

# LNG Fuelling

AN LNG JOURNAL PUBLICATION

3rd Quarter 2020

## Siem introduces world's first LNG-powered PCTC

Shipping line Siem has introduced the first transatlantic car freighter powered by LNG, delivering its first cargo on behalf of Volkswagen Group.

The *Siem Confucious* made its maiden shipment of vehicles from Europe to North America marking the world's first voyage by an LNG-fuelled Pure Car Truck Carrier (PCTC).

"We are proud to put the world's first LNG vehicle transporter of this size into service. This is an important part of our decarbonisation strategy," Thomas Zernechel, Head of Volkswagen Group Logistics, said.

### goTOzero

The *Confucious* set sail from Emden in the northwest of Germany bound for Veracruz in Mexico and is expected to reduce carbon dioxide emissions for the shipment by up to 25 percent and sulphur oxide emissions by up to 100 percent.

"By 2025, in accordance with the environmental mission statement 'goTOzero', the company aims to reduce its total net CO2



Siem's *Confucious*

emissions by 30 percent and be CO2-neutral in 2020. All transports - by water, road and rail - must be climate-friendly to achieve this," Zernechel added.

The innovative vessel features 13 car decks and a capacity to hold 7,500 Car Equivalent Units (CEU). This equates to around 4,800 vehicles in the Volkswagen Group model, with a mix from passenger cars to light commercial vehicles.

### 12,600 kW dual-fuel engines

A sister vessel, the *Siem Aristotle*, is expected to join the *Confucious* imminently. Both ships measure 200 metres in length and 38 metres

in width and are powered by 12,600 kW dual-fuel marine engines with direct injection and exhaust gas after treatment from MAN Energy Solutions.

"In eco-speed mode they travel at a speed of 16.5 knots. The two tanks in each ship, each holding 1,800 cubic metres, are sufficient to cover the entire distance with the fuel stowed in Europe. In addition to liquid, deep-frozen natural gas, the car carriers could also be operated with biogas or E-gas from regenerative sources," a spokesperson for VW said.

Based in Kristiansand, Norway's southernmost city, Siem Shipping specializes in reefer, bulk and roll-on/roll-off sea carriage.



Vehicles prepare for loading

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## South Korea revises LNG bunker regulation

Authorities in South Korea have revised gas regulations to accelerate the uptake of LNG as a fuel for transport in the country.

The Ministry of Trade, Industry and Energy announced revisions to the Urban Gas Business Act, allowing reclassification of the LNG bunkering sector that will open up competition.

The change to legislation is designed to loosen minimum requirements for private-sector firms seeking to enter the market and it is hoped this will boost supply of LNG bunker fuel and infrastructure.

### Flexible pricing

Under the new rules, potential LNG suppliers will only be required to hold a minimum of ₩100 million, around US\$84,000, along with storage capacity and refuelling vehicles or vessels.

Volumes will also be more flexible with operators able to adjust

import capacities and fuel prices to meet demand rather than requiring government approval.

The South Korean government has been keen to promote LNG as a bunker fuel through investment in infrastructure designed to drive a transition to LNG in the maritime sector. State-owned LNG importer Kogas forecasts that domestic LNG bunkering demand is set to grow to 311,000 tonnes per year by 2022.

### Domestic demand

One of the country's largest shipbuilders, Shipbuilder Samsung Heavy Industries has also backed a shift to LNG fuelling, dedicating increasing capacity to construction of large LNG-fuelled vessels, as the Korea Energy Economics In-



Busan port, South Korea

stitute predicts that LNG bunkering demand will increase to between 1.23 million and 1.36 million tonnes in 2030.

"We see increasing demand for LNG-fuelled VLCCs on top of that for S-max and A-max tankers powered by LNG. SHI aims to take more opportunities to come as we

have predominated the market with the advancement of technologies," a spokesperson for Samsung Heavy Industries said.

Samsung Heavy Industries' shipyard in Goeje is one of the largest in the world, comprising three dry docks and five floating docks.

## Rotterdam posts record growth in LNG bunker volumes

Authorities at the port of Rotterdam have reported a record rise in LNG bunker sales in the second quarter, as the fuel took market share from traditional marine fuel oil.

The port saw LNG bunker sales volumes totalling 58,522 tonnes in the second quarter, remarkable 316% increase over the same period in 2019 when volumes were

5,403 tonnes.

The figures also represent a sharp uptick from Q1 when the port achieved only 35,190 tonnes of LNG bunker sales.



Port of Rotterdam

"It is the Port's ambition to be the 'greenest port in the world,'" Allard Castelein, CEO of the Port of Rotterdam Authority, commented earlier in the year, noting the authorities ambition to become "the ideal LNG hub for import, export, storage, and bunkering."

### Marine fuel oil declines

In comparison, marine fuel oil sales slumped in the second quarter as the port announced 1.78 million cubic metres as opposed to 1.8 million for 2019, a decline of 1.1%.

Marine gas oil fell slightly from 351,113 cubic metres in 2019 to 341,838 this year, marine diesel oil declined from 78,622 cubic metres

to 78,535 cubic metres, while lubes rose, increasing from 16,749 cubic metres last year to 18,323 cubic metres.

### 12 billion m3 capacity

Located in the Port in the province of South Holland in the Netherlands, the port of Rotterdam is Europe's largest seaport in Europe, and has been at the vanguard of LNG bunkering activities since 2014.

The port has capacity for 12 billion cubic metres of LNG import and export and has supported growth in LNG shipping via its Gate terminal, a joint venture of Gasunie and Vopak, on the Maasvlakte.

### LNG Fuelling

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# Newport advances turnkey LNG retrofitting

Ship services specialist Newport Shipping has increased its focus on LNG conversions and retrofitting in the wake of the COVID-19 pandemic as it sees renewed demand for solutions to meet IMO 2050 decarbonisation goals.

Relying on a range of technologies from LNG containment, fuel handling and transferring, excess BOG recycling, safety, alarm, and monitoring, Newport's retrofit projects focus on particular characteristics and requirements of each vessel.

"Achieving the IMO 2050 targets requires synchronized collective moves by all key market participants. The recent COVID-19 crisis will only intensify the urgency towards building a more environmentally friendly and humane global eco-system for generations to come. Newport Shipping's management has decided to take an immediate and proactive approach to be part of the solution", Lianghui Xia, Managing Director, Newport Shipping, said.

## Financial constraints

With many firms facing stringent financial constraints in the aftermath of global lockdowns, retrofitting is frequently both a technical challenge and a balancing act to match financial costing against utilisation.

"For instance, it is very hard to justify financially retrofitting an LNG fuel system on vessels with less than 10 years of trading life," Samantha Fisk of Newport Shipping notes. "Retrofit projects normally are budget controlled and might go with type C deck mounted tanks or below deck tank configurations as fits their demands. Vessel's main service area can influence the type, capacity, and location of LNG fuel containment and storage tank as well as overall plant features."

Headquartered in London, Newport operates a global strategic network of 12 shipyards with 28 drydocks capable of handling all vessel sizes. The firm completes approximately 2,100 drydocks annually across the Atlantic and Pacific markets.

## Capex considerations

To accelerate uptake of retrofitting, Newport has introduced a turnkey solution with a 5-7 year payment plan without fixed vessel mortgage collateral, reducing the upfront financial



Lianghui Xia, Managing Director, Newport Shipping

burden imposed on shipowners.

