation such as circuit breaker tripping.

2 LV AC AUXILIARY SUPPLIES

Onshore compensation compounds are considered critical substations.

The Customer shall provide three independent (from separate power sources) three phase / single phase 400 V AC / 230 V AC LV power supplies for OCC auxiliary LV AC loads as shown on Figure 1.

There will be two main supplies (Primary and Secondary) and a back-up Diesel Generator supply. The primary main LV AC supply shall be via the MV/LV house transformer connected to MV power sources within OCC or another MV rural or urban supply. In case of Primary supply is from MV rural supply, it shall be independent from Secondary Supply source. In case of primary power supply from STATCOM MV switchgear, a voltage control shall be provided to ensure stable voltage at LV side.

Main auxiliary power sources will be proposed by Customer for review by EirGrid.

Note: Prior to commissioning of the MV/LV house transformer, supply to the station can be via a MV rural/urban network supply.

Secondary main LV AC supply shall be fed from Rural or Urban Network through MV/LV transformer.

The selection between Primary and Secondary main supplies will be through ACO-1 (Automatic Change Over No 1) facility as it is shown on Figure 1.

In the event of loss of primary main Supplies, the ACO-1 (Automatic Change Over No 1), with a short delay of no more than three seconds, shall switch to the secondary main (hot) supplies. All connected loads shall be re-powered automatically.

In the event that both main supplies are not available, with longer delay (not less than 20 seconds), a back-up Diesel Generator which shall start automatically and provide power to all connected loads through ACO-2.

All incoming breakers to the main LV AC switchboard shall be monitored (alarms, statuses) and controlled from remote through SCADA. Voltage indications for all sources and the switchboard busbars shall also be available.

On restoration of mains voltage supply (either primary or secondary) the scheme shall be re-arranged by operators remotely through SCADA to revert back to the available main supply.

As a base case, all sources of supplies shall be sized to feed the full LV AC load of the station with 20% spare capacity for any future loads.LV main supply shall feed all of the substation auxiliary loads. These include but are not limited to the following.

- Control and Protection systems
- Battery chargers (including diesel generator battery charger)
- LV AC UPS
- AC supply for charging CB operation springs
- Heating in all outdoor switchgear mech. boxes including marshalling kiosks heaters
- Sump pumps
- Building services
- Security management systems
- Lighting
- STATCOM auxiliaries

The voltage level at OCC LV switchboard (main switchboard) shall be stable with maximum variations of plus or minus 10% of nominal 400/230V under all possible operational (no load, full load) and upstream supply scenarios. Provision of offload tap changer shall be considered to achieve the above requirement. If provided, offload tap changers shall have a range of +/- 5% with each tap of 2.5% (five possible tap positions).

