Bunkering and Operation of Gas Fuelled Ships

Gasskonferansen - Bergen 2011

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4 May 2011

MANAGING RISK

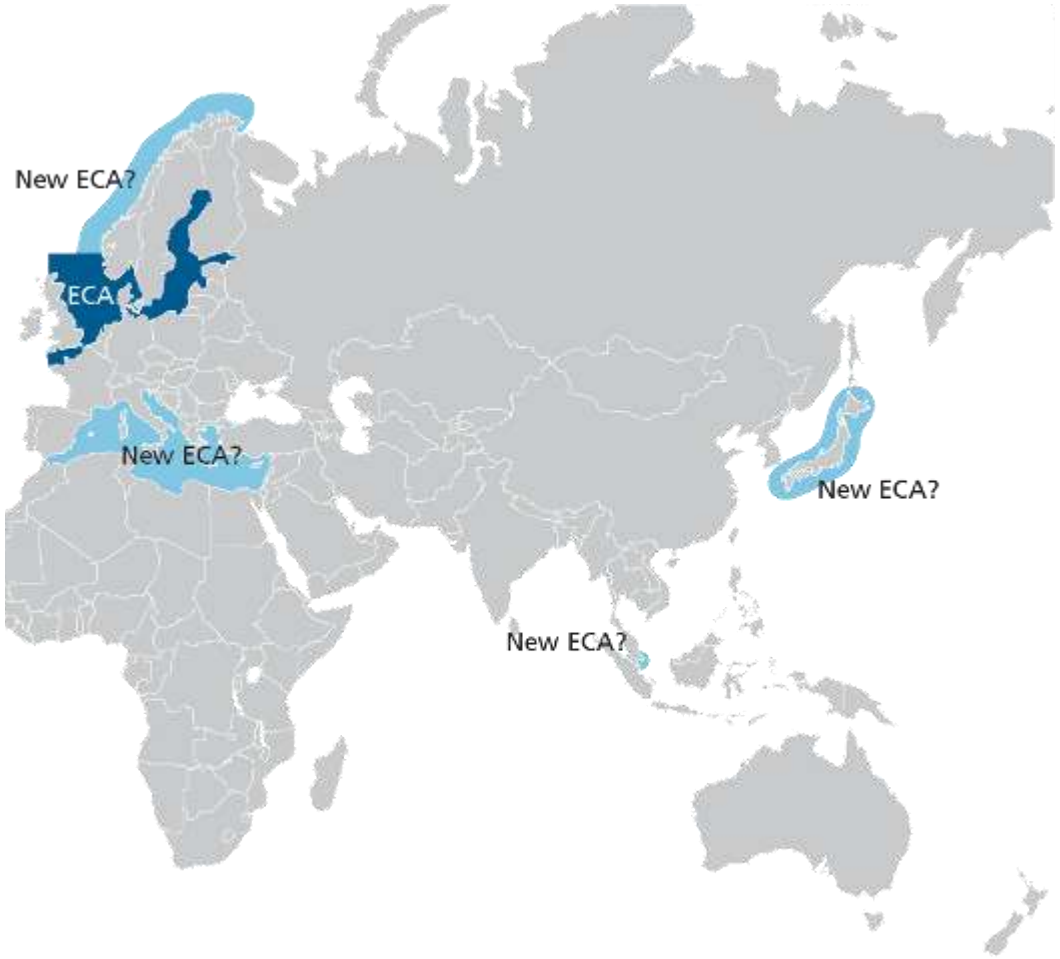
Agenda:

- LNG fuelled ships – why? And why just Norway?
- LNG bunkering
- Operation of LNG fuelled ships

The global shipping industry is facing challenging requirements

Existing fleets	
Requirement	Compliance option
2010: SOx < 1,0% 2015: SOx < 0,1%	• HFO + scrubber • Distillate fuels • LNG

Newbuilds	
Requirement	Compliance option
2011: NOx Tier 2 2016: NOx Tier 3	• Scrubber + SCR • LNG



