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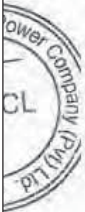
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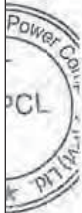
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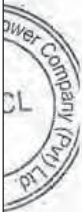
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B0.2.11.2.6 Monitoring of generation (Section 8.7)

For effective operation of the Transmission System, it is important that a **Generator's** declared availability is realistic and that any departures are continually fed back to the **Generator** to help effect improvement. The monitoring by the **NLDC** of Generating Unit output, and active and reactive reserve capacity, shall be carried out to evaluate the reliability and performance of plant.

The **NLDC** shall continuously monitor Generating Unit outputs and bus voltages (by SCADA). More stringent monitoring may be performed at any time, as detailed in the Testing Section, when there is reason to believe that a **Generator's** declared availability may not match the actual availability or declared output does not match the actual output.

Generators shall provide to the **NLDC** hourly generation summation outputs where no automatically transmitted metering or SCADA equipment exists.

The **Generator** shall provide other logged readings that the **NLDC** may reasonably require, for monitoring purposes where SCADA data is not available.

Generators shall submit data to **NLDC** as listed in Data Registration Section, termed as Frequency and Voltage Management.

B0.2.11.2.7 Contingency planning (Section 9)

Total System Blackout (Section 9.3.1)

NLDC shall instruct all relevant **Generators** having Power Stations with Black Start capability to commence their pre-planned Black Start procedure.

Remark: The Maitree-STPP shall **not** have Black Start capability.

Partial Transmission System Blackout (Section 9.3.2)

NLDC shall ensure with the **Licensee** and **Users** that security of the healthy part of the Transmission System is maintained.

NLDC and the **Licensee** shall gradually extend the healthy system to provide start-up power to appropriate Generating Units.

NLDC and the **Licensee** with close coordination with Distribution Utilities and **Generators** shall gradually restore demand to match generation as it becomes available.

All **Users** shall take care to ensure load generation balance is maintained at all times under **NLDC's** direction.

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Special Consideration (Section 9.5)

During the restoration process following Transmission System blackout conditions, normal standards of voltage and frequency shall not apply.

B0.2.11.2.8 Protection (Section 12)**General Principals (Section 12.3)**

No item of electrical equipment shall be allowed to remain connected to the Transmission System unless it is covered by appropriate protection aimed at reliability, selectivity, speed and sensitivity. Guidelines mentioned in protection manuals may be kept in view.

All Users shall co-operate with the Licensee to ensure correct and appropriate settings of protection to achieve effective, discriminatory removal of faulty equipment within the time for target clearance specified in this Section.

Protection settings shall not be altered, or protection bypassed and/or disconnected without consultation and agreement of all affected Users. In the case where protection is bypassed and/or disconnected, by agreement, then the cause must be rectified and the protection restored to normal condition as quickly as possible. If agreement has not been reached the electrical equipment will be removed from service forthwith.

Fault Clearance Times (Section 12.5)

From a stability consideration the maximum fault clearance times for faults on any User's system directly connected to the Transmission System, or any faults on the Transmission System itself, are as follows:

Target Clearance Times:

- i. 400 kV : 100 ms
- ii. 230 kV : 160 ms
- iii. 132 kV : 160 ms.



Slower fault clearance times for faults on a Users system may be agreed to but only if, in the Licensee's opinion, system conditions allow this.

Generator Requirements (Section 12.6)

All Generating Units and all associated electrical equipment of the Generator connected to the Transmission System shall be protected by adequate and coordinated protection so that the Transmission System does not suffer due to any disturbance originating from the Generating Unit.

In the event of failure of the protection systems provided to meet the fault requirements detailed above, backup protection shall be provided by the Generator with a fault clearance time not slower than 400ms for faults on the Generating Unit's HV connections. The protection shall also cover EHV lines and transformers to the standards as for the Transmission System and

circuit breaker fail, pole slipping, loss of excitation, power system stabilizer and negative phase sequence tripping.

Transmission Line Requirements (Section 12.7/12.7.1/12.7.3)
Every 400 kV Line and 230 kV Line taking off from a Power Station or a substation shall have main protection and backup protection as mentioned below. The **Licensee** shall notify **Users** of any changes in its policy on protection from time to time.

- Two distance protections plus directional earth-fault protection (in directional comparison scheme) shall be provided as the Main-1 and Main-2 protection respectively.
- One stand alone directional 3-phase or 2-phase over-current relay and one directional earth-fault relay shall provide the backup protection.
- Three pole and/or single pole single shot auto-reclosing equipment shall be fitted, as appropriate, as considered by the licensee. All auto-reclosing equipment will be made inoperative for three phase trip-out and/or back-up protection operation.
- Both distance and directional earth-fault functions shall have compatible communication aided transfer trip scheme.

For short transmission lines Line Differential Protection along with backup Directional normal, Directional time-lag and/or Non-Directional Over-current and Earth-fault protection shall be provided as an appropriate protection scheme.

Relay Panels for the protection of lines of the **Licensee** taking off from a Power Station shall be owned and maintained by the **Licensee**. **Generators** shall provide space, connection facility and access to the **Licensee** for such purpose.

