

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

Volume II

Section III

Schedule of Requirements (SOR)

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

TABLE OF CONTENTS

1.	INTRODUCTION.....	1
2.	MECHANICAL EQUIPMENT/SYSTEM.....	2
3.	ELECTRICAL EQUIPMENT.....	4
4.	MISCELLANEOUS EQUIPMENT	19
5.	OTHER.....	19
6.	NOTES.....	20

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

1. INTRODUCTION

Broad schedule of requirements is furnished herewith for price schedule as mentioned in Section-V of Volume-I of the Bid Documents. The schedule of requirements is indicative of requirements of major equipment and essential services. The scope of supplies and services shall be as per various clauses in the different volumes of this Package and the tenderer shall be responsible to ensure completeness of supplies and services even though these are not fully covered in this volume.

Any item of supply not explicitly listed but otherwise either evident by the contents of the specifications or essential for smooth operation of the equipment shall be construed as forming part of the supply and no additional charges shall be payable for the same.

If any particular items which were not explicitly listed are found to be essential, the tenderer / contractor shall affirm the inclusion of the same in the scope of supply without any extra charge on the contrary if any items reflected in this Schedule of Requirement is not required; the tenderer shall exclude such items. However, such inclusion / exclusion shall be brought out in the Schedule of Deviation with justification for consideration of the purchaser.

Tenderer shall have to quote as per list of items / equipment detailed in this section as well as taking General Technical Specification, particular Technical Specifications & drawings into consideration.

The schedule of requirement given below may under-go a change during detail engineering-

Mandatory special tools, tackles & slings etc. if included in the workshop sections as well as in any other section, the same shall be considered only once for procurement and it shall be brought-out in the schedule of deviation.

List of mandatory spares identified in the various sections which is indicative in nature. Tenderers have liberty to include / delete the items suiting to their plants & equipment but such inclusion / deletion shall be clearly reflected in schedule of deviation with proper justification subject to acceptance of the purchaser. The spare parts shall be interchangeable with and shall be of the same or higher quality than the original component.

Tenderers shall have to quote for each individual mandatory spares.

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

2. MECHANICAL EQUIPMENT/SYSTEM

Sl. No.	Brief Description	Quantity
a)	Vertical Shaft Francis Turbine, direct coupled, 300 rpm, capable of generating 81.20 MW at Generator terminals at rated head of 201.80 meter, complete with its associated Spiral Distributor & other accessories, including embedded and foundation parts, Instruments, Control & Safety Devices, Lube Oil System etc., complete in all respects. (TG Unit shall be capable of generating with 10% Continuous Overload)	3 sets
b)	Digital microprocessor type Governor with fully redundant controllers and Governing Equipment complete in all respects for optimizing and controlling the turbines and guide vanes opening & closing mechanism etc. The system should be compatible to the use of SCADA system.	3 sets
c)	Oil Pressure system for Governor complete with Pumps, Motors, Valves, Oil Pressure Accumulators (N ₂ accumulators), Piping, Instruments etc.	3 sets
d)	Oil Pressure system for MIV complete with Pumps, Motors, Valves, Oil Pressure Accumulators (N ₂ accumulators), Piping, Instruments etc.	3 sets
e)	Monorail with hoist located at the level below runner and used to handle Runner during maintenance, necessary platform and other accessories for maintenance of Turbine Runner, Vent Pipes etc.	3 sets
f)	Trolley with tilting Hydraulic Cylinder for Runner removal and installation during maintenance	1 set
g)	Cooling Water System complete with Cyclone Separator, Motorized Automatic Online Self-Cleaning Strainers, Valves,	3 sets

