

Methanol

Safe Bunkering & On-Board Handling

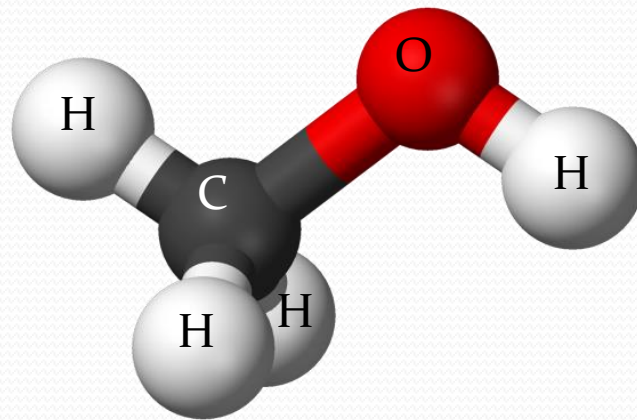
Workshop, Gothenburg Feb 23rd 2017
Bengt Ramne

Agenda

- Why methanol as marine fuel? – Bengt Ramne
 - Marine methanol projects
- Rules for application of methanol as marine fuel – Ulf Freudendahl
- Methanol Safe Bunkering & On-Board Handling
 - What is the problem?
 - What is needed?
 - What has been done for LNG?
 - Who can/should do what?
- Visit onboard Stena Germanica
 - Engine room
 - Bunker station
- Visit to ScandiNAOS workshop
- Wrap up and next step

Why methanol as marine fuel?

- **An efficient, universal, future-proof, energy carrier that can be sustainably produced in large quantities**

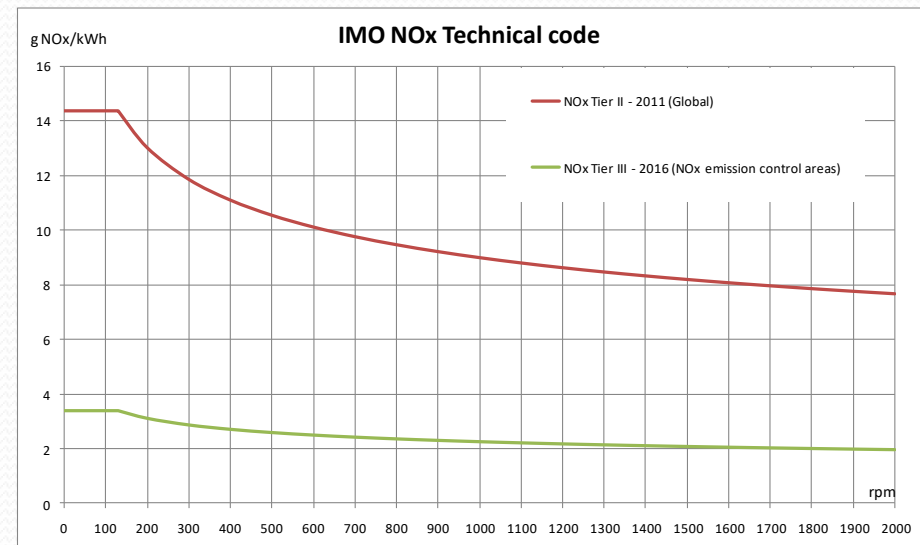
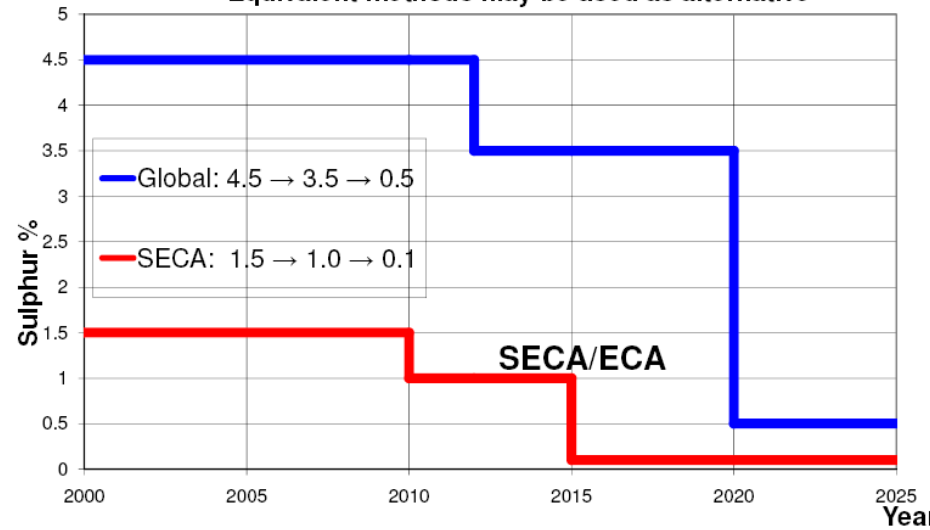


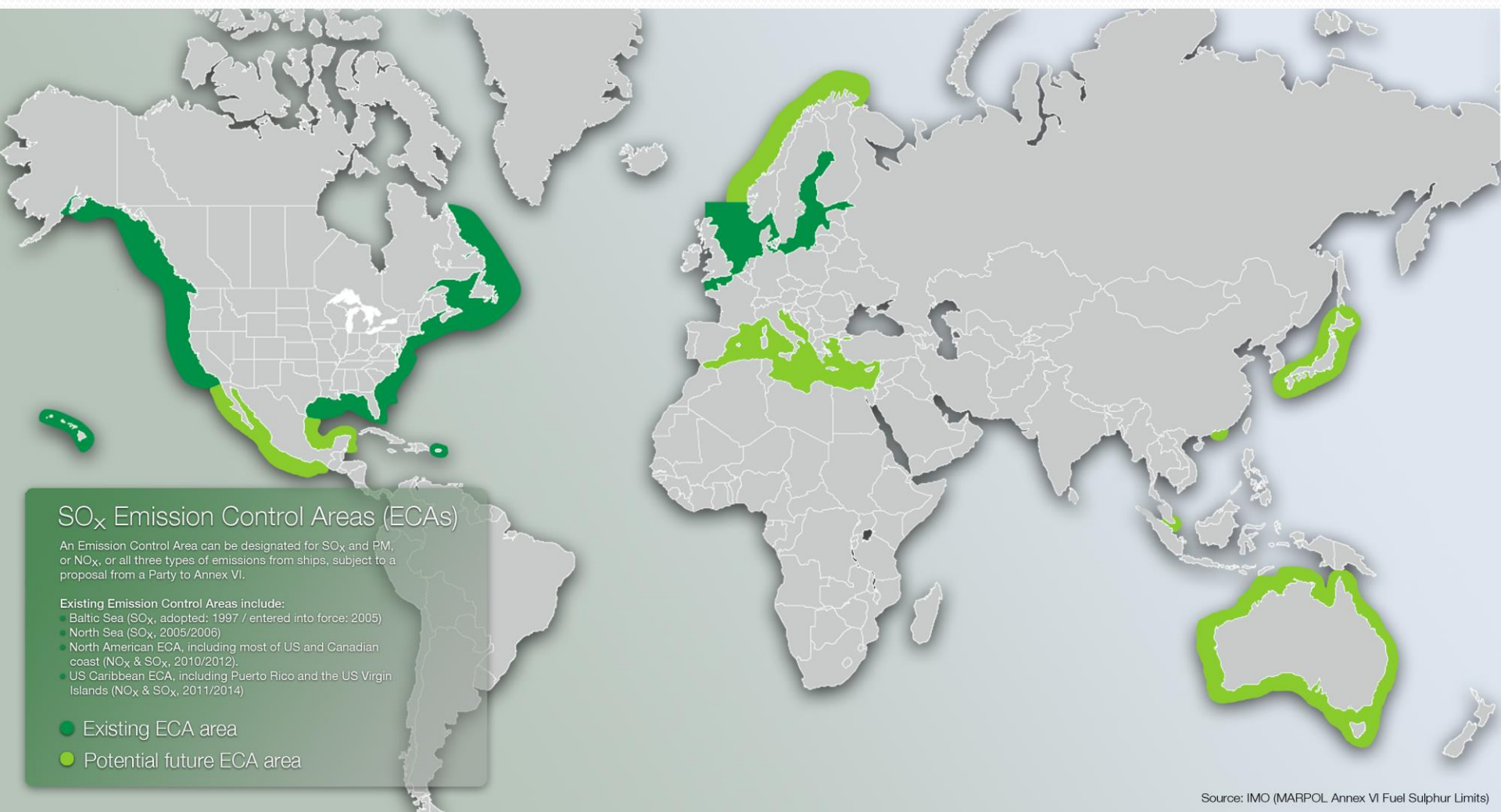
The Immediate Challenge

- MARPOL 73/78 amended with 1997 Protocol
 - includes Annex VI titled “Regulations for the Prevention of Air Pollution from Ships”.
 - Possibility to define emission control areas
 - Baltic Sea (SO_x, adopted: 1997 / entered into force: 2005)
 - North Sea (SO_x, 2005/2006)
 - North American ECA, including most of US and Canadian coast (NO_x & SO_x, 2010/2012).
 - US Caribbean ECA, including Puerto Rico and the US Virgin Islands (NO_x & SO_x, 2011/2014).
- MEPC 57 April 2008
 - Amendments to the MARPOL Annex VI regulations
0.1% sulphur from 2015 in Baltic Sea and North Sea ECA areas
- EU legislation

