

In this issue:

- 1 **US LNG exports may top pre-Covid levels by November**
A widening JKM-TTF spread will soon make US LNG more attractive in Northeast Asia.
- 4 **Relative Competitiveness of Middle Eastern term LNG supply to the Indian Subcontinent**
There are several factors more important than mere distance affecting price, our Markets Editor Alexander Wilk writes.
- 8 **Where's LNG investment heading?**
Hans Kristian Danielsen, Vice-President, Marketing and Sales with DNVGL – Oil & Gas, explores the factors driving growth in LNG
- 11 **July LNG trade continues to improve on Asian demand growth**
Markets Editor Alexander Wilk reports on the latest trade flows
- 15 **A round-up of latest events, company and industry news**
For the Record
- 28 **Svanehøj sees success with deepwell cargo (gas) pumps**
One piece of equipment that is indispensable for a vessel carrying liquids is a cargo pump and LNGCs are no exception.
- 29 **Jetty-less receiving solution gains traction**
There have been a few jetty-less type discharge systems designed for oil and gas sectors down the years.
- 30 **LNG bunker training responds to pandemic restrictions**
Ray Gillett, General Manager at GTT Training tells LNG Journal's fuelling editor Malcolm Ramsay how training for LNG bunker operations have been affected by Covid-19
- 31 **World Carrier Fleet: Details of LNG vessels**
- 39 **Tables of import and export LNG terminals and plants worldwide**

US LNG exports may top pre-Covid levels by November

Higher global forward prices and improving netbacks for buyers of US LNG in Europe and Asia are expected to push up exports to pre-Covid levels by November. Come December, analysts anticipate more than 9 Bcf per day of US LNG exports through February 2021. Markets Editor Anja Karl investigates.

Global gas prices surged over 60 percent in Europe and Asia last month as buying interest returns with the approaching autumn season. Sellers of the super-chilled fuel, particularly in America, jumped at the opportunity by ramping up US LNG exports from 3.1 billion cubic feet per day (bcf/d) in July to 3.7 bcf/d in August and 3.8 bcf/d in September.

Asian buyers not only embrace US spot LNG cargoes due to attractive netbacks but also as a way of ensuring supply security in the face of ongoing maintenance at the Gorgon LNG plant in Australia. The risk of reduced long-term supplies from Down Under can be mitigated by turning to flexible spot cargoes.

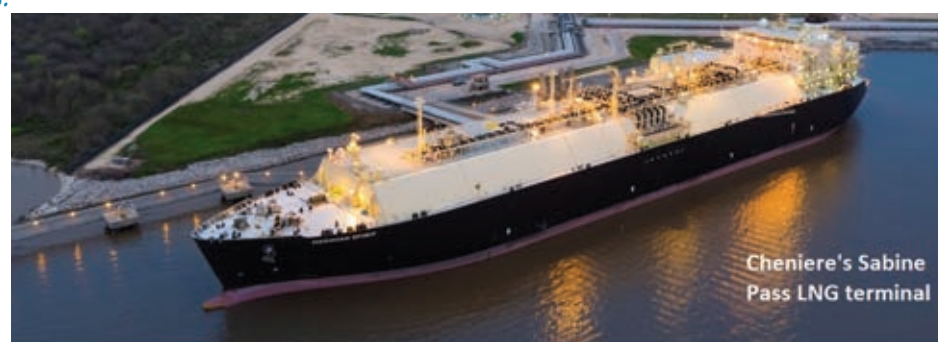
Forward prices for the Japan-Korea-Marker (JKM), as well as at the British National Trading Point (NBP) and the Dutch Title Transfer Facility (TTF), are increasing as industries and manufacturing resumes, especially in Asia Pacific where policymakers took resolute action to jump-start economies after Covid-related lockdowns.

November JKM futures were last seen at \$5.075 per MMBtu on CME Group's trading platform, while December JKM futures are hovering around \$5.525 and January 2021 contracts have risen as high as \$5.725 per MMBtu.

"If JKM-TTF spreads widen to \$0.71 per MMBtu, Asian buyers will rush to snap up US spot LNG cargoes," Energy Aspects said. Assuming a freight rate of \$75,000 per day for an LNG tanker, the current JKM-TTF spread of around \$0.46/MMBtu indicates there is "substantial upside for spot freight rates this winter."

Henry Hub prices rebound

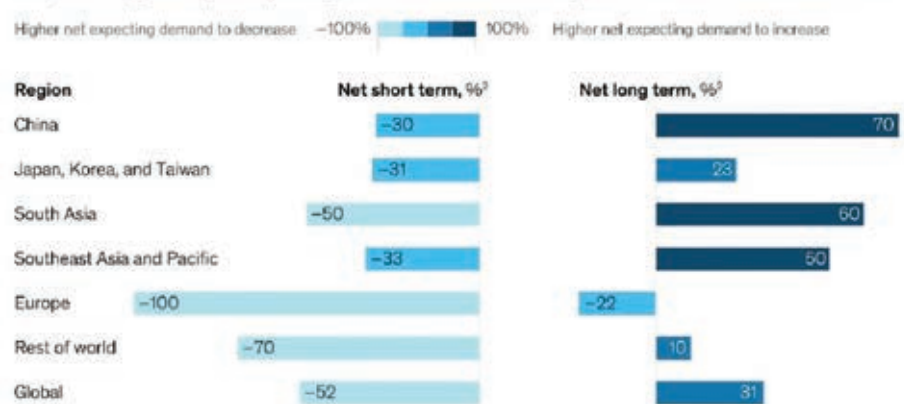
In the United States, one of the countries hardest hit by the pandemic, Henry Hub have risen to \$2.749 per MMBtu for November, and \$3.245 per MMBtu for December.



Cheniere's Sabine Pass LNG terminal

Despite disruption due to COVID-19 in the short term, buyers remain confident in gas and LNG demand for the medium and long term.

Net percentage of buyers expecting a decrease or increase in gas/LNG demand due to COVID-19¹



¹Buyers were asked, "Has COVID-19 changed the demand expectations for gas/LNG for a typical firm like yours?"
²Calculated as percentage expecting demand to increase, minus percentage expecting demand to decrease.
Source: LNG Buyers Survey 2020, Energy Insights by McKinsey

McKinsey
& Company

"Higher natural gas spot prices reflect rising demand and especially for US LNG exports amid declining US natural gas production," the government's latest Short-Term Energy Outlook (STEO) reads. Henry Hub spot prices are expected to rise to around \$3.40 per MMBtu in January 2021.

Going into next year, monthly average spot prices are now expected to stay above \$3.00 per MMBtu, averaging \$3.19 per MMBtu – a significant increase on the \$2.16 per MMBtu analysts had forecast just a month ago.

Buyers, surveyed by McKinsey, remain confident in gas and LNG demand for the medium to long term. China, South Asia as well as Asia Pacific are seen as the regions with the fastest demand growth (see table).

Supply swiftly returns

Reacting to this sudden price recovery, several US liquefaction plants have

increased capacity: Cheniere Energy stepped up exports from Corpus Christi in Texas and on September 11 sent out the first cargo from Sabine Pass in Louisiana since shutting the plant just before hurricane Laura made landfall. Exports also rose at Freeport LNG in Texas and Kinder Morgan's Elba Island terminal in Georgia.

Cameron LNG, in contrast, is still shut amid lingering problems with electric power supply and the London-based consultancy Energy Aspects reckons the workload to restore electricity and clean up the ship channel serving Cameron could keep the liquefaction plant idle until mid-October.

Substantial LNG carrier capacity has built up offshore the Louisiana and Texas coast, according to our LNG Market Tracker, as the tropical storm Beta is disrupting loading procedures. Some 0.89 million tons of nominal LNG

LNG *journal*



The World's Leading LNG publication

Maritime Content Ltd

2 Prospect Road
St Albans AL1 2AX
United Kingdom
www.LNGjournal.com
+44 (0)20 7253 2700

Publisher

Stuart Fryer

Markets & Commissioning Editor

Anja Karl
anja@lngjournal.com

Markets Editor

Alexander Wilk
alexander@lngjournal.com

Technical Editor

Ian Cochran
iancochran74@gmail.com

Fuelling Editor

Malcolm Ramsay
malcolmrays@gmail.com

Advertising

David Jeffries, Only Media Ltd
Tel: +44 (0) 208 150 5293
djeffries@lngjournal.com

Subscriptions Sales Manager

Stephan Venter
venter@lngjournal.com

Subscriptions Renewals Manager & Customer Care

Gabi Weck
gabi@lngjournal.com

Production

Vivian Chee
chee@btconnect.com

Subscription

Print & online **£655/€810/US\$1050**

Online only **£595/€725/US\$950**

See website for more details
www.lngjournal.com
hotline +44 (0)20 7253 2700

No part of this publication may be reproduced or stored in any form by any mechanical, electronic, photocopying, recording or other means without the prior written consent of the publisher. Whilst the information and articles in LNG journal are published in good faith and every effort is made to check accuracy, readers should verify facts and statements direct with official sources before acting on them as the publisher can accept no responsibility in this respect. Any opinions expressed in this magazine should not be construed as those of the publisher.

Printed by The Manson Group Ltd
Reynolds House, 8 Porters' Wood
Valley Road Industrial Estate
St Albans, Herts AL3 6PZ, U.K.

carrier capacity are lingering in the US Gulf of Mexico, waiting to be able to enter port.

Near-curve TTF gas prices ease

Gas prices at the Dutch Title Transfer Facility (TTF) are set to fall in the near term as the rebound in global LNG prices is encouraging more pipeline gas deliveries to Europe. Analysts see supply coming back from the Troll field in Norway, as well as from Algeria to Spain.

Equinor, producer of the huge Troll oil and natural gas field in the Norwegian North Sea, opted earlier this year to defer third-quarter production to periods with "higher expected gas prices" and Norway's gas exports consequently fell 7 percent to just 7.81 Bcm in August but are now being ramped up again.

With storages at historic highs throughout the EU and especially in Ukraine, injections into storage will continue as long as there is a contango in European near-curve prices. Come October, there will be the physical limits to storage and incremental demand from Europe will peter out, forcing excess

supply of US LNG to find a home in Asia Pacific.

Trade: Spot deals on the rise

Though Asia's traditional LNG buyers are hesitant, China returns to growth and is increasingly chasing cheap spot cargoes. "While Japan and South Korea have stabilised LNG demand, China has increased its LNG imports by more than 40 percent in 2017 and 2018 before increasing another 12 percent in 2019 and another 10 percent in the first half of 2020," Hiroshi Hashimoto of the Institute of Energy Economics Japan (IEEJ) told the Gastech virtual summit.

"China is, therefore, becoming a larger LNG market. At the same time spot and short-term transactions are increasing and presently represent one third of LNG trade, meaning 120 million tonnes per annum of LNG," he said, indicating the spot market share may increase further. LNG from the USA travels longer and volumes are on the up, he said, noting "more optimization of transportation [was still] desirable."

As for trends and the future directions of LNG flows, Hashimoto highlighted that

"both buyers and sellers want long-term visibility." The portfolio approach at one end could create flexibility at the other end, expanding market scopes," he explained. Standardization in every aspect is deemed vital to optimise transactions, e.g. in sharing LNG volumes between different companies.

The International Energy Agency (IEA), meanwhile, anticipates the current length in global LNG markets is here to stay. "Slower growth in gas demand post-2020 results in liquefaction capacity additions, outpacing incremental LNG import through 2025, thus limiting the risk of a tight LNG market." China, India and some emerging Asian markets are seen as the only silver lining, accounting for most of potential demand growth. Even if most of the 2020 losses are to be recovered in 2021, the Covid-19 crisis has "longer-lasting impacts" which could lead to roughly 75 bcm/y of lost gas demand growth over the years to 2025.

LNG trade is forecast to reach 585 bcm/y by 2025, up 21% from 2019-levels. However, IEA anticipates LNG trade will rise at slower rate than liquefaction capacity additions, thus limiting the risk of a tight market. ■

BP's sees China's LNG hunger fade from 2035

Global gas demand is recovering from the Covid-19-related "dip" and grows robustly over the next 15 years, with LNG trade in the BP's 'Rapid Scenario' forecast to doubling from 425 billion cubic metres in 2018 to around 1,100 Bcm by the mid-2030s. China's hunger for gas is seen fading from 2035 as the Asian superpower increasing taps domestic resources.

Growth in the Net Zero scenario is shorter lived, peaking in the mid-2020s, followed by a far faster decline, such that gas demand by 2050 is around 35% below 2018 levels. In contrast, gas demand increases throughout the next

30 years in Business-As-Usual (BAU), increasing by a third to around 5300 Bcm by 2050. In this scenario, gas consumption is assumed to grow particularly strong across developing Asia, Africa and the Middle East.

LNG trade falls by 2050

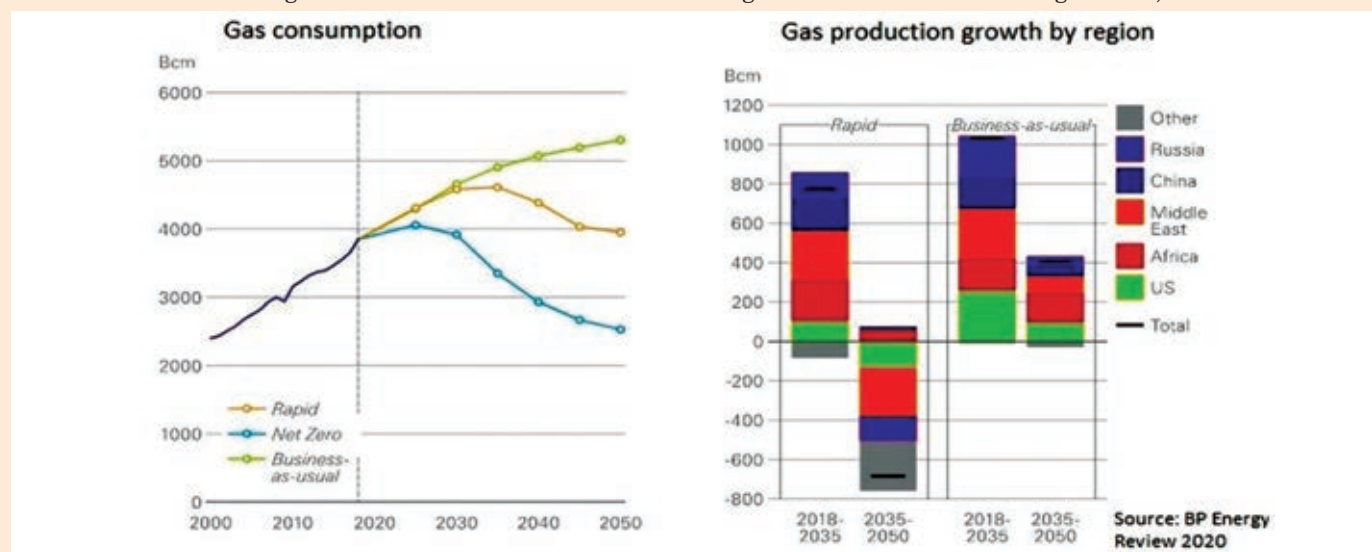
From 2035, however, global LNG imports are forecast to fall back largely triggered by a pronounced demand drop in China where domestic shale gas and biomethane production is rising steadily. "LNG trade by 2050 falls to around 970 Bcm.

The pace of this decline in LNG exports after the mid-2030s is greater than the

speed of depreciation of liquefaction facilities, implying that towards the end of the Outlook some facilities need to be operated at less than full capacity or shutdown prematurely," BP explained in its latest 'Global Energy Outlook'.

At the height of global demand around 2033, global gas consumption could reach 4,600 Bcm/y but will ease off to around 4,000 Bcm/y by 2050 once emerging Asia has exploited its full potential of natural gas use in the power generation sector.

Most incremental supply will come from the US, Africa and Middle East while Europe remains an important balancing market, or LNG sink. ■



For ALL your **LNG** Transport & Storage needs.

Factory built, fast delivered
1,200+ m³ LNG Tanks.



Railroad Tank Wagons



On-site or Factory Built Storage Tanks, Intermodal ISO Tank-Containers, Railroad Tank Wagons, & more..

Corban Energy Group (CEG) has been creating highly engineered products required by the natural gas supply chain, from upstream to downstream. CEG has established natural gas terminals throughout the world, provided quality LNG/CNG equipment for the American market, and built storage tanks as large as 200,000 CM in capacity, with its worldwide network of engineering & manufacturing partners.

Call or e-mail us to find out how your company can benefit from our comprehensive natural gas products and services today.

www.CorbanEnergyGroup.com

CORBAN ENERGY GROUP

Your Solution for LNG/LPG



T. 201.509.8555 info@corbanenergygroup.com

418 Falmouth Avenue, Elmwood Park, NJ 07407, USA

Relative Competitiveness of Middle Eastern term LNG supply to the Indian Subcontinent

It may be easy to think that due to the short distances between the world's LNG powerhouse Qatar and the Indian subcontinent Middle Eastern LNG supply will always be the most competitive choice in term of price. However, there are several factors more important than mere distance, our Markets Editor Alexander Wilk writes.

