

Third Latin America Energy
Summit
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LNG for Marine Transportation
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Desarrollo de Negocios

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### Agenda

- 1. Why LNG for marine transportation is an attractive choice
- 2. Trends in LNG for shipping a growing market
- 3. Potential for Chile
- 4. Shell's LNG for marine transport business

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October 2019

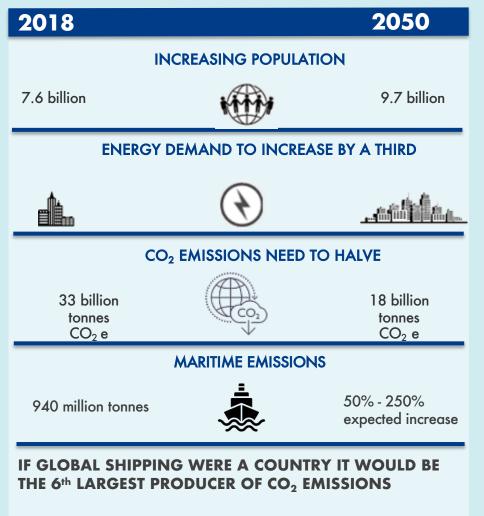
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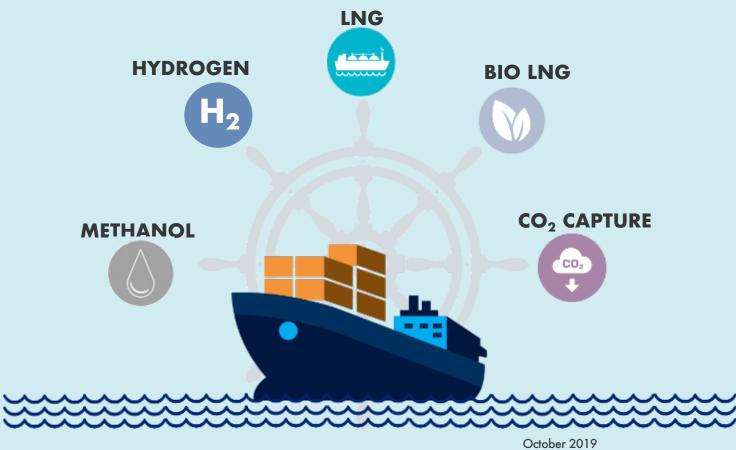
# Why choose LNG as a marine fuel?



### A challenge which requires multiple solutions

Scale and complexity of the energy challenge requires a variety of cleaner energy solutions

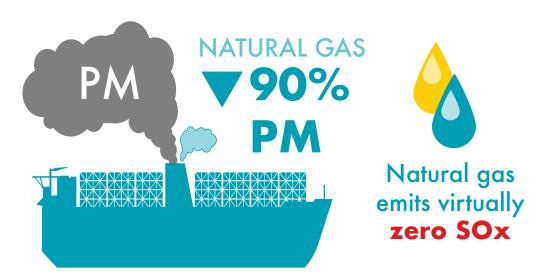




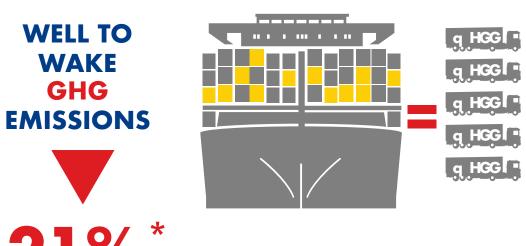
Source: UN estimates and IMO GHG3 study

#### LNG is Cleaner

## LNG has **lower local emissions** (PM, SOx, NOx)



#### LNG has lower GHG emissions



One ship equivalent to 500 heavy duty trucks removed from the road

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GHG impact than fuel completely combusted to CO<sub>2</sub>.

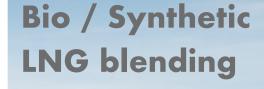
<sup>\*</sup>Significantly reduced NOx depending on tier 1/2/3 engine: Particle- and Gaseous Emissions from an LNG Powered Ship; M. Anderson, K. Salo, E. Fridell; Environ. Sci. Technol. 2015, 49, 12568-12575

<sup>\*</sup> Thinkstep, Greenhouse Gas Intensity of Natural Gas prepared for Natural & Bio Gas Vehicle Association

<sup>(</sup>NGVA) Europe, V1.0, 05/05/2017 for ship and truck WtW savings. One example of emissions reduction

using one large high pressure 2-stroke engine. Unburned methane in the exhaust (methane slip) has 6 higher

