

ESP-001- 2A Rev.00		BHARAT HEAVY ELECTRICALS LTD PROJECT ENGINEERING & SYSTEMS DIVISION	Std. / Doc. Number	
			PY51675	
			Rev. No.	01
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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED , It must not be used directly or indirectly in any way detrimental to the interest of the company.	TECHNICAL SPECIFICATION FOR GAS ENGINE PACKAGE			
	PROJECT	ANDAMAN & NICOBAR GAS POWER PROJECT (50 MW)		
	CUSTOMER	NTPC VIDYUT VYAPAR NIGAM LTD. (NVVNL), Delhi		

Revisions: Refer to record of revisions	Prepared by :	Checked by :	Approved by :	Date :
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1.0.0 INTENT OF SPECIFICATION:

BHEL is looking for a prospective Qualified Engine Manufacturer (QEM) qualified as per the requirements specified in this Technical Specification

This specification specifies the requirement of Design, Engineering, Manufacturing, Assembling, Inspection, Testing at manufacturer's works and Delivery of properly packed Engine sets 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:**LEGEND**

NVVNL	NTPC Vidyut Vyapar Nigam Ltd
BHEL	Bharat Heavy Electricals Limited
PE&SD	Project Engineering & Systems Division, Hyderabad, unit of BHEL
BQC	Bidder Qualification Criteria
PO	Purchase Order
LOI	Letter of Intent
Contractor	EPC Contractor
QEM	Qualified Engine Manufacturer
Bidder	QEM / Bidder responding to this enquiry by BHEL for Gas Engines
Tender	NVVNL's Tender Specification for ANDAMAN & NICOBAR GAS POWER PROJECT (50 MW) along with Amendments, Corrigenda etc issued by NVVNL till Tender due date

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 override 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.



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2.0.3 The Bidder shall accept full responsibility for the completeness and for the faultless working of all the equipment. 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 equipment 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.

2.0.5 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.

2.0.6 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 BIDDER QUALIFICATION CRITERIA

- 3.1 The Bidder should be an Engine manufacturer who has designed, manufactured, supplied and commissioned/supervised commissioning of at least one (01) Gas Engine for power generation, having minimum rating as that of the offered Gas Engine, which should have logged a minimum of 4000 fired hours since commissioning and should have been in successful operation, for a period of at least one (01) year, prior to the date of techno-commercial bid opening.**

BHEL will associate with an Engine Manufacturer meeting requirement of 3.1 above, who shall also be the supplier of the Gas Engines for this contract. In such an event, BHEL along with its techno-commercial bid, will furnish a letter of undertaking from above associate, as per format enclosed, for successful performance of Gas engines, failing which BHEL will be disqualified and its bid shall be rejected.

- 3.2 The Unit(s) as referred at 3.1 above must have been commissioned within the last 10 years ending on last day of the month immediately previous to the month in which last date of bid submission falls (in case of extended bid submission date, original bid submission date shall be considered).**

The units referred at 3.1 should also have been in operation for at least 1 (one) year after commissioning.

Proof of commissioning from Owner/End User shall be submitted by the Intending Bidder along with the Technical Bid.

However, for operation for at least 1 (one) year after commissioning, any one of the following document is required to be submitted by the bidder along with the Bid.



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- ✓ Certificate for Operation for 1 year from Client
OR
- ✓ Certificate of Release of full Security Deposit (Bank Guarantee) by Client against the defect liability period.
OR
- ✓ Certificate of Completion of Performance Guarantee and Test run (PGTR) with completion date at least 1 year prior to bid submission.
OR
- ✓ Certification by CEO/CFO with due notarization that Defect Liability Period is completed and there is no claim by client on account of performance of the Plant/Equipment.

