SECTION I

INSTRUCTIONS TO BIDDERS

Inquiry No: 718/17

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1. INTRODUCTION

The HELLENIC GAS TRANSMISSION SYSTEM OPERATOR (DESFA) S.A., hereinafter referred to as CLIENT or OWNER, invites eligible Bidders to submit a Bid for the **Inquiry No 718/17**:

Title	:	**FRONT END ENGINEERING DESIGN FOR NEW SMALL SCALE LNG INFRASTRUCTURE AT REVITHOUSSA TERMINAL**
Budget	:	**490.000€**, plus V.A.T.
Time Schedule	:	Eight (8) months from the COMMENCEMENT DATE

1.1 Eligible Bidders should be:

- Economic Operators, as per par. 6 of Article 2 of the Directive 2014/25/EU, registered in a European Union (E.U) or a European Economic Area (E.E.A.) country or a country having an Association or Bilateral Agreement with the E.U., allowing the participation in Public Tenders of Contracting Authorities with activities in Natural Gas Sector, who may also be mentioned hereinafter as Companies
  or
- Associations/Joint Ventures/ Consortium of Companies as above.

Companies participating in present Tender as a member of an Association/Joint Venture/Consortium are not allowed to submit Bids solely, or as a member of other Joint Venture /Consortium or rely on the capacity of other entities participating in present Bid solely or as a member of other Association/Joint Venture /Consortium also participating in same Bid.

1.2 To facilitate bidding and Bid evaluation, the documents enclosed shall reflect the form of the CONTRACT which will be entered into by DESFA and the successful Bidder, hereinafter referred to as well as ENGINEER.

1.3 The Bidders shall submit the documents according to all instructions given in this document.

1.4 Alternative Bids cannot be submitted and if submitted shall not be taken into consideration.

1.5 In these Instructions to Bidders, reference to the Inquiry Documents shall mean reference to the documents listed in Article 10 of present document.

1.6 The publishing expenses of this Inquiry in two daily financial newspapers, with a sum of .....€, plus V.A.T. shall be borne by the successful Bidder.
Before the payment of the first invoice issued by the successful Bidder, an amount equal to the aforementioned expenses shall be paid to DESFA.

1.7 All direct and indirect costs of any nature for the preparation of the Bid by the Bidders, including costs associated with attending pre-Bid meeting(s), participating in site visits and clarification meetings etc. shall be at Bidder's own cost.

1.8 Obtaining of the Tender Documents in hard copy from DESFA's Office or in electronic format from DESFA's web address www.desfa.gr (Announcements - Tender Documents) is a prerequisite for the participation in the Tender.

1.9 Not applicable.

1.10 Words in capital letters in the Inquiry Documents have the meaning assigned to them in Article 2 of SECTION: "Terms and Conditions".

2. APPLICABLE LEGISLATION

2.1 This Inquiry is governed by the Laws of Greece and European Directive 2014/25/EC which shall be applicable in general to all relations between DESFA and the Bidders regardless of their nationality. Any dispute shall be subject to the exclusive jurisdiction of the Law Courts of Athens.

Terms and Conditions of this Inquiry, contained in the attached Sections. Bids evaluation shall be effected in accordance with the present INSTRUCTIONS TO BIDDERS and DESFA's Regulation for Procurement of Supplies and Services. Said Regulation shall also apply to the CONTRACT, unless otherwise provided in the CONTRACT.

Procedure for settlement of disputes, during Tender is governed by Law 3886/2010 (Government Gazette 173 A'/30.09.10) and in any case by applicable legislation.

2.2 Law N. 4013/2011 in conjunction with Ministerial Decision no 5143/2014 (Government Gazette 3335 B' /11.12.2014) as applicable, regarding the mandatory contribution in favour of the Hellenic Single Public Procurement Authority. Common Ministerial Decision no 1191/2017 (Government Gazette 969 B' /22.03.2017) as applicable, regarding mandatory contribution in favour of Authority for Examination of Pre-trial appeals.

2.3 Not Applicable.

2.4 Any other supplementary clauses, regulations, interpretive circulars or other in connection or authorised by the above mentioned, even if not stated herewith.

3. SCOPE OF SERVICES

3.1 The SERVICES, which this Inquiry refers to, pertain to the Front End Engineering Design of marine and electromechanical cryogenic installations for new Small Scale LNG Infrastructure at Revithoussa Terminal. The SERVICES are described in detail in SECTION "Scope of Services". The Scope of Services has been prepared by DESFA with the contribution of D'APPOLONIA S.p.A..

3.2 Not Applicable.

3.3 The Terms & Conditions of the Contract to be entered into with the successful Bidder (hereinafter "CONTRACT") are further provided in SECTION "Terms and Conditions".

3.4 ENGINEER shall provide Engineers for the SERVICES under this CONTRACT as described in Article 15 here below.

3.5 DESFA reserves the option to increase the SERVICES up to thirty percent (30%) of the CONTRACT PRICE, by adding services, similar to those described in the Tender documents. This DESFA's option shall be effected either by Variation Order or through Supplementary Contract with the successful Bidder with the same terms,

prices and rates as those of the present Tender (CONTRACT) and the scope of the option shall cover additional SERVICES.

3.6 Said option is expected to be exercised within eight (8) months from the CONTRACT Signing Date.

4. COMMUNICATION - APPLICABLE LANGUAGE

4.1 The Bids including all related documentation and all Tender related communication shall be submitted and conducted in Greek or English language.

Documents submitted or originally issued in a language other than Greek or English shall be accompanied by an official translation in English or Greek language issued by a lawyer or a competent authority.

For the Contract and Contract execution, the applicable language is defined in SECTION "Terms and Conditions".

4.2 The Bidders may contact DESFA for bidding matters, in writing, (by letter or fax) at the following address:

HELLENIC GAS TRANSMISSION SYSTEM OPERATOR (DESFA) S.A.
357-359 Messogion Ave.,
GR 152 31- HALANDRI, ATHENS
GREECE
FAX No: (+30) 210 - 6749504
PHONE No: (+30) 210 - 6501200
ATTENTION: Mr. N. Soumalevris

4.3 Tender Documents, without APPENDIX A: *THE RELEVANT TO SCOPE OF SERVICES PART OF "TECHNICAL FEASIBILITY AND COST ESTIMATE STUDY FOR THE DEVELOPMENT OF INSTALLATIONS FOR SMALL SCALE LNG IN GREECE- SMALL SCALE LNG – TERMINAL SITE SELECTION"* of SECTION "Scope of Services", may be obtained through the following ways:

- In hard copy at DESFA's above mentioned address, upon giving the following information:
  - Bidder's full legal name
  - Bidder's telephone & fax No, e-mail address
  - Name of contact person
- In electronic format from DESFA's web address: www.desfa.gr (Announcements - Tender Documents).

In both cases, Bidders after obtaining the Tender Documents as above, shall also receive from the above mentioned address, in hard copy, the APPENDIX A: *"THE RELEVANT TO SCOPE OF SERVICES PART OF "TECHNICAL FEASIBILITY AND COST ESTIMATE STUDY FOR THE DEVELOPMENT OF INSTALLATIONS FOR SMALL SCALE LNG IN GREECE- SMALL SCALE LNG – TERMINAL SITE SELECTION"* of SECTION "Scope of Services", under the condition of signing the CONFIDENTIALITY CLAUSE (Annex 5 of SECTION: "Instructions to Bidders") by a duly authorised representative.

4.4 The Tender Documents can be obtained until **.../.../2017**, at the latest.

5. BID CONTENTS

5.1 The Bid must be submitted in an outer sealed envelope bearing only the following information:

1) DESFA's name and address:
HELLENIC GAS TRANSMISSION SYSTEM OPERATOR (DESFA) S.A.
357-359 Messogion Ave.,
GR 152 31- HALANDRI, ATHENS
GREECE
2) The Inquiry Title and Number
3) Bidder's name
4) The indication: "Bid, to be opened by authorised person only."
5) The Bid due Date

5.2 Each Bid shall bear the full legal name and business address of the Bidder. The Bid and its contents shall be signed by the person (s) authorised to bind the Bidder.

5.3 This outer sealed envelope of the Bid must contain three (3) separate envelopes (A, B, C) with the indication of the Inquiry Number and Bidder's Name on each envelope as follows:

I - ENVELOPE A - Authorisation Documents
This envelope shall include one (1) original and one (1) copy of all documents specified in Art. 14 herein.

II - ENVELOPE B - Technical Offer (Contents Unpriced)
This envelope shall include one (1) original and one (1) copy of all documents specified in Art. 15 herein.

III ENVELOPE C - Financial Offer (Contents Priced)
This envelope shall include one (1) original of all documents, as specified in Art. 16 herein.

Envelope C shall be sealed and shall be clearly identified to denote the inclusion of documents (of the Bid) with prices. For this purpose, the Bidder must use a distinguishable label, preferably red, indicating the contents.

NOTE:
"Original" in this document means also true and exact copy of the original, authenticated either by a competent authority or by lawyer, or by notary.

5.4 In case of any deviations or contradictions between the originals and any of the copies (if any), the originals shall prevail.

5.5 Each Bidder shall prepare its Bid in strict accordance with the provisions of these INSTRUCTIONS TO BIDDERS, its attachments and Other Inquiry Documents.

6. BID SUBMISSION

6.1 The submission of the Bids shall be effected by a representative of the Bidder, or by recorded delivery mail, or by courier, provided that Envelopes (A, B and C) reach

DESFA not later than **12:00** hrs, of the date **…/…./2017**, which is the final deadline for the receipt of Bids by DESFA (**Bid Due Date**), at the following address:

HELLENIC GAS TRANSMISSION SYSTEM OPERATOR (DESFA) S.A.
357-359 Messogion Ave.
152 31 – CHALANDRI
GREECE
Phone No. : (+30) 210- 6501200
Fax No. : (+30) 210- 6749504

For the attention of DESFA's General Document Center, where it will be registered upon receipt.

6.2 **Bids received later than the stated time and date shall not be taken into consideration.**
All Bids shall be stamped upon submission, indicating the precise time and date of receipt by DESFA. Bidders will receive written confirmation of such receipt.

7. VALIDITY OF BIDS

7.1 **The Bids shall be valid (and therefore binding on the Bidders) for eight (8) months as from the Bid due date.**

Bids with validity period less than specified in the Inquiry Documents, shall be rejected.

7.2 Said period of validity might be extended following a written request by DESFA (prior to the expiration date). In case a Bidder fails to comply with such a request, then said Bidder shall be considered as having waived all its rights in relation to the Inquiry and its Bid.

8. COMMENTS, QUALIFICATIONS, DEVIATIONS, EXCEPTIONS etc. RELATED TO TECHNICAL MATTERS

8.1 Comments, qualifications, deviations, exceptions, etc., (if any) regarding technical matters shall be included in a list, duly signed by the Bidder, submitted as a separate part of the Bid (Envelope B - see Article 15 herebelow), for consideration by DESFA. However, comments, deviations, exceptions etc., lowering the quality and/or safety level in part or in whole, will not be accepted, as per article 17 herebelow.

8.2 For comments, qualifications, deviations, exceptions, etc. which are included in the above list of Envelope B, the procedure described in Article 17 herebelow shall apply.

8.3 For the purpose of the Inquiry, all Bidders' comments, qualifications, deviations, exceptions, etc, in relation to any term or condition of the Inquiry Documents related to technical matters, shall be called, hereinafter, Deviations.

9. GUARANTEES

9.1 In order to participate in this Tender, each Bidder must deposit, **subject to Rejection of the Bid** at the time of Bid submission, to be included in Envelope A, a Participation Guarantee Letter, **equal to nine thousand eight hundred (€ 9.800)**

EURO, valid for at least one (1) month more than the minimum validity period of the Bid specified in Article 7 hereabove, i.e. valid for nine (9) months as from the Bid Due Date.

9.2 The Participation Guarantee Letter shall be addressed to the HELLENIC GAS TRANSMISSION SYSTEM OPERATOR (DESFA) S.A. and shall be in full accordance with the attached Annex 2 Form. Any deviation or omission might lead to the rejection of the Bid.

9.3 The Participation Guarantee Letter of the Bidder, to whom a CONTRACT will be awarded, will be returned after the receipt of a Performance Guarantee upon signing the relevant CONTRACT. The Participation Guarantee Letters of the other Bidders shall be returned after the signing of the aforementioned CONTRACT between DESFA and the successful Bidder, except in case of rejection of the Envelopes A or B of a Bidder's Offer, for which the Participation Guarantee Letter of the Bidder shall be returned after the final rejection of the Offer by DESFA.

9.4 A Performance Bond of five percent (5%) of the CONTRACT Price, covering the entire Guarantee Period (as this is defined in the CONTRACT), shall be required from the Bidder to whom the CONTRACT will be awarded, prior to the signing of the CONTRACT. The Performance Bond shall be addressed to the HELLENIC GAS TRANSMISSION SYSTEM OPERATOR (DESFA) S.A. and shall be in full accordance with the APPENDIX C Form of the attached SECTION: "TERMS & CONDITIONS".

9.5 In case the aforementioned (in paragraph 9.3) Bidder does not present himself to sign the CONTRACT and/or fails to sign it without reservation, as stated in Article 18 herebelow, and/or fails to submit the required Performance Bond, then the relevant Participation Guarantee Letter shall be completely forfeited in favour of DESFA as a penalty expressly stipulated hereby, irrespectively of whether DESFA has sustained or not any damages or loss; the same shall apply for any Bidder, in case any such Bidder withdraws and/or modifies (by its own initiative) his Bid, after the Bid due date and prior to the expiration of the period of validity (see Article 7 hereinabove) of said Bid.

9.6 In the case DESFA requests in writing the extension of the validity of their Bids as per Article 7 hereabove, the Bidders must also extend the validity of the Participation Guarantee Letter. If a Bidder refuses or fails to comply with such a request, then said Bidder shall be considered as having waived all its rights in connection with the Inquiry.

9.7 All Letters of Guarantee must be issued by a bank, legally operating in any member-state of the E.U. or the European Economic Area (E.E.A) or in a member-state of the Government Procurement Agreement of the World Trade Organization, as ratified by Law N. 2513/1997 (Government Gazette A' 139), entitled as such in accordance with applicable legislation, or by TMEDE. The Letters of Guarantee will be issued in Greek or in English language.

10. INQUIRY DOCUMENTS AND ORDER OF PRECEDENCE

10.1 The following documents, hereinafter collectively referred to as Inquiry Documents, shall form an integral part of the Inquiry. In the event of any conflict (as far as this Inquiry is concerned), identified in the conditions set forth in the Inquiry Documents, the following order of precedence shall prevail, from the higher to the lower:

Section I: Instructions to Bidders with Annexes

Section II: Draft CONTRACT Agreement
Section III: Terms and Conditions with Appendices
Section IV: Scope of SERVICES with Appendices

11. ASSOCIATIONS - JOINT VENTURES - CONSORTIA

Wherever in the Tender Documents reference is made to Joint Venture (J/V), it means Association or Joint Venture or Consortium.
The legal formation of the Joint Venture is not a prerequisite for taking part in the present Tender.
The Bid submitted by a J/V shall comply with the following requirements:

11.1 The Bid shall be signed either a) by all members of the J/V, or b) by the J/V's common Legal Representative. The name of the signatory shall be printed underneath each signature.

11.2 A copy of the J/V agreement that has been or which is intended to be entered into by the members of a J/V signed by all the J/V members shall accompany the Bid.

The following information shall be included at least in said agreement:

- That the members of the Joint Venture shall be fully, jointly, indivisibly and severally liable for execution of the SERVICES in accordance with the CONTRACT provisions and that, in the event that any one of the members ceases to be a member of the Joint Venture and/or goes into liquidation, then the remaining member(s) shall have full obligation to carry out and complete the SERVICES and shall be empowered to use all resources furnished by any party in the J/V.

- The interest of each of the members of the J/V which shall be unchanged for the whole duration of the CONTRACT.
  NOTE: Further more in case of Consortium the description of the CONTRACT part which will be undertaken by each member of the Consortium shall be also included in said agreement.

- The name of the J/V partner, who is nominated to act as leader of the J/V and who, in such capacity, is authorised to receive instructions and act on instructions from DESFA on behalf of the J/V after Contract Award and for representation issues.

- The J/V's common Legal Representative.

11.3 **Subject to rejection of the Bid:**

- the Leader of the J/V should be a company with a minimum interest of fifty percent (50%) in the J/V.

12. BID OPENING PROCEDURE

12.1 Following the Bid submission, an Inquiry Committee appointed by DESFA will open the outer sealed envelope of the Bids at **12:30 hrs** of the **Bid due Date**.

Representatives of Bidders participating in the Bid are invited to be present, if they so wish.

The evaluation of the Bids shall follow the procedure stated herebelow in three (3) separate and distinct stages:

- The evaluation of the contents of Envelopes A
- The evaluation of the contents of Envelopes B
- The evaluation of the contents of Envelopes C.

12.2 The Inquiry Committee shall open Envelopes A and B and shall countersign the contents. The Inquiry Committee shall also at the same time sign the sealed Envelope C.

The Inquiry Committee reserves the right to request the submission of any clarification and supplementary or supporting documentation in relation to Envelopes A and B, according to article 310 of Law 4412/2016. Bidders shall reply in writing not later than seven (7) days from receipt of said request.

The content of Envelopes A and B will then be evaluated by the Inquiry Committee with reference to their compliance with the Inquiry Documents.

12.3 Following the conclusion and announcement of the evaluation of Envelopes A and B, Envelopes C shall be unsealed by the Inquiry Committee only for the Bids which have been so far accepted. The Inquiry Committee will inform in writing the relevant Bidders as to the place and time of unsealing of Envelopes C. The Inquiry Committee reserves the right to request the submission, of any clarification in relation to envelope C, according to article 310 of Law 4412/2016. Bidders shall reply in writing not later than seven (7) days from receipt of said request.

12.4 All sealed Envelopes as well as the Participation Guarantee Letter of the Bids which have not been accepted, will be returned, against receipt. The other documents of the rejected Bids will not be returned.

12.5 Following the opening and evaluation of each stage of the Bid evaluation (i.e. Envelopes A&B and Envelope C), the Inquiry Committee records its findings. The Inquiry Committee concludes its work by recording its evaluation of the Financial Offers and the drafting of its proposal to DESFA's appropriate body for the successful Bidder of the Tender.

13. NOT APPLICABLE

14. CONTENTS OF Envelope A

Envelope A shall contain the following original plus one (1) copy of documents, in sequential order as follows.

A. LEGALIZATION DOCUMENTS

14.1.1 Participation Guarantee Letter
A duly completed Participation Guarantee Letter according to Article 9 hereabove and as per form of Annex 2 attached herein.

14.1.2 Statement
The Bidder, or in case of a J/V each of its members shall submit a written statement, (as per Annex 4, SECTION , "Instructions to Bidders") stating that:

- The Bidder has studied all the terms of the Inquiry and that he accepts all terms contained in the Inquiry Documents with no reservations whatsoever.
- All submitted data and information contained in their Bid are true.

14.1.3 Contacting information
The Bidder's representative Name and Fax Number.

14.2.1 Company Statutes and Company's decision taking body/person.

The Bidder, or in case of a J/V all members of the J/V, shall submit:

(i) The Company Statutes valid according to the legislation of the country the Bidder is registered as well as the documents listed herebelow:

Notes: a. For companies operating under Greek Law, certificate of Department of Commerce (GEMI), showing their legal establishment and operation, the valid statute, the constituent to body of the incumbent Board of Directors for SA and the setting of legal representatives. In case the issue of relevant certificate is not possible, public documents of which will result the above, i.e. the relevant Greek Government Gazettes (ΦΕΚ) for the SA-Ltd and the published copy of the valid statute with any amendments

b. For foreign companies, Company Statutes should be accompanied by documents for the person(s) having powers of representation and decision in respect of the company.

