

**RUOLO DELLA MARINA MILITARE PER
L'IMPIEGO DEL GAS NATURALE NELLA
PROPULSIONE NAVALE**

Roma, 21 / 11/ 2013

***La tutela ambientale
sui mari internazionali***
**(Environmental Regulations
of the Shipping Industry)**

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Shipping sector and Environmental Legislation

Introduction: the global dimension of sea transport

Environmental (and other) legislation is a challenge due to the **characteristics of the shipping sector**:

- global operations in trade
- registration of ships in different countries
- marine fuel can be bunkered in any location

The **environmental impact of shipping** can be segmented in five categories:

- SOX and PM emissions
- NOX emissions
- CO2 emissions
- Chemical releases from vessels
- Waste generation (solid as well as liquid waste)



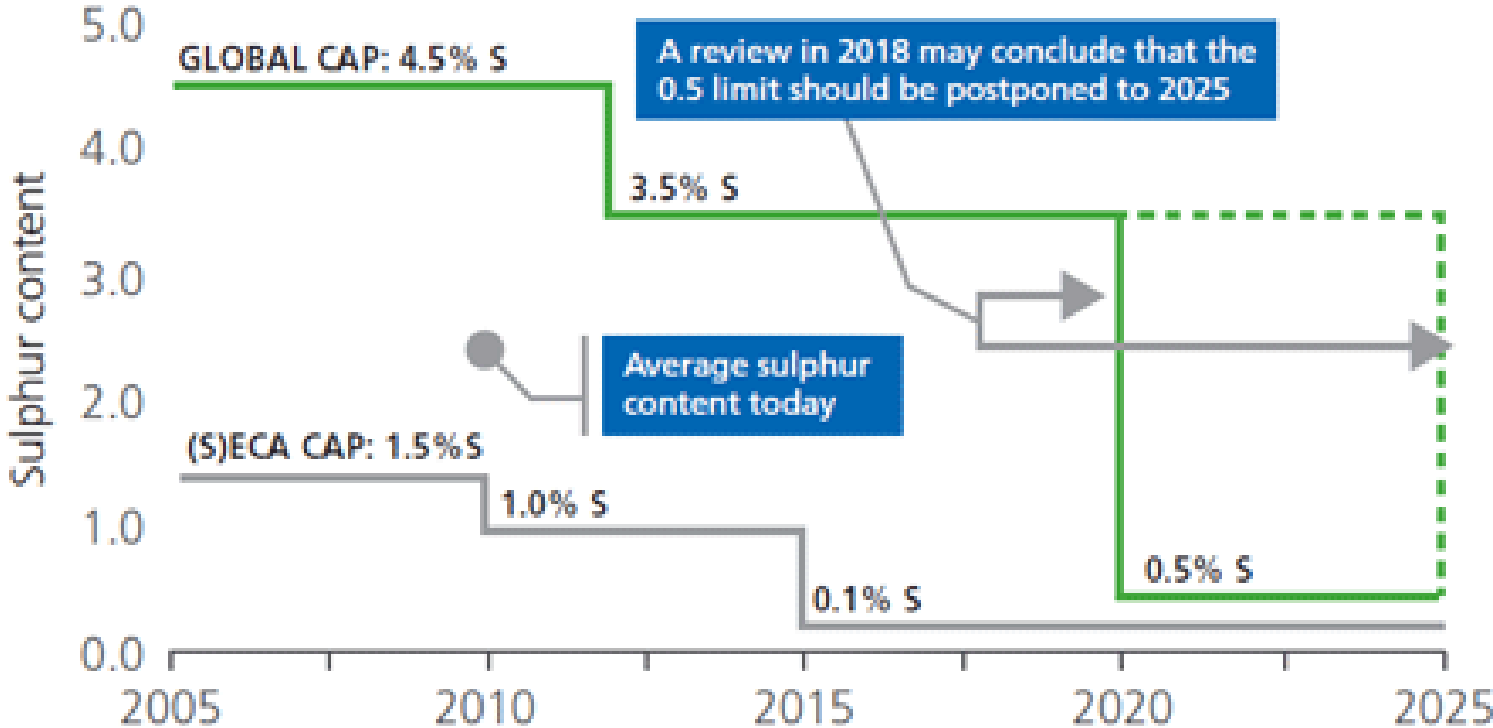
IMO: the International Organization responsible for safety and security of shipping and developing international regulation

