



NTPC-SAIL POWER COMPANY PRIVATE LIMITED

PROJECT: DURGAPUR POWER PROJECT-III (2X20MW)

PACKAGE NAME: EPC PACKAGE

“Salient Technical Features of the equipment/systems/services covered in IFB CC/C&M-C-381(R) dated 30.12.2015, are mentioned below. These Salient Technical Features are mentioned only to facilitate the prospective bidders to prima-facie understand the requirements under the tender and shall not in any way limit or alter the scope of work and technical features/specification of equipment/ systems/ services covered in the Bidding Documents. Detailed provisions in regard of scope of work and technical features/ specification of equipment/ systems/ services, contained in the Bidding Documents shall be final and binding.”

A BRIEF SCOPE OF WORK

The Brief scope of work for the subject EPC Package for DURGAPUR PP-III (2X20MW) is as follows:

Design, Engineering, Manufacture, Supply, Construction, Erection, Testing & Commissioning works for the turnkey EPC Package for DURGAPUR PP-III (2 x 20 MW), on the basis of single point responsibility, completely covering the following activities and services in respect of Steam Generator, Steam Turbine Generator and Electrostatic Precipitator, all Balance of Plant (BOP) systems, drawl of make-up water, DM water, Fuel oil from existing PP II network, all electrical systems including Switchyard, complete Control & Instrumentation and complete Civil, Structural and Architectural works and Solar PV Plants at roof-top covered under the specifications:

- a) Basic Engineering of the plant including preparation of Plant Definition Manuals;
- b) Detailed design of all the equipment and equipment system(s) including civil, structure steel & Architectural works included in bidder's scope;
- c) Providing engineering drawings, equipment sizing & performance data, instruction manuals, as built drawings and other information;
- d) Compliance with statutory requirements and obtaining clearances from statutory authorities, wherever required;
- e) Complete manufacturing including shop testing/type testing;
- f) The complete Civil, structural and architectural works including Ash dyke, topographical survey, site leveling, construction water for plant area, water supply and sanitation, infrastructure works including roads & drainage for plant, Effluent & sewage treatment facility for plant, main plant area structures and foundations

- including turbine building, bunker building, boiler structure, ESP structure, service building, Administrative building, compressor house, complete coal handling plant and Ash handling plant, chimney, pipe/cable galleries and pipe/cable trenches, duct banks, pedestals, cooling towers, balance of plant buildings including CW System, make-up water drawl system, ETP / STP buildings and structures, offsite structures and buildings, transformer yard structures, switchyard structures, fuel oil handling system and fire protection system structures and foundations, bridges and culverts for crossing of roads inside plant area, landscaping and other miscellaneous buildings and structures;
- g) Packing and transportation from the manufacturer's works to the site including Logistic studies, insurance, customs clearance & port clearance, port charges, if any;
 - h) Receipt, storage, preservation, handling and conservation of equipment at the site;
 - i) Fabrication, pre-assembly, if any, erection, insurance, testing, commissioning and completion of facilities including putting into satisfactory operation all the equipment including successful completion of initial operation;
 - j) Performance and guarantee tests after successful completion of initial operation;
 - k) Supply of spares on FOR site basis;
 - l) Reconciliation with Customs Authorities, in case of foreign Bidders;
 - m) Satisfactory conclusion of the Contract;
 - n) Insurance and other requirements

Detailed scope of work has been specified in the bidding documents.

B SALIENT TECHNICAL FEATURES

1.00.00 Steam Generator

1.01.00 Type

The Steam Generator (SG) shall include all equipment required for Two (02) numbers of Boiler of top supported single drum natural circulation and having Atmospheric Fluidized Bed Combustion with under-bed fuel feeding system

1.02.00 Other Features of Steam Generator Design

The Steam Generator shall be AFBC (Atmospheric Fluidised Bed Combustion) type; top supported, dry bottom, with balance draft furnace with Economiser & Superheater arrangement and shall be suitable for outdoor installation. Tubular type Air Preheater is envisaged for flue gas heat recovery.

