

# Future Technological Challenges in LNG shipping

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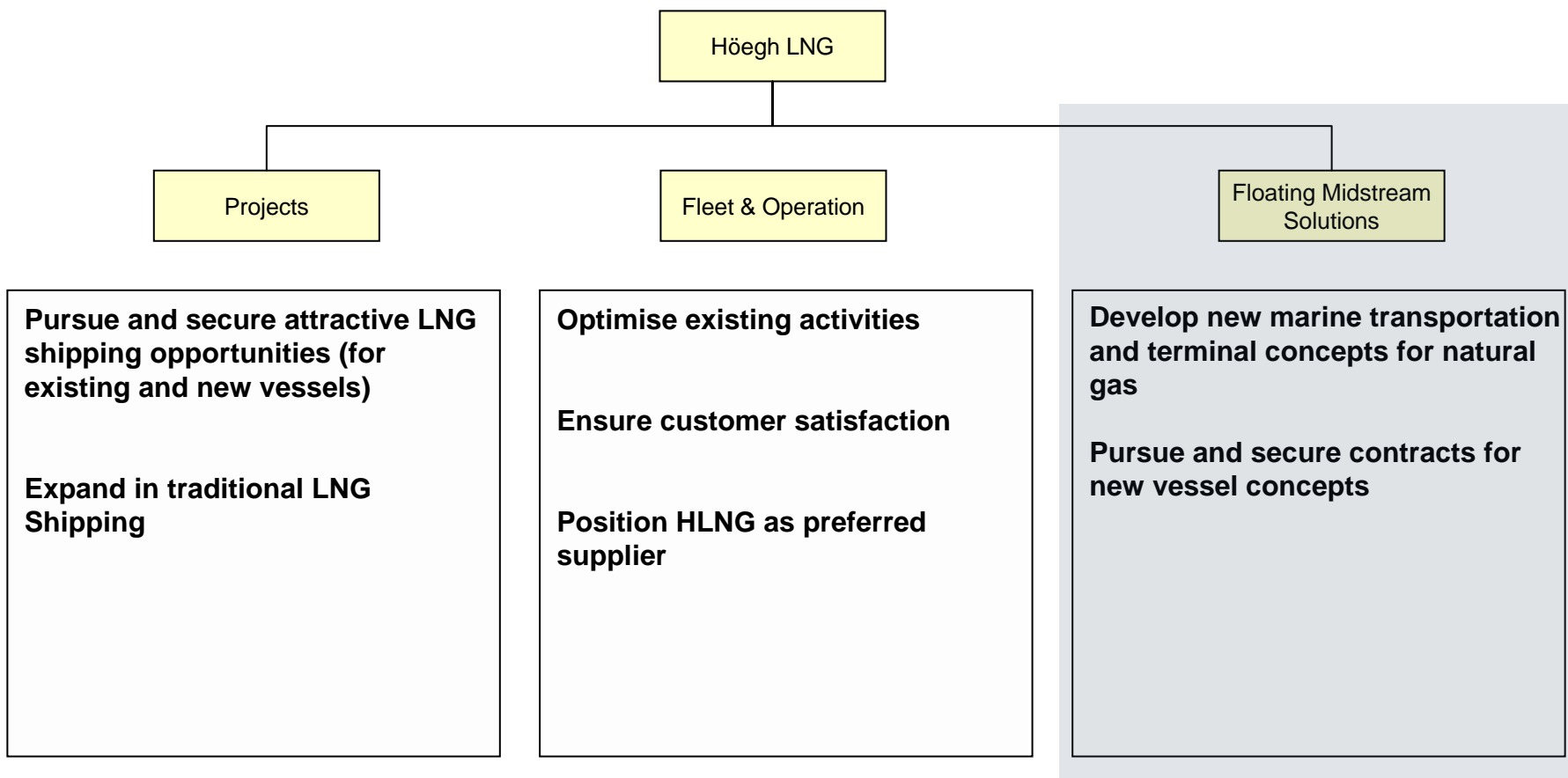
*LNG Journal - Norshipping 2005*

## Höegh LNG - background

- Independent shipowner and operator
- More than 30 years of LNG experience
- Currently operating 4 LNG carriers
- Taking delivery of 2 newbuildings early 2006
- Actively working at developing new marine terminal and transportation concepts

