

## **Technical Specifications**

The In-line turboexpander (ITE) system shall have design to handle natural gas flow in the range of 20,000 SCMH to 1,30,000 SCMH at varying upstream pressure in the range of 26 to 50 Kg/cm<sup>2</sup> with let-down / downstream pressure in the range of 20-35 Kg/cm<sup>2</sup> to generate 7 MW (+/-1%) per day without any pre or post electrical/water bath/ catalytic/solar heating arrangement.

The In-line turboexpander system shall be designed to operate continuously at a gas pipeline pressure of 100 Kg/cm<sup>2</sup> and at ambient conditions of Delhi-NCR. It shall have provision of roller bearings as backup to magnetic bearings for uninterrupted operations /ramp down.

### **MATERIALS SPECIFICATIONS**

**Power Cable Connectors:** Power Cable connectors at ITE shall be certified for installation in Zone 1.

**Cable Identification:** Cable tags shall be of 2 mm thick, 20 mm wide aluminium strap of suitable length to contain cable number, equipment no., etc.

**Ferrules:** Ferrules shall be of approved type size to suit core size mentioned control cable by the terminal numbers to which the cores are connected for ease in identification and maintenance.

**Cable Glands:** In safe area shall be nickel-plated Brass double compression type of approved/ reputed make. Glands for classified hazardous areas shall be certified by CMRI.

**Multi Cable transit:** Multi Cable Transit shall be used for cable entry to all type of control room walls, Decks, Firewall etc. The Multi diameter-based cable transits shall be repeatedly re-openable and re-usable without the need of special tools and discarding the modules in normal operation.

**Cable Trays:** This shall be either prefabricated hot dip galvanized sheet steel trays or site fabricated angle iron trays as specified elsewhere.

### **INTERCONNECTING PIPING, FITINGS, VALVES**

The interconnecting pipes shall be as per the standard for natural gas use. All Piping, fittings, flanges, valves used shall be suitable operation at 100KG/cm<sup>2</sup> pressure and for ITE service.

Piping shall be tested hydraulically/ pneumatically to 1.5 times the operating pressure after isolating the instruments. Flushing of piping shall be carried out as per instructions of Engineer-in-charge. Lines shall be blown after hydro-testing.

### **FILTRATION SYSTEM**

Inlet twin suction gas filter / Duplex suction filter suction line strainer at the package inlet and at other stage (if required).

## **TECHNICAL SPECIFICATIONS DESIGN BASIS**

### **CODES AND STANDARDS- As Applicable**

- Static and Mobile Pressure Vessel (SMPV) Rules (Unfired) Gas Cylinder Rules

- NFPA 59A
- PESO and DERC guidelines
- ASME BPV Code Sec VIII
- EN 13458-1
- EN 13458-2
- ISO 13631-2002: Petroleum and natural gas industries packaged reciprocating gas compressors
- PNGRB regulations
- OISD 179-2016: Safety requirements on compression, storage, handling, refueling natural gas (CNG) for use in automotive sector.
- ASME B 31.3 -2016 – Process piping
- NFPA-37-2015: Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines
- NFPA-52: 2016- Vehicular natural gas fuel systems code
- NFPA-496-2017: Standard for purged and pressurized enclosures for electrical equipment.
- NFPA-68 -2013: Standard on explosion protection by deflagration venting.
- NFPA-70 -2017: National electrical code
- NFPA 12-2015: Standard on Carbon dioxide extinguishing system
- ASME Sec IX: Qualification Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators
- Gas Cylinder rules – 2016
- IS: 5571, IS: 5572, IS: 5580, IS-325/IEC or EQV for electric motor.
- ANSI, ASTM, NEC, NEMA, Indian Electricity Rules, Indian Explosives Act.
- DERC Gazette Notification SG-DL-E-14112024-258653

The Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Retail Outlets dispensing Petroleum, Auto LPG and CNG) Regulations, 2018” including draft Schedule 4. In case of any discrepancies in the requirements of above codes, the most stringent requirement shall govern. Only latest edition of above-mentioned codes shall be followed.