The **Generator** shall ensure that all common facilities needed for installing required protective relaying are made available to the **Licensee**.

Transformer Requirements - Generating Station/Transmission System (Section 12.9.1)

All windings of auto-transformers and power transformers of EHV class shall be protected by differential relays and REF relays as main protection. In addition there shall be one backup time lag 3-phase Over-current and Earth-fault protection relay. For parallel operation such backup protection shall have directional feature. For protection against heavy short circuits, the Over-current and Earth-fault relays should incorporate a high set instantaneous element. In addition to electrical protection, gas operated relays, winding temperature protection and oil temperature protection shall be provided. Over-voltage, thermal overload and over-fluxing protection should also be provided.



8140A01/FICHT-15702705-v5
 BIFPCL/EPC-Main Plan/2015/1/

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Substation Busbar and Fire Protection (Section 12.10.1/12.10.2)

All Users shall provide adequate main and backup bus zone protection incorporated with Local Breaker Backup (LBB) or Breaker Fail Protection (BFP) for busbars in all 400 kV, 230 kV and 132 kV class substations.

Adequate precautions shall be taken and protection shall be provided against fire hazards to all Apparatus of the Users conforming to relevant Bangladesh Standard Specification and/or provisions in the Electricity Rules, 1937 and amendments thereof and other standard engineering practices.

Data Requirements (Section 12.11)

Users shall provide the Licensee with data for this Section as specified in the Data Registration Section.

B0.2.11.2.9 Testing (Section 14)**Introduction (Section 14.1)**

This Section specifies the responsibilities and procedures for arranging and carrying out Tests which have (or may have) an effect on the Transmission System or the Generator's or Distributor's systems.

Objective (Section 14.2)

The objective of the Section are to establish whether Generating Units can operate within their Generation Schedule and Dispatch parameters as registered under the Data Registration Section and that the Generator and Distributor comply with the Connection Section. It shall also establish whether each Generating Unit's declared availability capacity is as declared and that the requirements of the provisions of frequency, voltage management and reserve capability are met in accordance with the provisions of the Grid Code.

B0.2.11.2.10 Performance standards for transmission (Section 17)**Purpose and Scope (Section 17.1.1/17.1.2)***Purpose:*

- a) To ensure the quality of electric power in the Grid.
- b) To ensure that the Grid will be operated in a safe and efficient manner and with a high degree of reliability; and
- c) To specify safety standards for the protection of personnel in the work environment

Scope of Application:

This Chapter applies to all Grid Users including:

- a) the Licensee
- b) the System Operator/ NLDC
- c) generators



- d) distribution utilities, and
- e) any other entity (e.g. owners of HVDC converter, large furnaces, etc.) with a User System connected to the Grid.

Power Quality Standards (Section 17.2)

Power Quality Problems (Section 17.2.1)

For the purpose of this Article, Power Quality shall be defined as the quality of the voltage, including its frequency and the resulting current that are measured in the Grid during normal conditions.

A Power Quality problem exists when at least one of the following conditions is present and significantly affects the normal operation of the System:

- a) The System Frequency has deviated from the nominal value of 50 Hz.
- b) Voltage magnitudes are outside their allowable range of variation.
- c) Harmonic Frequencies are present in the System
- d) There is imbalance in the magnitude of the phase voltages.
- e) The phase displacement between the voltages is not equal to 120 degrees.
- f) Voltage Fluctuations cause Flicker that is outside the allowable Flicker Severity limits, or
- g) High-frequency Over-voltages are present in the Grid.

Frequency Variations (Section 17.2.2)

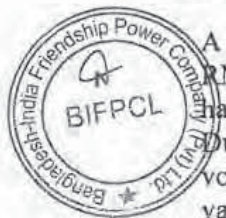
The nominal fundamental frequency shall be 50 Hz. The control of System frequency shall be the responsibility of the System Operator. The System Operator shall maintain the fundamental frequency within the limits of 49.0 Hz and 51.0 Hz during normal conditions.

Voltage Variations Section 17.2.3)

For the purpose of this Section, Voltage Variation shall be defined as the deviation of the root-mean-square (RMS) value of the voltage from its nominal value, expressed in percent. Voltage Variation will either be of short duration or long duration.

A Short Duration Voltage Variation shall be defined as a variation of the RMS value of the voltage from nominal voltage for a time greater than one-half cycle of the power frequency but not exceeding one minute. A Short Duration Voltage Variation is a Voltage Swell if the RMS value of the voltage increases to between 110 percent and 180 percent of the nominal value. A Short Duration Voltage Variation is a Voltage Sag (or Voltage Dip) if the RMS value of the voltage decreases to between 10 percent and 90 percent of the nominal value.

A Long Duration Voltage Variation shall be defined as a variation of the RMS value of the voltage from nominal voltage for a time greater than one minute. A Long Duration Voltage Variation is an Under-voltage if the RMS value of the voltage is less than or equal to 90 percent of the nominal voltage. A Long Duration Voltage Variation is an Overvoltage if the RMS



value of the voltage is greater than or equal to 110 percent of the nominal value.

