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Technical specification

for

design, procurement and construction of a natural gas Inter-connector Greece-Bulgaria (IGB Project)

1 General

1.1 Project title

The title of the project to be executed by the EPC Contractor is:

„Design, procurement and construction of a natural gas Interconnector Greece-Bulgaria (IGB Project)“

1.2 Project outline

The Project concerns the design, procurement and construction of the natural gas Interconnector Greece-Bulgaria (IGB Project) which will directly connect the national gas transmissions systems of the Republic of Greece and the Republic of Bulgaria, with the outer diameter of DN 800.

The IGB Project pipeline will connect an existing National Gas Transmission Pipeline (operated by DESFA SA) at Komotini and the Trans Adriatic Pipeline (TAP) in Greece with an existing gas pipeline near the Bulgarian town of Stara Zagora (operated by Bulgartransgaz EAD). The proposed pipeline will measure a total distance of approximately 182.6 km, (31.6 km in Greece and 151 km in Bulgaria).

The design of this bi-directional pipeline system shall be in accordance with the internationally recognized codes of practice EN1594 and ASME B31.8, and also in conjunction with the relevant local ordinances (Bulgarian ordinances for the Bulgarian Section and Greek ordinances / regulations for the Greek Section), for the safe transportation of 3 bNcmy of gas initially, with the provision for the future expansion up to a maximum technical capacity of 5 bNcmy.

The Project also includes the associated above ground installations (AGIs), which are depicted in the following Figure 1 and are divided into the following categories:

1. Stations
    a. Gas Metering Stations (GMS)
    b. Automated Gas Regulating Stations (AGRS) and Off-takes
    c. Block Valve Stations (BVS)
    d. Pigging (launching and receiving) Stations (PS)
2. Buildings and Rooms
    a. Dispatching Centre & O&M Base Building (at Stamboliyski, Bulgaria)
    b. RCC Buildings or Containers (at each Block Valve Station in Greece and Bulgaria)
    c. Control & Boiler Building (at Komotini GMS, Greece)
    d. Metering and Regulating Streams Housing at Komotini GMS (Greece)

e. Control Rooms (at Stara Zagora GMS, Dimitrovgrad AGRS & Kardjali AGRS, Bulgaria)

f. Boiler Rooms (at Stara Zagora GMS & Dimitrovgrad AGRS, Bulgaria)

g. Regulating Skid Housing (at Stara Zagora GMS, Dimitrovgrad AGRS and Kardjali AGRS)

h. Technical Measuring Rooms (at Stara Zagora GMS, Dimitrovgrad AGRS & Kardjali AGRS, Bulgaria)

The following underground systems related to the pipeline and GMS and AGRS are also included within the Project:

- the Cathodic Protection Stations (CPSP) to be installed along the pipeline; and
- the Cathodic Protection Systems for Stations (CPSS) to be installed at the GMS and AGRS.

The Project also includes the following:

- Corrosion protection system for pipeline and stations;
- Integrated Control and Safety System, including Security Systems; and
- Telecommunication System.

The following figure depicts schematically and indicatively the AGIs along the pipeline route:

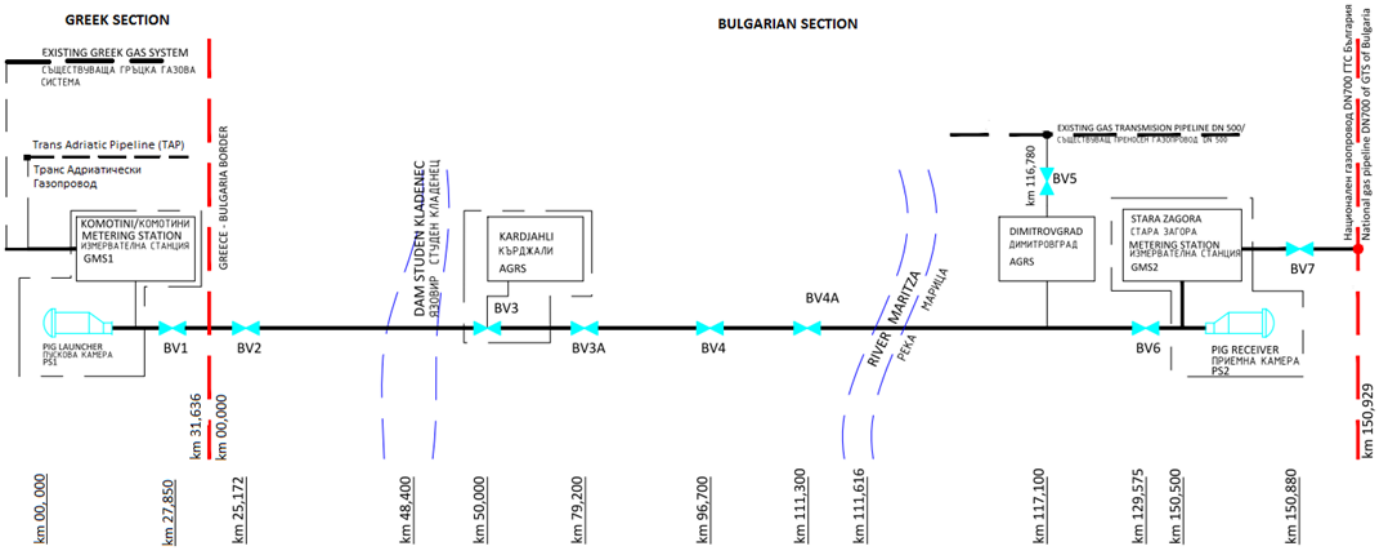

Figure 1: AGIs along the Pipeline Route

The following table indicates the AGIs and other significant points along the pipeline, sorted by geographical location from south to north.

Table 1
AGIs and significant points along IGB sorted by geographical location from South to North

S/N	Geographical location	Building	Gas Metering Station	AGRS & Off-take	Pigging Station	BVS Station	CP Station (for pipeline)	CP System (for stations)
1	Komotini Tie-ins, (hot Tap)	-	-	-	-	-	-	-
2	Komotini	Control & Boiler Building	GMS1	-	PS1	-	-	CPSS1
3	Pandrosos	-	-	-	-	-	CPSP1	-
4	Nymfea	RCC Building	-	-	-	BV1	-	-
5	**Greek / Bulgarian Border**							
6	Velikdenche	RCC Container	-	-	-	BV2	CPSP2	-
7	Studen Kladenets Dam crossing (HDD)	-	-	-	-	-	-	-
8	Kardjahli	Control Room, Technical Measuring Room and Regulating Skid Housing	-	AGRS	-	BV3	-	CPSS2
9	Mandra	RCC Container	-	-	-	BV3A	CPSP3	-
10	Stamboliski	RCC Container	-	-	-	BV4	-	-
11	Stamboliski	Dispatching Centre and O & M Base	-	-	-	-	-	-
12	River Maritza south	RCC **C**ontainer	-	-	-	BV4A	-	-
13	River Maritza Crossing (HDD)	-	-	-	-	-	-	-
14	Dimitrovgrad	Control Room, Technical Measuring Room, Boiler Room and Regulating Skid Housing	-	AGRS	-	-	-	CPSS3
15	Dimitrovgrad Tie-in (Hot Tap)	RCC **C**ontainer	-	-	-	BV5	-	-
16	Trakia	RCC **C**ontainer	-	-	-	BV6	CPSP4	-
17	Stara Zagora	Control Room, Boiler Room, Technical Measuring Room and Regulating Skid Housing	GMS2	-	PS2	-	-	CPSS4
18	Stara Zagora Tie in (Hot Tap)	RCC **C**ontainer	-	-	-	BV7	-	-

The IGB Project pipeline system has the following major design parameters:

- Design Code: EN 1594 “Gas supply systems - Pipelines for maximum operating pressure over 16 bar – Functional Requirements and ASME B31.8 “Gas Transmission and Distribution Piping Systems”;
- Pipeline Outside Diameter: DN800 for main part and DN700, DN600 and DN300 at the connection with existing pipelines;
- Steel Grade for line pipe: L450ME according EN ISO 3183, Annex M;
- Design Pressure: 80 barg, AGIs 82,5 barg, Max Incidental Pressure 82,5 barg;
- Maximum Operating Pressure (MOP): 75 barg; and
- Line Pipe Nominal wall thickness for DN800 (mm): 11.00, 14.20, 16.00, 20.00.

Documents describing generally the project are:

File Name	Document Title
IGB-04-FEED-DBM	Design Basis Memorandum
IGB-04-FEED-I.1-EN-Rev01	GENERAL EXPLANATORY NOTE Technical design
10760-PHL-PR-00-002 Rev 2	Overall Process Description
IGB-04-FEED-I from the Technical Design	System flow Diagram of Interconnector Greece-Bulgaria/overview map
10760-PL-P1-02-402-sh1_REV4	Recommended pipeline routing map recording plan Greek Section maps hmgs 1:50.000 - Komotini & Mytikas

Further details are given in the FEED documents for the Greek Section and in the Technical Design for the Bulgarian Section, both attached to this Technical Specification.

The scope of work to be performed by the EPC Contractor also contains detailed design, material procurement and all construction works up to commissioning and staff training for implementing the Project.

All required services under the Contract – including but not limited to the detailed design - shall be based on the technical documentation (including for the Greek Section the FEED documents attached to this Technical Specification and for the Bulgarian Section the Technical Design, including alignment letters from third parties, Spatial Parcelling Plan, and EIA Decision, each attached to this Technical Specification), which will be handed over as a part of this project (see the attachments to this Technical specification).

The procurement part includes all required material **except** the line pipes with nominal diameter DN800, which will be separately procured by the Contracting Entity under a separate contract.

Further details for this project interface are given in chapter 2.7 of this Technical Specification.

1.3 Definitions

The words and the expressions of the Project terminology in this document are as follows:

Commencement Date	has the meaning given in clause 1.1 of the Contract.
Commissioning	activities related to filling of gas and putting in operation of the system as a whole as described in more detail in section 2.8.4.2.
Construction Supervision Entity	has the meaning given in clause 1.1 of the Contract.
Contract	The contract (to be) entered into between the Contracting Entity and the EPC Contractor for the design, procurement and construction of a natural gas Interconnector Greece-Bulgaria (IGB Project).
Contracting Entity	means the entity defined as “Employer” in the Contract.
Contracting Entity’s Representatives	Any entity, including without limitation the Employer's Representative, Owner's Engineer or Third Party Inspector, advised to the EPC Contractor by the Contracting Entity to carry out defined duties on behalf of the Contracting Entity in accordance with clause 3 of the Contract.
Defects Notification Period	has the meaning given in clause 1.1 of the Contract.
Delivery Point	has the meaning given in clause 1.1 of the Contract.
Design Supervision Entity	means, with respect to Bulgaria, the entity (in accordance with Article 162 of the SDA) to carry out mandatory "design supervision" within the meaning of the SDA, for so long as such assessment is required pursuant to the provisions of the SDA.
EPC Contractor	means the "Contractor" as defined in the Contract.
Equipment	Equipment, materials, bulk materials, specified and ordered from a list of suppliers approved by Contracting Entity.
FEED	in relation to the Greek Section of the Works, the front end engineerign design document attached to this Technical Specification.
Line Pipe Supplier	has the meaning given in clause 1.1 of the Contract.
Mechanical Completion	All system and supplies under the SoW installed in their final position and ready to start of commissioning.
Operational Permit	in relation to the Bulgarian Section, the Bulgarian Operational Permit, and in relation to the Greek Section, the Greek Operational Permit, and "Operational Permits" means together both of them.
Owner's Engineer	has the meaning given in clause 1.1 of the Contract.
Performance Certificate	has the meaning given in clause 1.1 of the Contract.
Pre-commissioning	all testing and inspection activities, before filling of gas, as described in more detail in section 2.8.4.1.

Specifications	The technical documentation and specifications of the Works (or any specific part of the Works) set out in the attachments to this Technical Specification and any additions and modifications thereof or addition thereto made in accordance with the Contract
Taking-Over Certificate	has the meaning given in clause 1.1 of the Contract
Technical Design	in relation to the Bulgarian Section of the Works, the technical design attached to this Technical Specification.
Technical Documents	together: in relation to the Bulgarian Section of the Works, the Technical Design and in relation to the Greek Section of the Works, the FEED.
Works	has the meaning given in clause 1.1 of the Contract.

Other capitalised terms used in this Technical Specification which are defined in clause 1.1 of the Contract have the meaning given to them in clause 1.1 of the Contract.

Throughout this document the following terminology is used:

"must":	signifies a legal or statutory requirement
"shall":	means that the Party or person referred to has the obligation under this Contract to perform the duty referred to
"may"	means that the Party or person referred to has the choice of whether to act or not in the manner referred to
"will"	signifies a feature which the EPC Contractor may assume to be already present.

1.4 Precedence of documents

Without prejudice to clause 1.5 of the Contract, any case of apparent conflict between the requirements of this Technical Specification, any of the attachments to this Technical Specification and/or any other relevant documents or requirements with which the EPC Contractor is required to comply pursuant to this Contract shall be brought to the Contracting Entity's notice by the EPC Contractor. Unless otherwise agreed, the following descending order of precedence shall apply:

1st This Technical Specification (excluding its attachments)

2nd The attachments and referenced documents to this Technical Specification (see paragraph 4)

3rd The applicable Codes and Standards for the Project

4th Other Codes, Standards and Recommendations, as appropriate.

Clause 1.5 of the Contract shall apply in relation to the precedence of documents comprising the Contract.

1.5 Abbreviations

The following abbreviations may be used in the contents of this document for the shortening of commonly used project terms and expressions:

AC	:	Alternating Current
AGI	:	Above Ground Installation
AGRS	:	Automated Gas Regulating Station
API	:	American Petroleum Institute
ASME	:	American Society of Mechanical Engineers
ASTM	:	American Society for Testing and Materials
ATEX	:	Atmosphere Explosive
BMS	:	Building Management System
bNcmy	:	Billion Normal Cubic Meters per Year
BVS	:	Block Valve Station
CAB	:	Chamber of Architects in Bulgaria
CEID	:	Chamber of Engineers in the Investment Design
CCTV	:	Closed Circuit Television
CP	:	Cathodic Protection
CPSP	:	Cathodic Protection Station (for pipeline)
CPSS	:	Cathodic Protection System (for stations)
CS	:	Construction Supervision Entity
DC	:	Direct Current
DEG	:	Detailed Engineering Design
EDR	:	Engineering Document Register
EIA	:	Environmental Impact Assessment
EMP	:	Environmental Management Plan
EN	:	European Norms
EPC	:	Engineering, Procurement, Construction
EPR	:	Equipment Procurement Register
ER	:	Electrical Resistance
ESD	:	Emergency Shut Down
FAT	:	Factory Acceptance Test
FEED	:	Front End Engineering Design
FEG	:	Field Engineering
FOC	:	Fiber Optic Cable

FTD	:	Final Technical Documentation
FV	:	Flow Control Valve
GMAS	:	Gas Management Application System
GMS	:	Gas Metering Station
HAZOP	:	Hazard and Operability Study
HDPE	:	High Density Polyethylene
HSE	:	Health, Safety & Environmental
I/O	:	Input / Output, electrical connections
IEC	:	International Electro-technical Commission
IEE	:	Institution of Electrical Engineers
IFC	:	Issue For Construction
ICS	:	Integrated Control and Safety
ISA	:	Instrument Society of America
ISO	:	International Standards Organization
ITP	:	Inspection and Test Plan
LSAW	:	Longitudinal Seam Submerged Arc Welded
MIP	:	Maximum Incidental Pressure
MOP	:	Maximum Operating Pressure
MPR	:	Monthly Progress Report
MTO	:	Material Take Off
NDE	:	Non Destructive Examination
NDT	:	Non Destructive Testing
NGTS	:	Natural Gas Transmission System
NMS	:	Network Management System
O & M	:	Operation and Maintenance
OHSAS	:	Occupational Health and Safety Assessment Series
OHTL	:	Overhead Transmission Line
OE	:	Owner's Engineer
PCS	:	Process Control System
PEP	:	Project Execution Plan
P&ID	:	Piping and Instrumentation Diagram
PG	:	Pressure Gauge
PLC	:	Programmable Logic Controller
POC	:	Project Organization Chart
PS	:	Pigging Station
PT	:	Pressure Transmitter
PVC	:	Polyvinyl Chloride

QA	:	Quality Assurance
QAM	:	Quality Assurance Manual
QC	:	Quality Control
QCP		Quality Control Plan
RCC	:	Remote Control & Communication
ROW	:	Right Of Way
RTU	:	Remote Terminal Unit
SAT	:	Site Acceptance Test
SCADA	:	Supervisory Control and Data Acquisition (including Telemetry)
SCS	:	Station Control System
SDA	:	Spatial Development Act - Bulgaria
SI	:	International System of Units
SIL	:	Safety Integration Level
SOW	:	Scope Of Work
SPAR	:	Spare Parts Assessment report
SSV	:	Slam Shut Valve
TAP	:	Trans Adriatic Pipeline
TEE	:	Technical Chamber of Greece
TSO	:	Transmission System Operator
TG	:	Temperature Gauge
TD	:	Technical Design for Bulgarian Section
TPI	:	Third Party Inspection
UPS	:	Uninterruptible Power Supply
WBS	:	Work Breakdown Structure

1.6 Structure of this document

This document defines the EPC Contractor's scope of work (SOW) in the following sections:
general including collaboration rules and
specific in accordance with the requirements of the Technical Documents.

This document has been divided into the following main chapters:

1. GENERAL

Introduction to the project, general definitions, precedence and structure

2. EPC Contractor's scope of work – general

Description of the EPC Contractor's general duties in respect of project management and control, QA/QC, acquisition of Permissions, engineering, Materials procurement, construction, Pre-commissioning, Commissioning and Start-up, as well as for collaboration and communication with other relevant Project parties for the implementation of the Project.

3. EPC Contractor’s scope of work – specific

Description of the EPC Contractor's scope of work in accordance with the Technical Documents including information to interfaces, document structure, special requirements and clarifications. Each sub-chapter contains

- a brief description of the main components falling within that sub-chapter,
- the extent of EPC Contractor’s services during the Works execution,
- EPC Contractor’s SOW and battery limits, and
- Cross-references to the relevant parts of the Technical Documents.

4. Attachments and references

Attachments and references to this Technical Specification.

1.7 Norms and legislation

The attached to this Technical Specification “List of Applicable Norms and Legislation” (10760-LST-EN-00-001) provides a list of national (Greek and Bulgarian), European and international laws, regulations, design codes and standards applicable to the project. The list is not exhaustive. The EPC Contractor shall, in performing the Contract, comply with all applicable Laws. Clause 13.8 of the Contract shall apply in the event of Changes in Law.

Without prejudice to clause 1.13 of the Contract, the following precedence of laws, regulations, standards and codes shall apply:

1. Local /National Acts and Regulations
2. European Directives and Regulations
3. European Codes and Standards
4. International Codes and Standards

Wherever such document with lower precedence has more stringent requirements than the documents with higher precedence, the more stringent requirements shall be applied.

For the Bulgarian part the applicable acts, regulations and norms are given as well in each part of the Technical Design.

2 EPC Contractor's Scope of Work – general

The objective of the Contract is the complete realization of the Interconnector, Greece – Bulgaria (IGB) project stretching from the Komotini area (Greece) to Stara Zagora area (Bulgaria), which is in compliance with the Contract and which is completely fit for that purpose.

The scope set out below, the documents of FEED for the Greek Section and TD for the Bulgarian Section and all documents referred to within such documents constitute the Contracting Entity's requirements as defined in the Contract.

Without limitation to items set out in this SOW, the Works include everything of whatever nature that is reasonably required for the achievement of the objective of the Contract.

The EPC Contractor's scope of work includes – in general - the following parts. Each one of them is analyzed in the next paragraphs of this document in conjunction with the specific requirements of the particular components of the Project. The main SOW parts are:

- Review of the FEED and Technical Design (TD) and all technical documentation referred to in those Technical Documents taking into consideration among others changes or comments from the Contracting Entity and requirements due to acquisition of Permissions.

- collect all available data from the Contracting Entity and other sources/ Regulators/ Permission documents / EIA in order to define their effect to the design and implementation process.

- Acquisition of permissions by Regulators / infrastructure owners and other Parties, as required in support of the Permissions process of the Project.
  Note: For the Greek territory the Contracting Entity shall obtain the Installation Permit Decision and the Independent Natural Gas Transmission System License and shall update the Installation Act Decision (as required, in relation to the Komotini Station), prior to the start of relevant construction works. The EPC Contractor shall be compliant with these permits and shall obtain all other permissions needed during construction process.

- For Bulgarian territory the construction permit is already obtained.
  The EPC Contractor shall be compliant with already obtained permits and agreements concerning third party installation and shall obtain all other Permissions needed during construction process.

- Elaboration of the Detailed Engineering Design (DEG) based on the FEED for the Greek Section and based on TD according *to Ordinance No 4 from 21st May 2001 for the scope and content of investment projects* for the Bulgarian Section.

- HAZOP (Hazard and Operability) Study

- Elaboration of the field engineering (FEG)

- Preparation of all document sets required for achieving the Operational Permits or otherwise required by Regulators or infrastructure owners.

- Preparation and submission of the final technical documentation (FTD) package including as-built drawings

- Mobilization / demobilization

- Providing all facilities, Equipment, instruments, transport, cars etc. as well for own personnel, Contracting Entity's staff and representatives of the Construction Supervision Entity and the Design Supervision Entity.
- Project management, project control and construction management
- Quality management, quality control
- Health, safety and environment management
- Procurement of Equipment supplied by EPC Contractor
- Take-over of the Line Pipe (DN800) supplied by the Line Pipe Supplier
- Receipt at point of delivery and transportation to EPC Contractor's storage of the Line Pipe (DN800) supplied by the Line Pipe Supplier.
- Receipt at point of delivery and transportation to EPC Contractor's storage of Equipment, part of EPC Contractor's scope, including all necessary liaison with Equipment suppliers, shipping agents, etc. and assistance with customs clearance (as required).
- Storage of Equipment supplied by EPC Contractor and Line Pipe (DN800) supplied by Contracting Entity
- Transportation of all Equipment including Line Pipe (DN800) from storage areas to Site
- Construction - erection – installation including facilities and access roads
- Execution of the tie-ins, crossings and interconnection activities with existing installations
- Inspection
- Pre-commissioning
- Commissioning and Start-up
- Training for operation staff in all disciplines
- Providing permit documents according the requirements of the Regulators for the Operational Permits

2.1 Collaboration between Contracting Entity and EPC Contractor

The project shall be performed in close cooperation between the EPC Contractor and the Contracting Entity and all other parties involved in the implementation process, including without limitation the Owner's Engineer, Third Party Inspector, Construction Supervision Entity and Design Supervision Entity.

More details for the scope of the other parties involved in the project can be found in the web page under section public procurement procedures: http://www.icgb.eu/buyers-profile/public-procurement-procedures

Without prejudice to, and in addition to, any other obligations on the EPC Contractor in this Contract, including any other requirements in respect of reporting in this Technical Specification, both parties will inform on short notice the other party about any event which may have significant impact to or may significantly disturb the successful project implementation.

The Contracting Entity shall be advised in writing of all technical agreements between the EPC Contractor and its Suppliers of works, services, equipment and materials.

The EPC Contractor shall provide to the staff of the Contracting Entity, the Construction Supervision Entity and the Design Supervision Entity facilities and Equipment in all phases of the project and at different sites, in accordance with the details given in the document attached to this Technical Specification “Offices, facilities and vehicles for contracting entity use”.

For the Bulgarian Section the Spatial Development Act (SDA) gives clear obligations to the EPC Contractor to liaise not only with the Contracting Entity but also with the Construction Supervision Entity and all other parties (Design Supervision Entity, Directorate General Technical Inspection, etc.) depending on the type of occurrence and in accordance with the requirements of the SDA.

2.1.1 Design Review and Approval

The Contracting Entity, represented by its own employees or by nominated representative(s), will be entitled to review and approve EPC Contractor’s DEG, FEG and FTD issues and documentation.

The Contracting Entity and Contracting Entity's Representatives shall have full access to EPC Contractor’s engineering offices, where all the required documentation of the project will be processed, issued and delivered.

All engineering deliverables of the EPC Contractor are subject to approval by the Contracting Entity in accordance with clause 5.2 of the Contract. The procedure for review and approval shall be agreed between the parties in order to not jeopardize the time schedule. The procedure shall be part of the Project Execution Plan.

Contracting Entity’s review and approval of EPC Contractor’s documentation relevant to DEG, FEG, FTD, procurement issues, as well as any other quality and construction documentation, does not release EPC Contractor from his responsibilities regarding any failure, malfunctioning, defect etc. associated with the provided review / approval and clause 5.2.7 of the Contract shall apply.

For the Bulgarian Section the role of the Construction Supervision Entity (CS) and Design Supervision Entity according the Spatial Development Act (SDA) shall also be taken into account by the EPC Contractor.

Deviations from the TD have to be aligned with both parties mentioned above. General deviations from the TD are subject to procedure according national legislation and have to be considered during DEG elaboration for the Bulgarian Section as further described in 2.5.3 below.

2.1.2 Construction Monitoring

EPC Contractor shall allow authorized persons of Contracting Entity and Construction Supervision Entity access at all times, to either EPC Contractor's workshops or construction site in accordance with clause 7.3 of the Contract.

Contracting Entity will be entitled to inspect EPC Contractor's warehouse(s) to verify stocks of Equipment and store conditions. The above representative(s) will be entitled to stop at any time activities carried out at construction site or at warehouse(s) not complying either with the applicable Specifications or the Contract requirements.

The approval given for the execution of Works by Contracting Entity does not release EPC Contractor from its responsibilities of good performance of the Works and his obligations stipulated in the Contract.

Any possible defect occurred and verified during fabrication, installation, erection or field testing, repair of failure, shall be rectified by EPC Contractor at its own care and charge.

EPC Contractor will be fully responsible of any supplied Equipment and of any loss or damage occurred during the Works up to the issue (or deemed issue in accordance with the Contract) of the Taking-Over Certificate for the Works by Contracting Entity. (Responsibility for the Line Pipe to be supplied by the Line Pipe Supplier is as described in clause 17.2 of the Contract).

Therefore, any repair or relocation expense will be at EPC Contractor's care and charge.

The EPC Contractor must submit 15 days look ahead schedules for Contracting Entity to program the supervision of Works. Especially for overtime or Works on holidays or weekends, Contracting Entity must be notified at least 48 hrs. in advance.

The Construction Supervision Entity (CS) and Design Supervision Entity are an additional part of the construction monitoring, which is mandatory according SDA in Bulgaria.

2.1.3 Third party inspection

An independent Third Party Inspector shall be appointed, on behalf of the Contracting Entity, in accordance with clause 3.1.7 of the Contract. The Third Party Inspector shall be responsible for conducting field inspections of the performance of the Works in the Republic of Greece.

The EPC Contractor is obliged to provide all required information and inform the Third Party Inspector about all relevant activities as instructed by the Contracting Entity and generally support such Third Party Inspector in the same way as any other representative of the Contracting Entity.

In Greece the role of the Third Party Inspector is mandatory according the *Greek Technical Regulation for NG Pipelines with Maximum Pressure Operation above 16 bar*.

2.2 Project Management & Control

EPC Contractor shall be responsible for all aspects of the management and execution of the Works, included but not limited to planning, control, reporting, supervision, administration, management of Suppliers, quality assurance, expediting, health/safety/environment management, security, development of procedures, obtaining all necessary approvals and Permissions.

The EPC Contractor shall provide all necessary superintendence in accordance with clause 6.8 of the Contract of the EPC Contractor's obligations under the Contract.

The Project Management and Control applies to all phases of the Contract, including the design phase; construction phase, and all other phases.

Independent from all management and control activities which may be taken by the Contracting Entity the EPC Contractor is fully responsible for:

1. Managing and controlling all project activities with the target to keep and optimize the project plan in any phase of the project,

2. Foreseeing risks and possible problems and taking measures in advance,

3. Analysing and solving all problems and

4. Informing the Contracting Entity.

EPC Contractor shall implement clear communication channels that effectively transmit the required information to Contracting Entity regarding the Works progress.

2.2.1 General

The Project Management and Control responsibility of the EPC Contractor shall include but shall not be limited to the following activities:

1. Organization of regular monthly meetings with the Contracting Entity to discuss overall progress of the Works. EPC Contractor or Contracting Entity may call additional meetings where urgent discussions and decisions have to be taken for any matter of the project. EPC Contractor shall take minutes of all meetings with Contracting Entity and shall issue these to Contracting Entity for approval.

2. Hold weekly construction review meetings, to monitor execution of Works progress and HSE issues with the Contracting Entity / Contracting Entity Representative Site personnel.

3. Issue daily work programs and issue each month to Contracting Entity a Monthly Progress Report (MPR) including the Contracting Entity's requirements as described in section 2.2.3.1 below and clause 4.21 of the Contract.