Natural gas production in the United States has expanded rapidly since 2010 and created an environment where not only was production growing much faster than consumption, but also where the necessary pipeline infrastructure to supply the domestic US market was struggling to catch up. This laid the foundation for developers to enter the LNG export industry with their initial focus supplying fast growing demand centres in the Pacific. Very few Asian importers of LNG have sufficient pipeline alternatives to LNG, meaning that regional gas prices have frequently been significantly higher than elsewhere in the world. The growth in shale gas production drove Henry Hub below \$2.00/mmBtu at a time when natural gas delivered into Asia was priced at \$15.00/mmBtu or more. That potential margin promised a tremendous window of opportunity for LNG developers such as Cheniere. Following the Fukushima crisis in Japan, which swiftly removed most of the island nation's nuclear capacity due to precautionary shut-down orders, LNG prices even spiked to above \$20/mmBtu. However, the LNG industry has been growing ever more dynamic, so that opportunities arise and fade increasingly quickly. One of these opportunities is going to be robust LNG demand growth on the Indian subcontinent, in our view. This poses the question to what extent US LNG may be competitive vis-à-vis nearby Middle Eastern competition.

Emerging Asian LNG demand centres

India and Pakistan have ascended to become leading growth markets for LNG in the world. Indian offtakes stood at 23.2 million tonnes (mmt) in 2019 whilst Pakistan's demand amounted to 6.9mmt for the same year, our shipping data shows. India thereby imported close to 50% more that year than Taiwan whilst the combined LNG demand of India and Pakistan of 30.1mmt began to encroach that of South Korea, which stood at 38.9mmt in 2019.

Landed Prices

Landed LNG prices in India and Pakistan are typically linked to Brent and priced based on the arithmetic mean of Brent for

the three months preceding the delivery month.

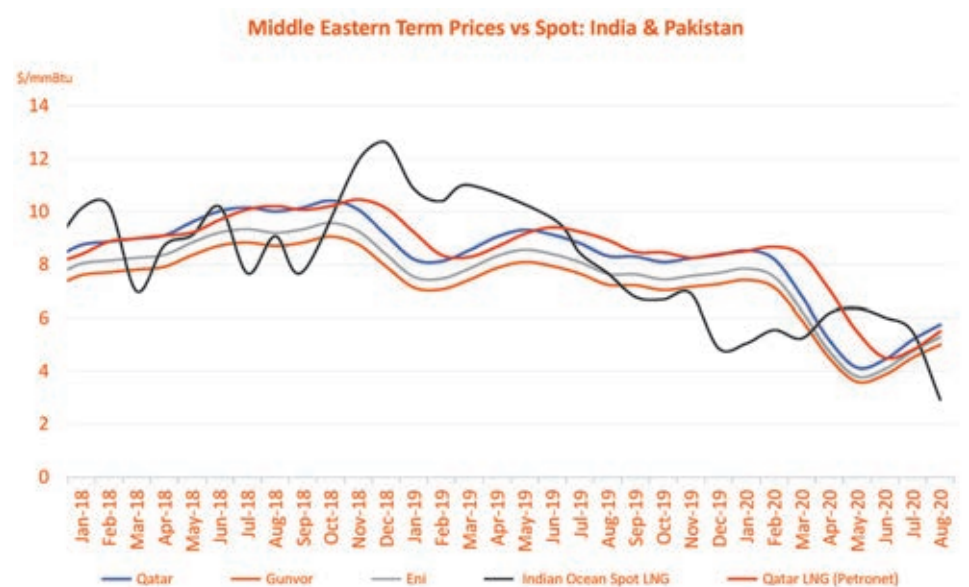
With prevailing low Brent as well as subdued demand growth as both countries are still reeling from strict lockdowns in response to the COVID-19 pandemic, spot and landed LNG term prices have decreased considerably since the beginning of the year. Landed Brent-linked LNG on term contracts averaged \$8.02/mmBtu in January but stood at only \$4.25/mmBtu in May, on account of the slide in Brent the preceding quarter, and climbed relatively little to \$5.39/mmBtu on average in August. Published spot prices for deliveries to Pakistan saw a similar downward trend, decreasing from \$10.86/mmBtu in January to as low as \$2.22/mmBtu in August.

Cost comparisons

The costs of supplying LNG for portfolio players (not to mention their netbacks) hinge on several variable factors ranging from feedgas prices to LNGC charter day rates. These factors can lead to substantial differences in the competitiveness of different LNG supply sources.

Sabine Pass and Cheniere's pricing mechanism: The bulk of US LNG capacity is concentrated along the US coast of the Gulf of Mexico and we used the Cheniere-operated Sabine Pass LNG project as an example for LNG shipments to India/Pakistan from that area. Not only is Cheniere's plant the US' largest LNG operation in the United States with nominal capacity of c. 25 million tonnes per annum (mtpa), its pricing regime has also been made fairly transparent.

As is commonly the case with US LNG, Cheniere effectively operates a 'cost-plus' model, whereby the company purchases and feeds natural gas from the national pipeline grid into its cooling loops and charges the Henry Hub price plus a gas procurement and transport fee of 15% on top. By contrast, Middle Eastern supply is typically Brent-linked. In addition, Cheniere has tied its capacity leaseholders into tolling agreements, whereby they are charged a liquefaction fee. Accordingly, we have divided our price analysis into 'Low Tolling' and 'High Tolling' to account for the low end of the



Source: Author's research, Pakistan LNG, NYMEX

fee spectrum of \$2.25/mmBtu to the high end of \$3.50/mmBtu, which the majority of capacity leaseholders are paying, according to the IAEE.

Cove Point: The Dominion Energy-operated Cove Point liquefaction project comprises a single train with a nameplate capacity of 5.25 mtpa and which is underpinned by two 20-year firm contracts that split available capacity in half. One contract is held by ST Cove Point (STCP), a joint venture of Japan's Sumitomo Corporation and Japanese utility Tokyo Gas, nominally to supply the portfolios of both Tokyo Gas and Kansai Electric Power, another Japanese utility. The other contract is held by GAIL Global USA LNG, the American subsidiary of India's state-owned processing and distribution company GAIL India Ltd. (formerly known as Gas Authority of India Ltd.). The company is India's largest state-owned natural gas processing and distribution company and has been instrumental in facilitating the import of LNG by Petronet into the country, too. The project is connected to Dominion Energy's bi-directional Cove Point Pipeline, a relatively small, short-haul pipe that connects the LNG terminal to the Henry Hub denominated gas pipeline grid.

Other Suppliers

As indicated in the graph above, there are portfolio players such as Eni and Gunvor who are supplying Pakistan in particular from their contingents in Nigeria and elsewhere. Concurrently, spot cargoes

supplied by companies such as SOCAR Trading, DXT Commodities or PetroChina Intl. Singapore are also sourced from various plants in Africa and Southeast Asia as well as from Qatar and the United States. However, we highlight that our data suggests there were only five such spot cargoes from Qatar this year – four in January and one in March – with none deriving from the United States.

Shipping costs

To examine the relative economic viability of exports from the Middle East and the United States to India, shipping costs must be added.

LNGC day rates for vessel charters from the US Gulf to the Pacific basin are currently relatively low as they are oscillating in the low \$50,000 range, according to available Argus Round Voyage (ARV) data at the time of writing. According to Argus, the ARV rates include all costs paid by the charterer to the vessel owner. These rates stood as high as \$170,000 per day roughly this time last year. Understandably, such a difference significantly impacts the cost for a portfolio player delivering US LNG to India.

Our shipping cost calculations and estimates are based on an LNG tanker with 160,000m³ of capacity, which translates to approximately 3,000,000mmBtu of deliverable natural gas. We assume LNGCs are chartered on a round-trip basis in line with ARV data and our calculations account for a day for loading and a day for unloading. If these

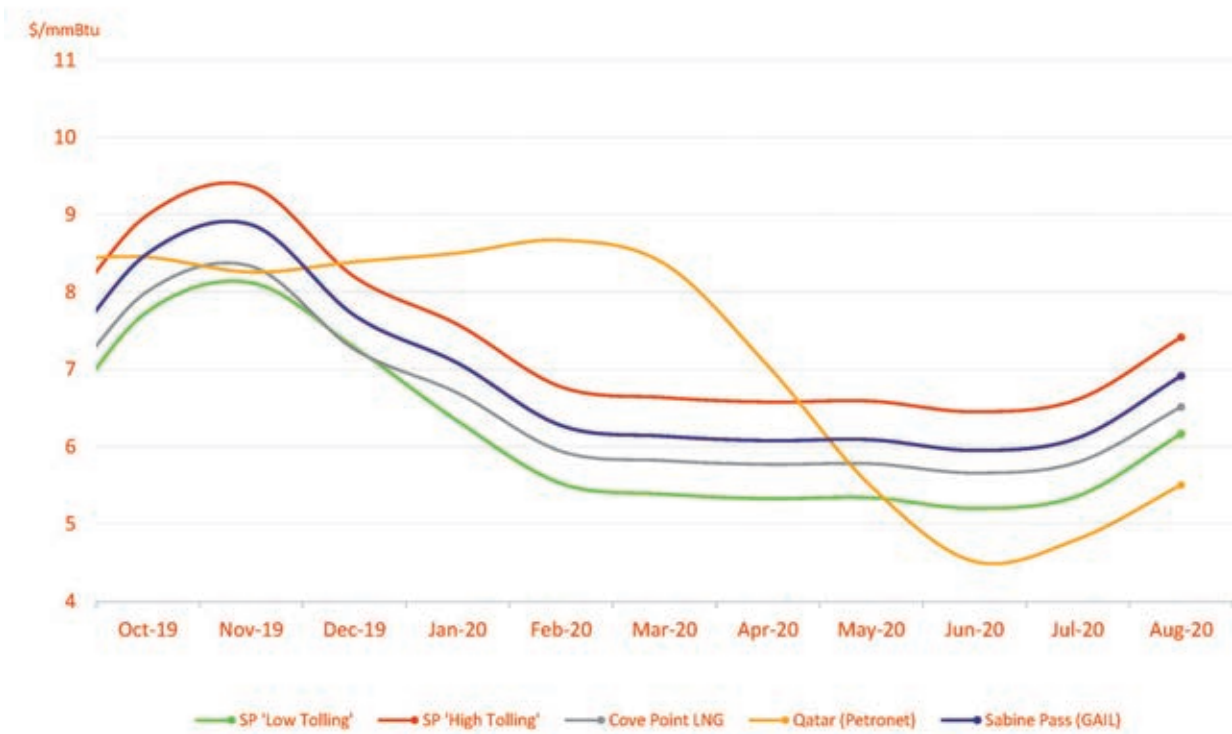


Beware of suppliers selling LNG equipment without the world-class expertise.

Don't buy inferior LNG equipment. It won't do the job as well as MCR® Coil Wound Heat Exchangers from Air Products. Why? You need multiple cores in parallel cold boxes to produce the same amount of LNG as a single, modularized Air Products' Coil Wound Heat Exchanger. Our proven LNG technology is more compact, reliable and efficient. It's why all our LNG trains passed their performance test the first time. That's not surprising. After 70 years of designing and operating cryogenic process facilities worldwide, we've earned a reputation for safe, high-performance, cost-effective solutions. That's something you can only buy from us.

tell me more
airproducts.com/LNG

India: US LNG (FOB) vs Landed Price from Qatar



Source: Company reports, tender documentation, LNG Journal analysis

operations take longer or ports are congested and additional demurrage time occurs, these costs will usually increase though contracts often contain indemnity clauses if the cause of the delay falls within the scope of the destination port’s responsibility. Our cost assessment also accounts for fuel at \$35 per nautical mile. We have also included in these calculations fees for transiting the Panama and Suez Canals and assumed that the ballast leg will lead back through the same Canal as was the case on the laden journey (transit fees are roughly 10% lower on the ballast leg). Using data provided by maritime services provider Wilhelmsen, we calculated total costs of \$792,000 for using the Panama Canal and \$630,000 for the Suez Canal.

By contrast, Qatar controls much of its fleet through Nakilat, the state-owned LNG shipping giant – meaning the charter component in the LNG price could be considered a sunk cost. However, since the Ras Laffan LNG complex is also exporting via vessels chartered by third parties, we have included charter costs for Qatari shipments, too.

Results

Our calculations indicate that the competitiveness of US LNG to the Indian subcontinent vis-à-vis Middle Eastern supply led by Qatar depends considerably on Brent and the Henry Hub price and less so on the much larger shipping distance from the Gulf of Mexico or transit fees through either the Panama or Suez Canal. This not to say that charter rates have no impact at all, but they need to be above

\$90,000/day to have a significant impact on overall competitiveness.

This was the case at the end of last year, with the result that even when comparing the landed LNG price for gas supplied by Qatar with our calculated FOB price from Sabine Pass (except where tolling fees were at the low end), Qatari LNG was more competitive. With LNGC charter rates in excess of \$90,000/day, as was the case during 4Q 2019, shipping US LNG to the Indian subcontinent was generally more expensive than competing landed Qatari supply at c. \$8.35/mmBtu. Portfolio players wanting to ship LNG from Sabine Pass to India faced costs between \$9.00/mmBtu and \$9.37/mmBtu in October and November, according to our calculations. Only supply loaded with a low tolling fee would have been competitive.

However, as vessel charter rates and the Henry Hub price began trending down fast, the situation changed. Prior to the outbreak of COVID-19, when Brent was at well above \$50/bbl, US LNG supply to the Indian subcontinent became competitive on an FOB basis at the prevailing Henry Hub price from December 2019 onwards. The Henry Hub price began to trend downwards from \$2.65/mmBtu in November 2019 to \$1.63/mmBtu in June this year and \$2.3/mmBtu in August. Accordingly, our calculations indicate GAIL would have been able to load LNG at Sabine Pass for \$5.32/mmBtu and ship it to Dahej in India for around \$7.08/mmBtu in total via the Panama Canal in January. In contrast, landed LNG from Qatar was priced at \$8.50/mmBtu the same month.

Qatar’s Brent-linked, long-term LNG supply resulted in considerably higher

prices in 1Q 2020, because it is typically priced based on the arithmetic mean of Brent for the three months preceding the delivery month. As such, the landed price of Qatari LNG was between \$8.36 and \$8.70/mmBtu at the time compared to \$5.99 and \$6.92/mmBtu for US LNG on an FOB basis (i.e. leaving a considerable margin for the supplier).

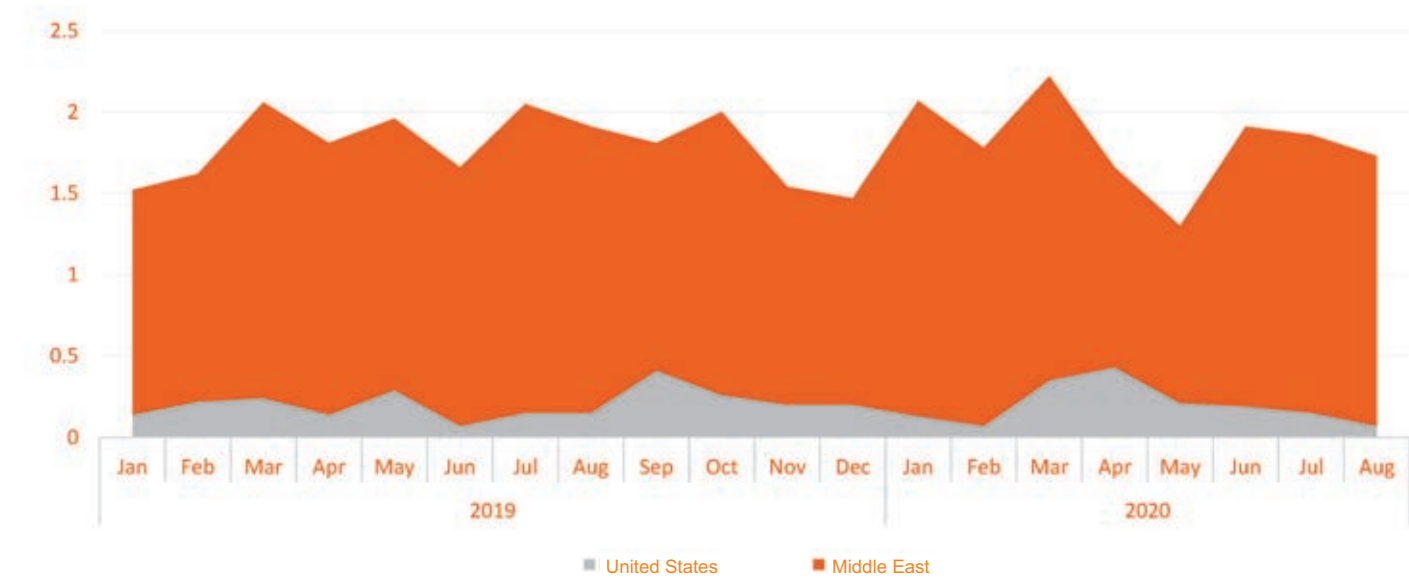
As a result, US LNG managed to gain market share from competing Middle Eastern supply, growing from 0.13mmt in January to 0.43mmt in April.

