



# **BEC POWER PVT LIMITED**

**1X600 MW SUPER-CRITICAL COAL BASED THERMAL POWER  
PLANT AT  
SAPOS, DABHRA TEHSIL, IN JANJGIR-CHAMPA DISTRICT  
(CHHATTISGARH)**

**EPC SPECIFICATION FOR IMPLEMENTATION ON EPC BASIS**

**TENDER NO.: BEC-SPEC-600MW SC – EPC - 01**

**SEPTEMBER 2011**

## **BEC POWER PVT. LIMITED**

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## **1.0 GENERAL**

M/s.BEC POWER PRIVATE LTD are proposing to install a IPP, a TG set of rating 600 MW along with a supercritical boiler of capacity 1913-2102 TPH with steam parameters at required temperature & pressure.

This specification is issued for implementation of the 600 MW super critical IPP and its auxiliaries through the EPC mode. This specification covers the design, engineering, manufacture, assembly / re-assembly, tests at manufacturer's works, packing, ocean shipment and clearance through Indian Port of entry in case of imported plant & equipment, inland transportation, in-land delivery to the site, unloading, storage and in-plant transportation within site, complete civil and structural design and construction work as required for the plant and facilities covered by this specification, complete services of erection, testing, successful commissioning, carrying out PG test, handing over and training of Purchaser's personnel, for the power plant complete with all accessories, auxiliaries and ancillaries as specified hereinafter and elsewhere of this specification and as required for safe and trouble free operation of the facilities.

The scope shall broadly include the equipment / systems, described in the subsequent sections of this specification, but shall not be necessarily restricted to these only. Whatever additional items necessary for safe and efficient operation of the equipment / systems described elsewhere in this specification, shall also be included as a part of the total services to be offered by the bidder.

This specification also includes carrying out performance guarantee tests at site after successful commissioning and all necessary equipment, instruments, services, labour as required for this purpose shall be under the scope of supply of the successful bidder.

Any additional plant, equipment, material, services which are not specifically mentioned here, but are required to make the plants / systems in the scope of the bidder complete in all respects in accordance with the technical specification and for safe operation and guaranteed performance, shall be covered under the scope of this specification.

This specification also includes training of purchaser's personnel at manufacturers' works and at site in operation and maintenance of the plant.

### **1.1 UTILITIES**

**Power:** The plant power system which will be linked to the 400 KV switchyard of IPP for obtaining the start-up power and also for evacuation of the power generated to nearest grid (PGCIL) substation/switchyard. Power from the proposed power plant would be evacuated through 400kV lines to the PGCIL 400 kV grid sub-station. The power generated in the proposed IPP which will be at 21Kv will be interfaced with the switchyard of the IPP through 21KV system. Suitable transformer will be provided in the IPP switch yard for stepping up/stepping down the power from 21KV or 400 KV and

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vice versa. The power plant will have an Power distribution system at 11 KV & 3.3 KV and an LT power system at 415 V.

**1.1.2 Water:** Source of Raw water for cooling and other uses in the plant would be from nearby Mahanadi river which is about 3 km on south side away from site. The approximate analysis of the raw water from the 2 sources is given below:

Constituent in PPM

Total Hardness	59 ppm
TDS	76 ppm
PH	7.8
Dissolved Oxygen as O <sub>2</sub>	6.1 ppm
Methyl Orange Alkalinity	150 ppm
BOD	1.6 ppm
COD	3.0 ppm
Silica as SiO <sub>2</sub> - dissolved	150 ppm

The raw water has to be pumped from the river water pump house to raw water reservoir. The raw water will have to be suitably treated and supplied as make up to the condenser cooling water system, auxiliary cooling water system and DM plant of the power plant as well as other uses such as effluent treatment & reuse system, firefighting, drinking, chemical laboratory, etc. EPC bidder shall include for a raw water storage tank of adequate capacity in his scope. All necessary treatment facilities for raw water shall be included in their scope by the EPC bidder.

**1.1.3 (a) Fuel:** Domestic coal would be used for the proposed 1x600MW thermal power plant. Typical analysis of coal is furnished in the table below:

Description	Unit	Design Coal	Worst coal
Proximate Analysis			
Fixed carbon	%	26.0 (up to 28)	22.0
Volatile matter	%	22.0 (up to 24)	18.0
Moisture	%	10.0	12.0 (up to 7)
Ash	%	42.0	45.0
Gross calorific (HHV) value	kCal/kg	3600	2587
Ultimate Analysis			
Carbon	%	35.87	30.56
Hydrogen	%	2.66	2.24
Sulphur	%	0.40	0.50 (up to 0.6)

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Nitrogen	%	0.72	0.60
Oxygen	%	8.35	6.10
Moisture	%	10.00	12.0
Ash	%	42.0	45.0
HARD GROVE INDEX		55	50
ASH CHARACTERISTICS			
Ash initial deformation temperature (IT)	Deg. C	1120-1360	1120-1360
HT (Hemispherical temp.)	Deg. C	1400	1400
Fusion temperature	Deg. C	>1400	>1400

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**(b) Coal Handling system:** Coal handling system envisaged would be capable of handling coal to meet firing rate requirement of steam for 1x600 MW units. Coal handling system would consist of a stream of conveyors and equipment from track/ground hopper to coal bunkers near steam generators. In case of stocking, the coal would be diverted to stockyard and reclaimed by means of stacker cum re-claimer, when required.

