GASONET SERVICES (RJ) LIMITED

ANNUAL RATE CONTRACT FOR SUPPLY OF MOTOR DRIVEN CNG COMPRESSOR AT CHURU, MANDI, PAURI GARWAL (RISHIKESH) & CHAMPAWAT GA

RESONANCE ENERGY PVT LTD

TECHNICAL VOLUME II OF II

TENDER NO.: GSL/REPL/002/CP

OPEN DOMESTIC COMPETITIVE BIDDING

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Rev.	**Date**	**Prepared By**	**Checked By**	**Approved By**

TECHNICAL SPECIFICATION

1.0 DETAILED TECHNICAL SPECIFICATION & SCOPE OF WORK FOR ELECTRIC MOTOR DRIVEN GAS COMPRESSOR PACKAGE

1.1 SCOPE OF WORK

This specification along with applicable codes as referred, describe the minimum requirements for design, engineering, manufacturing, inspection, testing, supply including packaging, forwarding, insurance, custom clearance, handling and unloading at port as well as at PURCHASER stores/ site at Gasonet Services Limited (Noida) , package string test, supply, erection & commissioning at site of " ELECTRIC MOTOR DRIVEN GAS COMPRESSOR PACKAGE" as required for dispensing CNG to vehicles at various location in the GA of Gasonet. Various parts of this specification shall be read in conjunction with each other and in case where the different parts of this specification differ the more stringent requirement shall govern.

Any additional work/equipment or technical requirement not mentioned in the specification but required to make the offered system complete in accordance with the specification and for safe and proper operation, shall be deemed to be included in the scope of work by the Supplier.

1.2 CODES AND STANDARDS

The design, construction, manufacture, supply, testing and other general requirements of the compressor package equipment shall be strictly in accordance with the data sheets, applicable API codes, and shall comply fully with relevant National/ International standards, Indian Electricity Act, Indian Electricity Rules, regulations of Insurance Association of India and Factories Act while carrying out work as per this specification. Any modification suggested by the statutory bodies either during drawing approval or during inspection, if any, shall be carried out by the Supplier without any additional cost and delivery implications. The following codes and standards (versions/ revisions valid on the date of order) are referenced to & made part of specification:

- API-11P, Second edition, API 618
- NFPA-37, OISD 179, NFPA-52: 2006, NFPA -496, NFPA -68, NFPA-70
- ANSI, ASTM, NEC, NEMA
- Indian Electricity Rules, Indian Explosives Act.
- EUROPEAN NORM P.E.D., Italian NORM D.P.R. 547/55
- EUROPEAN NORM P.E.D, D.M. 24.5.02 - D.M. 28.6.02
- D.M 24.11.84 parte prima - sez. II°, D.M. 24.5.02 - D.M. 28.6.02, DIN 2413, SAE J 514
- EUROPEAN NORMS, CEI EN 60079-10/CEI EN 60079-14/CEI, EN 60204-1/ CEI EN 60439-1, ATEX STANDARD

1.3 PRECEDENCE

In case of any conflict among the various documents of this requisition the following preferential order shall govern:

1. Data sheets/drawings

2. This Technical Specification
3. International standards/codes as applicable
4. Indian Standards / codes applicable

Compliance with this specification shall not relieve the Supplier of the responsibility of furnishing equipment and accessories of proper design, material, and workmanship to meet the specified operating conditions.
No deviations to the technical requirements and to the scope of supply specified in this enquiry document shall normally be accepted and offers not in compliance to the same shall be rejected summarily. In case a deviation is required due to inherent design of the equipment offered, the Supplier shall list all such deviations at one place giving reasons thereon.

1.4 DOCUMENTS TO BE SUBMITTED

Supplier shall necessarily furnish the following documents without which the order shall be considered incomplete:

i) Proven Track Record Formats duly filled in
ii) Checklist duly filled in with regards to scope of supply
iii) Completely filled in Data Sheets of booster compressor, instrument air compressor and electric motors.
iv) Deviations if any to this Technical Specification
v) Tentative Lay out / key plan/ General Arrangement indicating size of skids, center
vi) distance between skids and space required along with maintenance requirements

1.5 SCOPE OF SERVICES

i) Engineering, design and manufacturing.
ii) Procurement of raw materials etc., from sub-vendors.
iii) Preparation of documentation for design, approval by Purchaser/consultant.
iv) Inspection and testing as per T.S.
v) Surface preparation, protective coating and painting as per T.S.
vi) Packaging for transportation to site and supply.
vii) Erection, testing & commissioning as per T.S.
viii) Field trial run and performance test at site.
ix) All electrical work related to compressor package (PDB to compressor package & its accessories). Laying of power cables, termination at both ends, supporting, Erection, Testing, Commissioning & accessories as required for safe & smooth operation of compressor shall be in bidder scope.
x) Priority panel complete with isolation valve to connect SS tubes.

1.6 SCOPE OF SUPPLY FOR EACH COMPRESSOR PACKAGE:

Each compressor Package shall be complete with:

i) Lubricated or non-lubricated two throw balanced opposed reciprocating compressor or hydraulic booster with lube oil system and cooling system as required.
ii) Electric motor as compressor driver.
iii) Instrumentation and control system as specified in the tender.
iv) Electrical equipment / Instruments being requested in the Compressor package

v) Separate junction boxes for different type of signals like analog, digital signals, alarm, shutdowns, and thermocouples, RTDs etc. for interfacing to local panel.
vi) Mass Flow Meter (Emerson (Micro-motion) / Compac / E&H or equivalent (PESO approved make or model) at the inlet & outlet of Compressor package
vii) Common structural steel skid for the compressor- electric motor and for all auxiliary systems.
viii) Structural supports within the compressor package for all piping, electrical and instruments etc.
ix) Inter Stage and Discharge Gas, air cooled heat exchangers.
x) Priority Panel at Package Discharge as per Priority fill system
xi) All interconnecting oil, gas, water, air piping within the compressor package.
xii) Impulse and pneumatic piping/Tubing for all valves, fittings as specified & required for mounting the instruments.
xiii) NRV as required for smooth operation.
xiv) Y- type strainers, valves, sight flow indicators, check valves, manual drain/ traps etc. as required for various auxiliary systems i.e., lubrication system, cooling water systems etc.
xv) Coupling/V-belt/pulleys.
xvi) Single Acoustic enclosure for both Compressor and electric motor as specified.
xvii) Automatic CO_2 extinguishing system consisting of two cylinders, piping and valves.
xviii) Inlet and outlet manual isolating valves.
xix) Complete Erection, Testing & Commissioning of compressor packages.
xx) Piping from air compressor and CO_2 cylinders up to enclosure (each up to 12 meters maximum).
xxi) Special tools and tackles.
xxii) Training of 3 GSL Personnel at packager's workshop and /or Sub-vendors' workshop. The traveling, boarding and lodging shall be borne by PURCHASER. Training module shall span suitable to cover the equipment constructional features, maintenance procedures etc.

No separate price will be paid for training.

Bidder may outsource auxiliary equipment from domestic market from reputed manufacturer approved by PURCHASER. However, the bidder shall provide overall guarantee for the package including instrument air compressor and CO_2 flooding system.

Exclusions

The following are excluded from the scope of the supplier:

i. All civil works and foundation design. However, the Supplier shall furnish all the relevant data for design of pedestal/ foundation. However, grouting of equipment including supply of material is a part of erection.
ii. CNG storage cascade. Supplier to note that piping from air compressor and CO_2 cylinders up to enclosures is in the scope of supplier.
iii. Main incoming cable from owner PDB to main control panel of the compressor through Conduit/trenches. Cable from owner's electronic earth pit (EE) for electronic circuit in control Panel, cables from owners main earthing ring to control panel body earth and all interconnecting Cables including complete erection accessories like double compression cable, FLP gland, cable tags, Lugs etc. as required.

