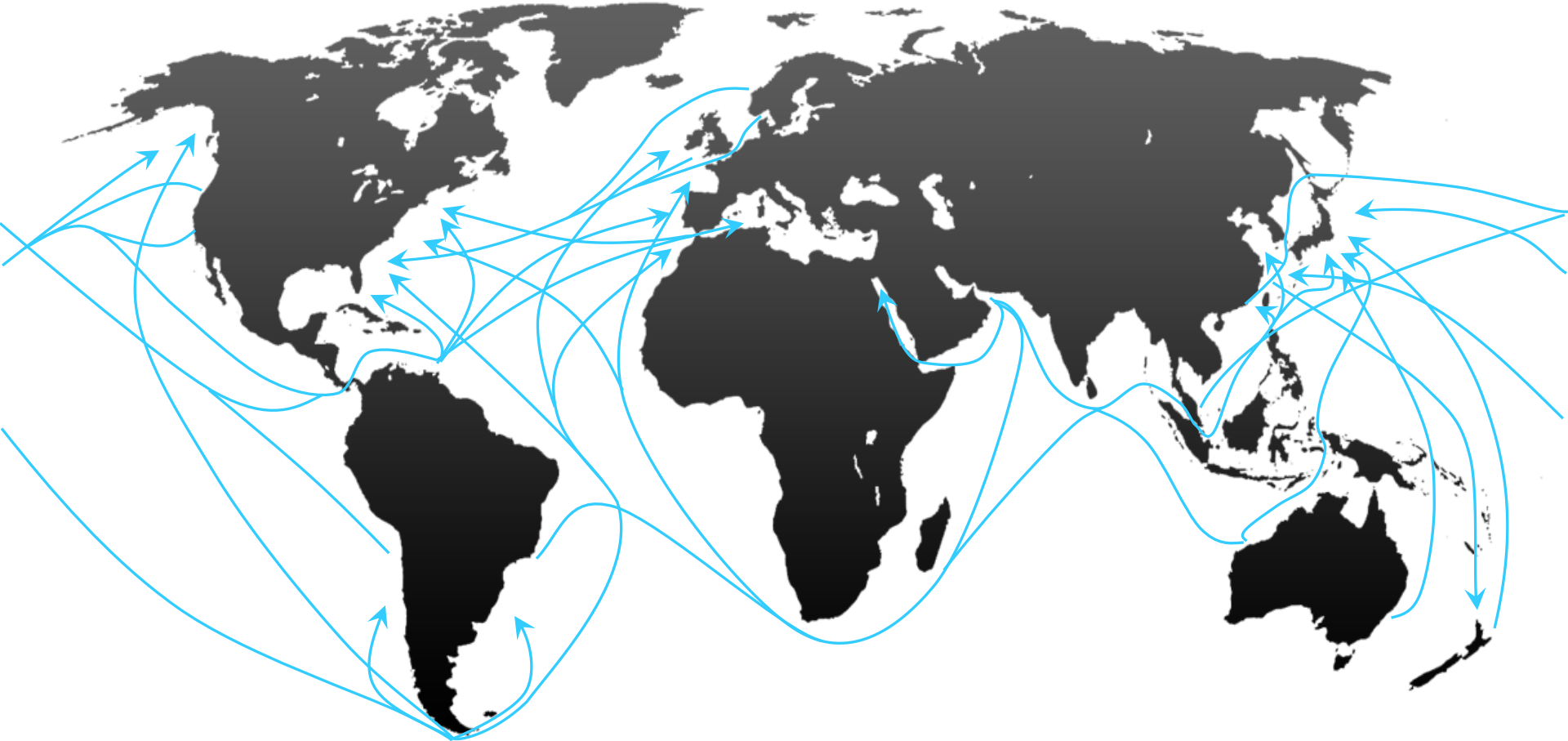


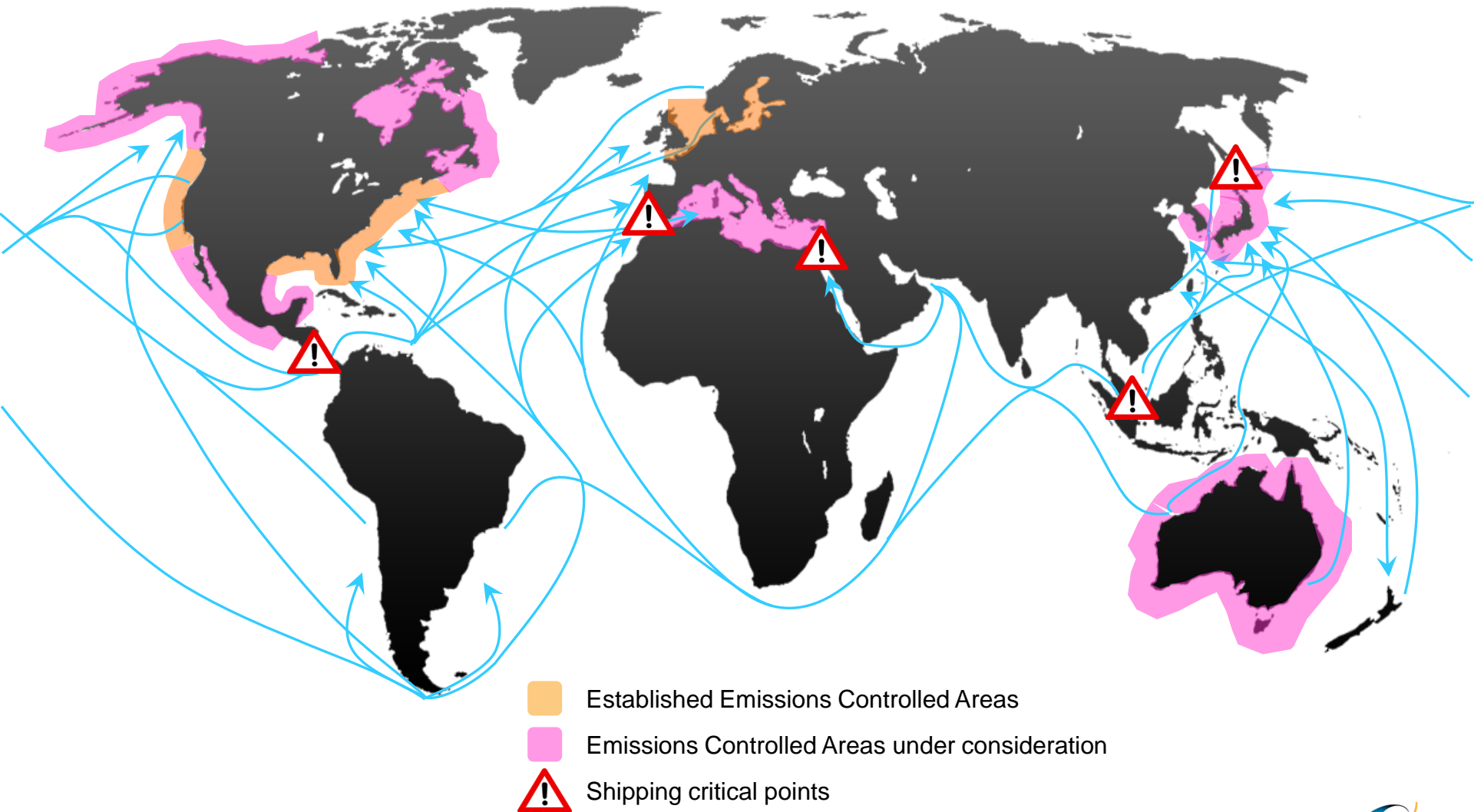
LNG AS A BUNKER FUEL

WARTSILA
IMSF CONFERENCE, OSLO
MAY 2012

Until now.....