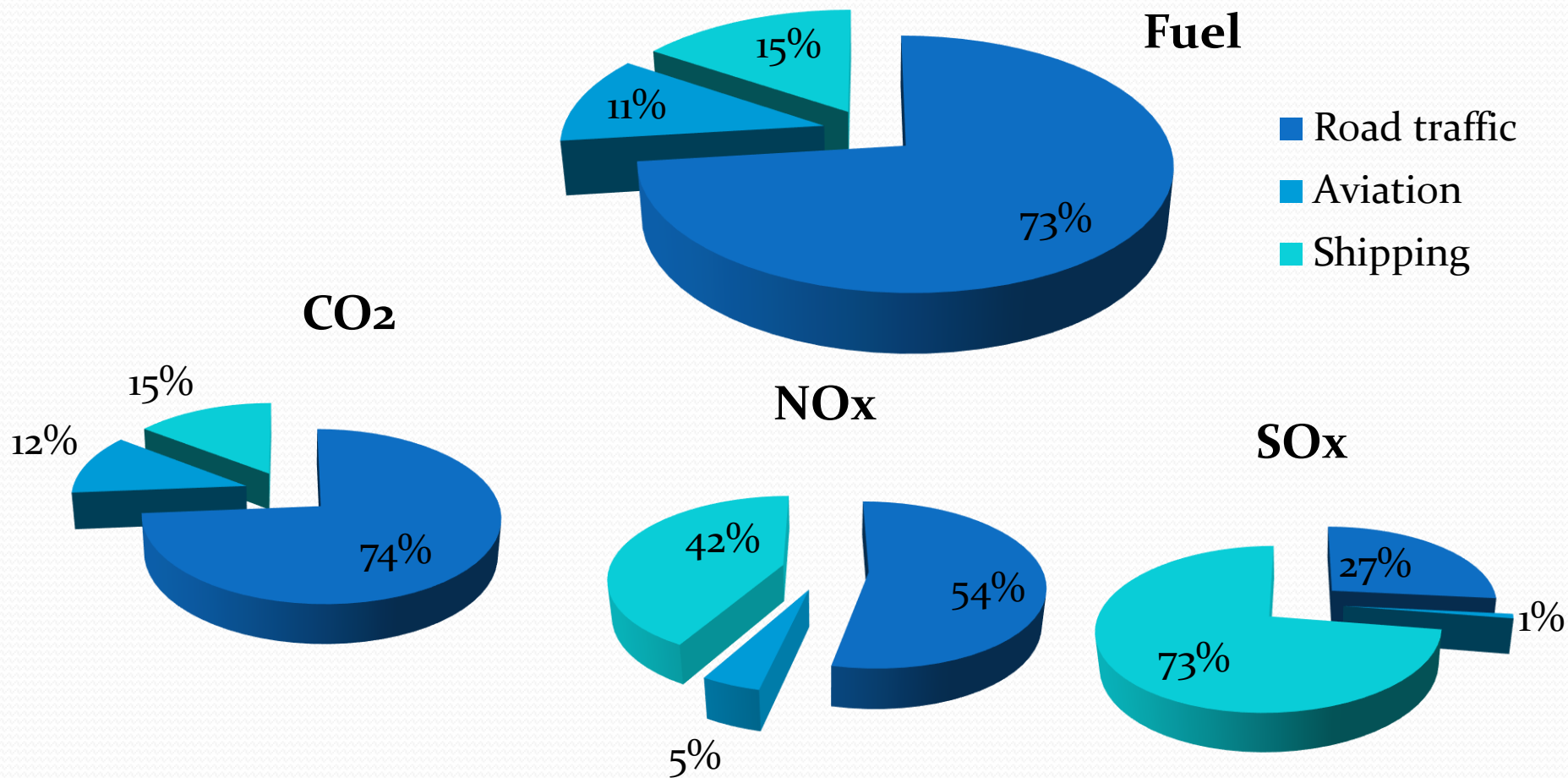
MEPC 57 IMO Fuel-sulphur Content

Equivalent methods may be used as alternative



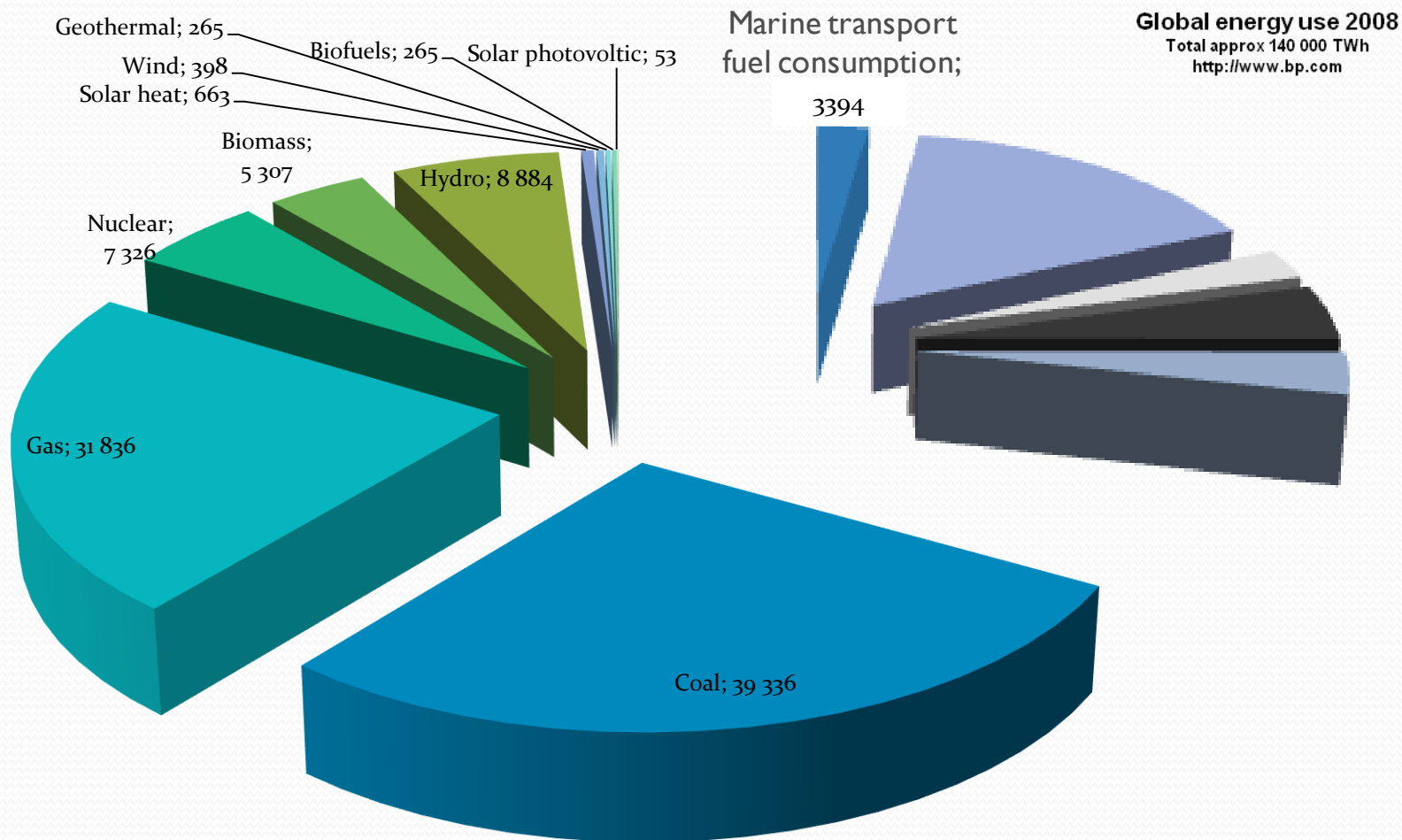


Emissions



Data from Eyring et al. J Geophys Res 110 (2005) - Presented by Erik Fridell

Where can we find alternatives to HFO?