4. Managing his personnel, his employees, his subcontractors (if any) and his suppliers.

5. Manage to timely obtain all Regulators' approval for his work, as well as any Permissions required to be issued for the execution of Works and associated BVS, PS, GMS and AGRS, for the RCC Buildings/containers, Control & Boiler Buildings and Houses, for Dispatching Centre and O&M Base Buildings and for ICS & Telecommunication systems.

6. Provision of a Project Management Team acceptable to Contracting Entity to manage the implementation of the Works, as well as job descriptions with duties and responsibilities, for each key position of the Project Management Team.

7. Coordination and control of work of major projection functions, i.e. detailed design, engineering, procurement, project control, subcontracting, construction and commissioning to ensure the execution of the Works in full compliance with the Contract requirements.

8. Performing periodic technical audits and inform Contracting Entity of the results of such audits together with any action taken where appropriate and any other recommendation for Contracting Entity consideration.

9. Continuously follow a quality assurance program per ISO 9001 throughout the execution of the Works and submit periodic reports to Contracting Entity.

10. Create and supervise the implementation of the Environmental Management Plan according to the environmental management system per ISO 14001 or equivalent throughout the execution of the Works and submit periodic reports to Contracting Entity.

11. Continuously follow a health and safety management system program according national rules and latest European standards in accordance with OHSAS 18001 or equivalent and submit periodic reports to Contracting Entity.

12. Undertake the total management, detailed design, engineering, procurement, construction, Pre-commissioning, Commissioning and Start up and the management and supervision of all Suppliers including any suppliers of all services and ancillary or temporary facilities that are necessary for the expeditious completion of the Works respecting all conditions of the Contract.

2.2.2 Project planning

In addition to any other requirements in the Contract, EPC Contractor shall process and submit for review the following documents:

1. Issuance of a comprehensive and detailed Project Execution Plan (PEP), which shall cover all aspects for the implementation of the Contract – preparatory works, supplies, construction, training, tests, organizational structure, coordination procedure and requirements for control at the Site. The PEP shall follow the planned time schedule as per the Technical Proposal (Appendix № 11 to the public procurement documentation) and shall represent the overall analytical schedule, illustrating all particular stages of the Project.
   EPC Contractor shall process the project data and issue / update monthly the PEP and all the project schedule reporting shall be fully supported by the output of this package. The PEP shall include, but not limited to, the following milestones / activities.

   a. Commencement Date

   b. EPC Contractor’s mobilization for DEG performance

   c. Project Organization Chart (POC) depicting the work breakdown structure of EPC Contractor’s key involved personnel, including suppliers. This document shall be submitted for approval to the Contracting Entity accompanied with job descriptions and CVs of all key personnel

d. A statement concerning the location of the office(s), in which the DEG, the procurement, the FEG, and the construction will be handled and managed.

e. Review of FEED (Greek Section), TD (Bulgarian Section), existing survey data and documents describing the status of Permissions.

f. DEG activities

g. EPC Contractor's mobilization, establishment of temporary facilities and start of construction works at Site

h. Site drawing(s) showing EPC Contractor's proposed construction area, storage area, site offices, etc., and access requirements.

i. Quality Assurance / Control and HSE documentation preparation and submission schedule, QA Procedures, Construction Method Statements & Risk Assessments.

j. Acquisition of all required Permissions by Regulators / infrastructure owners

k. Inquiry issuance / supplier list / purchase order placement / manufacturing period / delivery dates for all Equipment (those supplied by EPC Contractor and those supplied by Contracting Entity)

l. A list of candidate suppliers and / or vendors that EPC Contractor proposes, with details of their scope of work / services / Equipment supply.

m. Subcontract management (specialist engineering, installation, testing etc.) in accordance with clause 4.4 of the Contract

n. Design review and approval

o. Project document control

p. Field engineering activities (survey, civil, etc.) and the submissions of the processed documents

q. Field construction activities for the main linear works per spread (ROW preparation/clearance, line pipe transportation and stringing, trenching, welding, NDT, field joints coating, lowering in, backfilling, reinstatement, hydrostatic testing & drying, marking, etc.), for all crossings (shown separately for each crossing) and for all AGIs (split in major activities for each AGI). Field construction activities for building, civil / structural, electrical, instrument and mechanical / piping works.

r. FOC & HDPE conduits installation

s. Tie-in works

t. Pre-commissioning and Commissioning for the pipeline

u. Start-up of all mechanical and electrical installations, as well as of ICS and Telecommunications systems

v. Training

w. Date for Mechanical Completion

x. Preparation for gas-in activities

y. Time for completion of the Works

z. Final Technical Documentation preparation and submission to Contracting Entity

aa. Demobilization

2. Progress “S” curves for overall, engineering, procurement and construction (split in major activities) depicting progress per month for the whole duration of the project. The “S” curves shall be updated with actual data on a monthly basis and shall be included in the Monthly Progress Report (MPR).

3. Manpower histograms showing proposed direct / indirect personnel per spread, per discipline and main work activity on a monthly basis. The histograms shall be updated with actual data on a monthly basis and shall be included in the Monthly Progress Report (MPR).

4. Histograms and details of the major construction equipment and materials, which EPC Contractor intends to use in construction, e.g. excavators, hydraulic hammers, side booms, cranes, bending machines, boring machines, welding machines and other special equipment and materials, etc. per spread and main construction activity on a monthly basis. The histograms shall be updated with actual data on a monthly basis and shall be included in the Monthly Progress Report (MPR)

2.2.3 Reporting

The EPC Contractor shall draw up reports/protocols within 5 working days on all meetings attended by the Contracting Entity and shall submit them to the Contracting Entity. After approval and/or signature by the Contracting Entity and EPC Contractor the reports/protocols will be considered as contractual documents.

Naming, formatting and submitting rules have to be strictly followed in accordance to the agreed document management system.

2.2.3.1 Monthly progress report

The EPC Contractor shall prepare a Monthly Progress Report (MPR), which shall be distributed according the agreed distribution list. The cut-off date shall be the last day of each month. It shall be submitted within 3 days of the cut-off date. The report and supporting data as a complete set and according document management rules shall be e-mailed to the Contracting Entity and all other parties indicated by the Contracting Entity.

The report shall be in English.

The level of detailing and the format of data included in the MPR shall be in line with the Contracting Entity requirements to establish and analyse the current and forecast progress of the Works. The cost of all resources for the production, presentation and modification of the Monthly Progress Reports, including any modification to the detail and format that may be requested from time to time at the discretion of the Contracting Entity, is included in the

Contract Price. All detailed data that is relevant to the substantiation of the EPC Contractor's progress and time schedule shall in any case be retained and made available to the Contracting Entity upon request.

In addition to any other specific information that may be requested by the Contracting Entity, the MPR shall routinely include all items of the following sub-chapters and as provided in clause 4.21.3 of the Contract.

2.2.3.1.1 Contract Data Sheet

The Contract Data Sheet contains:

1. Contract Title, Number and WBS (as applicable)
2. EPC Contractor
3. Target Completion Date
4. Forecast Completion Date
5. Key Contract Dates (Target and Actual – as may be requested)
6. Contract Price
7. Amount of Contract Price Certified
8. Other Data (as may be requested and varied from time to time).

The Target Completion Date shall be the date on which the EPC Contractor aims to complete the Works.

The Forecast Completion Date shall be the EPC Contractor's conservative assessment of the completion date. This assessment shall include consideration of any events or circumstances, actual and forecast, which may jeopardize the completion in accordance with the Contract. The forecast shall not presume the effectiveness of any measures to be adopted to overcome delays until such measures have been adopted and proven effective.

2.2.3.1.2 Progress Data Sheets

Progress Data Sheets shall cover each stage of the design, procurement, manufacture, delivery, construction, training, testing and commissioning, as applicable and without limitation to any other relevant activities.

The Progress Data Sheets will be produced in Excel format, as well as any other program or means that the Contracting Entity may from time to time select.

The specific format of the Progress Data Sheets shall be tailored to the nature of the project and circumstances at the discretion of the Contracting Entity. The initial format shall be proposed by the EPC Contractor and established during the mobilization period.

Any progress weighting factors used in the Progress Data Sheets shall be set by the Contracting Entity.

S-curves shall be produced from the Progress Data Sheets.

The Contracting Entity shall inform, from time to time and depending on the stage of the project, which Progress Data Sheets and S-curves are to be provided in the main body of the Monthly Progress Report and which can be included in Appendices.

2.2.3.1.3 Updated Time Schedule

The actual and forecast schedules shall be compared with the fixed Target Schedule. Schedules will be produced in a well-known software package, as well as any other program or means that the Contracting Entity may from time to time select.

Upon project initiation, the EPC Contractor shall produce a detailed Time Schedule, with dates that are no later than those required by the Contract, in accordance with clause 8.3 of the Contract. This becomes the Target Schedule. The Target Schedule, including the logic of the network and resources behind it, shall not be changed by the EPC Contractor.

The EPC Contractor shall continuously maintain an updated time schedule to reflect actual events and also to reflect the EPC Contractor's conservative forecast of future events and circumstances.

The updated time schedule shall be included in each monthly report. For each activity, the target schedule shall be shown as one line and, immediately below, the actual / forecast schedule shall be shown as a second line.

The Contracting Entity shall inform, from time to time and depending on the stage of the project, which details of the updated time schedule are to be provided in the main body of the report and which can be included in appendices.

2.2.3.1.4 Corrective Measures

In the event of any shortfalls between the actual or forecast progress and target progress, such shortfalls shall be identified in the MPR with details of the mitigation measures being, or to be, implemented. The impact of the mitigation measures shall be predicted. The effectiveness of any such implemented measures shall be presented.

2.2.3.1.5 Inquiry Status Report

The EPC Contractor shall prepare and maintain on a monthly basis the "Inquiry Status Report" which, as minimum will contain the following information:

- Contract Number / Inquiry File Number
- Material Description
- Supplier's Names and Locations
- Inquiry Issue Number
- Date of Issue
- Date Bids required
- Date Bids received
- Purchase Order Number
- Delivery Time (planned - actual)
- Remarks

2.2.3.1.6 Cash Flow Forecast

A monthly cash flow record and forecast shall be produced in Excel format, covering the period from contract award up to the date of final payment. Actual payments shall be shown for past months. The forecast payments for future months shall be based on the forecast schedule. The cash flow record and forecast shall be traceable to the terms of payment and the activities depicted on the time schedules.

2.2.3.1.7 Contractual Notices Given and Received

A listing and brief description of any contractual notices given by the Contracting Entity to the EPC Contractor and by the EPC Contractor to the Contracting Entity. Such notices shall be listed chronologically. The Contracting Entity shall inform, from time to time, any modification to the grouping and presentation of such notices.

2.2.3.1.8 Quality Reporting

Items as set out in the reporting requirements of the relevant QA / QC chapter below.

The Items may be modified from time to time to cover data that the Contracting Entity deems necessary to establish and analyse the actual progress of the Works in relation to specified requirements.

2.2.3.1.9 Safety

Safety statistics, including details of any hazardous incidents and activities relating to environmental aspects and public relations.

2.2.3.1.10 Project Risk Register

The risk register shall identify risks associated with the construction process, particularly with the safety, integrity and quality of the assets, with impact on the environment and with respect to operation and maintenance. The risk register should identify and categorize the risks, assess the impact and identify the mitigation actions and plans to be used. The risk register shall be updated on regular basis.

2.2.3.1.11 Photographs

Photographs showing progress on site and in places of manufacture, as applicable.

2.2.3.1.12 Other Data

Any and all other data that the Contracting Entity may deem necessary, and modify from time to time, in order to establish and analyze the progress of the Works. Any such data will be requested by the Contracting Entity. It may include, but is not necessarily limited to, the following:

- bespoke illustrations and diagrams to depict progress
- cost, time and resource sheets for any and every activity
- details of methods and procedures for any and every activity
- logic networks on which schedules are based
- records of EPC Contractor’s Equipment and personnel
- manpower and resource histograms

- Engineering Document Register
- Register of Material Requisitions
- Supplier and Sub-Contractors' Lists
- Project Status Report
- Procurement Register
- Update on Inquiry Status Report
- Supplier / Sub-Contractors Evaluations
- Audit Reports of whatever nature
- Status of Final Technical Documentation

2.2.3.2 Verbal presentation & discussion of progress

In addition to the submission of the MPR, and if deemed necessary by the Contracting Entity, the EPC Contractor shall verbally present and discuss the progress of the Works in a progress review meeting that shall take place at the Contracting Entity's offices. This meeting shall be in addition to any other progress related meetings that take place at any other venue.

2.2.3.3 Supplementary reports

Subsequent to the submission of the Monthly Progress Report (MPR), the Contracting Entity may request the EPC Contractor to submit supplementary reports which shall contain any data that the Contracting Entity deems necessary to further examine the current and forecast progress of the Works.

2.2.4 Document control

EPC Contractor shall establish a software based system for the efficient document control and management system.

More specifically EPC Contractor shall prepare an Engineering Document Register (EDR), which shall include for any document transfer to the Contracting Entity the sending of a document transmittal comprising minimum the following information fields:

a. Document / drawing number,
b. Type of document
c. Title of document.
d. document language
e. Number of sheets per engineering issue (i.e. 1 of 3, 2 of 3, etc. defined by the same drawing number).
f. Revision number
g. Status of document like
draft for information / issue for approval / approved / etc.
h. Transmittal number
i. Transmittal date
j. Associated process like-
DEG, FEG, FTD, QC, Permissions, Project management, etc.
k. Related site

l. Related design discipline
m. Remarks
n. Etc.

The EDR has to enable the Contracting Entity at any time of the project to easily find by a search with selected criteria any document transfer from and to the EPC Contractor.

The EDR shall include all the DEG, FEG, FTD and Project, Quality and HSE management documents & drawings which shall be processed and issued by EPC Contractor.

Additionally a Master Document Register shall be prepared and maintained by the EPC Contractor.

During the Kick Off Meeting of the project the EPC Contractor shall propose a system, which shall allow the Contracting Entity to manage all project documents during the project and unlimited after the project without special license fees.

Document transmission rules for electronic transmission:

1. Any document transmission for documents of DEG, FEG, FTD, Permissions, Quality Management HSE, training, etc. shall be accompanied by a document transmittal in the agreed format and with all applicable information filled in, like defined above and finally agreed during the Kick Off Meeting of the project.

2. Documents shall be transferred electronically to the agreed distribution list of email recipients or via document transfer server or via electronic media with parallel information to the agreed distribution list of email recipients. Details will be agreed during the Kick Off Meeting.

3. All project documentation shall be transferred with a document transmittal which shall clearly specify the document status: Issued for Review / Approval / Construction / Information, etc.

4. The syntax of the subject of emails for document transfers shall be as well explicitly agreed during the Kick Off Meeting.

Complete correspondence, notations, minutes of meetings and other notes shall be identified additionally with keyword, works number, order number and the respective reference number.

Document transmission rules for hard copy documents:

- Paper copies shall be submitted as defined in the aattachments to this Technical Specification and on special request of the Contracting Entity.

- Paper copies must be organized with sufficient cover sheets, folder labelling and table of content sheets, which shall give an easy overview and which shall be aligned with the electronically submitted documents.

- All hard copies of documents shall be of a sufficient clarity to ensure good reproducibility when photocopied or scanned. All documents shall be sent to Contracting Entity according the document transmission rules.

- The EDR and any Document Management System and Master Document Register shall be confirmed by the Contracting Entity.

2.2.5 Document follow up

Contracting Entity reserves the right to provide comments, corrections, recommendations and finally any corrective suggestion on any document regardless to the engineering status of it, even on the ones submitted for information only.

In case that Contracting Entity has comments relevant to errors, omissions, corrections, re-design, conceptual failures, etc., the submitted documents shall be sent back, to the EPC Contractor with a “Reviewed With Comments” status notification in order EPC Contractor to proceed with the required corrective / improving actions.

If the documents submitted by EPC Contractor are acceptable and only minor corrections should be required, then the documents shall be sent back to the EPC Contractor with a “Reviewed with Minor Comments” notification and EPC Contractor shall resubmit the documents for final review. In that case, EPC Contractor may proceed with the construction activities or the next process step with close co-ordination with Contracting Entity’s instructions and supervision.

Finally, if the submitted document issues are fully acceptable, then the relevant issues shall be sent back to the EPC Contractor with a “Approved” status notification and therefore, not any further action by EPC Contractor is required.

Contracting Entity reserves the right to reject a document at any stage, if the required quality has not been reached.

2.2.6 Documentation language

The general project communication language will be English.

All technical documentation issued by EPC Contractor, as well as commercial, legal or for project communication, protocols, reports etc. shall be in English.

All documents, which are used as official project documentation in front of Regulators or any legal or national entity in Greece or Bulgaria, must be bilingual in English / Greek for the Greek territory and English / Bulgarian for the Bulgarian territory.

EPC Contractor shall provide the translation from/to English to/from Greek or Bulgarian and shall be responsible for the accuracy of the translation, because the local language prevails in the process for obtaining of Permissions..

In other sections of this document further specific language requirements are given, e.g. training documents need to be in local language same as any documents addressing personnel, which is not fluent in English.

2.3 Engineering

The engineering of the EPC Contractor shall be based on:

1. For the Greek Section
    a. The FEED
    b. All Permissions documents and Regulator instructions, including EIA documents, for the Greek Section
2. For the Bulgarian Section
    a. Technical Design documents (TD)
    b. Detailed Spatial Plan – Parcelling Plan (DSP-PP)
    c. All Permissions including instructions from Regulators, i.e. EIA documents, and infra-structure owners and any agreements with third parties for the Bulgarian Section
3. All other requirements of the Contract, including this Technical Specification and the documents set out in the attachments to it including but not limited to additional technical documents provided by Contracting Entity – hydraulic report, SCADA report, feasibility study for TAP interconnection, etc.
4. and all further input and requirements given by the Contracting Entity or relevant Regulators during the project.

The documents, which will by produced and delivered by the EPC Contractor to the Contracting Entity, shall be submitted in the agreed EDR according chapter “Document Control” with the respective document transmittal structure, naming structure, file naming structure and directory structure, etc.

During the engineering phase, a number of Contracting Entity’s or Contracting Entity’s Representatives’ personnel may be resident at EPC Contractor’s offices in order to coordinate and review with EPC Contractor’s engineering team the design documents and expedite the required comments / approvals to this design documents.

Contracting Entity shall decide duration and frequency of such presence of his personnel at EPC Contractor’s offices at any time or after EPC Contractor’s request in order to review and expedite development of the design.

EPC Contractor shall as well provide within his FEG offices, for the exclusive use of Contracting Entity and Construction Supervision Entity facilities and equipment according to the attachments to this Technical Specification

2.3.1 Detailed Engineering Design – DEG

EPC Contractor shall complete the DEG by its own resources or assign the elaboration of DEG to qualified engineering supplier(s). The completion of DEG is necessary for acquisition of all Permissions, for adaptation to technical data of various manufacturers, for consideration of all comments from Regulators and Permission documents, i.e. EIA, for sufficient detailing for the construction works and in accordance with any eventual comments from the Contracting Entity

EPC Contractor shall prepare all necessary final DEG documents and drawings in sufficient detail, providing (as required) all the Surveying Geological, Geotechnical, Seismic, Geo-electrical, Civil / Structural, Pipeline, Piping, Stress Analysis, HAZOP, MTO, Mechanical, Instrumentation, Electrical and Telecommunication / FOC documentation (studies, technical descriptions, calculations, drawings, etc.) for the pipeline, the BVS and PS, the AGRS and GMS, and the associated RCC containers.

EPC Contractor shall ensure that the final DEG and the firm data of specified Equipment are compatible with the Technical Documents and Specifications and shall provide guarantees for the offered design services, as specified in other sections of the Contract.

EPC Contractor shall validate and/or develop the technical documents into a full detailed design in compliance with this Technical Specification, the applicable Specifications, the typical and Standard drawings, the FEED, the Technical Design and detailed survey drawings, the calculations, as well as any other relevant document being considered as applicable and significant by Contracting Entity and / or his representatives for the appropriate technical outcomes of the DEG.EPC Contractor shall submit for review and approval all the elaborated DEG documentation to Contracting Entity, Construction Supervision Entity and Design Supervision Entity prior to commence any relevant construction work.

EPC Contractor shall submit the packages of the DEG for review and approval to Contracting Entity in respect to the scheduled activities and milestones, fulfilling the duration requirements of the PEP, and according to the Contract requirements.

During the DEG, EPC Contractor shall keep fully informed the Contracting Entity for the engineering status for all concerning issues through both the reports / studies and drawings submitted by EPC Contractor in accordance with Contracting Entity's requirements.

EPC Contractor's DEG shall include (minimum), without limitation, the following:

a. Preparation and issue of Engineering Document Register (EDR)
b. Project Execution Plan & Quality Control Plan
c. Review and rework and/or further develop Design drawings, calculations, Specifications, data sheets, risk assessment, installation procedures, studies and reports used to describe and specify the Works.
d. Review and rework and/or further develop all MTOs
e. Manage the key field equipment interfaces, in particular control, safety and communication interfaces.
f. Coordinate design of I/O and control interfaces with third parties. Third party liaise shall be coordinated by Contracting Entity.
g. Full integration of (3rd parties) suppliers designs (i.e. block diagrams, cable schedules, I/O schedules, data sheets, loop drawings, termination and hook up drawings, equipment layout, single line diagrams, schematic diagrams etc.) into project design and in a common project format.
h. Specifications, drawings and requisitions required to procure Equipment, supplies, spare parts and services for the Works, including preparation of Material Lists and Material Take Offs with adequate information for bid request and order placement
i. Supplier data for Equipment, supplies and spare parts forming part of the Works including Equipment lists
j. Materials certificates
k. Application software
l. Specifications, drawings and procedures for development, assembly and installation of the Works
m. Preparation of documentation for tests at suppliers' shops and for Factory Acceptance Testing (FAT), for pre-commissioning and for commissioning. Such documentation shall provide step by step procedures for testing the Equipment, systems and software. For each test, the test number, name, expected results and space to record the actual

results shall be provided. The documents must be internally reviewed according to the EPC Contractor's quality procedures before being submitted to Contracting Entity

n. Progress reports (including subcontract status reports), management plans and method statements associated with the Works
o. Operations Manual describing how the Equipment should be operated under normal and abnormal conditions, start up and shutdown procedures
p. Maintenance Manual describing how the Equipment should be maintained to ensure continued operation in accordance with the design parameters
q. Training plan and training manuals
r. Preparation and issue of detailed lists of recommended and approved spare parts
s. Verification that the suppliers' final data sheets and certified outline drawings conform to the material requisitions and Specifications of the project.

EPC Contractor's DEG services shall also include the examination and verification of the technical adequacy and conformity of suppliers / manufacturers documentation, with the DEG outlines and the applicable Specifications.

DEG of **ICS and Telecommunications systems** shall be in accordance with the Technical Design, FEED, Specifications and the latest edition of the applicable codes and standards. In case of conflict between various codes and standards, Contracting Entity Representative shall decide which are applicable.

Please note, that the provided FEED for the Greek Section and the TD for the Bulgarian Section have discrepancies and do not describe a satisfactory consistent SCADA system as required by the Contracting Entity. The *Report with identification of discrepancies on existing documentation for SCADA system* attached to this Technical specification reflects the status of the documents.

The EPC Contractor shall develop during detailed engineering phase of the IGB Project based on available documentation for both countries and based on the latest technology a common SCADA and Telecommunication systems for the whole IGB Project system. The detailed design shall take into account the discrepancies of the available documentation and the provisions of the law in Bulgaria concerning the introduction of changes in Technical Design.

Special attention shall be as well given to the **HDD's** at Dam Studen Kladenec with 1641m and River Maritsa with 542 m (Technical Design parts IGB-04-FEED-II.2.1.1.29.1; IGB-04-FEED-II.2.1.2.52.1 and IGB-04-FEED-II.2.1.2.52.2). All design, planning, Equipment (line pipe including) and works are obligation of the EPC Contractor. The EPC Contractor shall choose the most suitable technology and Equipment for the HDD's. If necessary the specifications in the TD shall be amended accordingly taking into consideration the provisions of the SDA in Bulgaria concerning changes in the Technical Design.

After reviewing the TD and FEED regarding **Corrosion protection** and analysing potential discrepancies in the engineering approach for both countries,– the EPC Contractor shall elaborate in DEG a unified design of the Corrosion protection for the whole pipe line in both countries. Any design decision regarding the Corrosion protection shall be also aligned with other issues related to – power supply, earthing, soil resistance, crossings of obstacles, etc.

DEG shall be in sufficient detail to enable purchasing of all Equipment and executing the installation works without further design or drawings preparation other than drawings which may be required to support the construction activities.

For the Greek Section the FEED and all related documents need to be checked, reworked and further developed by the EPC Contractor, if applicable.
All available MTOs are indicative and need to be finalized.
Special attention need to be paid to the amount of Line Pipes DN 800, which are to be provided by the Line Pipe Supplier, see chapter *2.7 Material procurement - Line pipe DN800* . These amounts are not deducted from the MTO's in FEED. The EPC Contractor shall correct the MTO s accordingly.

EPC Contractor shall also perform any additional investigation, research and assessment considered necessary for the issue of an integrated and technically acceptable detailed engineering and design documentation.

The DEG of GMS1 shall include all required facilities and pipeline sections needed for the interconnection with TAP and DESFA pipelines. The FEED attached to this Technical Specification contents initial variant of GMS1 with only connection to DESFA. The Contracting Entity requires from EPC Contractor to design and construct GMS1 with connections to both pipe lines – TAP and DESFA. The extension of the initial variant of GMS1 with interconnection to TAP is described in the feasibility study *IGB – TAP interconnection, Evaluation report of options for interconnection* attached to this Technical Specification. The DEG of GMS1 shall be based on the FEED, the feasibility study for extension of the initial variant of GMS1 and any further requirements, aligned with TAP. The relevant cost of the DEG, as well of the performance of the relevant Works is included in the Total Lump Sum Price.

For the Bulgarian Section the EPC Contractor must pay special attention to requirements resulting from Permissions or preliminary contracts or agreements with infrastructure owners, because these documents may give obligations for the DEG phase.

The Bulgarian legal requirements such as SDA and Ordinance No 4 from 21st May 2001 for the scope and content of investment projects give clear rules for the DEG in Bulgaria. For the Bulgarian Section the DEG should be in the form of a "Working Design" within the meaning of SDA (art. 139, para 1, p. 3), with the content under Ordinance 4 on the scope and content of the investment designs.

The legislation sets requirements and restriction regarding changes of TD incorporated in DEG. EPC Contractor shall be aware that, when necessary, declines from the TD shall be made taking into consideration the provisions of the SDA concerning introduction of changes in the Technical Design (art. 154) and Ordinance 3 on issuing acts and protocols during construction (art. 8). In case of significant changes (e.g. change of pipe line's route) it could lead to amendment of Permissions which are based on TD. For the as-build drawings related to insignificant changes SDA (art.175) and Ordinance 3 on issuing acts and protocols during construction shall be followed (art. 8).

Also the role of the Construction Supervision Entity and Design Supervision Entity in the development of DEG needs to be taken into account. The participation of licensed designers according SDA in the DEG is mandatory.
The evaluation of the available surveys and technical documents from TD and from Authorities related to the Permissions procedure for the Bulgarian Section shall be done during execution of DEG

The EPC Contractor shall be aware that part "Structural" from the DEG shall be certified by the Construction Supervision Entity.

MTOs/Bill of quantities shall be reviewed, and adapted if applicable. Special attention need to be paid to the amount of Line Pipes DN 800, which are to be provided by the Line Pipe Supplier, see chapter *2.7 Material procurement - Line pipe DN800* . These amounts are not deducted from the MTO documents in the TD. The EPC Contractor shall correct the MTOs in order to define the amounts of materials that are in the scope of work of the EPC Contractor accordingly.

2.3.2 Field Engineering Design – FEG

Field engineering (FEG) comprises the EPC Contractor's engineering services and documentation exceeding the DEG for the performance of the construction works and the required "As built" documentation to be provided to the Contracting Entity.

For the Bulgarian Section special attention shall be paid to the role of the Construction Supervision Entity, the Design Supervision Entity and the provisions of the SDA, because changes may have impact to the Permissions process and need to be carefully agreed with all involved parties according SDA.

The EPC Contractor's FEG consists of drawings (e.g. longitudinal drawings showing the demand for field and elastic bends and factory made bends or arrangement drawings at stations, etc.) and all necessary calculations, special construction methods, interim works in general, modifications to access roads, Permissions from Regulators with any additional design required for the construction of the pipeline system, as well as any other supplementary issue which is necessary for the proper Works completion (e.g. engineering for water management).

The EPC Contractor shall process and submit all FEG issues and documents to the Contracting Entity for review and approval, according to the time schedule and the requirements concerning Contracting Entity's review.

EPC Contractor shall also update (if required) the permanent access road design documentation (recording plans, longitudinal sections, cross sections, etc) prior to any construction activity, so that the drawings to be applied on site to be free from any legal or other technical defect.

