

“শেখ হাসিনার উদ্যোগ, ঘরে ঘরে বিদ্যুৎ”



ASHUGANJ POWER STATION COMPANY LIMITED.

TENDER DOCUMENT

FOR

**CONSTRUCTION OF ASHUGANJ 100 MW
HFO POWER PLANT PROJECT.**

VOLUME 2 OF 2 (PART B)

TECHNICAL PARTICULARS

Tender Reference No. APSCL/100MWHFO/PD/IFT/2017/01

23 NOVEMBER- 2017

SCHEDULES AND DRAWINGS

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SCHEDULE-A

GUARANTEES

1. Plant Output Guarantees

The guaranteed performance of the plant (with all units) at Site condition (35° C, 1.013 bar, 98% Relative Humidity) and 0.80 generator power factor shall be as follows:

Base Load

Heavy Fuel Oil (HFO)

Net Power Output, KW

:-----

Net Heat rate, KJ/Kwh

:-----

NO_x Level [at 15% O₂]

:-----

Noise level, dB (A)

:-----

Net Heat Rate (LHV of fuel) at load &

100% 75% 50%

(Note: 75% and 50% load of the plant means aggregate of 75% and 50% load of individual Engines.)

At Site Condition, KJ/Kwh

:----- ----- -----

Total Auxiliary consumption

:-----

Lube oil consumption g/kWh

:-----

i) Net Power Output

Net power output shall mean the total plant power output measured at the high voltage side of the step-up transformer.

ii) Net Heat Rate

Net heat rate shall mean the heat equivalent of the fuel consumed by the total plant, time based upon the Lower Calorific Value, divided by the net power output as defined above.

iii) Fuel

The fuel (HFO/LFO) shall be considered in accordance with the Technical Specification given in Clause 20.4 of Volume 2 of 2, Part-A.

iv) Tolerance

No tolerance on Net Heat Rate and Net Power Output shall be allowed. The performance tests shall be carried out on the site in accordance with section 16, Vol. 2

of 2 (Part-A), Technical Requirements to prove that the above performance guarantees are available. Also other capability/ parameters shall be verified.

v) Performance Correction Curves

The following curves, which are necessary for correcting Power Output, Heat Rate and Inlet/Outlet Temperature from the test ambient condition to the guarantee reference condition, shall be furnished with the Tender.

- Variation in barometric pressure
- Variation in ambient temperature
- Variation of generator efficiency with Power Factor
- Variation in Altitude and Relative Humidity
- Others if any

2. Step-Up Transformers Guarantees

The following items shall be guaranteed by the Contractor:

i) Losses:

a) Full load loss at ONAF rating at the rated voltage & frequency and principal tap position:

-At 0.8 Power Factor, Lagging : ----- KW

-At Unity Power Factor : ----- KW

b) No-Load loss under the rated voltage,

tap and frequency : ----- KW

ii) Impedance at rated power and frequency : ----- %

Value of Net power output, Net heat rate, Transformer loss and Auxiliary power consumption should be complied with the value that specified by Manufacturer.

3. Completion of Commercial Operation Date (COD)

The Commercial Operation Date (COD) of the plant shall be completed within the period from the Effective Date of Contract.

: ----- days

SCHEDULE-B

TECHNICAL DATA SHEET

	Item Name	Unit	To be filled by Tenderer
B-1	Engine and Accessories		
	General		
	No. of Engine	No.	
	Manufacturer		
	Type		
	Model		
	Net output at site condition		
	Base load	kW	
	Capable of unit load change without structural damage	kW/min	
	Critical speed above and below rated speed		
	Max. vibration		
	Power rating at generator terminal		
	Power rating:		
	Ambient temp=45°C	kW	
	Ambient temp=35°C	kW	
	Ambient temp=25°C	kW	
	Ambient temp=20°C	kW	
	Maximum vibration limit	mm/sec	
	Speed		
	Rated Speed, Engine	rpm	
	Rated Speed, Generator	rpm	
	Engine Performance		
	Overhaul Life on base load	hours	
	Expected life of cylinder	hours	
	Expected life of reciprocating parts	hours	
	Expected life of stationary parts	hours	
	Number of hours of continuous operation allowed at peak output	hours	

	Item Name	Unit	To be filled by Tenderer			
	Number of hours of peak operation allowed per year	hours				
	Overhaul life on peak load	hours				
	Overhaul life on number of hours	hours				
	Overhaul life number of starts	no.				
	Starting time from cold condition	in min				
	starting time from standby condition	in min				
	Electrical power required for standby	kWh				
	Indicated hp/kW	hp or kW				
	Brake hp/kW	hp or kW				
	Indicated thermal efficiency					
	Brake thermal efficiency					
	Mechanical efficiency					
	Heat rate		100%	75%	50%	25%
1.	Ambient air temp 45°C	kJ/kWh				
2.	Ambient air temp 35°C	kJ/kWh				
3.	Ambient air temp 25°C	kJ/kWh				
4.	Ambient air temp 20°C	kJ/kWh				
	Out-put		100%	75%	50%	25%
5.	Ambient temp=45°C	kW				
6.	Ambient temp=35°C	kW				
7.	Ambient temp=25°C	kW				
8.	Ambient temp=20°C	kW				
	Start-up time from cold start to synchronous speed					
	Normal	Minute.				
	Emergency	Minute				
	Capable rated load change without structural damage	kW/Min				
	Full Load Heat Balance					
	Useful work					
	Cooling					
	Exhaust					
	Friction, Radiation and others					
	Heat input	100 unit				
	Starting Time					
	From Cold	hour				
	From Standby	hour				
	Time required from no load to maximum load					

	Item Name	Unit	To be filled by Tenderer
	Normal	Minute	
	Emergency	Minute	
	Starting reliability	%	
	Number of consecutive starts to prove reliability	no.	
	Sound attenuation		
	100 meter from unit	dB (A)	
	50 meter from unit	dB (A)	
	1 meter from unit	dB (A)	
	Engine data		
	Number of cylinder	no	
	Piston materials		
	Piston ring materials		
	Cylinder with liner material		
	Max allowable gas temperature after combustion	° c	
	Brake mean effective pressure	psi	
	Cylinder bore	mm	
	Piston stroke	mm	
	Mean piston speed	mm/sec	
	Complete engine weight	ton	
	Heaviest piece during erection	ton	
	Heaviest piece after erection (disassembled)	ton	
	Engine output (On shaft)	MW	
	Specific fuel consumption	Nm ³ /kwh	
	Cooling system		
	Type and description		
	Design ambient temperature for water	° c	
	Lubrication system		
	Type and description		
	Capacity of lube-oil storage tank	Liter	
	Cap. of maintenance tank	Liter	
	Type of lube-oil purifier		
	Capacity of lube oil purifier	liter/hour	
	Type of filtration unit		
	Manufacturer		
	Type of lube-oil heater		
	Pre lube-oil pump manufacturer		
	Type		