The Great Challenge

Established targets

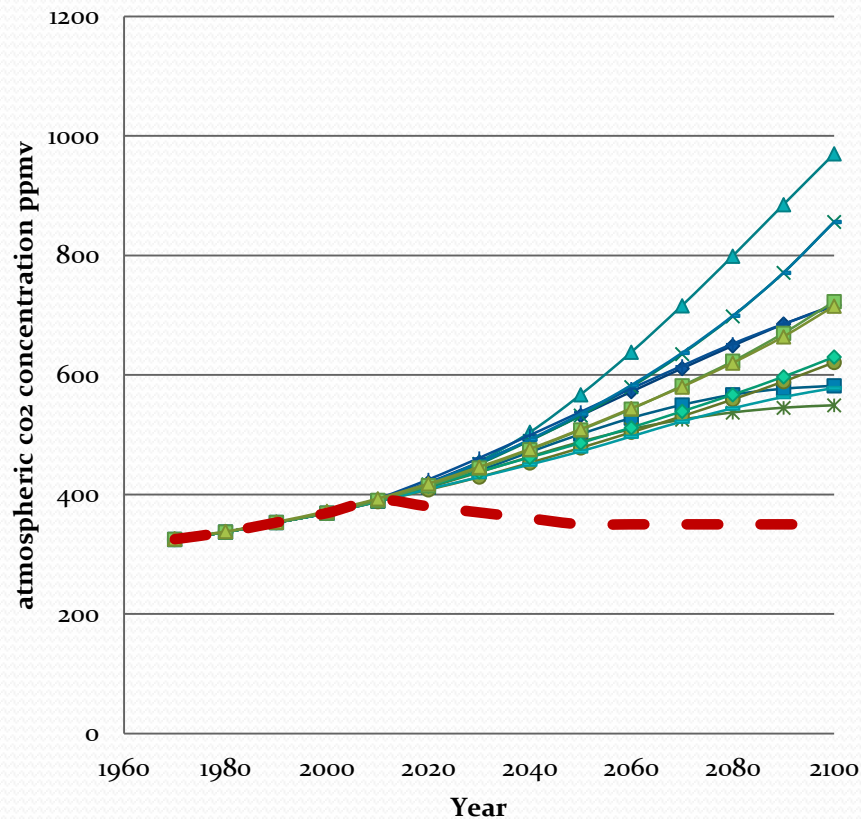
- 2C
Target of global temperature increase
COP 15 meeting December 2009 in Copenhagen organized by
United Nations Framework on Climate Change UNFCCC
- 50-85%
Global GHG emission level in 2050 of today's level in order to reach 2C target according to
Intergovernmental Panel On Climate Change IPCC 2007
- 80-95%
EU target for CO₂ emission reduction by 2050

Complication

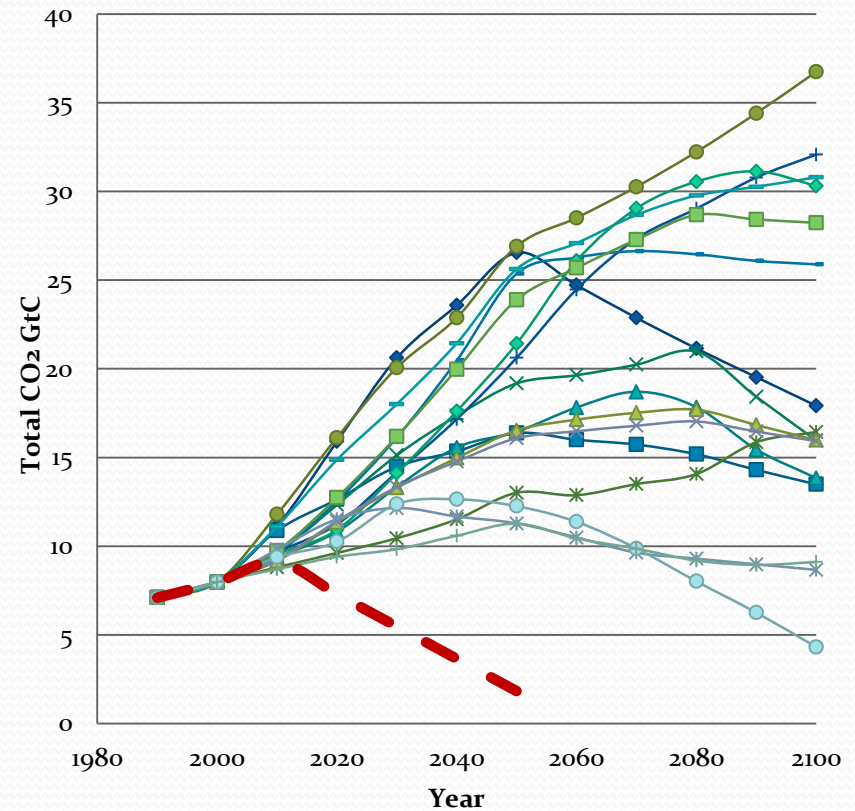
- All scenarios from IPCC (Intergovernmental Panel on Climate Change) shows that GHG emission will **increase** not **decrease**