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

	piping, Strainers etc., and all electrical & mechanical accessories;	
h)	<p>HP & LP Compressed Air System complete with Compressors, Air dryers, Air Receivers, pipes, valves, fittings, Instruments, specialties for compressed air, oil & water services and all electrical and mechanical accessories;</p> <p>A separate compressed air system to run the machine in synchronous condenser operation mode.</p>	1 set
i)	Station Drainage system complete with main and stand-by Submersible Sump Pumps, Motors, Valves, Automatic Detachable Pedestal Coupling. Dismantling joint, Guide Rail Pipes, Piping, necessary Cabling, Motor Starters, Level Switches & Alarm System etc.	1 lot
j)	Unit Dewatering system complete with main and stand-by Submersible Sump Pumps, Motors, Valves, Automatic Detachable Pedestal Coupling. Dismantling joint, Guide Rail Pipes, Piping, necessary Cabling, Motor Starters, Level Switches & Alarm System etc.	1 lot
k)	Flood pumps complete with Submersible Sump Pump, Motor, Valves, Automatic Detachable Pedestal Coupling. Dismantling joint, Guide Rail Pipes, Piping, necessary Cabling, Motor Starters, Level Switches & Alarm System etc.	1 lot
l)	Monorail with hoist used to handle drainage, dewatering and flood pumps during maintenance, necessary platform and other accessories.	1 lot
m)	Lubricating and Governor Oil Filtration set.	1 set
n)	Conducting Model Test of the Turbine	As required
o)	Spherical Main Inlet Valve of 2750 mm diameter complete with actuating mechanism, transition sections and dismantling joint;	3 sets

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

p)	Butterfly Penstock Protection Valve of 5750 mm diameter complete with actuating mechanism, transition sections and dismantling joint;	1 set
q)	Fire Fighting system for Powerhouse, Transformer and Switchyard.	1 set
r)	HVAC System for Powerhouse	1 set
s)	Cabin & Radio Remote Control, Indoor Double Girder Electrically Operated overhead traveling Crane (EOT) of requisite capacity, Class M3 for Powerhouse complete with, hooks, motors, electrical control panel, trolley, brakes, bumpers, crane stops, safety devices, limit switches, load limit device for MH, AH, platforms, ladders, fittings & connections and electrical accessories, complete cabling, LT Rails & DSL and their embedded parts & fixtures etc., as per Technical Specification.	1 set
t)	Cabin & Radio Remote Control, Indoor Double Girder Electrically Operated overhead traveling Crane (EOT) of requisite capacity, Class M3 for Valve house, complete with, hooks, motors, electrical control panel, trolley, brakes, bumpers, crane stops, safety devices, limit switches, load limit device for MH, AH, platforms, ladders, fittings & connections and electrical accessories, complete cabling, LT Rails & DSL and their embedded parts & fixtures etc., as per Technical Specification.	1 set
u)	EOT crane of 10 T capacity for erection and maintenance of GIS equipment. The crane shall be capable of lifting equipment from the rails of transformer enclosure.	1 No.
v)	Elevator	1 set
w)	Workshop Equipment	1 set

3. ELECTRICAL EQUIPMENT

S.No.	Brief Description	Quantity
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EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

1.	GENERATOR & EXCITATION SYSTEM:	
	Vertical Synchronous Generator (Salient Pole Type): Vertical Shaft Generator of rating 80 MW, suitable for 10% continuous overloading with 11 kV generation at 0.85 pf complete with static excitation system, digital AVR, shaft current measurement system and consisting of following:	3 Sets
1.1	Stator complete with frame, punching and windings	
1.2	Rotor complete with shaft, spider rim, poles with winding and accessories and pedestal bearings	
1.3	CO2 based fire protection system along with piping and sensors etc.	
1.4	Lubricating system complete with necessary pipe work, valves, filter, pump set etc. for lubrication of the bearings.	
1.5	Oil coolers for the bearings & Air coolers for cooling of Generator Winding	
1.6	Sole plates, foundation bolts, bolts, dowels etc. required for proper erection, levelling, alignment etc. of generator.	
1.7	Generator housing door, stairs, railings, platform, convenient outlets, internal illumination, dome light etc.	
1.8	Platform, stairs, walkways, handrails etc. for access to the bearings, slip-rings etc .	
1.9	Static Excitation System and Digital AVR (2A+1M)	
1.10	Excitation Transformers	
1.11	Hydraulic Brake System Hydraulic/ Pneumatic Brake & Jack System	
2.	11kV ISOLATED PHASE BUS DUCT AND ASSOCIATED EQUIPMENT	3 Sets
2.1	11kV Isolated Phase Bus Duct Consisting of:	