### LNG Can Support IMO 2030 and 2050 Pathways





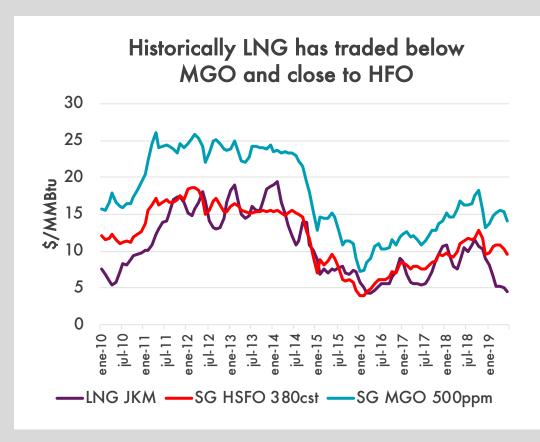
LNG fuelled engine
up to 21%

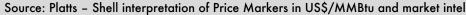
WtW GHG saving\*

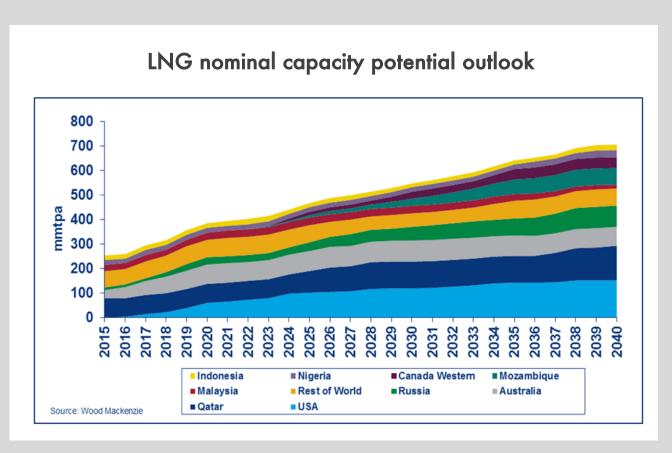
- Key consideration: CH4 = CH4
- Leveraging existing infrastructure
- Worldwide availability
- No regret costs

<sup>\*</sup>Based on ThinkStep Study "Life Cycle GHG Emission Study on the Use of LNG as Marine Fuel" published in 2019

### **LNG** is Cost Competitive







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Source: Wood Mackenzie - Global Gas Markets Long-Term Supply Outlook 2018: LNG Supply

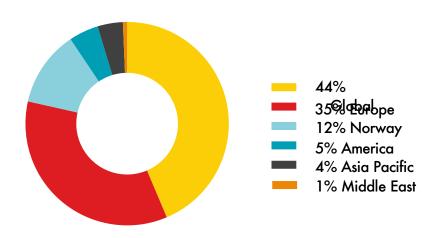
# Trends for LNG in shipping

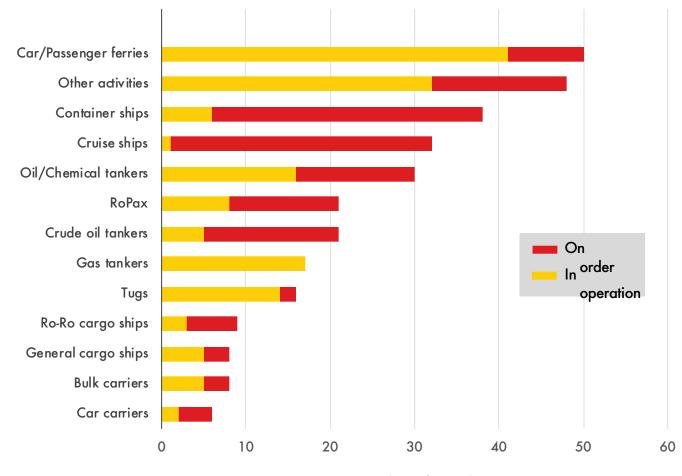


### Take up of LNG vessels is growing - The IMO 2020 transition provides some opportunity for further growth.

Currently 155 LNG-fuelled vessels operating globally, with 149 more in the order book and over 141 'LNG Ready' vessels either on the water or on order.