From now on....



The Question?

What will be shipping industry's response to increasing environmental challenges

LOCAL

NO_x

Acid rains
Tier II (2011)
Tier III (2016)

LOCAL

SO_x

Acid rains
Sulphur content in fuel

LOCAL

Particulate
matter

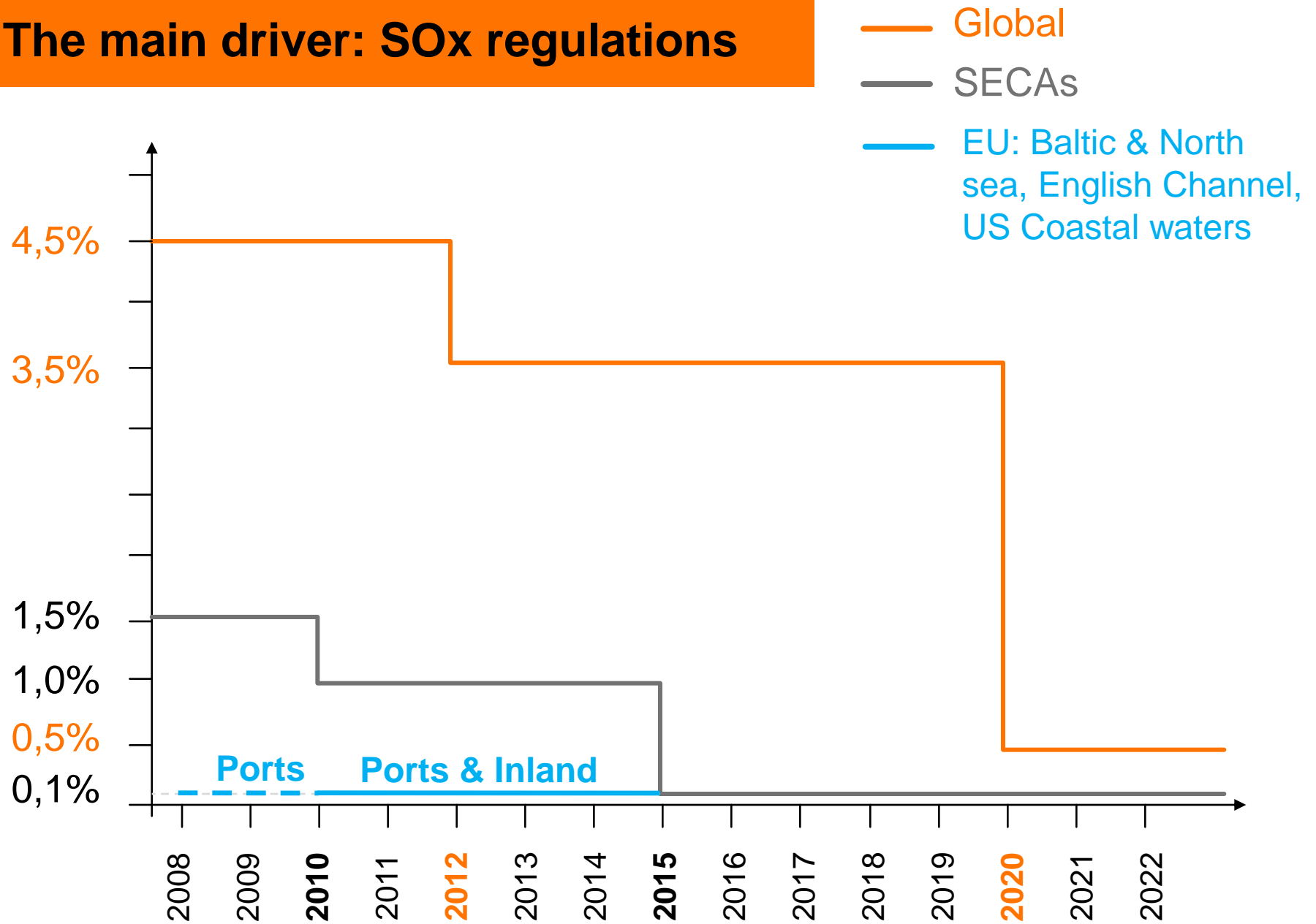
Direct impact on humans
Locally regulated

GLOBAL

CO_2

Greenhouse effect
Under evaluation by IMO

The main driver: SOx regulations



NOTE: today's average %S in HFO is 2,7

What solution?

Several different alternatives are viable for emissions regulations fulfillment:

1



Change to low-sulphur distillate fuels

Does not fulfill NO_x limits!