**1.1.4 (a) Ash Handling System :** The average ash content in coal would be about 45%. Bottom ash would be collected either in dry or wet form. In a wet type, water impounded bottom ash hopper design, the ash from bottom ash hopper would be passed through clinker grinders and the slurry would be pumped to disposal area using jet pumps.

Dry fly ash would be evacuated either through pressurized pneumatic system or vacuum pneumatic system. Fly ash from silo would be disposed in dry form. Fly ash disposal system also would have provision for wet disposal to ash pond in slurry form.

**(b) Ash Disposal:** Dry fly ash would be evacuated either through pressurized pneumatic system or vacuum pneumatic system. Fly ash from silo would be disposed in dry form. Fly ash disposal system also would have provision for wet disposal to ash pond in slurry form.

### **1.1.5 CONSTRUCTION FACILITIES**

(a) Construction materials required for the construction of the proposed power plant would be procured from nearby sources.

(b) Construction power would be required; and same would be met from the grid power supply available from a nearby substation.

(c) Water required for construction purposes shall be drawn from River Mahanadi. Alternatively, availability of ground water source shall be explored. Water shall be pumped from deep tube wells and stored in an over-ground tank for further distribution by gravity to various distribution points.

For this permission will be taken from appropriate authority. Water supplement from rain water harvesting pond would also be done.

## **1.2 PLOT PLAN**

The proposed plot layout of the existing facilities indicating the disposition of the proposed 600 MW IPP plant units is shown in Drawing enclosed for bidder's reference.

Indian coal and Indonesian coal which are the main fuel for the plant will be received at plant site by rail/ road and unloaded and stacked in the coal storage yard. The coal from the storage yard will be fed by means of Reclaimer, front end loaders into the coal ground hoppers where from the coal will be transported by a set of belt conveyors to the

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crushing and screening houses. The crushed and sized coal of the required size range will be fed to the coal storage bunkers in the boiler plant.

The turbo generators along with their auxiliaries will be located in the TG building. A crane of adequate capacity (capacity to be confirmed by EPC bidder) in the TG building will serve the proposed 600 MW unit. The electrical panels will be located in the annex to the TG building at ground level. The floor at the TG deck level of this annex building will house the main control room. The 400 KV switch yard will be located as shown on the enclosed layout. The other power plant facilities such as raw water storage, raw water treatment plant, DM plant, auxiliary cooling water system, air cooled condenser etc will be located as shown on the enclosed layout.

### 1.3 SITE CONDITIONS

The Bidder should acquaint himself with the site conditions, approaches, availability of materials, camping facilities for his labour force and all other relevant information required for bidding, before submitting the Bids. No claim on account of any ambiguity due to variations/changes in conditions given below will be entertained by purchaser subsequent to finalisation of contract.

Location	:	Sapos, Dabhra Tehsil,Janjgir-Champa District, Chhattisgarh
Longitude/Latitude at site	:	E83 <sup>0</sup> 09' 1.5", n 21 <sup>0</sup> 45' 27"
Nearest Railway station	:	Robertson,25 km. away
Nearest seaport	:	Paradeep, 496 km & Vizag,630 km away
Nearest Domestic Airport	:	Raipur, 230 km away
Max. dry bulb temp.	:	45°C
Min. Dry Bulb temp.	:	9° C
Site altitude above MSL	:	217 mt
Design dry bulb temp. for Electrical equipment	:	<b>50°C</b>
Relative humidity for de sign	:	80%
Design wet bulb temperature	:	28 deg C
Annual wind mean speed	:	44 m/s
Annual Average rainfall	:	1170 mm

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Susceptibility to earthquake	:	Zone III as per IS 1893-20
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#### **1.4 CODES AND STANDARDS**

All requirements of the latest statutory regulations in force such as Indian Boiler Regulations, Indian Explosives Act, Indian Factories Act, Indian Petroleum Act, Indian Environmental Act, Indian Electricity Act etc., shall be strictly adhered to for designing of the plant, equipment & process systems. Bidder shall be responsible for getting necessary clearances for the plant and equipment from the above statutory authorities at various stages during execution of this contract.

The components of all other equipment shall be designed, assembled and tested in accordance with the relevant standards published by Indian Standards Institution and / or as specified in the relevant technical specification.

Components which are not falling under any Indian Statutory Regulations and manufactured as per reputed National Standards/ ISO shall also be accepted unless it is in conflict with the requirements of this Bid Document in which cases the stipulation of Bid Document shall prevail. Such codes / Standards other than Indian codes / Standards must be equal to or more stringent than the Indian Code / Standards must be submitted to the Purchaser with four (4) copies of their English versions duly certified.

All electrical equipment supplied shall comply with the latest revision of the Indian Electricity (Supply) Act, Indian Electricity Rules, Indian Standard (IS) of International Electric technical commission (IEC) Publication and also within the statutory requirements of the Government of India and Government of Orissa as regards safety, ear thing and other provisions specified therein for installation and operation of electrical equipment.

The Bidder shall be responsible for obtaining necessary approval and clearance and making whatever additions / modifications considered necessary by CEIG / Electricity Company and other Statutory Authorities to bring the installation in conformity with the above Rules / Regulations at various stages during execution of this contract.

All Environmental / Pollution Control measures and Monitoring devices are to be incorporated as per the requirement of relevant standards under Environmental & Safety Act and as per the stipulations of Pollution Control Board of the state in which plant is located.

Internationally accepted standards which ensure equal or higher performance than those specified shall also be accepted.

#### **1.5 STANDARDISATION**

Contractor shall standardise various types and make of equipment and accessories in order to reduce diversity, convenience of operation and maintenance and minimise inventory.

