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TECHNICAL SPECIFICATION FOR EMERGENCY DIESEL GENERATOR SETS

PROJECT :	CAPTIVE POWER PLANT (CPP) PACKAGE, VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
CUSTOMER :	M/s HINDUSTAN PETROLEUM CORPORATION LIMITED
CONSULTANT :	M/s ENGINEERS INDIA LIMITED (EIL), NEW DELHI

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**DOCUMENTS TO BE SUBMITTED WITH THE BID:**

The bidder must submit the following documents along with their bid to enable BHEL to evaluate their offer.

- a) Duly filled in Emergency Generator Package datasheet
- b) Duly filled in Engine datasheet
- c) Tentative GAD of DG set
- d) Tentative Layout of DG room
- e) Un-priced copy of attached BHEL price bid formats indicating quoted/ not quoted against each row & column.
- f) Equipment qualification criteria / PTR / Reference Lists
- g) Checklist as per annexure-5
- h) Deviation list [if any] as per annexure-11

In case the above mentioned documents are not submitted with the offer, the offer of the bidder may be liable for technical rejection.

1.0.0 INTENT OF SPECIFICATION:

This specification specifies the requirement of Design, Engineering, Manufacturing, Assembling, Inspection, Testing at manufacturer's works and Delivery of properly packed and painted Diesel Generator sets, coupling with all accessories as specified in the scope of work and as required for the safe and trouble-free operation of equipment to be installed at site.

2.0.0 SPECIAL NOTES TO BIDDERS:

2.0.1 This specification shall read in conjunction with its enclosures. In case of any discrepancy arising between this specification & its enclosures, the most stringent of all shall be followed and shall over-ride others. Further, if a requirement in this specification or its enclosures, calls for decision of BHEL, it shall be bidder's sole responsibility to clearly bring out the same distinctively in his technical tender offer, to enable BHEL to furnish their decision. If such a requirement is not duly addressed by bidder during tender stage and same comes out during order execution stage, it shall be binding on the bidder to comply with the decision furnished by BHEL then, without any cost, delivery, or any other commercial implications.

- a) Bidders shall comply with various requirements of this specification. Bidders can bring out only those deviations, which are impractical to meet, for BHEL review.
- b) Bidders may please note that unless the deviations are specifically brought out under deviations clause, it will be considered that no deviations are taken, even if they are mentioned elsewhere directly/indirectly in the offer.

2.0.2 Any additional equipment, material, etc., which are not specifically mentioned here, but are required to make the supplied equipment complete in all respect, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be covered under the scope of this specification.

2.0.3 The Bidder shall accept full responsibility for the completeness and for the faultless working of all the equipments. These shall be executed on the basis of proven design principle and in accordance with the latest state of the art in such a manner that the purpose to be served by the Pump unit is fulfilled in every respect and a maximum of operational dependability and efficiency are assured. Standardization of equipment, materials etc. shall be employed in the design. Care shall be taken to ensure safe operation as well as simplicity of assembling and dismantling of all parts of the plant.

2.0.4 Bidder shall quote strictly as per the scope of supply and requirements of this specification. Unsolicited or Alternate offers from the bidders will not be entertained.

2.0.6 In case bidder feels that it is necessary to exclude some components of scope of supply or some of the features of specification requirements due to any technical constraints, bidder shall bring the same to the notice of purchaser during pre-bid stage and take their prior approval before submission of their bid.

2.0.7 Incase Bidder is unable to offer due to any specific requirement of specification, Bidder shall bring out the same in their regret letter. Otherwise, it will be considered that non-participation by the bidder is attributable to reasons other than any specification requirements.

**3.0.0 APPLICATION OF SYSTEM:**

Total 2 numbers of DG Sets (2 x 50%) to meet the Emergency load requirement of HPCL-Vizag Refinery as well as Captive Power Plant (CPP) with in HPCL-Vizag Refinery. This is to aid in safe shutdown or to minimize impact of normal power supply failure. DG Set shall be installed within a DG room.

3.1.0 SITE DATA:

Sl. No:	Parameter	Unit	Minimum	Normal	Maximum	Design
1	Barometric Presssure	mm Hg	735	750	760	760
2	Ambient Temperature	°C	12.5	36	45	45
3	Relative humidity @ ambient temperature	%	60	80	95	95
4	Rainfall data for 1-hour period	mm	--	80	100	100
5	Rainfall data for 24-hour period	mm	--	--	293	293
6	Wind Velocity**	km/hr	1-5	--	185	185
7	Elevation above mean sea level	m	--	--		5.56

Notes

** Maximum wind velocity is for cyclone prone region. Wind pressure shall be based on IS Code No. 875

4.0.0 SCOPE OF SUPPLY:

Total 2 numbers of DG Sets (2 x 50%). The system shall be provided as per Annexure-1 taking into all requirements including for testing, painting, Engineering, documentation, sub vendor list, equipment specifications etc., for DG Set & its various auxiliaries/Accessories as specified in this specification and enclosures. Please refer to the enclosed BOQ (Annexure-1) for general clarity on scope of supply. In case of any item/s missing from Annexure-1 but required for trouble free operation of System, Bidder shall consider the same.

4.1.0 CODES AND STANDARDS:

- 4.1.1 The equipment & accessories covered by this Specification shall be designed, manufactured and tested in accordance with the latest relevant standards and codes of practice as applicable including the below mentioned list but not limited to it.
- 4.2.0 The DG Set & Electrical accessories shall also confirm to the latest Electricity, Rules & other related statutory agencies as regards safety, earthing and other essential provisions specified (RESPECTIVE INDIAN STATE).
- 4.3.0 The installation work shall confirm to Indian electricity Act and Indian electricity rules as amended upto the date this specification is issued. Nothing in this specification shall be construed to relieve the contractor of this responsibility.
- 4.4.0 In the event of any conflict between the codes and standards referred, and the requirements of this specification, the requirements, which are more stringent, shall govern. If they are equally stringent, the Seller shall follow the hierarchy as follows.
1. Statutory Regulations
 2. This specification:
 - (i) PY51350 Specification
 - (ii) Equipment Data sheets(Annexure-2)
 - (iii) SLDs
 - (iv) Other Annexures

**3. Codes and Standards**

APPLICABLE STANDARDS	COMPONENTS / ITEMS
BS :5514,ISO:3046,SAEJ1349, IS-10000, DIN 6270,85 549/1958	Diesel Engine
IS-1271, 2253, 4722, 4128, 4389, 6362, 7132, 7306, 7816, 12065, 12075, 12802,13364, 13118, IEC- 60034	Alternator
VDI 2063	Measurements and evaluation of mechanical vibrations of reciprocating piston engines and piston compressors.
IS-5, 2007	Color for ready mixed paints 8. enamels
IS-694, 2010-2012, IS-1554 Part 1, IS 7093 for XLPE	PVC Insulated cables for working voltage up and including 1100 Volts.
IS-1248, Part - 1 to 9, 1991-2003	Direct acting indicating analogue electrical measuring instrument & their accessories.
IS-2026, Part-1, 1991-2011	Power Transformers (General)
IS-2551, 1990	Danger Notice Plates.
IS-2705, Part-1, 2,3,4, 1992-2002	Current Transformers
IS-3156, Part-1, 2,3,4, 1992-2002	Voltage Transformers
IS-3231, Part-0, 1,2,3, 1987-2001	Electrical Relays for Power System Protection.
IS-5082, 1998-2003	Wrought Aluminum & Aluminum alloy bars, Rods, Tools & Sections for Electrical purpose.
IS-5578, 1984-2001	Guide for marking of Insulated Conductors.
IS-7372, 1995	Lead Acid storage batteries for Motor vehicles.
IS-60947, Part-1-5, 2007-2012	Low voltage Switchgear & Control Gear assemblies.
IS-60947, Part-1-5, 2007-2012	Low Voltage Fuses: Supplementary requirement for fuses for Industrial applications.
IS-60034, 1750	Classification of degree of protection provided by enclosures of electrical equipments.
IS-8183	Bonded mineral wool
IS-1460 -1995	HSD
IS-60947, Part-1-5, 2007-2012	Low voltage Switchgear & Control Gear assemblies.
IS-60947, Part-1-5, 2007-2012	Low Voltage Fuses : Supplementary requirement for fuses for Industrial applications
IS-60034, 1750	Classification of degree of protection provided by enclosures of electrical equipments
IS 2629	Recommended practice for HOT-DIP galvanization of Iron and Steel
IS 2623	Methods for testing uniformity of coating of Zinc ' Coated articles.
OSID-GDN-180	OSID standard on lightening protection.
IS 4722	DG starting motor

4.2.0 Engine:

Engine shall be four stroke water cooled, Naturally aspirated/turbo charged with charge air cooler, spark ignited type and shall run on diesel. The engine rated speed shall be **1000 rpm (direct through flexible coupling) or lower.**

The diesel engine shall be suitable for delivering power requirement of the driven equipment (Alternator etc.) after taking into consideration the transmission losses, site de-rating and power requirements of auxiliaries and other parasitic loads.