3.3 Financial Criteria

3.3.1 The average annual turnover of the Collaborator(s) / Associate(s), in the preceding three (3) financial years as on the date of techno-commercial bid opening, should not be less than the INR 45 Crore (Forty-five crore Only) or equivalent foreign currency (In case of foreign Currency (which shall be convertible in Indian rupee, list of convertible currencies mentioned in NIT covering letter), average of month end TT buying rate shall be considered)

3.3.2 Audited financial statement have to be submitted for all the three years as indicated against clause 3.3.1 above. If financial statements are not required to be audited statutorily, then instead of audited financial statements, financial statements are required to be certified by chartered accountant. Published Annual Report available in the public domain shall also be acceptable. Further in case of foreign bidders, Copy of profit & loss account statement and balance sheet duly certified inline with the law of the country shall be submitted. If foreign vendor is submitting P&L, Balance sheet and any another account statements other than English, then certified English version also has to be submitted.

3.3.3 In case audited Financial statements have not been submitted any of three years as indicated above, then the applicable audited statements submitted by bidders against the requisite three years, will be averaged for three years i.e. total divided by three.

3.4 QEM shall not be under Holiday List/ Negative List/ Suspension List/ Banning List of NTPC, BHEL.

4.0 DOCUMENTATION

4.1 The QEM shall furnish documentary proof **in applicable formats of the Attachment 3 available in Tender, mentioned in ITB in Annexure-2** with copies of work order(s)/ contract agreement(s)/ relevant pages of contract document(s) mentioning the value and the scope of work, completion certificate(s) by owner/ Consultant indicating executed value and certificate(s) of commissioning of previous plants from owner/ Consultant, fulfilling the qualification criteria for themselves

4.2 A job completed by a bidder as a Sub-Contractor shall be considered for the purpose of meeting the technical and commercial experience criteria of BQC subject to submission of following documents in support of meeting the "Bidder Qualification Criteria":

4.2.1 Copy of work order along with Schedule Of Rates (SOR) issued by Main Contractor.

4.2.2 Bidder has to submit a Certificate from the End User/ Owner/Consultant of the Owner stating that the Main Contractor has intimated them about the engagement of Bidder as a Sub-Contractor OR the Bidder had been allowed/permitted as a Sub-Contractor in the concerned job(s).



4.2.3 Copies of Completion/Commissioning Certificates (as the case may be) issued by the Owner/ Owner's Consultant/Main Contractor. The said Certificates shall have details like work order no. /date, brief scope of work, ordered & executed value of the job, completion date etc. In case bidder is not able to furnish the completion certificates from the Owner/Owner's Consultant in his name then the Certificate issued in the name of Main Contractor shall also be considered as proof of completion of the relevant job.

4.3 A job executed by a QEM for its own plant/ projects can't be considered as experience for the purpose of meeting requirement of BQC of the Bidding Document. However, jobs executed for Subsidiary/ Fellow subsidiary /Holding company will be considered as experience for the purpose of meeting BQC subject to submission of tax paid invoice(s) duly certified by Statutory Auditor of the bidder towards payments of statutory tax in support of the job executed. Such bidders shall submit these documents over and above the other required documents under the various Clauses of BQC

5.0 TERMS OF CONTRACT

5.1 Successful QEM will be finalized by BHEL considering lowest amount quoted by all the qualifying bidders to this enquiry, for the Total Engineering Sub-Contracting Work for subject NVVN Tender.

5.2 BHEL will place LOI on successful QEM (i.e. L1 Bidder), immediately after finalization of this enquiry and negotiation, if any.

5.3 **In the event of price reduction during negotiation by BHEL with NVVN, corresponding reduction will be passed on to the successful QEM (on finalized Post-Order price).**

Order for Post Order Engineering will be placed on successful QEM after BHEL wins the contract from NVVN, at price finalized with the successful QEM after reducing the corresponding discount passed on to NVVN.