1.7 SAFETY

1.7.1 All controls shall operate in a fail-safe mode i.e., failure of any control shall not lead to running of

equipment in unsafe mode. Fail safe control shall be available through both software and hardware for all trips.

1.7.2 Area Classification: The hazardous area classification Class-I, Division I, Group D as per NEC or Zone I, Group II A/ II B as per IS/ IEC. Certificate from recognized agency to the effect that equipment supplied and/or installed conform to above area classification. All Devices shall meet the requirement for the specified area classification in which they are installed, including instrumentation leads.

1.7.3 All exposed rotating parts shall be provided with adequate guards of non-sparking type.

1.7.4 Drive belt if used shall be of fire retardant and anti-static type.

1.7.5 Piping shall be arranged in a manner so as to provide clear headroom and accessibility within the package. Adequate clearances shall be provided for all the engineered components for O&M point of view.

1.7.6 Package enclosures shall have one IR type L.E.L detectors and one Ultra Violet (UV)/IR fire detectors in each enclosure to cover the enclosures effectively.

1.7.7 All material used in the package shall be flame retardant.

1.7.8 The Compressor Package shall trip if any of the enclosure is opened while the machine is running.

1.7.9 Relief Valves shall be provided at BDV and discharge/ priority panel and in between inter stages of compressor with setting as per cl. 7.20.3 of API – 11P with R.V. venting as per cl. 7.20.4 of API-11P. All vented lines to be connected to common relief valve header.

1.7.10 Warning and Operating instructions to be displayed at equipment as per the statutory/safety regulations including following warning and caution signage:

1.7.10.1 "No Smoking" Sign on the package.

1.7.10.2 Caution notice "This Machine may automatically start at any time".

1.7.10.3 "Stop Motor".

1.7.10.4 "Flammable Gas"

1.7.11 CO2 flooding system:

The package shall be protected by automatically operated CO2 flooding system designed as per NFPA-12 which should have minimum following features: -

1.7.11.1 Two no. Gas Detector IR type which have self-check function to generate fault alarm and have 4 to 20 mA transmitter for 0 to 100% LEL shall be provided. Supplier shall provide suitable comparator like trip amplifier to generate alarm signal at 20 % LEL and trip signal at 50% LEL. Indication lamp shall be provided for fault, alarm and trip signal in LCP.

1.7.11.2 Flame detector (UV-IR type) with self-check function and transmitter, alarm on detection of flame shall be provided. Package should have two no. flame detectors. Self-check function to generate fault alarm and trip alarm in case of flame detection Indication lamp shall be provided for fault and trip signal in LCP.

1.7.11.3 CO2 flooding system shall consist of two nos. of 45 kg each CO2 cylinders. However actual size of the cylinder shall be as per compressor enclosure size. The Supplier shall submit necessary calculation during detailed engineering. The cylinders shall be protected from weather and direct sunrays as per Gas Cylinder Rules, 2004. Cylinders shall be fitted with actuated Valves, Solenoid valves etc. for automatic actuation. Control philosophy shall be such that in case detection fire by fire detector cylinder shall discharge CO2 automatically. One pressure gauge to be located at gauge panel to detect the pressure in Cylinder shall be provided.

1.7.11.4 FRLS (Fire resistant low smoke) cables shall be used for the wiring of the system.

1.7.11.5 Interlock of CO2 Flooding system with compressor as per following sequence:

i. Compressor shall trip on detection of gas at present level.

ii. Compressor shall trip on detection of flame at present level and automatic discharge of CO2 gas shall take place from the cylinder.

iii. Maintenance Override Switch shall be provided to keep the system off during maintenance.

iv. Compressor shall not start if the CO2 Flooding System is faulty, not working, switched OFF during maintenance etc.

1.7.11.6 One blinking aviation lamp shall be provided at top of compressor canopy suitable for hazardous area for fire indication.

1.7.11.7 Cylinder shall be provided preferably inside the package. Provision of manual, operation from outside shall be provided.

1.7.11.8 All installation shall be compatible for hazardous area Class 1, Page 81 Division 1, Group-D for Methane Gas.

1.7.11.9 Technical specifications, Operation and Maintenance Manual, CCOE Certificate, Approval/ Manufacturing certificates for cylinders and cylinder valves, gas detectors, flame detectors, solenoid valves etc. shall be furnished by the supplier along with system. Software and hardware, calibration procedure shall be provided by the supplier along with the supply sufficient to handle the system independently.

1.7.11.10 System shall be tested by the supplier after commissioning at site by creating fire signal and actual discharge of CO2 Gas from the Cylinders. The cylinders must be refilled by the vendor at no extra cost to purchaser after testing. If the system fails during testing, subsequent testing and refilling would be at vendor's cost.

1.7.11.11 Warning and Operating instructions to be displayed at equipment as per the statutory/ safety regulations.

1.7.11.12 The complete package shall be warranted for minimum 1 year from the date of successful commissioning of package. The warranty shall be provided directly by the supplier.

1.0 UTILITIES & BATTERY LIMITS

1.1 UTILITIES

Supplier shall make his own provision for Instrument air with an electric motor driven air compressor, receiver, and air dryer system. The instrumentation air shall also be used for Motor Driven CNG Compressor (250 SCMH). Hence the system is to be designed considering the same.

1.1.1 Air compressor with discharge pressure of 7 kg/cm2 (g) suitable electric motor rating with dryer and oil filter shall be supplied by the Supplier. Air receiver of min. 100 litre water capacity shall be provided. Air dryer suitable for automatic operation may be integrated with air compressor or may be supplied separately. Air compressor, drier and air receiver for instrument air, shall be kept off the package in safe area or client building. Piping, electrical & instrumentation cabling shall be in Suppliers scope. Necessary FR unit shall be provided as per requirement. Manual drains and automatic moisture traps shall be provided in the system. Air receiver shall be provided with SRV, pressure

switch, pressure gauge and drains. Pressure switch and pressure gauge shall have isolation valve.

1.1.2 Tapping from Air Receiver and dryer shall be provided to compressor with isolation valve from air receiver.

1.1.3 Cooling water is not available as utility and the package shall be provided with self- sufficient cooling water system for Compressor, as required, with makeup tank.

All the electrical equipment in the system shall be suitable for area classification of Hazardous area CLASS-1, DIV.-1, GROUP-D of NFPA.

1.1.4 All electrical and instrumentation terminals shall be as specified.

1.1.5 Electric power shall be made available by Owner.

1.1.6 For running the compressor and illumination 415 Volt (+10 %) 3-phases 4 Wire, 50 Hz (+5%) shall be provided by Owner at a single point inside the electrical room/ site suitable area. Supplier shall indicate power/ Feeder (KW/Amp) requirement in the offer.

1.1.7 Purchaser shall provide UPS (240 ±1 % V, 50 ±1 % Hz) for control supply requirements at a single point (feeder in UPS ACDB) near the booster compressor. Supplier shall indicate power/ feeder (KW/Amp) requirement in the offer. Surge protection devices of MTL/Phoenix make shall be provided in the control panel.

1.2 BATTERY LIMITS

1.2.1 All customer interface connections, gas Inlet shall be brought out to the package edge and terminated with ¾" pipe OD. Discharge connection shall be terminated with 1/2" pipe OD.