#### **Design parameters**

S.No.	Parameters	Tender Requirement	Unit
1	Gas Pipeline Working Pressure Compatibility	100	Kg/Cm <sup>2</sup>
2	Pressure at Inlet of IET	26-50	Kg/Cm <sup>2</sup>
3	Pressure at outlet of IET	20-35	Kg/Cm <sup>2</sup>
4	Temperature, In	25	Deg C
5	Temperature, Out	05	Deg C
6	Power Generation	7	MWh per day

Note :

1. Bidder to comply with the data in above Tables for evaluation during Proof of Concept. If any row is not filled by bidder or ANNEXURE: GUARANTEED PARAMETERS is not submitted by the bidder in first submission of bid or above tables are modified in any manner, then bid will be rejected summarily
2. The Guaranteed value of power generation quoted by the bidder (Sr. no.6 bid evaluation. If any row is not filled by bidder or above tables are modified in any manner, bid will be rejected summarily.

## **GAS COMPOSITION**

INLET NATURAL GAS COMPOSITION:

Sr. No.	Component	% Mole
1	Methane	90 – 99
2	Ethane	0.2 – 5.0
3	Propane	0.02 – 0.75
4	Butane	0.001 – 0.25
5	Pentane	0.0001 – 0.05
6	Nitrogen	0.2 – 1.0
7	Carbon Dioxide	0.2 – 3.0
8	Sulphur	Refer Below
	Total	100

**Preferred Makes of Equipment Sourced Domestically :**

S.No.	Item description	Preferred Makes
1.	FLP Switchgear	Baliga/ FCG/ FPE / Flexpro/ Sudhir
2	Switches/fuses/contactors	L & T/ GEC/ Siemens/ Schneider
3	Push Button	L & T/ Vaisno/Technik
4	MCCB	Siemens/ Legrand/Schnieder

5	Vibration switch	Robertshaw Control/ Murphy/Metrix
6	PLC	Rockwell Automation/ GE Fanuc/ Siemens/ Allen Bradley / L&T/Telemechanique/ LHP /ABB PHOENIX
7	UV Flame detectors /Surge Protectors	General Monitors / Crowcon / Honeywell / Sieger/ Detronics /Khrome Schroder/ Net safety/ Esp Safety Pvt. Ltd/M/S Oldham, Spectrex Detronics Honeywell Net Safety Crow On Sieger Isolators Barriers Esp Safety, Meggitt Avionics
8	Pressure Transmitter	Druck/Wika/Honeywell/ABB/Fisher/Rosmount/ Yokogawa/BAUMER/WAAREE
9	Pressure Regulator	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 /M/s Gorter Controls (Netherlands)/M/s Dresser/ Nirmal /M/s Vanaz
10	Pressure Safety Valve	M/s BHEL, OFE & OE Group (New Delhi)/ M/s Keystone Valves (India) Pvt. Ltd. Baroda/ M/s Sebin Sarasin Valves India (P) Ltd. (New Delhi/ Halol-Gujarat)/ M/s Tyco Sanmar Ltd. (New Delhi/ M/s Parcol SPA, Italy/ M/s Nuo pignone, Italy/ M/s Sarasin, France/ M/s Tai Milano SPA, Italy/ M/s Fisher Rosemount (Now M/s Emerson Process) Singapore/ Mercer USA/ M/s Fainger Leser., Alstom Fluids Sapag Anderson Greenwood Crosby Bhel (Trichy ) Aspro, Dresser Inc. Fukui Seisakusho Co. Ltd. Instrumentation Ltd. (Palghat) Nakakita Seisakusho Co Ltd. Nuovo Pignone Spa (Italy) Parcol Spa Safety Systems Ur Ltd. Sarasin Rsbd Sebin Valves India Pvt. Ltd. Tai Milano Spa Tyco Sanmar Ltd. Tyco Valves & Controls India Pvt. Ltd Farinosla Fainger Laser Mercer Fisher Rosemount (Emerson) Ofe & Oe Group Keystone Valves Pvt. Ltd Baroda Sebin Valves Pvt. Ltd. Halol
11	Pressure Gauges & Temperatures Gauges.	M/s AN Instruments Pvt. Ltd., New Delhi/ M/s General Instruments Ltd., Mumbai/ M/s WIKA/M/s, Altop Badotherm Process Instruments B.V. Bourdon Haenni S.A British Rototherm Co. Ltd Budenberg Guage Co. Ltd. Dresser Inc. General Instruments Consortium Manometer (India) Pvt. Ltd. Nagano Keiki Seisakusho Ltd. Waaree Instruments Limited Baumer Walchandnager Industries Ltd. Wika Alexander Wiegand & Co GmbH Wika Instruments India Pvt. Ltd. Druck Ashcroft Filtration Technique Beko, YIL, Ashcroft Baumer
12	RTDs :	M/s General Instruments Ltd. Mumbai/ M/s Nagman Sensors (Pvt.) Ltd./ M/s Pyro Electric, Goa/ Altop/ WIKA /SIEMENS/WAREE/ BAUMER/ YIL

