“Port infrastructure for alternative fuels and maritime transport: the Livorno case”

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THE LNG TIMELINE IN THE PORT OF LIVORNO

- 2009 – 2013: OLT OFFSHORE LNG TERMINAL
- 2012 – COSTA project (as stakeholder)
- 2013 – GREENCRANES project
- 2014 – SEATERMINALS project
- 2015 – MEANING Initiative
- 2016 - GAINN
LNG USES

- BUNKERING
- FLEET FOR PUBLIC SERVICE
- FERRY BOAT
- VEHICLE FOR CYCLE WASTE
- «TURBOGAS 3»
- ROAD GAS STATION
- FISHING BOAT
- PLEASURE BOAT
- LOCAL PUBLIC TRANSPORT
- NO METHANIZED AREA
- COAST INDUSTRIES
- POWER DOCK FOR CRUISE VESSEL
- PORT VEHICLE
Technical dialogue with third countries

- aspect of training needs, stakeholder consultation and involvement of third countries in the Mediterranean strategy for the development of the LNG value chain.

Current state of infrastructure, regulatory and technological advancement

- state of progress about the development of the supply chain, the formation of the operational and management personnel, methods of governance, methodological tools to attract investment and involve international actors.

Pilot Courses

- For figures of middle management and for the operational staff (sea side and land side). During this session we will present the pilot courses held in Livorno and the results obtained in the stakeholder consultation

Stakeholder consultation

- The strategic development objectives of the LNG chain
- The consistency of these objectives with national development addresses
- Identification of alternative scenarios of development;
- Effects and impact of the selected development path
- The development goals for the training of operational staff and middle management
LIVORNO PORT: A LONG-TERM TRADITION IN THE CHEMICAL AND “GAS & OIL” SECTORS

- Costiero Gas Livorno (LPG)
- Laviosa Chemical Mining (Plant 1)
- Solvay Rhodia
- Eni Ugione Dock
- Enel Power Plant
- Costieri D’Alesio
- Costieri del Tirreno Storage
- Toscopetrol
- Costieri Nerl Storage
- Masol
- Labromare (Plant 2)
- Toscopetrol Nerl
- Laviosa Chemical Mining (Plant 2)
- Styron Italia
- Labromare (Plant 1)
- Oil Products Dock Piers 10-11-12-13

Chemicals & DG Traffic:
- ~ 600 Ships
- ~ 3,500,000 tons (import)
- ~ 200,000 Atb
- ~ 10,000 c/c
- Operations based on ship-to-ship transfer of LNG in open sea. Ship-to-Ship manoeuvres approved for wave Hs up to 1.5 m while LNG transfer designed for wave Hs up to 2.5 m.

- Regasification unit on board for send-out with nominal capacity of 3.75 bm³/a and a storage capacity of 137,500 m³ in 4 spherical Moss-type tanks more suitable for partially-filled terminal in offshore environment (anti-sloshing).

- The terminal is completely self-sufficient and has the same operational features as typical onshore regasification terminals.

- LNG loading occurs by direct transfer from LNG carriers moored side-by-side to the terminal via traditional (Jetty) loading arms.

- Wobbe Index Corrector installed to produce Nitrogen can allow to receive most of the LNGs types.

- Terminal is allowed to receive LNG carriers size in the range between 65,000 and 155,000 m³ (about 80% of the current worldwide LNGc fleet).

- High flexibility in send out flow rate (maximum capacity of 15 MSm³/d with a very low minimum send out) allows high trading value to the users.
Favouring stakeholders awareness about eco-efficiency in port operations
Supporting the start-up phase of innovative actions in early stage markets

Definition of the Italian national policies
Italian LNG Masterplan

MEANING Initiative:
definition of a global strategy for the Port of Livorno as a LNG hub for the Northern Thyrrenian sea

Setting up of new industrial partnerships
Development of new products that can lead to market innovations

EUROPEAN PROJECTS’ PARTNERS & ACTIVITIES
PRODUCTS & PROTOTYPES DEVELOPMENT

Retrofit conversion of a diesel unit to a dual fueled (Diesel – LNG) Reachstacker.