(ii) A certified copy of the Minutes of Meeting of the Board of Directors, or other competent decision-taking body or duly authorised person of the Bidder:

A. Regarding their decision to participate in the Bid according to the terms and provisions of this Inquiry

B. Appointing a Legal Representative(s) authorised to represent the Bidder until the date of CONTRACT signature

C. In case of J/V declaring the Company's percent participation in the J/V and naming the Leader of the J/V that shall be formed in the case of CONTRACT award.

D. In case of J/V appointing the Common Legal Representative of the J/V

14.2.2 A statement signed by the aforementioned Legal Representative(s) of the Bidder, accepting fully said appointment.
Note: In case of J/V, said statement by Legal Representative of each member as well as by Common Legal Representative should be submitted.

14.2.3 Joint Ventures (J/V):
In the case the Bidder is a J/V, submission of additional documents, as per provisions of Article 11 hereabove.

14.3 Companies participating in the Bid, solely or as a member of a J/V, shall submit Registration Certificates in accordance with the Legislation of the country where they are established, proving that the Bidder has the essential qualifications in order to be capable to execute the CONTRACT.

For E.U. countries, the above mentioned Registration Certificates should be issued as provided for, in Annex XI of the European Directive 2014/24.

Note: Where the country concerned does not issue such documents or certificates as required above, these may be replaced by a declaration made by the person concerned, before a judicial or administrative authority, a notary, or a competent professional or trade body, in the country where the Bidder is established, stating also, within the same declaration on oath, that the country concerned does not issue such documents or certificates as required above.

14.4.1 The Bidder's, or in case of a J/V each of its members', president of the BoD, chief executive officer, the members of the BoD or any person having powers of representation and decision in respect of the company, shall submit an extract from the judicial record or, failing that, an equivalent document issued by a competent judicial or administrative authority in the country of origin or the country where that person comes showing that the aforementioned persons have not been the subject of a conviction by final judgment for one or more of the reasons listed below:

A. Participation in a criminal organisation, as defined in Article 2 of Council Framework Decision 2008/841/JHA of 24 October 2008 on the fight against organised crime (OJ L 300, 11.11.2008, p. 42);

B. Corruption, as defined in Article 3 of the Convention on the fight against corruption involving officials of the European Communities or officials of Member States of the European Union (OJ C 195, 25.6.1997, p. 1) and Article 2(1) of Council Framework Decision 2003/568/JHA of 22 July 2003 on combating corruption in the private sector (OJ L 192, 31.7.2003, p. 54) as well as corruption as defined in the national law of the contracting authority or the economic operator;

C. Fraud within the meaning of Article 1 of the Convention on the protection of the European Communities' financial interests (OJ C 316, 27.11.1995, p. 48), which was ratified by Law 2803/2000 (A· 48);

D. Terrorist offences or offences linked to terrorist activities, as defined in Articles 1 and 3 of Council Framework Decision 2002/475/JHA of 13 June 2002 on combating terrorism (OJ L 164, 22.6.2002, p. 3) respectively, or inciting or aiding or abetting or attempting to commit an offence, as referred to in Article 4 of that Framework Decision;

E. Money laundering or terrorist financing, as defined in Article 1 of Directive 2005/60/EC of the European Parliament and of the Council of 26 October 2005 on the prevention of the use of the financial system for the purpose of money laundering and terrorist financing (OJ L 309, 25.11.2005, p. 15) which was incorporated in the national legislation by Law 3691 / 2008 (A ` 166);

F. Child labour and other forms of trafficking in human beings as defined

in Article 2 of Directive 2011/36/EU of the European Parliament and of the Council of 5 April 2011 on preventing and combating trafficking in human beings and protecting its victims, and replacing Council Framework Decision 2002/629/JHA (OJ L 101, 15.4.2011, p. 1), which was incorporated in the national legislation by Law 4198/2013 (A` 215);

14.4.2 The Bidder, or in case of a J/V each of its members, shall submit extracts from Judicial records, or failing this, equivalent documents issued by competent judicial or administrative authorities in the country of origin and/or the country where the Bidder (or in case of a J/V each of its members) is registered, proving that:

A. The Bidder is not bankrupt, under liquidation, bankruptcy, obligatory management, compromise, or is in any other similar situation resulting from a similar procedure (as it is for Greek Companies the procedure of Article 99 of Law 3588/2007, as applicable), as provided by National Legislation.

B. No procedure has been instigated against the Bidder for declaration in bankruptcy, obligatory management, compromise or any other similar situation resulting from a similar procedure (as it is for Greek Companies the procedure of Article 99 of Law 3588/2007, as applicable), as provided by National Legislation.

C. The Bidder has not been convicted for anything related to its professional integrity and behaviour.

D. The Bidder has not committed any serious professional misdeed, which can be verified by any means by DESFA.

14.4.3 The Bidder, or in case of a J/V each of its members, shall submit Certificates issued by competent authorities in the country of registration proving that the Bidder, or in case of J/V each of its members:

A. Has fulfilled its obligations, concerning the payments of Social Security contributions according to the Legislation of the country where it is established, or according to Greek Legislation;

B. Has fulfilled its obligations related to payment of taxes, according to the Legislation of the country where it is established or according to Greek Legislation, in the event that it has previously developed activities in Greece.

Notes to 14.4.1, 14.4.2 and 14.4.3:
Where the country concerned does not issue such documents or certificates as required above, these may be replaced by a declaration, by the Bidder, in front of Judicial or Administrative authority, notary or the appropriate professional organisation of the country where the Bidder is established, stating also, within the same declaration on oath, that the country concerned does not issue such documents or certificates as required above.

14.5 Not Applicable.

14.6 Not Applicable.

14.7 Published or certified copies of Bidder's, or in case of a J/V, of each of its

members, Statements of Accounts for the last three (3) years, showing annual turnover. The average of the above last three (3) years annual turnover must be positive.

14.8 Not Applicable.

B. TECHNICAL EXPERIENCE DOCUMENTATION

14.9 Bidder's Profile

Documents indicate the profile, structure, organization and infrastructure of the Bidder, or in the case of a J/V each of its members, with regard to Front End Engineering Services.

Information on the available computer hardware and software, services and technologies offered, list of equipment and machinery owned by the Bidder, or in the case of a J/V of each of its members, for the use of similar Services.

14.10 Bidder's General Experience:

a. List of Contracts demonstrating Bidder's, or in the case of J/V of each of its members, overall experience in Basic Engineering or Front End Engineering Services concerning Small Scale LNG Infrastructure (including marine and electromechanical cryogenic installations) executed successfully during the last eight (8) years, stating analytically:

   i) description of the Engineering Services (Contract Scope)
   ii) name of the Client with reference person for communication
   iii) Contract number/type/date of signing
   iv) Short technical description of the Project according to the Contract
   v) Initial and final Contract price
   vi) Planed and actual completion period
   vii) The participation interest (%) in the J/V (if applicable)

b. List of Bidder's Contracts, or in the case of a J/V of each of its members, similar Contracts as above currently under execution, stating analytically the aforementioned information (as per 14.10 above) as well as the un-executed part for each Contract (in terms of progress/cost) at the Bid submission date.

Note on 14.10 a and b:

In case that the Bidder is a member of a Group of companies formed after merging, as per provisions of Law No 2940/01, cumulative experience shall be considered.

c. Minimum Experience Requirements

Subject to rejection of the Bid, the Bidder, under one or more contracts, must have successfully executed solely as an Engineer or as a member of a J/V Engineer with a minimum participation interest of 50% in such Joint Venture within the last eight (8) years at least one relevant study (Basic Engineering Design or FEED) of LNG vessels loading Jetty, including the

study of marine facilities and the necessary electromechanical cryogenic installations.
The above must be proved by relevant documents issued by the owner, otherwise the declared experience will not be taken into consideration by DESFA.
In the case of a J/V, the above minimum requirements, may be satisfied cumulatively by J/V members. Anyone of the J/V members satisfying any of the above minimum requirements must participate with at least 30% interest in the J/V and one of them must be the Leader of the J/V.

14.11 Bidder's Quality Management System:

Subject to rejection of the Bid, the Bidder, or in case of a J/V each of its members, shall submit a Management System Quality Assurance Certificate according to ISO 9001 or equivalent Certificates or evidence of equivalent management quality assurance, as stated in Article 81 of the European Directive 2014/25/EU, valid at the time of Bid submission.

14.12 Not Applicable.

C. ADDITIONAL DOCUMENTATION IN CASE THAT THE BIDDER RELIES ON PARTICULAR RESOURCES OF OTHER ENTITIES

14.14 In case the Bidder relies on and uses the economic and financial or/and technical or/and professional capacity of Other Entities, as per Directive 2014/25/EC, article 79. These Entities must be registered in a European Union (E.U) or a European Economic Area (E.E.A) country or a country having an Association or Bilateral Agreement with the E.U, allowing the participation in Public Tenders of Contracting Authorities with activities in Natural Gas Sector and the documents mentioned below should be included in Envelope A for each Other Entity, as applicable according to its' legal form:

14.14.1 A Statement signed by the Legal representative of such Other Entity that all submitted data and information are true.
Duly certified J/V agreements or articles of Association valid, according to the legislation of the country of registration and the documents mentioned in article 14.2.1.i.a in case of Entities operating under Greek Law and article 14.2.1.i.b in case of foreign Entities.

Documents under subparagraphs 14.4 of present article, where the term "Bidder" is substituted by the term "Other Entity". In addition:

- In case the Bidder relies on and uses the economic and financial capacity of Other Entities, the duly certified documents described in paragraph 14.7 of present article,
- In case the Bidder relies on and uses the technical or/and professional capacity of Other Entities, the duly certified documents described in paragraphs 14.3, 14.9, 14.10 and 14.11 of present article,

where the term "Bidder" is substituted by the term "Other Entity".

In case that above mentioned documents are not submitted, the application of use of particular resources of Other Entities shall not be taken into consideration.

14.14.2 A certified copy of the Minutes of Meeting of the Board of Directors, or other competent decision-taking body or duly authorized person of the Other Entity, regarding the approval of the availability to the Bidder, for the whole duration of the execution of the Contract, of the particular economic and financial or/and technical or/and professional capacity. The relevant decision should be detailed and should specify the particular resources to be available for the SERVICES, in a manner that DESFA can proceed with evaluation and judge the importance of those resources during the bidding phase and can control the realization of said commitment during the execution of the CONTRACT.

14.14.3 Binding agreement in original between the Bidder and such Other Entity proving the commitment for provision of resources.

In case that the requirements listed above are not fulfilled, such application of the Other Entity shall not be taken into consideration by DESFA.

Above mentioned relationship shall be valid for the whole duration of the CONTRACT. In case that during the CONTRACT'S performance the relationship between the Bidder and the Other Entity is not valid, DESFA has the right to apply the contractual provision for ENGINEER'S forfeiture.

The statements and the documentation both of the Bidder and of the Other Entity related to the use of particular resources shall be part of the Contract Documents.

15. CONTENTS OF Envelope B

Envelope B shall contain one (1) original plus one (1) copy of the following documents, in sequence as follows:

15.1 A **BID LETTER** (as per Annex 1 attached herewith) duly signed by the Bidder.

15.2 Bidder's organizational Structure

a. Organization chart for the execution of the SERVICES.
b. A description of the proposed duties and responsibilities of all key positions included in the Organizational Structure.
c. The Bidder shall submit a list of Subcontractors (if any) for the elaboration of any parts of the services. The list shall be accompanied by the Subcontractors' proposed scope of services and full details on the experience and activities of these Subcontractors, similar to those mentioned in paragraphs 15.2 a, b here above.
d. A statement by Bidder that after CONTRACT award, the Sub-Contractor(s) identified shall not be removed or replaced without the prior written approval of DESFA.
e. The venue(s) where the Engineering services shall be performed.

f. In case that Bidder uses the technical or/and professional capacity of Other Entities, personnel belonging to the Other Entity or having the technical or/and professional capacity shall be included in the Organization chart.

Subject to rejection of the Bid:

- **In the case of a J/V, the Leader shall cover at least the following positions:**

  - **Project Manager**
  - **Engineering Manager**

15.3 Profile of the key personnel

The Bidder shall submit a List of the Key Personnel accompanied by detailed CVs, including those of the main Subcontractors proposed by the Bidder to be dedicated for the execution of the SERVICES.

Key Personnel shall include at least: Project Manager, Engineering Manager, Marine engineering Leader, Civil engineering Leader, Process Manager, Safety Manager, Environmental Manager, QA/QC Manager, Electrical Engineer, Instrumentation Engineer, Telecom Engineer and Planner Engineer.

Additionally, a declaration by the Bidder (as per Greek Law 1599/86) shall be submitted, stating that a) the personnel nominated in the Bid for the SERVICES, shall remain the same till completion of CONTRACT and b) clarifying the legal relation and the type of engagement with nominated personnel.
A respective declaration of acceptance by the nominated personnel shall be submitted stating also that all terms and conditions of such cooperation with Bidder have been agreed.
Substitution of the nominated personnel is not allowed unless their cooperation (legal relation between successful Bidder and nominated personnel) is terminated.
Only substitutes with the same qualifications as the Key Personnel of the Bid can be accepted. Substitution will be effected only after prior DESFA's written approval.

15.4 Bidder's proposal for the use of relevant Hardware and Software

Bidders shall provide details of the hardware and software that will be used in the elaboration of the Engineering services.

15.5 QUALITY MANAGEMENT SYSTEM:

The Bidders should demonstrate that they apply an efficient and effective Quality Management System that allows them to provide the services according to DESFA 's Requirements.

The Bidders shall submit a sample Quality Manual and a Quality Plan for the specific PROJECT in the Tender which should demonstrate the Quality System the Bidder intends to apply throughout the execution of the SERVICES.
The sample Quality Plan shall represent a detailed breakdown of all activities for the provided SERVICES. For each one of these activities the following fields shall be clearly identified:

- Quality Requirements
- Applicable Quality System Procedures
- Applicable Technical Specifications
- Inspection and Approval Levels
- Deliverable Documents

The SERVICES Quality Manual shall have the structure dictated by ISO 9001 or equivalent Certificate or evidence of equivalent quality assurance measures and shall adequately cover the following issues:

- Quality Policy and Management Responsibility
- Project Organization Chart
- General Description of the Quality System
- List of applicable Quality System Procedures

The successful Bidder (ENGINEER) shall perform all his activities within a framework of his own Quality System which shall meet the requirements of DESFA'S Specification QA-SPC-001 of SECTION "Scope of Services" and the standards of ISO 9001 or equivalent Certificate or evidence of equivalent quality assurance measures.

15.6 SERVICES Execution Plan:

a. Time Schedule

The Bidder should provide a detailed time schedule for the elaboration of the Front End Engineering, in the form of a Bar Chart, showing critical milestones, interfaces between disciplines within Bidder's organization and interfaces with external parties, Subcontractors etc., and descriptive information for the execution of the SERVICES, covering all aspects of the Front End Engineering.

The time limits shown in TIME SCHEDULE (Appendix B of SECTION "Terms and Conditions") should be strictly followed.

b. Detailed description of SERVICES Execution Plan

The Bidder should provide comprehensive detailed technical descriptions for the provision of the SERVICES, allowing a complete technical evaluation of Bidder's proposal.

c. List of all documents and drawings that Bidder will issue during the Front End Engineering elaboration.

15.7 Submission of Deviations list as per NOTE 1 here in below.

15.8 Any other information further explaining the Bidder's Technical Information.

General Notes:

1) **Deviations, if any and to the extent permitted by Article 8 hereabove, should be entered into a separate list under a relevant heading. In case there are no such deviations, the word "NONE" must be stated in a relevant document, under the same as above heading**.

2) Bidders should not include in ENVELOPE B any data connected to their offered prices (included in ENVELOPE C), otherwise their offer might be rejected.

16. CONTENTS OF Envelope C

16.1 Envelope C must contain one (1) original of the following documents:

A. **BID LETTER** (as per Annex 1), duly stamped and signed by the Bidder.

B. **Price Schedule** (as per Annex 3), filled-in and duly stamped and signed by the Bidder.

- All quoted prices shall be expressed in EURO
- Offer Prices quoted in the Price Schedule should be in strict accordance with the Inquiry Documents.
- Quoted CONTRACT PRICE shall include any cost for execution of the SERVICES described in the Inquiry Documents, including ENGINEER's profit.
- Any withholding tax, duty or mandatory contributions to public authorities or institutions shall be included in the offered price, with the explicit exception of the Value Added Tax (VAT).

16.2 The Bidder shall initial and stamp each page of the contents of Envelope C as well as must sign and stamp the Bid as provided in the Inquiry Documents.

16.3 In case any deviation from DESFA'S requirements is contained in Bidder's ENVELOPE C, which is not mentioned in the relevant list as per Art. 8 and 15 hereinabove, DESFA reserves the right to reject the Bid.

16.4 Any un-initialed page may be initialed by the Legal Representative of the Bidder at the time of opening of Envelope C. In any case all members of the Inquiry Committee may initial the relevant pages of the contents of Envelope C and Bid shall be considered as valid. However, any omission in duly signing by the Legal Representative the contents of Envelope C as provided in the Inquiry Documents, shall be a reason for rejection of the Bid.

16.5 The offered Lump Sum (CONTRACT PRICE) shall be ENGINEER's full compensation for the execution of the Engineering Services so as to satisfy all requirements of SECTION "Scope of Services".

17. EVALUATION PROCEDURE

Evaluation of the Bids shall be performed as follows:

17.1 Only Bidders which have submitted an Envelope A according to Article 14 hereabove will be accepted for further evaluation.

17.2 Bids shall be rejected if:

- It appears from the Envelopes A and/or B that the Bidder does not have the know-how or the experience and generally the technical and/or the financial capacity for executing the CONTRACT.
- The Bidder has committed any serious professional misdeed which can be verified by any means by DESFA.
- The Bidder has provided, at any stage of the Inquiry, false information.
- The Bid is not precise enough to the point that it is impossible to establish with certainty what is offered against which price, or the Bid is not responsive or the offer price is unreasonably low.

17.3 For the evaluation of the Bids, all deviations (i.e. comments, qualifications, deviations, exceptions, etc) in the list as per Article 8, contained in Envelope B, will be grouped by the Inquiry Committee and at its option, into two (2) categories as follows:

a) Those which can be accepted without any price impact.
b) Those which cannot be accepted or have an economic impact that affects the economic offer. In such case the relevant Bid will be rejected.

17.4 In case a deviation is contained in the contents of Envelope B and such deviation is not mentioned in the list of deviations as per Art. 8 and 15 hereinabove, then DESFA reserves the right to consider that this constitutes a case of submission of false information and to reject the Bid.

17.5 TECHNICAL EVALUATION

Based on the data submitted with Envelope B, Bidders' Technical Offers shall be evaluated as follows:

The items set out in the table here below, will be used for the Technical Evaluation of the Bids based on submitted information contained in Envelope B.
The grading and evaluation procedure set out here below shall be strictly followed.

ITEM No	ITEM	GRADE*
1	Bidder's organizational Structure, Profile of the key personnel, use of relevant Hardware and Software and Quality Management System, as clauses 15.2, 15.3, 15.4 & 15.5	
2	Detailed description of SERVICES Execution Plan as clause 15.6	

(*) Grade shall be given on a 10 point scale (i.e. 100, 90, 80, etc.), where the value 100, 70, 30 and zero represent the following:

100 : Items for which the Technical Offer is fully documented, in full accordance with the Inquiry requirements, or better.

70 : Items for which the Technical Offer is complete and satisfactory in major issues of the Inquiry requirements. Minor omissions do not affect the SERVICES and are upgradeable.

30 : Items for which the Technical Offer is incomplete in major issues

0 : Items for which the Technical Offers is not acceptable.