All moving parts of equipment which can conceivably cause injury to the operator and otherwise authorised personnel within the vicinity of working area shall be suitably guarded according to the safety regulations. The complete assembled units shall be

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designed so that all parts subject to wear including shafts and bearings shall be easily accessible for inspection, maintenance and replacement, with minimum loss of time.

All equipment supplied shall allow access to facilitate connecting up, and shall operate satisfactorily under such variations of load, pressure and climate conditions as may occur in working.

The plant and equipment offered shall be of proven latest design and of adequate capacity strictly as per the requirement mentioned under this specification. The material shall be new and of first grade quality. The workmanship and design shall be in accordance with the best engineering practice and shall be such as have been proved to be suitably for the intended purpose and for giving satisfactory performance under the prevailing climatic conditions and proposed system of supply. Liberal factor of safety shall be used throughout the design and special consideration shall be given for parts subjected to alternating stresses of shocks.

Systems shall be designed incorporating the latest technology and maximum flexibility in operation with sufficient stand-by provision. All system design shall be subjected to the approval of Purchaser.

Equipment furnished by the Bidder shall be complete in every respect with all mountings, fittings, fixtures and standard accessories which are normally supplied even though not specifically detailed in the specification. The Purchaser shall not be called for any extra payment in respect of such mountings, fittings, fixtures and accessories which are needed for the safe operation of the equipment as required by applicable codes within Indian Territory though they may not have been included in this contract.

All equipment shall have suitable approach ladder and platform for repair and maintenance wherever necessary.

The Bidder shall endeavour to utilise and adopt same codes, standards, and norms keeping in mind the minimum variation & comprehensive standardisation of the different spare parts for similar / identical basic component / equipment, machinery and for the plant as a whole.

## **1.6 DOCUMENTS FORMING PART OF THIS TENDER**

The following documents enclosed to this specification shall be considered as a part of this tender Document:

Annexure-1	-	Technical Specification for Mechanical system for Packages A & B)
Annexure-2	-	Technical Specification for Electrical system for Packages A & B)

Bidder shall note that the layout drawings and schematic diagrams furnished with this specification are for the specific purpose of clarifying purchaser's requirements, which are to be considered for preparing the bid. The schematic diagrams and layout drawings enclosed with this specification are not valid for interpretation of scope of work during contract execution stage. Successful bidder shall prepare drawings and schematic diagrams as required for equipment offered taking also into consideration the technical

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specification and typical schematic diagram for manufacturing, supply and erection. Drawings and schemes which are finally approved by purchaser shall determine the respective scope of supply & erection and responsibility of supplier.

**1.7 COMPLETE SERVICES TILL COMMISSIONING**

The scope of service under this specification has been elaborated in above clauses. It is stressed that all responsibility from design, manufacture to successful commissioning and performance acceptance test at site rests totally on the successful Bidder. Purchaser shall not, in any way, be responsible for any delay in transportation and clearance through Indian Port of entry.

In case bidder offers equipment from foreign sources, it is suggested that bidder shall employ reputable Indian agents who will furnish necessary helps to ensure speedy clearance through port, handling and transportation. Bidder / Indian agent should make visits to the site before submission of offers in order to assess the quantum of work involved in transportation and site erection, as accurately as possible.

Till commissioning, successful bidder shall be responsible for providing any experts & man power - skilled, semi-skilled or unskilled. However, access of owner's Personnel shall be there for them to familiarise with the equipment before commissioning. All erection tools and tackles, equipment (like cranes, winches, welding equipment etc.), consumables like lubricant, welding gas or rods, etc., shall be supplied by the successful Bidder. It is suggested that reputable local sub-contractor should be arranged by the Indian agent for this service.

**1.8 PROVISIONAL TAKE OVER, PERFORMANCE GUARANTEES, LD / PRICE REDUCTION FOR NON PERFORMANCE, FINAL TAKE OVER ETC.:**

After all the systems have been erected & commissioned (including completion of steam blowout & target plate clearance for turbine quality of steam and after completion of setting of relief valves) and completely stabilized and proved safe, the Contractor in consultation with the Purchaser/ Consultant shall offer the system as a whole for continuous and safe operation as a "Trial run "for 15 days. A "reliability run" at rated design load for 72 hours of uninterrupted operation shall also be undertaken during such " Trial Run ". Minor problems and continuous interruptions of duration not exceeding 1 hour during the trial run shall be ignored. However problems leading to interruptions exceeding 1 hour shall be properly attended to and the entire trial run repeated for another 15 days. On successful completion of the trial run and reliability test the boiler will be taken over by the Purchaser and a Provisional Acceptance Certificate (PAC) issued.

All equipment shall be guaranteed for workmanship and materials, and satisfactory performance. The guarantee for performance shall cover individual items and systems including electrics for their ratings/outputs, as required in the specification. On issue of the PAC as mentioned in para 1.8.1 above supplier shall conduct the performance guarantee tests within 1 month of issue of PAC to establish the various parameters guaranteed by him in the contract.

Instruments, gauges and flow meters installed for the normal operation of the equipment shall be made use of during the acceptance tests as far as practicable. However, if there

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is no panel-mounted instrument for measurement, separate calibrated instruments shall be hooked up for the performance test purpose. Temporary meters required for PG test shall be arranged by the contractor. The Performance test on the unit shall be conducted within one month from the date of Provisional taking over. Upon successful completion of the Performance tests, and compliance of all contractual conditions by the contractor such as submission of all final drawings and documents, as built drawings and operation & maintenance manuals etc. as well as fulfilment of all other obligations, Purchaser will issue to contractor a final acceptance certificate.