"If a vessel has an opportunity to compensate CAPEX in the following 3-5 years Newport can supply complete power plant for the vessel. i.e. some of the engines are not capable of burn LNG without significant modification on the engine which will increase CAPEX," Fisk explains.

Newport Shipping's turnkey solution encompasses equipment procurement, full-scope design work, on-site project execution

at the shipyard with deferred payments.

"Retrofitting all the vessels currently at sea with greener technology is paramount if we want to attain the scale of emission-cutting that is required. As we see it now, apart from agreeing on the optimum fuel option, the other major challenge is that the agreement and implementation of the environmental agenda is governed by financial metrics", Xia said. ■



Newport Shipping sees the potential of LNG



## Rolande opens Ulm fuelling station

Dutch fuel merchant Rolande LNG has entered the German market with the opening of a CNG/LNG filling station near Ulm in the south of the country.

The self-serve station features two LNG pumps and two CNG pumps and will operate 24/7 with a daily capacity for up to 150 vehicles.

“We believe that LNG not only makes transport more environmentally friendly but, at the same time, also more profitable. And everyone should get something out of that. This is why we want to supply all customers in Germany with the cleanest and most efficient deployable fuel of this time: LNG! We are not only building filling stations for this but are also organising the entire sales and marketing chain from import to nationwide full-area coverage,” Jolon van der Schuit, CEO of Rolande, commented.

### Connect2LNG

The new Ulm filling station forms

part of the EU-financed Connect2LNG project which aims to commission five new stations in Germany and France.

“Opening of this LNG filling station in Germany is a significant contribution to building a low-emission European transport network along the Rhine-Danube corridor. The Connect2LNG project plays an important role in the fight against climate change and I am happy that the European Union can support it financially,” Dirk Beckers, Director of INEA, said.

### Further expansion

The new LNG fuelling station is the first in a planned expansion across Germany with new facilities planned in Dortmund, Duisburg, Grasdorf, Lübeck and Ziesar by the end of this year.

“We will continuously develop



Rolande LNG fuelling station

new concepts for a future nationwide offer in Germany and other European countries. We also provide our entire competence of many years to our customers. This applies to both the sustainable handling of resources as well as the economically optimal use of LNG,” van der Schuit added.

Rolande LNG is a wholly owned subsidiary of Iveco Dealer Schouten

and has developed both LNG truck and infrastructure from its research base at Giessen in North Brabant. The firm has received funding from the Dutch Ministry of Economic Affairs to roll out comprehensive LNG fuelling infrastructure in the Netherlands, including service stations, distribution, procurement, customer and providing trucks. ■

## EU invests in Spanish LNG bunkering projects

The European Commission is to invest €27 million in two LNG bunkering projects in Spain.

The funding will be released via the Connecting Europe Facility (CEF) mechanism and will go towards development of ship bunkering projects in Barcelona and Algeciras. Both projects are coordinated by Spanish gas specialist Enagás alongside partner Knutsen, and the Port Authorities of Barcelona and Bahía de Algeciras.

“These new grants show how Europe acknowledges the role that natural gas, and in particular LNG, will play in the decarbonisation of the maritime sector. The funds granted by the Connecting Europe

Facility, which have been used to support a total of eight projects in Spain in the latest call, will help to achieve the climate objectives set out in the European Green Deal,” a spokesperson for Enagás said.

### LNGhive2 initiative

The projects form part of the EU's LNGhive2 initiative, which is designed to strengthen Spain's position as a European LNG bunkering hub. led by Puertos del Estado this initiative follows the successful implementation of the CORE LNGas hive project, focused on

small-scale supply and adaptation of infrastructure and logistics for LNG bunkering.

“LNG is, today, the best alternative to advance the decarbonisation of maritime transport. It is a fuel that allows compliance with the regulations of the International Maritime Organization (IMO), which in January 2020 established the limit of the sulphur content in fuel at 0.5%,” Enagás said in a statement.

### LNG bunkering triples

Enagás reports that bunkering

operations in Spain in the first half have tripled compared to the previous year, with 297 bunkering operations completed to June 2020 compared with 89 in 2019. The volume of LNG supplied has also doubled with 62,837 cubic metres delivered in 2020.

“Of the 15 barges currently supplying LNG in the world, six have operated in Spain in recent years, reinforcing the country's role in supplying LNG to ships from trucks, ships or terminals. All this has been possible thanks to the developments and advances of the public / private initiatives ‘CORE LNGas hive’ and ‘LNGhive2’, co-financed by the European Commission,” a spokesperson for Enagás commented.

In total, 49 partners participate in the CORE LNGas hive and LNGhive2 initiatives, including 21 public bodies, 13 port authorities and 28 private or industrial partners. ■



Port of Algeciras





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# Pilot LNG floats Galveston LNG bunker plans

Energy developer Pilot LNG has announced plans for new refuelling infrastructure in Houston with the launch of its Galveston LNG Bunker Port.

The new project is expected to have nameplate production capacity of 0.5 million tonnes per annum and feature 18,000 cubic metres of storage capacity.

"The proposed Galveston LNG Bunker Port would provide the necessary infrastructure to supply the growing market for LNG marine fuel, substantially reducing marine emissions and cutting ship-owners' fuel costs at the same time," Jonathan Cook, CEO of Pilot LNG, said.

The proposed facility will be the region's first dedicated LNG bunker terminal and will serve one of the largest port complexes in the US, comprising the Ports of Houston, Texas City and Galveston.

## LNG distribution

The new facility follows the successful launch of the bunker barge Clear Jacksonville in 2018.

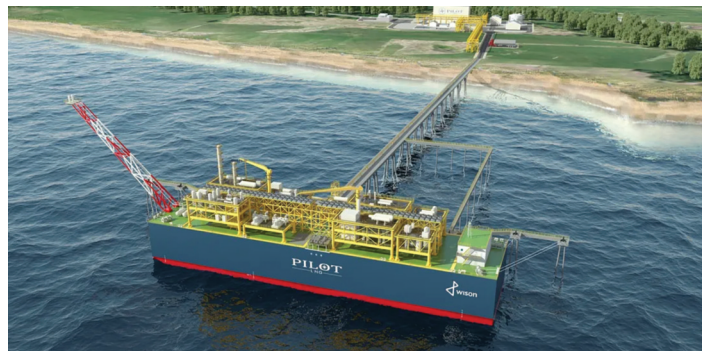
"The distribution logistics

will be a US Jones Act either tow barge or ATB, examples of which can be seen in the Clear Jacksonville 2,200 m<sup>3</sup> tow barge running from the Jax LNG facility in Florida, or the QLNG-4000 ATB that will be running from Elba Island, GA for Shell to deliver bunker volumes to Port Canaveral for Carnival Cruise Lines," Pilot LNG said in a statement by email.

The Galveston Bay area, which encompasses the industrial Ports of Houston, Texas City and Galveston handles over 10,500 deep-water vessel visits per year. Within this area lies the Houston Ship Channel which operates over 133,000 tug/tow movements per year.

## Wison to complete EPC

Terminal design is based on floating liquefaction (FLNG) technology with engineering, procurement and construction work for the off-



Galveston LNG Bunker Port

shore section to be completed by Pilot partner, Wison Offshore & Marine.