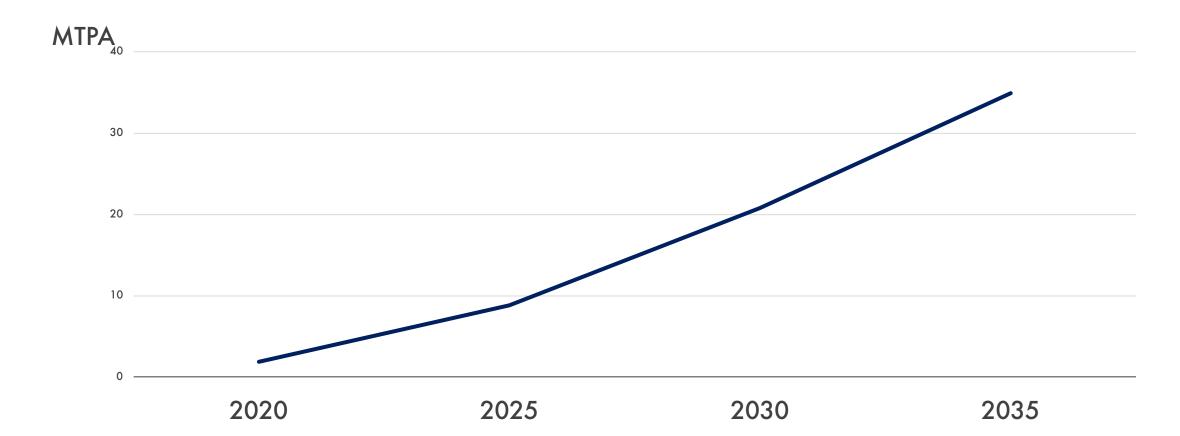
#### **OPERATING AREA OF VESSELS ON ORDER**





