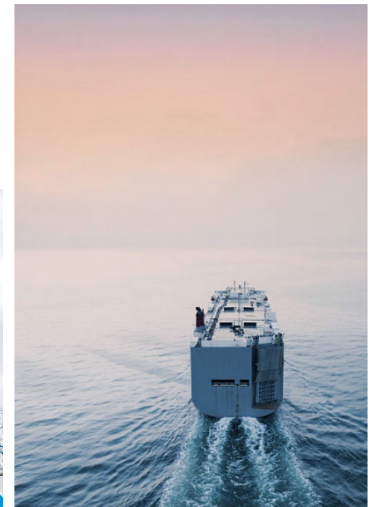

ADVANCING LNG FOR CLEANER MARINE

METI LNG Producer-Consumer Conference
Denis Bonhomme, ENGIE Global LNG
18 October 2017

AGENDA

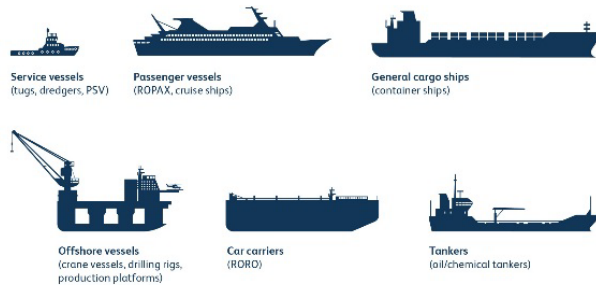
- 1 The growth of LNG as a marine fuel
- 2 Gas4Sea : combining strong LNG positions with shipping expertise
- 3 A first ship to ship project in Northern Europe
- 4 What's next ?



The growth of LNG as a marine fuel

36.97236° / -76.3319°

Where we are today with LNG as a marine fuel

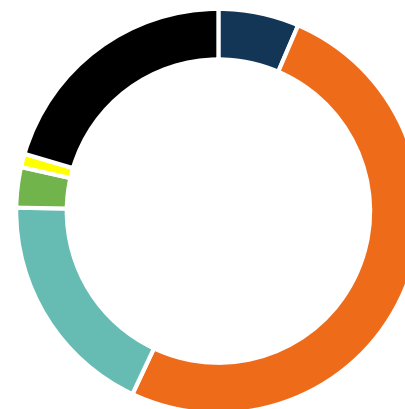


- 99 LNG-fuelled vessels in operation and 96 on order⁽¹⁾
- various kinds of ships are being ordered
- 5 bunkering vessels under construction for Northern Europe
- dedicated small scale jetties for loading bunkering vessels are being considered at LNG terminals

LNG fuelled vessels in operation



Confirmed Order



- Norway
- Europe
- America
- Asia & Pacific
- Middle Est
- Global

(1) Source : DNV-GL January 2017, excl. LNG carriers and inland waterway vessels

Currently, most of LNG fuelled ships are located in Norway, the tendency being a strong rebalance towards the rest of Europe and North America

**combining strong LNG
positions with a
shipping expertise**

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Three major players in the energy and shipping sectors



- Global energy player
- In the LNG industry since 1965
- Mainly present in the Atlantic Basin
- 16.4 mtpa LNG portfolio, sourced from 6 countries
- Fleet of 12 LNG carriers (including 2 FSRU)
- 1st European LNG importer
- 2nd largest operator of LNG terminals in Europe