2



Apply exhaust gas treatment technologies

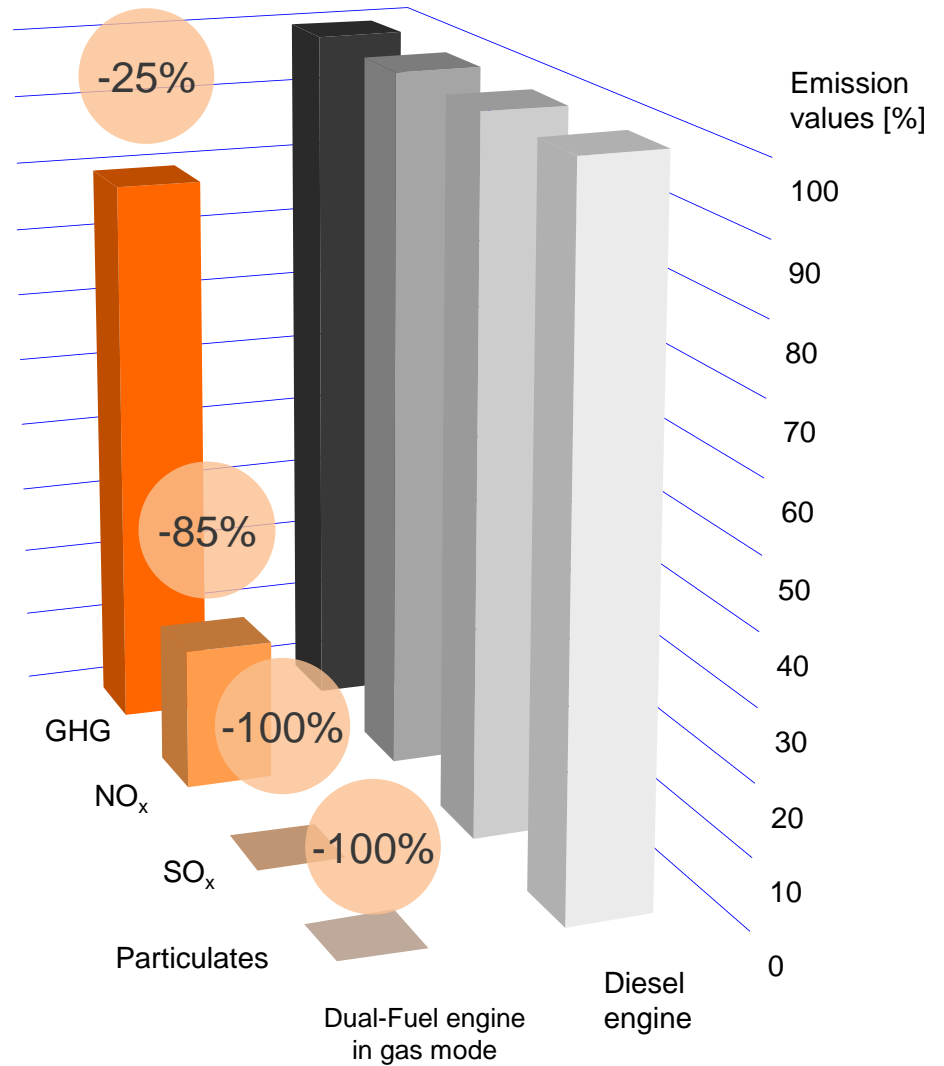
3



Switch to LNG

THE GENERAL ANSWER LNG IS CLEAN

**LNG PROVIDES
COMPLIANCE WITH
EMISSION
REQUIREMENTS
WITHOUT
ABATEMENT
TECHNOLOGIES**



Key questions



Natural gas is great, but where do I get it?

Where is the infrastructure and can I depend on gas...

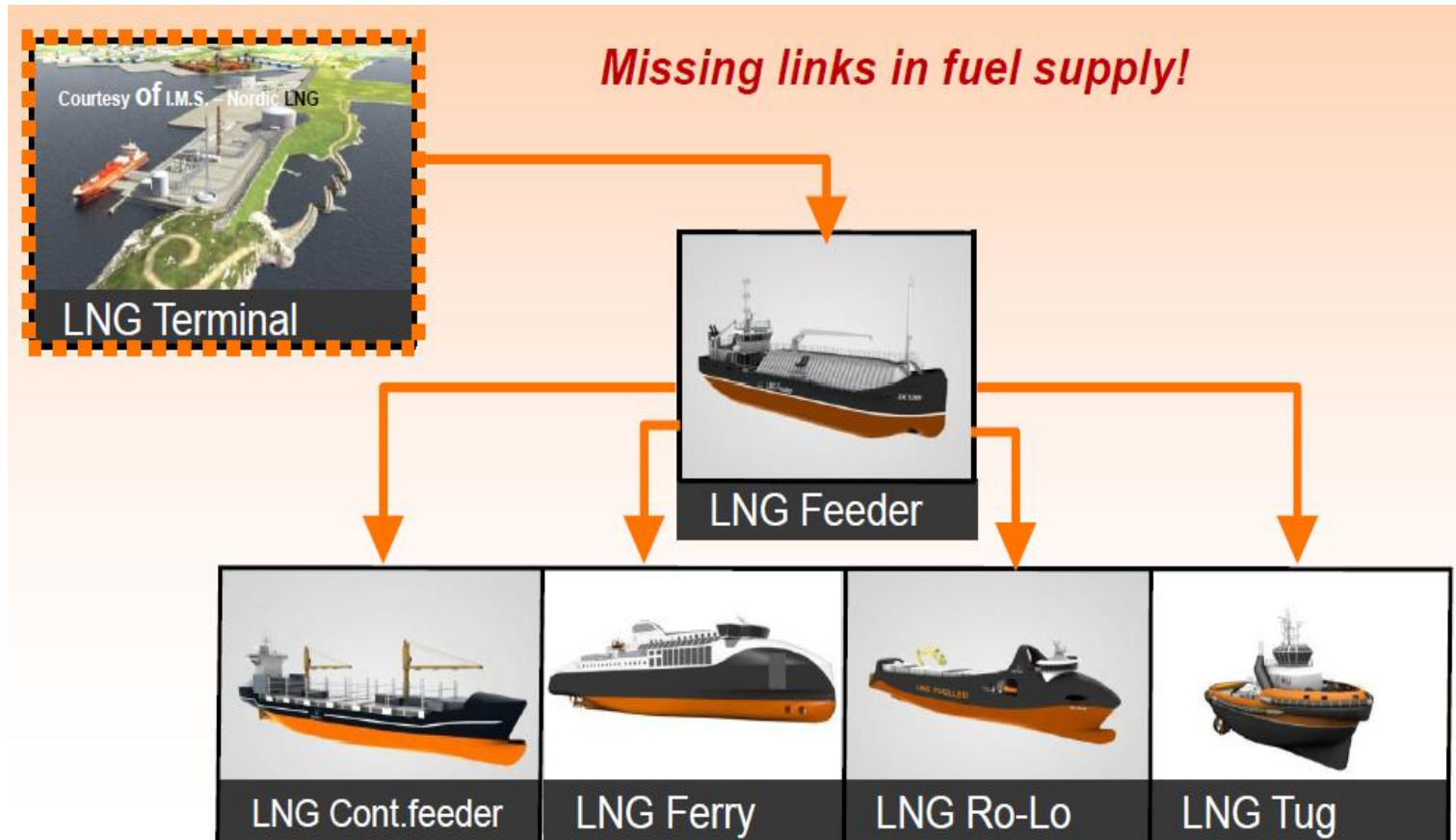
It's the chicken and egg dilemma...

