

# Supercooled

## The evolving LNG fleet driving the global gas boom

Greater LNG shipping flexibilities needed to absorb the shocks of a critical point in LNG growth

LNG special report

October 2018



## THE EVOLVING LNG FLEET DRIVING THE GLOBAL GAS BOOM

The LNG shipping fleet has been instrumental in expanding trade flows for natural gas, opening up new markets and making LNG a global commodity in its own right, and the trend is set to continue as the fleet grows in size and becomes more flexible.

The global fleet is set to see its biggest expansion in 2018, which will be vital to continue facilitating spot trade development, meet growing ton mile demand, largely driven by rising US LNG flows to Asia, and serve the new wave of supply expected from pre-FID export projects after 2020.

The ramp-up of US liquefaction capacity through 2020 will continue to be a key driver of ton mile demand and spot shipping prices, while China's growing gas appetite and LNG terminal expansion will likely result in both additional demand and greater seasonality, making shipping flexibility an even greater necessity.

However, with US-China LNG trading threatened by tariffs and the timeline of new FIDs still uncertain, the delicate balance of the sector is anything but certain.

The profile of LNG shipping ownership is also becoming more diversified, as reduced earnings visibility forces traditional owners to look for co-investors, and new market players look to expand their fleets in order to take advantage of an increasingly liquid trading space.

LNG shipping technology is evolving fast, bringing greater efficiencies in trading, helping extend LNG supply chains into new areas of demand and facilitating the evolution of LNG towards an increasingly commoditized marketplace.

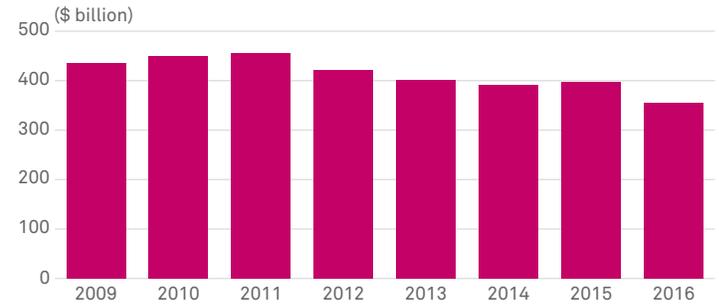
### LNG shipping set for its biggest expansion yet

Despite the decline in ship finance and rising interest rates, LNG shipping continues to attract investment, ensuring that shipping capacity growth meets demand projections, and freight rates are kept at sustainable levels.

The global LNG shipping fleet will see its biggest expansion yet in 2018, with the delivery of more than 70 new LNG carriers - more than 8 million cu m, versus 4.1 million cu m in 2017 - and one of the largest order volumes in a given year.

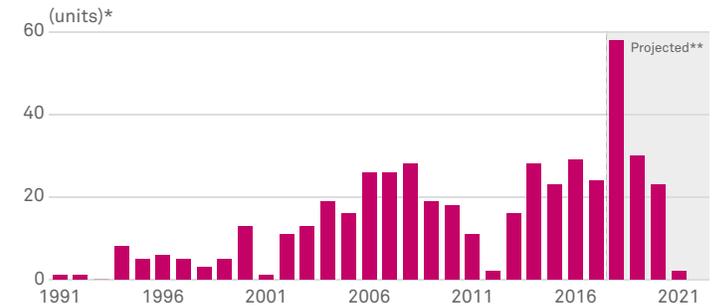
In the first seven months of 2018, 28 large LNG carriers were ordered, more than the 26 ships ordered in 2016 and 2017 combined. The record for new orders was set in 2014, with 62 large gas carriers in a single year.

## SHIP-FINANCE FROM BANKING SECTOR SHRINKS



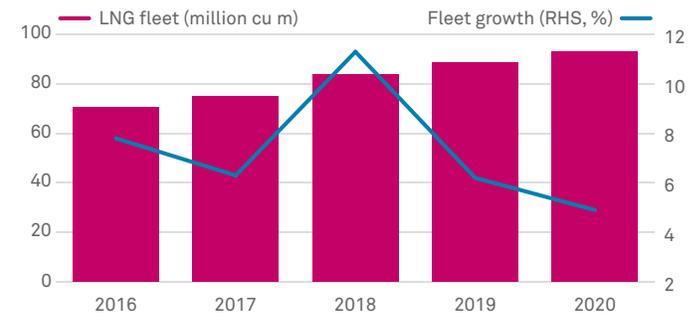
Global ship-finance has been volatile and trending downwards. Syndicated loans were the main mode of shipping finance, but bank investment in the shipping industry has seen a gradual decline.  
Source: Shipping consultants, Xinhua-Baltic 2018 Report

## 2018 WILL SET A NEW RECORD FOR NEW LNG CARRIER ADDITIONS TO THE GLOBAL FLEET



\*Data does not include vessels scrapped.  
\*\*Projected deliveries after accounting for slippages.  
Source: Vessels Value

## LNG FLEET GROWTH SLOWING AFTER 2018



Source: Drewry

## FREIGHT RATE FORECAST (\$ per day)

|                   | 2016   | 2017   | 2018   | 2019   | 2020   |
|-------------------|--------|--------|--------|--------|--------|
| <b>Spot rates</b> |        |        |        |        |        |
| Steam Turbine     | 20,000 | 26,000 | 40,000 | 65,000 | 50,000 |
| DFDE              | 34,000 | 46,000 | 65,000 | 80,000 | 75,000 |

Source: Drewry

“The pace of deliveries in 2018 and 2019, which now hold together 94% of the orderbook in unit terms, will shape the industry for many years to come,” the head of research with Italian ship brokerage Banchemo Costa, Ralph Leszczynski, said.

