



LNG Terminal FSRU Toscana (Italy)

Technical/Operation Terminal Users Information Memorandum



2015

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1 Introduction

1.1 OLT OFFSHORE LNG TOSCANA S.P.A.

OLT Offshore LNG Toscana S.p.A. ("OLT") is the company that owns and operates FSRU Toscana Terminal. OLT was set up from the association of some of the major industrial companies in the national and international energy sector. The shareholders are: E.ON (48,24%), IREN GROUP (49,07%) and GOLAR LNG (2,69%).





OLT is based in Livorno and operates in compliance with the following certifications:

- Compliance with ISO 9001
- IMS in compliance with ISO 14001
- Compliance with D. Lgs. 231/01 as amended
- Compliance with OHSAS 18001
- Compliance with SA 8000

The OLT team provides management oversight as well as commercial management.

OLT personnel onshore controls and manages the O&M and the Support Vessel contracts and liaises with the local Authorities, the Users and Snam Rete Gas Italia for commercial operations.

OLT O&M team (Manager, Technical and Marine Superintendent) and HSEQ Manager obtained a Ship Superintendent Certificate, released by GL Academy after passing an in-house dedicated training course. Moreover, OLT team members receive dedicated trainings for each position, in accordance to personal background and duties (e.g. use of software training, e.g. Optimoor, MARIN training for Marine superintendents, BOSIET/OPITO certificates...).



OLT is associated with SIGTTO, OCIMF, Assocostieri (the Italian Oil&Gas Storage Companies Associations) and GIE.

Considering that most of the international players in the LNG field, before entering in any business with the Terminal, will ask for a Terminal Vetting, OLT signed a contract with an acknowledged third party to prepare itself and its operators ECOS and NERI to perform an independent Terminal Assessment.





The scope of work is an independent vetting type assessment (review of documents, procedures, interview of the management and operators), which is supplemented by a SIRE type vetting onboard the FSRU during commercial operations.

The internal preparatory works were based on the OCIMF 2004 Marine Terminal Baseline Criteria and were updated in order to be in compliance with Marine Terminal Management Self Assessment (MTMSA) Baseline Criteria.

With reference to the Terminal Vetting, being an offshore FSRU, but at the same time like an EU onshore Terminal, OLT system is based on the following aspects:

- OCIMF Marine Terminal Management and Self Assessment (MTMSA) (2012)
- OCIMF Marine Terminal Operator Competence and Training Guide (2013)
- Standard SIRE type vetting onboard the FSRU

1.2 FSRU TOSCANA

The Hull no. 1444 LNG Carrier (former "Golar Frost", built on 2004 by Hyundai Heavy Industries and acquired from Golar LNG Corporation on July 2nd 2008 by OLT), was converted into the floating LNG receiving terminal of FSRU type named **"FSRU Toscana"** (IMO 9253284 – LI10153 – CALL SIGN IBAH).

