

Singapore Branch Professional Talk

LNG Bunkering: Delivering the Fuel of Choice for Vessels

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15th May 2019

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Agenda

- 1) Why is LNG the fuel of choice for the marine vessels?
- 2) Introduction to FuelNG
- 3) Profiling current LNG Bunkering operations in Singapore
- 4) How is an LNG Bunkering contract structured?

Why is LNG the Fuel of Choice for Marine vessels?

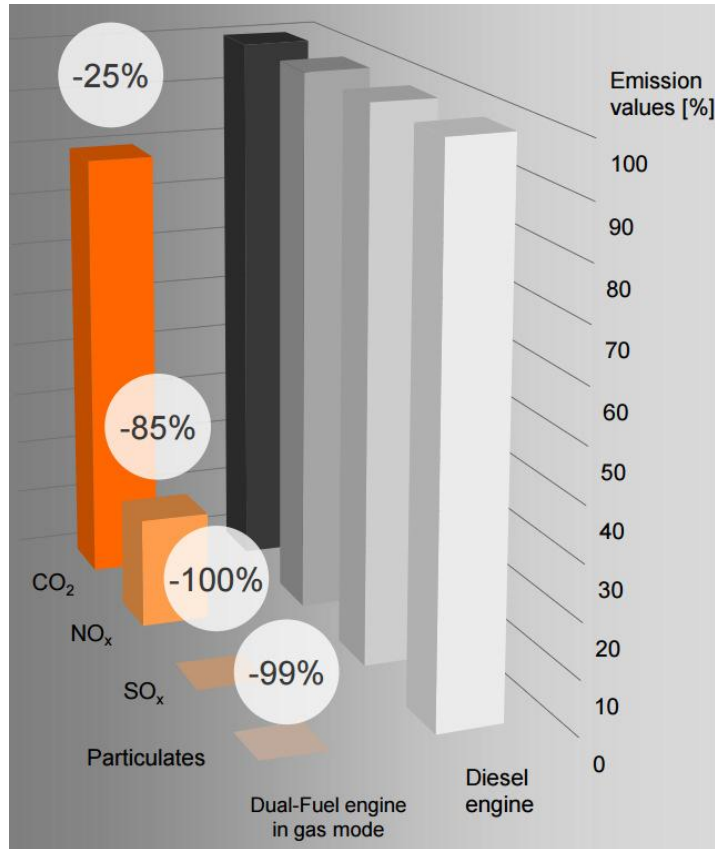
1. Environmental
2. Regulatory
3. Economic

About **60.3 percent** of the world's ship orders are projected to be for LNG-fueled vessels by 2025.....

The study, based on data from Clarksons and Lloyd's Register expected demand for LNG bunkering vessels to jump more than tenfold, from 313,000 tons in 2016 to **3.2 million tons** in 2030.

source for marine transport. We need to address the lifecycle of existing assets and bunkering infrastructure, which is acting as a brake on adoption, but this should accelerate. The train has left the station and cannot be stopped."