EPC Contractor shall recheck and update the pipeline longitudinal section and recording plan drawings (alignment sheets) after the ROW preparation as well as for each and every crossing with major roads, railways, major channels, rivers and lakes (as appropriate), if so should be requested by Regulators in order to obtain the relevant construction permit.

The EPC Contractor shall be responsible for ensuring the adequacy of all design interfaces and its suppliers' design submissions, checking for conformance to Specifications, reviewing for completeness and integrating the design into the overall design package.

Civil FEG drawings, engineering technical data and requisitions for construction and purchase of Equipment including the FEG data shall be sent to Contracting Entity for review and approval prior to release for order placement or construction.

The EPC Contractor shall keep a red marked copy of all drawings and will incorporate on them all field modifications. A copy shall be given to Contracting Entity for review prior to Mechanical Completion. These red marked copies will be used as a drafting basis for the "As built" issue of the drawings.

2.3.3 Final technical documentation - FTD

Following the Mechanical Completion, EPC Contractor shall elaborate and submit to Contracting Entity for review and approval all the "Final" Technical Documentation (FTD) of the project. The final acceptance of the FTD shall be given by Contracting Entity.

For the Bulgarian Section special attention shall be paid to SDA and the role of the Construction Supervision Entity and the Design Supervision Entity.
In the SDA among others chapter 11 for "as built" drawings, and the paragraphs 168, p. 6 - final report; 175 – executive ("As built") documentation; 176a Technical passport of the pipe line according to Bulgarian legislation apply.

EPC Contractor shall provide FTD in the specified hard copies and in digital form (editable files and scanned files) as per requirements of the relevant Specification and Contracting Entity's Documents Requirements specified in this Technical Specification.

More specifically, EPC Contractor shall collect, classify, keep, book-bind and prepare the following, but not limited, items:

1. Final "As Built" documentation, which shall include system technical description drawings, Equipment lists, material / erection requisitions, data sheets and Mechanical catalogues, as provided by the Contract.

2. EPC Contractor shall prepare the relevant "as built" documents in digital files in DWG format and the corresponding technical descriptions, calculations, reports etc. shall be processed in MS WORD and / or EXCEL format.

3. Operational Manuals, which are the documents for the direct operation of the systems.

4. Maintenance Manuals, which are the documents, required for directly support operation.

5. Quality & Inspection Records, by which is verified the quality of civil / mechanical / piping / electrical / instrumentation Equipment and the field coating work. All the quality inspection literature as per the subject SOW shall be included in this specific final package.

6. Inspection Data Books, which include the quality records for Equipment supplied by a single Supplier / manufacturer.

7. Design, Drawings and Data Manuals (i.e. Manufacturing Record Book), containing general layout drawings, manufacturing/packing/shipping & storage/installation procedures, material certificates, test reports etc.

8. Contract documentation

9. DEG documentation with integrated FEG documentation (including all issued documentation).

10. Cadastre photographing of the newly constructed gas pipeline, which shall include the easement areas, the sites thereto, etc. for issuing the certificates under the Act on Cadastre and property register with reference to art. 175, par. 5 of the SDA in Bulgaria and accordingly in Greece.

11. Quality Assurance Manuals

12. Safety Manual

13. Spare parts manuals.

14. General Operation and Emergency Situation Scenario Manual of the whole Pipeline and the Stations. In this manual the way the whole plant is operating, is described, in both normal and emergency situation conditions. It is also described how all individual installations composing the whole Pipeline and Stations installation, are working together, while references are made to each installation's manual respectively.

15. Permissions and approvals by Regulators.

16. Any other documentation required by the Contract.

17. All relevant software and source codes regarding supervisory flow computer, stream flow computer, gas chromatograph etc.

2.4 Quality assurance / quality control

The EPC Contractor's Quality System shall provide information for the planned and systematic control of all quality related activities performed during design, procurement, construction, Pre-commissioning and Commissioning. The implementation of the Quality System shall be in accordance with the EPC Contractor's Project Quality Assurance Manual and Project Quality Control Plan. The Project Quality Control Plan shall describe in detail in a matrix format how the EPC Contractor's Quality System addresses the elements of ISO 9001 section 4 with reference to responsible parties within the EPC Contractor's Organization for the implementation / control of each area, the applicable procedure used to control each area and verification of documents produced for each area.

The EPC Contractor's Quality Management System implementation shall conform to the requirements of ISO 9001 covering all management aspects and shall impose the same requirements on suppliers.

EPC Contractor shall maintain ISO 9001 Certification by an accreditation body for the duration of the Contract.

EPC Contractor shall ensure that high standards of quality and safety are maintained by using competent personnel throughout both in terms of performance of the Works and in the final product of the Works in order that safe working environment, safe design and quality build is created for the lifetime of the facilities.

The EPC Contractor's Quality Management System and all quality issues shall be under the responsibility of a competent QA Manager. The QA Manager is to be a permanent representative of the EPC Contractor's Project Team throughout all Project stages.

In addition to any other QA / QC requirements set out in the Contract, EPC Contractor shall submit – within twenty-eight (28) days from the Commencement Date - to the Contracting Entity the draft Quality Assurance Manual (QAM) and Quality Control Plan(QCP) for all phases of Works execution. Consequently, EPC Contractor shall establish, maintain and document a QA / QC system in accordance with the Contract and Contracting Entity's guidelines.

Unless otherwise agreed with the Contracting Entity/ Contracting Entity Representative, the proposed Quality System shall satisfy the essential elements of current edition of the ISO 9001, "Quality Systems - Model for Quality Assurance in Design / Development, Production, Installation and Servicing" – as well as the ISO 9004 "Quality Management and Quality System Elements - Guidelines".

For the QA / QC system implementation EPC Contractor shall prepare and issue the following documents:

- Quality Assurance Manual (QAM)
- Quality Control Plan (QCP)
- Quality Procedures (QPRs)
- Quality Forms (QFMs)

The Quality Assurance Manual shall have the structure dictated by ISO 9001 and shall adequately cover the following issues:

- Quality Policy and Management Responsibility

- Project Organization chart
- General Description of the QA System
- List of applicable Quality System Procedures

In the QAM, EPC Contractor shall illustrate the Engineering / Procurement / Construction quality policy, by which he assures that all the project activities are being performed according to the standards, applicable codes and applicable Specifications.

The QAM is the mandatory and dominating quality document, in which the documentation of QCP / QPRs / QFMs , as well as the quality specified type of reporting shall be described, codified and listed, so that the QC evolving actions to be sufficiently achieved.

EPC Contractor, shall also include the basic project quality organization chart, taking into consideration that the QA / QC team has to be independently connected with the Project Manager duties and in no case under the responsibility of the construction teams.

The Quality Control Plan shall present a detailed breakdown of all project activities. For each one of these activities the following fields shall be clearly identified:

- Quality Requirements
- Applicable Quality System Procedures
- Applicable Technical Specifications
- Inspection and Test Plans (ITPs) which show Inspection and Approval Levels (extent, frequency, responsibilities etc.)
- Deliverable Documents

Quality related activities to be described, include, but are not limited to, the following:

a. extent of inspection
b. frequency of inspection
c. who should perform the inspection (responsibilities).
d. how the inspection should be performed (methodology, technology).
e. how the inspection should be documented (reporting, registering).
f. characterization of the quality activities (witness, hold, review, approval, etc).

Contracting Entity's inspectors and supervisors shall ensure that inspection and control exercised by EPC Contractor is being performed on an efficient and satisfactory manner.

Both Quality Assurance Manual and Quality Control Plan shall be provided to Contracting Entity in accordance with clause 8.1.2.3 of the Contract and no quality related work may start before these documents are approved by Contracting Entity.

Special care shall be taken by the EPC Contractor for the stringent implementation of the QA / QC system throughout the Engineering and Construction periods.

No activity will be considered by Contracting Entity as completed until all the necessary inspection has been performed, documented by EPC Contractor's QA department and accepted by Contracting Entity's inspectors. For Bulgarian Section this is with due

consideration of the functions of the Construction Supervision Entity, Design Supervision Entity, technical supervision, labour inspection, fire protection service, basin directorate etc.

In case that EPC Contractor has failed to follow the approved procedures for inspection and QA / QC, Contracting Entity may reject the concerned works. EPC Contractor shall provide inspection data books for all Equipment and performed erection works, relevant to mechanical, instrumentation and electrical equipment.

The Contracting Entity reserves the right to audit the EPC Contractor's quality system at any stage of the project. The EPC Contractor shall conform to the findings of those audits and take all necessary corrective actions.

The described QA / QC requirements shall be extended but not limited to, the following:

1. Pipe Welding Execution and Control
2. Welders Qualification Procedures (WPQ)
3. Welding Procedure Specifications (WPS)
4. Civil and structural works QA / QC
5. Piping / Mechanical works QA / QC
6. Electrical works QA / QC
7. Instrument & control works QA / QC
8. Coating works QA / QC
9. Painting Works QA / QC
10. DEG works QA / QC (Design Control)
11. FEG works QA / QC
12. Material procurement QA / QC
13. Construction works productivity reporting / controlling
14. Warehouse facilities management procedures
15. Computer Use for DEG, FEG and Site work.
16. EPC Contractor's Quality Surveillance of suppliers and other vendors based on and adjusted to their Scope of Work, foreseen risks, quality requirements stated in the contracts and purchase orders, levels of quality performance
17. Management system for identification and resolution of Non-Conformances, reporting and handling (observation: all non-conformances shall be verified for close-out by Contracting Entity in a timely manner prior to shipment/handover)
18. EPC Contractor's deliverables and the relevant Time Schedule linked to the Contract Commencement Date

Important Note: No material / equipmen will be installed in the project without being first reviewed and accepted, as depicted in the relevant documentation / certification, according to the requirements of this project.

On Bulgarian Section the role of the Construction Supervision Entity and the Design Supervision Entity shall be considered.

All Equipment, which will be incorporated in the project, should have CE mark.

2.5 Permits Acquisition

The EPC Contractor shall take into consideration that the permit situation in Greece and Bulgaria are different, because the legal requirements in both countries are very different and because the technical documents in both countries – FEED in Greece and TD in Bulgaria – are not on the same status.

2.5.1 General Requirements for Permit Acquisition

Apart from the Permissions obtained from the Contracting Entity from the relevant statutory authorities, it is the EPC Contractor's responsibility to prepare and properly stamp and sign as per Regulators' and Law requirements, all other required documentation, such as drawings, descriptions, calculations, etc. and to get Regulators' approvals and licenses, which are necessary according to the Greek and Bulgarian legislation for the performance and completion of the Works in compliance with the Contract.

In all cases, paid fees, expenses, time extension will be borne by EPC Contractor. e.g. Contracting Entity shall not suffer any cost for the obtaining of any Permissions or any extra cost due to delays in obtaining Permissions. In case that the involved Organizations or Regulators ask for guarantees, the EPC Contractor shall pay the expenses, fees, commissions etc., at his own care and cost.

The EPC Contractor shall submit all issued Permissions and licenses to the Contracting Entity.

The EPC Contractor incontestably shall provide all necessary guarantees to assure that he shall follow strictly all Specifications and guidelines of the Organizations or Regulators / infrastructure owners involved by performing all the necessary protective measure works (duct banks, cable protection, concrete sleeves, PVC sleeves, etc.).

For Bulgaria the requirements of the infrastructure owners, which are given in their approval statements, shall be strictly followed, same as requirements of the EIA, which are given in the EIA-Decision form the Ministry of Environment.

During the Works phase, as well as later during the operation of the system the EPC Contractor shall secure the safety of Contracting Entity regarding failures or damages to Contracting Entity’s property by the organizations’ or Regulators / infrastructure owners’ involved installations.

Any breaches of local / national working regulations, labour relations agreements, etc., are under the responsibility of the EPC Contractor.

The application to Power Supply Companies in Bulgaria and Greece by the EPC Contractor shall be for a permanent type of connection covering the full load electrical power consumption for each AGI operation in Contracting Entity’s name. In such case the EPC Contractor shall reimburse the cost difference between a temporary connection and the permanent one but he will be charged for the period of its mobilization until the Taking-Over Certificate is issued in respect of the Works.

The same principle shall be followed in all connections to other Public Utilities.

The EPC Contractor shall comply with the EIA decision and the requirements from the relevant Regulators related to the EIA decision as well in Bulgaria and Greece, as here usually are various restrictions and boundary conditions as well for the DEG and as well for scheduling construction and commissioning activities..

2.5.2 Permit Acquisition in Greece

The following documents are available or are expected to be available to the Contracting Entity prior to the Commencement Day and reflect the status of the Permissions procedure:

- FEED for the Greek Section
- EIA report in Greece and Decision of the Environmental Terms Approval
- Installation act
- Installation permit
- Prior to the Commencement Date the Contracting Entity will obtain also Licence for Independent Network Operator on Greek territory
- Memorandum of Agreement and Understanding with Greek Ministry of Culture

The terms of the above mentioned Documents are mandatory for the Project .

In Greece it is obligatory to have a Third Party Inspector (TPI), who is responsible for certification of materials and works according Greek law.

The TPI services are part of the services provided by the Owners Engineer.
EPC Contractor shall obtain all Permissions required from the relevant Regulators before execution of construction works. EPC Contractor shall develop the DEG documents accordingly.

During the DEG phase the EPC Contractor shall contact all relevant Regulators / infrastructure owners, public service / utilities organizations and public and land owners in order to define:

- the existence and location of all existing underground networks and installations (by obtaining the necessary updated network drawings),
- their requirements for design purposes with existing or future (planned) crossings with infrastructure, such as crossings with railways, highways, rivers, lakes, streams, channels, public utilities, etc.
- time periods and seasons for construction or other on-site activities, which effect the normal land usage and compensation payments to land users and owners.

Upon definition of all existing networks and aforementioned requirements, EPC Contractor shall prepare all necessary documentation, such as studies / calculations / drawings, etc. for the acquisition of Permissions for infrastructure crossings (existing or future) by all competent (public or not) service organizations / Regulators/ infrastructure owners / land owners.

EPC Contractor is then responsible to apply and obtain all required Permissions for crossings with existing or future infrastructure, such as roads, railways (boreholes, transversal borings, open cuts, exploratory excavations on roads, sidewalks or for crossing networks of other Public Service Organizations, etc.)

EPC Contractor is responsible to apply and obtain from relevant Regulators all required Permissions for the construction of all buildings included in his SOW. The EPC Contractor shall be responsible for handling all required procedures according to the Greek, including

resolution of Regulators comments. All technical documentation shall be submitted by EPC Contractor in digital form and required hard copies. The EPC Contractor shall submit a copy of the issued building permits, including all stamped permits documentation, to the Contracting Entity prior to commencement of any construction activity on site.

The EPC Contractor is responsible to apply and obtain from competent Regulators all required Permissions relevant to the AGIs (e.g. Building Permits).

EPC Contractor is also responsible to apply and obtain from relevant Regulators all required Permissions for the permanent (asphalt) paved access roads leading to the AGIs as applicable. Moreover, EPC Contractor has to inform the Regulators (e.g. the Forest Authorities, prior to entering in the Right of Way Zone in forest areas) and in general follow the Regulators' recommendations and instructions, in accordance with the applicable Laws.

In case of water pumping or dewatering, the EPC Contractor is responsible for obtaining authorizations for both pumping and discharge.

EPC Contractor is not required to provide any specific services regarding payments of Right of Way and no obligations regarding crops compensations. Nevertheless general obligations regarding Right of Way acc. local legislation are set out in DESFA technical job specification 499/1, *High pressure(HP) transmission systems, Site requirements*, (referred in para. 4 of this Technical Specification) and have to be followed by the EPC Contractor during construction.

According the Archaeological Surveys in Greece, EPC Contractor has the following obligations and duties:

- EPC Contractor shall take into account all provisions defined in "*Memorandum of understanding and cooperation by the Ministry of culture and sports and ICGB for the natural gas interconnector Greece-Bulgaria (IGB)*" (attached to this Technical Specification), which shall liaison with Contracting Entity and relevant Regulators concerning archaeological monitoring and excavations during performing of the Works.

- EPC Contractor personnel performing the construction works is required to follow the directives of designated officials, of the Ministry of culture and sports, in regards to the manner and means of work, as well as, where appropriate, with regard to the type of machinery.

- If presence of antiques is identified during trial excavations or during the course of work, EPC Contractor shall cease works immediately, to be followed by salvage archaeological excavations.

- EPC Contractor is responsible for promptly delivering spaces in which archaeological research is to be conducted, fenced and free of any network, vegetation, or newer construction on his own costs.

- EPC must take all measures necessary for monitoring and prevention of damage to existing monuments that are adjacent to the project zone.

- On request of Contracting Entity due to his obligations following from the signed memorandum mentioned above, EPC shall ensure personnel, necessary infrastructure (machinery, tools and materials), transport, storage, additional office space and security of the site throughout the duration of the archaeological monitoring and excavations, for which it will be reimbursed through the provisions envisaged in the Contract.

The EPC Contractor shall prepare a draft file which shall be attached to the application for issuance of the Greek Operational Permit, proceeding also to all necessary actions in order to be finally completed.

2.5.3 Permit Acquisition in Bulgaria

For the Bulgarian Section the major part of the Permissions and approvals are available before the start of the construction works.

The permit situation in Bulgaria before starting the Works shall be considered as follows:

1. Environmental Impact Assessment (EIA) is finalized and approved from the Ministry of Environment and Water.

2. Spatial Development Plan (SDP) is finalized and approved from the Ministry of Regional Development and Public Works.

3. Technical Design (TD), including details for all known crossings at that stage is finalized and approved from the Ministry of Regional Development and Public Works.

4. Approvals from third party owners of infrastructure, Regulators and operators of installations are all done for the stage of TD. All documents and conditions related to these approvals are included in the TD.

5. Preliminary contracts with utilities suppliers (water, electricity, etc.) are finalized and will be provided to the EPC Contractor.

6. Construction Permit (CP) is issued from the Ministry of Regional Development and Public Works and is available for the EPC Contractor.

EPC Contractor shall consider that all activities during construction process according Permissions are quite strictly regulated among others by the Spatial Development Act (SDA) and the Environmental Protection Act (EPA)

The Spatial Development Act is a legal document and has to be followed.

Some examples for requirements are:

- The EPC Contractor has to coordinate DEG, FEG, FTD and construction works with the Construction Supervision Entity and Design Supervision Entity.

- Opening of construction site, Interruption of construction works, acceptance protocols etc. are regulated in the applicable legislation (acts and ordinances), and must be observed.

- All documents of DEG, FEG and FTD need to be signed and stamped by licensed Designers with full designer capacity acc. the chamber of architects and the chamber of engineers in investment design, acc. the Bulgarian legislation and SDA.

- All changes of the design in any phase need to be approved by the Design Supervision Entity and coordinated with the Construction Supervision Entity. Major changes in DEG according TD shall be approved in compliance with art. 154 of SDA and requires additional Permissions procedures.

The EPC Contractor shall:

- analyse the state of the available Permissions and especially all requirements for DEG and construction works resulting from granted Construction Permit, EIA approval, and any preliminary contracts.

- update the DEG documents accordingly, if required

- acquire all additional approvals and Permissions from Regulators and owners of third party installations necessary for the construction works before starting the related construction works and to pay all costs.

- Inform local municipalities and all affected Regulators, entities, land owners or land users for starting any construction activity

EPC Contractor must comply with applicable Laws and ordinances / acts and must comply with all statements, opinions and preliminary contracts received during the approval process for construction permit.

The coordination between all participants in the Permissions process, as well as the EPC's interaction with the rest of the stakeholders shall be ensured by the Contracting Entity through the OE.

EPC Contractor duties regarding compensation of land owners / users for crop loss during construction are as follows:

- Acting on behalf of Contracting Entity
- Analysis of the affected plots based on the SDP (ПУП)
- Proper identification of land owners/users
- Calculation of the compensation payments, following the applicable legislation, methods and procedures by licensed appraiser/s, that are to be hired by the EPC Contractor.
- Agreement with the land owners / users
- Presentation of the results of the compensation procedure to Contracting Entity in order to obtaining approval for the proposed payments
- Payment of the compensations to the affected land owners/users by the Contracting Entity

The EPC Contractor shall make cadastre photographing of the newly constructed gas pipeline, which shall include the easement areas, the sites thereto, etc. for issuing the certificates under the Act on Cadastre and property register with reference to art. 175, par. 5 of the SDA.

Archaeological surveys are obligatory in Bulgaria according SDA, but **are not** yet done. The Archaeological surveys will be ordered by the Contracting Entity and are **not** within the scope of the EPC Contractor.
The archaeological survey will start prior to construction and shall be monitored by the EPC Contractor. If necessary, the EPC shall adjust its construction schedule in areas where archaeological activities are planned in order not to stop or restrict the ongoing archaeological activities.

2.6 Equipment procurement, storage, transportation & handling – general requirements

2.6.1 General

The supply of all Equipment and services required is included in EPC Contractor's scope of work, unless otherwise specified.

The EPC Contractor will also supply all consumables, as needed for the execution of the Works.

The EPC Contractor shall submit a supplier list and a procurement plan covering all Equipment, instruments, materials, engineering and erection services, etc. The supplier list shall be considered as an important contractual document. The both documents mentioned above are subject of evaluation by the Contracting Entity regarding quality, reliance and time frame of the Project activities.

For the Greek Section EPC Contractor shall ensure that all purchased Equipment procured by him and to be incorporated in the Project shall be supplied with the relevant certificates in accordance with DESFA's Technical job specification 970/2, *High pressure (HP) transmission systems, Shop inspection of Equipment for NGT project*

The said job specification includes a list with Equipment for which the requirements of the specification for certification shall be followed. The relevant certification costs shall be included in the Contract Price.

If there is a difference between said job specification and the Project specifications regarding the norms and standards according which the Equipment is specified, then the norms and standards from the Project specifications shall prevail.

For the Bulgarian Section the EPC Contractor shall ensure that all Equipment shall be provided by him with certificates in accordance with the required quality and origin certificates as well as compliance certificates in accordance with the applicable ordinances on major requirements under the *Act on technical requirements for products* and the *"Ordinance on structure and safe operation of the transmission and distribution gas pipe lines and on the facilities, installations and instruments for natural gas"* and any other requirements according Bulgarian legislation, if applicable.

In addition, for the Bulgarian Section, all pipes and pipe line components (definition according BDS EN 1594) falling under the Bulgarian "Ordinance on structure and safe operation of the transmission and distribution gas pipe lines and on the facilities, installations and instruments for natural gas'' shall be supplied with certificates Type 3.1 acc. BDS EN 10204. If the said pipes and pipe line components are greater than DN 200 or made from grades with specified minimum yield strength greater than 360 N/mm^2 then they shall be supplied with certificates Type 3.2 acc. BDS EN 10204.

The relevant certification costs are included in the Contract Price.

It is to be noted that the quantities of materials (material take off (MTO) provided by Contracting Entity are as accurate as the design phase and legislation and good engineering practice require. The EPC Contractor shall review, verify and update the MTO's from FEED and TD prior to start procurement process and shall adjust the final content of MTO's according DEG taking into consideration the exclusions specified at section 2.7.2.

All the Equipment, Contracting Entity's supply and EPC Contractor's supply, shall be loaded on trucks and transported from EPC Contractor's storage yard to site on EPC Contractor's

care and cost. For all cases EPC Contractor must take care for the coating not to be defected during all installation works.

The EPC Contractor shall give special attention to the storage conditions of the sensitive Equipment and especially to the electrical and instrumentation equipment, so that to avoid undesirable damages and / or defects during the construction of the project.

EPC Contractor shall provide, as a minimum, the procurement and related services listed hereunder, including but not limited to, purchasing, contract control, expediting, inspection and testing, shipping, delivery and storage from source to the site, as necessary to complete the construction and all other aspects of the Works.

EPC Contractor shall ensure that all Equipment supplied for the Works are brand new, of the best quality, in strict compliance with the characteristics, requirements, drawings, material requisitions, Specifications, data sheets and project standards issued and fully suitable for the intended use.

Furthermore, the EPC Contractor shall proceed to:

- Issue the Equipment Procurement Register (EPR), indicating the type and quantity of Equipment to be received at site.
- Administer the field warehouse(s) and the site expedition working groups.

The EPC Contractor shall provide guarantees for all Equipment, which are included in his scope of supply for the services included in this SOW. Guarantee period for each purchased Equipment shall be as per the Contract.

The EPC Contractor shall ensure upon his responsibility that the selected Equipment are fully compatible with the engineering documents and design basis of the project and shall provide all the necessary guarantees for the entire IGB Project pipe line installation, as specified in relevant sections of the Contract.

The Contracting Entity's approval of all Equipment proposed by EPC Contractor is required, prior to EPC Contractor's commitment with any supplier,

Regarding EPC Contractor's supplied Equipment, supply of Equipment not approved by authorized international organizations and companies or not properly tested as well as newly inserted in the market will not be accepted. Only Equipment with proven application for the intended operation and use period could be selected. Equipment's proven application time period is defined as the continuous operation for a minimum of two years' time without breakdowns for similar duties and operating conditions at another natural gas network system in the European Union.

2.6.2 Uniformity of Equipment

Special attention shall be paid by EPC Contractor, in order to assure uniformity of the Equipment all over the IGB Project pipe line installation.

Similar Equipment (instrumentation, electrical equipment, electronic equipment (switches, routers, valves etc.) shall be supplied by the same suppliers / manufacturers approved by the Contracting Entity, in order to minimize quantities and varieties of spare parts and to facilitate the spare parts interchangeability and the maintenance of the IGB Project pipe line installation.

This requirement also applies to Equipment supplied by various suppliers as packaged units. It shall be the EPC Contractor's responsibility to notify its suppliers about the sub-suppliers they should use.

2.6.3 Procurement planning

The Equipment and quantities provided in the Bill of Quantities, which are included in the technical documentation, shall be finalized by the EPC Contractor during DEG.

Procurement planning shall be determined by final DEG engineering and construction requirements.

Within sixty (60) Days from the Commencement Date, the EPC Contractor shall forward to Contracting Entity the detailed procurement plan. The plan shall include a detailed schedule of procurement with respect to the project procurement functions and their respective duration. This plan shall also be developed in conjunction with the project-scheduling group for the timely and efficient procurement of Equipment. The plan shall define all procurement activities necessary to ensure that:

- Necessary supplier data is received in time to finalize the detailed design
- Inspection and Third Party Approval / Inspection activities to be completed in time prior dispatching.
- All Equipment items to be delivered to the Project Jobsite prior to their "Required at Site" dates and that the construction requirements for Equipment are addressed in the proper sequence to complement planned field construction activities.

Planning shall cover coordination and execution of overall transportation activities for timely receipt of all Equipment.

The EPC Contractor shall prepare, maintain and issue to Contracting Entity on a monthly basis an "Inquiry Status Report", as stated in the Chapter “Reporting” as part of the MPR.

2.6.4 Procurement and contracting

The EPC Contractor’s procurement and contracting responsibilities comprise, without limitations, the following:

- EPC Contractor shall submit project specific Procurement Procedures for Contracting Entity’s review and approval. EPC Contractor’s final project-specific Procurement Procedures shall be submitted for review and approval by Contracting Entity within 30 days of the Commencement Date.
- EPC Contractor shall comply with mandatory Contracting Entity approvals and / or participation during the execution of the activities.
- Depending on the section (Greek or Bulgarian), all foreign firms / suppliers must comply with Greek and / or Bulgarian Law and satisfy Greek and / or Bulgarian regulations concerning Regulators' requirements.
- In all cases recommended suppliers shall satisfy Contracting Entity’s requirements regarding ISO 9001.
- EPC Contractor shall ensure that all Warranties / Guarantees accrued shall be assigned to Contracting Entity after completion of the Project.
- EPC Contractor shall coordinate and interface with Contracting Entity

- EPC Contractor shall perform, organize and coordinate transportation of Equipment with custom clearance, transportation and document handling activities. EPC Contractor shall be responsible for ensuring that all traffic activities are performed efficiently from point of export to the storage areas of Equipment on the site.

- EPC Contractor shall procure Commissioning and start-up spares as may be deemed necessary during this stage of the Work. The cost of Commissioning and start-up spares shall be included in the Contract Price.

- EPC Contractor shall secure all special tools and construction equipment required for the installation, testing, commissioning, start-up, operation and maintenance of Equipment

2.6.5 Purchasing

The EPC Contractor's purchasing responsibilities comprise, without limitations, the following:

a. EPC Contractor shall purchase Equipment as per approved Specifications and in accordance with procurement plan and schedule.

b. The procurement shall cover both Permanent Works, as well as Temporary Works

c. EPC Contractor shall purchase Equipment only from the supplier list mentioned in PEP's requirements.

d. EPC Contractor shall select known / recognized firms, having QA / QC structures, having a good repute and possessing the necessary organization, skilled manpower and adequate manufacturing facilities to deliver, in accordance with the market standards and the agreed procurement schedule. Preliminary approval on the above-mentioned suppliers must be obtained from Contracting Entity.

e. Single-source selection of suppliers shall be subject to Contracting Entity approval and should be restricted to a minimum, should apply only to bulk materials, simple static equipment and items of a general nature. Contracting Entity shall be provided with all information required herein for approval by Contracting Entity

f. Each order shall include appropriate provisions to permit the inspection of the ordered parts at manufacturer premises by Contracting Entity / Contracting Entity Representative or appointed inspection consultant

g. EPC Contractor shall make no material or manufacturing method substitutions without prior approval by the Contracting Entity/Contracting Entity Representative.

h. Perform all post award administrative and procurement activities until purchase order closeout.

i. In case of deviation of the supplied equipment to the Contracting Entity's requirement the EPC shall inform the Contracting Entity accordingly and get the relevant approval to proceed or otherwise replace the supplier and/or Equipment.