13	SS Tubes for CNG application	M/s Sandvik, Sweden/ M/s Tubacex/ M/s Ratnamani Metals & Tube/ M/s Parker/M/s FAE
14	SS tube Fittings/ On Off SSball/needle/ non-return valve for CNG application	M/s Swagelok (USA)/ M/s Parker (USA)/ M/s Hoke (Circore Instruments)/ M/s Hamlet/ M/S SSP/M/S BMT Korea/ HYLOK/M/s Dk- Lok/ ABAC/ VOSS
15	Cables and wires	INCAB/ Universal/ ASEAN/CCI/ Duracab/ FORT Gloster/ Finolex/ KEI/ Hylite/ Polycable/ Associated cables/ HAVELLS
16	Barrier/Isolators/Surge protector	MTL / Phoenix / P&F
17	SMPS	Telemecanique (Schnieider)/ Siemens/Phoenix
18	Coalescent Filter /Regulators	Asea Brown Boveri Ltd. Blue Star Ltd Placka Instruments & Controls Pvt. Ltd Shah Pneumatics Shavo Norgren (I) Pvt. Ltd V Automat & Instruments Pvt. Ltd. Veljan Hydrair Pvt. Ltd. Compac Newzealand
19	Field Instruments (P, DP,F,L,T)	ABB Automation Ltd. Ashcroft Brown Bovert Ltd. Murphy CcsWaree Fisher Rosemount India Limited Fisher Rosemount Singapore Pte Ltd. Fuji Electric Co. Ltd. Honeywell Inc. ,TataHoneywell Yokogawa Electric Corporation, Yokogawa Blue Star Ltd. Wika Druck Beko Filtration Technique
20	Suction Filter	Beko Filter Ultra Filter Filtration Technique Parker
21	Vibration Switch	Murphy, Metrix ,Robertshaw Contro
22	Two Way / Three Way Valves/ 2- Way Drain Valves	Swagelok, Parker, Compac, Hamlet, Hylock, Sealexcel,Oasis, Stauff, SSP/ DK-Lok
23.	Cartridge Filters	Beko Filter Ultra Filter Filtration Technique Zander Gmbh (Germany) Grand Prix Fab (Pvt.) Ltd., New Delhi Multitex Filtration Energy Pvt. Ltd., Ingersol Rand (Ir) Elgi Anesta Iwata Motherson Chicago Pneumatics
24.	CO2 Cylinder Valve With Actuator For Co2 Flooding System	GINGEKERR ,CEODUEX (ROTAREX), KIDDE, FIKEANSUL ,LPG, VTI ROTEX, KEW
25	ON OFF BALL/NEEDLEVALVE	PARKER ,SWAGELOK ,ABAC ,SPIRAX SARCO, WORCESTER, WAREE / BAUMER ,STAUFF ,SSP L&T ,SANKEY CONTROLS ,ROTEX, AUDCO