1.2.2 As and where specified on the data sheets all vents (i.e., Relief valve, distance piece and packing) shall be manifolded and terminated at skid edge outside the enclosure and vented to safe height of 2.5 m at package roof.

1.2.3 All drains from different process equipment, distance piece and packing shall be manifolded and terminated as single point for customer interface duly flanged with isolation valve.

1.2.4 Electronics earth pit shall be made available at a distance of about 5 mt. from compressor package. Electronic Earthing Cable from this earth pit shall be in the Supplier's scope shall be terminated to dedicated earth provided in the panel through proper size of glands. Owner's earthing main ring shall be made available at compressor foundation for equipment earthing. Electrical earthing for motor shall be done through Cable and the body earthing to be done through GI strip of 25 x 3 inside the compressor package shall be in the Supplier's scope.

2.0 DESIGN CRITERIA

3.1 Following specification is intended to give the Supplier the technical and operating conditions the compressor must fulfill.

3.2 The Supplier shall meet all applicable statutory codes, national law and local regulation for safety and environment protection.

3.3 Offered package shall be complete with compressor, electric motor, hydraulic pump and piping, cooling system, suction and discharge filters, instrument air dryer, oil filter, control panel, safety and control devices and other accessories required by OEM design for automatic and safe operation the system. The supply shall include all interconnecting piping/tubing/cables. Cooling system shall be of closed-circuit type/ air cooled.

3.4 The compressor package control system shall be designed for unattended safe operation in automatic mode and shall unload, start, load, stop safely. The compressor shall start in auto in case high bank pressure in cascade/dispenser falls below 200 kg/cm2g and stop once the pressure in all three banks reaches to 200 - 250 kg/cm2g.

3.5 Compressor shall be suitable for continuously variable suction pressure from 250 kg/cm2g to 30 kg/cm2g, supplied through LCV mounted CNG storage cascade.

3.6 Compressor shall be suitable for discharge pressure of 250 to 220 kg/cm2g corresponding to suction of 200 kg/cm2g to 30 kg/cm2g,

3.7 In case of any oil or gas leakage in Compressor cylinder (1st / 2nd stage), the maintenance activities like changing of O-ring, piston, seal etc. should be carried out at GSL site itself. Necessary provision for the same shall be made by the supplier in order to execute the above.

3.8 Compressor shall be designed to ensure flow capacity as indicated in the tender.

3.9 Cooling System

3.9.1 Compressor Cylinder

Compressor cylinders may be air-cooled or water-cooled. The CW shall be cooled by an air-cooled heat exchanger (closed circuit).

3.9.2 Inter / After Gas Coolers

Water or Air-cooled inter-stage and final stage discharge coolers shall be provided which shall limit the gas temperature after the after cooler to Ambient +10-degree C. Cooler design shall be based on 20% extra load corresponding to max severe operating conditions based on the thermal duty. Gas coolers shall be designed as per API-661 requirements.
For cooling of the Heat Exchangers, a cooling fan to be provided. Cooling system to be preferably installed on same skid along with compressor due to space constraints. Supplier shall submit cooler sizing calculation for review.

3.10 Enclosure of CNG Compressor Package

3.10.1 The maximum allowed temperature within the enclosure shall be 10°C above ambient temperature. Adequate ventilation fans shall be provided to meet the above and also to account for heat dissipation of the coolers. Interlock shall be provided to start the exhaust fan to vent out any entrapped gases in the enclosure before starting the main compressor. In case heat exchanger fan is compressor shaft driven, the same cannot be utilized as ventilation fan.

3.10.2 The compressor package shall consist of single enclosure for Compressor and Electric Motor. The

equipment shall be mounted on one common skid. The Enclosure to restrict maximum noise level to 75 dB (A) at 1 meter from the enclosure.

3.10.3 Enclosures shall be providing with a degree of protection equivalent to IP 54 as defined in AS 1939, shall be flame proof and provided with forced ventilation system.

3.10.4 The enclosures shall have doors for normal access and removable wall panels for ease of maintenance or full-size doors are to be provided in three sides of enclosure. If panels are non-removable type, they should have access to open for maintenance

3.10.5 All the pressure, temperature, oil level, lube oil pressure, coolant temperature, coolant level indicators shall be visible from outside of enclosures and shall be mounted on gauge panel visible from outside.

3.10.6 Enclosures shall have internal flame proof lighting arrangement.

3.10.7 For handling of all heavy parts for maintenance purpose lifting arrangement i.e. beam fitted with chain hoist shall be provided in enclosure.

3.10.8 The Compressor shall be located inside an acoustic enclosure. All Coolers, knock out Drums, Scrubbers, Cooling System, lubrication system along with interconnecting piping shall be inside an enclosure. Enough headroom shall be made available for easy access and maintenance of all equipment. The piping layout with respect to the compressor, intercoolers, KOD and auxiliary's location shall be subject to Purchaser's approval during detailed engineering stage.

Components such as pressure gauges, temperature, pressure switches, filter automatic ball valves, Safety valves etc., which require in-situ adjustment, maintenance and reading, shall be easily accessible.

- Conduits and tubing shall be arranged in orderly and systematic manner and shall be routed neatly to enter the back of display or monitoring panels
- Routine service item such as, but not limited to, crank case oil filters, inter stage gas filters, inlet and outlets gas filters and drive belt shall be located to facilitate easy one-man servicing.
- One person should be able to access crank case oil inlet and drains to allow addition or drainage of oil without removing panels or adjacent components and without the need of the pump.
- Items which must be operated & monitored during operation shall be readily accessible without opening the door.
- Suitable gradients shall be provided on the enclosure roof for rain drainage and to avoid water pockets.

3.11 Piping

3.11.1 All gas piping shall be designed, fabricated & tested in accordance with ANSI B 31.3 and shall be SS 316 material up to 1" size. Above 1" size the CS pipe material with welding & flanged joints is acceptable.

3.11.2 All rigid piping, tubing & other components of compressor package shall be designed for full range of pressure & temp and loading to which they may be subjected with a factor of safety of at least 4 based on minimum specified tensile strength at specified ambient temperature.

3.11.3 The instrument air tubing material shall be SS 304.

3.11.4 All high-pressure double ferrule fitting and valves shall be S.S. material only. Material of tube shall also be SS316 as per ASTM A269.

3.11.5 External drain & vent piping shall be Carbon Steel and not less than 1" nominal size. However, all the internal drains shall be SS 300 series material.

3.11.6 Ethyl Mercaptan dosing is envisaged hence all materials coming in contact with gas shall be compatible to such gas with Ethyl Mercaptan dosing and be of compressor manufacture's standard. The use of SA 515 material is prohibited.

3.11.7 The instrument air header SS 304 material up to compressor enclosure from air compressor shall be supplied by purchaser. Further connection shall be taken by supplier. Low pressure CO2 piping: GI heavy duty from CO2 flooding system to nozzles shall be in supplier's scope. High pressure CO2 pipe shall be seamless CS.

3.11.8 The ingress of oil into CNG adversely affects vehicle emission and storage system. Hence in case of lubricated cylinders vendor shall supply a proven, maintenance free oil removal system with automatic and manual drain after after-cooler to remove oil from compressed gas. The offered oil mist removal system shall restrict the oil less than 1 PPM in discharge of compressor

3.11.9 PP support shall be used for all tubes.

3.0 DESIGN DATA FOR REFERENCE:

4.0 ELECTRONICS

4.0.1 Starter/Control Panel/ Control philosophy

All electrical / instrument item shall be suitable for the following: Power supply for electric control panel: either 220/230 V AC or 110/115 V AC, however, Supplier to note that all control electric / electronic compressor shall be capable of with standby voltage fluctuation with ± 15% of rated voltage (220/230 V AC or 110/115 V AC). In case card / component are not capable for with standing above voltage fluctuates the scope of supply of compressor package shall include UPS / voltage stabilizer / voltage conditioner, surge protection, etc.