Approval of any supplier by Contracting Entity / Contracting Entity Representative shall not relieve the EPC Contractor from any obligations under the Contract with respect to conformance with stated requirements and shall be without prejudice to Contracting Entity/Contracting Entity Representative's rights of approval under the Contract.

2.6.6 Expediting

EPC Contractor shall perform all expediting of Equipment; supplier data, personnel and documentation from invitation to bid through delivery at Site for those Equipment purchased by EPC Contractor and those goods sub-ordered by suppliers for the Works.

EPC Contractor shall similarly expedite all replacement Equipment and associated documents, which are the subject of guarantee or insurance claims. Such expediting shall be performed as necessary for the duration of Contract.

EPC Contractor shall maintain updated records of expediting efforts and report information and results obtained on “Inquiry Status Report”.

EPC Contractor shall report any unreasonable slippage from the Project Schedule which may affect the overall Project Schedule, with reasons for the delay, at which time Contracting Entity/Contracting Entity Representative will have the right to:

- Jointly expedite the supplier.
- Instruct EPC Contractor to place a full time expeditor in the supplier’s facilities at no additional cost to Contracting Entity.

2.6.7 Inspection and testing

The EPC Contractor shall be responsible for conducting all source inspection requirements and coordinating with the Third Party Inspector / third party inspection consultants approved by Contracting Entity in the performance of all source inspection activities.

EPC Contractor shall prepare and provide to Contracting Entity / Contracting Entity Representative a coordination procedure, as described in and in accordance with clause 8.1.2.5 of the Contract, for inspection and for coordination with Contracting Entity / Contracting Entity Representative team.

EPC Contractor shall submit to Contracting Entity / Contracting Entity Representative, written reports on inspections carried out, in sufficient detail for Contracting Entity / Contracting Entity Representative to monitor the effectiveness of inspection.

Reference is also made to relevant Specifications and other Contract Documents.

Any Non-Conformity during testing and inspection need to be reported to the Contracting Entity. Corrective measures shall be planned by the EPC Contractor and shall be given to the Contracting Entity for approval before execution.

The Non-Conformities shall be treated according the EPC Contractor’s quality management system, especially preventing measures for similar process steps in the project shall be developed.

2.6.8 Delivery and storage

The EPC Contractor is responsible to construct / install, organize, maintain and operate during the construction period appropriate open, sheltered and - where required - (indoor) storage areas for IGB Project pipe line Equipment storage, in compliance with Specifications and Contract requirements, which shall be subject to Contracting Entity’s approval.

The EPC Contractor’s delivery and storage responsibilities comprise, without limitations, the following:

1. EPC Contractor is responsible for the on time delivery of all Equipment and their safe storage at site, prior to incorporation into the Works.

2. EPC Contractor shall prepare and monthly update and forward to the Contracting Entity a Equipment Delivery Program indicating supplier, country of origin, delivery time and delivery point (location), as well as a detailed Equipment status showing also storage area, incorporation in the Works, etc.

3. EPC Contractor shall be responsible for transportation of Equipment to their final positions. Incorporation of the Equipment into Works is EPC Contractor's responsibility.

2.6.9 Spare Parts and consumables

The EPC Contractor's scope of work includes the supply of the following categories of spare parts:

- Spare parts and consumables for pre-commissioning and commissioning.
- Spare parts and consumables for startup and test runs required.

The EPC Contractor shall provide Spare Part Lists for two (2) years operation, including pricing information, based on the recommendations of the manufacturers. The Spare Part Lists for the two (2) years operation shall be approved by Contracting Entity. Before placing relevant purchase orders, the EPC Contractor shall include an option for the supply of such Spare Parts and consumables in the purchase order.

The Contracting Entity may exercise the option included in the purchase order at any time at its own costs.

Spare parts data shall include, but not limited to, a fully detailed Bill of Material listing of all potentially required spares or replacement items or consumables for the anticipated life of the Equipment.

EPC Contractor shall prepare a Spare Parts Assessment report (SPAR) for each manufacturer or supplier.

SPAR shall include, as a minimum:

1. Criticality rating of the Equipment and level of installed redundancy
2. Time of acquiring any necessary spares/availability from stock or built to order
3. Prediction of the need for spare parts
4. Ability to repair the part versus replacing it
5. Spares cost and expected usage/turnover rates
6. Impact on safe operation
7. Shelf life
8. Recommended initial purchase quantities

EPC contractor shall collate all Spare Parts and SPAR records into a composite data file in an electronic format.

During the Defects Notification Period and until the Performance Certificate is issued, the EPC Contractor shall, wherever and whenever necessary procure, purchase, transport and deliver at his own cost and expenses all Equipment necessary for repairing and replacing any defective Equipment for which the EPC Contractor shall be liable under the Contract.

However, during such period, the EPC Contractor may borrow any necessary Spare Parts and Special Tools and consumables from the Contracting Entity’s stocks, provided under the terms here below that such items are available. The EPC Contractor shall promptly replace the borrowed items, at no cost to Contracting Entity's stocks.

Nevertheless, the EPC Contractor at his own cost and expense is responsible for making available on sites of all necessary Equipment, accessories, Spare Parts and Special Tools and consumables to perform his part of the inspections and / or tests set out in the Contract .

2.7 Material procurement - Line pipe DN800

2.7.1 General

The SOW of the EPC Contractor excludes the delivery of Line Pipe with nominal diameter DN800. This Line Pipe will be delivered by the Line Pipe Supplier under a parallel running contract with the Contracting Entity.

The EPC contractor is responsible of the review and amendment of the Line Pipe quantities during detailed design in accordance with clause 4B of the Contract.

Contracting Entity, EPC contractor and Line Pipe Supplier shall reasonably agree an overall integrated Line pipe manufacturing and delivery schedule, in accordance with clause 4B of the Contract.

2.7.2 Excluded Scope

The type and amounts of pipes which are to be delivered by the Line Pipe Supplier are specified in the *Bill of Quantities - line pipe DN800* and is attached to this Technical specification.

It is EPC Contractor's obligation regarding the Line Pipe amounts to check the initial quantities of Line Pipes to be ordered by Contracting Entity in the MTO Line Pipe after review of the Technical Documents and as part of preparation for detailed design. EPC Contractor shall amend if necessary the initial quantities of Line Pipes in accordance with clause 4B.1.2. of the Contract EPC shall provide the necessary amendments not later than one (1) month after Commencement Date.

During the Detail Design Phase DEG the EPC Contractor shall check the ordered amounts and is fully responsible for providing required correction of the amounts of each of the specified types of line pipe DN800, taking in account the provisions of SDA in Bulgaria regarding changes in TD, and provided that no change to any Pipe Length Ratio shall be made less than 3 months, and no change to the quantity of any Type of Line Pipe shall be made less than 4 months, prior to the last Guaranteed Delivery Date in respect of the relevant type of Line Pipe, and the restrictions at clauses 4B.1.2.4 and 4B.1.2.5 of the Contract shall apply to any such proposed change

Any consequences from shortage of Line Pipe during the Project shall be deemed as a responsibility of the EPC Contractor.

Line pipe DN800 for the HDDs is not excluded and remains in the scope of the EPC Contractor.

2.7.3 Delivery schedule monitoring

The Delivery Periods and completion dates for delivery of the Line Pipe are set out in the preliminary delivery schedule attached to this Technical specification.

The EPC Contractor shall monitor the Line Pipe production progress to assure the delivery dates or to initiate in-time measures to avoid extra cost due to shifted delivery dates.

The results of the expediting the Line Pipe delivery have to be a part of the monthly progress report of the EPC Contractor.

The EPC Contractor shall follow all expediting obligations outlined in the Specifications as well for the line pipe DN800.

2.7.4 Inspection and testing

According to the Specifications the Line Pipe has to be tested at the pipe mill before delivery to site.

The EPC Contractor shall participate in quality inspections during on-site inspection and acceptance of the Line Pipes at the defined Delivery Points initiated by the Contracting Entity in accordance with clause 4B.2.5 of the Contract and shall check all quality documents of the Line Pipe DN800.

Any defects detected in the Line Pipe after take-over by the EPC Contractor of that Line Pipe (on issuance by the EPC Contractor of the Site Acceptance Certificate for that Line Pipe), which was apparent or reasonably discoverable from the EPC Contractor's inspections to be carried out pursuant to this Contract, shall be deemed as a responsibility of the EPC Contractor. Clause 4B.2 of the Contract deals with defects in the Line Pipe which were not apparent or reasonable discoverable from those inspections.

The EPC Contractor shall check the completeness and content of all documents necessary to fulfil his obligations according quality, Permissions, and technical documentation before taking over the Line Pipe.

2.7.5 Delivery and storage

All Line Pipe DN800 for the Bulgarian Section will be delivered to maximum 3 different Delivery Points at pipe yards along the trace between Stara Zagora and the last train station in Podkova – 35 km South from Kardzhali. The location of pipe yards, construction camps, etc. shall be in accordance with the EIA Decision.
For the Greek Section the Line Pipe DN800 shall be delivered to one Delivery Point at pipe yard close to the train station Komotini – distance not more than 20 km.

The delivery to the Delivery Points is part of the contract of the Line Pipe Supplier.

The EPC Contractor has to select the pipe yards and Delivery Points accordingly, after approval by the Contracting Entity, and notifies the Contracting Entity in accordance with clause 4B.1.1. of the Contract.

The EPC Contractor has in his SOW:

1. Providing the pipe yards including selection, agreement with owners, Permissions from Regulators, construction, operating and maintaining the storage sites – Delivery Points – in compliance with the Specifications.
   The final location of the pipe yards has to be communicated to the Contracting Entity no later than 2 months following the Effective Date.

2. Unloading of the pipes at the Delivery Points and take-over of full responsibility of the pipes. The EPC Contractor has to provide all machines and devices for a secure unloading according the Specifications.

3. Contracting Entity and EPC Contractor will execute the inspection at the Delivery Point and at the time of handover, check the pipes for damages and in case of detected damages document them in a quality report.

4. Contracting Entity and EPC Contractor will sign a Site Acceptance Certificate (for Bulgaria Act № 9 under Ordinance 3 on issuing of act and protocols in the construction). The Site Acceptance Certificate shall evidence that EPC Contractor accepts the pipes

at its Delivery Point and becomes responsible for Line Pipes storage, handling and further use.

5. The results of the inspection and the signature of the Site Acceptance Certificate will be the base for the Line Pipe acceptance and elaboration of Provisional Acceptance Certificate between Contracting Entity and the Line Pipe Supplier.

6. All measures required for roads to make sure, that all Delivery Points are accessible, even for trucks transporting 18m Line Pipe.

7. Transport from pipe yard and/or Delivery point to the site or to further local storage places.

8. Distribution of the Line Pipe along the trace to their final positions and incorporation of the Equipment into Works.

The preliminary delivery schedule for the Line Pipe DN800 is attached to this Technical specification. The schedule will be updated in accordance with clause 4B of the Contract.

2.8 Construction

2.8.1 General

EPC Contractor shall be responsible for all construction works as required by the Contract, in accordance with the drawings, Specifications and program of the Works, and all applicable Laws.

EPC Contractor shall comply with the requirements of all applicable Laws relating to all aspects of the Contract scope and all other statutory regulations, standards and codes of practice specified in the Contract and applicable to the Works.

For the Bulgarian Section the TD (Volume XI) has a part for “Organization of Construction Works” which shall be followed. Furthermore, for the Bulgarian Section the EPC Contractor shall exercise all functions and bear the responsibilities set in art. 163 SDA and shall hire the persons required by art. 163a SDA, as well as shall bear full responsibility according to art.168, para.7 SDA.

A copy of all regulations, standards and codes of practice referred to by name or number in the Contract shall be retained on site by the EPC Contractor.

EPC Contractor must obtain Contracting Entity’s written approval prior to any interference with the facilities being constructed by others.

EPC Contractor is responsible to construct and erect the entire Works. Under EPC Contractor’s overall responsibility, EPC Contractor and its suppliers will execute all construction and erection works for civil, structural, piping / mechanical, instrument & control, electrical, field coating and painting, as well as any relevant work, necessary for the safe and even completion of the Works.

During the execution of the above mentioned works, the following tasks shall be performed:

1. EPC Contractor shall provide a dedicated project team to perform the Work consisting of all required Key Personnel, other Personnel, support facilities and service sufficient to manage , control and execute the Works in accordance with the requirements of the Contract

2. Key Personnel shall be assigned full time to the Works and shall not be re-moved/demobilized without approval

3. Immediately following the Commencement Date, EPC Contractor shall submit for Contracting Entity’s review and approval a Key Personnel and Personnel Mobilization Plan.

4. Prior to commencing any work, EPC Contractor shall survey the areas of work and verify the survey drawings provided by Contracting Entity.

5. EPC Contractor shall prepare a coordinated and comprehensive construction and erection schedule, in accordance with the project control procedures, taking all necessary steps to make sure that the construction and erection suppliers shall adhere to it.

6. EPC Contractor shall provide all temporary works necessary to complete the permanent works. The Works associated with the temporary works shall be in accordance with the Contract, particularly with reference to health and safety.

7. EPC Contractor shall provide all necessary assistance and adequate technical supervision for ensuring strict compliance with all construction and erection Specifications by its own staff and suppliers.

2.8.2 Mobilization/Demobilization – EPC Contractor's general obligations

EPC Contractor's SOW shall include, at least, but not limited to, the following:

1. Supply and install at his own care and cost field temporary facilities and camp, change room(s), canteen(s), toilette facilities, etc.; organise material's warehouse according to Specifications.

2. Provide first aid support measures and medical attendance according to the local regulations and legislation (Greek and Bulgarian respectively) for all the site personnel. Moreover provide safety equipment and training for all site personnel.

3. Provision of a safe site in compliance with all relevant EU and local / National legislation.

4. Supply and distribute within his field facilities and to the erection site all utilities (electrical power, telephone, potable water, air, etc.) in order to cover all needs of the Works.

5. Maintain a clean Site, collect and dispose all wastes and scraps according to Contracting Entity's instructions and applicable legislation (e.g. permissions by relevant municipalities).

6. Dispose, at EPC Contractor's expense, all unsuitable or unused materials from the earthworks to licensed dumps.

7. Supply specialized manpower to perform erection activities and technical manpower to develop at site any documentation necessary for erection purposes.

8. Supply all temporary equipment, tools, consumable materials, erection equipment and scaffolding for a perfect and timely execution of the Works.

9. Provide communication facilities to site offices (telephone, fax, e-mail, etc.).

10. EPC Contractor shall provide Site Office facilities and Site Cars as specified in *Offices, facilities and vehicles for contracting entity use* (attached to this Technical Specification).

11. Reinstate the areas of works after completion, with all required landscaping, paving and repairing works.

The contract is co-financed with funds from the European Energy Program for Reconstruction (EEPR).

Except as otherwise specified in the EEPR publicity and visibility requirements, the EPC Contractor shall place in the beginning of the construction period five (5) billboards at locations, indicated by the Contracting Entity, along the length of the pipeline route.
At the end of completion of the Works the 5 billboards shall be by replaced with five (5) commemorative plaques (in accordance with the EU rules on co-financed project).

- The dimensions of the billboards shall be: 4 m wide and 2,45 m high.

- The dimensions of the commemorative plaques shall be: 70 cm wide and 50 cm high.

The location of these boards shall be agreed with the Contracting Entity. They could be for example in Bulgaria –the Dispatching Centre, AGRS Dimitrovgrad, AGRS Kardjali, GMS Stara Zagora and in Greece – GMS Komotini.

2.8.3 Health, safety and environmental (HSE)

EPC Contractor shall be responsible for all aspects of HSE at worksites through all the stages of development of Detailed Engineering (DEG), Field Engineering (FEG), Procurement, Construction up to the completion of the Permanent Works. This responsibility shall extend to all Sub-contractors managed by EPC Contractor in executing the Works.

EPC Contractor shall plan, develop, implement and monitor all HSE activities on behalf of the Contracting Entity, in accordance with Works Contract

EPC Contractor shall demonstrate HSE leadership and management commitment to achieve the HSE policy goals, compliance with national and European Legal and Regulatory requirements and the application of the HSE Manual and HSE Plan

In addition to any other HSE requirements set out in the Contract the following shall be applicable.

- EPC Contractor is obliged to care and comply with the relevant Greek, Bulgarian and European Union's legislation regarding the safety measures to be taken during the execution of the Works.
- The system shall be in accordance with OHSAS 18001: 2007 or equivalent and ISO EN 14001:2004 or equivalent.
- In Bulgaria the *Ordinance № 2 from 22.03.2004 on the minimum health and safety requirements in carrying out construction works* must be followed, but not limited to.

EPC Contractor shall prepare and provide to Contracting Entity a detail schedule, according to which the HSE Documentation shall be submitted for review / approval by the Contracting Entity.

EPC Contractor shall clearly define communication protocols for managing HSE interfaces with Suppliers.

Communication with external parties shall be through Contracting Entity 's communication representative or its delegate.

2.8.3.1 EPC Contractor's HSE documentation

EPC Contractor shall prepare and submit for review and approval to Contracting Entity within a month from the Commencement Date, the HSE Documentation described in the following sub-chapters.

EPC Contractor will not be allowed to perform any construction activities, if subject documents have not been approved by Contracting Entity, unless otherwise agreed, exceptionally and only in writing.

2.8.3.1.1 HSE Manual

(HSEM) Describes the HSE philosophy which shall be followed by EPC Contractor for the execution of the Works. The HSEM shall fulfil and comply with all the regulations, requirements, lawful instructions, etc. of the Bulgarian, Greek and European Union legislation. Furthermore, the HSE personnel organization (responsibilities, specialties, assignments, communication lines, etc.) shall be also illustrated in the HSEM.

The minimum requirements (components and content) for the HSEM are:

1. Performing HSE policy

2. Description of EPC Contractor's HSE organization (including legal requirements for Safety Technician, Safety Coordinator during the design phase and Safety Coordinator during the construction phase), delegation of HSE responsibilities, provisions for training, information, consultation and HSE meetings (purpose, scope, level, regularity, recording and keeping minutes of meeting) to be specified.

3. Planning and implementing systems including:

    a. List of HSE standards, procedures and Specifications (including statutory and contractual requirements) applicable to the Project;

    b. Reporting, recording and analysing accidents and/or incidents;

    c. HSE studies performed or a list of the ones to be performed;

    d. Control and monitoring system (forms) of HSE performance;

    e. Risk assessment

    f. Decision making flow chart;

    g. A table providing activities, related risks and related HSE measures to be taken;

    h. HSE study for hydro test;

4. HSE Audit method. EPC Contractor shall perform HSE audits at intervals of 30-45 days maximum. A report shall be issued and will be available to Contracting Entity upon its request.

5. Typical Traffic Arrangement Study (TTAS) shall be submitted to Contracting Entity for review. TTAS shall refer to the Specifications, describe method(s) for traffic deviations and rerouting) specify minimum signing, guarding and lighting requirements, specify minimum bridging requirements and refer to any other related topics. TTAS shall be then submitted to the traffic police authorities for review and acceptance.

6. Specify provisions for evaluating, reviewing and revising of written HSE Management System including the method and regularity.

EPC Contractor shall ensure that Sub-contractors develop and implement their HSE Management System in line with EPC Contractor's HSE Management System. The HSE documentation to be developed by EPC Contractor shall be suitable for Sub-contractors for use. EPC Contractor shall develop HSE rules applicable for all worksites The HSE Management System shall be reviewed and improved as required.

EPC Contractor shall develop and implement a common risk management process that shall be followed by Construction personnel and Sub-contractors. EPC Contractor shall ensure that the personnel at all levels of the organizations of EPC Contractor and Sub-contractors understand, manage and prioritize operating risks and implement risk reduction measures to prevent accidents and harm to people, damage to property and harm to environment.

HSE Policy goals are to achieve zero harm to people and assets, and zero environmental incidents. The policy and goals can be achieved by:

a. complying to applicable laws, regulations and standards, Authority requirements.

b. consulting and seeking contribution from all organizations involved on issues that have the potential to affect the health, safety and environment

c. leading, training and motivating Contracting Entity and EPC Contractor personnel involved in the completion of Works, to work in a safe and responsible manner

d. identifying, assessing and managing risks that impact health, safety and the environment prior to commencing activities or when circumstances change

The HSEM is issued in the English language. Should any part of the HSE manual be addressed to personnel not fluent in English, then these parts of the HSE manual shall be translated in their language by EPC Contractor.

2.8.3.1.2 HSE Plan

(HSEP) Describes in a tabulated format the standard HSE control system according to which the HSE procedures shall be applied. The HSEP shall be issued, so that all the construction activities related with the site development works, such as, ROW preparation, line pipe stringing, excavation, trenching, backfilling, lowering of the pipe, welding and welding inspection, coating, hydro testing, piping works, structural and concrete works, mechanical & electrical works, instrumentation works, equipment erection / installation, painting transportation, storage and handling of the Equipment, etc. to be efficiently monitored. Reference to the applicable legislation, codes and standards (per each activity) shall also be made.

More specifically, HSEP shall present in a table format the following information:

1. Activity

2. Specifications (what Specifications shall be considered for the subject activity)

3. Level of control (who is responsible to perform an inspection, how often)

HSEP is issued in the English language. Should any part of the HSEP be addressed to personnel not fluent in English, then these parts of the HSEP shall be translated in their language by EPC Contractor.

2.8.3.1.3 HSE Procedures

(HSEPR) Describe the specific application of EPC Contractor's HSE System. The HSEPR shall be prepared and issued for all main activities to be undertaken and shall include all the measures to be taken during the construction works development.

More specifically, HSEPR shall include indicatively (as applicable), but not limited to:

1. Works in urban areas, if any

2. Routing

3. Deforestation

4. Excavations/backfilling /reinstatement/ explosives

5. Formworks and concrete works

6. Scaffolding and ladders
7. Lifting appliances gear and activities
8. Electrical activities installations and Equipment operation
9. Mechanical Equipment
10. Welding
11. Radiographing
12. Asphalt works
13. Chemical substances, if any
14. Night works
15. Permit to work
16. Work in confined spaces
17. Transportation
18. Coating/sand blasting
19. Pipe laying
20. Pressure vessels
21. Fire safety
22. Accident occurred
23. First aids
24. Working in roofs
25. Storage
26. Sanitary facilities
27. Noise control
28. Etc.

It may not be necessary to prepare an HSE procedure for one of the activities mentioned above if an HSE assessment provides adequate justification following Contracting Entity's approval.

HSEPR are issued in the English language. Should any part of the HSEPR be addressed to personnel not fluent in English, then these parts of the HSEP shall be translated in their language by EPC Contractor.

2.8.3.2 HSE organization

1. EPC Contractor shall nominate as responsible for all Works HSE issues the EPC Contractor's HSE Manager. The HSE organization including key personnel shall be submitted to Contracting Entity for approval. The HSE organization including key personnel shall be submitted to Contracting Entity for approval. Part of the duties of the EPC Contractor during the construction on the Bulgarian territory is the appointment of HSE Coordinator according the requirements of the Ordinance No.2 from 22nd of March 2004 in Bulgaria. The appointed person shall have the expertise and responsibilities set out in the relevant legislation.
   EPC Contractor shall give special attention to the appropriate HSE System implementation, incorporating to his construction involved personnel, specialized dedicated HSE Engineers, on a full time basis, having certified experience and University Level education

2. EPC Contractor shall develop an HSE Organization and provide HSE personnel. Reporting line, roles and responsibilities for the EPC Contractor's personnel shall be clearly defined. EPC Contractor shall provide competent HSE resources that have the appropriate skills, qualification and experience to effectively manage HSE Risks, deliver HSE performance improvement and apply control mechanisms to identify and correct any deviation from the HSE Plan. Contracting Entity have the right to assess their competency and approve/reject such personnel.

3. EPC Contractor shall also have an Incident Management Team capable of managing all potential emergency cases. The involved personnel shall be adequately trained and certified

4. EPC Contractor's HSE Engineers, shall be involved with the fulfilment of the HSE procedures, shall be appointed as long as work will be continued and shall be organizationally referred to the EPC Contractor's Project Manager. The role of HSE Engineer IS NOT consultative to the Project Manager, but belongs to the managerial team of the EPC Contractor. HSE Engineers SHALL NOT be involved in any other activities.
   The role and responsibility of HSE Engineers is to:

   a. Ensure that HSE legislation is fulfilled

   b. Ensure that contractual requirements are satisfied;

   c. Procedure evidence at all times for action taken (training, information, PPE, inspections, audits, meetings, announcements to Regulators etc);

   d. Ensure evidence for action required by others (operator's license, site requirement license, monitoring of health, permits for labs etc.); and

   e. Ensure that HSE responsibilities are delegated sufficiently throughout EPC Contractor's organization, as well as throughout supplier's organization and everyone undertaking their responsibilities satisfactorily.

5. The requested qualification of HSE Engineers is given in Annex 7 to the tender documents

2.8.3.3 HSE meetings

EPC Contractor shall participate in HSE meetings called by the Contracting Entity at a level specified in the request. Minutes of meeting shall be kept by Contracting Entity.

2.8.3.4 Specific requirements for safety services

The EPC Contractor shall undertake the sole responsibility for the safety of the Works (including fire prevention and intervention) and shall enhance Contracting Entity's safety procedures and regulations wherever applicable.

For the Bulgarian Section there is a specific part in the TD for Health and Safety, which must be observed.

The EPC Contractor shall also complete safety orientation and training of all employees prior to commencing work on site. The scope of safety obligations shall include, but will not be limited, to the following:

1. Providing safety and fire prevention procedures at Site
2. Provide a safe working environment for all personnel engaged in the execution of the work
3. Providing sufficient responsible safety personnel, adequate safety procedures and instructions and ensure that these procedures, together with Contracting Entity's regulations, are being applied.
4. Supervising EPC Contractor's and suppliers' personnel to ensure that they comply with the safety procedures and instructions during the performance of the Works.
5. Completing routine checks on EPC Contractor's and suppliers' first aid and other medical facilities to ensure adequacy of supplies and services
6. Conducting routine checks on fire fighting equipment and safety equipment to ascertain proper functionality where applicable.
7. Ensuring that all personnel wear correct safety clothing, headgear and footwear at Site as appropriate.
8. Assisting Contracting Entity in handling claims for accidents involving employees of third parties working on Project.
9. Enforcing safety regulations.
10. Maintaining safety records
11. Reporting to Contracting Entity on the status of planning and implementation of activities to ensure safe construction and operation of installations

In addition to the above:

- The EPC Contractor shall submit for Contracting Entity’s approval, detail procedures for the control of fire, safety, first-aid and security.
- The EPC Contractor's procedures shall comply with all Contracting Entity requirements and shall comply with relevant industry codes, practices and standards as well as any mandatory regulation imposed by relevant Regulators.
- EPC Contractor's procedures shall govern the activities of his personnel and supplier's personnel and any other third party personnel and any other activities from whatever source, which form part of the Works.

2.8.3.5 Action Tracking

EPC Contractor shall use own Action Tracking System to ensure that all HSE actions identified by EPC Contractor and Sub-contractors are recorded, monitored and closed out by the appropriate designated authority.

Actions might derive from HSE assurance activities, reviews, audits, investigations, etc.

EPC Contractor shall input required data to Contracting Entity or its Representative

2.8.3.6 Specific requirements for environmental services

The Contracting Entity aims to avoid adverse environmental impacts as far as it is feasible. The Contracting Entity requires the EPC Contractor and all Contractor's Personnel, Sub-contractors and Suppliers to take all reasonable steps to protect the environment (both on and off the Site) and to limit damage and nuisance to people and property resulting from pollution, noise and other results of his operations.

Contracting Entity requires the EPC Contractor, Sub-contractors and suppliers to execute all phases of this project in full compliance with ISO14001.

The EPC Contractor shall submit his Environmental Management Plan (EMP) plan and procedures on how to execute their works in accordance with this requirement and the Environmental Impact Assessment Studies for approval to Contracting Entity. For the Bulgarian Section the EPC Contractor shall observe the requirements specified in Decision 1 /2013 of the Ministry of Environment and Waters for approval of the EIA Report.

The EMP is required for the monitoring, inspection, auditing and incident reporting of environmental activities. EMP purpose is to provide a mechanism for ensuring that measures to mitigate potentially adverse environmental impacts are implemented, to ensure that standards of good construction practice are adopted throughout the construction of the pipeline and to provide a framework for mitigating impacts that may be unforeseen or unidentified until construction Works are completed.