	Item Name	Unit	To be filled by Tenderer
	Motor rating	kW	
	Capacity	liter/hour	
	Starting system		
	Type of starter		
	Manufacturer		
	Capacity		
	Type of compressor		
	Pre. to stop compressor	bar	
	Pre. to start compressor	bar	
	No. of air bottle	no	
	Air bottle capacity	liter	
	Pipe line pre. to the engine	bar	
	Engine intake air filters		
	Manufacturer		
	Type		
	Material		
	Type of louvers		
	Turbocharger		
	Inlet pr. of turbine	bar	
	Exhaust pr. of turbine	bar	
	Suction pr. of compressor	bar	
	Exhaust pr. of compressor	bar	
	Temp. of air after compressor	°C	
	Engine governor or control & Hardware		
	Manufacturer		
	Type		
	Main CPU unit specification		
	Manufacturer		
	Software manufacturer		
	Name of speed regulation		
	Name of fuel valve control		
	Maximum speed rise after full load rejection to be guaranteed by contractor		
	DCS System		
	Description		
	Manufacturer		
	Version		
	Housing		
	Material		

	Item Name	Unit	To be filled by Tenderer
	Finish		
	Turning gear		
	Motor rating	hp	
	Main shaft speed on turning gear	rpm	
	Fire protection system		
	Fire Fighting Devices		
	Manufacturer		
	Fire water storage tank capacity	Liter	
	No of fire hydrants hose cabinets		
	Fire pump rating (motor driven)		
	Fire pump rating (Diesel engine driven)		
	No. of portable extinguishers	CO ₂	
	Foam based fire suppression system for Fuel Tanks		
	Fuel Oil System		
	Transfer Pump (Heavy oil)		
	Manufacturer		
	Number	no.	
	capacity	liter/hour	
	Motor rating	kW	
	Storage Tank (Heavy oil)	2 Nos.	
	Capacity of each Tank	Liter	
	Dimension:		
	Diameter	Meter	
	Height	Meter	
	Storage Tank (Light oil)		
	Capacity of each Tank	Liter	
	Dimension:		
	Diameter	Meter	
	Height	Meter	
	Fuel Oil Day Tank	2 Nos.	
	Capacity	Liter	
	Dimension: Diameter	Meter	
	Height	Meter	
	Maintenance Lifting Device		
	Overhead Maintenance Cranes		
	Manufacturer		
	Type		
	Model		

	Item Name	Unit	To be filled by Tenderer
	Capacity	Ton	
	Hydraulic Mobile Crane		
	Manufacturer		
	Model		
	Type		
	Capacity	Ton	
	Control Room Air Conditioning		
	Manufacturer		
	Model		
	Type		
	rating	ton	
	Exhaust heat recovery system		
	Type of Exhaust gas boiler		
	Capacity of boiler	kW	
	No of feed water pumps	Nos.	
	Motor rating for feed pump	kW	
	Feed Pump capacity	liter/hour	
	Steam generation	kg/hour	
	Steam pre (Saturated)	Bar	
	Feed water temp	°C	
	No of chemical dosing pump	Nos.	
	Chemical to be dosed		
	Auxiliary boiler		
	Manufacturer		
	Capacity		
	Fuel type and consumption rate		
	Others		

B-1.2 Emergency Diesel Engine Generator (EDG) Engine Performance Data at the Site Condition (350 C, 1.013 bar, 98% RH)

- Type of EDG set -----
- Model Number -----
- Manufacturer of EDG set, Country -----
- Net output at Site condition -----
- Base Load, KW -----
- Net Heat Rate at Site Condition -----
- Base Load, KJ/Kwh -----

- Guaranteed rate of unit load change is -----
Capable without structural damage, KW/min. -----
- Noise at a distance of 100 metres -----
(in each octave band, see section 2, Vol. 2)
- Critical speed above and below -----
rated speed -----
- Engine speed, rpm -----
- Generator, rpm -----
- Generator rated Voltage & pf -----
- Engine Starting System -----
- Max. starting time required from -----
standstill to full speed, min -----
- Max. vibration limit, mm/sec -----
- Min. time required for applying full -----
load to unit, -----
From cold standby, min -----
From warm shutdown, min -----
- Estimated hours at or below base rating of -----
between : -----
Minor inspection, hours -----
Normal inspection, hours -----
Major overhaul, hours -----
- Estimated shutdown period, hour and -----
Man-hours for : -----
Minor inspection -----
Normal inspection -----
Major overhaul -----
- Number, type and arrangement of -----
cylinders -----
- Number of strokes -----
- Compressor pressure ratio -----
- Starting system -----
- Description of Speed governing system -----
and fuel control system -----
- Fuel consumption -----
- Description of cooling system -----

-Auxiliary power consumption, KW -----

B-2. Generator and Ancillaries

2.1 Generator

-Manufacturer, Country -----

-Type -----

- KVA rating -----

- Power factor (0.80) at Generator Terminal -----

-Max. leading & lagging KVAR capability -----

-Rated voltage between lines, KV -----

-Connection of armature winding -----

-Rated Current, A -----

-Rated frequency, Hz -----

-Efficiency -----

 at pf 0.8, % -----

 at pf 1.0, % -----

-Stator overloading, % -----

-Critical speed, rpm -----

-Max. torque when the stator is short-circuited, Nm -----

-Generator Characteristics -----

 Instantaneous Max. short-circuit current -----

 at nominal voltage, A_{peak} -----

 sub-transient reactance, X_d'' pu -----

 transient reactance, X_d' pu -----

 synchronous reactance, X_d pu -----

 negative sequence reactance, pu -----

 zero sequence reactance, pu -----

 field time Constant, $T_{d'0}$ sec -----

 Transient time Constant, T_d sec -----

 initial time Constant, T_d'' sec -----

-Moment of inertia GD^2 of rotor, $Kg-m^2$ -----

-percent rise on voltage when full load is -----

 rejected and operating at pf 0.8 , % -----

 pf 1.0 , % -----

-Telephone influence factor -----

- | | | |
|---|-----------------------------------|-------|
| | Balanced | ----- |
| | Residual | ----- |
| -Class of winding insulation | | |
| | Armature winding | ----- |
| | Field winding | ----- |
| -Type of cooling [TEWAC] | | |
| -Short circuit ratio, sat | | |
| -Generator rated excitation requirements for operation at rated kVA | | |
| | Excitation voltage | ----- |
| | Excitation current | ----- |
| - Generator calculated losses at 100% Base rating | | |
| | Total generator iron loss, kW | ----- |
| | Generator stator $I^2 R$ loss, kW | ----- |
| | Generator rotor $I^2 R$ loss, kW | ----- |
| | Generator stray load loss, kW | ----- |
| | Generator wind-age loss, kW | ----- |
| | Total generator loss, kW | ----- |
| -Generator weights | | |
| | Weight of rotor, kg | ----- |
| | Weight of complete stator, kg | ----- |

2.2 Exciter (Shaft mounted, Brushless)

- | | |
|--|-------|
| - Manufacturer, country | ----- |
| - Type | ----- |
| - Rated output, kW | ----- |
| -Rated load field voltage at 0.80 pf/1.00 pf | ----- |
| -Rated exciter current at 0.80 pf./1.00 pf | ----- |
| - Exciter ceiling voltage, V | ----- |
| -Maximum continuous exciter current, A | ----- |
| -Excitation system voltage response ratio | ----- |

2.3 Automatic Voltage Regulator

- | | |
|--------------------------------|-------|
| -Manufacturer, country | ----- |
| - Type | ----- |
| - Description of AVR, Ref. No. | ----- |

2.4 Generator Protection

(Manufacturer Cat. No. or Type)

- | | |
|--|-------|
| -Generator differential relay | ----- |
| -Generator ground over-current relay | ----- |
| -Field/rotor ground detection system | ----- |
| -Reverse power relay | ----- |
| -Loss of field relay | ----- |
| -Voltage restraint over-current relays | ----- |
| -Negative phase sequence relay | ----- |
| -Under/Over frequency relay | ----- |
| -Synchro-check relay | ----- |

