



GAIL GAS LTD

(A wholly owned subsidiary of GAIL (India) Limited)

CNG AND CITY GAS DISTRIBUTION PROJECT

BID DOCUMENT FOR CNG CASCADE VOLUME – II OF II (TECHNICAL)

(BID DOCUMENT NO: 110290/WGI/GAIL GAS/24-R0)



DELIVERS. EVOLVES.

WHOLE LIFE SOLUTIONS FOR PIPELINE AND SUBSEA SYSTEMS

ISSUED BY



JP KENNY



GAIL GAS LIMITED
CNG AND CITY GAS DISTRIBUTION PROJECT



TECHNICAL SPECIFICATION FOR CNG STATIONARY CASCADE

CLIENT JOB NO

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TOTAL SHEETS

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DOCUMENT NO

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**TECHNICAL SPECIFICATION FOR CNG
STATIONARY CASCADE**

Document No.

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1.0 CNG STATIONARY CASCADES DESCRIPTION

1.1 General

The intent of this tender is to outline minimum requirement for Design, Engineering, Manufacturing, Assembly, Testing, Supply, Testing at site, Commissioning of CNG storage both stationary and mobile storage systems as per Technical specification of tender.

- 1.2 Loading, unloading, transportation to GGL store are in the bidder's scope. Cascade destination shall be as follows:

Dewas - 2 Nos

Kota - 5 Nos

Sonipat - 1 Nos

Ghaziabad – 15 Nos, Mandatory Spares: all;

This tender covers the supply of Mobile and Stationary Storage Cascades for GAIL GAS Ltd.

S. No.	Storage Sizing	Type	Quantity
	(Water Ltrs capacity) at 15°C	Stationary	Nos.
1.	3000	Stationary	23

In the Mother Stations, the compressed natural gas would be directly filled into stationary storage cascades.

2.0 FEED GAS SPECIFICATION

2.1 Gas Composition (INDICATIVE ONLY)

The expected gas composition of the feed gas to the CNG Storage Cascade is given below:

S.NO.	COMPOSITION	GAS COMPOSITION (MOLE %)
1.	Hexane (C ₆ +))	0.00000~0.01749
2.	Propane (C ₃)	0.3165~1.81075
3.	I - Butane (IC ₄)	0.0659~0.31968
4.	N - Butane (NC ₄)	0.0884~0.34786
5.	I - Pentane (IC ₅)	0.007601~0.0333
6.	N - Pentane (NC ₅)	0.000989~0.0294
7.	Nitrogen (N ₂)	0.1559~0.22262
8.	Methane (CH ₄)	92.20796~97.8421
9.	Carbon-di-oxide (CO ₂)	0.00000~0.7559
10.	Ethane (C ₂)	0.5377~5.08257
11.	Total	100.00
12.	Gross Calorific Value (Kcal/SM ³)	9128.77~9733.378
13.	Net Calorific Value (Kcal/SM ³)	8225.66~8787.137
14.	Specific Gravity	0.5769~0.60810

2.2 Gas Storage Pressure

Fill Pressure: - 250 bar (g)

Gas Delivery Temperature

Maximum 55°C Dependant on ambient temperature

2.3 CNG Specification

The CNG specification shall meet the ISO 15403:2000 (E) natural gas quality designation for use as a compressed fuel for vehicles.

The proposed specification of the CNG is as follows:

Gas Temperature : 0 Degree Celsius to +55 Degree Celsius

Pressure dew-point : - 25 Degree Celsius

Particulate matter : Less than 5 microns

Odorant (Mercaptan) : 2 to 7 mg/SCM

2.4 Design Philosophy

Storage fulfils the following functions:

ONE - It allows more vehicles to fill than the compressor could fill directly one after the other during peak time.

TWO - It allows the vehicle to fill at a faster rate than if directly from the compressor.

THREE - It prevents the compressor from stopping and starting too often.

FOUR- The Combine storage capacity is compartmentalized into three banks. Each bank is separated with check valves and the direction of flow should be from highest volume to lowest volume and provided with pressure relief valve for each of the bank separately.

It is anticipated that the natural gas feed composition, flow rate and pressure will be fluctuating. Hence, Supplier should design the CNG storage facilities with optimum degree of flexibility, reliability, operability to accommodate the varying composition of feed Gas, other unexpected contaminants, flow rate and pressure fluctuation etc.