EPC Contractor shall manage and oversee waste management (e.g. for HDD works) as a result of Works performance and ensure that the Equipment and tools required to collect, segregate, process, transport and store all waste generated during the Works and execution of the Permanent Works, are maintained and fully operable.

2.8.4 Pre-commissioning, Commissioning and Start up

The main objective of Pre-Commissioning, Commissioning and start-up is to ensure that Equipment and systems are safely brought after Mechanical Completion to a safe and reliable operational status.

EPC Contractor shall supply personnel, Equipment and technical support in order to perform all activities in compliance with the Pre-commissioning, Commissioning and start-up schedule and project specifications.

2.8.4.1 Mechanical Completion and Pre-commissioning

The Pre-commissioning includes all activities for checking the functionality and the correct installation of the whole scope of the EPC Contractor after Permanent Works installation completion and before filling gas.

All checks shall be according ITPs of the EPC Contractor and all suppliers and Equipment manuals and according Technical Design for Bulgaria and FEED for Greece.

These checks include, but are not limited to:

- Mechanical check of all installations, e.g. open/close valve, pigging stations, AGIs
- Pressure testing of pipeline and facilities
- Pigging, cleaning, drying
- Instrument, wiring, and signal checks, end switches, Scada signals, metering systems
- communication and software checks
- CCP checks, functionality of the system and insulation quality
- For the Bulgarian Section Registration of Equipment according Ordinance '*Structure and Safe Operation of Transmission and Distribution Gas Pipelines and Facilities, Installations and Equipment for Natural Gas*' at *State Agency for Metrology and Technical Supervision*.

The EPC Contractor is fully responsible for planning, performing and documenting all pre-commissioning activities.

The summary of responsibilities to be undertaken and Works to be completed by the EPC Contractor's scope, shall include but is not limited to the following:

- Provide a team of suitably experienced and qualified personnel for pre- commissioning as per approved plans, schedules and procedures.
- Mobilize qualified personnel to perform the start-up planning activities as outlined in this Contract.
- Prepare and submit for Contracting Entity's approval, the field pre-commissioning, organization and deployment schedule, together with Job Description of each position in the organization and key personnel resume.
- Complete a "Mechanical Completion" review of the whole project by P&ID's and relevant Specifications
- Develop specific Mechanical Completion and Pre-commissioning forms required for the completion of Works.
- Be responsible for communicating with all suppliers to obtain any clarification, explanation and additional information regarding supplied Equipment for the purpose of developing the pre-commissioning planning activities.
- Identify the need for supplier special equipment/tools required for the execution of the Pre-commissioning.
- Coordinate activities of any suppliers and other suppliers participating in the Works completion.
- Conduct work-planning meetings as required.
- Inspect and test installations for correct design and conformance to operational requirements of all instruments / Equipment.

- Prepare pre-commissioning manuals, which shall include all relevant procedures, test Specifications, technical data, quality control forms and systems acceptance criteria, to Contracting Entity satisfaction. These manuals shall be produced and submitted to Contracting Entity for approval prior commencing pre-commissioning.

- Check all Equipment, valves, piping instruments, etc.,

- Check the lubrication systems and proceed to any additional lubricants which are required,

- make all operation checks for all components like flow control valve, stroke the slam shut valve actuators and balance the CP system.

The EPC Contractor shall provide at his own cost and care:

- The initial filling-up of the lubricants for all relevant Equipment.

- The initial charges of chemicals.

- The initial filling-up of any other type of Equipment.

- All utilities required for pre- commissioning including water for testing and flushing for purging and dry out of Equipment and piping.

- All testing equipment and materials for performing the testing and

- All disposal according the latest environmental standards for all commissioning materials, water, etc.

2.8.4.2 Commissioning and Start up

The Commissioning and start-up includes all activities for gas filling and first operation. These activities will be carried out by EPC's personnel and with the support of operational staff of the Operator of the IGB Project.

The general scope and responsibility of the EPC Contractor during commissioning and start-up is as follows:

- Developing a commissioning plan and aligning the plan with the commissioning procedure of the Contracting Entity and all needs of the affected gas grids.

- Final check of the whole system with all components to be ready for "Gas In" is full responsibility of the EPC Contractor

- Leading the commissioning and start-up activities with key experts at each station and with key experts for each system, e.g. process, Scada, CCP, telecommunication and software

With sufficient time buffer, any commissioning activities shall be coordinated with the Contracting Entity according:

1. Permit status, both for Bulgarian Section and Greek Section

2. Required information to Regulators, both for Bulgarian Section and Greek Section

3. Coordination with gas grid operator and owner in Bulgaria and Greece

4. Coordination with any other utility suppliers (electricity, water, etc.)

5. Coordination with legally required entities, in Bulgaria according SDA among others the CS and the *State Agency for Metrology and Technical Supervision*

The summary of responsibilities to be undertaken and Works to be completed by the EPC Contractor's scope, shall include but is not limited to the following:

- Provide a team of suitably experienced and qualified personnel for commissioning as per approved plans, schedules and procedures.

- Mobilize qualified personnel to perform the start-up planning activities as outlined in this Contract.

- Prepare and submit for Contracting Entity's approval and coordination the field commissioning and start up organization and deployment schedule, together with Job Description of each position in the organization and key personnel resume.

- Ensure all necessary consumables and spare parts are provided and available at Sites.

- Be responsible for communicating with all suppliers to obtain any clarification, explanation and additional information regarding supplied Equipment for the purpose of developing the Commissioning planning activities.

- Inspect and test installations for correct design and conformance to operational requirements of all instruments / Equipment.

- Prepare commissioning plans, which shall include all relevant procedures, technical data, quality control forms and systems acceptance criteria, to Contracting Entity satisfaction. These plans shall be produced and approved by Contracting Entity prior commencing commissioning.

- Well in advance prepare and submit for Contracting Entity's approval, the master schedules for start-up planning activities. These schedules shall reflect all contractual responsibilities related to these activities and will comprise as a minimum, the following documents:

    - Activities sequence chart

    - Logic block diagram

    - Overall Network

    - Operational System Fragment Network

    - Critical Path Identification

    - Supplier Representative Schedule

- Prepare start up logic diagram.

- bring the whole system to normal operational condition in his role as consultant.

The EPC Contractor shall provide at his own cost and care, if not done already during pre-commissioning:

- The initial filling-up of the lubricants for all relevant Equipment.
- The initial charges of chemicals.
- The initial filling-up of any other type of Equipment.
- All utilities required for pre- commissioning and commissioning including water for testing and flushing for purging and dry out of Equipment and piping.
- All testing equipment for performing the testing and
- All disposal according the latest environmental standards for all commissioning materials, water, etc.

It shall be noted that if AGRS1 (Kardjali) cannot be commissioned at the time of the Permanent Works completion then this part of EPC obligations shall be excluded from EPC's Scope of work.

2.8.5 Punch list

Punch list shall identify any defective work of the EPC Contractor both during the design phase and the construction phase to final acceptance of the Works.

Any and all defects shall be noted in the Punch list together with the remedial and corrective actions.

The Contracting Entity shall create, manage and administrate an electronic punch list of defects for the pipeline system. The Punch list shall record all defects, faults, failures, and non-compliances with the requirements of the Contract that occur during the Works and anywhere within the pipeline system. The Contracting Entity shall be the sole party permitted to update the punch list and to change the status of any punch list record. The EPC Contractor shall have full and unrestricted access to the punch list but shall not be permitted to change the status of any punch list item.

The punch list items that are remedied or rectified, shall not be removed from the punch list, but shall be assigned a status of 'rectified' with details of the nature of the rectification work performed, when the rectification was verified, including the nature of the verification process, and the EPC Contractor's personnel that verified the rectification.

2.8.6 Training

EPC Contractor shall provide on the job and formal classroom training to Contracting Entity's staff to ensure that the staff involved in subsequent commissioning, start-up, operation and maintenance of the whole Scope and including SCADA and Telecommunications Systems shall be capable of carrying out allocated duties in a safe and competent manner.

EPC Contractor shall:

- prepare a training plan for approval by the Contracting Entity.
- include a proposal for personnel structure of the Contracting Entity's operational staff based on the characteristics of the developed IGB system

- Prepare all Training documents in English and the applicable languages (Greek and Bulgarian)
- Agree the Training program and schedule with the Contracting Entity considering having multiple training sessions for different shifts of Contracting Entities personnel.
- execute all training sessions and on the job trainings according the agreed training schedule.
- provide all facilities and resources required to complete the training including the preparation of all training material, training tools and documentation
- provide qualified instructors
- provide training documents including operation manuals for all Equipment and installations - for each trainee one (1) set and four (4) additional sets to be provided to the Contracting Entity.

The training plan shall include details of the methods, resources, schedules and location for the training. The plan shall ensure that training activities can be completed in conjunction with other activities associated with the Works.

The Training documents and the training session shall be in Greek language for the Greek Section and in Bulgarian language for the Bulgarian Section. If the trainer does not speak the local language, the EPC Contractor has to provide a relevant qualified translator at his own cost.

2.8.7 Suppliers Contracting

The EPC Contractor is allowed to employ suppliers for delivery of equipment and services according the proposed supplier list.

In this case the EPC Contractor has to comply with:

- In case that the EPC Contractor would like to employ suppliers, which are not originally specified in the proposed supplier list, a written approval by the Contracting Entity has to be obtained.
- In any case, EPC Contractor’s recommended lists of suppliers shall have to include their experience and shall only include firms known to be of good repute and possessing the necessary organization and manpower skills to perform the respective services in accordance with the contractual standards and agreed schedules.
- Prepare, maintain and issue to Contracting Entity subcontract status reports, which, as a minimum will contain the following information:
    a. Subcontract Number
    b. Subcontract Description
    c. Supplier's Name and Location
    d. Date placed
    e. Starting Date (planned-actual)

f. Remarks

The EPC Contractor shall not sub-contract any element of its obligations under the Contract other than in accordance with clause 4.4 of the Contract.

3 EPC Contractor's scope of work – specific

The chapter 3 of this document describes the EPC Contractor's Scope of Work (SOW) which is specific to the different construction sites and their applicable disciplines.

The different construction sites in the following Sub Chapters are grouped as follows:

1. Pipeline with Valve and Pigging Stations
2. Gas Metering Stations (GMS) and Automated Gas Regulation Stations (AGRS)
3. Dispatching centre and Operation and Maintenance (O&M) base
4. ICS and telecommunication.

A Brief description, hints to the battery limits and links to the technical document packages for the Bulgarian and for the Greek Section are given to facilitate the understanding of the whole project.

The FEED Documents for the Greek Section are organized as follows:

Volume	Name
1	**Overall - General**
2	**Pipeline**
3	**Block Valve Station BVS1 - Nimfea**
4	**Komotini Gas Metering Station – GMS1**
5	**Other documents (**feasibility study for the connection to TAP, etc.)

The Technical Design (TD) for the Bulgarian Section is organized as follows:

Volume	Name
I	**General documentation**
II	**Subproject: Interconnection pipeline Greece-Bulgaria**
III	**Subproject: GMS Stara Zagora**
IV	**Subproject: AGRS Dimitrovgrad**
V	**Subproject: AGRS Kardzhali**
VI	**Subproject: Dispatch center**
VII	**Technological connection - connection organization. Connection system equipping.**
VIII	**External connections**
IX	**Bill of quantities**
X	**Assessment and risk analysis**
XI	**Project for construction organization**
XII	**Management plan for construction waste**

The Volume II is the linear part, which is the pipeline including block valve and pigging stations and RCC containers.

3.1 Pipeline

Chapter 3.1 mainly focuses on the part of SOW related to the pipeline itself, the Block Valve Stations, the Pigging Stations and the associated RCC containers. For the remaining AGIs and systems of the Project chapters 3.2, 3.3 and 3.4 shall apply

3.1.1 Brief description

The pipeline section with DN800 nominal pipe diameter extends from Komotini (Greece) PS1 up to Stara Zagora (Bulgaria) PS2, while the following interconnecting sections are foreseen:

- Interconnecting Section from the tie-in point with the existing Greek National Gas Transmission System (ITG Pipeline 36") up to Komotini GMS1 with DN700 / 28" nominal pipe diameter
- Interconnecting Section, with DN600 / 24" and approximate length of 800m, from the tie-in point of TAP Block Valve Station GBV04 up to Komotini GMS1. A stub-out connection (end-cup) with a isolation valve and purging facilities will be provided at BVS GBV04.
- Transmission gas pipeline for hot tap connection to the Bulgarian national gas transmission system DN500/20") after AGRS Dimitrovgrad with a diameter of DN300/12", 370m long
- Transmission gas pipeline for hot tap connection to the Bulgarian national gas transmission system DN700/28" after GMS Stara Zagora with a diameter of DN700/28", 310 m long.

All line pipe in the scope of EPC Contractor (connections with DESFA, TAP and Bulgartransgaz) to be installed in the high pressure part of the Works shall conform strictly to the requirements set in the technical documentation for the line pipe DN800.

The proposed pipeline from the tie-in to DESFA network to the tie-in with Bulgartransgaz network will measure a total distance of approximately 182.6 km, (~31.6 km in Greece and ~151 km in Bulgaria).

The pipeline is divided into two discrete sections:

1. **Komotini – Greek / Bulgarian border (Greek Section)**
2. **Greek / Bulgarian border – Stara Zagora (Bulgarian Section)**

The length measurement of the pipeline in the technical documents is as well split in 2 parts:

0 km to 31.6 km from Komotini to Greek / Bulgarian border and

0 km to 151 km from Greek / Bulgarian border to Stara Zagora

In the following table all pig and valve stations are listed, which are considered to be part of the pipeline.

Pigging Stations and Block Valve Stations along IGB sorted by geographical location from South to North				
Greek Section				
S/N	**Geographical location**	**Station Typ**	**Unit**	**Remarks**
1.1	Komotini	Pigging Station	PS1	In the same plot with Komotini GMS1
1.2	Nymfea	Block Valve Station	BV1	DN800 / 32”
Bulgarian Section				
S/N	**Geographical location**	**Station Typ**	**Unit**	**Remarks**
2.1	Velikdenche	Block Valve Station	BV2	DN800 / 32”
2.2	Kardzhali	Block Valve Station	BV3	In the same plot with Kardzhali AGRS, DN800 / 32”
2.3	Mandra	Block Valve Station	BV3A	DN800 / 32”
2.4	Stamboliski	Block Valve Station	BV4	DN800 / 32”
2.5	River Maritza south	Block Valve Station	BV4A	DN800 / 32”
2.6	Dimitrovgrad	Block Valve Station	BV5	DN300 / 12”
2.7	Trakia	Block Valve Station	BV6	DN800 / 32”
2.8	Stara Zagora	Pigging Station	PS2	In the same plot with Stara Zagora GMS2
2.9	Stara Zagora Hot Tap	Block Valve Station	BV7	DN700 / 28”

The two longest crossings are in the Bulgarian Section at:

1. Dam Studen Kladenec – total length of drill 1641m.
2. River Maritsa – total length of drill 542 m

For these crossings HDD is foreseen.

3.1.2 Structure of documents

The documents given below in this chapter allow to get an easier overview about the design. All documents not listed here have the same importance and shall be considered as well.

Greek Section of the pipeline:

An overview over the FEED documents for the Greek Section is given in file

Docu No/File name	Document name
IGB _FEED Docs List - Greece_11.07	LIST OF FEED DOCUMENTATION FOR THE GREEK SECTION

Maps and general description are given in the technical documents in:

File Name	Document Title
10760-PL-P1-02-402-sh1_REV4	Recommended pipeline routing map recording plan Greek Section maps hmgs 1:50.000 - Komotini & Mytikas (Sheet 1/3)
10760-PL-P1-02-421-sh1_REV2	Pipeline routing map recording plan Greek Section from K0+000.00 to K5C+084.78 (Sheet 1/2)
10760-PL-P1-02-422-sh1_REV2	Pipeline routing map recording plan Greek Section from K10+160.64 to K10+196.31 (Sheet 1/2)
10760-PL-P1-02-423-sh1_REV2	Pipeline routing map recording plan Greek Section from K5C+084.78 to K10+160.64 (Sheet 1/2)
10760-PL-P1-02-424-sh1_REV2	Pipeline routing map recording plan Greek Section from K10+196.31 to K13+019.24 (Sheet 1/2)
10760-PL-P1-02-425-sh1_REV2	Pipeline routing map recording plan Greek Section from K13+019.24 to K17+453.07 (Sheet 1/2)
10760-PL-P1-02-426-sh1_REV2	Pipeline routing map recording plan Greek Section from K17+453.07 to K23+240.37 (Sheet 1/2)
10760-PL-P1-02-427-sh1_REV2	Pipeline routing map recording plan Greek Section from K23+240.37 to K40+066.08 (Sheet 1/2)
10760-PL-P1-02-428-sh1_REV2	Pipeline routing map recording plan Greek Section from K40+066.08 to K55+084.56 (Sheet 1/2)
10760-PL-P1-02-429-sh1_REV2	Pipeline routing map recording plan Greek Section from K55+084.56 to K74+018.35 (Sheet 1/2)
10760-PL-P1-02-430-sh1_REV2	Pipeline routing map recording plan Greek Section from K74+018.35 to K85+056.53 (Sheet 1/2)
10760-PL-P1-02-431-sh1_REV2	Pipeline routing map recording plan Greek Section from K85+056.53 to K105+003.25 (Sheet 1/2)
10760-PL-P1-02-432-sh1_REV2	Pipeline routing map recording plan Greek Section from K105+003.25 to K109+000.00 (Sheet 1/2)
10760-RPT-PL-P1-405 Rev1	Detailed Survey Technical Report in Greek Territory

The general information and location for Nimfea Block Valve (BV1) station can be found in the following documents:

Docu No/File name	Document name
10760-CI-B1-01-401	Topographical Survey Plan - Recommended location of Nimfea Block Valve Station (BV1)/ Greek Section - From K84+072.66 To K85+005.97
10760-CI-B1-01-411	Cadastral Survey Plan - Recommended location of Nimfea Block Valve Station (BV1)/ Greek Section - From K84+072.66 To K85+005.97
10760-MTO-ME-B1-401_REV0	Nimfea Block Valve Station (BV1) - MTO List
10760-ME-B1-02-401_REV0	Nimfea Block Valve Station (BV1) – Piping Arrangement Βαλβιδοστάσιο (BV1) Νυμφαίας (BV1) – Σχέδιο Διάταξης Σωληνώσεων

Bulgarian Section of the pipeline:

The linear part of the pipeline in Bulgaria together with the related sub sites, telecommunication and corrosion protection are elaborated in Volume II in the Technical Design.

The list below follows the sequence of the documentation structure in this chapter.

1. Linear part – including the results from the site surveys, longitudinals, reclamation works, drilling and blasting works.
2. Intersection with obstacles and infrastructure projects – contains document packages for the crossings with rivers, roads, railroads, canals.
3. Block valve – full documentation packages for each block valve station.
4. Technological fibre-optic communication line
5. Electrochemical (Cathodic) corrosion protection
6. Health and safety plan
7. Fire safety

The following table shows the structure of the Technical Design. The document in the right column gives the general information about the design part.:

Vol	Subvol	Part	Name	Doc No
II			Subproject: Interconnection pipeline Greece-Bulgaria	
	1		Linear part	
		1	Geological surveys	IGB-04-FEED-II.1.1
		2	Hydraulic surveys	IGB-04-FEED-II.1.2
		3	Geodesy and geological pipelines	IGB-04-FEED-II.1.3
		4	Technical and biological reclamation	IGB-04-FEED-II.1.4
		5	Drilling and blasting	IGB-04-FEED-II.1.5
	2		Intersection with obstacles and infrastructure projects	
		1	Intersection with rivers and gullies	IGB-04-FEED-II.2.1
		2	Intersection with roads	IGB-04-FEED-II.2.2
		3	Intersection with railroads	IGB-04-FEED-II.2.3
		4	Intersection with canals	IGB-04-FEED-II.2.4
	3		Block Valves	
		1	Master plan and landscaping	IGB-04-FEED-II.3.1
		2	Part Technological and Technological pipelines	IGB-04-FEED-II.3.2
		3	Part Architectural	IGB-04-FEED-II.3.3
		4	Part Structural	IGB-04-FEED-II.3.4
		5	Part Electrical	IGB-04-FEED-II.3.5
		6	Automation of technological processes	IGB-04-FEED-II.3.6
		7	Heating, ventilation and air conditioning	IGB-04-FEED-II.3.7
	4		Technological fibre-optic communication line	
		1	Geodesy	IGB-04-FEED-II.4.1
		2	Part Technological	IGB-04-FEED-II.4.2
		3	Part Structural	IGB-04-FEED-II.4.3
	5		Electrochemical corrosion protection	IGB-04-FEED-II.5
	6		Health and safety plan	IGB-04-FEED-II.6
	7		Fire safety	IGB-04-FEED-II.7
VII			Technological connection - connection organization. Connection system equipping.	IGB-04-FEED-VII
VIII			External connections	
	1		External power supply networks	IGB-04-FEED-VIII.1
	2		Access roads	IGB-04-FEED-VIII.2

Please note, that in Subvol. 2 “Intersection with obstacles and infrastructure projects” contains as well the two longest crossings in the Bulgarian Section, where HDD shall be applied, at Dam Studen Kladenec with length of 1641m and River Maritsa with length of 542 m.

All design, planning, materials (line pipe including), Equipment and Works are obligation of EPC Contractor. For the Bulgarian Section detailed information on crossings is specified in the TD. HDD technology is specified in the EIA Decision as well. EPC shall chose the most suitable technology and Equipment for the HDD’s. If necessary the specifications in the TD shall be amended accordingly

The overview about design and routing are in the following documents:

File Name	Document Title
IGB-04-FEED-I.1-EN-Rev01	GENERAL EXPLANATORY NOTE Technical design
IGB-04-I	System flow Diagram of Interconnector Greece-Bulgaria/overview map
IGB-Situacia-25000-1	Situation. Section km 0 - km 29
IGB-Situacia-25000-2	Situation. Section km 29 - km 59
IGB-Situacia-25000-3	Situation. Section km 59 - km 90
IGB-Situacia-25000-4	Situation. Section km 90 - km 122
IGB-Situacia-25000-5	Situation. Section km 122 - km 150.929

General description, layout and P&ID for Block Valve Stations are given in the following documents:

Docu No/File name	Site	Document title
IGB-04-FEED-II.3.2-Rev00	For All BVS	Explanatory note to TECHNOLOGICAL PART AND TECHNOLOGICAL PIPELINES
IGB-04-FEED-II.3.2-ME-B2-02-401_Rev00	BV2	Piping arrangement for block valve station BV2
IGB-04-FEED-II.3.2-PR-P0-02-004_Rev00	BV2	Block valve station BV2 - P&ID
IGB-04-FEED-II.3.2-ME-B3A-02-401_Rev00	BV3A	Piping arrangement for block valve station BV3A
IGB-04-FEED-II.3.2-PR-P0-02-007_Rev00	BV3A	Block valve station BV3A - P&ID
IGB-04-FEED-II.3.2-ME-B4-02-401_Rev00	BV4	Piping arrangement for block valve station BV4
IGB-04-FEED-II.3.2-PR-P0-02-008_Rev00	BV4	Block valve station BV4 - P&ID
IGB-04-FEED-II.3.2-ME-B4A-02-401_Rev00	BV4A	Piping arrangement for block valve station BV4A
IGB-04-FEED-II.3.2-PR-P0-02-009_Rev00	BV4A	Block valve station BV4A - P&ID
IGB-04-FEED-II.3.2-ME-B5-02-401_Rev00	BV5	Piping arrangement for block valve station BV5
IGB-04-FEED-II.3.2-PR-P0-02-011_Rev00	BV5	Block valve station BV5 - P&ID
IGB-04-FEED-II.3.2-ME-B6-02-401_Rev00	BV6	Piping arrangement for block valve station BV6

IGB-04-FEED-II.3.2-PR-P0-02-012_Rev00	BV6	Block valve station BV6 - P&ID
IGB-04-FEED-II.3.2-ME-B7-02-401_Rev00	BV7	Piping arrangement for block valve station BV7
IGB-04-FEED-II.3.2-PR-P0-02-017_Rev00	BV7	Block valve station BV7 - P&ID

3.1.3 Battery limits

The battery limits for the part of the project related to pipeline and its associated facilities (BVS and PS stations) are defined as follows:

- **Southern start point at Komotini:** The Tie-in (Hot Tap) to the Greek National Gas Transmission System at Komotini, Greece, including mechanical, civil and all required works, is included in EPC Contractor's Scope of Work.
  and
  The Tie-in to TAP Block Valve Station GBV04 at Komotini, Greece, including mechanical, civil and all required works, is included in EPC Contractor's Scope of Work.

- **Connection after AGRS Dimitrovgrad**: The Tie-in (Hot Tap) to Transmission gas pipeline ((Bulgartransgaz), including mechanical, civil and all required works, is included in EPC Contractor's Scope of Work.

- **Northern end point at Stara Zagora**: The Tie-in (Hot Tap) to the transmission system of Bulgartransgaz at Stara Zagora, Bulgaria, including mechanical, civil and all required works, is included in EPC Contractor's Scope of Work.

- **All BVS and PS and the associated RCC containers** are included in EPC Contractor's Scope of Work. In particular, for each station the SOW includes

  - all structures, buildings located inside the property limits,

  - the access roads between existing roads and property limits,

  - The design for Greek Section and Detail Design for Bulgarian Section, procurement and construction of the permanent fence lines,

  - Design (Greece) and DEG (Bulgaria), procurement and delivery of the power supply utility system up to the permanent fence or for Bulgarian Section up to the connection point to the power greed foreseen in TD and aligned in the preliminary contracts with the relevant service provider, in order to connect the systems with the local electricity network. The concrete / steel pillar as well as any other installation and / or Permission required by Local Electricity Supply Company for the connection of each BVS and PS station with the local electricity network.
    For the Bulgarian Section the routing of the power cables for each above ground installation is set and defined in the Spatial parcel plan and TD.

The above mentioned property limits are indicated in the relevant stations' drawings or will be provided by Contracting Entity to EPC Contractor after Contract Award.

3.1.4 Construction

During the construction, the following tasks shall be performed:

1. Prior to commencing any work, EPC Contractor shall survey the areas of work and verify the survey drawings provided by Contracting Entity.

2. EPC Contractor shall prepare a coordinated and comprehensive construction and erection schedule, in accordance with the project control procedures, taking all necessary steps to make sure that the construction and erection Suppliers shall adhere to it.

3. EPC Contractor shall provide all Temporary Works necessary to complete the Permanent Works. The works associated with the Temporary Works shall be in accordance with the Contract and Specifications, particularly with reference to health and safety.

Independent from all below mentioned works and requirements, the approved detailed design shall be followed.

For the Bulgarian Section the requirements are given in the TD. Special attention shall be paid to Ordinance No. 3 on elaboration of acts and protocols during the construction works.

For the Greek Section the Volume 1 “Overall -General” contains Job Specifications, which are listing similar requirements.

The EPC Contractor shall always follow the more strict requirements, if compliant with applicable law, or shall clarify in case of contradictions with the Contracting Entity and the Construction Supervision Entity.

3.1.4.1 Civil erection works

EPC Contractor’s SOW includes the erection of all Block Valve Stations (BVS) and Pigging Stations (PS) including RCC containers mentioned in paragraphs herein above.

The scope of civil erection works includes also the demolition, waste material disposal and reconstruction of existing facilities and impeding alongside the route of the pipeline, where applicable.

More specifically, EPC Contractor’s civil works shall include but not be limited to, the following:

1. Cleaning, levelling and maintenance
   in proper and safe conditions of the working ROW zone alongside the pipeline route including the supply and installation of temporary fences and the reinstatement of private structures, roads or areas used/destroyed for haulage.

2. Trenching and excavation works alongside the pipeline route and the land areas selected for Block Valve Stations (BVS) and Pigging Stations (PS).
   EPC Contractor shall excavate the trench by all means of mechanical equipment to the required depth and width and stack the topsoil and the excavated subsoil beside the trench separately. Material, which is not suitable as backfilling and cannot be spread over the ROW shall be removed to disposal areas approved by Regulators(at no cost for Contracting Entity). The bottom of the trench shall be dried before pipe is lowered in. The topsoil will be restored on top.

3. Trenching and excavation works at all special construction points,
   active faults, crossings with roads, railways, watercourses, channels, pipes, cables, etc. Crossings include rivers, lakes, watercourses, rail-roads, national roads, prefecture and municipality roads, main and suburban roads, secondary roads, other unpaved / unimproved and agricultural roads, irrigation channels, as well as crossings with other existing underground and / or above ground utilities such as water transmission pipes, fuel pipes, sewer pipes, power and telecommunication cables, etc.