The challenge vessel operators are facing



.....Challenges

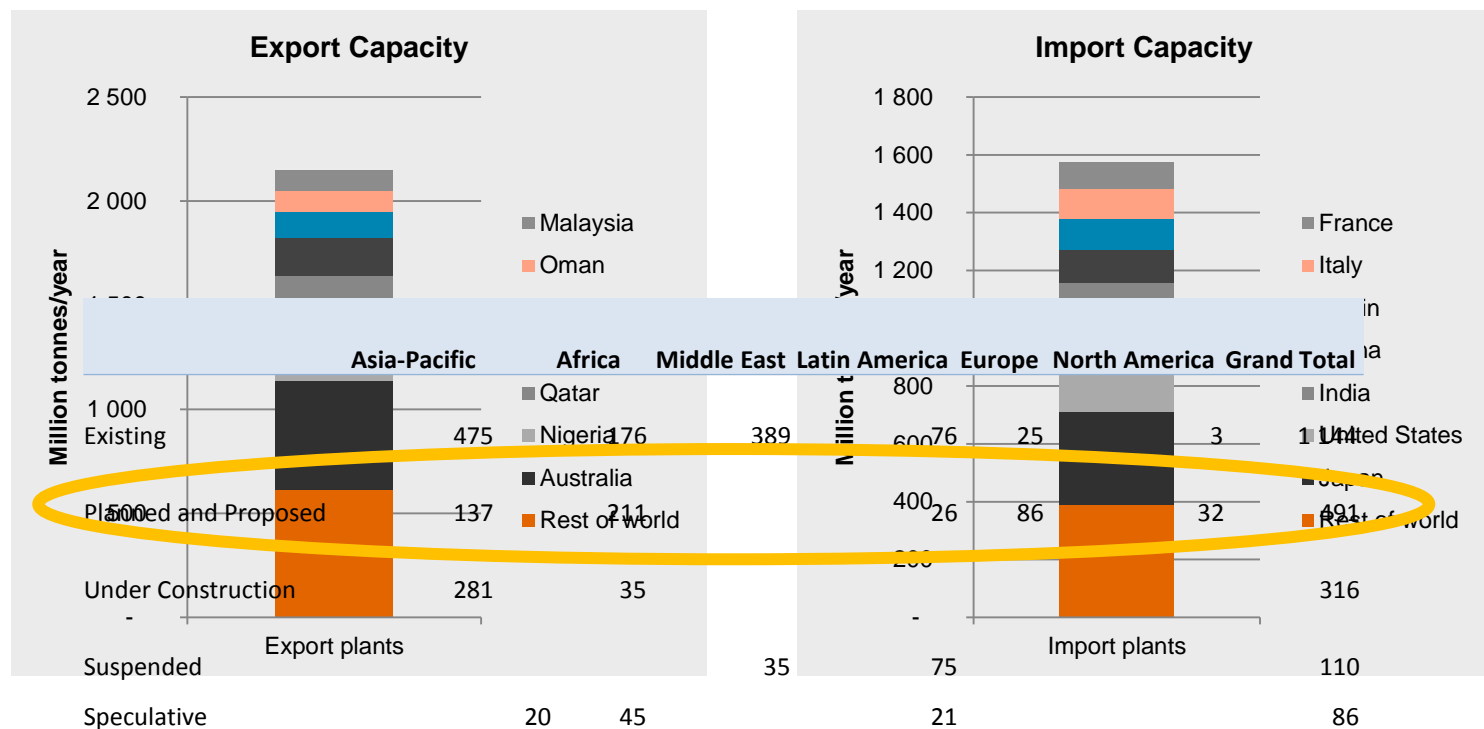
- LNG Infrastructure missing
- Rules and regulations for LNG onboard ships are not fully yet there
- Bunkering rules missing-safety procedures existing



LNG BUNKERING BY TRUCK



...Imbalances between import and export capacities still exist

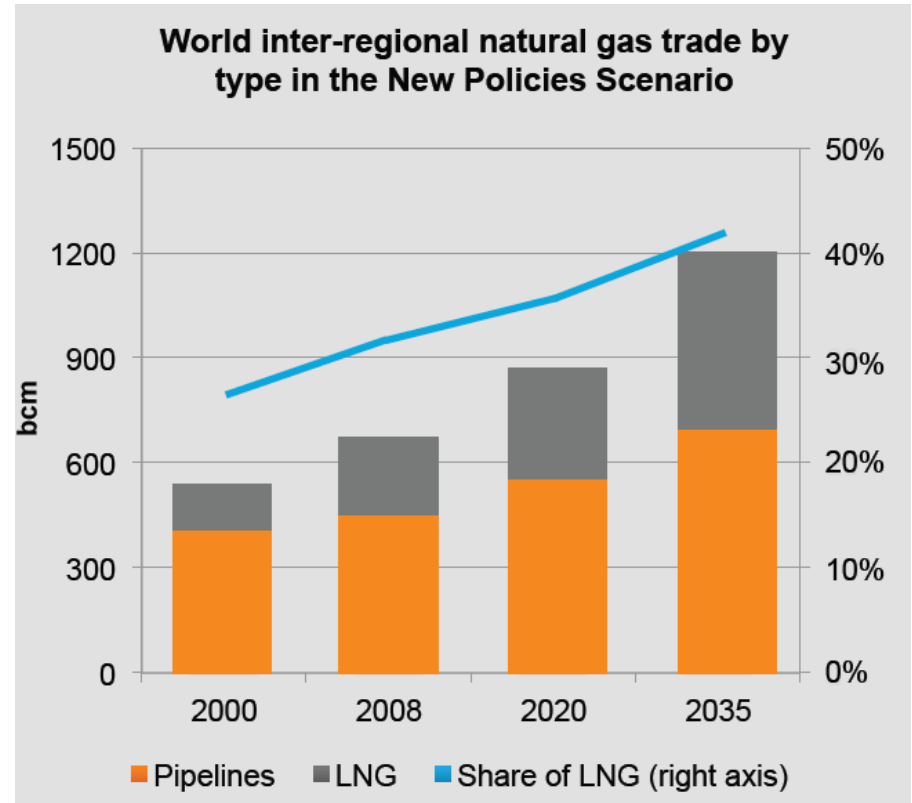
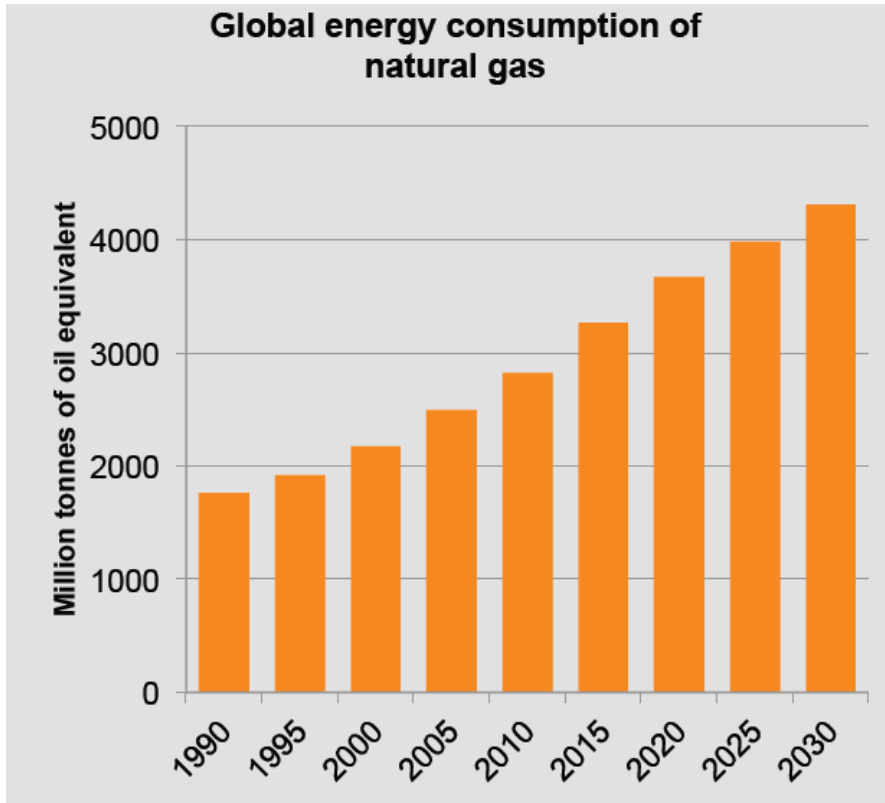


