Case examples: CEF -fundings for Innovations

ILKKA RYTKÖLÄ

Wärtsilä

Contents

Into the Future – Baltic SO_2lution 2013-EU-21003-S

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

COLLABORATION METHOD
ZERO VISION TOOL

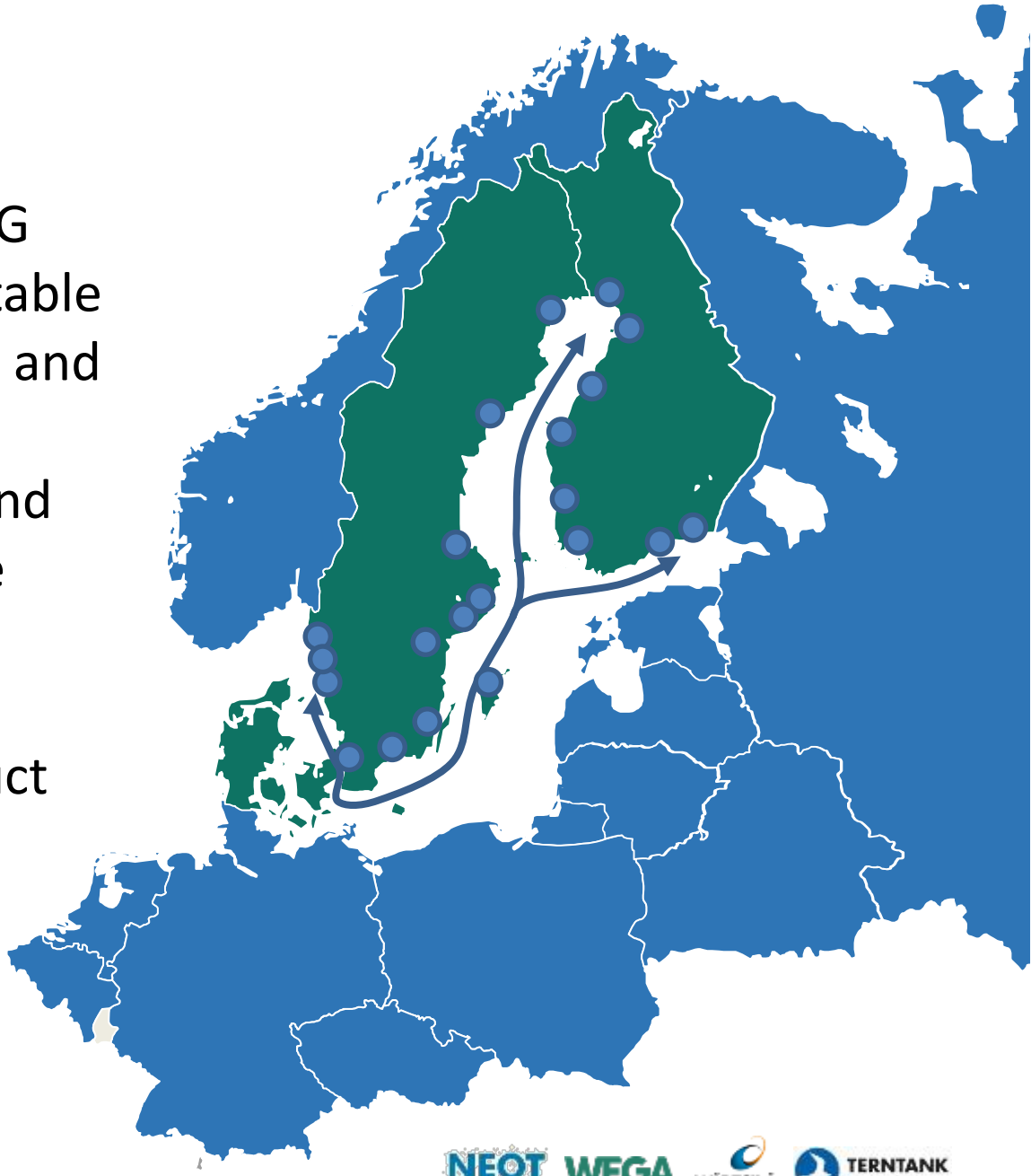
BALTICSO_2LUTION

Solution; introducing an innovative and environmentally effective transport model and a generic low-emission, dual-fuel engine technology package that would be suitable both for new-built and retrofitted vessels.

