Liquefied Natural Gas – alternative fuel for transportation expanding into Danube region

Workshop on Modernization of Danube Vessels Fleet
Vienna, 18 April 2018

LNG in the Danube Region

- LNG Masterplan for Rhine-Main-Danube
- LNG for Upper Austria
- Projects in Slovakia
- Projects in Hungary
- Projects in preparation in Romania (Constanta & Galati)
LNG Masterplan: Terminals – Deployment & Concepts

- RHINE REGION ELABORATION OF TECHNICAL DESIGN AND OBTAINING PERMITS
  LNG BUNKER STATION IN THE PORT OF ANTWERP
  Capacity: 400 m³ of LNG
  Facilities: storage of LNG and CNG, bunkering inland ships with LNG, fuelling road transport with LNG & CNG
  Investment & operation: by concessionaire
  Start of operations: by January 2019

- RHINE REGION FEASIBILITY STUDIES
  CHECKING THE OPTIONS
  LNG INFRASTRUCTURE IN THE PORT OF MANNHEIM
  Capacity: 500 m³ of LNG
  Facilities: LNG storage, truck fuelling, vessel bunkering
  Estimated investment: 6-7 MEUR
  Operational costs/year: 250,000 EUR
  Interested investors are welcome

  LNG INFRASTRUCTURE IN THE PORT OF SWITZERLAND
  Capacity: 1,000 m³ of LNG
  Facilities: LNG storage, truck fuelling, vessel bunkering
  Estimated investment: 6-7 MEUR
  Operational costs/year: 250,000 EUR

- DANUBE REGION (FEASIBILITY STUDIES & DEPLOYMENT)
  LNG FLOATING TERMINAL IN KOMARNO (SLOVAKIA)
  Size: 126 x 24 m (L x W), Draught: 2 m
  Capacity: 12 x 350 m³ of LNG
  Facilities: LNG storage, vessel bunkering, facilities for other services, e.g. ship waste reception facilities, potable water, etc.

  LNG TERMINAL IN RUSE (BULGARIA)
  Bulmarket DM Ltd.
  Location: on the river Danube in the port area in Ruse, on the grounds of former heavy machinery building factory, on an area of 1,000 m²
  Capacity: 4 vertical tanks of 250 m³ of LNG (total 1,000 m³)
  Facilities: storage, vessel (un-) loading facility, truck-loading station, truck & vessel fuelling station

  LNG TERMINAL IN GALATI (ROMANIA)
  Capacity: 4,000 m³ in semi-pressurised tanks with option to increase up to 8,000 m³
  Facilities: LNG storage, truck fuelling, vessel bunkering
  Estimated investment: 17 MEUR

  SMALL SCALE LNG TERMINAL IN CONSTANTA (ROMANIA)
  Capacity: 5,000 m³
  Facilities: LNG storage, (un-) loading of (smaller) seagoing vessels, fuelling of inland vessels and trucks

www.lngmasterplan.eu
LNG PROJECTS IN DANUBE REGION – ONGOING & IN PREPARATION

- LNG Upper Austria
- fuELCNG project
- LNGAFT
- CNG Clean Fuel Box Project
- PAN LNG
- PAN-LNG-4-DANUBE
- LNG Terminal in Krk
- LBG: Fuelling Renewable
- Integrated project LNG for Galati
- Integrated project LNG for Constanta
LNG HUB IN UPPER AUSTRIA

- Exploitation of (fossil) natural gas resources in Upper Austria by small scale liquefaction
- **First LNG filling station for trucks in Austria** at Ennshafen already available
- Subsequently deploying a supply infrastructure at Ennshafen for **bunkering of inland vessels**
- Building a strong **bio-LNG component**
- Developing **LNG filling stations (L-CNG)** on further transport hubs in Upper Austria
- **Generating the demand for LNG** as an alternative fuel in trucking / food distribution / other market segments
- Originating a **critical number of LNG trucks** for market development
- Creating synergies along the LNG value chain
- Regional partners under lead of RAG AG, Ennshafen OÖ GmbH, Iveco Austria, trucking companies, et al.
PROJECTS IN SLOVAKIA

LNGAFT - LNG AS ALTERNATIVE FUEL FOR TRANSPORT
First pilot deployment of 1 LNG-fuelling open access point for road transport in Zvolen & 15 LNG mono-fuelled buses in Slovakia – first infrastructure in line with the Directive 2014/94/EU on the deployment of alternative fuels infrastructure.