- Export terminals plans were suffering serious delays already before world economic crisis
- Rising construction of liquefaction projects. Grand Total 912 467 424 199 111 35 2148 up dates for many
- Long term fundamentals are perceived to be strong as demand for energy recovers, production of oil from traditional fields declines and environmental regulations push for cleaner fuels
- Uncertainty regarding potential for shale gas; as shale gas exploitation might undermine demand for LNG
- Bunker fuel retail network, need for secondary distribution and storage → Major challenge is who will invest first?... Retailers or shipowners?

Demand for gas and LNG is increasing

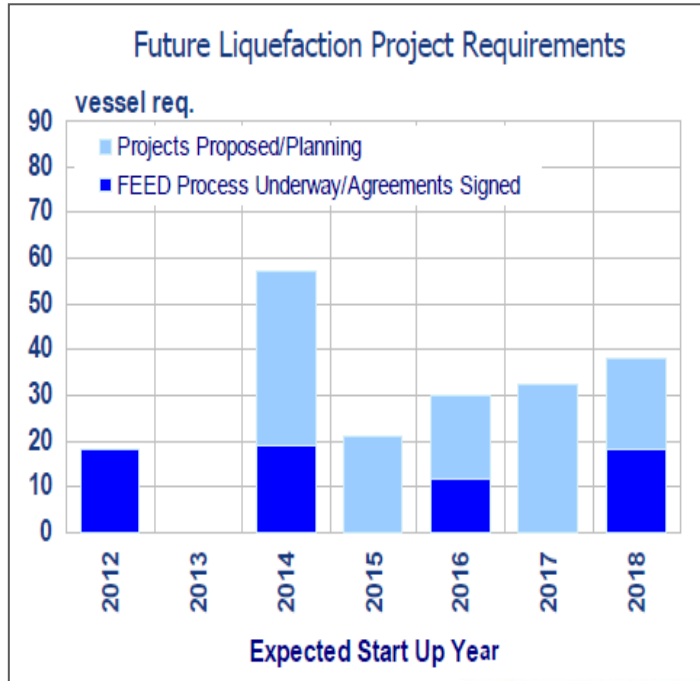
- Demand for natural gas is expected to grow

- LNG will grow faster than pipeline gas



Source: Demand for natural gas from BP's energy outlook, IEA

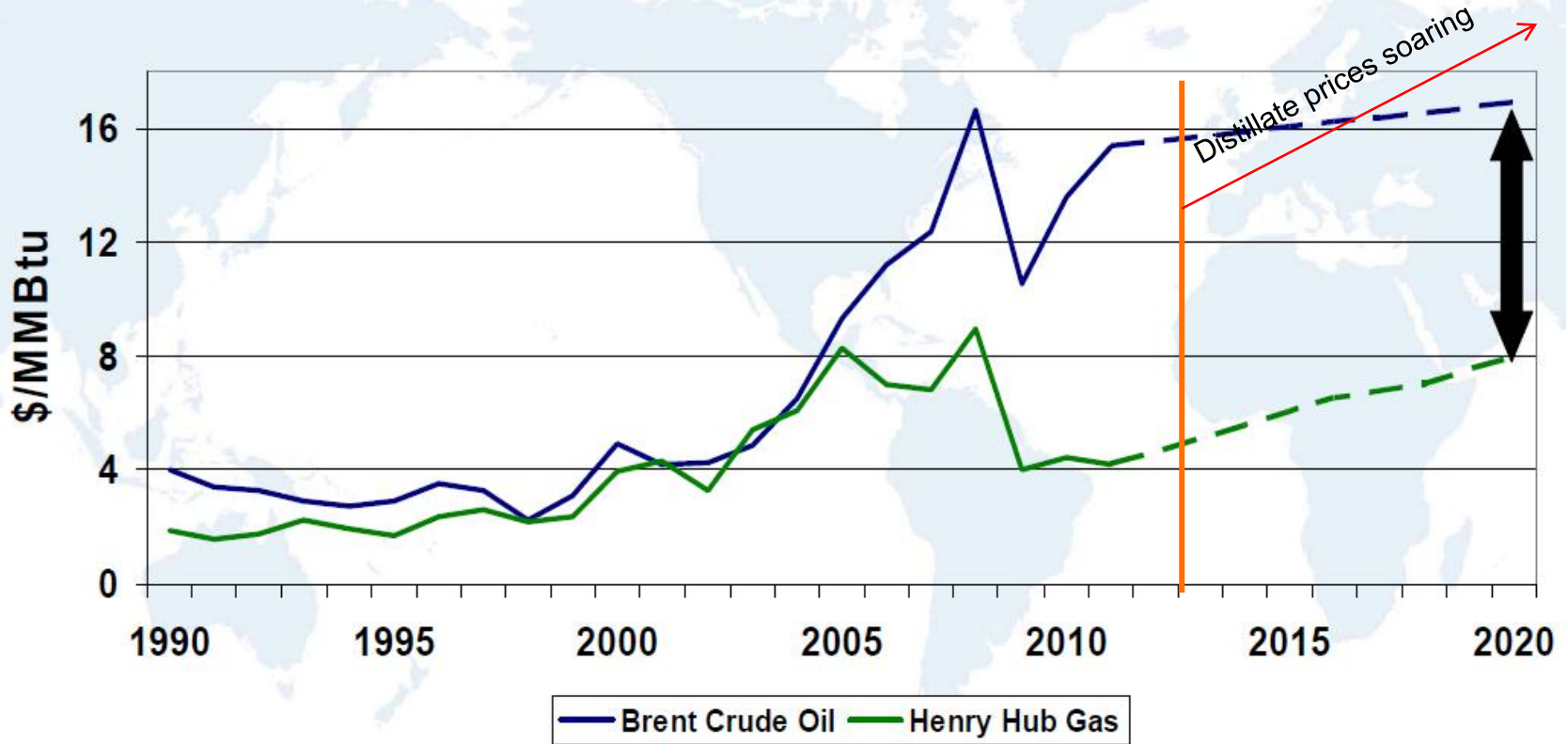
Natural gas trades, demand and availability



- Newbuilding prices are very attractive

LNG is economical...