The design standard of engine shall be ISO 3046 duly taking care of requirements mentioned in EIL std. Spec. 6-43-0040, Rev 2, Data Sheet of DG Set & other EIL specifications attached with this document. (Refer Annexure-11 for details)

4.3.0 Alternator:

The Alternator shall be synchronous, brushless, self-excited, self-regulated, naturally ventilated, 6750 KVA rated at 0.8 PF (lag), 3 phase neutral system, 11 KV, 50 HZ, Insulation class "F" Temperature rise shall be limited to Class B limits. The alternator shall have double bearings. The Alternator shall have necessary inherent regulation and for close regulation, there shall be automatic voltage regulation (AVR). The AVR for the generator shall be panel mounted where a control knob shall



be provided for voltage control for synchronization and voltage raise/ lower feature should be compatible with auto synchronizer for parallel operation.

Alternator shall have following characteristics:-

- a) Voltage regulation of $\pm 1\%$ at loads from no load to full load and power factor 0.8 lagging to unity.
- b) Overload capacity of 10% of rated capacity for one hour in every 12 hrs of operation.
- c) Voltage & frequency variation of $\pm 5\%$ & $\pm 3\%$ respectively.
- d) Alternator shall be provided with QDCTs, RTD & BTD.
- e) Alternator shall be provided with CTs as per attached SLD.

4.4.0 Neutral Earthing

Neutral earthing shall be made with suitable neutral grounding resistance (NGR) and neutral isolation switch (NIS). NGR rating shall be 600A, 10Sec and Neutral isolator shall be Vacuum break type.

4.5.0 Generator Control Panel /AMF Panel

Generator Control Panel shall include Generator Protection system, Metering, AMF system, Synchronizing equipment including Auto synchronizer (common for both DG sets), Load sharing controller, Annunciation window etc., Numerical relay used for Generator protection shall have IEC-61850 HSR protocol.

The generator control panel shall be free standing, metal enclosed fabricated with cold rolled sheet steel of 2mm thickness, dust and vermin proof type with a hinged door and having a degree of protection IP 41 unless otherwise specified. Power and control equipment shall be segregated inside the panel as far as practicable. The maximum height of the operating handle / switches shall not exceed 1800 mm and the minimum height shall not be below 300 mm. All control wiring shall be done using copper conductor 1100V grade FRLS PVC insulated wires with suitable ferrules and lugs. 1.5 sq. mm. for control circuits and for power circuits the size shall be suitable for equipment rating. The panel shall be complete with all necessary internal wiring, control circuit relays and terminations. All circuit components, control switches, indicator lamps and push buttons shall be clearly identified by name plates.

The DG set shall be fully automatic start with overriding facility for manual operation and also during emergency/ test function. In auto mode operation, the set shall come ON and take load in case of mains failure (AMF). The DG set shall be able to be synchronized with other DG sets in auto and manual mode with auto load sharing. Restoration of EB supply shall be smooth through momentary grid paralleling. Selection controls for Synchronizing with DG in Auto/Manual mode shall be provided. Auto Synchronizer, CSR (check Synchronisation relay), Synchronous Scope, Double voltmeter, Double frequency meter, Voltage Raise/lower switch and speed Raise/Lower switch for manual mode of operation shall be provided. Load sharing shall be automatic in manual synchronization. Remote monitoring and control of the DG set shall be done from SCAP (By Customer). The connections shall be brought to a common place in the control panel.

The Generator protection shall be considered as per protection SLD attached & Numerical relay specification. The following flush type meters shall be provided as bare minimum :-

- i) Ammeter.
- ii) Voltmeter.
- iii) Frequency meter.
- iv) Power factor meter.
- v) KW meter.
- vi) KWH meter.
- vii) Excitation current and voltage.

The following Alarm/Annunciation shall be provided as bare minimum:-

- i) High engine coolant temperature
- ii) Low lube oil pressure
- iii) Over Speed shutdown
- iv) Fail to start
- v) Over/under frequency
- vi) Over/under Voltage
- vii) Over current



- viii) Earth fault
- ix) Reverse Power
- x) Differential winding fault
- xi) High Alternator Winding temperature.
- xii) High Alternator Bearing temperature.

4.6.0 OPERATING PHILOSOPHY:

- i) Two Nos. 2x50% DG sets & each shall be rated for [6750kVA@PF 0.8](#). In the event of loss of normal auxiliary power, Emergency Diesel Generator will supply AC Power to emergency loads for safe shutdown of the unit plus emergency station load.
- ii) The Engine shall be of Prime Power Rating while the Alternator shall be of Continuous duty.
- iii) The DG Set is required for Emergency duty. The prime mover shall be suitable for a duty of 12 hours continuous running, of which 1 hour shall be at 10% overload at rated speed.
- iv) Emergency DG Set shall have AMF start facility and shall be capable of starting automatically on mains failure and Auto manual SS in auto position and take up the load within 30 seconds. The DG circuit breaker should close automatically to energize the essential loads, which shall happen automatically up to a preset value.
- v) On Mains failure, any one of the DG set shall start automatically, based on the downstream load, second DG set shall start on auto & accordingly both DG sets shall share the load.
- vi) Emergency DG shall be capable of parallel operation with grid during on load live changeover & during load testing.
- vii) Emergency DG Set shall be suitable for operation, control, monitoring, synchronizing from Synchronization Control & annunciation Panel (SCAP) & Electrical control system (ECS by customer) located in Central Control Room. Necessary interface shall be provided accordingly.
- viii) Generator and associated electrics shall be suitable for parallel operation amongst themselves with other generating sets & parallel operation with Grid at operating voltage and under the load conditions up to rated value and with the generator neutral solidly earthed. DG vendor shall develop scheme for automatic start of 1 or 2 DGs based on the loading and parallel operation of DGs along with active & reactive power sharing.
- ix) The DG set shall be capable of starting the largest emergency drive motor (850 KW) while the DG is operating at full base load i.e. with all other emergency loads in operation. Starting power factor of 0.2 and starting current of **5.5 times** (inclusive of tolerance) of full load current is considered for calculating voltage drop during start of motor which should be within 15% at motor terminals.
- x) The fuel oil system and lubricating oil system shall also start simultaneously as soon the engine receives starting impulse.
- xi) The ventilation fans and exhaust fans (if any) shall also start simultaneously as soon as the DG set gets start command.
- xii) There shall be a provision for Remote Start/Stop of the DG set. The DG set shall have facility to stop manually from Remote/Local.
- xiii) The DG set shall have suitable control arrangement so as to meet functional and control requirement mentioned elsewhere in the specifications.

4.7.0 11KV Breaker Panel

Each DG set shall be provided with stand alone 11kV local Breaker panel along with Measurement and Protection equipment as bare minimum. Under normal condition, the DG breaker is in closed condition and is meant for local isolation. DG synchronization shall be done through HT breaker which is part customer's 11kV Emergency switchboard. HT switchgear panel shall comply to the attached specification (6-51-0001, Rev06). Fault level of HT switchgear shall be 40kA for 1 sec (rms) and 105kA (peak).

**4.8.0 415V DG Auxiliary MCC**

A common 415V DG Auxiliary MCC shall be provided for DG Auxiliaries. It shall have Two Incomers and one Bus-coupler. 2x100% 415V Incoming power supply will be provided upto to the 415V DG Auxiliary MCC by customer, further distribution shall by DG Vendor. 415V DG Auxiliary MCC shall comply to the attached specification (6-51-0018, Rev05). Fault level of MCC panel shall be 65kA for 1 sec (rms)& 136kA (Peak)

4.9.0 Base frame:

Common base plate for mounting the diesel engine and the driven alternator shall be supplied by the bidder. Non-skid decking shall be provided on the base plate. A base plate shall be a single fabricated unit. The base plate shall be provided with lifting lugs for a four point lift. Lifting the base plate complete with all equipment mounted shall not permanently distort or otherwise damage the base plate or the machinery mounted on it.