In 2Q of this year, however, the fast decline of Brent to as low as \$19.33/bbl on 21 April meant that Qatar’s LNG supply caught up in terms of price competitiveness to the extent that it now sits well below our calculated FOB prices for Sabine Pass and Cove Point. Landed Qatari LNG was priced at \$5.50/mmBtu compared to c. \$6.16/mmBtu for Sabine Pass supply with a low tolling fee in August. LNG from Cove Point cost c. \$6.51/mmBtu FOB in the same month. This development correlated with a swift decline in US LNG shipments to the Indian subcontinent, decreasing from 0.19mmt in June to just one cargo of 0.07mmt in August, our data shows.

Conclusion

Despite the close proximity of Middle Eastern LNG supply to the emerging LNG markets of Pakistan and India, it is not a given that it will always be the most competitive source of gas supply. Although necessarily based on assumptions and some estimates such as fuel consumption, our cost calculations indicate that the prices of Brent and Henry Hub gas as well as vessel charter rates can quite swiftly turn supplying region with US LNG from a loss-making proposition to a profitable one.

LNG Shipments to India & Pakistan (MMt)



Source: LNG Journal

Golar FSRU during first STS LNG cargo transfer on February 4th, 2020 at milestone Sergipe Project in Brazil.

© Golar LNG



*Carlos Jr. - TexEngen Brasil / CELSE Terminal,
Golar Power's FSRU Golar Nanook



www.mibitaliana.it



Where's LNG investment heading?

DNV GL's Energy Transition Outlook forecasts a potential golden age for liquefied natural gas (LNG) in the coming decades, but uncertainty remains in the short term. Hans Kristian Danielsen, Vice-President, Marketing and Sales with DNV GL – Oil & Gas, explores the factors driving growth in LNG, the more immediate challenges facing the industry, and crucially, where investment is heading.

DNV GL forecasts that natural gas will soon be the world's largest primary energy source, and that global imports of natural gas between regions will more than double to around 1,685 cubic gigameters (Gm³) per year by 2035, then stabilizing at this level. A quarter of world gas demand will be traded between net import and net export regions, and much of this will come in the form of LNG. Seaborn trade of natural gas will increase four-fold to 1,680 million tons (Mt) per year in 2050.

North America is set to lead the sprint in our forecasts, but escalation in the trade war with China could affect this, influencing where the investment is heading (Figure 1). Should this risk not materialize, we forecast that North America will increase liquefaction capacity almost 10-fold over the next decade. Such an expansion would account for three-fifths of a projected LNG capex spike in the mid-2020s.

On the demand side, we forecast that the Indian Subcontinent and Greater China are set to dominate LNG imports, accounting for almost half of global regasification capacity.

Uncertainties in the short term

International gas prices hit a record low in 2020, as the Covid-19-induced market crash added to existing price pressures, affecting the more immediate outlook for LNG. This is already filtering through as countries fill their storage capacity amid lower demand and cheaper imports. The main question for the future of LNG though, is how this will affect investment?

2019 was a record year for new LNG

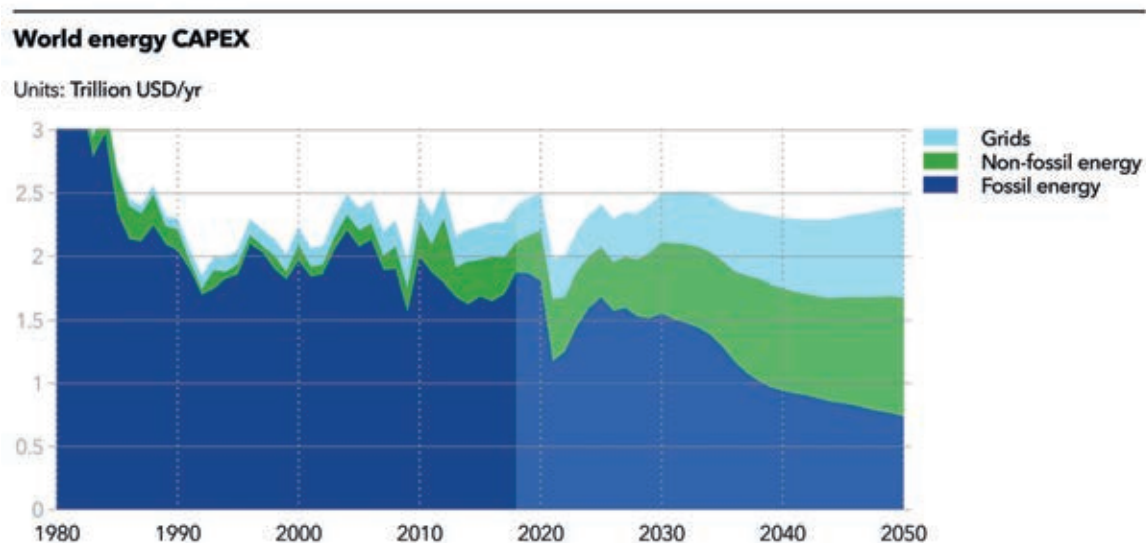
project approvals. However, with subdued demand in 2020 and increased supply as significant liquefaction capacity came online, some LNG suppliers were immediately exposed to both volume and price risk.

With regasification terminals having filled their storage, some importers have cancelled purchases.

For example, in February 2020, as enforced lockdowns spread globally, state firms in China cancelled some cargoes. As the country began to emerge from the first wave of the pandemic, an upturn in economic activity led to a rush to purchase the fuel as LNG prices fell to record lows.

This has led to some LNG cargo cancellations and producers curtailing production. Many LNG projects are based on contracts with fixed prices, which have served to protect the revenues of producers in some cases, but have also led to cancellations as the option left to most buyers is to cancel rather than push for a lower price, aside from buyers on take or pay contracts.

Overcapacity and the direct knock-on effects on production are likely to be short term, though, with our forecasts showing that demand for natural gas, and particularly LNG, are set to rebound quickly in the coming years.



The more significant effects may lie in changes to investment. Short-term challenges have led to final investment decisions (FIDs) on several major liquefaction projects being pushed back, and a number of international projects seeking FID being delayed. Projects have been postponed or delayed in the US, Canada, Mozambique and Qatar, among others.

Factors influencing long-term growth and certainty

We forecast that natural gas will take its place as the world's largest energy source from the mid-2020s – with global gas demand growing to a peak around a decade later.

As the least carbon-intensive fossil fuel, gas can play a prominent role in reducing emissions in the energy transition. Much of this we expect to be led by policy, as countries switch from coal to natural gas in power generation. Gas

process, is also a driver of certainty for natural gas and LNG.

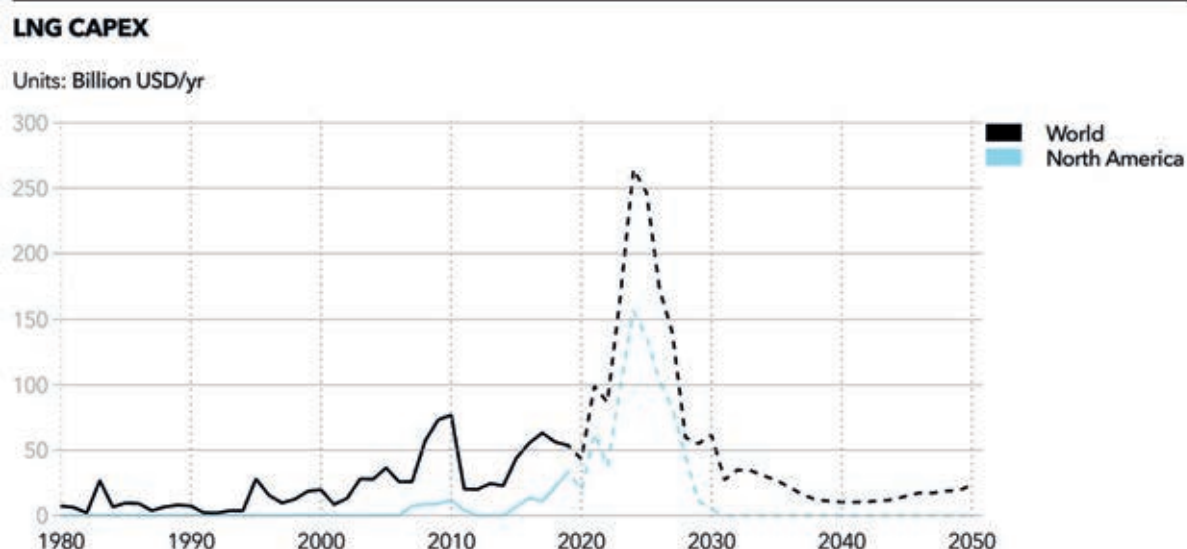
In terms of gas prices, analysis from DNV GL's Energy Transition Outlook 2020 shows that lower gas prices significantly increase demand for gas, much of which would be met by LNG. Gas demand is sensitive to changes in gas price. We forecast that reducing the gas price by 50 percent from our forecast would increase the demand for gas production by 22 percent in 2050. On the other side, a 50 percent increase in gas price above our forecast would result in a 15 percent drop in gas demand in 2050.

The price of gas influences the pace at which it replaces coal in the world's energy system. With a lower gas price, we expect there to be much more demand for gas. In turn, we would expect there to be greater need for the LNG liquefaction capacity additions that have recently been postponed or put on hold due to low gas prices, but the low prices may put pressure on the viability of some liquefaction projects. This suggests LNG investments should go ahead in the longer term, but that short-term overcapacity could delay or affect where the investment is heading.

Where is the investment heading?

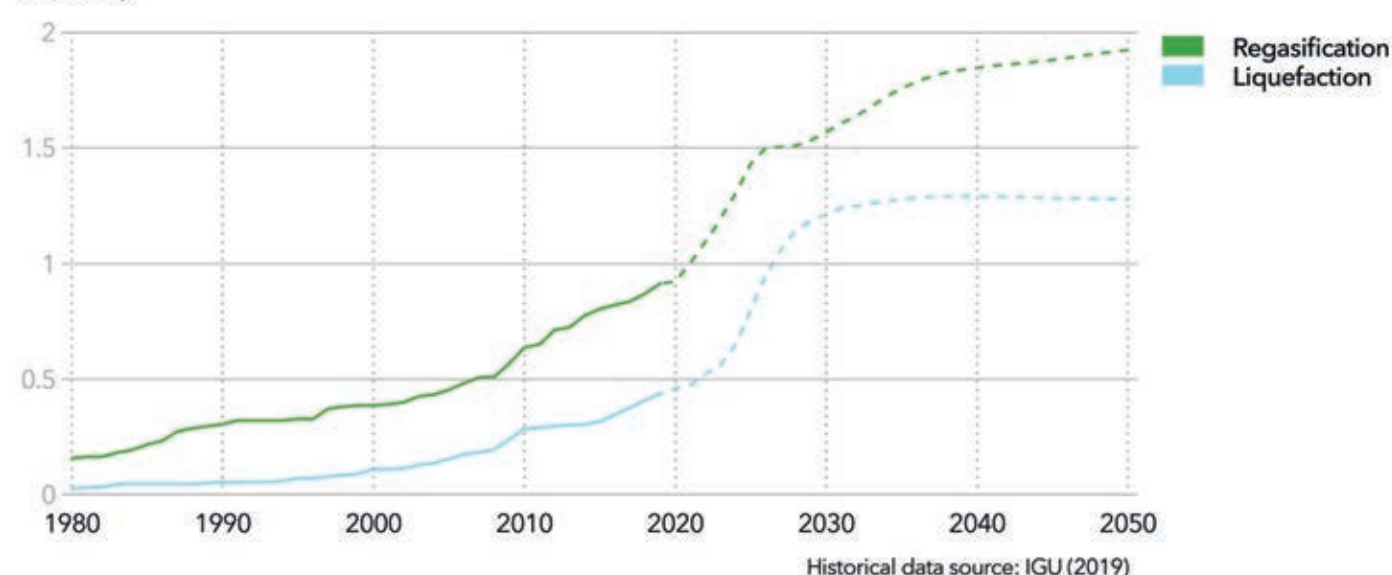
As of February 2020, 42 markets were importing LNG and some 20 were exporting, according to International Gas Union (IGU).

Due to the investment required countries are most likely to invest in infrastructure to export LNG when they



World LNG liquefaction and regasification capacity

Units: Gt/yr



have longstanding, significant gas reserves and can source the feed gas for liquefaction at competitive cost. Further, competitive edge is held by producers with a reputation for reliability, and by locations with the shortest shipping routes to Asian markets.

These are the particulars of large exporters such as Australia, Qatar, Russia, and the US, all of which have already made significant investments in LNG. However, the trade war between US and China, as well as increased tensions between Australia and China adds complexity to the commercial picture. Unless these tensions ease there is a risk that American as well as Australian projects will win a lower share of new contract volumes than their commercial offering justifies. This could potentially favour Qatar, Russia and possibly East-African gas projects.

On the regasification side, South Korea, Japan, and Taiwan have previously dominated LNG imports. China is soon to take the lead and India is on a similar trajectory, with significant

investment in regasification facilities, but many other markets are also eyeing increases in regasification capacity, many more countries than are investing in exports. Part of this is that liquefaction facilities require multi-billion-dollar investments in facilities, while investments in regasification terminals run in the hundreds of millions.

Some current LNG export regions face growing populations and energy demand and may increasingly use domestic gas reserves for domestic consumption. We forecast South East Asia as a whole to switch from a net gas exporter to a net importer in the 2030s as domestic demand outpaces supply. Malaysia and Indonesia are currently net LNG exporters, but are set to become net importers, for example.

These many import markets suggest an increasingly flexible LNG market, with many sources of demand. Changes in LNG financing will add to this, with stakeholders increasingly taking on their own marketing and selling responsibilities, rather than requiring

buyers to purchase minimum quantities of LNG under long-term agreements. These are signs of a strengthening spot market for LNG.

Regional imbalances driving LNG value chains

We forecast that global capacity for regasification will more than double by 2050 (Figure 2). The Indian Subcontinent and Greater China will produce only a fraction of the gas they consume, accounting for more than 75 percent of natural gas imports from 2035. With few pipelines supplying the region and little or declining gas production, we expect LNG to meet much of the demand. This necessitates significant increases in LNG regasification capacity, with Greater China set to surge more than five-fold to almost 400 Mt/yr. Likewise, we predict the Indian Subcontinent will see a rapid rise from around 40 Mt/yr in 2018 to more than 500 Mt/yr by 2050.

South East Asia will start from a similar point, increasing six-fold to 240 Mt/yr by 2050. Regasification capacity in

Europe will increase moderately to 225 Mt/yr in the mid-2020s.

Supporting this growth in demand, we forecast that liquefaction capacity will triple over the next decade globally to 1,200 Mt/yr, before plateauing until 2050. We predict that North America will account for just under half (560 Mt/yr) of this capacity in 2030. The region would also see the largest growth in liquefaction, accounting for around 44 percent of global capacity by 2050. Middle East and North Africa will be the second largest, representing about 17 percent of global liquefaction capacity.

LNG a reprioritisation of investment?

In terms of investment, we forecast that capex in LNG will increase dramatically in the mid-2020s, with North America accounting for three-fifths of the around \$250 billion set to be invested in both 2024 and 2025 (Figure 3). The region will account for a similar proportion of the more than \$170 billion in 2027 and \$140 billion in 2028, before global investment falls to \$60 billion, a little higher than in 2018.

Total world fossil energy capex is set to fall significantly in the next year. We forecast that it will rebound to 2025 but will still be lower than 2018 levels, taking a different course than the huge increase in LNG capex in these years.

In 2024, LNG will account for 17 percent of world fossil capex and 15 percent of world fossil capex in 2025, up from less than 4 percent in recent years. We've seen investment delayed at least for 2020, so uncertainty in the short term could affect the timeline. This investment is a sign of reprioritization, as the world shifts towards a future in which natural gas will be the world's largest primary energy source, with it increasingly traded as LNG across the world's oceans. ■



Author



Hans Kristian Danielsen, Vice President, Marketing and Sales, DNV GL – Oil & Gas

He was appointed Marketing & Sales Director of DNV GL's Oil & Gas business area in April 2018. He has a Master of Science degree in Marine Machinery from the Norwegian Institute of Technology and joined the company's trainee programme in January 1996.

He since has worked in several operational and governance roles within the organization, including Head of Section for Upstream Safety, LNG Segment Director, Country Manager for Australia & New Zealand, Global Head of Marketing and Sales, and Global Key Account Manager for Equinor (formerly Statoil).

EXCELLENT DESIGN LNG & CNG MARINE LOADING ARMS



24/7 Service
All Brands



LNG Bunkering



LNG & CNG Marine
Loading Arms

August LNG trade continues to improve on Asian demand growth

August LNG trade improved marginally on the back of higher Atlantic and Pacific exports to cover additional demand in Asia. Meanwhile, US LNG's previous market retreat reached a preliminary stop and thereby lifted Atlantic performance. However, monthly Qatari output continued to decrease and thus once more hampered Middle Eastern supply performance, our Markets Editor Alexander Wilk reports.