1.03.00 Rating of Steam Generator(s)

Steam Generator shall be designed to cater to duty requirements at Boiler Maximum Continuous Rating (BMCR) specified below:

Capacity of steam generator & steam parameters	Steam Flow T/Hr.	Temp Deg C	Pressure Kg/ sq cm
	102% of the turbine VVO steam flow	To achieve turbine throttle main steam temp as indicated in clause 3.02.00 .Steam temp at super heater outlet shall be at least 3 deg c higher than the rated main steam temp at turbine inlet.	To be designed for sufficient steam pressure to cater to the requirement of Turbine inlet throttle steam pressure indicated in clause 3.02.00.
Feed water temp at economizer inlet		To be optimized by the bidder	

1.04.00 Limiting Parameters for Steam Generator Design

The Steam Generator design shall comply with the following limiting parameters with design coal' firing, under stipulated ambient air condition i.e. 27 degree Celsius temperature and 60 % relative humidity:

Flue gas temp at air heater outlet – 140 deg C (Maximum)

1.05.00 Operating Requirement:

1.	Minimum load without oil support	----
2	Operation without HP Heaters in service	Steam generator shall also be designed for continuous operation with HP heaters out of operation. The steam generator heat output under HP heaters out conditions shall be at least 100% BMCR heat output with HP heater in service.
3	Steam Temperature control range	The automatic control range of steam Generator temperature shall be from 60% BMCR to 100% BMCR. Under the above control range, the steam

		temp at SH shall be maintained at their rated values.
4	Mode of Steam Generator Operation	The plant shall be designed to operate as a base load station catering the captive power requirement. Design of plant equipment and control system would permit participation of plant in automatic load frequency control.

1.06.00 Coal/Ash data

The primary fuel for the main steam generator shall be coal. Light Diesel Oil (LDO) shall be used for start-up of the main Steam Generator(s). proximate analysis of design coal on as received basis are as under:

Moisture (%)	-	6.0
Ash (%)	-	24.3
Volatile matter (%)	-	8.2
Fixed carbon (%)	-	61.5

Sieve analysis of the coal is as given in the specification.

2.00.00 Electrostatic Precipitator (ESP)

2.01.00 System Description:

The Electrostatic Precipitators shall be of outdoor type and installed on the cold end side of tubular air preheaters. The flue gas shall be drawn from air preheater outlets of the balanced draft, crushed coal fired Steam Generator and guided through adequately sized duct work into the gas streams of ESP. Similarly, the flue gas after the Electrostatic Precipitators shall be led to the suction of the induced draft fans.

2.02.00 Service Conditions

The Steam Generators are designed to burn crushed coal. LDO shall be used during startup of Steam Generator. The ESP shall be designed to remove fly ash particles (to meet the stipulated ESP emission levels) from the flue gas generated in the Steam Generator with fluidized bed combustion.

3.00.00 Steam Turbine

3.01.00 Type

The steam turbine shall be regenerative, condensing, directly coupled or coupled through a gear box to generator suitable for indoor installation.

3.02.00 Rating

The steam turbine generator unit shall conform to the following design and duty conditions:

1	Output under economic maximum continuous rating (EMCR) guaranteed output load at Generator terminals	20MW
2	Turbine throttle steam pressure	To be optimized by bidder but not less than 85Kg/cm ² (abs)
3	Turbine throttle steam temperature	To be optimized by bidder but not less than 510 deg C
4	Design & operational requirement including variations in rated steam temp & pressure	Generally as per IEC 45 or otherwise specified in the spec.
5	Condenser Pressure	To be optimized by bidder
6	Frequency variation range around rated freq of 50Hz	+3% to -5% (47.5Hz to 51.5Hz)
7	Turbine Protection against water induction	As per ASME-TDP-1 latest edition

3.03.00 Other Features

Turbine shall be capable of operating continuously with valves wide open (V.W.O.) to swallow at least 105% of EMCR steam flow to the turbine at rated main steam parameters and also the corresponding output shall not be less than 105% of rated load with 3% make up and optimised condenser pressure.

The steam turbine generator unit shall be suitable for direct connection to steam generator having no inter connection with other units either on the boiler feed water side or main steam side.

Turbine shall be designed for uncontrolled extractions for regenerative feed heating based on optimized cycle and suitable for tropical conditions.

4.00.00 Generator

4.01.00 Type

Stator air/water cooled, cylindrical air cooled rotor type.