REASON FOR REJECTION OF THE BID:

During the Technical Evaluation phase, the Technical Offers are rejected if the Bidder's Grade in any of the two items is less than seventy (70)

For those Bidders for which the Technical Offer is in compliance with the Inquiry Documents and is acceptable the evaluation of Envelope C will follow.

17.6 FINANCIAL EVALUATION

For the Bids that have been so far accepted, the opening of Envelope C will follow and the Financial Offers shall be announced.

During this stage DESFA may, at its discretion, ask any Bidder(s) to justify in writing his (their) offered price(s). DESFA shall require Bidder(s) to explain offered price(s) or cost(s) that appear to be abnormally low. Bidder shall reply in writing not later than ten (10) days from receipt of said request. DESFA reserves the right to reject any Bidder's offer in case DESFA judge that Bidder's reply does not explain satisfactorily the low level of offered price(s) or cost(s).

The successful Bidder will be the Bidder with the most economically advantageous offer (the acceptable Bidder having the lowest non-rejected Offer).

IMPORTANT NOTE:

It is hereby clarified that if the Total Lump Sum price of the Services is greater than the Budget of the Inquiry, as it is specified in Article 1 here above, the relevant Bid shall be rejected.

17.7 DESFA reserves the right not to award the CONTRACT as a result of this Inquiry, or to repeat the Inquiry or any phase of it or cancel the Inquiry or proceed otherwise according to applicable law, without any obligation to the Bidders.

17.8 The evaluation of the Bids will be concluded with the (written) approval of its results by DESFA.

18. AWARD-CONTRACT SIGNATURE

18.1 The successful Bidder will receive a Letter of Intent (by letter or fax).

The successful Bidder upon receipt of said Letter of Intent, but not later than two (2) working days as from its receipt, shall notify DESFA (by letter or fax) of its acceptance without any reservation.

Following said acceptance, a Letter of Award (by letter of fax) will be issued by DESFA.

18.2 The CONTRACT will be signed as soon as said Bidder submits to DESFA the following documents which documents in any case should be submitted not later than ten (10) working days from the day of receipt by said Bidder of the Letter of Award:

A. Minutes of the successful Bidder's (or in case of a J/V from each of its members) Board of Directors, or other competent decision making body of successful Bidder, duly signed, and stating:

(i) Their decision to accept the CONTRACT award.

(ii) The appointment, by a Power of Attorney, of the Legal Representative(s) who must be authorised to sign the CONTRACT and to act on ENGINEER'S behalf during the execution of the CONTRACT.

B. Declaration signed by said Legal Representative(s) accepting the aforementioned Power of Attorney without any conditions or reservations.

C. Performance Guarantee as stated in Article 9 hereabove (GUARANTEES).
D. In case of a Joint Venture, legal documents proving that the Joint Venture has been formed according to Article 11 stipulations and according to the Law.

All the above documents must be duly certified by the competent authority of the country of registration, and shall be accompanied by official translation in the Greek or English language.

18.3 In case the successful Bidder fails to notify DESFA the acceptance of DESFA's Letter of Intent within the aforementioned two (2) days time limit or fails to submit the aforementioned documents of paragraph 18.2 above after DESFA's letter of Award, DESFA shall have the right to cancel the award of the CONTRACT to said Bidder and to claim for compensation of damages related to the delays due to such failure of said Bidder and provisions of article 9.5 hereinabove shall apply.

18.4 In case the successful Bidder is a J/V, the award will be in the name of the J/V. Each member of the J/V will be fully, jointly, indivisibly and severally liable to DESFA and will be represented by a common Representative throughout the validity period of the CONTRACT.

19. NOT APPLICABLE

20. CONFIDENTIALITY

Any technical information and data furnished by DESFA with the Inquiry Documents shall remain the property of DESFA and shall be treated confidentially and they shall not be used, disclosed or released to any Third Party for any other purposes, other than for preparing the Bids.
In case that any Bidder designates information as confidential, reasoning the existence of technical or trade secrecy, in his relative statement, should expressly

refer all relative provisions of legislation or competent authority's decisions that imposes the confidentiality of said information.
Information concerning offered quantities and prices, financial offer and the contents of technical offer used for the evaluation are not confidential.

21. RESERVATIONS AND RIGHTS OF DESFA

21.1 Participation to the Bid constitutes an acceptance by the Bidder that it has complete knowledge of the terms and provisions of the Inquiry Documents and accepts their contents without reservation.

Any omission to submit the Bid according to the Inquiry Documents as well as the omission of a signature on any document does not entitle the Bidder to invoke this fact in its (Bidder's) favour in any way.

The Bidder shall be responsible for and be bound by its Bid as submitted.

21.2 DESFA will have no responsibility or obligation whatsoever to indemnify and/or to compensate the Bidder for any expense or loss incurred for the preparation and submission of the Bid, in particular, in case the terms and provisions of the Inquiry Documents are changed by DESFA or the Bid is not accepted, or the Inquiry is extended or adjourned or annulled or cancelled at any stage and time and for any reason whatsoever, or in case DESFA takes any decision according to the terms and provisions of the present Inquiry Document. Therefore, participants to the Inquiry which submit a Bid, regardless of whether this is finally accepted or not, have no right against DESFA deriving from the Inquiry or for participating to the Bidding.

21.3 The Bid is considered to be a proposal to DESFA and not an acceptance of it by DESFA. Therefore the CONTRACT sample and other issues and documents imply that the Bidders submit their Bid in accordance with the terms and provisions of those issues and documents that constitute an integral part of their Bid.

21.4 The terms, provisions and limitations concerning the submission of Bids are to the benefit of DESFA, who is entitled to proceed with any relevant change before the submission of Bids without any right on behalf of the Bidder or other third parties arising from this fact.

22. LOCAL LAWS AND REGULATIONS

The Bidder must be fully aware of local Laws, Regulations, Decrees, practices and other conditions in Greece, which might affect its Bid and the performance of its obligations.

Failure of the Bidder to become familiar with such matters shall not release it from its obligations.

23. NOT APPLICABLE

24. SITE VISIT

The Bidders may visit the SITE to become fully acquainted with the existing and expected conditions, which might in any way, influence the cost and/or implementation of the Scope of SERVICES. The Bidders shall cover all costs incurred by the Bidders in connection with the SITE visit.

Any failure to fully investigate the SITE or the foregoing conditions shall not release any Bidder from its responsibility to properly consider the difficulty or cost of successfully implementing any part of the Scope of SERVICES.

25. CLARIFICATION MEETINGS / DESFA's CLARIFICATION OF BID

If requested by DESFA, Bidders must be prepared for a formal presentation of their Bids as well as to clarify any queries of DESFA probably at DESFA's premises. Such meetings shall take place at any reasonable time between Bid submission and CONTRACT award. Bidders shall make their own arrangements for attending said meetings and bear the associated costs.

26. BIDDER'S CLARIFICATION REQUESTS

Bidders may request in writing clarifications of the Inquiry Documents at any time up to fourteen (14) days prior to the Bid due date.

DESFA will endeavour to reply to the requested clarifications not later than eight (8) days before the Bid due date.

27. DESFA's AMENDMENTS TO THE INQUIRY

DESFA may issue amendments in the form of a Bid Addendum at any stage during the Bid period but not later than six (6) DAYS before the initial Bid due date and extend the time for submission of Bids if such extension will be considered appropriate by DESFA.

The Bidders shall confirm in writing the inclusion in their Bid of all clarifications/amendments issued prior to receipt of the Bid by DESFA (see Annex 1 – Bid Letter).

For clarifications/ amendments issued by DESFA subsequent to receipt of the Bid, but in any way prior to the Bid due Date, the Bidder shall be responsible for thoroughly examining the Bid documents and incorporating the clarifications/amendments in his Bid. Any failure by the Bidder to comply with the aforesaid clarifications or amendments issued by DESFA, may be a reason for the rejection of its Bid.

28. ATTACHED DOCUMENTS

The following Annexes are attached herein and constitute integral part of present Instructions to Bidders:

Annex 1: FORM OF BID LETTER

Annex 2: FORM OF PARTICIPATION GUARANTEE LETTER

Annex 3: PRICE SCHEDULE

Annex 4: FORM OF STATEMENT

Annex 5: CONFIDENTIALITY CLAUSE

SCOPE OF SERVICES
(hereinafter Scope of Work)

CONTENTS

Doc. No. 16-156-H1
Rev. 0 – MARCH 2017

D'APPOLONIA
consulting, design, operation & maintenance engineering

DESFA
Revithoussa, Greece

Small Scale LNG Installations at the Revithoussa Terminal
New Maritime Infrastructure at North-Eastern Side of Revithoussa Isle

Scope of the Work for the FEED Design

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Scope of the Work for the FEED Design

Rev.	Description	Prepared by	Controlled by	Approved by	Date
0	First Issue	A. Bonaventura / A. Sola / D. Vannucci	P. Paci	A. Lo Nigro	March 2017

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SCOPE OF WORK FOR THE FEED DESIGN
NEW MARITIME INFRASTRUCTURE AT NORTH-EASTERN SIDE OF REVITHOUSSA ISLE

1 PROJECT BACKGROUND

1.1 GENERAL

The Hellenic Gas Transmission System Operator (DESFA S.A., hereinafter the "CLIENT") develops and manages the existing LNG Terminal on the Revithoussa isle.

The DESFA LNG Terminal is located about 40 km West of Athens on the Island of Revithoussa in Megara Bay. It has been in operation since the year 2000 and it is featured to receive LNG carriers of up to 155,000 m^3.

The existing terminal consists of an import jetty (located on the southern side of the isle), storage system, re-gasification equipment and send-out facilities. The Terminal overall authorized storage capacity is of 225,000 m^3. Storage system is composed of No. 2 storage tanks of 65,000 m^3 each plus a third one (capacity of 95,000 m^3) which is currently is under construction.

Re-gasification Sustainable Maximum Send-out Rate (SMSR) will reach 1,400 Nm^3/h, while the peak send-out rate will reach 1,650 Nm^3/h with the expansion works currently in progress and expected to be completed early in 2018.

The Terminal serves as the entering point of LNG at Hellenic gas transmission system. At its facilities can be performed the process of:

- Unloading of LNG vessels;
- Storage of LNG;
- Recovery of boil off gas from storage tanks;
- Vaporization of LNG;
- Natural Gas export to the Hellenic gas transmission system.

According to recent changes in environmental naval regulations (MARPOL Annex VI) which will involve need to reduce pollutants emissions to atmosphere, thus favoring use of LNG as fuel for ship, DESFA is planning to implement changes to the LNG Terminal in order to allow LNG loading of small scale LNG carriers (storage capacity between 1,000 and 20,000 m^3) from the Terminal.

The LNG loading will be carried out by installing a new maritime infrastructure on the North-Eastern coastline of the isle, which has been selected as the most preferable location according to technical, environmental and safety constraints and associated costs.

As expected schedule for implementing this new infrastructure will be of about 2 years, DESFA also intends to realize an interim solution on the southern side of the isle, in correspondence of the existing quay that currently hosts large LNG carriers.

The purpose of this document is to define the Scope of Work (SoW) for the preparation of the FEED Engineering Package (hereinafter FEP) for guaranteeing LNG supplying to small LNG carriers from new maritime infrastructure to be located on the North-Eastern side of Revithoussa isle.

1.2 PROJECT BACKGROUND

In 2015 DESFA awarded to D'Appolonia the development of a "Technical Feasibility and Cost Estimate Study for the Development of Installations for Small Scale LNG in Greece" study (hereinafter: "Feasibility Study") focused on the site selection of the most suitable location to install a new maritime infrastructure on Revithoussa isle that could host small scale carriers with a capacity between 1,000 m^3 of 20,000 m^3.

The Feasibility Study to allow LNG loading of small scale vessels was completed in December 2015.

A site selection process was carried out and defined as the most suitable location a coast sector located on the North-Eastern side of the isle (Sector 2 as per figure below).

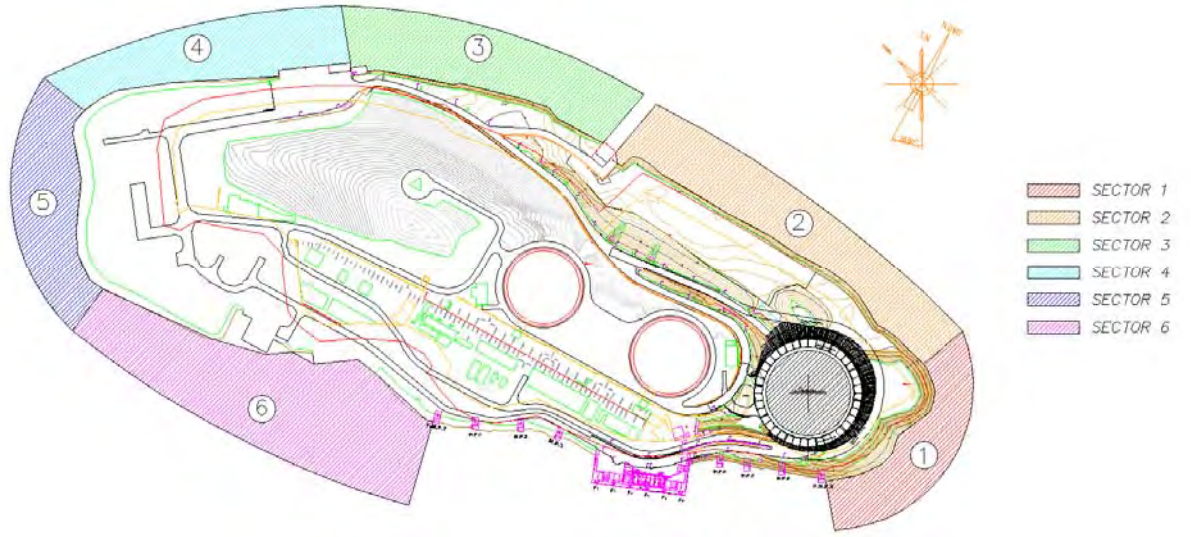

Figure 1.1: Site Selection

Proposed technical solution included a new maritime infrastructure located parallel to the coastline, presented in Figure 1.2. The Feasibility study highlighted the following:

- the location is capable of hosting all the vessels included in the range 1,000 m^3 (70 m L.O.A.) – 20,000 m^3 (150 m L.O.A.);
- no interferences with existing maritime infrastructure and/or on-shore plant facilities has been detected;
- proposed location involves minimum safety criticalities (due to prevailing winds, minimum LNG line length from pumps to loading arms and distance between two moored LNG carriers, which is compliant with best practices of Port Engineering design);
- no critical issues are expected in relation to the modification of the coastal morphology;
- though such a location involves visual impact from inhabited areas located Northward, overall impact on the environment and landscape is not critical.

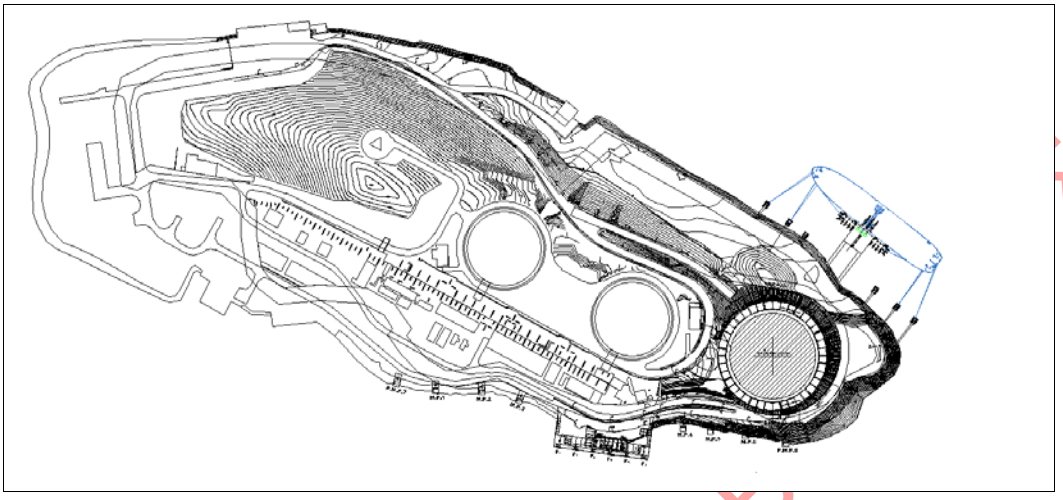

Figure 1.2: Berthing System at North-East Side of Revithoussa Island

The LNG will be transferred toward the small LNG Carriers having capacity between 1,000 m^3 and 20,000 m^3. The small LNG carriers will be moored at a dedicated jetty that will be fitted with all equipment and facilities needed to perform the loading operations and achieve the required safety level. The new jetty and the loading system will be sized to allow the transfer of 20,000 m^3 of LNG.

Since the completion of Feasibility study, after a more detailed investigation of the LNG needs for bunkering, a revised operation program for the new infrastructure was selected, allowing the berthing of two LNG carriers at the same time.

The new jetty located at North – East Side as well, perpendicular to the coastline, is presented in Figure 2.2.

2 PROJECT SUMMARY

2.1 SITE AND TERMINAL DESCRIPTION

Revithoussa island is situated 40 km West of Athens in Saronikos gulf. The Terminal is located at 500-600 m from the shore. A map of Revithoussa isle showing the site lay-out is provided on Figure 2.1.

Figure 2.1: Revithoussa Isle

The isle is at more than 1 km from closest local inhabited areas, all of them located to the North.

The LNG Terminal is composed of the following main equipment:

- LNG unloading system composed of No. 3 loading arms for LNG transfer (2 having a flowrate of 1,750 m^3/h each and a third one of 3,750 m^3/h) plus No. 1 vapor return;
- storage of LNG, composed of No. 3 storage tanks, two with a capacity of 65,000 m^3 each plus a third one of 95,000 m^3 currently under construction;
- recovery of boil off gas from storage tanks;
- vaporization of LNG, through submerged combustion vaporizers (SCVs) and open rack vaporizers (ORVs), for an overall SMSR re-gas capacity of 1,400 Nm^3/h and a peak one of 1,650 Nm^3/h;
- Natural Gas export to the Hellenic gas transmission system.

2.2 DESCRIPTION OF MAIN INTERVENTIONS

A new pile jetty having an overall length of about 180 m will be installed along the North-East side of Revithoussa isle. The jetty will be perpendicular to the coast, allowing the berthing of two LNG carriers at the same time. . Minimum sea depth of 11 m shall be guaranteed to host LNG carriers of up to 20,000 m^3.

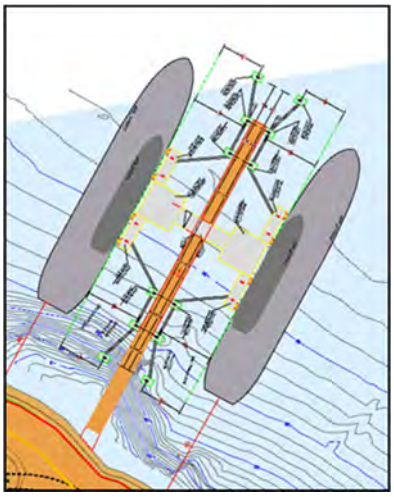

Figure 2.2: Jetty Layout Perpendicular to the Coastline

Local bathymetric characteristics are provided by the CLIENT (based on a survey carried out in October 2015). As per local geotechnical features in the area, the jetty will be based on drilled steel piles. The jetty will be equipped with mooring arrangements necessary to receive all LNG carriers having a storage capacity from 1,000 m^3 to 20,000 m^3 both in full loaded and in ballast conditions. Envelope of mooring arrangement plan has guaranteed compliance with allowable horizontal angles for head, stern, breast and spring lines as well as vertical angles for breast and spring lines.