After global LNG trade had stabilised at 26.22 million tonnes (mmt) on marginal month-on-month growth of 0.05mmt (0.2 percent) in July, our data for August shows more substantial growth of 0.52mmt (2 percent) to 26.77mmt. This growth was predominantly due to Japan and China increasing offtakes robustly, thus outweighing major reductions in Argentina and Italy. Meanwhile, renewed growth in US LNG exports together with Russian seasonal shipments via the Northern Sea Route to China also supported results. However, Middle Eastern exports still could not move past a significant export reduction by Qatar even as Oman boosted shipments. Although the Middle Eastern LNG powerhouse continued to expand exports to South Korea, it substantially decreased shipments to Japan and Bangladesh. As such, despite the second consecutive month of growth since March, overall trade performance in August 2020 still represented a decrease of 2.80mmt (-9.5 percent) compared to August 2019. On the other hand, the negative gap on year-on-year trade has begun to shrink since the difference was more than 14 percent in July.

Exports

August's month-on-month export performance increase was primarily supported by the Atlantic Basin, where

shipments were up by 0.60mmt (7.8 percent) over July to reach 8.29mmt. This stood in stark contrast to the Basin's 0.26mmt (-3.3 percent) reduction in July. Coming in second by volume growth was the Pacific Basin, where shipped volumes climbed by 0.48mmt to 11.36mmt. Middle Eastern exports, however, decreased by 0.58mmt to 7.10mmt (-8 percent).

Pacific Basin

The Pacific Basin ended the month of August 0.48mmt (4.4 percent) up in exports compared to July, which increased capacity utilisation by 4pp to 85 percent.

The Basin's biggest exporter – Australia – shipped 0.51mmt (9.2 percent) more month-on-month, and thereby reversed the month-on-month decrease in exports seen in June and July, when shipments had dropped by 0.55mmt and 0.07mmt, respectively, due to maintenance and lower South Korean demand. Australia's improved performance was supported by significantly higher production levels at NWS LNG and the continued resurgence of demand in Japan. Despite having extended the deadline for completion of urgent maintenance, Gorgon LNG also managed to increase its monthly exports by 0.11mmt (12.9 percent) to 0.96mmt whilst Ichthys LNG, benefitting from robust Japanese demand growth, increased exports by 0.12mmt (22.6 percent). However, smaller Australian

plants saw some production losses led by Pluto LNG with a month-on-month decrease of 0.13mmt (-26.5 percent). The plant frequently exports gas to Taiwan, but which saw a significant drop in monthly demand in August. On the other hand, smaller plants usually supplying Japan, i.e. Darwin LNG, or benefitting from a wider portfolio as in the case of Gladstone LNG, managed to increase shipments by roughly one cargo each. Finally, Wheatstone LNG also increased exports by 0.05mmt (6.7 percent) in August via an additional shipment to China, but which was 'lost' from Queensland Curtis LNG's monthly balance.

North of Australia, Papua New Guinea's PNG LNG saw shipments grow by 0.07mmt (10.4 percent) to 0.74mmt even as the number of cargoes shipped remained steady due to higher load levels among those vessels, based on our data and calculations. PNG LNG supplies China, Japan and Taiwan. A similar effect in terms of number of shipments could be observed in neighbouring Indonesia, where exports were slanted towards China and away from domestic destinations. However, Malaysia saw a substantial month-on-month export decrease of 0.16mmt in August as it did not manage to capitalise on the demand increases in China and Japan. Malaysia LNG operator Petronas had indicated earlier this year that LNG exports would

be subject to continuous adjustments in response to market conditions. In similar vein, Brunei LNG slashed August shipments by 0.21mmt (-38.2 percent) to 0.34mmt as it lost market share in Japan.

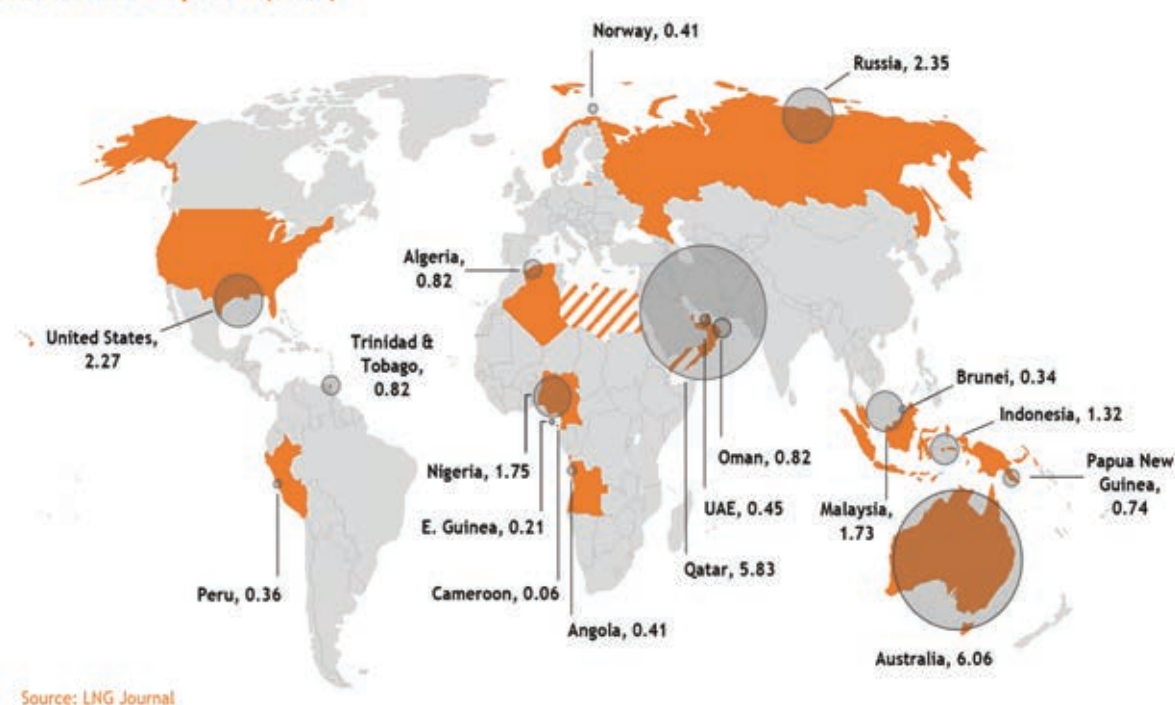
Elsewhere in the Pacific, Russia's Sakhalin-2 LNG saw exports increase once more by 0.07mmt (9.5 percent) to 0.81mmt in August compared to 0.74mmt in July. Notably, that growth mainly derived from an increase in exports to Japan by 0.34mmt, which, however, was tempered by lower demand for Russian LNG in South Korea and Taiwan. Concurrently, Peru's Pampa Melchorita plant also increased exports by 0.04mmt (12.5 percent), helped by higher Japanese demand.

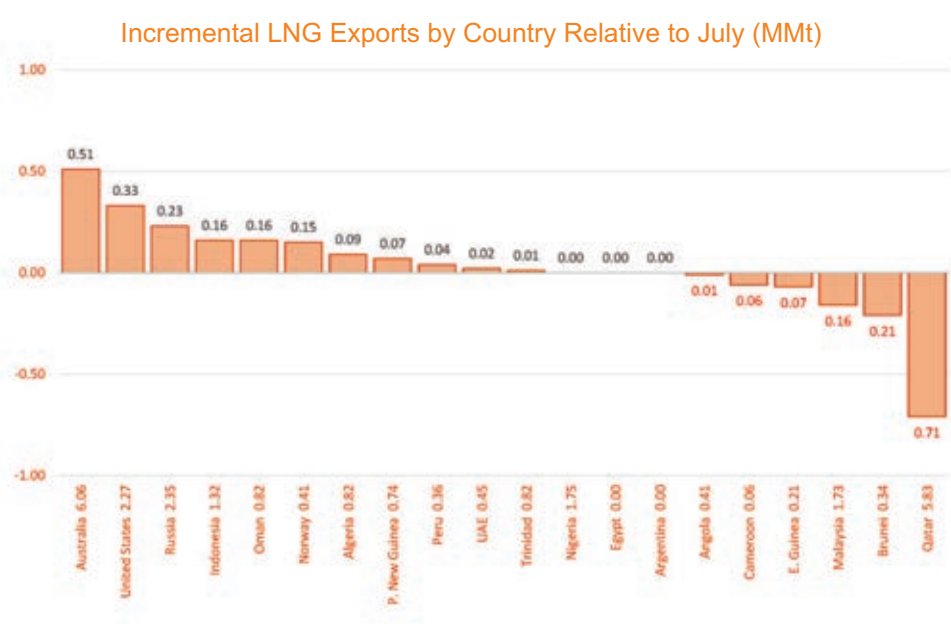
Atlantic Basin

The Atlantic Basin's overall shipped LNG increased noticeably by 0.60mmt (8 percent) month-on-month in August, leading to growth in export capacity utilisation of 4pp to 64 percent.

The amount of LNG exported within the eastern part of the Atlantic Basin – comprising Europe, Russia and Africa – saw a considerable overall net increase of 0.26mmt (4.3 percent) month-on-month in August. That growth was facilitated by increments of 0.15mmt, 0.16mmt and 0.19mmt at Algeria's Skikda plant, Norway's Snøhvit LNG and Russia's Yamal LNG, respectively. As we reported

Global LNG Exports (MMt)





Source: LNG Journal

in August, Skikda LNG resumed production in late July following a prolonged maintenance period. Concurrently, Norway continued to benefit from demand growth in Spain and Poland whilst Yamal LNG’s export growth was both supported by Chinese demand and boosted by offtakes in France, including transshipments to Argentina and the UAE. Taking advantage of warmer summer climate, the plant made use of the Northeast Passage in the Arctic to ship gas to the Beijing area and the island of Hainan. However, a total of 0.32mmt of Yamal gas also went into the Maasvlakte Gate Terminal in Rotterdam and Belgium’s Zeebrugge terminal, much of which we suspect was bunkered, ready to be re-exported at a later date. Notably, we continued to detect relatively little scope for arbitrage in August as re-exports remained relatively low at 0.34mmt (they stood at almost twice that amount in June), although there was also a substantial improvement over the 0.18mmt seen in July.

Net African LNG exports were down slightly by 0.05mmt (-1.5 percent) month-on-month in August, led by continued subdued supply from Algeria’s Arzew plant, which curtailed shipments by 0.10mmt (-14.0 percent). The FLNG vessel Hilli Episeyo stationed offshore Kribi in Cameroon also could not maintain monthly output, reducing shipments by 0.06mmt (-50.0 percent). In addition, Equatorial Guinea’s EG LNG cut output by 0.07mmt (-25.0 percent) to 0.21mmt whilst Angola LNG barely kept month-on-month production steady at 0.41mmt. Fortunately, these decreases were tempered by robust month-on-month export growth due to the restart of Algeria’s Skikda plant.

In the western half of the Basin,

exports discontinued the tumble seen earlier in the summer by increasing shipments by 0.34mmt (12.4 percent) from 2.75mmt in July to 3.09mmt in August. The rate of monthly decline had already more than halved in July although US LNG exports had continued to suffer heavy net export reductions at the time. This trend found a preliminary stop in August, although US LNG exports in September are likely to suffer once more due to severe weather. Whilst Cameron LNG decreased shipments by 0.15mmt (-23 percent), Cove Point LNG managed to maintain its monthly exports at 0.43mmt. The remaining US LNG plants – led by Corpus Christi LNG – saw shipments increase. As such, Corpus Christi LNG’s loadings were up 0.23mmt (121 percent) followed by Freeport LNG with 0.16mmt (229 percent). Notably, Sabine Pass LNG, which had led the decline in US LNG loadings with a drop of 0.77mmt (-55 percent) in June, managed to drastically slow that decline to just 0.03mmt (-5 percent) in July and reverse it with a marginal increase of 0.02mmt (3 percent) in August. In addition, Elba Island LNG was seen in the market with a shipment aboard the Maran Gas Hector travelling to Quintero in Chile. Market visibility at the time of writing indicated these volumetric increases were supported by US LNG regaining some lost market

share in China and Japan alongside demand growth for US LNG in Europe (e.g. Italy) and South America (mainly Chile and Argentina). However, we highlight that roughly 0.57mmt were still en route to the Pacific without confirmed destinations but with estimated arrivals towards the end of September so that the eventual composition of demand for US LNG – but not overall volumes shipped – had yet to transpire at the time of writing.

In South America, Atlantic LNG in Trinidad & Tobago also reversed a decreasing trend in shipments by maintaining broadly steady exports of 0.82mmt in August as Caribbean demand returned. Argentina’s Tango FLNG barge, meanwhile, did not load a cargo.

Middle East

In contrast to July, when Middle Eastern LNG exporters kept activity broadly steady, exports decreased substantially by 0.58.mmt (-8 percent) to 7.10mmt in August. The performance was underpinned by a strong decrease in Qatari shipments, which was only tempered by an increase out of Oman and the UAE. As such, the Basin’s utilisation of operational export capacity (i.e. excluding Yemen and Egypt) decreased by 7pp to 92 percent in August from 99 percent in July.

Owed to the massive size of the Ras Laffan LNG complex, LNG supply from Middle East was determined by changes to Qatar’s exports. Not considering Idku LNG’s continued market absence following a one-off shipment in July, Qatar accounted for all of the Basin’s monthly export reduction in August. The Persian Gulf state’s shipments decreased by 0.71mmt (-11 percent) month-on-

month. Whilst shipments to both the Atlantic and Middle East decreased by c. 0.15mmt, the majority of Qatar’s export reduction was due to lower demand for its gas in the Pacific. Although Qatar’s market share in China remained broadly steady, shipments to Bangladesh and Japan in particular decreased noticeably by a total of 0.56mmt (-46 percent).

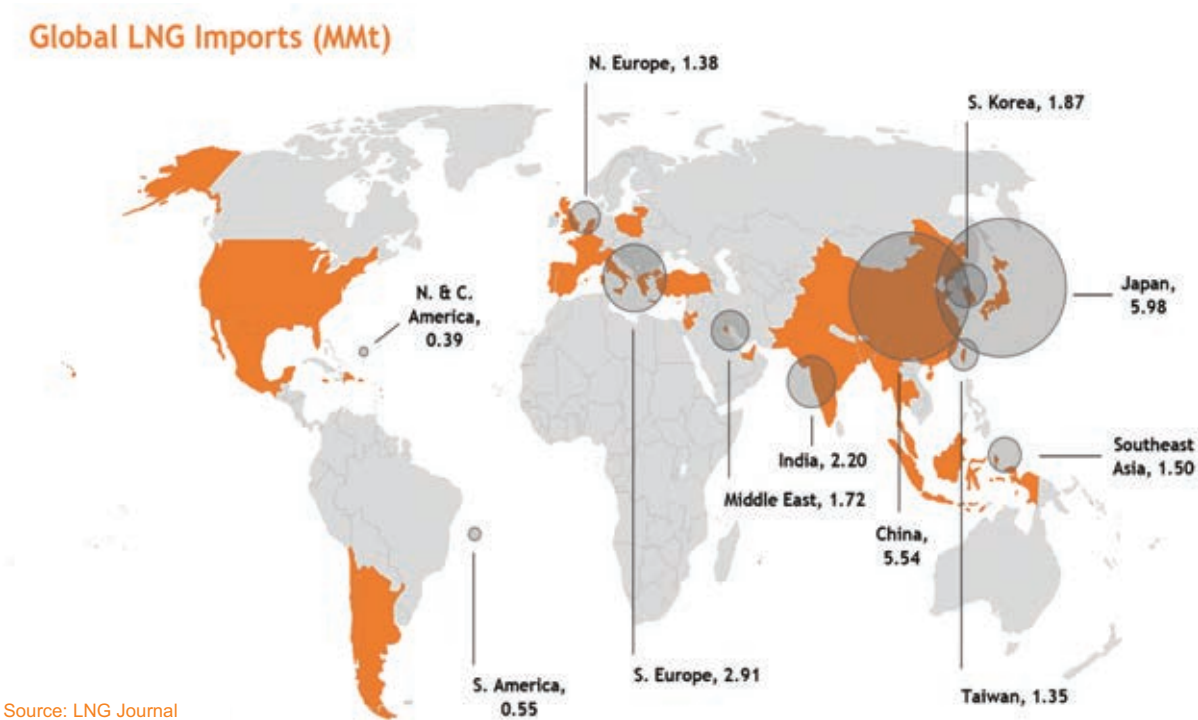
The other active producers on the Arabian Peninsula – Oman and the UAE – saw an overall export increase of 0.18mmt (16.5 percent) led by Oman. The country benefitted significantly from demand growth in Japan, which boosted Omani LNG exports by 0.11mmt in August. Additionally, the country shipped one cargo more to South Korea. The UAE, meanwhile, compensated for a decrease of 0.06mmt in exports to India with a 0.06mmt export from Abu Dhabi’s Das Island plant to Dubai and a 0.07mmt shipment to Pakistan.

