

An aerial photograph of a large container ship sailing on a deep blue ocean. The ship is viewed from an elevated angle, showing its deck with various pieces of equipment and a large stack of colorful shipping containers (red, white, blue, and brown) on the upper deck. The ship's wake is visible in the white foam of the water. The overall scene is set against a clear blue sky.

**SEA | LNG** 

**LNG: The economic, environmental  
and evolutionary marine fuel**

# THE INDUSTRY ADVOCATE

WORKING ACROSS THE MARINE VALUE CHAIN



# LNG AS A MARINE FUEL

## THE STRATEGIC OPPORTUNITY



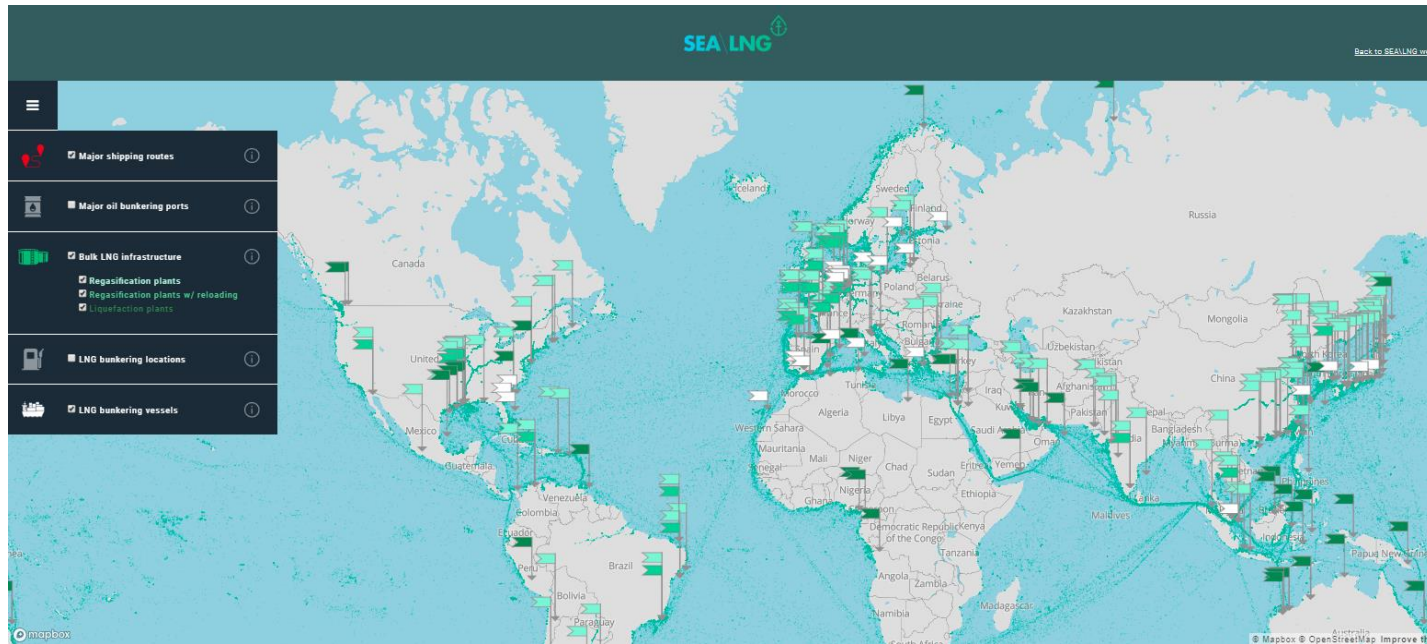
- Infrastructure – global LNG infrastructure is growing fast
- Economics – LNG offers a compelling commercial case
- Environment – LNG is a superior and future fit fuel



# INFRASTRUCTURE CASE

## BULK INFRASTRUCTURE ALREADY EXISTS – ‘LAST MILE’ INVESTMENTS HAPPENING

- Plentiful and growing LNG supply
- Bulk LNG infrastructure exists and is in the right places
- ‘Last mile’ investments are happening (globally)
- LNG bunkering available or planned in 9 of top 10 bunkering locations
- Bunker vessels – 9 in operation and many more on order