The Grid Owner and the System Operator shall ensure that the Long Duration Voltage Variations result in RMS values of the voltages that are greater than 95 percent but less than 105 percent of the nominal voltage at any Connection Point during normal conditions.

Harmonics (Section 17.2.4)

For the purpose of this Section, Harmonics shall be defined as sinusoidal voltages and currents having frequencies that are integral multiples of the fundamental frequency. The Total Harmonic Distortion (THD) shall be defined as the ratio of the RMS value of the harmonic content to the RMS value of the fundamental quantity, expressed in percent.

The Total Demand Distortion (TDD) shall be defined as the ratio of the RMS value of the harmonic content to the RMS value of the rated or maximum fundamental quantity, expressed in percent. The Total Harmonic Distortion of the voltage and the Total Demand Distortion of the current at any Connection Point shall not exceed the limits given in Tables 17-1 and 17-2, respectively.

Harmonic Voltage Distortion

Voltage Level	THD*	Individual	
		Odd	Even
400 kV	5%	1.0%	0.5%
132-230 kV	2.5%	1.5%	1.0%
66 kV	3.0%	2.0%	2.0%

* Total Harmonic Distortion

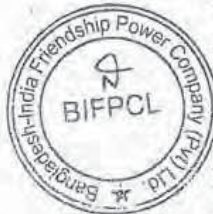
Table 17-1: Maximum Harmonic Distortion Factor

Harmonic Current Distortion

Voltage Level	TDD*	Individual	
		Odd	Even
400 kV	1.5%	1.0%	0.5%
132-230 kV	2.5%	2.0%	0.5%
66 kV	5.0%	4.0%	1.0%

* Total Demand Distortion

Table 17-2: Maximum Harmonic Distortion



T.H.D of the line-to-line terminal voltage for the Generator shall be as per latest IEC 60034-3 (clause 9.11.2 - Limits (Total Harmonic Distortion (THD) for synchronous machines) will be accepted. As per this clause of IEC, it shall be limited to 5%. However, at the 400 kV and 230 kV grid connection points the requirements of the specification Section B0.2.11.2.10 shall apply.



Voltage Unbalance (Section 17.2.5)

For the purpose of this Section, the Negative Sequence Unbalance Factor shall be defined as the ratio of the magnitude of the negative sequence component of the voltages to the magnitude of the positive sequence component of the voltages, expressed in percent. For the purpose of this section, the Zero Sequence Unbalance Factor shall be defined as the ratio of the magnitude of the zero sequence components of the voltages to the magnitude of the positive sequence component of the voltages, expressed in percent. The maximum Negative Sequence Unbalance Factor at the Connection Point of any User shall not exceed one (1) percent during normal operating conditions.

The maximum Zero Sequence Unbalance Factor at the Connection Point of any User shall not exceed one (1) percent during normal operating conditions.

Voltage Fluctuation and Flicker Severity (Section 17.2.6)

For the purpose of this Section, Voltage Fluctuations shall be defined as systematic variations of the voltage envelope or random amplitude changes where the RMS value of the voltage is between 90 percent and 110 percent of the nominal voltage. For the purpose of this Section, Flicker shall be defined as the impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.

In the assessment of the disturbance caused by a Flicker source with a short duty cycle, the Short Term Flicker Severity shall be computed over a 10-minute period. In the assessment of the disturbance caused by a Flicker source with a long and variable duty cycle, the Long Term Flicker Severity shall be derived from the Short Term Flicker Severity levels.

The Voltage Fluctuation at any Connection Point with a fluctuating demand shall not exceed one percent (1%) of the nominal voltage for every step change, which may occur repetitively. Any large Voltage Fluctuation other than a step change may be allowed up to a level of three percent (3%) provided that this does not constitute a risk to the Grid or to the System of any User. The Flicker Severity at any Connection Point in the Grid shall not exceed the values given in Table 17-3.

	Short Term	Long Term
132 kV and above	0.8 unit	0.6 unit
below 132 kV	1.0 unit	0.8 unit

Table 17-3: Maximum Flicker Severity

Transient Voltage Variations (Section 17.2.7)

For the purpose of this Section, Transient Voltages shall be defined as the high-frequency Over-voltages that are generally shorter in duration compared to the Short Duration Voltage Variations. Infrequent short-duration peaks may be permitted to exceed the levels specified in Section 17.2.4 for harmonic distortions provided that such increases do not



compromise service to other End-users or cause damage to any Grid equipment. Infrequent short-duration peaks with a maximum value of two (2) percent may be permitted for Voltage Unbalance, subject to the terms of the Connection Agreement or Amended Connection Agreement.

B0.2.11.2.11 House load operation (not requested by the Grid Code of Bangladesh)

Each Unit shall successfully go to house load operation in the event of disconnection or complete isolation of such Unit from the Grid.

Each Unit shall be capable of performing house load operation up to a maximum of 2 hours. A Unit that has achieved house load operation shall not be shut down without the prior consent of the NLDC.

