



MASTERPLAN
FOR RHINE-MAIN-DANUBE

MASTERPLAN FOR LNG ON RHINE-MAIN-DANUBE AXIS

BUILDING A PIONEER MARKET AND LNG ARTERY FOR
EUROPE



RATIONALE FOR LNG IN IWT

- **Environmental drivers**

- LNG as fuel reduces air emissions (-10-20% CO₂, -80-90% NO_x, almost zero PM & SO_x)
- Further CO₂ reduction possible by “blending” (balance) with BIO-LNG

- **Economic drivers**

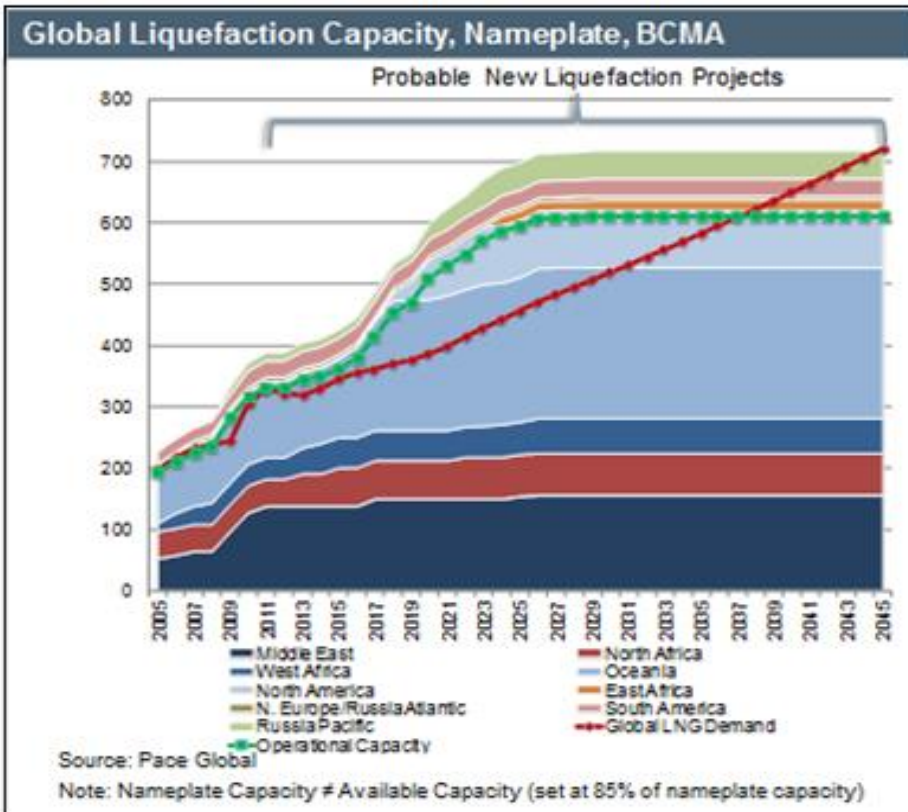
- Price gap Gasoil - LNG and estimated price reduction for LNG due to massive production increase; favourable payback time of investment; significant reduction in fuel consumption; fuel cost savings result into higher profitability/lower transport costs
- LNG as cargo will increase transport volumes and will offer energy cost savings to many industries along the Rhine-Main-Danube axis; reduces oil dependency and supports diversification of energy mix

- **Regulations**

- **EU Directive on Deployment of Alternative Fuels Infrastructure** (approved April 2014) demands deployment of LNG fuelling infrastructure (in a sufficient number of maritime ports till 2025, inland ports till 2025, core road network till 2025 & common technical standards for CNG and LNG refuelling points by 2015)
- **Future air emission regulation:** “LNG most effective measure to reach Stage IV for medium and large inland vessels” (NAIADES 2/Panteia-NEA report)
- **ECA/SECA regulation which** fosters built-up of LNG infrastructure in NW-Europe and development of Small Scale LNG Supply Chains

SURPLUS IN LNG SUPPLY

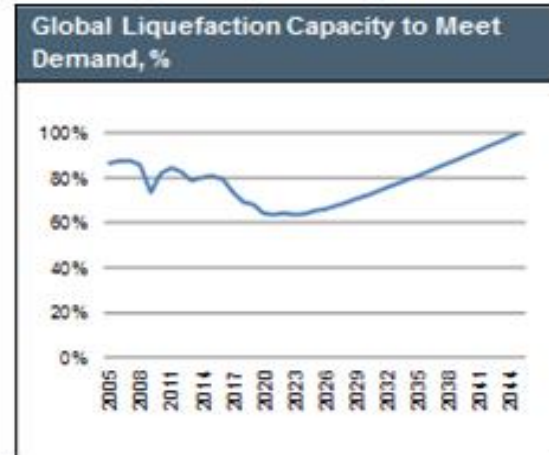
Global Liquefaction Capacity Margins Will Widen until the Mid 2020s



Global liquefaction capacity reached 404 BCMA in 2012

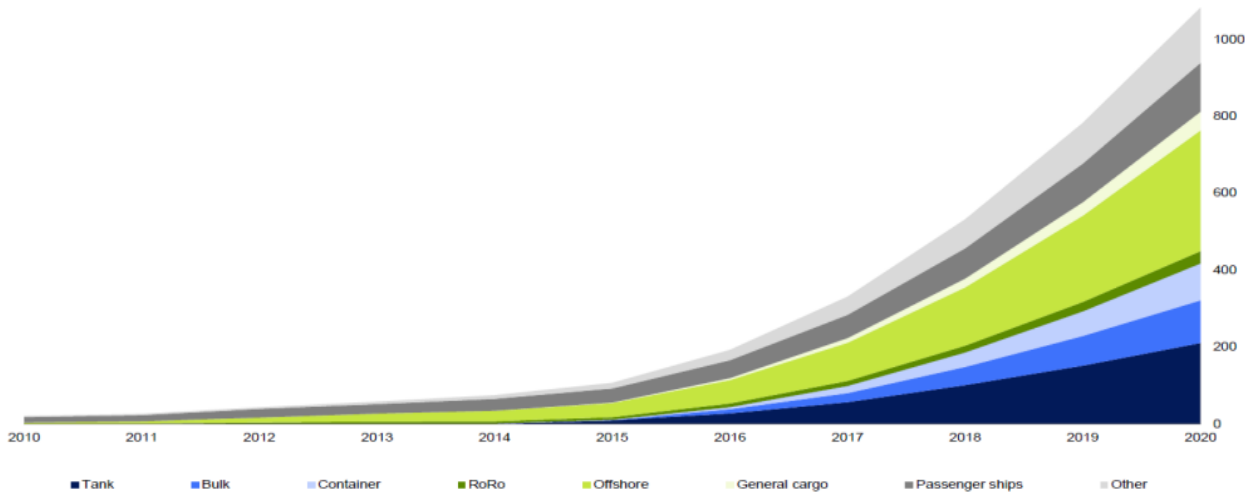
- Global LNG trade volumes reached 328 BCMA, or approximately 81 percent of capacity