"Since delivering the world's first FLNG facility currently operating in Argentina, Wison has developed numerous floating solutions across the LNG value chain, with a focus on promoting a cleaner energy infrastructure alternative to the global market," Vivian Li, head of Wison Offshore & Marine in North America for Wison, said.

Land based EPC is still under

discussion, following work by CHIV & Baird to complete Pre-FEED and ongoing FEED underway for the shore-side & marine infrastructure.

## NEWS NUDGES

### Gothenburg plans liquefied CO<sub>2</sub> fuel

A joint venture partnership in Gothenburg, Sweden, is preparing new infrastructure to develop the world's first liquefied carbon dioxide bunkering technology.

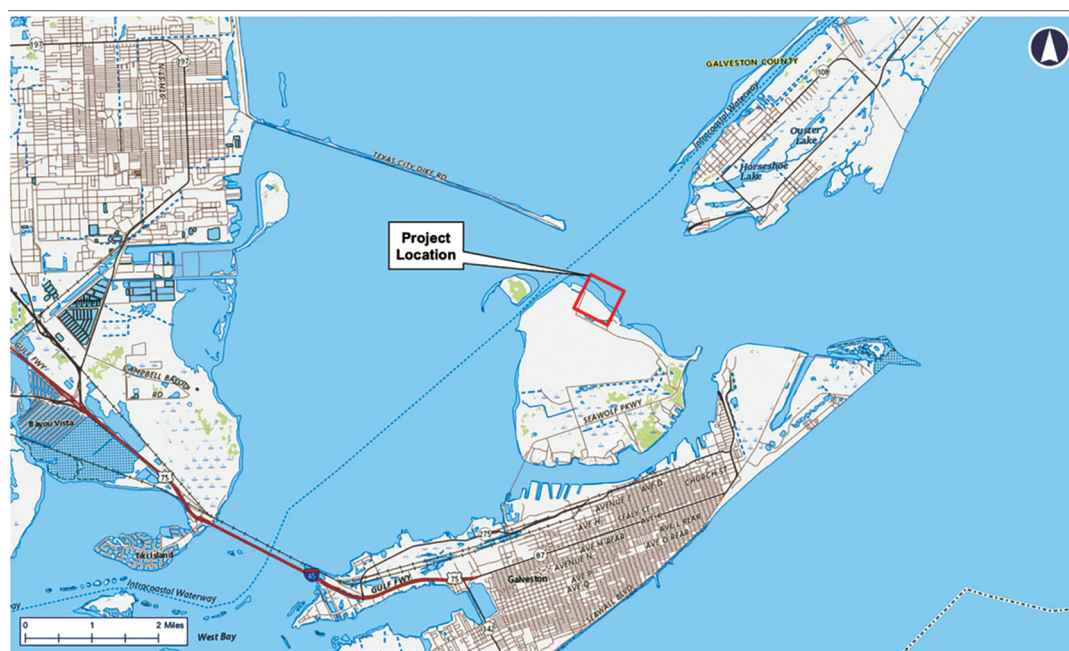
The proposed solution will use gas received from carbon capture and storage technology and could complement LNG as a fuel source at the port as part of an energy transition that is driving the uptake of gas as a replacement transport fuel.

The CinfraCap project is a joint venture between Göteborg Energi, Nordion Energi, Preem, St1, Renova, and Gothenburg Port Authority.

"We must speed up the process if we are to achieve our climate goals and collaboration is the best way forward. We expect to be able to transport two million tonnes of captured carbon dioxide per year from our quayside facility and to do so we must have an efficient infrastructure," said Elvir Dzanic, Gothenburg Port Authority chief executive and one of the parties involved in the joint CinfraCap infrastructure project.

"Since delivering the world's first FLNG facility currently operating in Argentina, Wison has developed numerous floating solutions across the LNG value chain"

-Vivian Li, head of Wison Offshore & Marine in North America



Galveston LNG Bunker Port location



# Golar Power plans Pará LNG network

Natural gas specialist Golar Power has announced plans to develop the first LNG terminal in the North of Brazil, paving the way for a comprehensive LNG fuelling network across the region.

The firm signed a Memorandum of Understanding with Norwegian state-owned energy firm Norsk Hydro, hailing it as a “major step towards one of the largest greenhouse gas reduction initiatives, globally”.

The new plant will initially focus on supplying fuel for Norsk Hydro’s Alunorte refinery plant near to Vila do Conde Port in the Municipality of Barcarena.

## Comprehensive LNG network

Proposals outline plans for a comprehensive LNG distribution network across the state of Pará and the region.

“This LNG supply chain will cover an area larger than Eastern Europe and consist of thousands of kilometres of river and road transportation systems, serving numerous industrial, commercial, and transportation customers,” a spokesperson for Golar Power said.

Golar Power expects the new LNG supply chain to cover an area larger than Eastern Europe and consist of thousands of kilometres



Golar Power vessel

of river and road transportation systems, serving numerous industrial, commercial, and transportation customers.

“We are delighted to be helping Norsk Hydro achieve its ambitious global sustainability goal of reducing CO2 emissions by 30% by 2030, and at the same time contributing to a significant reduction in energy prices and environmental emissions within the entire North Region of Brazil,” Eduardo Antonello, CEO of Golar Power, said.

## Regional transition

The project partners expect that the terminal will facilitate the replacement of LPG, diesel, fuel oil, and coal with approximately 1.8 million tonnes of LNG equivalent per annum.

“This LNG project will help make our operation more sustainable and will facilitate access to cleaner burning natural gas for other industries and consumers in the state of Pará,” John Thuestad, Hydro Bauxite and Alumina Vice-

President at Norsk Hydro said.

The terminal will be complemented by the Barcarena FSRU that Golar Power plans to commission during the first half of 2022.

“The reduction in LNG prices we have seen in recent years has significantly increased LNGs relative competitive position... creating the foundation for a broader transition away from carbon-intensive energy sources in the region,” Golar Power said in a statement.



Alunorte alumina plant



## Nicholls switches to Iveco LNG fleet

Haulier Nicholls Transport has progressed its transition to gas across its fleet with the acquisition of a fleet of 10 Iveco Stralis vehicles.

The Iveco Stralis NP 460 6x2 tractors each feature gas tanks mounted on either sides of the chassis and were acquired from commercial vehicle specialist dealer Haynes Trucks.

"Moving to alternative fuels has been high on our agenda - but gas is currently the only technology that's ready for 44-tonne operation. Gasrec has been hugely proactive and gave us the confidence to switch fuels, following experiences with demonstrators organised through Iveco and Haynes," Paul Nicholls, managing director of Nicholls Transport, said.

### Pumped mobile station

The fleet is served by pumped mobile refuelling station installed by fuel supplier Gasrec as part of a strategy to 'seed new locations' for LNG refuelling.

"It's ideal for an early adopter

like Nicholls, being capable of supporting as many as 30 gas vehicles from a single location. This is the precursor to a larger and fully open-access development we are looking at for the Nicholls site," James Westcott, chief commercial officer of Gasrec, explained.

### Emissions savings

The new vehicles will replace existing Euro 6 diesel vehicles, offering significant emission reductions, with particulate matter cut by 99% NO2 emissions down by around 90 per cent, noise reduced by 50%.