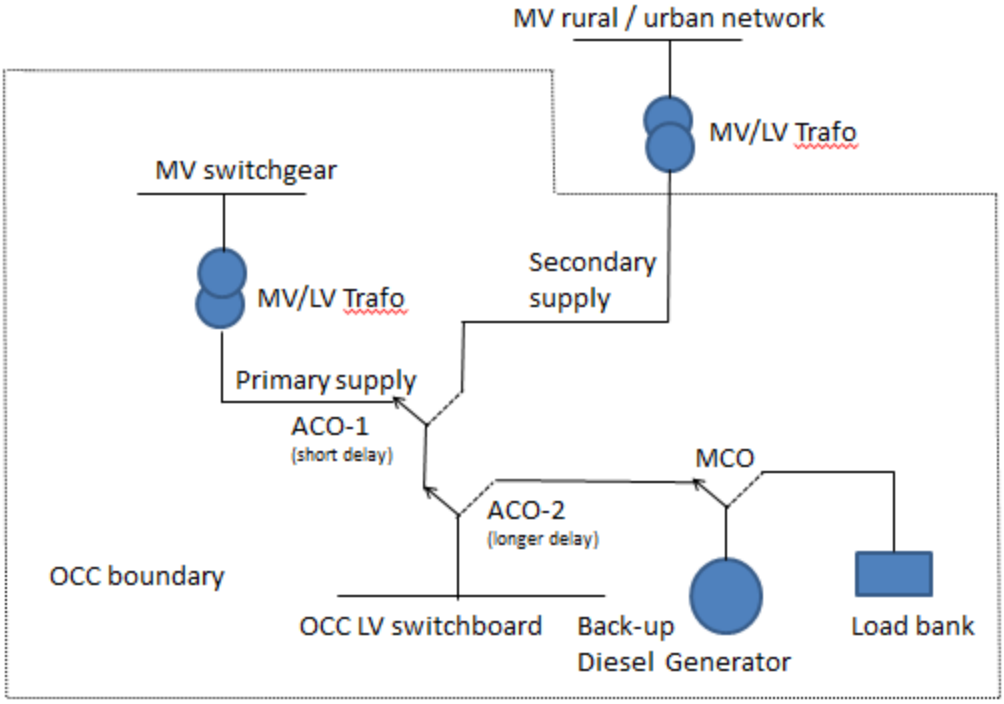

Figure 1 - Onshore compensation compound LVAC arrangement

2.1 GENERAL REQUIREMENTS

All equipment, components of auxiliary power supply system (switchboards, circuits breakers, distribution boards / panels, transformers, generator) shall have interfaces with SCADA, Substation Control System (SCS). It shall be possible to monitor status, voltages and control incomers to the main switchboard. Any alarms, trips of any breakers, including MCBs shall be sent to SCADA, SCS.

Individual alarms from LV power sub-distribution can be grouped into common alarms for each panel, distribution board.

Status, alarms monitoring and remote testing of diesel generator shall be possible from SCADA, SCS.

The arrangement for the provision of the LV backup supply shall be reviewed by EirGrid.

The LV supply requirements shall be also designed and installed in accordance with EirGrid specification OFS-SSS-405-R0 “Station 220 V DC and 230/400 V AC Distribution Boards.

2.2 STANDBY DIESEL GENERATOR REQUIREMENTS

The Customer shall provide a suitable standby diesel generator.
The function of the diesel generator is to provide emergency standby / backup auxiliary power in the event of a failure or loss of the LV mains supply.
Each unit shall consist of a Diesel Engine, Alternator and integral Fuel Tank mounted on a fully-bunded sub-base frame and delivered as a single assembly.
It shall also include the circuit breaker through which the generator is electrically

connected to the LV distribution board.

Testing facilities (including on load bank testing) for back-up diesel generator to be provided.

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The diesel fuel tank shall contain sufficient fuel to supply the generator running at full load for 24 hours. The location and arrangement of the standby diesel generator shall be reviewed with EirGrid. It shall be installed in a suitable building or sound- and weatherproof containerised metal enclosure suitable for outdoor installations as a package.
Customer shall propose and provide a suitable spares holding, maintenance and servicing requirements based on manufacturer's recommendations.

3 STATION 220V DC SUPPLY

The DC supply requirements shall be designed & installed in accordance with the latest revision of the EirGrid specification OFS-SSS-404 "220V Lead Acid Batteries and Chargers.

DC essential and emergency loads of SCADA, telecom systems shall also be connected to 220V DC distribution.

4 STATION 400/ 230V AC CRITICAL SUPPLIES

400/230V AC UPS (uninterruptible power supply) system(s) shall be supplied for OCC LV AC essential and emergency loads, critical auxiliary loads, SCADA and telecommunication loads. The UPS backed consumer (load) list shall be reviewed by EirGrid.

The UPS shall be fully redundant (2x100%). Further requirements for 400 / 230V AC UPS are given in a dedicated section of OFS-OSP-136 functional specification and shall be complied with.

Alternative proposals to the above can also be considered (such as as-built batteries / inverters for each critical LV AC load / system).

In any case all OCC critical, essential, emergency loads must be battery backed for uninterruptible supplies in case of any loss or disturbance of main auxiliary power supplies.

Back-up battery capacity of LV AC UPS shall be sufficient to supply all connected loads for at least 24 hours or, if required, for longer to meet the requirements of relevant regulations.