4.02.00 Rating

Generator and its excitation system shall have a capability at least matching the declared maximum continuous rated output of the associated steam turbine at all power factors between 0.8 lagging and 0.95 leading with +3% to -5% frequency

variation, terminal voltage variation of +/- 5% and combined voltage & frequency variation of 5%. It shall be ensured that when the Generator is working at this capability and design cooling water temperature, no part of the Generator shall attain a temperature in excess of the temperature limits specified for class-B insulation as per IEC-60034.

4.03.00 Also the generator and its excitation system shall be capable of continuous stable operation without any excessive temperature rise at the peak output of the associated steam turbine under VWO & HP heater out condition at all power factors between 0.8 lagging and 0.95 leading with +3% to -5% frequency variation, terminal voltage variation of +/- 5% and combined voltage & frequency variation of 5%. Temperature of different parts may exceed those permissible for class-B insulation under such operating conditions, but shall be lower than those permissible for class-F insulation as per IEC-60034.

4.04.00 Rated Parameters

1.	Power Factor	0.8 (lag)
2.	Terminal voltage	As per manufacturer's standard
3.	Frequency	50 Hz
4.	Speed	As per manufacturer's standard
5.	Short circuit ratio	Not less than 0.48 (without any tolerance)

5.00.00 **Coal Handling Plant**

Coal Handling Plant shall be designed based on specified Indian Coals. Rated capacity of CHP shall be as specified in the technical Specification. Coal from the coal stock yard up to the power plant will be transported by trucks by the owner.

The design capacity of the conveyors shall be 110% of the rated capacity.

Two stage crusher is envisaged.

6.00.00 **Ash Handling Plant**

Ash handling system consists of the following sub systems:

1) Bed Ash Handling System

Pressure conveying system consisting of screw compressor, air lock/ pump tanks, air intake & discharge valves, CI / MS pipes IA compressors etc.

2) Dry Fly Ash Conveying system

Two alternatives for pneumatic conveying system are specified for conveying of fly ash in dry form from ESP hoppers upto buffer hoppers.

i) Vacuum Conveying System

It shall consist of liquid ring vacuum pumps, material handling valves, cast iron and MS pipes, instrument air compressors etc.

OR

ii) Pressure Conveying System

It shall consist of screw compressors, air lock/pump tanks, ash intake & discharge valves, CI & MS pipes, instrument air compressors etc.

3) Dry Fly Ash Transportation system

The dry fly ash from the buffer hoppers in each unit shall be transported to storage silos. The user industries shall take the dry fly ash from storage silos either in closed tankers or in open tankers. Provision shall be kept for disposal in slurry form to the ash dyke also.

4) Ash Disposal System

i) Bottom ash, economizer ash and air preheater ash (if applicable) shall be disposed off from ash slurry sump to ash disposal area by bottom ash slurry disposal pumps.

ii) The fly ash and air preheater ash (if applicable) shall be disposed off by slurry disposal system in lean phase.

7.00.00 CW Pumps, Cooling towers and Make up water system

CW equipment & Systems, Cooling towers and make up water system shall be provided as per the scope of technical specifications.

8.00.00 Fire protection system, Air compressors, AC and ventilation system shall be as per the scope of technical specification.

9.00.00 WATER TREATMENT SYSTEM

Water treatment system covers drawl of make up water from PP II, chlorination , Liquid Effluent Treatment, drawl of DM water from PP II.

10.00.00 **Electrical Systems**

The electrical items shall cover following:

Generator, Excitation System and its Auxiliary Systems Motors, Electric Actuators

Generator Busducts, MV Busducts and Generator Circuit Breaker.

Power Transformers, Auxiliary Oil Filled Transformers, Indoor Dry type Transformers

MV Switchgears, LV Switchgears and LV Busducts, Numerical Relay Networking, DC System, Battery and Battery Charger

HT Power Cables, LT Power and Control Cables, Cabling, Earthing and Lightning Protection, Lighting, DG Sets

33 kV GIS.

Control & Protection of complete electrical system including 33 kV switchyard and Generator Relay Panels, interfacing with Plant DCS system (Common control & monitoring for Plant equipments and Switchyard).