"It's our collective responsibility as an industry to do something to tackle climate change and make road transport more sustainable, and by opening this LNG station and investing in the Stralis NP fleet, we're showing our customers and competitors that's possible to do today... As an industry, we



Nicholls' Iveco Stralis NP fleet

really need to make this happen," Nicholls commented.

Based in Turin, Italy, vehicle manufacturer Iveco is a wholly-owned subsidiary of CNH Industrial Group. The firm launched its Stralis NP 460 range in 2018, delivering autonomy of up to 1,600 kilometres.

"Nicholls saw the potential for natural gas and we were delighted

to help them take this big step forward in sustainability. Iveco has delivered more than 35,000 natural gas-powered vehicles into service around the world, so we have a lot of confidence in this technology. For a business like Nicholls, LNG makes perfect sense," Sascha Kaehne, Iveco's UK & Ireland business director, commented.

## Canadian alliance supports LNG fuelling expansion

New LNG industry body the Canadian LNG Alliance has announced plans to integrate the fuel as a key part of the country's clean energy transition.

The new alliance brings together industry actors across the country and was formed through the re-branding of the existing British Columbia LNG Alliance.

"LNG is Canada's opportunity. By all of us working together -

governments, industry, Indigenous Nations, workers, and communities - to responsibly build an LNG industry, we can provide a significant and much-needed economic boost to our country," Bryan Cox, CEO of the Canadian LNG Alliance, said.

### Significant positive impact

The alliance recently funded the publication of a new report, titled A Rising Tide: The Economic Impact of B.C.'s Liquefied Natural Gas Industry, highlighting a 'significant positive impact' from switching to LNG as a transport fuel.

"The report shows a significant positive impact for the entire country. Obviously for B.C. because that's where the facilities will be and are being built, but also for Ontario and Alberta. It really shows the interconnectivity of the Canadian economy," Cox explained.

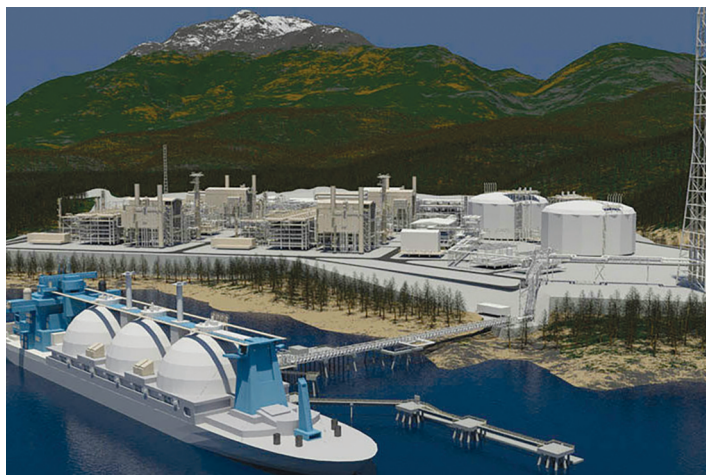
The report outlines a base scenario where 56 million tonnes of LNG is produced per year by 2034 increasing Canada's gross domestic product by US\$11 billion per year.

### Huge opportunity

Key to the advancement of LNG fuelling infrastructure are several major export projects, such as LNG Canada in Kitimat, B.C. and Woodfibre LNG near Squamish.

It's a different way of framing LNG as to how it contributes to a growing economy and what that does for various sectors... Our natural gas opportunity is huge, both as fuel we use every day and if we can get that responsibly produced fuel to the rest of the world.

The alliance comprises some of the largest energy infrastructure developers in Canada, including: Chevron Canada, Shell Canada Energy, PetroChina, Korea Gas Corporation, Mitsubishi Corporation, Woodfibre LNG, Woodside Energy, FortisBC, AltaGas, Idemitsu Kosan, Enbridge, and ExxonMobil.



Artist's rendition of Kitimat LNG project





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## Gasum adds Lieto filling station

Finnish gas specialist Gasum has strengthened its gas filling station network, adding capacity for heavy-duty transport refuelling with a new station in Lieto.

The station, located in Eteläkaari 1 on highway 10, and will serve long-haul transport. The facility forms part of the Avanti business and industrial area.

“We’re very proud to have opened a new station in Lieto and that it strengthens the Nordic gas filling station network. Consumers and lawmakers increasingly expect actors in the heavy-duty transport sector to provide eco-friendly services,” Jani Arala, Senior Sales Manager for Traffic at Gasum, commented.

### Liquefied Biogas

The new station will also strengthen Gasum’s use of liquefied biogas, with support for the local circular economy through the utilisation of renewable biogas produced from local biowaste and sewage sludge at the Turku biogas plant.

“Since almost 40% of emissions from Finnish road traffic originate in delivery and heavy-duty transport, logistics companies play an important role in reducing emissions. Because the climate impacts of fuels originate in various stages in the production and distribution chain, the only sustainable way to assess the climate friendliness of



LNG gasum truck

fuels is their climate impacts throughout the entire fuel lifecycle,” a spokesperson for Gasum explained.

### Low-emission fuel solutions

Gasum estimates that biogas can reduce greenhouse gas emissions during the lifecycle of the fuel by up to 90% compared to traditional fossil fuels with biodegradable waste, industrial side-streams and sewage sludge recycled to fuel transport.

“It is important to improve accessibility to low-emission fuel

solutions so that Nordic freight can be transported increasingly more cleanly. Each new gas filling station takes us closer to that goal,” Arala concluded.

As the national Finnish transmission system operator, Gasum has led the way in integrating LNG in the transport supply chain in the country and now operates an extensive network of filling stations across Finland and the Nordic region. The group employs around 350 staff in Finland, Norway and Sweden and generated revenues of more than €1 billion in 2019.

## NEWS NUDGES

### Helsinki expands LNG truck refuelling

Authorities at the port of Helsinki in Finland have expanded LNG bunkering capabilities with the launch of new truck-to-ship operations at the Hanasaari terminal.

First bunkering operations were carried out by fuel supplier Eesti Gaas with the bulk carriers Viikki and Haaga refuelled in cooperation with operator ESL Shipping.

“LNG will replace the diesel fuel used so far as a marine fuel, as a result of which we will have cleaner air and the Baltic Sea... In addition to new passenger ships, new cargo ships are also increasingly switching to LNG technology,” Kalev Reiljan, member of the management board at Eesti Gaas, said.

Eesti Gaas is 67% owned by investment company Infotar and includes subsidiaries AS EG Ehitus, which designs and builds gas networks, and distribution service provider AS Gaasivõrgud.



Gasum LNG fuelling station



# Petronet invites tenders for LNG refuelling outlets

Fuel supplier Petronet has announced plans to commence a new LNG supply business, supporting LNG refuelling capability across India.

The firm plans to boost demand for the fuel by as much as nine million tonnes per year, equivalent to around a third of the country's import levels. The firm aims to tender for work to complete a series of LNG fuelling stations on

major motorway routes.

"Being the pioneer and the largest LNG infrastructure company of India, Petronet is initially inviting partners amongst authorized CGD entities and OMCs for facilitating setting up "LNG Sta-

tions" across major national highways," a spokesperson for Petronet said in a statement.

## 50 LNG retail outlets

The firm is partnering with Indian Oil Corporation, and BPCL, to es-

tablish pilot facilities with capacity to refuel as many as 5,000 trucks with LNG and has already begun piloting five LNG outlets on the Delhi-Mumbai highway with Gujarat Gas.