And Norway is taking the lead on LNG

Ships in operation

Year	Type of vessel	Owner	Class
2000	Car/passenger ferry	Fjord1	DNV
2003	PSV	Simon Møkster	DNV
2003	PSV	Eidesvik	DNV
2006	Car/passenger ferry	Fjord1	DNV
2007	Car/passenger ferry	Fjord1	DNV
2007	Car/passenger ferry	Fjord1	DNV
2007	Car/passenger ferry	Fjord1	DNV
2007	Car/passenger ferry	Fjord1	DNV
2008	PSV	Eidesvik Shipping	DNV
2009	PSV	Eidesvik Shipping	DNV
2009	Car/passenger ferry	Tide Sjø AS	DNV
2009	Car/passenger ferry	Tide Sjø AS	DNV
2009	Car/passenger ferry	Tide Sjø AS	DNV
2009	Patrol vessel	REM	DNV
2009	Car/passenger ferry	Fjord1	DNV
2010	Patrol vessel	REM	DNV
2010	Car/passenger ferry	Fjord1	DNV
2010	Tug	Wuhan Ferry Company	
2010	Patrol vessel	REM	DNV
2010	Car/passenger ferry	Fjord1	DNV
2010	Car/passenger ferry	Fjord1	DNV
2010	Car/passenger ferry	Fosen Namsos Sjø	DNV