And most of the existing LNG fleet will be operational for decades, as the average age of the fleet is only 10.8 years versus a shelf life of more than 40 years.

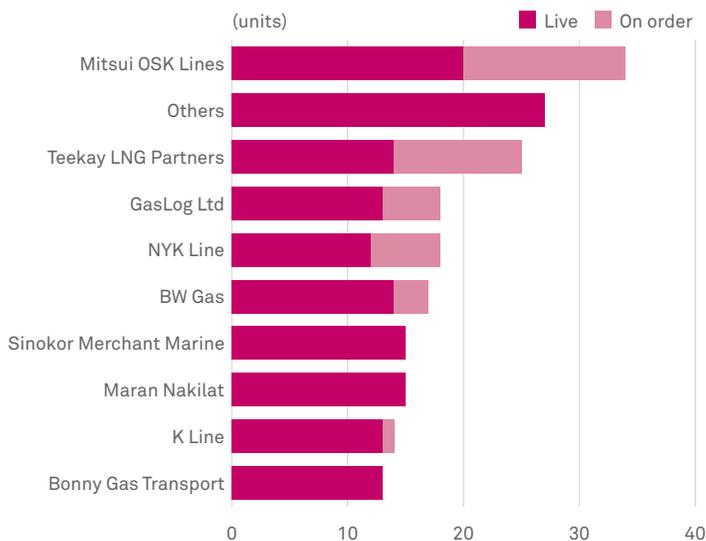
However, the delicate balance in LNG shipping is by no means certain, and will depend on the sector’s ability to respond to shifts in supply and demand, including potential trade disruptions emerging from rising tensions between the US and China and the pace at which pre-FID export projects are delivered post 2020.

**A more competitive, diversified LNG shipping market**

The profile of LNG shipping ownership is also changing, with more participants such as traders and power utilities becoming ship owners, as the LNG trading space becomes more liquid and diversified, and the breakdown of long-term LNG contracts forces traditional ship owners to look for co-investors.

The LNG shipping fleet has been typically concentrated among large shipping owners, such as Malaysia’s MISC, South Korea’s K-Line, Qatar’s Nakilat and Japan’s Mitsui OSK Lines and Nippon Yusen Kabushiki Kaisha Lines. The 12 largest owners still control about half of the trading

**TOP 10 OWNERS OF LARGE LNG CARRIERS (120,000 cu m to 180,000 cu m)**



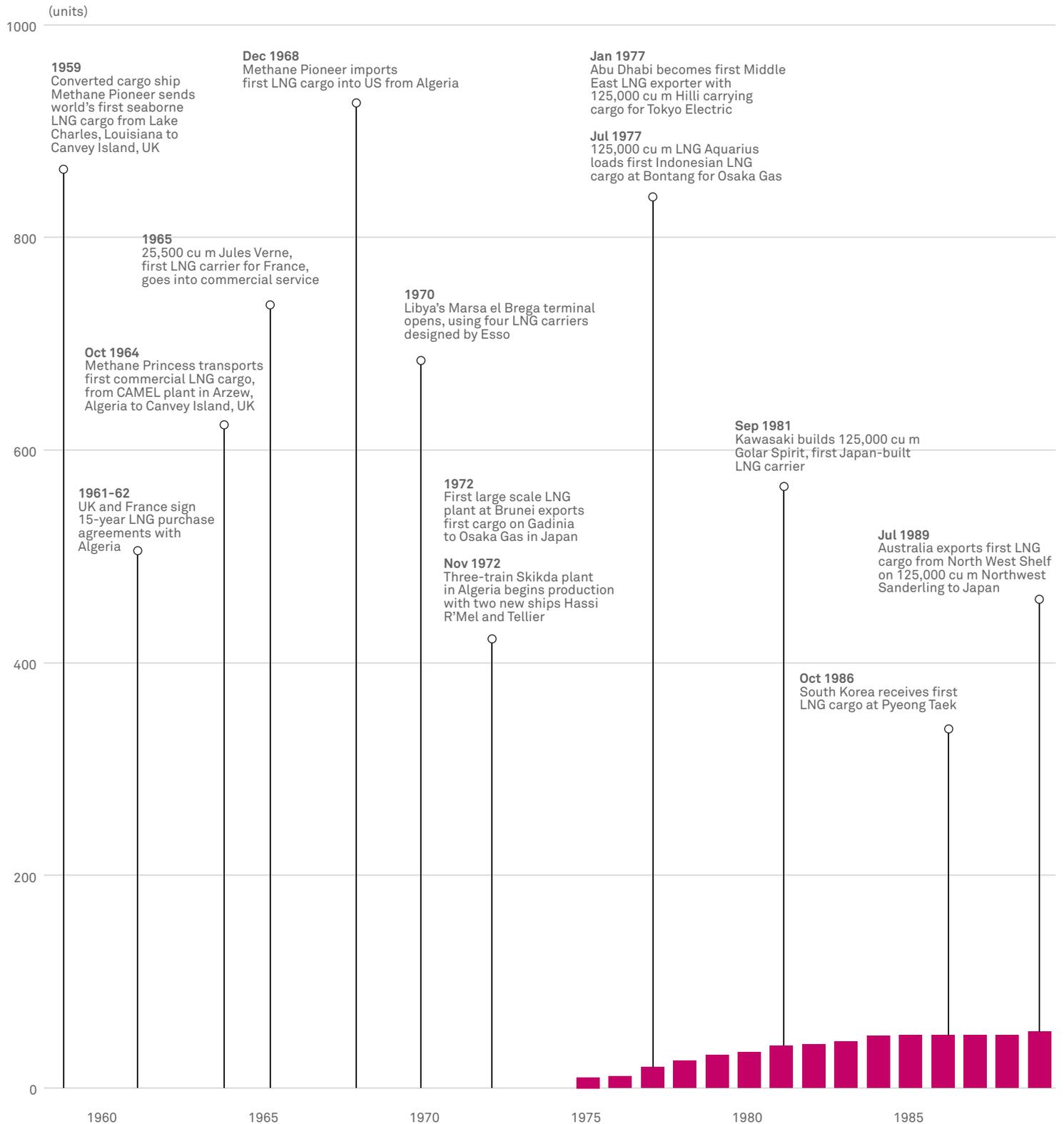
Note: Most of the global LNG fleet has been standardized at a capacity of 120,000 cu m to 180,000 cu m, to boost economies of scale.  
Source: Vessels Value