A further three LNG stations are under development by Indraprastha Gas, a joint venture between state-run gas distributor Gail and refiner BPCL.

In total, Petronet LNG plans to add 50 LNG retail outlets across India's west-

ern and southern road corridors by the first quarter of 2021 fiscal year. Oil ministry figures suggest that India's LNG imports rose to 2.38 billion cubic metres in May as demand continues to grow for the fuel.

## Rising demand

The proposed LNG fuelling network is in line with ambitious government plans to develop LNG as a road transport fuel across the country.

Petronet LNG developed the country's first LNG receiving and regasification terminal and today operates the site in Dahej, Gujarat along with another terminal in Kochi, Kerala.

Petronet estimates that India will need an additional 40 million tonnes of LNG per year by 2030 to meet demand. ■



LNG fuelling station

# World's first LNG-fuelled research vessel completes bunkering

The world's first LNG-fuelled research vessel has completed bunkering in Germany, refuelling near Berne.

The truck-to-ship LNG bunkering operation was carried out on the vessel ATAIR which is under construction at the Fassmer shipyard in Berne/Motzen in the Lower Saxony district of Wesermarsch.

The new vessel is under construction for the German Federal Maritime and Hydrographic Agency (BSH). Once complete it will be used for sea surveying, wreck search and research. The vessel is due to enter service later in 2020 and will replace an older design, commissioned in 1987.

## TIER IV

As a research vessel that will operate in areas of sensitive marine interest, the use of LNG fuel for the new ATAIR has been crucial in meeting the highest emissions standards. Once complete ATAIR will comply not only with the TIER

III exhaust emission regulations, but also with EPA TIER IV rules regarding soot particles.

Design optimisation has also included novel hull and engine design to minimize underwater sounds, protecting the marine environment and ensuring optimal conditions for scientific work.

## Gasum expands footprint

The operation was completed by Nordic fuelling specialist Gasum, marking the first truck-to-ship bunkering operation for the firm in Germany.

"Our first LNG bunkering operation with trucks in Germany was a great success and we are proud that we can support the Fassmer shipyard with this very important newbuild project... this truck-to-ship delivery underlines our commitment to expand our geographical footprint in continental

Europe," Jacob Granqvist, Sales Director of LNG Maritime at Gasum, said.

The firm reports that it is "working actively on extending our business in the region" with several new projects lined up in Germany, Poland, The Netherlands and Belgium.

Headquartered in Espoo, Finland, Gasum provides integrated gas services across the Nordic region and northern Europe. The firm is also the transmission system operator of the natural gas grid of Finland, a natural gas importer and seller and biogas refiner in Finland and Sweden. ■



ATAIR research vessel



# Chart to supply Risco with LNG fuelling equipment

Fuelling specialist Chart Industries has signed an agreement with upstream oil and gas group Risco Energy to supply fuelling stations and LNG equipment for gas-to-power infrastructure in Indonesia.

The agreement covers provision of fuelling stations, storage tanks, ISO containers, mobile equipment, and trailers.

"Chart's local partnership with Risco Energy will enable the Indonesian region to have access to affordable, sustainable and environmentally friendly natural gas fuelled solutions," Jillian Evanko, CEO of Chart, said.

## Pertamina, PLN push LNG infrastructure

The deal will support national energy firm Pertamina's plans to develop gas power in Indonesia. Pertamina has partnered with electricity distributor Perusahaan Listrik Negara (PLN) to meet grow-

ing demand and surmount the issues of remote power generation inherent in the island nation.

"This agreement shows Risco's commitment in continuing to support the Indonesian energy infrastructure sector. We look forward to building and developing more assets for Indonesia's power and industrial customers," Ken Sauer, Risco Energy's Managing Director, said.

Headquartered in Georgia in the US, Chart Industries' product portfolio covers the entire liquid gas supply chain from production, storage, distribution and end-use of LNG to atmospheric, hydrocarbon, and other industrial gases.

"Risco has been operating LNG



LNG transport

logistic facilities in Sambera, East Kalimantan, and has conducted LNG deliveries to Papua. In the first year of operation at Sambera, there were zero incidents (LNG spills) and Risco has delivered over 1 million btu of LNG to PLN. Risco-Chart collaboration enhances Risco's ability to provide total turnkey LNG infrastructure solutions to meet Indonesia's gas to power demand," Aditya Pratama, Gas Infrastructure Director at Risco, explained.

## Ground storage capacity

The new equipment from Chart will support Risco's efforts as a gas infrastructure provider to Pertamina subsidiary, PT Perta Gas Niaga (PTGN). Under this partner-

ship Risco will deliver significant LNG storage capacity via ground storage tanks as well as hundreds of logistic support tanks due to be delivered by Chart over the next 24 months.

"PTGN has cooperated with Risco since 2018 to supply gas infrastructure for PLN requirements in Kalimantan, Central and Eastern Indonesia. This agreement will further support PTGN and Risco's plans to continue working on developing more gas-to-power projects for PLN, industrial private sector, fuel conversion projects and smelters. Together we hope to meet the needs of the government growing demands for power across Indonesia," Linda Sunarti, President Director of PTGN, said. ■



Risco LNG refuelling truck

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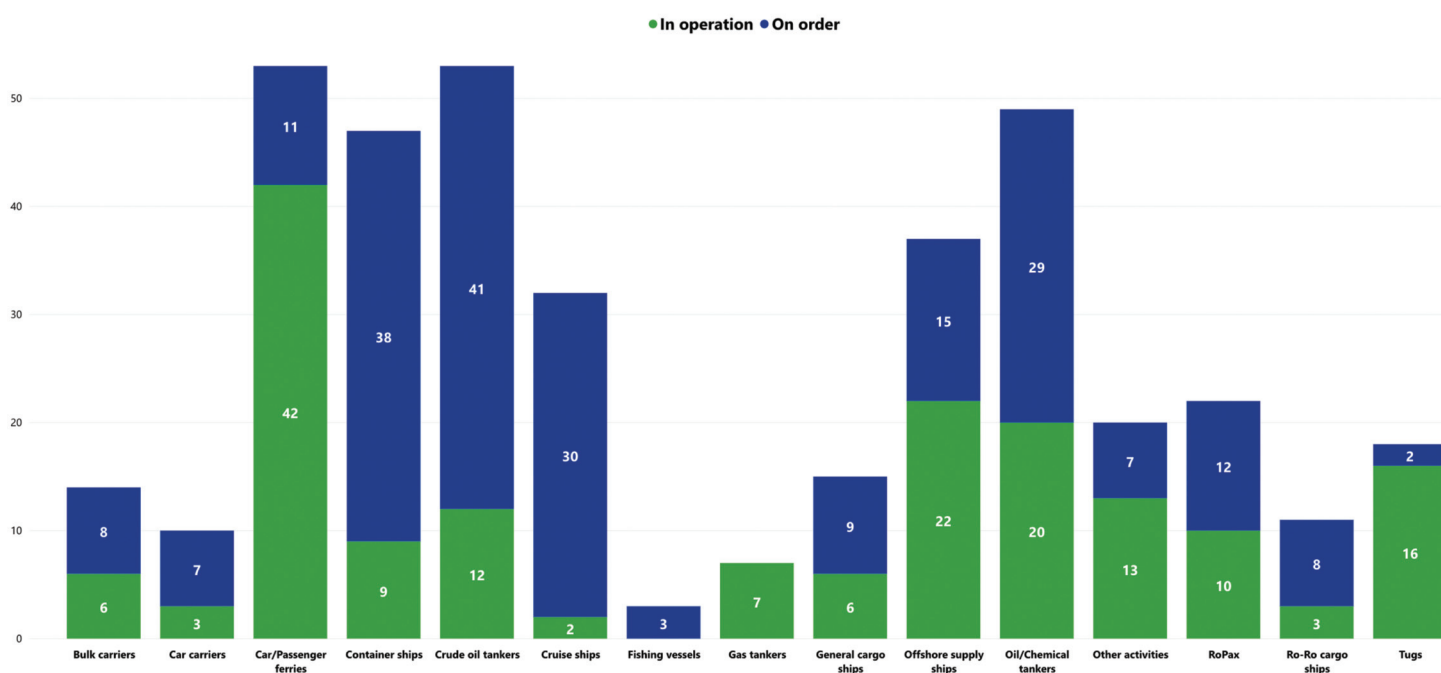
## LNG BUNKER VESSELS

