



## PLUTO LNG TRAIN 2

**SR Number :** 26221-100-SR5-W000-00014 (C124)

**Title:** TECHNICAL SUPPORT SERVICES FOR INSTALLATION OF LNG REFRIGERATION COMPRESSORS (BAKER HUGHES GE- BHGE) EQUIPMENT

### 1. GENERAL SCOPE OF WORK

The SUBCONTRACTOR shall provide technical subject matter experts to perform erection, inspection, and supervision services as an integrated part of CONTRACTOR's construction team for the field installation and pre-commissioning of the Propane, Ethylene and Methane Refrigeration Compressors, Original Equipment Manufacturer (OEM) supplied equipment from BHGE for the Pluto T2 LNG Project.

### 2. WORK INCLUDED

- 2.1 SUBCONTRACTOR shall supply the required field personnel for the installation and pre-commissioning of refrigeration compressors and turbine packages. The individuals shall have the necessary skills to assure the correct installation of gas turbines and compressors package including inlet and exhaust ducts, filter houses, associated accessories, ductwork, steelwork, piping, instrumentation, control systems, and electrical components.
- 2.2 SUBCONTRACTOR to follow the CONTRACTOR's work packages, BHGE installation manuals and site quality checklists, and provide personnel to oversee the process from receipt of materials through to the equipment available for turnover, including documentation required for red flag reviews. SUBCONTRACTOR shall work within an integrated organization comprised of SUBCONTRACTOR supervision, OEM Technical Representatives and CONTRACTOR field engineering and supervision and report to CONTRACTOR site management. SUBCONTRACTOR shall be trained in the use of CONTRACTOR's project software programs for equipment and material management, drawing control, planning, and scheduling, as required.
- 2.3 SUBCONTRACTOR shall also assist CONTRACTOR in sequencing the construction of related compressor shelters, auxiliary equipment, transformers, and all compressor related piping in order to optimize the field installation schedule of the OEM scope of equipment supply. CONTRACTOR will furnish SUBCONTRACTOR with specifications, drawings, and vendor prints of engineering design associated with OEM's Purchase Order.



- 2.3 SUBCONTRACTOR supervision shall be provided as requested by CONTRACTOR. The personnel required and man-day durations will be provided by CONTRACTOR. The manpower required is subject to change and will be evaluated by CONTRACTOR on a monthly basis and reviewed with SUBCONTRACTOR. SUBCONTRACTOR shall provide CONTRACTOR resume / CV of candidate for each position required by CONTRACTOR and mobilize the candidate only after CONTRACTOR's approval.
- 2.4 SUBCONTRACTOR shall support CONTRACTOR with engineering receiving inspection of all equipment and associated subcomponents. This shall include confirming the receipt in good condition of all shipped and required OEM items and SUBCONTRACTOR immediately documenting and advising CONTRACTOR of any discrepancies or problems with the condition of the items.
- 2.5 SUBCONTRACTOR shall support CONTRACTOR by maintaining a comprehensive "Action items list" for each equipment string and provide updated list to CONTRACTOR on weekly basis. This list shall include all the material and technical clarification required from OEM to complete the package for start-up.
- 2.6 SUBCONTRACTOR shall adhere to CONTRACTOR established site controls and procedures and rules as it relates to Health, Safety, and Environmental (HSE), Quality Control, progress monitoring, and equipment and labor allocation. SUBCONTRACTOR shall also participate and contribute to HSE campaigns, audits, and programs, and permit to work system. SUBCONTRACTOR shall assist CONTRACTOR in providing Quality Assurance (QA) documentation, protocols, and records as required to compile the installation and commissioning lifetime records and handover packages for OEM supplied equipment.
- 2.7 SUBCONTRACTOR shall prepare and submit daily reports describing the work performed, craft assigned, and equipment utilized in report formats provided by CONTRACTOR.
- 2.8 SUBCONTRACTOR shall support CONTRACTOR in preservation activities for the OEM equipment and material including verification that all necessary actions, as recommended by the OEM or established by CONTRACTOR, have been implemented and carried out.

### **3. SUPPLY BY SUBCONTRACTOR**

The following services as described below or as described in this exhibit shall be supplied by SUBCONTRACTOR:

- Supervision with managerial support
- Personnel familiar with OEM LNG Refrigeration Compressors and experienced in supervising dry gas seal, bearing, and coupling installation
- Personnel familiar with OEM Gas Turbine Package including all auxiliaries



- Supervision with experience to assist in the development of QA documentation, protocols, and records as required to compile installation and commissioning lifetime records and turn-over documentation per CONTRACTOR requirement
- Supervision with experience to help with the Project Schedule updates and analysis limited to SUBCONTRACTOR scope of supply

#### 4. **SUPPLY BY CONTRACTOR**

The following labor, equipment, material, and services will be supplied by CONTRACTOR:

- OEM Technical Representatives
- Craft labor – skilled and unskilled up to the general foreman level
- Tools and consumables
- Erection equipment including scaffolding and powered access equipment, such as cranes, scissor lifts, man-lifts, flatbeds, pick-up trucks, and other mobile equipment to allow the movement of personnel and material
- NDE services as required
- Installation drawings, specifications, and manuals
- Master packing lists and/or bill of materials for OEM supply
- Site power and water for construction and site offices
- Equipment and fluids required for hydrotests or pneumatic tests of piping systems
- First fill of lubricating oil, gases, and other fluids.
- Personnel protective equipment, including high visibility clothing, hard hats, gloves, and safety glasses.

#### 5. **MECHANICAL AND ELECTRICAL INSTALLATION**

As a member of an integrated team, the SUBCONTRACTOR shall supervise to the extent necessary to perform all aspects of mechanical and electrical system installation of OEM supplied equipment, including but not limited to the items listed below.

- Setting of all OEM supplied turbines, compressors, starter motors, helper motors, blowers, lube oil skids, and other auxiliary equipment skids
- Setting of OEM supplied panels, separators, coolers, and tanks
- Preliminary alignment of all OEM equipment
- Grouting of all OEM supplied equipment, materials, and supports as required
- Exhaust duct assembly
- Air inlet filter house and inlet ducting assembly including support steel
- Ventilation blower system assembly
- Assistance in the planning for the installation of suction and discharge piping, strainers, spring cans, hangers and other engineered supports, and alignment checks



- Installation of lube oil, seal gas, drains and vents piping and testing
- Sign-off and submission of Inspection and Test Reports / Installation Records
- OEM supplied piping and testing
- Fire suppression system
- Installation of the Gas Generator
- Lube oil flushes for all OEM equipment, including flushing circuit diagrams and material take offs for flushing activities
- Compressor seals
- Compressor couplings
- OEM supplied electrical raceway, cable, terminations, testing of point-to-point cabling and megger testing of power and instrumentation cable. Tubing installation and testing
- Installation of instruments, with final cable terminations
- Vibration monitoring system
- Batteries, battery charges and DC system
- Loop checks for all OEM supplied instrumentation
- Final alignment of OEM equipment
- Cold Crank turbines
- Install compressor load couplings
- Compressor mechanical run and air blows
- On-line/Off-line Water Wash System