



LNG as a Maritime Fuel

An opportunity for the LNG industry

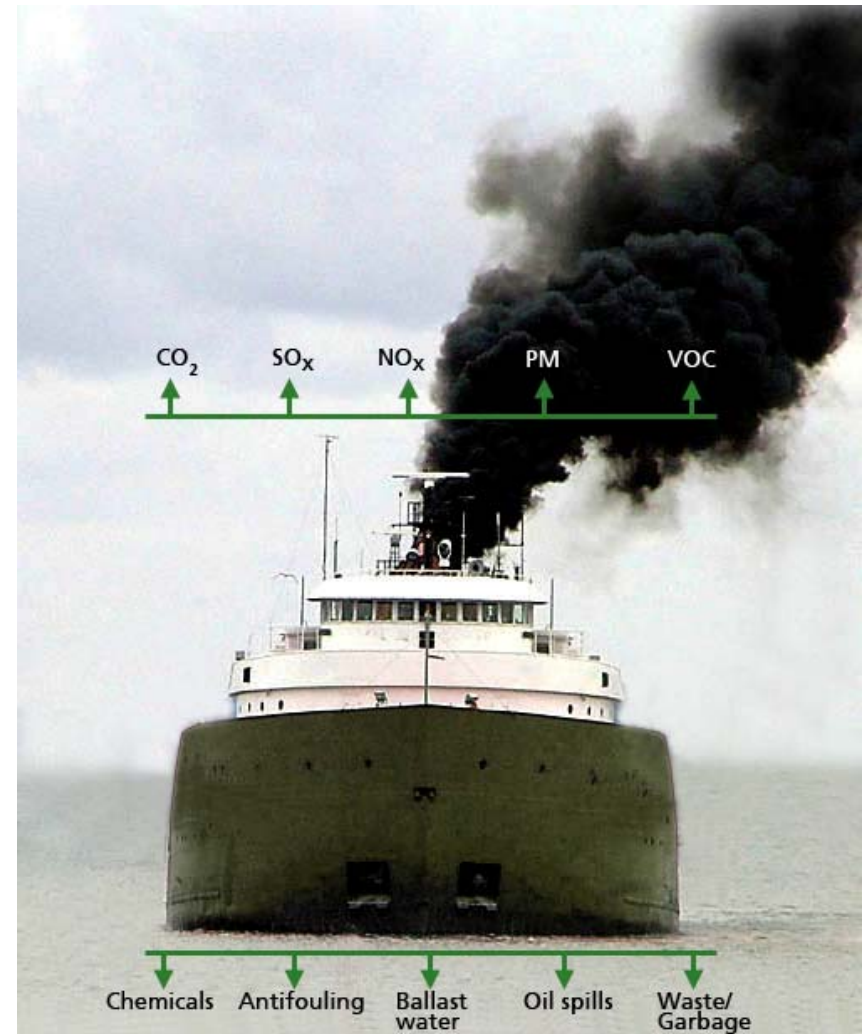
Kenneth Vareide

Director of Operations,
North America Maritime

5 December 2010

There are two important forces in the maritime industry which are all pulling in the same direction

- Regulators are increasingly focusing on the environment
- The Market is driving better economical performance



Emission Control Areas present a challenge for the Maritime Industry

ECA requirements - EU

- **ECA (Emission Control Area) requirements:**
- Maximum level of sulphur in fuel, all ships:
 - 1,0% by 1st Jul 2010
 - 0,1% by 1st Jan 2015

ECA requirements - US

- **Sulphur (all ships)**
 - 2012 (august) : max 1.0% sulphur fuel
 - 2015: max 0.1% sulphur fuel
- **NOx (newbuilds)**
 - 2011: 20% NOx reduction from marine engines
 - 2016: 80% NOx reduction

New ECA?

New ECA?

ECA

New ECA?

New ECA?

New ECA?