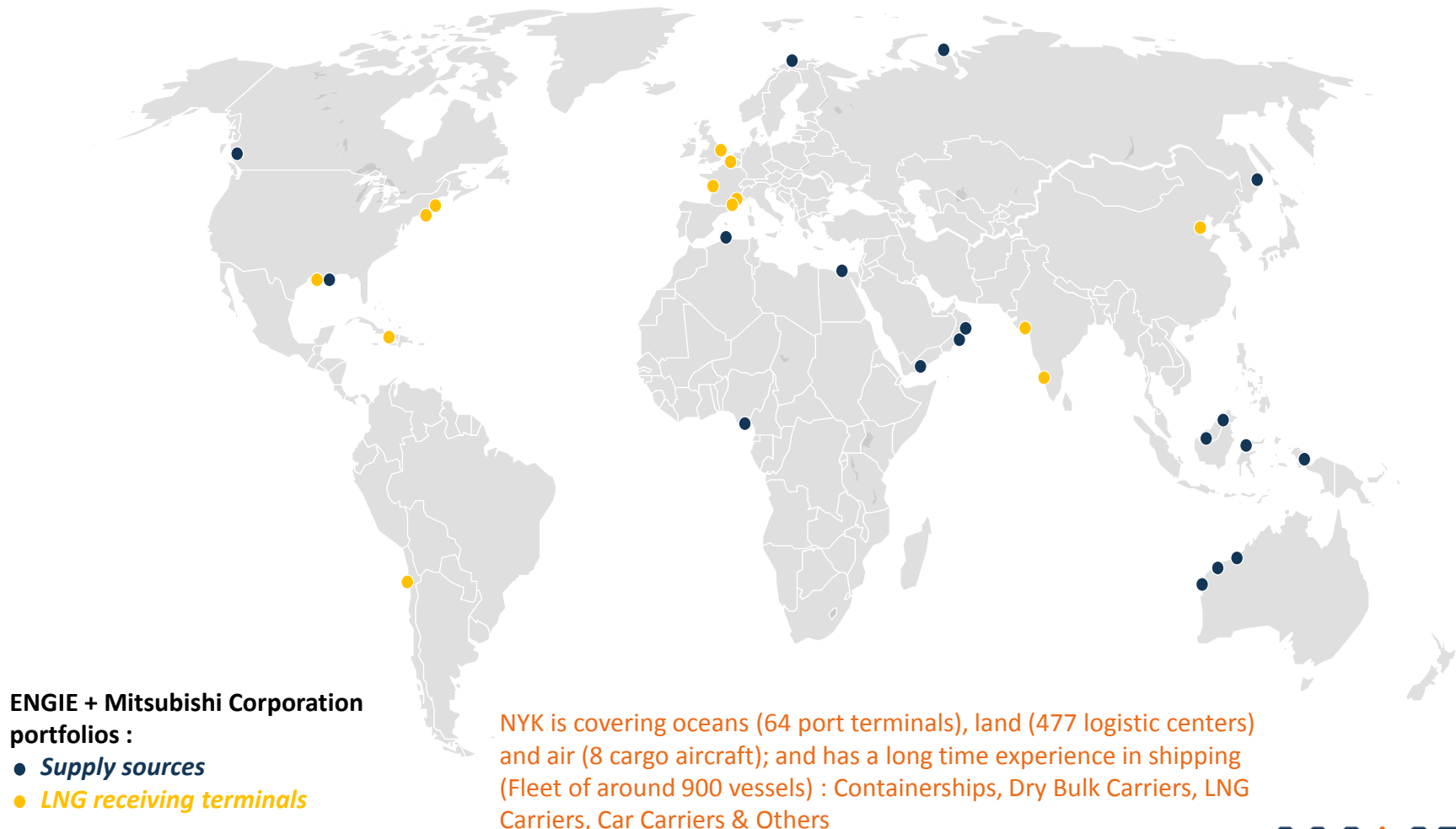
- Global integrated business enterprise
- In the LNG industry since 1969
- Mainly present in Asia
- 7.4 mtpa LNG portfolio, sourced from 6 countries
- Fleet of 24 LNG carriers
- 1st LNG importer in Japan



- Global logistic and shipping company
- Entered the LNG transport in 1983
- Fleet of around 900 ships
- One of the biggest owners of LNG fleet with 69 LNG tankers (including joint owning)