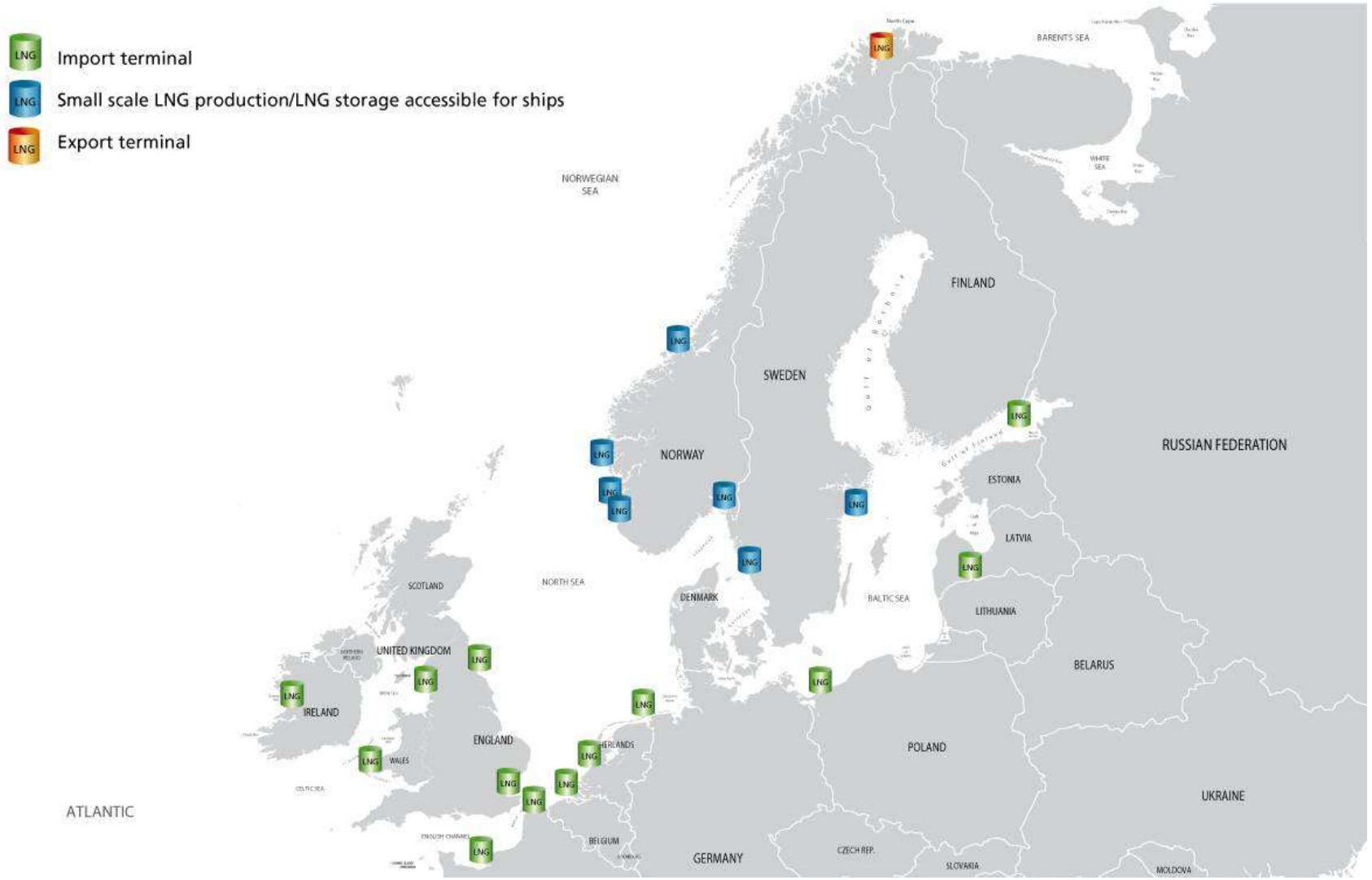
Confirmed orderbook

Year	Type of vessel	Owner	Class
2011	PSV	DOF ASA	DNV
2011	Ro-Ro	Sea-Cargo AS	DNV
2011	Ro-Ro	Sea-Cargo AS	DNV
2011	Car/passenger ferry	Fjord1	DNV
2011	PSV	Solstad Rederi AS	DNV
2011	General Cargo	Nordnorsk Shipping AS	DNV
2012	PSV	Olympic Shipping	DNV
2012	PSV	Eidesvik	DNV
2012	PSV	Eidesvik	DNV
2012	High speed RoPax		DNV
2012	PSV	Island Offshore	DNV
2012	PSV	Island Offshore	DNV
2013	Car/passenger ferry	Torghatten Nord	DNV
2013	Car/passenger ferry	Torghatten Nord	DNV
2013	Car/passenger ferry	Torghatten Nord	DNV
2013	Car/passenger ferry	Torghatten Nord	DNV
2013	RoPax	Viking Line	

Planned conversion

Year	Type of vessel	Owner	
2011	Car/passenger ferry	Fjord1	DNV
2011	Chemical tanker	Tarbit Shipping AB	GL

Why only Norway? Because of infrastructure

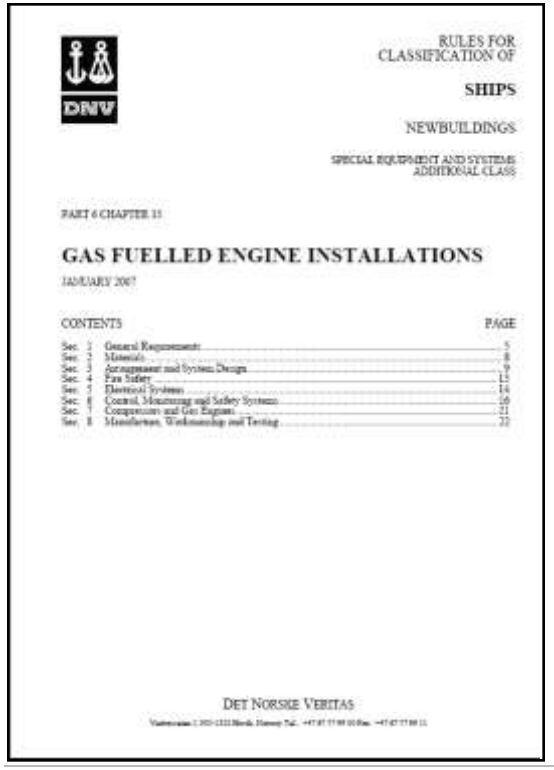


Internationally, LNG exists only in large volumes

Status on rules, regulation, and standardization

Gas fuelled ships

- DNV class rules published 2001
- Norwegian Maritime Directorate developed rules
- Interim Guidelines for IGF code published 2010