Global liquefaction capacity margin is expected to drop to 64 percent in 2020 before rising to 90 percent by 2040

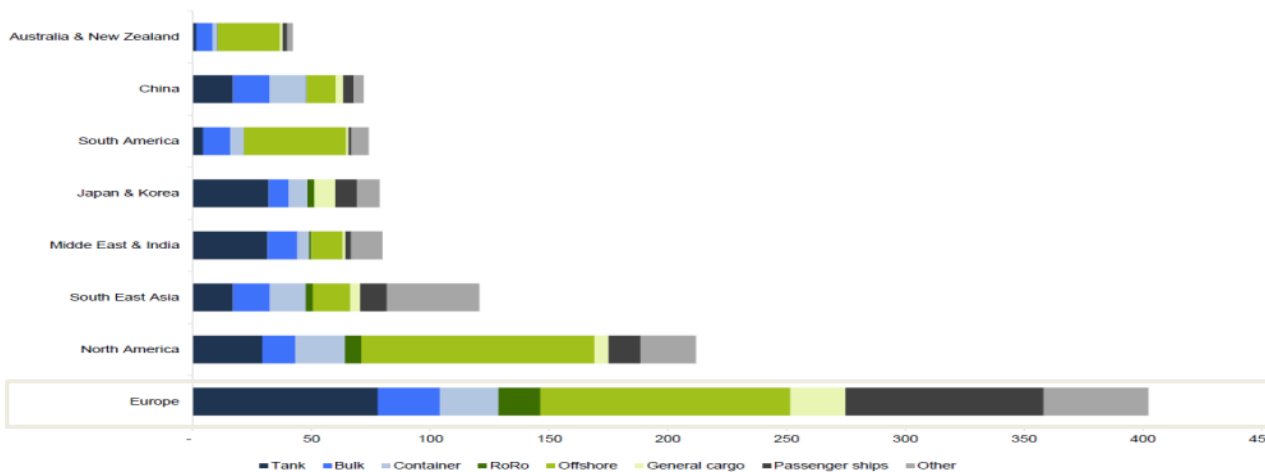


400 LNG-FUELED VESSELS IN OPERATION THROUGHOUT EUROPE BY 2020

LNG fuelled vessels worldwide & per region per shiptype [#]



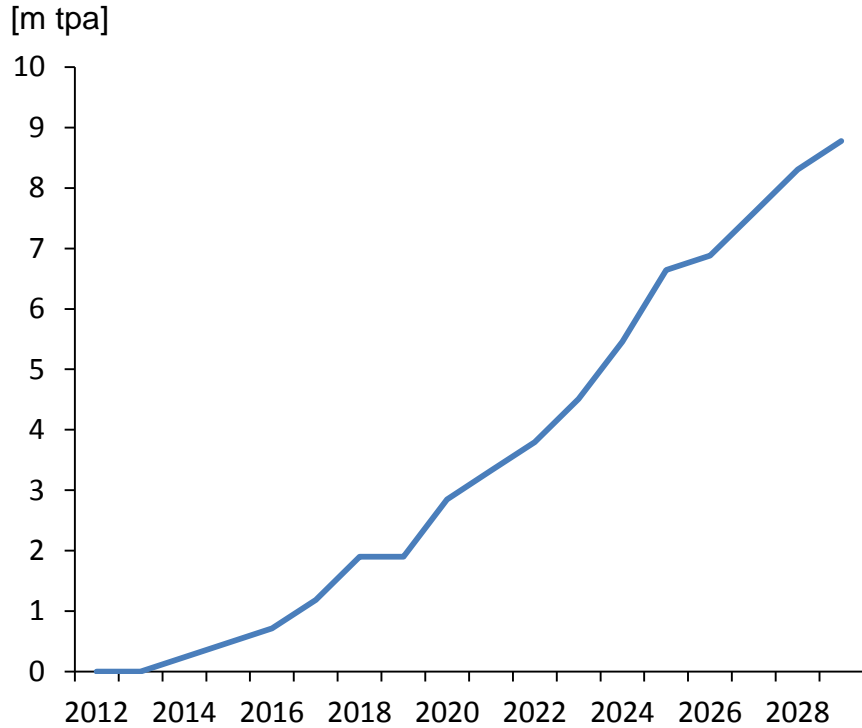
- DNV expects 1.000 vessels to be running on LNG by 2020 of which 400 will operate in Europe