- The International Maritime Organization (IMO) is based in London, part of the United Nations.
- The “***International Convention on the Prevention of Pollution from Ships***” is the main international convention to prevent pollution by ships.
 - Air pollution is regulated in Annex VI “*Regulations for the prevention of Air Pollution from Ships*” (came into effect in 2005).
 - IMO's Marine Environment Protection Committee (MEPC) revised the MARPOL Annex VI by reducing the global sulphur limit (2008).
- At the global level, no sector GHG emissions reduction target has been established. International shipping is not covered by an EU emissions reduction target (complex MRV system)



Legislation (IMO and EU) on maritime engine emissions

RESTRICTIONS FOR SULPHUR CONTENT IN MARINE FUELS:

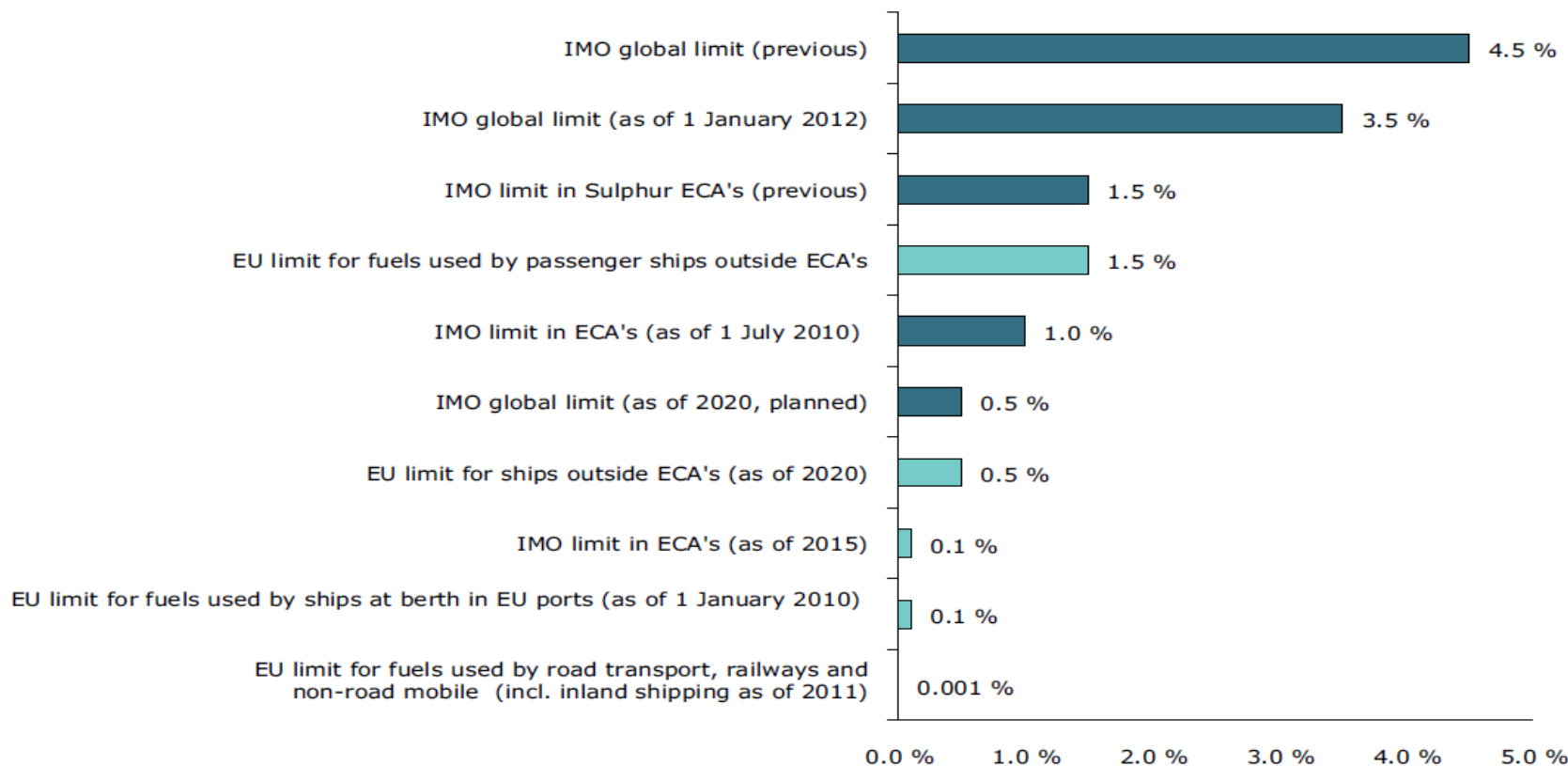


Source: DNV



Overview of the different implemented and planned sulphur limits for marine fuels under IMO and EU legislation.

Different requirements on the sulphur content of marine fuels, depending on location



Source: European Environment Agency

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Directive 1999/32/EC relating to a reduction in the sulphur content of certain liquid fuels. [The consolidated version]

EU Legislator - Chronology

Reference	Description
Dir 1999/32	Incorporation of IMO standards into EU law [The directive does not contain provisions to regulate NOX emissions]
