APPENDIX B

REQUIREMENTS FOR ELECTRICAL EQUIPMENT AND INSTRUMENTATION
## Requirements for Electrical and Instrumentation Equipment

| Electrical Requirements for the Fuel Gas Trigeneration Plant | • Electrical system design and specification for all systems using electricity, including electrical reticulation and tie-in points and bonding (electrical continuity design):
| | - Fuel Gas Generator
| | - Black Start
| | - Backup power
| | - UPS
| | - Emergency power
| | - Fire system
| | - Cathodic Protection
| | - SCADA
| | - Instrumentation
| | - Sensors and actuators
| | - Telecommunications
| | - Others not mentioned here but applicable to the design
| | • Specifications of electrical power supply system and electrical insulation including compliance codes and design standards and requirement for all electrical designs and equipment within the electrical design
| | • Specifications of emergency power supply
| | • Single line diagrams for all electrical systems
| | • Requirement of information for:
| | - Interlocking method with instrumentation system;
| | - Fire alarm system
| | - Lighting system
| | - Consumers requiring emergency power and duration of it;
| | • Information for motor controls (local, central, etc) with reference to measurement required for process equipment as follows:
| | - Any other electrical equipment/system
| | - control, indication, metering and control logic philosophy of various drivers (with basic logic diagrams)
| | - data on control requirements like remote start-up, auto start-up for motors
| | • High, medium and low voltage requirements for each process equipment
| | • Implications of power failure and recommended process equipment emergency supply for all types of electrical loads which require emergency power
<p>| | • List of drives requiring emergency power feed along with their power consumption |</p>
<table>
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<tr>
<th><strong>Controls and Instrumentation</strong></th>
<th>The following information, drawings, specifications and/or data sheets shall be included in this section.</th>
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<td>• Information for alarm signal and interlocking system</td>
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<td>• List and specification for special control and measuring system</td>
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<td>• Preliminary layout for physical arrangement of operator stations in the central control room/control rooms including reference to the requirements regarding ventilation, air-conditioning, UPS, etc.</td>
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<td>• Recommendation on transmission system of instruments</td>
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• Special requirements for Process Control System, Emergency Shut Down (ESD) and Unlimited Safety System (USS)
• Requirements for Advanced Process Control (APC) and Optimization
• Calculation and sizing of all flow measuring devices
• List and basic specifications of instruments
• The specification/data sheets shall include the following items as minimum requirements:
  - Tag number
  - Name and service
  - Quantity;
  - Process equipment, system and location
  - P&ID number
  - Area classification requirement;
  - Applicable standards/codes;
  - Basic design data;
  - Process design data;
  - Materials of construction;
  - Instrument operating range;
  - Alternate operation modes (if any)
• Specification/data sheets shall be provided for but not limited to the following equipment:
  - Alarms;
  - Interlocks;
  - Analysers;
  - Flow instruments;
  - Pressure instruments;
  - Level instruments;
  - Level switches;
  - Tank gauging;
  - Transmitters;
  - Temperature instruments;
  - Orifice Plates, orifice flanges and other primary flow elements;
  - Control Valves;
  - Fire and gas detectors;
  - Safety relief valves;
  - Motor Operating Valve (MOV), Blowdown Valve (BDV), and Emergency Shut Down (ESD) valve;
- Junction boxes;
- Solenoid valves;
- Converters.

- Control Valve calculated and estimated valve size as per the Manufacturer Catalogue (competent manufacturers), flow rates and operating range, operating conditions, applicable physical properties of process and utility streams, action of the measured variable, flashing status of the fluid and position in case of air failure shall be provided in the specification sheets for all types of safety relief valves.

- Flow rates, set pressure, operating conditions relieving conditions with applicable physical properties of the emergency stream for each emergency case and type of the valve and selected and calculated orifice size shall be provided in the specification sheets for all types of safety relief valves.

- The estimated required layout for physical arrangement of control panels in the central control room/control rooms/technical rooms including size of ventilation, air conditioning, UPS, computers room and other facilities required described elsewhere, etc. shall be provided.

- Requirement/information for:
  - telecommunication system (Public Address System, telephone system, VOIP)
  - Closed Circuit Television System (CCTV)