Henry Hub Gas versus Brent Crude 1990 to 2020



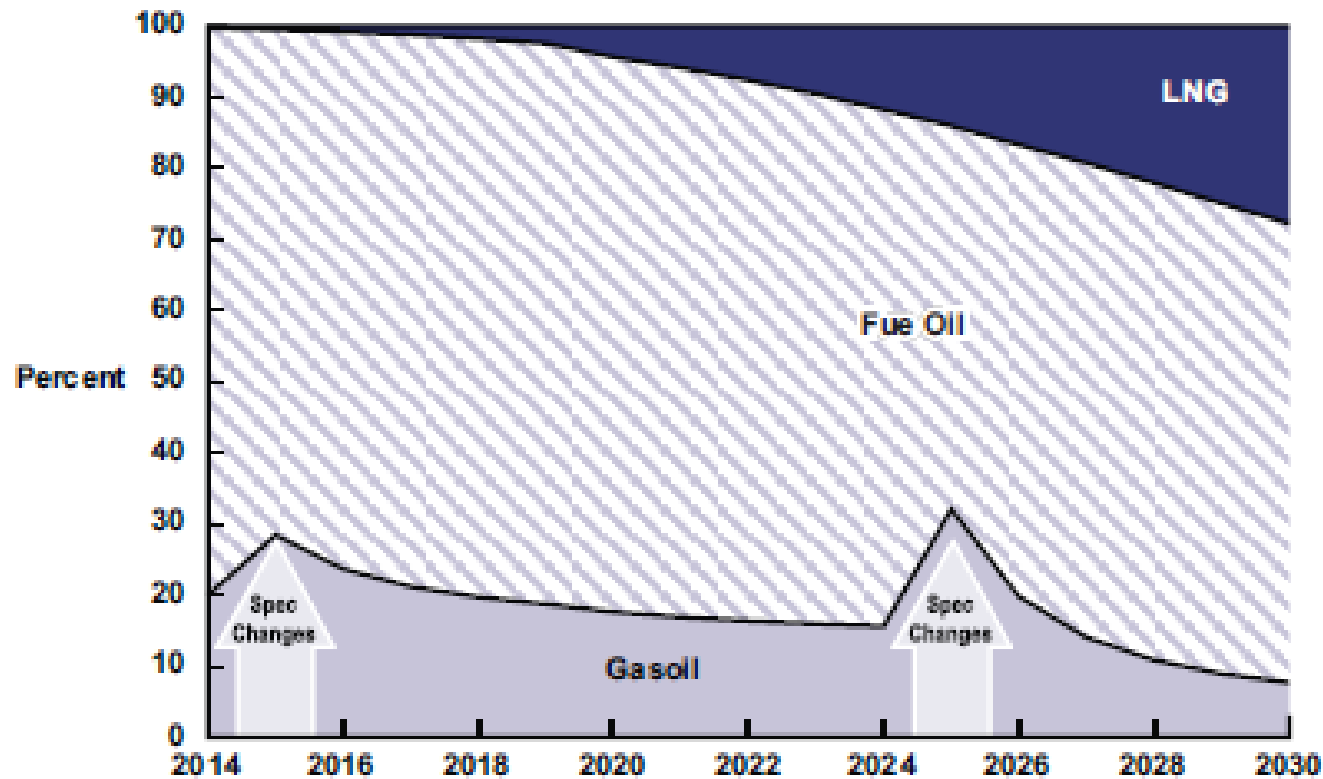
Source: CMAI

INTERNAL USE ONLY

Source: Methanex

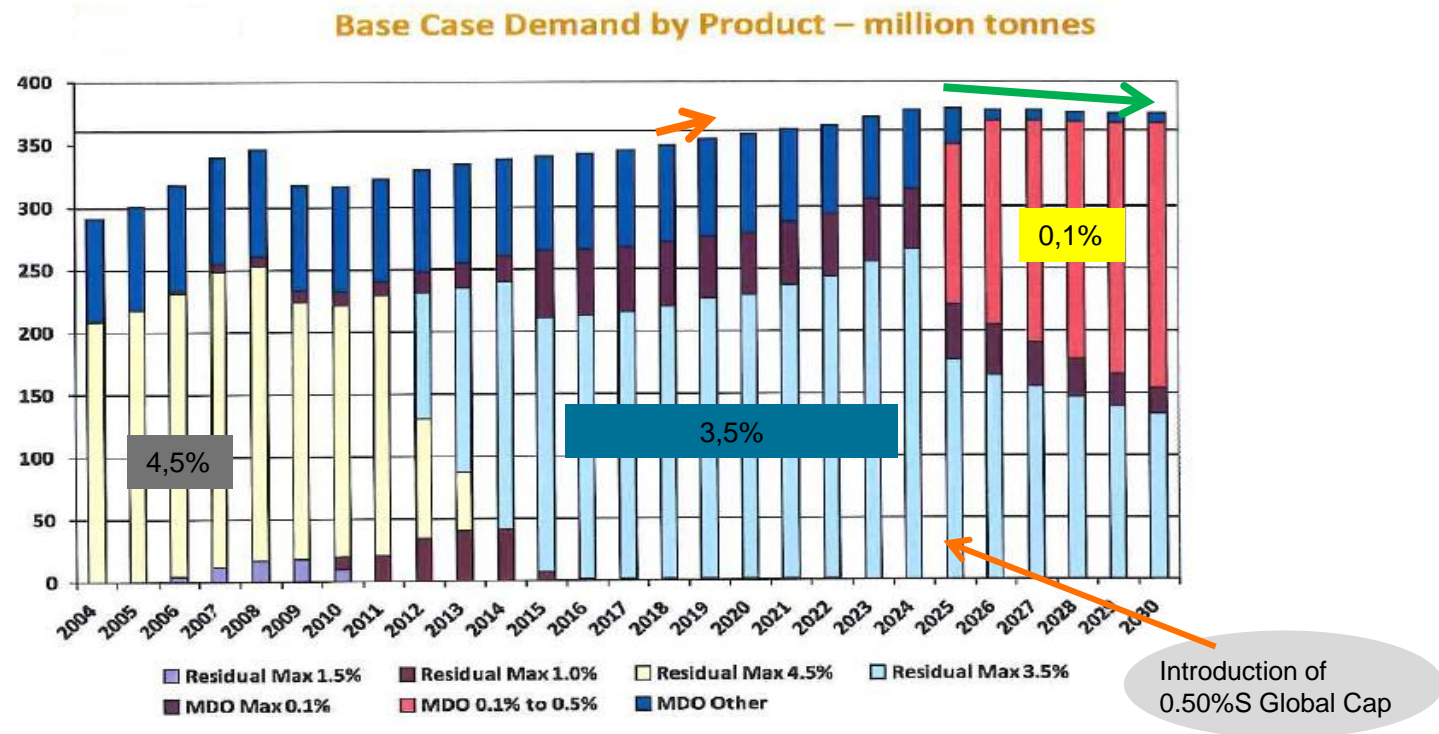
Different views on the future of LNG

Potential Share of Various Bunker Fuels in Time



Source: IHS CERA
10704-4

...Global Sulphur Cap introduced after 2025



- After 2025: Increased compliance due to introduction of the global sulphur cap in different areas of the world,
- **Adoption of scrubbing will be more widespread as vessels are built with scrubbing capability**
- Bunker demand will drop slightly as a result of increased use of LNG, and other alternative fuels
- Switch to diesel will result in global bunker distillate demand rising from 30% → 40% after 2015, falling slightly as owners opt for scrubbers but rises after through 2025 until more newbuilding designs with scrubbers and residual demand outstrips distillates after 2035