Dir 2005/33	Introduced the IMO concept of Sulphur Emissions Control Areas (SECAs) and the associated fuel standards. Sulphur content was limited to: <ul style="list-style-type: none">- a max of 1.5% for ships operating in the Baltic Sea as from 2006- a max of 1.5% for ships operating in the North Sea and the English Cannel as from 2007 Requirements that went beyond the IMO rules were introduced: <ul style="list-style-type: none">- A 0.1% max sulphur requirement for fuels used by ships at berth in EU ports from 1 January 2010- The 1.5% fuel standard applies also to passenger ships operating on regular service outside SECAs
Dir 2012/33	<ul style="list-style-type: none">- Full alignment with the sulphur provisions of the 2008 IMO amendment.- It fixes the introduction of the 0.5% fuel standard to 2020- It sets a 3.5 % m cap for the sulphur content of fuels for ships equipped with a scrubber



Tough legislation is being viewed as a driver for switch to LNG as ship fuel

Other drivers to reduce the environmental footprint of the shipping industry:

IMO regulation for **NOX emissions** from marine diesel engines

- Tier I - Ships built between 2000 and 2011 need to comply with NOX emissions at max engine speed of about 9.8–17 g/kWh
- Tier II - Ships built after 2011 need to comply with 7.7–14.4 g/kWh
- Tier III - Ships operating after 2016 in NECAs need to comply with emissions of 2.0– 3.4 g/kWh

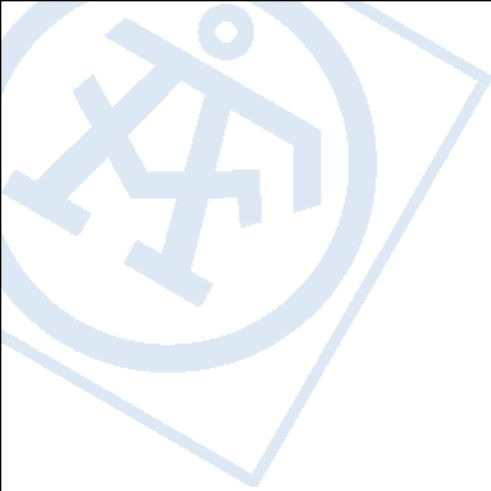
Energy Efficiency Design Index (EEDI), which is an international directive regulating the energy efficiency in new ships

Ship Energy Efficiency Management Plan (SEEMP), which is an international directive regulating all ships