Cased crossings shall only be utilized where this is a mandatory requirement of the third party whose service is being crossed or where national ordinance requires this (i.e. Bulgarian ordinance). In cases the pipeline is installed inside a casing pipe sleeve, measurements between the casing or the metal reinforcement and the pipeline must be carried out, in order to determine any possible interaction between the gas pipeline and a metal surface (such as measurements of the resistance between the pipe and the metallic structure, polarization tests of the pipeline, “on-off” measurements, etc.). The measurements shall be carried out in all phases of the construction period.
Special construction at unstable soil conditions shall be carried out in accordance with approved DEG documentation, the standard drawings and the Specifications.
The bottom of any trench shall be prepared, so that no damages on the installed facilities occur. Details and requirements for the above works are laid down in the Specifications and typical drawings.

4. Backfilling and reinstatement
   EPC Contractor shall carry out the backfilling using proper material and following the approved quality control procedures.
   The trench shall not be backfilled before the pipeline has been surveyed and controlled and a release notice has been given by Contracting Entity and Construction Supervision Entity. The backfilling shall be performed in accordance with the requirements of the Specifications and other DEG documentation.
   EPC Contractor shall reinstate all site surfaces, including the working width, construction sites, storage sites and existing access roads in private and public areas, etc., to their original condition. The areas shall be cleaned from all debris and leftover materials.
   The surface reinstatement works shall be carried out after backfilling of pipe trench and reinstatement of drains and in accordance with the requirements of the Specifications.

5. Block Valve Stations (BVS) and Pigging Stations (PS)
   EPC Contractor shall perform the civil works and the site development at the BVS and PS areas belonging to the pipeline as shown in the available Design and DEG documentation and in accordance with the applicable Specifications and drawings of the Contract. These works include, but not limited to, stations area (provided by Contracting Entity) levelling, soil improvement (if required), whole station land plot rainfall drainage (as required), fencing (as and where required, including also main and secondary entrance gates) of the land plots, excavations, concrete and structural steel works, HDPE pipes installation (two HDPE pipes alongside the whole pipeline route), any power and signal cables required, backfilling, reinstatement, a gravel layer covering and around the stations area (to the extent shown in the relevant drawings), concrete and / or asphalt paving and curbs, any pit required, cleaning, etc. for the complete installation of the BVS and PS.
   Details and battery limits for each station are shown in the relevant Plot Plan drawings for these stations (distinguished by type).
   EPC Contractor is also responsible for the construction of the permanent roads leading to the stations.

6. Marker and Measuring Posts
   EPC Contractor shall install the necessary number of marker and measuring posts along the routing line of the pipeline including BVS and PS (as required) according to the requirements of the DEG documents and drawings. Marker and measuring posts shall be placed in accordance with Specifications and standard drawings.

7. Concrete works
   Concrete works are comprised, but not limited to, of the reinforced concrete duct banks,

concrete saddles, concrete slabs, concrete paving, concrete pits, concrete pillars, concrete supports for valves and piping supports, concrete foundations and paving for RCC houses, etc. in BVS, PS, CP Stations, concrete infrastructure of all buildings and installations, concrete coating of pipeline at river crossings, concrete drainage ditches and possible concrete ditch breakers, as well as any other structure required for the completion of the Works. For the Bulgarian Section detailed elaboration on concrete works is specified in the TD.

8. Road crossings
   All reconstruction and reinstatement of surface ground, tracks, paved roads, road signs, road shoulders, pedestrian walkways, road marking, in special points of crossings. For the Bulgarian Section detailed elaboration on road crossings works is specified in the TD.

9. Muddy bottom areas
   Replacement of muddy bottom of the pipeline trench in the specified areas alongside the pipeline route and BVS and PS (as required). This includes the disposal of the material in an authorised area as well as the supply and laying of replacement material. For the Bulgarian Section detailed elaboration on muddy bottom areas is specified in the TD.

10. HDPE Pipes Installation for FOC
    Installation, inspection and testing of two (2) HDPE pipes within the pipe trench and stations for fibre optic cable (FOC) at the Greek Section and of one (1) HDPE pipe within the pipe trench and two (2) HDPE pipes inside a separated distant trench at the Bulgarian Section.

11. RCC Buildings / Containers
    EPC Contractor shall construct the RCC containers (including civil, structural, building and electro-mechanical works), which shall be installed within the battery limits of the stations, according to the DEG documentation and the applicable Specifications, drawings and standards. The RCC containers shall be fully fitted out.

12. Trial cuts
    EPC Contractor shall perform trial cuts in particular locations along the route of the pipeline in order to verify the accurate position of the underground networks as advised by the relevant service organizations and Regulators or at any other location that may be required during the course of the project.

13. Pipeline special protection measures
    EPC Contractor shall pay special attention at the areas where pipe protection measures have to be applied according to the Contract, the Technical Design, DEG documents and drawings. More specifically, EPC Contractor has to execute perfectly any civil works associated to the slope protection and the erosion protection measures (concrete structures, etc.), the trenching / excavation and backfilling details at locations interferences of pipeline with active faults and the special protection measures specified and designed exclusively for the pipe protection from seismic effects at particular geologically problematic areas and crossing locations.
    The following pipeline protection measures shall be considered:

    a. Additional depth of cover

    b. Specified minimum separation distance from third party service

    c. Pipeline marker mesh or concrete flagstones

d. Concrete slabs and flag stones

e. Pipeline casings (as required by Greek and Bulgarian legislation)

f. Increased wall thickness

g. Increased coating thickness (at HDD crossings)

h. River, or ravine, bed erosion protection

i. River, or ravine, bank erosion protection

j. Slope drainage and stabilization measures

k. Special pipeline backfill

l. Surface and subsurface erosion protection measures in sloped terrain

m. Buoyancy control measures

3.1.4.2 Piping / mechanical erection works

The Scope of the piping and mechanical erection works includes but not limited to the following:

1. Transportation, hauling and stringing of the pipes
   EPC Contractor shall carry out the hauling and stringing operations in preparation for pipe welding.

2. Field Bending of pipes including documentation.

3. Welding Execution and Welding Inspection
   EPC Contractor shall align the line pipes and start the welding operation with qualified welders in accordance with the qualified procedures and the requirements mentioned in the Specifications.
   EPC Contractor shall plan, prepare, qualify, perform, evaluate, supervise and document all welding inspection by means of non-destructive examination (NDE) by a NDE specialist approved by Contracting Entity. Where destructive testing is required for procedure qualifications this shall be performed by a qualified and approved laboratory in accordance with the Specifications requirements. For the Bulgarian Section the NDT Laboratory must me certified according to BDS EN ISO/IES 17020:2012 by National Evaluation and Accreditation Agency or by a foreign accreditation body, which is party to the Multilateral Agreement on Mutual Recognition of the European Organization for Accreditation or an equivalent standard with a valid Certificate of Accreditation and Scope of Control covering the Control Methods on the date of the deadline for submission of offers.
   All material, Equipment, personnel, procedures, documents and facilities necessary for the welding and the NDE shall be performed in accordance with the Specifications. It is highlighted that all the pipeline welds shall be 100% NDE inspected.

4. Coating of Field Joints
   After passing NDE and weld clearance has been given by Contracting Entity , EPC Contractor shall coat all pipeline components and steel structures which have not been factory-coated, install all field joints coating (heat shrink sleeves), and repair damages and defects on items already coated. Also, cleaning and performance of the relevant

inspections and tests are part of this work, which shall follow the requirements in the Specifications.

5. Pipe lowering in
   EPC Contractor shall prepare the trench and make it ready to receive the welded pipe string, set up all side-booms in the proper position and carry out the lowering in operation following the procedures and the requirements in the Specifications.

6. Block Valve Stations (BVS) and Pigging Stations (PS)
   EPC Contractor shall be responsible for installation, erection, inspection and testing of the BVS and PS assemblies as shown on the approved DEG documentation, the standard drawings and in accordance with the relevant Specifications of the project. Moreover, EPC Contractor shall install properly and safely avoiding defects and damages all the mechanical equipment regarding the gas stations.

7. Tie-In Works
   EPC Contractor shall perform the relevant hot-taps at Komotini area, Stara Zagora and Dimitrovgrad areas in order to interconnect the IGB pipeline system with the existing national grids and. The connection with TAP pipeline will be performed as a tie-in at a stub out flange located at the fence of the TAP BVS-04 .
   Tie-in operations shall be in accordance with the relevant Specifications and Contracting Entity's relevant instructions and procedures, the provisions of the interconnection agreements with other TSO's, as well as the Tie-in procedure, which will be submitted by EPC Contractor and will be reviewed and approved by Contracting Entity.

   For the Bulgarian Section the TD sets the scope of work related to the tie-in activities – inter connection points, bill of materials and Equipment, and any other additional technical provision. Please consider among others the following documents from TD:

   - IGB-04-FEED-II.1.3.-Pr112; IGB-04-FEED-II.1.3.-Tech30 (interconnection point at Stara Zagora) and
   - IGB-04-FEED-II.1.3.-Pr113; IGB-04-FEED-II.1.3.-Tech24 (interconnection point at Dimitrovgrad).

   The EPC Contractor shall investigate the option, that an insulation joint shall not be assembled on the connecting pipe DN700 (at Stara Zagora, tie-in to Bulgatransgaz pipeline) and to shift the battery limits of the cathodic protection systems of the two operators to an insulation joint at the outlet of GMS Stara Zagora (please refer to I.J. in drawing IGB-04-FEED-III.6-01).
   The final detailed EPC's scope of work – Equipment and works – related to the Tie-in activities might be amended after finalization of the interconnection/cooperation agreements with the relevant TSO's and elaboration of the detailed design.
   EPC Contractor shall notify the Contracting Entity in advance of the timings of the tie-in works.

8. Pipeline Cleaning, Gauging, Pressure Testing, Calliper Pig Run and Drying
   EPC Contractor shall be responsible for obtaining and utilizing a water supply source to carry out the cleaning of the pipeline and removal of the debris using the appropriate pigs, set up the arrangement for hydraulic testing and carry out the testing itself all in accordance with the Specifications. Certain requirements for the Bulgarian Section to be followed are given in the Technical design, EIA Decision and the Approval documents to the Technical design. For the Greek Section there is also a separate Technical specification for the pressure test which shall be followed. (see the attachments to this Technical specification)

Water for cleaning and hydro testing shall be free of debris and contaminants. On completion of hydro testing the water shall be suitably filtered / settled before disposal, as detailed in the Project Specifications and to the satisfaction of the Contracting Entity in full compliance with relevant Regulators' requirements and regulations in force.
In accordance with the Contract provisions, at the end of the testing activities and once the pipeline is continuous, but before the commencement of the drying works, EPC Contractor shall pass an electronic calliper (geometry) pig into the line in order to check the geometry of the pipeline and locate diameter reductions, such as dents, buckles, flat spots, construction debris, etc. A relevant procedure shall be submitted by EPC Contractor for review by Contracting Entity's Representative.
The resulting report of the pig run shall be used to locate and make all the repairs needed. It shall then be rerun to provide a final report for the acceptance decision by Contracting Entity, as well as a permanent record of the "as laid" condition.
Upon completion of the testing, EPC Contractor shall follow with the drying operation until the pipeline is clean and dry. This operation shall be in accordance with the applicable Specifications.

9. Use of Bends
   EPC Contractor shall follow the pipeline route shown on the detailed survey drawings and route maps provided by Contracting Entity. All changes of directions shall be constructed by means of factory made bends, field bends or elastic bends in accordance with the relevant approved DEG and standard drawings and Specifications.

10. Crossings
    Regarding crossings with any type of obstacles (underground networks / utilities, pipelines, cables etc.), EPC Contractor shall pay special attention to keep the minimum required clearance between utilities and the gas pipeline, to cover the requirements of the Contract Documents and the requirements of the involved Regulators and infrastructure owners. The same shall apply to parallel runs of the pipeline with such utilities. For the Bulgarian Section detailed elaboration on crossings is specified in the Technical Design. Special attention shall be paid as well to the HDD crossings at water obstacles.

3.1.4.3 Instrument erection works

The scope of instrument erection works includes, but is not limited to, the following:

Instrument Erection Works include installation, testing calibration and commissioning of the instruments described and designed on the approved DEG documentation. EPC Contractor shall be responsible for the integration of all instruments along the pipeline.

In all BVS and PS EPC Contractor will install the field cables in the trays inside the RCC containers and terminate them in the SCADA RTU cabinet. Surge protection devices shall be installed in the field instrument equipment and in the SCADA RTU cabinet for overvoltage protection.

EPC Contractor shall have full responsibility for ensuring that the instruments fulfil their purpose of installation and function properly.

All instruments and related equipment and materials installed outdoor shall have design temperature limits according to the design data provided by Contracting Entity.

After the instrument installation and completion, the Equipment shall be tested in line under simulated process conditions. In case of any total line test malfunction occurrence, then the test shall be stopped and the failures attributed to EPC Contractor's portion, shall be corrected within the time schedule of the test and at EPC Contractor's own cost.

If the failure is detected but cannot immediately be corrected, EPC Contractor shall have sufficient instruments and manpower to be able to pinpoint the failure and correct it at his own expenses. All outcomes and test data shall be analytically registered on a Site Test Data Sheet.

EPC Contractor shall provide calibration certificates and functional tests performed prior to instrument installations.

3.1.4.4 Electrical erection works

EPC Contractor's SOW includes installation, testing, commissioning and start-up of the complete CP System (temporary and permanent) including power supply system for CP stations, pipeline earthing system, electrical power supply system, security system for RCC containers, fire alarm and gas detection system for RCC containers surge / lightning protection system, lighting system and permanent earthing system for all BVS and PS.

EPC Contractor's SOW also includes the investigation finalized to detect the presence of any metallic structure which can affect the correct operation of the CP system. Proper measures in order to avoid the above situation shall be undertaken to ensure safe distances between the pipeline and any metallic structure.

EPC Contractor shall:

1. Perform all electrical works in accordance with the approved DEG drawings reviewed by Contracting Entity and the project Specifications and Standard Drawings.

1. Take measurements of the actual soil resistivity, at locations where the proximity effects will result to earthing of the pipeline, in order to verify that the estimated length of the earthing conductor is adequate and conforms to the valid applicable norms. However EPC Contractor's obligation is to install the finally verified earthing conductor length.

2. Proceed with coating repair and / or coating application or placing the proper insulation materials at the required distance, of the existing metallic pipelines which are crossed and / or running parallel to the gas pipeline, in order to eliminate the electrical influence between the two pipelines.

3.1.4.5 Cathodic Protection System

The Cathodic Protection system will be designed in accordance with the requirements of the EN 12954 "Cathodic Protection of buried or immersed metallic structures – General principles and application for pipelines" and the cross referenced standards therein.

The CP system shall be constructed and tested according to the Specifications and the standard drawings provided by Contracting Entity, as well as the following approved DEG documentation, which will be issued by EPC Contractor and approved by Contracting Entity:

- CP study
- List of measuring posts
- Detail locations of the measuring posts alongside the route of the pipeline, shown in the longitudinal section drawings, as well as in the stations drawings, as required
- Any other DEG drawings

The pipeline shall be protected by four (4) Cathodic Protection Stations. Totally the CP system shall consist of the following:

a. CP-Station (transformer/rectifier unit) with impressed current anodes, including the concrete pier for kWh meter of the Local Electricity Supply Companies (in Greece and respectively in Bulgaria)

b. Sacrificial anodes (as required)

c. Insulating joints

d. Measuring posts and cable connection to the primary structure

e. Reference electrodes

f. Polarization probes

g. ER Coupons

h. All wiring systems cables and accessories installation and operation of all items above.

EPC Contractor is responsible for the contacts with the Local Electricity Supply Companies (in Greece and respectively in Bulgaria) for the connection and power supply of the CP Stations.

For the Bulgarian Section detailed elaboration on connection and power supply of the CP stations is given in the TD. In the Bulgarian Section there is a 40km section, where an existing Pipeline and the IGB Pipeline will run in parallel. Special measures are foreseen in the TD against interferences of the 2 CP Systems.

3.1.4.5.1 Temporary Cathodic Protection

The pipeline shall be protected against corrosion for the period defined between installation of the pipeline and the operation of the CP system. For this reason, a temporary CP-system shall be provided and installed by EPC Contractor, for the constructed and backfilled sections of the pipeline, in accordance with the soil resistivity and in accordance with the following table :

SOIL RESISTIVITY (Ω – m) RANGE	- INSTALLATION
- 0 – 10	Within one (1) month
- 10- 100	Within three (3) months
- Above 100	Within six (6) months

The Temporary CP study shall be prepared by the EPC Contractor, which is responsible for the provision of all the required field data.

EPC Contractor shall submit for review to the Contracting Entity the following:

a. Temporary CP Study

b. Installation Quality Procedure

c. Installation Time Schedule

For the temporary CP system the relevant Specifications and the approved DEG documentation for installation of sacrificial anodes shall be followed (the same configuration as at K4S measuring post). Magnesium sacrificial anodes must be soaked in water 24 hours before installation. During installation the soil must be watered enough in order the anode and the first backfilling layer to be saturated.

After the installation and a short polarization period, EPC Contractor shall prove the efficiency of the temporary CP system by executing the following, but not limited to, measurements:

- Current,
- Potential (on – off),
- Anode resistance to remote earth.

By the end of the Works and before the start-up of the permanent cathodic protection system all temporary connections shall be removed.

3.1.4.6 Pipeline Earthing System

Where the pipeline is routed parallel or obliquity to high voltage transmission lines and alternative current AC-traction lines, electromagnetically induced voltages, caused by load and / or fault currents, may reach unacceptable levels on pipeline, EPC Contractor shall install, at locations determined by the proximity effects study, a complete earthing system and take the appropriate measures to cope with any proximity effects, as required.

The proximity effects study and the relevant list of the earthing system will be performed by EPC Contractor and reviewed by Contracting Entity .

The earthing along the pipeline in connection with measuring posts shall be horizontal, continuous hot dip galvanized solid round conductor of external diameter 10mm, tested according to EN50164, connected as shown on the relevant Standard Drawings.

EPC Contractor shall install horizontal earthing conductors running parallel to pipeline, with leakage resistance to remote earth, according to the results of the proximity effects study to cope with the proximity effects (as required), with the following tolerance on the resistance values : ± 10%.

All parts of the horizontal earthing shall be minimum 0.2 m from the pipeline.

The earthing conductors shall be installed at K1G, K3G and K4G type of measuring posts in accordance with the relevant approved DEG pipeline longitudinal section drawings. The connection of the discharge voltage arrester shall be carried out shortly after the completion of the construction period.

The remote earth resistance of the installed length of the earthing conductor must be, after measurements, in accordance with the requirements of the proximity effects study.

However, EPC Contractor shall perform the following:

1. Measurement on site in order to define, if the earth resistance of the installed grounding electrodes (solid round conductor) is below the value required by the relevant proximity effect study to cope with the proximity effects.

2. The electrode (solid round conductor) length at each selected location shown on the relevant proximity effect study will be an estimation. EPC Contractor shall perform site measurements in order to prove that the earth resistance of the installed electrodes is below or equal to the value required by the relevant proximity effect study to cope with the proximity effects and to remove the induced current from the pipeline. If the earth resistance of the installed electrodes is greater than the required value, then EPC Contractor shall install additional earthing electrodes in order to meet the relevant requirements of the proximity effects study.

For the Bulgarian Section detailed elaboration on pipeline earthing system is specified in the Technical Design.

3.1.4.7 Electrical Power Supply System

The power supply voltage level in Greece is 400 / 230 V or 380 / 220 V, at 50Hz, and in Bulgaria is 380 / 220 V, and 20kV at 50 Hz ± 0,1 Hz, unless otherwise specified. EPC Contractor is responsible for the contacts with the Local Electricity Supply Companies (in Greece and respectively in Bulgaria) for the connection and power supply of the system for purposes of the CP system of the pipeline, as well as for all BVS and PS and for the RCC containers.

EPC Contractor shall install all devices according approved DEG, in particular the following:

- Transformer (where applicable) and switchboard(s)
- UPS with battery back-up.
- A UPS L.V. switchboard.
- Lighting system including indoor / outdoor lighting fixtures, fittings supports, etc.
- Socket outlets installation (230V, 1 phase, 16A and 400 V, 3 phase, 32A).
- Earthing installation for all non-current – carrying metal parts of Equipment, metal work, cable sheaths, lighting fittings, switches, socket outlets etc.).
- Surge / lightning protection system.

3.1.4.8 Lighting System at Stations

EPC Contractor shall install and test lighting poles with fixtures at all BVS and PS and supply all necessary Equipment in accordance with Specifications, Material Requisitions, DEG and Standard Drawings. Contracting Entity/Construction Supervision Entity approval of all Equipment prior to their installation is required.

More specifically, EPC Contractor shall install at each BVS and at each PS street lighting fixtures, aiming to cover as a minimum an average illumination level of 10 Lux for outdoor lighting.

Street lighting fixtures shall be mounted on hot-dip galvanized lighting poles 8.5 m height, with single mount bracket

The exact number and location of the lighting fixtures / poles in each station shall be according to Lighting System Calculations which shall be performed by EPC Contractor (in compliance with the Specifications and Contract Documents) and reviewed by Contracting Entity.

For the Bulgarian Section the relevant Technical Design part shall be taken into consideration.

3.1.4.9 Permanent Electrical Earthing System at Pipeline Stations

EPC Contractor shall install and test vertical earthing system at pits, lighting poles, fences and other steel structures, and supply all necessary Equipment in accordance with Specifications, Material Requisitions, Standard Drawings and approved DEG documentation. Contracting Entity/Construction Supervision Entity approval of all Equipment prior to their installation is required.

Above ground pipeline system shall be earthed according the earthing concept in the approved DEG.

All necessary precautions shall be taken, in order to avoid electrolytic corrosion between different types of metal.

3.1.4.10 Low Current Systems

EPC Contractor shall install the following:

Fire alarm and gas detection system consisting of manual fire alarm station, smoke detectors, gas detectors, fire alarm control panel and alarm devices, where applicable.

Security alarm system consisting of door violation sensors, infrared intrusion detector, security system control panel, alarm devices.

See also chapter for ICS and Telecommunication.

3.1.4.11 Fibre optic cable (FOC)

The Telecommunication and SCADA system developed in the FEED (for Greece) and in the TD (for Bulgaria) have major discrepancies and are not aligned as specified in the *Report with identification of discrepancies on existing documentation for SCADA system*. The activities related to the FOC construction are subject to results of the detailed design phase and are to be taken into account as well as the provisions of the law in Bulgaria concerning the changes in Technical Design.

FOC Installation Works include installation, splicing, testing, and commissioning of the FOC described and designed on the approved DEG documentation.

Scope of work shall comprise of procurement, installation and testing of a two 96 core FOC, inside the HDPE conduit along the pipeline routing at the Greek Section and two 96 core FOC, inside the HDPE conduits (one within the pipe trench and one inside a separated distant trench) along the pipeline routing at the Bulgarian Section, passing through all intermediate sites. EPC Contractor shall terminate the FOC inside the RCC containers at the termination / patch panels. In the field, the EPC Contractor shall terminate the FOC in underground splicing chambers. Location of the splicing chambers shall be decided taking into consideration minimum number of splices, accessibility of chambers and amount of cable left on the drum cable.

All Equipment installed outdoors shall have design temperature limits according to the design data provided by Contracting Entity.

After the FOC's installation and completion, the performance tests shall be performed in order to verify all FOC links. The following tests shall be included, but not limited to:

- FOC links attenuation;
- Optical Time Domain Reflectometer (OTDR) traces

EPC Contractor shall provide installation tests prior to FOC splicing, verifying cable quality.

3.1.4.12 Works related to existing infrastructure and installations

EPC Contractor shall make all contacts with Regulators, utility owners and land owners, concerning verification of the location of the existing installations, prior of the commencement of the Works.

During the excavations within the battery limits of the ROW and the BVS and PS, EPC Contractor shall give special attention to the installed by other parties underground networks, which shall be revealed and reinstated.

EPC Contractor shall not receive extra compensation for any difficulty due to underground networks discovered during the excavation for the mechanical, civil, electrical and instrumentation works. All responsibilities for supporting works shall be covered solely by EPC Contractor.

EPC Contractor shall provide all necessary works to support or hang up pipes, tubes, and cables of other Organizations, discovered in the trenches, cuts or exploratory excavations. Said works shall be done following the instructions of the Organization involved.

Special attention should be given by EPC Contractor to the instructions of Local Electricity Supply Companies, in areas where the pipeline runs close to overhead transmission lines (OHTL).

EPC Contractor should give great attention and diligence to keep the property, obstructs, networks of other organizations or Regulators harmless during the execution of the Works.

Without prejudice to any liability of the EPC Contractor for such damage under the Contract, if a damage shall occur, EPC Contractor shall repair and restore functions on his own expenses.

In case the organization of the damaged network restores functions by his own teams and means, EPC Contractor shall pay invoices issued by the organization. If EPC Contractor refuses to pay, Contracting Entity shall deduct the relevant amount from the EPC Contractor's payment certificates.

EPC Contractor is responsible to warn immediately the said organization in case of any leakage or defect due to above damages.

The organization involved shall decide who has to repair. EPC Contractor may ask the organization's network personnel to inspect pipeline works, in order to prevent any damages.

Prior to starting excavation works EPC Contractor shall ask for accurate network plans from the organizations and shall confirm accuracy by trial cuts or by boreholes.

If a part of existing network needs relocation (as per relevant organization request) EPC Contractor shall study the situation in cooperation with the organization and shall inform Contracting Entity for the most adequate technical solution. EPC Contractor shall support his technical proposal with :

a. Technical description

b. Drawing and/or sketches showing the said relocation

In case the relocation of any existing network (above ground or underground) is required (as per relevant organization request) the relevant cost shall be borne by EPC Contractor

If any contact and / or work arrangement should be required with the Regulators involved, then EPC Contractor shall do the relevant actions.

For the Bulgarian Section the conditions with the infrastructure owners are agreed and documented in the Permission documents, in the Spatial plan and the approval documents supplementing the Technical design

The agreed approach with the relevant stockholders shall be followed by the EPC.

3.1.4.13 Traffic arrangements

Special attention should be given by EPC Contractor to minimize public nuisance and traffic disturbance during the execution of the Works. Special sidewalls and corridors shall be constructed on EPC Contractor's care and expenses to ensure the above safety scope.

EPC Contractor shall take care for the contacts with the relevant Regulators for the issue of the necessary Permissions for the imposed traffic arrangements.

In Bulgaria these issues must be coordinated with the *Agency for Road Infrastructure and traffic police*.

The EPC Contractor must strictly comply with the provisions of all relevant Greek / Bulgarian laws, in order to provide all required traffic boards, traffic lights, deviation roads, etc. and generally avoid creating troubles to the public.

In case that interruption or suspension of traffic is necessary for the execution of the Works, EPC Contractor shall prepare a complete study and a detailed schedule of traffic operational arrangements and shall apply to the relevant Regulators for permission.

A preliminary study and schedule as above shall be submitted for review / comments to the Contracting Entity well in advance (i.e. at least one month) prior the commencement of construction activities.

The arrangements for the traffic control shall include (as required) indicatively, but no limited to, the following:

1. Warning boards of operational sites.
2. Horizontal painted road hatching.
3. Balustrades, wooded or steel rails, ropes, all painted with proper reflected colors.
4. Heavy steel plates to cover open trenches for traffic purpose.
5. Proper wooden or steel bridges for pedestrians.
6. Temporary bitumen roads for traffic deviations,
7. Traffic flags, traffic operators, security personnel, etc.

The EPC Contractor shall be fully responsible for all damages of roads and things of public or networks of others caused by EPC Contractor or his personnel and / or his suppliers.

As far as the traffic control is concerned, EPC Contractor shall be responsible for:

a. Traffic signal and marking,

b. Traffic boards and lights,

c. Traffic permanent installations and power cables

d. Horizontal painted road hatching

e. Restoration of the above according to the instruction given by the Regulators and Contracting Entity.

3.2 GMS & AGRS

This chapter describes the EPC Contractor's Scope of Work (SOW) concerning the various Gas Metering Stations (GMS) and the Automated Gas Regulating Stations (AGRS) together with the associated buildings (Control and Boiler building, Station Control Rooms, Boiler Rooms and Regulating Skid housings).

3.2.1 Brief description

In particular, the following GMS and AGRS are foreseen:

GMS and AGRS along IGB sorted by geographical location from South to North							
S/N	Geographical location	Building / House	Station	AGRS & Off-take	Pigging Station	BVS Station	CP System (four stations)
1	Komotini	Control/Utilities Building	GMS1		PS1		CPSS1
Greek / Bulgarian Border							
2	Kardjahli	Control Room, Technical Measuring Room and Regulating Skid Housing		AGRS		BV3	CPSS2
3	Dimitrovgrad	Control Room, Technical Measuring Room, Boiler Room and Regulating Skid Housing		AGRS			CPSS3
4	Stara Zagora	Control Room, Technical Measuring Room, Boiler Room and Metering Skid Housing	GMS2		PS2		CPSS4

The process description and plot plan configuration of the above mentioned stations is depicted in detail in the relevant documents, Process Flow Diagrams, Piping & Instrumentation Diagrams as well as drawings.