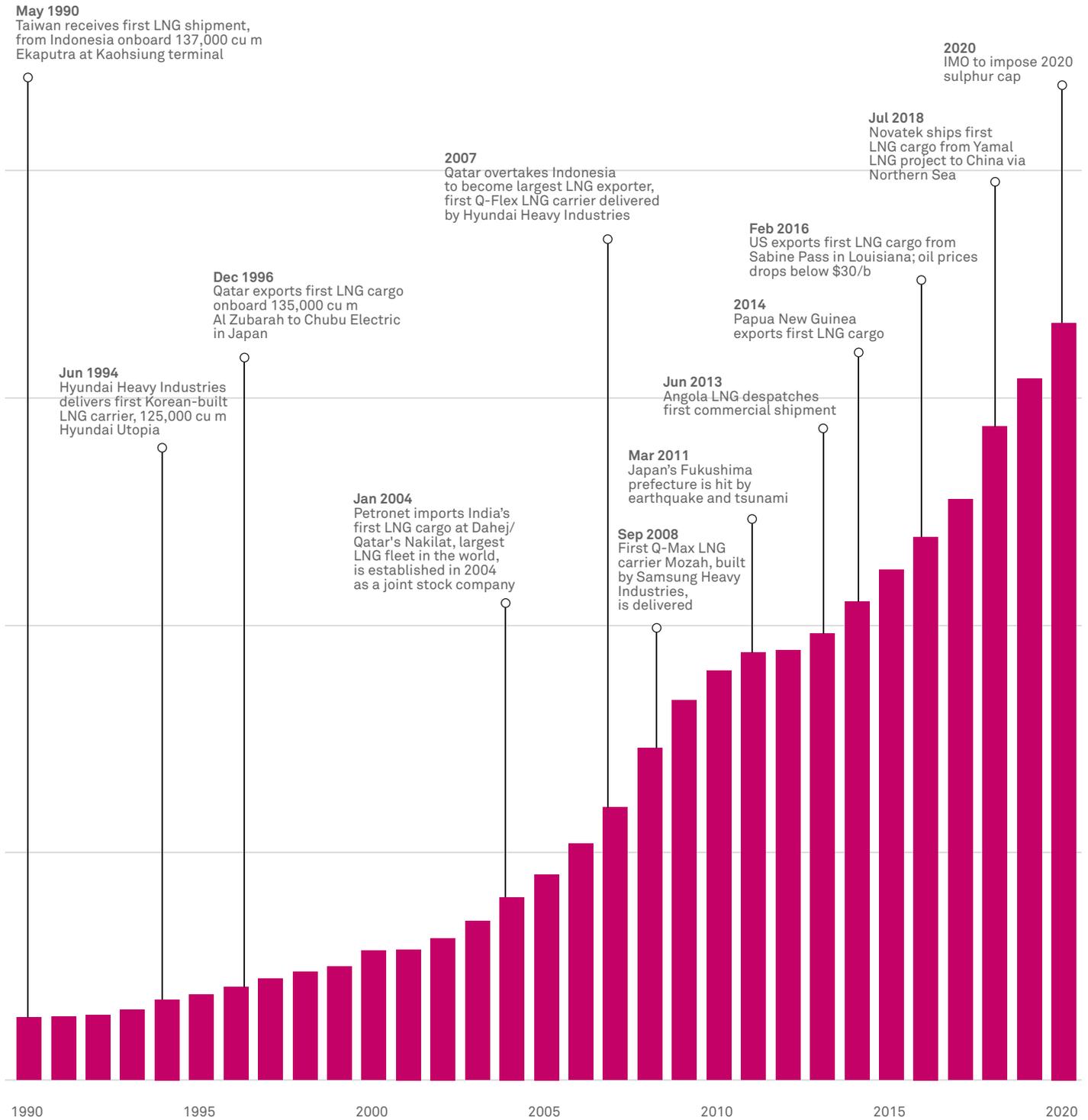
“As the US represents a greater and greater percentage of global supply, the weighted average shipping distance should also start to trend upwards.”