... joined strengths to globally develop LNG as Marine Fuel

A global LNG activity associated with a shipping expertise



A partnership for the development of LNG as a marine fuel



September 2016: launching of Gas4Sea global brand



LBV under construction in HHIC (Korea)

June 2014: Order of the first purpose built LNG Bunkering Vessel (LBV) of 5,000cm capacity with Hanjin Heavy Industries & Construction Co. Ltd. (Korea)

From February 2017: delivery of the LBV and start of ship to ship operations in the port of Zeebrugge (Belgium)



October 2015: Fluxys acquires 25% in our first LNG Bunkering Vessel

2014: Signature of a "Framework Agreement" between ENGIE, Mitsubishi Corporation and NYK Line for LNG Bunker Supply Business Development

A first project in Northern Europe

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ENGIE ZEEBRUGGE

Delivered in February 2017

Yard : **Hanjin Heavy Industries & Construction Co.**

Port of Registry: Zeebrugge

Flag : Belgium

Classification society: **Bureau Veritas**



Cargo :

- 2 IMO type C LNG tanks for a total capacity of 5,100 m³

Tank 1 : 2,550.0 m³

Tank 2 : 2,550.0 m³



10 – LNG Bunkering



... with UECC as a launching customer



... from Zeebrugge Port



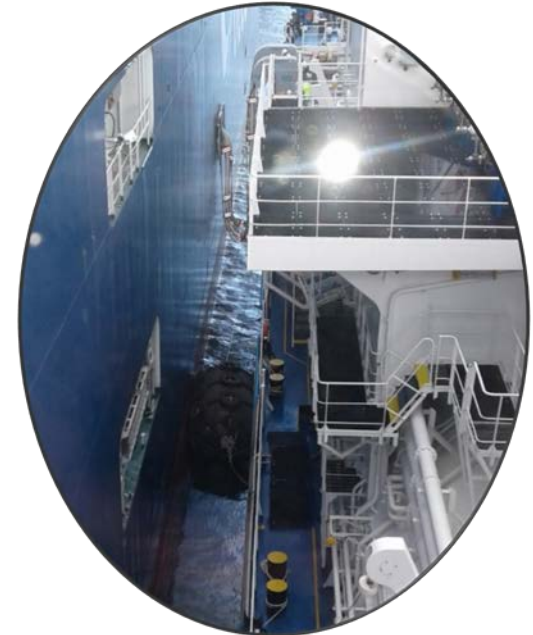
Loading at **Fluxys LNG terminal**,
compatible with both jetties

Zeebrugge Port Authorization
was granted after a **risk and
safety assessment** (HAZID)
involving all stakeholders.

LNG bunkering authorized in
SIMOPS for UECC vessels.