Imports & Domestic Trade

LNG imports in August were also determined by the Atlantic Basin, where imports were down by 0.87mmt (-14 percent) over July to reach just 5.59mmt in August. This was contrasted by relatively minor demand growth in the Pacific Basin and the Middle East, where offtakes increased by 0.14mmt (1 percent) and 0.28mmt (19 percent), respectively.

Pacific Basin

Pacific Basin imports grew in August, increasing slightly by 0.14mmt (1 percent) to 18.87mmt from the 18.74mmt seen in July. The commensurate import capacity utilisation thereby also increased by 1pp to 51 percent. Overall Pacific demand continued to be buoyed by Japanese demand growth of 0.40mmt (7.1 percent)



Source: LNG Journal

whilst South Korea once again was leading the demand curtailment within the Basin, cutting back on LNG offtakes by 0.25mmt (-11.8 percent). Meanwhile, China increased offtakes by 0.38mmt (7.4 percent) to 5.54mmt.

As a prominent emerging LNG demand centre in the Pacific Basin, India's demand stood out by showing only relatively little month-on-month growth of 0.09mmt (4.3 percent). Although this still represented stronger month-on-month demand growth than in July, as we predicted last month, the nonetheless flattish demand profile in August stood in stark contrast to the robust growth seen in May and June. In May, demand rebounded quickly after a brief interim in April when the country was put under one of the strictest lockdowns seen at the time.

In Southeast Asia, Indonesian demand decreased at a much slower pace to 0.13mmt in August, coming in 0.01mmt (-7.3 percent) below the 0.14mmt in July. Indonesian legislators had previously extended their Large-Scale Social Restrictions measures until end-July as infection rates threatened to accelerate and the country's LNG demand consequently more than halved that month. We highlight that Indonesia is re-imposing a citywide lockdown on Jakarta – the country's major LNG demand centre – starting 14 September to contain a new outbreak. We therefore expect relatively weak Indonesian demand in September, too. In contrast, neighbouring Malaysia saw domestic demand increase by 0.08mmt (47.1 percent) to 0.25mmt. Malaysian LNG demand was covered by two Australian shipments via Gladstone

LNG delivered to Pengerang's petrochemical plants as well as two Brunei LNG shipments totalling 0.13mmt to the Sungai Udang FSRU.

The roster of typically price-conscious Asian buyers – including Bangladesh, Thailand, Chile, Mexico, Singapore and Myanmar – collectively slashed imports by 0.31mmt. This was primarily due to Thailand curtailing its monthly LNG intake by 0.24mmt (-38.7 percent) from 0.62mmt to 0.38mmt as the country had boosted offtakes in July. Bangladesh and Mexico also decreased imports by 0.05mmt (-12.5 percent) and 0.06mmt (-33.3 percent), respectively. The Pacific's latest demand-side addition, Myanmar, saw August imports grow by 0.01mmt (112.6 percent), although our shipping data highlights this was not due to an increase in structural demand but instead due to scheduling. Finally, an increase of 0.04mmt (12.1 percent) in Singapore compensated for a decrease of 0.04mmt (11.1 percent) in Chile.

The roster's demand decrease – specifically that of Bangladesh – also had a negative impact on FSRU utilisation in the Pacific by importing 0.05mmt less month-on-month through these floating terminals. This weighed on FSRU utilisation within the Basin, pulling it down by almost 4pp to 39.9 percent. As highlighted in the Atlantic and Middle East sections below, overall FSRU utilisation across all three basins thus also decreased even as FSRU capacity utilisation increased robustly in the Middle East.

Atlantic Basin

Unlike their Pacific equivalent, LNG

imports in Atlantic Basin rebounded on a retreat that had previously seen an interlude in July as they decreased by 0.87mmt (-14 percent) to 5.59mmt in August. The decrease was driven by retreating Argentinian demand, which detracted from overall monthly offtakes with 0.38mmt (-62 percent). Key European buyers such as Italy and the Netherlands together also slashed imports by 0.49mmt so that broadly steady demand of 0.75mmt and 0.41mmt in France and Turkey, respectively, could not alter the larger picture.

Even robust growth among other European buyers did not outweigh the aforementioned reductions. Spain, for instance, boosted offtakes by 0.15mmt (10.7 percent) whilst the United Kingdom increased LNG imports by 0.06mmt (10.3 percent). This left only a limited roster of smaller European buyers – namely Poland and Portugal – to add to monthly imports with 0.10mmt in total.

In the western half of the Atlantic, the Caribbean and South America – including Argentina, Brazil, Jamaica, Puerto Rico, the Dominican Republic, Panama and Colombia – saw month-on-month LNG demand decrease significantly by 0.30mmt overall in August and thus accelerated the month-on-month decrease for the region that had set in the previous month. Even robust growth in the Dominican Republic and Puerto Rico of 0.08mmt could not hope to compensate for the decline seen in Argentina.

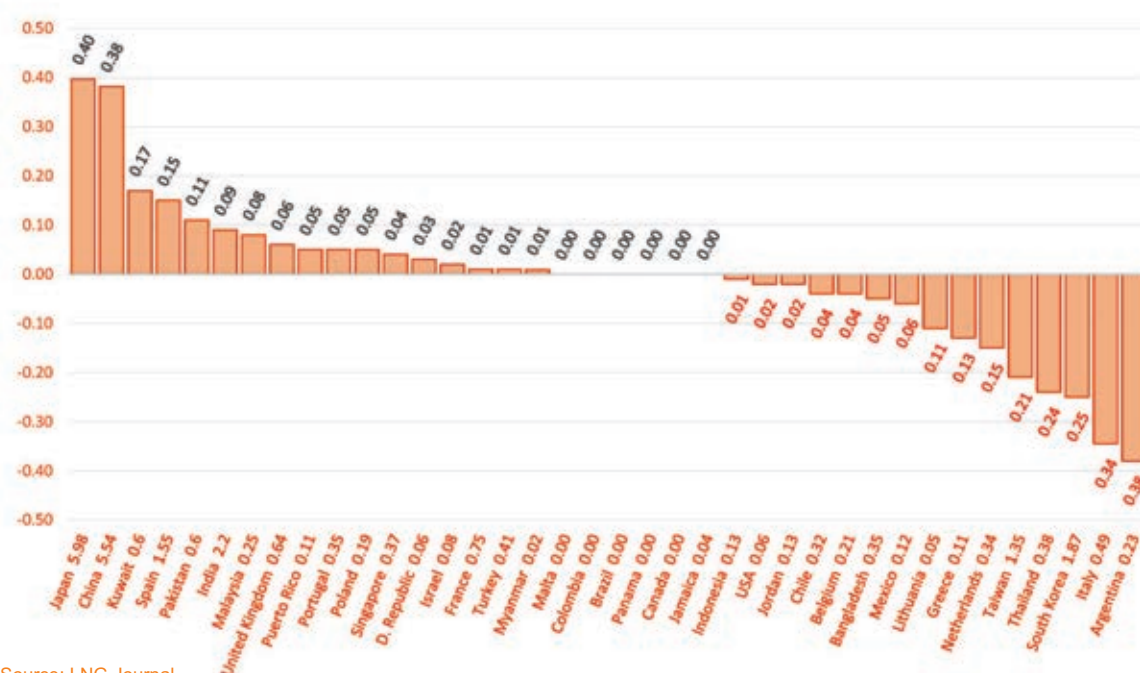
Accordingly, the use of FSRU capacity by volume throughout the

basin dropped by almost 17pp to just 14.3 percent. In North America, Canada did not import a cargo and could not compensate for a demand reduction in the United States. US LNG imports decreased by 0.02mmt (-25 percent) to 0.06mmt in August in line with bi-directional use of the Cove Point LNG facility.

Middle East

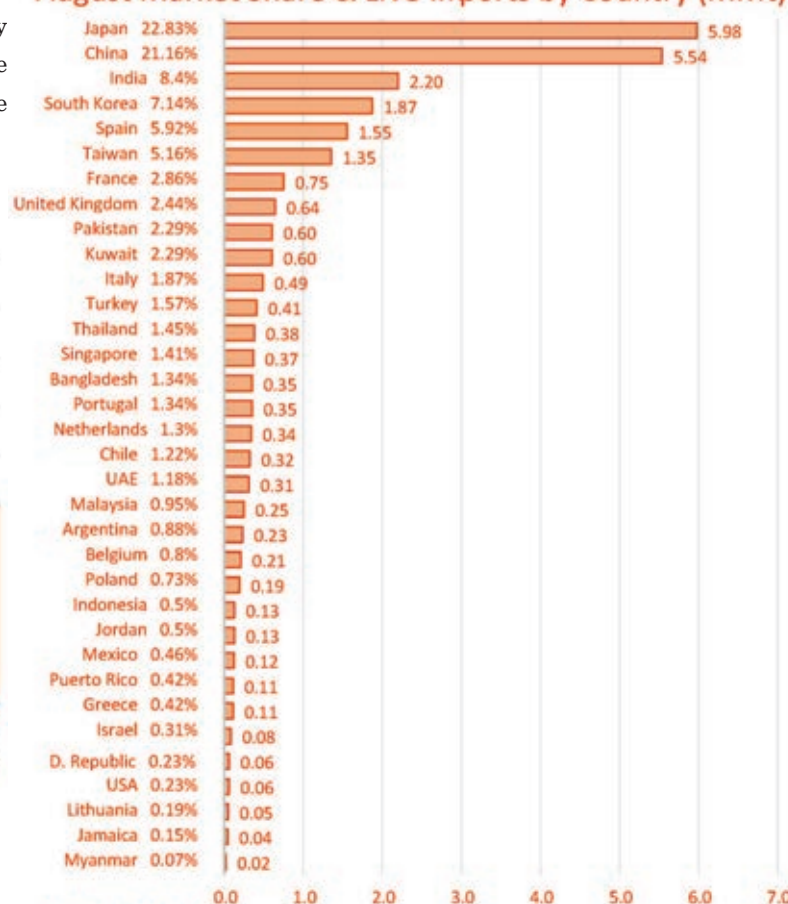
Among the three basins, the Middle East achieved the largest monthly demand growth margin to 1.72mmt in August, showing a net increase of 0.28mmt (19 percent) over July. In particular, Kuwait added 0.17mmt in August that were 'missing' in July and thereby increased offtakes to 0.60mmt. Meanwhile, Pakistan's Port Qasim facility also raised monthly imports by 0.11mmt (22 percent) to the 0.60mmt mark in August. Similarly, Israel imported 0.02mmt (33 percent) more to reach 0.08mmt in August compared to 0.06mmt in July. Meanwhile, Dubai's DUSUP maintained imports at a steady 0.31mmt. However, Jordan stood out among Middle Eastern importers by decreasing its offtakes by 0.02mmt (-13 percent) to 0.13mmt in August. This decrease notwithstanding, Middle Eastern import capacity utilisation still saw an increase of 9pp to 58.1 percent.

Incremental LNG Imports by Country Relative to July (MMt)



Source: LNG Journal

August Market Share & LNG Imports by Country (MMt)



Source: LNG Journal

LNG OneWorld.com



For the Record

AIR PRODUCTS received an order from Algerian national energy company Sonatrach to supply four cryogenic heat-exchangers for one of the North African nation's liquefaction plants on the Mediterranean Coast. The LeHigh Valley, Pennsylvania-based company said the heat-exchangers would be manufactured at its plant in Florida and will replace the original ones supplied by Air Products more than 40 years ago. Air Products is the world's leader in LNG technology and equipment and the latest order will head for Sonatrach's GL1Z LNG facility in Arzew, northern Algeria. "The four heat exchangers will each have 1.3 million tonnes per year production capacity and will replace four previous heat exchangers supplied by Air Products in the late 1970s, which are some of the longest operating MCHEs in the world," said the US company.

The four MCHEs to be supplied by Air Products will be installed at the heart of the proprietary AP-C3MR™ propane pre-cooled mixed refrigerant liquefaction process at the multi-Train facility. The original six MCHE's at the Sonatrach facility were supplied by Air Products in 1977. Since that time, the location has undergone multiple rejuvenation projects and the original MCHEs are still in service. The new exchangers will incorporate the latest advances in design and manufacture which have been developed by Air Products over the past four decades. "This is a very significant contract for Air Products to have won with a very important customer, Sonatrach, who has been a valuable customer of ours for many years," said Samir J. Serhan, Chief Operating Officer at Air Products. "This is another important milestone in our commitment to work with Sonatrach in Algeria and deliver the best heat-exchanger technology in the LNG industry," he added. "Air Products is very proud that we built the original heat-exchangers, which are still operating at the Arzew facility in Algeria and have been for over four decades," explained Serhan.

"Air Products' goal is to provide excellent customer service and develop long-standing relationships with our

customers and our continuous work with Sonatrach in Algeria is a perfect example of doing just that," stated Serhan.

Toufik Hakkar, Sonatrach's Chief Executive, said the supply, installation, supervision, and commissioning of the four MCHEs is part of Sonatrach's plan to revamp its LNG plants. "This project will help reduce maintenance costs, reduce gas consumption rates and maintain LNG gas production at the GL1Z facility," added Hakkar. "We have confidence in the expertise and capacity of Air Products as a Sonatrach LNG technology traditional provider, and as a partner in the gas industry to manage the contract in a way that matches our plan," stated the Sonatrach's CEO. Additionally, beyond the supply of the equipment, Air Products said it would be responsible for overseeing the installation of the equipment and also provide advisory services and engineering studies. Air Products will build the LNG heat-exchangers at its Port Manatee, Florida manufacturing facility.

Air Products opened its Port Manatee plant in January 2014 and completed a 60 percent expansion in October 2019 to meet the needs of the ever-growing LNG industry. "In October 2018, Air Products dedicated a new LNG equipment test facility (ETF), which will enable Air Products to improve the reliability and yield produced from its LNG equipment and to design new equipment," the US company noted. For over 50 years Air Products said it had manufactured LNG heat-exchangers, which currently operate in over 100 LNG Trains in 20 countries around the world. Typically, an LNG heat-exchanger can be as large as over 15 feet (5 metres) in diameter and 180 feet (55 metres) long. A finished unit can weigh as much as 500 tons.

AIR PRODUCTS, the leading US industrial gases and LNG equipment maker, said it was awarded a long-term gases contract to supply a new industrial facility in Penang in Northern Malaysia. The latest win will further strengthen Air Products' long-standing relationship with its global customer making memory chips and storage solutions for the electronics markets. Air Products will install a proprietary PRISM cryogenic nitrogen generator to supply high purity, reliable and economical on-site gaseous nitrogen, and a significant volume of liquid nitrogen to the new facility, located in an industrial park in Penang. "The gases will be used in the customer's chip assembly

processes and cold testing of the memory products, helping improve product quality, productivity and environmental performance," said Air Products. The LeHigh Valley, Pennsylvania-based company conducts its industrial gases business alongside its provision of LNG equipment products such as the main cryogenic heat exchangers for plants and its proprietary propane pre-cooled mixed refrigerant liquefaction process.

Most of the worldwide LNG production comes from Air Products technology. The company provides key equipment for the natural gas liquefaction process for large export plants, small and mid-sized plants and floating LNG facilities. Air Products said it has been serving Malaysia since 1974 and considers itself recognized for the safety and reliability of its operations. "Air Products has established a leading position in North Malaysia. In Penang, the company's two advanced air separation units in the Prai Industrial Park, together with an extensive supply network that expands into the Bukit Minyak Industrial Park and the Batu Kawan Industrial Park, provide a strong and highly reliable gases supply to its customers," said the company.

Alex Tan, president of Air Products in Southeast Asia, said the company was honored by the continued trust of its customer in supporting its growth plans and significant investment in Malaysia. "Malaysia is one of the largest exporters of electrical and electronics (E&E) products. The E&E industry is not only a key growth driver of the country's industrial development, it also enables the country to move into Industry 4.0 by leveraging the latest smart technologies such as Internet of Things and artificial intelligence with the intermediary products and components produced," stated Tan.

AUSTRALIA exported a record 79.1 million tonnes of LNG in the 12 months to June 2020, up 5.9 percent from 74.7MT a year earlier while domestic gas consumption grew on both the East and West coast markets in the second quarter in contrast to the experience during Covid-19 across most of the developed world. Australian domestic gas consumption on the East Coast was 7.7 petajoules higher quarter over quarter in the second three months of the year, according to the monthly report from consultants EnergyQuest. "Gas-use-for-power (GPG) was down by 5.9 petajoules in the quarter, though other gas-use

(residential, commercial and industrial) increased by 13.6 petajoules with increases in all states except New South Wales," said the report. EnergyQuest noted that as one of the world's major LNG producers Australia is to some extent becoming a price-maker in relation to spot prices. The Platts Japan-Korea Marker has increased from US\$2.15 per million British thermal units at the start of July to US\$4.66 per MMBtu on 4 September. "This coincides with unexpected outages at the Western Australian Gorgon LNG project due to the shut-downs for repairs," said the report.