4.10.0 LO skid:

Forced feed lubrication and pre lubrication system (Skid mounted) inclusive of but not limited to sump, strainer, oil filters, control valves, pre lube pumps, main lube oil pumps, motor driven oil filing pump, oil coolers, piping, fittings, instrumentation and controls shall be Bidder's scope of supply.

The type of oil cooler and oil filter can be as per manufacturer's standard.

4.11.0 Coupling:

Direct flexible type coupling as per manufacturer's standard. Coupling shall be sized for Max. continuous torque, which is based on the potential maximum power of the diesel engine.

4.12.0 Cooling water system:

Closed circuit cooling water system with radiator with temperature control valve, expansion-make up water tank, motor driven fan, engine/motor driven water-circulating pump etc. to be provided bidder. DM Water Quality shall be given by BHEL for make up purpose.

4.13.0 Starting system:

Diesel engine shall be provided with compressed air starting system. Each engine shall be provided with two air compressors (One motor driven + One engine driven) and one No. of air receiver (The receiver shall be sized for at least 6 consecutive starts without recharging). The air compressors shall be of Reciprocating /Screw Type as per Manufacturer recommendation.

4.14.0 Fuel system:

Diesel oil treatment system (if required) and diesel oil control system shall be supplied by the vendor. It shall have minimum fuel lifting pump, fuel oil filters, fuel injection pump and fuel piping and fittings.

Each DG Set shall be provided with one no of 990 liters day tank. The day tank shall be located outside the room. In case, Fuel day tank is mounted above engine fuel connection level, a fuel float (surge) tank shall be provided along with its interconnecting piping/hoses to ensure that the system not permit gravity flow to the engine through fuel supply line during engine shutdown.

Fuel unloading, bulk storage and supply of fuel to 990 Ltr day tanks is in the scope of BHEL. However, 990 ltr day tanks (without instrumentation), piping from day tanks to engines and recirculation back to day tanks with required coolers are in the scope of bidder. Please refer to attached P&ID for fuel storage system (Drawing No. PY-D-P-1-M104-1052-02) for further details.

4.15.0 Combustion air intake & Engine Exhaust system:

The vendor shall prepare a layout drawing showing the layout and routing of air intake and engine exhaust piping/ducting, and include in his scope complete piping/ducting, nozzles, expansion bellows, silencer, Stack for Each DG Set (with aviation Lamp and Lighting Arrestor) and supports as required as per layout and routing. The type and location of air intake filter shall be



bidder's standard and shall be suitable for the climatic/environmental conditions of site. In case the filter is located outside the engine building/engine enclosure, vendor shall provide the following for the filter:

- a) Insect screen
- b) Rain hood
- c) Supporting structure with approach for maintenance.

Exhaust gas piping and silencer shall be provided with thermal insulation & cladding for personnel protection. The insulation thickness shall be adequate to limit the surface temperature at cladding not exceeding 60 deg. C. The extent of insulation and cladding shall be up to complete length of exhaust piping. The height of the exhaust stack for DG Set shall be as per guidelines provided in "Environmental Regulations on Engine for Generator set application and Generator sets" issued by Central pollution control Board (CPCB) of Government of India and shall be minimum of 30 meter height from ground Level.

4.16.0 Speed Governing System:

Speed governing system shall be Woodward or equivalent make. The governing class shall be selected by the vendor suitable for meeting the voltage and frequency variations specified in Electrical specifications. The governor and fuel injection pumps of both DG sets shall be of identical characteristics as they will be operating in parallel.

4.17.0 Noise and Exhaust gas Emission:

Unless otherwise specified, any applicable legislation/statutory requirements relating to the protection of environmental and to the health and safety of personnel, with regard to noise and exhaust gas emission, as applicable to the place of installation shall be fully complied with by Engine manufacturer. Even though DG set is located in acoustically, treated DG room the noise level when measured at one-meter distance from the DG room in any direction shall be as per CPCB norms.

4.18.0 Noise Attenuation System:

In order to meet CPCB norms for Noise Level, Bidder to consider Noise attenuation system for the DG Hall in their scope of supply. Noise attenuation system means complete engineering, Supply of Material (Such as Panels, Fixing accessories, Support Structural etc.).

4.19.0 Interconnecting Piping & Fittings: Bidder to consider all the interconnecting piping and fittings for DG Set to/from Diesel Engine to Various auxiliaries/Accessories and between various auxiliary systems. **All pipe & fittings shall be prefabricated.**

4.20.0 Maintenance Platform: Maintenance platform for DG Set & Its various auxiliaries/Accessories is to be provided.

4.21.0 Instrumentation:

- a) Bidder to consider instruments, control and safety devices required for trouble free and smooth running of DG Set and auxiliaries in their scope of supply as specified in specification and additional requirement, if any, as per manufacturer recommendation.
- b) There shall be hardwired & soft communication between above DG control panel & DCS system. No Control operation of DG set is envisaged from DCS System.
 1. There shall be 5 nos. of Hardwired Feedback signals (DI, Potential free contact) from each DG control panel to DCS system.
 2. One no. of redundant serial link with MODBUS TCP/IP protocol shall be considered for each DG control panel for connectivity with DCS.
- c) For other instrumentation requirement, enclosed standard EIL spec. is to be followed (Annexure-11).

4.22.0 Motors: LT Motor (Wherever):

For all applicable LT motors following details to be referred:

Available Power supply:

Voltage: 3Ph-11kV (+/-6%) for Motor >160KW

Voltage: 3Ph-415V (+/-6%) for Motor >=0.18kW to 160KW

Voltage: 1Ph-240V (+/-%) for motor <0.18kW.

Frequency: 50HZ (+/- 3%)

Combined voltage & Frequency variation +/-10%

LT Motor shall be as per enclosed EIL specifications [annexure-13]



Crimp type tinned Copper lugs and double compression SS cable glands shall be supplied along with the motors for the specified cable sizes for power, space heater cables and any other cables terminating at motor end.

4.23.0 Complete Unit Test:

Complete unit test is to be included in Bidder's scope of supply.

All machinery equipment shall be unitized with respective drivers at the manufacturer's works before dispatch to check fit-up of equipment, alignment, location of boltholes, interface locations / dimensions etc.

Unitisation shall be carried out at GEG/DG authorized packager works or Engine Manufacturer works.

4.24.0 First Fill of Lubricant: Excluded from Bidder's scope of supply. Bidder to furnish details of Lubricants required during DDE.

4.25.0 All other items necessary for safe and smooth running of DG Set & accessories required to make the supplied Equipment complete in all respect.

4.26.0 Commissioning Spares:

2 sets [1 set for each DG assembly including all Auxiliaries and Equipment] of commissioning spares DGs shall be quoted as per manufacturer's recommendation.

Bidder to furnish the list along with the offer regarding requirement of commissioning spares for entire DG package commissioning.

Any commissioning spare consumed over and above the recommended commissioning spares, during commissioning shall be supplied free of cost by the equipment vendor.

Any leftover (unused) spares after commissioning, out of those included by vendor, shall be handed over to the owner.

4.27.0 Mandatory Spares:

Mandatory Spares shall be as per Price Bid Format (Annexure-3).

Special notes for Mandatory spares:

- 1) All Mandatory spares should be supplied separately with green color painted box.
- 2) Loose items sent by Vendor to sites shall be quantified/numbered/tagged and not merely mentioned as ONE lot of loose items.
- 3) A packing list covering items having shelf life are to be intimated to site. Also, shelf life items shall be packed separately in black color painted box for easy identification at site.

4.28.0 Special Tools and Tackles: Two set for DG Set Assembly & its various Auxiliaries/Accessories.

The bidder shall furnish a complete 1 sets of all special tools, wrenches etc. with necessary tools boxes as required for operation and maintenance [disassemble, assemble, or maintaining the unit] of the DG Set packages & its various Auxiliaries/Accessories.) supplied, as a part of scope of supply. **Bidder shall furnish a list of such tools along with offer for the system.** Prices for the special tools and tackles shall be part of main scope of supply. No separate price shall be offered for the same.

4.29.0 LOGIC DIAGRAM & WRITE UP:

Interlocks & Protections realized in PLC, DCS. However, vendor shall provide the necessary write-up & logic diagram.

4.30.0 Software: Bidder to consider software for PLC, if applicable for any of the equipment, in their scope of supply and provide soft copy/hard copy of the logics so that same can be loaded by customer at a later date if required.

4.31.0 CONFLICTS IN SPECIFICATION REQUIREMENTS:

In case of any conflict between this specification and Annexures, stringent of the requirement will govern.