Bidders shall guarantee the following parameters for the major equipment and facilities in the IPP which shall be established during the guarantee tests after commissioning of the IPP:

- Maximum continuous rating of the boilers
- Steam pressure and temperature at super heater outlet
- Dust content at outlet of Chimney of the boiler.
- Power output of TG at rated turbine inlet conditions.
- Noise level at 1m from TG unit.
- Vibration of TG train
- System capacity (Tons/hour) and granulometry of coal handling system.
- DM plant output and quality of DM water.
- Station heat rate
- Auxiliary power consumption of IPP
- Unburnt carbon in fly ash.

Guaranteed parameters as above shall be established by the supplier by performing suitable tests as per agreed procedures within 1 month from the date of Provisional take over by purchaser. In case the supplier fails to establish the guarantees in the first attempt he shall repair, replace or carry out modifications at his cost and repeat the test to establish the guarantees within a reasonable period to be mutually agreed upon. A maximum of two chances will be given for repair and retest to bring the parameters within the guaranteed values and the total time period for such retests shall be a maximum of 4 months from the date of commissioning. However, if the performance guarantees are not proved within the above attempts or time period Liquidity Damages (LD) / price reduction as defined in following clause will be applied in the case of some of the parameters.

**1.9 LD CLAUSE / PRICE REDUCTION:**

**Price reduction for Non performance:**

The following LD/price reduction shall be applicable in case of non-achievement of guarantee parameters as per Para 1.8.4 above:

Nature of Shortfall	LD/price reduction rate	Limit of non acceptability
Maximum continuous rating of boiler	0.5% of contract price for every 4 Ton deficiency or part thereof.	Deficiency up to 8 Ton will be accepted with LD. Beyond 8 Ton equipment will have to be rectified by supplier to bring it

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		within the acceptable limit.
Steam pressure and temperature	Not applicable	No tolerance is acceptable on these parameters.
Dust content at output of chimney	Rs.50,000 /- per mg increase in dust content / Nm <sup>3</sup> over guarantee value	Limit of acceptance with LD upto 60 mg/Nm <sup>3</sup> beyond which equipment will have to be connected with no extra cost to Purchaser.
Power output of TG	0.5% of contract price for every 1000 KW deficiency or part thereof.	Deficiency up to 2000 KW will be accepted with LD. Beyond 2000 KW equipment will have to be rectified by supplier to bring it within the acceptable limit.
Noise level and vibration of TG 1	Not applicable	No tolerance is acceptable on these parameters
Capacity and granulometry of coal handling system & DM water quality	Not applicable	No tolerance is acceptable on these parameters.
Station heat rate	0.5% of contract price for every 1% decrease in efficiency or part thereof.	Deficiency up to 2% will be accepted with LD. Beyond 2 % equipment will have to be rectified by supplier to bring it within the acceptable limit at no extra cost to Purchaser.
Guaranteed Auxiliary power consumption	Rs. 1.5 lakhs for every 1 KW additional power consumption over the guaranteed value	Increase in auxiliary power consumption upto 300 KW will be accepted with LD. Beyond 300 KW equipment will have to be rectified by supplier to bring it within the acceptable limit at no extra cost to Purchaser.

If the total value of the penalties for shortfall in performance exceed ten percent (10 %)/ or more of Total Contract price, and the supplier has expressed his inability to rectify the defects & bring the equipment performance to the guaranteed value, then the purchaser retains the option to reject the equipment, and in case of such option the supplier shall, jointly and severally, replace the

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equipment with one, which shall meet the guaranteed values. The replacement shall be done within a reasonable period mutually agreed and with no extra cost to the purchaser.

For those items for which shortfall in performance is not acceptable beyond the permissible tolerance, the supplier shall jointly and severally, shall carry out modifications to obtain the guaranteed performance within the stipulated tolerance. It may be noted that as these are primary parameters, they must be corrected even before the trial run is started, and further, these parameters must remain stable throughout the period of trial run.

If finally, in spite of all practical efforts by the supplier the stipulated guarantees on these parameters are not established, the purchaser retains the option to reject the equipment. In case the option to reject is exercised by the purchaser, the supplier shall jointly and severally be responsible for the replacement of the rejected equipment within a reasonable time as will be indicated by the purchaser and achieve the performance as guaranteed.

In the event of equipment rejection for reasons as stated above, it is obvious that the overall project schedule will be affected. To minimize the loss due to such an occurrence, the purchaser retains the right to use the faulty equipment until new replacement arrives at site. It may be noted that as the faulty equipment has not been taken over by the purchaser the responsibility for it lies entirely with the supplier. During this period the supplier shall not limit the use of the faulty equipment, except for reasons of safety during operation, both of personnel and the equipment.

**Price reduction for Delay in Delivery:**

Time is the crux of the project. The supplier shall endeavour to deliver, install & commission the plant within time period specified in contract. If the supplier fails to deliver, install & commission any or all the goods within time period, specified in contract the Purchaser shall, without prejudice to his other remedies, under contract, deduct from the contract price, as liquidated damages, a sum equivalent to 0.5% of the total contract price for each week of delay up to maximum 5 % of contract price. Once the maximum is reached the purchaser may consider termination of the contract.

**Total LD / price reduction**

The total price reduction on account of both clause 1.15.1 and 1.15.2 above shall be applicable independently subject to an overall ceiling (considering an aggregate of all items) of 10%/ or more of the total contract price.