The national regulator, the Australian Competition and Consumer Commission publishes East Coast netback gas price estimates based on the Platts JKM. This means that unexpected developments in Western Australia that affect spot prices will directly feed in to East Coast netback estimates and possibly East Coast prices. "To this degree any domestic contracts indexed to LNG spot prices will be hostage to unexpected shutdowns by West Coast projects, as well as projects elsewhere in the world," EnergyQuest explained. The overall Australian LNG export market followed the rest of the world on the score that towards the end of the year the industry began to buckle under the weight of a global glut of the fuel.

Production of LNG in the second quarter of 2020 fell to 19.1MT, the lowest since the third quarter of 2018. In July, Australian projects shipped a total of 5.8MT (85 cargoes), only marginally lower than 5.9MT (85 cargoes) in June, but well below the record level of 7.0MT in December 2019. "From May onwards, the effects of Covid-19 on Australian LNG (in an already oversupplied LNG market) began to hit home," said the report. "Projects began extending maintenance periods to rein in production and experienced cargo deferrals. Of the 85 Australian cargoes shipped during June, 33 cargoes were delayed during the month," it added.

The immediate impact on LNG price realisations was mixed. Producers such as Woodside Petroleum, operator of the North West Shelf and Pluto LNG export plants, with a relatively high proportion of spot cargo sales, felt the biggest price impact. However, the East Coast Australia-Pacific LNG facility and the Santos-run Gladstone LNG saw out the full year to end-June 2020 with little deterioration in realized prices. Total export revenue for the year to June was A\$47.8 billion (US\$34.8Bln), down only

3.8 percent from a year earlier. However, the negative impact on prices and revenues was accelerating thereafter. Export revenue in the second quarter of A\$10.5 billion was down 16.1 percent from \$12.6 billion in first quarter. “Queensland’s LNG projects finished the financial year strongly. All three projects shipped record tonnages in FY 2020,” said the report. “Queensland LNG export revenues were steady at A\$4.16 billion between Q2 2019 and Q2 2020 and up slightly from the first quarter. However, revenues are likely to have turned down from July,” it added.

The latest round of quarterly reports by Australian oil producers laid bare the full effect of the pandemic-led collapse in oil prices. Realised oil prices for Woodside Petroleum, which emerged in Q2 2020 as the country’s largest oil producer, plunged to US\$31 per barrel in the second quarter of 2020, down 55 percent from US\$69 per barrel in the same period of 2019. “The latest price was also down sharply from Woodside’s average realised price of US\$52 per barrel in the first quarter of 2020,” said the report. “The country’s second and third largest oil producers, Beach Energy and Santos, suffered a similar fate to Woodside,” it added.

BEIJING GAS, the growing liquefied natural and pipeline supplier, maintained substantial revenues in the first half of 2020 while profits fell as the company said it was advancing its LNG import projects in Tianjin and Tangshan. First-half revenue for Beijing Gas amounted to HK\$23.11 billion (US\$2.98Bln) compared with HK\$24.25Bln in the first six months of last year, a decline of 4.7 percent. Beijing Gas is mainly engaged in city-gas distribution. It supplies more than 14 billion cubic metres of gas to the Chinese capital Beijing, comprising more than 50 percent of the city’s total gas demand. The company said the whole Beijing Enterprises Holdings group recorded first-half revenues of HK\$32.04Bln (US\$4.13Bln) versus HK\$32.03 in the first six months of 2019, representing a decrease of 6.4 percent, mainly due to the Chinese yuan’s depreciation of around 4.5 percent to the US dollar compared with last year.

Profit attributable to shareholders amounted to HK\$3.57 billion (US\$460.6 million) compared with HK\$4.75Bln in the same period of 2019, a drop of 24.8 percent. Beijing Gas said its aggregate gas sales volumes in the first half came to 8.95 billion cubic metres after combining

with that of its subsidiaries outside Beijing. “Sales were affected by the combination of Covid-19 and the extension of the heating period. Gas sales volume for the Beijing city amounted to 8.58 Bcm, little changed compared with the same period of last year,” said the company. In its business outlook, Beijing Gas said it would intensify efforts in market development with its focus on carrying gas projects and pipeline connection works in the suburbs within the greater Beijing area. “We will strengthen collaboration with the government of Tangshan city outside the Beijing market and endeavour to expand market share,” said Beijing Gas. “We accelerated the construction of its major projects, including the orderly development of the construction works of the Nangang LNG project in Tianjin and the LNG emergency reserve project in Tangshan,” said Beijing Gas.

The Nangang import project being developed at Tianjin is currently scheduled to come on line in 2022 with 10 tanks and up to 2 million tonnes of storage. Completion of the Nangang facility will give the Tianjin region three import facilities to guarantee energy supply security to the Chinese capital, Beijing. The Beijing Gas terminal will have an initial 5 million tonnes per annum of capacity and adds to the supply available from Sinopec’s Tianjin North import terminal and the Floating Storage and Regasification Unit (FSRU) capacity deployed in recent years by China National Offshore Oil Corp. Beijing Gas has also joined PetroChina in the construction of Phase 3 of the Tangshan LNG terminal, which is expected to complete by the end of 2020. “We intend to capture more opportunities both domestically and abroad and we are planning the development of our LNG business by adding value and offering comprehensive energy services,” said the company.

BHP, the Anglo-Australian global commodities company, has awarded the world’s first LNG-fuelled bulk carrier tender to a Singapore-based shipping line with the aim of reducing greenhouse-gas emissions by more than 30 percent per voyage while delivering iron ore from Western Australia to China. Eastern Pacific Shipping (EPS) has been awarded the five-year time charter contract for five LNG-fuelled Newcastlemax bulk carriers from 2022. The bulk carriers will be of 208,000 deadweight-ton. The LNG

bunkering supply contract is expected to be awarded in October 2020.

BHP Chief Commercial Officer, Vandita Pant, said the LNG-fuelled vessels would virtually eliminate sulphur oxide emissions and significantly reduce carbon-dioxide and nitrogen-oxide emissions. “As one of the largest dry bulk charterers in the world BHP recognises the role we play in working with our suppliers and customers to drive actionable reductions in GHG emissions across the maritime supply chain,” said Ms Pant. “The tender marks a progressive shift for BHP and the broader mining and shipping industry and is a significant step toward lowering GHG emissions in the 1.5 billion tonne iron ore seaborne market,” she explained. “We expect the introduction of LNG-fuelled vessels will result in more than 30 percent lower CO2-e emissions on a per voyage basis compared to conventional fuel along the Western Australia to China route,” stated Pant.

The commodities company still holds LNG project interests in Western Australia, including in the nation’s oldest facility, the Woodside-operated North West Shelf plant and is a shareholder in the Scarborough gas field that will underpin the expansion of Pluto LNG in the Burrup Hub. BHP issued the LNG-powered bulk carrier tender in July 2019 and said that it subsequently completed a rigorous due-diligence process to identify and short list tenderers. “Safety, technical and economic factors, as well as a clear demonstration to make a sustainable positive change for the industry, were among the stringent criteria,” said BHP. The company’s CCO Pant said Singapore’s EPS offered a competitive bid and an efficient vessel design with superior fuel efficiency and GHG emissions reductions.

The EPS management team displayed a significant alignment of values with BHP. “The LNG bunkering time charter contract, with a total cost of ownership less than a conventionally fuelled Newcastlemax, will enable BHP to manage the fuel supply risk, build LNG operations capability internally and capture OpEx benefits through optimization of voyage operations and fuel utilization,” said Pant. “As an established provider of marine transportation to the energy market for 60 years, EPS shares BHP’s commitment to lowering emissions in the maritime supply chain and we look forward to working with them to align with the GHG

goals of the International Maritime Organisation,” she added. EPS Chief Executive Cyril Ducau said that with aligned values and sustainability agendas, his company was thrilled to work with BHP on this project. “BHP’s commitment to making a positive change for the industry resonated with our decarbonisation mission and our culture of environmental protection,” added Ducau. “When these vessels are delivered in 2022, they will be the cleanest and most efficient in the entire dry bulk shipping fleet and will be IMO 2030 compliant, eight years ahead of schedule,” stated the EPS CEO.

BOSKALIS Subsea Services of the Netherlands said it completed a multi-million-dollar contract awarded by French energy group Perenco to support a pipeline and gas lifespan extension project in the UK’s Southern North Sea in competition to liquefied natural gas deliveries. The arrival of LNG in the UK gas market was in response to the continuing decline of offshore natural gas fields in the North Sea. The Isle of Grain LNG terminal, a former gas peak-shaving facility on the Medway River east of London, became the UK’s first new LNG import terminal with deliveries by BP when work was completed in early 2005. The Canvey terminal, located across the estuary from the Isle of Grain and used in the world’s first LNG trade from Algeria, was shutdown at the time.

Boskalis Subsea said that one of its dive support vessels (DSV), the “Boka Da Vinci”, was mobilised to replace a 29-metre section of pipeline, which delivers natural gas from the NW Bell field to the Bessemer Platform. The hydrocarbons are then delivered to the Bacton gas complex in Norfolk via the Inde Field, first discovered in 1966, for processing and onward distribution to the UK natural gas grid run by National Grid plc. There are six gas facilities at Bacton, including three terminals run by Perenco, Italy’s Eni and Royal Dutch Shell and which receive gas from Southern North Sea and some Central North Sea offshore gas fields. Initial gas processing, such as removal of free water, takes place on offshore gas installations.

On arrival by pipelines at the onshore terminals gas and condensate are received in slugcatchers to separate gas and hydrocarbon liquids and condensed water. Boskalis said the DSV and 100 crew on board were mobilised from Great Yarmouth Port to the pipeline’s location,

78 kilometres (48 miles) east of the Lincolnshire coast. “This marks our first saturation diving project with Perenco,” said Tim Sheehan, global business development and strategy director for the Dutch company. “Winning this contract on such a high priority pipeline project is testament to our growing reputation for being nimble and successfully delivering safe, integrated, cost-effective services,” added Sheehan.

Perenco is investing in extending the life of two gas fields in the southern North Sea.

The Southern Hub Asset Rationalisation Project combines the Leman and Inde fields into one production hub and will cut production costs. The work includes de-manning and simplifying of the Inde 23A and Leman 27A facilities into normally unmanned installations. Production is sent through to the Bacton gas terminal via the existing PL24 pipeline. “The Southern sector of the North Sea is a highly tidal region with relatively shallow water depths resulting in narrow windows of opportunity for carrying out subsea

remedial work,” said Boskalis. “Our state-of-the-art vessels are well equipped to support the many challenges and tasks associated with inspection, repair and maintenance campaigns in both shallow and deepwater,” the company added. The “Boka Da Vinci” is equipped with two bells for saturation diving work up to a depth of 300 metres and accommodation for up to 120 people. It also has a 140 ton active heave compensated main crane and available main deck space with a load capacity of 3,300 tons. Following a detailed analysis and successful testing of Magma Global’s flexible M-Pipe technology, Boskalis applied rigid spool methods to transport the replacement pipe solution.

The vessel also shipped a mechanical connector from Connector Subsea Solutions, as well as equipment to carry out testing, flushing and cutting services. Boskalis Subsea Services is part of Boskalis’ offshore energy group and serves global deepwater, inspection, repair and maintenance (IRM), SURF and decommissioning markets. The other main UK gas terminals which receive gas

from the UK continental shelf are at St Fergus in Aberdeenshire, at Easington in East Yorkshire, at Theddlethorpe in Lincolnshire and at the Teesside terminal further north.

BRAZIL’S lower house of the National Congress has approved a bill to further open up the natural gas and LNG terminal market to private competition and break the monopoly held by state-controlled energy company Petróleo Brasileiro, known as Petrobras. The bill passed by 351 votes for to 101 against will now go to the Senate for expected final authorization. The new legal framework changes natural gas distribution from a regime of concessions by the government to one of authorizations by the country’s oil and gas regulator, Agência Nacional de Petróleo, Gás Natural e Biocombustíveis (ANP).

Analysts said the first result would be to reduce regulatory obstacles to building new LNG terminals, natural gas pipelines and other infrastructure needed by the South American nation. Petrobras was supposed to have lost the monopoly in the

oil and gas sector by a law passed more than 20 years ago, though in practice kept a virtual monopoly in the natural gas industry. Brazilian congressmen argued that the new natural gas law would attract more than US\$7 billion in private sector initial investments and generate millions of jobs. Petrobras has gradually been scaling back control of Brazil’s energy industry by selling assets, including thousands of miles of pipelines. Petrobras began the binding phase in the sale process in July 2020 of its 10 percent remaining stake in gas pipeline firm Nova Transportadora do Sudeste (NTS) at the same time as reviving the possibility of floating LNG production from some of its prolific offshore oil and gas basins.

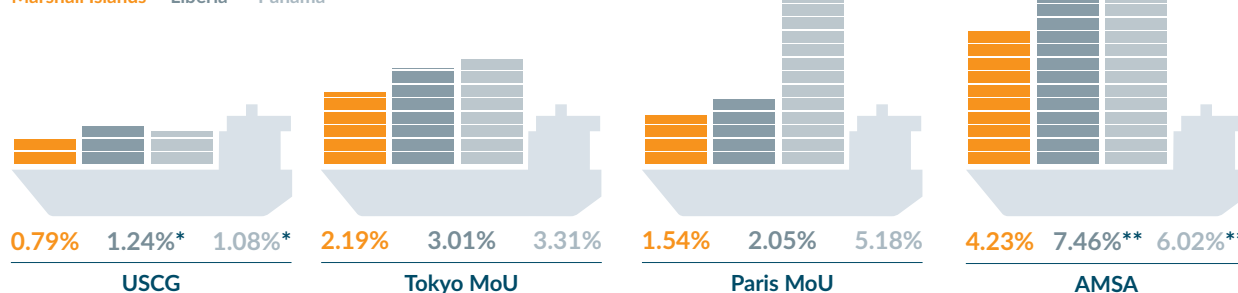
NTS provides natural gas transportation in a network of 2,048 kilometres located in the nation’s southeast and connecting Rio de Janeiro, São Paulo and Minas Gerais. The NTS system is also connected to the Bolivia-Brazil pipeline to the west and natural gas terminals to the east and south. A group led by Canada’s Brookfield Asset



THE MARSHALL ISLANDS REGISTRY

Port State Control Detention Trends (%)

Marshall Islands Liberia Panama



* Liberia and Panama are targeted for additional PSC examinations by the USCG for having a detention ratio up to two times the overall detention average.

Sources: 2019 Port State Control Annual Reports.

** Liberia and Panama have exceeded the overall AMSA average detention rate over the three years from 2017-2019 and Liberia is listed among the top five worst detention rates by flag State.

Fly the world's quality flag

With steadfast quality and unmatched service we consistently outperform other flags. Our record speaks for itself.

www.register-iri.com



International Registries (Far East) Limited
in affiliation with the Marshall Islands Maritime & Corporate Administrators

hongkong@register-iri.com

Management Inc., which in October 2019 bought a stake in the Cove Point LNG plant in Maryland, purchased 90 percent of NTS from Petrobras in 2016 for \$5.2 billion. Ahead of the law being passed Brazil began the process to lease its LNG regasification terminal and associated facilities located in the northeast state of Bahia, a floating storage and regasification unit and the busiest in Brazil. The Bahia terminal in Salvador is one of three controlled by Petrobras in Brazil. The two others at Pecem in the northeast state of Ceara and at Guanabara in the state of Rio de Janeiro and which has been idle since 2018.

While Brazil's three terminals have been significantly under-utilized, the government is now opening the way for third-party access. The natural gas reforms and the reduction in the market power of Petrobras began back in 2015 when the company finalised the sale of 49 percent of Gaspetro, the natural gas distribution firm. Renewables other than hydro power are also expected to grow along with LNG-to-power projects led by companies such as Golar Power. Golar Power is a joint venture partnership comprising Golar LNG and US equity fund, Stonepeak Infrastructure Partners, and its activities are centred on northeast Brazil, including a project in Sergipe, the smallest Brazilian state. Golar Power has also signed an accord with the Brazilian state government of Pernambuco to develop an LNG import terminal in the Port of Suape.

BURCKHARDT Compression, the Swiss manufacturer of compressor systems and a service provider for LNG and other markets, has continued its global expansion by agreeing to acquire the 40 percent of Chinese company Shenyang Yuanda Compressor it didn't already own. Burckhardt has entered into a memorandum of understanding to acquire the remaining stake. It had bought its initial 60 percent of Shenyang Yuanda, based in northeast Liaoning Province, in March of 2016. The Swiss company has previously taken over US and Japanese companies. US subsidiary Arkos Field Services was fully acquired in November 2019. Burckhardt also in April 2020 completed a deal to acquire the global compressor business of Japan Steel Works Ltd. "To finance the China acquisition, Burckhardt plans to issue a bond in the Swiss capital market," said the Winterthur-based firm. Burckhardt offers a variety of compressor solutions

for fuel gas compression that have been specifically designed for marine applications.