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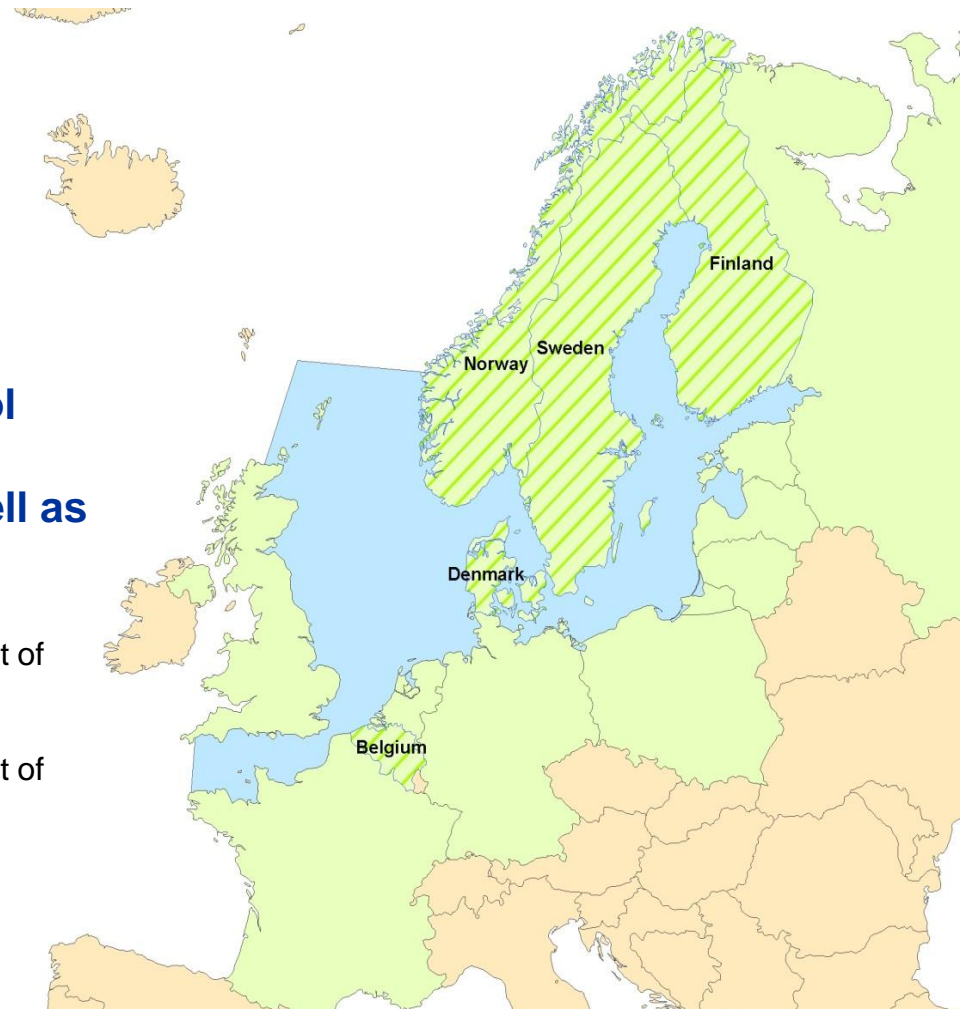




The 2015 Sulphur Emission Control Area – SECA limit has severe implications for ship owners as well as for entire supply chains

- 1.0 % as the maximum allowable sulphur content of bunker fuel (from July 1, 2010);
- 0.1 % as the maximum allowable sulphur content of bunker fuel (from January 1, 2015).

Due to stringent regulations on emissions, shipping industry is rethinking its fuelling options.



Ship Owner Compliance Strategies

■ Existing ships:

- To use **Marine Gas Oil (MGO)** has least capex costs but high opex
- Fitting a **HFO scrubber** to use Heavy Fuel Oil is next alternative, higher capex, lower opex
- **Retrofitting LNG** has highest capex but potentially lowest opex, with low payback in the range 2-4 years

Retrofitting suits some ship types and ships with longer remaining life

■ New Builds:

- Payback for incremental cost of LNG, around 2 years
- Payback increases to 4 years if relative price of LNG is high



