

Specifications of Main Electrical Equipment

CO₂ Capture Facility

Kårstø, Norway

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0	4 Feb 08	Issued For Comment	BA	SMS	PO	WR			
Rev.	Date	Reason for Revision	By	Check	App	App	Client		
 Bechtel Power Corporation			Job No. 25474						
			Document No. 25474 - 000 - 3PS - E000 - 00001					Rev. 0	
			PAGE 1 of 5						
GASSNOVA			Project No. - Originator - Disc Code - Doc Type - Serial No.						
			10112936 - PB - E -TSP - 0001						

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1.0 PURPOSE

This purpose of this document is to provide a brief specification of main electrical equipment. The main electrical equipment for the project includes the following:

- Transformers
- Medium and Low Voltage Switchgears
- Rectifier ,Battery and Inverter system
- Emergency Diesel Generator
- Adjustable Speed Static Converter Motor Drive Systems (ASDS)
- Medium Voltage Power Capacitor Bank

2.0 POWER TRANSFORMERS

Power Transformers will be in accordance with Exhibit E5.2- Document 10112936-FI-B-CON-0102.

3.0 MEDIUM VOLTAGE SWITCHGEAR

Medium Voltage Switchgears will be in accordance with Exhibit E5.2- Document 10112936-FI-B-CON-0103.

4.0 LOW VOLTAGE SWITCHGEAR

Low Voltage Switchgears will be in accordance with Exhibit E5.2- Document 10112936-FI-B-CON-0104.

5.0 RECTIFIER, BATTERY & INVERTER

Rectifier, Battery and Inverter will be in accordance with Exhibit E5.5- Document 10112936-FI-B-CON-0105.

6.0 EMERGENCY DIESEL GENERATOR

Emergency Diesel Generator will be in accordance with Exhibit E5.6- Document 10112936-FI-B-CON-0106.

7.0 ADJUSTABLE SPEED STATIC CONVERTER MOTOR DRIVE SYSTEM (ASDS)

ASDS will be in accordance with Exhibit E5.12- Document 10112936-FI-B-CON-0112.

8.0 MEDIUM VOLTAGE POWER CAPACITOR BANK

This specification covers the design and testing of a factory assembled metal enclosed power capacitor bank.

8.1 GENERAL DESIGN FEATURES

- The capacitor bank including all the power and control equipment shall be housed in a metal enclosed cubicle suitable for indoor or outdoor installation.
- The capacitor shall comply with IEC 600871 standard and shall be provided with external fuses.
- The capacitor banks are designed according to two possible connection modes- delta connection or double star connection.
- Capacitor bank shall consist of two or more stages of automatically switched capacitor stages.
- The capacitor bank shall comprise
 - Power components such as isolating switch, earth switch, surge arrester, individual capacitor stage vacuum switch, capacitors, current limiting reactor, control voltage transformer, current and voltage transformers
 - Digital power factor controller
 - Protection and metering

8.2 DESCRIPTION OF MAIN COMPONENTS

8.2.1 Enclosure

The enclosure shall be free standing and compartmentalized and constructed from galvanized steel or aluminium. Indoor cubicle shall be provided with IP31 and outdoor cubicle with IP54 ingress protection suitable for zone 2 group 2A and T2 application. Anti-condensation heater shall be provided. The busbar shall be of tinned copper and suitably rated to withstand the 31.5 kA short time current. Enclosure shall be suitable for bottom. Powder coated paint finish shall be provided.

8.2.2 Isolator/Earth switch

Externally operated air-disconnect switch and mechanically interlocked earth switch shall be provided for visual isolation from incoming cables and general earthing of the capacitor bank.

8.2.3 Surge Arrester

Surge arrester shall be provided for protection of capacitor banks against multiple over voltage strikes. Design shall be maintenance free and resistant to explosion and shatter.

8.2.4 Capacitors

Capacitors shall comprise several elements consisting of a non-chlorinated biodegradable dielectric of polypropylene film and aluminium foil which are connected in series and parallel groups and star or delta connections depending on the design. Capacitor tank shall be constructed from corrosion resistant material. Each capacitor shall be provided with discharge resistors to bring the residual voltage down to 75V in 10 minutes after switch off.

8.2.5 Inrush reactors

Inrush reactors shall be provided to reduce current surge when switching capacitor stages in parallel. Reactors shall be aluminium wound and resin encapsulated.

8.2.6 Vacuum Switch

Vacuum switches shall be designed for heavy duty capacitor switching.

8.2.7 Power factor Controller

Capacitor stages shall be automatically controlled by a digital power factor controller that can switch stages ON and OFF based on VAR load or power factor. Controller shall be microprocessor based and shall be insensitive to harmonics.

8.2.8 Capacitor Bank Protection

Protection for the capacitor shall include overload, under-voltage, overvoltage, external fuse and unbalance.

8.3 INSPECTION AND TESTING

The capacitor bank shall be subjected to inspection during fabrication and testing. Routine test shall be carried out in accordance with IEC 60871-1. Type test certificates shall be carried out in case certificates of type tests as defined in the IEC are not available.