TIME: 10/2016 – 12/2019
BUDGET: 5,036,700 EUR
PARTNERS:
• Danube LNG – EEIG – coordinator
• SAD Zvolen – public (bus) transport provider
CONTACT
• Robert Kadnar, kadnar@danubelng.eu
• Dusan Behun, behun@danubelng.eu

fueLCNG project
• Project applied for CEF Transport Call 2016
• Small scale LNG production plant (of assumed 1,25 ton/h production capacity)
• 3 large LNG stations for filling vehicles along the core TEN-T corridors with LNG fuel
• 14 L2CNG stations along the TEN-T core corridors on D1 and D2 highways.
• LNG logistics supply infrastructure (LNG semi-trailers) – creation of fueLCNG Virtual Pipeline with truck-to-ship and truck-to-truck filling
• Creating a pilot fleet of more than 50 vehicles running on LNG

Budget: 18,462,690 EUR (85% EU Financial Contribution)
Programme: CEF 2016 (2016-SK-TMC-0235-S)
Applicant: Slovenský plynárenský priemysel, a.s. (SPP)

LBG: FUELLING RENEWABLE TRANSPORT IN THE VISEGRAD COUNTRIES
Project applied for CEF Transport Call 2016. The aim is to support the transition from fossil fuels to the use of the renewable fuel Liquefied Biogas (LBG) for transport.
Develop a network of 20 fuelling stations (LBG/LNG) in Poland, the Czech Republic, Slovakia and Hungary, and an initial fleet of 225 trucks.

Budget: 32,443,103 EUR (85% EU Financial Contribution)
Programme: CEF 2016 (2016-SK-TMC-0320-S)
Applicant:
• ST Logistic s.r.o
THREE EU-FUNDED PROJECTS IN HUNGARY

PAN – LNG PROJECT
Studies, works & Pilot deployment for 5 L-CNG fuelling stations and one small scale liquefaction plant based on fossil gas wells & bio-methane sources .

TIME: 09/2014 – 09/2017
BUDGET: 16,983,290 EUR
Implementing Body & Contact:
• Hungarian Gas Transport Cluster Association (MGKKE)
• Henrik Domanovszky - domanovszky@panlng.eu

PAN-LNG-4-DANUBE
Making LNG available for Danube IWW transport at Csepel Freeport by deploying a fixed LNG refuelling station. Also fuelling trucks and possibly locomotives. In addition, retrofit of existing vessels for LNG propulsion.

TIME: 06/2016 – 09/2019
BUDGET: 7,097,150 EUR
Project Promotor:
• Ministry of National Development

CNG Clean Fuel Box Project
CNG availability & use at country level with “Clean Fuel Box (CFB)” that is a LCNG self-service, compact compressor & refuelling station able to refill CNG vehicles independently of gas network. Deployment of 39 stations & purchase of LNG feeder & natural gas vehicles.

TIME: 10/2016 – 12/2018
BUDGET: 11,615,100 EUR
Implementing Body & Contact:
• Hungarian Gas Transport Cluster Association (MGKKE)
• Henrik Domanovszky – domanovszky@panlng.eu
Pre-feasibility study and a preliminary design for a small-scale LNG terminal in the port of Constanta

**Location**
- Port of Constanta

**Functions**
- The considerations were made for a terminal of an initial capacity of 5,000 m³ with a future expansion up to a maximum of 10,000 m³. The layout includes a storage facility, (un-)loading facilities for maritime vessels, bunkering of inland vessels and fuelling of trucks. The chosen location will allow vessels with a draught up to 7 m.

**Technical solution**
- For its gradual expansion bullet-type horizontal storage vacuum-isolated tanks of 2,500 m³ each are recommended.

**QUICK FACTS**

**LNG small scale terminal:** 5,000 m³ (up to 10,000 m³) with LNG storage, (un-)loading of (smaller) seagoing vessels, fuelling of inland vessels and trucks.