The Great Challenge

IPCC CO₂ concentration



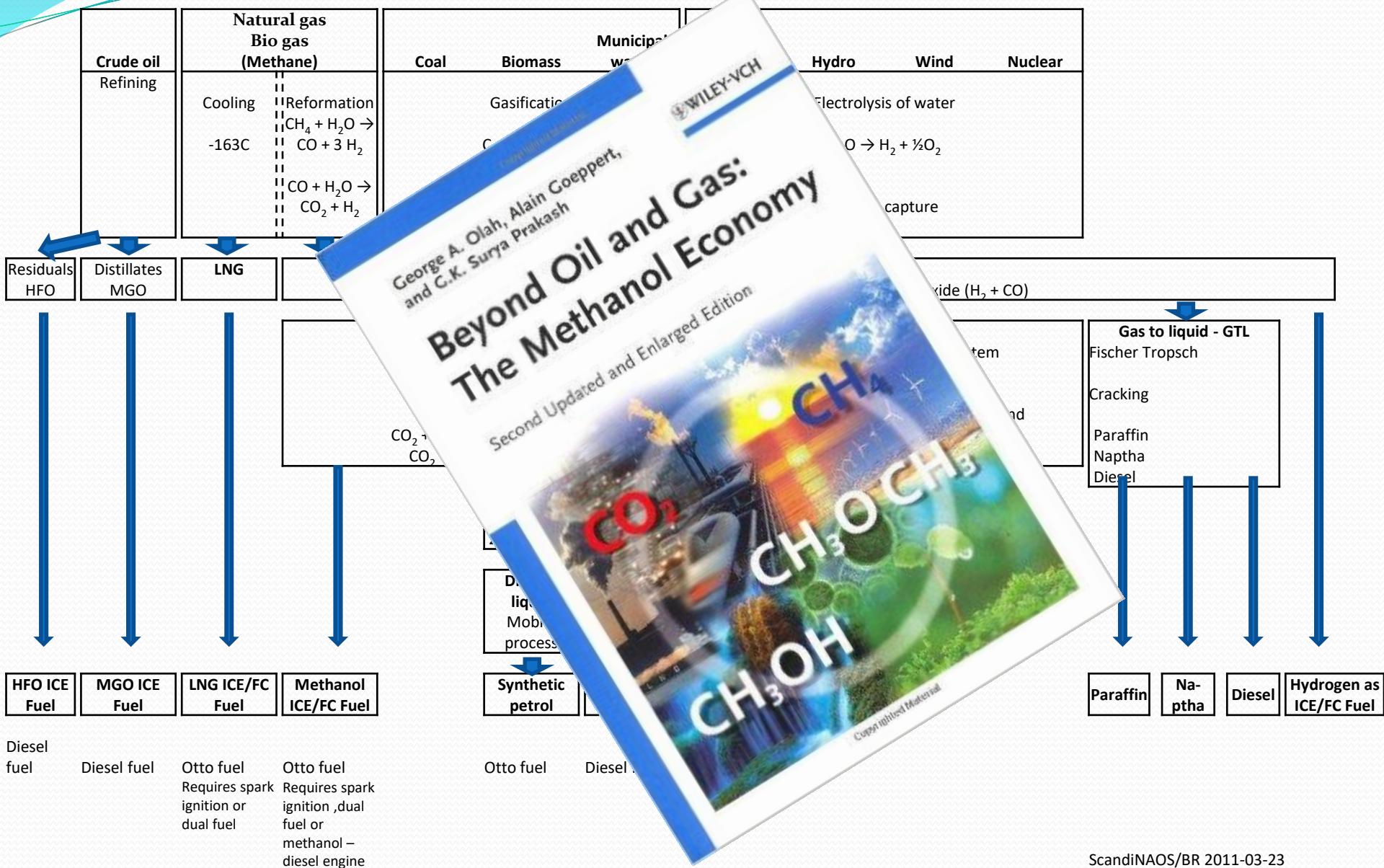
IPCC CO₂ emission



The potential in methanol

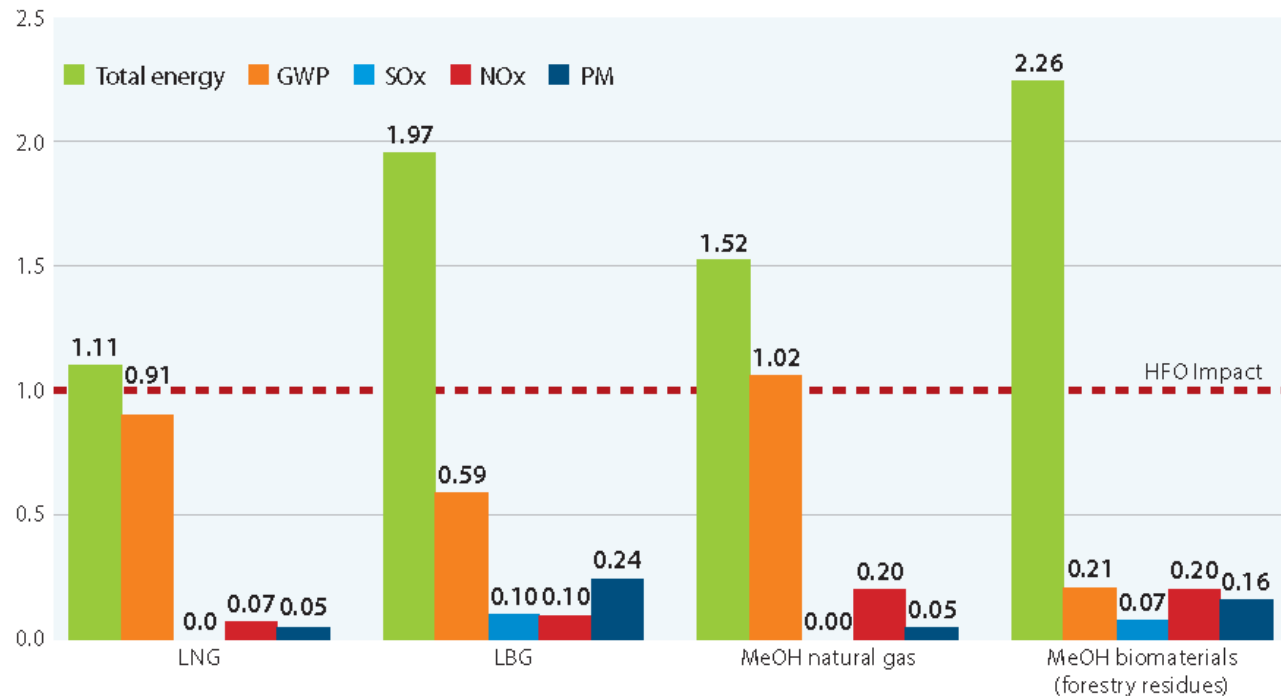
- Methanol produced from natural gas can today be produced and distributed at a lower cost than MGO (based on cost per kWh)
- Fossil methanol has a lower “well to propeller” environmental impact than MGO
- Conversion of marine engine system to methanol cost a fraction compared to conversion to LNG
- Fossil free methanol can, with existing technology, be produced from renewable bio mass at a cost that is approx. 20% higher than the cost of oil based fuels
- Emerging technology will enable production of large quantities of CO₂ neutral methanol from renewable primary energy sources such as geothermal, sun, wind, and hydro power

Alternative Marine Fuel – Feedstock and products

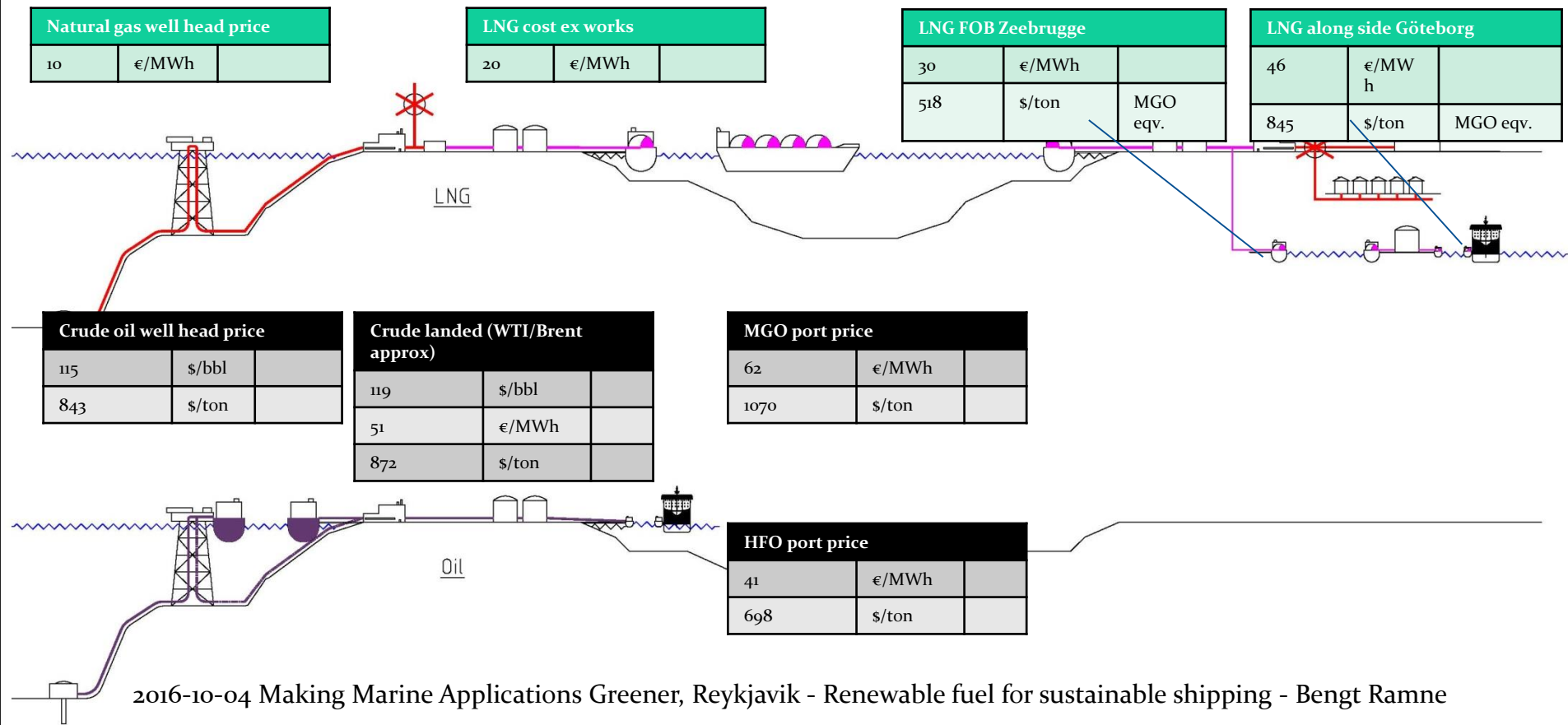
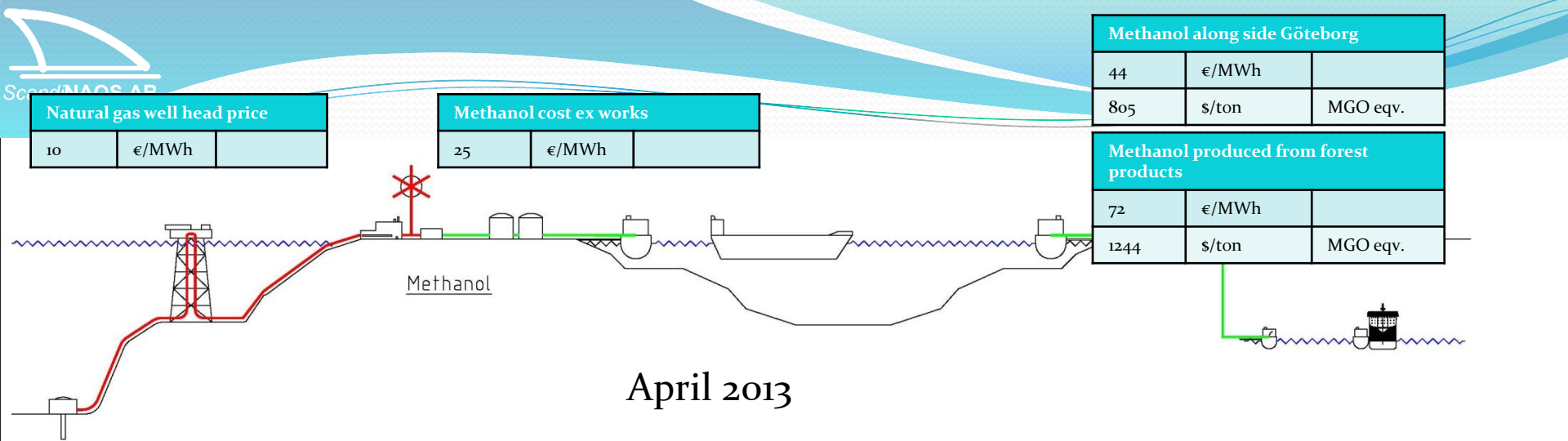