**Note-1**

For procuring bought out items from vendors other than those listed above, the same may be acceptable subject to prior approval of consultant/owner to the following: -

- The vendor/ supplier of bought out item(s) is a regular and reputed manufacturer/ supplier of said item(s) for intended services and the sizes being offered is in their regular manufacturing/ supply range. Further, the bidder has to certify that the item(s) has/have been regularly used by them in all the packages for the last two years and they are working satisfactorily.
- The vendor/ supplier should not be in the Holiday list of Client / Any other PSU.

**Note-2**

For any other item(s) for which the vendor list is not provided, bidders can supply those item(s) from reputed vendors/ suppliers who have earlier supplied same item(s) for the intended services in earlier projects and the item(s) offered is in their regular manufacturing/ supply range.

The bidder is not required to enclose documentary evidences (PO copies, Inspection Certificate etc.) along with their offer, however in case of successful bidder; these documents shall be required to be submitted by them within 30 days from date of Placement of Order.

**Annexure: Guarantee Parameters-ITE System**

	DESCRIPTION	Unit	Bidder to specify
1	Natural Gas Flow in SCMH required across ITE at the following process parameters: <ul style="list-style-type: none"><li>• Inlet pressure of natural gas into ITE - 35 kg/cm<sup>2</sup> (g),</li><li>• Inlet temperature of natural gas to ITE - 24 deg C</li><li>• Outlet pressure of natural gas from ITE - 25 kg/cm<sup>2</sup>(g)</li><li>• Outlet temperature of natural gas from ITE = 5 deg C</li><li>• Net usable Power Generation of 300 Kwh (Min 7 MWh/Day) downstream of ITE VSD panel</li><li>• Ambient Temperature ranging from 3 Deg C up to 50 Deg C</li><li>• No Preheating of Natural Gas</li><li>• Zero Gas Loss during operation</li><li>• 24X 7 unmanned operations</li><li>• Active Magnetic Bearings for shaft rotation</li><li>• Natural Gas Composition (as per Annexure A)</li><li>• Max natural gas flow available at site is 65000 SCMH</li></ul>		
2	Average Noise level at 3 Meters from ITE (Max 90 dBA)	dBA	
3	Auxiliary electrical load in KWh (Max 10 KWh)	kWh	
4	Service life of the ITE between overhauls (Minimum 10 Years)	In Years	
5	Foot Print Area (Mtr.×Mtr.) of the ITE Skid (Max 2 Mtr x 1 Mtr)	Mtr.×Mtr.	
6	ITE System Safety Compliance ( Zone 0 / Zone 1 )		

**Notes: -**

- a) The bidder shall establish the capacity during machine performance test at site
- b) Guarantee parameters shall be submitted as part of bids which shall be used for techno-commercial evaluation.
- c) In case bidders seek any change in guaranteed values after submission of bid, bidders bid/offer shall be rejected.
- d) Rejection Criteria: The following may lead to rejection of the bids
  1. ITE system requiring Preheating of Inlet Gas
  2. ITE system requiring foot print in excess of max available foot print mentioned in the bid
  3. ITE System requiring a flow of more than 65000 SCMH to generate net output of 300 kWh
  4. ITE System generating less than 300 kWh net of Auxiliaries, measured downstream of VSD (before transformer)

5. ITE with MTBO (Mean time Between Overhauls / Component replacement) of less than 10 Years
6. Failure to Submit ITE performance table mentioning the variation in ITE output at +/- 10 % variation in process parameters of flow, temperature and pressure
7. ITE without Zone 1 Compliance.