– Jeff Moore, Head of Asia LNG Analytics  
S&P Global Platts

# Milestones in LNG Shipping and Growth in Fleet Size



Source: GIIGNL. Britcham. Shell. shipping brokerages. consultants



fleet and account for around 30% of the orderbook, according to Banchero Costa.

This is the legacy of two separate factors: a traditional LNG business model based on point-to-point bilateral long-term contracts between a small number of suppliers and buyers, and shipping banks' preference for concentrating capital among a few established low-risk ship owners at relatively low interest rates.

As legacy long-term LNG contracts are being displaced with shorter, more flexible deals, earnings visibility is also reduced, and this is forcing traditional ship owners to share their investments with new market players seeking to take advantage of greater returns from an increasingly liquid trading space through enhanced shipping optimization capabilities.

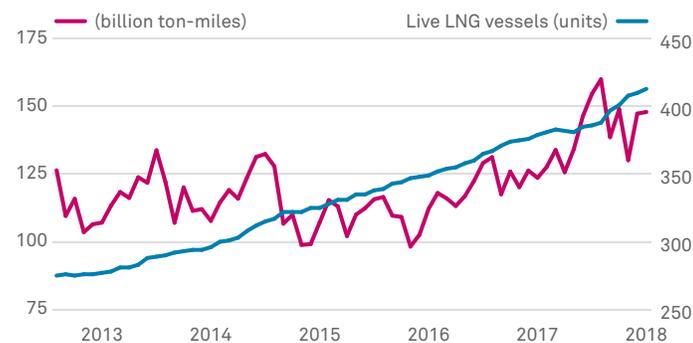
Looking forward, LNG shipping finance will depend on acceptance of the increasingly diverse nature of LNG trading and the pivotal role of spot markets, with improved operational efficiencies supporting LNG economics and stronger pricing benchmarks strengthening the market's hedging capabilities.

**US LNG projects to drive voyage length**

The balance of the LNG shipping market through 2020 will largely depend on the equilibrium between the LNG fleet expansion and the rate of ton mile demand growth driven by more US LNG making its way to Asia.

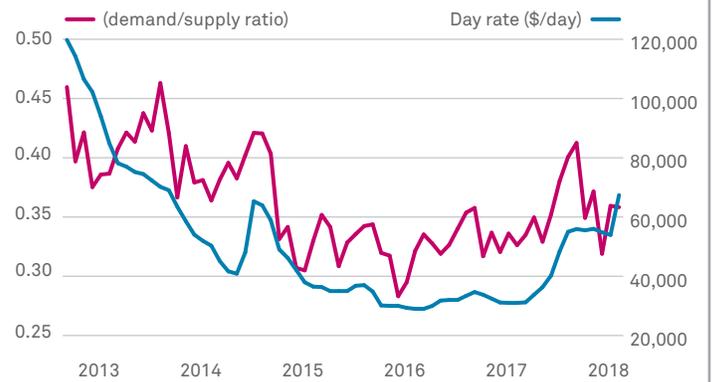
US LNG requires far more shipping resources than its Indo-Pacific competitors to reach the key Asian markets, yet more than 40% of total US supply went to Asia in the first half of 2018, versus only about 19% in 2017, according to Platts Analytics.

**TON-MILE DEMAND FOR LARGE LNG CARRIERS SPIKED IN LATE 2017**



Note: The large outstanding orderbook is concerning, but the rise in ton-mile demand has been robust as well and has led to a finer balance between the demand for ships and the supply available.  
Source: VesselsValue

**LNG VESSEL DEMAND/SUPPLY vs FREIGHT RATES**



Source: Vessels Value

LNG freight rates are directly correlated with the demand for LNG transportation, and inversely correlated with vessel supply. More LNG carriers positioned at a loading point will drive down shipping rates as a larger pool of vessels chases a limited number of cargoes; whereas longer voyages tend to drive up freight costs as ships are tied up at sea for longer durations. The demand/supply ratio can be calculated by dividing the total LNG ton mile demand — the tonnage of cargo shipped multiplied by the average distance over which the cargo is transported — with the total number of LNG carriers available. An increase in this ratio correlates closely with strong rates, and tends to be a leading indicator of market earnings.

And this trend is set to continue as US liquefaction capacity is currently only about one third of a projected 2020 capacity of more than 55 million mt/year.

“This means that as the US represents a greater and greater percentage of global supply, the weighted average shipping distance should also start to trend upwards,” said Jeff Moore, head of Asia LNG Analytics with S&P Global Platts.

An overall increase in average shipping distance and voyage time could have major implications on spot shipping prices, as the limited number of LNG vessels would serve longer and longer voyages, he added.