Project duration
01/10/2013 - 31/12/2015

Objectives of the Action

- To introduce a new LNG engine technology suitable for both new buildings and retrofits
- To increase LNG demand and deployment in the Baltic Sea region
- To reduce harmful air emissions in the product supply chain
- To connect 21 ports in Sweden and Finland



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The project information

Member states involved:
Denmark, Finland and Sweden

Implementation time:
01/10/2013-31/12/2015

The budget of the Action:
7 259 080 €

The TEN-T co-funding:
3 629 540 €

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Activities and status

1.	Feasibility study of the low emission LNG engine system	
2.	Supply chain case study	
3.	LNG engine and tank system procurement process	
4.	Test bed installation study	
5.	Test bed installation	
6.	Dissemination and project management	

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1. Feasibility study of the low emission LNG engine system

- The feasibility study was completed to find the conditions to introduce the game-changing low pressure technology to both new built and retrofitted vessels

- The Activity consisted of the following sub-activities
  1. Technology package design
  2. Generic installation procedure for new-built vessels
  3. Generic installation procedure for retrofitted vessels
  4. Market introduction plan, including connection to European yards

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COLLABORATION MAKES ZERO VISION REAL

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2. Supply chain case study

The purpose of the case study was to investigate the benefits of LNG technology in sea freight

1. The Greenhouse Gas Emissions in the existing supply chain were investigated
   - Collected data from existing T/C Vessel M/T Ternholm
   - Calculated Supply Chain emissions
   - Compared Ternholm with average of the Vessels
2. Estimated emissions reductions through deployment of LNG
3. Investigated LNG availability in the Baltic Sea region

The actual LNG emissions will be verified in the follow-up project Solution$_4$Future, when LNG vessels are operating in the same routes

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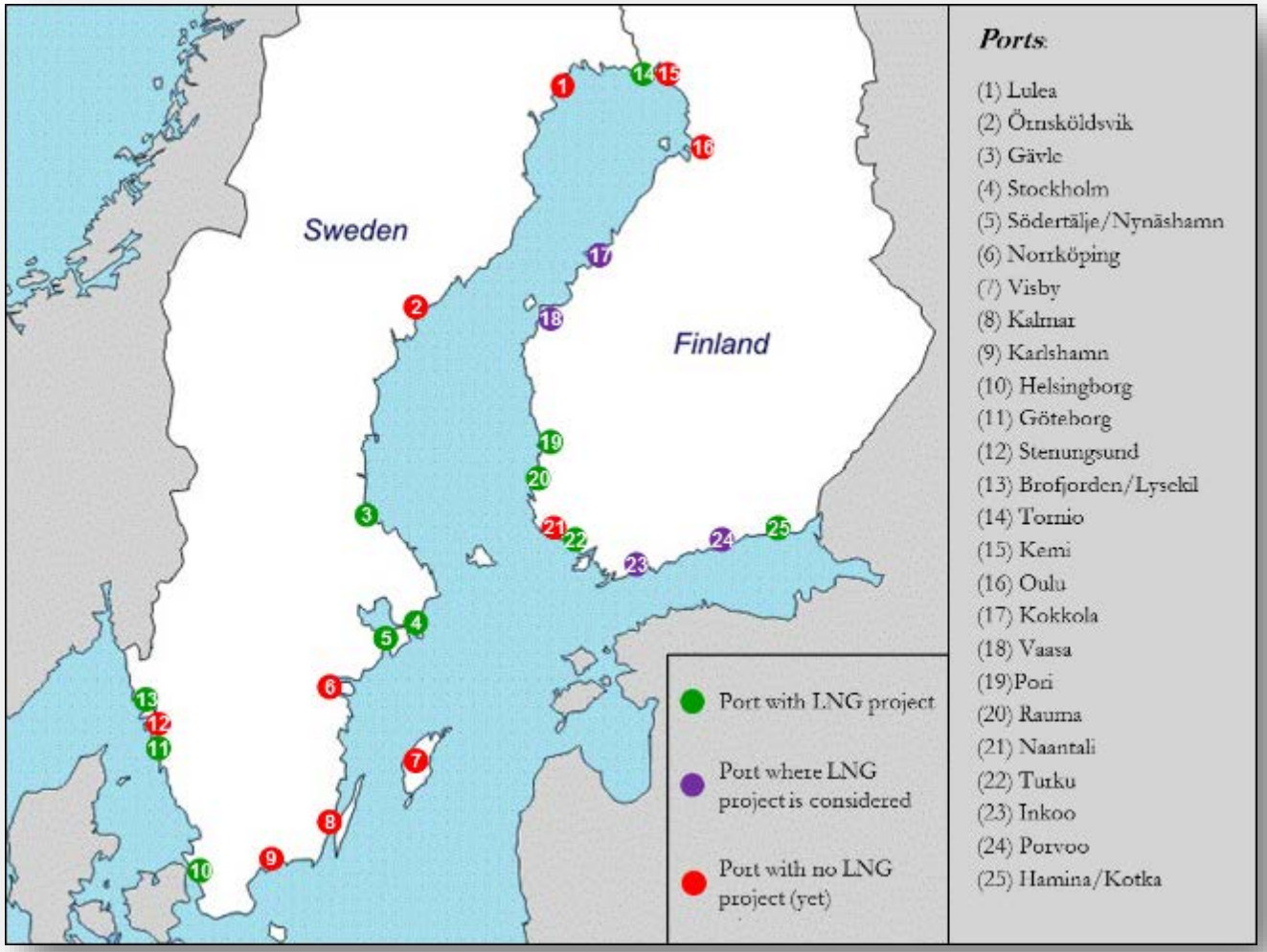
Results: LNG Availability