| Vessel Name                               | Home Port                                    | Delivery year | Country       | LNG Tank Capacity | Owner                                                                                              | Operator                                            |
|-------------------------------------------|----------------------------------------------|---------------|---------------|-------------------|----------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Yidu inland river LNG bunker barge        | Yidu port                                    | 2014          | China         | 500               | Xilan Natural Gas Group                                                                            | Xilan Natural Gas Group                             |
| FlexFueler 001                            | Amsterdam                                    | 2019          | Netherlands   | 1480              | Titan LNG                                                                                          | Titan LNG                                           |
| FlexFueler 002                            | Antwerp                                      | mid-2020      | Belgium       | 1480              | Titan LNG                                                                                          | Titan LNG                                           |
| Titan Hyperion                            | TBD                                          | 2021          | Netherlands   | 8000              | Titan LNG                                                                                          | Titan LNG                                           |
| PRO1                                      | Houston                                      | Q42022        | United States | 7600              | LNG PRO Bunkers                                                                                    | TBN (Probunkers group co.)                          |
| PRO2                                      | Hong Kong                                    | Q12023        | Hong Kong     | 7600              | LNG PRO Bunkers                                                                                    | TBN (Probunkers group co.)                          |
| Coralius                                  | Risavika                                     | 2017          | Norway        | 5600              | Sirius Veder Gas                                                                                   | Sirius Rederi                                       |
| Cardissa                                  | Rotterdam                                    | 2017          | Netherlands   | 6500              | Shell                                                                                              | Shell                                               |
| Coral Methane                             | Rotterdam                                    | 2018          | Netherlands   | 7551              | Anthony Veder                                                                                      | Shell                                               |
| NYK Western Japan LNG bunker vessel       | The Setouchi & Kyushu areas of western Japan | 2020          | Japan         |                   | NYK, Kyushu Electric Power Co., Inc., Saibu Gas Co., Ltd. and The Chugoku Electric Power Co., Inc. | NYK, Kyushu Electric Power Co., Inc., Saibu Gas Co. |
| ENGIE Zeebrugge                           | Zeebrugge                                    | 2017          | Belgium       | 5100              | Engie, NYK Line, Mitsubishi Corporation and Fluxys                                                 | NYK                                                 |
| Kairos                                    | Lithuania                                    | 2018          | Lithuania     | 7500              | Babcock Schulte Energy                                                                             | Nauticor                                            |
| Naturgy LNG bunker vessel                 | Barcelona                                    | 2020          | Spain         | 6000              | Naturgy                                                                                            | Naturgy                                             |
| LNG bunker vessel Total / MOL             | Marseilles-Fos                               | 2021          | France        | 18600             | Mitsui O.S.K. Lines, Ltd.                                                                          | MOL and Gazocean                                    |
| Gas Agility                               | Northern Europe                              | 2020          | Netherlands   | 18600             |                                                                                                    | Mitsui O.S.K. Lines, Ltd.                           |
| KOGAS LNG bunker vessel                   | Busan                                        | 2020          | South Korea   | 7500              | Korea Line                                                                                         | Korea Line                                          |
| Pinoeer Knutsen                           |                                              | 2020          | Norway        | 1100              | Knutsen                                                                                            | Knutsen                                             |
| Q-LNG ATB Bunker Barge 4000               | Port Canaveral, FL                           | 2020          | United States | 4000              | Q-LNG                                                                                              | Harvey Gulf International Marine                    |
| Q-LNG ATB Bunker Barge                    | TBD                                          | TBD           | United States | 8000              | Q-LNG                                                                                              | Harvey Gulf International Marine                    |
| Shturman Koshelev LNG bunker vessel       |                                              | 4Q2020        | Europe        | 5800              | Shturman Koshelev LLC                                                                              | Gazpromneft Marine Bunker Ltd (Gazpromneft)         |
| Singapore LNG bunker vessel               | Singapore                                    | 2020          | Singapore     | 7500              | FueLNG                                                                                             | FueLNG                                              |
| Clean Jacksonville                        | Jacksonville Jax LNG                         | 2018          | United States | 2200              | TOTE                                                                                               | FOSS Maritime                                       |
| ENN LNG bunker vessel                     | Zhoushan                                     | 2020          | China         | 8500              | ENN Energy                                                                                         | ENN Energy                                          |
| LGC 6000                                  |                                              | 2020          | Europe        | 6000              | Eesti Gaas                                                                                         | Eesti Gaas                                          |
| FUKUOKA FUKUOKA 1350                      | Yokohama                                     | 2021          | Japan         | 2500              | Ecobunker shipping                                                                                 | Ecobunker shipping                                  |
| CLS LNG bunker vessel                     | Chubu region (Central Japan)                 | 2020          | Japan         | 3500              | CLS, a joint venture estab. by Kawasaki Kisen Kaisha Ltd., JERA Co., Inc., Toy                     | CLMF, a joint venture estab. by Kawasaki Kise       |
| Oizmendi                                  | Huelva                                       | 2018          | Spain         | 600               | Cepsa                                                                                              | Cepsa                                               |
| Seagas                                    | Stockholm (Louden)                           | 2013          | Sweden        | 187               | Gasum                                                                                              | AGA                                                 |
| Avenir bunker vessel 1                    | Oristano, Sardinia                           | 2020          | Europe        | 7500              | Avenir LNG                                                                                         |                                                     |
| Avenir bunker vessel 2/ Petronas          |                                              | 2020          | Malaysia      | 7500              | Avenir LNG                                                                                         |                                                     |
| Avenir bunker vessel 3 (Location unknown) | Not yet decided (being built in China)       | May 2021      | China         | 7500              | Avenir LNG                                                                                         |                                                     |
| Avenir bunker vessel 4 (Location unknown) | Not yet decided (being built in China)       | Aug 2021      | China         | 7500              | Avenir LNG                                                                                         |                                                     |
| Avenir bunker vessel 5 (Location unknown) | Not yet decided (being built in China)       | Jun 2021      | China         | 20000             | Avenir LNG                                                                                         |                                                     |
| Avenir bunker vessel 6 (Location unknown) | Not yet decided (being built in China)       | Sep 2021      | China         | 20000             | Avenir LNG                                                                                         |                                                     |