Environmental Impact

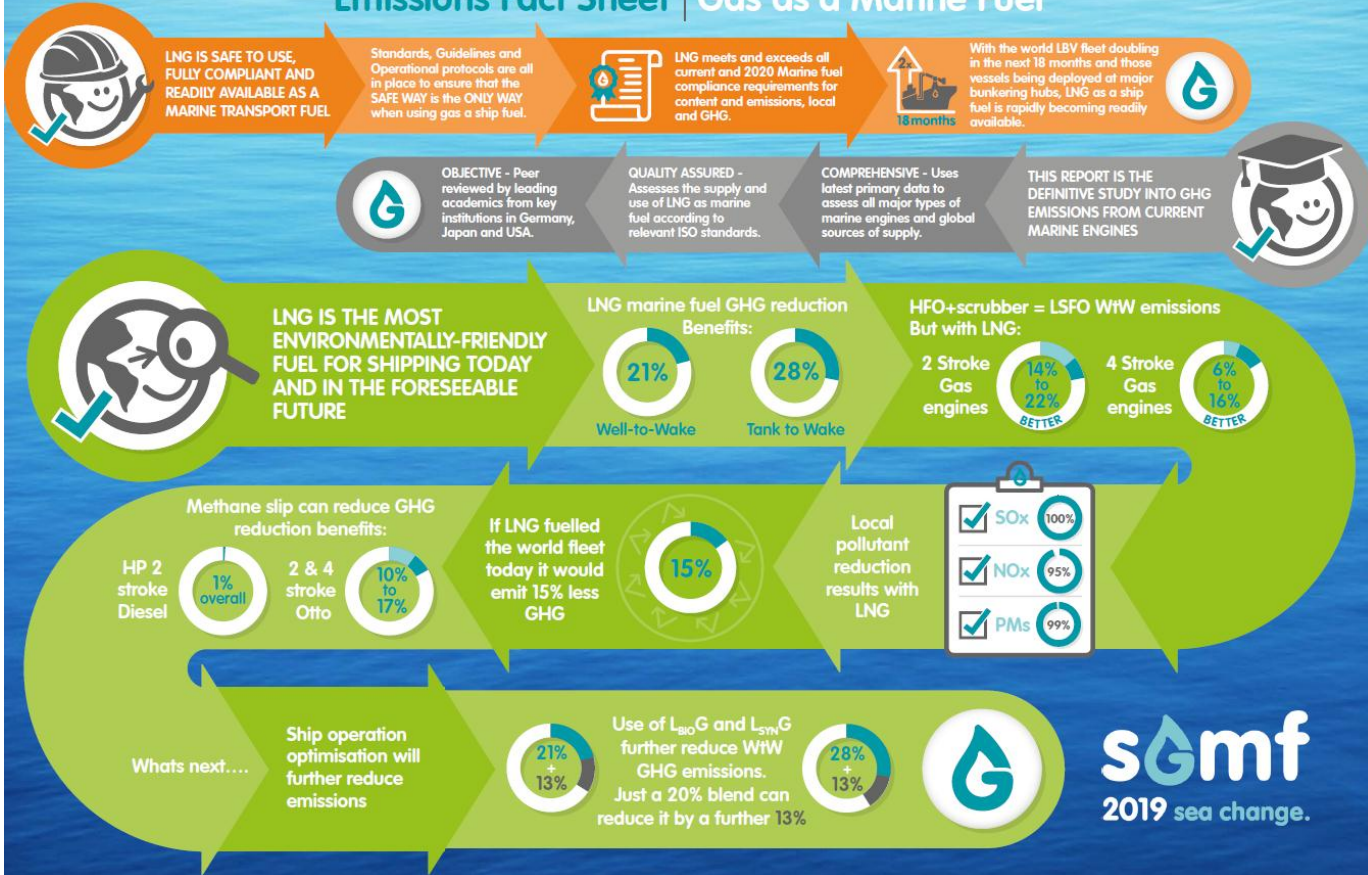


- Local pollutants, such as Sulphur oxides (SOX), Nitrogen oxides (NOX) and particulate matter (PM), are reduced when using LNG

- ✓ SOX emissions are reduced close to zero.
- ✓ NOX emissions are reduced by 85-95 % to meet the IMO Tier III limits without NOx reduction technologies when using Otto cycle engines.
- ✓ PM emissions reductions of up to 99 %

Environmental Impact

Emissions Fact Sheet | Gas as a Marine Fuel



LNG Bunkers will keep you out of Jail !!

Straits Times 5th April 2019

IMO Sulfur Limits

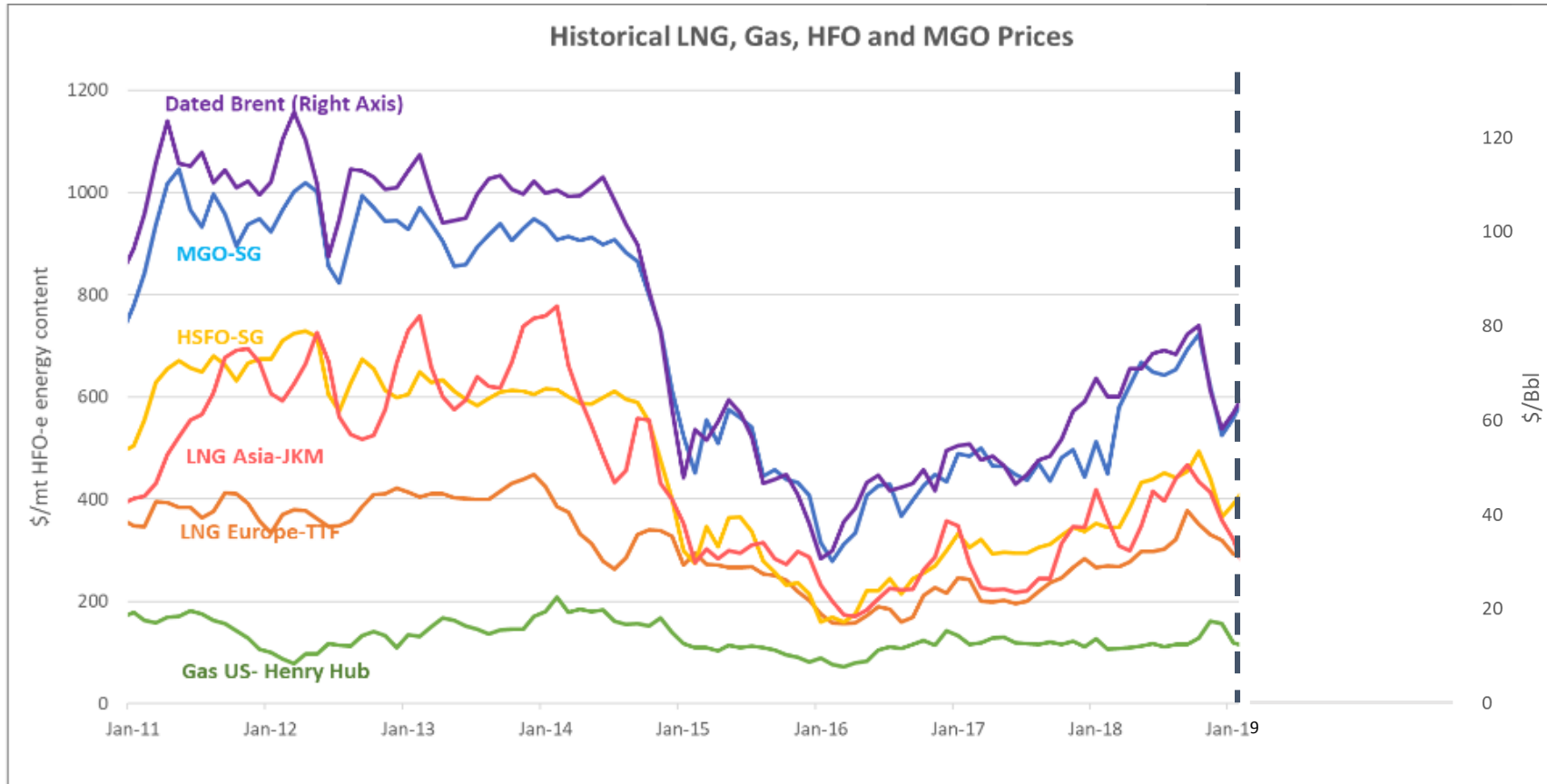
Singapore has a message for shipping companies considering cheating on rules starting next year to combat pollution, in order to save a few dollars on their fuel bills: Don't.