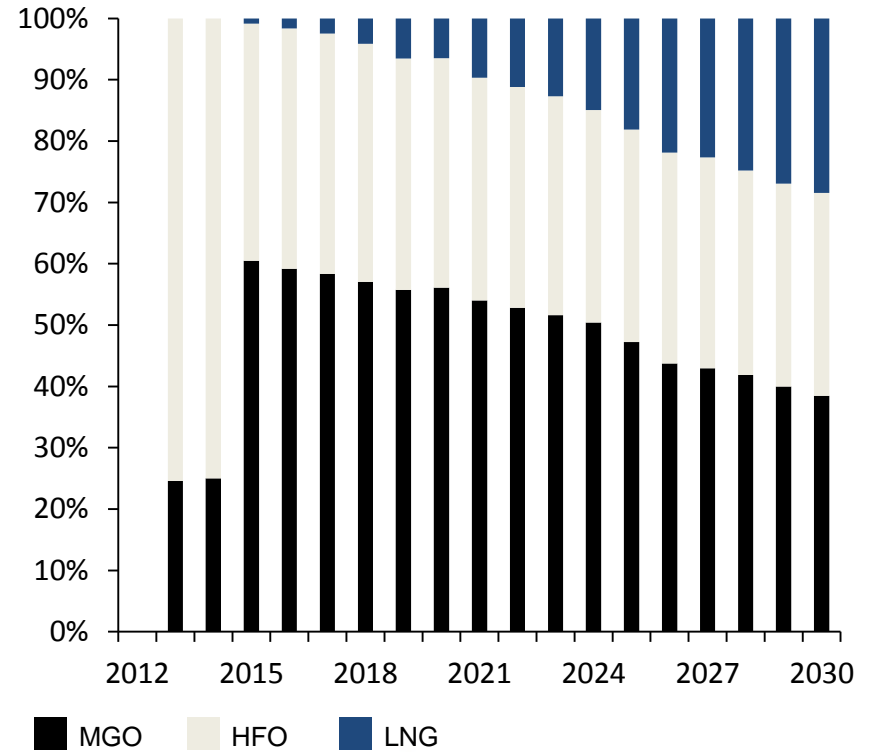
LNG EXPECTED TO ACCOUNT FOR CA. 25% OF OVERALL FUEL MIX BY 2030 IN NWE

Market forecast (WoodMacKenzie 2014)

Volume LNG bunker market North Western Europe [tpa]



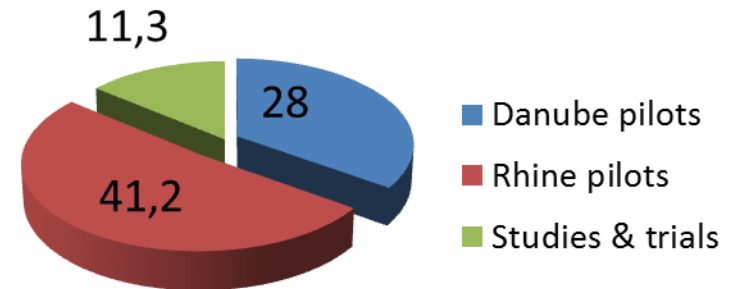
Share LNG in total bunker market North Western Europe



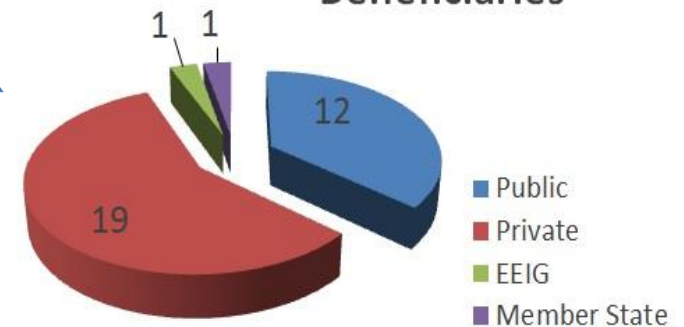
LNG MASTERPLAN – KEY FIGURES

- **Programme:** TEN-T Multi-annual Call 2012
- **Timeframe:** 1 January 2013 - 31 December 2015
- **Est. investment:** approx. 120 mil. EUR
- **Budget (eligible costs):** 80,5 mil. EUR
(out of which 69,2 mil. EUR are dedicated to pilot activities)
- **EU funding:** 40,25 mil. EUR
- **Beneficiaries:** 33 EU-funded organisations
(majority from private sector) and 1 Non-EU funded organisation
- **Special endorsement:** by several Ministries of Transport and CCNR
- **Non-funded partners:** more than 50 public/private organisations participating in IRG and AG

Budget (mil. EUR)

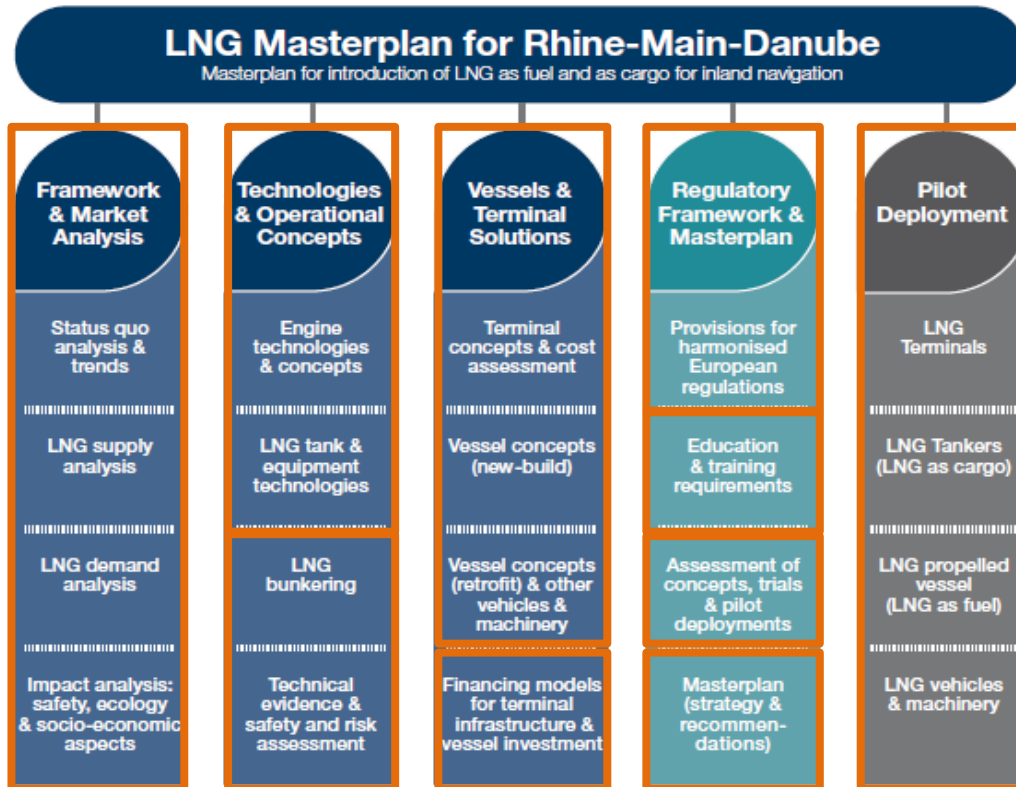


Beneficiaries



LNG MASTERPLAN – WORK STRUCTURE

Work plan



Comments

- Identify **supply options** & quantify **pioneer markets** in the hinterland of inland ports
- **Elaborate technical concepts** for inland navigation sector by investigating & assessing of innovative engine, or LNG tank & equipment technologies
- Facilitate the creation of a harmonised European **regulatory framework** considering LNG as fuel and as cargo for inland navigation
- Deliver & assess **technical concepts** for new and retrofitted vessels & terminals & execute **pilot deployments** (investments) & looking into **finances**
- Develop a **comprehensive strategy with a detailed roadmap for the implementation of LNG in line with the EU policies in transport, energy and environment** → wide scale deployment