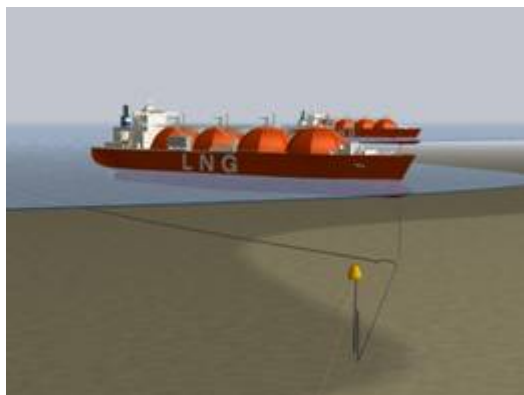


# Organization and focus



Our solutions...

## SRV



## FSRU

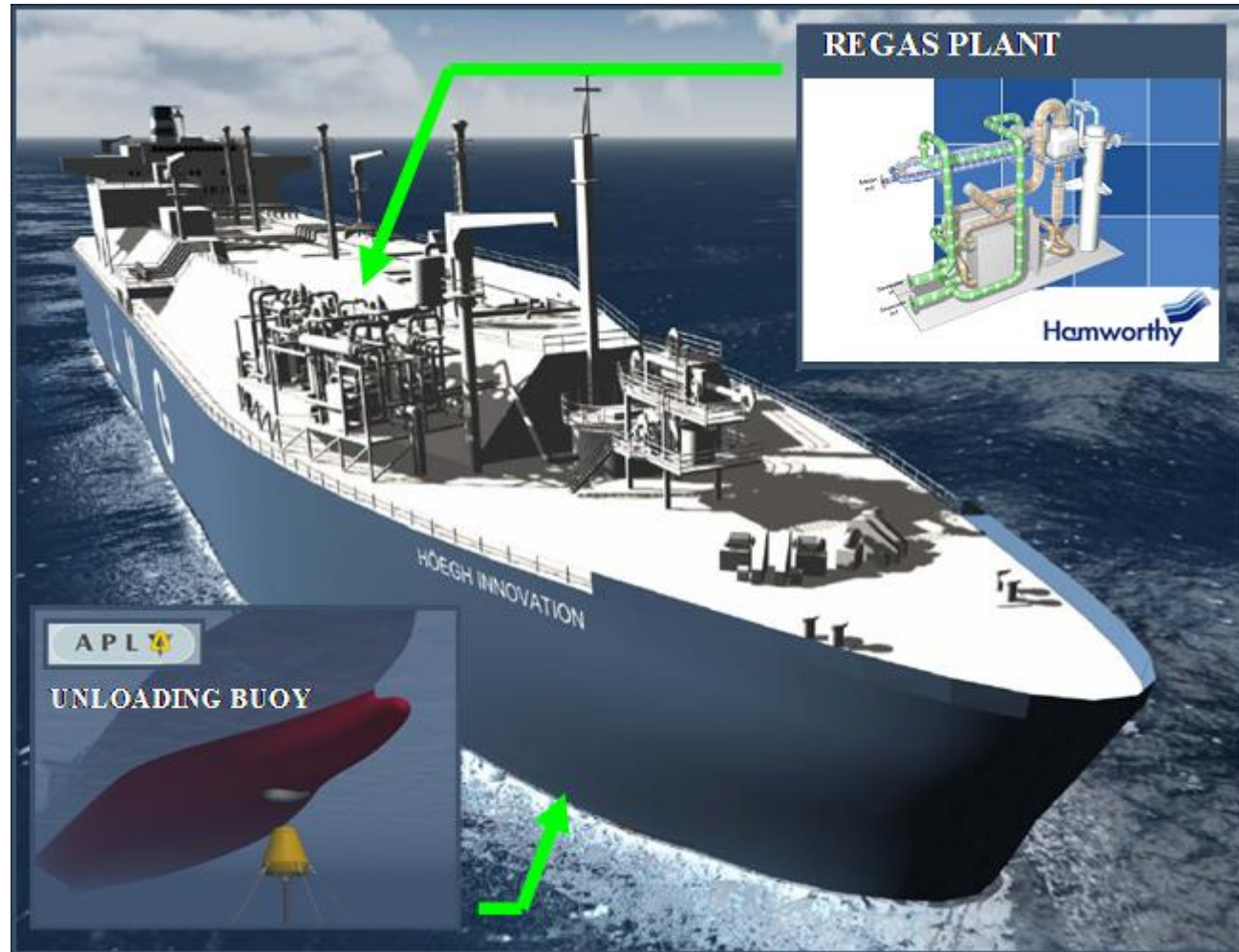


## CNG

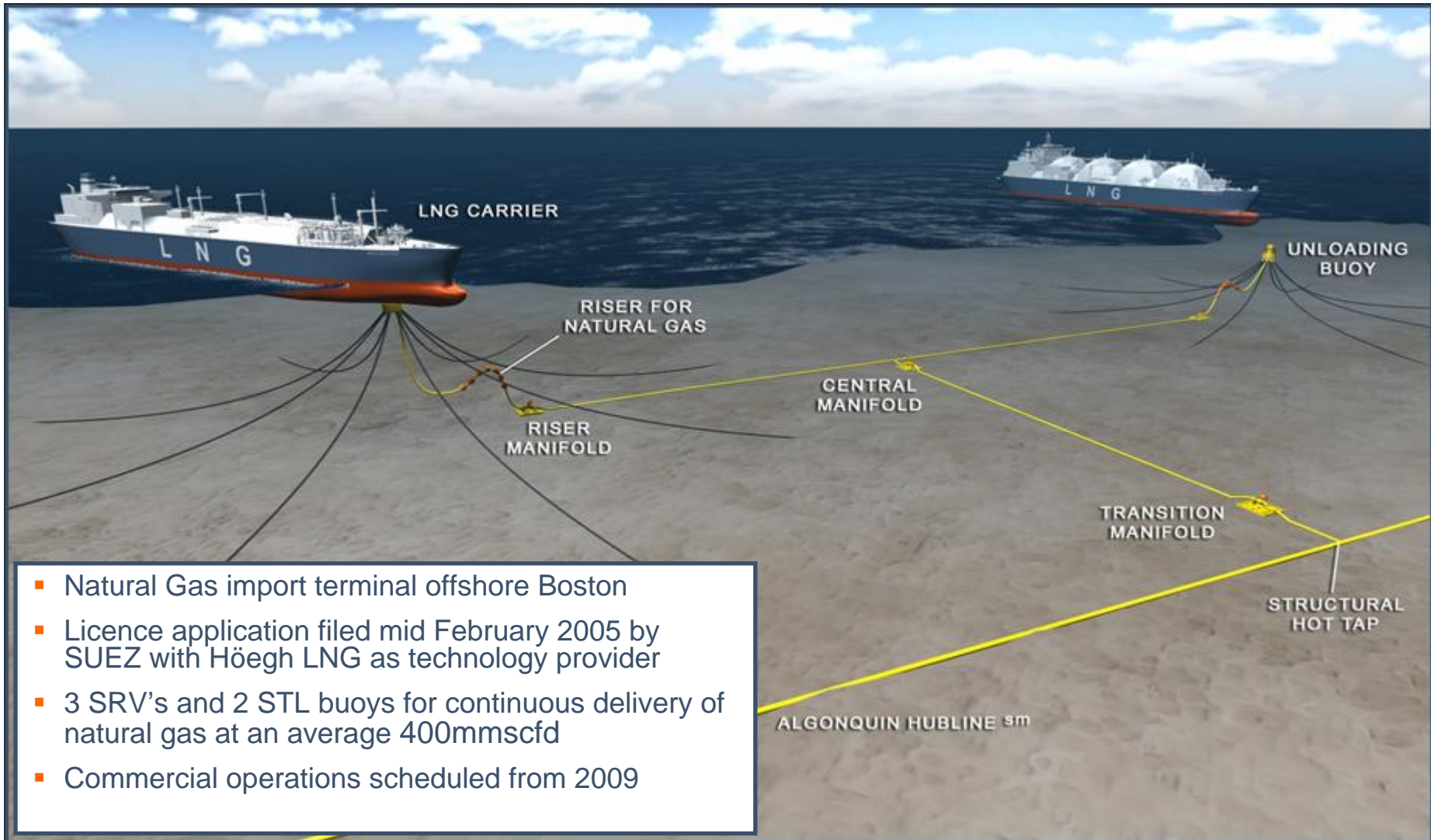


# LNG Shuttle and Regasification Vessel (SRV™)

- Development since 2001
- Modified LNG vessel
  - Regasification plant
  - Natural gas unloading system
  - NG odorization and metering
- Supplies natural gas to shore via risers and a subsea connecting pipeline
- Easy to locate offshore
- Environment friendly
- Economically competitive
  - Small to medium volumes
  - Small to medium distances
- For harsh wave environment