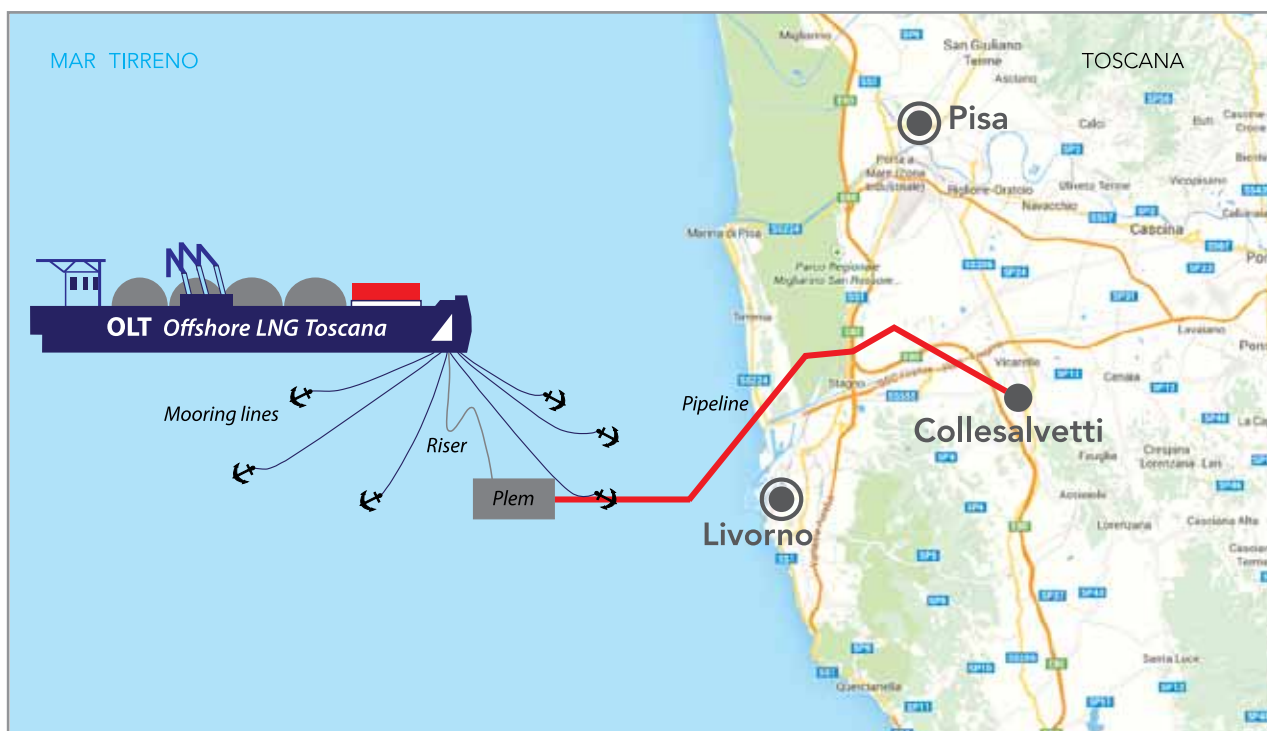


Figure 1-1 FSRU Toscana

The Terminal is permanently moored – Latitude 43° 38' 40 " N, Longitude 09° 59' 20 " E (single point mooring) offshore Livorno (Italy), approximately 12 nmiles from the coast in a water depth of about 120 metres and it is connected to shore through a gas export pipeline.

The Project was built by Saipem S.p.A. ("Saipem") under a lump-sum turn-key design, engineering, procurement, construction, installation, and commissioning contract (the "EPCIC Contract"), including 2 years warranty period, and consisted of the conversion of an existing LNG vessel into a floating storage and regasification unit ("FSRU").

The conversion encompassed the area from the outboard flange of the LNG loading arms to the sub-sea expansion spool connecting the SSIV, including the FSRU, all risers and umbilicals and all moorings up to the sealine manifold.

The regasified LNG is transported onshore by a 32-inch diameter, 29 km offshore pipeline, and a 7.2 km onshore pipeline constructed by Snam Rete Gas S.p.A. ("SRG"), Italian grid owner and operator, under the terms of a separate construction agreement and connected to the national gas transportation network on the main-land working at pressure between 50 bar to 85 bar.

The Terminal is equipped to receive unloading LNG Carriers on a side-by-side configuration. At present the Terminal is authorized to receive LNG Carrier with a capacity ranging from 65,000 bcm to 155,000 bcm.

The authorization process to receive LNG Carriers up to "New Panamax" class is ongoing. The Terminal has a maximum loading rate of 12,000 bcm per hour; this allows an LNG Carrier to complete the discharge operation in a range of 12 to 14 hours.

The Terminal has completed the commissioning activities carrying out 4 ship to ship operations.

On December 20th 2013 OLT Offshore LNG Toscana started its commercial activity.