5.4 The fol. shall be required from QEM:

5.4.1 LoU: This Letter of Undertaking by successful QEM shall be required for submission along with BHEL's offer to NVVN and shall be valid for till the Defect Liability Period

5.4.2 MOU: This MOU between BHEL and successful QEM shall be the basis for future order for Post-Order Engineering services and shall contain the major commercial clauses which shall be in-principal agreed by both BHEL and the successful QEM. **Based on this agreement of terms and conditions, price bid shall be opened and negotiated if required and based on final mutually agreed price, this MOU will be formally signed on non-judicial stamp paper followed by submission of bid bond @1% of final agreed price within 30 days of signing of MOU or date of submission of BHEL bid to NVVN, whichever is earlier.** The initial validity of this bid bond shall be for 6 months from the date of MOU and shall be kept valid till the validity of this MOU. The MOU will be converted to a definitive Agreement between BHEL and QEM within one month after award of job from NVVN for execution of Post-Order Engineering, if BHEL gets order from NVVN.

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Security Deposit @ 1% of the Contract value shall be submitted within 30 days from the date of issue of LOI/ WO by BHEL after which the BID bond furnished by successful bidder shall be returned discharged by BHEL.

6.0 BID EVALUATION CRITERIA

- 6.1 The bidders are expected to meet the Bidder Qualification Criteria as detailed earlier in this specification. The same shall be evaluated during technical bid scrutiny. The offers made by the bidders not meeting the BQC are liable for rejection.
- 6.2 The bid evaluation shall be on lowest value arrived among all the quoted bidders as per the data filled by bidders in Price Bid Format. Quotations submitted in partial will be summarily rejected. BHEL will not entertain any other expenses/ assumptions written separately elsewhere other than those specified in the price bid format.
- 6.3 The Price Factors shall be binding on the Bidders. No deviation shall be permitted.
- 6.4 Successful Bidder shall be awarded the LOI for Pre-Bid Tie-up. Subsequently PO for Gas Engines will be awarded to Successful bidder if BHEL bags the order as EPC contractor.
- 6.5 QEM shall not have any claim whatsoever, if BHEL is not successful in winning the Contract.

7.0 DELIVERABLES TO BE SUBMITTED DURING PRE-BID AND POST BID STAGE

- 7.1 QEM shall furnish engineering inputs for enabling BHEL to prepare a comprehensive Offer to NVVNL
- 7.2 Post receiving PO, incase BHEL is successful in bagging order from NVVNL, the deliverables as required by NVVNL's Tender shall be furnished by QEM

8.0 PERFORMANCE GUARANTEE

- 8.1 QEM to furnish the guarantee performance in the attachment Annexure-8 along with Technical & Price bid.
- 8.2 QEM to guarantee the required parameters as per NVVNL's tender and in case of any shortfall in performance, shall carry out re-engineering / repair and/or replace of such defective components/equipment.
- 8.3 QEM shall provide a list of test procedures for validating Performance Guarantees.