- Lockout relays _____
- EDG protection relays _____
- Auxiliary relays _____
- Inter-connection protection [main & back-up] from
plant to grid _____
- Others: Specify _____

B-3. Generator 11 KV Switchgear

- Generator Switchgear
- Manufacturer, country _____
 - Circuit breaker _____
 - Catalogue No. _____
 - Type _____
 - Closing current at 110 volts DC (nominal), A _____
 - Time to close, m sec _____
 - Tripping current at 110 volts DC (nominal), A _____
 - Time to trip, m sec _____
 - Rating and capabilities _____
 - Current rating, A _____
 - Voltage rating, V _____
 - Nominal 3 phase interrupting capacity, MVA _____
 - Maximum symmetrical interrupting capacity, kA _____
 - 3 second short time rating, kA _____
 - Closing and latching capability, kA _____
 - Operating Mechanism _____
- | -Instruments and devices | Manufacturer | Type |
|--|--------------|-------|
| Current transformers | | |
| Single ratio | | _____ |
| Multi ratio | | _____ |
| Potential transformers | | _____ |
| Control and instrument switches | | _____ |
| Indicating lights | | _____ |
| | | |
| -Lightning arresters | | _____ |
| -Surge protection devices | | _____ |
| -Type of bus insulation | | _____ |
| -Type of bus supports | | _____ |
| -Type of insulation on connections | | _____ |
| -Size of completely assembled switchgear | | _____ |
| Length, mm | | _____ |
| Width, mm | | _____ |
| Height, mm | | _____ |
| - Total weight of switchgear, kg | | _____ |
| -Attached type test report, No | | _____ |

B-4. 230 kV Equipment

4.1 230 kV Circuit Breaker

- Manufacturer, Country _____
- Type designation _____

- Number of poles -----
- Rated voltage, KV -----
- Maximum design voltage -----
- Minimum voltage for rated
interrupting capacity, KV -----
- Rated continuous current, A -----
- Rated frequency, Hz -----
- Rated insulation level -----
- Impulse withstand voltage, KV -----
- Power frequency withstand
voltage (1 min.), KV -----
- Rated interrupting capacity, MVA -----
- Maximum interrupting current, kA -----
- Rated momentary current -----
- Rated duration of short-Circuit, 3 sec -----
- Rated making current, kA -----
- Operating duty -----
- Operating time, m sec. -----
- Rated interrupting time, m sec -----
- Closing time, m sec -----
- Opening time, m sec. -----
- Minimum dead time, m sec. -----
- Reclosing time, m sec. -----
- First-pole-to clear factor -----
- At 100% breaking capacity -----
- At 10% breaking capacity -----
- Out of phase breaking current -----
- At 2.0 times rated voltage, KA -----
- At 2.5 times rated voltage, KA -----
- Creepage distance of the insulator, mm -----
- Weight of complete circuit breaker, Kg -----
- Type of operating mechanism [Hydraulic] -----
- Outline drawings, No -----
- Standard specifications to which the
circuit breaker shall conform -----
- Attached type test report, No -----

4.2 230 kV Current Transformer

- Manufacturer, country -----
- Type designation -----
- Rated voltage, KV -----
- Maximum design voltage, KV -----
- Rated Primary Current, A -----
- Rated Secondary current, A -----
- Rated frequency, Hz -----
- Rated insulation level -----
- Impulse withstand voltage, KV -----
- Power frequency withstand
voltage (1 min), KV -----
- Number of cores -----
- For metering service -----
- For relaying service -----
- Accuracy Class -----

- For metering service -----
- For relaying service -----
- Rated Burden -----
- For metering service, VA -----
- For relaying service, VA -----
- Rated continuous thermal current, % -----
- Short-time current rating (1 sec), KA -----
- Creepage distance of insulator, mm -----
- Weight of single phase unit, Kg -----
- Out line drawing, No -----
- Standard specification to which the CT shall conform -----
- Attached type test report, No -----

4.3 230 kV Capacitive Voltage Transformer (CVT)

- Manufacturer, country -----
- Type designation -----
- Rated voltage, KV -----
- Maximum design voltage, KV -----
- Rated Primary Voltage, KV -----
- Rated Secondary Voltage, V -----
- Rated Secondary Voltage, V -----
- Rated frequency, Hz -----
- Rated insulation level -----
- Impulse withstand voltage, kV -----
- Power frequency withstand voltage (1 min), KV -----
- Number of cores -----
- For metering service -----
- For relaying service -----
- Accuracy Class -----
- For metering service -----
- For relaying service -----
- Rated Burden -----
- For metering service, VA -----
- For relaying service, VA -----
- Rated continuous thermal current, % -----
- Short-time current rating (1 sec), KA -----
- Creepage distance of insulator, mm -----
- Weight of single phase unit, Kg -----
- Out line drawing, No -----
- Standard specification to which the PT shall conform -----
- Attached type test report, No -----

4.4 230 KV Lightning Arrester

- Manufacturer, country -----
- Type designation -----
- Rated voltage, KV -----
- Maximum design voltage, KV -----
- Rated frequency, Hz -----
- Rated discharge current, KA -----

- Min. power frequency spark-over voltage -----
- Impulse protective level -----
- Max. spark-over voltage for a standard full wave, KV -----
- Max. front wave impulse spark-over voltage, KV -----
- Max. discharge voltage at the rated discharge current, KV -----
- Creepage distance of insulator, mm -----
- Weight of single phase unit, Kg -----
- Type of operating counter -----
- Out line drawing, No -----
- Standard specification to which the LA shall conform -----
- Attached type test report, No -----

4.5 230 KV Isolators (Disconnecting switch) and Earthing switch

- Manufacturer, Country -----
- Type -----
- Rated voltage, KV -----
- Rated normal current, A -----
- Rated short time withstand duration, 1 sec., KA -----
- 3 sec., KA -----
- Dynamic peak, KA -----
- Impulse withstand voltage -----
- Across the isolating distance, KV -----
- To earth and between poles, KV -----
- Power Frequency withstand voltage, 1 min. -----
- Across the isolating distance, KV -----
- To earth and between poles, KV -----
- Operating mechanism -----
- Number of auxiliary contacts -----
- Method of interlocking -----
- Creepage distance of insulators -----
- Weight of complete Isolator -----
- Out line drawing, No -----
- Standard specification to which the Isolator shall conform -----
- Attached type test report, No -----

4.6 Steel Structure

- Manufacturer, country -----
- Standard specifications to which the steel structure shall conform -----
- Type -----
- Minimum thickness of members -----
- Outline drawings -----

4.7 Bus bar and Connectors (Bus bar / Bay Extension)

- Manufacturer, country -----

- Standard specifications to which the busbar and connectors shall conform -----
- Type of busbar -----
- Characteristics of bus conductor -----
 - Material -----
 - Nominal sectional area -----
 - Construction of conductor -----
 - Calculated sectional area -----
- Ultimate minimum breaking strength, kg -----
- Outside diameter, mm -----
- Standard unit weight, kg/ m -----
- Calculated resistance at 20°C, ohm / Km -----
- Outline drawing of conductor, No. -----
- Outline drawing of connection, No's -----