Captains and owners of vessels that burn overly sulphurous fuel in the Asian country's territorial waters could face as long as two years in prison from the start of next year, according to the Maritime and Port Authority of Singapore (MPA).



Economic Impact

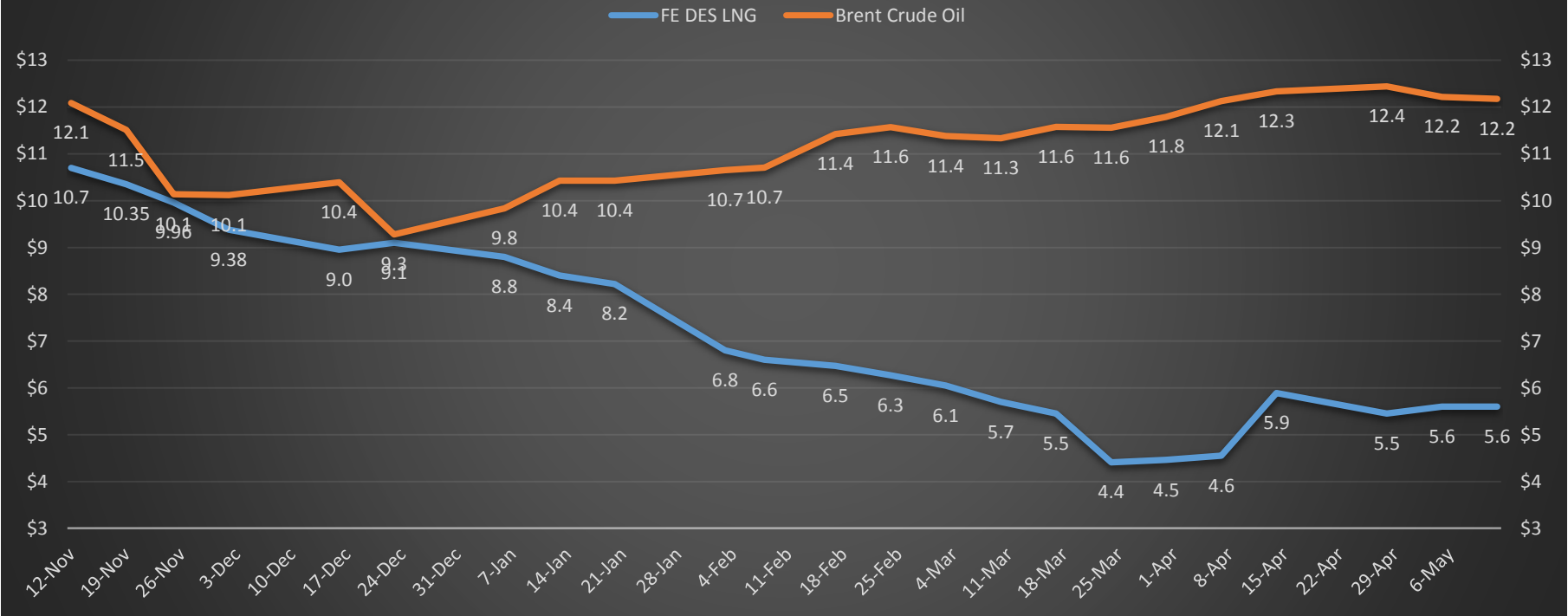
Historical LNG, Gas, HFO and MGO Prices



Source: Shell consolidated data

Economic Impact

Comparison Brent Vs LNG DES pricing

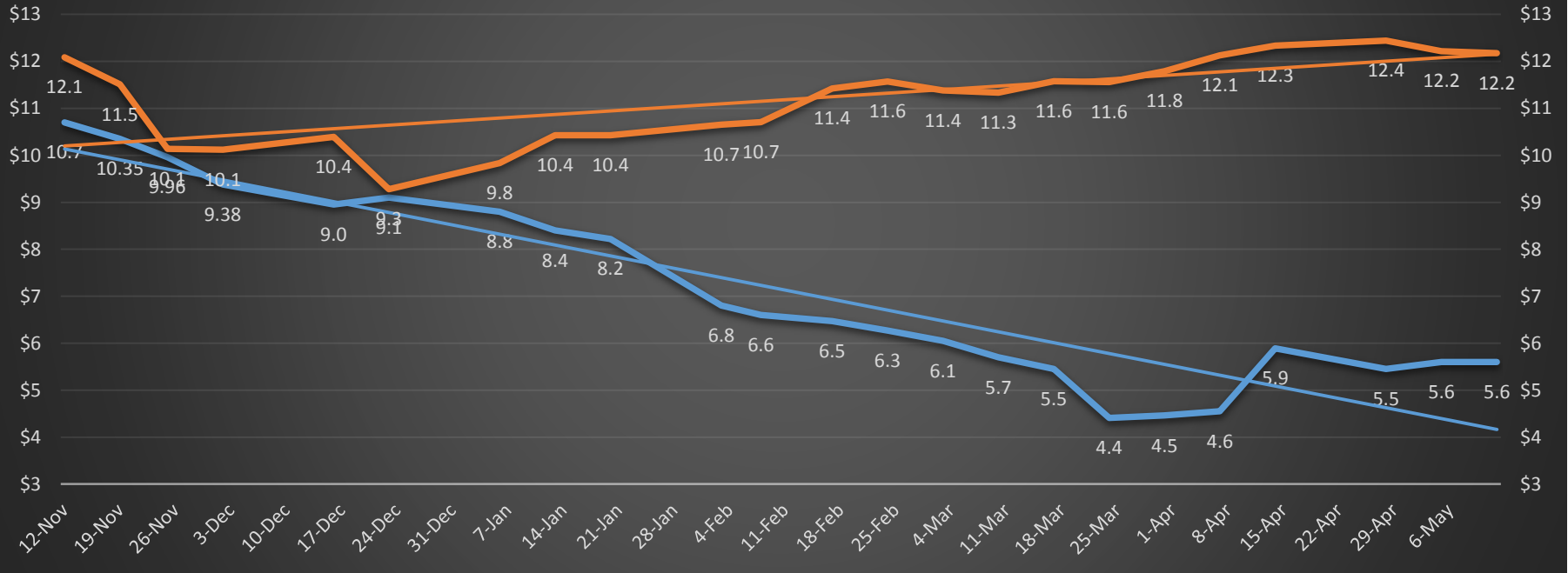


Source: Data from Fearnley's Weekly Market report

Economic Impact

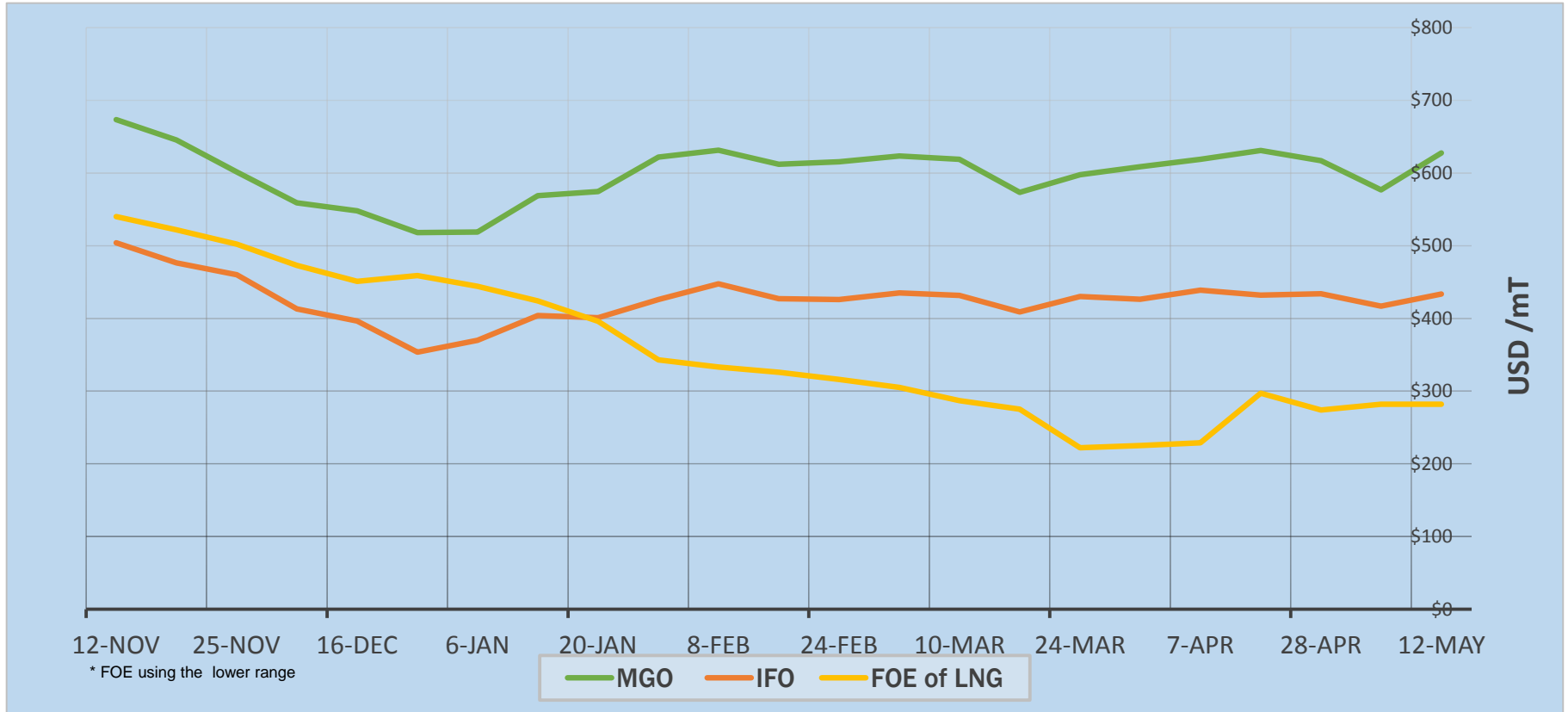
Comparison Brent Vs LNG DES pricing

FE DES LNG Brent Crude Oil Linear (FE DES LNG) Linear (Brent Crude Oil)



Source: Data from Fearnley's Weekly Market report

Economic Impact



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Introduction to FueLNG

- 50-50 joint venture between Keppel and Shell
- Incorporated in July 2016
- Safety-First approach to LNG Bunkering Operations
- Provide economical LNG bunkering distribution solutions for all LNG suppliers and/or ship owners
- One of 2 exclusive licensees in Singapore
- Completed more than 100 Truck to ship LNG bunker operations
- Fuel Supplier of the year at Lloyd's List Asia Pacific award 2018



FueLNG's Contribution to the LNG Bunkering Industry



FueLNG @ FPSO Research Forum 2019



FueLNG @ TR56 Sharing



FueLNG @ TC for LNG Bunkering managed by SDO@SCIC



FueLNG @ LNGC Asia Summit 2019



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Roadmap Towards LNG Bunkering in SG