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| Vessel Name                                  | Home Port                      | Delivery year | Country       | LNG Tank Capacity | Owner                                                                     | Operator |
|----------------------------------------------|--------------------------------|---------------|---------------|-------------------|---------------------------------------------------------------------------|----------|
| Bunker Breeze                                | Algeciras                      | 2018          | Spain         | 1200              | Suardiaz Energy Shipping                                                  |          |
| Coral Fraseri                                | Unknown                        | 2019          | Global        | 10000             | Anthony Veder                                                             |          |
| DEPA Limassol                                | Limassol                       | 2022          | Greece        | 4000              | DEPA                                                                      |          |
| DEPA Piraeus                                 | Piraeus                        | 2022          | Greece        | 4000              | DEPA                                                                      |          |
| Domestic LNG Bunkering Vessel in China       | To be decided (China)          | 2021          | China         | 6000              | CNOOC                                                                     |          |
| Domestic LNG Bunkering Vessel in China       | To be decided (China)          | 2021          | China         | 12000             | CNOOC                                                                     |          |
| LNG Bunker & Feeder Vessel Reganosa          | Mugardos                       | 2023          | Spain         | 10000             | Reganosa                                                                  |          |
| LNG bunker barge GALP                        |                                | 2022          | Portugal      |                   | GALP                                                                      |          |
| LNG bunker vessel Swinoujscie                | Swinoujscie                    | 2023          | Poland        |                   | Polskie LNG                                                               |          |
| LNG London                                   | Rotterdam                      | 2019          | Netherlands   | 2998              | LNG Shipping (Victrol & Sogestran)                                        |          |
| MOL LNG bunker vessel                        | Singapore                      | 2021          | Singapore     | 12000             | MOL                                                                       |          |
| Oslo Tank                                    | Bergen                         | 2020          | Norway        | 850               | Bergen Tankers                                                            |          |
| Polaris ATB                                  | TBA                            | TBA           | United States | 5400              | Polaris New Energy                                                        |          |
| Poseidon Med II bunkering barge              | TBA, Adriatic Sea              | 2020          | Europe        | 4000              | Venture led by DEPA                                                       |          |
| Shell LBV                                    | Home port has not been decided | 2022          | --            | 18000             | Shell have sent out a tender for the vessel, but ownership is not decided |          |
| Small LNG bunkering vessel in South Korea    |                                | 2021          | South Korea   | 500               | Ministry of Oceans and Fisheries                                          |          |
| Titan LNG bunker barge TBN (FlexFueller003)  | Zeebrugge                      | TBD           | Belgium       | 1480              | Titan LNG                                                                 |          |
| Titan LNG bunker barge TBN (FlexFueller004)  | Lubeck                         | TBD           | Germany       | 1480              | Titan LNG                                                                 |          |
| Woodside Western Australia LNG bunker vessel | Dampier                        | 2021          | Australia     | 12000             |                                                                           |          |

## LNG-FUELLED FLEET BY VESSEL TYPE





## WORLD SMALL SCALE LNG FLEET\*

| Built | Name                 | CBM    | Cargo Type       | Trading area              | Trading in LNG?   | Ship Owner / Operator |
|-------|----------------------|--------|------------------|---------------------------|-------------------|-----------------------|
| 1974  | Seagas               | 187    | LNG              | Sweden                    | Yes               | AGA                   |
| 1988  | Kayoh Maru           | 1,517  | LNG              | Japan                     | Yes               | Daiichi               |
| 1993  | Aman Bintulu         | 18,928 | LNG              | Malaysia - Japan          | Yes               | Perbadanan/NYK        |
| 1996  | Surya Aki            | 19,475 | LNG              | Indonesia - Japan         | Yes               | MCGC                  |
| 1997  | Aman Sendai          | 18,928 | LNG              | Malaysia - Japan          | Yes               | Perbadanan/NYK        |
| 1998  | Pelita Energy        | 18,800 | LNG              | Malaysia - Japan          | Yes               | Perbadanan/NYK        |
| 2000  | Triputra             | 23,096 | LNG              | Indonesia - Japan         | Yes               | MCGC                  |
| 2003  | Pioneer Knutsen      | 1,100  | LNG              | Norway                    | Yes               | Knutsen               |
| 2003  | Shinju Maru No.1     | 2,540  | LNG              | Japan                     | Yes               | Shinwa                |
| 2005  | North Pioneer        | 2,500  | LNG              | Japan                     | Yes               | Japan Liquid Gas      |
| 2007  | Sun Arrows           | 19,531 | LNG              | Malaysia - Russia - Japan | Yes               | Mitsui                |
| 2008  | Kakurei Maru         | 2,536  | LNG              | Japan                     | Yes               | Hogaki Zosen          |
| 2008  | Shinju Maru No.2     | 2,540  | LNG              | Japan                     | Yes               | Shinwa                |
| 2009  | Coral Methane        | 7,551  | LNG/LPG/Ethylene | Northwest Europe/Baltics  | Yes, sometimes    | Anthony Veder         |
| 2010  | Coral Favia          | 10,000 | LNG/LPG/Ethylene | Worldwide                 | No                | Anthony Veder         |
| 2010  | Coral Fraseri        | 10,000 | LNG/LPG/Ethylene | Worldwide                 | No                | Anthony Veder         |
| 2011  | Akebono Maru         | 3,556  | LNG              | Japan                     | Yes               | Chuo Kaiun            |
| 2011  | Coral Furcata        | 10,000 | LNG/LPG/Ethylene | Worldwide                 | No                | Anthony Veder         |
| 2011  | Coral Fungia         | 10,000 | LNG/LPG/Ethylene | Worldwide                 | No                | Anthony Veder         |
| 2011  | Vision Spirit        | 12,000 | LNG/LPG/Ethylene | Worldwide                 | No                | Teekay                |
| 2011  | Unikum Spirit        | 12,000 | LNG/LPG/Ethylene | Worldwide                 | No                | Teekay                |
| 2012  | Coral Energy         | 15,600 | LNG              | Northwest Europe/Baltics  | Yes               | Anthony Veder         |
| 2013  | JX Energy TBN        | 2,500  | LNG              | Japan                     | Yes               | JX Energy             |
| 2013  | Kakuyu Maru          | 2,500  | LNG              | Japan                     | Yes               | Tsurumi Sunmarine     |
| 2013  | Coral Anthelia       | 6,500  | LNG/Ethylene     |                           |                   | Anthony Veder         |
| 2015  | LNG Barge TBN        | 3,000  | LNG              | US Coast                  | Yes               | LNG America           |
| 2015  | JS Ineos Ingenuity   | 27,500 | LNG/Ethylene     | Markus Hook - Rafnes      | Ethane, for Ineos | Evergas               |
| 2015  | JS Ineos Insight     | 27,500 | LNG/Ethylene     | Markus Hook - Rafnes      | Ethane, for Ineos | Evergas               |
| 2015  | JS Ineos Intrepid    | 27,500 | LNG/Ethylene     | Markus Hook - Rafnes      | Ethane, for Ineos | Evergas               |
| 2015  | PetroChina TBN       | 30,000 | LNG              | China                     |                   | PetroChina            |
| 2016  | Clean Jacksonville   | 2,200  | LNG              | US Coast                  | Yes               | CME                   |
| 2016  | LNG Prime            | 2,250  | LNG              | Northwest Europe          | Yes               | Veka Deen LNG         |
| 2016  | JS Ineos Indepence   | 27,500 | LNG/Ethylene     | Markus Hook - Rafnes      | Ethane, for Ineos | Evergas               |
| 2016  | JS Ineos Innvation   | 27,500 | LNG/Ethylene     | Markus Hook - Rafnes      | Ethane, for Ineos | Evergas               |
| 2016  | JS Ineos Inspiration | 27,500 | LNG/Ethylene     | Markus Hook - Rafnes      | Ethane, for Ineos | Evergas               |
| 2016  | Hai Yang Shi You 301 | 30,000 | LNG              | Bali FSU                  | Yes               | CETS (CNOOC)          |
| 2017  | Oizmendi             | 600    | LNG              | Bilbao                    | Yes               | Itsas Gas             |
| 2017  | ENGIE Zeebrugge      | 5,000  | LNG              | Northwest Europe          | Yes               | NYK                   |
| 2017  | Coralius             | 5,800  | LNG              | Northwest Europe/Baltics  | Yes, for Skangas  | Anthony Veder         |
| 2017  | Cardissa             | 6,500  | LNG              | Northwest Europe          | Yes               | Shell                 |
| 2017  | LNG-Gorskaya TBN     | 7,300  | LNG              | Russia                    | Yes               | LNG-Gorskaya          |