9.0 OTHER INSTRUCTIONS

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- 9.1 Since speedy completion of project is essential for a tight project schedule, it shall be responsibility of QEM to ensure timely delivery.
- 9.2 QEM shall familiarize fully with the standard/ procedures/ practice of BHEL/OWNER, to avoid any dispute at later date and after order placement.
- 9.3 BHEL shall not pay any amount, other than the fee specifically agreed, towards any cost incurred by QEM by way of salaries to their employees (income and taxes), insurance of any nature, benefits/ bonus to the employees, etc. BHEL's liability is limited to the amount contracted for the services to be rendered under the scope of work defined.
- 9.4 QEM shall not commit any expenditure on behalf of BHEL without BHEL's consent in writing, during the execution of the work defined in the scope.
- 9.5 QEM shall bear all expenses/ fee penalties if it infringes on patents/ licenses of any persons/ organizations or in case of suits, court proceedings, damage claims etc., due to any reason whatsoever.
- 9.6 QEM shall ensure that it possesses the latest revisions of various national and international standards, codes of practices, statutory & environmental regulations etc. as applicable, for execution of the work. BHEL shall not provide any such documents to QEM. Engineers of QEM assigned for this project shall have familiarity on relevant documents as mentioned above for their use and applications.
- 9.7 QEM shall maintain at their own cost the personal accidents policy, life insurance and / or any such insurance required in respect of their personnel deputed to outstation visits for the given contract.
- 9.8 BHEL reserves the right to terminate or suspend the contract or withdraw part of the scope of the work at any stage of its execution, if it is found that QEM has not met its obligation for the performance / progress is not up to the expected standards and overall work is likely to suffer. In such an event, BHEL shall give 15 days' notice in writing. In such case all costs incurred accordingly by BHEL to complete any work forming part of the contract shall be recovered from QEM. In case of such premature termination of contract, BHEL reserves the right to claim damages from QEM including the initiation of judicial proceedings.
- 9.9 QEM shall keep all information/data/drawings etc. related to the work as confidential information and shall not divulge or use the information indirectly or directly in any way detrimental to the interest of BHEL. All drawings, documents, manuals, design calculations including all originals prepared or obtained during the work shall remain the property of BHEL and shall be handed over to BHEL on demand.
- 9.10 QEM shall comply with the laws and regulations of the country, the state and territories concerned, during the progress of the work.
- 9.11 QEM shall submit progress report on the status of the work entrusted to them periodically and as mutually agreed upon.



9.12 QEM shall ensure optimal & economic design while executing the work, but without sacrificing the customer specification requirements/ Statutory regulations/ code provisions/ safety aspects.

10.0 APPLICATION OF SYSTEM:

It was planned to setup a power plant of approx. 50 MW capacity at Hope Town, Port Blair, Andaman & Nicobar Islands. Re-gasified Liquefied Natural Gas (RLNG) shall be the fuel for the project.

Power generation shall be with RLNG fired engine sets. The Net Capacity of Plant shall be 50 MW $\pm$ 10% (45 MW to 55 MW) with 4 to 6 nos of Identical Units.

10.1 SITE DATA:

Refer NVVNL Tender Document

11.0 TECHNICAL REQUIREMENTS:

1	Engine Sets Details	
a)	Type	Gas Engine sets with RLNG as fuel
b)	Duty	Designed for continuous operation at any load between 30-100% of power output for the fuel specified.
c)	Operating capability	Base Load , Cyclic Loading and Daily start/stop
d)	Location	Located inside room
e)	Applicable Code and Standard	ISO 3046, ISO-8528, Annexure-2
f)	Total Number of Engine sets	4 to 6 Nos identical Engine to meet the plant capacity of 50 MW $\pm$ 10% (45 MW to 55 MW).
g)	Type of Engine	Four stroke, radiator cooled, turbo charged with charge air cooler and having an embedded engine control system, controlling the combustion process individually in each cylinder
h)	Engine Rated Speed	Medium speed (Rated shall be Max. 1000 RPM)
2	Engine Fuel system	
a)	Type of Fuel	Re-gasified Liquefied Natural Gas (RLNG)
3	Engine Starting System	
a)	Type of starting	Startup system including Start up Air compressor & Air Bottles. Same shall be as per standard proven practice of the QEM for the offered model of Gas Engine.
4	Engine Cooling system	
a)	Type of Cooling system	Radiator Cooled
6	Engine Lubrication System	
a)	Type of lubrication system	As per standard proven practice of the QEM for the offered model of Gas Engine
b)	Total no of Lubrication systems	Complete and self-contained lubrication oil system for each Engine
7	Coupling	



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a)	Type	Coupling between Engine to Generator/Alternator shall be as per standard and proven practice of the QEM for the offered model of Gas Engine.
8	Turning Gear System	
a)	Type	Turning gear system shall be as per standard and proven practice of the QEM for the offered model of Gas Engine.
9	Governing System	
a)	Type	Engine governing system shall be as per standard and proven practice of the QEM for the offered model of Gas Engine.
10	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.