FUELNG
A venture between Kappel and Shell



Sept 2015

Jan 2016

2017

Sept 2017

2018 - 2019

2020
onwards

- Launch of \$12 million co-funding program for LNG-fuelled vessels

- Award of LNG Bunkering Licenses
- Formation of FuelNG

- LNG Bunkering Roundtable
- Launch of TR 56 Technical Reference for LNG Bunkering
- Port dues incentives

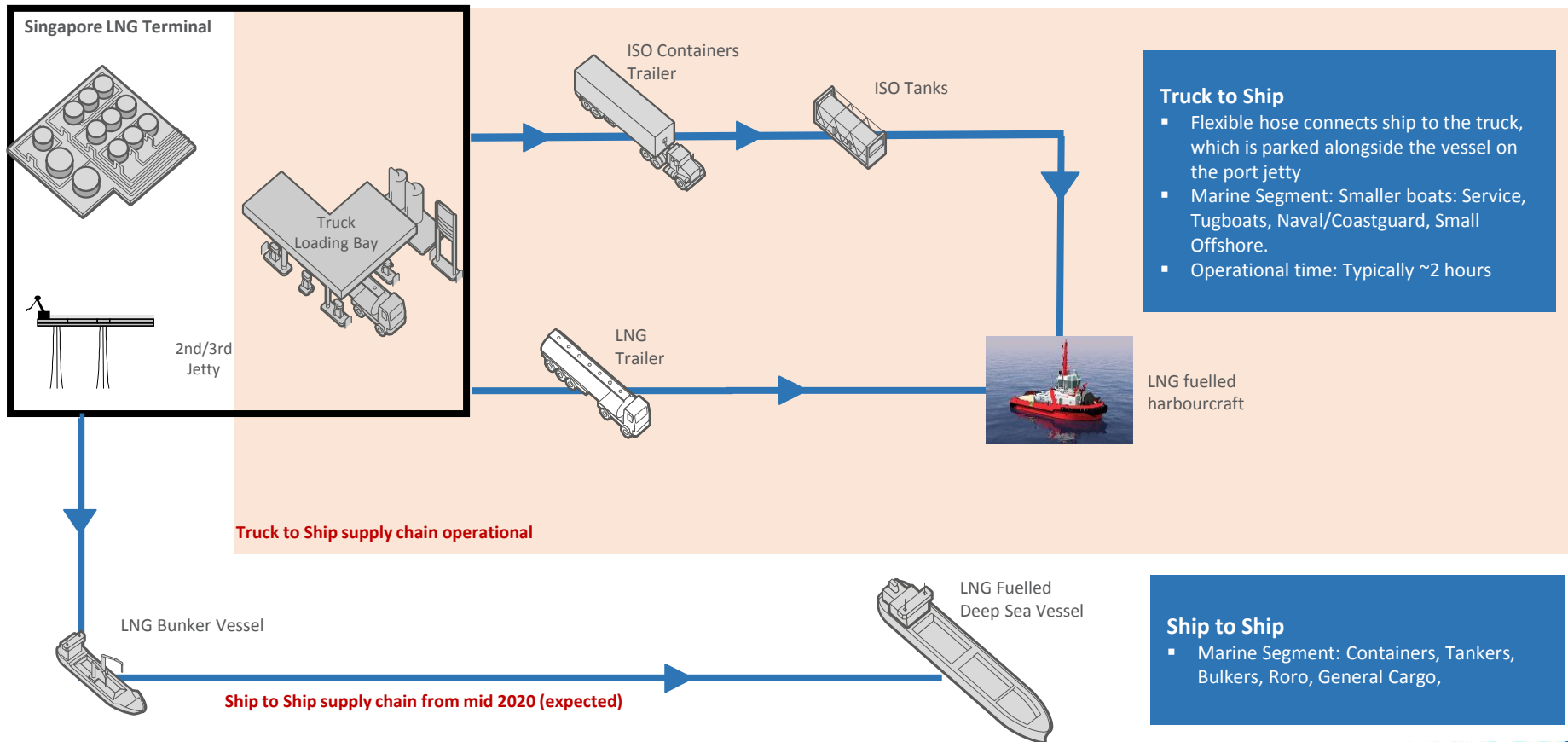
- First LNG truck to ship bunker for Golar Hilli commissioning.

- First two LNG powered tugs delivered in Singapore, Jurong Port LNG bunker ready

- LNG Bunkering Vessel (LBV) shipbuilding contract signed.
- First STS LNG Bunkering Carried out in Singapore.

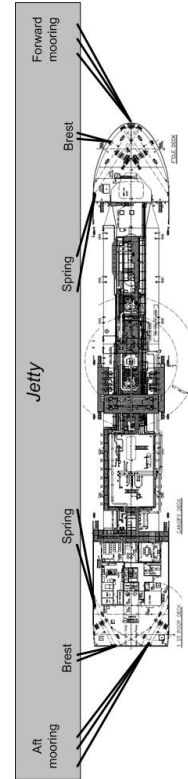
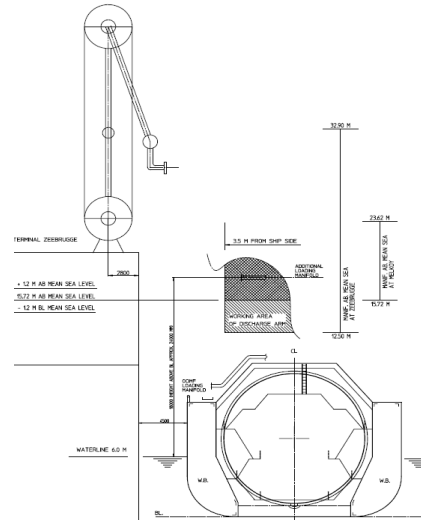
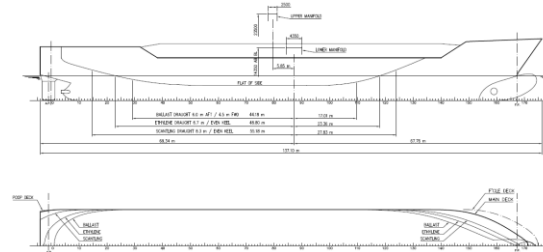
- **1st January 2020** Effective date of Global 0.5% Sulphur Cap
- **Ship to ship LNG Bunkering ready at Q3 2020**