The CNG storage facilities should consist of standardized modules, which are assembled into a complete system. Each system should be designed in standardized modular frames bundled together. The modular approach allows the CNG Stationary storage and mobile storage facilities to be easily installed there by reducing installation time. The individual cylinders shall be interconnected using SS-316 tubes and fittings of appropriate pressure and temperature rating and suitable for CNG service.



The design life of the CNG storage facilities should be not less than 20 years.

2.5 Design Basis

The Supplier should prepare the design basis required to meet the demands mentioned in items 1.0 & 2.0 and submit the designed documents for approval of GAIL GAS Limited before manufacturing.

2.6 Applicable Standards and Codes

The design, construction, manufacture, supply, testing and other general requirements of the Storage Cascades should be strictly in accordance with the Applicable Standards and Codes and should comply fully with relevant Indian or International standards, Gas Cylinder Rule 1981, Indian Explosives Act- 1884, Stationary and Mobile Pressure Vessels (Unfired) Rules (SMPV) 1981, CNG Cylinder Design Code, IS:7285,2004(part-2), CNG Cylinder Valves, IS:3224 1979 (Amendments 1983,84,85,86,89,92,98), Hydrostatic Stretch Test, IS: 5844 - 1970, Safety Devices of Gas Cylinders, IS : 5903 -1970, Regulations of Insurance Association of India and Factories Act while carrying out work as per this specification.

The bidder without any additional cost and delivery implications should carry out any modification suggested by the statutory bodies either during drawing approval or during inspection, if any.

The following codes and standards (versions, revisions valid on the date of order) are referenced to & made part of specification:

- i) NFPA 52 Standards for CNG vehicular fuel systems and CNG cylinder code "IS:7285-2004(PART-2)
- ii) OISD 179 Safety requirements for compression, storage, handling and refueling of CNG for use in automotive sector.
- iii) GAS CYLINDER RULE 2004 Standards for CNG Storage and Gas Cylinder Rules.
- iv) STATIC AND MOBILE PRESSURE VESSELS (UNFIRED) RULES (SMPV) (Latest Edition)
- v) CNG CYLINDER DESIGN CODE IS: 7285 2004 (Part-2)
- vi) CNG CYLINDER VALVES, IS: 3224 (Latest Edition)
- vii) HYDROSTATIC STRETCH TEST IS: 5844 (Latest Edition)

viii) SAFETY DEVICES OF GAS CYLINDERS IS: 5903 (Latest Edition)-Regulations of Insurance Association

ix) INDIAN EXPLOSIVES ACT

x) ANSI, ASTM, NEC, NEMA, ASNZ

3.0 SITE STATIONARY GAS STORAGE CASCADES

3.1 Cylinders

Supply of CNG storage cascades of water litre capacity as specified at clause no. 1.1 Permissible tolerance -0% or + 5% at 15°C with the following minimum details:

- 3.1.1** All cylinders should be designed, constructed and tested in accordance with the Indian Standard 7285, as amended from time to time, IS : 7285 or B 55045:Part 1 or (US) D.O.T 3AA or similar such other standard code approved by the Chief Controller of Explosives.
- 3.1.2** Cylinder material shall be seamless alloy steel (Cr-Mo) or as per design approval by Chief Controller of Explosives. The neck threading shall be as per IS: 3224 or as per design approval by Chief Controller of Explosives. The thread size of Dia. 25.04 mm standards, type 4 threads with taper of 1 in 8 on diameter conforming to IS: 3224 or equivalent is recommended. The shut off valve shall be fusible burst disc conforming to requirements of IS: 3224 or as per design approval by Chief Controller of Explosives.
- 3.1.3** A Test and Inspection certificate issued by the manufacturer of the cylinder duly countersigned by an Inspector that the Cylinder meets the requirements of the standard or code referred above submitted to Chief Controller of Explosives shall be provided to the Purchaser.
- 3.1.4** All cylinders should be new and unused. Re-certified cylinders are not acceptable. Before dispatching, using or refilling the cylinder which has to be made gas-free, air contained there in shall be purged by N2 gas. Cylinder of 50 / 60/ 75 litre water capacity at 15°C are only envisaged. All cylinders in a cascade shall be of same capacity.
- 3.1.5** Total storage volume with no negative tolerance should be designed to meet storage patterns sizes for storage:
Stationary Storage- 3000 WLC at 15°C
- 3.1.6** The storage facilities in which cylinders are in a horizontal position, the storage unit should be limited to a height of 1.6 M, a length of 4.0 M and width of the cascade should be limited to approximately 10% more than the length of cylinder for 3000 WLC stationary cascade . To ensure ready access all cylinder fittings should be arranged to face one direction in each unit.
- 3.1.7** The cylinder shut-off valve shall be with fusible burst disc conforming to requirements of IS: 3224 or as per design approved by CCOE, Govt. of India.