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

2.1.1	11 kV isolated Phase Bus Duct of required length with current transformer as marked in enclosed SLD along with Generator end termination, Transformer end termination including flexible required bellows, seal off bushings for IPBD crossings at floor, separating walls etc. bends (H/V), Delta formation , potential transformers, surge protection cubicle, 0.25μF capacitor, neutral cubicle, and grounding transformer/resistor assembly cubicle including bends, delta connection, seal-off bushings, tapping arrangement for UAT, ET, NGT & LAVT etc. and termination arrangement.	
2.1.2	LAVT Cubicle - Lightning Arrestor, Surge Capacitor, CT and PT Cubicle (LAVT) with Copper/Aluminium bus bar (3 X 1 Ph)	
2.1.3	NGT Cubicle - Generator Neutral Grounding Cubicle (NGT) including Neutral Isolating Switch, Single Phase Neutral Grounding Transformer, Loading Resistor, CT's & Copper/Aluminum bus bar	
3.	IN TRANSFORMER YARD	
3.1.1	The water connection to the isolation valves provided within the transformer enclosure including flexible and supports.	As required
3.1.2	RTU Panel (TRB)	1/bank
3.1.3	N ₂ Injection based Fire Protection System	1 Lot
4.	33 kV MEDIUM VOLTAGE SWITCHGEAR :	1 Lot
	33 kV Indoor Switchgear panel with Vacuum circuit breakers / SF6 circuit breakers (630A), 25 kA, Copper Busbar, CTs, PTs, Meters (MFM), Busbar Protection & other protections etc. consisting of : 1. Incomer from SST - 1 No.	

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

	2. Incomer from Local Supply – 2 Nos. 3. Outgoing for Station Auxiliary Transformer - 2 Nos. 4. Outgoing for Remote site - 2 Nos. 5. Outgoing for Local/colony distribution – 2 Nos. 6. Bus PT panel - 1 No. 7. Spare Outgoing for future use - 1 No. 8. Earthing trolleys for maintenance – 1 No.	
5.	415 V LOW VOLTAGE SWITCHGEAR :	
5.1	Station Service Board (SSB) 415 V, 3150 A, 50 kA, Metal enclosed Switchgear with Copper bus bar, interlockings, MFMs, Protections, Starters etc. which shall comprise of following panels: 1. 3150 A ACB Incomer feeder from Station Service Transformer - 2 Nos. 2. 1250 A ACB Incomer feeder from DG Set - 1No. 3. 3150 A ACB breaker for Bus Coupler- 1No. 4. ACB outgoing Feeders – 3 Nos + 1 No. (Spare). 5. MPCB / MCCB outgoing feeders - 1 Lot	1 Set
5.2	Unit Auxillary Board (UAB) 415 V, 1250 A, 50 kA, Metal enclosed Switchgear with Copper bus bar, interlockings, MFMs, Protections, Starters etc. which shall comprise of following panels: 1. 1250 A ACB Incomer feeder from Station Service Board - 1 No.	3 Sets

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

	<p>2. 1250 A ACB Incomer feeder from Unit Auxiliary Transformer - 1No.</p> <p>3. MPCB / MCCB outgoing feeders - 1 Lot</p>	
5.3	<p>Gas Insulated Switchgear room AC Distribution Board (GIS-ACDB)</p> <p>415 V, 400 A, 50 kA, Metal enclosed Switchgear with Copper bus bar , interlockings, MFMs, Protections etc. which shall comprise of following panels:</p> <p>1. 400 A Incomer feeder (Working) from Station Service Board - 1 No.</p> <p>2. 400 A Incomer feeder (Stand by) from Station Service Board - 1 No.</p> <p>3. MPCB / MCCB outgoing feeders - 1 Lot</p>	1 Set
5.4	<p>Main Distribution Board (MDB) at HRT intake Location</p> <p>415 V Metal enclosed Switchgear with Copper bus bar , interlockings, MFMs, Protections etc. which shall comprise of following panels:</p> <p>1. One No. Incomer feeder from 160kVA, 33 /.433kV Transformer at Intake location- 1 No.</p> <p>2. One No. Incomer feeder from 200kVA DG set at Intake location - 1 No.</p> <p>3. MPCB / MCCB outgoing feeders - 1 Lot</p>	1 Set
5.5	<p>Main Distribution Board (MDB) at Valve House Location</p>	1 Set