Singapore LNG supply chains

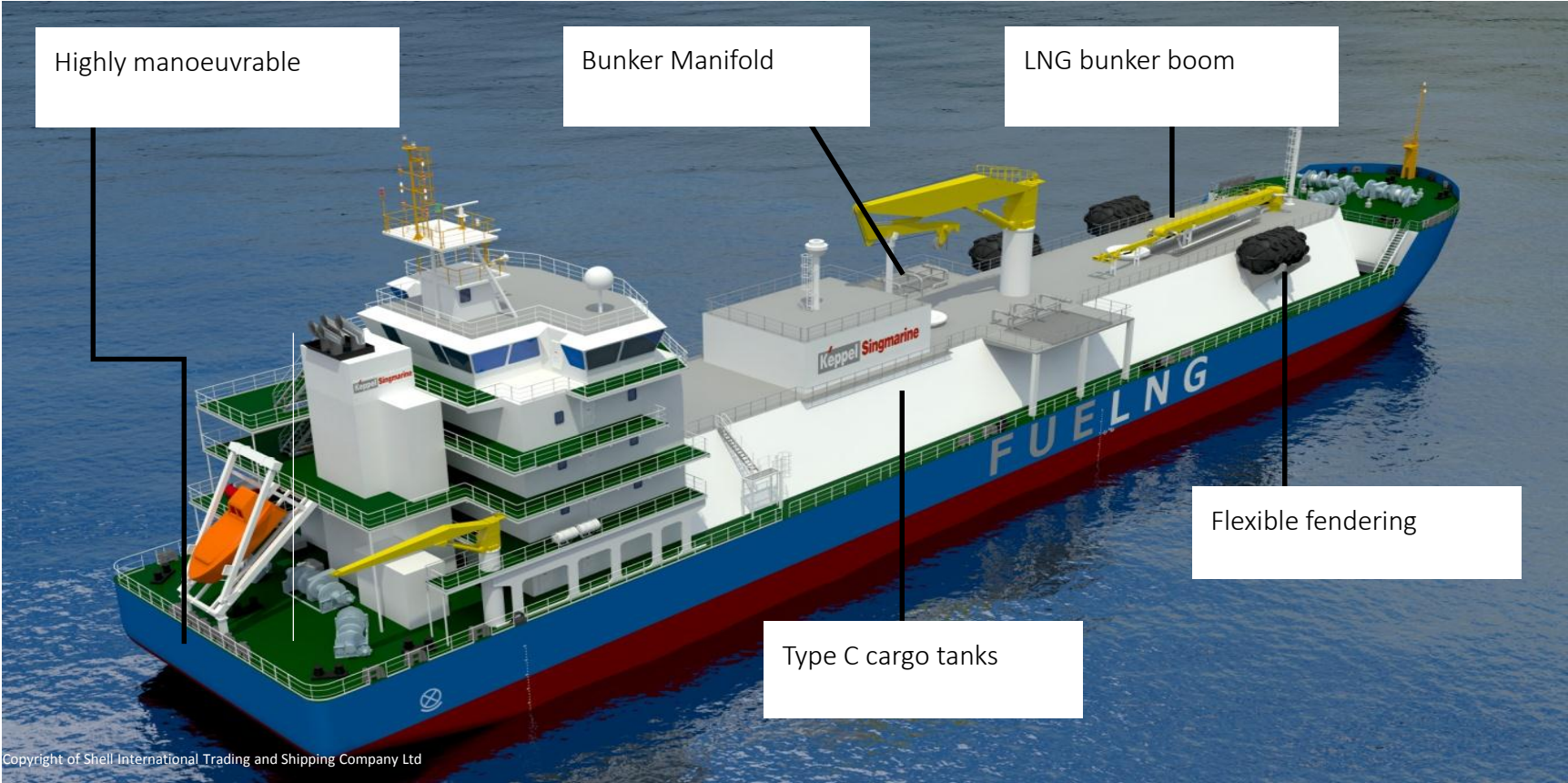


Ship to Ship Bunkering

- **Draught:**
 - *Normally not an issue for LBV!*
- **Fender contact:**
 - *Distance between the fenders on the terminal*
 - *Vessel's parallel body length*
- **Safe mooring:**
 - *Position of bollards on the jetty*
 - *Arrangement and strength of mooring lines on-board vessel*
- **Cargo manifolds:**
 - *Working envelope of loading arms on the jetty*
 - *Position of vessel's presentation flanges*
- **Ship-shore link – ESD system:**
 - *Electric, fibre optic and/or pneumatic onshore*
 - *Compatibility of system(s) on-board vessel*
- **Gangways:**
 - *Position and working envelope of gangway on jetty*
 - *Space and safe landing position on-board vessel*