- 3.1.8** The burst disc shall rupture on excess pressure as well as excess temperature either individually or combined. The burst disc discharge shall be manifold to a common header for safe venting. Vendor shall indicate burst pressure and temperature.
- 3.1.9** The cylinder shut-off valve orifice shall be designed for high flow to permit the combined flow of 100 kg/min for each bank at a pressure of 250 bar (g). Vendor to furnish necessary calculation indicating overall pressure drop of each bank, coefficient of flow (Cv) values, valve orifice size etc.
- 3.1.10** Number of cylinders in the cascade shall be divided into three independent banks for low, medium & high pressure of different storage pressure. Vendor shall optimize the number of cylinder in each bank for maximizing the recovery from the storage cascade and submit the calculations along with the bid, indicative ratio of Low : Medium : High is 5:3:2 by volume.
- 3.1.11** The interconnecting tube work of cylinder manifold in configuration suitable for priority filling and sequential dispensing system by the electronic CNG dispensers.
- 3.1.12** Full bore 3/4" ball valves for isolation shall be provided at inlet/outlet of each line/ banks.
- 3.1.13** Pressure gauge of appropriate range suitable for CNG service shall be provided in each bank at the common manifold point with enclosure having transparent panel for visibility of the gages. One common temperature gauge of the range 0-100°C should also be provided.
- 3.1.14** Inter-Connecting tube work shall be maximum of 3/4"OD SS-316 tubing. The sizing of connecting tubing between each outlet and its associated cylinder shall be such that where they join the total incoming flow areas shall not be less than the total outgoing area. The loops in the tube work shall be provided for absorbing contraction, expansion and vibration. Piping/ tubing shall be suitably clamped to the frame structure.
- 3.1.15** There shall not be any back flow between any two banks with all valves open.
- 3.1.16** Cylinders installed horizontally should be separated from one another in each storage unit by a distance of not less than 30mm. The material used to separate the cylinders should be sufficiently strong enough and should not absorb moisture and anti-static material. Special precautions should be taken to avoid corrosion at the point of contact.
- 3.1.17** All cylinder valves and fittings must be rated for the full range of temperature and pressures and the manufacturer should stamp or otherwise permanently mark the valve body to indicate the service rating.
- 3.1.18** All cylinders is to be hydrostatically tested and approved by third party certification body. Test certificates shall be duly endorsed by approving body and issued before delivery.
- 3.1.19** The location of inlet/outlet tube manifold and pressure/temperature gauges shall be at the first width side of the cascades taking anti-clockwise from the side of the common cylinders valves.



3.1.20 The cascade cylinder shall be purged with N₂ and maintain 1 bar (g) pressure before despatch.

3.1.21 Marking of Cylinders

- a. Every Gas cylinder shall be clearly and permanently marked in accordance with the following conditions by stamping, engraving or similar process;
 - i) On the shoulder of the cylinder which shall be enforced by forging or other means, or
 - ii) On such a part which is inseparably bound with the cylinder and which is not or only negligibly affected by the stresses due to the gas pressure within it.
- b. The name plate shall not be affixed to the cylinder by soldering, if there is risk of corrosion.
- c. In conjunction with the original marking, space shall be provided for stamping the test date obtained at the periodic inspection.
- d. Markings shall be as carried out and the letters and numerals used shall be of such shape and size that the marking is clear and easily readable and does not give place for misreading.
- e. All cylinders must be permanently stamped with the word CNG together with the following information:
 - i) Manufacturers, owners and inspectors marking and rotation number;
 - ii) Specifying that the cylinder has been manufactured for “CNG only”
 - iii) A symbol to indicate the nature of heat treatment (such as normalizing, quenching, or tempering) given to the cylinder during manufacture.
 - iv) The date of the hydrostatic stretch test, as the case may be, with the code mark of recognized testing station where the test was carried out. The code mark shall be registered with the Chief Controller of Explosives.
 - v) Working pressure and test pressure;
 - vi) Tare weight
 - vii) Water capacity.
- f. All the markings, except the manufacturers marking, which may be on the base, shall be stamped on the neck end of the cylinder.