4.8 Post Insulator (if any)

- Manufacturer, country -----
- Number of units in complete post insulator -----
- Diameter (max.), mm -----
- Length of each unit, mm -----
- Weight of complete post insulator, Kg -----
- Creepage distance , mm -----
- Min. Power frequency (dry) flash-over voltage, KV -----
- 50% lightning impulse (+ve), KV -----
- 50% lightning impulse (-ve), KV -----
- Max. vertical working load -----
 - Tension, Kg -----
 - Compression, Kg -----
- Mechanical routine test load (tension), Kg -----
- Mechanical type test load (tension), Kg -----
- Vertical breaking load (tension), Kg -----
- Max. torsional working load, Kg-m -----
- Max. cantilever working load -----
 - (complete post insulator), Kg -----
- Min. cantilever breaking load upright -----
 - (complete post insulator), Kg -----
- Outline drawings -----
- Standard specification to which the Post Insulator shall conform -----

4.9 Suspension Insulator Assembly (if any)

- Manufacturer, country -----
- Type -----
- Insulator materials -----
- Characteristics of disc element Diameter -----
 - Diameter, mm -----
 - Unit spacing, mm -----
 - Creepage distance, mm -----
 - Electro-mechanical failing load, Kg -----

- Mechanical routine test load , Kg -----
- Min. Power frequency flash-over voltage -----
- Dry, KV -----
- Wet, KV -----
- 50% lightning impulse (+ve), KV -----
- 50% lightning impulse (-ve), KV -----
- Ball and Socket size, mm -----
- Characteristics of Insulator assembly -----
- Number of discs -----
- Total length, mm -----
- Creepage distance, mm -----
- Min. Power frequency flash-over voltage -----
- Dry, KV -----
- Wet, KV -----
- 50% lightning impulse (+ve), KV -----
- 50% lightning impulse (-ve), KV -----
- Breaking strength of complete set, Kg -----
- Materials to be used -----
- Compression type dead end clamp -----
- Bolted type clamp -----
- Miscellaneous hardware -----
- Outline drawings -----
- Standard specification to which the Post Insulator shall conform -----

B-5. Step-up Transformers and Associated Equipment

5.1 Step-up or Unit Transformer

- Manufacturer, country -----
- Standard -----
- Type -----
- Rated output (ONAN/ONAF), MVA -----
- Vector group -----
- Nominal ratio of transformation -----
- at no load, KV/KV -----
- Type of cooling -----
- Total range of variation of transformation -----
- ratio expressed as percentage of high voltage -----
- with low voltage Constant -----
- Increasing ratio, % -----
- Decreasing ratio, % -----
- Size of each step, % -----
- Type of tap changer (Make : **only MR, Germany or ABB, Sweden**) -----
- Type of gas/oil actuated relay -----
- Impedance voltage at 75°C expressed as a -----
- percentage of normal voltage (ONAF rating) -----
- At highest ratio, % -----
- At normal ratio, % -----
- At lowest ratio, % -----
- Voltage regulation at normal ratio, -----

- 75°C and a power factor of,
 Unity, % -----
 0.8, % -----
- Magnetising current at normal ratio
 - High tension winding, A -----
 - Low tension winding, A -----
 - Auxiliary Plant losses
 - Forced air plant, KW -----
 - Fixed losses at normal ratio and 75°C, KW -----
 - Load losses at IEC rating, normal ratio and 75° C
 - ONAF rating, pf 1.0/0.8, KW -----
 - ONAN rating, pf 1.0/0.8, KW -----
 - Total losses at IEC rating, normal ratio and 75°C
 - At ONAF rating, pf 1.0/0.8, KW -----
 - At ONAN rating, pf 1.0/0.8, KW -----
 - Efficiency at IEC rating normal ratio and 75°C
 - At ONAF rating, pf 1.0/ 0.8, % -----
 - At ONAN rating, pf 1.0/0.8, % -----
 - Type of transformer, shell or core -----
 - Type of core joint Minimum magnetic flux density in core iron at normal voltage and frequency based upon the net section of iron
 - Cores, T -----
 - Yoke, T -----
 - Type of windings
 - High tension winding -----
 - Low tension winding -----
 - Maximum current density in windings
 - High tension winding, A/ sq. mm -----
 - Low tension winding, A/ sq. mm -----
 - Type of radial coil supports
 - High tension winding -----
 - Low tension winding -----
 - Type of insulation used for,
 - High tension winding -----
 - Low tension winding -----
 - Tapping -----
 - Tapping connection -----
 - Core bolts -----
 - Core bolt washers -----
 - Maximum observable oil temperature at IEC rating, °C -----
 - Calculated thermal time Constant
 - At ONAF rating, hour -----
 - At ONAN rating, hour -----
 - Type of winding maximum temperature indicator -----
 - Total quantity of oil required to fill complete

- transformer up to lowest visible level
in conservator, litres -----
- Volume of oil to be removed to the level of
the top yoke, litres -----
- Volume of oil required to raise oil in conservator
from lowest visible level to highest level, litres -----
- Total volume of conservators, litres -----
- High above transformer foundation pad of
conservator highest oil, mm -----
- Proposed filling medium for transformers
shipped light and empty of oil -----
- Makes and grades of oil suitable for filling
transformer -----
- Thickness of transformer tank
Sides, mm -----
Bottom, mm -----
- Number of cooling fan unit -----
- Surface area of each cooler unit, mm² -----
- Heat dissipation of each cooler unit as percentage
of total heat dissipation at IEC rating, % -----
- Average rate of oil flow through each
cooler unit, litres/min -----
- Weight of parts
Weight of copper, Kg -----
Weight of core sheets, Kg -----
Weight of all other ferrous parts, Kg -----
- Weight of core and winding assembly, Kg -----
- Weight of complete transformer, Kg -----
- Weight of transformer arranged for shipment, Kg -----
- Dimension of transformer including all fittings
Length, mm -----
Breadth, mm -----
Height, mm -----
- Dimension of transformer arranged
for shipment
Length, mm -----
Breadth, mm -----
Height, mm -----
- Weight of each cooler, Kg -----
- Lightning impulse insulation level
High tension winding, KV_{peak} -----
Low tension winding, KV_{peak} -----
High tension neutral, KV_{peak} -----
- Power frequency withstand voltage for 1 minute
High tension winding, KV -----
Low tension winding, KV -----
- Temperature rise
Winding, °C -----
Top insulation oil, °C -----
- Audible sound level at 1 meter
from transformer surface, dB -----
- Creepage distance of bushing -----

High tension bushing, mm	-----
Low tension bushing, mm	-----
Neutral bushing, mm	-----
Outline drawing, No	-----
-Attached type test report, No	-----

5.2 Transformer Protection

(Manufacturer Cat. No. or Type)

- Differential relay	-----
- Restricted Earth Fault relay	-----
- Over-current relays (LV & HV)	-----
- Earth Fault relays (HV, LV & Neutral)	-----
- Pressure relays	-----
- Temperature relays	-----
- Lockout relays	-----
- Auxiliary relays	-----
- Others: specify	-----

B-6. Station Auxiliary Transformers

- Manufacturer, country	-----
- Cooling class	-----
- Continuous kVA rating, kVA	-----
- Impedance at maximum kVA with ONAN rating, %	-----
-Guaranteed efficiency at 100 per cent of maximum kVA with ONAN rating, %	-----
- Standard, IEC	-----
-Excitation current at 100 per cent rated voltage, in per cent based on maximum kVA with ONAN rating, %	-----
- Guaranteed losses at 100 percent rated voltage No load loss, kW	-----
Total losses at maximum with ONAN rating, kW	-----