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3. LNG engine and tank system procurement process

- Procurement of the Technology package including ship engine, LNG tanks and other necessary equipment

- Secured a cost efficient installation of a technology package aboard the test vessel

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LNG tank, vaporazing and pressure control system

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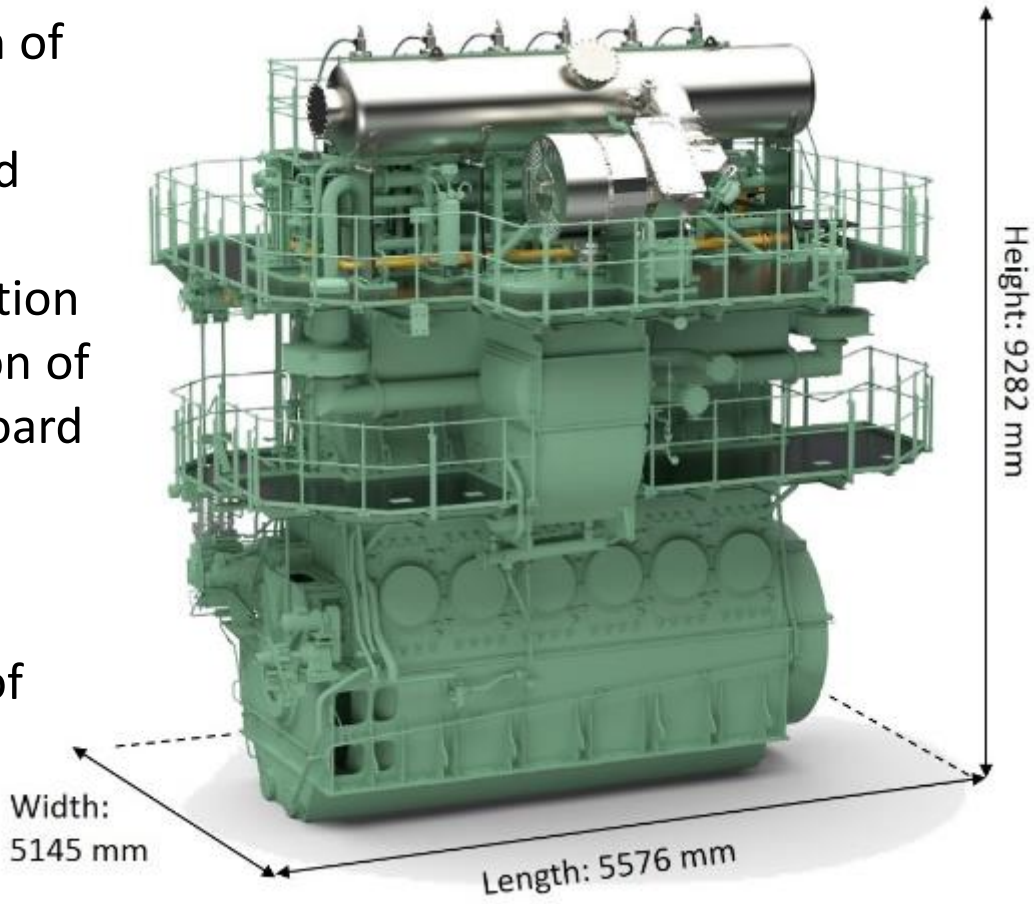
4. Test bed installation study
5. Test bed installation