1. Within such time, each Unit on house load operation shall be ready to be resynchronized to the Grid System and able to increase output in the usual manner.
2. In the event the Grid System is not energized, each Unit on house load operation shall have the capability to energize a dead bus and to start the other Unit, when instructed by the NLDC. Subsequently, upon instruction by the NLDC, such Unit shall be able to increase output in the usual manner.

B0.2.12 Facility technical limits

The following sections describe the minimum requirements regarding the facility.

B0.2.12.1 Unit start

The facility shall be able to achieve the following operating levels within the same period (in minutes) specified in the following table.

Conditions	Boiler firing to turbine start	Steam turbine start to synchronous	Notice to start to steam turbine synchronous	Synchronous to full load	Total
Cold start after more than 48 hrs outage	TBD	TBD	12 hours	TBD	TBD
Warm start after 8 to 48 hrs shutdown	TBD	TBD	4 hours	TBD	TBD
Hot start after 8 hrs shutdown	TBD	TBD	3 hours	TBD	TBD

Table B0-3: Required start-up times (minutes)¹

¹ To be determined by the Tenderer



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B0.2.12.2 Despatch ramp rates

Ramp rates of 3%/min to 5%/min are expected for the Power Plant when operating between 30% and 100% BMCR. Ramp rates of less than 5%/min are subject to Employer's approval.

The facility shall be able to achieve the following despatch ramp rates as specified in the following table:

Despatch ramp rates		(Excluding Pulverizer changing over time)	
		Loading (MW)	Ramp rates (MW/min)
Cold start	(0 to 7%)	0 – 42	TBD
	(7 to 30%)	42 – 180	TBD
	(30 to 50%)	180 – 300	TBD
	(50 to 75%)	300 – 450	TBD
	(75 to 100%)	450 – 660	TBD
Warm start	(0 to 7%)	0 – 42	TBD
	(7 to 30%)	42 – 180	TBD
	(30 to 50%)	180 – 300	TBD
	(50 to 75%)	300 – 450	TBD
	(75 to 100%)	450 – 660	TBD
Hot start	(0 to 7%)	0 – 42	TBD
	(7 to 30%)	42 – 180	TBD
	(30 to 50%)	180 – 300	TBD
	(50 to 75%)	300 – 450	TBD
	(75 to 100%)	450 – 660	TBD

Despatch ramp rates (per Unit)²

B0.2.13 Environmental impact requirements

Air pollution

The permissible exhaust gas emissions shall comply with the stipulations of the generating license granted. Compliance for the following pollutants shall be guaranteed and proved:

Emission	Unit	Maximum Threshold
Total PM	mg/Nm ³	50
Sulphur dioxide (SO ₂)	mg/Nm ³	200
Nitrogen oxide (NO _x)	mg/Nm ³	510

Table B0-5: Emission limits

Note:

- NO_x refers to oxides of nitrogen, referenced to NO₂.

Reference conditions for NO_x, SO₂, and particulates are 6 % O₂, dry (i.e. zero moisture), 0 °C and 1013 mbar atmospheric pressure, that means, unit for emissions is mg/Nm³

² To be determined by the Tenderer



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The stack height shall follow the requirements of the Environment Conservation Rules, 1997 of Bangladesh.

Water pollution

Permissible emission limits for aqueous discharges into the river via the Plant Water Discharge System shall comply with the Waste Water Effluent Standards, see Technical Schedule of **Section B0** and IFC EHSG - TPP - Table 5 - Effluent Guidelines. If there are differences in effluent limits in the two guidelines the more stringent limit should be applied. But limit of TDS with 2100 ppm shall not be followed.

The findings of the Environmental Impact Assessment (EIA) shall be used for Plant design.

Other waste water which is not allowed to be discharged to the requirements waste water treatment plant will have to be disposed externally.

Soil contamination

The Plant should be designed, operated and maintained in such a way to prevent any soil contamination by oil and chemical spillage during subsequent operation and maintenance of the Plant.

Permissible noise levels

The Plant shall be designed and constructed inter alia in accordance with IFC Environmental, Health and Safety Guideline Thermal Power Plants (EHSG-TPP) to reduce the operating noise level as much as possible. No individual within the boundary of the Site shall be exposed to a noise level exceeding the limits stated in the EHSG-TPP and "The Sound Pollution (Control) Rules, 2006".

Far field noise under normal operation of the Plant measured along the Site boundary of the Plant towards the Township shall not exceed 50 dB(A) during daytime and 40 dB(A) during night-time.

For any other point of the Site boundary of the Plant the noise pressure level shall not exceed 60 dB(A) during daytime and 50 dB(A) during night-time. Day time is defined from 6:00 am to 9:00 pm. Night time is defined from 9:00 pm to 6:00 am.

During the engineering phase the Contractor shall award an independent Third Party to conduct noise propagation calculation to prove that the permissible noise levels at the Plant boundary are met.

In addition the statutory requirements of Bangladesh shall be followed as far as stricter as the other standards, such as EHSG-TPP.

Furthermore the following maximum noise pressure levels shall be not exceeded:

dB(A)



- At 1 m horizontal distance from equipment/enclosures and 1.5 m above operating floor 85
- Within turbine building 90 (Note 1 & 2)
- Steam generator 90 (Note 1)
- Within central control rooms in power plants 55.