3.1.22 Marking on the Valves

Valves fitted to the cylinder shall be clearly and durably marked in accordance with the following provisions by stamping, engraving or similar process:

- i) The specification of the valves;
- ii) Year and quarter of manufacture;
- iii) Manufacturers symbol;
- iv) Working pressure;



- v) The name or chemical symbol of the gas for which the valve is to be used;
- vi) The type of screw threads on the outlet namely left handed (L.H) or right handed (R.H);
- vii) Inspectors stamp;

3.1.23 Identification Colours

Every cylinder is painted with the appropriate identification colours specified in IS: 4379 for Industrial cylinders.

Colour of the Cylinder shell --- White

Colour of band at neck end of cylinder--- Red (IS Standard Colour No. 537)

Colour of the Frame --- Yellow

3.1.24 Labelling of cylinders

- i) Every cylinder shall be labelled with the name “CNG ONLY” with letter of at least 25mm high in contrasting colour and the name and address of the Purchaser by whom the cylinder was filled with gas.
- ii) A warning in the following terms shall be attached to every cascade containing Compressed Natural Gas namely:
 - a. Do not change the colour of the cylinder
 - b. This cylinder should not be filled with any gas other than CNG.
 - c. No flammable material should be stored in the immediate vicinity of this cylinder or in the same place in which it is kept.
 - d. No oil or similar lubricant should be used on the valves or other fittings of this cylinder.
 - e. Please look for the next date of test, which is marked on a metal ring inserted between the valve and the neck of the cylinder, and if this date is over, do not accept the cylinder.

3.1.25 All storage system should be supplied in three banks arrangement:-

Low Bank-50% by volume of the total capacity

Medium Bank- 30% by volume of the total capacity

High Bank- 20% by volume of the total capacity

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3.2 Pressure Relief Devices

3.2.1 Each bank (All the three banks) used for the storage of CNG should be equipped with a suitable pressure relieving device and a suitable isolating valve which should be readily accessible when installed in the storage bank. The isolating valve should not be capable of closing off the pressure relieving device.

3.2.2 Relief devices should be positioned in such a way as to avoid discharge of high pressure gas to the operator or persons in close vicinity and suitably extended.

3.3 Safety Relief Devices for Cylinder Storage

3.3.1 Cylinders manufactured in India, if fitted with safety relief devices in their bodies, shall have such safety devices manufactured and maintained in accordance with IS:5903.

3.3.2 Piping and gas storage systems should be protected against overpressure by safety relief devices fitted in each bank. Relief devices installed to protect the storage systems should have sufficient capacity to vent the maximum flow produced by the compressor and should be set to open at a pressure not exceeding 20% above the maximum allowable working pressure of the system or the pressure which produces a hoop stress of 75% of the specified minimum yield strength, whichever is lower.

3.3.3 A combination burst disc/fusible alloy assembly should be incorporated in the cylinder valves. Burst disc should yield at a pressure not less than 1.5 times manufacturer's recommended operating pressure of the cylinder, and not more than test pressure. The disc should relieve pressures in excess of 30 MPA.

3.3.4 In addition to 3.3.2 a mechanical pressure relief valve which opens at a predetermined pressure should be used. This should not be part of the cylinder valve.

3.3.5 Safety relief valves should be provided with means to seal to prevent tampering by unauthorized persons.

3.3.6 Minimum required rate of discharge from the safety valve should be at least equal to any input from the system whether stored or being compressed.

3.3.7 Each safety relief valve should be clearly marked by the manufacturer.

3.3.8 The maximum pressure in the storage system should not exceed 255 bar (g)

3.3.9 The cascade cylinders should be supplied with impact test certification.

3.4 Corrosion Protection

3.4.1 Pressure vessels which are made of materials that are subject to corrosion by atmospheric conditions should be protected by painting or other equivalent means necessary to prevent corrosion.

3.5 Valves

3.5.1 All Valves fitted to gas cylinders shall comply in all respects with the following Specifications namely:

- i) In respect of Industrial Gas Cylinder, IS: 3224
- ii) Valves for cylinders shall have outlets provided with left hand screw threads for the pipes or connections.
- iii) The valves shall be attached to the cylinder neck by screwing and not by making any permanent attachment or inserting adapter in between.
- iv) The design of spindle operated valves shall be such that when fitted to the cylinders it shall not be possible to withdraw the spindle under normal operating conditions.