Life-cycle energy use and environmental impact

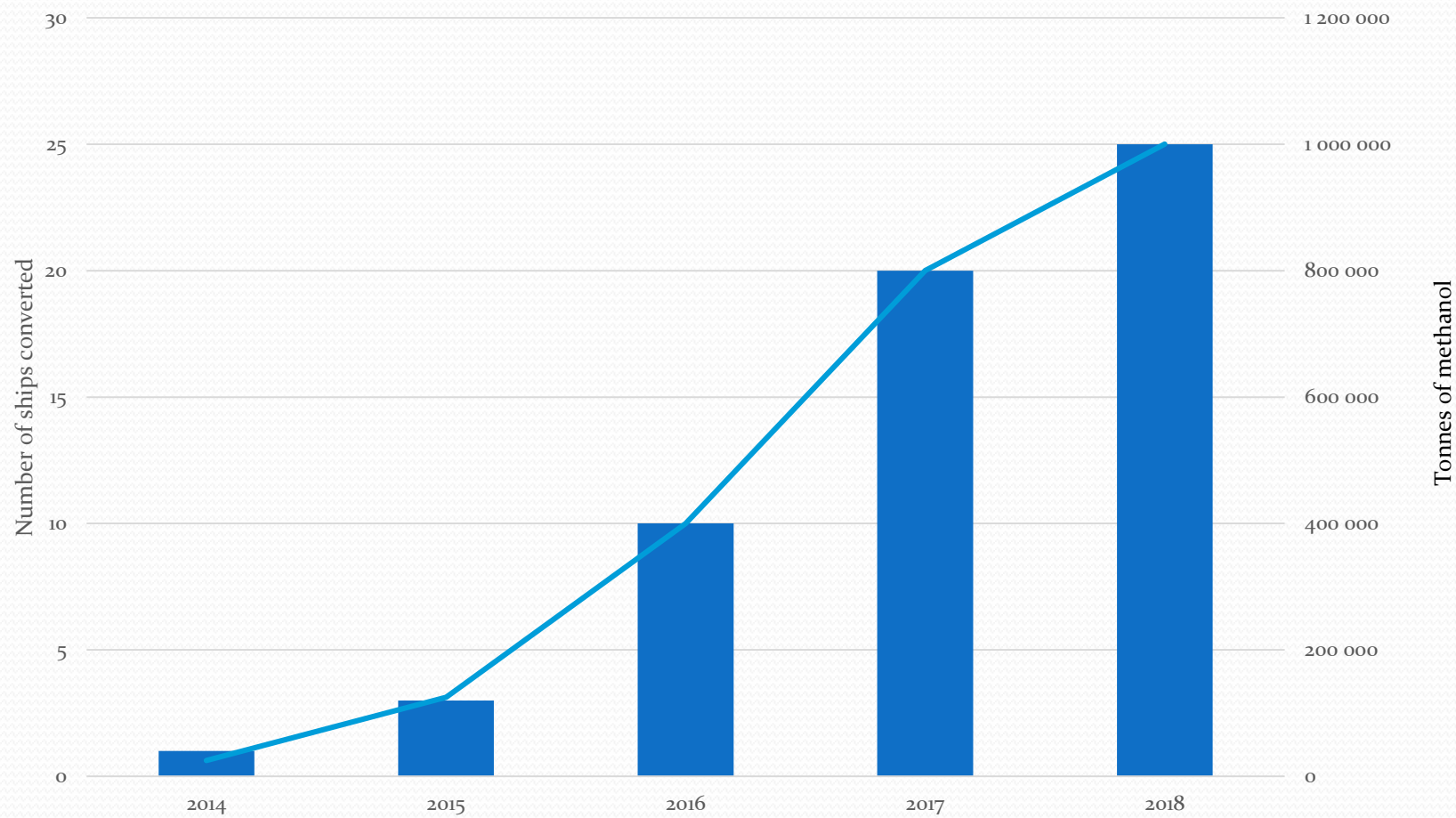
Figure 10: Life-cycle energy use and environmental impact from LNG and methanol as compared with HFO (HFO = 1 in diagram for all impacts*)



*Energy input and impacts are considered from a well to propeller perspective and apply to the fuel used for transporting one ton for one km with a RoRo ship.
 LNG figures assume 4% methane slip, as reported by the manufacturer.
 Source: Brynolf et al, 2014