So far, however, the ramp up in average shipping distance out of North America has been largely offset by declines in average shipping distance from the Middle East and Pacific regions, which have become more self-sufficient as export projects in Australia ramp up and Middle Eastern demand increases.

### China to soak up tonnage

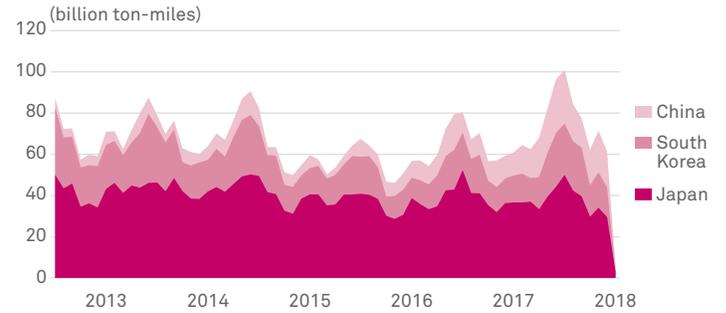
One of the biggest markets tapped by US LNG has been China, where economic growth, industrial recovery and coal-to-gas switching policies have helped offset stagnant demand growth in the legacy customers of Japan and South Korea.

China imported more than 30 million mt in January-August 2018, up by nearly 50% year on year, and the country's dependence on inter-basin LNG inflows is also on the rise, partly supported by declining supplies from Southeast Asian legacy producers and limited spot availability from eastern Australia, where rising domestic gas prices have created political opposition to LNG exports.

"If China continues its drive to reduce pollution, ton mile demand could surprise to the upside, rewarding those who ordered ships in the past five years or acquired modern units through sale and purchase activity," Court Smith, shipping analyst at VesselsValue, said.

China imported more than 2 million mt from the US in January-August 2018, versus 1.60 million mt in the full year 2017, and the commissioning of new LNG terminals in the country's northeast coast is

### TON-MILE DEMAND OF TOP THREE LNG IMPORTERS – CHINA OFFSETS JAPANESE DECLINE



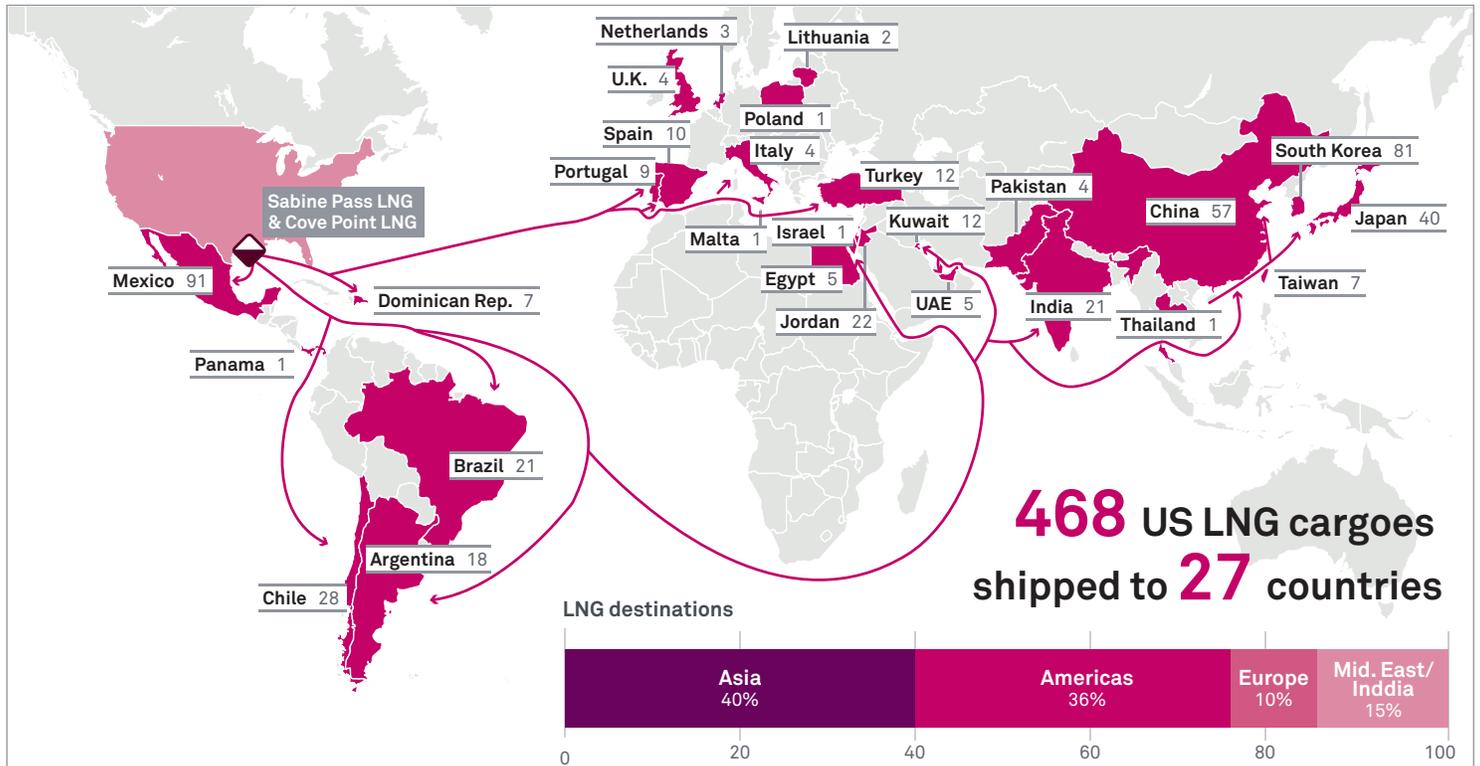
Note: Japan's LNG demand fell 10% so far this year to 265 million cu m/d, despite peak electricity demand, extreme heat conditions and high power prices. But higher ton-mile demand from Chinese LNG imports has offset Japan, and driven up freight costs.  
Source: Vessels Value