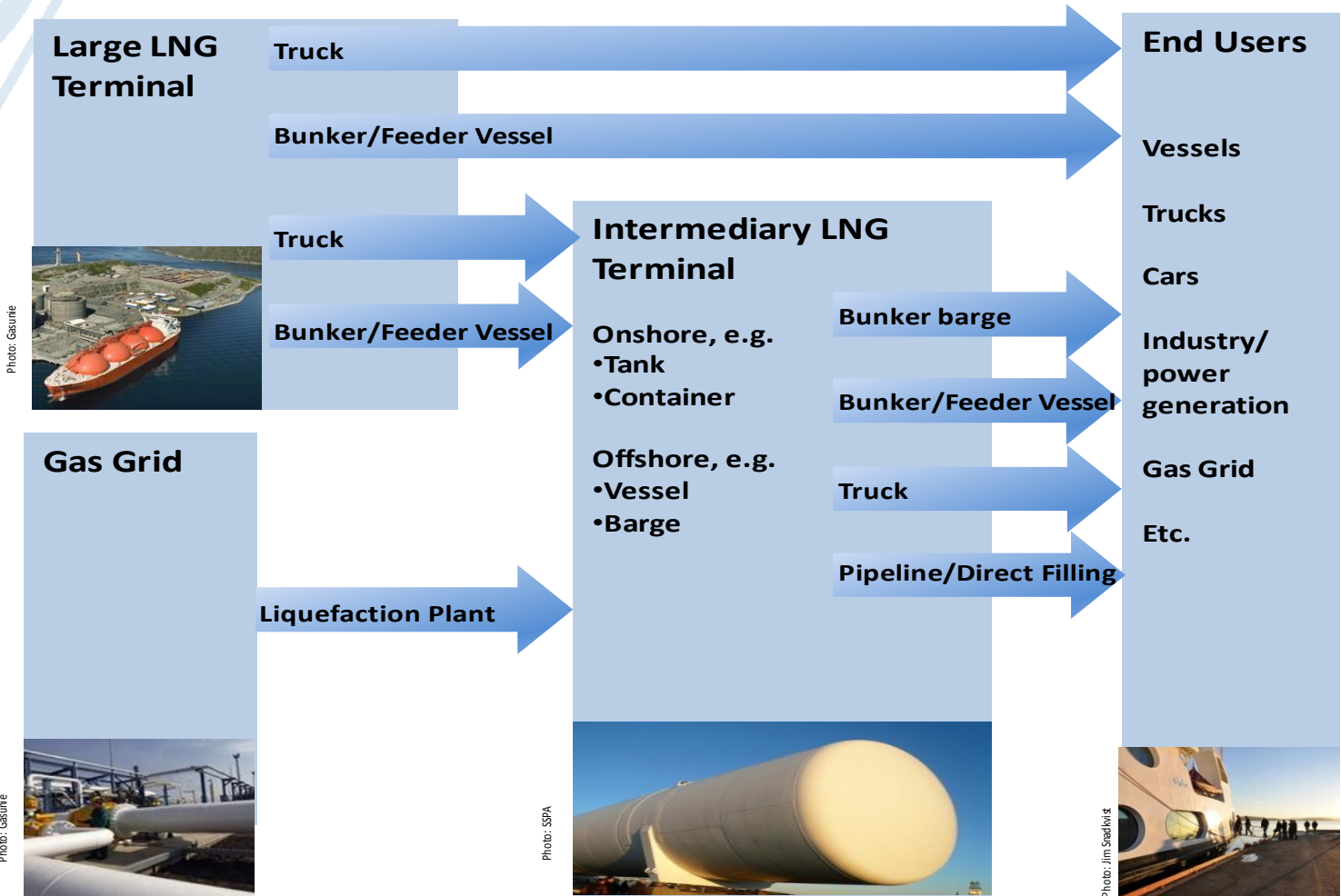
Ship owners : which strategy?