For all other details, please refer NVVNL Tender Document.

RLNG SPECIFICATION:



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	Particulars	Unit	Minimum	Maximum	Typical
1.	COMPOSITION				
a.	Methane (C1)	% Molar	88.0	98.5	93.0
b.	Ethane (C2)	% Molar	1.5	6.0	3.35
c.	Propane (C3)	% Molar	-	3.5	1.75
d.	Butane (C4)	% Molar	-	2.0	1.0
e.	Pentane (C5) & heavier	% Molar	-	0.1	0.1
f.	Nitrogen	% Molar	-	1.0	0.8
2.	Gross Heating Value	Kcal/standard m ³	8994	10508	-
3.	Pressure	Bar (g)	8	10	-
4.	Temperature	Degree C	25	35	-
5.	Moisture	Kg/Million SM3		112	
6.	Impurities				
a.	Carbon dioxide	ppm – mole	-	100	
b.	Oxygen	ppm – mole	-	50	
c.	Hydrogen Sulphide	mg/Nm3	-	5	
d.	Mercaptan Sulphur	mg/Nm3		7	
e.	Total Sulphur	mg/Nm3		30	
	(including mercaptans)				
8.	CONTAMINANTS				
	Trace Metals				
i.	Pb + Zn	ppm (wt)	-	0.50	
ii.	Na + K	ppm (wt)	-	0.30	
iii.	Vanadium	ppm (wt)	-	0.50	
iv.	Calcium	ppm (wt)	-	2.0	
v.	Magnesium	ppm (wt)	-	2.0	
vi.	Sum of heavy metals	ppm (wt)	-	1.0	

Note : Typical composition has been given only as a reference condition for Performance Guarantee (refer clause Annexure-2). Actual composition of the gas generally may be anything with in the range indicated, However, the engine shall also be designed to run on gas fuel with methane no, corresponding to at least (-) 10% of the methane number calculated on the minimum composition mentioned here above.



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.

Emission value to the guaranteed conditions shall be as per Annexure-2 and CPCB guidelines.

Noise level shall be as per standards of MoEF & CC and Central pollution Control Board (CPCB), India Refer Annexure-2.

However, the noise generated by the machine shall be limited as per applicable standard.

12.0 SCOPE OF SUPPLY:

12.1 4 to 6 nos identical Engine to meet the plant capacity of 50 MW $\pm$ 10% (45 MW to 55 MW).

Note: Bids with total plant net capacity less than 45 MW shall not be considered for evaluation and shall be rejected & any net output in excess of 55MW shall not be taken into consideration for evaluation.

The system shall be provided as per **Annexure-2** taking into all requirements including for testing, painting, Engineering, documentation, sub vendor list, equipment specifications etc., for Engine Set & its various auxiliaries/accessories as specified in this specification and enclosures.

Please refer to the enclosed scope matrix (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 to consider the same in his offer. The item/s mentioned in Annexure-1 are indicative in nature (Item, Quantity), Actual items (Serving the same purpose) may vary from bidder to bidder. However bidder to provide proper reasoning of non consideration of any particular item or quantity listed in Annexure-1.

Note: Bidder shall use Hydrogen/Carbon Relation Ratio under GRI method as per ISO/TR 22302:2014(E) for calculating the Methane number for deciding reference point of correction curve as well as for calculating the Methane number of supplied gas during Performance guarantee test. Bidder shall necessarily submit the calculation of reference methane number as mentioned above along with the bid.

Bidder in their bid shall furnish the certified correction curves for Methane Number RLNG fuel, Power Factor, Frequency for correcting the Net Output and Net Heat Rate of the each Gas Engine set with their Bid documents. Only certified correction curves to be submitted with the Techno Commercial Offer.

13.0 ELECTRICAL SYSTEMS



13.01 SCADA/DCS SYSTEM

Centralized DCS/ SCADA with required redundancy levels for operation of the entire power plant including or logics and protections covering the engine room, all power plant auxiliaries and tank farm shall be supplied by the bidder.