**1.10 INSPECTION AT WORKS FOR IBR CLEARANCE:**

Equipment shall be offered for inspection prior to despatch. The test shall be conducted as per the procedure laid down by the concerned Indian Boiler Regulations (IBR) and got cleared by Boiler Inspectorate for pressure parts as per IBR. Third party inspection by internationally reputed testing agencies like Lloyds inspection, BVQI shall be arranged by supplier as per requirement of Indian Boiler Inspectorate. All necessary cost for getting the IBR clearance shall be included by the bidders in their offers.

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Test procedures and other documents required by the testing agency shall be submitted and got approved before start of inspection. QA plan shall also be submitted for approval immediately on placement of order.

#### **1.11 INSPECTION BY PURCHASER / CONSULTANT**

All plant and equipment as per this specification shall be inspected for ensuring the required quality as per the inspection plan indicated in this specification. Supplier shall ensure full and free access to purchaser's inspector to the manufacturing factory /premises any time during contract period, to facilitate him to carry out inspection and testing. All instruments, apparatus tools & tackles, gauges, templates, consumables etc. required for testing shall be arranged by the supplier free of cost to the purchaser. All tests shall be carried out by the supplier at manufacturing works and purchasers testing engineer will witness such tests.

Inspection report / protocol shall be prepared after inspection and all the test results, observations shall be recorded neatly, signed in triplicate and two copies to be handed over to the testing engineer. Based on the inspection report, inspection engineer will review and issue inspection memo and despatch clearance from his office to the supplier for further action. In case of stage inspection, the subsequent stages can be taken up only on obtaining the inspection clearance for that stage. Items shall not be despatched without obtaining inspection clearance.

If any defect / deviation are observed, the same shall be recorded in the report and corrective measure that will be taken shall be discussed and mutually agreed. If the correction is not accepted by the testing engineer, the same shall be referred to the designer / consultant for review and approval. In due course of inspection, if any additional tests are required to be carried out, the same shall be done without any additional cost to the purchaser.

Items will be categorised as A, B and C. Major items whose testing is to be witnessed are categorised as "A" and those items, which are not to be witness tested, shall be categorised as "B". All other items like foundation bolts, support structures and similar items shall be categorised as "C". Itemised categorisation will be done at the time of finalisation of order. All routine tests for category A as per applicable standards will be witnessed by the inspection Engineer. Material tests certificates and internal inspection test certificates shall be submitted for category B. Items categorised as category C may be despatched by suppliers after ensuring the quality themselves.

Even though inspection is conducted, if any defect is found at site, the same shall be corrected / replaced by supplier without any additional cost to the purchaser.

Following documents shall be submitted and acceptance obtained from purchaser / consultant / inspection engineer before start of inspection for items categorised as "A".

- Approved drawings for dimensional details, single line diagram etc.
- Data sheets for motors etc.
- Manufacturer catalogue for standard items
- Test procedures wherever required.

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- Type test certificates as applicable.
- Calibration certificate of standard test instruments
- Internal inspection report for the tests conducted by manufacturer for the subassemblies and for the stage inspection at factory.
- Material test certificates where required.

**Following inspection plan as per table below is generally proposed for the scope of this tender. However, depending on the scope, the plan will be finalised at the time of placement of order.**

**PROPOSED INSPECTION PLAN**

Sl. No	Item description	Routine test	Operation checks
1	Boiler / Turbine / ACC / DM plant / FHS / AHS	X, T, W, D	Hydro test / MR test
2	Bought outs like boiler feed pumps etc	X, T, W	-
3	Control Panels	X, T,D	-
4	Instruments & control	X, T	-
5	Motors	X, T	-
6	MCC	X, T, W, D	
X –Routine tests to be conducted T – Type test Certificates to be submitted for review W – Factory tests will be witnessed by purchaser D – Dimensional, general arrangement, workmanship, finish checks			

The modalities & the QA plan proposed will be discussed & mutually agreed.

**1.12 BOILER REGISTRATION**

The boiler shall be manufactured as per Indian Boiler Regulations with latest amendments. One set of relevant documents and certificates signed by the Chief Inspector of Boilers of concerned state shall be forwarded to the customer. Boiler registration formalities, IBR approval and approval by other statutory bodies shall be done by tenderer. However, Purchaser shall pay only the statutory fees to the concerning department through the Challan

**1.13 WARRANTY**

The contractor is liable for any failure of equipment supplied by him and he will be responsible for making good such failures by replacement of defective and failed parts. The contractor's liability for faulty design, materials or workmanship shall be for a period of 24 months from the date of commissioning or 36 months from the date of last supply, whichever is earlier.

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**1.14 NOISE ABATEMENT**

The Bidder shall adopt good engineering practices such as well-balanced machinery, acoustically correct enclosures, structures and supports from resonance, acoustically designed fluid paths for ducting and pipe work etc. Noise abatement devices such as those for sound isolation and for absorption as well as for vibration isolation and/or dampening shall be provided as per OSHA standards and also conform to ISO Standards. Noise level shall not exceed 85db at 1 m distance for rotating equipment, other normal operating equipment, pipe-work etc. Start-up vents, Safety valves etc., which are expected to operate occasionally shall have silences to limit the noise level at 105db at 10M distance.

**1.15 SUPERVISION FOR ERECTION AND COMMISSIONING**

Experienced engineers shall be posted at site for erection supervision by the contractor who shall interact with consultant and client on a day-to-day basis and reporting shall be on daily basis. For major bought out items like boiler feed pumps etc. erection & commissioning engineer from OEM shall be made available by contractor.