# Neptune LNG Project – Höegh's SRV technology applied



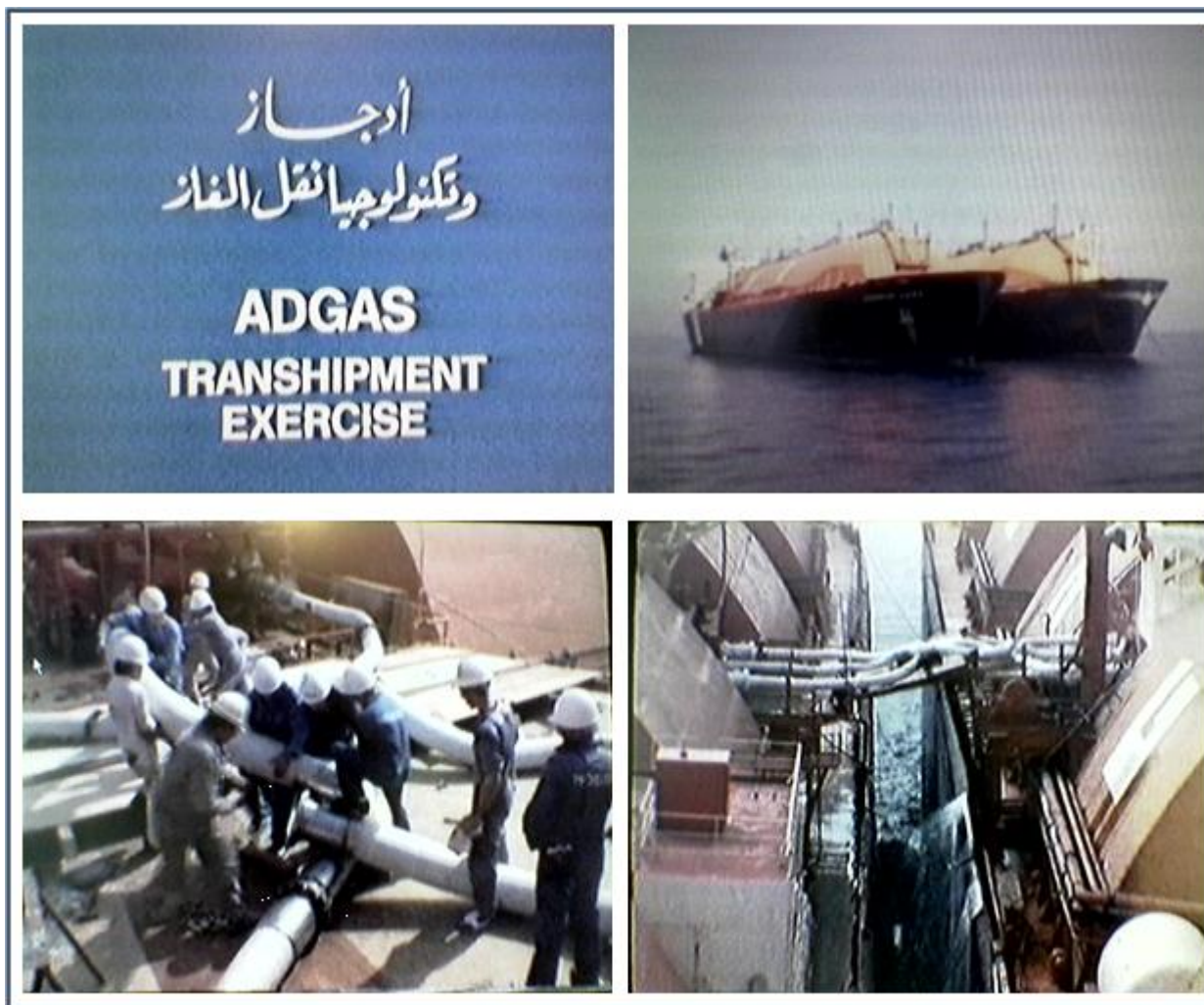
# Floating Storage and Regasification Unit (FSRU)