- Supervision of the installation of the low emission technology package on board the test bed vessel
- A detailed installation instruction was created for the installation of the technology package on board the test bed vessel
- Gave important input to the future development of the technology and the updates of the installation procedures



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Engine in the factory acceptance test (FAT)

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6. Dissemination and project management

- The proposed Action is a part of the cooperation platform Zero Vision Tool www.zerovisiontool.com

- The ZVT method has been used in project management, execution, reporting and dissemination through the extensive network and knowledge among partners. The ZVT platform includes quarterly reporting procedures and quality control

- Several presentations, conferences and seminars, press-releases and interviews

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Supporting organisations

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www.zerovisiontool.com/Baltic-so2lution

EMISSION REDUCTION

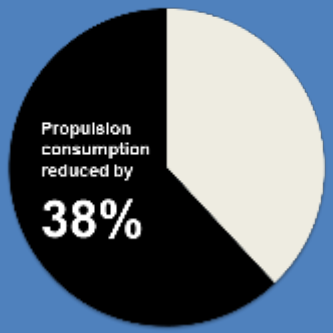
99 % LESS SO_X

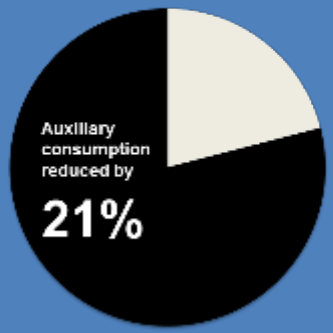
97 % LESS NO_X

40 % LESS CO_2

99 % LESS PARTICLES

ENERGY EFFICIENCY





Compared to a vessel with same size built around 2005, operational speed 14 knots.

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Methanol
–
The Marine Fuel of The Future

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Methanol; The Marine Fuel of the Future - Activities

Activity	Activity name	Start date	End date	Milestone number	Resp
1	Ship conversion	01/01/2013	31/12/2015	1, 2, 3, 4, 5, 6, 7	Stena
2	Engine conversion kit	01/01/2013	31/12/2015	4, 5, 6, 7, 8, 9	Wärtsilä
3	Storage tank and port facilities	01/02/2013	30/04/2015	10, 11, 12	Stena
4	Bunker vessel conversion	01/03/2013	31/12/2014	13, 14	Stena
5	Risk and environmental impact assessment, Port of Gothenburg	01/01/2013	30/06/2014	15,16, 17	Stena
6	Risk and environmental impact assessment, Port of Kiel	01/01/2013	30/06/2014	18, 19, 20	Stena
7	Horizontal activities	01/01/2013	15/12/2015	21, 22, 23	Stena