- Integration and realisation of a prototype according to the design
- Prototype functional testing
- Prototype pilot and performance analysis in a real Port Container Terminal

Retrofit conversion of a diesel unit to a dual fueled (Diesel – LNG) Rubber Tyred Gantry (RTG).

The retrofit conversion of a R.T.G. engine is an absolute innovation since it does not exist in the market any models of RTG powered by dual fuel, neither OEM, nor retrofit.

LNG Mobile Refueling Station, able to refuel LNG tanks placed both at elevated and normal heights. Modular, Flexible, the station can be arranged on different types of platforms/trailers and it can be easily handled by a normal terminal fork-lifts. Autonomy: it has a built-in power generator that makes the unit completely autonomous.
The main data of terminal size and capacity are the following:

- **LNG Storage Capacity**: up to 9,000 m$^3$ (6x1500 m$^3$)
- **Maximum transfer capacity for filling SSLNG vessels**: 250 m$^3$/hr
- **Max LNG transfer capacity for filling truck/rail-tanks**: 60 m$^3$/hr
- **Number of LNG loading bays for truck-mounted tanks**: 3
- **Number of LNG loading bays of rail-mounted tanks**: 2

Setting up of an LNG terminal/storage facility with a capacity of 1,500 m$^3$, scalable up to 9,000 m$^3$.

Enabled for filling operations of small LNG bunker barges/vessels and tanks mounted on trucks, trailers, semi-trailers or rail wagons.

Definition of a port sensing network (IoT) for risks mitigation: the resulting specifications have been already implemented in the Port of Livorno Monitoring and Control Application (MONI.C.A.)
LNG ISO Cryo-Container based onshore storing and distribution facility in the port of Livorno

1. Quay-to-Ship LNG bunkering
2. Feeding of storage facilities in other ports
3. Feeding of refueling stations (road & rail)
4. Use as tank onboard ships
5. Feeding of territorial methane distribution networks (e.g. Sardegna)

Expected benefits
- Modularity and Adaptability
- Short development time
- Existing handling facilities
- Container trailers service
- Container ships service
- Full intermodal approach
- Storing efficiency maximization (stacking)
- Simplified logistics for final users
- LNG transportation towards remote targets
The terminal will be able to receive Small LNG carriers with the following characteristic:

- Mini LNGC with a cargo capacity in the range of 1,000 m³ to 7,500 m³
- Mini LNGC Length: between 60 m to 110 m
- Loading rate between 250 m³ and 900 m³ (the timing is the same requested for bigger LNG carriers)
- Manifold in accordance to OCIMF recommendation
- ESD in accordance to SIGTTO recommendation
- Minor modifications will allow to perform the transfer of LNG from port side
- Purchase of new cryogenic hoses, reducers, fenders etc...

Preliminary feasibility study
Identification of the terminal’s capability to performing LNG transfer into mini LNG carriers and the consequent modifications needed.
THE PARTNERS NETWORK

INSTITUTIONS

21 JANUARY 2013: Mou Innovation, ICT, Alternative fuels

RESEARCH

INDUSTRY

POLO UNIVERSITARIO SISTEMI LOGISTICI

Green Port Congress - Venice, 12 October 2016 - Livorno Port Authority presentation
- The Port of Livorno «MEANING» Initiative: studies and development actions in the Tuscan Port cluster for the setting up of a full LNG chain serving the Northern Tyrrhenian sea;

- During the MIT and MISE stakeholders consultation phase, it has been absorbed and integrated in the Italian LNG Masterplan and, consequently, in the GAINN-IT Initiative.
Lowering the energetic dependency, making the use of energy more efficient and reducing the emission levels, will play a crucial role for the Livorno port future development.