Manufacturer	Type
--------------	------

-Bushing	-----
High voltage	-----
Low voltage	-----
Neutral	-----
- Current transformers	-----
- Approximate weight, Kg	-----
- Total assembled, Kg	-----
- Type of oil preserver system, Ref. No	-----
-Primary and secondary voltage, V	-----
- No. of taps	-----
- Tap range	-----
- Vector group	-----
- Class of insulation	-----
- Temperature rise at, °C	-----
- ambient temperature, °C	-----
- Winding temperature, °C	-----

- Oil temperature, °C

Transformers Protection

(Manufacturer Cat. No. or Type)

- over-current relays (LV & HV)

- Earth Fault relays (HV & LV)

- Pressure relays

- Lockout relays

- Auxiliary relays

B-7. 415 V Switchgear and Motor Control Centre

7.1. 415 V Switchgear and Motor Control Centre

- Manufacturer, country

- Air circuit breaker

Manufacturer Type

Type designation

Nominal current, A

Rated Voltage, V

Method of closing

Power required to:

Close

Open

Short circuit current rating, kA

Short circuit current, 3 sec, kA

Combination starter units

Starter contactor

Manufacturer Type

Control transformer

Circuit breaker

Starter contactor coil

operating characteristics

Size1 Size2

Minimum pickup, V

Maximum dropout, V

Dimension of each switchgear

PCC MCC

Length, mm

Depth, mm

Height, mm

Weight, Kg

Number of vertical section

7.2. Switchboard Design

- Degree of protection

-Short time rating

Current, kA

Associated time, sec

- Type of insulation provided on
bus bars and connections

- Type of protection provided within
cubicles(shutter, insulating, cover, etc)

-Bus bars

Current rating of bus bars, A	-----
System short time current, 3 sec, kA	-----
Short time current rating, 3 sec, KA	-----
Bus bar material	-----
Cross sectional area of bus, mm ²	-----
-Type of connection	-----
- Minimum clearance in air:	-----
Between phases, mm	-----
Live parts and earth, mm	-----

B-8. DC Supply System

8.1 Battery Units (110 V, DC, Nominal)

- Manufacturer, country	-----
- Type	-----
- Catalogue No.	-----
-Capacity (AH at 5 Hr discharge)	-----
-Number of cells per unit	-----
-Weight per cell, kg	-----
-Total battery weight, kg	-----
-Overall dimension of battery rack	-----
length, mm	-----
Width, mm	-----
Height, mm	-----

8.2 Battery Chargers

- Manufacturer, country	-----
- Type	-----
- Capacity, A/kW	-----
- DC Voltage adjusting range	-----

B-9. Lighting and Small Power Supply

	Manufacturer	Cat. No. or Type
- Panel boards, AC	-----	-----
-Panel boards, DC	-----	-----
- Lighting fixtures	-----	-----

B-10. Control and Protection System

(for each unit, transformer, auxiliary etc.)

10.1. Control and Protection panel

-Manufacturer, country	-----
-Type of construction	-----
-Dimension, mm	-----
-Instrument	-----

AC Voltmeter	-----
AC Ammeter	-----
Power factor meter	-----
Wattmeter	-----
Varmeter	-----
Synchroniser	-----
Annunciator	-----
Watt-hour meter	-----
Var-hour meter	-----
Control switch	-----
-Protection relay	-----
Gen. protection relays	-----
Transformer protection relays	-----
Gen. Bus protection relays	-----
Inter-connection protection relays	-----
Auxiliary system protection relays	-----
EDG protection relays	-----
-Lockout relays	-----
Control relays	-----
Trip relays	-----
Auxiliary relays	-----

(Note: The Tenderer shall attach additional sheets as required.)

10.2. Descriptive Matter

-Control system /HMI	-----
[Local & Remote], Ref. No.	-----
-Protection system, Ref. No.	-----
-Data logging system, Ref. No.	-----
-List of annunciator, Ref. No.	-----
-Drawing of panels, Ref. No.	-----
-Detail of GT Control,	-----

10.3 Description of standard Weather Station and also to interface with Automatic Plant Control, Protection & Monitoring System, Ref. No.

10.4 Description of Continuous Emission Monitor Module and also to interface with Automatic Plant Control, Protection & Monitoring System, Ref. No.

B-11. Cabling and Grounding

11.1 230 kV Underground Power Cable (Single-core XLPE, Copper)

-Manufacturer, country	-----
-Type designation	-----
-Applicable standard	-----

- Insulation material
 - Cross-section of conductor, mm²
 - Conductor material Type of conductor (round, stranded, compacted)
 - Outer sheath material
 - Min. Permissible bending radius, mm
 - Weight per meter, Kg
 - Delivery length, meter
 - Voltage designation, V
 - Max. operating voltage
 - Current carrying capacity at temperatures.....
 - at laying conditions...
 - 1 sec. short circuit current after full load at 70° C cond. temp., A
 - Max. conductor resistance at 20°C
DC, Ohm / KM
 - AC, Ohm / KM
- (Note: The Tenderer shall attach additional sheets as required.)

11.2 11 kV Power Cable (XLPE, Copper)

- Manufacturer, country
- Type designation
- Applicable standard
- Number of cores
- Insulation material
- Cross-section of conductor, mm²
- Conductor material
- Type of conductor (round, stranded, compacted)
- Outer sheath material
- Min. Permissible bending radius, mm
- Weight per meter, Kg
- Delivery length, meter
- Voltage designation, V
- 1 sec. short circuit current after full load at 70° C cond. temp., A
- Max. conductor resistance at 20°C
DC, ohm/KM
- AC, ohm/KM

(Note: The Tenderer shall attach additional sheets as required.)

11.3 415 V Power Cable (Copper)

- Manufacturer, country
- Type designation
- Applicable standard

- Number of cores
- Insulation mater
- Cross section of conductor, mm²
- Conductor material
- Type of conductor (round, stranded, compacted)
- Outer sheath material
- Min. Permissible bending radius, mm
- Weight per meter, Kg
- Delivery length, meter
- Voltage designation, V
- 1 sec. short circuit current after full load at 70° C cond. temp.

11.4 Control and Instrument Cable (Copper)

a.

- Type
- Manufacturer, country
- Applicable standard
- Insulation material
- Number of cores
- Core size, mm²
- Outer sheath material
- Weight per meter, kg
- Delivery length, m

b.

- Type
- Manufacturer, country
- Applicable standard
- Insulation material
- Number of cores
- Core size,mm²
- Over sheath material
- Weight per meter, kg
- Delivery length, m

(Note: The Contractor shall attach additional sheets as required.)