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

	<p>415 V Metal enclosed Switchgear with Copper bus bar , interlockings, MFMs, Protections etc. which shall comprise of following panels:</p> <ol style="list-style-type: none"> One No. Incomer feeder from 160kVA, 33 /433kV Transformer at Valve House location- 1 No. One no. feeder from DG set- 1 No. MPCB / MCCB outgoing feeders - 1 Lot 	
5.6	One Lot of distribution boards as per requirements complete with cubicles, bus bar system, circuit breaker, instruments transformers, instruments, relay, cabling and wiring and other accessories.	1 Lot
6.	UNIT CONTROL, SCADA AND AUTOMATION	
6.1	Unit control boards (UCB), Auto synchronizing panel with redundant programmable controllers & input output modules with plant SCADA, Automation, Control (PCS) including HMI, redundant fibre optic cables for inter panel connection, transmitter/receiver, router, cabinet, Software for work stations etc. to make it complete system	3 Lots
6.2	Common Control board (CCB) with redundant programmable controllers & input output modules with plant SCADA, Automation, Control (PCS) including HMI, redundant fibre optic cables for inter panel connection, transmitter/receiver, router, cabinet, Software for work stations etc. to make it complete system	1 Lot
6.3	Operator work stations	3 Nos.
6.4	Engineering work station	1 No.
6.5	Portable Engineering work station (Laptop)	1No.
6.6	Large Video Screen (LVS)	1 Set
6.7	Printers	3 Nos.
6.8	Historian work station	1No.
6.9	Furniture for control room	1 Lot

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

6.10	Intake Control board	1No.
6.11	Valve House Control board	1No.
6.12	Operator work station for remote sites	2Nos.
6.13	VOIP System	1 Lot
6.14	Fibre Optic cable (ADSS) from power house to remote sites with all accessories for complete FO communication and including all hardware for laying etc.	1 Lot
7.	PROTECTION, AUTOMATION, METERING & COMMUNICATION SYSTEM	
7.1	Protection Board for Generator and Generator Step up Transformer (UPBs), Set of complete board comprising of a free standing 3 section Rack Mounting type cubicle, each section 750x750x2000 front (tempered glass) and back door, IP54 dust tight and containing the following:	3 Sets
	<p>Section 1: Protection A containing:</p> <p>(ALSTOM, Siemens, ABB, GE make relays)</p> <ul style="list-style-type: none"> • Multifunction Digital Generator Management Relay • Multifunction Digital Transformer Management Relay • Digital Communication Processor • Lockout Relays (manual Reset) [86], Tripping Relay (auto Reset) [94], Test Switches, Space heater, switch for socket, space heater and other panel supply, AC Compact LED Tube fitting complete with Door switch, DC source MCB, heavy duty terminal blocks, internal tinned copper wiring, 200°C fluoropolymer insulation etc. • Multifunction Meter • BCU 	
	<p>Section 2: Protection B containing:</p> <p>(ALSTOM, Siemens, ABB, GE make relays)</p>	

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

	<ul style="list-style-type: none"> • Multifunction Digital Generator Management Relay • Multifunction Digital Overall Differential Relay • Digital Communication Processor • Lockout Relays (manual Reset) [86], Tripping Relay (auto Reset) [94], Test Switches, Space heater, switch for socket, space heater and other panel supply, AC Compact LED Tube fitting complete with Door switch, DC source MCB, heavy duty terminal blocks, internal tinned copper wiring, 200°C fluoropolymer insulation etc. 	
7.2	Protection Board for Station Service Transformer (SST) , Set of complete board comprising of a free standing 3 section Rack Mounting type cubicle, each section 750x750x2000 front (tempered glass) and back door, IP62 dust tight and containing the following:	2 Sets
7.2.1	<p>Section 1: Protection A containing:</p> <p>(ALSTOM, Siemens, ABB, GE make relays)</p> <ul style="list-style-type: none"> • Multifunction Digital Transformer Management Relay • Digital Communication Processor • Lockout Relays (manual Reset) [86], Tripping Relay (auto Reset) [94], Test Switches, Space heater, switch for socket, space heater and other panel supply, AC Compact LED Tube fitting complete with Door switch, DC source MCB, heavy duty terminal blocks, internal tinned copper wiring, 200°C fluoropolymer insulation etc. • Multifunction Meter • BCU 	