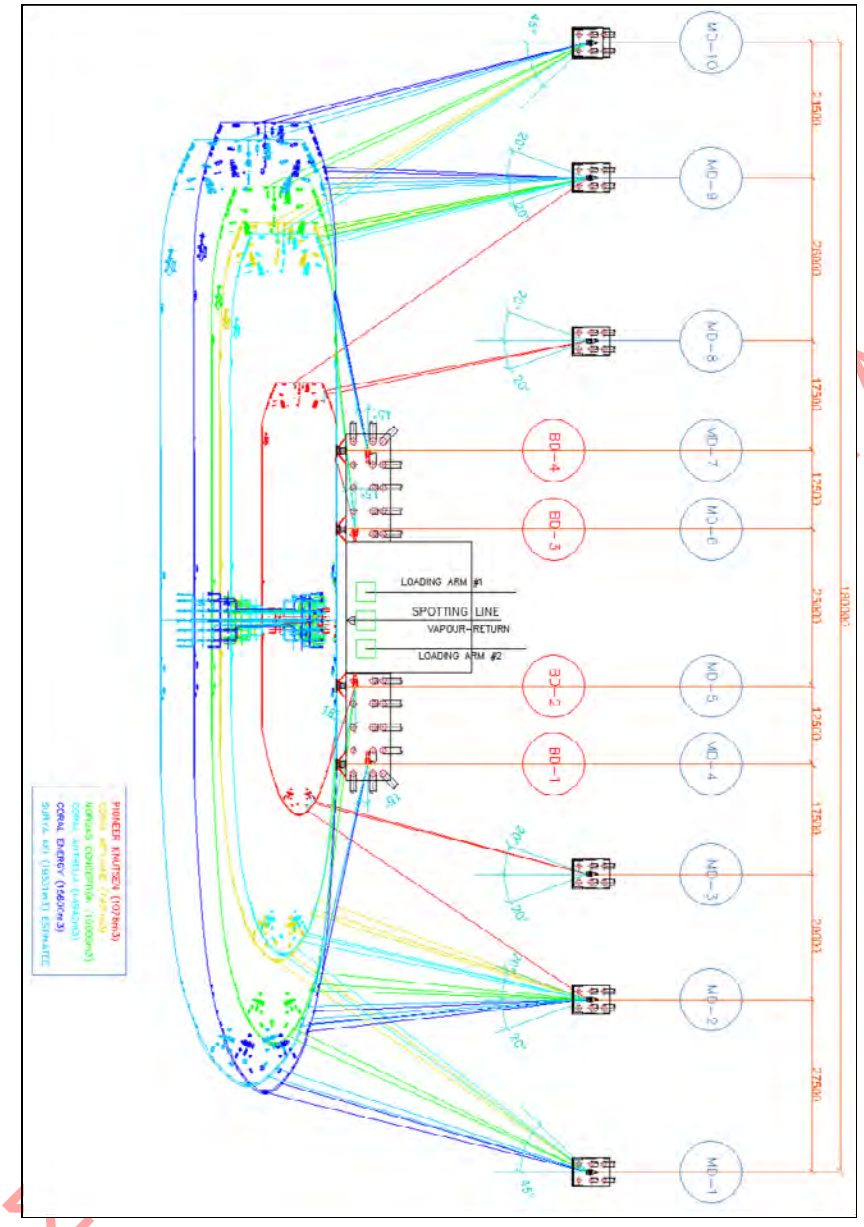

Figure 2.3: Plan Mooring Arrangement Envelope

The overall interventions will include:

- pile jetty connected to the top by a reinforced concrete platform;
- access gangway;
- unloading platform;
- mooring and breasting dolphin;
- No. 3 x 12" loading arms (one for LNG, one for vapor return a hybrid spare third one) suitable to route up 2,000 m^3/h of LNG or BOG;

- transfer system composed of 1 x 16" LNG transfer line and a 1 x 10" vapor line, as well as tie-ins and crossover lines in order to connect the new infrastructure with delivery lines from the 3 tanks;
- main equipment (vapor desuperheater, KO drum for liquid-gas separation, fiscal meter and sampling units);
- firefighting system for the new jetty;
- main interventions on I&C system.

Detailed description of main interventions is presented in the Feasibility Study.

It will be ENGINEER responsibility to endorse the feasibility study and confirm/amend the information here-included.

2.3 ACRONYMS AND ABBREVIATIONS

CLIENT	Hellenic Gas Transmission Operator System (DESFA S.A.)
ENGINEER	the Party which provides the FEED Engineering Services, according to the Contract
PROJECT	FEED Design for Small Scale LNG Installations at the Revithoussa Terminal in order to guarantee loading of mini LNG carriers from a new maritime infrastructure to be located on the North-Eastern side of Revithoussa isle
BoD	Basis of Design
BOG	Boil Off Gas
BOR	Boil Off Rate
CCTV	Closed Circuit Television and Video
DCS	Distributed Control System
EDR	Engineering Document Register
EMMP	Environmental and Monitoring Management Plan
EPC	Engineering, Procurement and Construction
ESD	Emergency Shut Down
FE	Finite Element
FEP	FEED Package
FF	Fire Fighting
I&C	Instrumentation and Control
JMD	Joint Ministerial Decision
LNG	Liquefied Natural Gas
OCIMF	Oil Companies International Maritime Forum
ORV	Open-Rack Vaporizers
PSV	Pressure Safety Valves
SCV	Submerged Combustion Vaporizer

SIF	Safety Instrumented Function
SIL	Safety Integrity Level
SIS	Safety Integrity System
SMSR	Sustainable Maximum Send-out Rate
SoW	Scope of Work
UXO	Unexploded Ordnance

3 PROJECT ASSUMPTIONS AND OBJECTIVES

3.1 PROJECT ASSUMPTIONS

3.1.1 General

The activities to be performed by the ENGINEER will be based on the following main assumptions:

- FEED design shall guarantee technical solutions to host small LNG carriers from 1,000 to 20,000 m^3. List of vessels to be considered by the ENGINEER shall include as a minimum the ones presented in Feasibility study;
- it will be in ENGINEER scope of work to endorse the outcomes of the Feasibility Study mainly with reference to the mooring arrangement system. As mooring has been preliminarily sized according to international standard and best practices (in the Feasibility Study), within the FEED a dedicated dynamic mooring study (that takes into account all forces potentially affecting the mooring sizing) shall be developed by the ENGINEER. The ENGINEER shall also develop a dedicated met-ocean study whose results will be used for defining local forces on the mooring and breasting system. CLIENT will make available a wave study covering the area under consideration;
- layout of the mooring system shall be optimized in order to allow the mooring of all the vessels included in the range considered in the Feasibility Study. Mooring arrangements shall guarantee full compliance between the mooring equipment and breast lines and stern lines, as well as spring lines;
- it will be in ENGINEER scope of work to verify compliance of the new transfer system with considered small scale vessels. If necessary, loading arms compliance shall be verified with major international vendors currently operating in the LNG market;
- ENGINEER shall define technical solutions related to both mooring and civil maritime infrastructure and process, mechanical, piping, I&C and electrical that could guarantee project development;
- ENGINEER first shall issue a Basis of Design (BoD) that shall be subject to CLIENT's written approval prior to incorporation of the data into the FEED design studies;
- the FEED design will be developed according to the following codes and standards in order of preference:
  - Greek legislation,
  - European legislation,
  - European standards,
  - DESFA's specifications (available on the company website),
  - other international standards (where aspects of the design are not covered by the aforementioned);
- ENGINEER shall take into account that the new infrastructure should be able to operate 24h/day, 7days/week.
- it will be in ENGINEER scope of work to define the interface requirements with the 3rd tank and obtain the agreement of the CLIENT;

- FEED design shall be developed according to geotechnical and seismic characterization of the area.

Furthermore, the ENGINEER shall make sure that LNG Carrier will be able to moor and sail away 24hrs a day. In detail:

- Night berth criteria equipment;
- Need for tugs and pilots;
- Tidal and weather criteria for berthing / un-berthing in emergency case

shall be addressed.

3.1.2 Input Data

The ship loading system shall be designed according to the following data:

1. LNG Ship tank capacity Range 1,000 to 20,000 m^3
2. LNG Ship loading Rate Range 100 to 2,000 m^3/h
3. Properties of LNG

Properties of LNG	Lean	Rich
Temperature	-162.0 °C	-161.8 °C
Operating Pressure	1.263 bara	1.263 bara
MW	16.515	18.876
SG	0.431	0.472
Viscosity	0.120 cP	0.165 cP
	0.275 cSt	0.346 cSt

4. Properties of NG (for vapor return line sizing)

   The properties of methane vapor are used to approximate for LNG vapor.

   The relevant characteristics at normal boiling point (1 atm) are:

Boiling temperature	°C	-161.4
Liquid density	kg/m3	422.46
Latent heat of vaporization	kJ/kg	510.15

5. Existing Storage Tank Data

No. of tanks:	2 (3 for future)
Gross capacity per tank :	2x 75,500 m^3 + 1x 112,500
Net capacity per tank:	2x 65,000 m^3 + 1x 95,000
Operating Pressure:	113 - 263 mbarg
BOR:	0.075% w/day (0.05% for 3rd tank)

6. Other Design Data

Heat Gain through lines:	25 W/m^2
Ship Tanks Operating Pressure:	0.1 – 3 barg
Ship Heel:	5 % of Ship Capacity

3.2 PROJECT OBJECTIVES

The main objectives of the FEED services the ENGINEER shall provide are the following:

- The FEED shall be developed at a level suitable for the CLIENT to place contracts with EPC Contractor to be able to perform the Detailed Design and for the CLIENT to execute Tendering procedures. Battery limit conditions in terms of range of LNG Composition, temperature, pressure, etc. at the receiving point will be confirmed at kick off meeting;
- execution of a mooring study, for all the vessels included in the range considered in the Feasibility Study;
- reduction of the technical uncertainties to allow competitive bids for construction of the project and minimize qualifications and risk of price escalation from bidders;
- elaboration of a Health and Safety Plan;
- execution of a Safety Study;
- execution of HAZID and HAZOP study;
- execution of an Environmental and Social Impact Assessment Study, as well as an Environmental Management and Monitoring Plan in accordance with current Greek legislation;
- execution of site surveys
- preparation of Technical Tender Documents for EPC contractor's tenders (e.g. Scope of Work);
- under CLIENT's approval, preparation of the Scope of work for any additional study that is necessary for the execution of the project;
- assessment of project installed costs to a level of certainty of ±15% to 20%;
- perform sensitivity analysis as required to reduce the impact of the cost uncertainty;
- provision of all the documentation required for the efficient follow-up of the project;
- development of an EPC Construction schedule;
- support of the CLIENT during the Tendering procedures;
- support of the CLIENT during the environmental and safety permitting procedures;
- development of coordination procedures with the existing plant.

4 PROJECT QUALITY/PROJECT MANAGEMENT

ENGINEER shall perform all his activities within the frame work of his own Quality System which shall be certified according to the requirements of ISO 9001 by an accredited certification body. The Quality System shall also cover the requirements set by CLIENT in QA-SPC-001 "Requirements of Contractors/Suppliers Quality System".

ENGINEER shall prepare all the documentation which is required for the efficient monitoring and control of the project.

ENGINEER shall submit to the CLIENT for review their proposed Quality Program together with a draft Project Quality Plan relevant to the FEED design services.

ENGINEER shall understand and accept the "draft" Project Quality Plan is to be fully developed and agreed by the CLIENT and implemented as an integral part of the Contract. The Project Quality 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 Approval levels;
- Deliverable Documents.

ENGINEER shall provide a list and description of the existing procedures and methods within their organization covering the design verification process and the interface control between various disciplines/working parties. ENGINEER shall include in their description the scope and the method by which terms of reference are set during checking, review and approval.

ENGINEER shall prepare and issue, as a minimum, the following documents:

- Project Plan (to include both the scope of work and project control requirements);
- Engineering Plan;
- Project Procedures;
- Project Quality Plan;
- Project Organization Chart;
- Coordination Procedure (comprehensive of requirements for correspondence, communication and meetings, details of contacts, etc.);
- Document Control Procedure (including coding and labelling of technical documents);
- Engineering Document Register (EDR);
- time schedule for FEED design;
- Monthly Progress Report with Narrative (Introduction, Achievements in each month/work status, Areas of concern and Main Activities in the following month) and updated detailed time schedule.

Interim working meetings shall be organized at ENGINEER's premises as deemed appropriate. For these meetings the use of video-conference or teleconference facilities shall be considered.

The contract price will include ENGINEER's expenses for ENGINEER's participation at a kick-off meeting and site visit (see para.5.1.1), and for organizing a presentation of the first issue of the FEED design both at CLIENT's premises.

CLIENT reserves the right to audit the ENGINEER activities based on CONTRACT requirements. ENGINEER shall comply with the findings of those audits.

5 SCOPE OF SERVICES

5.1 SITE SURVEYS AND INVESTIGATIONS

5.1.1 Site Visit

At the beginning, a site visit on Revithoussa Island shall be carried out to gather data and information on the existing plant. The site survey will be focused on the analysis of the existing plant, in terms of equipment location.

5.1.2 Geological / Geotechnical Study

In order to provide the preliminary geotechnical parameters for LNG structures/facilities, foundations, a geological and geotechnical characterization of the area shall be carried out by the ENGINEER based on project and public domain available data.

Geological characterization should provide as a minimum the following:

- lithological types;
- structure and the physical characteristics of the soil;
- geological model of the subsoil;
- stratigraphy;
- structural, hydrological and geomorphological characteristics; level of geological and seismic hazard;
- soil parameters such as unit weight;
- soil strength and/or soil spring (horizontal and vertical).

It will be in ENGINEER scope of work data acquisition for the geological / geotechnical characterization (CLIENT will provide support) and, in case of lack of data, to promptly inform the CLIENT for additional data and/or suggest CLIENT geological/ geotechnical assumptions to be assumed. Final input data and/or assumptions shall be agreed with the CLIENT.

5.1.3 Geohazard Assessment

ENGINEER shall provide a geohazard assessment to identify the main features which could pose a risk to the field development based on geological study and the analysis of available data.

Based on accessible data a general characterization of the site shall be performed on the basis of literature review and existing geotechnical and geophysical surveys in the area or nearby areas if available. The characterization shall include:

- Geologic setting;
- Seismic setting/parameters;
- Geotechnical parameters;
- Local faulting;
- Bathymetry;

- Geomorphology.

A general review of the geologic setting, followed by morphologic and stratigraphic interpretation of the seabed features in the area should be performed.

The geological features identified should then be cast in context of the general depositional environment to understand their significance, particularly in respect to potential hazard for the structures. The study should then be finalized by creation of a formal geohazard inventory, identifying specific hazards and their locations.

Qualitative assessment of the criticality of these hazards shall be used to develop final recommendations for field layout and future surveys. In order to perform the study field layout any available geophysical and geotechnical data and survey reports performed in the area are required to the Client (i.e., geological report, seismic report, etc.).

Results of the study shall be provided in a concise report, including charts of potentially hazardous features and proposed design parameters for FEED design execution.

Furthermore, if is judged as necessary, ENGINEER shall provide technical specification for detailed geophysical and geotechnical investigations for execution during the Detailed Engineering phase of the project (see specialist studies below).

5.1.4 Met-Ocean Conditions

Engineer shall review Met-ocean conditions taken into consideration in Feasibily study and provide any other data required for the execution of FEED.

The CLIENT highlights that a wave study has already been performed (details are presented on Chapter 5.8.2). It will be in ENGINEER scope of work to update the wave study (if necessary) and/or provide additional information.

5.2 FEED DESIGN

The FEED Package shall be developed according to the following steps:

- Basis of Design;
- Design Philosophies;
- Engineering Design and Special Studies.

5.2.1 Project Plans

Project management and quality plans to be developed are described at Paragraph 4.

In addition, an HSE Plan shall be developed during the Tendering phase and re-issued at the beginning of the Project. The HSE Plans shall contain:

- ENGINEER HSE Policy;
- ENGINEER HSE Team for the Project;
- List of activities and relevant schedule;
- Method statements.

5.2.2 Basis of Design (BoD)

The purpose of the BoD is to record all input information, design philosophies, feedstock and product specification, overall plant operating conditions during the loading of the small scale LNG carriers. The BoD will be developed based on preliminary information included in the Feasibility Study that shall be verified and upgraded (where necessary), based on:

- latest updates of the European Directives, Norms, Codes and relevant standards, current at the time of the award of the FEED engineering;
- CLIENT requirements, based on experience at the Revithoussa LNG Terminal. This will include document and equipment numbering and specifications (where not limited by confidentiality agreement). It will be in the ENGINEER's responsibility to review and verify the data received from the CLIENT at the start of the FEED design;
- relevant codes, standards and specifications currently adopted at national and international level. The list will be compiled from existing CLIENT specifications and standards, ENGINEER's standards and specifications, International and National Codes and standards, European norms and standards, and any codes, standards and specifications required by the Regulatory Authorities. First priority is the European Standards ENs and in case they do not cover a particular matter, then the International Standards ISO and after them are the Internationally Recognized Standards such as API or ANSI/AMSE.

The BoD's will be subject to CLIENTs review and approval and will be the basis of the FEED design.

The BoD will cover the following:

- General information:
  - project overview,
  - definitions,
  - abbreviations,
  - design life,
  - units of measurement,
  - design codes and standard,
  - list of specification and standards;
- General site data:
  - project location,
  - site and plot plan,
  - meteorological data,
  - seismic data;
- LNG composition (Min., Typical, Max.) and main characteristics;
- battery limit conditions;
- utilities and other systems:
  - availability of utilities (nitrogen, instrument air, plant air, cooling water, etc.) and relevant operating and design conditions,
  - Power supply;

- General design philosophies;
- other issues:
  - QA/QC philosophies,
  - coding – tagging philosophies,
  - project issues,
  - safety issues,
  - environmental issues.

It will be ENGINEER responsibility to collect data and ensure its correctness and consistency; CLIENT will provide support and will be responsible for providing all the data available relevant to the existing sections of the Plant.

5.2.3 Design Philosophies

Philosophies shall be developed to provide guidelines for carrying out the design of the Project. Philosophies developed shall comply with CLIENT ones. As a minimum the ENGINEER shall develop philosophies related to the following:

- Process design;
- Electrical Design;
- Piping and Layout Design;
- Instrumentation, Control and ESD;
- Loss Prevention;
- Ballast water management.

Each philosophy developed shall provide:

- Scope and applicability of the philosophy;
- Design intent;
- Approach description;
- Applicable laws, codes and standards.

5.2.4 Process Design

The process modification shall be designed to allow the Terminal to perform the following additional operating case:

Case	LNG Reloading	Regasification	LNG Receiving
New Case	Nominal Capacity	Nominal Capacity	Nominal Capacity

ENGINEER shall assess the different conditions considering the possible compositions of the LNG stored / received.

Process simulations using commercial software (e.g. UNISIM, HYSIS, etc.) shall be developed for the different operating conditions. Special care shall be put in the assessment of the interfaces between modifications, existing LNG Tanks, incoming mini-LNG Carriers.

The ENGINEER shall, as a minimum, develop/update the following documentation:

- Reports and Studies:
  - Heat and Material Balance,
  - Process Description,
  - Boil Off Management Study;
- Diagrams and Lists:
  - Process Flow Diagrams,
  - Fluid List,
  - Chemical List,
  - Utility Flow Diagram,
  - Piping and Instrumentation Diagrams,
  - Cause and Effects Matrix;
  - Utility Consumption Table;
  - Equipment List;
  - Line List;
  - Emission Summary Table
- Data sheet and Specifications:
  - Process Equipment Data Sheet and Specification;
  - PSV Data Sheet;
  - Control Valves Data Sheet,
  - ESD Valves Data Sheet

Process design shall consider the possibility of executing the construction activities minimizing the impact on the production.

