



Case study

The project in brief

The OLT Offshore LNG Toscana project is a conversion of an LNG carrier (Golar Frost) into a floating FSRU (Floating Storage Regasification Unit) located 22 km off the coast between Livorno and Pisa, Italy. The FSRU is anchored to the seabed with a single rotation point at the bow which permits the ship to move with the weather and sea conditions.

Communications between the FSRU and the onshore facility are vital for ensuring the safety of the offshore crew as well as providing accurate production information, services such as voice and LAN access, as well as mobile radio.

Introduction

The Floating Storage Regasification Unit (FSRU) Toscana is essential infrastructure for the launch and the development of liquefied natural gas used as clean fuel for land and maritime transport in Italy and in the Mediterranean area. At full capacity, the OLT terminal project has a regasification capacity of 3.75 billion cubic meters a year, about 4% of Italy's national consumption.

The FSRU Toscana is moored about 22 km off the Italian coast located between Livorno and Pisa and is connected to the national grid through a 36.5 km long pipeline, 29.5 km on the sea bed and 7 km on land.

Objectives

The Offshore LNG Toscana (OLT) project needed a radio system to provide broadband communications link between the OLT office, based in Livorno, and the FSRU at sea. The radio system is the main network connection between the FSRU and the onshore office. A backup link is provided via satellite. For technical and reliability reasons a fibre optic connection was not practical.

Challenges

The radio link to the FSRU presented a number of technical challenges:

- **Antenna height:** The location of the onshore office site limited tower options so a suitably elevated 900 m ASL intermediate location was required to minimise signal strength fluctuations due to the path distance and the curvature of the earth.
- **Propagation over sea surface:** Multipath fading over the 47 km sea path affects the radio wave propagation as reflected signals arrive through different paths and at variable phase angles.
- **The network had to provide reliable 11 Mbit/s data rate capacity to the FSRU, without drop outs caused by propagation conditions and FSRU vessel movement as well as the unpredictable movements of other ships passing through path to the harbour area.**

Solution

Ponti Radio PR, a highly experienced radio system integration company, was contracted to design and build the broadband radio system. Working with 4RF, Ponti Radio PR designed a solution addressing the key challenges of the project.

The Aprisa XE radio system was chosen for this application operating in Hitless Space Diversity (HSD) mode at 1.4 GHz. Well proven in offshore FIPSO applications, the Aprisa XE hitless mode automatically chooses the best radio path on a block-by-block basis using FEC metrics of the powerful Reed-Solomon error correction algorithm used in the Aprisa XE modem.

The onshore antenna system was implemented using a pair of high gain 2.4 meter diameter antennas spaced 10 meters apart. Offshore, the antenna system was more complicated as it needed to allow for the off pointing caused by the movement of the FSRU.

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The Aprisa XE system has proved to be the best technical and economic choice. It provided the perfect balance for the FSRU in terms of bandwidth need, costs and time of development.

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Andrea Vallavanti, ICT Manager,
OLT Offshore LNG Toscana

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The OLT radio link project has been one of our most challenging achievements. The success confirms the quality of the technology and the highly collaborative approach of 4RF, our expertise in systems integration did the rest.

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Marco Calamoneri, Engineering
Director, Ponti Radio PR

The FSRU antenna is a modest gain Yagi-style mounted on a QPT 50 pan and tilt positioning system from Moog Sensor and Surveillance Systems. This rugged and durable positioning system is controlled by a Ponti Radio PR developed antenna tracking system with software that calculates the correct heading data from the vessel's gyrocompass, pointing the antenna in the proper direction to compensate for FSRU rotation. The software also monitors the radio link operation raising alarms if any of the positioning system or radio system components fail.