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

7.2.2	<p>Section 2: Protection B containing:</p> <p>(ALSTOM, Siemens, ABB, GE make relays)</p> <ul style="list-style-type: none"> • Multifunction Digital Overall Differential Relay • Digital Communication Processor • Lockout Relays (manual Reset) [86], Tripping Relay (auto Reset) [94], Test Switches, Space heater, switch for socket, space heater and other panel supply, AC Compact LED Tube fitting complete with Door switch, DC source MCB, heavy duty terminal blocks, internal tinned copper wiring, 200°C fluoropolymer insulation etc. 	
7.3	<p>Section 3: Common Protection and Control containing:</p> <ul style="list-style-type: none"> • Multifunction digital Overcurrent relay (50/51, 51G) for ET and UAT • Digital Ground Voltage relay (64B), Auxiliary and timed relays, common I/O rack, Pistol grip CB Control Switch, Pistol grip local distance switch, Test switches, Space heater, switch for socket, AC Compact LED Tube fitting complete with door switch, DC source MCB, heavy duty terminal blocks, internal tinned copper wiring, 200°C fluoropolymer insulation etc. • BCU • Multifunction Meter for UAT & ET. 	3 Sets
7.4	<p>GIS Protection Board (LPB):</p> <p>Free standing 6 section Rack Mounting type each section 750x750x2000 front (tempered glass or Lexan) and back door, IP62 dust tight and containing the following</p>	4 Sets
	Lines 1 and 2 Protection A containing:	

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

	<p>(ALSTOM, Siemens, ABB, GE make relays)</p> <ul style="list-style-type: none"> • Multifunction Digital Line Distance/ Differential Relay • Intelligent Revenue Metering system (Schneider/ Power measurement ION7700 or equivalent) • Lockout Relay (manual reset) [86], Tripping relay (auto reset) [94], Auxiliary and timed relays, Test Switches, 240V AC Space Heater c/w thermostat, 5A/15A, 240V AC MCB switch for socket, space heater and other panel supply, 20 W, 240V, AC Compact LED Tube fitting complete with Door switch, DC source • MCB, Fuse Blocks and fuses, Heavy duty Terminal Blocks. • BCU • Multifunction Meter (Main & Check) 	
	<p>Lines 1 and 2 Protection B containing:</p> <ul style="list-style-type: none"> • Multifunction Digital Line Distance/ Differential Relay • Intelligent Revenue Metering system <p>(Schneider/ Power measurement ION7700 or equivalent)</p> <ul style="list-style-type: none"> • Lockout Relay (manual reset) [86], Tripping relay (auto reset) [94], Auxiliary and timed relays, Test Switches, 240V AC Space Heater c/w thermostat, 5A/15A, 240V AC MCB switch for socket, space heater and other panel supply, 20 W, 240V, AC Compact LED Tube fitting complete with Door switch, DC source • MCB, Fuse Blocks and fuses, Heavy duty Terminal Blocks. 	
7.5	Bus Protection containing: (BPB)	1 Lot

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

	<p>Free standing Rack Mounting type with front (tempered glass or Lexan) and back door, IP62 dust tight and containing the following</p> <ul style="list-style-type: none"> • Each Multifunctional Digital Bus Differential Relay c/w One Central Unit, twenty Peripheral Units (20 zones) to provide Main and Check feature (Independent for Protection A & Protection B). • Breaker Failure Relay (Independent for Protection A & Protection B). • Lockout Relay (manual reset) [86], Tripping relay (auto reset) [94], Auxiliary and timed relays, Test Switches, 240V AC Space Heater c/w thermostat, 5A/15A, 240V AC MCB switch for socket, space heater and other panel supply, 20 W, 240V, AC Compact fluorescent Tube fitting complete with Door switch, DC source. • MCB, Fuse Blocks and fuses, Heavy duty Terminal Blocks. • BCU • Multifunction Meter • Mimic/Indication of Unit Protection panels on GIS protection panels. 	
7.6	Unit Bay Controller and Metering Board (BMB) (Units, SST Metering)	1Set
7.7	Line Metering Board	4 Set
7.8	Common RTU Board	1Set
7.9	GIS and Pot Head Yard Protection Engineering Workstation as per Technical Specifications	1Set
7.10	Portable Engineering Work Station as per Technical Specifications	1 Set
7.11	Protection Operating Work Station as per Technical Specifications	1 Set