5.2.5 Layout Design

The new equipment and infrastructures part of the Project shall be included in the existing layout optimizing the surface consumption and making piping connections as short as possible.

- Layout of new facilities shall be designed in order to ensure:
- Sufficient room for inspecting the equipment from any direction;
- Sufficient room for performing maintenance including removal of part of the equipment;
- Potential sources of ignitions (electrical motors, substations, air coolers, etc.) shall be put as far as possible from potential sources of release of flammable fluids and, as feasible, in the opposite direction with respect of the prevailing wind;
- Distances between different equipment (both existing and news) shall comply with Greek legislation and shall take into account outcomes of the safety studies.

ENGINEER shall develop or update:

- A general layout of the plant;
- Detailed drawings of the areas of modification;

- Demolition drawings;
- Equipment arrangement drawings;
- 3D model for the new infrastructures;
- Etc..

ENGINEER shall be responsible to collect all information relevant to the area and to integrate them with the actual provided by CLIENT.

A site visit and survey will be performed after the kick off meeting; additional survey shall be communicated in advance to CLIENT. Drawings provided by CLIENT will be in the available format; it will be ENGINEER responsibility to transpose them into modern AutoCAD / Microstation format as necessary.

According to Feasibility Study, ENGINEER will define the geometry, minimum size and position of:

- berthing system , comprehensive of breasting dolphin, jetty and mooring dolphins;
- unloading platform;

as well as the distribution of the mooring equipment such as to ensure the operability of the new berthing structure and loading system for different sizes and types of vessels defined in Feasibility Study.

5.2.6 Piping Design

Piping design shall be developed applying CLIENT existing piping specification. Where necessary, new piping specifications shall be developed based on EN or ASME code. As a minimum ENGINEER shall provide:

- Material selection
- Piping routing drawings;
- Piping demolition drawings;
- Piping arrangement drawings;
- List of supports;
- Tie-in List
- Calculation reports including stress analysis (as necessary).

5.2.7 Metallurgy, Painting and Insulation

Material selection as well as insulation and painting shall be defined by ENGINEER on the basis of CLIENT specifications integrated, as needed.

5.2.8 Electrical, Surge/Lighting and Cathodic Protection/Design

The electrical supply for the new equipment and facilities part of the present scope of work shall be provided from the existing infrastructures in Revithoussa LNG Terminal.

It will be ENGINEER responsibility to investigate available spare room in existing sub-station(s) for feeding the new equipment; CLIENT will provide its support granting the access to the substation(s) and providing CLIENT standards.

The design of the new sections of the electrical distribution systems shall be consistent with the existing one but updated to Greek legislation and norms presently in force.

Lighting system for new jetty shall be developed to allow night operation for berthing and sailing away.

The modifications shall be designed in order to minimize the disruption to the normal operation of the Terminal.

5.2.9 I&C Design

New instrumentation and controlling cables shall be designed according to CLIENT standards and Greek/EN norms.

The existing DCS/ESD system shall be updated to monitor and control new facilities. It will be ENGINEER responsibility to verify spare capabilities and I/O in the existing DCS and/or adequate them as needed.

Ship to Shore communications shall be provided including monitoring and ESD functions.

Dedicate graphic page for monitoring reloading operations shall be provided on DCS; such page shall be visible both from control room and local control room for reloading operation monitoring to be provided at the new quay.

ENGINEER shall integrate the existing emergency shutdown and fire and gas monitoring systems with the new functions necessary for safe operation of the reloading facilities.

5.2.10 Civil Design

Civil design will include FEED of:

- berthing system , comprehensive of breasting dolphin, jetty and mooring dolphins;
- unloading platform;
- pile system.

Berthing system will be sized according to berthing loads, which shall be calculated for all considered design ships presented in the Feasibility Study and on the basis of the average curve falling midway between Curves B&C of the European or, alternatively, commonly adopted international standard (i.e.: BS 6349 Part 4 Fig 1). Berthing loads will be determined based on the classical kinetic energy method of analyses by considering a variety of vessels, in fully and partially loaded conditions that may use berth at the Terminal.

The loading platform shall be designed for the combination of loads that will produce the highest forces for each component: all dead loads (D), live loads (L), environmental including wind, wave and currents loads (W), thermal effects from fixed equipment and from environmental actions and earthquake effects (E) applied to the structure. Loads will include but not be limited to: pipe supports, anchors and thrust blocks; process vessels; control equipment; loading arms; quick release hooks; vessel access structures and berth control system.

Detailed calculation of the berthing structures shall be performed using adequate Finite Element (FE) software (i.e. SACS, SAP or similar) capable to take into account environmental loads including Met-ocean loads and seismic loads, operating loads and dynamic load due to the mooring/anchoring system.

Different FE model shall be developed respectively for mooring and breasting dolphins rather than loading platform to take into account the different load cases acting on the structures (mooring or operating loads).

The FE model shall include foundation piles and concrete platform. Marine growth shall be considered for design of structures as being additive to the exposed pile areas subject to wave and current.

Design shall be carried out in order to guarantee the following design life:

- Civil engineering structures: 30 years
- Coating systems (to first maintenance): 10 years
- Impressed current cathodic protection systems: 30 years
- Wearable items such as fenders, attachments: 8 years

Pile design will include definition of size and depth considering the input data reporting in geological report and verification shall be performed according to European and International Standard.

5.3 COST ESTIMATE AND TIME SCHEDULE

5.3.1 Project Schedule

A level 1 schedule (according to AACE International Recommended Practice No. 37R-06) shall be produced as a summary program for the works and presented in bar chart format. The schedule shall be based on a work breakdown structure that shall be consistent with the FEED design elements of the works and reflecting the execution methods and logic to be adopted during the EPC schedule.

The schedule shall be of a sufficient detail to illustrate how the EPC work will be accomplished, and will identify both major key dates and milestones and interfaces to demonstrate the critical and high-risk areas of the work.

5.3.2 Cost Estimate

ENGINEER shall prepare a Total Installed Cost Estimate having an accuracy of ±15% to 20% based on the FEED design and documentation (Class 3 as per AACE International Recommended Practice No. 18R-97). The estimate shall be based on the EPC execution schedule to be developed in the FEED phase and described further in this section. The level of detail of the cost estimate will be consistent with the required accuracy for a Class 3 cost estimate and will thus be based on sized equipment list, prices for major equipment items and subcontracts, third party quotes and key quantity material take-offs for bulk commodities.

Furthermore ENGINEER shall proceed separately with the cost estimate of the SIL Assessment study and SIL verification of the existing SIS (Safety Instrumented Systems).

5.4 SPECIALIST STUDIES

5.4.1 Mooring Study

The analysis shall be performed using a validated time domain computer program used in the analysis of dynamic ship behavior under the influence of the worst combination of

operational environmental loads, including winds, currents and waves, while the ship is at berth, restrained by fenders and mooring lines (i.e. Orcaflex, OPTIMOOR or equivalent). Winds will be applied from directions determined on the base of the met-ocean studies. Tidal variations shall be considered in the mooring analysis. Orientation of the lines and orthogonal force components as time-motion dependent factors shall be determined through the dynamic analysis.

Sketch drawings of all design vessels (1.000-20.000 m3 LNG) shall be prepared showing each vessel at the berth portside-to and starboard-side-to, to demonstrate that the layout of the berth complies with OCIMF requirements. The results of this study may also highlight any vessels which might warrant individual consideration in addition to the preliminary ones. The mooring analysis shall consider the selected design vessels berthed portside-to and given the probability of starboard berthing, select starboard-side-to berthing conditions will be analyzed based on results of portside berthing.

The mooring dolphins shall be designed to resist any reasonable combination of mooring line loads from any design vessel included in the range of vessels as per the Feasibility Study.

Mooring shall be generally made by breast and spring lines only and the OCIMF recommendations relating to mooring line angles shall be followed for the majority of vessels. The use of head and stern lines should only be considered in exceptional circumstances for smaller ships, where the efficient location of mooring structures for the majority of vessels makes it unavoidable.

Calculations shall be prepared to demonstrate that mooring forces have been evaluated for the full range of vessels likely to moor at the terminal.

Line overload conditions and the related redistribution of mooring line loads must be met with a port protocol that describes appropriate measures to be taken to restore berth via redistribution of lines, the supplement use of tugs and/or the need to vacate berth, as situations warrant.

The mooring analysis shall include simulations of a single line being released under upset condition, if requested.

5.4.2 Traffic Study

Traffic Impact Study: Detailed traffic analysis in and around the project areas with special reference to the quantification of traffic flows, baseline air quality data and noise levels at selected points and identification of development planning likely to generate excess traffic. Based on the expected number of vessel arrivals, the generated traffic flow, mainly supply trucks and garbage collection trucks, will be estimated.

5.4.3 Benthic Study

Benthic Study: a detailed analysis of the benthic communities' structure will be executed. The analysis of the abundance and biomass of the species, and the diversity indices, will be executed with the help of specific statistical techniques.

5.4.4 SOW and Technical Specifications for Detailed Geophysical and Geotechnical Survey

Technical specifications for the execution of detailed geophysical and geotechnical surveys shall be developed based on the provided project layout and review of existing data which

will be provided by Client. All available information and data shall be combined and integrated in order to define the scope of work for the surveys.

In particular, the investigations to be carried out shall provide the following information:

- Presence of existing underground services/foundation;
- Identify and characterize all possible geohazard;
- Determine soil profile and present variability within the Project area;
- Determine geotechnical parameters for design;
- Determine groundwater levels;
- Determine groundwater regime and permeability;
- Determine the dynamic properties of foundation soils;
- Determine chemical characteristics of soils and groundwater to evaluate aggressiveness on buried structures and possible special requirements for handling and disposal of excavated material;
- Present potential contamination of soils and groundwater;
- Determine electrical resistivity of foundation soils at the site, for the design of earthing and as an additional measure of aggressiveness on buried structures;
- Determine thermal conductivity of foundation soils at the site, for the design of buried electrical cables (if relevant).

The field work for the nearshore geophysical survey shall include, as minimum:

- Acquisition of accurate bathymetric data and development of a Digital Terrain Model (DTM);
- Acquisition of geomorphological data to identify evidence of any geohazard;
- Identification/confirmation of the presence of manmade structures/obstacles at the structure locations (including UXO);
- Acquisition of seismic data to gather information on the shallow stratigraphy and develop isopach maps.

The field work for the onshore geophysical survey shall include, as a minimum:

- Seismic refraction survey: acquisition of P and S wave velocity;
- Electrical resistivity survey.

The field work for the nearshore and onshore geotechnical survey shall include, as a minimum:

- Sampling and in-situ testing (e.g. CPT and/or SPT) at the planned jetty locations;;
- Sampling and in-situ testing (e.g. CPT and/or SPT) at the planned LNG structures and facilities;
- Standpipe piezometer. Installation where excavations are expected.

A comprehensive laboratory testing program shall be prepared in order to provide all the required information. Both onshore and nearshore geotechnical investigation shall comply with ASTM or BSI standards.

Results of the geophysical and geotechnical surveys shall be provided in separate reports. At the end of each survey (e.g. geophysical nearshore, geophysical onshore, geotechnical nearshore, geotechnical onshore) a Field Report shall be provided including a log of all activities performed at site and data recovered in field. A Final Geophysical Report shall be provided for each survey including all processed and interpreted data. A Final Geotechnical Report shall be provided for each survey including both in-situ and lab tests results.

5.5 AUTHORITY APPROVALS AND PERMITS

CLIENT is responsible for obtaining all required Approvals and Permits for the execution of the project. During the ESIA stage, the CLIENT shall complete the contacts with all Authorities involved, aiming to the acceptance verification and validation of the proposed project.

The ENGINEER shall determine and advise the requirements for all the Regulatory Approvals and the documents which shall provide to CLIENT for obtaining these approvals. The CLIENT will supervise the work. Any revision of these documents required by the Authorities is within ENGINEER scope of work. Drawings should be in AUTOCAD and PDF form.

5.6 SAFETY ASPECTS AND SAFETY STUDIES

5.6.1 Safety Study

ENGINEER will be responsible to develop (in both English and Greek languages) the Safety Study for the new facilities part of Project Scope of Work. The Safety Study shall be in compliance with the requirements of the Joint Ministerial Decision JMD 172058 (OGJ 354/B/17-2-2016) which harmonizes the Greek Legislation with the European Directive Seveso III.

Liaising with Authorities responsibility will rest in CLIENT's hands.

5.6.2 HAZID Study

A HAZID is a multidisciplinary review process used to identify potential health, safety and at early stage of the project ENGINEER shall be responsible for conducting a HAZID review study to assess generic risks related to the Project when details are not available yet. The HAZID Workshop will be led by a "HAZID Chairman", who shall be technically skilled, familiar with the process and objectives of HAZID and able to guide the team through the HAZID process. The Chairman will explain the HAZID process to be followed before the HAZID session starts.

ENGINEER shall provide the HAZID Chairman and Secretary that shall be approved by CLIENT in advance.

HAZID shall be executed at ENGINEER premises; CLIENT shall be invited to participate.

ENGINEER shall be responsible for HAZID follow up.

5.6.3 HAZOP Study

ENGINEER shall conduct the HAZOP review study for all the modification / new sections of the Project. ENGINEER shall provide the HAZOP Chairman and Secretary that shall be

approved by CLIENT in advance. A HAZOP Term of Reference shall be issued in advance for approval.

HAZOP shall be executed at ENGINEER premises; CLIENT shall be invited to participate.

ENGINEER shall be responsible for HAZOP follow up and recommendation implementation.

5.6.4 SIL Study

ENGINEER shall develop a SIL Allocation study for all the new/modified safety instrumented functions part of Project Scope of Work. SIL allocation shall be conducted applying LOPA technique as per IEC 61508/61511.

Furthermore a SIL Verification study shall be conducted to demonstrate to CLIENT that proposed SIF configurations meet required SIL Level values.

The following reports shall be issued:

- SIL Allocation Report;
- SIL Verification Report

5.6.5 Health and Safety Studies

ENGINEER shall develop all the HSE studies necessary for the safe design of the new facilities and their integration with the existing.

In particular ENGINEER shall provide updated escape ways layouts implemented with the new layouts and the new personnel presence distribution. Escape ways shall meet CLIENT's standards and Greek legislation.

Safety signs and safety equipment layout shall be developed and integrated with the existing ones.

Extension of hazardous areas shall be revised to include new facilities and new operations and provide guidelines for the purchase of the new equipment. In addition to the updated hazardous areas drawings, a hazardous areas report shall be issues providing not only details on calculations performed but also highlighting cases in which new hazardous areas involve existing equipment previously in safe area. Extension of hazardous areas shall be developed according to EN60079-10.

5.6.6 Fire Safety Studies

Fire studies developed by ENGINEER shall cover the following aspects:

- Upgrade of active fire protection system to cover the new areas;
- Requirements for passive fire protection of new facilities;
- Upgrade of fire and gas detection system to cover the new areas/equipment.

As a matter of fact, ENGINEER shall evaluate the firewater requirements for the new areas as well as any need for improvement for existing areas modified by the Project. Active fire protection shall be designed according to CLIENT's specification as applicable. ENGINEER shall issue:

- FF calculation report;
- FF layout;

- Active fire protection P&IDs.

In case available source of firewater will not be sufficient to cover the new necessities, ENGINEER shall be responsible to provide technical solutions to be discussed and agreed with CLIENT.

Separate active fire protection of the new berth shall be considered to protect the area including also the presence of the mini LNG Carrier.

Passive fire protection for new equipment part of the scope of work shall be designed according to CLIENT standards and API2218. Duration of fire protection shall take into consideration the outcome of the other safety studies but shall not be less than 60 minutes.

5.7 ENVIRONMENTAL ASSESSMENT (ESIA)

Based on FEED design, safety studies and the specialist studies (Bathymetric surveys, Wave, Navigational assessment, benthic, etc.), an "Environmental and Social Impact Assessment (ESIA)" shall be prepared. Indicatively, ENGINEER should take into consideration the following Legal and International Framework, as a minimum:

- National Legislation as:
  - Article 2, par. 2 of Environmental Law 4014/2011 relating "Environmental licensing of projects" (G.G. 209/A/21-09-2011),
  - Ministerial Decision 1958/2012 (G.G. 209/A/2011) on "Categorization of public and private projects" as modified by Ministerial Decision 37674/2016 (G.G. 2471/B'/10-08-2016) "Modification and Coding of categorization of public and private projects",
  - Law 1650/1986 (GG 160A/16-10-1986) "To protect the environment and it's amendment",
  - Ministerial Decision 170225/2014 (G.G.135/B/27-01-2014) "Specialization of contents of environmental licensing files of A' Category Projects",
  - Law 4042/2012 on Environment Protection- Compliance with Directive 2008/99 / EC - Framework for Waste management and generation,
  - Provisions of Presidential Decree 148/2009, «Environmental responsibilities prevention and reinstatement» etc.,
  - Law 3937/2011 on "Biodiversity Conservation",
  - Law 1269/ 1982 (G.G. 89/A/21-07-1982) as amended and in force for Prevention of Pollution from Ships, (MARPOL 73/78) -Ratification of the International Convention for the Prevention of Pollution from Ships and amendments,
  - Joint Ministerial Decision 8111.1/41/2009 (G.G. 412/ B/ 2009) "Measures and conditions for port reception facilities of waste generated on ships and cargo residues-Compliance with the provisions of 2007/71/EC Directive" taking also into consideration the permanent Circular with numb. 8136.16/01/16-2014 "Port Facilities of Waste Receipt and Cargo residue",
  - Council Ministerial Decision No. 1649/45/2014, "On particularization of permitting processes and public participation in public hearings and consultations during environmental permitting",
  - Joint Ministerial Decision No. 9269/470/2007 "Remedies public against acts or omissions of the Administration on information and participation issues when

approving environmental terms, in accordance with Articles 4 and 5 of Law 1650/86, as replaced by Articles 2 and 3 of Law. 3010/02 (1391 / B) and in compliance with the provisions of Articles 3 (para. 7) and 4 (para. 4) of Directive 2003/35/EC on public participation in drawing up certain plans and programs relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337 / EEC and 96/61/EEC";

- European Legislation as:
  - Directive 2014/94/EE on "Clean power for Transport",
  - Directive 2012/33/EU, which foresees that as of 2020, ship operators that trade in European territorial seas and exclusive economic zones will be required to burn fuel with less than 0.5% of sulphur content,
  - EIA Directive 2011/92/EU and its amendment Directive 2014/52/EU-Environmental Impact Assessment Directive and its amendment Directive 2014/52/EU-Environmental Impact Assessment Directive. The EIA Directive of 1985 has been amended three times:
    - Directive 97/11/EC brought the Directive in line with the UN ECE Espoo Convention on EIA in a Trans-boundary Context. The 1997 Directive widened the scope of the EIA Directive by increasing the types of projects covered and the number of projects requiring mandatory environmental impact assessment (Annex I). It also provided for new screening arrangements, including new screening criteria (included in Annex III) for Annex II projects, and established minimum information requirements,
    - Directive 2003/35/EC sought to align the provisions on public participation with the Aarhus Convention on public participation in decision making and access to justice in environmental matters,
    - Directive 2009/31/EC amended Annexes I and II of the EIA Directive, adding projects related to the transport, capture and storage of carbon dioxide (CO2),
  - Directive 2008/99 / EC - Framework for Waste Management and Generation,
  - Directive 2007/71/EK for the modification of Annex II of European Directive 2000/59/EK relating the port reception facilities of waste generated on ships and cargo residues,
  - Directive (WFD) 2000/60/EU on Water framework,
  - Directive (MSFD) 2008/56/EC on Marine strategy framework,
  - Directive 2008/98/EC on Waste and repealing certain Directives (Waste Framework Directive),
  - Directive on the control of major-hazards involving dangerous substances (SEVESO III),
  - PED, ATTEX Directives,
  - Directive 2004/35/EU on Environnemental Liability;
- International Regulations as requirements of Annex VI of the IMOMARPOL Convention, SOLAS etc.;
- Standards and Guidelines as OCIMF, SIGTTO, NFPA etc..

