


Stand-by Emergency Diesel Generator Design Basis

CO₂ Capture Facility

Kårstø, Norway

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1.0 SYSTEM OVERVIEW

The purpose of this document is to discuss the design philosophy and sizing basis for the stand-by emergency diesel generator (EDG), tag number 1ANMG001.

The emergency diesel generator will be sized to supply essential facility loads. All low voltage equipment essential during extended loss of offsite power will be powered from the emergency diesel generator. Normal supply to the essential MCC (1ECECM03) will be arranged from Load Center #1 or #2 (1ECEKL01 or 1ECEKL02). In case of failure of all normal power supply to the essential MCC bus, a change over to the emergency diesel generator will be made to supply power to the essential MCC.

2.0 BOUNDARIES AND INTERFACES

The diesel generator system will interface with the 400V system for power as it feeds power to the 400V system to the essential MCC and receives control power supply from the 400/230VAC system.

The generator system will interface with the SAS for necessary start/stop commands and alarm indications.

3.0 CODES AND STANDARDS

The electrical equipment will be selected based on applicable IEC standards.

4.0 TECHNICAL DATA

The diesel generator will be provided with a self contained enclosure with suitable ventilation to maintain a stable temperature per the site HSE requirements. The EDG will be equipped with diesel engine, synchronous generator, an integral brushless excitation and governing system, automatic voltage regulator and all associated protection and controls. The unit will be a 400V, 3-phase, 50Hz, 4 wire system, with an output of 600kWe/750kVA rated for stand by duty. The neutral of this system will be isolated at the diesel generator. The diesel generator control panel will be located on the skid enclosure. The EDG will be equipped with a 4 pole air circuit breaker suitable for remote electrical operation.

5.0 OPERATION AND CONTROL

The diesel generator will have three selectable operating modes; local manual, remote manual (SAS control), and automatic. The system will normally be in automatic mode.

During remote manual operation, the operator will issue a “Start Diesel Engine” command and the generator will automatically commence a complete starting sequence which includes checking of auxiliaries, starting the engine and the building up of voltage and frequency for the generator. Once the diesel generator has reached the rated voltage and frequency, the operator will issue a synchronizing command, and the generator will be automatically synchronized to the 400V bus.

During local manual mode the operator will issue a start command from the local control panel. The engine will automatically commence a complete starting sequence which includes checking of auxiliaries, starting the engine and the build up of voltage and frequency. The operator will then control the synchronization manually through the control panel. Synchronization will at all times be supervised by synchronization check relays.

In remote or manual mode, once synchronized, the EDG will automatically take-up load to the preset value, which will be controlled through the unit's power controller. A normal stop sequence will automatically de-load the diesel generator and open the breaker.

During automatic mode, upon loss of voltage on both load center busses (low voltage on the essential MCC), an emergency condition will be initiated. An emergency condition signals opening of both incoming breakers to the essential MCC, automatically starts the diesel generator, using the 24V battery provided with the diesel generator, and automatically closes the diesel generator breaker. Loads which do not disconnect on transfer to the EDG will be re-powered as soon as the EDG breaker closes. Loads which are disconnected that need to be started will be automatically added through an auto sequencing logic in the SAS. The presently identified loads which will be re-energized on EDG breaker closure are the UPS system, essential lighting, essential heat tracing, and essential HVAC. During detailed design, any additional loads requiring automatic sequencing will be controlled through the SAS.

On restoration of normal power, the plant operator will issue a trip generator breaker command which will open the diesel generator breaker and close the operator selected incoming breaker to the essential MCC in a break-before-make sequence.

6.0 ALARMS, INDICATIONS AND TRIPS

The following main protective trips will be provided for the diesel generator through its skid mounted controls:

- Over-Speed
- Low-Low Oil Pressure
- High-High Engine Temperature
- High-High Oil Temperature
- Generator Differential
- Reverse Power Protection
- Over-Voltage/ Under-Voltage
- Overload
- Voltage Controlled Over-Current

- Over-Frequency/ Under-Frequency

The following main Alarms and Indications will be taken to the SAS:

- Engine Fail to Start
- Low/ High Fuel Level
- High Alternator Winding Temperature
- Diesel Generator Breaker Status Open/Closed
- Running
- Voltage
- Current
- Power
- Low Battery Voltage
- Battery Charger Failure
- Diesel Generator Not in Auto
- Low Oil Pressure
- High-Engine Temperature
- High Oil Temperature
- Earth Fault Detection

7.0 SIZING

Sizing of the diesel generator will be selected so as to supply all the essential loads such as DC and UPS systems, required HVAC system, essential lighting and socket system, and essential trace heating. The below table outlines the sizing basis:

Item Description	Required Load (kW)
UPS and DC System	64
Essential Lighting	80
Essential Heat Tracing	100
HVAC System	197
Sub Total	441
Total With Design Margin (20%)	530
Selected Size	600 kWe/750 KVA