3.5.2 Each gas storage unit should have a quick action gas storage isolation valve installed in the steel supply pipe immediately adjacent to its gas storage unit to enable individual shut off and isolation of each unit. These valves will be within fence enclosure.

3.5.3 Separate common valve system to be supplied for each storage bank complete with non return valve.

3.6 Rigid Piping

3.6.1 All rigid piping, tubing and other components on the storage system should be designed for the full range of pressures, temperatures and loadings to which they maybe subjected with the factor of safety of at least 4 based on the tensile strength at 20°C. Any materials used including gaskets and packing should be compatible with natural gas and its service conditions.

3.6.2 All piping should be designed in accordance with engineering calculations based on the requirements of ASME B31.3 in conjunction with EEMUA supplement to ASME B31.3 or equivalent design standards. Standards used should be used in total.

3.6.3 All welding piping should be fabricated and tested in accordance with ANSI/ASME B31.3, API 1104, ASME SEC.IX. Whichever standard is chosen for use, it should be used in total.

3.6.4 All piping to be tested after assembly to a pressure equal to that of the pressure relief device setting and proved leak free.

3.6.5 Cylinders to be connected in stainless steel tubing 316 (Stainless Steel Tubing Specifications ASTM A269, ultimate tensile 517 MPA, or equivalent) incorporating stress reducing hoops. Only approved manufacturers of high pressure fittings are to be used. All fitting should be of fractional dimension in Inch unit.



3.7 Pressure & Temperature Gauges

- 3.7.1** Every CNG storage unit including each manifold group or bulk storage tank should be provided with a suitable pressure gauge for each bank. The pressure gauge should be directly connected to the bank or storage system. The gauge should be dial graduated to read approximately double the operating pressure. Pressure gauge should be equipped with 3-way relief/isolation valve. Similarly one surface contact type Temperature gage should be provided at a suitable location representing the equivalent temperature of the whole cascade.
- 3.7.2** A good quality industrial pressure gauge should be used with a dial face of at least 63mm or larger. Gauges should be built to requirements of BS 1780 or ANSI/ASME B40.1 or equivalent.

3.8 Pipe Work, Valves and Fittings

Pipe work should be designed, tested and installed to ensure its safe operation at the worst conceivable conditions of flow, pressure and temperature.

All pipe work should be ASTM 316 stainless steel tube. Fittings shall be of SS 316 of approved make. The system should be “go-no-go” gaugable to demonstrate that fittings are properly tightened. Wherever, possible valves and control devices should incorporate the same end connector system. The number of fittings used should be minimized. The Supplier should ensure that personnel assembling the pipe work should be competent in the system employed. Valves & Fittings shall be of PARKER / SWAGELOK make and SS tubing shall be of SANDVIK make. Vendor to ensure that only one make, out of the specified makes of SS Tubes, Valves & fittings shall be used in a cascade and no mixing of makes shall be permitted.

The preferred valve types for isolation are ¼” turn full ball valves. Such valves have similar material to the tube they are attached to. Ball valves must be of good quality and be appropriately selected frequency of use. Ball seats must be suitable for natural gas operation of the gas composition indicated.

Valves and fittings subject to corrosion must be either inherently resistant, or be coated with a corrosion inhibiting paint or surface treatment.

The gas inlet connection of each bank shall be terminated with ¾” union after the isolation valve.

3.9 Cylinder Frame

- 3.9.1** Cascade storage system to be skid mounted and complete with removable metal frames and non-metal / non-sparking spacer material.
- 3.9.2** Cascade and spacer frame to be painted with anti-rust and etching primer under coat. Importance should be drawn to avoiding corrosion which can limit the working life of a



cylinder and affect the fatigue characteristics in serious cases. The implementation of good periodic maintenance anti-corrosion procedures is strongly recommended.

3.9.3 Each storage system should be supplied with suitable lifting lugs. Bottom and top of frame shall be reinforced to prevent any twisting or strain to inter connections among cascade cylinders during lifting by crane, forklift and during transport

3.9.4 All cylinder tubing, manual isolation valves and pressure relief valves should be protected from knocking by any moving object and should not protrude outside the metal frame or brackets.