Political & regulations

- Environmental legislation
- Gas handling regulations
- Predictability of energy policies

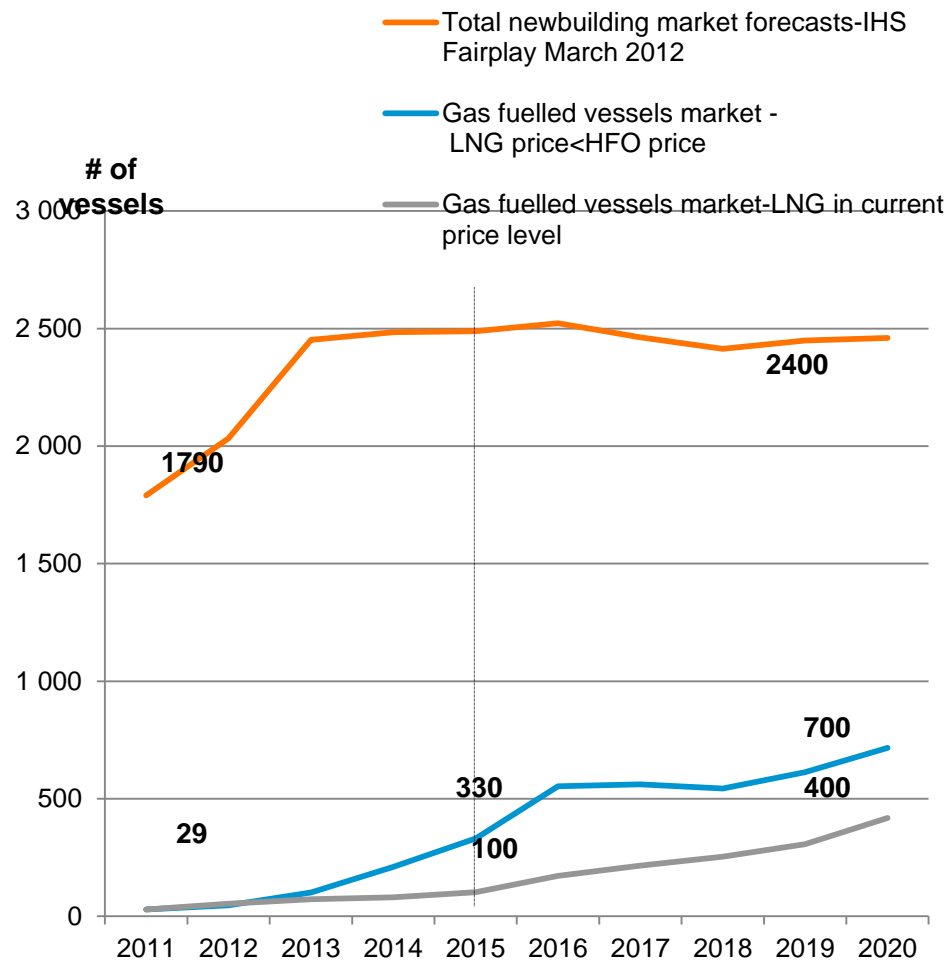
Economical

- Cost of gas vs. abatement technology
- Gas price vs. alternative fuels (HFO)
- Gas availability & bunkering infrastructure

Technological

- Engine technology exists
- Onboard gas storage technology is improving, but feasible already today
- Further application engineering needed

Estimated new building market (contracting)



Main drivers for the market are environmental legislation, fuel price and gas availability

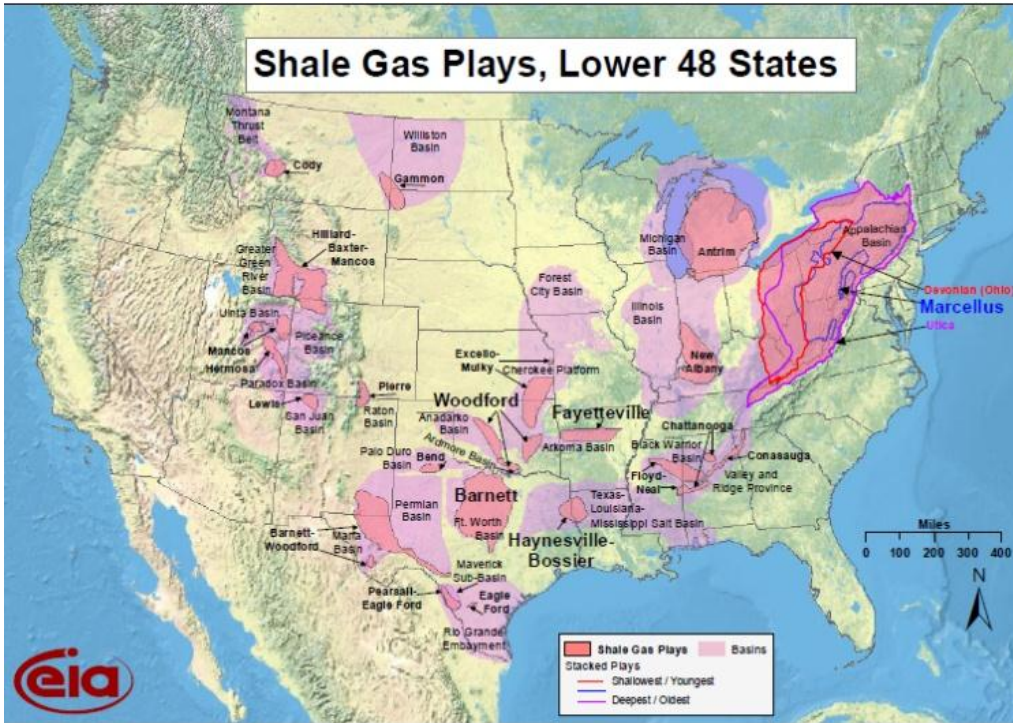
*IHS Fairplay/Lloyds Fairplay = SAI (Institute of Shipping Analysis)