- Creation and/or integration of small-scale renewable energy power plants ("Energy Districts" and "Smart Grids"), with particular focus on LNG power;
- Solutions for increasing eco-save/eco-efficiency and real time monitoring of port energy consumptions;
- Fossil fuels needs analysis and studies/actions for their gradual substitution, with periodic updates of energy audits in the port operating companies;
- Integration of energy decisions within the Port of Livorno Energy Plan, with particular focus on energy and production networks safety, due to their proximity with urban areas.
THE TUSCAN PORT SYSTEM
AS A “SERVICE” FOR THE LNG CHAIN

OFF-SHORE
- Strengthening the position of the Tuscan Port System in the future
- LNG oriented Motorways of the Sea market

IN-PORT
- Reinforcing Livorno as a «Oil & Gas» port
- LNG energy production
- Widespread adoption of LNG powered vehicles
- The port as a knowledge provider in the LNG sector

ON-SHORE
- LNG Intermodal services (road/rail)
- Becoming a LNG hub for the land transport modes, through the adoption of ISO-Tank container

LNG NATIONAL TRAINING CENTRE

Industrial Partners
SUPPLYING FACILITIES

New functions for the OLT storing & regasification terminal: SSLNG operations

STORAGE & DISTRIBUTION FACILITIES

Small-scale facilities network for the Northern Tyrrhenian sea: Livorno as a hub port

TRANSPORT

Mini LNG carriers (1000-3000 m³)
Bunker barges (400-1000 m³)
Trucks/Trains/ISO containers (50-80 m³)

FINAL USERS

Rail & Road Transport
Industrial Facilities
Maritime Transport

Advantages of the Tuscan Port system LNG hub:

- Strategic positioning both for the maritime and the land transport sectors
- Offshore LNG storage, regasification AND bunkering facility
- Onshore small scale LNG storage and distribution facility
- LNG as energy source: a new cold ironing approach + energy surplus for terminals needs
- Intermodal LNG distribution via Iso-tank containers
A NEW APPROACH TOWARDS THE «COLD IRONING» PROCESS

FROM «QUAY ELECTRIFICATION»

TO «MOBILE AND MODULAR» LNG FUELED POWER UNITS

• LNG SUPPLY FROM
• ONSHORE STORAGE FACILITY
• ISOTANK CONTAINERS LOGISTICS

• MOBILE
• MODULAR
• LNG FUELED
• POWER GENERATOR

• MOBILE
• SEA-TO-LAND
• LAND-TO-LAND
• INTERFACE OR ADAPTER

• COLD IRONING:
  • CRUISERS
  • FERRIES
  • NEW SHIPS

• TERMINALS:
  • LIGHTNING
  • REEFER AREAS
  • ELECTRIC RTG AND VEHICLES

• Clean, versatile and low-cost energy for addressing port energy needs
- Initial Storage volume: 1500 m$^3$ corresponding to 675 tons
- Upwards scalability: up to 9000 m$^3$
- Annual number of supplies: 20 (during the startup phase)
- Annual number of bunkering operations: 25 during the initial phase, assuming a standard quantity of 1200 m$^3$ for each operation
LNG INTERMODAL DISTRIBUTION FACILITY

**FEATURES**

- ISO-compliant containers, worldwide std.
- Shorter handling time, versatility
- Low-level investments for starting up
- No need of refrigeration plants

**APPLICATIONS**

- LNG supplying for port/yard activities
- LNG supplying for power generation
- Possible use as tank for LNG ships
- LNG supplying for refuelling stations (road)
- LNG feeding for gas distribution networks

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**Dedicated truck service (container trailers)**

**Modularity and Adaptability**

**Maximisation of the storage capacity**

**A full intermodal approach**

**Dedicated ship service (container ships)**
A comprehensive, distributed, facility network for the training in the LNG sector, as required also in the Italian forthcoming law (at present, a decree-scheme) implementing Directive 2014/94/EU.

Livorno – Piombino – Interporto «Vespucci»: each subject will contribute with its own:
- Facilities
- Equipment
- Logistical resources
- Logistics spaces
- Livorno “test bench” for the LNG chain simulation.
FINANCIAL RESOURCES FOR LNG DEVELOPMENT

LNG «NEIGHBORHOOD»
- STUDIES
- NETWORK BUILDING
- SMALL PILOTS

LNG «RESEARCH»
- APPLIED RESEARCH
- PROTOTYPES
- TECH. STUDIES

LNG «SOCIETY»
- TRAINING
- HR DEVELOPMENT

LNG «DEVELOPMENT»
- TECH. STUDIES
- PROTOTYPES, PILOTS
- SMALL SCALE INFRASTRUCTURES

Autorità Portuale di Livorno

European Investment Bank

PORT OF LIVORNO
THANK YOU FOR YOUR ATTENTION!

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