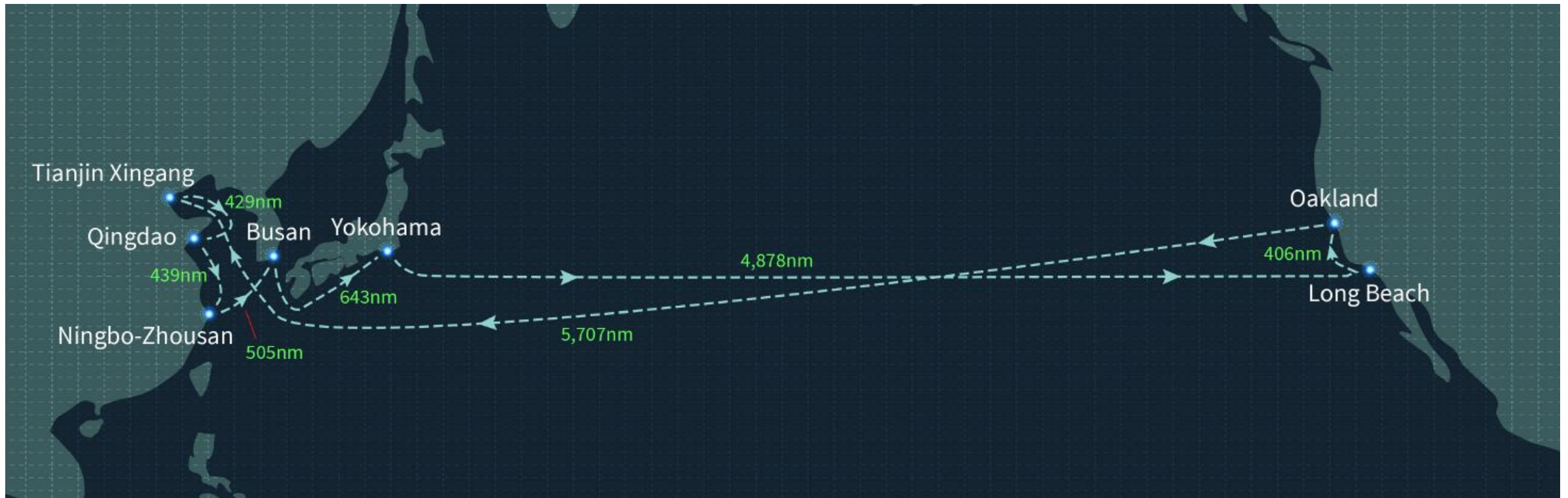


Source: SEA LNG Bunker Navigator

# ECONOMICS – ADDING VALUE THROUGH LNG

- ECA Voyage times not so relevant

## ASIA – USWC LINER ROUTE



# ECONOMICS – INDUSTRY ACCEPTED FIGURES

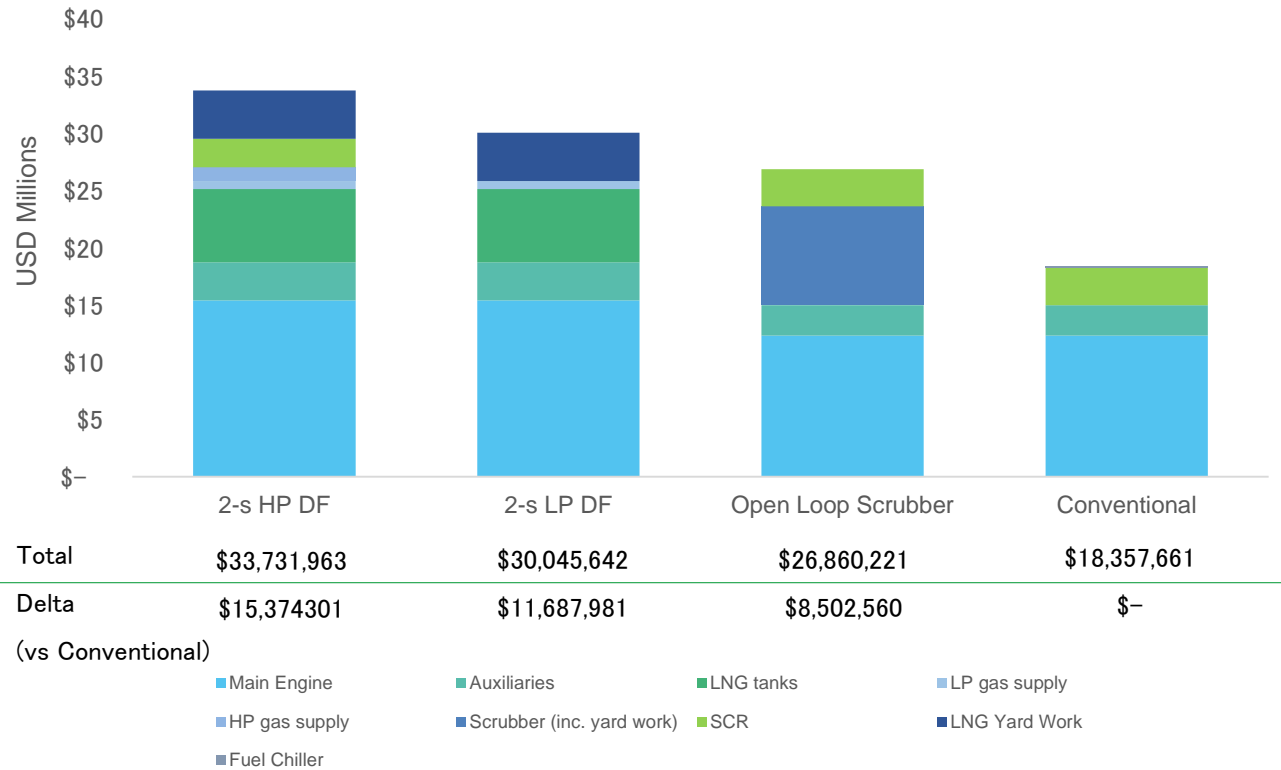
## CONSERVATIVE ASSUMPTIONS REINFORCE BUSINESS CASE

- 14K TEU Newbuild vessel
- Both strong freight markets sailing at designed operating speed and weak freight markets involving slow steaming tested
- Weighted Average Cost of Capital of 8% over 10 year investment horizon period
- Multiple Fuel Cost Scenarios tested
- LNG DF, HFO w/Scrubber and VLSFO engine options– Capital and Operating costs modelled.
- Open Loop Scrubber assumed to be viable