3.9.5 The frame shall not allow lateral and rotational movement of cylinders during regular road transport under circumstances.

3.9.6 The frame structure of each cascade shall be capable of withstanding 4g (four times gravity) impact from any direction without any distortion.

3.9.7 All structural items used in the frame shall be weather proof.

3.9.8 Supplier shall submit structural drawing of the frame giving details of the steel design calculation, welding procedure, corrosion protection etc. for approval before commencement of fabrication work.

3.9.9 Cascade Assembly to be protected by a roof MS sheet canopy supported on cylinder frame. Roof sheeting to be precoated galvanized iron or approved equivalent.

3.10 Protection of Valves and accessories

3.10.1 All valves and accessories shall be safeguarded against accidental damage or interference.

3.10.2 Valves and accessories shall be mounted and protected in such a way that risk of accidental rupture of the branch to which the valve or accessory is connected is minimized.

3.10.3 Valves and accessories situated at the rear of a vehicle shall be protected by the rear cross member of the frame of the vehicle against damage.

3.11 Equipment

3.11.1 Piping, Fittings and meters:

- i) All piping, fittings and meters mounted on the Cascade shall be designed to with stand the most sever combined stresses imposed by the following, namely:
 - a. The maximum design pressure of the vessel
 - b. The super imposed pumping pressure of the shock loading caused by road movements;

- ii) The materials used for vessel equipment shall be sufficient ductile to withstand rough usage and accidental damage. Brittle materials such as cast iron shall not be used.

3.11.2 Protection of piping and equipment:

- i) All piping and equipment shall be adequately protected to minimize accidental damage which may be caused by rough usage, collision or over-turning;
- ii) Any equipment or section of piping in which liquid may be trapped shall be protected against excessive pressure caused by thermal expansion of the contents.

3.11.3 Marketing of connections-

All connections on the vehicle which require manipulation by the operator of the vehicle should be clearly marked to prevent incorrect operation. The form of this marking should correspond with the operating procedure laid down for the vehicle.

4.0 CALIBRATIONS TEST CERTIFICATES AND THIRD PARTY CERTIFICATION

4.1 Every Cylinder should be carried with Hydrostatic or Hydrostatic stretch test and a certificate should be provided.

4.2 Leak test should be carried for each cylinder or cascades with all tubings, valves and a certificate should be furnished to the Owner.

4.3 All Instrument gauges, Valves, Pressure gauges, safety relief devices, shut off valves tubings and piping etc should be Pressure tested, calibrated and such test, calibration certificates.


4.4 If any of the test certificates is not in order, the Suppliers should replace the affected equipment with valid certificate at Supplier cost.

4.5 Calculation shall be carried out for 4G Static of one complete cascade with all cylinders mounted and filled and the same should be submitted for review of the Owner.

4.6 Burst test of one cylinder from the entire supplies shall be produced and in case offered once are new design the schedule for the test should be informed prior to enable the Owner or their authorized representative to depute their personnel for witnessing the test.

4.7 All standards shop tests/QA / QC as per the recommendation of the manufacturer / Chief Controller of Explosives to be carried out and a copy of such certificates shall be furnished to the Owner.

4.8 Record of storage capacity check of each cylinder in a cascade shall be furnished and same shall be demonstrated.

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4.9 Third Party Inspection

All the above quality system implementation, witness and verification of requisite documents shall be independently check, verified and certified by any one of the approved Third Party Inspection Agencies. M/s Bureau Veritas, M/s SGS, M/s LRIS or any other Lloyds' Approved firms after the cascades have been assembled to complete finish condition before dispatch. Vendors shall inform the Name of the appointed Agency along with contact details.

Vendors shall notify GAIL GAS LTD well in advance (minimum 10 days) of such inspections so as to enable GAIL GAS LTD provides clearance for conducting the inspections and also to depute GAIL GAS LTD's official to witness the same.

5.0 WARRANTY SERVICING AND SPARE PARTS

5.1 All necessary spare parts to sustain the operations and maintenance of the CNG Stationary storage facilities should be supplied and stock at the Supplier workshop / warehouse located in India for immediate replacement of parts. The costs to stock these spare parts should be at supplier cost. However, once the parts are replaced in the CNG mother and daughter Cascades, the Company's should compensate the Suppliers accordingly provided that the warranty period has expired.