Ship to Ship Bunkering



Highly manoeuvrable

Bunker Manifold

LNG bunker boom

Flexible fendering

Type C cargo tanks

Truck to Ship Bunkering

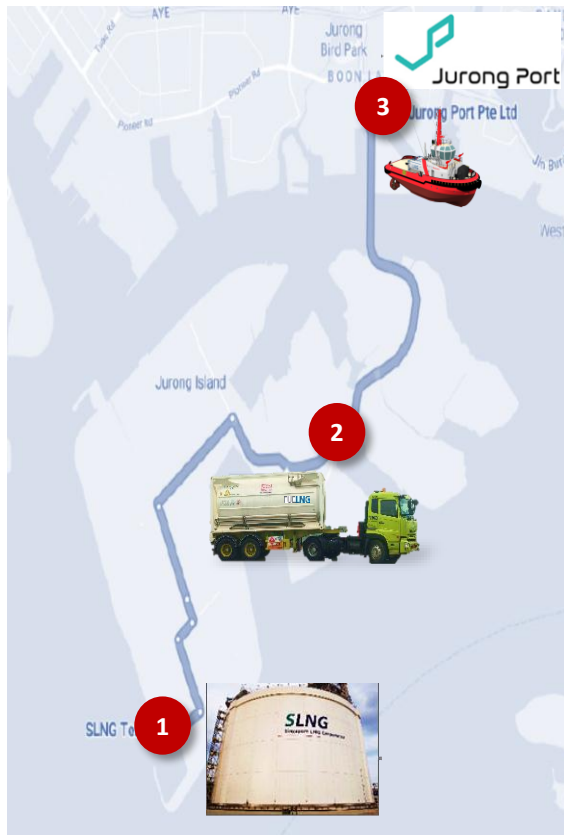


- First LNG truck to ship bunker for Hilli Episayo for commissioning purposes within the Keppel Shipyard.



- LNG bunkering of Keppel Smit's LNG fueled tug at Jurong Port

Truck to Ship Supply Chain



KST is one of the largest and leading Harbour tug service providers in Singapore and Asia Pacific region.



LNG Fuelled Tugs in Singapore

KST Liberty and Maju Loyalty

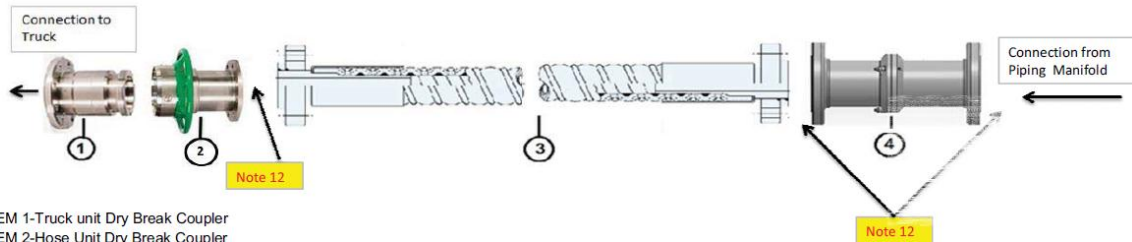
- 2 x 20m³ LNG tanks fixed on vessel
- Conduct weekly LNG bunkering

Operations at SLNG Terminal



- HAZID & HAZOP
- Terminal Route Planning
- Appropriate training (SMA)
- Dry Run

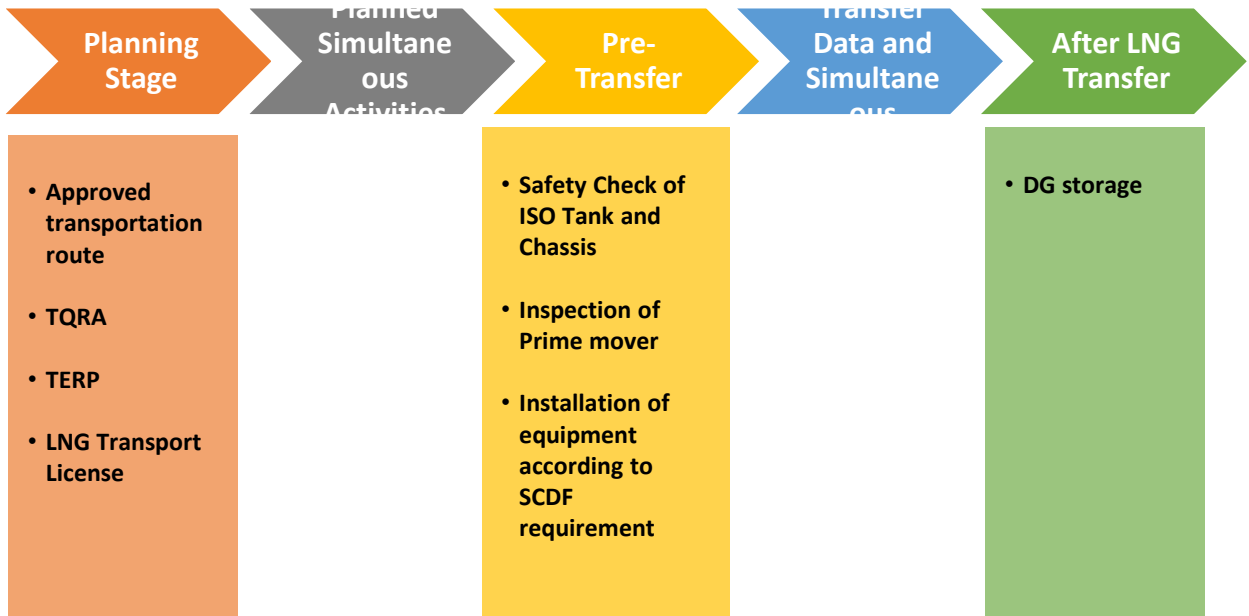
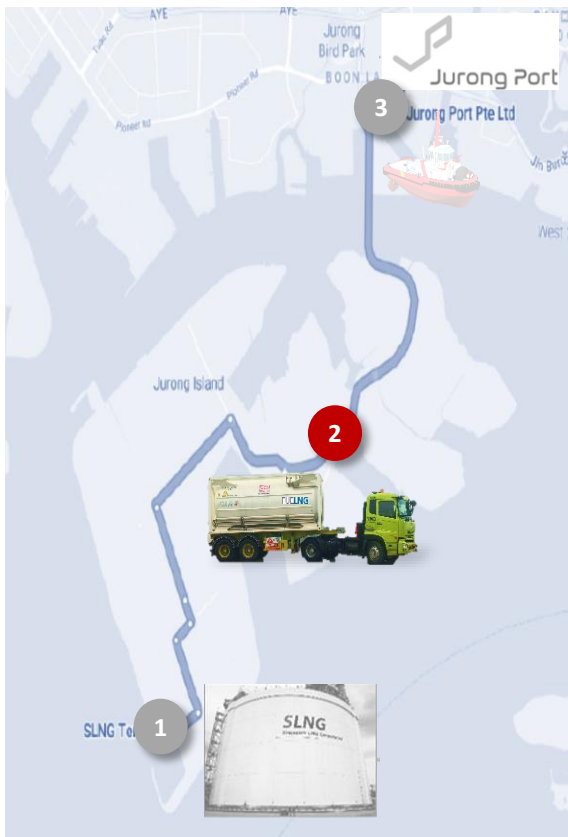
- Bunkering Checklist
- Certificate of Quality and Quantity (COQQ)