According to Ministerial Decision 1958/2012 (G.G. 209/A/2011) as amended by the Ministerial Decision 37674/2016 (GG. 2471/B'/10-08-2016), the necessary facilities and

installations on LNG Terminal, due to Poseidon Med II Project are categorized as **A_1 Category** "Service of LNG Carriers with L>150m", **Group 2**: Port of industrial service facilities (industrial service facilities, fuel handling, petrochemical or chemical products, movement of toxic and dangerous cargoes, etc.)/ **s/n** 3 "Port Facilities".

The current ESIA will be submitted to the Department of Environmental Licensing / Ministry of Environment and Energy.

5.7.1 Contents of the ESIA

Taking into consideration the significance and type of the project, the contents of the Environmental and Social Impact Assessment (ESIA) will be in accordance with the requirements of Annex II - Basic Specifications of Environmental and Social Impact Assessment (ESIA) of projects of A' category as well as **Annex 4.3 / Group 2** "Port Facilities" of M.D. 170225/2014 (GG 135/B/2014). The contents are listed below.

1 INTRODUCTION

2 NON TECHNICAL SUMMARY

3 SHORT DESCRIPTION OF THE PROJECT

4 AIM AND PURPOSE OF IMPLEMENTATION OF THE PROJECT-BROADER CORRELATIONS

5 COMPLIANCE OF THE PROJECT WITH REGIONAL AND URBAN SPATIAL PLANNING CONSTRAINTS

6 PROJECT DETAILED DESCRIPTION

7 ALTERNATIVE SOLUTIONS

8 CURRENT STATE OF THE ENVIRONMENT

9 ASSESSMENT AND EVALUATION OF THE ENVIRONMENTAL IMPACTS

10 IDENTIFICATION OF ENVIRONMENTAL ISSUES

11 ENVIROMENTAL MANAGEMENT AND MONITORING PROGRAM

12 CODIFICATION OF RESULTS AND RECOMMENDATIONS FOR THE APPROVAL OF ENVIRONMENTAL TERMS

13 ADDITIONAL INFORMATION

14 PHOTOGRAPHIC DOCUMENTATION

13 MAPS AND DRAWINGS

14 ANNEXES

15 ENGINEER SIGNATURES

It will be in ENGINEER's scope of work, in case of changes in regulations in force, to update the ESIA accordingly during project development. Environmental and Social Impact Assessment (ESIA) should include at least the following.

5.7.1.1 Non-Technical Summary of the Project

The Non-Technical Summary of the project will include main information on the project's background, analysis of environmental and territorial constraints, environmental baseline,

project description, analysis of the alternatives, impact evaluation and analysis of mitigation measures, as well as aspects related to consultation.

5.7.1.2 Introduction

Introduction will include contact details of the CLIENT, type and size of the development, aim of the project, legislative and regulatory framework, and structure of the ESIA study and analysis of the project.

5.7.1.3 Project Description

The project description shall be presented and structured according to existing legislation. It shall include, as a minimum, information about project definition, project overview (i.e.: scope of the project, design philosophies and applicable codes and standards, general project components, project schedule, natural gas data, system throughput). Project description will include a preliminary analysis of the existing LNG plant, including main changes related to 2nd upgrading of the re-gasification capacity, port facilities, installation of the 3rd tank and Truck Loading Station.

Description of main interventions for mini LNG supply from Revithoussa will be presented, including maximum and minimum size of the carriers and effects on overall LNG plant operability.

Analysis of the interactions with the environment during LNG plant operation will be clearly presented, with reference to:

- Noise and air environment;
- waste production and management;
- physical presence of new infrastructure;
- power consumption.

Construction phase will be included, highlighting:

- main interventions to be implemented;
- use of workforce and machineries;
- interferences with the existing;
- temporary construction facilities (location included);
- overall construction phase (as well as commissioning and start up) schedule;
- main interactions with the environment (wastes, noise, emissions to atmosphere, soil and water consumption).

A comparison with BREF/BAT provisions (if any) will be included with major information for specifications preventing incidents and major accidents.

5.7.1.4 Assessment of the Alternatives

The ESIA shall include an analysis of the alternatives. The analysis shall be based on the position, size and the technology as well as the main findings of Feasibility Study. The analysis shall also include the different technical alternatives related to LNG maritime infrastructure layout (orientation parallel or perpendicular to the coastline), transfer system, their functional characteristics etc.

Assessment of the alternatives shall also include the no-project scenario, in terms of reduction in overall Terminal capabilities (no possibility of reloading). Engineer should also quote an Extended Survey of the Safety Study.

5.7.1.5 Environmental and Social Baseline

The environmental and social baseline shall be focused on the definition of current main features of Revithoussa Isle, with a focus on the area where the new interventions will be located.

Baseline will be developed according to information provided from international database, data and information provided by the CLIENT and results of special studies (Bathymetric and Surveys, Wave, Navigational Assessment, etc.).

As a new infrastructure shall be installed and according to its location (in an area currently not affected by LNG plant operation), environmental baseline shall be mainly focused on the following:

- met-ocean;
- oceanography and maritime conditions;
- sea water quality;
- geology, seismicity and topography;
- marine biota;
- onshore natural environment, biota and vegetation;
- presence of/proximity to natural protected areas;
- bathymetry of the area.

Environmental baseline will also be carried out with reference to:

- topography;
- geology and seismicity;
- soils;
- hydrogeology and hydrology;
- meteorological conditions;
- onshore natural environment, biota and vegetation;
- presence of/proximity to natural protected areas (Natura 2000);
- landscape;
- existing pressures on the ecological environment (Land Use, emissions, noise, etc.).

Social baseline will include the following (as a minimum):

- demographics;
- regional development/social data;
- health;
- economic development/economic activities (agriculture, secondary and tertiary section);
- human maritime activities identification (navigation routes, fishing);

- productive activities;
- land use in the area;
- cultural heritage (archaeological sites and constraints identification);
- existing and scheduled infrastructure.

ENGINEER should also describe the interaction of the above elements.

5.7.1.6 Impact Assessment and Mitigation Measures

Impact assessment Chapters will include the analysis of main effects on social topics and environment due to project development, both during the construction phase and operation phase. The Chapter will first include the methodology developed for evaluation and assessment of impacts on main components.

Impact assessment during the construction phase shall be focused on:

- Noise;
- Solid and liquid waste;
- Impact on air quality;
- Impact on water and soil;
- Sea water and soil quality;
- Marine biota;
- Social;
- Landscape;
- Aesthetic impact;
- Safety – human health.

Impact assessment during the operation phase shall be focused on:

- variations to local met-ocean conditions (due to presence of the new maritime infrastructure);
- Impact on water and soil;
- Sea water quality;
- Marine biota;
- Air quality/odors;
- Noise (from transport and disposal);
- Landscape;
- Existing infrastructure;
- Marine traffic;
- Social;
- Safety – human health.

Impacts related to:

- cumulative factors;

- decommissioning,

shall be assessed as well.

Special emphasis will be given to the assessment of Noise impact as well as Impacts on Air Quality.

List above represents a minimum requirement and the ENGINEER shall make his own proposal based on existing legislation to evaluate all impacts associated to project development (also according to requests coming from the Authorities and other stakeholders). Detailed description of the measures envisaged to prevent, reduce, recover and offset any significant adverse impacts on the environment taking also into account Non Routine Events and issues referring to the decommissioning of the Project's installations.

5.7.1.7 Public Consultation Procedure and Stakeholder Identification and Short Mapping

The ENGINEER shall describe public consultation. Regarding the project a list of stakeholder potentially affected by the initiative shall be presented, as well as estimated duration of the permitting path, the following documentation due to Stakeholder Identification and Short Mapping is recommended:

- Definition of Stakeholder Engagement;
- Stakeholder Engagement Framework (National and EU legislation – international obligations);
- Financial Requirements;
- Phases of Stakeholder Engagement;
- SEP Development;
- Outcomes of the Stakeholder Engagement.

The Final ESIA will be accompanied by maps, drawings, spreadsheets, etc. as well as photographic material, authority approvals.

5.7.1.8 Environmental Monitoring Programme

An Environmental monitoring program will be proposed to be implemented in order to ensure the effective protection of the environment and the implementation of the proposed measures, which will include the proposed monitoring program.

5.7.1.9 Annexes

The ESIA will include the following Annexes:

- Communication with Authorities;
- Copy of the most recent Decision of Environmental Terms for the existing installations of the Revithoussa Island;
- Waste Collection and Management Plan: It is noted that in the context of the preparation of the Final E. S.I.A a Waste Collection and Management Plan for ships and cargo residues (petroleum and cargo residues, used lubricating oils, and wastes) will be prepared, that will meet the requirements of relevant law;

- Air pollution study: air pollution impacts will be estimated by using the adequate software for air emissions and dust assessment and the necessary input (traffic data, emissions by equipment etc.) both for the construction and the operation phase of the project. The acquired data will be used as an input to the air pollution impact study;
- Noise impacts Study: for assessing the noise impacts (both for construction and operation phase), the IMMI software will be used, which produces noise maps and has special modules for assessment of industrial noise (ISO 9613) and traffic noise (CRTN);
- Traffic Impact Study: Detailed traffic analysis in and around the project areas with special reference to the quantification of traffic flows, baseline air quality data and noise levels at selected points and identification of development planning likely to generate excess traffic. Based on the expected number of vessel arrivals, the generated traffic flow, mainly supply trucks and garbage collection trucks, will be estimated;
- Benthic Study: Based on the suggested additional port infrastructure at each area, a detailed analysis of the benthic communities' structure will be executed. The analysis of the abundance and biomass of the species, and the diversity indices, will be executed with the help of specific statistical techniques;
- Wave and Current Study or Met-ocean Study: the scope of the study is to evaluate the wave disturbance resulting from storm occurrences at the proposed area of the project. It is also important to assess the impacts from currents in the area. A met-ocean study is required in order to characterize the project site and allow the assessment of the met-ocean design parameters. Wind and wave hind cast time series nearby the study area shall be gathered and compared/validated with available measured data. If needed numerical modeling activity should be performed in order to propagate offshore waves to the nearshore site. Obtained data shall be analyzed and processed in order to derive the typical and extreme met-ocean conditions for the design of all nearshore facilities (i.e. Jetty) and the mooring analysis. The methodology applied shall be fully compliant with the main International Rules (DNV, RINA, API), summarized as follows:
  - assessment of wind typical conditions and extreme values omnidirectional and directional values) from statistical analysis of offshore wind data. Wind shall be provided for typical averaged durations (i.e. 1 hour, 10 min, 1 min and 3 s),
  - wave numerical modeling to simulate wave propagation at the study area using state-of-art numerical models,
  - assessment of wave typical conditions at the project facilities locations. Significant wave height (Hs) vs wave directions scatter diagrams, relationships Hs-Tp (peak period) and Hs-Tz (mean period), typical Hs-Hmax relationship, etc.,
  - assessment of wave extreme values (omnidirectional and directional values) at the project facilities locations (return period to be selecting according to the main International Rules),
  - hydrodynamic numerical modeling to simulate currents and water levels at the study area,
  - estimate of extreme currents omnidirectional and directional values) and water levels at project facilities locations.

The following met-ocean parameters shall also be provided:

- Meteorological parameters (air temperature, pressure and humidity, etc.);

- Sea water parameters (water density, salinity, temperature).

5.7.1.10 Photographic Documentation

ENGINEER shall include in the ESIA a Photographic documentation of the area of the proposed installations, LNG Terminal, proposed feeder's, sea bottom etc.

5.7.1.11 Maps and Drawings

The following shall be prepared:

- all relevant maps (general map, geology map, soil map, nautical map, hydrology map, bathymetry map, land uses, protected areas);
- all relevant drawings (general overview, layouts, plot plans, side plans, views).

5.7.1.12 Environmental Management and Monitoring Plan

The principles of an EMMP shall be developed, so that during the construction and operation stages of the project, adequate environmental precaution measures will be successfully applied. Furthermore, the Environmental Management and Monitoring Plan (EMMP) has to describe the possible risks that arise from the project and the mitigation measures that are required. The EMMP shall be developed according to the provisions of Law 4014/2011(GG 209/A/21-09-2011) and further modifications and the Guidelines of Best Practice and of Financial Institutions shall be taken in mind as well.

5.7.2 Key Issues of ESIA

Engineer shall take into consideration the following Studies in order to proceed to proper assessment and propose the necessary mitigation measures for the construction and operation of project:

- Waste Collection and Management Plan;
- Air Pollution Study;
- Noise Pollution Study;
- Traffic Impact Study;
- Benthic Study;
- Current and Wave Study-Met-Ocean.

The ENGINEER will also include an Environmental and Social Management Plan which will include a list of a stakeholders involved and the Impacts affecting each individual stakeholder. ENGINEER will not proceed to any stakeholder engagement or meeting officially without Desfa's Consent.

ENGINEER will proceed to sample, analyze the levels of water pollution (heavy metals) of water column as well as sea sediments in the proposed area of the project, with the help of a diver. ENGINEER will also proceed to the description of a Composition and Morphology Bottom in the proposed area. Photographic documentation of sea bottom in the proposed installation area has to be added to ESIA and Annexes.

ENGINEER will fulfill any additional obligations and requirements of Annex 4.3 of M.D. 170225/2014 GG 135/B/2014. ENGINEER should also quote an Extended Survey of the Safety Study in the ESIA

In the case that changes will occur in the existing Waste Management Study of Revithoussa Island by the operation of the new infrastructure then ENGINEER shall proceed to the reviewing of the existing approved solid and liquid waste management Study of the Terminal.

An EMMP shall be developed, so that during the construction and operation stages of the project, adequate environmental precaution measures will be successfully applied. The EMMP shall be developed according to the provisions of Law 4014/2011 and further modifications and the Guidelines of Best Practice and of Financial Institutions shall be taken in mind as well.

5.7.3 Deliverables

ENGINEER shall submit the first issue ("for comments") of the ESIA to the CLIENT for its review and approval. Following receipt of comments from the CLIENT, ENGINEER shall issue the final ESIA with the elaboration of appropriate studies and EMMP as part of the final FEED package.

It will be CLIENT's responsibility to hand over the ESIA to the Authorities and to handle all the matters relevant to the official issuance of the necessary permit by the competent Authorities.

The ENGINEER shall assist the CLIENT whenever required with his presence at the various meetings with the Authorities, with the additional data that may be requested during the public consultation round and the validation of the ESIA.

All deliverables shall be issued in two languages (Greek and English). Three series in Greek (one original plus two copies) and one in English shall be issued. Additionally, there will be added one example of soft copy saved on a CD or DVD-ROM unit.

All files should be in native files (PDF, WORD and EXCEL).

Maps and Drawings should be in AUTOCAD and PDF form.

5.8 AVAILABLE STUDIES AND INFORMATION

5.8.1 Topographic Survey

CLIENT shall provide to the ENGINEER, a topographical survey including all topographical, engineering, manmade and surface details in the designated area of the LNG area. Details shall be presented on large-scale plans with appropriate symbols and full annotation.

All surface, sub-surface and overhead details shall be included together with a grid of levels suitable for the derivation of a digital terrain model (DTM) covering the whole area and contour the complete area of the site.

5.8.2 Wave Study

A wave study has been performed in order to characterize the project site and allow the assessment of the met-ocean design parameters. Numerical modeling has also been performed in order to propagate offshore waves to the nearshore site.

5.8.3 Manouvering / Navigation Study

A maneuvering study will be made available by CLIENT for the SSLNG area of Revithoussa Isle.

5.8.4 Bathymetric study

CLIENT shall provide to the ENGINEER, a bathymetric study for the SSLND area.

6 PROJECT DELIVERABLES

6.1 DELIVERABLE LIST

List of deliverables shall include as a minimum the ones in the following table.

Table 6.1: Deliverable List

Discipline	Deliverable
General	Design basis
	General report
	List of applicable code and standard
	Safety and coordination plan
	Bill of quantities
	Maintenance plan
	Project Plan
	Engineering Plan
	Project Organization Chart
	Coordination Procedure
	Project Time Schedule
	Engineering Document Register
	Monthly Progress Report
	Ballast Water Management Philosophy
Quality	Project Quality Manual
	Project Quality plan
	Project Quality procedures
Specialist Studies	Preliminary geohazard assessment report
	Geophisical report
	Seismic and geological report
	Moooring analysis report
Civil and Structural	Program and technical specification for geotechnical inspection
	Geotechnical section and stratigraphy
	General layout - as built
	General layout - final layout
	General layout - alignments
	General layout - section
	Met-ocean study
	General layout - mooring scheme
	General layout - mooring equipment layout
	Material specification
	Cathodic protection specification
	Mooring equipment specification
	Piles specification - material, fabrication and installation
	Paint specification
	Loading platform, trestle and walkway - structural design report
	Loading platform, trestle and walkway - plants and section, foundation piles and typical construction details
	Mooring dolphin - structural design report
	Mooring dolphin - plants and section, foundation piles and typical construction details
	Breasting dolphin - structural design report
	Breasting dolphin - plants and section, foundation piles and typical construction details
PROCESS	Process description
	PFD
	UFD
	Heat and Material Balances

Discipline	Deliverable
	Utility Balances
	Equipment List
	Fluid List
	Emission summary table
	Utility Consumption List
	PSV, ESD and Control Valves data sheets
	Chemicals List
	P&ID
	Equipment Data Sheet and technical specification
	BOG Management Report
	Line List
	Process design Philosophy
	Cause &Effect Matrix
ELECTRICAL AND I&C	Electrical design philosophy
	Electrical Load List
	General Single Line Diagram
	Electrical Load Flow Calculation Report
	Power Cable Sizing Report
	Grounding system Layout
	Lighting system Layout
	New Berth Lighting System layout
	Lightning Protection Study
	CCTV Specification
	Electrical Equipment and cw General Layout
	Hazardous Area Report
	I&C philosophy
	I&C Architectural System
	Hazardous Area Drawings
PIPING & LAYOUT	General layout
	Main areas layout
	Demolition drawings
	Main equipment arrangement drawings
	Piping routing drawings
	Piping demolition drawings
	Piping arrangement drawings
	List of supports
	Tie-in list
	Calculation report
	Piping & Layout design philosophy
	Material selection
SAFETY	HSE plan
	SIL allocation report
	SIL verification report
	Fire-Fighting (FF) Report
	FF P&ID
	FF Layout
	FF Detection System Layout
	FF Hydrants Location Layout
	Escape Way Layout
	HAZID study
	HAZOP study
	Safety equipment layout
	Main buildings FF Layout
	Loss Prevention Philosophy
	Safety Report
	Passive Fire Protection Report

Discipline	Deliverable
	Passive Fire protection Layout
	Fire & gas layout
	Fire & gas detectors specification
Environmental	ESIA Study

In addition to the Technical Deliverables presented above, the ENGINEEER shall develop the following Non-Technical Deliverables:

- Scope of Work for the EPC contract;
- EPC tender Technical Volume;
- EPC Execution Schedule;
- EPC Cost Estimate.

ENGINEER shall be also in charge of providing documents needed by the CLIENT following requirements of local Authorities.

6.2 PROJECT LANGUAGE

All deliverables shall be issued in English language, except the following studies that shall be bilingual (Greek and English):

- Safety Study;
- Health and Safety Study;
- Fire Safety Study;
- Environmental Impact Assessment Study;

The following studies:

- Safety Study;
- Health and Safety Study;
- Fire Safety Study,
- Environmental Impact Assessment Study

shall be signed by a suitably licensed member of the Technical Chambers of Greece.