Notes:

1. At normal operation
2. Generally at maximum 88 dB(A), exceptions are the turbine stop valve and control valves 95 dB(A) and turbine drive boiler feed pumps 97 dB(A).
3. Noise level from non continuous operating valves (like pressure control valve, water separator drain control valve, etc.) shall be limited to 90 dB(A).
4. The noise level for safety valves including ERV shall be limited to 115dBA for the safety valves provided with silencer as per OSHA standard. Noise level around Mill will be 90 dBA.
5. Noise level at the boundary fence as specified must be complied with.

High noise areas (areas with noise levels >85 dB(A)), which require that personal noise protecting gear shall be used when working in such high noise areas, shall be marked.

Electromagnetic Field (EMF)

In accordance with the EHSG-TPP the occupational EMF exposure shall be prevented or minimized.

All technical measures and the required equipment necessary to fulfil the EHSG-TPP shall be provided by the Contractor. Inter alia areas with expected elevated EMF levels shall be identified and marked.

Fire and explosion, electrical and chemical hazards

In accordance with the EHSG-TPP all technical measures to prevent, minimize and control physical, electrical and chemical hazards shall be include in the Contractor's scope of services and supplies.

B0.2.14 Provenness Criteria for Critical Equipments and Sub-systems shall be as per Annexure-I of B0 (Refer Amendment no.05 to Bidding Documents).

B0.3 Supplies and Services**B0.3.1 General**

The scope of this specification covers all supplies and services required for meeting the purpose of the Plant, even if these are not expressly mentioned in the following.

The works include the following main components, where the detailed scope of supply is given in the corresponding Sections as listed below:

- **Section B1:** Steam generator plants
- **Section B2:** Steam turbine generator plants
- **Section B3:** Air and flue gas systems
- **Section B4:** Fuel and Ash handling system
- **Section B5:** Plant Water and Cooling Systems
- **Section B6:** Water treatment systems
- **Section B7:** Electrical works
- **Section B8:** Instrumentation and control works
- **Section B9:** Civil Works
- **Section B10:** Electrical Works 400/230 kV Substation
- **Section B11:** Jetty
- **Section B12:** Auxiliary plant systems

The corresponding Annexes and Attachments are contained in **Part C**.

The relevant costs of these supplies and services to be given in the price schedules are to be assigned corresponding to the individual items concerned for each of the sections. The costs of the common equipment and services have to be included in the corresponding Section prices.

B0.3.2 Scope of engineering services

The Engineering services refer to the complete specified Plant and covers following services:

- **Basic and detail engineering**
- **Permit engineering**
The Contractor shall actively participate in drawing-up of all required licensing applications.

All services shall be performed by the Contractor to affect the required permits to commence the works and operate the Plant, including but not limited to:

- preparation of all documents as required according to the pertinent laws
- clarifications with authorities
- participation in all clarification meetings
- construction permits
- boiler and pressure vessel approvals
- water/waste water permits
- operation permits
- fire fighting approvals
- and all other services as required.



Furthermore, all other required engineering and other services to meet the purpose of the Project and the agreed project time schedule shall be executed by the Contractor.

B0.3.3 Deputation of Engineers during the Warranty Period

At least seven (7) English speaking graduate engineers, (3 operation experts, 1 Turbine & auxiliary expert, 1 Boiler & auxiliary expert, 1 for I&C, 1 for Generator and Switchyard area expert), with adequate knowledge and at least fifteen years of relevant experience of pulverised coal fired power plant of 500 MW and above unit size including two years of relevant experience in power plant of same type and technology being offered here from the Contractor, shall be permanently at site during the Warranty Period that means two months prior to PAC of first unit of the Plant upto end of warranty period of second unit. They shall be competent to advise and lead the Employer's staff on all aspects of engineering, operation and maintenance.

B0.3.4 Common equipment and services

The following supplies and services are to be included in the corresponding Section prices:

B0.3.4.1 General

- Material and personnel costs for tests and inspections which are mandated in legislation

Employer/employer representative/TPA will be responsible for their respective expenses in connection with inspection, examination and testing.

- Material and personnel costs for site inspections
- Declaration of conformity with requirements from Bangladesh and markings for all machines
- Engineering design of complete supplied equipment including interface coordination
- All as-built documents (on data carriers; data formats as requested by the Employer)
- Quality control plan and safety plan
- Complete documentation as set out in the tender specification
- Operating manual (5 hardcopies and 3 electronic copies)
- Detailed operating and maintenance instructions/manual (5 hardcopies and 3 electronic copies)
- A maintenance program for all equipment of the Plant instructions (5 hardcopies and 3 electronic copies)



- For all documents softcopy format shall be searchable pdf, however in addition all drawings, diagrams like P&IDs shall be supplied in ACAD or other editable format, and all lists in Excel format.
- All insurances, such as, but not limited to:
 - transport insurance, incl. marine cargo insurance
 - installation all risks,
 - third party liability,
 - automobile liability,
 - M.V. Policy for: motor vehicles, private cars & commercial vehicles,
 - CPM policy for heavy construction equipment,
 - Workmen's Compensation,
 - Employer's liability,
 - Group personal insurance, for contractor's & subcontractor's employees.