Estimated Total Costs

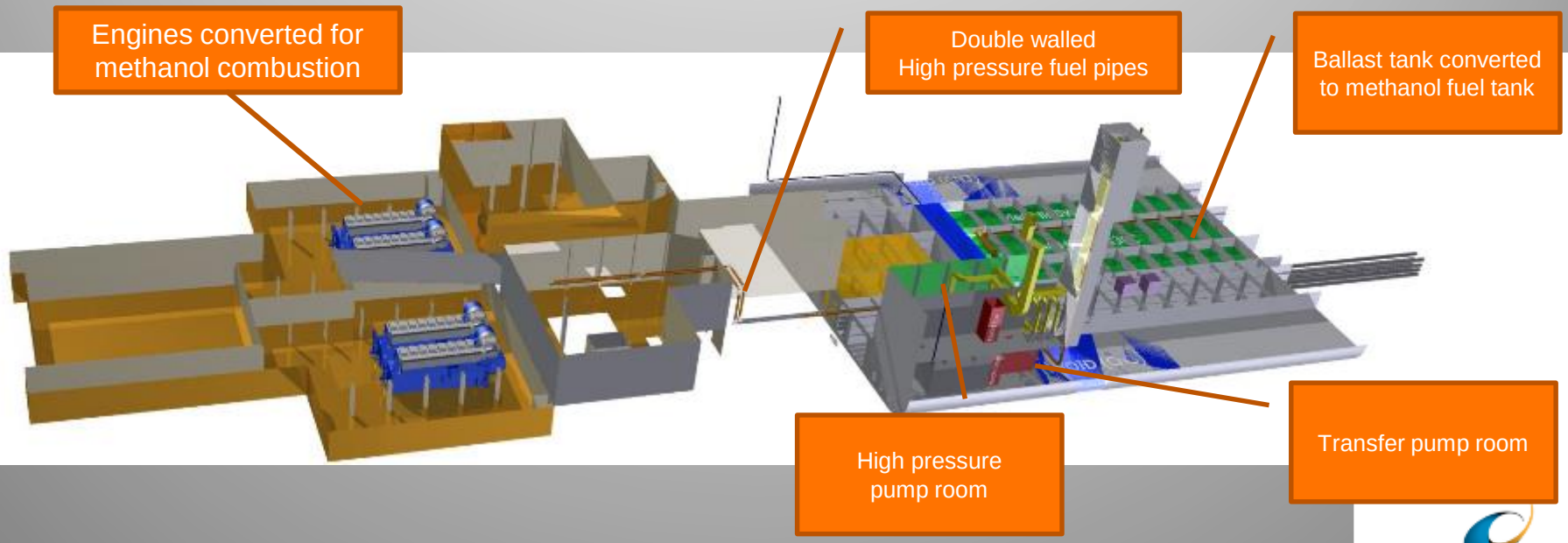
Total Costs for the 7 activities making up the Global Project will be **22 412 000 €**.
The EU aid is expected to be 50 % of the Total Costs or **11 206 000 €**

Stena Germanica – Pilot installation

Commissioned 31.01.2000

Main Engines:
4 x Wärtsilä Sulzer 8ZA40S
Output: 6000 kW/ engine

Stena Germanica – Scope of conversion



Methanol adaptation

Engine conversion to dual fuel

High pressure pipes

New engine control system for all four engines

New electrical installation

Methanol storage tank painted with zinc silicate

High pressure pumps

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Engine conversion kit – features

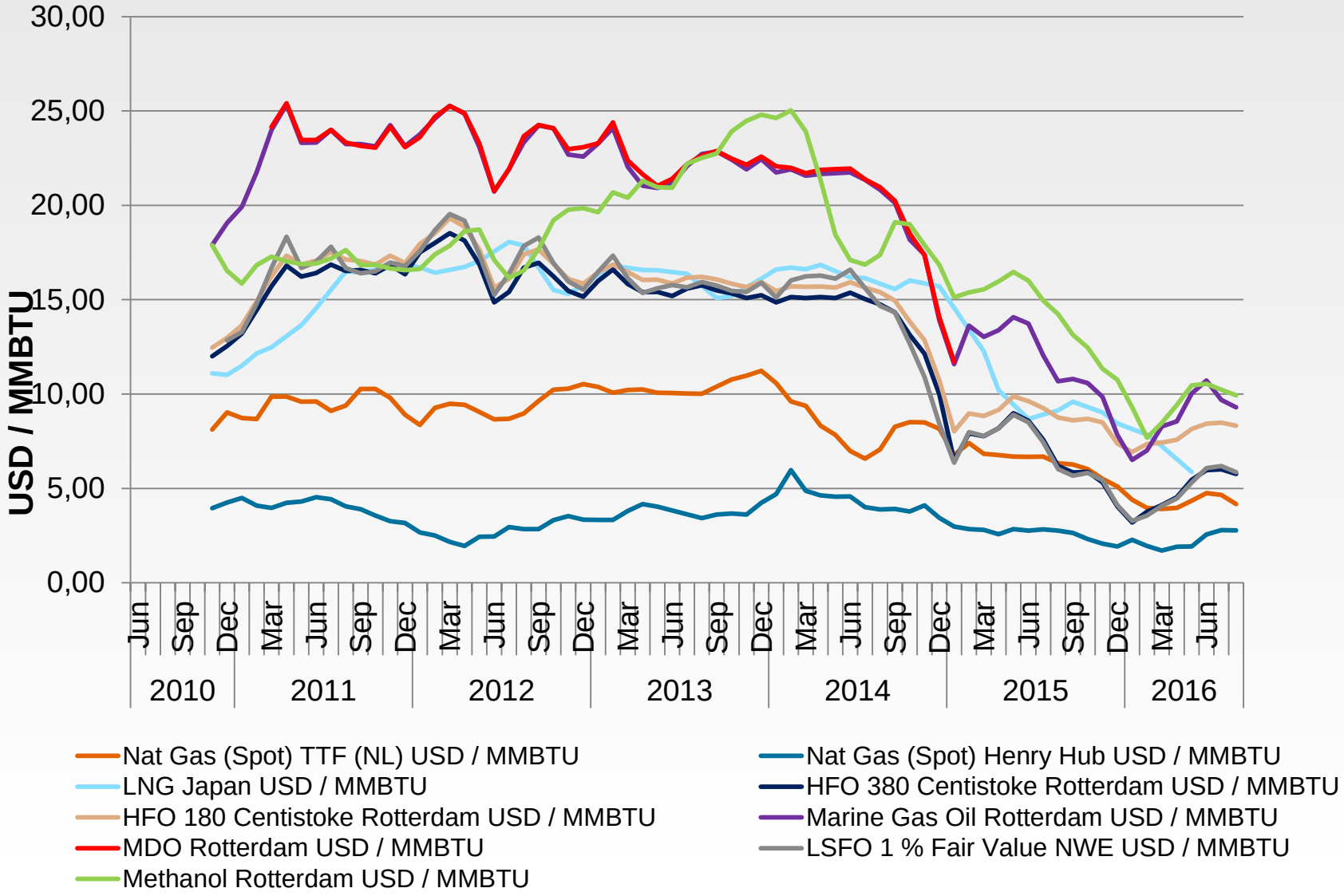
- Adaptation of proven engine technology, minor modification to the engine
- No reduction in efficiency or output running on methanol
- Load response unchanged, full fuel redundancy
- Existing fuel or ballast tanks can be converted to methanol tanks
- Short off-hire time, can be done engine by engine
- Lower thermic load on the engine
- Much lower NOx, SOx, and PM (particulates), good base for future ECA regulations
- Available methanol infrastructure (bunker fuel to be developed)