Crucial role of US to gas development

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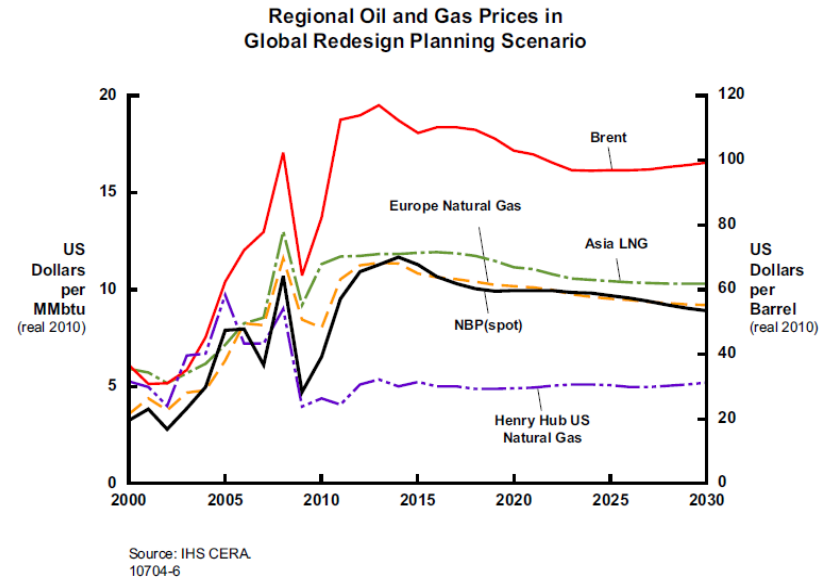
Shale gas effect on LNG pricing

US is Saudi Arabia of shale gas... swims in centuries of supply



Source: Energy Information Administration based on data from various published studies. Updated: March 10, 2010

Natural Gas bargain price

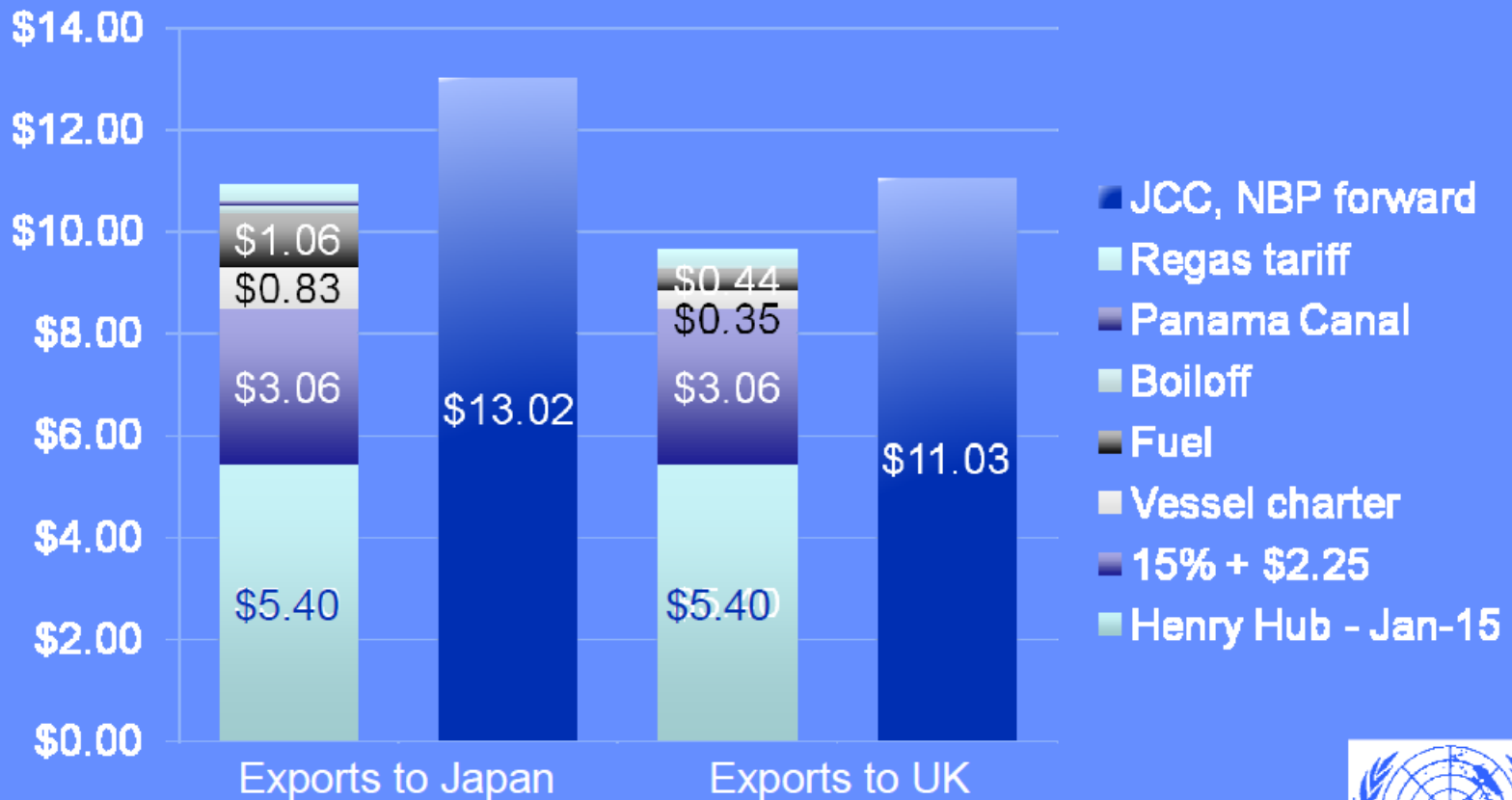


Source: IHS CERA 10704-6

gas drivers ... shale supply + bargain prices

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US LNG exports appear economical



Source: Deutsche Bank Global Markets Research, October 2011.

Source: Economic Commission for Europe, Committee on Sustainable Energy, Francisco de la Flor, 2012

Thank you!

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