LNG IS FUEL AND ENERGY RESOURCE

LNG SUPPLY CHAINS TO INDUSTRIAL HEARTLANDS OF EUROPE



Project Partner Site Existing / planned Terminal

Rhine/Meuse-Main-Danube: LNG ARTERY FOR EUROPE

Inland navigation functions as pioneer consumer and facilitator

© Pro Danube Management GmbH

BENEFICIARIES (PROJECT PARTNERS)

A3PS - Austrian Agency for Alt. Propulsion Systems
 Erste Group Bank AG
 EVN AG
 FH OÖ Forschungs & Entwicklungs GmbH
 Pro Danube Management GmbH
 Schönherr Rechtsanwälte
 LINZ AG

AT

Gemeentelijk Havenbedrijf Antwerpen

BE

Bulmarket DM Ltd.

BG

Asociace NGV o.s.

CZ

DST Entwicklungszentrum für Schiffstechnik und
 Transportsysteme e.V.
 Germanischer Lloyd SE
 Universität Duisburg Essen
 Staatl. Rhein-Neckar-Hafengesell. Mannheim mbH

DE

Port autonome de Strasbourg

FR

Bernhard Schulte (Cyprus) Ltd

CY

Chemgas Barging S.ar.l

LU

Argos Bunkering B.V.
 Chemgas Holding B.V.
 DCL Barge B.V.
 Havenbedrijf Rotterdam N.V.
 Stichting STC-Group
 Kooiman Marine B.V.
 Veka Mariska BV
 Bodewes Binnenvaart B.V.

NL

National Company The Maritime Danube Ports
 Administration, Galati
 Ceronav
 Navrom S.A.
 Transport Trade Services S.A.
 University of Craiova

RO

Danube LNG (EEIG)
 Výskumný ústav dopravný, a. s.

SK

Ministero delle Infrastrutture e dei Trasporti

IT

ADVISORY GROUP & INDUSTRY REFERENCE GROUP

Industry Reference Group

- Air Liquide Advanced Technologies (FR)
- Anthony Veder LNG Shipping B.V (NL)
- Batini Traverso Consulting Ltd. (UK)
- Bomin Linde LNG GmbH & Co. KG (DE)
- Bulgarian River Shipping JSCo (BG)
- Caterpillar Marine Power Systems (DE)
- Connect LNG AS (NO)
- Cryonorm Systems B.V. (NL)
- DNV Kema Nederland B.V. (NL)
- Energy Valley Foundation (NL)
- Enovos Luxembourg S.A (LU)
- Ennshafen OÖ GmbH (AT)
- Galli and associates Marine and Port Consultants (UY)
- Gas-und Wärme Institut Essen e.V. (DE)
- Gaztransport & Technigas Sas (FR)
- GAZU GmbH
- ICS Danube Logistics SRL (MD)
- Inros Lackner SE (DE)
- LIQUIND (DE)
- LNG Europe B.V. (DE)
- Mercurius Shipping Group (NL)
- MOL Hungarian Oil and Gas Plc. (HU)
- MTU Friedrichhafen GmbH (DE)
- N.V. Nederlandse Gasunie (NL)
- National Company “Maritime Ports Administration” Constanta (RO)
- NAVMAR Inc. SRL (RO)
- Netherlands Organisation for Applied Scientific Research - TNO
- Odessagaz (UA)
- OMV Gas & Power GmbH (AT)
- Port of Amsterdam (NL)
- Pöyry Deutschland GmbH (DE)
- PMSC S.A. (CH)
- QaGroup Holding B.V. (NL)
- Remontowa LNG Systems Sp (PL)
- SEATECH Engineering Ltd. (PL)
- Shipyard ATG Giurgiu (RO)
- Steel Trans s.r.o. (SK)
- Stevas Shipping (BE)
- Stroje a Mechanizmy, a.s. (SK)
- TIS Group of marine terminals (UA)
- Vanzetti Engineering Srl
- via donau – Österreichische Wasserstraßen GmbH (AT)
- Wartsila Netherlands B.V. (NL)
- Westport Innovations Inc. (FR)
- Worldenergy (CH)

Advisory Group

- Bundesministerium für Verkehr, Innovation und Technologie (AT)
- Bundesverband Öffentlicher Binnenhäfen (BÖB)
- Bureau Veritas
- Central Commission for the Navigation on the Rhine (CCNR)
- Duisburger Hafen AG
- European Barge Unit (EBU)
- European Federation of Inland Ports (EFIP)
- European Transport Workers’ Federation
- European Skippers’ Organisation (ESO)
- Inland Navigation Europe (INE)
- International Sava River Basin Commission
- Lloyds Register EMEA
- Ministerie van Infrastructuur en Milieu (NL)
- Ministerstvo dopravy (CZ)
- Ministerstvo dopravy, vystavby a regionalneho rozvoja (SK)
- Ministerul Transporturilor (RO)
- Ministry of Transport, Information Technology and Communications (BG)
- Port Authority Osijek (HR)
- Port of Switzerland (CH)
- Romanian Inland Port Union (UPIR)
- Secretariat of Danube Commission (HU)

OUTPUT FRAMEWORK & MARKET ANALYSIS

FRAMEWORK

Status Quo Analysis & Trends (SuAc 1.1)

- Stakeholder analysis & LNG small scale logistics analysis
- LNG in maritime (status /trends)
- LNG in inland navigation (status /trends)
- LNG in road transport (status/trends)
- Existing & future emission regulations (IWT)
- Gap analysis & trend assessment