# ECONOMICS – ENERGY COSTS OUTWEIGH CAPEX

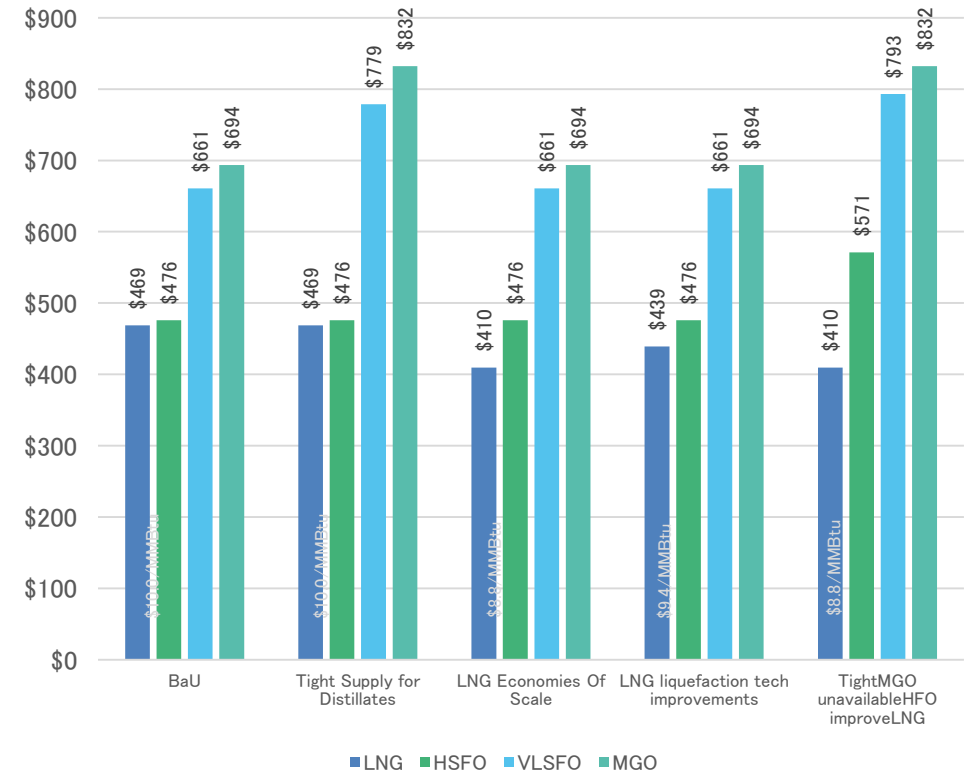
- Diminishing CAPEX hurdle

## CAPEX SUMMARY



- Competitive Energy Costs

## 2020 PRICES FOR FIVE SCENARIOS (USD/MT)



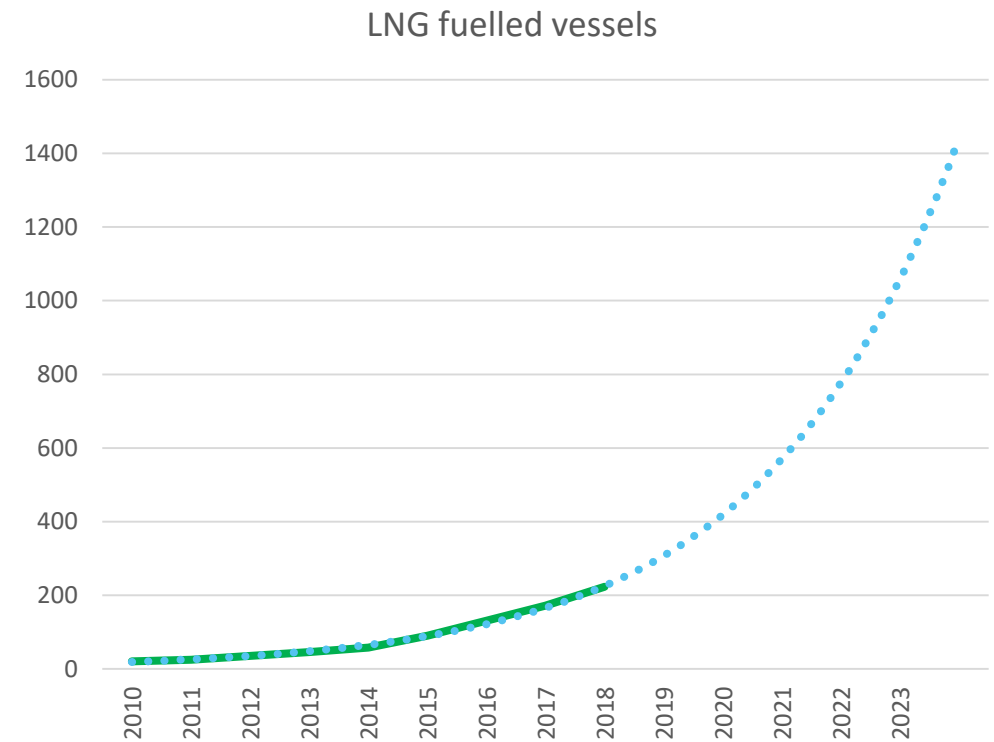
- Don't underestimate costs of scrubbers and other auxiliary equipment

# ECONOMICS – MORE WIDELY RECOGNISED

## GROWING ADOPTION OF INVESTMENT CASE

“LNG is the fuel of the future for shipping,” Rodolphe Saade, Chairman & CEO CMA CGM

- Number of LNG fuelled ships growing strongly:
  - 144 in operation
  - 139 on order
  - 20%-40% annual growth since 2010
- Advancing across a range of vessel types
- Move from short-sea shipping to deep-sea shipping space



Source: DNV GL LNGi, January 2019



# ENVIRONMENT – POSITIVE WAY FORWARD

LNG MEETS THE NEEDS OF TODAY AND TOMORROW

- Provides a proven local emissions solution
- Superior air quality benefits
- Only marine fuel providing Greenhouse Gas benefits
- Relatively stable pricing



# EMISSIONS CASE

## UNMATCHED LOCAL EMISSIONS PERFORMANCE & MAJOR STEP FORWARD FOR GHG

- Out performs conventional marine fuel
  - Zero SO<sub>x</sub>
  - 90% NO<sub>x</sub> reduction
  - 99% decrease in PM
- No waste disposal or discharge issues
- Significant GHG reductions:
  - 20% compared to existing
  - >40% with EEDI measures,
  - Further benefits with Bio or synthetic gas



# EVOLUTIONARY – LNG A FUEL OF PROGRESS

- Positive choice demonstrating strategic change to match consumer demands for environmental stewardship
- Addresses air quality, reduces Greenhouse Gas emissions, commercially viable and scalable now
- Expanded Greenhouse Gas opportunity through renewable natural gas



# WAY FORWARD FOR SEA=LNG

## EVOLVING & EXPANDING ENGAGEMENT

- Promoting LNG with real data together with academically reviewed Research Initiatives to assist owners with the decision process
- Additional Investment Cases for varying types of deep-sea tonnage
- Broadening the LNG knowledge base through outreach and education





**SEA / LNG** 