The instrumentation and control system shall be based on Distributed Control System (DCS/ SCADA) philosophy. It shall be designed to provide monitoring and control capabilities to ensure safe and reliable operation, minimize operator manual actions and alert operators as to any conditions or situations requiring manual intervention in a timely manner. The control functions shall be back up by interlocks and safety systems which cause pre-planned actions in case where unsafe conditions develop faster than controls or the operator can be expected respond. All I&C equipment shall be of proven design and will be selected to achieve highest level of plant availability and facilitate equipment Maintenance. All field control elements for modulating controls will have to be provided with actuators of motorized /pneumatic type. Signals from various process parameters will have to be electrical signals generated by field mounted electronic smart type transmitters. The above signals shall be processed in the DCS/ SCADA cabinets to produce electrical signal outputs of 4 - 20 mA DC, which will be converted to control signal to operate the pneumatic actuators. All computation and signal conditioning and control function generation shall be configured in the DCS/ SCADA.

Parameters such as battery voltage. coolant- pressure, temperature and fuel rate, oil-level, temperature and pressure and electrical parameters like current, frequency, kilowatts. KVA,KVAR, Power factor and voltage, vibration monitoring etc. shall be considered for continuously monitoring and displays a range of mechanical & electrical parameters

13.02 ENGINE CONTROL PANEL

Engines is supplied with a dedicated engine mounted control panel which is a PLC based control panel with MODBUS RTU communication protocol incorporating functions for local start, normal stop, emergency stop, engine analog data logging, alarm pre-processing and it is mounted on the engine in engine room.

13.02.01 GAS ENGINE SET CONTROL PANEL

The GCP controls and supervises the Gas Engine set (Engine and Alternator) and their related systems in combination with the local engine control and common control. It realizes the control, synchronization and protection of the alternator circuit breaker in MV (Medium Voltage) switchgear. The functions involved in GCP are,

- Alternator Excitation Control & Monitoring
- Alternator MV switchgear control and synchronization Alternator Protection
- Alternator active & reactive power control
- Coordination with Engine control and Plant common control system

Power supply input for control voltage from AC UPS distribution system. DC 24 V for PLC and HMI is produced by internal regulated power supply unit.



Visualization system by HMI for operating, supervision and alarm/event annunciation and acknowledge/reset.

Hardwired connections to MV switchgear, LV sub-distributions, CCP and ECP for safety relevant signals. Hardwired connections from the AVR to the excitation system of the alternator. Emergency stop button for engine and auxiliaries stop, alternator circuit breaker opening and de-excitation.

13.02.02 COMMON CONTROL PANEL

The CCP (Common Control Panel) controls and supervises the plant related and a Gas Engine set related systems of the entire power plant. It also realizes the control, synchronization and protection of the circuit breakers as mentioned under synchronization scheme. The functions involved in CCP are;

- MV/LV transformer circuit breaker synchronization
- MV, LV motor operated circuit breaker control
- Active and reactive power management
- Auxiliaries manual/automatic operating procedures, status indication
- Control of all Engine related and plant related auxiliaries
- Events, alarms generation and annunciation
- Analogue values indication and trending
- Single lines and electrical systems
- Systems P&IDs (Pipe & Instrumentation Diagrams)

Power supply input for control voltage from AC UPS distribution system. DC 24 V for PLC and HMI is produced by internal regulated power supply unit. Visualization system by HMI for operating, supervision and alarm/event annunciation and acknowledge/reset. Mains unit for complete Mains Protection and synchronization Hardwired connections to MV switchgear, LV main distribution and GCP for safety relevant signals.

14 O&M SPARES:

Bidder to include necessary O&M spares required for 3 years of Operation and maintenance period. Bidder to furnish list of such O&M spares.