4.32.0 Air Conditioning, Ventilation & Fire Protection System:

Materials required for Air Conditioning, Ventilation & Fire Protection System for DG hall is **Not** in Bidder's scope of supply. However, bidder to furnish their recommendation/requirement so that the DG set & its auxiliaries/accessories shall run trouble free.

**5.0.0 TECHNICAL DETAILS/REQUIREMENT:**

Sl. No.	Description	
1	DG Sets General Details	
a)	Type	Emergency DG Set [Suitable for Black start]
b)	Duty	Prime Power Rating
c)	Location	Located inside room
d)	Applicable Code and Standard	ISO 3046, ISO-8528, EIL Specification[6-43-0040Rev02 & 6-51-0040Rev.06]
e)	Total Number of DG set	2 Nos (2 X 50%)
f)	Engine Rated Speed	1000 rpm (direct through flexible coupling) or Lower
2	Engine Fuel system	
a)	Type of Fuel	HSD
b)	Total No. of Fuel tank	2 Nos. [1 No. for Each DG Set. However, interconnection provided between the tanks for increased time of operation of One DG even in case of HSD supply failure].
c)	Capacity of Fuel tank	990 liter
d)	Location of Main Fuel tank	Outside DG room
3	Engine Starting System	
a)	Type of starting	Compressed air starting system for Each DG Set
b)	Total Number of air compressor	(1 motor driven + 1 engine driven) for each DG set
c)	Type of Compressor	Reciprocating/Screw Type as per Manufacturer recommendation.
d)	Total Number of air receiver	2[1 No. For Each DG set Suitable for at least 6 consecutive start without recharging]
4	Engine Cooling system	
a)	Type of Cooling system	Radiator Cooled with DM water
b)	Type of Cooler	As per manufacturing std.
5	Engine Exhaust System	
a)	No of chimney	2(1 No. for Each DG Set)
b)	Minimum Height of chimney	30 mtrs
4	General Details	
a)	Type of Diesel Engine	Four stroke, water cooled, turbo charged with charge air cooler, spark ignited type
b)	Nominal Output(Gross)	6750 KVA @pf 0.8
c)	Fuel	HSD
d)	Governor	Woodward or Equivalent

6.0.0 OPTIONAL PRICES:

Please Refer to Attached Price Bid Format.

Bidder to furnish the following as optional prices:

- 1) 2 year recommended spares as per each equipment manufacturer's recommendations

7.0.0 EQUIPMENT QUALIFICATION CRITERIA (EQC):**7.1.0 Qualification requirement of Packager:**

- a) The DG set vendor shall have engineered, packaged, supplied, installed, commissioned and tested in the last Ten (10) years, at least One (1) no. DG set of similar (80% or higher) power rating as compared to the offered DG set from the proposed packaging plant of DG set. As a minimum, the above past supply reference shall have completed One (1) year of satisfactory operation at site, as on bid due date. The Ten years time period mentioned above shall be reckoned from the bid due date.



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- b) In case the DG Set vendor is an authorized packager of the proposed DG set, vendor shall provide a declaration letter from the authorized signatory of the manufacturer of the proposed Diesel Engine confirming the status of the vendor as their authorized packager and confirming that vendor is authorized to package the proposed DG set for the proposed site of installation.
- e) ~~Vendor's offering shall be a size and design which has a past supply reference of field operation at operating conditions similar to those specified (i.e. proto types are not acceptable). The equipment model/ frame offered shall be from regular manufacturing range of the Vendor from EIL approved manufacturing unit/ works. Vendor shall quote only for those equipment & models/series for which he is enlisted/ approved by EIL.~~

7.2.0 For DG Set:

- a) The DG Set vendor shall either be the manufacturer of the offered diesel engine or an authorized packager/Dealer/Distributor of the manufacturer of the offered diesel engine.
- b) The proposed DG Set shall be from the regular manufacturing/Supply range of the vendor shall sufficient proven track record without any problems. The proposed DG Set shall not be a prototype machine or a scaled version of existing equipment.
- c) The Diesel Engine of the offered DG Set shall meet the requirements as specified in Cl. No. 1.5.2.1 to 1.5.2.4 of EIL Specification of DG Set (Doc. No. 6-43-0040Rev.02)..

7.3.0 For Diesel Engine:

- a) The vendor shall be regular and established manufacturer of diesel engine and shall be the manufacturer of the proposed Diesel Engine having adequate design, Engineering, Manufacturing and testing facilities for the same.
- b) The diesel Engine model offered shall be from the existing manufacturing range of the vendor for industrial applications and already type tested at either manufacturers work or outside. The Engine model offered shall meet the following minimum service and manufacturing experience requirements specified in Sl. No. c) below.
- c) The diesel engine proposed shall be identical in terms of Model No., Speed, ISO Power rating and similar in terms of type o fuel, Type of Cooling arrangement, Materials, Mechanical Design etc. as compared to at least ONE (1) unit of the proposed engine model which have been designed, manufactured, tested and supplied from the proposed manufacturing plant in the last TEN (10) years and shall have completed ONE (1) year of satisfactory operation at site as on bid due date.

7.4.0 Proven Track Record:

The vendor shall furnish PTR for the offered Engine model in the prescribed format attached with the inquiry document. Since this reference list will be used for establishing provenness of proposed model for operating under specified operating conditions, it is in vendor's own interest to select such references, where the proposed model is supplied and operating at conditions similar to those specified for items against which the proposed model is offered. In addition, manufacturer's catalogue and general reference list shall also be furnished for the proposed genset model and engine model. Vendor to furnish duly fill in PTR as per Annexure-7.

8.0.0 QUALITY PLAN & INSPECTION AGENCY & TESTING:

8.1.0 QUALITY PLAN:

Quality plan will be reviewed during detailed Engineering stage with respect to inspection, standard Engineering practices & specification requirements and various tests and stages of inspection and appropriate agencies for Inspection will be Intimated. Bidder to abide by the same. QAP shall be furnished inline with ITP for DG Set [Annexure-6] for BHEL review/Approval during details engg.

Pl refer Annexure-6 for guidelines & QAP format. For details, refer EIL specifications, Annexure-11.

8.2.0 INSPECTION AGENCY:

BHEL/Third Party appointed by BHEL.

The various review/witness/observation stages by individual agencies (or) Group of Agencies as above will be in line with approved quality plan. Pl refer Annexure-6 for guidelines & QAP format. For details refer EIL specifications, Annexure-11.

8.3.0 TESTING:

8.3.1 For Engine :

Engine shall be witness tested in accordance with the latest edition of ISO:3046. The routine load and fuel consumption test shall be of the following duration:



- a) Part Loads (50% & 75%) : ½ hour Each
- b) Full Load (100%): 4 hrs.
- c) 10 % Overload: 1 hr

After the Specified tests have been completed satisfactorily, the fuel stop on the fuel injection pump shall be set and sealed at the specified site rating including provision for 10% overload.

The Engine shall be subjected to all Tests at Engine manufacturer's shop as defined in EIL Electrical Specification (Annexure-11) and EIL datasheet (Annexure-2).

8.3.2 Generator:

- a) Witness of generator control panel functional requirements by simulation.
- b) Witness of Routine Test as per IS 4722, Waveform test, Vibration test of generator.
- c) The Alternator shall be subjected to all Tests at Alternator manufacturer's shop as defined in EIL Electrical Specification (Annexure-11) and EIL datasheet (Annexure-2).

- 8.3.3**
- a) Full Load test for 4 Hrs. & 10% overload for 1 hr. of Engine Generator Set at Packager's Shop.
 - b) Transient voltage performance with job AVR and shop driver
 - i) By 100% load rejection at unity pf ii) By 100% load application at 0.2 pf
 - c) Site testing of the DG Set (DG Set shall be tested at site based on the available load to demonstrate power and voltage build-up at the alternator terminals).

9.0.0 PAINTING:

Painting of DG Set shall be epoxy. Final Shade of Generator shall be RAL7032. For further details on Painting, Please refer EIL Spec for painting (Doc. No. 6-79-0020 Rev.0) [Annexure-11].

10.0.0 PACKING AND FORWARDING:

The equipment shall be protected for a storage of 12 months at site. If any extra precaution is to be taken by the purchaser for storage beyond 12 months, the same shall be explicitly indicated in the O&M manual.