- Enlarged SRV adapted for use as FSRU
- Permanently moored on unloading buoy
- Receives cargo from LNGCs via ship to ship transfer system
- Economically competitive for
  - Medium to large volumes
  - Medium to large distances

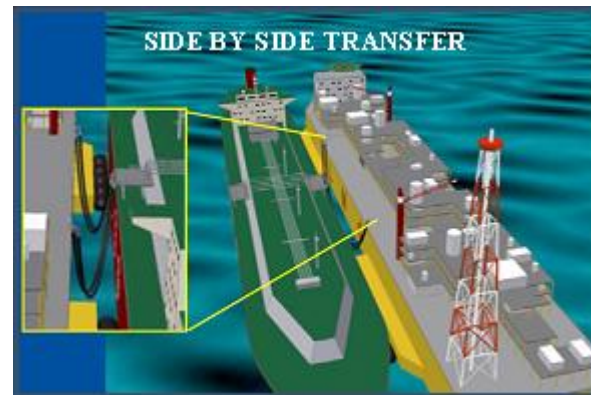
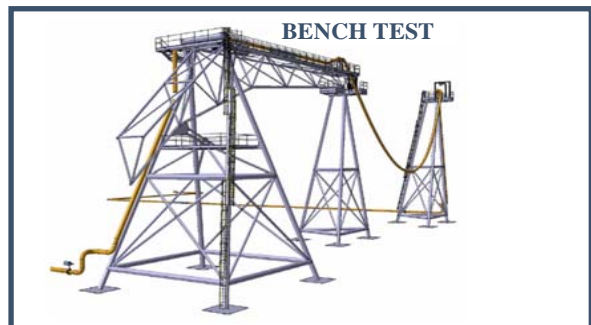
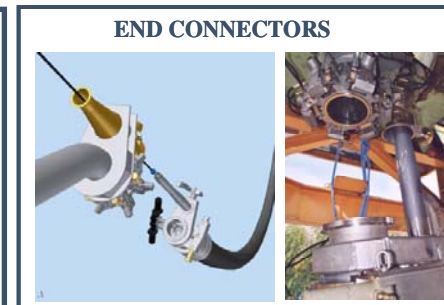
The missing link:  
Reliable ship to ship LNG  
transfer technology

# Arabian Gulf 1984



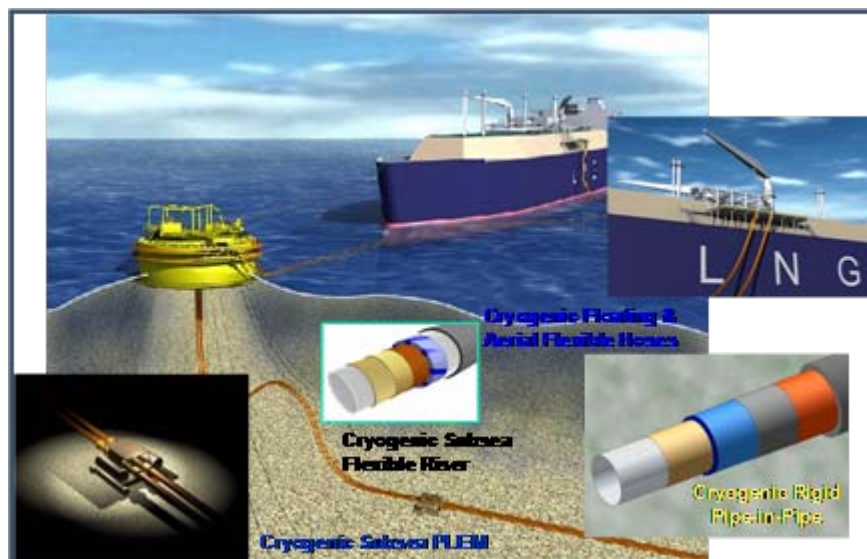
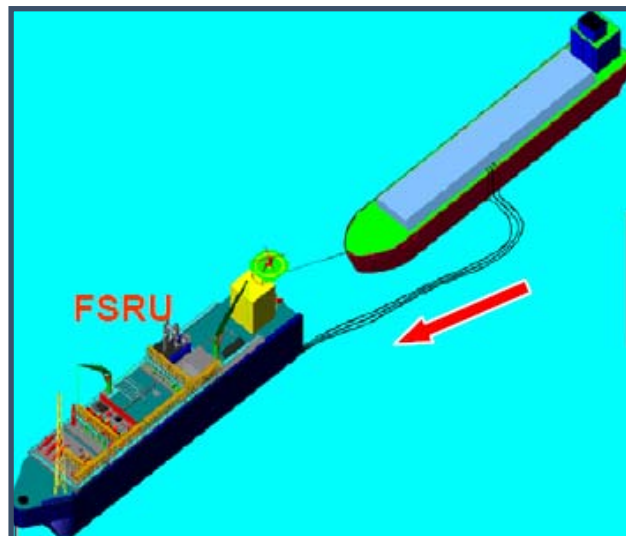
# JIP - Amplitude LNG Loading System (ALLS)