4.0.2 Power supply for local control panel:

a) Same as Power supply for electric control panel
b) 24 V DC power for gas detector flame detector, etc. AC to DC converter shall be provided with surge protector, if required.

The compressor package control system shall be so designed that the first item to go into trip condition shall lock out to indicate the cause of trip though the cause of trip may have disappeared. The lock out condition shall be manually reset. Compressor Package shall be provided with either micro-PLC based LCP or relay-based LCP which shall be mounted on the package enclosure, which shall be mounted on the package enclosure. All the interlocking, monitoring and controlling of the

booster compressor shall be done through digital signal only by providing either PLC or rely. If PLC is used hardware shall be in accordance with IEC-61131- 2 and program shall be made only in ladder diagram.

4.0.3 Following push button / switch shall be provided:

Emergency stop at Compressor panel and Control Room/Sale room Shut / Stop Auto / Manuals Fault accept Fault reset CO2 cylinder by pass Test button for lamp & hooter
Maintenance Over ride switch

4.0.4 Panel provided with following indication lamps:

All process alarm trip Indication for filling sequence

Fire detector related indication

Compressor running

Control power supply ON for 24 V DC and 230 / 115 V AC

All solenoid coils, power contactors etc. shall have operating voltage of 220/230 V AC or 110/115 V AC, and 50 Hz. For any other Voltage requirements, it will be in Supplier's scope.

4.0.5 Motor shall be TEFV squirrel cage type in standard frame size as per IS/IEC rated for continuous duty with high efficiency and designed for star/delta starting. Motors shall be suitable for starting under specified load conditions with 75% of rated voltage at the terminals. Motor torque shall be compatible with speed torque curve of compressor. Motor windings shall be class F insulated with temperature rise limited to class B. Minimum degree of protection of motor enclosure shall be IP55 as per IS. Motors for use in hazardous areas shall have protection Ex (d) as per area classification.

4.0.6 The motor name plate rating (exclusive of service factor) shall be minimum 110% of the greatest HP required under any of the specification operating conditions. All motors shall be tested in accordance with IS/IEC.

4.0.7 Each motor shall compulsorily be protected with thermal-magnetic over current relay.

4.0.8 The electrical power supply distributions panels, switchgear panels and starter panels shall be skid mounted construction, explosion proof suitable for installation on nearby compressor package in hazardous area classification. There shall be FLP push button panel available at the compressor skid. The switchgear shall have one incomer and adequate number of outgoing feeders. All explosion proof panels and FLP push button shall be CMRS certified. The incomers shall be provided with suitably rated switch fuse unit, ammeter, voltmeter with selector switch, energy meter, hour meter, PF meter, etc. Motor feeders shall be provided with heavy-duty switch. HRC link type fuses, contactors (AC-3 duty), bi-metal relay, single-phase prevention, ammeter, push buttons, earth leakage relays, and indication lamps for Start/Stop/Trip, etc. Adequate number of MCB feeders for control and lighting shall be provided. Supplier shall furnish single line diagram of the panel with the bid.

4.0.9 There shall be separate panel for main incoming switch (MCCB) and the starter of main motor. There shall be a minimum clearance of 30 mm between the two power contractors. Indication lamp for start stop/trip etc. shall be provided.

4.0.10 The compressor panel shall have phase reversal relay to detect the electrical supply phase sequence

and trip the compressor on wrong phase sequence.

4.0.11 Supplier shall make provisions for earthing of the complete package as required as per IS. All electrics shall comply with latest IS/IEC. Epoxy based paints shall be applied on all electrical equipment. Supplier "s scope shall include obtaining statutory approvals for the complete package, wherever necessary. All hardware used for earthing systems shall be hot dip galvanized or Zinc coated.

4.0.12 Earthing: Metallic part of all equipment not intended to be alive shall be connected to earth as per provisions of IS: 3043/IEC recommendation. Grounding of all electronics shall be separately connected to earth using insulated copper wire. Grounding of electronic equipment shall not be connected to earthing for electronics or equi-potential bonding.

4.0.13 Pre-lubricated sealed bearings for all motors may be considered provided a full guarantee is given for 4 to 5 years of trouble - free service without necessity of re-lubrication.

4.1 EMERGENCY SHUTDOWN DEVICES

The emergency shutdown (ESD) system is also in scope of vendor. This shall be in accordance with NZS5425. A fail-safe system shall be designed and incorporated to isolate cascades storage from dispensers, stop compressor isolate the compressor suction and cut off power supply on activation of ESD switch. This ESD switch shall have to be manually reset to restart the compressor package again. ESD shall activate either on pressing emergency push button (red button) or on fire detection. Red button (3 no's) shall be located near dispenser, control panel and at compressor side.

4.2 Electric Motor and Drive Arrangement

4.2.1 Electric motors

a) Type of drive totally enclosed fan ventilated (TEFV) high efficiency as per IEEMA standard 19-2000
b) Protection Flame proof & weatherproof enclosure.
c) Insulation Class "F" with Class "B" temperature rise
d) Mounting Horizontal foot mounting

4.2.2 Motor accessories

a) Compressor grooved flywheel
b) Motor grooved drive pulley
c) Drive v belts
d) Flexible coupling for direct drive
e) Drive guard
f) Adjustable motor slide rails for v belt tensioning be used.

4.2.3 Preferred makes shall be as follows:

Sr No	Item Description	Makes
1	FLP Motors	ABB/Compton/Siemens/ Bharat Bijlee or equivalent
2	FLP Switchgear	Flexpro/FPE/FCG/Baliga/ Sudhir or equivalent
3	Switches/fuses/contractors	L&T /GEC/Siemens/Schneider make or equivalent
4	Push Button	L&T/Siemens/Legrand or equivalent
5	MCCB	Siemens/Legrand/Schneider make or equivalent
6	Vibration Switch	Not applicable
7	PLC	Rockwell Automation/ GE Fanuc/ Siemens/ Allen Bradley / L&T/ Schneider make or equivalent
8	IR Gas Detectors	General Monitors / Crowcon / Honeywell / Sieger / Detronics/ Khrome Schroder / Net safety. or equivalent
9	UV Flame Detectors	General Monitors / Crowcon / Honeywell / Sieger /Detronics/ Khrome Schroder / Net safety. or equivalent
10	Mass Flow Meter	Emerson (Micro-motion) / Compac / E&H or equivalent
11	PT	Druck/Wika/Honeywell/ABB/Rosmount or equivalent
12	PR	M/s Pietro Fiorentini S.p.A. (Italy)/ M/s Emerson Process Management/ M/s RMG- Regel Messtechnik (Germany) / M/s Mokveld Valves BV (Netherlands)/ Tartarini / Fisher or equivalent
13	PSV	M/s BHEL, OFE & OE Group (New Delhi)/ M/s Keystone Valves (India) Pvt. Ltd. Baroda/ M/s Sebim Sarasin Valves India (P) Ltd. (New Delhi/ Halol-Gujarat)/ M/s Tyco Sanmar Ltd. (New Delhi/ M/s Parcol SPA, Italy/ M/s Nuopignone, Italy/ M/s Sarasin, France/ M/s Tai Milano SPA, Italy/ M/s Fisher Rosemount (Now M/s Emerson Process) Singapore/Mercer USA. or equivalent
14	SS Tubes	M/s Sandvik, Sweden/ M/s Tubasax/ M/s SSP or equivalent
15	SS Fittings	M/s Swagelok (USA)/ M/s Parker (USA)/ M/s Hoke (Circore Instruments)/ M/s Hamlet/ M/S SSP/M/S BMT Korea/ HYLOK or equivalent
16	Plug Valve for air water	M/s Nordstrom Valves Inc. USA/ M/s Serck Audco Valves, UK/ M/s Breda Energia Sesto Industria Spa, Italy/ M/s Sumitomo Corporation, New Delhi/ M/s Fisher Xomox Sanmar India Ltd., New Delhi/ M/s Larsen &Toubro Ltd. (Audco India Limited), Chennai. or equivalent
17	Solenoid Valve	M/s ASCO / M/s Rotex / M/s parker Hanifen or equivalent
18	On off ball/needle valve	M/s Parker / M/s Swageloc or equivalent
19	Cables and wires	INCAB/ Universal/,ASEAN/CCI/ FORT/ Closter/ Finolex/ KEI or equivalent
20	Barrier/Isolators/Surge protector	MTL/Phoneix/P&F or equivalent