10.1.0 For Imported Supplies:

10.1.1 The bidder wherever applicable, shall, after proper painting, pack and crate all materials for shipment in a manner suitable for export to a tropical, humid climate in accordance with internationally accepted export practices and in such a manner so as to protect them from damage and deterioration in transit by road, rail and/or sea and during storage at bidder's own warehouse and at the site, as the case may be, till the time of erection. Without prejudice to any other liabilities or obligations of the bidder, the bidder shall be responsible for all damage(s) to the materials due to improper packing.

10.1.2 The bidder shall notify the OWNER and Engineer-in-Charge of the date of each shipment from the port of embarkation as well as of the expected date of arrival of such shipment at the designated port of arrival only for the OWNER's/Engineer-in-Charge's information.

10.1.3 The bidder's notification shall give complete shipping information concerning the weight, size and content of each package and such other information as the bidder may require.

10.1.4 The packing material used should be duly certified by a Phytosanitary Certificate issued as per international norms.

10.1.5 For Sea Worthy Packing, Please refer Annexure-12.

10.2.0 INDIGENOUS SUPPLIES:

10.2.1 The bidder shall, wherever applicable, after proper painting, pack and crate all items in such a manner as to protect them from deterioration and damage during rail and road transportation, during storage at BIDDER'S OWN WAREHOUSE and at the site, as the case may be till the time of erection. Without prejudice to any other liabilities or obligations of the BIDDER, the BIDDER shall be responsible for all damage(s) due to improper packing.

10.2.2 The bidder shall notify Owner/ Engineer-in-Charge of the date of each shipment from the works and expected date of arrival at the site for the Information of Owner/ Engineer-in-Charge.



10.2.3 The BIDDER's notification shall also give all shipping information concerning the weight, size and content of each packing and such other information as the Owner/ Engineer-in-Charge may require.

10.2.4 The following documents shall be sent to the Owner/ Engineer-in-Charge within 3 (three) days from the date of shipment :

- Tax invoice (2 copies)
- Packing List (2 copies)
- Test Certificate (4 copies)
- Railway Receipt/Lorry Receipt (2 copies)
- Insurance Certificate (2 copies) or copy of BIDDER'S Policy
- Third Party Inspection Release Note or Inspection Certificate as per QAP approved by Owner/ Engineer-in-Charge or waiver certificate issued by Owner/ Engineer-in- Charge.

11.0.0 SUB VENDORS:

Bidder shall follow approved sub vendors list as per Annexure-8. In case of any specific practical difficulty, bidder is requested to bring out the same with proper reason for not following vendor list [Annexure-8 A or B]. For other items for which sub vendors are not specified, bidder can follow their standard vendors. However, they have to ensure the Proven Track record of the sub vendors and Bidder to take prior approval of BHEL for the same.

Note: Packager shall not source any items from his sub vendors who are part of EIL holiday list of vendors.

12.0.0 DOCUMENTATION:

12.1.0 **MASTER DOCUMENT LIST:** Refer Annexure-5

12.2.0 A master documentation shall be prepared during kick off meeting identifying all the DOCUMENTS / DRAWINGS to be submitted by the bidder as part of documentation. Bidder shall ensure submission of all documentation as per approved Master Document List.

12.3.0 Bidder to note that the dates of submission of all the documents shall be finalized based on PO date. It shall be solely bidder's responsibility to get approval on the entire document from purchaser to meet project schedule.

12.4.0 DRAWING APPROVAL / REVIEW CATEGORY:

The master document list shall clearly identify the class of review to be performed against each document.

Following classes of review shall be followed for all the documents engineered by the bidder

- APPROVAL (A): Approval is mandatory and bidder cannot proceed without obtaining Purchaser's approval.
- INFORMATION / RECORDS (I): This type of documents shall be submitted to Purchaser for his information. Bidder can proceed if Purchaser's comments are not received within 14 working days of receipt in Purchaser's office.

12.5.0 DRAWINGS REVIEW & APPROVALS:

12.5.1 Each drawing submitted by the bidder shall be with a title block furnished by BHEL during detailed engg stage.

12.5.2 All drawings / documents shall be thoroughly checked, duly signed, and stamped by the vendor including drawing /documents of sub-vendor, before submission to BHEL. Documents, which are unchecked, unsigned, and without revisions marked clearly, shall be returned without review. Any delay on account of this shall be to the vendor's account. After first review of documents, vendor to submit all the further revisions of documents along with comment resolution sheet. Successive documents submitted without comment resolution sheet shall be returned without review

12.5.3 The approval and /or review by BHEL /End customer shall not be construed by the bidder as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

12.5.4 Documents once reviewed in Code-1 shall not be submitted (incorporating some changes) again for review, however if some change is really necessary, the same shall be brought to the notice of BHEL separately through design change note for review / information. Finally As-built drawings, duly updated, shall be submitted.

12.5.5 During detailed engg stage, BHEL shall furnish check list reg minimum contents in GA drawing. Bidder to submit GAD [duly incorporating all requirements as per the check list] along with signed checklist. GAD shall not be reviewed without duly filled in checklist signed by the bidder.

12.6.0 DRAWINGS REVIEW & APPROVALS:

12.6.1 Each drawing submitted by the bidder shall be with a title block furnished by BHEL during detailed engg stage.

12.6.2 All drawings / documents shall be thoroughly checked, duly signed, and stamped by the vendor including drawing /documents of sub-vendor, before submission to BHEL. Documents, which are unchecked, unsigned, and without revisions



marked clearly, shall be returned without review. Any delay on account of this shall be to the vendor's account. After first review of documents, vendor to submit all the further revisions of documents along with comment resolution sheet. Successive documents submitted without comment resolution sheet shall be returned without review

12.6.3 The approval and /or review by BHEL /End customer shall not be construed by the bidder as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and drawings.

12.6.4 Documents once reviewed in Code-1 shall not be submitted (incorporating some changes) again for review, however if some change is really necessary, the same shall be brought to the notice of BHEL separately through design change note for review / information. Finally As -built drawings, duly updated, shall be submitted.

12.6.5 During detailed engg stage, BHEL shall furnish check list reg minimum contents in GA drawing. Bidder to submit GAD [duly incorporating all requirements as per the check list] along with signed checklist. GAD shall not be reviewed without duly filled in checklist signed by the bidder.

12.7.0 NO. OF COPIES OF EACH DOCUMENT TO BE FURNISHED:

All the documents shall be submitted as given below:

SL NO.	DESCRIPTION	NO. OF COPIES / PIECES TO BE SUBMITTED	WHEN TO SUBMIT
1)	Initial drawings/documents under approval and information category.	Soft copy only	Within 2 weeks of placement of order
2)	BHEL shall furnish their observation on submitted documents	Soft copy only	Within 2 weeks of document submission
3)	*Revised drawings/documents along with compliance sheet incorporating all BHEL comments. *Vendor to incorporate all BHEL comments so that further revisions can be minimized.	Soft copy only	Within 1 weeks of receipt of commented Drawings from BHEL
4)	BHEL shall furnish their observation on submitted documents	Soft copy only	Within 2 weeks of document submission
5)	Final Drawings/documents	12	Within 2 months of placement of order.
6)	Erection Documentation	5	1 month before dispatch of equipment. The list of documents identified under master document list for erection to be furnished in 5 no's of
7)	Draft O & M Manuals for BHEL review. Note: Bidder to furnish final hard copy of O&M only after getting concurrence on soft copy.	Soft copy	At least 2 months before the delivery date of equipment
8)	Revised O & M Manuals with Test Certificates to be submitted to BHEL (Hyderabad)	12	Within one month before the delivery date of equipment
9)	Final O&M manuals in a CD	4	Within one month after dispatch of equipment after BHEL concurrence on soft copy.

13.0.0 PRICE BID FORMAT:

Bidder to indicate his offer as per Price Bid format enclosed as Annexure-3.

All the items included in the price bid format shall be quoted as per tender specification and pre-bid clarifications as per annexure-9, if any. Responsibility of ensuring correctness & completeness of scope of supply as per specification requirement solely lies with bidder.

The equipment supplied shall be complete in all respects. The bidder shall not be eligible for any extra payment in respect of such mountings, fittings, fixtures and accessories if required for the safe and reliable operation of the equipment. Any additional equipment, material, etc., which are not specifically mentioned here, but are required to make the supplied equipment complete



in all respect, in accordance with the intent of this technical specification, contractual agreement, statutory requirements, relevant/applicable codes/standards, good engineering practices, and for safe and trouble-free operation, shall be deemed to be in bidder scope Only.