Mainly three options to continue sailing in ECAs from 2015

1. Switch to low sulphur fuel	2. Install an exhaust gas scrubber	3. Switch to liquefied natural gas (LNG) as fuel
<p>Marine Gas Oil (MGO) and Marine Diesel Oil (MDO) can be supplied with a sulphur content of below 0.10%.</p>	<p>Exhaust gas scrubber can be installed to remove sulphur using sea water and/or chemicals.</p>	<p>No additional abatement measures are required in order to meet the ECA SOx requirements.</p>
<p>Little modifications and investment needed</p>	<p>Can use cheaper, high sulphur fuel</p>	<p>Reduces NO2 and CO2 Currently cheap but future price uncertain</p>
<p>Availability of low sulphur fuel is already limited</p> <p>Rising demand is expected to increase this fuel's price uncertainty</p> <p>Wear and tear</p>	<p>Uncertainty about scaling up installations for large diesel engines (in the range of 50 MW and upwards).</p> <p>Takes up space and investment cost It requires alterations on board (tanks, pipes, pumps), a dedicated special waste facility and a wash water treatment system.</p> <p>Requires additional energy increasing the power consumption, and CO2 emissions.</p>	<p>LNG-fuelled ship requires purpose-built or modified engines and a specially designed system including a vaporiser and double-insulated piping with gas sensors and shut-down arrangements.</p> <p>Fuel availability uncertain.</p> <p>Infrastructure currently limited.</p>



Maritime supply chain





CALL for TENDER / European Commission DG Transport :
*Study on the completion of an EU framework on LNG-fuelled ships
and its relevant fuel provision infrastructure*

Time-limit for receipt of tenders: 10/01/2014

Estimated total value: 1 000 000 EUR

Lot 1: analysis and evaluation of identified gaps and of the remaining aspects for completing an EU-wide framework for marine LNG distribution, bunkering and use [250 000 EUR]

Lot 2: creating awareness on LNG risks and opportunities [450 000 EUR]

Lot 3: analysis of the LNG market development in the EU [175 000 EUR]

Lot 4: explore financing opportunities, assess and develop financial mechanisms beyond the EU financial framework aiming at supporting the deployment of marine LNG technology.[125 000 EUR]

Source - http://ec.europa.eu/transport/facts-fundings/tenders/index_en.htm

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Analysis and evaluation of identified gaps and of the remaining aspects for completing an EU-wide framework for marine LNG distribution, bunkering and use [LOT 1]

Key Issues / Solutions for an EU-wide harmonisation

- Gaps and barriers for a consolidated EU-wide framework for LNG distribution, bunkering and use
- Local rules and procedures in place (safety and security aspects of LNG storage, bunkering and handling , ports/supply side and ships)
- Quantitative risk assessment, risk acceptance criteria
- Permitting processes, incident reporting
- Parameters such as costs and benefits for the affected parties
- Sulphur Directive and relevant provisions under the proposal for a Directive on the deployment of alternative fuels infrastructure
- 'LNG action plan' at EU, Member State and sector level
- Mid- to long-term basis scenarios



Analysis of the LNG market development in the EU [LOT 3]

Market overview and estimations on deployment of LNG as a bunker fuel

- Future estimations of the LNG bunkering fuel market (LNG supply and demand, prices, etc.), both globally and in the EU including the introduction of 'LNG-ready' ships
- LNG re-fuelling infrastructure development in the EU (which is likely to increase considerably)
- Trends in LNG supply chain management at EU and global level and challenges posed to the transport system
 - economic impact
 - environmental impact
 - social impact





Recent work includes:

“North European LNG Infrastructure Project”

....a Feasibility Study for an LNG Filling Station Infrastructure

Co-financed by
the European Union TEN-T and the Danish Maritime Agency

Full Report and Appendices available at:

http://www.dma.dk/themes/LNGinfrastructureproject/Documents/Final%20Report/LNG_Full_report_Mgg_2012_04_02_1.pdf



AF Consult and LNG

- Consulting and engineering group with 7500 staff and offices in 26 countries:
 - **LNG Transactions practice** – introducing major users and producers of LNG
 - **Gas Economics practice** – economic drivers of gas prices and trading
 - **Gas Markets practice** – the shipping and distribution of gas and LNG
 - **Gas Engineering practice** – gas pipelines and handling





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Grazie

Danke

Ευχαριστίες

Dalu

Thank You

Köszönöm

Tack

Спасибо

Dank

Gracias

谢谢

Merci

Seé

ありがとう

Obrigado