11.5 Grounding Wire

- Manufacturer, country
- Conductor size, mm²
- Conductor material
- Type of Conductor
- Short circuit current for 3 sec., A
- Weight per meter, kg

- Delivery length, m -----

B-12. Maintenance Facilities

12.1 Overhead electric Crane

- Manufacturer, country -----
-Type -----
- Maximum safe working load -----
 Main hoist, slow speed, Kg -----
 Main hoist, fast speed, Kg -----
 Auxiliary hoist, Kg -----
-Test load for crane, Kg -----
-Span of crane, -----
 Centre to Centre of gantry rails, m -----
-Geared Speeds -----
a) Main hoist, slow speed -----
 Raising with full load , m/min -----
 Raising with no load, m/min -----
 Lowering with full load, m/min -----
 Lowering with no load , m/min -----
 Creep speed, m/min -----
b) Main hoist, fast speed -----
 Raising with full load, m/min -----
 Raising with no load, m/min -----
 Lowering with full load, m/min -----
 Lowering with no load , m/min -----
 Creep speed, m/min -----
c) Auxiliary hoist -----
 Raising with full load, m/min -----
 Raising with no load, m/min -----
 Lowering with full load, m/min -----
 Lowering with no load, m/min -----
 Creep speed, m/min -----
d) Cross traverse, m/min -----
e) Long travel, m/min -----
-Crab -----
a) Particulars of crab rail -----
b) Type of wheel bearing -----
c) Max. load on each wheel, Kg -----
-Power supply required by crane -----
-Maximum current demand by crane, A & KW -----
-Motors -----

	Main Hoisting	Auxiliary Hoisting	Cross Traverse	Long Travel
a) Number	-----	-----	-----	-----
b) Type	-----	-----	-----	-----
c) kW at full load	-----	-----	-----	-----
d) Speed at full load, rpm	-----	-----	-----	-----
e) Motor rating	-----	-----	-----	-----

- f) Manufacturer -----
 -Brakes -----
 a) Number -----
 b) Type -----
 c) Dimensions -----
 d) Lining material -----
 -.Type of main girder -----
 - End carriage -----
 a) Wheelbase -----
 c) Maximum load excluding
 impact of travelling wheels, Kg -----
 - Hoisting wire rope -----

- | | Main
Hoist | Auxiliary
Hoist |
|--|---------------|--------------------|
| a) Construction | ----- | ----- |
| b) Quality of steel | ----- | ----- |
| c) Diameter | ----- | ----- |
| - Collector gear | ----- | ----- |
| a) Type | ----- | ----- |
| b) Rating | ----- | ----- |
| c) Manufacturer | ----- | ----- |
| - Gantry rails | ----- | ----- |
| a) Size | ----- | ----- |
| b) Material | ----- | ----- |
| d) Weight , Kg | ----- | ----- |
| -Maximum deflection at
Mid-span on the main girder
at maximum loading, mm | ----- | ----- |
| - Vertical distance from top
of gantry rail to lowest
overhead obstruction required, m | ----- | ----- |
| - Weights | ----- | ----- |
| a) Net weight of complete crane, Kg | ----- | ----- |
| b) Net weight of complete crab, Kg | ----- | ----- |
| c) Weight of motors, Kg | ----- | ----- |

12.2 Hydraulic Mobile Crane

- Manufacturer, country -----
 -Type -----
 -Model -----
 -Capacity -----
 -Maximum lifting capacity, Kg at ---m radius-----
 -Basic boom length, m -----
 -Maximum boom length, m -----
 -Wire speed for lifting, m -----
 -Wire speed for boom, m -----
 -Type of carrier -----
 -Maximum running speed, KM/hour -----
 -Climbing capacity, (tan⁰) -----
 -Minimum rotating radius, m -----
 -Type of outer rigger -----

-Safety apparatus -----

12.3 Fork Lifters

Manufacturer, country -----
Type -----
Model -----
Capacity -----

12.4 Transport/Vehicles

1) Jeep:

Manufacturer, country -----
Type -----
Model -----
Capacity -----

2) Car:

Manufacturer, country -----
Type -----
Model -----
Capacity -----

3) Double Cabin Pickup:

Manufacturer, country -----
Type -----
Model -----
Capacity -----

4) 12 seated Microbus:

Manufacturer, country -----
Type -----
Model -----
Capacity -----

B-13. Communication Equipment

13.1. PABX Telephone Equipment

Manufacturer, country -----
Type -----
Supply voltage, V -----
Line capacity -----
Traffic capacity -----
Facilities -----
Extension Services class -----
Signals and tones -----

13.2. Paging Equipment

Manufacturer, country -----

Type	-----
Capacity	-----
Supply voltage, V	-----

1) Main Amplifier

Type	-----
Output, W	-----
Form	-----
Dimension, mm	-----
Weight, Kg	-----
Power Consumed	-----
Paging , W	-----
Waiting, W	-----
Power Supply, V	-----

2) Hand Set

Type	-----
Form	-----
Dimension, mm	-----
Weight, kg	-----

3) Speaker

Type	-----
Form	-----
Impedance, ohm	-----
Output, w	-----
Dimension, mm	-----
Weight ,kg	-----

Description

13.3.	PLC Extension	-----
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13.4.	Tele-metering Facilities	-----
--------------	--------------------------	-------

13.5.	SCADA and Communication System with NLDC, PGCB	-----
--------------	---	-------

13.6.	CCTV System	-----
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B-14. Fire Protection Equipment

14.1 Hydrant & Pumps [Motor, Engine & Jockey]

-Number of Hydrant/pumps for yard	-----
for power house	-----
Hose size and length (D x L) mm x m	-----

14.2 Portable Fire Extinguisher

a. 100 kg trolley mounted dry powder extinguisher

-Manufacturer, country _____
-Type of powder _____
-Weight of powder, Kg _____

b. 10 kg portable dry powder extinguisher

-Manufacturer, country _____
-Type of powder _____
-Weight of powder, Kg _____

c. 5 kg portable gas extinguisher

-Manufacturer, country _____
-Type of powder _____
-Weight of gas, Kg _____

14.3 Auto-Release CO2 Fire

Extinguishing System _____
-Manufacturer, country _____
-Type of powder _____
-System Description _____

14.4 Fire detection Equipment

-Manufacturer, country _____
-Type of Equipment _____
-Weight of panel, Kg _____

14.5 Transformer Water Deluge, Ref. No. _____

14.6 Foam based fire suppression system _____

B-15. Civil Work and Building Works

15.1. Standards and Codes to be used in design and construction

No.	Work Item	Standard and Codes
1.	Filling Works	_____
2.	Foundation Works	_____
3.	Piling	_____
4.	Building	_____
5.	Steel Sheet Piling Wall	_____
6.	Concrete Works	_____
7.	Reinforcement Works	_____
8.	Structural Steel Works	_____
9.	Road	_____
10.	Brickwork	_____
11.	Painting	_____
12.	Lighting and Power Supply	_____

13. Air Conditioning System -----
14. Plumbing -----
15. River bank protection works -----
16. -----

15.2. Concrete

1) Proposed Materials -Standards:

- (i) Cement -----
- (ii) Aggregates -----
- (iii) Concrete Admixture -----
- (iv) Reinforcement -----
- (v) Other -----

2) Proposed Manufacturers/Source/Quarries

- (i) Cement -----
- (ii) Aggregates -----
- (iii) Concrete Admixture -----
- (iv) Reinforcement -----
- (v) Other -----

3) Compressive Strength of Concrete at 28th Day

- 1) Engine generator foundation Kg/cm² -----
- 2) Supper-structure Kg/cm² -----
- 3) pile Kg/cm² -----
- 4) Concrete pavement -----
- 5) -----
- 6) -----

15.3. Piling and Subsoil Improvement

15.3.1 Piling

1) Type of foundation pile

- a) Diameter/cross section and length, D= -----m
L= -----m
- b) Allowable working load of a pile, Kg -----
- c) Method of driving in Piles -----
- d) Piling Plant -----
- e) Method of Jointing Piles -----
- f) Name of structures, equipment and buildings to be applied -----