Main offer consists of those items which will be part of main order after successful bidder is identified. Optional Items consists of those items which need to be quoted by bidder but may or may not be ordered by BHEL. Bidders are instructed to provide the pricing details listed under Main offer and Optional items as per the prescribed format. Prices quoted by the bidder shall remain firm till the successful handing over of the entire package to end customer. Any request for upward revision of price during any intermediate stage before handing over the plant to end customer will be summarily rejected by BHEL.

14.0.0 PRE-BID CLARIFICATIONS & DEVIATIONS:

14.1.0 Bidders shall comply with various requirements of this specification. It may please be noted that the requirements specified here in this specification are the standard practices being followed by the bidders. However, same things are presented in a structured form so that it can be ensured that the requirements of ultimate customer are complied with.

14.2.0 Bidders can bring out only those deviations which are impractical to meet, for our review in pre bid clarification only.

14.3.0 Bidders may also please note that the data sheets for, valves, instruments etc., submitted along with the offer will be considered as indicative only, as the requirements specified in the specification are standard in nature. These will not be reviewed by BHEL before award of contract. Same will be reviewed during order execution stage in line with the requirements of specification and agreed deviations.

14.4.0 All pre-bid clarifications & deviations shall be clear bring as per annexure- 09 Only.

14.5.0 In case bidder doesn't bring any clarification/deviation in pre-bid stage, the same shall be brought in their offer with following conditions:

- Any deviations to Customer specifications, same are acceptable provided these deviations are also regularly accepted by Customer for their direct orders on bidders. In such cases, proof of the same shall be furnished along with the offer.
- Bidders may please note that unless the deviations are specifically brought out under deviations clause, it will be considered that no deviations are taken, even if they are mentioned elsewhere directly/indirectly in the offer.
- Price implication due to non-acceptance [by BHEL/Customer] of the deviations considered by bidder will not be permitted.
- Deviations [if any] shall be clear bring as per annexure- 10 only.

15.0.0 ANNEXURES:

Following input documents and specifications are enclosed to facilitate the bidder to furnish the offer and ensure compliance:

Annexure	Description
1A	Scope Demarcation between BHEL & Vendor
1B	DG SLD
1C	Layout
1D	Fuel supply P&ID
2	Data Sheet
3	Price Bid Format
4	Checklist
5	Master Document List
6	Quality Related Documents
7	Experience Record Performa
8	Sub Vendor List
9	Pre bid Clarification format
10	Deviation Format
11	EIL Specification
12	Sea Worthy Packing Specification



RECORD OF REVISIONS

[illegible]

ESP-001- 2A Rev.00		PROJECT ENGINEERING & SYSTEMS DIVISION			Std. / Doc. Number
					Annexure-1
					Rev. No. 00

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Annexure-1

Sl. No.	CONTENTS
1A.	Scope of Supply
1B.	Single Line Diagram
1C.	Layout
1D.	Fuel Supply P&ID

Revisions: Refer to record of revisions	Prepared by :	Checked by :	Approved by :	Date :
	Rajeev Jain	Girish Prasad Palo	Siva Prasad Babu	09.06.2018

PROJECT SCOPE OF SUPPLY / WORK (FOR HSD OPERATED DG SETS)				
Project : M/s. HPCL Engine Model No: Location: Vizag				
Rev.00 Dt. 20-Jun-2018				
S.N	Item	Qty	SUPPLY/WORK BY	
			DG set Vendor	BHEL
A	<u>MECHANICAL:</u>	NO		
A.1	<u>Diesel Engine 50Hz, 6750 kVA Rated power</u>	2	✓	
	<u>Speed Control System:</u> (Woodward or Equivalent)	2	✓	
	<u>Safety and Control System:</u> Overspeed Stop, alarm and Shutdown	2	✓	
	Sensors		✓	
	Base Frame on resilient Supports	2 Lot	✓	
	External Flanges with Counterflanges	2 Lot	✓	
A.2	<u>HSD System Delivered Separately:</u>			
	HSD bulk storage tank	1		✓
	HSD Transfer Pumps (1W+1S)	2		✓
	Diesel Supply System	1		✓
	HSD Tank (Day tank) 990 Ltrs	2	✓	
	Instrumentation on Day Tank	2	✓	
	Interconnecting piping between Day tanks including valves, elbows etc.,	1 Lot	✓	
	External Pipes, Valves & Flanges/Joints, Tees, Elbows etc., between engines & day tanks	1 Lot	✓	
	Waste Oil Sump	1	✓	
	Waste Oil Pump	2	✓	
	Engine Fuel Feed Pump System	2	✓	
	External Pipes, Valves & Flanges/Joints, Tees, Elbows etc., between Waste oil sump and Engine	1 Lot	✓	
	External Pipes, valves, Flanges, Tees, Elbows, beyond to Waste oil pump for further disposal	1 Lot		✓
	Overflow Pipes, valves, Flanges, Tees, Elbows etc., beyond to beyond Day tanks for further disposal	1 Lot		✓
A.3	<u>Lubricating Oil System Built on Engine inclusive of the following</u>			
	Lub Oil Circulating Pump, Engine-Driven	2	✓	
	Lub Oil Low / High Level Alarm Transmitters	2	✓	
	Lub Oil Duplex Filter	2	✓	
A.4	<u>Lubricating Oil System Delivered Separately:</u>			
	Lubricating Oil Cooler Plate Type	2	✓	
	Pre-Lubricating pump-Electric driven	2	✓	
	Thermostatic 3 -Way Valve	2	✓	
	External Pipes, Valves, Flanges/joints Tees, Elbows, etc.,	1 Lot	✓	
A.5	<u>Air and water cooling system built on engine inclusive of the following:</u>			
	Charge air cooler	2	✓	
	Engine drive Pumps for High & Low Temperature System	2 Sets	✓	
	Preheater arrangement-High Temp. System	2	✓	
	Thermostat Valve	2	✓	
A.6	<u>Cooling Water System Delivered Separately:</u>			
	Radiator coolers	2 Set	✓	
	Maintenance water pump	2	✓	
	Expansion Tank for jacket water	2	✓	
	Maintenance water tank	1	✓	
	Treated Water for radiator cooling system	1 Lot		✓
	External Pipes, Valves, flanges/Joints, elbows, tees etc., Between Engine & radiator	1 Lot	✓	
A.7	<u>Compressed Air Start System Built on Engine inclusive of the following:</u>			
	Air starter/starters for engine starting	2	✓	
	Turning Device	2	✓	