set to increase both consumption and the seasonal characters of purchases, making shipping flexibility an even greater necessity.

### Is the US-China trade war the perfect storm for LNG shipping?

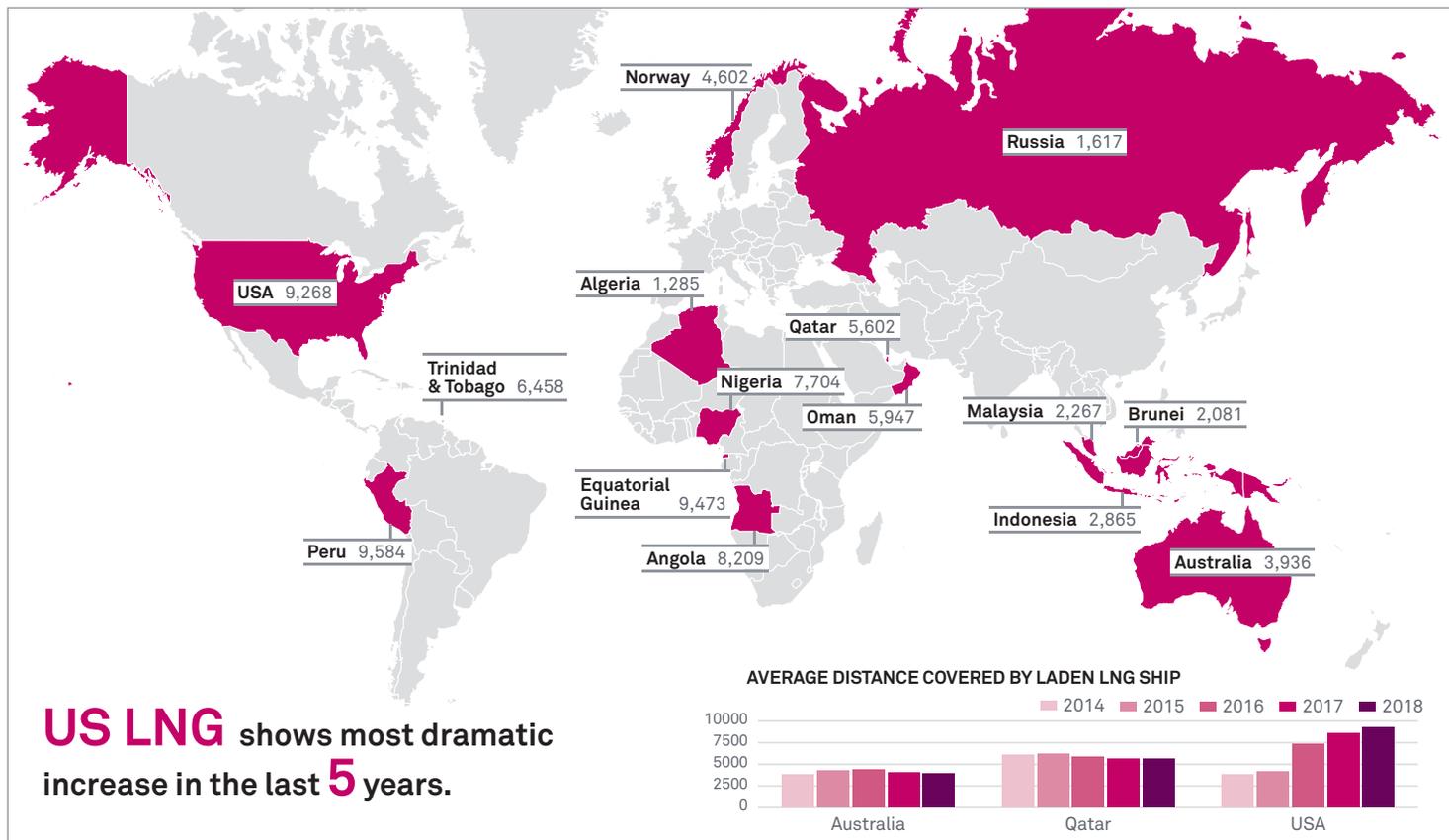
The US-China trade war has raised some concerns about a contraction in shipping demand as Chinese buyers realign

### LATIN AMERICA AND ASIA MAIN DESTINATIONS FOR FLEXIBLE US LNG: FEB 2016 - SEP 2018



\*This data includes a few cargoes from early October.  
\*\*Figures indicate number of cargoes.  
Source: S&P Global Platts Analytics

**AVERAGE DISTANCE TRAVELED BY AN LNG VESSEL ON A SINGLE VOYAGE BY COUNTRY OF PRODUCTION\***



\*Measured in nautical miles.  
Source: S&P Global Platts Analytics

their purchases of spot US LNG cargoes, and replace them with LNG from sources closer to Chinese ports.