**LNG regasification terminal (onshore):** 130,000 m³ (up to 260,000 m³) with regasification facility connected to the gas grid, (un-)loading of seagoing & inland carriers, bunker vessel supplying small-scale terminal and vessels

**CONTACT**
- Ion Stanciu, ion.stanciu@tts-group.ro
Proposed integrated project - LNG for Constanta

LNG Fuelling Stations & Vehicles in City
- L-CNG-fuelling stations
- LNG-fuelled Buses & Trucks

Project in preparation

LNG Terminal in Constanta Port
- Storage tanks
- Truck loading station
- Truck & railroad fuelling station
- Bunker Station Maritime & Inland Vessels

LNG-fuelled ferries to Georgia

©SOLBUS
©IVECO
©IVECO
©Navrom
©Shell
©SINARA Group
©Shell
© Pump Service

Danube - Black Sea Canal

©DANUBE MANAGEMENT GMBH
**LNG TERMINAL IN GALATI**

Pre-feasibility study and a preliminary technical concept for a LNG terminal in the maritime Danube area in Romania

**Location**
- Eastern part of the Port of Galati situated on the riverbank inside the Industrial Park Galati - area of 20,000 m². It has a convenient road access and is located in the vicinity of the Oil Terminal Galati (dangerous goods zone) and of other currently operating industrial areas (e.g. Damen Shipyard).

**Functions**
- A proposed LNG terminal with an initial storage capacity of 4,000 m³ (design capacity up to 8,000 m³) may offer a wide range of distribution: LNG bunkering for inland and maritime vessels, supplying LNG to road transport as well as to industries.

**Technical solution**
- Implementation of semi-pressurised tanks option in two phases is recommended, envisaging at first a LNG terminal with a capacity of 4,000 m³.

**QUICK FACTS**
- **Capacity**: 4,000 m³ in semi-pressurised tanks with option to increase up to 8,000 m³
- **Facilities**: LNG storage, truck fuelling, vessel bunkering
- **Estimated investment**: 17 MEUR

**CONTACT**
- Mrs Iumenita Meterna: hidro@apdmgalati.ro
Proposed integrated project - LNG for Galati

**L-CNG Fuelling Stations & Vehicles**
- IVECO
- L-CNG-fuelling stations
- LNG & fuelled Buses & Trucks

**Bio-methane Sources**
- Landfill
- Wastewater treatment facility

**LNG Terminal & Facility**
- Agro bio-methane production
- Small-scale LNG Terminal
- Liquefaction
- Bunker Station Maritime & Inland Vessels

Project in preparation
CHALLENGES FOR LNG IN DANUBE REGION

• **LNG supply to Danube** region is complex and more costly
  • regional fossil sources / liquefaction / pipeline gas
  • exploitation of high bio-methane potential

• **Multi-client strategy & combination of transport & energy projects** is essential
  • maritime & road sector, off-road sector
  • peak shavers, off-pipeline industrial clients add significant high market potentials for industrial fuel

• Significant **price gap LNG – Diesel essential** for sustainable business case
  • still extremely high prices for LNG equipment / standardized solutions / economies of scale
  • transparent and competitive pricing of LNG required

• Despite “proven technologies” **technical challenges for inland vessels** significant

• **Retrofitting** makes sense for certain types of vessel (e.g. container vessels, tankers) but requires **public co-funding & facilitation of finance** due to structural shortcomings of sector

• **Lack of public support schemes & severe restrictions of EU programs to fund critical mass of LNG vehicles**

• Politicians/Authorities tend to **overestimate safety risks** of LNG & **underestimate contribution to air emissions reductions** – more information needed

• **Future taxation policy of LNG** as transport fuel in several countries not predictable on mid/long-term perspective for road transportation
And by the way when talking about trucks…

<table>
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<th>Range</th>
<th>Urban</th>
<th>Regional</th>
<th>Light Off-Road</th>
<th>Mid Distance</th>
<th>(International) Long Distance</th>
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<td>Parallel Hybrid</td>
<td>Plug-in Hybrid</td>
<td>CNG Bio CNG</td>
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<td>No benefit</td>
<td>Not feasible</td>
<td>+++</td>
</tr>
</tbody>
</table>

+++ Benefit for environment

… LNG is ONE alternative but **for HDV** it is the ONLY ONE which is economically feasible, now and for the next decade

[LNG HD Truck € 130.000 (range 1.500 KM / Full Electric € 325.000 (range 200 KM (Status 2017))]
LNG TERMINAL IN KRK/CROATIA – Possible LNG source

Scope:
• Stage I: FSRU based LNG terminal in Krk/Croatia
• Stage II: On-shore LNG terminal by retaining and upgrading the benefits of the FSRU solution

Location:
• Northern part of the Island of Krk, within the Municipality of Omišalj

Capacity & Facilities:
• FSRU with a storage capacity of 150,000 - 180,000 m³
• Dedicated jetty and auxiliary systems
• Connecting high pressure pipeline

Project submitted & funding awarded:
• Second 2016 CEF Energy Call for Proposals
Further Information & Contact

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