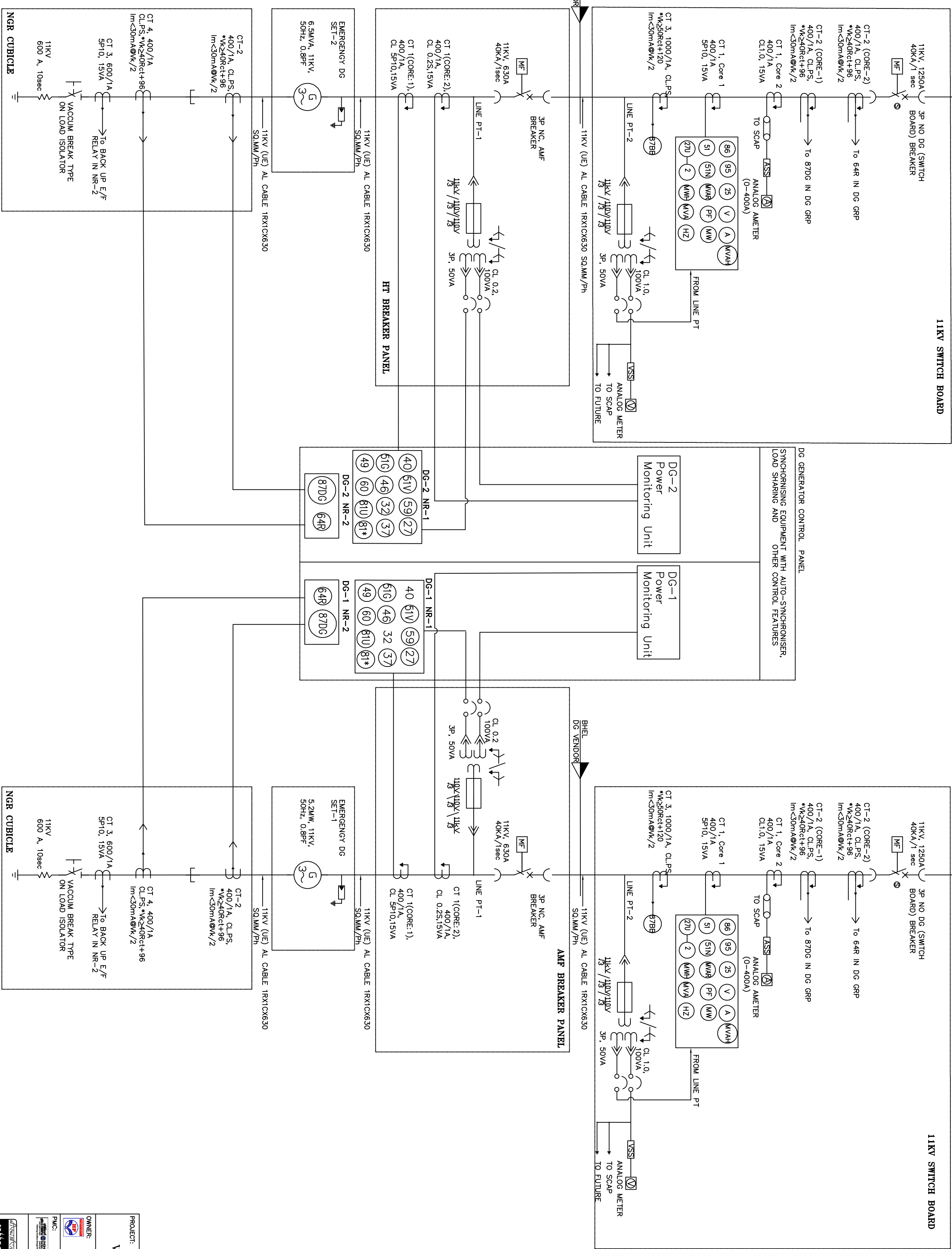
A.8	<u>Compressed Air System delivered separately:</u>			
	1. Electrical Motor driven + 1 Engine Driven air compressor along with Volume bottle	2 Set	✓	
	External Pipes, Valves, flanges/Joints, Tees, Elbows, Between Engines, compressors and volume bottles	1 Lot	✓	
A.9	<u>Combustion Air System, Built on engine:-</u>			
	Turbocharger with Air Inlet bend	2 Set	✓	
	Dry Type air filter unit	2 Set	✓	
	Expansion Bellows	2 Set	✓	
A.10	<u>Charge Air System:</u>			
	Intake Air Filters	2 Set	✓	
	Intake Air Silencer	2 Set	✓	
	Intake Air Ducting (between engine & Air Filters)	2 Set	✓	
A.11	<u>Exhaust Gas System delivered separately:</u>			
	Exhaust Gas Silencer	2	✓	
	Exhaust duct between engine and chimney	2 Lot	✓	
	Expansion Bellows, Inside Genset House	1 Lot	✓	
	Exhaust Duct insulation (With Al. cladding) for Exhaust Duct and the stack pipe upto 3.0 m height from ground Level	1 Lot	✓	
	Two numbers of Exhaust gas chimneys (common structurally supported)	1 Lot	✓	
	Aviation lamp and lightning arrestor	1 Lot	✓	
	Painting for chimney, pipes, structural supports	1 Lot	✓	
A.12	<u>Documentation</u>			
	Instruction Books in English	1 Lot	✓	
	Project information	1 Lot	✓	
A.13	<u>Standard Tools</u>			
	Standard maintenance Tools for diesel engine & Turbo Charger and Its Various Auxiliaries	2 Sets	✓	
A.14	<u>Spares Parts as per tender</u>			
	Spares required for commissioning (As Required) for one DG set	2 Lots	✓	
A.15	<u>Noise Attenuation System</u>			
	Materials required for Noise Attenuation System for DG Hall to meet CPCB Norms including required Doors and Windows	1 Lot	✓	
A.16	<u>Paint:</u> Paint Material for Unpainted Items and Touchup Paint	1 Lot	✓	
A.17	<u>Engine Platform</u>			
	Maintenance Platform for Engine	1 Lot	✓	
	Maintenance Platform for Various Auxiliaries/Accessories of DG Set	1 Lot	✓	
	Staircase as required	1 Lot	✓	
B	<u>ELECTRICAL:</u>			
B.1	6750 kVA Alternators - 11KV, 50Hz, 0.8Pf, Air Cooled IP 23 Enclosure, Insulation class F with temperature limited to class -B	2	✓	
	Alternator Phase side & Neutral side terminal box suitable for HT cable terminations & CT placements	2 Sets	✓	
B.2	600A for 10Sec NGR panel with vacuum type neutral isolator	2	✓	
	11 kV Generator Breaker panel along with PT's, CT for measurement & protection	2	✓	
B.3	Generator Control Panel , including AMF system, Synchronizing equipment & Auto Synchroniser, Generator protection relays, Load sharing controller, Annunciation window etc. (Common synchronizing equipment for both DG sets to be considered)	2	✓	
	MCC Panel for auxiliaries equipments (For DG auxiliaries) - 2 I/C & 1 B/C MCC common for both DG sets	1	✓	
	PLC Panel for DG auxiliaries (Located along with Generator Control Panel)	2	✓	
B.4	415 V Power supply up to DG MCC Auxiliary panel (2 nos. redundant feeders)	--		✓
	<u>Cables & Trays (within battery limit for Both DG sets):-</u>			
	HT Power cables including Kits within DG package & upto customer 11kV Emergency Switchgear.	Lot		✓
	LT Power cables, Control cables, Signal cables, cable glands & lugs within DG package	Lot	✓	

B.5	LV Power cable from Customer 415V PMCC to 415V DG Auxiliary panel.	Lot		✓
	Control & signal cables between DG equipment & customer HT switchgear/Remote control panel etc	Lot		✓
	HT Power cable termination kit at DG side equipment(Cable glands, lugs etc.)	Lot	✓	
	LT Power cable (Incoming side at DG MCC) & control cable termination including cable lugs & glands at DG side equipment	Lot	✓	
	HV, LV & Control Cable trays (Within DG area)	Lot	✓	
B.6	<u>Earthing Systems (Both DG sets):-</u>			
	Above Ground Earthing material within DG Area upto raisers	Lot	✓	
	Below Ground earthing material including raisers in DG area	Lot		✓
	Air termination rods for lightning protection system	Lot	✓	
	civil works related to earthing & Lightning protection	Lot		✓
B.7	<u>Illumination System (Both DG sets)</u>			
	Complete Illumination system within DG Area	1 Lot		✓
	Aviation lamps	Lot	✓	
B.8	<u>Heat Ventilation & Air Conditioning, Fire Protection System</u>			
	Air conditioning system for Control Room	1 Lot		✓
	DG room ventilation	1 Lot		✓
	Fire Protection System for DG Hall & Control Room	1 Lot		✓
C	<u>Steel Structures: (Within DG set Scope of Supply Equipment)</u>			
C1	Supports for exhaust gas ducting	1 Lot	✓	
	Supports for charge air ducting	1 Lot	✓	
	Supports for Fuel, Oil, Air & Water Pipe Line	1 Lot	✓	
	Structure supports for Fuel & Water Tanks	1 Lot	✓	
	Supports for Earthing & Cable Tray	1 Lot	✓	
	Supports for Radiators	1 Lot	✓	
D	<u>ENGINEERING SERVICES FOR GEN SET ONLY</u>			
D.1	<u>Engineering Services:</u>			
	General Arrangement	1 Lot	✓	
	General Layout of DG Hall	1 Lot	✓	
	Piping Arrangement drawings	1 Lot	✓	
	General Description	1 Lot	✓	
	Relay settings	1 Lot	✓	
	Earthing & lightning layouts	1 Lot	✓	
	Cable tray layouts	1 Lot	✓	
	Cable schedules & ICDs	1 Lot	✓	
D.2	<u>Starting-up (Service): (per diem basis)</u>			
	Mechanical Supervision for erection	1 Lot	✓	
	Electrical supervision for erection	1 Lot	✓	
	Mechanical Supervision for Commissioning	1 Lot	✓	
	Electrical Supervision for Commissioning	1 Lot	✓	
	Mechanical Supervision for Start up & Load Trial	1 Lot	✓	
	Electrical Supervision for Start up & Load Trial	1 Lot	✓	
E	<u>Civil Works & Handling Equipments:</u>			
E.1	Soil Investigation	1 Lot		✓
E.2	Civil Structural Design Engineering	1 Lot		✓
E.3	All foundations for genset, auxiliaries, electrical equipment, tanks etc.	1 Lot		✓
E.4	Trenches in side DG building & Eath pits.	1 Lot		✓
E.5	Foundation bolts, fixing bolts, Check, Wedges, Sole Plates etc.	1 Lot	✓	
E.6	EOT crane for Engine maintenance	1 Lot		✓
E.7	Grouting work of sole plates, auxiliary equipment, frames etc.	1 Lot		✓
E.8	Drainage system	1 Lot		✓
E.9	Roof Monitoring system	1 Lot		✓
E.10	DG building	1 Lot		✓
F	<u>Other Items & Facilities</u>	1 Lot		
F.1	Statutory Permissions and approvals	1 Lot		✓
F.2	Erection & Commissioning of DG Set and Its Various Auxiliaries/Accessories	1 Lot		✓
F.3	Sea shipment - Insurance charges for Engine / Alternator	1 Lot	✓	
F.4	Sea shipment - freight charges for Engine / Alternator	1 Lot	✓	