RULES FOR CLASSIFICATION OF

SHIPS

NEWBUILDINGS

SPECIAL EQUIPMENT AND SYSTEMS ADDITIONAL CLASS

PART 6 CHAPTER 13

GAS FUELLED ENGINE INSTALLATIONS

JANUARY 2007

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DET NORSKE VERITAS

Port and bunker operations for LNG

- Less experience and documentation
- Standards does not address this completely
- Development:
  - STS Gothenburg
  - Bungas - Hamburg
  - EU funded study
  - ISO project

STS Gothenburg: Several rules/guidelines relevant, but not directly applicable

IMO - IGC Code
Rules for the bunker boat, which is a small LNG carrier

IMO - IGF Code
Rules for the receiving ship, the ship using LNG as fuel

SIGGTO
Guidelines for LNG transfer

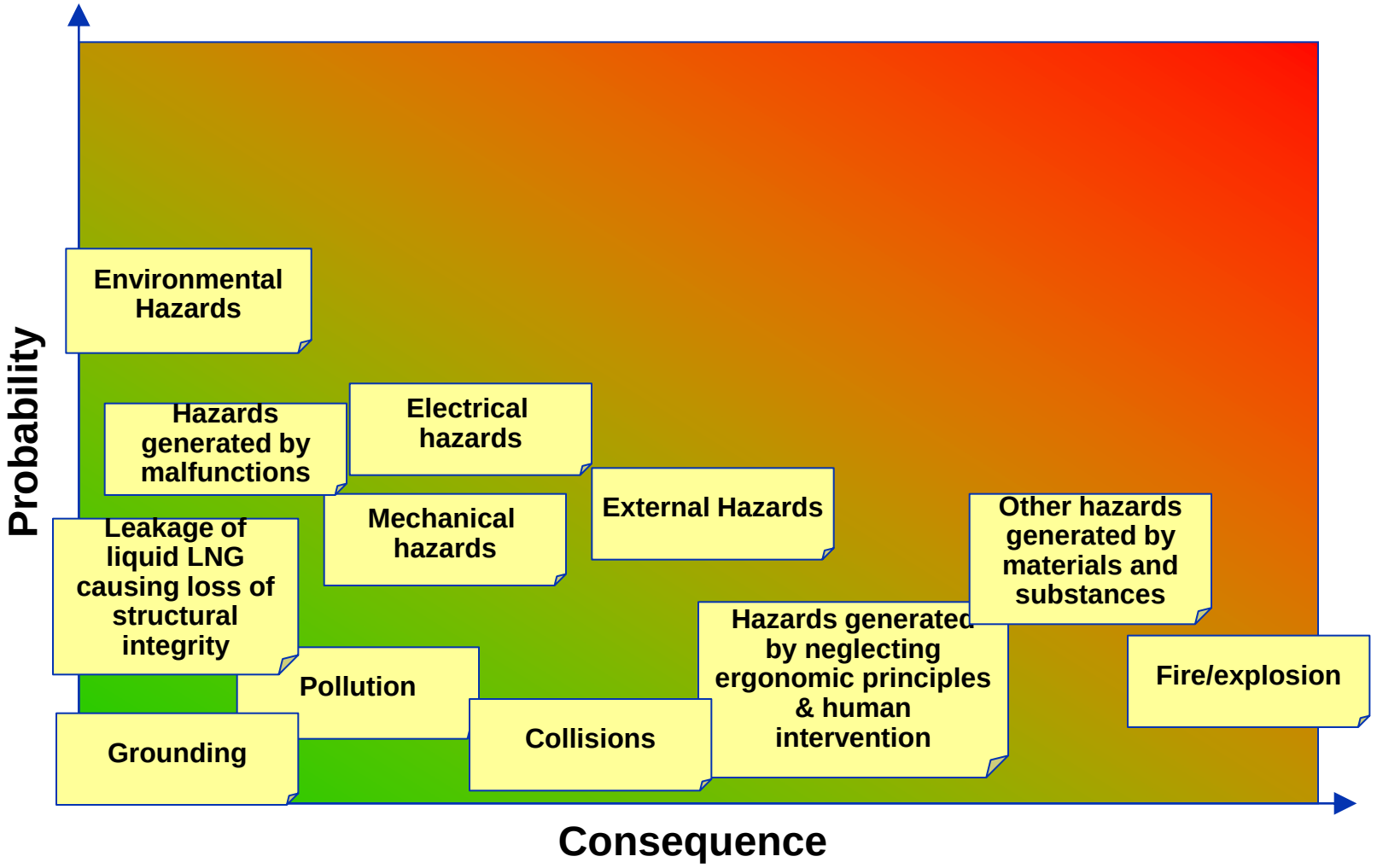
OCIMF
Guidelines for Oil transfer, ship to ship oil bunker procedures