Aprisa XE

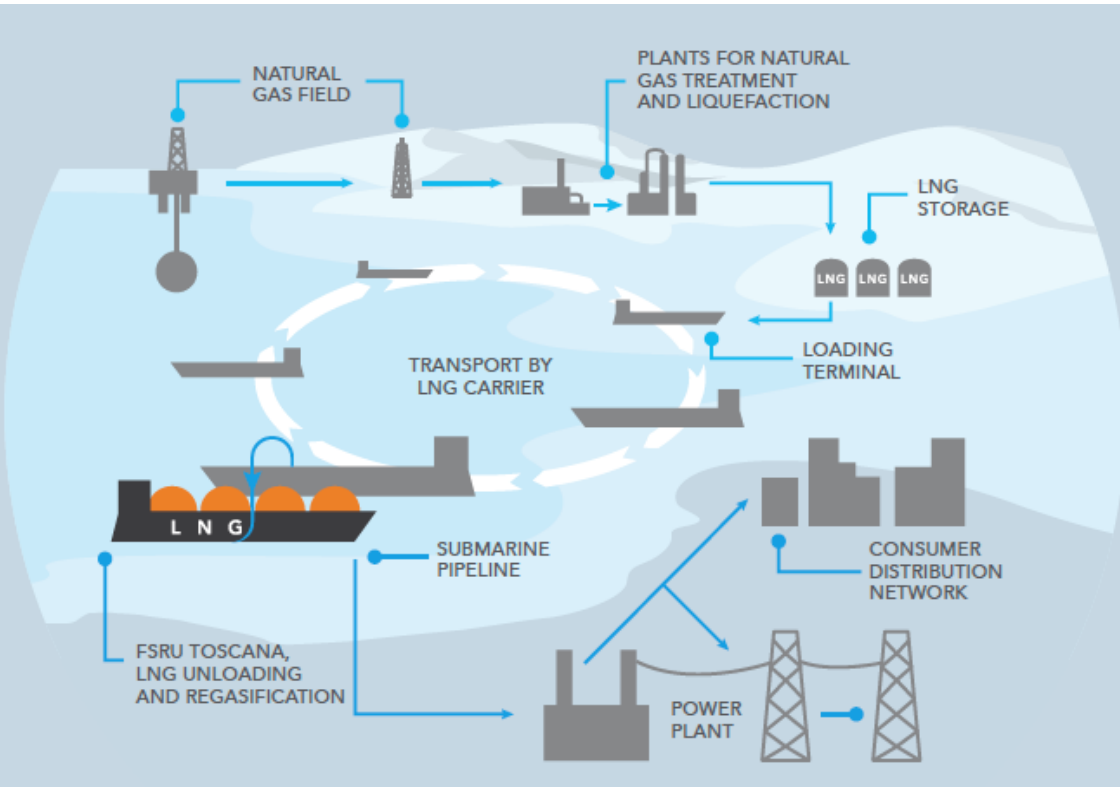


Image: OLT Offshore LNG Toscana

The FSRU antenna tracking system specification includes:

- Rotation of the vessel by 360°
- Roll: ± 18°
- Pitch: ± 5.3°
- Yaw: ± 2°
- Surge: ± 4.6m
- Heave: ± 7.5m
- Sway: ± 6.2m

OPT 50 Pan and Tilt Unit



Image: Moog Sensor and Surveillance Systems

To meet these specifications and to obtain an unobstructed view for the antenna on board the FSRU, it was necessary to modify the radar mast to mount the pan and tilt assembly in the clear.

Result

The radio link is now used to provide broadband data connection to the FSRU, to carry VoIP telephone and fax connections to the Livorno IP-based telephone central station as well as supporting onshore to offshore land mobile radio (LMR) communication through a DMR network.

ABOUT 4RF

Operating in more than 130 countries, 4RF provides radio communications equipment for critical infrastructure applications. Customers include utilities, oil and gas companies, transport companies, telecommunications operators, international aid organisations, public safety, military and security organisations. 4RF point-to-point and point-to-multipoint products are optimized for performance in harsh climates and difficult terrain, supporting IP, legacy analogue, serial data and PDH applications.

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