Note:

The gas metering stations (GMS1) at Komotini will be connected to the National Gas Transmission Pipeline (operated by DESFA SA) and additionally to TAP. So far the FEED for GMS1 includes only information for the connection to the National Gas Transmission Pipeline. Additional feasibility study report and drawings is prepared for TAP measurement lines and auxiliary equipment (see the attachments to this Technical specification) and shall be further designed in details by the EPC Contractor. The metering station shall comprise of separate measuring lines for both connected systems and common auxiliary equipment and facilities. Further clarifications and agreements with DESFA and TAP operators for the tie-ins shall be carried out by the EPC Contractor, as at this stage they are preliminary.

Indicatively, the main components of the GMS and AGRS installation includes, but not limited to, the following:

1. The filtering, metering and regulation system (piping, filter / separators, meters, heat exchangers, regulating valves, heaters, analysers, etc.) and supporting activities on metering system.

2. Invoicing System (training included).

3. All related works to the Tie-ins/Hot Taps to other transmission systems (DESFA and TAP for Greece and Bulgartransgaz for Bulgaria).

4. Utility Systems, including, but not limited to, standby electricity generation, UPS system, closed drain drum, hot water system, firefighting system, ventilating system, fuel gas system, nitrogen production system, potable water, sewer and drainage.

5. Supporting Station Control System activities (ICS, SCADA, Telecom system).

6. CP System for Stations (CPSS).

7. Electrical Installations.

8. Lightning Protection System.

9. Civil Works.

10. Construction of the GMS and AGRS buildings / houses, as well as the analyser houses.

The stations will be designed for unmanned operation. Only for special cases personnel will be on site.

3.2.2 Structure of documents

The documents given in this chapter allow to get an easier overview about the design. All documents not listed here have the same importance and shall be considered as well.

In Greece:

An overview over the FEED documents for the Greek Section is given in the following document, the documentation related to GMS1 in Komotini is described in chapter 4.

Docu No/File name	Document name
IGB _FEED Docs List - Greece_11.07	LIST OF FEED DOCUMENTATION FOR THE GREEK SECTION

The general information and location of the station is given in the following files of the project:

GMS Komotini (GMS1) and Pigging Station 01 (PS1)

Docu No/File name	Document name
10760-CI-A1-01-411	Cadastral survey plan, Komotini gas metering station (GMS1) & pigging station (PS1), Greek Section from K1+363.56 to K1A+173.79
10760-MTO-ME-A1-402_Komotini_GMS1-PS1_MTO_En	Komotini Gas Metering Station (GMS1) / Pigging Station (PS1) Piping MTO List
10760-ME-A1-02-401__Rev0_Komotini-Sheet 1	KOMOTINI GAS METERING STATION (GMS1) & PIGGING STATION (PS1) - PIPING ARRANGEMENT ΜΕΤΡΗΤΙΚΟΣ ΣΤΑΘΜΟΣ ΚΟΜΟΤΗΝΗΣ (GMS1) & ΣΤΑΘΜΟΣ ΞΕΣΤΡΟΥ (PS1) ΣΧΕΔΙΟ ΔΙΑΤΑΞΗΣ ΣΩΛΗΝΩΣΕΩΝ

10760-ME-A1-02-401__Rev0_Komotini-Sheet 2	KOMOTINI GAS METERING STATION (GMS1) & PIGGING STATION (PS1) - PIPING ARRANGEMENT ΜΕΤΡΗΤΙΚΟΣ ΣΤΑΘΜΟΣ ΚΟΜΟΤΗΝΗΣ (GMS1) & ΣΤΑΘΜΟΣ ΞΕΣΤΡΟΥ (PS1) ΣΧΕΔΙΟ ΔΙΑΤΑΞΗΣ ΣΩΛΗΝΩΣΕΩΝ
10760-CI-A1-01-402_REV1	Komotini Gas Metering Station (GMS1) & Pigging Station (PS1), Plot plan
10760-MTO-CI-A1-401_REV0	Komotini Gas Metering Station (GMS1) & Pigging Station (PS1) Civil Works MTO
10760-LST-EL-A1-402_ REV0	Electrical Works MTO for Komotini Gas Metering Station (GMS1) / Pigging Station (PS1)
10760-LST-CP-A1-401_REV0	Komotini Gas Metering Station (GMS1) & Pigging Station (PS1) - Cathodic Protection System MTO List
10760-MTO-ME-A1-401-REV1	Komotini Gas Metering Station (GMS1) & Pigging Station (PS1) Building Mechanical Installations MTO List
10760-LST-PR-A1-002 Rev 2	Lines List Komotini GMS
P574-000-08-001	TAP – Preliminary process flow diagram Gas regulating and metering sections
P574-000-08-002	TAP – Preliminary process flow diagram Fuel Gas and hot water system Independent M/R station for IGB – TAP interconnection
P574-000-08-004	TAP – Preliminary process flow diagram Close drain system Independent M/R station for IGB – TAP interconnection
P574-000-LS-INS-001 Rev 1	TAP - Preliminary Exchanged Signal List between IGB and TAP
P574-000-RP-GEN-001 Rev 1	TAP - Evaluation Report of Options for Interconnection
P574-100-01-001 Sheet 1 Rev 1	TAP – Preliminary arrangement Integrated M/R station for IGB – TAP interconnection Recommended plot
P574-100-01-001 Sheet 2 Rev 1	TAP – Preliminary arrangement Integrated M/R station for IGB – TAP interconnection Alternative plot
P574-200-01-001 Rev 1	TAP – Preliminary typical arrangement Independent M/R station for IGB – TAP interconnection

In Bulgaria:

The documents of TD are mainly organized by subproject for each station and below the related design disciplines:

Volume	Part	Name	Doc No
III		**Subproject: GMS Stara Zagora**	
	1	Geological and Hydrogeological report	IGB-04-FEED-III.1
	2	Master plan and landscaping	IGB-04-FEED-III.2
	3	Part Technological and Technological pipelines	IGB-04-FEED-III.3

	4	Part Architectural	IGB-04-FEED-III.4
	5	Part Structural	IGB-04-FEED-III.5
	6	Automation of technological processes	IGB-04-FEED-III.6
	7	Fire safety	IGB-04-FEED-III.7
	8	Part electrical	IGB-04-FEED-III.8
	9	Technological connection systems	IGB-04-FEED-III.9
	10	Heating, ventilation and air conditioning	IGB-04-FEED-III.10
	11	Energy Efficiency	IGB-04-FEED-III.11
	12	Health and safety plan	IGB-04-FEED-III.12
	13	Water supply and sewage	IGB-04-FEED-III.13
IV		**Subproject: AGRS Dimitrovgrad**	
	1	Geological and hydrogeological report	IGB-04-FEED-IV.1
	2	Master plan and landscaping	IGB-04-FEED-IV.2
	3	Part technological and technological pipelines	IGB-04-FEED-IV.3
	4	Part architectural	IGB-04-FEED-IV.4
	5	Part structural	IGB-04-FEED-IV.5
	6	Automation of technological processes	IGB-04-FEED-IV.6
	7	Fire safety	IGB-04-FEED-IV.7
	8	Part electrical	IGB-04-FEED-IV.8
	9	Technological connection systems	IGB-04-FEED-IV.9
	10	Heating, ventilation and air conditioning	IGB-04-FEED-IV.10
	11	Energy Efficiency	IGB-04-FEED-IV.11
	12	Health and safety plan	IGB-04-FEED-IV.12
	13	Water supply and sewage	IGB-04-FEED-IV.13
V		**Subproject: AGRS Kardzhali**	
	1	Geological and hydrogeological report	IGB-04-FEED-V.1
	2	Master plan and landscaping	IGB-04-FEED-V.2
	3	Part technological and technological pipelines	IGB-04-FEED-V.3
	4	Part architectural	IGB-04-FEED-V.4
	5	Part structural	IGB-04-FEED-V.5
	6	Automation of technological processes	IGB-04-FEED-V.6
	7	Fire safety	IGB-04-FEED-V.7
	8	Part electrical	IGB-04-FEED-V.8
	9	Technological connection systems	IGB-04-FEED-V.9
	10	Heating, ventilation and air conditioning	IGB-04-FEED-V.10
	11	Energy Efficiency	IGB-04-FEED-V.11
	12	Health and safety plan	IGB-04-FEED-V.12
	13	Water supply and sewage	IGB-04-FEED-V.13

VII		**Technological connection - connection organization.** **Connection system equipping.**	IGB-04-FEED-VII
VIII		**External connections**	
		External power supply networks	IGB-04-FEED-VIII.1
		Access roads	IGB-04-FEED-VIII.2

General description, layout and process diagram can be seen from the following documents:

File name	Site	Document title
IGB-04-FEED-III.3-Rev01-ENG	GMS Stara Zagora	Explanatory note to TECHNOLOGICAL PART AND TECHNOLOGICAL PIPELINES
IGB-04-FEED-III.3-PR-A2-01-001_Rev01	GMS Stara Zagora	Process flow diagram Stara Zagora gas metering station
IGB-04-FEED-III.3-ME-A2-02-401_Rev01	GMS Stara Zagora	Piping arrangement for Stara Zagora gas metering station (GMS2). Pigging station PS2
IGB-04-FEED-IV.3-Rev00-ENG	AGRS Dimitrovgrad	Explanatory note to TECHNOLOGICAL PART AND TECHNOLOGICAL PIPELINES
IGB-04-FEED-IV.3-PR-M3-01-001_Rev00	AGRS Dimitrovgrad	Process flow diagram Dimitrovgrad Off-take/automated gas regulation station
IGB-04-FEED-IV.3-ME-M3-02-401_Rev00	AGRS Dimitrovgrad	Piping arrangement for Dimitrovgrad AGRS
IGB-04-FEED-V.3-Rev00-ENG	AGRS Kardzhali	Explanatory note to TECHNOLOGICAL PART AND TECHNOLOGICAL PIPELINES
IGB-04-FEED-V.3-PR-M1-01-001_Rev00	AGRS Kardzhali	Process flow diagram Kardzhali Off-take / automated gas regulation station
IGB-04-FEED-V.3-ME-M1-02-401_Rev00	AGRS Kardzhali	Piping arrangement for Kardzhali AGRS. Block valve station BV3

3.2.3 Battery limits

The battery limits for the part of the project related to the GMS and AGRS are defined as follows:

- All structures, buildings located inside the property limits,
- The access roads between existing roads and property limits,
- DEG, FEG and FTD for Greece and Bulgaria, procurement and delivery of the power supply utility system up to the permanent fence, in order to connect the systems with the local electricity network. The concrete / steel pillar as well as any other installation and / or Permission required by Local Electricity Supply Company for the connection of each GMS and AGRS with the local electricity network as applicable.
  The connecting cable routes for the external power supply in Bulgaria is already predefined in the Technical Design and approved from the Authorities for the Bulgarian Section. The cable routes for the Greek Section are open to be decided and approved with the suppliers.

- parts of the public utility networks from the connection points defined by the relevant public utility organizations up to the connection points (counters – metering points) inside the property limits, if applicable.

- The Detail Design for Greek and the Bulgarian Section, procurement and construction of the permanent fence lines

The type of utility connections is given in the following table:

Station	Electricity	Water	sewer
GMS 1 Komotini	Connection to the supplier to be specified during DEG	Connection to the supplier to be specified during DEG	Connection to the supplier to be specified during DEG
AGRS Kardzhali	20 kV connection point, overground	n.a. (internal basin foreseen)	n.a.
AGRS Dimitrovgrad	20 kV connection point, overground	n.a. (internal basin foreseen)	n.a.
GMS 2 Stara Zagora	20 kV connection point, underground	n.a. (internal basin foreseen)	n.a.

The above mentioned property limits are indicated in the relevant stations' drawings or will be provided by Contracting Entity to EPC Contractor after Contract Award.

3.2.4 Construction

Independent from all below mentioned works and requirements, the approved detail design shall be followed.

For the Bulgarian Section most of the following requirements are integrated in the TD.

For the Greek Section the Volume 1 "Overall -General" of the FEED contains Job Specifications, which are listing similar requirements.

The EPC Contractor shall always follow the more strict requirements or shall clarify in case of contradictions with the Contracting Entity.

3.2.4.1 Civil erection works

The EPC Contractor shall perform all construction works, including survey and material supply as described, but not limited to the following:

- Supply and install his own field temporary facilities.

- Field survey and soil Geotechnical investigation. EPC Contractor shall perform all of the above mentioned soil/concrete tests and he will provide all the required samples only if necessary. The TD for Bulgarian Section covers these data.

- General excavations and site preparation works including any slope stabilization measures required, according to Project Specifications and relevant Technical Documents. In case that the EPC Contractor meets any above ground or underground obstructions during grading he shall remove these at his own cost.

- If dewatering is necessary for pumping to an authorized area outside Contracting Entity's property this shall be performed on EPC Contractor's care and cost.

- Earth and road works including asphalt and /or concrete paving and curb works within the Stations' area. Paved and asphalt surfaced areas as described in the relevant Technical Documents and shown in the Civil and Plot Plan Drawings. Wherever there are existing roads and paved areas that need to be damaged in order for the new installations to be constructed, the EPC Contractor shall reinstate all damaged areas and he shall restore the whole site to a proper and functional form, according to all relevant regulations, Specifications and technical requirements.

- Supply and install fencing around the land stations including main and secondary gate and fence supports as shown on the relevant plot plan and standard drawings as well as reinstate the existing fence wherever it has been shuttered by construction or other works related to this project.

- Execution of all concrete works for the project such as reinforced concrete duct banks and concrete saddles, concrete paving, concrete pillars and concrete supports for valves and piping supports and generally all stations' Equipment and building foundations and superstructures. Before commencing works on site, the EPC Contractor shall provide all required in-situ and laboratory tests on his own care and cost. The EPC Contractor shall submit a detailed list of all tests in accordance with the requirements of the Specifications, mentioning the individual procedures and shall proceed only after Contracting Entity's approval. Quality control forms for the concrete works shall be submitted to the Contracting Entity and the Construction Supervision Entity before concreting as well as concrete characteristics, strength and composition shall be defined before concrete mixing and shall be submitted to the Contracting Entity and the Construction Supervision Entity for approval. The use of super plasticizer, if necessary, shall be subject to Contracting Entity's and the Construction Supervision Entity approval shall be considered in the concrete proportions as specified by the Manufacturer's instructions.

- Elevated steel structures, platforms, ladders, stairs, etc. including supply of material, fabrication, primer painting, delivery at sites of the prefabricated items and erection. The EPC Contractor shall perform construction of any structural steel which includes supply of material, fabrication, primer painting, delivery at sites of the prefabricated items and erection and to submit test certificates to prove that steel characteristics are as required. Mill certificates shall be submitted to the Contracting Entity for approval before shop fabrication is started. Steel items to be supplied by the EPC Contractor consist of, but are not limited to the following:

  a. Steel profiles including connections for all steel members, bolts, anchor bolts, base plates, etc.

  b. Trolley beams.

  c. Galvanised grating and/or chequered plates.

- For buildings construction, the EPC Contractor shall perform all construction works and material supply for the new buildings according to the architectural drawings, the job Specifications and the relevant Greek or Bulgarian and international codes. Building works to be performed by the EPC Contractor include, but are not limited, to the following:

  a. Reinforced concrete works including excavation and backfilling.

b. Miscellaneous building works described in the relevant Technical Description and Job Specifications.

- Equipment foundations, sleepers, pipe supports foundation, pipe culverts, etc.
- Underground installations (Underground piping, el. trenches, sewer system, etc.).
- The EPC Contractor shall provide mechanical channels of reinforced concrete with removable precast reinforced concrete cover. Electrical duct banks, if any, are included in the scope of work.
- Where required, the EPC Contractor shall provide the installation of the drainage system and the tie ins to the existing main drainage system of the area, as well as the following:

  a. supply and install concrete or PVC drainage pipes (if required)

  b. supply and install concrete pits for special joints

  c. material handling

  d. trenches backfilling to perform the grade elevation shown on the drawings

  e. testing and flashing of all underground system before and after backfilling.

- Backfilling, re-levelling of the area to final grade, roads, surface drainage system, retaining walls (if any), etc.
- Transport to the site and laying gravel surfacing.
- The EPC Contractor shall provide fireproofing of Equipment and structures in accordance with applicable job Specifications.
- Any other works required as per relevant Technical Documentation, Technical Design and Project Drawings.

All above works shall be executed in accordance with the applicable Specifications and Codes and Standards and national laws.

3.2.4.2 Piping / mechanical erection works

The Scope of Piping and Mechanical erection works for each GMS and AGRS includes but is not limited to the following:

- Equipment erection.
- Fabrication and erection of all pipe works including pipe supports for all GMS and AGRS and the guarantee / golden welds of the tie-in points.
- Preparation for Hot tapping, where required for tie-ins, shall be included in the scope.
- Align the pipes and start welding operation with the qualified welders following the approved quality control procedures and the requirements mentioned in the Specifications.

- Coating of underground buried pipes in accordance with Specifications.
- NDT's as required.
- The EPC Contractor shall plan, prepare, qualify, perform, evaluate, supervise and document all welding inspections by means of non-destructive examination (NDE) by a NDE specialist approved by Contracting Entity. Destructive testing shall be performed by a qualified and approved laboratory in accordance with the Specifications requirements. For the Bulgarian Section the NDT Laboratory must me certified according to BDS EN ISO/IES 17020:2012 by National Evaluation and Accreditation Agency or by a foreign accreditation body, which is party to the Multilateral Agreement on Mutual Recognition of the European Organization for Accreditation or an equivalent standard with a valid Certificate of Accreditation and Scope of Control covering the Control Methods on the date of the deadline for submission of offers.
- Close cooperation with Contracting Entity Representatives is mandatory.
- Functional tests of filter–separators, gas heaters, utilities etc., in accordance with the applicable Specifications and standards.
- Pressure testing of piping and drying.
- Painting of structural steel, Equipment and piping shall be in accordance with job Specifications, in full.
- Equipment and piping shall be insulated in accordance with job Specifications, in full. The EPC Contractor's scope of work includes but is not limited, to the following:

  a. Insulation engineering

  b. Material selection and procurement (typically filter–separators, heaters etc)

  c. Training of local labour force and supervision, for each

  d. Preparation of detail working procedures per individual item

  e. Calculation, supply of Equipment and installation of pipe supports

  f. Quality Assurance and Quality Control program

3.2.4.3 Instrument erection works

The scope of instrument erection works includes, but not limited, to the following:

- Installation of Instruments (PT, TT, PG, TG) and flow computer panels.
- Installation of junction boxes.
- Installation of cable trays or cable trenches, including instrument and communications cables.
- Installation of Equipment i.e. flow meters, FV, SSV, analysers etc.
- Lay-down and termination of all instrumentation / communications cables including from/to ICS and telecom.

- Calibration of instruments, loop checking and alignment in accordance with applicable job Specifications and standards.

- During loop check / alignment the complete testing of each Loop shall be recorded by the EPC Contractor. This shall include all interconnections between the various automatic control systems associated with Station Streams and process & utilities plant, panels, instruments etc. so that all inputs and responses relating to instruments are tested and verified.

The EPC Contractor shall have full responsibility for ensuring that the instruments fulfil their purposes of installation and function properly.

All instruments and relative Equipment installed outdoor shall have design temperature limits according to the requirements in the technical documents to this project.

After the instrument installation and completion, the Equipment shall be tested in line with the simulated process conditions. In case of any total line test malfunction occurrence, then the test shall be stopped and the failures shall become the EPC Contractor's responsibilities, shall be corrected within the testing time schedule and at EPC Contractor's own cost.

The EPC Contractor shall provide calibration certificates and functional tests performed prior to instrument and Equipment installations and perform field and bench calibration if required.

3.2.4.4 Electrical erection works

The scope of electrical erection works for each GMS and AGRS includes, but not limited to, the following:

- Connections to the Local Electricity Supply Company
- Cable lay-down and interconnections from switchboards to the users
- Installation of control stations, junction boxes, etc.
- Installation of lighting system
- Assembly and wiring of all switchboards and local panels
- Installation of earthing and lightning protection systems
- Installation of emergency power system (Gen. Set and Batteries)
- Installation of UPS and batteries
- Low current Installations
- Installation of Cathodic Protection System

The EPC Contractor is responsible for the complete erection works for all electrical installation mentioned above in accordance with the reference Specifications, standards and drawings.

All connections and/or interconnection cabling systems are included in the EPC Contractor’s scope of work.

The following requirements are applicable:

- The electrical works shall be executed in accordance with applicable standards, Specifications and standard drawings.
- Prior to any installation the EPC Contractor shall prepare a set of drawings with area classification definitions of stations' areas in accordance with IEC 60079-10 and API RP 505.
- All electrical items shall meet the requirements of the area classification in which they are to be installed and shall meet the surface temperature requirements of the relative codes.
- Hot dip galvanised junction boxes shall be easy to handle, operate, maintain and inspect.
- Thirty (30%) per cent spare space and pre-drilled gland entries shall be provided for junction boxes and control cabinets.
- Twenty-five (25%) per cent spare capacity for every kind of control cables shall be provided for future expansion.
- Hot dip galvanised rigid steel conduit shall be used for cables as applicable. In corrosive atmospheres, the use or rigid PVC conduits or rigid steel conduit shall be considered, as applicable.
- Minimum degree of Equipment Protection (IP) shall be IP 65 for outdoor installations.
- The Works shall include tests on equipment and material.

In addition the following requirements are included in the EPC Contractor scope of work:

- The concrete structure for Local Electricity Supply Company cubicle.
- The interconnection works between Local Electricity Supply Company cubicles which will be installed by Local Electricity Supply Company and the main distribution switchboard.
- All cable routings outside the buildings / houses shall be run underground.
- All cable entries from safe areas to hazardous areas shall be gas tight.
- Power and control cables from/to motorised valves shall be underground.
- The EPC Contractor has to install insulating joints for the isolation of the Pipeline's Cathodic Protection System (e.g. in the connection point with the pipeline).

It is noted that all power and control cables shall be non-fire propagating type in accordance with IEC 60332-3.

The power and control cables from/to remotely operated ESD valves for emergency shutdown, located at the stations' inlet and outlet, shall be fire resistant in accordance with IEC 60331.

The following alarm and indication signals shall be collected in separate terminal blocks:

- Main feeder from Local Electricity Supply Company faults (common alarm).
- E.D Generator and feeder (common alarm).
- E.D Generator operates (indication)
- UPS fault
- UPS battery operation
- UPS battery low
- DC system fault
- DC system battery operation
- DC system battery low
- Fire alarm (common alarm)
- Fire alarm system fault (common alarm)
- Security alarm system (common alarm)
- Security alarm system (energized / de-energized)

The interconnection works between these signals from electrical switchboards and local RTUs and the interconnection works between PTC (Public Telephone Company) junction box that will be installed by PTC and the telephone system and to SCADA System is also included in the EPC Contractor SOW.

To enable performance test execution, the EPC Contractor shall supply and install kWh-meter in the EDG incoming feeder and the external grid connection.

3.2.4.5 Traffic arrangements

Special attention should be given by EPC Contractor to minimize public nuisance and traffic disturbance during the execution of the Works. Special sidewalls and corridors shall be constructed on EPC Contractor's care and expenses to ensure the above safety scope.

EPC Contractor shall take care for the contacts with the relevant Regulators for the issue of the necessary Permissions for the imposed traffic arrangements.

The EPC Contractor must strictly comply with the provisions of all relevant Laws, in order to provide all required traffic boards, traffic lights, deviation roads, etc. and generally avoid creating troubles to the public.

In case that interruption or suspension of traffic is necessary for the execution of the Works, EPC Contractor shall prepare a complete study and a detailed schedule of traffic operational arrangements and shall apply to the relevant Regulators for permission.

A preliminary study and schedule as above shall be submitted for review/comments to the Contracting Entity well in advance (i.e. at least one month) prior the commencement of construction activities.

The EPC Contractor shall be fully responsible for all damages of roads and things of public or networks of others caused by EPC Contractor or his personnel and/or his suppliers.

As far as the traffic control is concerned, EPC Contractor shall be responsible for:

a. Traffic signal and marking,

b. Traffic boards and lights,

c. Traffic permanent installations and power cables

d. Horizontal painted road hatching

e. Restoration of the above according to the instruction given by the Regulators and Contracting Entity.

3.2.4.6 Access roads

Without prejudice to clauses 4.13 and 4.15 of the Contract, where the existing access road does not provide adequate access conditions, the EPC Contractor is responsible to improve the existing road by paving, widening or extension, according to relevant Specifications, as instructed by the Contracting Entity . The EPC Contractor shall be responsible to obtain all required Permissions.

3.3 Dispatching centre and O&M base

This chapter describes the EPC Contractor's Scope of Work (SOW) concerning the Dispatching Centre and Operation & Maintenance Base.

3.3.1 Brief description

The Dispatching Centre and Operation & Maintenance Building (O&M Base) at Stamboliyski village, Municipality of Haskovo, Bulgaria, will be used for the Operation and Maintenance of the Natural Gas Interconnection Greece-Bulgaria (IGB) Project.

The Dispatching Centre and Operation and Maintenance Base is a compound consisting of a series of buildings and outdoor facilities inside a secured and fenced plot with an overall plot area of 9548 m².

The general layout of the dispatching center and O&M base consist of the following buildings and facilities:

- Main entrance with checkpoint;
- Roads inside compound;
- Parking lot with 27 parking spaces, 3 of them for people with disabilities;
- Office building - 735,63 м2;
- Building housing repair workshops – 425,24 м2;
- Depot - 413,60 м2;
- Outdoor storage space – shelter 121,82 м2;

The plot access is across two passages from the side of a newly designed road at the North-Western end of the plot. The construction of the newly designed road is within the Scope of Work of the EPC Contractor.

There is a passage for cars leading to the parking lot. There is a cargo passage to provide access of heavy-freight trucks to the depot and outdoor storage space in the middle of the site where the main checkpoint of the safeguard plot is situated.

Driveways cross the site separating the buildings in the middle of the site in two compounds parallel to the main road. The office building and the building housing repair shops lay in the forefront. The farm buildings comprising a depot and a shelter lay in the background.

The vertical landscape design provides for an office building and a building housing repair workshops with inclined walls and single-pitched roofs aligned on a North-West – South-East diagonal.

The plots between buildings are planted with grass, trees and shrubs to create a wholesome micro-climate and a place of relaxation and respite from toil.

The site layout provides for setting up:

- mud/oil trap of rainwater from the parking lot;

- sewage pump fittings;
- power transforming plant;
- diesel-generator;

Other facilities to be foreseen within the scope of DEG and the project:

- Waste water treatment unit
- Planting and Landscaping
- Irrigation system including Irrigation boreholes

The layout of buildings and facilities of the O&M base is shown in General layout plot plan in the Technical Design and in the documents listed in the next sub chapter.

3.3.2 Structure of documents

The documents given in this chapter allow to get an easier overview about the design. All documents not listed here have the same importance and shall be considered as well.

Volume	Part	Section	Name	Doc No
VI			Subproject: Dispatch centre	
	1		Geological and hydrogeological report	IGB-04-FEED-VI.1
	2		Master plan	IGB-04-FEED-VI.2
	3		Geodesic - tracing plan and landscaping	IGB-04-FEED-VI.3
	4		Part architectural	IGB-04-FEED-VI.4
	5		Part structural	IGB-04-FEED-VI.5
	6		Park planning	IGB-04-FEED-VI.6
	7		Part electrical	IGB-04-FEED-VI.7
	8		Technological connection systems	IGB-04-FEED-VI.8
	9		Water supply and sewage	IGB-04-FEED-VI.9
	10		Heating, ventilation and air conditioning	IGB-04-FEED-VI.10
	11		Energy Efficiency	IGB-04-FEED-VI.11
	12		Health and safety plan	IGB-04-FEED-VI.12
	13		Fire safety	IGB-04-FEED-VI.13
	14		Powder fire extinguishing	IGB-04-FEED-VI.14
	15		Automation of technological processes	IGB-04-FEED-VI.15
VII			Technological connection - connection organization. Connection system equipping.	IGB-04-FEED-VII
VIII			External connections	
			External power supply networks	IGB-04-FEED-VIII.1
			Access roads	IGB-04-FEED-VIII.2

General description, layout and process diagram can be seen from the following documents:

File name	Document title
IGB-04-VI.15-Rev00-ENG	Explanatory note to AUTOMATION OF TECHNOLOGICAL PROCESSES
IGB-04-FEED-VI.15-01_Rev00	Structural diagram IAPCS Gas Pipeline on the Territory of Bulgaria
IGB-04-FEED-VI.2-Rev00-(EN)	General layout (Explanatory note)
IGB-04-FEED-VI.2-Rev00	General layout
IGB-04-FEED-VI.3-03-TP-Rev01	Tracing plan
IGB-04-FEED-VI_7_ENG-Rev00	Explanatory note to ELECTRICAL PART
IGB-04-FEED-VI.7.SI.SP&LI_REV01	Site electric installation
IGB-04-FEED-VI.7.SI.ELV_Rev00	Site plan – low voltage installation
IGB-04-FEED-VI.8.DZ-zapiska_EN	Explanatory note to TECHNOLOGICAL CONNECTION SYSTEMS
IGB-04-FEED-VI.8-01	General layout - Trace of protective HDPE pipes for FOC
IGB-04-FEED-VI.9.EXPL.NOTE (EN)-Rev00	Explanatory note to WATER SUPPLY AND SEWERAGE
IGB-04-FEED-VI.9.SI.1-REV01	Situation water pipe and waste water pipe

3.3.3 Battery limits

The battery limits for the part of the project related to Dispatching Centre and O&M Base are defined as follows:

The EPC Contractor's Scope of Work includes

- all structures and buildings located inside the property limits,
- the access roads between existing roads and property limits,
- parts of the public utility networks from the connection points defined by the relevant public utility organizations up to the connection points (counters – metering points) inside the property limits, especially:
    - 20kV electrical supply – connection to existing over ground electrical line and new underground cable with approx. length of 500m. At the connection point new steel braced pillar need to be installed.
    - Drinking water supply – ø110 underground connection to existing ø 600 pipe-line located next to the plot border in a distance of approx. 10m.
    - Telecommunication
- Detail Design, procurement and construction of the permanent fence lines

3.3.4 Construction

3.3.4.1 Architectural construction works

EPC Contractor's SOW includes the construction of all Buildings and indoor and outdoor facilities that serve the Dispatching Centre and Operation and Maintenance Base.