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

7.12	Dispatch Work Station (DWS) With GPS Clock, antenna & IRIG-B Distribution.	1 Set
7.13	Energy Management Station (EMS) including all software	1 Set
7.14	Control and Monitoring containing : <ul style="list-style-type: none"> Digital Communication Processor Common I/O rack complete with indicating light and Control switches LED indicating light, 220V DC, 100,000AGC hours, Pistol Grip Circuit Breaker Control Switch, Pistol Grip Local distance switch, 240V AC space heater c/w thermostat, 5A/15A, 240V AC 3 pin socket, 5A/15A, 240V AC MCB switch for socket, space heater and other panel supply, 20W, 240V, AC Compact LED Tube fitting complete with Door Switch, DC source MCB, Fuse Blocks and fuses etc. 	1 Lot
7.15	GIS SCADA (PAMS) communication with main PH SCADA (OFC Cable & Patch Panels) <ul style="list-style-type: none"> Free standing 4 section Rack Mounting type each section 750x750x2000 front (tempered glass or Lexan) and back door, IP62 dust tight Redundant multimode optical fiber cables with all the necessary accessories like Connectors, Adaptors, LIUs, Patch panels, Patch cords etc. 	1 Lot
7.16	Relay Testing Kit	1 Lot
7.17	Standalone Event Logger and Disturbance Recorder	1 Lot
8.	DIESEL GENERATOR SET:	
8.1	415 V, 800 kVA Silent DG set (with acoustic enclosure) along-with AMF panel, inbuilt day tank and 999 Litres weekly storage tank with associated system.	1 Set

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

8.2	415 V, 250 kVA Silent DG set (with acoustic enclosure) along-with AMF panel for remote site with inbuilt day tank and 999 Litres weekly storage tank with associated system.	1 Set
9.	COMMUNICATION SYSTEM & CCTV SYSTEM	1 Lot
9.1	Communication System complete with 64 telephone sets & EPABX system suitable for the same + PA System.	
9.2	CCTV System with Monitor as described in Tender Specifications	
10.	DC SYSTEM & UPS SYSTEM :	1 Lot
10.1	Two (2) 220 V DC 1000AH Plante/ Ni-Cd Battery bank including battery racks	
10.2	Two (2) sets of 220 V DC Battery chargers (main and standby) and all accessories	
10.3	220 V DC Battery Discharge Panel	
10.4	Two (2) 220 V DC distribution board (DCDB)	
10.5	Two (2) 220V GIS DC Distribution Board (DCDB)	
10.6	220V DC/240V AC Inverter	
10.7	240V AC Distribution Board (ACDB)	
10.8	Two (2) 48 V DC 400AH Plante/ Ni-Cd Battery bank including battery racks	
10.9	Two (2) sets 48 V DC Battery chargers and all accessories	
10.10	Two (2) 48 V DC distribution board (DCDB)	
10.11	One (1) 220V DC/48V DC Converter	
10.12	25 kVA UPS battery, power distribution board & and all necessary accessories - 1 Set	

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

10.13	6 kVA UPS battery, power distribution board & and all necessary accessories - 2 Sets	
10.14	240AC/24V DC Converter with 24V DC Distribution Board - 1 Set	
11.	POWER & CONTROL CABLES	1 Lot
11.1	HT Power Cables: 33 kV, single core, armoured, XLPE insulated, PVC sheathed, compacted stranded circular cross section, Aluminium conductor, FRLS Type, rodent proof mainly for interconnection of equipment.	
11.2	HT Power Cables: (if required) 11 kV, armoured, XLPE insulated, PVC sheathed, compacted stranded circular cross section, Aluminium conductor, FRLS Type, rodent proof mainly for interconnection of equipment.	
11.3	LT Power Cables: 1100 V grade, multi-core, HR PVC/XLPE insulated, PVC sheathed (inner and outer extruded), stranded compacted circular cross-section, FRLS Type, rodent proof, copper conductor of different sizes.	
11.4	Control Cables: Control Cables - 1100 V grade, stranded copper conductor, PVC insulated, FRLS Type, rodent proof, colour coded with inner sheathed extruded PVC over all PVC sheathed of different sizes and cores.	
11.5	Instrumentation Cables: Annealed tinned flexible copper conductor, PVC insulated, polyester taped, Twisted pairs, individual & overall shielded, FRLS Type, rodent proof.	
11.6	Cable Accessories: Termination Kits, Lugs (tinned copper Lugs), Glands, Ferrules etc.	
12.	CABLE TRAYS	1 Lot
12.1	Perforated / Ladder Type GI Cable Trays, racks & necessary hardware with support structures & accessories.	
13.	ILLUMINATION SYSTEM :	1 Lot