Note:

All electrical & electronics items installed in the booster shall be PESO approved. Valid certificate shall be provided by the supplier.

The bidder has to submit CCOE (PESO) approval of their equipment/ model along with the bid.

If the bidder is providing, any other make of the above item, the make must be PESO approved. Also, the same make should be mentioned in the PESO certificate of the model.

4.0 INSTRUMENTATION & CONTROLS

5.0 Instrumentation

5.0.1 All the instruments and control shall be suitable for area Class I, Group D, Division I.

5.0.2 All package mounted transmitters & temperature elements shall be intrinsic safe as per IEC 79-11 and solenoid valves, switches and related junction boxes shall be flame proof 'd' as per IEC 79-1. Other special equipment / instrument, where intrinsic safety is not feasible or available, shall be flame proof/explosion proof as per IEC 79- 1.

5.0.3 The compressor package instrumentation & control is to be configured for manual as well fully automatic control system including starting, shutdown as applicable for unattended operation.

5.0.4 All the instrumentation shall be capable or operating for full range of operation.

5.0.5 Separate junction boxes shall be provided for each type of signal i.e., e\analog digital, solenoids RTD, thermocouple and for power supply. No cable shall share power & signal.

5.0.6 All temperature and pressure gauges shall be mounted on gauge panel visible from outside.

5.0.7 Compressor package shall be provided with min following instruments; All tripping shall be with lamp indication and annunciation.

i. Temp indicator 1st, 2nd stage discharge and after- after cooler
ii. Pr indication 1st, 2nd stage discharge, high & med bank. Pr switch, 2nd stage discharge, high & med bank
iii. Hydraulic oil tank: Level switch & gauge, temp indication & switch; pump pressure indication, return oil pressure indication.
iv. Coolant: Temperature & pressure indication & switch and temperature indication after cooler.
v. Hour meter.

5.1 Priority Fill System

Vendor shall supply a suitable priority fill system with compressor top-up facility inclusive of regulating valves, by pass valve & liquid filled pressure gauges all mounted in a stainless steel structural. The priority fill system shall be installed to ensure that vehicle filling takes precedence over cascade filling. Full bore ball valves shall be provided so that compressor can take suction either from LCV cascade or stationary cascade. Tubing and valves from LCV cascade and stationary cascade to compressor shall be ¾” SS 316 OD and other tubing and valves shall be 3/4” size. End connections shall be 3/4” size pipe OD.

5.2 Case –I: Valves positioned to take suction from LCV cascade.

a) If the LCV cascade pressure is more than 200 kg/cm2, the gas dispensing should take place directly from LCV

to dispenser bypassing booster compressor.

b) Compressor shall start on pressing of manual start push button when the LCV cascade pressure falls below 200 kg/cm2.The priority of filling shall be as follows;

I) First priority: Priority panel shall first fill the vehicle through dispenser.

II) Second priority: If no vehicle is to be fueled, priority panel shall fill the stationary cascade. The compressor shall shutdown automatically when either all stages of stationery cascade are filled to a pressure of 250 kg/cm2 or pressure in mobile cascade is less than 30 kg/cm2.

5.3 Case -II; Valves positioned to take suction from stationary cascade

a. Dispensing shall be done through stationary cascade without compressor running, if stationary cascade pressure is more than 200 kg/cm2.

b. Compressor shall start on pressing of manual start push button if stationary cascade pressure is less than 200 kg/cm2. Dispensing into the vehicle should take place as usual. Compressor shall trip if either there is no vehicle for fueling or pressure in stationary cascade is less than 30 kg/cm2.

5.0 CABLING

6.1 Cabling inside the enclosure shall be of 1.5 Sq. mm core.

6.2 Cabling outside enclosure shall be minimum 2.5 Sq. mm core.

6.3 Cables shall be 1100-volt grade, stranded copper conductor, PVC insulated, PVC sheathed, round wire armored, FRLS cables.

6.4 Cables shall be terminated using double compression type metallic frame proof glands and copper lugs.

6.5 Spare cores to be kept in each control cable.

6.6 All JB's shall have flame proof metallic enclosure.

6.7 All the signal cables shall be screened armored cables.

6.8 All the control and power cables shall be armored cables only.

6.9 All the communication cables shall be screened and shall be terminated to JB through threaded GI conduits only.

6.10 All the cables shall be laid in through galvanized cable tray.

6.11 Following electrical cables shall be supplied and laid by purchaser.

a) Cables from PDB to compressor skid.

b) Cables from compressor to hooter and up to ESD push button in control room.

c) Cables from compressor to ESD push button near dispenser.

d) Cables form PDB to air compressor.

6.12 Following cables shall be supplied and laid by Supplier:

a) Power and signal communication cables from compressor to mass flow meter during PG test.

b) Cables from purchaser's terminating points to compressor package's components.

c) Termination of cables in compressor control panel and in electrical panel including cable lugs and cable glands are in Supplier's scope.

d) All cable shall be laid through GI cable tray of suitable size.

6.0 INSPECTION AND TESTING

6.1 General

a) Inspection and Test Requirements shall be as per approved QAP.
b) Supplier shall confirm compliance to all inspection and testing requirements stipulated therein and included the inspection charges in the lump sum cost.
c) Purchaser/consultant shall witness tests as per data sheet and this specification. The Supplier shall notify the timing of such inspection and testing at least 15 days in advance to Purchaser/consultant. Purchaser/consultant shall depute their representative for witnessing the tests in which case the cost of representative shall be borne by the purchaser.
d) Supplier shall submit detailed Test Procedure for Approval of the Purchaser two months in advance of the actual date of conducting each test.

6.2 Mechanical running test (MRT)

The MRT for each compressor shall be carried out in presence of Purchaser/consultant or their representatives (or a third party as arranged by Purchaser) with job or shop driver including complete job driving system for 4 hours continuously at shop of compressor manufacturer. The compressor need not be pressure loaded for MRT test. During this test following shall be recorded at agreed intervals.

- Vibration levels measured on cylinders and frame
- Bearing temperature
- Oil cooler inlet and outlet temp

7.0 PAINTING AND PROTECTION

Packing shall be sufficiently robust to withstand rough handling during ocean shipment & in-land journey. Sling points shall be clearly indicated on crates.