The Scope of the Architectural construction works, includes but not limited to the following:

- Brick masonry works for external and internal partition walls
- External wall and under floor thermal insulation
- Facade decorative bricks
- Plastering
- Internal wall tiling and decorative brick finishes
- Internal and External Doors (steel, aluminium and wood)
- Aluminium frame windows, louvers and associated glazing
- Flooring (industrial flooring, ceramic tile, raised access floors)
- Marble flooring (as applicable) and window/door sill works.
- Roof thermal insulation and waterproofing
- Building waterproofing
- Gypsum board internal partition walls
- Suspended Ceilings
- Sanitary
- Fixed furniture in WCs, locker rooms, kitchenette, reception and guard house
- Painting of rendered surfaces, fair faced concrete, steelwork, etc.
- Pergola skylight corridor in Maintenance building block
- Planting and Landscaping of O&M base surrounding area

All in accordance with the available Technical Design and following approved DEG documentation reviewed by Contracting Entity / Contracting Entity Representative and the applicable Technical Description, Specifications and Drawings.

3.3.4.2 Civil erection works

EPC Contractor's SOW includes the construction of all Buildings and indoor and outdoor facilities that serve the Operation and Maintenance Base.

The Scope of the Civil / Structural construction works, includes but not limited to the following:

- Earthworks. Excavations and site preparation according to technical Specifications. In case EPC Contractor meets any above ground or underground obstructions during grading, these shall be removed on EPC Contractor's cost. Transportation of excavation materials at an authorized place outside IGB property. Backfilling using excavation reclaiming products, borrow, sand gravel or paving gravel.

- Reinforced Concrete Works. Concrete foundations, slab on ground and concrete columns for all buildings. Concrete roof slabs for the Administration, the Workshop, the Utilities Buildings and the Gate Security House. Concrete water and sewage tanks. Foundation of waste water treatment plant.

- All necessary concrete works for electrical and mechanical installations in surrounding area (sewer system, drainage system etc.)

- Road, pavements and parking area construction.

All in accordance with the approved DEG documentation reviewed by Contracting Entity / Contracting Entity Representative and the applicable Technical Description, Specifications and Drawings.

3.3.4.3 Mechanical installations

EPC Contractor shall perform all mechanical works necessary to realize the O&M base specified by the Technical Volume.

The Scope of the mechanical construction works, includes but not limited to the following:

- Water supply system which includes: water supply pump station, water storage tank, hot/service water distribution network.

- Sewage and drainage system which includes: Equipment installation (pumps, oil separator, collection tank, etc.) and sewage, ventilation and drainage pipe works.

- Waste water treatment plant.

- Fire Fighting System, which includes all fixed and portable fire fighting equipment and installations.

- H.V.A.C. System which includes air conditioning, ventilation, heating, air-ducts.

- Irrigation system and supplementary water supply to the Irrigation system, including pump, interconnection piping and all other required Equipment.

- Pressure testing of piping, Pre-commissioning & Commissioning of all above systems.

All Equipment shall be in accordance with the applicable Technical Descriptions, Specifications and Drawings.

All instruments and relative Equipment installed outdoor shall have design temperature limits according to the design data provided by Contracting Entity.

EPC Contractor shall provide calibration certificates and functional tests performed prior to instrument installations.

3.3.4.4 Electrical installations

EPC Contractor shall perform all electrical works in accordance with the approved DEG drawings reviewed by Contracting Entity and the Specifications and Standard Drawings.

The scope of electrical works includes, but is not limited to, the following:

- Electrical substation
- Assembly and wiring of all switch boards and local panels
- Cable lay-down and interconnection from the substation of the switchboards to the users.
- Electrical power supply and automation system of the borehole pump
- Diesel generator
- Lighting, grounding and lightning protection systems
- Telephone, data and loudspeaker (public address) systems
- Fire Alarm, Intrusion Alarm and Site Security Alarm systems
- Connection to the Local Electricity Supply Company
- Pre-commissioning & Commissioning

All in accordance with the available Technical Design and following approved DEG documentation reviewed by Contracting Entity / Contracting Entity Representative and the applicable Technical Description, Specifications and Drawings.

3.3.4.5 Traffic arrangements

Special attention should be given by EPC Contractor to minimize public nuisance and traffic disturbance during the execution of the Works. Special sidewalls and corridors shall be constructed on EPC Contractor's care and expenses to ensure the above safety scope.

EPC Contractor shall take care for the contacts with the relevant Regulators for the issue of the necessary Permissions for the imposed traffic arrangements.

The EPC Contractor must strictly comply with the provisions of all relevant Bulgarian laws, in order to provide all required traffic boards, traffic lights, deviation roads, etc. and generally avoid creating troubles to the public.

In case that interruption or suspension of traffic is necessary for the execution of the Works, EPC Contractor shall prepare a complete study and a detailed schedule of traffic operational arrangements and shall apply to the relevant Regulators for permission.

A preliminary study and schedule as above shall be submitted for review/comments to the Contracting Entity well in advance (i.e. at least one month) prior the commencement of construction activities.

The EPC Contractor shall be fully responsible for all damages of roads and things of public or networks of others caused by EPC Contractor or his personnel and/or his suppliers.

As far as the traffic control is concerned, EPC Contractor shall be responsible for:

a. Traffic signal and marking,

b. Traffic boards and lights,

c. Traffic permanent installations and power cables

d. Horizontal painted road hatching

e. Restoration of the above according to the instruction given by the Regulators and Contracting Entity.

3.3.4.6 Access roads

Without prejudice to clauses 4.13 and 4.15 of the Contract, where the existing access road does not provide adequate access conditions, the EPC Contractor is responsible to improve the existing road by paving, widening or extension, according to relevant Specifications, as instructed by the Contracting Entity . The EPC Contractor shall be responsible to obtain all required Permissions.

3.4 ICS and Telecommunication

3.4.1 Brief description

This part of the Project concerns the Integrated Control and Safety (ICS) System and associated Telecommunication System for the remote control and monitoring of the entire pipeline system together with AGI (Above Ground Installations) and including all instrumentation and safety systems, as well as the interfaces with the existing Bulgarian Natural Gas Transmission System Operator (TSO), with the existing Greek Natural Gas TSO and TAP TSO.

For the entire pipeline together with AGI (BVS, PS, GMS and AGRS, Dispatching Centre and O&M Base and RCC containers, Control & Boiler building, Station Control Rooms, Boiler Rooms, Technical Measuring Rooms, etc.) and in accordance with the relevant documents and drawings the EPC Contractor's SOW includes (but not limited to) the completion of the Detailed Engineering Design (DEG), as well as the Procurement, Manufacture, Factory Acceptance Testing (FAT), Installation, Pre-commissioning, Commissioning and Site Acceptance Testing (SAT), HAZOP Study, SIL (Safety Integrity Level) Review, as necessary to provide a complete operational ICS (Integrated Control and Safety System) and associated Telecommunication System.

EPC Contractor shall ensure that the final DEG and the Manufacturer data and certification of specified Equipment are compatible with the documents and drawings included in technical documentation to this project and shall provide guarantees for the offered design services, as specified in other sections of the Contract.

In particular, the ICS system shall include but not limited to the following:

- Supervisory Control and Data Acquisition (SCADA) System
- Emergency Shut Down (ESD) System
- Fire and Gas Detection System
- Process Control System (PCS)
- Other Control Systems associated with packages / systems / Equipment
- Instrumentation systems including metering
- Field instrumentation and control / monitoring equipment
- Control Room instrumentation and control / monitoring equipment
- Closed Circuit Television (CCTV) System
- Security Systems
- Connection to national fiscal (custom) Regulators in order to provide commercial information about delivered quantities if required by the national legislation.

The SCADA system for the IGB refers to the system to oversee the entire pipeline operations, providing control, monitoring and data acquisition functions across all sections of the pipeline. This shall include gas dispatching (planning and scheduling), reconciliation, presentation of metering data and auditing procedures.

In particular, Telecommunication System includes, but not limited to, the following:

- The Fibre Optic data backbone, which has the primary function to facilitate the operations of SCADA, PCS & ESD System, Security & CCTV System, PA/GA System, Office Data Network System and VoIP Telephone System, thus allowing safe and efficient operation of the pipeline and the facilities.

- Nodes linked by optical fibres, in a single ring configuration, forming a reliable high speed medium for the transparent transport of voice, data, LAN and video services, while providing multiple communication paths between the various stations.

- Fibre Optic Cables shall be used to connect the Dispatching Centre with the Greek and Bulgarian National Gas Transmission Operators and TAP pipe line system. Each TSO and ICGB shall terminate all fibres of their FOC in the station building at the battery limits of the FOC, between each TSO & ICGB. FOC terminations shall be in the Fibre Optic Patch Panel in the station building

- IP Telephony System

- Network Management System (NMS)

It is highlighted that any service or work not specifically described in this Scope of Work but which is deemed necessary for the complete and proper project execution and operation will be considered to have been specified and included in the EPC Contractor's Scope of Work.

3.4.2 Structure of documents

The documents given in this chapter allow to get an easier overview about the design. All documents not listed here have the same importance and shall be considered as well.

Please note, that the provided FEED for the Greek Section and the TD for the Bulgarian Section may have discrepancies and EPC Contractor has to deliver a satisfactory consistent and operating SCADA system according to the requirements of the Contracting Entity. The *Report with identification of discrepancies on existing documentation for SCADA system* (see the attachments to this Technical Specification) reflects the status of the documents.

The purpose of the report is to provide an analysis of consistency and identification of discrepancies of the Technical design TD and FEED documentation elaborated for Bulgarian and Greek territory.
The report describes differences and discrepancies of both documentation that shall be taken in account during the elaboration of the unified detailed design for the whole IGB system.

The EPC Contractor shall develop during detailed engineering phase of the IGB Project based on available documentation for both countries and based on the latest technology a common SCADA and Telecommunication systems for the whole IGB system. The detailed design shall take into account the discrepancies of the available documentation and the provisions of the law in Bulgaria concerning the changes in Technical Design.

Volume	Part	Name	Doc No
II		**Subproject: Interconnection pipeline Greece-Bulgaria**	

	6	Automation of technological proesses	IGB-04-FEED-II.3.6
III		**Subproject: GMS Stara Zagora**	
	6	Automation of technological processes	IGB-04-FEED-III.6
IV		**Subproject: AGRS Dimitrovgrad**	
	6	Automation of technological processes	IGB-04-FEED-IV.6
V		**Subproject: AGRS Kardzhali**	
	6	Automation of technological processes	IGB-04-FEED-V.6
VI		**Subproject: Dispatch center**	
	8	Technological connection systems	IGB-04-FEED-VI.8
	15	Automation of technological processes	IGB-04-FEED-VI.15
VII		Technological connection - connection organization. Connection system equipping.	IGB-04-FEED-VII

The required functionality of this system is given in documents:

Docu No/File name	**Document name**
	Report with identification of discrepancies on existing documentation for SCADA system
IGB-04-FEED-VII.1-EN	TECHNOLOGICAL CONNECTION – ORGANIZATION OF THE CONNECTIONS. EQUIPMENT OF THE CONNECTION SYSTEMS
IGB-04-FEED-VII.1-Comm1_rev00	Transmission gas pipeline Greece-Bulgaria. Overall Architecture of Telecommunications systems
IGB-04-FEED-II.3.6-03-06_08-19_Rev00-6	Black diagrams telecommunications systems - Dimitrovgrad AGRS
IGB-04-FEED-III.6-03-07_09-23_Rev00-7	Black diagrams telecommunications systems - GMS2 Stara Zagora
IGB-04-FEED-IV.6-03-07_09-23_Rev00-7	Black diagrams telecommunications systems - Dimitrovgrad AGRS
IGB-04-FEED-V.6-03-07_09-23_Rev00-7	Black diagrams telecommunications systems - Kardzhali AGRS
IGB-04-FEED-VII.2.1-Comm1_rev00	Transmission gas pipeline Greece-Bulgaria. Block Valve BV-2 - Telecommunication cabinet
IGB-04-FEED-VII.2.1-Comm2_rev00	Transmission gas pipeline Greece-Bulgaria. Block Valve BV-3A - Telecommunication cabinet
IGB-04-FEED-VII.2.1-Comm3_rev00	Transmission gas pipeline Greece-Bulgaria. Block Valve BV-4 - Telecommunication cabinet
IGB-04-FEED-VII.2.1-Comm4_rev00	Transmission gas pipeline Greece-Bulgaria. Block Valve BV-4A - Telecommunication cabinet
IGB-04-FEED-VII.2.1-Comm5_rev00	Transmission gas pipeline Greece-Bulgaria. Block Valve BV-5 - Telecommunication cabinet
IGB-04-FEED-VII.2.1-Comm6_rev00	Transmission gas pipeline Greece-Bulgaria. Block Valve BV-6 - Telecommunication cabinet
IGB-04-FEED-VII.2.1-Comm7_rev00	Transmission gas pipeline Greece-Bulgaria. Block Valve BV-7 - Telecommunication cabinet

IGB-04-FEED-VII.2.2-Comm1_rev00	Kardzhali AGRS and BV-3 - Telecommunication cabinet
IGB-04-FEED-VII.2.2-Comm2_rev00	Dimitrovgrad AGRS - Telecommunication cabinet
IGB-04-FEED-VII.2.2-Comm3_rev00	Stara Zagora GMS - Telecommunication cabinet
IGB-04-FEED-VII.4-Comm2_rev00	Transmission gas pipeline Greece-Bulgaria. Block valve station - FO cables and telecommunication cabinet arrangement
IGB-04-FEED-VII.4-Comm3_rev00	AGRS Kardzhali - FO cables and telecommunication cabinet arrangement
IGB-04-FEED-VII.4-Comm4_rev00	AGRS Dimitrovgrad - FO cables and telecommunication cabinet arrangement
IGB-04-FEED-VII.4-Comm5_rev00	GIS Stara Zagora - FO cables and telecommunication cabinet arrangement
IGB-04-FEED-VII.4	TECHNOLOGICAL CONNECTIONS -CONNECTION ORGANIZATION. SYSTEM CONNECTION EQUIPMENT. OPTICAL INFRASTRUCTURE. EXTERNAL CONNECTIONS WITH OTHER TELECOMMUNICATION OPERATORS.
IGB-04-FEED-VII.4-Comm1_rev00	Transmission gas pipeline Greece-Bulgaria. Scheme of optical connectivity and fiber optics

3.4.3 Battery limits

The battery limits for the part of the project related to ICS and Telecommunication are defined as follows:

The EPC Contractor's Scope of Work includes

- the installation of the entire ICS and Telecommunication Systems along the entire pipeline and all AGI related to IGB system
- Equipment, cabling, hardware and software for
    - SCADA System,
    - Emergency Shut Down (ESD) System,
    - Fire and Gas Detection System,
    - Closed Circuit Television (CCTV) System,
    - Security Systems,
    - Process Control System,
    - other Control Systems associated with packages / systems / Equipment, Instrumentation systems including metering,
- Field instrumentation and control / monitoring equipment, Control Room instrumentation and control / monitoring equipment
- The Fibre Optic cables and associated equipment / accessories.

EPC Contractor's scope includes also the definition (during his Detailed Engineering Design) of the required signals to be exchanged between Dispatching Centre of the IGB Project and other Dispatching Centres (namely those of the Bulgarian Natural Gas TSO and the Greek Natural Gas TSO and TAP) and to provide all required means for these interconnections, which shall be realised via fibre optic cable.

3.4.4 Factory Acceptance Testing

The Factory Acceptance Testing (FAT) shall be performed after the assembly of the RTU and Station Control System cabinets according to a procedure prepared by the supplier / EPC Contractor and approved by the Contracting Entity in order to confirm the proper functioning of the equipment.

The FAT shall be considered complete when all defects are corrected. Both parties shall sign a FAT Certificate after the successful completion of the FAT.

The Factory Acceptance Testing (FAT) shall be conducted jointly by qualified representatives of supplier / EPC Contractor, Contracting Entity and Construction Supervision Entity. The supplier / EPC Contractor shall provide necessary testing and simulation equipment for performing the FAT.

The RTUs and Station Control System cabinets shall be staged at the supplier / EPC Contractor's facilities and shall be connected with analogue and digital I/O simulators. The testing shall demonstrate to the extent possible, without field conditions and without connection to the SCADA, that the Equipment and custom software function properly, fulfil their purpose of installation and satisfy all project requirements, Specifications and approved detailed design documents.

The FAT shall be performed in accordance with the FAT document approved by the Contracting Entity. Nevertheless the Contracting Entity / Contracting Entity Representative has the right to test any aspect of required system functionality and add tests to the approved FAT procedure document, including Equipment response to failures.

Defects found during the FAT shall be recorded in a Defects Log. The supplier / EPC Contractor shall correct all defects noted during the FAT at EPC Contractor's cost and care. After correction of all defects, the tests shall be repeated in accordance with the FAT document for any portion of the work affected by the problem or the correction activity.

3.4.5 Construction

3.4.5.1 SCADA installation works

The scope of SCADA installation works include, but is not limited to, the following:

SCADA Installation Works include installation of RTUs and Station Control System cabinets, testing and commissioning of signals described and designed in the approved DEG documentation including verification of the data points, displays, reports, historian and GMAS (Gas Measurement and Analysis System) application at the Main Control Centre SCADA.

At all Stations, the local Control Building or RCC container signals from Fire & Gas detection and extinguishing system, security system, UPS unit, power distribution panel including voltage supervisor, temperature switches, etc. shall be connected to the digital I/O cards of the PLC / RTU.

Also where the valves will be automatically actuated, there shall be additional digital input signals, i.e. valve opened, valve closed, local/remote hand switch position and valve gas reservoir pressure low alarm indications, and additional digital output signal, i.e. valve close command.

In addition to the signals described above, which are external to the RTU cabinet (located inside the RCC container for each BVS and PS station), the EPC Contractor shall add the signals from the fuses of the I/O cards of the RTU (one digital input per I/O card) which are internal to the RTU cabinet. Wiring and software configuration of these signals is also included in the EPC Contractor's scope.

Cabling of the above and all other signals according approved DEG inside the Station Control Building, at all Stations, shall be performed by the EPC Contractor including terminating the cables in the terminal strips of the Station Control System cabinet. Cabling of the above signals inside the RCC House, at BVS and PS Stations, and termination of cables in the terminal strips of the RTU cabinet shall be performed by the EPC Contractor.

Barriers inside the Station Control System cabinet for the loops as well as SPDs for lightning protection inside the Station Control System cabinet shall be provided by the EPC Contractor at all Stations. The cables from the field instrumentation and the terminating of these cables shall be provided by the EPC Contractor.

Additional signals from the Gas Metering Stations and Automated Gas Regulating Stations shall be communicated over the local TCP/IP network. The PLC, in SCS cabinet, shall relay the input signals to SCADA and shall receive commands from the SCADA including open/close valve commands, set point analogue commands, etc., which shall be sent to the local system (i.e. stream/supervisory flow computers) of the Gas Metering Station via the Station's TCP/IP network. The Gas Metering Stations may either be set in local (i.e. flow computer mode) or remote control mode (i.e. SCS), hence the PLC (in SCS cabinet) should read back the output commands and should back initialize the tracked output when the Station's control is returned to remote (i.e. to the PLC in SCS cabinet) so that no valve is commanded to the opposite state and no regulator PID controller set point or output is bumped. Bump less transfer of the PID controller set point is also required when the regulator's mode is switched from manual to auto, i.e. the commanded set point should automatically be set equal to the actual set point of the PID controller. The set point tracks the process variable (PV) of the PID controller in manual mode is relevant for the PLC (in SCS cabinet) because such tracking functionality, if desired, should be provided in the SCS logics, (by others).

The EPC Contractor shall develop and install a gas measurement and analysis system at Main Control Centre SCADA with all the quantity and quality (gas composition and gas properties) data of the Gas Metering Stations.

The I/O signals of all the Stations described above either hardwired or through the TCP/IP network shall be displayed on the SCADA. The Station Control Systems and RTUs, connections to the PLCs / RTUs etc. shall be configured on the SCADA.. RTU failure and communication error management and alarming should be configured and programmed as required in the RTUs and the SCADA.

3.4.5.2 Telecommunication installation works

Telecommunication Installation Works include installation of IP node with enclosure, installation of Equipment for the FOC and back-up communications path, installation of Equipment for the interface with the existing Bulgarian Natural Gas Transmission System Operator (TSO) and with the existing Greek Natural Gas TSO and TAP network, installation of an IP PBX at the Main Control Centre including the supply of IP phones for all sites and the installation of a Network Management System software.

In the Control Building or RCC container of each Station, there shall be one IP node with Ethernet ports of RJ-45 connector. The local SCADA equipment shall be connected by the EPC Contractor to the Ethernet switch with Ethernet cable category 6 (or higher) supporting 1Gbps rate.

The power supply of the telecom / IP node must be redundant. The IP node chassis or the enclosure must be equipped with redundant fan modules. Any alarm contacts from the power supply units of the Equipment in the enclosure must be interfaced to the local RTU through instrumentation cables.

Optical patch panels will be provided at all stations by the EPC Contractor

Any requirements for the data exchange for national fiscal (custom) Regulators in order to provide commercial information about delivered quantities if required by the national legislation shall be fulfilled.

3.4.5.3 Site Test

After the instrument installation and completion, the Equipment shall be tested under simulated process conditions. In case of any test malfunction occurrence, then the test shall be stopped and the failures attributed to EPC Contractor's portion, shall be corrected within the time schedule of the test and at EPC Contractor's own cost.

If the failure is detected but cannot immediately be corrected, EPC Contractor shall have sufficient instruments and manpower to be able to pinpoint the failure and correct it at his own expenses. All outcomes and test data shall be analytically registered on a Site Test Data Sheet.

3.4.6 Pre-commissioning, Commissioning and Start up

Pre-commissioning comprises the tests to be performed by the EPC Contractor without connecting to third parties Equipment apart from power supply and grounding. Commissioning includes integration of EPC Contractor's Equipment with existing and third party Equipment, the verification of the data exchanged with others and the testing of the loops of buildings and field instruments and E/M equipment contacts.

Regarding the system pre-commissioning, commissioning and start up, the EPC Contractor shall observe the requirements of the applicable legislation in Bulgaria (SDA) and Greece and shall perform without limitation the following:

The EPC Contractor shall develop procedures and check lists for pre-commissioning, commissioning and start up to ensure that such activities will be performed in a safe, structured and controlled manner.

The EPC Contractor shall provide all facilities and resources required to respond to any incidents or emergencies from the Works during the pre-commissioning, commissioning and start up activities.

The pre-commissioning and commissioning activities shall be carried out by the EPC Contractor's own personnel under the instructions of a qualified Commissioning Engineer responsible for coordinating the commissioning activities and reporting to Contracting Entity on the status and progress of commissioning activities in accordance with the pre-commissioning and commissioning plans produced by the EPC Contractor and approved by the Contracting Entity. The pre-commissioning and commissioning activities shall be witnessed by Contracting Entity.

The performance of pre-commissioning and commissioning shall demonstrate and confirm:

- the correct functioning of the installed Equipment
- the proper incorporation of the local SCADA equipment in the local TCP/IP network
- the proper communication with SCADA and the correct exchange of data

- the correct functioning and integration of the connected field instrumentation and building signals
- the proper integration with third party and existing systems
- the fulfilment of the purpose of installation and the satisfaction of all project requirements, Specifications and approved detailed design documents

Commissioning of any part of the Works related to ICS and Telecommunication shall only commence with the prior permission of the Contracting Entity when the relevant parts of the Works are completed and connected. Sectional commissioning and initial operation of the Works may be required and must be approved beforehand by the Contracting Entity.

Defects found during the commissioning shall be recorded in a Defects Log. The EPC Contractor shall correct all noted defects at EPC Contractor's cost and care. After correction of each defect, proper operation shall be verified for any portion of work affected by the problem. The commissioning shall be considered complete when all defects are corrected.

Start up of all systems shall be performed by Contracting Entity and EPC Contractor personnel together as described in the approved Operation Manuals. Any non-compliance with the Specifications shall be corrected by the EPC Contractor at its own cost.

3.4.7 Deliver Software and Licenses

Without prejudice to clause 1.10 of the Contract, the EPC Contractor shall deliver the source code of all custom software developed for the Contracting Entity without limitation. Subject to clause 1.10 of the Contract this requirement excludes the source code of Equipment operating system, Equipment firmware as well as the source code of off-the-shelf applications purchased by the EPC Contractor from suppliers.

The EPC Contractor shall deliver all the required software licenses to the Contracting Entity for operating and maintaining the installed hardware and software including the software for general control of the entire pipe line system regarding real-time operation and maintenance

The EPC Contractor shall make up and shall deliver recovery disks for restarting the RTUs and any other Equipment from failure.

4 Attachments and references

Following documents shall be attached to this Technical specification:

1. Technical Design for the Bulgarian Section of the gas interconnector Greece - Bulgaria
2. Technical description of the Greek Section of the gas interconnector Greece - Bulgaria
3. EIA Report and Decision for Bulgaria
4. Quantitative Risk Assessment for the Greek Section (QRA), actual revision
5. IGB – TAP interconnection, Evaluation report of options for interconnection
6. Documents related to the coordination and approval of the Technical design for the gas interconnector Greece - Bulgaria on the territory of Republic of Bulgaria
7. Design Basis Memorandum
8. Report with identification of discrepancies on existing documentation for SCADA system
9. Hydraulic study report for IGB Project
10. Construction permit № PC-48 dated 12.09.2017
11. Coordination letter between ICGB AD and Municipality of Dzhebel
12. Coordination letter between ICGB AD and P-United EOOD
13. Coordination letter between ICGB AD and Directorate of Natural resources, concessions and control in The Ministry of Energy of Republic of Bulgaria
14. Technical Specification for supply of line pipe DN800 / 32”, including attachments to it:
    - Bill of Quantities - line pipe DN800
    - Specification for Transport, Handling and Storage of Pipes, Project IGB
15. Memorandum of understanding and cooperation by the Greek Ministry of culture and sports and ICGB for the natural gas interconnector Greece-Bulgaria (IGB)
16. Offices, facilities and vehicles for contracting entity use
17. Documents requirements
18. Preliminary delivery schedule - Appendix 4 of Agreement for Line Pipe supply
19. List of Applicable Norms and Legislation (10760-LST-EN-00-001)
20. FEED for the Greek Section of gas interconnector Greece - Bulgaria

To all of the above listed documents an access will be provided on the internet site of ICGB AD starting with the launch of public procurement with the exception of the FEED for the Greek Section.

The FEED will be provided only to the preselected candidates in the tender for the preparation and submission of their offers.

Following technical specifications in their up-to-date version can be found on the DESFA's website (www.desfa.gr):

- DESFA technical job specification 499/1, High pressure(HP) transmission systems, Site requirements, http://www.desfa.gr/projects/library/Pipelines/civil

- DESFA's Technical job specification 970/2, High pressure (HP) transmission systems, Shop inspection of equipment and materials for NGT project, http://www.desfa.gr/projects/library/Pipelines/miscellaneous

The complete decision regarding the Installation Act for IGB pipe line for the Greek Section can be found on following internet address:

http://www.et.gr/idocs-nph/search/pdfViewerForm.html?args=5C7QrtC22wEc63YDhn5AeXdtvSoClrL86k-uc3ngzt-juFUDqazHcNeJInJ48_97uHrMts-zFzeyCiBSQOpYnTy36MacmUFCx2ppF-vBej56Mmc8Qdb8ZfRJqZnsIAdk8Lv_e6czmhEembNmZCMxLMtS-sT2e0zmIJOyISLCPox1-o1j_GYLPaSyQcq-NQM7TJ