**1.16 TRAINING**

All system shall be operated by O&M group of the client from the day of start of commissioning under the direct supervision of the commissioning team deployed by contractor. Commissioning engineers of contractors shall operate for at least 6 months from the date of reaching 60% of full power operation. During the 6 months O&M team shall be trained and gain confidence for independent operation.

**1.17 SUBLETTING OF CONTRACT**

Bought out items shall be procured from approved vendors only. List of suggested vendors is enclosed as Appendix to this specification. The Contractor shall not without the consent in writing of the Purchaser/Consultant, which shall not be unreasonably withheld, assign or sublet his Contract or any substantial part thereof other than for raw materials, for minor details, or for any part of the works of which the makers are named in the Contract, provided that any such consent shall not relieve the Contractor from any obligation, duty or responsibility under the Contract.

**1.18 ACCESS TO PURCHASER**

Complete responsibility of installing and commissioning of the plant lie with the Bidder. However supervision of work by Owner / Engineer shall be there and involvement of personnel of purchaser for familiarisation with the equipment shall be allowed. For any important test or check to be conducted, Owner / Engineer shall be notified in advance for witnessing the same.

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**1.19 DESIGN CO-ORDINATION MEETING**

The Contractor will be called upon to attend design co-ordination meetings with the Purchaser / Engineer, other Contractors and the Consultants of the Purchaser during the period of contract. The Contractor shall attend such meetings at his own cost as and when required and fully co-operate with such persons and agencies involved during these discussions.

**1.20 TRANSPORTATION & PACKAGING**

All the equipment shall be suitably protected, coated or covered or boxed or crate as per standard package to prevent damage or deterioration during transportation, handling and storage at site till time of erection, considering tropical humid climate. Contractor shall be responsible for any loss or damage during transportation, handling & storage due to improper packing.

**1.21 DRAWINGS AND DOCUMENTS**

**Information to be furnished with the tender**

Bidders shall submit following drawings along with the bid for review before finalisation of the tender.

- General layout of Boiler and Auxiliaries proposed by the bidder.
- Scheme diagrams of Boiler steam system, Feed water system, Auxiliary system steam, Deaerator etc.,

**Drawings to be submitted after award of contract**

Bidders shall submit following drawings after award of contract.

**a) Approval category**

Basic design drawings, general arrangement drawings, P&I diagrams, procurement data sheets for bought out items, pipe routings, electrical single line diagrams, electrical relays schedules shall be included in the approval category of drawings. List of drawings, which will be in approved category, will be finalised at the time of placement of order.

**b) Certified data /Drawings for purchaser's input**

Contractor shall submit following drawings for purchaser's design inputs.

- Foundation plan and load data for each item of equipment for civil design
- Layout and Dimensional drawing for finalising room/area requirement.
- Details of embedment, cut-outs and insert requirement.
- Terminal details and terminal flange dimensions
- Motor schedule and its details
- Instrumentation I/O schedule and DCS details

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**c) Information category drawings and documents**

Contractor shall submit following drawings for purchaser's review and acceptance. Generally the information content in these drawings will be noted for correctness.

- Pipe & Hanger schedules for pressure pipes
- List of bought out components / Bill of quantities with specifications
- Stress analysis results for piping
- Isometric view of piping drawing
- Design calculation sheet for adequateness of earthing.
- Fault level calculations for electrical buses

**d) Erection drawings and site fabrication drawings**

Contractor shall submit the following drawings before start of erection of the systems

- Instructions showing pre-requisites and procedure for erection
- Erection drawings for proper erection and assembly of all equipment.
- Pre commissioning check list for erection completion which will be signed as protocol for erection completion
- Commissioning procedures
- Check list for completion of commissioning as part of protocol for commissioning
- Handing over protocol

**e) Inspection and Test reports**

Purchaser shall submit all factory test reports and inspection reports, minutes of meeting during inspection etc. and protocol for erection completion, commissioning protocol etc. at the end of contract for purchaser and plant records.

**f) Operation and maintenance manuals**

Contractor shall supply of the following documents & drawings with the delivery of equipment.

- Operation and maintenance manuals.
- List of recommended spare parts with specification and supplier reference.
- List of consumables with quantum of usage, make, supplier reference etc
- All drawings and documents in soft form.

The above drawings and documents are required to be submitted by the in the following number of copies:

<b>S. No</b>	<b>Status of the Drawing, Data etc</b>	<b>No. of copies for Purchaser</b>	<b>No. of copies for Consultant</b>
1	Preliminary	2 Prints	3 Prints + Soft copy
2	Reference	2 Prints	3 Prints+ Soft copy

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3	For Approval	2 Prints	3 Prints
4	Final & Certified duly signed	12 Prints & 1 soft copy	4 Prints
5	Operation & Maintenance Manuals	4 Copies	2 Copies
6	Performance & acceptance Test Procedure	2 Copies	3 Copies
7	All other Documents	2 Copies	3 Copies

All design drawings shall be oriented to match the plant arrangement drawings and shall have a key plan identifying the plant area to which they apply. All layout drawings shall be made with the NORTH arrow pointing to the TOP of the sheet.

## **1.22 MISCELLANEOUS**

### **Painting**

All items of equipment shall be thoroughly cleaned and painted with two coats of approved primer and two coats of approved alkyd based finish paint as per standard practise of the equipment supplier. The successful bidder shall furnish painting procedure for equipment, piping, structural and other items before start of erection or before fabrication of the items.