6.3 CLIENT REVIEWS

All documents are subject to CLIENT's review and ENGINEER undertake the obligation to revise the documents according to CLIENT's comments / recommendations.

The Deliverables shall be issued by ENGINEER as follows:

- First issue for comments (maximum three (3) rounds of comments) of all deliverables (documents, data sheets, manuals, specifications, plans, drawings, etc.). CLIENT shall comment within 10 working days at the first round and within 5 working days at the subsequent rounds. Past these periods without any comment it will be assumed that CLIENT does not have any comment. Documents to be reviewed as well as comments shall be exchanged, between ENGINEER and CLIENT, through the application Es Project Remote used by CLIENT. CLIENT shall provide ENGINEER with the relevant software and the RSA device which is necessary for the remote access of DESFA's PMR data base. The minimum requirements are:

- Operating system: Windows XP or more recent,
- Operation platform: NET Framework 4.

- As soon as all deliverables are completed and all CLIENT'S comments and recommendations have been incorporated, wherever appropriate, ENGINEER shall issue the Final Issue of the Deliverables for CLIENT'S acceptance. This will be issued in three (3) hard copies (one original plus two copies) and one soft copy saved on a CD or DVD or USB stick unit. The CD or DVD or USB stick shall contain all the native files (MICROSOFT, EXCEL, WORD, AUTOCAD etc.) plus a full set of scanned documentation in PDF or in multipage TIFF G4 format 300 x 300 DPI resolution. It will also include all marked-up and commented documents which shall be retained for traceability of the design development, input to technical audit.

Doc. No. 16-156-H2
Rev. 0 – MARCH 2017

D'APPOLONIA
consulting, design, operation & maintenance engineering

DESFA
Revithoussa, Greece

Small Scale LNG Installations at the Revithoussa Terminal Main Interventions on Existing Quay at Southern Side of Revithoussa Isle

Scope of the Work for the FEED Design

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Scope of the Work for the FEED Design

Rev.	Description	Prepared by	Controlled by	Approved by	Date
0	First Issue	A. Bonaventura / A. Sola / D. Vannucci	P. Paci	A. Lo Nigro	March 2017

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1 PROJECT BACKGROUND

1.1 GENERAL

The Hellenic Gas Transmission System Operator (DESFA S.A., hereinafter the "CLIENT") develops and manages the existing LNG Terminal on the Revithoussa isle.

The DESFA LNG Terminal is located about 40 km West of Athens on the Island of Revithoussa in Megara Bay. It has been in operation since the year 2000 and it is featured to receive LNG carriers of up to 155,000 m^3.

The existing terminal consists of an import jetty (located on the southern side of the isle), storage system and re-gasification equipment and send-out facilities. The Terminal overall authorized storage capacity is of 225,000 m^3. Storage system is composed of No. 2 storage tanks of 65,000 m^3 each plus a third one (capacity of 95,000 m^3) which is currently is under construction.

Re-gasification Sustainable Maximum Send-out Rate (SMSR) will reach 1,400 Nm^3/h, while the peak send-out rate will reach 1,650 Nm^3/h with the expansion works currently in progress and expected to be completed early in 2018.

The Terminal serves as the entering point of LNG at Hellenic gas transmission system. At its facilities can be performed the process of:

- Unloading of LNG vessels;
- Storage of LNG;
- Recovery of boil off gas from storage tanks;
- Vaporization of LNG;
- Natural Gas export to the Hellenic gas transmission system.

According to recent changes in environmental naval regulations (MARPOL Annex VI) which will involve need to reduce pollutants emissions to atmosphere, thus favoring use of LNG as fuel for ship, DESFA is planning to implement changes to the LNG Terminal in order to allow LNG loading of small scale LNG carriers (storage capacity between 1,000 and 20,000 cm) from the Terminal.

The LNG loading will be carried out by installing a new maritime infrastructure on the North-Eastern coastline of the isle, which has been selected as the most preferable location according to technical, environmental and safety constraints and associated costs.

As expected schedule for implementing this new infrastructure will be of about 2 years, DESFA also intends to realize an interim solution on the southern side of the isle, in correspondence of the existing quay that currently hosts large LNG carriers.

The purpose of this document is to define the Scope of Work (SoW) for the preparation of the FEED Engineering Package (hereinafter FEP) for guaranteeing LNG supplying to mini LNG carriers from existing quay on the Southern side of Revithoussa isle (interim solution).

1.2 PROJECT BACKGROUND

In 2015 DESFA awarded to D'Appolonia the development of a "Technical Feasibility and Cost Estimate Study for the Development of Installations for Small Scale LNG in Greece" study (hereinafter: "Feasibility Study") focused on the site selection of the most suitable location to install a new maritime infrastructure on Revithoussa isle that could host small scale carriers with a capacity of 20,000 m^3 or less.

The Feasibility Study to allow LNG loading of small scale vessels was completed in December 2015.

A site selection process was carried out and defined as the most suitable location a coast sector located on the North-Eastern side of the isle.

As installation of the new maritime infrastructure will require an estimated duration of almost 2 years, in order to guarantee opportunity of small scale LNG carriers reloading during this timeframe, pre-feasibility analysis of utilizing the existing quay has been carried out.

LNG reloading at the existing quay on the southern side of Revithoussa shall be considered as "interim solution". Within the Feasibility Study, compliance of the existing mooring and transfer system at the quay were preliminarily investigated.

The proposed layout is shown in the following picture.

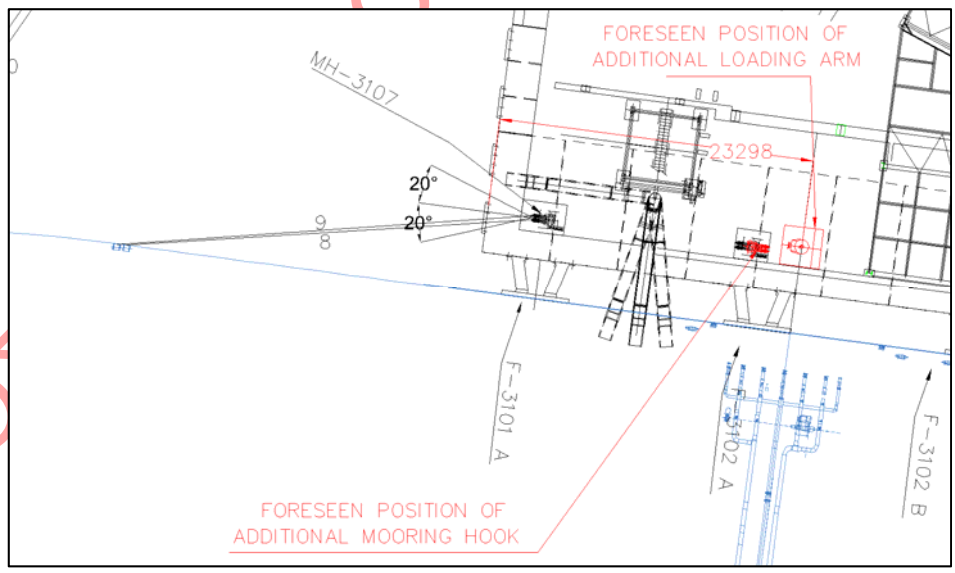

Figure 1-1: Identification of Additional Equipment

The assessment has been done by means of a geometric analysis of the mooring layout related to several ships characterized by different capacities (between 1,000 m^3 and 20,000 m^3). As well, compliance of the LNG transfer system was investigated.

The Feasibility Study highlighted possibility of receiving carriers with capacity as low as 20,000 m^3 or, in case carriers are equipped with two different levels of manifolds, as low as 15,000 m^3.

2 PROJECT SUMMARY

2.1 SITE AND TERMINAL DESCRIPTION

Revithoussa island is situated 40 km West of Athens in Saronikos gulf. The Terminal is located at 500-600 m from the shore. A map of Revithoussa isle showing the site location is provided on Figure 2.1.

Figure 2.1: Revithoussa Isle

The isle is at more than 1 km from closest local inhabited areas, all of them located to the North.

The LNG Terminal is composed of the following main equipment:

- LNG unloading system composed of No. 3 loading arms for LNG transfer (2 having a flowrate of 1,750 m^3/h each and a third one of 3,750 m^3/h) plus No. 1 vapor return;
- storage of LNG, composed of No. 3 storage tanks, two with a capacity of 65,000 m^3 each plus a third one of 95,000 m^3 currently under construction;
- recovery of boil off gas from storage tanks;
- vaporization of LNG, through submerged combustion vaporizers (SCVs) and open rack vaporizers (ORVs), for an overall SMSR re-gas capacity of 1,400 Nm^3/h and a peak one of 1,650 Nm^3/h;
- Natural Gas export to the Hellenic gas transmission system.

2.2 DESCRIPTION OF MAIN INTERVENTIONS

To guarantee LNG supply from Revithoussa before the installation of the new jetty, possibility of using the existing quay has been investigated. Analyses done in order to define the feasibility of using the existing quay for mooring the mini-LNG carrier has been done starting form the following assumptions:

- as highlighted by the analysis of layout of the existing quay, the best position for the installation of the new loading arms is located on the western side of the quay, near the existing gangway;
- in order to allow the positioning of adequate spring lines, additional mooring hooks have to be installed close to the location of MH-3108

Compliance CHECK of the existing mooring system to receive small scale carriers has been carried out according to international standards (no dynamic analysis taking into account movements of the vessel due to the waves) and with the whole range of vessels having a capacity of up to 20,000 m^3.

With reference to the LNG transfer system, in order to verify the feasibility of using the existing Terminal for the supply of small Carriers, the compatibility between the loading arms operability envelope and the manifold positions has been assessed (according to the international guideline "Recommendations for Manifolds for Refrigerated Liquefied Natural Gas Carriers (LNG)" provided by OCIMF).

The Feasibility Study highlighted possibility of receiving carriers with capacity as low as 20,000 m^3 or, in case carriers are equipped with two different levels of manifolds, as low as 15,000 m^3.

To guarantee the mini LNG carriers loading, the existing ESD, DCS systems and Ship-Shore ESD and Communication Link shall be extended to include the new installations. Existing system and relevant documentation shall be updated as necessary to take into account the new equipment and function provided (e.g. ATEX area classification, extension of F&G system, PERC and new PMS system in case of new arm; mooring line extension recording, etc. in case of additional mooring hooks).

Availability of spares and areas shall be verified and confirmed.

More detailed description of the required interventions is presented in the Appendices A, B and C.

2.3 ACRONYMS AND ABBREVIATIONS

CLIENT	Hellenic Gas Transmission Operator System (DESFA S.A.)
ENGINEER	the Party which provides the FEED Engineering Services, according to the Contract
PROJECT	FEED Design for Small Scale LNG Installations at the Revithoussa Terminal in order to guarantee loading of mini LNG carriers from existing quay on the Southern side of Revithoussa isle
BoD	Basis of Design
BOG	Boil Off Gas
BOR	Boil Off Rate
CCTV	Closed Circuit Television and Video
DCS	Distributed Control System
EDR	Engineering Document Register
EPC	Engineering, Procurement and Construction

ESD	Emergency Shut Down
FE	Finite Element
FEP	FEED Package
FF	Fire Fighting
I&C	Instrumentation and Control
JMD	Joint Ministerial Decision
LNG	Liquefied Natural Gas
OCIMF	Oil Companies International Maritime Forum
ORV	Open-Rack Vaporizers
PSV	Pressure Safety Valves
SCV	Submerged Combustion Vaporizer
SIL	Safety Integrity Level
SIS	Safety Integrity System
SMSR	Sustainable Maximum Send-out Rate
SoW	Scope of Work

3 PROJECT ASSUMPTIONS AND OBJECTIVES

3.1 PROJECT ASSUMPTIONS

3.1.1 General

The activities to be performed by the ENGINEER will be based on the following main assumptions:

- FEED design shall guarantee technical solutions to host small LNG carriers from 1,000 to 20,000 m^3. List of vessels to be considered by the ENGINEER shall include as a minimum the ones presented in Feasibility study;
- it will be in ENGINEER scope of work to endorse the outcomes of the Feasibility Study mainly with reference to the mooring arrangement system. As mooring has been preliminarily sized according to international standard and best practices (in the Feasibility Study), within the FEED a dedicated mooring study shall be developed by the ENGINEER. The ENGINEER shall take into account for FEED met ocean conditions already used for the 2nd upgrade of the existing maritime infrastructure in Revithousa LNG Terminal;
- layout of the mooring system shall be optimized in order to allow the mooring of all the vessels included in the range considered in the Feasibility Study. Mooring arrangements shall guarantee full compliance between the mooring equipment and breast lines and stern lines, as well as spring lines;
- it will be in ENGINEER scope of work to verify compliance of the new transfer system with considered small scale vessels. If necessary, loading arms compliance shall be verified with major international vendors currently operating in the LNG market;
- ENGINEER shall define technical solutions related to both mooring and civil maritime infrastructure and process, mechanical, piping, I&C and electrical that could guarantee project development;
- ENGINEER first shall issue a Basis of Design (BoD) that shall be subject to CLIENT's written approval prior to incorporation of the data into the FEED design studies;
- the FEED design will be developed according to the following codes and standards in order of preference:
  - Greek legislation,
  - European legislation,
  - European standards,
  - DESFA's specifications available at the CLIENT's website,
  - other international standards (where aspects of the design are not covered by the aforementioned);
- it will be in ENGINEER scope of work to take into account any changes related to the 2nd upgrading of re-gasification capacity (SMSR of 1,400 Nm^3/h and peak send-out rate of 1,650 Nm^3/h) as well as to the 3rd tank construction. The interface requirements with the 3rd tank will be defined by ENGINEER and agreed with the CLIENT.

- FEED design shall be developed according to geotechnical and seismic characterization of the area (provided by the CLIENT). In case available information is not adequate, the ENGINEER shall promptly advise for additional data and/or surveys development. Final decision of survey carrying out will be agreed with the CLIENT.

Furthermore, the ENGINEER shall make sure that LNG Carrier will be able to moor and sail away 24hrs a day. In detail:

- Night berth criteria equipment;
- Need for tugs and pilots;
- Tidal and weather criteria for berthing / un-berthing in emergency case.

Shall be addressed.

3.1.2 Input Data

The ship loading system shall be designed according to the following data:

1. LNG Ship tank capacity Range 1,000 to 20,000 m^3
2. LNG Ship loading Rate Range 100 to 2,000 m^3/h
3. Properties of LNG

Properties of LNG	Lean	Rich
Temperature	-162.0 °C	-161.8 °C
Operating Pressure	1.263 bara	1.263 bara
MW	16.515	18.876
SG	0.431	0.472
Viscosity	0.120 cP	0.165 cP
	0.275 cSt	0.346 cSt

4. Properties of NG (for vapor return line sizing)

   The properties of methane vapor are used to approximate for LNG vapor.

   The relevant characteristics at normal boiling point (1 atm) are:

Boiling temperature	°C	-161.4
Liquid density	kg/m3	422.46
Latent heat of vaporization	kJ/kg	510.15

5. Existing Storage Tank Data

No. of tanks:	2 (3 for future)
Gross capacity per tank :	2x 75,500 m^3 + 1x 112,500
Net capacity per tank:	2x 65,000 m^3 + 1x 95,000
Operating Pressure:	113 - 263 mbarg
BOR:	0.075% w/day (0.05% for 3rd tank)

6. Other Design Data

Heat Gain through lines:	25 W/m^2
Ship Tanks Operating Pressure:	0.1 – 3 barg
Ship Heel:	5 % of Ship Capacity

3.2 PROJECT OBJECTIVES

The main objectives of the FEED services the ENGINEER shall provide are the following:

- development of the FEED design. The FEED shall be developed at a level suitable for the CLIENT to place contracts with EPC Contractor to be able to perform the Detailed Design and for the CLIENT to execute Tendering procedures. Battery limit conditions in terms of range of LNG Composition, temperature, pressure, etc. at the receiving point will be confirmed at kick off meeting;
- execution of a dynamic mooring study to confirm the possibility of berthing small scale LNG carriers at the existing quay or to indicate the necessary infrastructure modification for such berthing to be made possible;
- reduction of the technical uncertainties to allow competitive bids for construction of the project and minimize qualifications and risk of price escalation from bidders;
- elaboration of a Health and Safety Plan;
- execution of a Safety Study;
- execution of HAZID and HAZOP study;
- execution of site surveys;
- preparation of Tender Documents for EPC contractor's tenders;
- under CLIENT's approval, preparation of the Scope of work for any additional study that is necessary for the execution of the project;
- assessment of project installed costs to a level of certainty of ±15% to 20%;
- perform sensitivity analysis as required to reduce the impact of the cost uncertainty;
- provision of all the documentation required for the efficient follow-up of the project;
- development of an EPC Construction schedule;
- support of the CLIENT during the Tendering procedures;
- support the CLIENT during the safety permitting procedures;
- development of coordination procedures with the existing plant.

3.3 COORDINATION WITH EXISTING PLANT

All coordination procedures shall be submitted to CLIENT for his approval.

4 PROJECT QUALITY/PROJECT MANAGEMENT

ENGINEER shall perform all his activities within the frame work of his own Quality System which shall be certified according to the requirements of ISO 9001 by an accredited certification body. The Quality System shall also cover the requirements set by CLIENT in QA-SPC-001 "Requirements of Contractors/Suppliers Quality System".

ENGINEER shall prepare all the documentation which is required for the efficient monitoring and control of the project.

ENGINEER shall submit to the CLIENT for review their proposed Quality Program together with a draft Project Quality Plan relevant to the FEED design services.

ENGINEER shall understand and accept the "draft" Project Quality Plan is to be fully developed and agreed by the CLIENT and implemented as an integral part of the Contract. The Project Quality 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 Approval levels;
- Deliverable Documents.

ENGINEER shall provide a list and description of the existing procedures and methods within their organization covering the design verification process and the interface control between various disciplines/working parties. ENGINEER shall include in their description the scope and the method by which terms of reference are set during checking, review and approval.

ENGINEER shall prepare and issue, as a minimum, the following documents:

- Project Plan (to include both the scope of work and project control requirements);
- Engineering Plan;
- Project Procedures;
- Project Quality Plan;
- Project Organization Chart;
- Coordination Procedure (comprehensive of requirements for correspondence, communication and meetings, details of contacts, etc.);
- Engineering Document Register (EDR);
- time schedule for FEED design;
- Monthly Progress Report with Narrative (Introduction, Achievements in each month/work status, Areas of concern, and Main Activities in the following month) and updated detailed time schedule.

A kick-off meeting shall take place at CLIENT's premises. ENGINEER shall participate at its own expense.

Interim working meetings shall be organized at ENGINEER's premises as deemed appropriate. For these meetings the use of video-conference or teleconference facilities shall be considered.

ENGINEER shall organize a presentation meeting, at its own expense at CLIENT's premises at the first issue of the FEED design deliverables.

CLIENT reserves the right to audit the ENGINEER activities based on CONTRACT requirements. ENGINEER shall comply with the findings of those audits.

5 SCOPE OF SERVICES

5.1 SITE SURVEYS

At the beginning, a site visit on Revithoussa isle shall be carried out to gather data and information on the existing plant. The site survey will be focused on the analysis of the existing plant, in terms of equipment location, status of the 2nd upgrading project and presence of construction yards on the isle.

5.2 FEED DESIGN

The ENGINEER shall develop a front end engineering design that will allow the Terminal to operate as described in the attached feasibility study.

The FEED Package shall be developed according to the following steps:

- Plans for the project development;
- Basis of Design;
- Design Philosophies;
- Engineering Design and Special Studies.

5.2.1 Project Plans

Project management and quality plans to be developed are described at Paragraph 4.

In addition, a HSE Plan shall be developed during the Tendering phase and re-issued at the beginning of the Project. The HSE Plans shall contain:

- ENGINEER HSE Policy;
- ENGINEER HSE Team for the Project;
- List of activities and relevant schedule;
- Method statements.