California regulation already limits the use of marine bunker to either Marine Gas Oil (max 1.5%) and Marine Diesel Oil (max 0.5%) within 24 nm of land. From January 2012 this will be reduced to 0.1%.

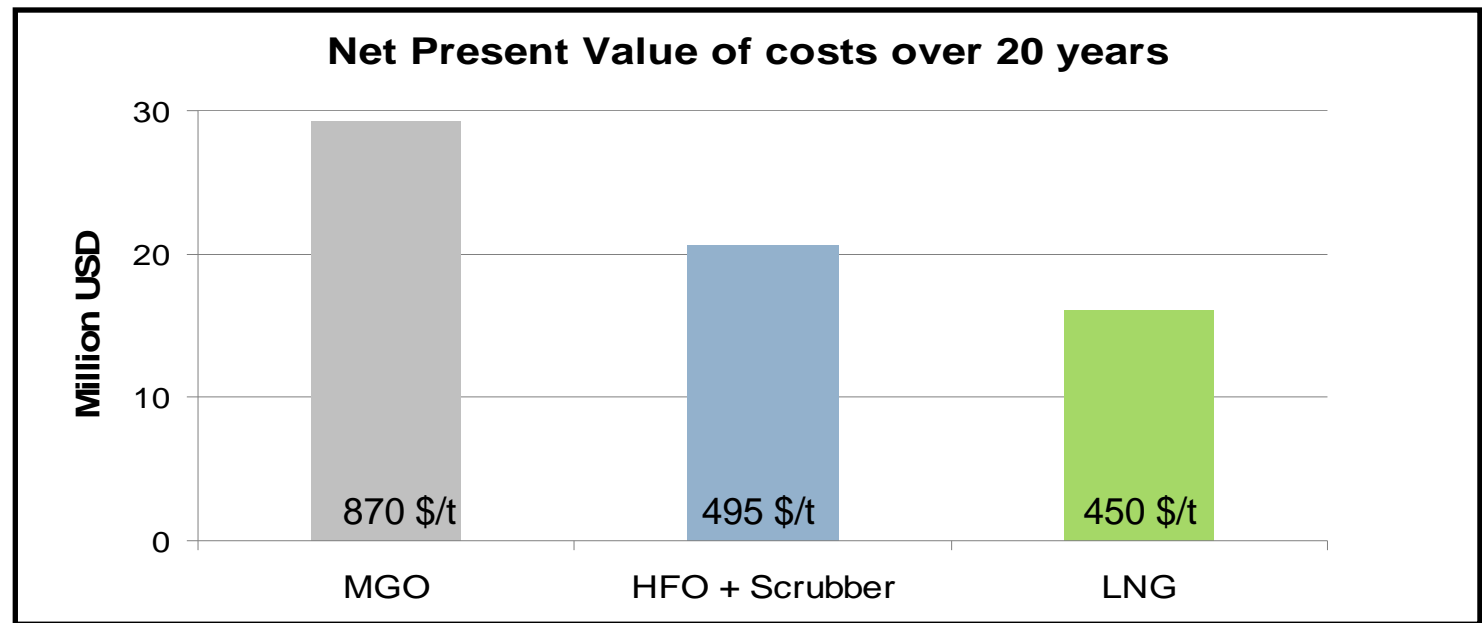
New Building Scenario

LNG Provides the Best Economically Projections



Three alternatives to meet the future ECA requirements:

1. Low sulphur fuel (0,1% sulphur)
2. Install scrubbers
3. Switch to LNG

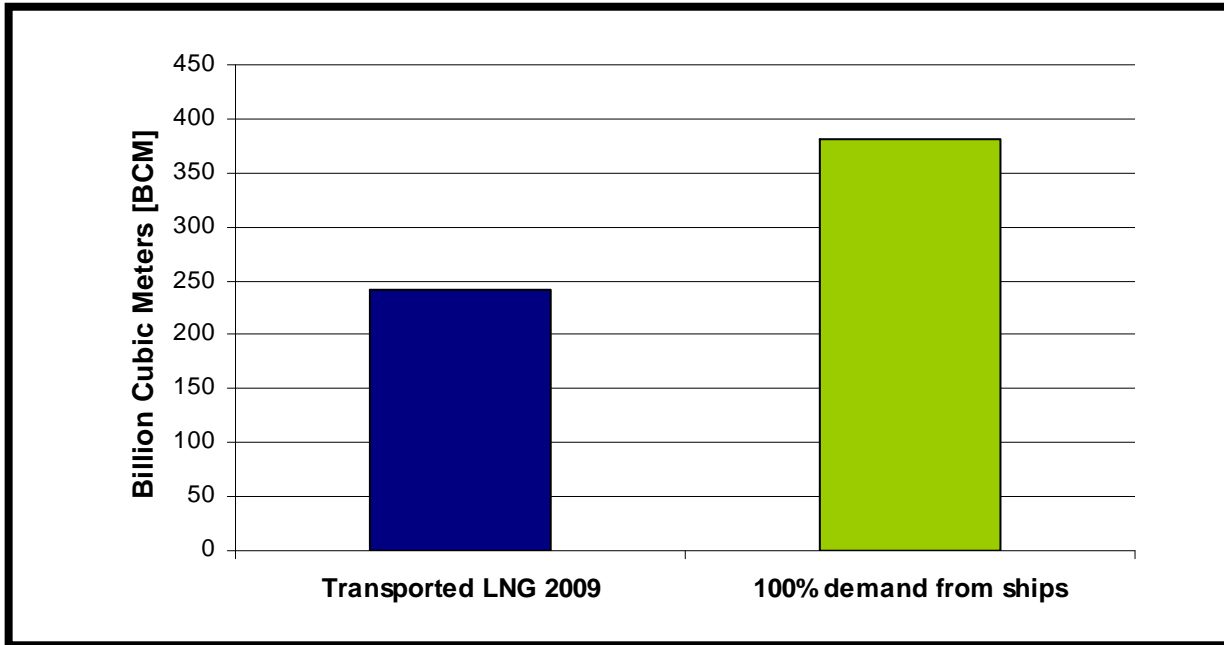


Source:
DNV's "Baltic Report"

Environmentally LNG is a winner



And "small scale" might not be so small after all



Summing up

Two significant forces in the maritime industry are all pulling in the same direction making LNG a viable option

Short Sea Shipping an ideal case for LNG in the short term

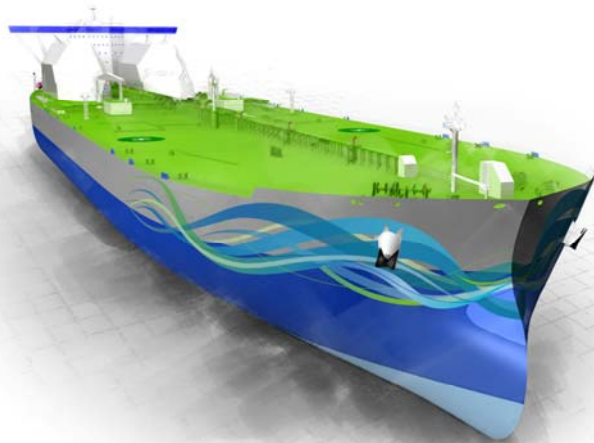
Deep Sea Shipping an ideal case for in medium to long term

Maritime provides an opportunity for the LNG industry

“Concept vessels” prove it can be done with today's technology

Triality

VLCC



- LNG-fuel
- Ballast free
- Significant economic benefits
- Better environmental performance

Quantum

Container Ship



- “Baby Post Panamax”
- Applying light weight material
- Ballast free
- Dual-fuel (LNG-MDO)
- Better environmental performance
20% reduction of CO2 emission

Safeguarding life, property and the environment

www.dnv.com



MANAGING RISK