The risks were exacerbated by US commitments to make it easier for European countries to buy American LNG by reducing trade barriers, in recent announcements from Washington. US-Europe shipping distances are shorter and the NATO alliance has a vested interest in reducing Russia’s grip on Europe’s gas supply.

However, the potential readjustment of trade flows resulting from China’s tariffs on US LNG could also increase the role played by intermediaries such as LNG traders, and the need for shipping optionality, which could have an upward impact on ton mile demand and LNG shipping rates.

China has imposed retaliatory tariffs on an additional \$60 billion worth of US imports including a 10% tariff on LNG effective September 24. This was in response to earlier announcements by the White House on \$200 billion worth of Chinese goods, including various aluminum and steel items that had been left out of tariffs imposed in March.

The move has left Chinese buyers scrambling for substitutes and approaching independent trading houses and oil majors for options to divert their US spot cargoes, and swap them for non-US LNG ones, which is likely to result in either price premiums for non-US volumes or discounts for US cargoes, especially over the peak winter demand season.

**Evolving LNG ships**

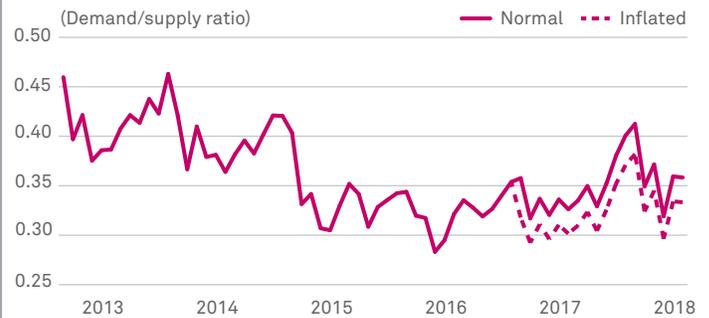
LNG shipping technology is evolving fast, making LNG ships bigger and more efficient.

New propulsion technologies like the MEGI (M-type, Electronically Controlled, Gas Injection) are bringing greater efficiencies in trading; better insulation are helping reduce the amount of gas that evaporates during the voyage, known as “boil-off”, while the growth of floaters, small scale LNG and LNG bunkering are helping extend LNG supply chains into new areas of demand.

Floating storage and regasification units in particular have helped facilitate growth of the LNG market by reducing



### LNG FLEET EXPANSION IS EASILY ABSORBED BY TON-MILE DEMAND



Note: In this simulation, LNG vessel supply/demand is artificially inflated with new ships. Despite the addition of 31 new LNG carriers to the global fleet, demand growth in late 2017 was strong enough to absorb the new vessels with minimal impact.

Source: Vessels Value

In order to assess the impact of new LNG vessel deliveries on freight rates, the actual demand/supply ratio (LNG ton mile demand/LNG carriers available) was compared with a hypothetical ratio that included 31 new LNG vessels. These additional ships added to the supply pool represent all outstanding orders for 2018. The demand growth in late 2017 was so strong that even adding 31 ships to the fleet from January 2017 pushed the ratio up to levels where it would lead to higher rates, according to Vessel Value. This analysis suggests that US-China LNG trades, if unaffected by trade disputes, could generate significant ton mile demand and increase freight rates, while new LNG vessel deliveries from 2018-2020 are likely to be absorbed by growing LNG demand.

the cost and time of entry for new LNG importers, and the need to commit to permanent onshore facilities, which importers have seen idled for months or years when market conditions change.

The evolution of propulsion technologies is redefining LNG shipping optionality. The LNG fleet has already shifted from traditional steam turbine propulsion to dual and tri-fuel diesel electric (DFDE/TFDE) that are 35% more fuel efficient and command higher freight rates.

The next generation of MEGI LNG vessels are even more fuel efficient than TFDEs by 25% and allow excess boil off to be reconverted to LNG.

Oil majors are leading several groundbreaking initiatives. Shell and Total, the world's largest LNG sellers by volume, are using advanced analytics around wind speed, ballast usage and sailing speeds to



ensure optimized shipping and maximum profitability, according to analysts at Bernstein Research. Standard LNG voyages result in delays costing around \$80,000 per trip at the median level that can touch \$350,000, with potential industry wide losses of \$800 million.

### The rise of the spot LNG market

As the backbone of the natural gas industry, a liquid, flexible and competitive LNG shipping sector is essential to facilitate the evolution of LNG towards an increasingly global commodity.

With nearly a third of global transactions conducted on a spot or short-term basis, spot fixtures are also on the rise. Platts reported 165 fixtures in 2016, 278 in 2017, and 184 by mid-July 2018.

The spot fixtures reported typically have one year or less on the fixed portion of the charter.

The increased sophistication of LNG trading requires greater precision and transparency in the shipping markets.