Construction Power facilities

Complete Electricals for Offsite Areas.

Type, Routine & commissioning Tests, Mandatory Spares as specified.

11.00.00 **C & I Systems**

The control system, called Distributed Digital Control Monitoring & Information system (DDCMIS) is envisaged to be procured under this package for control and operation of

➤ Integral control & protection of boiler including Burner Management System and Boiler protection system.

➤ The integral control & protection of Steam Turbine Generator including Electro-hydraulic control & Turbine Protection system.

➤ Modulating controls of the Steam Generator (SG)

➤ Modulating controls of Feed water & Condensate Cycle

➤ Binary control of auxiliaries of Steam Generator (SG)

➤ Binary control of auxiliaries of Turbine Generator (TG)

- Electrical Breaker including synchronization circuits.
- Coal Handling Plant.
- Water System (DM Water system, Cooling Tower etc.).
- CW System.
- Air Conditioning and Ventilation systems.
- Ash Handling Plant.
- Make-up water System.

Human Machine Interface (HMI) is based on Large Video Screen (LVS) displays supported by TFT monitor based Operator Work Stations (OWS). These devices through customized user-friendly displays, soft alarm facia and pop-up displays are used for giving fast pin-pointed faults/ status to the operator. Local ON/OFF operation of equipments is envisaged through Graphical Interface Unit (GIU). The total system is networked through a Station-Wide LAN for use of real time data of various plant areas by other users like maintenance, planning, efficiency enhancement groups etc.

The sequence of events recording & alarm annunciation are also implemented as a part of DDCMIS system. A GPS based master and slave clock system is to be provided for uniform and synchronized timing signals throughout the entire station.

The power supply for the control system is based on 24V DC provided through microprocessor based modular charger system and for the peripherals and other subsystem through 230V Single Phase UPS.

Main Equipment related instruments like Flame Monitoring system, Coal Bunker Level measurement system, gravimetric feeder control system, Acoustic Pyrometer, Acoustic Steam Leak detection system, Furnace and Flame viewing system, Turbine stress control / evaluation system, Turbine supervisory and diagnostic system etc are also procured through this package.

Field instruments like pressure, DP, flow & level transmitter, analyzers along with their process connection & piping as well as measurement systems like vibration monitoring system etc are also procured through this package.

A plant-wide CCTV system based on IP technology is included in this package for surveillance of plant equipment as an aid to the operation.

Apart from above, an on-line Steam & Water analysis system (SWAS), PA system, Operator control desks, panels, shielded twisted pair cables as well as optical fiber cables for system interconnection and all types of Instrumentation Cables are also included in this package.

12.00.00 Civil Works

The site for Plant and offsite areas comprises of layers of filled up soil/ silty clay / clayey silt and sand/weathered rock layer at deeper depths. Removal of filled up soil as required for the work and its disposal to a location arranged by the bidder. The scope of Civil works shall include the analysis, design, construction, erection of all civil, structural and architectural work and all other items mentioned in this specification.

Entire civil engineering work including Design & engineering for all buildings, structures and facilities for foundations and equipments, roads, ramps, paving, parking areas, Supply / procurement of all materials, storm water drainage , plumbing & sanitary fittings, service lines and all other miscellaneous civil engineering works within the battery limit as shall be necessary for completing this package on a turnkey basis.

This civil works shall cover, survey works , site leveling works, design, preparation of general arrangement drawings, construction and fabrication drawings, supply of labour & materials and construction of all civil, structural and architectural works by the Bidder.

Open foundation are envisaged for major structures. The steel structures shall be pre-fabricated in factory and shall have bolted field connections (except chimney flue liners, coal bunkers & ducts which may be fabricated and welded at site).

13.00.00 SOLAR P.V Plants

Solar Photo-voltaic plants to be supplied under the package shall be grid-connected rooftop SPV plants including all auxiliaries. The SPV modules must conform to latest edition of IEC 61215 / IS 14286 for crystalline silicon Terrestrial PV Modules design qualification and type approval. In addition, the modules must also conform to IEC 61730 part 1 & Part 2 or equivalent IS for construction & testing requirements respectively.

14.00.00 Dozer:

Supply of one no dozer of 5 Tonne capacity is in the scope.