2 Terminal Users Information

2.1 TERMINAL USERS MANUAL

All the following Terminal Users Manuals are available on OLT web site:

<http://www.oltoffshore.it>

following Business Area/Operational Management/Technical Manuals and Maritime Regulations

a.	• Terminal Information and Regulation Booklet
b.	• LNG CARRIER APPROVAL AND VETTING PROCEDURE
c.	• TERMINAL SAFETY REGULATION - Ministero delle Infrastrutture e dei Trasporti and Capitaneria di Porto di Livorno Ordinanza n° 6/2014 dated January 29th 2014
d.	• HANDLING MANUAL – available when required
e.	• Environmental Safety Criteria
f.	• LNG and GAS Quality and Measurement Manual

2.2 LNG CARRIERS CALLING AT FSRU TOSCANA TERMINAL

With reference to the compatibility process for any LNG Carrier willing to operate at “FSRU Toscana” Terminal, the typical information exchanged with vessel owner/operator to perform the process are the following:

- Confirmation list (provided by OLT and to be filled by vessel owner/operator)
- Mooring arrangement
- SSI interface plane
- General arrangement
- VPQ
- Last SIRE report
- Proposed mooring lay out by vessel owner/operator or Optimoor study
- Vessel Optimoor.vsl file, if available





3 LNG and Gas Quality

The Terminal was designed to allow the reception of a wide range of LNG, coming from a large spectrum of producing countries. The composition of the mixtures can be contained within the limits shown in the table below.

Property	Specification		Unit
Wobbe Index	Minimum	47,31	MJ/Sm ³
	Maximum	53,00	MJ/Sm ³
Gross Calorific Value	Minimum	*	MJ/Sm ³
	Maximum	*	MJ/Sm ³
Nitrogen (N ₂)	Minimum	0	mol %
	Maximum	2	mol %
Methane (CH ₄)	Minimum	83	mol %
	Maximum	95	mol %
Ethane (C ₂ H ₆)	Minimum	4	mol %
	Maximum	14	mol %
Propane (C ₃ H ₈)	Minimum	0.5	mol %
	Maximum	4	mol %
C ₄	Minimum	0.03	mol %
	Maximum	2.5	mol %
H ₂ S + COS (as sulphur)	Maximum	6.6	mg/Sm ³
Mercaptans (as sulphur)	Maximum	15.5	mg/Sm ³
Total sulphur (as sulphur)	Maximum	150	mg/Sm ³
Mercury (Hg)	Maximum	50	Nano g/Sm ³
Hydrocarbon dew point (cricondenthem)	Maximum	- 3	°C (1-70 bara)
Water (H ₂ O)	Maximum	0,1	ppm (vol)
Oxygen (O ₂)	Maximum	100	ppm (vol)
Carbon dioxide (CO ₂)	Maximum	100	ppm (vol)
Solids		No deposits on 60 mesh strainers	

Table n. 1:
LNG quality
specifications

GCV, Wobbe
Index reference
standards: ISO
6976:1995 for
calorific values
(combustion
reference
temperature:
+15°C, standard
cubic meter +15°C
@ 1,01325 bara)

The high flexibility in receiving different LNG quality is allowed thanks to the process module “Wobbe Index Corrector” installed at the stern of the Terminal which is capable of producing up to 10,400 Sm³/h of nitrogen. The nitrogen, mixed with the natural gas generated through the regasification process, is able to correct the Wobbe Index of gas bringing it within the specifications required by Snam Rete Gas, the Italian Grid Operator.

“Wobbe Index Corrector” module allows the reception of a wide range of quality LNG (see picture below) with a Wobbe Index between 47.31 MJ/Sm³ and 53.00 MJ/Sm³ guaranteeing maximum daily send-out of 15 MSm³/day.