F.5	Sea shipment – Insurance for indogenous scope	1 Lot		✓
F.6	Sea shipment – Freight for indogenous scope	1 Lot	✓	
F.7	Transportation to FOB port of origin	1 Lot	✓	
F.8	Port clearance & tpt & Ins to HPCL site	1 Lot	✓	
F.9	Storage, Erection & commissioning insurance	1 Lot		✓
F.10	First fill of lub oil & grease	1 Lot		✓
F.11	Lub oil and grease for operation	1 Lot		✓
F.12	Power & water during Installation & Commissioning at site	1 Lot		✓
F.13	Fuel during commissioning	1 Lot		✓
F.14	Fire fighting system for class B&C types of fire	1 Lot		✓
F.15	Manpower for maintenance	1 Lot		✓
F.16	Manpower for operation	1 Lot		✓
F.17	Sludge disposal	1 Lot		✓
F.18	Required Levelled Land	1 Lot		✓
F.19	Landscaping, roads and related facilities	1 Lot		✓
F.20	All Insurance at site	1 Lot		✓
F.21	Any temporary facilities including warehouse at site	As Require		✓
F.22	Safe & Secure Storage of equipments at site	1 Lot		✓
F.23	All piping and cabling between power plant and Purchager's process plant/substation	1 Lot		✓
F.24	Proper (A.C) Loading for DG set's Engineers	1 Lot	✓	
F.25	Access to DG set's Engineers at site	1 Lot		✓
F.26	Open space for storage of Fabrication machines, materials etc.	1 Lot		✓
F.27	Office space with furniture for DG set's engineers	1 Lot		✓
F.28	Invitations for VISA for DG set Engineers	1 Lot		✓
F.29	Air tickets and travel expenses for DG set Engineers	1 Lot	✓	
F.30	Boarding for DG set Engineers	1 Lot	✓	
F.31	Local transportation for DG set Engineers	1 Lot	✓	

ON: 9.0D 10 10 10 HS

BUS B, 11KV, 3Ph, 3W, 50Hz, 1250A, 40KA/1Sec, AL Bus Bar



- NOTES:
1. THIS SLD MEANT FOR TENDER PURPOSE ONLY
 2. *KNEE POINT VOLTAGE INDICATED IN THE SLD ARE TENTATIVE AND WILL BE AS PER OEM'S RECOMMENDATION BASED ON FINALISATION OF RELAY MODEL
 3. ALL RELAYS EXCLUDING AUXILIARY RELAYS SHALL BE NUMERICAL MICROPROCESSOR BASED WITH IEC-61850HSR COMMUNICATIONS PROTOCOL.SYSTEM

PROJECT: CAPTIVE POWER PLANT (CPP) PACKAGE
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)
JOB NO. B016

OWNER: HINDUSTAN PETROLEUM CORPORATION LIMITED

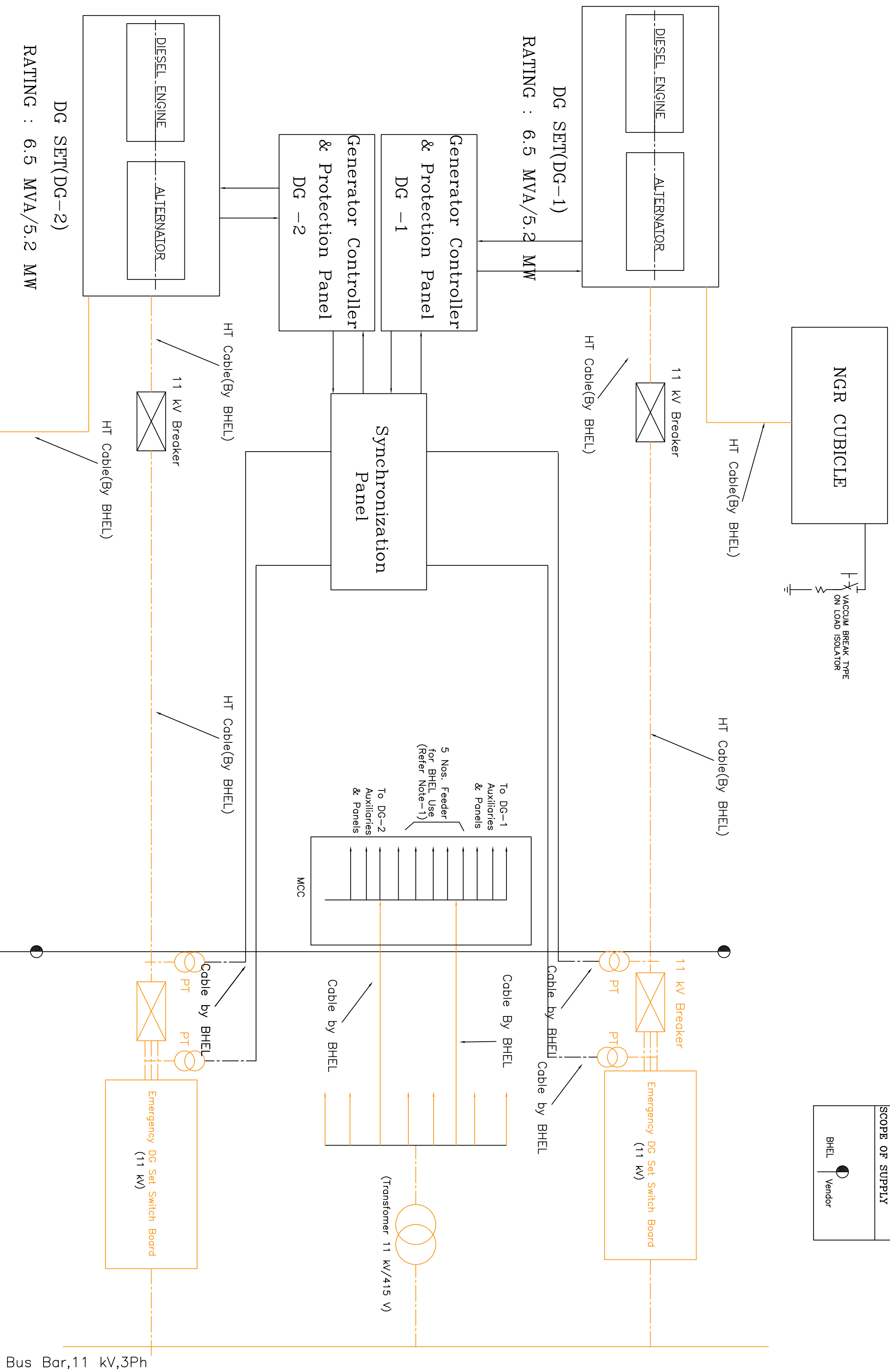
PMC: ENGINEERS INDIA LIMITED (EIL), NEW DELHI

DEPT: BHARAT HEAVY ELECTRICALS LTD. HYDERABAD

NAME	SIGN.	DATE	NO. OF
DRN. GRN/AVS	-SD-	26.05.18	VAR.
CHD. P.SURESH	-SD-	26.05.18	
APPRD. J.K.PATILNAK	-SD-	26.05.18	

NO. OF ITEMS: 00

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INVENTORY NO	SIGN. AND DATE
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GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261

[illegible]

PE&SD INTERNAL REVIEW	
ELEC	C&I SIGN

ENGINEERS INDIA LIMITED (EIL), NEW DELHI									
HINDUSTAN PETROLEUM CORPORATION LIMITED									
OWNER:									
PKC:									
PROJECT:									
CAPITVE POWER PLANT (CPP) PACKAGE									
VISAKH REFINERY MODERNIZATION PROJECT (VRMP)									
JOB NO. B016									
10									
11									
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