Source: DNV GL, Updated as of Dec 31st 2018

### Projections for LNG in global marine transportation

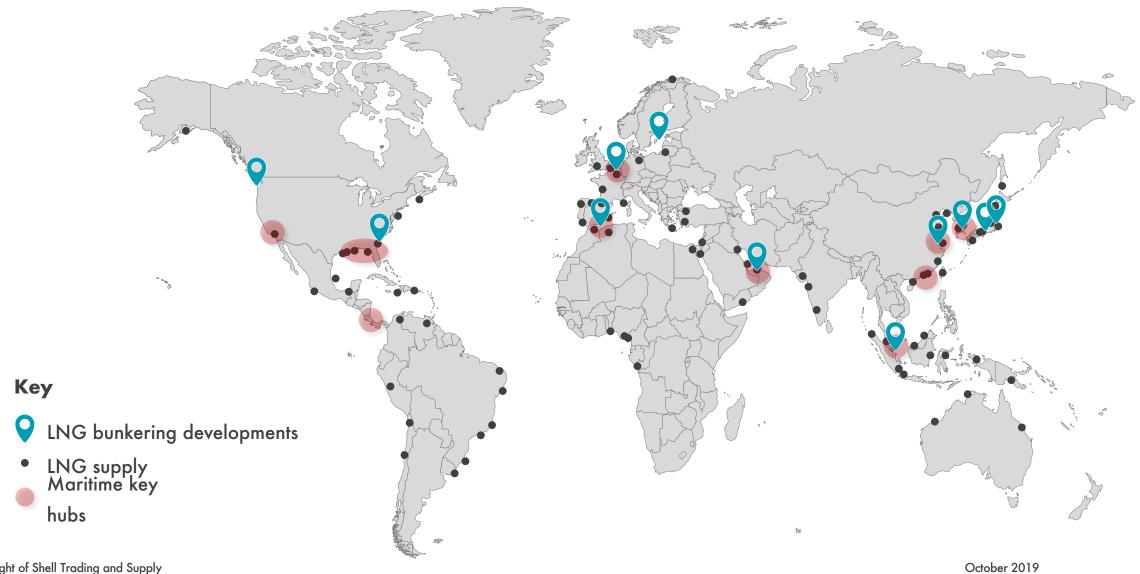


Source: Shell interpretation of DNV-GL & Woodmac data

### **Potential for Chile**



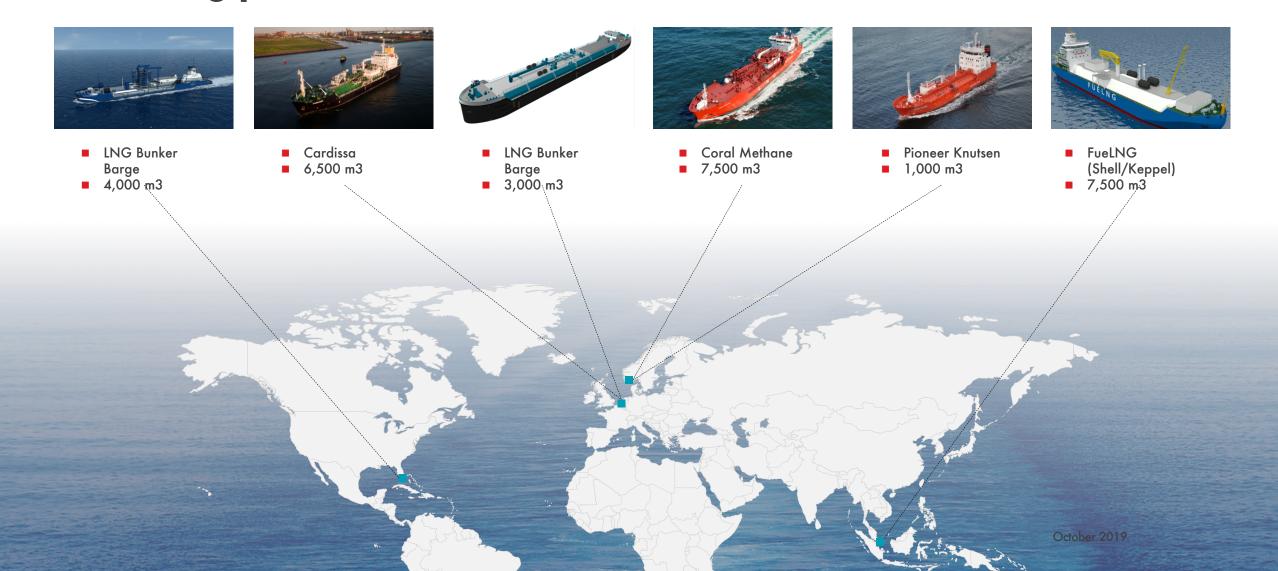
### Could Chile be a hub?



# Shell's marine LNG business



## In line with growing customers demand, Shell is investing in its LNG bunkering portfolio and infrastructure

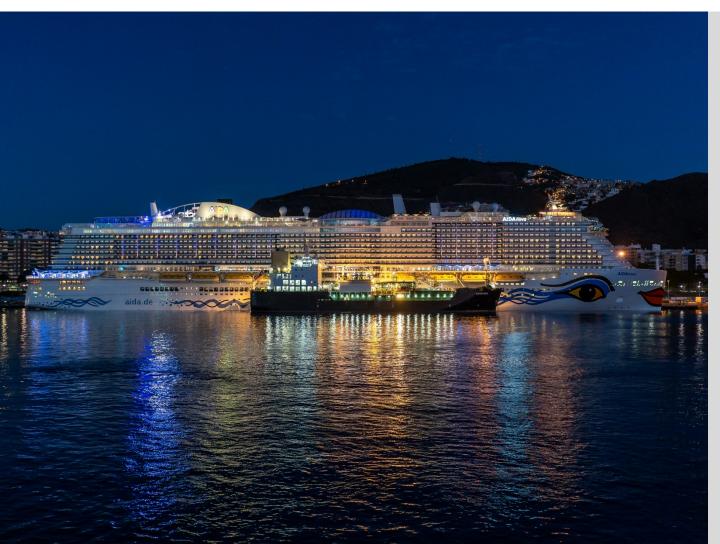


### **Sovcomflot**



- Agreement signed with SCF for the supply of LNG to fuel the first iceclassed Aframax crude oil tankers in the world to be powered by LNG
- Shell refuels the vessels at the Port of Rotterdam and from a second supply point in the Baltics
- Operational since Q3 2018

### **Carnival**



- In 2016, Carnival and Shell signed a global agreement for the supply of LNG
- Initially, this supply was for Rotterdam and the Western Mediterranean, serving Carnival's 1st two LNG fuelled cruise ships
- Carnival and Shell have also agreed to supply LNG in Florida for vessels 3 and 4

## As with all new markets, there are challenges ahead Collaborative relationships are key.

How to grow marine LNG demand?

How to drive down the LNG infrastructure costs?

How will the global sulphur cap be implemented?

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LNG market development is challenged by various factors that can only be mitigated through collective industry efforts.







LNG for marine transportation is available today, is a cleaner alternative fuel for marine transport and is an important step in an identified pathway towards cleaner shipping

- Globally it is projected to grow strongly
- Chile is well placed to take advantage of this growth through development of a South America hub and be a world leader in supporting cleaner fuels in this important transportation segment