Completed in Q1/2015 (D 1.1.1)

Impact Analysis (SuAc 1.4)

- Safety – summary of properties, hazards, safety regulations & incidents connected to LNG
- Ecology – current state & tendency of transport, its impact on enviro & enviro efficiency of transport (trends)
- Socio-economic aspects

Completed in Q4/2014 (D 1.4.1)

MARKET - Danube

LNG Supply Analysis-Danube (SuAc 1.2)

- Global Energy Market
- Specific European Energy Market
- Supply Chain Scenarios & SWOT analysis
- National Supply Analysis (AT, SK, DE, BG, RO)

Expected in Q2/2015 (D 1.2.2 - Danube)

LNG Demand Analysis-Danube(SuAc 1.3)

- Methodology (Feb 2014)
- National & regional results of demand studies (DE, AT, BG, CZ, SK, HU, IT, RO)
- Visibility events (AT Jul 2014, others)
- Evaluation workshop (to be in Q2/2015)

Completed in Q1/2015 (D 1.3.1.1 - Danube)

MARKET - Rhine

Rhine region study

(Port of Rotterdam, Antwerp, Mannheim, Strasbourg, Basel)

[Contracted June 2014: Pace, Buck, TNO]

- Literature review LNG in shipping (SuAc 1.1 - completed in Q4/2014)
- Supply chain analysis & assessment of options for the Rhine corridor - different sourcing options for LNG and the different supply chain options along the Rhine corridor (SuAc 1.2)
- Elaboration of dynamic model, development and deployment scenarios will be generated for the Rhine Ports Group (SuAc 1.3)
- Brochure “Facts & figures for LNG as fuel and cargo in inland navigation” (SuAc 1.4)

Expected in Q2/2015

OUTPUT SAFETY & REGULATORY FRAMEWORK

Activity 2.3

LNG bunkering (D 2.3.1) addresses:

1. Overview of regulatory framework
2. LNG bunkering procedures

LNG (un)loading (D 2.3.2) addresses:

1. Difficulties between LNG vessel & shore connections & provides overview of regulatory framework
2. Standardised installations for LNG (un)loading
3. Standardisation scenarios & procedures for (un)loading LNG

Activity 2.4

Safety & Risk Assessment addresses:

1. Comparison of risk assessment tools used in the Rhine Ports (D 2.4.1)
2. Study on operational safety & nautical conditions with regard to LNG bunkering in the Rhine Corridor (D 2.4.2)
3. Risk comparison of different bunker scenarios (D 2.4.2)
4. Emergency & incident response study (D 2.4.4)

Rhine Ports' studies

- A. „LNG bunkering and LNG loading and unloading: technical evidence, safety and risk assessment leading to provisions for harmonised European regulations“ [DNV GL]
- B. „Emergency & incident response“ [Falck/Gezaemnljke Brandweer]
- C. “Recommendations on Police Regulations” covering (i) overview of existing local & international police legislation, (ii) consultations to CCNR, (iii) recommendations on adjustment of Police Regulations [Claire Groenewegen]

Expected: Q2/2015



Official publication of “**Emergency & incident response study & Guidelines & recommendations**” on 15 April 2015 in Mannheim

ICGR Group “International Coordination Group on Regulatory adjustments” was established ... (Kick-off in Apr 2014)

1. To create a platform addressing the LNG related regulatory issues
2. To support the regulatory bodies with expertise on defined LNG related topics addressed by LNG Masterplan
3. To elaborate set of guidelines & recommendations based on input from studies delivering:
 - ... Study on bunkering regulations (D 4.1.2)
 - ... Study on port regulations (D 4.1.3)
 - ... Study on police regulations (D 4.1.4)
 - ... Report on guidelines & recommendations for emergency response organisations (D 4.1.5)

Activity 4.1

Harmonised regulatory framework is of utmost importance for a safe & effective transport of LNG as well as for LNG bunkering.

Keeping LNG's safety records high through Education & Training



- Gather information
- Identify professional profile with respect to various staff categories

- Elaborate common curricula on OL & ML based on the applicable legislation
- Include into the European framework of the PLATINA Tables of Competencies

- Develop training material for several staff categories to ensure full coverage of a logistics chain involving LNG
 - *(crew, terminal & bunkering personnel, company & management personnel, inspectors, students)*

- Pilot training according to the developed E&T standards with the help of the elaborated E&T materials

- Specification, pilot implementation & integration into the educational & training programme

Column 1	Column 2	Column 3	Column 4
COMPETENCE	KNOWLEDGE, UNDERSTANDING AND PROFICIENCY	METHODS FOR DEMONSTRATING COMPETENCE	CRITERIA FOR EVALUATING COMPETENCE
To describe the main physical properties of LNG	K, U <ul style="list-style-type: none"> • Explain what is LNG • Explain how LNG differs from other marine fuels • State the storage temperature • State the flashpoint, Lower Explosion Limit, Upper Explosion Limit and auto-ignition temperature of LNG 		
To describe environmental properties of LNG	K, U <ul style="list-style-type: none"> • Recognize the environmental impact of an operational release of LNG as compared to a release of a similar quantity of CO₂ • Describe the effects of losses of methane in the combustion process • Describe the advantages / disadvantages to use LNG 		

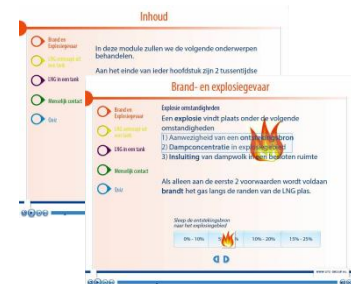
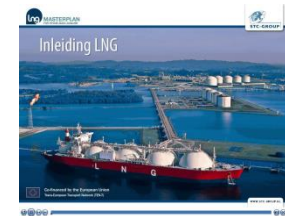
Table of competence



LNG for bunkering personnel, CERONAV, 21-24 Jul 2014



150's certification for LNG as fuel, STC, October 2014



TERMINAL CONCEPTS & PILOTS

Rhine

LNG Bunker Station for inland vessels in NW Europe by Port of Antwerp

Location selected, preliminary study, risk assessment & technical concept finalised, EIA screening completed in Feb 2015 & application for environmental permit submitted. Derogation from national legislation to produce CNG from LNG and not from local gas grid → available. Tender for construction & for operation → on-going

Pilot deployment expected: Q2/2016.