B0.3.4.2 Mechanical

- All necessary pipelines, valves, actuators
- All required line warm-up systems
- All connection and adaptation works for-tie-in into general supply systems
- All necessary vents, drains and rinsing connections as well as tundishes with covers, as far as possible aggregated to common groups of on operating level
- All connection elements, screws, bolts, nuts, including gaskets and seals as necessary
- All temporary installations required for tie-in measures including post-weld heat treatment complete etc.
- All temporary pipework as required during connection measures
- Check of required existing structures, plant components and systems and their rehabilitation where they lie within the scope of supply, or definition of required measures in good time if they lie outside of the scope of supply
- All necessary support structures, hangers etc.
- All necessary base frames, mounting plates, grouted in parts, rag bolts, covers etc.
- All required steel parts embedded in concrete
- All couplings and coupling guards for electric motors and other drives
- All necessary lifting equipment and hoists (hooks and provisions for chain blocks to be provided for repair work where loads exceed 50 kg, hoists to be provided for repair work where loads exceed 200 kg, and electrical operated hoist for loads exceeding 2,500 kg)
- Required safety equipment, pressure relief valves etc.
- All thermal and noise insulation including cladding as well as any other noise attenuation measures
- Stairways, ladders, platforms, galleries and walkways to all plant components, including escape routes as necessary



- All necessary steel structures, stairs, ladders on platforms weather protection
- All required ventilation or air conditioning equipment for safe operation of mechanical and electrical equipment, to be supplied
- All necessary corrosion protection measures for plant components and equipment stored or mounted on site up to the time of reliability test run
- Complete primer and top coatings conforming to colour code, clarified with the Employer
- Necessary noise abatements measures
- All required freeze protection and electric trace heating for outdoor installations
- Complete labelling of all plant components according to the Employers system and in plain language
- All fire protection measures
- All necessary lubrication systems
- Initial lubricant filling and sufficient lubricants for commissioning and reliability test run, minimization of lubricant types by screening and coordination with the Employer
- Water and demineralised water for pre-commissioning and commissioning activities,
- Provision of all connections and temporary pipework for acid cleaning, steam purging of the live steam line and flushing / cleaning of systems as necessary
- Flushing of all other lines including disposal of the effluents; protection with wood and/or plastic at all instrumentation and appendages to be installed during construction
- All standard accessories and auxiliary equipment which normally form part of the scope of supplies
- All necessary tests, inspections and works acceptances as well as all certificates and reports of these
- Exchange of filter elements following reliability test run
- Removal of temporary strainers
- Valve trims for purging and subsequent exchange
- Removal of any unused material
- Scaffolding for all work above ground level
- Necessary connection points for on line condition-based monitoring equipment.



B0.3.4.3 Substation control and monitoring system

At least but not limited to:

- all field equipment such as bay control units, bay protection equipments (described under chapter "Substation Control and Monitoring System) to be installed at the substation. The field equipment for the substation shall be interconnected by separate IEC 61850 fiber optic station busses in ring configurations. (The use of an IEC 61850 optical fiber link is required for all connections of equipments which directly interact with the station bus (the switches). In the particular case where, for example, the IEDs are wired to the BCU and only the latter is connected to the station bus, electrical links (preferably IEC 61850) are allowed for wiring connection of the IEDs with the BCU but an IEC 61850 optical fiber link between BCU and switches is required.
- all equipment to control and monitor the auxiliary equipment of the substation connected to the SCMS by redundant fiber optic links
- common bay unit / station computers
- operator and engineering workstations with TFT monitors and printers to be installed at the substation control room
- all equipment necessary for the implementation of an OPC server/client architecture between the substation and the Power Plant control rooms in order to allow the supervision and monitoring of the substation from the Power Plant DCS facilities. The OPC-server configuration shall be redundant
- Maintenance / service laptop which shall also be used for protection and disturbance analysis by respective log-in.
- data communication gateway to the National Load Dispatch Center (NLDC),
- energy meters for active energy (kWh) with accuracy of 0.2 S and for reactive energy (kVarh) with an accuracy of 0.5 S for tariff metering shall be provided for each outgoing line.

B0.3.4.4 Electrical



- All necessary electrical drives
- Complete installation material, that is wiring, cabling and piping material, all needed fastenings, conduits, brackets and other supports
- All required junction boxes and cubicles
- All field control boxes
- All cubicles, junction boxes, marshalling racks, terminal boxes, etc.
- Complete labelling of electrical equipment (also inside of cabinets)
- Lightning protection
- Electrical earthing of the equipment
- Cable and cable trays
- All necessary cables and wires for power, AC and DC instrument transformers, control, measuring, signals, etc.



- All necessary number plates for identifying the cables (numbering code to be determined)
- All necessary fixing materials
- All necessary fire protection materials for making good the cable openings through walls and ceilings as well as between switchgear and control, measuring, recording and switchgear cubicles, operating panels and desks, etc.,
- All necessary plastic protecting tubes for the cable runs
- All necessary materials for laying the cables in the ground
- All necessary cable connections including compression cable lugs, fixing and clamping materials, etc.
- All necessary cable sealing ends and cable connecting sleeves including fixing materials
- All necessary compression connectors.