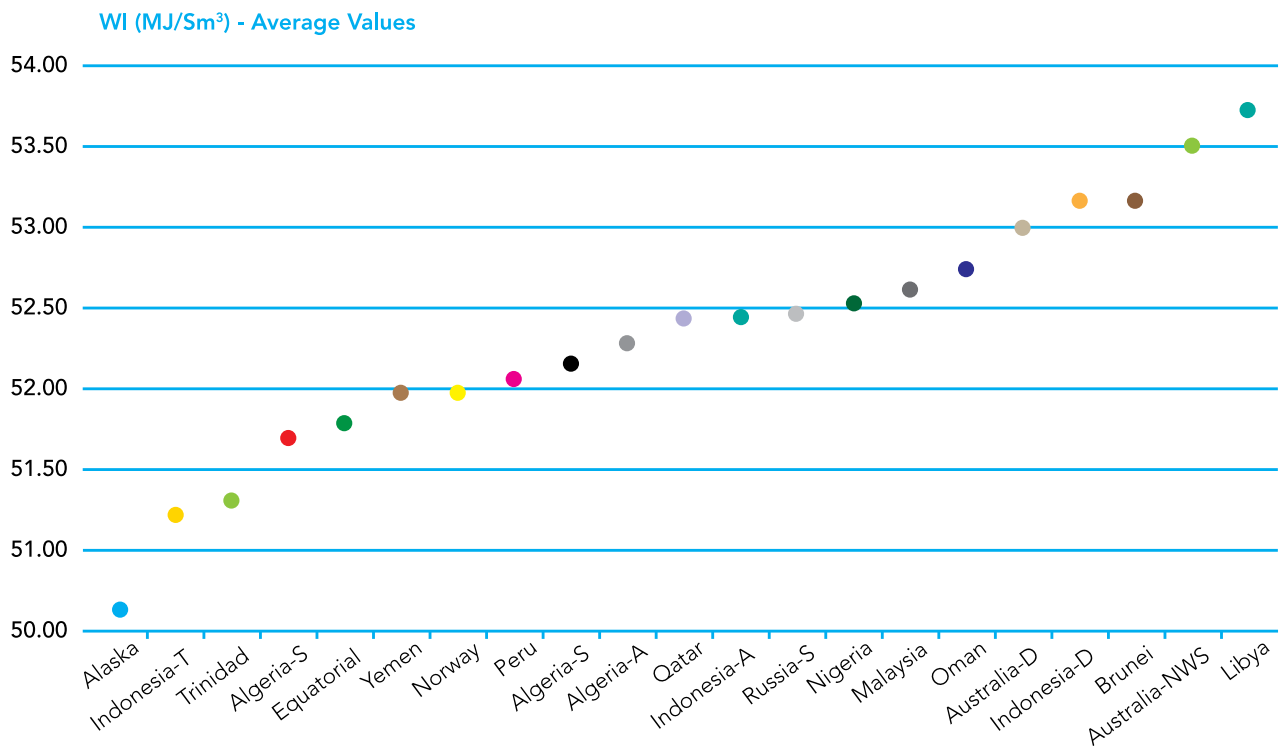


Table n. 2 Source: International Group of Liquefied Natural Gas Importers (GIIGNL)



4 Terminal Management Contracts

The FSRU Toscana Terminal operations are managed through the following contracts:

- O&M contract for FSRU and Subsea System
- Support Vessels

4.1 O&M CONTRACT FOR FSRU AND SUBSEA SYSTEM

 **The O&M Agreement** was signed by OLT and a company (ECOS, presently, but the agreement can be renewed every 5 years) in possession of the necessary qualifications (i.e. the Document of Compliance issued to an operator of LNG carriers that complies with the requirements of the International Safety Management Code – “ISM”). In particular, applicable legal requirements for the O&M Contractor consider a minimum experience of ten years of LNG carrier operations. Contractor is responsible for ensuring that the Terminal is verified and certified by the Italian Flag Administration or its technical advisor RINA. Further obligations for the Contractor are:

- Compliance with IMO ISM Code
- Compliance with ISO 9001
- IMS in compliance with ISO 14001 and OHSAS 18001
- Compliance with D. Lgs. 231/01 as amended
- Security management system in compliance with IMO ISPS Code with relevant certification provided by Italian Maritime Authority
- Compliance with IMO STCW Convention as amended
- Italian HSE obligations
- Compliance with all national, international, local or Italian flag laws and practices applicable to the performance of the Services or the operation of the Terminal

ECOS (O&M Contractor)

The required expertise to manage and operate the Terminal was found in the company Ecos Srl.