Port of Mannheim & Switzerland (case study)

Tender for the risk and cost assessment of LNG bunker stations in ports → launched in Jun & contract concluded in Dec 2014.

Outcomes expected in Q2/2015.

LNG terminal in Komarno in Slovakia by Danube LNG (feasibility study)

First drafts of terminal available (3 locations identified), incl. risk assessment, safety zone definition & project impact on the environment. Negotiations with City Council → on-going. Outcomes expected in Q4/2015 (incl. land-use planning documentation, EIA, HAZOP, CBA & planning permission)

LNG terminal in Ruse in Bulgaria by Bulmarket (pilot deployment)

Storage for LNG, bunkering for vessels, trucks, peak shaving unit, 4x250m³

Conceptual & preliminary design, together with planning permission → ready. Detailed Site Development Plan & HAZID → ready. Civil works started in Feb 2015.

Pilot deployment expected: Q4/2015.

Port of Galati by APDM (pre-feasibility study)

Pre-feasibility study regarding the development of LNG terminals on the Romania Maritime Danube was finalised in Dec 2014 and included selection of location(s) & scale, assessment of investments for LNG facilities & equipment needed.

Port of Constanta by TTS (feasibility study & technical design)

Pre-feasibility study & preliminary technical design for a LNG Small Scale Terminal, analysis of financing scenarios & identification of potential investors subcontracted in Nov 2014.

Outcomes expected in Q3/2015.



Danube



Co-financed by the European Union
Trans-European Transport Network (TEN-T)

VESSELS – PILOT DEPLOYMENTS

Rhine

DCL Barge B.V. (Danser Group)

Retrofitted container vessel with LNG used as propulsion

Area of operation: Rhine - ARA to Basel

Delivered in June 2014



Chemgas Barging B.V.

Conventional tanker for transport of liquefied gases fuelled by LNG

Area of operation: Rhine - ARA to Basel

Delivered in September 2014



Damen Shipyard Hardinxveld B.V. (previous Bodewes)

LNG propelled chemical tanker “Ecoliner”

Area of operation: Rhine

Expected in Q3/2015 (hull launched February 2015)



Argos Bunkering B.V.

MGO-LNG Bunker Vessel

Area of operation: Rhine

Expected Q2/2016 (on-hold)



LNG E-motion

LNG inland tanker

Area of operation: Rhine

Expected: Q2/2016 (on-hold)



VESSELS – CONCEPTS

Rhine	LNG inland tanker of Chemgas Holding (<i>downscaled to preparatory works</i>) → for both Danube & Rhine	Preparatory works & technical studies looking into solutions for LNG tank insulations & management of boil-off.
	LNG pusher of Kooiman Marine (<i>downscaled to study</i>)	Technical concept & HAZID finalised, CCNR & ADN approvals received.
Danube	LNG coastal carrier / bunker vessel of Bernhard Schulte (<i>downscaled to study</i>)	Technical concept & HAZID finalised, approvals available.
	Danube river-sea tanker for transport of LNG of Danube LNG (<i>study</i>)	Technical concept under elaboration. Expected in Q2/2015.
	River based unloading, floating pier for LNG port terminal of Danube LNG (<i>study</i>)	Technical concept under elaboration. Expected in Q2/2015.
	River barge for the transport of LNG of Danube LNG (<i>study</i>)	Technical concept under elaboration. Expected in Q2/2015.
	Retrofitting of vessels/pushers of NAVROM to LNG propelled – feasibility study (<i>downscaled to study</i>) → new study of technical design for new build pusher	Feasibility study finalised. It showed that the retrofitting of old Navrom pushers is economically not viable / technologically, in some cases almost not possible.
	Retrofitting of pushers of SPaP fleet to LNG fuel – Danube LNG (<i>study</i>)	Technical concept & economic evaluation under elaboration. Expected in Q2/2015.

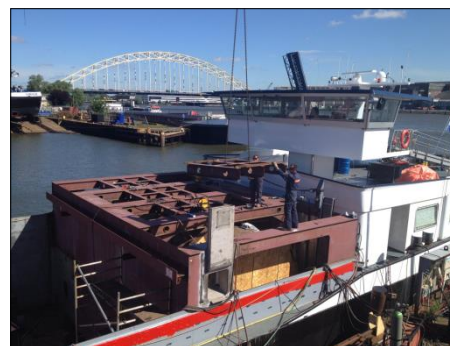
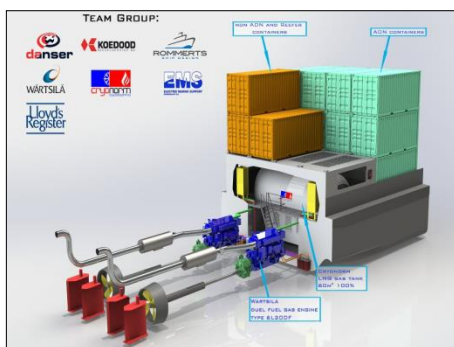
VESSEL PILOT DEPLOYMENT - READY

DCL Barge B.V. (Danser Group)

Type of vessel: Retrofitted container vessel with LNG used as propulsion

Operational area: ARA ports – Basel

In operation: from June 2014



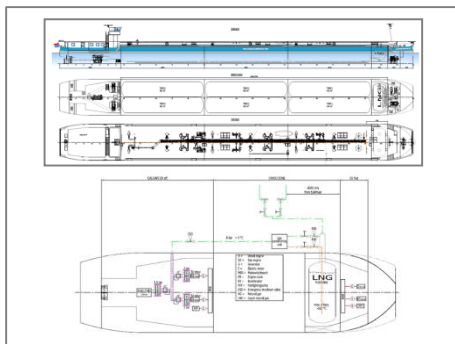
VESSEL PILOT DEPLOYMENT - READY

Chemgas Barging S.a.r.l.

Type of vessel: Conventional type-G tanker for the transport of liquefied gases with LNG used as propulsion

Operational area: ARA ports – Basel

In operation: from September 2014



From drawings to realization...