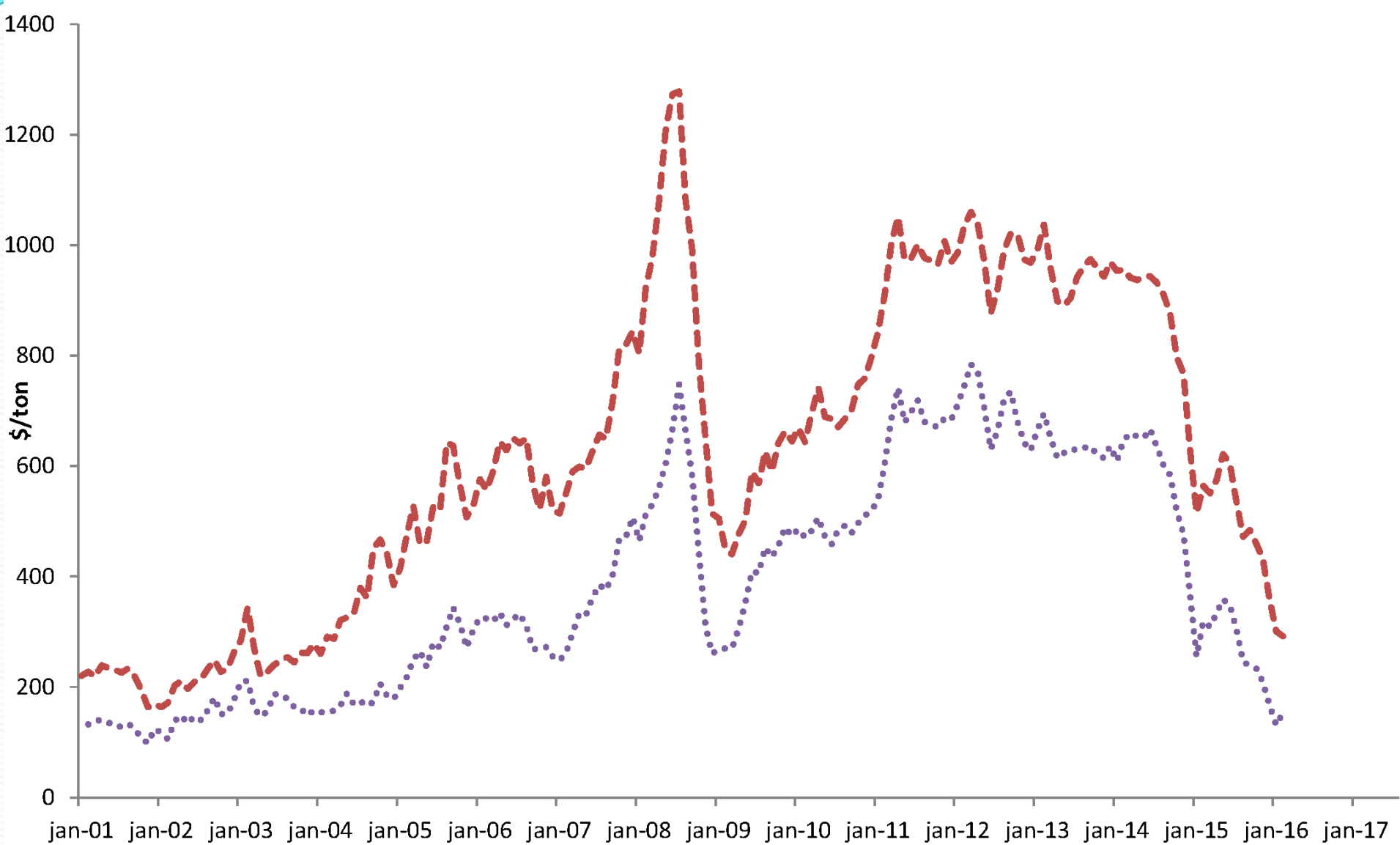


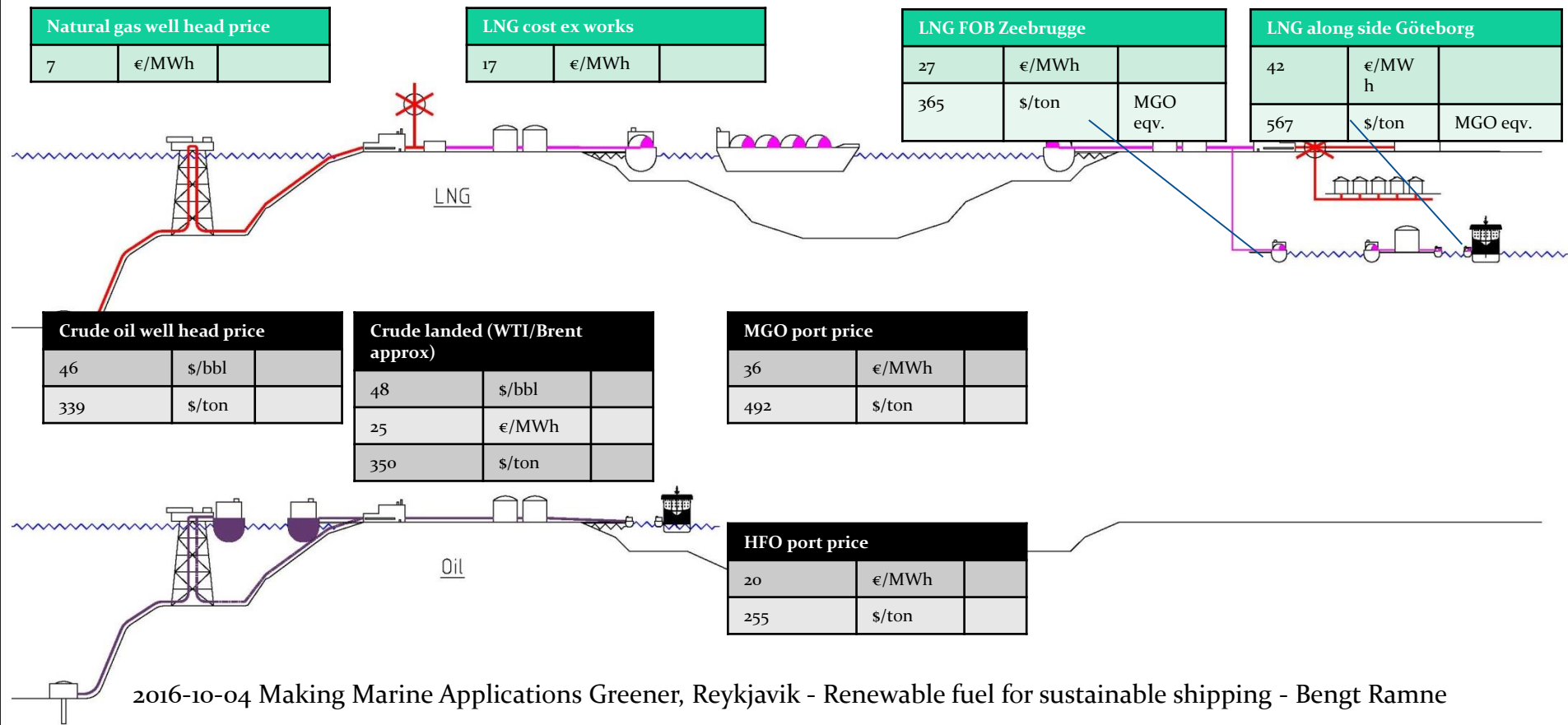
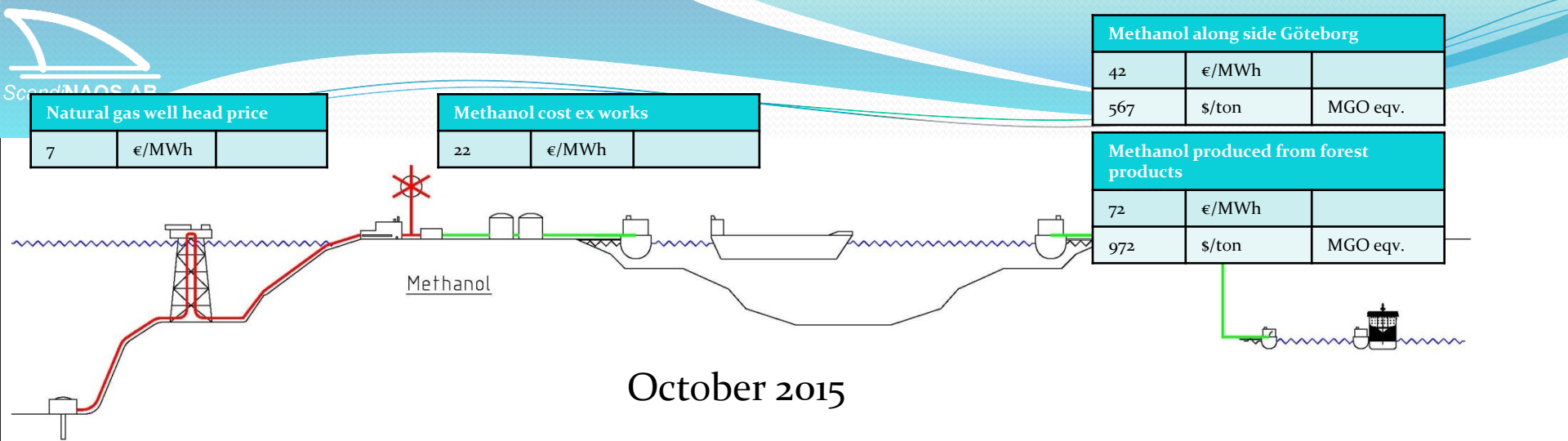
Planned global methanol project in 2013