5.2.2 Basis of Design (BoD)

The purpose of the BoD is to record all input information, design philosophies, feedstock and product specification, overall plant operating conditions during the loading of the small scale LNG carriers. The BoD will be developed based on preliminary information included in the Feasibility Study that shall be verified and upgraded (where necessary), based on:

- latest updates of the European Directives, Norms, Codes and relevant standards, current at the time of the award of the FEED engineering;
- CLIENT requirements, for document and equipment numbering and specifications (where not limited by confidentiality agreement). It will be in the ENGINEER's responsibility to review and verify the data received from the CLIENT at the start of the FEED design;

- relevant codes, standards and specifications currently adopted at national and international level. The list will be compiled from existing CLIENT specifications and standards, ENGINEER's standards and specifications, International and National Codes and standards, European norms and standards, and any codes, standards and specifications required by the Regulatory Authorities. First priority is the European Standards ENs and in case they do not cover a particular matter, then the International Standards ISO and after them are the Internationally Recognized Standards such as API or ANSI/AMSE.

The BoD will be subject to CLIENTs review and approval and will be the basis of the FEED design.

The BoD will cover the following:

- General information:
  - project overview,
  - definitions,
  - abbreviations,
  - design life,
  - units of measurement,
  - design codes and standard,
  - list of specification and standards;
- General site data:
  - project location,
  - site and plot plan,
  - meteorological data,
  - seismic data;
- LNG composition (Min., Typical, Max.) and main characteristics;
- battery limit conditions;
- utilities and other systems:
  - availability of utilities (nitrogen, instrument air, plant air, cooling water, etc.) and relevant operating and design conditions,
  - Power supply;
- General design philosophies;
- other issues:
  - interfaces with 2nd expansion,
  - QA/QC philosophies,
  - coding – tagging philosophies,
  - project issues,
  - safety issues,
  - environmental issues.

It will be ENGINEER responsibility to collect data and ensure its correctness and consistency; CLIENT will provide support and will be responsible for providing all the data available relevant to the existing sections of the Plant.

5.2.3 Design Philosophies

Philosophies shall be developed to provide guidelines for carrying out the design of the Project. Philosophies developed shall comply with CLIENT ones. As a minimum the ENGINEER shall develop philosophies related to the following:

- Process design;
- Electrical Design;
- Piping and Layout Design;
- Instrumentation, Control and ESD;
- Loss Prevention;
- Ballast water management.

Each philosophy developed shall provide:

- Scope and applicability of the philosophy;
- Design intent;
- Approach description;
- Applicable laws, codes and standards.

5.2.4 Process Design

The process modification shall be designed to allow the Terminal to perform the following additional operating case:

Case	LNG Reloading	Regasification	LNG Receiving
New Case	Nominal Capacity	Nominal Capacity	-

ENGINEER shall assess the different conditions considering the possible compositions of the LNG stored / received.

Process simulations using commercial software (e.g. UNISIM, HYSIS, etc.) shall be developed for the different operating conditions. Special care shall be put in the assessment of the interfaces between modifications, existing LNG Tanks, incoming mini-LNG Carriers.

The ENGINEER shall, as a minimum, develop/update the following documentation:

- Reports and Studies:
  - Heat and Material Balance,
  - Process Description,
  - Boil Off Management Study;
- Diagrams and Lists:
  - Process Flow Diagrams,
  - Fluid List,
  - Chemical List,

- Utility Flow Diagram,
- Piping and Instrumentation Diagrams,
- Cause and Effects Matrix;
- Utility Consumption Table;
- Equipment List;
- Line List;
- Emission Summary Table

- Data sheet and Specifications:
  - Process Equipment Data Sheet and Specification;
  - PSV Data Sheet;
  - Control Valves Data Sheet,
  - ESD Valves Data Sheet

Process design shall consider the possibility of executing the construction activities minimizing the impact on the production.

5.2.5 Layout Design

The new equipment and infrastructures part of the Project shall be included in the existing layout optimizing the surface consumption and making piping connections as short as possible.

- Layout of new facilities shall be designed in order to ensure:
- Sufficient room for inspecting the equipment from any direction;
- Sufficient room for performing maintenance including removal of part of the equipment;
- Potential sources of ignitions (electrical motors, substations, air coolers, etc.) shall be put as far as possible from potential sources of release of flammable fluids and, as feasible, in the opposite direction with respect of the prevailing wind;
- Distances between different equipment (both existing and news) shall comply with Greek legislation and shall take into account outcomes of the safety studies.

ENGINEER shall develop or update:

- A general layout of the plant;
- Detailed drawings of the areas of modification;
- Demolition drawings;
- Equipment arrangement drawings;
- 3D model;
- Etc.

ENGINEER shall be responsible to collect all missing information relevant to the area and to integrate them with the actual provided by CLIENT.

A site visit and survey will be performed after the kick off meeting; additional survey shall be communicated in advance to CLIENT. Drawings provided by CLIENT will be in the

available format; it will be ENGINEER responsibility to transpose them into modern AutoCAD / Microstation format as necessary.

According to Feasibility Study, ENGINEER will analyze new mooring arrangement layout and will define the new loading system type (and position) to be installed on the existing quay in order to ensure the operability of the terminal.

5.2.6 Piping Design

Piping design shall be developed applying CLIENT existing piping specification. Where necessary, new piping specifications shall be developed based on EN or ASME code. As a minimum ENGINEER shall provide:

- Material selection
- Piping routing drawings;
- Piping demolition drawings;
- Piping arrangement drawings;
- List of supports;
- Tie-in List
- Calculation reports including stress analysis (as necessary).

5.2.7 Metallurgy, Painting and Insulation

Material selection as well as insulation and painting shall be defined by ENGINEER on the basis of CLIENT specifications integrated, as needed.

5.2.8 Electrical, Surge/Lighting and Cathodic Protection/Design

The electrical supply for the new equipment and facilities part of the present scope of work shall be provided from the existing infrastructures in Revithoussa LNG Terminal.

It will be ENGINEER responsibility to investigate available spare room in existing sub-station(s) for feeding the new equipment; CLIENT will provide its support granting the access to the substation(s) and providing CLIENT standards.

The design of the new sections of the electrical distribution systems shall be consistent with the existing one but updated to Greek legislation and norms presently in force.

The modifications shall be designed in order to minimize the disruption to the normal operation of the Terminal.

5.2.9 I&C Design

New instrumentation and controlling cables shall be designed according to CLIENT standards and Greek/EN norms.

The existing DCS system shall be updated to monitor and control new facilities. It will be ENGINEER responsibility to verify spare capabilities and I/O in the existing DCS and/or adequate them as needed.

Ship to Shore communications shall be provided including monitoring and ESD functions.

Dedicate graphic page for monitoring reloading operations shall be provided on DCS; such page shall be visible from control room.

ENGINEER shall integrate the existing emergency shutdown and fire and gas monitoring systems with the new functions necessary for safe operation of the reloading facilities.

5.2.10 Civil Design

Civil design will include FEED of:

- berthing system adequacy to Small LNG Carriers;
- unloading platform adequacy for installation of new loading arms system.

ENGINEER shall verify the adequacy of the existing berthing system considering the new loads acting on the mooring equipment due to vessels approach (pressure on fenders, forces on the mooring lines and mooring hooks), evaluated through a detailed mooring. Installation of additional hooks shall be evaluated and verified during analysis.

Installation of a new loading arms system shall be analyzed and verified and, based on the adopted system, ENGINEER will proceed with the local structural verification of the dock area directly involved in the intervention, considering the variation of the operating load. Verification shall be developed according to European Standard.

If a global analysis of the loading platform under the new load condition will be needed, ENGINEER shall prepare a FE model based on documentation (structural drawings and calculation reports) provided by CLIENT in order to verify the entire structure under the combination of loads that will produce the highest forces for each component: dead loads (D), live loads (L), environmental including wind, wave and currents loads (W), thermal effects from fixed equipment and from environmental actions and earthquake effects (E) applied to the structure. Detailed calculation shall be performed using adequate Finite Element (FE) software (i.e. SACS, SAP or similar) capable to take into account environmental loads including Met-ocean loads and seismic loads, operating loads and dynamic load due to the mooring/anchoring system.

5.3 COST ESTIMATE AND TIME SCHEDULE

5.3.1 Project Schedule

A level 1 schedule (according to AACE International Recommended Practice No. 37R-06) shall be produced as a summary program for the works and presented in bar chart format. The schedule shall be based on a work breakdown structure that shall be consistent with the FEED design elements of the works and reflecting the execution methods and logic to be adopted during the EPC schedule.

The schedule shall be of a sufficient detail to illustrate how the EPC work will be accomplished, and will identify both major key dates and milestones and interfaces to demonstrate the critical and high-risk areas of the work.

5.3.2 Cost Estimate

ENGINEER shall prepare a Total Installed Cost Estimate having an accuracy of ±15% to 20% based on the FEED design and documentation (Class 3 as per AACE International Recommended Practice No. 18R-97). The estimate shall be based on the EPC execution schedule to be developed in the FEED phase and described further in this section. The level

of detail of the cost estimate will be consistent with the required accuracy for a Class 3 cost estimate and will thus be based on sized equipment list, prices for major equipment items and subcontracts, third party quotes and key quantity material take-offs for bulk commodities.

Furthermore ENGINEER shall proceed separately with the cost estimate of the SIL Assessment study and SIL verification of the existing SIS (Safety Instrumented Systems).

5.4 SPECIALIST STUDIES

5.4.1 Mooring Study

The activities to be performed will include:

- LNG Carriers motion analysis and offset;
- Mooring systems verification (including mooring lines, fenders, quick release hook and bollards) by means of dynamic mooring simulations;
- Loading arms limit envelop verification.

As a first step of the analysis, ships hydrodynamic behavior and ships motion analysis will be evaluated with a commercial suite of software (AQWA or equivalent) in order to have a proper representation of all the relevant physical phenomena.

Hydrodynamic system behavior is described by hydrodynamic coefficients (added mass, damping, 1st and 2nd order wave forces) calculated with the 3D theory. Due to shallow water depth of the location, the full Quadratic Transfer Function theory will be used for the evaluation of the 2nd order wave forces. As hydrodynamic features of each vessel depend on the vessel draft, the diffraction analysis will be performed for the 2 main loading configurations: ballast and full load.

The study shall lead to a 3D simulation of the movements of the LNG Carriers under the different met-ocean conditions that allows evaluation of movements and accelerations in the different point of the ship.

As second step of the study, a time domain analysis shall be performed by means of adequate software (Orcaflex, OPTIMOOR or equivalent) to verify the adequacy of both mooring arrangement configurations and loading arms defining a limit envelop of environmental criteria.

The analysis shall focus on the identification of the maximum operative envelope for the feasible mooring arrangements proposed according to SIGTTO following the prescription and verification criteria proposed in the applicable standards and guidelines.

In particular the following items that will be properly modelled in the 3D model shall be verified:

- Mooring lines: Allowable loads on the mooring lines shall be determined on the basis of the OCIMF requirements;
- Fenders: allowable compression on the fender shall be in compliance with the manufacturer specifications.

In addition, the maximum offset of the LNG Carrier manifold shall be evaluated in order to understand the maximum displacement respect to the initial configuration to verify the maximum working envelope of the loading arms.

The mooring dolphins shall be designed to resist any reasonable combination of mooring line loads from any design vessel included in the range of vessels as per the Feasibility Studies presented in Appendixes A, B and C.

Mooring shall be generally made by breast and spring lines only and the OCIMF recommendations relating to mooring line angles shall be followed for the majority of vessels. The use of head and stern lines should only be considered in exceptional circumstances for smaller ships, where the efficient location of mooring structures for the majority of vessels makes it unavoidable.

Calculations shall be prepared to demonstrate that mooring forces have been evaluated for the full range of vessels likely to moor at the terminal.

Line overload conditions and the related redistribution of mooring line loads must be met with a port protocol that describes appropriate measures to be taken to restore berth via redistribution of lines, the supplement use of tugs and/or the need to vacate berth, as situations warrant.

The mooring analysis shall include simulations of a single line being released under upset condition, if requested.

5.5 SUPPORT FOR AUTHORITY APPROVALS AND PERMITS

ENGINEER shall support the CLIENT in defining project data that will be necessary for developing the Environmental study (activity in charge of CLIENT) to be submitted to the authorities for obtaining project's approvals and permits.

5.6 SAFETY ASPECTS AND SAFETY STUDIES

5.6.1 Safety Study

ENGINEER will be responsible to develop (in both English and Greek languages) the Safety Study for the new facilities part of Project Scope of Work. The Safety Study shall be in compliance with the requirements of the Joint Ministerial Decision JMD 172058 (OGJ 354/B/17-2-2016) which harmonizes the Greek Legislation with the European Directive Seveso III.

Liaising with Authorities responsibility will rest in CLIENT's hands.

5.6.2 HAZID Study

At early stage of the project ENGINEER shall be responsible for conducting a HAZID review study to assess generic risks related to the Project when details are not available yet. The HAZID Workshop will be led by a "HAZID Chairman", who shall be technically skilled, familiar with the process and objectives of HAZID and able to guide the team through the HAZID process. The Chairman will explain the HAZID process to be followed before the HAZID session starts.

ENGINEER shall provide the HAZID Chairman and Secretary that shall be approved by CLIENT in advance.

HAZID shall be executed at ENGINEER premises; CLIENT shall be invited to participate.

ENGINEER shall be responsible for HAZID follow up.

5.6.3 HAZOP Study

ENGINEER shall conduct the HAZOP review study for all the modification / new sections of the Project. ENGINEER shall provide the HAZOP Chairman and Secretary that shall be approved by CLIENT in advance. A HAZOP Term of Reference shall be issued in advance for approval.

HAZOP shall be executed at ENGINEER premises; CLIENT shall be invited to participate.

ENGINEER shall be responsible for HAZOP follow up and recommendation implementation.

5.6.4 SIL Study

ENGINEER shall develop a SIL Allocation study for all the new/modified safety instrumented functions part of Project Scope of Work. SIL allocation shall be conducted applying LOPA technique as per IEC 61508/61511.

Furthermore a SIL Verification study shall be conducted to demonstrate to CLIENT that proposed SIF configurations meet required SIL Level values.

The following reports shall be issued:

- SIL Allocation Report;
- SIL Verification Report

5.6.5 Health and Safety Studies

ENGINEER shall develop all the HSE studies necessary for the safe design of the new facilities and their integration with the existing.

In particular ENGINEER shall provide updated escape ways layouts implemented with the new layouts and the new personnel presence distribution. Escape ways shall meet CLIENT's standards and Greek legislation.

Safety signs and safety equipment layout shall be developed and integrated with the existing ones.

Extension of hazardous areas shall be revised to include new facilities and new operations and provide guidelines for the purchase of the new equipment. In addition to the updated hazardous areas drawings, a hazardous areas report shall be issued providing not only details on calculations performed but also highlighting cases in which new hazardous areas involve existing equipment previously in safe area. Extension of hazardous areas shall be developed according to EN60079-10.

5.6.6 Fire Safety Studies

Fire studies developed by ENGINEER shall cover the following aspects:

- Upgrade of active fire protection system to cover the new areas;
- Requirements for passive fire protection of new facilities;
- Upgrade of fire and gas detection system to cover the new areas/equipment.

As a matter of fact, ENGINEER shall evaluate the firewater requirements for the new areas as well as any need for improvement for existing areas modified by the Project. Active fire

protection shall be designed according to CLIENT's specification as applicable. ENGINEER shall issue:

- FF calculation report;
- FF layout;
- Active fire protection P&IDs.

In case available source of firewater will not be sufficient to cover the new necessities, ENGINEER shall be responsible to provide technical solutions to be discussed and agreed with CLIENT.

Passive fire protection for new equipment part of the scope of work shall be designed according to CLIENT standards and API2218. Duration of fire protection shall take into consideration the outcome of the other safety studies but shall not be less than 60 minutes.

6 PROJECT DELIVERABLES

6.1 DELIVERABLE LIST

List of deliverables shall include as a minimum the ones in the following table.

Table 6.1: Deliverable List

Discipline	Deliverable
General	Design basis
	General report
	Project description (in Greek & English)
	Technical description (in Greek & English)
	List of applicable code and standard
	Safety and coordination plan
	Bill of quantities
	Maintenance plan
	Project Plan
	Engineering Plan
	Project Organization Chart
	Coordination Procedure
	Project Time Schedule
	Engineering Document Register
	Monthly Progress Report
	Moooring analysis report
	Ballast Water Management Philosophy
Quality	Project Quality Manual
	Project Quality Plan
	Project Quality Procedures
Civil and Structural	General layout - as built
	General layout - final layout
	General layout - mooring scheme
	General layout - mooring equipment layout
	Mooring equipment specification
	Mooring equipment - adequacy design report
	Existing quay - structural adequacy design report
	Existing quay - plants and sections and typical construction details
	Strengthening measures for existing quay (if required)
PROCESS	Process description / Operating Manual / Marine Procedure Manual
	PFD
	UFD
	Heat and Material Balances
	Utility Balances
	Equipment List
	Fluid List
	Emission summary table

Discipline	Deliverable
	Utility Consumption List
	PSV, ESD and Control Valves data sheets
	Chemicals List
	P&ID
	Equipment Data Sheet and technical specification
	BOG Management Report
	Line List
	Process design Philosophy
	Cause&Effect Matrix
ELECTRICAL AND I&C	Electrical design phylosophy
	Electrical Load List
	General Single Line Diagram
	Electrical Load Flow Calculation Report
	Power Cable Sizing Report
	Grounding system Layout
	Lighting system Layout
	Lightning Protection Study
	CCTV Specification
	Electrical Equipment and cw General Layout
	Hazardous Area Report
	I&C phylosophy
	I&C Architectural System
	Hazardous Area Drawings
PIPING & LAYOUT	General layout
	Main areas layout
	Demolition drawings
	Main equipment arrangement drawings
	Piping routing drawings
	Piping demolition drawings
	Piping arrangement drawings
	List of supports
	Tie-in list
	Calculation report
	Piping & Layout design philosophy
	Material selection
SAFETY	HSE plan
	SIL allocation report
	SIL veirifcation report
	Fire-Fighting (FF) Report
	FF P&ID
	FF Layout
	FF Detection System Layout
	FF Hydrants Location Layout
	Escape Way Layout
	HAZID study

Discipline	Deliverable
	HAZOP study
	Safety equipment layout
	Main buildings FF Layout
	Loss Prevention Philosophy
	Safety Report
	Passive Fire Protection Report
	Passive Fire protection Layout
	Fire & gas layut
	Fire & gas detectors specification

In addition to the Technical Deliverables presented above, the ENGINEEER shall develop the following Non-Technical Deliverables:

- Scope of Work for the EPC contract;
- EPC tender Technical Volume;
- EPC Execution Schedule;
- EPC Cost Estimate.

ENGINEER shall be also in charge of providing documents needed by the CLIENT following requirements of local Authorities.

6.2 PROJECT LANGUAGE

All deliverables shall be issued in English language, except the following studies that shall be bilingual (Greek and English):

- Safety Study;
- Health and Safety Study;
- Fire Safety Study;
- Project Description;
- Technical Description.

The following studies:

- Safety Study;
- Health and Safety Study;
- Fire Safety Study,

shall be signed by a suitably licensed member of the Technical Chambers of Greece.

6.3 CLIENT REVIEWS

In addition to status reviews as per Paragraph 4, CLIENT will review the FEP, including as a minimum the following:

- Basis of Design (BoD);
- plot and site layout;
- process design (including PFDs and P&IDs);

- safety studies review;
- construction activities design review;
- project cost and schedule;
- Health and Safety Plan;
- Health and Safety file;
- EIA and environmental issues;
- etc.