Christening of SIROCCO, 24 Sep 2014

PILOT DEPLOYMENTS – EXPECTED

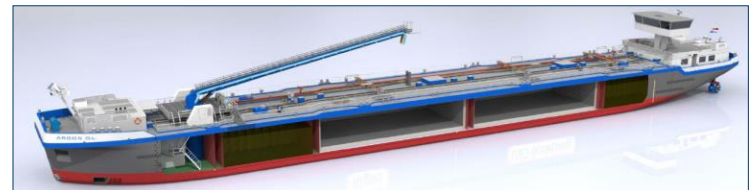
DAMEN

Type of vessel: LNG propelled chemical tanker
Operational area: Rhine
Expected: Q3/2015



Argos Bunkering B.V.

Type of vessel: MGO-LNG Bunker Vessel
Operational area: ARA
Expected: Q2/2016



LNG E-motion

Type of vessel: LNG inland tanker
Operational area: Rhine
Expected: Q2/2016



LNG TERMINAL IN RUSE (DEPLOYMENT)

Bulmarket DM

Terminal for storage of LNG and filling vessels & trucks with LNG

Location: Ruse, Bulgaria (Port Bulmarket 2)

Expected: Q4/2015



LNG BUNKER STATION IN ANTWERP (DEPLOYMENT)

Port of Antwerp Authority

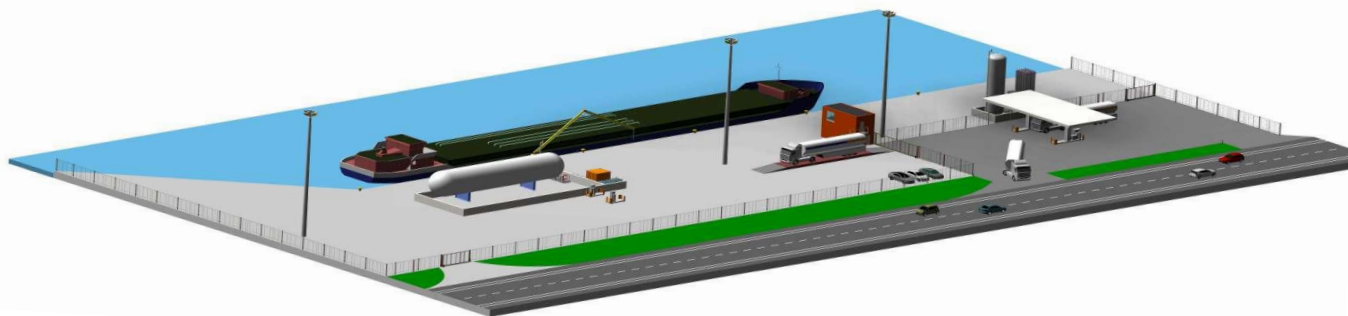
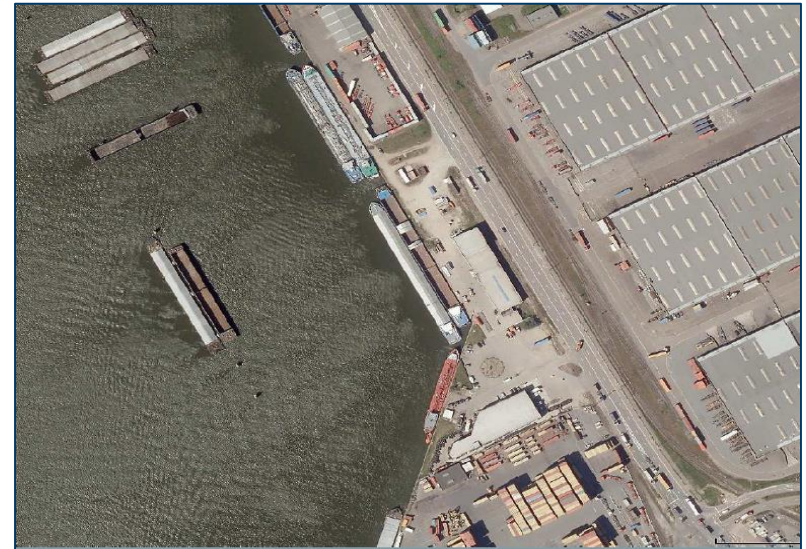
LNG bunker station for inland vessels

Location: Port of Antwerp

Expected: Q2/2016

General Specifications:

- Total LNG storage capacity below 200 ton LNG.
- Bunkering: up to 200 m³/hour and 10 bar.
- Filling station LNG: 2 x 150 l/min at 10 bar
- Filling station CNG: 2 x 70 Kg/min



LNG TERMINAL IN GALATI (STUDY)

Maritime Danube Ports Administration – APDM Galati

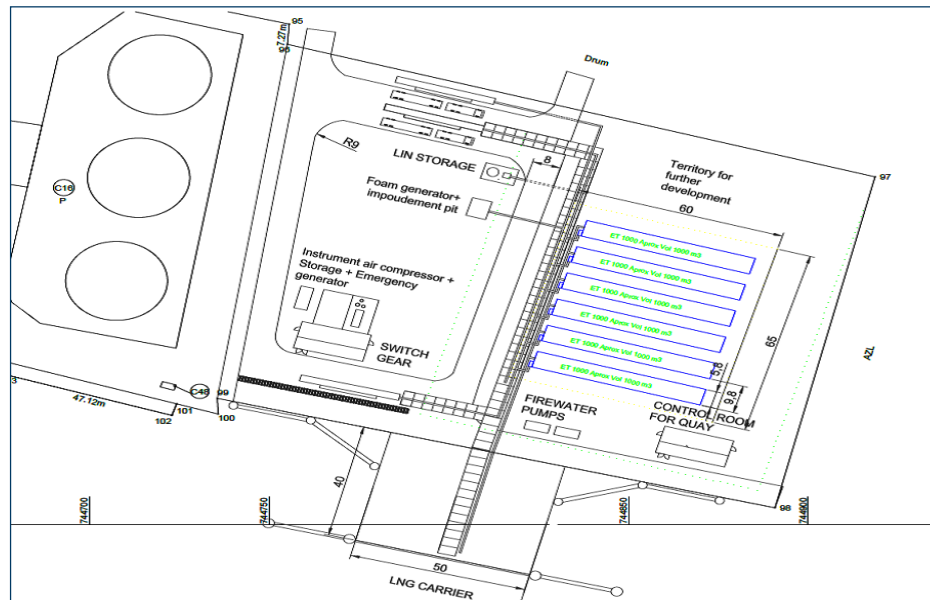
Pre-feasibility study and a preliminary technical concept for a LNG terminal in the maritime Danube area

Location: Port of Galati, Romania

Subcontractor: Actia Forum SP

Initial storage capacity: 4,000 cbm (design capacity up to 8,000 cbm)

Completed: Q4/2014



Recommendations
technical concept:
Semi-pressurised
tanks with an initial
capacity of 4,000 cbm

LNG TERMINAL IN CONSTANTA (STUDY)

Transport Trade Services S.A.