Methanol ships





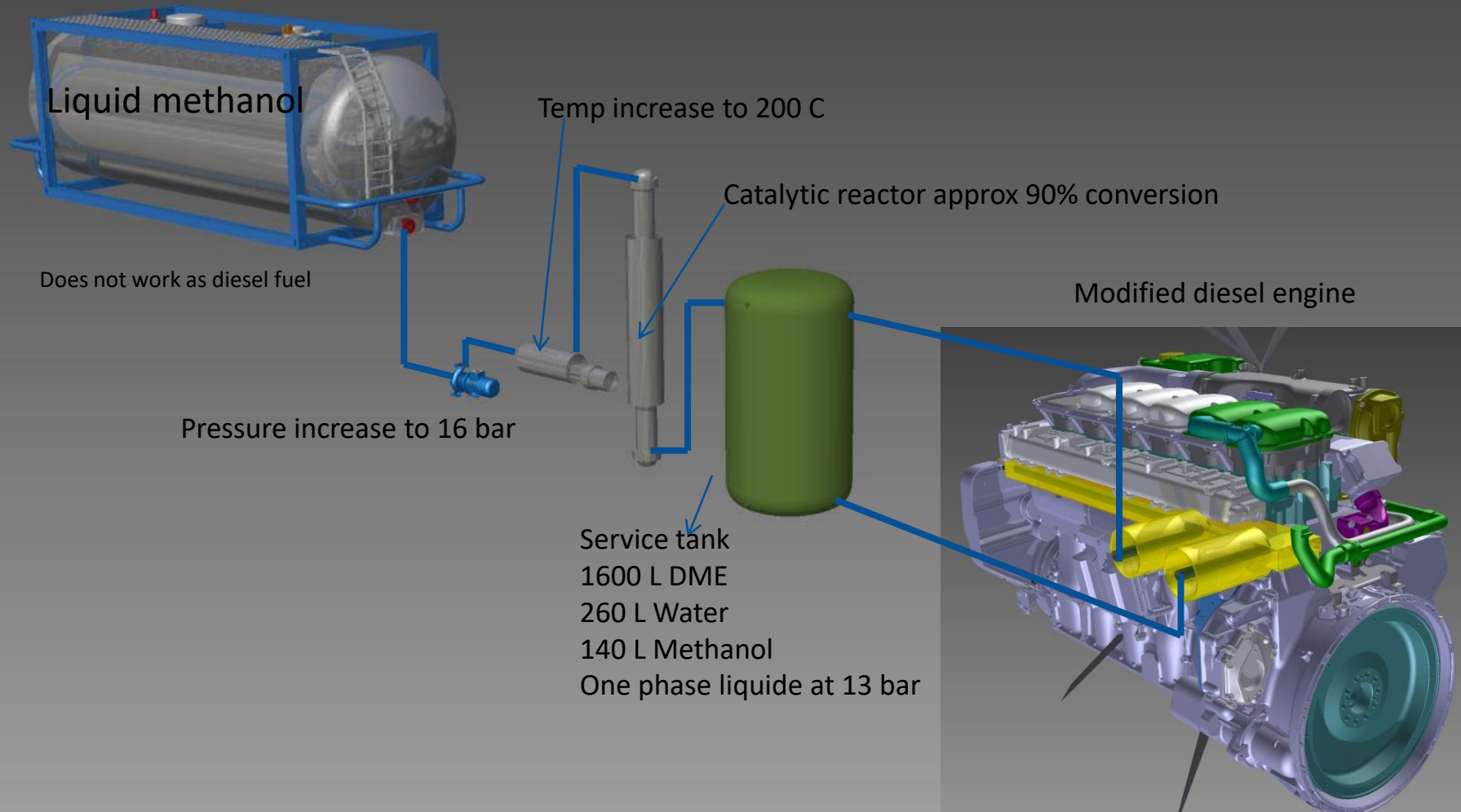


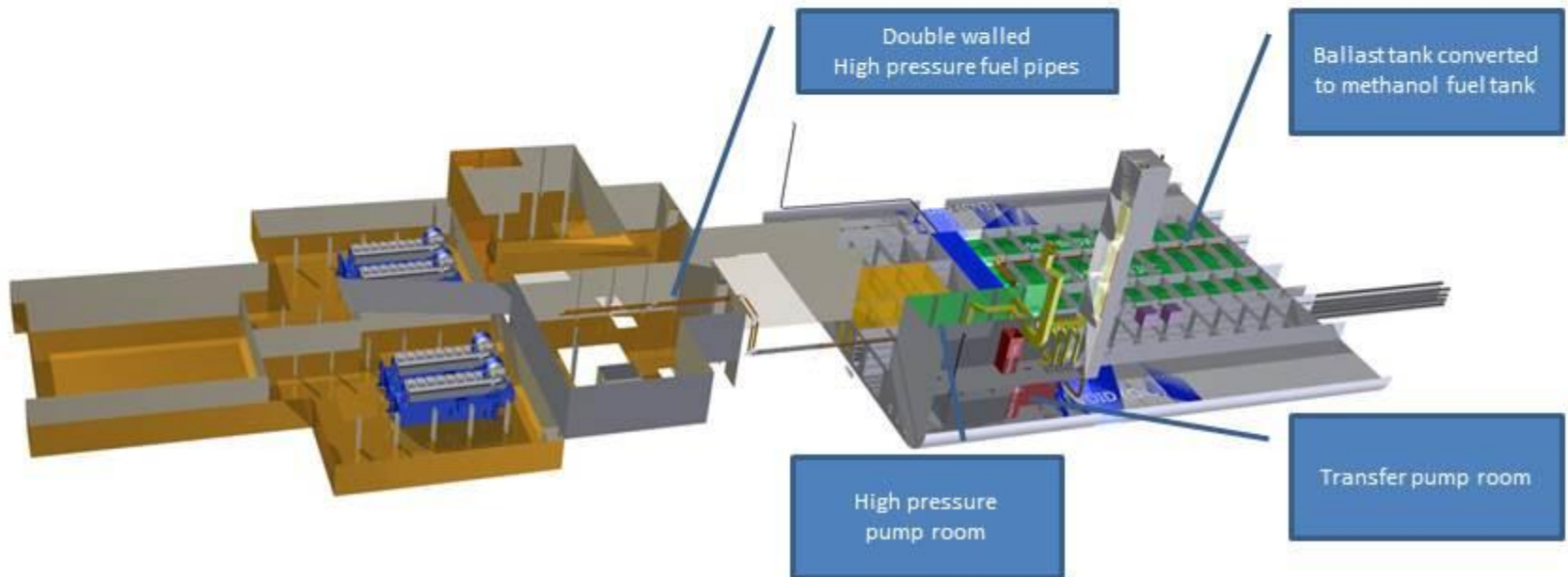
Marine methanol projects

- EffShip
- Project X
- SPIRETH
- Stena Germanica
- Waterfront
- Methaship
- SUMMETH
- GreenPilot
- GreenWorkboat

SPIRETH - Stena Scanrail









SUMMETH

Sustainable Marine Methanol



Financed through:



by:



Partners:



LUND
UNIVERSITY



SUMMETH Objectives

- Advancing the technological development
- Providing recommendations for introduction of methanol as an alternative fuel for coastal and inland waterway vessels to reduce their emissions and carbon footprint
- Investigate methanol combustion concepts and ship fuel systems that will lead to cost effective alternatives for ship operators to reduce their emissions and carbon footprint

GreenPilot



Financed by:



Partners:



GreenPilot in brief

- Project duration 1st of March 2016 – 30st of April 2018
- Major milestones
 - October 2016
 - Tank and system installation
 - Installation first engine type
 - April 2017
 - Installation second engine type
 - September 2017
 - Installation third engine type

Markets for methanol

- Natural gas based methanol for improving regional and local air quality
 - Coastal, port and inland waterways
- Renewable methanol
 - Regions with particular focus on sustainability

GREEN WORKBOAT



Rules for application of methanol as marine fuel

1. Ships >500 GT in international traffic
2. Smaller ships in domestic traffic
3. Pleasure boats

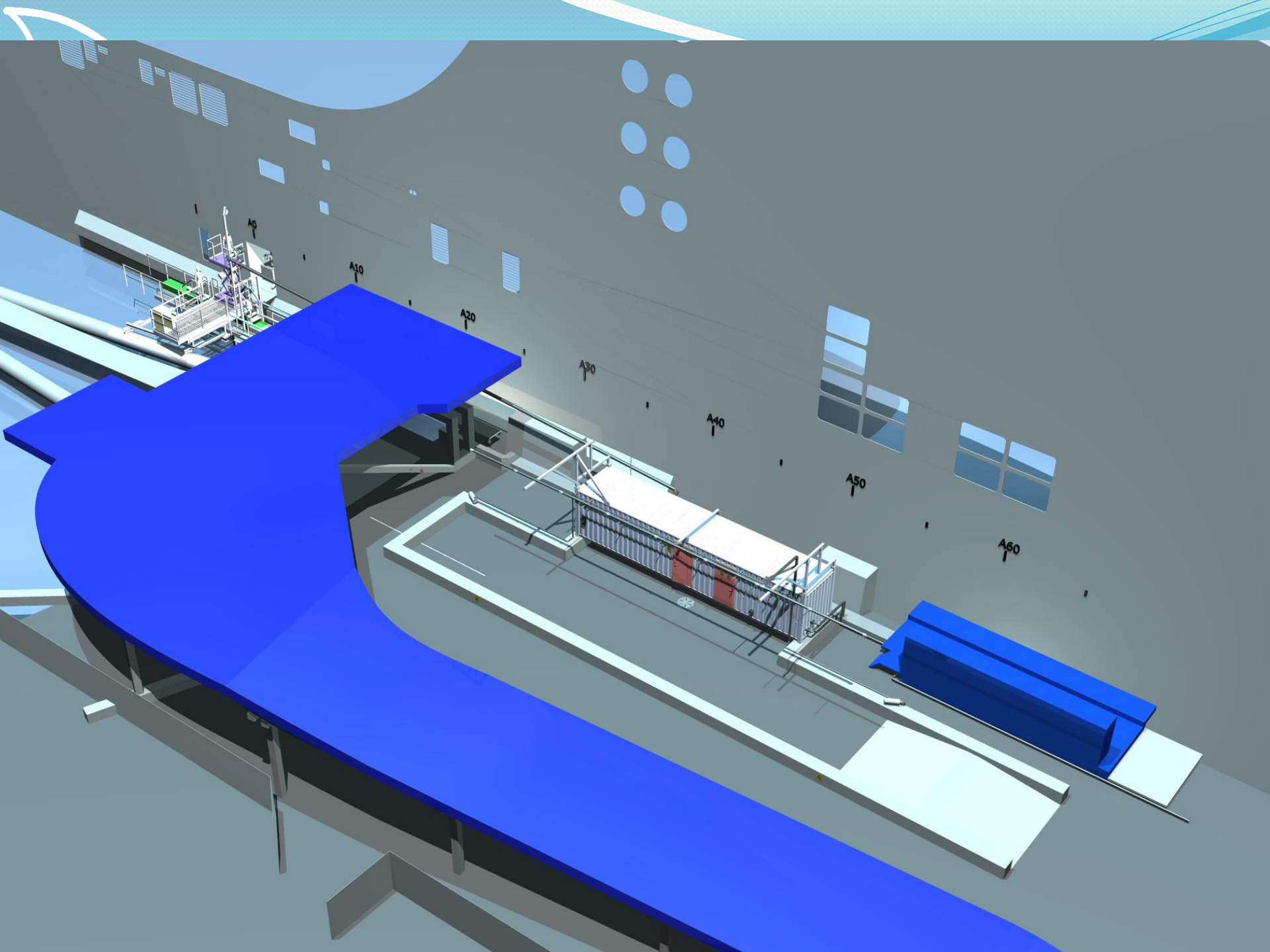
Rules - Ships >500 GT in international traffic