7.1 Surface Preparation

a) Rust, rust scale and foreign matter shall be removed fully to ensure that a clean and dry surface is obtained. The minimum acceptable standard for blast cleaning shall be Sa 2-1/2 or equivalent as per Swedish Standard SIS- 055900-1967 or equivalent.

b) Blast cleaning shall not be performed where dust can contaminate surfaces undergoing such cleaning or

during humid weather conditions having humidity exceeding 85%.

c) The first coat of primer must be applied by brush on dry surface. This should be done immediately after cleaning.

d) Surface shall be inspected by Purchaser/ third party before application of primer.

7.2 Painting (Primer & Finish Coat) or Powder Coated

Following primer and finish coats to be applied on the canopy and all structural parts as a minimum: -

a) Primer Two component epoxy zinc phosphate primer with minimum volume solids of 59%, an initial cure of 75 minutes at 25 deg. C and a weight of around 2.52 kg/liter.

No. of Coats: 1

DFT 75 (micron) each

b) Primer: Two component intermediate coat with epoxy high build MIO (micaceous iron oxide) of minimum volume solids of 80%, an initial cure of 60 minutes at 25 deg. C and a weight of around 2.1 kg /liter.

No. of Coats: 1

DFT: 100 micron

c) Finish Coat: Acrylic Polyurethane paint No. of Coats: 2

DFT 50 (micron) each coat

Total DFT 100 micron

Total DFT after application of primer and paint shall be 275 e (micron) minimum

7.3 The vendor to ensure that exterior steel surface of equipment and piping painted shall have a fade free life without oxidation of paint surface for at least 5 years in an environment of bright sunlight with an intense UV content.

7.4 The headers of air-cooled exchanger shall be zinc sprayed.

8.0 ERECTION, TESTING AND COMMISSIONING AT SITE

8.1 Supplier shall be responsible for erection commissioning, performance test, field noise level test and field trial run of all compressor packages at site.

8.2 Supplier shall be liable to pay all local taxes, levies applicable and comply with rules, laws prevailing in concerned state.

8.3 Arranging crane, unloading at store, loading from store & shifting from store to site, unloading at site/foundation, arranging special tools & tackles, grouting & grouting cement, lodging & boarding of Suppliers personnel, providing mobile phone facilities shall be included in the offered cost.

9.0 PACKAGE PERFORMANCE TEST AT SITE

Supplier shall assemble the complete package including auxiliary systems, instrumentation, safety devices within the enclosure at his shop/site and dispatch. The machine shall be accepted after the performance test at site.

Complete package shall be performance tested as a module along with electric motor. Supplier shall demonstrate all controls, shutdown, trips / alarms etc...

The test shall be the basis of acceptance / rejection of the package thereon. Supplier shall submit the detail test procedure for the same, which shall be approved by PURCHASER/CONSULTANT. The test for the package shall be witnessed by PURCHASERL/CONSULTANT or their representatives. All guaranteed and other critical parameters shall be demonstrated by the suppler. Supplier shall conduct a field trial run of each variable suction compressor package for minimum four hrs. in which satisfactory operation of complete package together with all accessory's controls shall be established for specified operation conditions, In case of any detect, discrepancies under specified site conditions. Supplier shall first rectify the same and repeat the field trial run. The Supplier shall record data of field trial run. In addition to this the package will be kept under supervision for 72 hours. in which satisfactory operation of complete package together with all accessory's controls shall be established for specified operation conditions without any breakdown, In case of any detect, discrepancies under specified site conditions., Supplier shall first rectify the same and repeat the field trial run.

10.0 SPARE PARTS, SPECIAL TOOLS AND TACKLES

10.1 All spare parts, special tools & tackles for erection and commissioning and operation & maintenance of compressor package shall be supplied by the packager and shall form his scope of supply.

10.2 A brand-new separate set of special tools and tackles as required for Normal maintenance beyond the operation period shall be supplied by the packager one month before completion of O&M period at no additional cost.

11.0 DATA AND DRAWING

Supplier shall necessarily furnish the following Documents:

i. Completely filled in Data Sheets of compressor, Electric motors
ii. Tentative Lay out / key plan/ General Arrangement indicating size of the package indicating overall dimension.
iii. Utilities requirements
iv. Electrical Load summary
v. Catalogues of compressor, electric motor, instrumentation items.
vi. P&I diagram
vii. Full technical details of the compressor
viii. Cross sectional drawings of the compressor unit.
ix. Flow v/s suction pressure and power v/s suction pressure graph or full range suction pressure I.e. 250 to 28 hg/cm2
x. Safety code for CNG application
xi. Electrical line diagram, O&M manuals of compressor. Any other document required over and above aforesaid documents during engineering stage after placement of order shall be supplied by Supplier. Supplier shall also supply above data in editable soft copy.

12.0 GUARANTEED PARAMETERS - BOOSTER COMPRESSOR

Sr No	Description	To be provided by Supplier
1	Average flow capacity (over range of suction pressure from 30 to 200 Kg/ Cm2 (g) at varying on continuous basis): Required 250 SCMH	
2	Electric power consumption in KWH with no (+) tolerance with overall full range of suction pressure (from 30kg/ Cm2(g) to 200 kg/Cm2(g) varying on continuous basis) to compress 250 SCMH gas with no (-) tolerance for loading and penalty purpose	
3	Minimum flow capacity in SCMH corresponding to suction Pressure of 200 Kg/Cm2(g)	
4	Minimum flow capacity in SCMH corresponding to suction Pressure of 30 Kg/Cm2(g)	
5	Minimum flow capacity in SCMH corresponding to suction Pressure of 80 Kg/Cm2(g)	
6	Sound level of enclosure in dBA (required 75)	

Note:

1 Parameters under Sl. No. 3, 4 & 5 are for reference only.

2 Supplier must indicate the guaranteed KW including all losses such as mechanical, transmission, power absorbed by compressor driven auxiliaries like cooler fans etc. but excluding air compressor.

13.0 GAS COMPOSITION AND CLIMATE

a. Gas composition -The expected gas composition of the feed gas to the CNG Storage Cascade is given below.

Component	Average Gas Composition(mole%)
Methane	92.352
Ethane	5.305
Propane	1.778
I Butane	0.270
N Butane	0.220
I Pentane	0.006
N Pentane	0.001
Carbon Dioxide	0.023
N- Hexane	0.000
Nitrogen	0.045
Total	100

NOTES

- O2 not more than 0.5 % mole

- Total non-hydrocarbon –Not more than 1.0 %
- Total S including H2S Not more than 10 PPM by weight
- H2S not more than 4 PPM by volume
- Moisture content in the range 112 to 144 Kg/ MMSCM
- Specific gravity to be calculated by Bidder
- Calorific value Net Kcal/SCM to be calculated by Bidder
- Temp of gas shall be max 55 °C

Climate

- Max. Height above Mean sea level: 130 meters (Approx.)
- Max. site temp.: 48 °C
- Minimum site temp.: 0 °C
- RH: 90%

14.0 DATA SHEETS

Data Sheets to be provided for following:

- Booster Compressor
- Compressor Motor
- Heat Exchangers
- Gas Detection System (IR Type)
- UV/IR Fire Detection System

15.0 CHECK LIST OF SCOPE OF SUPPLY

Notes:

(i) Supplier shall furnish all equipment, drivers, auxiliary systems, instruments and controls and safety devices as per the enquiry document. Anything required over and above what is specified, for safe and satisfactory operation of the equipment package shall be included by the Supplier in his scope.