Feasibility study and a general technical design for a small-scale LNG terminal

Location: Port of Constanta, Romania

Subcontractor: PANTEIA & Tebodin Netherlands B.V.

Initial storage capacity: (to be outcome of the study)

Expected: Q3/2015



Constanta Old Terminal

Agigea Terminal

LNG BUS TRIALS IN SLOVAKIA



LNG trial organized by Danube LNG, 02/2015

LNG Masterplan: Status April 2015

LNG Buses in Poland

- City of Warsaw (18 meters long):
 - 25 LNG buses were put into operation 1.1.2015
 - 10 LNG buses were put into operation 02.12.2015
 - By the end of 2016 plans to buy add. 130 LNG buses
- City of Olsztyn (12-meters):
 - 11 LNG buses to come into operation 1.10.2015
 - By the end of 2016 plans to buy add. 50 LNG buses

Price difference between LNG and diesel

Country / Company	Price LNG (€/kg)	Price diesel (€/l)	Delta ³⁾ LNG vs Diesel (% of diesel price)
Belgium / Drive system	0,98	1,29	54
Italy / Eni	0,98	1,52	46
The Netherlands / LNG24	1,22	1,36	64
Portugal / Galp	1,23	1,29	68
Spain / GasNaturalFenosa	1,0	1,18	61
Sweden / FordonsGas	1,62 ¹⁾	1,40	83
UK / Gasrec, Chive	1,2 ²⁾	1,65	52

1) 50 % Liquefied Biomethane

2) Gasrec offers a mixture with biomethane

3) The delta is calculated taking into account the difference in energy content
(1 kg LNG = 1,34 l diesel)

Source: LNG Blue Corridors, NGVA Europe



Co-financed by the European Union
Trans-European Transport Network (TEN-T)

REGULATORY FRAMEWORK

LNG as fuel (vessels not transporting dangerous goods)

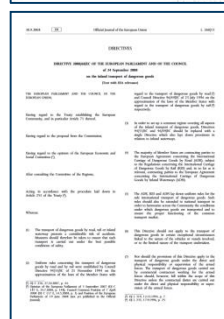
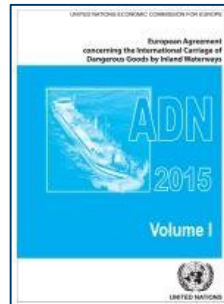
Regulated by RVIR / RheinSchUO of CCNR & Directive 2006/87/EC laying down technical requirements for inland waterway vessels

- LNG Amendment of the RVIR / RheinSchUO is expected to come into force mid-2016



LNG as cargo & LNG powered vessel transporting dangerous cargo

Regulated by ADN 2015 (European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways) & Directive 2008/68/EC on the inland transport of dangerous goods



Transportation of LNG in tank vessels (*using “conventional” isolated pressure tanks in accordance with ADN 2015*) is part of the new version of **ADN 2015** (in force from 1 Jan 2015)

- Hazard Identification study (HAZID), previously necessary for obtaining derogation, is no longer required for these tank vessels transporting LNG



BUT vessels powered by LNG and LNG tankers using boil-off and transporting dangerous goods, incl. LNG, will still require a derogation → it is expected that the regulations for the use of LNG for propulsion will be included in ADN as from 2017

SOME OPTIONS FOR SUPPLYING DANUBE



SOME LESSONS LEARNED

- LNG equipment costs were often underestimated (increases up to 20-30%)
- “Technologies” are there but still a lot of technical challenges (BOG, etc.)
- Retrofitting makes sense with certain types of vessel (e.g. container vessels, tankers, new vessels)
- LNG supply to Danube region is complex but offers high market potentials
- LNG hubs in hinterland need multi-client strategy to generate base load for cost-effective supply (road sector, off-road, peak shavers, off pipe clients, etc)
- Structural weakness of the IWT segment requires new financing instruments (“engine power/ molecules contracts”)
- Price gap LNG – diesel for barge operator should be higher than 15%
- “Integrators “ along the LNG value chain can speed up business by creating platforms projects with (potential) customers (breaking chicken – egg situation by creating commitment)
- Public co-funding in start-up phase is essential to make a business case for LNG hubs and vessel investment to compensate high LNG logistics costs as well as high LNG equipment costs
- Public/Politicians/Authorities tend to overestimate safety risks of LNG – more information needed

CONCLUSIONS

- LNG is the most **relevant alternative fuel for inland navigation** offering high environmental and economic benefits. Use of LNG supports major EU transport, environment and energy policy objectives
- Only inland vessels can deliver high volumes of LNG cost-effectively from seaside import terminals to the economic heartlands of Europe. **The barging sector, therefore, is pioneer consumer of LNG and enabler of LNG supply.**
- Inland terminals will function as satellites to the hinterland enabling to reach other pioneer markets like public transport and heavy duty transport sector
- **Rhine/Meuse-Main-Danube** axis will serve as **main European LNG artery** contributing to a more balanced European energy mix
- **LNG Masterplan** breaks up the chicken and egg situation and **prepares sector for wide-scale deployment in follow-up EU projects**. Public financial support is essential as well as supply chain approach involving end-consumers
- **European LNG technology industry cluster** will support implementation and facilitates economic growth and job creation
- **CEF - Connecting Europe Facility** will have to play a key role for further implementation; **Horizon 2020** shall provide a dedicated LNG research agenda.

THANK YOU FOR YOUR ATTENTION

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