B0.3.4.5 Instrumentation and Control

- All necessary control systems and auxiliaries
- All measurements and field control loops (thermometers, pressure gauges, transmitters, sensors, analyzers, local regulating devices, etc.) as well as all instruments for reliability test and checks for the duration of the performance tests
- Other special instruments/ systems like acoustic steam leak detection system (ASLD), acoustic pyrometer, communication systems, ambient air quality monitoring system (AAQMS), effluent quality monitoring system (EQMS)
- Complete installation material, that is wiring, cabling and piping material, all needed fastenings, conduits, brackets and other supports
- All required junction boxes and cubicles
- All field control boxes
- All instruments mounted on instrumentation racks
- All cubicles, junction boxes, marshalling racks, terminal boxes, etc.
- Signal exchange between local control system and DCS as well with instruments/control systems of other lots
- Complete labelling of I&C equipment (also inside of control cabinets)
- Lightning protection
- Electrical earthing of the equipment
- Clarification of all logic interconnections: sequence, interlocking, protection, safeguarding for coordinated operation/start-up/shut down of individual items of equipment
- Cable and cable trays
- All necessary cables and wires for power, AC and DC instrument transformers, control, measuring, signals, etc.
- All necessary number plates for identifying the cables (numbering code to be determined)
- All necessary fixing materials

- All necessary fire protection materials for making good the cable openings through walls and ceilings as well as between switchgear and control, measuring, recording and switchgear cubicles, operating panels and desks, etc.
- All necessary plastic protecting tubes for the cable runs
- All necessary materials for laying the cables in the ground
- All necessary cable connections including compression cable lugs, fixing and clamping materials, etc.
- All necessary cable sealing ends and cable connecting sleeves including fixing materials.

B0.3.4.6 Civil

- All necessary surveying works including all soil investigations required for safe and reliable design and construction
- Preparation of site, demolition works, removal of underground obstacles
- Earthworks, drainage, excavation and refilling works
- Piling of structures to prevent subsidence
- Concrete and reinforced concrete works, masonry and earthing
- Concreting of maintenance platforms and lay-down areas
- Water proofing works for pressing and non-pressing water
- Fire protection during construction
- Roofing; non asbestos
- Plumbing
- Facade works/glazing works; non asbestos
- Non-load bearing walls/installation partitions/dry construction works
- Metalwork and blacksmith work/raised flooring/doors and gates/sheet metal work
- Flooring work
- Fire protection with plumbing; fire protector
- Painting/varnishing
- Craneway works
- Room air conditioning systems, where required, e.g. control cubicle rooms, etc.
- Potable water, service water and waste water
- Housekeeping during construction
- Staff facilities during construction
- Transport of all dumping material to dump locations
- Performance and interpretation of soil bearing tests
- Temporary fencing of construction site
- Site offices for Employer and Employer's representatives
- The Contractor's site office
- Landscaping of areas required under this contract.



B0.3.5 Packaging and transportation

- Suitable packaging and transportation of the entire scope of supplies,
- free construction site, on-site transportation and temporary storage including inspections and, if necessary, ensuring the prerequisites for transportation
- Disposal of packing and transportation material
- Customs clearance
- Crane or hoisting facilities at seaport and site
- Transportation to site
- Unloading at site.

B0.3.6 Erection, commissioning and testing

- Complete erection of the scope of supply up to operational readiness: This includes mobilization and provision of the required supervisory staff, skilled and unskilled personnel, as well as of installation scaffolding, cranes, hoists, equipment and materials, personnel accommodation, prescribed tests and inspections.
- Commissioning and optimization of all plant components as well as conducting all necessary measurements.
- Supervision of erection, commissioning and Reliability Test Run of complete supplied equipment.
- All testing as specified.

B0.3.7 Training

The Contractor shall provide comprehensive training for Employer's engineering, operating and maintenance staff (Employer's staff) covering all aspects of the Power Plant equipment and systems and operation and maintenance.

The Contractor shall train, instruct and supervise the Employer's staff to an adequate standard of knowledge and capability for good trouble shooting, repair and of the plant equipment as well as to an adequate standard for safe and efficient commercial operation of the Plant.

The training shall at least include:

- ~~training at manufacturer's works during the assembly of the major plant items~~
- classroom and hands on training
- on the job training during erection, commissioning and reliability test run; and
- simulator training.

The Contractor shall submit the training plan for the classroom, on the job and simulator training including schedule, place, content of lectures etc. for



the Employer's approval no less than six (6) months in advance to the cold commissioning.

Post training assessment shall be carried out and documented. In case the results of the training are below the expectations, which have been agreed upon by both Contractor and Employer before training, the respective training modules shall be repeated in an improved way and the related cost for the repeated training shall be borne by the Contractor. In case the results are below expectations (to be agreed upon by both Contractor and Employer before training) the respective training modules shall be repeated in an improved way.