Port regulations
e.g. “Green bunkering” for Port of Göteborg

Swedish Civil Contingencies Agency - MSB
Regulations on land

Swedish Transport Agency – Maritime department
Regulations at sea

When rules are missing, a risk based approach is necessary



ISO standard on LNG bunkering

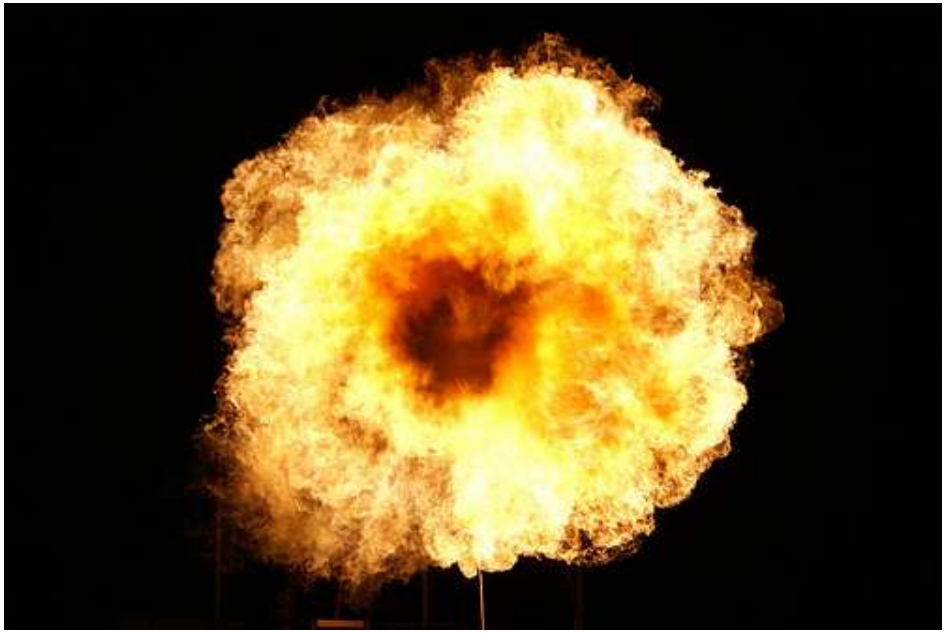
- DNV proposed the topic to ISO TC67/WG10 (ISO workgroup for the LNG industry)
- 20 companies and individuals have already indicated interest for participation, representing the following countries:
  - Norway
  - Belgium
  - Brazil
  - Canada
  - China
  - France
  - Germany
  - Italy
  - UK
- kick-off meeting will be arranged early June
- Objective: Develop standard for LNG bunkering equipment and procedures

Time to take stock on experiences with LNG?

- 20 ships launched over the past 10 years
- Some 200 000 hours of operation logged
- Qualitative feedback:
  - Less soot
  - ”White boiler suits”
  - Less maintenance
- Quantitative feedback:
  - No significant incidents are recorded

LNG is safe

- Two main areas of difference from other fuels:
  - Cryogenic effects
  - Forms gas clouds
- LNG has a strong track record
  - No significant incidents with ships
  - Very few incidents on land
- ***But, this performance is due to:***
  - ***Relevant requirements***
  - ***Good safety behaviour***



Good safety behaviour

- There are no specific requirements to crew training internationally or nationally
- Every ship operator needs to ensure good safety behaviour through company procedures
- Time to re-think this as LNG fuel starts to grow internationally?

Key take-aways

- LNG success stories in Norway due to Government requirements and incentives
- The industry is now developing practices and standards for bunkering
- Remember, LNG is safe **because** we are dealing with the risks!

Safeguarding life, property and the environment

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