11/23/2016

Methanol overview: Availability & Cost

Availability	
Fuel:	Liquid, widely used in chemical industry, Can utilize existing transport and terminal infrastructure
Technology:	Available for ZA40S engines today, Pilot Installation Q1 2015, Concept for other engines available, pilot projects research
Cost	
Capex:	Not a “complex” conversion; feasible ROI
Opex:	Methanol fuel prices competitive? to (MGO/MDO,LSFO)

FUEL PRICES



  23 November 2016 Ilkka Rytkölä Doc.ID: Revision: Status:

MIDWAY ALIGNMENT

Background

- Service uninterrupted for more than 50 years
- Economic feasibility under stress during 1999 – 2011
  - Operations suffering from major reliability issues & attractiveness of ferry
  - Previous owner/operator filed for bankruptcy in 2012
  - Environmentally and financially sustainable transport system requires a major upgrade
- NLC Ferry Ab Oy was jointly founded by city of Umeå and Vaasa in 2012
  - Establishing this long-term sustainable transport solution is the major aims of the co-operation
  - Temporary ferry solution: M/S Wasa Express, build 1981 by Wärtsilä (with W engines)

Overview of main project activities and schedule

PHASE I 2013-2015
- Planning & Design

PHASE II 2016-2020
- Execution & build

Temporary ferry

Concept for improved transport link

Upgrade of port infra

Concept for the land infra

Design of the new ferry

Building the new ferry

Midway Alignment activities:
Infrastructure
Temporary Ferry
Project Analysis
Concept for transport link
Concept for harbour infrastructure
Design of ferry

Project Management & co-ordination:
Kvarken Council

Wärtsilä's role:
Partner in the EU project
Ship Designer

Next steps:
Evaluation & financial engineering
Project planning

Main achievements in Phase 1 - the planned vessel & LNG terminal

The vessel cornerstones:

- **Reliability** – 1A Super ice going capabilities and remote monitoring of vessel operations
- **Safety** - less work in hazardous areas and design based on most stringent regulations
- **Innovations** – hybrid, LNG and possibility for LBG, digitalization & increased automation
- **Sustainability** – 1) cutting fuel & emission with 50% + slashing maintenance costs 2) increased cargo capacity & flexibility for seasonality

LNG infrastructure:

- Modular concept, operations can easily be enlarged when demand raises
- Capacity 3000-7000 cbm
- Truck loading, bunkering, rail connection
- Existing infrastructure

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