B0.3.8 Spare parts, tools, appliances, and consumables

B0.3.8.1 Spare parts

Reference is made to Amendment No 3 and Annexure I to Amendment No.3 (both already published on BIFPCL's Website).

B0.3.8.2 Tools and appliances

The following tools and appliances shall be supplied under this Contract for use by the Employer:

- a. two (2) sets of all special tools and gauges required for the operation and maintenance of the Plant
- b. one (1) set of special lifting and handling appliances required for the operation and maintenance of the Plant
- c. suitable storage bins/racks/shelves for the above.
- d. Standard tools according to the relevant Technical Schedules.



For I&C e.g. following special tools and gauges shall be provided (including but not limited): pressure calibrator, portable pressure source, calibration pressure pump, deadweight testers, precision pressure gauges, manometers, temperature baths/calibrator, multimeters, RTD simulator/tester, thermocouple calibrator precision source and simulation equipment, direct temperature indicating meter, standard pH-tester, multi function process calibrator, loop calibrator, voltage/current/temperature reference generator, intrinsic safe multifunction calibrator, depth gauge, feeler gauge, dial indicators, portable handheld tachometers, double channel digital storage oscilloscope, conductivity meter, electronic stethoscope, general purpose vibration meters, hand-held IR thermometers, humidity & moisture meters, hazardous and toxic leak detectors, field meters (leak and emission detectors), laser distance meters, US distance estimators, US handheld flow meters, US handheld level meters, portable sound level meter, anemometer, barometer, stop watch, standard technician tools etc.



One set of tool shall be handed over in new condition and one set shall be used by the Contractor for erection/commissioning.

Each tool or appliance is to be clearly marked with its size and/or purpose.

The tools and appliances supplied may have been used for erection and commissioning purposes by the Contractor, but shall be handed over in good working order.

Each set of tools and appliances under category (a) and (d) shall be suitably arranged in fitted boxes of mild steel construction, the number of boxes being determined in relation to the layout of the Plant and equipment in question. If the weight of any box and its contents should be such that it cannot conveniently be carried, it shall be supported on steerable rubber-tyred wheels.

Each cabinet and box shall be painted, fitted with a lock and clearly marked in white letters with the name of the item of equipment for which the tools and appliances contained are intended.

Suitable storage racks shall be provided for all portable lifting tackle in this contract.

Suitable lifting lugs, ears or ring bolts, or tapped holes for lifting rings shall be provided on all equipment items where the weight exceeds 15 kg.

All lifting tackle shall be stamped with a unique identification number and safe working load. A test certificate from an approved authority shall be supplied for each item of lifting tackle.

The Contractor shall provide a schedule of all lifting tackle and tools and appliances being supplied, for the approval of the Employer/Engineer.

The Contractor shall provide all runway beams, trolleys, lifting blocks, special slings etc. necessary for the safe and efficient handling and maintenance of the works. Particular attention shall be paid to high level equipment such as deaerators. Electrically operated hoists and runway trolleys shall be provided for all lifts in excess of 2.5 tons.

The tools and appliances with the appropriate storage racks, cabinets and boxes shall be handed over to the Employer at the time of taking over of the unit.

Where the Contract includes site erection, any special tools or appliances required solely for erection shall be provided by the Contractor for his own use and shall remain the property of the Contractor.

One set of tools shall be handed over in new condition and one set shall be used by the Bidder/Contractor for erection/commissioning.

For handling of the generator stator the following alternative is also acceptable: Tandem/combined operation of two turbine hall EOT cranes for which the necessary arrangements shall be provided. In such case the combined capacity of two EOT cranes shall not be less than the 105% of weight of generator stator, including the weight of lifting beam with swiveling equipment and slings. Main Turbine hall building civil and structural design shall be done accordingly.

Special lifting and handling appliances may be used by the Contractor for erection and commissioning, but shall be refurbished by the Contractor and shall be handed over to the Employer as per in new condition.

B0.3.8.3 Consumables

The Contractor shall supply all chemicals, reagents, resins, lubricants, grease, filters and consumable items for operation up to COD including top up requirement at the time of issuance of PAC/ declaration of COD. All lubricants proposed for the Plant operation shall be suitable for all operating and environmental conditions that will be met on site consistent with good maintenance procedures as instructed in the maintenance manuals.

All types of chemicals, consumables, lubricants and grease shall be readily obtainable locally and a number of different types shall be kept to a minimum. For each type and grade of lubricant recommended, the Contractor shall list at least three equivalent lubricants manufactured by alternative companies.

The Contractor shall submit to the Employer the list and schedule of lubricants, greases, chemicals and consumables items including items qualities and quantities required per month of the Plant operation for the Employer's approval eighteen (18) months prior scheduled COD of the 1st Unit.

B0.3.9 Documentation

B0.3.9.1 Documentation with tender

General

- If a consortial bid is submitted, documents on the consortial agreement
- Description of options and alternatives offered
- Completely filled in price-, guarantee-, time-, and data schedules of the specification
- List of proposed makes and vendors
- Reference lists for delivery and installation of plants of similar type and size with separate references for the steam generator and steam turbine operating at same or similar parameters
- Requirements of grid code which cannot be met (if any)