

# France-Norway Technology Partnership

30 mai 2018

## Innovation in LNG bunkering



- LNG platform for marine and IWT presentation
- Status of LNG bunkering in France
- Key trends in LNG bunker fuel market developments
- Technology role for further market penetration
  - Jetty less loading (Trelleborg)
  - BOG management (Air Liquide)
  - Membrane containment systems (GTT)
  - Innovative LNG fuelling arrangement (Brittany ferries)
- Potential for further cooperation to be evaluated



# La Plateforme GNL

7 Membres fondateurs



26 Membres associés



- From 2011 to 2016 the benefits of LNG in shipping and mobility was evaluated by the Administration, with a positive view
- In April 2017 the LNG platform was created to promote LNG bunkering in France :
  - Animate the sector, in compliance with the rules of competition;
  - Assist in the setting up of projects, including if necessary to obtain financing;
  - Participate in the development of professional rules;
  - Ensure the conditions for a better competitiveness of liquefied natural gas in France.



# Status of LNG bunkering in France

- **LNG supply to Aida Cruise ships (power gen,)**

- Le Havre since 05/2016
- Marseille from 01/2018



- **15% of the worldwide LNG fuelled orderbook**

- Brittany ferries « Honfleur »
- GIE dragage Ports : «Samuel de Champlain» conversion and «Ostrea» new built
- CMA CGM : 9 large containerships
- Largest bunker vessel chartered by Total to MOL
- Ponant : luxury, hybrid polar cruise ship
- CFT (50%) bunker barge in Rotterdam inland port,

- France is a bit late on some points

- Poor LNG fuelled fleet on stream
- Few uncertainties in regulation
- Lack of refueling infrastructure

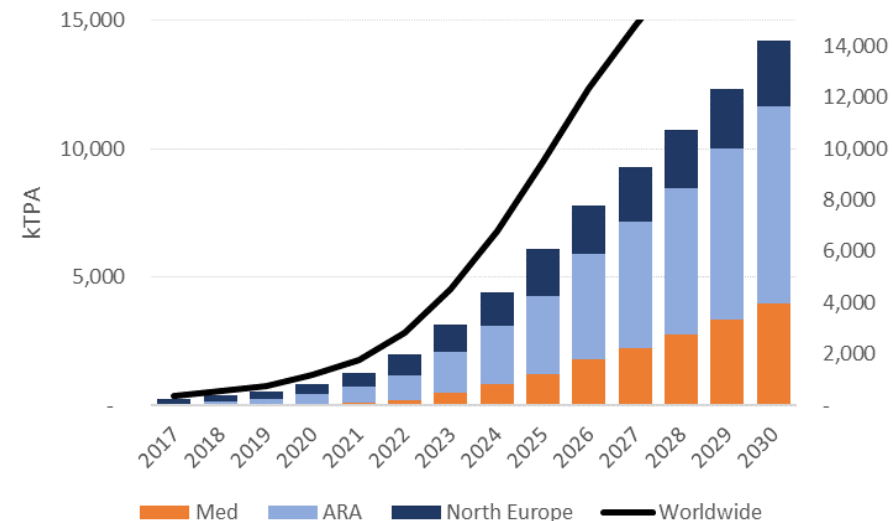
- ..but has strenghts

- Existing Large LNG terminals on Atlantic, Mediterranean and northern coastline
- Unique experience from engineering or operating companies and equipment makers
- Central position
- Recently, a strong political support
- Competitiveness of European gas prices

**We are very optimistic for huge development of LNG bunkering activities in France / Europe**

# LNG bunker fuel market main drivers

- LNG is the only alternative fuel available immediately, with proven technology and affordable
- LNG is compliant with stricter regulation on air pollution (NOx, PM) and GHG under consideration
- World LNG consumption expected to reach 10 MTPA in 2025, mainly in Europe (Total )
- Main Stake is to implement new infrastructure and reduce costs of logistics





# Technology role for further market penetration

## Jetty less loading (Trelleborg)

- Jetty less concept allows **cost savings** and shorter schedule
- Cryogenic hoses are key component of the concept
- Cryoline developed under CITEPH program by Trelleborg R&D center in Clermont-Ferrand
- The potential for small scale LNG units, including bunkering, is significant



# Technology role for further market penetration

## BOG management (Air Liquide)

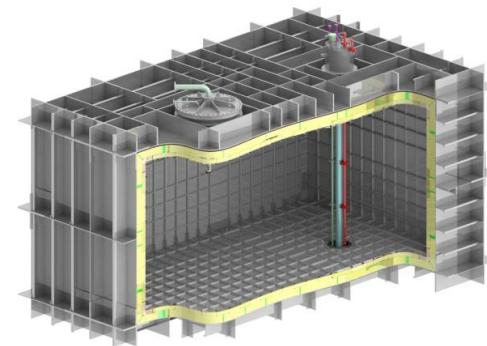
- BOG management required to **prevent from venting** (GHG)
- Turbo Brayton Subcooling system reduces BOG or remove it.
- Very compact, maintenance free (5 years) compressor
- Energy efficient and flexible : electric drive with Cryogenic expander power recovery
- Suitable for shipping or land based LNG storages,





## Membrane containment systems (GTT)

- **Cryogenic tank integration** is one of the main issue for ships design
- Membrane containment is proven and reliable (>90% LNG carrier orderbook)
- Most economical solution for large cryogenic tanks,
- New development underway to compete with Type C tanks
  - Exoskeleton
  - LNG Brick (self supporting structure with membrane inside)



# Technology role for further market penetration

## Innovative LNG fuelling arrangement (Brittany ferries)

- Key issues addressed : short call duration and lack of infrastructure
- Solution : LNG is provided by ISO containers on the upper deck of the ferry
- Main advantages :
  - Very flexible solution, easy to implement on a new built ferry
  - Low CAPEX for LNG logistics (only containers)
  - Provision for conventional large LNG tank when infrastructure is available



<https://youtu.be/BJVEAt7Yitg>



# Potential for further cooperation to be evaluated

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- Norway is also promoting LNG as a marine fuel.
- There is a potential to cooperate on :
  - LNG bunkering regulation in Harbours
  - Coupling / ERS improvment
  - Cost savings in the logistics chain
  - Improving GHG reduction toward new IMO target
  - ...