2) Type of foundation pile

- a) Diameter/cross section and length, D= ----- m
L= ----- m
- b) Allowable working load of a pile, Kg -----
- c) Method of driving in Piles -----
- d) Piling Plant -----
- e) Method of Jointing Piles -----
- f) Name of structures, equipment and buildings to be applied -----

3) Type of foundation pile

- a) Diameter/cross section and length, D= -----m
L=-----m
- b) Allowable working load of a pile, Kg -----
- c) Method of driving in Piles -----
- d) Piling Plant -----
- e) Method Of Jointing Piles -----
- f) Name of structures, Equipment and buildings to be applied -----

15.3.2 Subsoil Improvement

- 1) Method of subsoil improvement -----
- 2) Expected allowable bearing capacity of subsoil
(After improvement) -----Kg/m²
- 3) Name of structures, equipment and buildings to be applied -----

15.4. Type and Strength of Steel Sheet Piling Wall

- 1) Type of Sheet Pile -----
- 2) Length of a Pile, m -----
- 3) Width of a Pile, mm -----
- 4) Yield Point, Kg/cm² -----
- 5) Ultimate Tensile strength, Kg/cm² -----
- 6) Supplier -----
- 7) Specification of tie rods
- Materials -----
- Diameter, mm -----
- Length of a tie rod, m -----
- Interval, m -----

15.5. Structure Steel Works

- 1) Grades of Steel
- 2) Suppliers of Steel, Bolts & Fasteners
- 3) Methods of Welding
- 4) Corrosion Protection
- (i) Method and Materials
- (ii) Place of preparation
- 5) Proposed Coatings
- (i) Type of Product
- (ii) Manufacturer
- (iii) Dry Film Thickness
- (iv) Means of application
- (v) Place of application
- (vi) Colour
- 6) Yield Point
- 7) Ultimate Tensile Strength

15.6. Engine Generator, EDG., Transformers, Switchgears etc.

1) Weight of machine

Engine, Kg	-----
Generator, Kg	-----
Em. Diesel Gen set., kg	-----
HFO storage tank kg	-----
LDO storage tank kg	-----
HFO daily tank kg	-----
Unit Transformer (11/230 kV), kg	-----
Station Auxiliary Transformer (11/ 0.415 kV), kg	-----
Others, kg	-----
Total, Kg	-----

2) Dimension of Engine-Generators, Fuel tanks, EDG, Transformers foundation

(Lx Wx H) meter

Engine-Generator	-----
Fuel tanks	-----
EDG	-----
Unit Transformer	-----
Station Auxiliary Transformer (11/ 0.415 kV)	-----

3) Weight of Engine-Generator foundation, Kg -----

4) Weight of Fuel tanks foundation, Kg -----

15.7. Walls and Roofing

1) Insulation Materials	-----
2) Waterproofing Materials	-----
3) Caulking Materials	-----

15.8. Metal

1) Grades of Steel	-----
2) Suppliers	-----
3) Method and Materials for corrosion	-----

15.9. Construction Equipment and Their Specifications

1) Earth Works	-----
2) concrete Works	-----
3) Pavement works	-----
4) Structural Steel Works	-----
5) Piling Works	-----
6) Steel Sheet Piling Wall	-----

15.10. Description of 2X100 % capacity

Deep Tube Well Pump set, Ref. No. -----

15.11. Description of Water Supply

System, Ref. No. -----

15.12. Description of Civil and Building Works

Ref. Nos. _____

15.13. Description of air-conditioning system

for the buildings. Ref No. _____

Note: The tenderer shall attach additional sheets as required.

B-16. Environmental Impact.

(a) Air Emissions Levels.

With regard to project air emissions, please fill out the following table:

Emission	Percent Removal Efficiency at 100% Capacity	100% Capacity	75% Capacity	50% Capacity
SO _x	-----	-----ppmv	-----ppmv	-----ppmv
	-----	----- ib/hr	----- ib/hr	----- ib/hr
	-----	----- g/kj	----- g/kj	----- g/kj
	-----	----- m ⁹ /m ³	-----m ⁹ /m ³	-----m ⁹ /m ³
NO _x	-----	-----ppmv	-----ppmv	-----ppmv
	-----	----- ib/hr	----- ib/hr	----- ib/hr
	-----	----- g/kj	----- g/kj	----- g/kj
	-----	----- m ⁹ /m ³	-----m ⁹ /m ³	-----m ⁹ /m ³
CO ₂	-----	----- ppmv	-----ppmv	-----ppmv
	-----	----- ib/hr	----- ib/hr	----- ib/hr
	-----	----- g/kj	----- g/kj	----- g/kj
	-----	-----m ⁹ /m ³	----- m ⁹ /m ³	----- m ⁹ /m ³
CO	-----	-----ppmv	-----pmv	-----pmv
	-----	-----ib/hr	-----ib/hr	-----ib/hr
	-----	-----g/kj	-----g/kj	-----g/kj

Emission	Percent Removal Efficiency at 100% Capacity	100% Capacity	75% Capacity	50% Capacity
	-----	-----m ⁹ /m ³	-----m ⁹ /m ³	-----m ⁹ /m ³
Air Toxics (list)	-----			
Particulate Matter	mg/Nm ³			

ppm is defined as volumetric parts per million at 15%

(b) Effluent Discharge

No	Item	Unit	value
1.	Nitrogen including ammonia (N molecule)	Mg/l	
2.	Ammonia (Free ammonia)	Mg/l	
3.	Arsenic (As)	Mg/l	
4.	BGD ^r 20 ⁰ C	Mg/l	
5.	Boron	Mg/l	
6.	Cadmium (Cd)	Mg/l	
7.	Chloride	Mg/l	
8.	Chromium (Total Cr)	Mg/l	
9.	COD	Mg/l	
10.	Chromium (Hexavalent chromium)	Mg/l	
11.	Copper (Cu)	Mg/l	
12.	Dissolve Oxygen (DO)	Mg/l	
13.	Conductance	Micro mho/cm	
14.	Total soluble matters	Mg/l	
15.	Fluoride (F)	Mg/l	
16.	Sulphide (S)	Mg/l	
17.	Iron(Fe)	Mg/l	
18.	Total Kjeldahi nitrogen (N)	Mg/l	
19.	Lead (Pb)	Mg/l	
20.	Manganese (Mn)	Mg/l	
21.	Mercury (Hg)	Mg/l	
22.	Nickel (Ni)	Mg/l	
23.	Nitrate (N molecule)	Mg/l	
24.	Grease	Mg/l	
25.	Phenol compound (C ₆ H ₆ OH)	Mg/l	
26.	Dissolve phosphorus (P)	Mg/l	
27.	Radio active substance : Defined by Bangladesh nuclear Committee		
28.	pH	Mg/l	
29.	Selenium	Mg/l	
30.	Zinc(Zn)	Mg/l	

31.	Total dissolve evaporation residue	Mg/l	
32.	Temperature Summer Winter	Celsius	
33.	Suspended solid (55)	Mg/l	
34.	Cyanide (CN)	Mg/l	

(c) Noise Level

Area	WB Sound Level Limits, dB(A) (hourly Leq)		DOE Sound Level Limits, dB(A) (hourly Leq)	
	Day Time 7am-10pm	Night Time 10pm-7am	Day Time 6am-9pm	Night Time 9pm-6am
Sensitive Areas (e.g. schools)	N/A	N/A	N/A	N/A
Residential Areas				
Mixed-Use Areas (predominantly residential areas mixed with commercial and industrial)	N/A	N/A	N/A	N/A
Commercial Areas				
Industrial Areas				

SCHEDULE-C

DRAWINGS TO BE FURNISHED WITH TENDER

Drawings which adequately indicate the general arrangement of the equipment principle of operation, sizes general appearance and materials of construction shall be submitted. These drawings shall include, but not be limited to, the following.