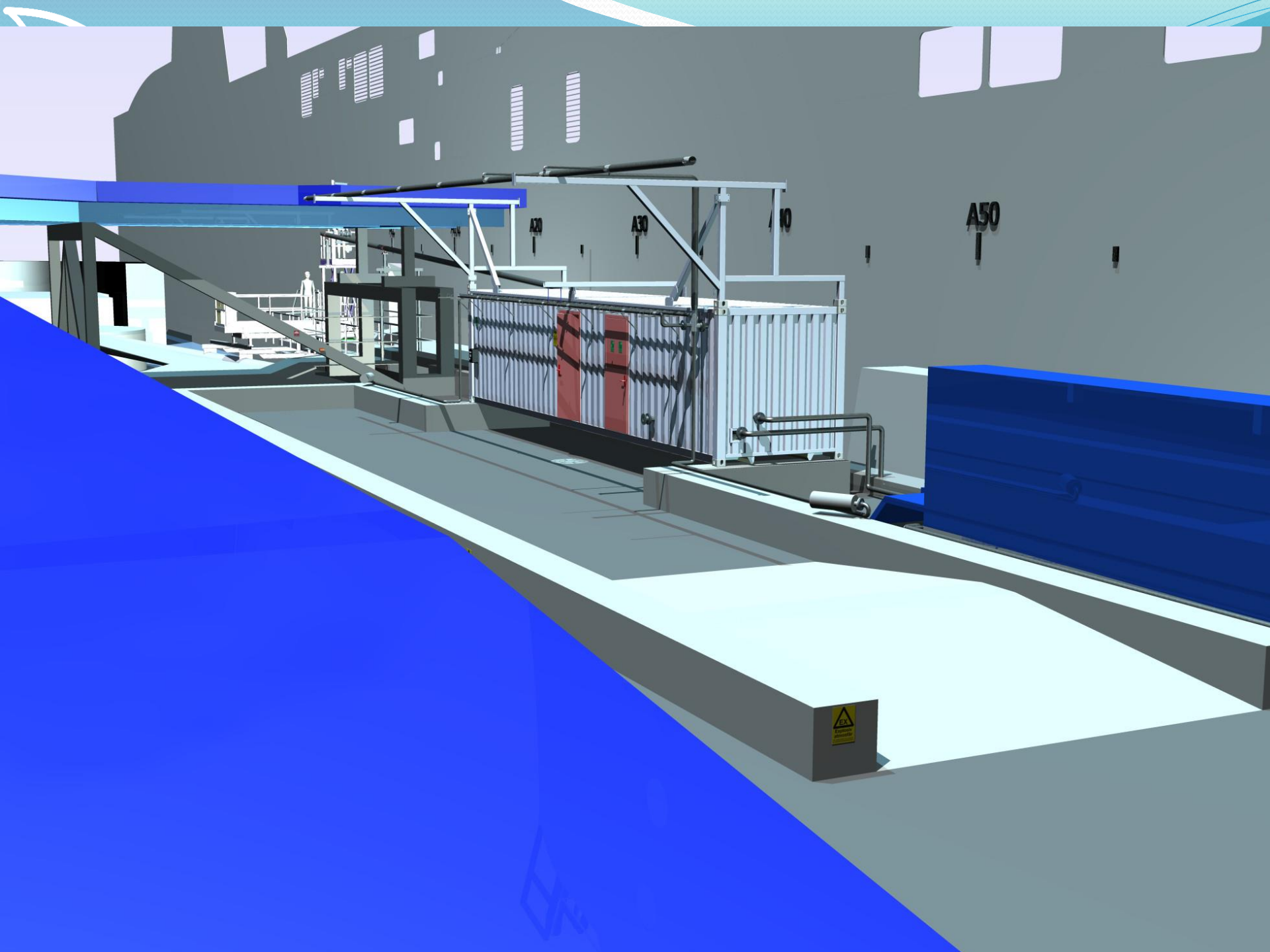
- The **IMO** rules focus on safety, security and environment
 - Previous SOLAS addresses only fuel with flash point < 60
 - In amended version the references are made to the IGF code
- The **class rules** give more explicit requirements for design of ship structure and ship systems. They do also cover production and testing
 - DNV GL – issued rules
 - Lloyds Register – issued rules
 - China classification society – draft rules

Methanol bunkering

- **Small scale bunkering using IBC tank**
- **Small fixed tank on quay**
- **Truck**
- **Bunker ship**



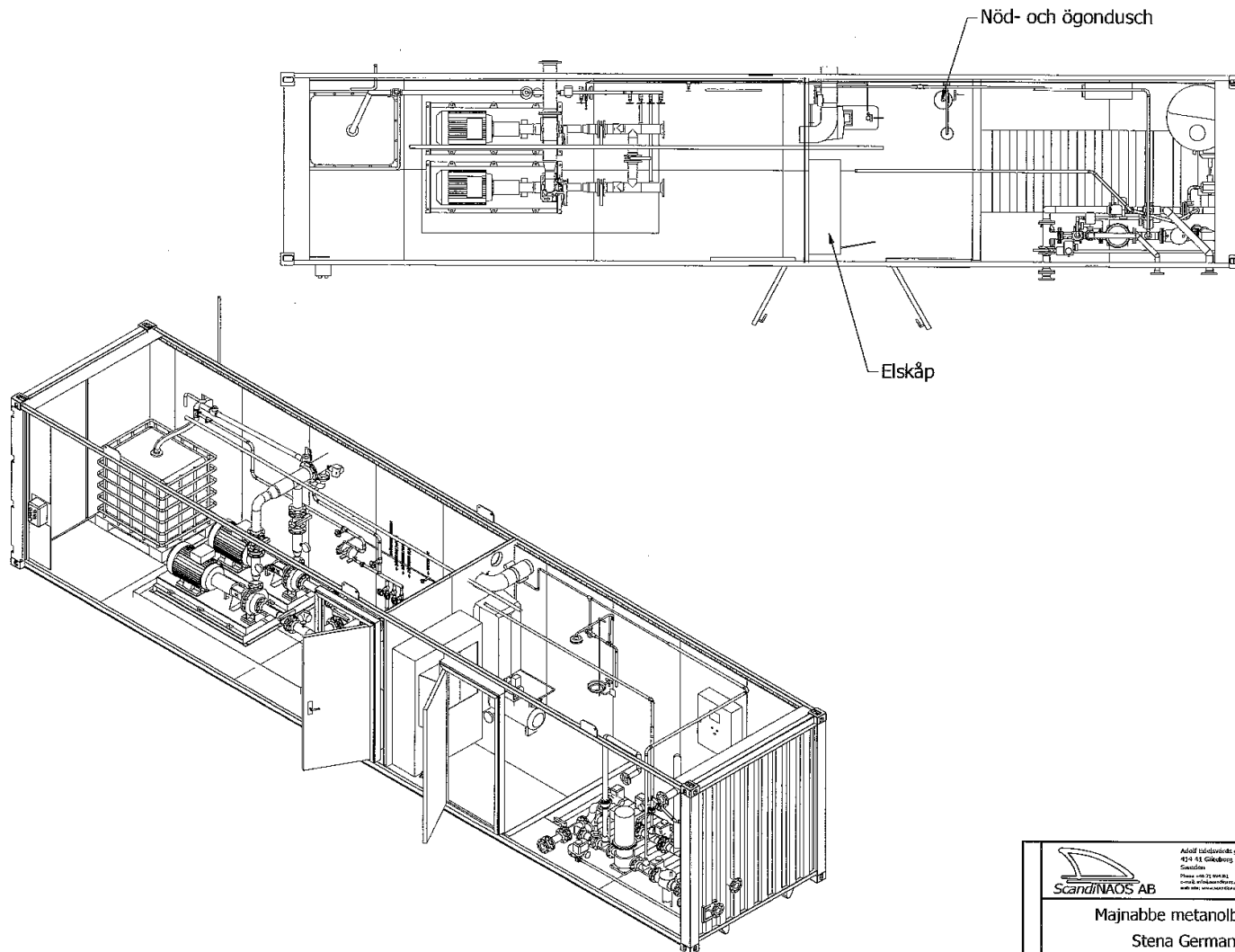







Methanol. Safe Bunkering & On-Board Handling, Workshop,
Gothenburg

REV	DESCRIPTION	DATE	APPROVED
0	Ny invallning	2015-03-02	



 <p>Adolf Luleåväg 117 654 83 Gäddede Sverige Phone: +46 90 300 000 www.scandinaos.se www.scandinaos.se</p>	<p>Ägare: Stena Germanica</p> <p>Proj. nr: 117</p> <p>Rev: 0</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>	
	<p>Majnabbe metanolbunkring</p> <p>Stena Germanica</p> <p>Arrangemang</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>
	<p>Proj. nr: 117</p> <p>Rev: 0</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>
	<p>Proj. nr: 117</p> <p>Rev: 0</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>	<p>Proj. nr: 117</p> <p>Rev: 0</p>

Bunker ship

- For a large scale implementation of methanol as marine fuel a bunkering system with bunker vessels or bunker ships will be used. This will be to large extent similar to the existing system with ship to ship transfer.
- Rules and requirements will be according to the flag authority, classification society and port authority.
- Many of the newer bunker ships are built as chemical tankers and have all equipment needed to carry methanol so no major modifications to the bunker ship should be required

What should a Methanol Bunkering Standard include?

- What is the problem?
- What is needed?
- What has been done for LNG?
- Who can/should do what?

Rules - Ships >500 GT in international traffic

- **IMO**

- **SOLAS**

- Chapter II-2, Part F, Regulation 17
 - Alternative design and arrangements
 - Chapter II-2, Part G Ships using low-flashpoint fuels
 - References the IGF code

- **IGF code, referenced in amended SOLAS**

- First generation IGF code only addresses LNG. In force from 1st of January 2017

- **ISO 20519:2017 Ships and marine technology Specification for bunkering of liquefied natural gas fuelled vessel**

- This document has been designed to support the IMO International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (IGF Code).

- **IMO**

- **SOLAS**

- Chapter II-2, Part F, Regulation 17
 - Alternative design and arrangements
 - Chapter II-2, Part G Ships using low-flashpoint fuels
 - References the IGF code

- **IGF code, referenced in amended SOLAS**

- Second generation also to include requirements for methanol and ethanol
 - Expected to be in force and applicable to ships constructed on or after 1st January 2024

Thank you