Its M-Type Electronically Controlled-Gas Injection (ME-GI) compressor systems are designed for boil-off gas management on LNG carriers equipped with MAN Energy Solutions ME-GI two-stroke engines. Burckhardt also provides its Laby brand compressors for LNG carriers with X-DF propulsion systems and other marine compressors for vessels such as bunkering ships. Burckhardt explained that for the China deal it had held a call option to acquire the remaining 40 percent of Shenyang Yuanda's outstanding shares since May 2020. The company said it planned to exercise this call option in November of 2020. Compressors manufactured by Shenyang Yuanda have been available in selected export markets through Burckhardt's sales and distribution channels since 2019.

Shenyang Yuanda Compressor employs around 650 people in China and generated sales of 100 million Swiss francs (\$110M) in 2019. A new factory in Shenyang will also commence operations at the end of September 2020. The China plant will be commissioned as planned despite a six-week standstill earlier in the year due to the outbreak of Covid-19. It comprises a production area of 86,000 cubic metres, giving 60 percent more factory floor space than two former sites combined. "The land of the current sites will be handed back to the Chinese government," explained Burckhardt. "Construction costs for the new plant and the relocation costs will, therefore, be reimbursed by the government," it added. In its latest outlook, Burckhardt confirmed its guidance for fiscal year 2020 and expects more than 650M Swiss francs in sales as well as stable profit margins.

CLEAN ENERGY Fuels Corp., which has a network of 540 filling station stations for liquefied natural gas, compressed natural gas and gas made from waste across the US and Canada has signed a contract to supply fuel to 800 New York Metropolitan Transportation Authority buses. Clean Energy, based in Newport Beach in California, said it would provide its Redeem renewable natural gas (RNG) brand to the city's buses. "The MTA is a prime example of a major transit agency recognizing the environmental benefits and financial value of RNG," said Andrew J. Littlefair,

President and Chief Executive of Clean Energy. "We're pleased to support their efforts by supplying low-carbon RNG, a cleaner fuel option that will help improve air quality and fight climate change in the region," added Littlefair. Clean Energy said the multi-year agreement is for an estimated 25 million gallons of RNG, made from waste, and which will reduce greenhouse gas emissions.

The Redeem brand is the first commercially available RNG vehicle fuel, derived from capturing methane that is produced from the decomposition of organic waste from dairies, landfills and wastewater treatment plants. The production of the fuel in 2018 attracted French energy major Total as an investor and its hold a 25 percent stake in Clean Energy and has a seat on the board. "Switching to Redeem will reduce the MTA's carbon footprint of its natural gas transit buses," said Clean Energy. Clean Energy is now one of North America's leading providers of the cleanest fuel for the transportation market. Clean Energy builds and operates its network of filling stations and owns natural gas liquefaction facilities in California and Texas. It also transports bulk LNG and CNG to non-transportation customers around the US.

Clean Energy signed an accord with Chevron Corp. in July 2020 to provide truck operators serving the ports of Los Angeles and Long Beach in California RNG. Chevron for its part will provide funding to Clean Energy stations near the ports. The US major's funding will allow truck operators to subsidize the cost of buying new RNG-powered trucks. Clean Energy, meanwhile, will manage the program, including offering fueling services for qualified truck operators.

DELEK Group, whose stakes in the offshore Leviathan and Tamar natural gas fields in the East Mediterranean make it a major supplier to Israel, Egypt and Jordan, posted a quarterly net loss as it prepares to welcome new partner Chevron and a possible LNG project after the US major's agreed acquisition of Noble Energy. The Tamar and Leviathan fields in Israeli territorial water have combined reserves of around 30 trillion cubic feet of gas. Delek Group said it ended second quarter with a net loss of 326 million Israeli shekels (\$97M), mainly arising from one-time accounting provisions.

Delek said the drop in energy prices and the lockdowns applied in Israel and around the world, the group's revenues in

the quarter were 1.94 billion shekels (\$577M), similar to the corresponding quarter last year, driven by a sharp rise in the Group's revenues from core operations offshore Israel and in the North Sea. The group's Delek Drilling subsidiary holds the natural gas stakes and it completed the refinancing of the Leviathan field with a \$2.25 billion loan. Delek Drilling has noted that in recent weeks, after the reporting period, there had been a "significant increase" in demand for natural gas.

Revenues from the sale of gas in Israel net of royalties rose by 64 percent in the second quarter to 498 million shekels (\$148M) compared with revenues of 304M shekels in the same three months of 2019. "The increase was mainly due to the start of gas production from Leviathan, and the sales to the local market as well as exports to Egypt and Jordan," said Delek. The major increase in sales of natural gas and condensate led to a growth in operating profit before one-time provisions were made. Chevron agreed in July 2020 to acquire Houston-based Noble Energy and its assets in US shale basins and the East Med, including the Leviathan and Tamar fields. The definitive agreement valued at \$5Bln between Chevron and Noble has been approved by both boards and is expected to close in the fourth quarter.

Delek Drilling has said the acquisition could mean the development of LNG export project. "Chevron brings a significant LNG capability into the Leviathan project," the Israeli company said at the time. Delek also runs a UK North Sea oil and gas business through its subsidiary Ithaca Energy. The Israeli company said Ithaca's revenues in the quarter were 971M shekels (\$290M) compared with revenues of 350M shekels in the parallel quarter last year. Delek said average daily output by Ithaca amounted to 70,400 barrels of oil equivalent per day compared with 15,200 boe/d in the same quarter of 2019. Delek had acquired the North Sea fields from new East Med partner Chevron.

The company's provisions in the earnings came in relation to the disposal of two subsidiaries, Cohen Development and Phoenix. As the quarterly results were announced, Delek noted that Bill Dunnett had been appointed as CEO of Ithaca. Dunnett, an engineer by training, has 35 years of experience in the field of energy and gas, during which time he served as CEO of Repsol Sinopec Resources UK and in a range of senior

positions in leading energy companies, including Shell, Petrofac and Halliburton. “Delek Group’s core operations continued to demonstrate strong performance in the second quarter,” said Idan Wallace, President and Chief Executive of Delek Group. “Major steps to strengthen both capital and collateral that the company completed during and following the reporting period, provide a tailwind to continue with the successful implementation of the Group’s strategy,” he added.

EAGLE LNG Partners has as helped achieve a first in LNG bunkering. The 18,000 deadweight-ton “Fure Ven”, a dual-fuel products tanker owned and operated by Furetank Rederi AB of Sweden, has become the first non-US-flagged vessel to bunker LNG at a US port. Eagle, a US leader in small-scale LNG development in Florida and elsewhere, supplied the fuel to the Swedish-flagged “Fure Ven” at its terminal and fuel station at Jacksonville in Florida. “This milestone paves the way for more international trading vessels to bunker at Jacksonville Port Authority (Jaxport), marking the latest tangible demonstration of LNG as a safe and reliable fuel solution,” said Eagle. “It also builds confidence in the case for LNG to help the shipping industry meet increasingly stringent environmental regulations, while still generating substantial cost savings,” added the US company.

Furetank is owned by the Höglund family and is a founding partner of the Scandinavian commercial joint venture, the Gothia Tankers Alliance, comprising 32 vessels from various small shipping lines in sizes of 6,000 dwt to 37,000 dwt. For the US bunkering operation, the vessel transited the St. Johns River and called at the Talleyrand Marine Terminal, which also serves the 7dUS shipping line, Crowley Maritime Corp. “Eagle LNG Partners safely transferred 225 metric tonnes of LNG to the vessel from their on-site storage facility, with the bunkering taking less than seven hours to complete,” said the US firm. “The tanker was laden with renewable diesel cargo for Preem, the largest petroleum and biofuels company headquartered in Sweden,” it added.

GAC Group, a global provider of logistics and marine services with Swedish heritage, assisted all parties by broking the LNG fuel and providing ship agency services to the vessel during her voyage across the Atlantic. It was the first

time that GAC’s Bunker Fuels division had secured a deal to supply LNG as a marine fuel. The “Fure Ven” is one of Furetank’s V-Series, a new generation of product and chemical tankers introduced in 2018, which leverage innovative design features and LNG to deliver a fuel reduction of approximately 40 percent. Furetank said these climate-smart vessels have also achieved substantial reductions in emissions. “As early as 2014, Furetank decided to convert one of our vessels to LNG propulsion,” explained Lars Höglund, Chief Executive of Furetank. “We note with pleasure that LNG bunkering is becoming available in more and more places, not least the US, and we are confident that investing in the V-series particularly contributes to a cleaner environment worldwide,” he added.

Sean Lalani, President of Eagle LNG, said his company was delighted to have been part of the re-fueling. “As a pioneer in LNG bunkering and a global leader in small-scale LNG, the team at Eagle LNG is proud to have partnered with the trailblazers at Furetank and GAC, along with numerous crucial stakeholders including JAXPORT, Crowley Maritime and the US Coast Guard, to safely accomplish this first-ever LNG bunkering in the US of a non-US flagged vessel,” explained Sean Lalani. “It is only fitting that this first bunkering happens in Jacksonville where JAXPORT, local officials, and the community have embraced the shipping industry’s transition to the more sustainable, affordable LNG,” he stated. Eagle LNG also praised the “pioneering spirit” of its partners at Crowley Maritime, with whom it has completed over 100 bunkerings in North Florida. “We look forward to utilizing our experience and assets to bunker more international vessels from this facility and our future operations in the Caribbean Basin in the coming months and years,” Lalani concluded.

EXMAR, the Belgian shipping line with a fleet of more than 40 vessels, posted its best first-half results of recent year and gave an update on the “Tango FLNG” production barge “force majeure” ongoing since June as well as the latest events relating to its financial position as a going concern. The operating result in the first half of 2020 was US\$19.2 million, including a provision for uncollected revenue of \$17.7M from YPF on the “Tango FLNG” deployed at Bahai Blanca port in Argentina. Exmar said the “Tango

FLNG” had delivered five shipments, or 624,000 cubic metres of LNG, to date with an availability of 99 percent. “The Winter regime is in place now in Argentina and liquefaction activities have been stopped as from 11 May as per our customer’s instruction,” explained Exmar.

Exmar first announced the YPF “force majeure” on June 25, 2020. “Exmar considers the notice to be unlawful, has reserved its rights and is considering its best option to defend its interests,” said the Antwerp-based company. “Since the last payment received in June 2020, in respect of the production in March 2020, further payments have been suspended on the ground of the alleged ‘force majeure’ and management has registered a provision for uncollected revenues of \$17.7M,” explained Exmar. The company’s FSRU barge known as “FSRU S188” continues serving under the charter party with international commodities firm Gunvor and arbitration with respect to a dispute under the contract is ongoing.

In conventional LNG carriers Exmar currently only has “Excalibur” in its fleet. It said the ship was on charter to US project company Excelerate Energy until the beginning 2022 at “rewarding levels”. Exmar also gave an update on its liquidity position under its corporate status in Belgium as a “going concern”. The company explained that in the first months of the year Exmar’s liquidity position had evolved positively because of the release on 26 February 2020 by the Bank of China of US\$40M from the debt service reserve account in respect of the financing of the “Tango FLNG”. The amount was partially allocated to the repayment of bridging loans and to cover Exmar’s capital commitments. Then subsequent to the “force majeure” on the FLNG barge the amounts outstanding amounted to \$30.3M of which \$24.1M is overdue.

The company noted that as a consequence of the YPF situation part of the Revolving Credit Facility of €18M (\$21.3M) granted by four banks and underwritten on a 50 percent basis by Belgian credit guarantee company Giganant has been temporally suspended. In addition to its LNG FSRU and FLNG interests, Exmar owns and manages a fleet of almost 40 other vessels including liquefied petroleum gas (LPG) carriers. The first-half operating result for its overall fleet was \$11.3M compared with \$6.9M for the same period in 2019. This increase was mainly explained by increased time-charter rates for the

midsize and VLGCs. “Despite the slowdown in oil and gas production due to the pandemic with a subsequent drop in rates for the VLGCs during the second quarter the rates recovered strongly and also benefitted the midsize segment that resulted in one of the best semesters in recent years,” explained Exmar. “The recovery in freight rates was inspired by strong US LPG production and long-haul LPG shipments. Also, a come-back of LPG demand in India and so more spot LPG imports were noteworthy,” stated the company.

The two VLGCs of about 88,000 cubic metres capacity under construction at Jiangnan Shipyard in China for Norwegian energy company Equinor will be delivered in mid-2021. “In addition to having larger capacity than a conventional VLGC these vessels will also be dual-fuelled with LPG to meet the highest possible emission standards,” said Exmar. “Exmar has reached an agreement in principle for post-delivery financing of the first vessel and is progressing well for the financing of the second vessel,” said the company. Exmar explained that the condensed first-half consolidated financial statements for the period ended 30 June 2020 have been prepared on a “going concern” basis. The main assumptions and uncertainties for Exmar underpinning the “going concern” assessment are concentrated around five key matters. These include the outcome of the dispute with Gunvor ongoing since September 2019, its post-delivery financing of the first Very Large Gas Carrier under construction in China and a positive outcome of the dispute with YPF on “Tango FLNG”. Also weighing on the future is the resolution of the Revolving Credit Facility issue and the refinancing deal for Exmar LPG (the joint venture with Teekay LNG) with a syndicate of banks led by Finland’s Nordea for \$280M to \$310M covering the current facility expiring in June 2021. “Finalization of this refinancing is expected in the fourth quarter 2020,” added Exmar.

FUKUSHIMA Natural Gas Power Plant started to generate electricity at full capacity from its two units in the prefecture where the nuclear plant exploded during an earthquake and tsunami in 2011. It is owned by a group of Japanese utilities and energy companies and will be receiving more liquefied natural gas volumes for the Soma LNG terminal. The power plant was

constructed by Fukushima Gas Power Co., a project company for the power plant and LNG terminal at Soma Port in the Shinchi district of Fukushima with business partners including Japan Petroleum Exploration Co. (Japex). The power plant with two gas turbine combined-cycle (GTCC) units of 590 MWh will use regasified LNG to provide secure power supplies with environmental benefits.

The completion of unit two at the plant means that full commercial operations have been set in motion. Construction of the power plant started in October 2017 and the first generating unit was commissioned in December 2019 and the second in August 2020. Japex has built a second LNG tank at the Soma terminal with 230,000 cubic metres capacity and installed additional regasification equipment to coincide with the start of the second power unit. These have been fully commissioned at the LNG terminal, which was mechanically completed in 2017. “Under the contract with FGP, Japex will manage the facilities constructed in the second phase, as well as the storage and regasification of LNG used for power generation, and the supply of regasified gas to the power plant based on the tolling requirements,” said Japex.

The coastal region of Soma where the LNG terminal is located was inundated by tsunami flood waters following the magnitude 9.0 earthquake and tsunami that struck Fukushima on March 11, 2011. The tsunami reached up to 4 kilometres (2.5 miles) inland from Soma Port. The port is about 45 kilometres (28 miles) north of the Fukushima Daiichi Nuclear Power Plant site that was at the centre of the disaster. The Fukushima Gas Plant project shareholders apart from Osaka Gas and Japex also include Mitsui & Co., Mitsubishi Gas Chemical and Hokkaido Electric Power. “The generated electricity is received by companies that have invested in Fukushima Gas Power, depending on the amount of LNG delivered under the tolling agreements,” said Osaka Gas, part of the Daigas Group. “Daigas remains committed to building a diverse power source portfolio, including environmentally friendly natural gas and renewable energy, and to expanding the electric power business in and outside Japan,” stated the company.

GLENFARNE Group, the owner of the Magnolia LNG export project in Louisiana, has made a request to the Federal Energy Regulatory Commission

for five more years to complete the plant and associated facilities. The regulators had previously approved construction of Magnolia LNG and related pipeline expansions in April 2016 under its previous owner, the Australian-listed company LNG Ltd that ceased trading amid financial difficulties. That approval had required LNG Ltd to complete the project within five years, by April 2021. The Magnolia plant is proposed for a 115-acre site near the Calcasieu Ship Channel. It is designed to produce 8.8 million tonnes per annum of LNG from four Trains. “Unforeseeable developments in the global LNG market have affected Magnolia LNG’s ability to enter into long-term LNG offtake contracts,” privately-held Glenfarne told the FERC in requesting the extension. “Magnolia and pipeline provider Kinder Morgan request a five-year extension of their authorizations, up to and including April 15, 2026, to place the Magnolia LNG Project facilities and Lake Charles Expansion Project facilities, respectively, into service,” Glenfarne added in its Magnolia project filing.

A final investment decision had not yet been taken on Magnolia as it sought to finalize a purchase agreement with a Vietnamese power and import venture in the Mekong Delta. That accord has now lapsed. Glenfarne also acquired LNG Ltd.’s patented optimized single mixed refrigerant (OSMR) liquefaction technology from the Australian administrators. Its purchase of Magnolia boosts the amount of US LNG export capacity Glenfarne has under development to 12 MTPA as it also owns Texas LNG Brownsville. The Texas project received authorization from the FERC in November 2019 for the facility to be sited along the Brownsville Ship Channel.