14.01 START UP AND COMMISSIONING SPARES:

Startup and commissioning spares are those spares which may be required during the startup and commissioning of the equipment/system.

1 set start up and of startup and commissioning spares for each Gas Engines shall be quoted as per manufacturer's recommendation.



Bidder to furnish the list along with the offer regarding requirement of startup and commissioning spares.

Any startup and 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 startup and commissioning, out of those included by vendor, shall be handed over to the owner.

14.02 MANDATORY SPARES:

The list of mandatory spares to be considered shall be as per Annexure-2.

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.

14.02 SPECIAL TOOLS AND TACKLES:

The bidder shall supply all necessary maintenance and inspection tools including special tools & tackles required for the disassembly, assembly, maintenance inclusive but not limited to, alignment tools for all rotating equipment, rotor removal equipment, torque wrenches capable of meeting all torque tightening requirements.

A list of tools to be supplied has been included in Annexure-2. Further, the bidder shall furnish a list of tools & MC equipment with the Bid documents, which shall be discussed and finalized during post bid discussions. All tools not listed in the inventory list and found to be necessary for maintenance of the works shall be deemed to be included in the Contract price.

15.0 FIRST FILL OF LUBRICANT:

Excluded from Bidder's scope of supply. Bidder to furnish details of Lubricants required during DDE.

15.01 LOGIC DIAGRAM & WRITE UP:



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

15.02 SOFTWARE:

Bidder to provide system Software/License for instrumentation of Package 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.

15.03 COMPLETE UNIT TEST:

Shop test for each Gas Engine set shall be carried out at manufacturer's work.

For demonstration of following tests shall necessarily be carried out with the "Alternator" that will be supplied for this package at site . System /items required for testing has to arranged by bidder.

- 1 Net Power output at Base/Full Load
2. Net Heat Rate at LHV basis at 100% of Gas Engine set base load.

Bidder to consider all other items necessary for safe and smooth running of DG Set & its accessories required to make the supplied equipment complete in all respect.

15.04 STATUTORY APPROVAL:

Bidder to furnish necessary documents to obtain the necessary approvals of Inspection Authority/Chief Inspector of competent approving Authorities etc , as may be required for designing and design calculations, manufacturing and erection procedure, testing etc as called for under the various Regulations . All such documentation submitted to statutory authorities shall also be submitted by the bidder for review.

15.05 Bidder to submit the brief write-up about the following systems along with Technical bid

- Gas System
- Engine Lubrication System
- Lube Oil system
- Compressed Air System
- Starting Air System
- Engine Cooling System
- Charge Air System
- Exhaust System
- NOx Control System

15.06 Optional Items (Recommended Spare List):



The bidder shall also provide a list of recommended spares for 03 years of normal operation of the plant. This list shall take into consideration the mandatory spares and should be independent of the list of the mandatory spares requested in this specification under clause 4.5.0.

Price of recommended spares will not be used for bid evaluation.

16.0 QUALITY PLAN & INSPECTION AGENCY & TESTING:

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 Gas Engine [Annexure-3] for BHEL review/Approval during details engg.

Pl refer Annexure-3 for guidelines & QAP format.

For details, refer specifications, Annexure-2.

INSPECTION AGENCY:

BHEL/NVVNL/NTPC/Third Party appointed by BHEL or NVVNL.

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-3 for guidelines & QAP format.

For details refer specifications, Annexure-2.

TESTING:

Testing shall be done as per applicable codes, QAP and annexure-2.

Inspection requirement of Various Auxiliaries/Accessories:

For Imported Items:

If any of the major BOP item/System are imported directly and are not offered for inspection during the unit test to BHEL/NVVNL/NTPC/Third Party appointed by BHEL or End customer, then same to be inspected prior to dispatch by any of the TPI agencies identified from the following list (Bidder to appoint TPI agency from the following on behalf of BHEL for inspection of items:

- i. Lloyds Register of Industrial Services (LRIS),
- ii. Bureau Veritas (BV),
- iii. Det Norske Veritas (DNV),
- iv. Certification Engineers International Ltd. (CEIL),
- v. TUV

**For Indigenous Items:**

Inspection of Various Auxiliaries/Accessories shall be carried out by BHEL/NVVN/NTPC/Third Party appointed by BHEL or End customer.