(ii) Supplier to write YES/NO against each item. Supplier is required to include complete scope, as such 'NO' is not warranted. However, in case for any of the items if vendor's reply is 'NO', vendor should give reasons for the same:

(iii) Supplier's scope of supply shall include but not be limited to the following:

Sr No	Description	
	Each Compressor package Complete with:	
1	Air cooled or water cooled, lube oil cooling water, inter-stage, and discharge gas coolers with necessary air-cooling arrangements	
2	Combined and separate closed circuit cooling water system for compressor	
3	Lubricating Oil system for compressor	

4	Safety relief valve on each suction and discharge stage of compressor	
5	All interconnecting oil, gas, water, air piping, within the compressor package.	
6	All valves, tubing, fittings as specified and required with in compressor package	
7	Fuel Supply hardware complete with SS piping, control valves, Mass Flow-meter, filter, vent/drain within the package suitable for the specified gas	
8	Common Skid for compressor and another auxiliary system	
9	Acoustic Enclosures for compressor with LEL, fire detection system and CO2 flooding system	
10	Instrumentation and control system	
11	Cabling with cable trays for all the electric device within package	
12	Supply of Emerson make Gas Mass Flow meter with integral display for PG test purpose at inlet & outlet	
13	Priority Panel at package discharge	
14	Tubing, Pipes valves and fittings	
15	Y type strainers, valves, sight flow indicators, check valves, auto/manual drain traps as required for various compressor auxiliary system	
16	All coupling & guards	
17	Erection, Testing, and commissioning including supervision	
18	All Mandatory Spares required for successful operation of Package	
19	Erection and Commissioning spares as required including lube oil consumable etc. required for erection and commissioning of each compressor package.	

16.0 PRICE LOADING, COMPENSATION, ERECTION, TESTING AND PG TEST

- This section describes the guaranteed parameter, which the booster compressor package must fulfill, the penalty for shortfall in guaranteed parameters and rejection of compressor package by the Purchaser.

- The guaranteed parameter shall be adjusted to account for variation in gas composition and prevailing ambient condition during testing.

- Necessary calculations correction curves shall have to be furnished by Supplier along with bid, which shall be final & no deviation shall be permitted afterwards.

- In case of any inconsistency in manufacture and/or operation of supplied compressor package, Supplier shall at his own risk and cost, eliminate the defects to the satisfaction of Owner.

- For loading and compensation purpose, power consumption with suction pressure of 30 to 200 Kg/cm2 (g) and discharge pr equal to dispensing pressure may be considered. Dispensing pressure will depend on empty vehicle cylinder pressure to be filled and compressor discharge pressure may not be 255 kg/ cm2 (g) continuously.

- Supplier shall furnish guaranteed value as per Clause NO 13 (Guarantee Parameters.) of TS enclosed with this specification.

16.1 Compressor Capacity

Supplier shall guarantee average capacity of 250 SCMH from suction pressure 30 to 200 kg/ cm2 (g) at suction temperature of 30o C, discharge pressure of 255 kg/ cm2 (g) with the no negative tolerance for errors in instruments and measurements.

16.2 Price Loading Criteria of compressor

The guaranteed KW including all losses such as mechanical, transmission, power absorbed by compressor driven auxiliaries like cooler fans etc. but excluding air compressor at guaranteed flow with zero percent positive tolerance, of all the technically qualified Supplier shall be compared. On the basis of the lowest KW quoted by the Supplier, other shall be loaded as follows;

Differential operating cost (Ex)
Ex (in Rs) = (Eb-E0) X Re X 9125
Where,
Ex = Differential electricity operating cost.

Eb = Average total power quoted by the Supplier to be loaded for compressor package in KW EO= Lowest Average total power quoted by the any Supplier for compressor package in KW. Re -- Unit rate of Electricity i.e. Rs 8.00

Note: The financial loading on account of power consumption shall not exceed 5 % of compressor supply cost on FOT basis.

16.3 Penalty against non- performance of compressor

16.3.1 Penalty due to Power consumption.

During compressor package performance test, in case the absorbed electric power at guaranteed parameters for entire compressor package including auxiliaries but excluding air compressor is more than the guaranteed power consumption mentioned at the time of bidding, penalty on the following basis shall be imposed on the Supplier
:

EY (in Rs) = 2.0 x (EBTB-EBGB) x Re x 9125

Where,

EY = Differential electric cost.

EBTB = Average total power absorbed by the compressor package in KW, at the time of performance test the compressor package at site. EBGB= Total absorbed power guaranteed for the complete package at the time of bidding. Re
-- Unit rate of electricity i.e. Rs 8.0

Note: The total penalty on account of Power consumption to be charged for non- conformance of guaranteed parameter shall not exceed 10% of compressor supply cost on FOT basis.

16.3.2 Penalty due to Compressor Capacity.

Over and above the penalty due to power consumption, if during PG test, the compressor minimum average calculated capacity is found less than tender requirement, penalty for the reduction in capacity shall be imposed on the Supplier on prorate basis based on FOT cost of compressor without any upper limit.

ANNUAL MAINTENANCE CONTRACT (AMC)

1. Compensation for non-fulfillment of obligation under Annual Maintenance Contract (AMC)

During the AMC in warranty period of 1 year and post warrantee period of further 4 year, the bidder must ensure that the compressor is available for 365 days a year for performing the required services as defined in the tender document.

2. Bidder's responsibility

The bidder shall depute his Supervisor for supervision of the services to receive instructions from Engineer-in-Charge or his representative.

3. Employment liability of Bidder

The bidder shall ensure and will be solely responsible f or payment of wages and other dues latest by 7th of the following m month to the personnel deployed by him in the presence of the Company's representativee.

The bidder shall be directly responsible and indemnify the company against all charges, claim s, dues etc. arising out of disputes relating to the dues and employment of personnel deployed by him.

The bidder shall indemnify the company against all losses or damages caused to it on account of acts of the personnel deployed by the Bidder. The bidder shall ensure regular and effective supervision of the personnel deployed by him.

The bidder shall be liable f or making good all damages/losses arising out of loss or theft of each handled, leakage, pilferage of any office, furniture equipment fitting and fixtures what-so-ever as may be caused directly or indirectly by the engaged persons through him/work carried out by them.

4. General

i) The operation and maintenance services shall be provided in terms of shift pattern on the round the clock basis as mentioned in the tender document. In case of Compressor operations are less than or equal to 2 shift operations then recovery for the O&M charges equivalent to the applicable minimum wages for skilled category shall be applicable. Recovery will be made on monthly basis from O&M running Invoices.

ii) The bidder shall deploy adequate number of technicians / supervisors / Engineers / helpers as well as tools & equipment for smooth and proper operation & maintenance of the compressors supplied in terms of the contract. In case required to meet operational requirements, the bidder shall augment the same as per direction of Engineer –in- Charge.

iii) The bidder is required to carry out all services as mentioned in the Scope of Services and Schedule of Rates on all the 365 days including Sunday and all Holiday & around the clock.

iv) The bidder shall allow weekly rest and daily working hours to his workmen as per the relevant Act/Law/and Rule made there under. However, no work shall be left incomplete /unattended onany holiday/weekly rest. Technician/operators provided shall have minim um qualification of ITI. Contract in person or his authorized representative shall provide the services on daily basis to interact with Engineer-in-charge and deployed workman.

v) The work force deployed by the bidder for O&M services at CNG installation shall be of sound relevant technical professional expertise which is otherwise also essential from the safety point of view of the personnel of the bidder as well as for the installation.