- Höegh LNG participation in development of LNG transfer technology
  - Flexible cryogenic hose by Technip
  - End connectors by KSB
  - Transfer architecture by EURODIM
- Qualification Air catenary early 2006
  - Bench test with LNG at Montoir LNG terminal
  - Ship to terminal transfer test at Montoir
- Enable side by side and tandem transfer in benign waters



# JIP – Floating Flexible

- Höegh LNG participation in development of floating flexible hose and sub sea cryogenic pipeline
  - Qualification scheduled in 2006
  - Enable ship to ship (tandem) transfer in harsh wave environment
  - Ship to shore transfer and offshore loading

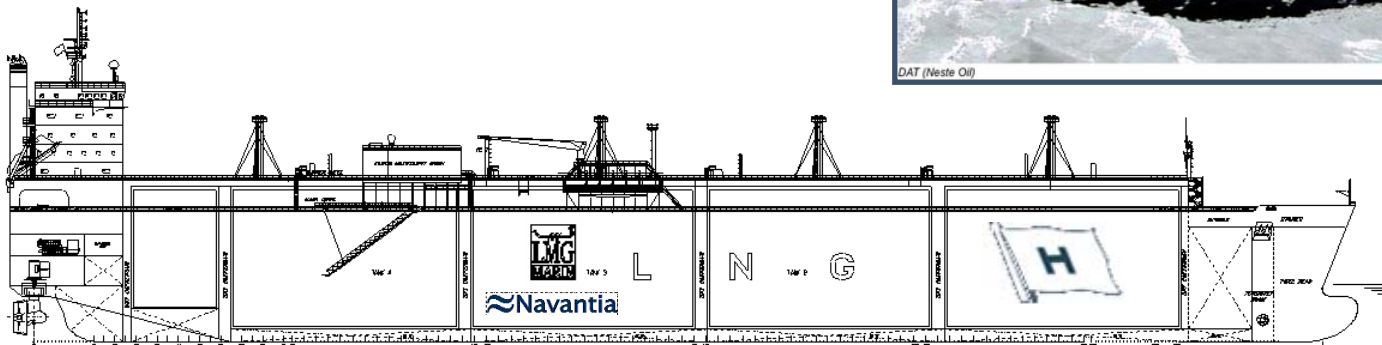
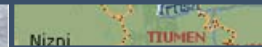


# Trends and technology drivers

- Future increase in LNG spot trading
  - Development of an alternative way of keeping the cargo tanks cold
- Increasing trade distances
  - Increased tonne mile potential of each vessel by increasing cargo carrying capacity and ship speed
  - More compact propulsion plants to free space for cargo
  - More focus on propulsion efficiency/fuel consumption
- For short trade distances
  - Increased tonne mile potential through reduced turn around time in port
  - Development of more efficient cargo handling equipment and operation procedures
- Sustained high LNG market price
  - Incentive to bring as much of the LNG as possible to the market
  - Reduced use of LNG fuel
- Arctic LNG development
  - Specialized ice strengthened or even ice breaking carriers designed to transport LNG out of the challenging environment of the Arctic

# Arctic LNG shuttle

- Höegh LNG study into a conceptual design Arctic LNG Shuttle
- Collaboration with LMG Marin and Navantia
- Investigate the viability of a shuttle and transshipment solution for Yamal LNG export
- Beam restriction for ice breaker escort service
- Draft limitations at liquefaction plant
- Maximize cargo carrying capacity within beam and draft restrictions



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