● **ECOS** is an Italian joint venture between Exmar Shipmanagement N.V. and F.Ili Cosulich S.p.A., founded specifically for the OLT Terminal project. ECOS manages and operates the Terminal under a contract (the "O&M Agreement"), covering, among the other duties:

- Manning and crew management
- Technical and safety management
- Terminal and commercial operation according to the instructions of OLT
- Provisions and catering
- Budgeting
- Bunkering
- Maintenance
- FSRU certification follow up
- Shore base management (personnel and facilities)
- Coordination of Support Vessels operations
- Coordination of emergencies (environmental, medicals...)



ECOS, before signing the O&M contract, received a Familiarization and Training Services (FTS) contract, during the conversion phase in Dubai from mid 2010. In particular, an ECOS team was permanently present at the yard during conversion works and on board during the commissioning phase for training purposes.



4.2 SUPPORT VESSELS

The Support Vessel Contract is aimed to provide the Terminal with all the maritime related services in accordance with the high level standards required.

The Support Vessel Contractor:

- Complies with IMO ISM Code (for vessel > 500 GRT)
- Complies with ISO 9001
- Has an IMS in compliance with ISO 14001
- Complies with D. Lgs. 231/01 as amended
- Its Safety Management System and Operational Procedures meet the standards of the International Safety Management (ISM) Code (DoC issued by RINA and Lloyd's register LRQA)
- Has a Security management system in compliance with IMO ISPS Code with relevant certification provided by Italian Maritime Authority
- Complies with IMO STCW Convention as amended

F.LLI NERI (Support Vessel Contractor)

The current service provider is F.Lli Neri S.p.A.

- **F.LLI NERI** company's purpose is to provide maritime related services. It has been operating in the maritime sector since 1905.

The Support Vessel contract covers, among the others, the following services:

- the provision of escort, tow or tug boat services to a calling vessel from the Pilot Boarding Station, or any other area in the Operating Area as may reasonably be required by the Calling Vessel Owner, to the Terminal
- the provision of all necessary assistance for the arrival, berthing and unberthing of any Calling Vessel at and from the Terminal including all required carriage and transfer of personnel (including, but without any limitation whatsoever, the pilot, berthing gang, mooring master and surveyors) and equipment (including, but without any limitation whatsoever, the ship-to-ship transfer equipment) either between any Calling Vessel and the Terminal or any Calling Vessel and any other vessels
- the provision of all required standing by services whilst a Calling Vessel is alongside the Terminal
- the provision of escort, tow or tug boat services to a Calling Vessel from the Terminal to the Pilot Boarding Station, or any other area in the Operating Area as may reasonably be required by the Calling Vessel Owner, Pilot Boarding Station to the Terminal



5 Towage, Pilotage and Mooring Liner services

- **Towage** : F.Ili Neri S.p.A.
- **Pilotage** : Livorno Port Pilot Association
- **Mooring Liners** : Livorno Port Mooring Liners Association
- **Shipping Agent** : Carlo Tonolo Fu Matteo







Disclaimer

This document sets forth certain information regarding the regasification facilities and services offered by the “FSRU Toscana” Terminal. Please note that the document can be amended from time to time pursuant to the Access Code and the relevant Technical Manuals. In each case OLT disclaims any and all responsibility for changes of the services herein described that may be as result of, *inter alia*, regulatory constraints defined by the relevant regulatory authority or may be imposed by Italian or European authorities.

The information herein contained should not be considered to give rise to any contractual relationship between OLT (or any of its affiliates entities) and any interested party.

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