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

13.1	Illumination System (Normal & Emergency) for Power House area, outdoor areas around power house, pothead yard area, approach road and remote sites (HRT intake & Valve house areas), complete with LED lighting fixtures, conduits and fittings, cabling and distribution boards (MLDBs & ELDBs, LDBs). It shall also include illumination of road near Power House & the two remote sites.	
14.	EARTHING SYSTEM :	1 Lot
14.1	Earthing System for Power house, transformer area, GIS, Pothead yard area, remote areas/sites and adjoining areas including MS rods for buried earthing grid, GI strip for equipment connection to Main Grid and GI exposed earth strip, MS rods including hardware such as bolts, nuts and lock-washers.	
14.2	Earthing and Surge protection of GIS & other equipment- <ul style="list-style-type: none"> • Earthing Grid for GIS in GIS floor • Earthing interconnection of GIS equipment and the GIS floor grid. • Connection between GIS floor earth grid with Power House Earth grid • Earthing of Generator Transformer Neutral to treated pit • Body Earthing of GTMB, CMB ,rail etc. to P.H. earthing mat • Pot head yard earthing grid above GIS floor level , its connection to pot head yard equipment and further to PH earthing grid 	
15.	ELECTRICAL WORKSHOP	1 Lot

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

4. MISCELLANEOUS EQUIPMENT

a)	Field Instruments and Receiving Instruments;	As required
b)	Complete Monitoring and Safety Instruments pertaining to the TG set;	3 sets
c)	Vibration Monitoring System	3 sets
d)	Air Gap Monitoring System and Vibration Analyzer including Zoom Control Station (ZCS)	1 set
e)	Partial Discharge Analyzer	3 sets
f)	Turbine Flow Measurement display in SCADA (complete with all necessary differential pressure transmitter, integrated instruments, peizometer tapings, interconnecting tubes etc., and special tools for calibration at the time of installation	3 sets
g)	Surge Shaft and TWL Level Sensors	1 set each

5. OTHER

a)	First fill of Oil for all equipment supplied, with 10% extra;	As required
b)	Mandatory Erection/Maintenance Tools & Tackles listed in chapters- Generator & Excitation System, 33kV Medium Voltage Switchgear, 415V Low Voltage Switchgear etc.	As specified
c)	Special Erection /Maintenance Tools and Tackles;	As required
d)	Mandatory Spare Parts – Mechanical & Electrical (as per Technical Specifications);	As specified

EPC execution of Power House Electro-Mechanical Works of Heo Hydro Electric Project (240MW) Arunachal Pradesh		Particular Technical Specifications
		Volume II Section-III
		Schedule of Requirements (SOR)

e)	Any Additional Spares required for 5-year trouble free operation period as recommended by Bidder over and above Mandatory Spares. List to be furnished along with price for consideration of the Employer.	As recommended (Optional)
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6. NOTES

- 1) The specifications and accompanying drawings are intended to describe and provide a finished piece of work. It is to be understood and agreed by Contractor, that the work desired shall be complete in detail, even though every item involved is not particularly mentioned. Contractor shall be required to provide all materials, equipment, labor, etc. necessary for the entire completion of the work described and shall not avail himself of any manifesting unintentional error, omission or inconsistency that may exist. The contractor shall carry out and complete the work in every respect to the satisfaction of Employer. The work shall meet the requirements laid down by the Employer/Engineer, latest local regulations of state, safety codes, fire and general insurance regulations and all other standards accepted practices.
- 2) This specification calls for execution of the Work in the most expeditious manner to ensure successful and timely commercial operation of the equipment installed. It is essential that Contractor has adequate experience for supply/erection/commissioning of similar equipment under his direct responsibility and supervision. It must have in its possession, adequate quantity of precision tools and erection/installation aids and must have on its direct roll, adequately qualified and experienced supervisory staff and craftsmen.
- 3) The contractor shall supply the equipment from reputed and experienced manufacturers. Preferred makes of major equipment shall be as per enclosed list.
- 4) The Bidder shall furnish the main offer as per above details, for the purpose of evaluation. However, the Bidder can make an alternative, if desired, for consideration of owner along with all the required information.