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\*Includes multi-gas, ethylene and LNG bunker ships with 40,000 cubic metres LNG cargo capacity or less

TBN = To Be Nominated indicates ships are still at construction/planning stage

\*\* = project shelved † =Data to be verified Data last updated = 11th August 2020

| Built | Name                     | CBM    | Cargo Type   | Trading area             | Trading in LNG?   | Ship Owner / Operator       |
|-------|--------------------------|--------|--------------|--------------------------|-------------------|-----------------------------|
| 2017  | LNG-Gorskaya TBN         | 7,300  | LNG          | Russia                   | Yes               | LNG-Gorskaya                |
| 2017  | LNG-Gorskaya TBN         | 7,300  | LNG          | Russia                   | Yes               | LNG-Gorskaya                |
| 2017  | Coral EnergICE           | 18,000 | LNG          | Northwest Europe/Baltics | Yes               | Anthony Veder               |
| 2017  | JS Ineos Invention       | 27,500 | LNG/Ethylene | Markus Hook - Rafnes     | Ethane, for Ineos | Evergas                     |
| 2017  | JS Ineos Intuition       | 27,500 | LNG/Ethylene | Markus Hook - Rafnes     | Ethane, for Ineos | Evergas                     |
| 2017  | Coral Encanto            | 30,000 | LNG          | China                    | Yes               | Anthony Veder               |
| 2018  | HUA XIANG 8              | 13,720 | LNG          | China                    | Yes               | Zhejiang Huaxiang           |
| 2018  | LNG London               | 3,000  | LNG          | Northwest Europe         | Yes               | Shell                       |
| 2018  | Shell Bunker Barge TBN 2 | 6,500  | LNG          | Northwest Europe         | Yes               | Shell                       |
| 2018  | Shell Bunker Barge TBN 3 | 6,500  | LNG          | Northwest Europe         | Yes               | Shell                       |
| 2018  | Kairos                   | 7,500  | LNG          | Baltic                   | Yes               | Bernhard Schulte            |
| 2018  | Bunker Breeze            | 0      | LNG          | Barcelona                | Yes               | Suardiaz Energy Shipping    |
| 2019  | SM Jeju LNG1             | 7,500  | LNG          | Korea                    | Yes               | Korea Line                  |
| 2019  | Stolt TBN                | 7,500  | LNG          | Mediterranean            | Yes               | Stolt-Nielsen Gas           |
| 2019  | Stolt TBN                | 7,500  | LNG          | Mediterranean            | Yes               | Stolt-Nielsen Gas           |
| 2019  | Gas Agility              | 18,600 | LNG          | NWE                      | Yes               | MOL                         |
| 2019  | Flexfueller 001          | 1,480  | LNG          | Amsterdam                | Yes               | Titan LNG                   |
| 2020  | SM Jeju LNG2             | 7,500  | LNG          | Korea                    | Yes               | Korea Line                  |
| 2020  | CNTIC VPOWER Global      | 28,000 | LNG          | Myanmar                  | Yes               | Dalian Inteh Group          |
| 2020  | Q-LNG 4000               | 4,000  | LNG          | US Coast                 | Yes               | Q-LNG Transport/Harvey Gulf |
| 2020  | Stolt TBN (option)       | 7,500  | LNG          |                          | Yes               | Stolt-Nielsen Gas           |
| 2020  | FueLNG TBN               | 7,500  | LNG          | Singapore                | Yes               | FueLNG                      |
| 2020  | CLS TBN                  | 3,500  | LNG          | Japan                    | Yes               | CLS                         |
| 2020  | Elenger TBN              | 6,000  | LNG          | NWE                      | Yes               | Elenger                     |
| 2020  | ENN TBN                  | 8,500  | LNG          | China                    | Yes               | ENN                         |
| 2020  | Flexfueller 002          | 1,480  | LNG          | Antwerp                  | Yes               | Titan LNG                   |
| 2021  | Stolt TBN (option)       | 7,500  | LNG          |                          | Yes               | Stolt-Nielsen Gas           |
| 2021  | Knutsen TBN              | 30,000 | LNG          | Mediterranean            | Yes               | Knutsen OAS                 |
| 2021  | Gazprom Neft TBN         | 5,800  | LNG          | Russia                   | Yes               | Gazprom Neft                |
| 2021  | PE TBN                   | 12,000 | LNG          | Singapore                | Yes               | MOL                         |
| 2021  | JMU TBN                  | 2,500  | LNG          | Japan                    | Yes               | JMU                         |
| 2021  | TBN                      | 18,600 | LNG          | Mediterranean            | Yes               | MOL                         |
| 2021  | TG TBN                   | 500    | LNG          | Korea                    | Yes               | Trans Gas                   |
| 2022  | Stolt TBN                | 20,000 | LNG          | Worldwide                | Yes               | Stolt-Nielsen Gas           |
| 2022  | Stolt TBN                | 20,000 | LNG          | Worldwide                | Yes               | Stolt-Nielsen Gas           |
| 2022  | Clean Cañaveral          | 5,400  | LNG          | USG                      | Yes               | PNE                         |
| 2024  | Stolt TBN (option)       | 20,000 | LNG          | Worldwide                | Yes               | Stolt-Nielsen Gas           |
| 2024  | Stolt TBN (option)       | 20,000 | LNG          | Worldwide                | Yes               | Stolt-Nielsen Gas           |
| 2026  | Stolt TBN (option)       | 20,000 | LNG          | Worldwide                | Yes               | Stolt-Nielsen Gas           |
| 2026  | Stolt TBN (option)       | 20,000 | LNG          | Worldwide                | Yes               | Stolt-Nielsen Gas           |

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\*Includes multi-gas, ethylene and LNG bunker ships with 40,000 cubic metres LNG cargo capacity or less

TBN = To Be Nominated indicates ships are still at construction/planning stage

\*\* = project shelved † =Data to be verified Data last updated = 11th August 2020