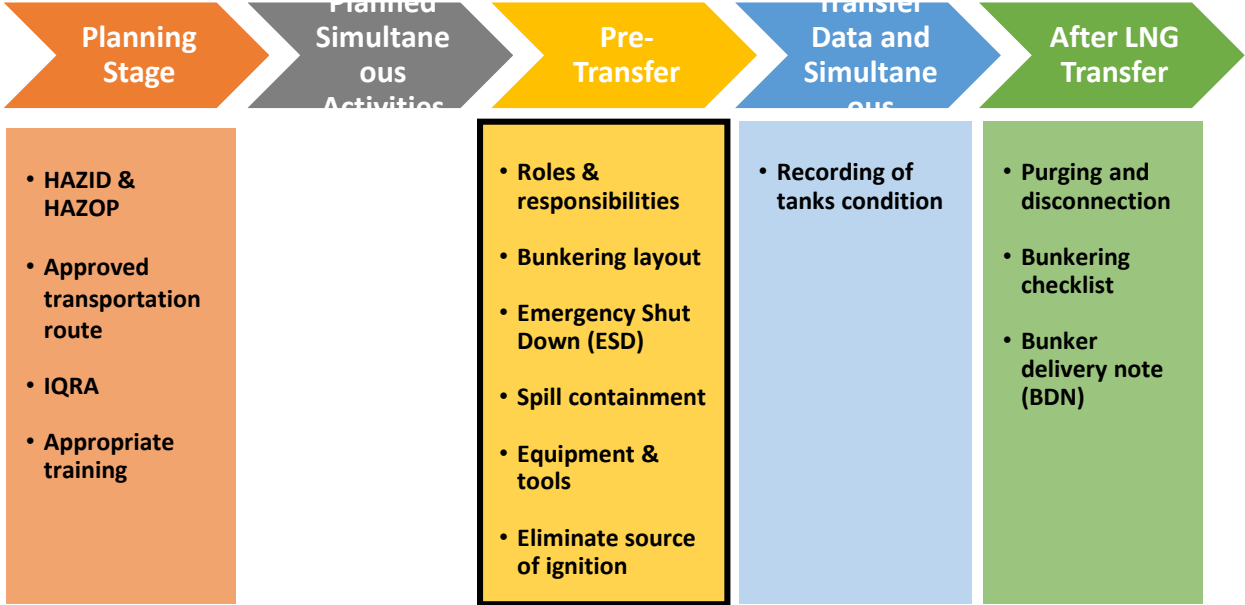
- ITEM 1-Truck unit Dry Break Coupler
- ITEM 2-Hose Unit Dry Break Coupler
- ITEM 3-Composite Hose
- ITEM 4-Safety Breakaway Coupler

(TLU)

Road Transportation to JP



Bunkering Operations



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LNG Bunkering Contract Structure

- ✓ Presently most LNG bunkering contracts are Bi – Party contracts which are Tailor made for the specific requirement.
- ✓ No Standard contract is available for LNG bunkering.
- ✓ BIMCO has announced that they shall start work on the LNG Bunker Purchase Contract in January 2019 and is expected to take approximately 18 months to complete.
- ✓ A typical LNG Bunkering Contract shall include:
 - ✓ Term of Contract
 - ✓ Min. – max. volume of LNG supply in a year
 - ✓ Min. - Max. parcel size for each bunkering
 - ✓ Agreed principles on quantity and quality measurement, specially related to energy content in LNG.
 - ✓ Failure to take and Failure to Supply clauses
 - ✓ List of bunkering ports where supply can be made
 - ✓ Agreed notice periods



LNG Bunkering Contract Structure

All stake holders in the LNG bunkering understand that **“Flexibility is the Key”**.

A range of different Bunkering Contract Structures can be provided by FueLNG to suit individual Ship Owners requirement, both for Spot as well as Term requirements :

- Only LNG bunkering service contract in Singapore (Ship Owner has the option to chose Molecule supplier)
- Full LNG Bunkering Contract in Singapore LNG Molecule (SHELL) + Bunkering Service
- Global LNG bunkering Supply (through SHELL Includes Molecules + supply)



Questions ?

Thank You