5.2 For Guarantee Refer Clause 20.0 of GCC

5.3 All the material and equipment to be free from defects in design, manufacture, material and workmanship.

5.4 Replacement shall be made if any defective items found damaged or not performing to the specified requirements of any part of cylinder for at least 24 months from the date of delivery or 12 months from the date of successful commissioning which ever is later.

6.0 SERVICES

- Preparation of submission of document drawing.
- Obtaining approvals from statutory authorities.
- Bidder to submit foundation and other drawings indicating requirement of work to be carried out by Owner within one month of placement of order.
- Supervision during trial runs if required.

7.0 DATA AND DRAWING DETAIL

After the placement of FOI, a conference (kick off meeting) will be held at such date and at such place, as may be mutually agreed upon between the Bidder and the purchaser. The intent of this conference should be to discuss / clarify various requirements and finalize the modus operandi for execution of the contract within the scheduled delivery period.

Along with the technical bid the following information is to be provided.

- i) Process and instrument diagram along with Bill of Material. The Bill of Material should indicate all items, quantity of all items installed per storage system, their part nos. and make.
- ii) Process and instrument diagram along with Bill of Materials for all major components within the tender.
- iii) General arrangement drawing of the storage system giving overall dimensions and erection shipping weight.
- iv) Technical data sheet of storage system.
- v) Typical cross sectional drawing and literature to fully describe the details of all major components such as Cylinders, valve, gauges piping etc. Data sheet indicating material of tube, tube size etc, piping and instrument diagram.
- vi) List of mandatory spares, supplier to provide a comprehensive list of spares for all major components both within the storage system and all auxiliary equipment. (Itemized rate to be given in price bid).
- vii) List of spares required in addition to those mentioned above for 2 years normal operation & maintenance per storage system (itemized rate to be given in price bid)
- viii) List of commissioning spares per storage system.
- ix) List of special tools & tackles required for installation & maintenance per storage system.
- x) Leaflets, catalogues for all major items.
- xi) Shop test procedure.
- xii) Maintenance schedule of the storage system along with list of Spares for O&M during warranty period.
- xiii) A complete zonal drawings of the Storage Cascade (complete package), all certification for all components used within the hazardous areas should be provided.

- xiv) Reference list of similar / identical storage system supplied in last 7 years of CNG application.
- xv) Deviation sheet (if any).
Within one month from date of P.O.
- xvi) General arrangement drawing, schematic of cascade piping, drawing of cascade frame the storage system giving overall dimension and erection / shipping weight.
- xvii) Detailed foundation drawing of the storage system for casting foundation giving load pattern etc.
- xviii) Details of inlet gas termination to the storage system including X, Y, Z coordinates with respect to centre of storage system skid or any reference.
- xix) Detailed time schedule for supply indicating time periods required for cylinder manufacturing, cascade frame fabrication, shop testing, dispatch of material from works and delivery at site.

ALONG WITH SUPPLY:

- xx) Operation and maintenance manuals - 3 sets all in original for each Storage Cascade. The instruction manual should describe in details the construction and recommended procedure for maintaining, operating and trouble shooting of the storage. System should also include cross-sectional drawings, exploded views of all spare parts along with part nos., quantity installed per storage unit. The manual should provide detailed catalogues of all bought out items.
- xxi) Test certificates of all major components like cylinders, shutoff valves, pressure relief valves tubing / pipe work etc.
- xxii) Calibration certificates for all measuring and protection devices.
- xxiii) In case of foreign supply, the bidder should get all certificates endorsed by office of Chief Controller of Explosives (CCOE), Govt of India within one month of delivery of cascades at site.

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QUESTIONNAIRE

(To be filled-in and submitted with the offer)

SI No.	QUESTIONNAIRE	Yes/No
1	Whether the Bidder has 'understood the scope of work as defined in NIT document?	
2	Whether the Bidder has visited site and ascertained type and nature of work involved and site conditions?	
3	Whether the Bidder has quoted for the complete work as defined in NIT document?	
4	Whether Bidder agrees to all clauses as defined in NIT document?	
5	Whether clause wise deviations have been mentioned in the offer?	
6	Whether the clauses on which no comments/deviations have been made are acceptable to the Bidder?	
7	Whether technical particulars of equipment being offered have been submitted by the Bidder along with the offer?	
8	Whether bar chart indicating time schedule for various activities keeping in view overall completion schedule have been submitted along with the offer?	

Dated:

(Authorized Signatory of the Bidder)

Seal of the Company



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