Ship owners for instance have now begun to seek payments from charterers to position and re-position their ships, plus ballast bonuses equal to 100% of the fuel and hire rate. This unprecedented development is

### PLATTS LNG SHIPPING ASSESSMENT METHODOLOGY

S&P Global Platts has revamped its freight cost calculation by adding two new components, the ballast rate and port costs, with the aim of enhancing the precision of its LNG shipping assessments. Platts added port costs for each loading and discharging point to its freight cost calculations, and introduced two new ballast rate assessments, one each for the Atlantic and Pacific basin, in order to assess the cost of the return leg of voyages.

#### What is a ballast rate assessment?

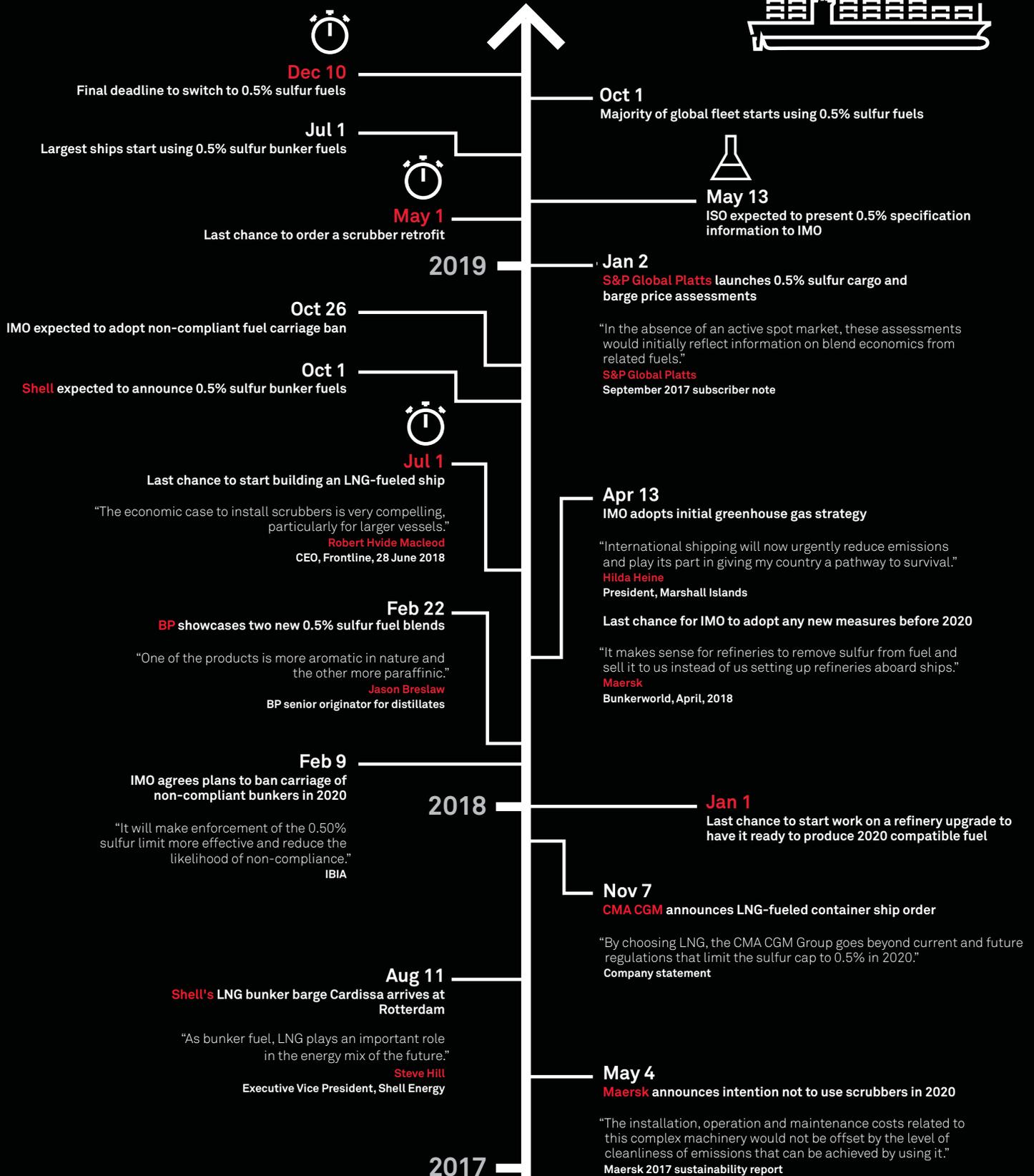
These assessments reflect the value typically charged by ship owners to charterers for the time and fuel used to position vessels for a spot voyage. Ballast Rates, sometimes known as a “ballast bonus,” are assessed using all available data from the spot markets, including lump sum amounts. The rates replace the old practice of assuming round-trip economics at 100% of Day Rates for all voyages.

#### Why is Platts assessing ballast rates?

Increased LNG shipping market seasonality and a growing number of spot fixtures have increased the market’s need for greater ballast rate transparency and accuracy on a \$/MMBtu basis, in order to increase the precision of freight costs and netback calculations.

the basis for the latest methodology change for Platts LNG shipping assessments.

# Countdown to 2020: A roadmap to the IMO's 0.5% sulfur cap



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