vi) Bidder has to ensure the safety of man and machine all the times. Damages of equipment due to negligence will be recovered as per the decision of Engineer in-Charge, which will be final.

vii) Regarding work completion, the decision of the Engineer-in-Charge will be final and binding.

viii) The bidder shall make his own arrangements to provide all facilities like boarding and transport etc.to his workmen.

ix) All personnel of the bidder entering on work premises shall be properly and neatly dressed and shall wear uniform, badges while working on premises of the company including work sites.

x) Bidder shall maintain proper record of his working employee's attendance and payment made to them. xi)

The Bidder's representative/supervisor shall report daily to the Shift-in-Charge for day to day working.

xii) All the safety rules and regulations prevailing and applicable from time to time at theinstallations as directed by PURCHASER will be strictly adhered to by the Bidder.

xiii) The rates quoted by the Bidder must be inclusive of all the taxes, duties and any other levies, Bidder's share of P.F. and insurance charges, Bidder's profit and any otherexpenditure etc.

xiv) It will be the responsibility of the bidder to pay as per the minimum wages of the appropriate government applicable under the Minimum Wage Act.

xv) The services shall be provided in terms of shift pattern on the round the clock basis. The bidder is responsible to provide effective e and efficient services in all shifts and assure that there is no disruption in the services for want of any resources.

xvi) The bidder shall establish a central control room to operate 24 hours, seven days a week where complaint regarding non-performance of the compressors in terms of the contract can be lodged. Further, the bidder shall deploy adequate number of technicians/ supervisors / engineers at various site offices in consultation with Engineer-in-Charge to provide trouble free operation & maintenance of the compressors.

xvii) All arrangements for communication from control room to the contract person working on job under the services shall be theresponsibility of the Bidder, viz pagers/ walky-talky.

xviii) All the jobs mentioned under scope of services shall be carried out as per sound engineering practices, work procedure documentation, recommendation of the manufacturer and as per the guidelines/direction of engineer-in-charge of authorized representative.

xix) The bidder shall carry out retesting of pressure vessels periodically i.e every year or earlier as per Gas Cylinder rules 2004/ Static and Mobile Pressure Vessels Rules.

5. Operation and Maintenance of compressor packages during one year warranty Period and further 4 year of post warranty period.

5.1 Scope of supply during one year warranty period:

All spares, consumables, lubricants, lubricating oil, coolant, sealant etc. required for carrying out the Operation and maintenance of the complete compressor package during the warranty period, including

periodic, breakdown m maintenance for continuous and uninterrupted operation of the compressor packages shall be in scope of the Bidder and shall be kept in stock. If any equipment gotfire or broken due to accident the same shall be replaced or rectified by the bidder. Electricity shall be supplied free of cost to the Bidder.

5.2 Scope of supply during post warranty period:

All spares, consumables, lubricants, lubricating oil, coolant, sealant etc. required for carrying out the Operation and maintenance of the complete compressor package during the post warranty period, including periodic, breakdown maintenance for continuous and uninterrupted operation of thecompressor packages shall be in scope of the Bidder and shall be kept in stock. If any equipment got fire or broken due to accident the same shall be replaced or rectified by the bidder. Electricityshall be supplied free of cost to the Bidder.

5.3 Scope of services:

The Bidder shall have to keep all the spares, consumables, lubricants, cool ant, etc. required for carrying out periodic, breakdown, emergency maintenance etc. of the package so as to minimize the down time of the compressor. Non- availability of compressor package for non- availability of spares shall be liable for compensation.

5.4 All tools, tackles and fixtures required for carrying out the above maintenance of the compressor shall be in scope of the Bidder. The scope will also include handling equipment like crane, forklift, chain pulley block, etc. required during the any maintenance activity.

5.5 Any expert services required from principal company or OEM shall be arranged by the bidder or his agent at his own cost. All arrangements like phone, fax, computer, Internet etc. required for correspondences with above personnel shall be arranged by the Bidder.

5.6 The periodic maintenance required to be done as per OEM recommendation shall be taken up promptly. The Bidder shall provide the detailed preventative maintenance schedule alongwith

a) Estimated down time required for each type of maintenance schedule.
b) List of spares and their quantities required for each type of maintenance schedule per compressor.
c) Type and number of man days required for each type of maintenance schedule per compressor.

The bidder shall plan such maintenance during non-peak hours and in consultation with the Engineer In Charge (EIC) of PURCHASER. Any maintenance that needs to be taken up shall be well planned in advance with due approval of the EIC.

5.7 The Bidder shall use only OEM's certified spares during maintenance. In case, the schedule maintenance of the OEM manual recommends checking and replacing parts like valve spring, valve plates, piston rings etc. after certain time interval, same shall be replaced or used further only on approval from the PURCHASER representative. However any untoward consequences f or non- replacement of such parts shall be the responsibility of the Bidder.

5.8 All routine and periodic checks / inspections required to be done as per OEM recommendation shall be done by the Bidder. Instruments required for above inspection like venire caliper, micrometer screw gauge, fill gauges, bore gauge etc. shall be in scope of the Bidder and these instruments shall be calibrated every year.

5.9 All parts replaced by the Bidder during the above contract period shall be properly packed and handed over to PURCHASER, on replacement.

5.10 The bidder shall submit a copy of the daily / weekly / fortnightly / monthly / bimonthly / quarterly and yearly performance report to the EIC in both soft and hard form. All stationery including the printed material shall be in scope of the Bidder.

5.11 All the maintenance / inspection job carried out by the Bidder shall be recorded and the report of thesame shall be

jointly signedby PURCHASER representative.

5.12 The EIC will be final authority to take decision with regards to maintenance or replacement of parts or any disagreement between the Bidder and PURCHASER, during the execution of the contract.

5.13 The Bidder shall carryout calibration of gas detectors and flame detectors every six months or earlier as per requirement or instruction of EIC of PURCHASER. Also yearly calibration of all instruments such as pressure gauges, transmitters, switches, mass flow meters etc. shall be in the scope of the Bidder. In addition to the above all safety relief valves shall also be tested and calibrated every year.

5.14 Calibration shall be done from government-approved laboratories and shall be carried out at least 15 days prior to the calibration due date.

5.15 The Bidder shall keep 1 set of safety relief valves in spare for the purpose of calibration.

5.16 The Bidder shall carry out retesting of pressure vessels periodically as per Gas Cylinder rules 1981 orStatic & MobilePressure Vessels Rules.

5.17 The periodic maintenance required to be done as per OEM recommendation shall be taken up promptly. The Bidder shall plan such maintenances during nonpeak hours and in consultancy with the Engineer in Charge (EIC) of PURCHASER. Any maintenance that needs to be taken up shall be well planned in advance with due approval of the EIC. The scope shall include preparation of m maintenance schedule for carrying out the maintenance during the contract period.

5.18 In case, the schedule maintenance of the OEM manual recommends checking and replacing parts like valve spring, valve plates, piston rings etc. after certain time interval, same shall replaced in the presence of PURCHASER representative.

If top overhauling and major overhauling of the compressor and prime mover is required as per compressor and prime mover manufacturer's O&M manual recommendation, the same shall be in supplier's scope.

5.19 Insurance of free issue items up to 15 days beyond commercial operation by purchaser or two months from the date of supply of equipment at site whichever comes earlier will be in the scope of supplier.The risks that are to be covered under the insurance shall include, but not be limited to the loss or damage in handling, transit, theft, pilferage, riot, civil commotion, weather conditions, accidents of all kinds, fire, war risk etc.