- Mechanical flow diagrams
- Heat rate curve
- Inlet temperature Power correction curves
- Inlet temperature heat rate correction curves
- Starting and loading curve
- Electrical one-line diagrams of main and auxiliaries
- Generator capability curve
- Generator "V" curves
- Zero Power factor saturation curve
- Major piping connection
- Engine, generator and auxiliaries foundations
- Fuel Oil System
- Heat Balance Diagram.
- Major Control & Protection System.
- Power output vs Ambient temperature
- Lub oil system
- Service / Compressed air system
- Fire protection system.
- Control building layout and section
- Cooling water supply system layout
- Exhaust heat recovery sytem
- No load saturation curve
- Synchronous impedance curve
- Generator unit equipment arrangement
- Layout plan of central control room
- General arrangement of the switchyard
- Foundation, loading and support information
- Dimensioned Outline drawing Of major equipment offered
- Detail drawings and descriptions providing a complete
- Understanding of the equipment offered
- Other drawings specified in the Specification.

SCHEDULE-D

DELIVERY TIME

	Time from Effective date to FOB (Months)	Time Required for Transportation (Months)	Time Required for Erection & Commissioning (Months)	Total time from Effective Date to Completion of COD (Months) *
1) Engine Generating Plant and Ancillary	-----	-----	-----	-----
2) 230 kV Switchgear, Equipment	-----	-----	-----	-----
3) Step-up Transformers	-----	-----	-----	-----
4) Crane/ Fork lifter	-----	-----	-----	-----
5) Station Electrical Services	-----	-----	-----	-----
6) Station Mechanical Services	-----	-----	-----	-----
7) Transport and vehicles	-----	-----	-----	-----

Note: The contractor shall guarantee the total time from effective date to completion of COD as marked with asterisk (*)

SCHEDULE-E

TOOLS AND APPLIANCES

The Tenderer shall list below all special tools and equipment for maintenance, which will be supplied and included in total Contract Price. Contractor shall not be permitted to use any equipment/ machinery/ tools, which are to be supplied against the Contract.

No.	Description	Quantity

Note: The Tenderer shall attach additional sheets as required.

NOT FOR SUBMISSION

SCHEDULE-F

DEVIATIONS FROM SPECIFICATIONS

The following is a list of deviations from Tender Documents

Clause No. and Page No.	Description and Reference to Documents submitted by Tender

Note : The Tenderer shall attach additional sheets as required

SCHEDULE-G

CIVIL AND BUILDING WORKS

The Tenderer shall be reminded that this is Turnkey Contract in which he is entirely responsible for every aspect. No additional costs will be considered for any item which the Tenderer has overlooked, but which is essential for the proper completion of the project in every respect so that the works fulfil the purpose for which they are required.

If the APSCL or the Engineer require minor modifications, additions or omissions to the scope of the Civil Works during the period of construction or maintenance, adjustment to the Contract Price will be made on the basis of the rates entered in the following Schedule.

The rates entered shall include all costs and expenses involved in the proper construction of the work, including overheads, profits, supervision, accommodation, insurances, transport, duties, all risks, liabilities or obligations etc. but excluding design costs, which are covered by a separate item.

The rates will be used to evaluate APSCL's or Engineer's minor modifications, omissions or additions to the works. Rates for any item not included shall be based on those quoted or analogous thereto.

Item	Description	Unit	Rate Taka
1.	Soil investigation work 1) a) Total number of soil borings b) Depth of each boring 2) c) List of Laboratory Testing work	m	
1.	Excavation 1) Excavate to reduce level and remove and deposit where directed on Site – include for timbering, de-watering, etc (measured net sizes as drawing) 2) Excavate to form pit, base or trench as previously described. 3) Additional excavation beyond net sizes for working space to fix and remove formwork and to backfill	m ³ m ³ m ³	
2.	Foundation Piling 1) Mobilisation and Demobilisation (items shall be specified) 2) Form of pile type and capacity stated : Type : Capacity :	linear, m	
3.	Concrete work Unreinforced (grade of concrete shall be specified) ----- ----- -----	m ³ m ³ m ³	
4.	Reinforced Concrete (grade of concrete shall be specified) ----- ----- -----	m ³ m ³ m ³	
5.	Reinforcement 1) 25 mm diameter and upward mild steel bar or round reinforcement hooked, bent and fixed including and necessary tying wire 2) 20 mm diameter and upward mild steel bar or round reinforcement hooked, bent and fixed including and necessary tying wire 3) 16 mm diameter and upward mild steel bar or round reinforcement hooked, bent and fixed including and necessary tying wire 4) 12 mm diameter as previously described 5) 10 mm diameter and ditto as previously described 6) Fabric reinforced weighing 4 Kg per square meter, including fixing 7) Extra over mild steel rates for high tensile reinforcement (all sizes)	Kg Kg Kg Kg Kg m ² Kg	
6.	Formwork 1) To sides of foundations, bases, etc	m ²	

Item	Description	Unit	Rate Taka
	2) To sides and soffits of beam 3) To wall	m ² m ²	
7.	Structural Steel work (grades of structure shall be specified) ----- ----- -----	1000x Kg	
8.	Concrete Quantities for Roads, Parking and Side walk Work a) Concrete Pavement b) Total tonnage of Reinforcing Steel	m ³ 1000xKg	
9.	Masonry Wall Quantities a) 30cm thick walls b) 25cm thick walls	m ³ m ³	
10.	Site Boundary Masonry Wall Total Length	m	
11.	River bank protection and side protection wall a. Reinforcement concrete (grades of structure shall be specified) b. Mass concrete c. Reinforcement	m ³ m ³ Kg	

SCHEDULE-H

LIST OF SUBCONTRACTORS

The following is a list of subcontractors the Tenderer proposes to employ for supply of materials and equipment and for erection and civil works

No.	Description of part or equipment making reference to specifications	Subcontractors full address

Note : The Tenderer shall attach additional sheets as required

SCHEDULE-I

DESCRIPTION OF TRAINING PROGRAMME

Details of Training programme including curriculum and Training aid to be used

NOT FOR SUBMISSION

SCHEDULE-J

MOBILISATION AND DEMOBILISATION SCHEDULE FOR CONSTRUCTION EQUIPMENT

The following is the specification, numbers, purpose of use and phasing for the mobilisation and demobilisation of construction equipment to be used on the Contract.

NOT FOR SUBMISSION

SCHEDULE-K

METHOD OF TRANSPORTATION AND UNLOADING

The following is a description of the Contractor's method for transportation to Site and unloading and installation at Site of the equipment for the Works.

SCHEDULE-L

LIST OF MANUFACTURER

The following is a list of manufacturer the Tenderer proposes to buy materials and equipment and for erection and commissioning

No.	Description of part or equipment	Manufacturer name	Manufacturer full address

Note : The Tenderer shall attach additional sheets as required

SCHEDULE-M

LIST OF SPARE PARTS

The following is a list of spare parts the Tenderer proposes for the life time (20 years) of the plant.

NOT FOR SUBMISSION