17.0 PAINTING:

All equipment/ piping/ pipe services are to be painted by the bidder in accordance with end customer standard colour coding scheme, which will be furnished to the bidder during detailed engineering stage.

18.0 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.

For Imported Supplies:

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.

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.

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.

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

For Sea Worthy Packing, Please refer Annexure-4. Packing for imported items shall be QEM Standard practice. However, same shall be similar/superior to sea worthy packing.

19.0 TERMINAL POINTS:

BHEL shall be provided the following utility at one point near the plant battery limit and further routing from battery limit to individual gas engines shall be in scope of bidder:-

1. Gas Terminal point at one point near the battery limit.



2. Equipment Cooling water supply & return at one point (for all the units) near the battery limit.
3. Instrument Air & Plant Air at one point near the battery limit.
4. Bidder to furnish if any other utility is required for the Gas engine operation.

20.0 EXCLUSION:

The following system shall be excluded from the bidder scope:-

1. RLNG supply.
2. Water System for complete plant
3. Plant Auxiliary system for complete plant
 - Compressed air system for Instrument & Service air)
 - Fire Detection & Protection System
4. Air conditioning system for complete plant
5. Ventilation system for complete plant
6. Elevator, Crane, hoist etc. for complete plant.
7. Power Evacuation system beyond Terminal point.

21.0 INDIGENOUS SUPPLIES:

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.

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.

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.

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.

22.0 SUB VENDORS:



Bidder shall follow approved sub vendors list as per Annexure-2. In case of any specific practical difficulty, bidder is requested to bring out the same with proper reason for not following vendor list during detailed engineering stage, in any case no price and commercial implication is allowed. 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.

23.0 DOCUMENTATION:

23.01 MASTER DOCUMENT LIST (MDL): Refer Annexure-5 which shall be finalized mutually after award of contract.

23.02 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.

23.03 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.

23.04 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.

23.05 DRAWINGS REVIEW & APPROVALS:

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

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.

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.

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 by QEM.

During detailed engineering stage, BHEL shall furnish check list regarding 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.

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

All the documents shall be submitted as given below:

S.NO.	DESCRIPTION	NO. OF COPIES	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 folders.
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.

24.0 PRICE BID FORMAT:



Bidder to indicate his offer as per Price Bid format enclosed with NIT.

All the items included in the price bid format shall be quoted as per tender specification and pre-bid clarifications as per Annexure-7, 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.

Bidder shall confirm the submission of the unpriced bid as part of their offer

25.0 PRE-BID CLARIFICATIONS & DEVIATIONS:

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.

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

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.

All pre-bid clarifications & deviations shall be clearly brought out as per format indicated in Annexure-6 & Annexure-7 respectively. No other format is acceptable.

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

**BHARAT HEAVY ELECTRICALS LTD**
PROJECT ENGINEERING & SYSTEMS DIVISION
HYDERABAD, INDIA

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- a) 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.
- 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.
- c) Price implication due to non-acceptance [by BHEL/Customer] of the deviations considered by bidder will not be permitted.
- d) Deviations [if any] shall be clear bring as per annexure-9 only.

26.0 LIST OF ANNEXURES:

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

Annexure	Description
1	Broad Scope Demarcation between BHEL & QEM
2	NVVNL' Tender Specification (including Amendments, Corrigenda published till the bid due date of Tender)
3	QAP Guidelines & ITP for Gas Engine
4	Sea Worthy Packing specification
5	Master Document list
6	Pre-Bid clarification Format
7	Deviation format
8	Guarantee Declaration Format

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