### **1.28.2 Lubrication**

All equipment shall have adequate lubrication arrangements for smooth and efficient operation. Sufficient lubrication points shall be provided wherever necessary and all such points shall be easily accessible. Grease guns shall be provided wherever necessary.

## **1.23 SPARES, TOOLS AND TACKLES & CONSUMABLES**

### **Commissioning Spares**

Provision for all spares required for commissioning of the equipment and for its efficient operation until provisional acceptance after demonstration of satisfactory performance in accordance with the guarantees forms part of tendered scope. These items shall be based on the Bidder's experience in commissioning similar plants in the past. The commissioning spares are to be included in the main offer and must be at site along with the main equipment. The successful Bidder shall be responsible for having the required items at site in sufficient quantities.

### **Spare Parts for Two (2) years' Normal Working**

Supply of Spare parts for two (2) years' normal working of the plant after provisional acceptance of the plant on demonstration of satisfactory performance shall be included in

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the scope of supply and work. List with recommended quantity and unit price shall be supplied. Purchaser reserves the right to directly order on the sub supplier for bought out items.

**Insurance Spares**

List of insurance spares if any based on Bidder's experience shall be furnished along with unit rates for Purchaser's consideration.

**Tools and Tackles**

The Bidder shall include in his tender all special tools and tackles required for normal operation and maintenance of the equipment.

**Consumables, etc.**

All consumables for erection, testing and commissioning including first fill of all items such as oil, grease, etc till handing over of the plant and equipment to purchaser shall be in the scope of the supplier.

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**2.0 SCOPE OF THE SPECIFICATION**

**2.1** The scope of supply of equipment and services covered by this specification are detailed in various sections of this specification. Any item, though not specifically mentioned but required to make the power plant and auxiliaries complete in all respects and for its reliable and safe operation and guaranteed performance shall be included by the tenderer in his offer. Obtaining statutory approvals and clearances at appropriate stages from various authorities shall also be treated as though included and the bidder shall include the same, unless otherwise specifically excluded elsewhere.

**2.2** Basic and detailed engineering services including but not limited to the following for the proposed IPP are covered by this specification:

- Basic engineering for the complete Power Plant covering complete process design, process calculations, material and heat balance, complete system design for plant and equipment including utilities, electrics, and instrumentation and automation systems.
- Complete procurement specification and data for standard bought out equipment/items, electrical system, instrumentation and automation system, utilities, water and other services.
- Assignment drawings, load data, anchorage details necessary for building structure design and carrying out piling and civil design. Complete civil and structural design for the power plant shall be in tenderer scope
- Similar assignments for other services/system/items, which are not included in bidders scope of supply but are needed for the completion of the project.
- Complete detailed engineering for all plant and equipment, which are within the scope of supply of successful Tenderer.
- Design of all technological structures such as all chutes, ducts, duct supports, hoods, hoppers, and equipment supports etc.
- All drawings, documents, manuals, performance curves, test certificates including operation and maintenance manual, erection manual, functional description etc.
- As built drawings

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**2.3** Supply, erection, testing and commissioning of the following equipment, systems and services for the power plant are included in this specification:

- One (1) Boiler of supercritical design capable of using “F/G grade Indian coal The capacity of the boiler shall be 1913-2012 TPH at required pressure of temperature. The boiler and auxiliaries shall be as per enclosed specification.
- One (1) Turbo generator set of capacity 600 MW at the designed inlet steam and temperature. The TG and auxiliaries shall be as per enclosed specification.
- One (1) Water cooled condenser with air extraction equipment, cooling tower and other auxiliaries for the turbine and a set of condensate extraction pumps with drive motors and other accessories.
- Coal unloading system like wagon tippler, Stacker, reclaimers etc.
- Complete piping, auxiliary piping, and interconnecting main steam, feed water, condensate, auxiliary steam etc. complete with hangers, supports, valves, specialties, etc. for each TG unit
- Raw Water Treatment and auxiliary cooling water system with pumps & accessories DM plant etc. as per specification enclosed.
- Fuel handling system complete with unloading mechanism such as wagon tippler etc., stocking & diverting system by Stacker cum re-claimer, track/ground hoppers, feeders, coal crushers, screens, conveyors, dust extraction system with bag filters, transport equipment such as front end loaders etc. as per specification enclosed.
- Complete pipe work for various water and utility systems with valves, fittings and accessories, coating and wrapping for underground pipes etc.
- Ash Handling System including bed ash handling system of pneumatic type, and dense phase dry type ash handling system for fly ash complete with conveying vessels, compressors & receivers complete with instrumentation, pipes & supporting structures, ash storage silos etc for the boiler.
- All electrical items as specified in enclosed specification for electrical systems.
- Instrumentation and control system with field and panel mounted instruments, control panels, DCS system, cabling and accessories as per enclosed specification for Instrumentation and DCS systems.
- Compressed air system both for general-purpose service air and instrument air along with compressors of adequate capacity with standby, after coolers, air receivers, dryer’s pipe work and accessories.
- Fire detection and protection systems & accessories complete with detectors, electrics, pumps & associated accessories, pipe work etc and portable CO2 extinguishers and sand filled buckets for electrical rooms, transformer area, control room, cable vaults, etc. as per requirements