Regular LNG bunkering operations



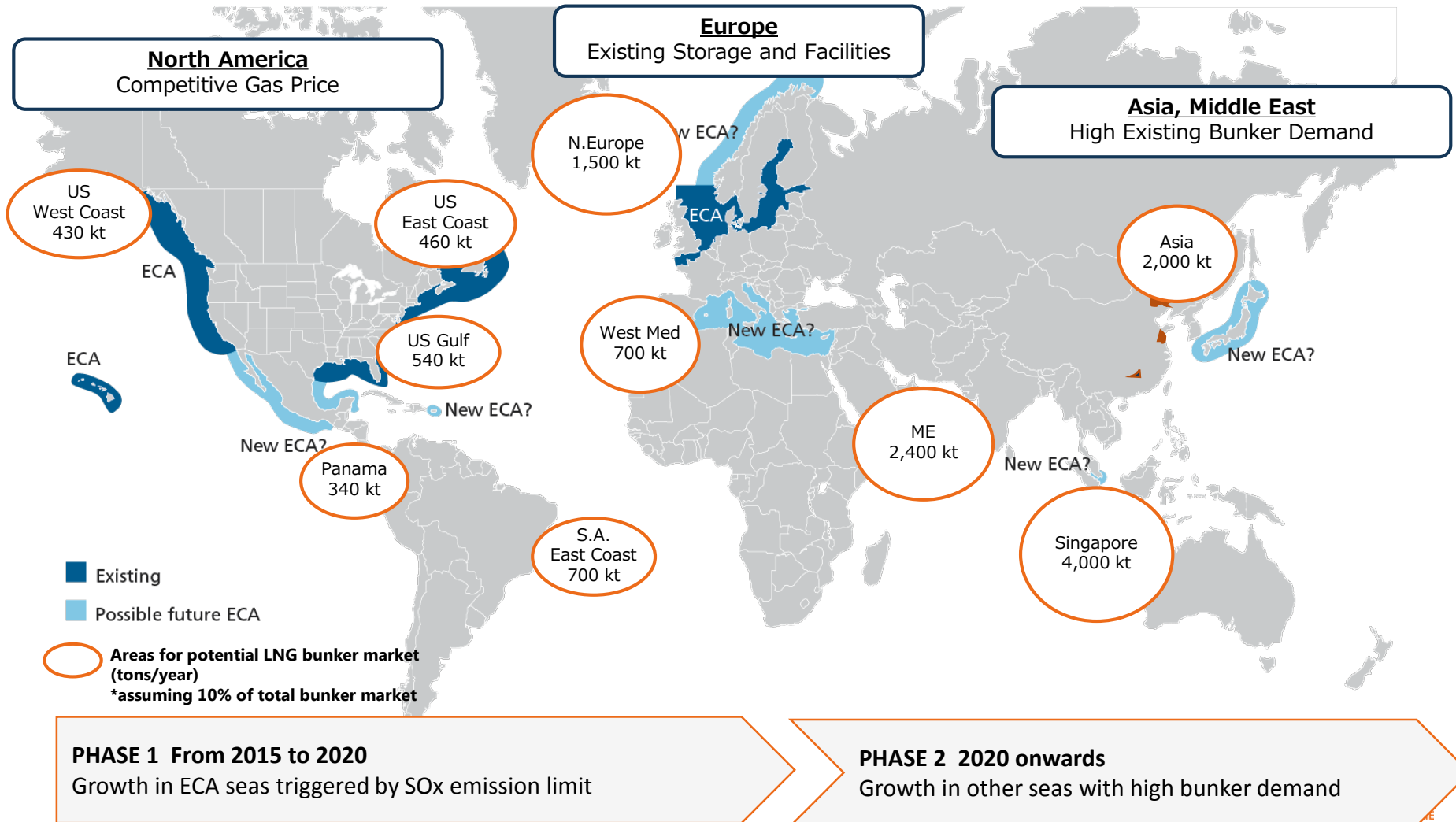
LNG transfer system

- 2 sets of manifolds (mid and fore parts) with a L-V-L configuration to avoid crossing lines in any configuration
- 2 cargo hose handling cranes
- Flexible hoses : 6 '' liquid and vapor return lines, with ERC and QCDC
- Max bunkering rate is 600 m³/h but it is highly dependent from the customer vessel piping and conditions
- Redundancy of the pumps (2 per tank)

What's next ?

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A global market with different drivers



<Latest Development>

PETRONAS, MISC & GAS4SEA PARTNERS TO PROMOTE LNG AS THE PREFERRED MARINE FUEL

(9-May 2017, Kuala Lumpur)

- Petronas LNG Ltd. (PLL) , MISC Berhad (MISC) and Gas4Sea partners, comprising ENGIE S.A. (ENGIE), Mitsubishi Corporation (MC) and Nippon Yusen Kabushiki Kaisha (NYK) , have signed a non-binding memorandum of understanding (MoU) to explore potential collaboration in promoting LNG as the preferred marine fuel.
- Under the terms of the MoU, the 5 parties will explore ways to collaborate and identify potential business opportunities in relation to LNG bunkering.



THANK YOU

www.gas4sea.com

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