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- HVAC System & its accessories for turbine building operating and ground floor, electrical room, battery charger room, control room, office room etc. including air conditioning & ventilation systems with package and split type air conditioners, air handling units for washed air supply systems supply and exhaust fans & associated ducting, piping etc.
- Mono rails with electric hoists for ESP, boiler, pump houses and other areas as required for maintenance.
- Inspection at Factory, Quality control at manufacturing works, testing of all the equipment as specified and as per the requirement of Indian Boiler act.
- Commissioning spares as required for all equipment / plant / systems as recommended by the respective manufacturers for successful commissioning and operation of the plant till the system is handed over after successful performance guarantee tests.
- Packing and forwarding, arranging transport inland or sea transportation, port handling and clearance of imported equipment safe transportation from manufacturer's place / port to site, inspection of packing on receipt at site etc.
- Erection of all plant, equipment, piping, instrumentation & control etc., supplied under this package, as specified.
- All erection tools such as cranes, hoists, welding sets, gas, electrodes, compressed air, sump pumps, paints, putty and all consumables, stores, etc., required for erection, testing and commissioning of the plant till handing over to purchaser.
- Flushing and first charge of lubricating oil, governing oil, inhibitor for water treatment, etc., and also adequate quantity of the same consumables for topping up for first six (6) months of initial operation after successful commissioning.
- Bidder shall furnish the list with itemised prices sufficient description and drawings for one set of operational spares required for all equipment / plant / systems as recommended by the respective manufacturer for regular reliable operation of the plant for not less than two (2) years after commissioning and guarantee tests. The cost of these items shall be included in the offer price.
- One (1) set of special tools and tackles, fixtures etc.required for regular operation and maintenance of the plant and equipment offered. Adequate means shall be provided for lifting and handling of each item of plant and equipment.
- All statutory permits license from competent authority approvals from Boiler Inspectorate, Electrical & Factory Inspector, and TAC/ NFPA, labour etc. as required for the project.
- Carrying out all pre-commissioning and commissioning tests in consultation with Purchaser's Engineer at site and commissioning of the systems.

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- Performance Guarantee tests for all the equipment as per mutually agreed procedure and as per Indian and International Standards.
- Submission of all drawings and documents to Purchaser's consultants and obtaining approvals before start of manufacturing or construction.
- Preparation of monthly reports in the agreed formats and attending monthly review meetings, design coordination meetings etc.
- Arrange permission for Purchaser's / Purchaser representative's entry to different stage and final inspection / testing of equipment at manufacturers works.
- Receiving and unloading of all equipment, plant and materials at site, checking with shipment list / consignment note and reporting for missing or damaged items, and make all arrangements for insurance claim as necessary.
- Proper stocking, storing under contractor's custody and security, providing proper maintenance of stored items and keeping proper records of materials at store for convenience and proper scheduling of erection work and for quick identification as and when required. Stores as required shall have to be constructed by the Bidder in the open space provided by Purchaser.
- Issue of materials from stores and maintaining details of account of the same as required.
- Transportation / shifting of materials from stores to erection site.
- Pre-assembly at site after proper checking as required.
- Erection and subsequent cleaning / flushing as required.
- Preparation of erection check list, carry out pre-start check of the installation to ensure correctness of the erection.
- Preparation of testing, commissioning procedures & start-up procedures & check lists.
- Carrying out commissioning testing, starting up checks, performance testing, and handing over of the complete plant / equipment / system / sub-systems.
- Supply of all drawings, data, test certificates, O & M manuals, etc., as necessary.
- Supply and compilation of different manufacturers operating and instruction manuals in a comprehensive manner prepared for use by operating and / or maintenance personnel.
- Submit complete "As-Built" drawings for the plant / system / sub-system / equipment / material as erected and installed at site incorporating each change or modifications in the executed works from the approved construction drawings.
- Project engineering and management and periodic reporting till handing over the plant.

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- Construction power, water & residence arrangement of EPC contractor staff shall be arranged by bidder.
- Boundary wall, main gate in bidder scope.

**2.4** The successful bidder shall provide the following manpower at site during erection, testing and commissioning:

- One experienced Site In charge having at least 25 years of experience in erection and commissioning of similar projects
- Engineers with experience in similar job as Supervisory staff, inspectors, erection and commissioning engineer for each major system to be decided at the time of finalisation of the contract.
- Skilled, semi-skilled / unskilled workman-labour clerical staffs, watch and ward staff, store-keeper, drivers etc.
- EOT and other cranes operators as required for all services till handing over of the plant.

**2.5** The successful bidder shall arrange for the training of reasonable number of purchaser's personnel, to be specified by the purchaser, in the shops manufacturing the equipment and machinery specified in the contract and also similar operating installations. The period of training shall be mutually agreed upon on the basis of total man-days.

**2.6** Terminal points for the scope of services as per this tender shall be as defined below. at all terminal point's scope of this contract shall include making the joint including supply of mating flanges, gaskets, bolts, nuts, etc.

- Fuel at the coal storage dump of the fuel storage area near the ground hopper, necessary dumpers and dozers are in the scope of the supply of bidder.
- Flue gases from boiler at stack outlet.
- Dust and fly ash at respective storage silo bottom flange.
- Furnace oil/LDO at the inlet of storage tank.
- Raw water supply system from dam intact well to raw water storage reservoir.
- Vents to be taken outside building limit wherever necessary with suitable bird net, rain protecting hood etc., fitted at the outlet with suitable approaches for servicing & maintenance.
- Drains and blow downs to be taken up to a collection sump through drain header or drain trench. All above ground drain piping inside the plant shall also be included by bidder in his scope.
- Complete Electrical system with 400 KV Substation.

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**2.7** Following items of work are excluded from the scope of work covered by this specification:

- Site levelling, soil investigation etc.
- Transmission line of 400 KV from 400 KV switchyard to grid sub station.