Texas LNG seeks to supply Permian feed-gas as LNG to global customers along with two other rival projects being developed alongside. These are the Rio Grande LNG project with five liquefaction Trains and over 26 MTPA of output and the smaller scale Annova LNG venture. Rio Grande is own by NextDecade Corp and one of the main shareholders in Annova is Exelon Corp, the utility headquartered in Chicago. All three Brownsville projects have pushed back their investment decisions and original construction and engineering timetables. Glenfarne’s Texas LNG leadership still includes the project’s co-founders, Chief Executive Vivek Chandra

and Chief Operating Officer Langtry Meyer. The sale to Glenfarne by the Australian administrators of LNG Ltd assets did not include the proposed Bear Head LNG project in the Canadian province of Nova Scotia with 12 MTPA of capacity.

GOLAR LNG Partners and Golar Power have entered into a cooperation agreement whereby the parties intend to work together to develop floating LNG terminal hubs. The terms and structure of the commercial cooperation will be worked on a project-by-project basis given the customized nature of each potential terminal which will be floating storage and regasification units (FSRUs). As part of the agreement, Golar Power and Golar LNG Partners, which is listed on Nasdaq, have agreed to terminate the existing omnibus agreement between the entities. “We are excited to formalize commercial cooperation with Golar Power, to leverage the expertise of the Golar Power team to develop FSRU terminals and parcel regasification demand,” said Karl Fredrik Staubo, Chief Executive of Golar LNG Partners. “This agreement will, alongside normal FSRU tendering activity, increase the Partnership’s re-contracting options, and provide an opportunity to potentially earn higher returns than standard FSRU contracts,” added Staubo.

The Golar LNG Partners fleet comprises 10 vessels, including conventional carriers, FSRUs and the floating liquefaction hull the “Golar Hilli Episeyo” operating offshore Cameroon. “The Partnership’s assets provide an opportunity to fast-track global terminal opportunities that should benefit both parties,” stated the CEO. Golar Power is a joint venture partnership comprising Golar LNG and US equity fund, Stonepeak Infrastructure Partners and its activities are centred on northeast Brazil, including a project in Sergipe, the smallest Brazilian state. Golar Power has also signed an accord with the Brazilian state government of Pernambuco to develop an LNG import terminal in the Port of Suape. The 50-50 venture in July 2020 also signed an agreement with Argentinian firm Galileo Technologies to expand its small-scale LNG activities in South America and focusing firstly on Brazil.

The deal with Galileo will enable Golar Power to develop a bio-LNG business based on biomethane. The first Golar Power order from Galileo involves the supply of two micro-LNG plants to

produce about 30 tonnes per day of LNG in a mature gas field in Bahia state, while the other will capture and liquefy biomethane from landfills in Sao Paulo state, with capacity to produce up to 15 tonnes per day of bio-LNG. Golar Power said these projects are designed to fill gaps in Brazil’s gas pipeline network and take natural gas to regions that lack connections.

GTT, the French technology firm and designer of liquefied natural gas storage tanks, has received an order from two South Korean shipyards for tank designs for six LNG carriers for Asian and European owners. GTT said two of the newbuilds will be constructed by Hyundai Heavy Industries on behalf of a European shipping line. The other four vessels will be built by Hyundai Samho Heavy Industries (HSHI), two on behalf of an Asian ship-owner and two for a European ship-owner. Each vessel of the six on order will have a capacity of 174,000 cubic metres. GTT said the ships would be fitted with the Mark III Flex membrane containment system.

The delivery dates for all six carrier are scheduled between the second and final quarters of 2023. “We are pleased to sign this new contract with the Hyundai Group shipyards, which once again confirms that the technologies developed by GTT meet the requirements of our customers thanks to their efficiency and safety,” said Philippe Berterroitière, Chairman and Chief Executive of GTT. GTT has also been increasing its China business and in July 2022 secured another contract for an onshore storage system in northeast Hebei province. While GTT is best known for its LNG storage systems for LNG carriers but is increasing its provision of onshore tanks. The Paris-based company said the onshore order was received from China Petroleum Engineering and Construction Corp.’s North China division for the design of a containment tank with 29,000 cubic metres capacity for an LNG peak-shaving plant in the city of Hejian.

GTT will design the membrane inner tank, which will be fitted with its GST technology and installed on the plant site. Peak-shaving facilities are stand-by sources of natural gas supplies at times of high demand. The onshore storage tank for Hebei is expected to be commissioned during the second half of 2021. GTT also recently received another Chinese order for maritime LNG storage tanks for three

newbuilds ordered by Cosco Shipping, which has a fleet of more than 30 LNG carriers. Those three vessels will have 174,000 cubic metres capacity and the order has been placed with China's Hudong-Zhonghua Shipbuilding. GTT said each of the Chinese newbuilds would be fitted with the No. 96 L03-plus membrane system and the delivery of the vessels is planned between the fourth quarter of 2022 and the second quarter of 2023.

INDIAN liquefied natural gas monthly imports edged higher as shipments cost less and began to gather pace along with economic activity and shipments for September at the nation's largest terminal from Cove Point in the US and from Trinidad. The latest LNG import figures show that imports for July 2020 amounted to 2.19 million tonnes, or more than 30 cargoes, a rise of 6.3 percent compared with July 2019. The cumulative imports for the first four months of the fiscal year came to 7.37MT, which was 7.7 percent lower compared with the 7.98MT received in the April to July period of 2019, according to the data from the Indian Ministry of Petroleum and Natural Gas.

The LNG deliveries to India came mainly from Qatar, Australia, the US and West Africa. The cost of the July cargoes amounted to around \$500M versus \$800M in July 2019. The fourth-month April to July costs were \$1.9Bln versus \$3.2Bln the first four months of the previous fiscal year. More Atlantic Basin cargoes are heading for the Indian market. The 174,000 cubic metres capacity "GasLog Gibraltar" is scheduled to deliver a cargo on September 5 to India's Dahej terminal from the Point Fortin plant in Trinidad. The 165,500 Cubic metres capacity carrier "Meridian Spirit" is scheduled to unload a cargo on September 12 at the Dahej facility from the US Cove Point plant in Maryland, where Gas Authority of India has a tolling agreement. The Ministry added that gross production of natural gas for the month of July, 2020 was 2.443 billion cubic metres versus 2.718 Bcm in July 2019. This was 10 percent lower compared with the corresponding month of the previous year. The cumulative production of natural gas came to 9.228 Bcm for the current financial year from April to July 2020 compared with 10.749 Bcm in the same period of 2019.

Before the Covid-19 outbreak Indian LNG imports had been rising to over 350

cargoes a year as more infrastructure is constructed, including pipelines to reach more industrial and city-gas customers. The main operating terminals on India's West Coast are at Dahej, Hazira and Dabhol, near Mumbai. The newest terminal at Mundra, north of Mumbai, is also now operational and awaiting more shipments. There is additionally the Kochi facility in the southwest state of Kerala and one East Coast terminal at Kamarajar, 25 kilometres north of Chennai Port in Tamil Nadu, and also

known as Ennore. The Mundra facility is co-owned by Gujarat State Petroleum Corp. and the Adani Group and is designed with two storage tanks. With the opening of the Mundra terminal, India now has 42.5 million tonnes per annum of regasification capacity. Of the LNG import terminals in full commercial use, capacity utilisation at India's largest terminal, Dahej, averaged 80.7 percent in the period from April to June, the latest numbers available, and total capacity is 17.5 MTPA.

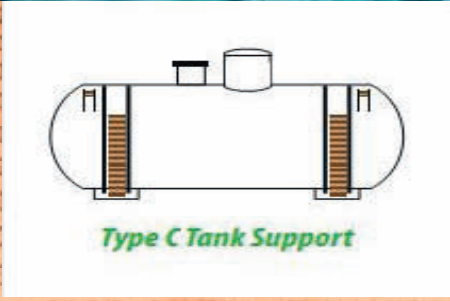
At Hazira it was 87.8 percent from 5 MTPA, while at Dabhol it was 39.3 percent from 5 MTPA. The utilization at the Kochi facility was 14.3 percent for the April-June period from 5 MTPA of capacity and at Kamarajar (Ennore) it was 8.0 percent from 5 MTPA. The newest Mundra terminal had 29.3 percent utilization from 5 MTPA of capacity. The Mundra facility is co-owned by Gujarat State Petroleum Corp. and the Adani Group and is designed with two storage tanks. India's import costs for the



**QUALITY & RELIABILITY
MADE IN GERMANY**






DEHONIT® / PERMALI SUPPORTS

- Floating LNK storage tank
- **LNG fuel tank support**
- Prismatic LNG and LPG tanks (up to 250.000 m³ and more)
- Bilobe, SPB, Prismatic, Cylinder, LNG, LPG, Ethylene, Chemical tanks

DEHONIT® / PERMALI MATERIAL IS APPROVED

- **GL** Germanischer Lloyd
- **BV** Bureau Veritas
- **DNV** Det Norske Veritas
- **LR** Lloyd's Register
- **GTT** Gaztransport, Technigaz
- **DIN ISO 9001 : 2008**
- **ABS** American Bureau of Shipping

FEATURES OF DEHONIT® / PERMALI

- Low specific weight
- High compressive strength
- Water resistant
- Low thermal conductivity
- Low coefficient of friction
- Temperature stability
- Low coefficient of linear expansion

WWW.DEHO.DE

WWW.PERMALIDEHO.CO.UK

previous full 2019-2020 fiscal year fell to \$9.5 billion from \$10.3Bln in the previous 12-month period.

KOSMOS ENERGY, a shareholder with BP of the UK in the delayed floating LNG project offshore Senegal and Mauritania in West Africa, has agreed to sell upstream interests in a portfolio of other frontier exploration assets to a subsidiary of Royal Dutch Shell for around \$100 million, plus future contingent payments of up to another \$100M. Kosmos, based in Dallas in Texas and listed on the New York Stock Exchange, has made the farm-down agreement with the Shell unit, B.V. Dordtsche Petroleum Maatschappij. Under the terms of the agreement, Shell will acquire Kosmos's participating interest in blocks offshore São Tomé & Príncipe in West Africa, offshore Namibia in southwest Africa and Suriname in South America. Kosmos plans to use up to one-third of the initial proceeds to test two high-quality infrastructure-led exploration prospects in the Gulf of Mexico, each offering hub scale potential with a low-cost, lower-carbon development scheme.

Kosmos assets in the Atlantic Margins include a stake in a world-class natural gas development offshore Mauritania and Senegal for which FLNG projects are being developed. Kosmos has said Phase 1 of the Greater Tortue-Ahmeyim project located offshore Mauritania and Senegal was now more than one-third complete. However, work on a breakwater installation was disrupted as a result of Covid-19 mitigation measures, meaning a delay to the project of about 12 months. This added to another delay instigated by Kosmos partner BP for a later delivery of the first FLNG production hull. Kosmos said the delays had resulted in a significant reduction in activity and budgeted spend in 2020, and the BP development carry is now expected to last through 2020 with remaining project expenditure spread over 2021, 2022 and 2023.

At the same time Kosmos is still in the process of selling part of its stake in the Mauritania-Senegal assets. The company expects to use the remainder of the proceeds from the Shell deal to reduce borrowings outstanding under its credit facilities. “With this transaction, we are continuing to focus our exploration portfolio on proven basins that offer superior returns with shorter payback and significant resource potential,” said

Andrew G. Inglis, Kosmos Energy's Chairman and Chief Executive. “The proceeds enable Kosmos to accelerate high graded exploration opportunities while strengthening the balance sheet, positioning Kosmos to create additional shareholder value,” he added. “The contingent payments locked into the agreement with Shell ensure we retain upside from frontier exploration with no further investment,” stated Inglis. Kosmos said it remained focused on its overall exploration portfolio with over six billion barrels of gross resource potential in the Gulf of Mexico and West Africa. “Kosmos also expects to realize approximately \$125M in total savings across capital expenditures and general and administrative expenses over the next two years as a result of the transaction,” it added. Closing of the transaction is expected in the fourth quarter of 2020 with an effective date of September 1, 2020 and is subject to customary conditions, including government approvals.

PETROCHINA posted a wider first-half overall net losses and falling revenues, including on imports of LNG and pipeline gas, but said it was optimistic for rest of 2020 on Chinese domestic demand. The state-controlled Chinese major said in a Web-based earnings presentation that first-half net losses came to 29.98 billion Chinese yuan (\$4.39Bln), of which the loss in the second quarter narrowed compared with the first quarter, “indicating a steady improvement in business” trends. PetroChina is the Hong Kong-listed affiliate of China National Petroleum Corp. (CNPC) and has LNG project stakes in Mozambique and Canada. The company said first-half revenues dropped to 929.04Bln yuan (\$136.06Bln), representing a year-on-year decrease of 22.3 percent.

However, the Exploration and Production segment, one of the company's four divisions, achieved an operating profit of 10.35Bln yuan (\$1.51Bln). The three other operating segments of the Group consist of Refining and Chemicals, Marketing and Natural Gas and Pipeline. International operations do not constitute a separate operating segment of the Group. The Marketing division recorded an operating loss of 12.89Bln yuan (\$1.88Bln), while the Natural Gas and Pipeline segment achieved an operating profit of 14.37Bln yuan (\$2.10Bln). This

was 21.5 percent lower than the 18.30Bln yuan (\$2.68Bln) operating posted in the first six months of 2019.

PetroChina said sales volumes of imported natural gas and LNG recorded a net loss of 11.83Bln yuan (\$1.73Bln), representing an increase in losses from last year of RMB631M yuan (\$92.4M) in the six months. “Under the influence of Covid-19 and the macroeconomic downturn, global natural gas market demand declined, while the international natural gas prices dropped across the world and LNG spot prices in Europe, America and Northeast Asia hit record lows,” said PetroChina. PetroChina operates three important Chinese LNG import terminals at Dalian and Tangshan in the northeast of the country and at Rudong in the central Jiangsu province in the coastal area near Shanghai. PetroChina additionally receives natural gas pipeline supplies from the Central Asian states of Turkmenistan, Kazakhstan, Uzbekistan as well Russia through CNPC. “The growth of demand for domestic natural gas slowed down and output of natural gas continued to increase relatively rapidly, while the growth of imports of natural gas declined substantially,” it added.

PetroChina said that in the first half, the overall domestic consumption of natural gas amounted to 155.6 billion cubic metres, representing an increase of 4.2 percent compared with the same period of last year. Domestic natural gas output amounted to 95.0 Bcm, an increase of 9.9 percent versus the same period last year. It noted that first-half Chinese imports of natural gas, both pipeline and LNG, amounted to 66.7 Bcm, representing a rise of 3.3 percent compared with the first half of 2019. PetroChina's managing company CNPC now imports pipeline natural gas from Gazprom Power of Siberia project as well as LNG from projects such as the Yamal plant in Arctic Russia and from PetroChina LNG agreements. The Chinese major is part of Royal Dutch Shell's LNG Canada project under its own name PetroChina and has a stake in the Area 4 reserves in the Rovuma Basin offshore Mozambique with Italian company Eni and ExxonMobil.

PETRONAS of Malaysia announced the launch of its LNG delivery service by truck for off-grid small-scale customers across Peninsular Malaysia from the regasification terminal at Pengerang in the state of Johor. “Petronas provides

industries in Peninsular Malaysia that are not connected to the natural gas infrastructure with an option to switch to gas as an alternative form of cleaner energy,” said the company. As part of the pilot phase, Petronas completed its first delivery of LNG to a tyre manufacturing plant for the company, Continental Tyre Alor Setar Malaysia. “The solution forms a part of Petronas's commitment to environmental sustainability and to drive the growth of natural gas usage in Malaysia,” said Adnan Zainal Abidin, a Petronas Executive Vice President and Chief Executive of the company's Gas and New Energy division.

He said that by establishing the necessary infrastructure the national oil and gas company offers customers a cleaner and competitive form of energy for power. “We achieve this by embracing our customers pain-points in our strategies which results in strong collaborations across Petronas's value chain to provide an integrated solution,” he explained. “Ultimately, we provide a one-stop centre for off-grid customers, covering supply, loading facilities and logistic services to ensure that their cleaner energy needs are met,” he added. “The launch of our latest solution is a testament to how Petronas delivers customer-centric solutions through our focus on innovation,” stated Adnan.

Along with other global energy companies, Petronas recently posted a loss due to lower prices and a curtailment of economic activity because of Covid-19. Petronas reported a first-half loss of 16.5Bln Malaysian ringgit (\$3.97Bln) and a 23 percent year-on-year reduction in revenue to 93.6Bln ringgit (\$22.5 billion) on the back of lower average realised prices and a drop in sales volumes for processed gas and LNG. The company said that it was looking at ways of cutting costs, including wage cuts to avoid reducing its number of employees. Petronas President and Chief Executive Muhammad Taufik Tengku Aziz, said the company was considering pay cuts for its more than 47,000 employees in the light of the continued challenging market conditions.

RUSSIAN joint venture companies, fleet owner Sovcomflot and natural gas company and LNG developer Novatek, have signed contracts with a Russian bank and Zvezda Shipbuilding in the Far East to construct and lease 10 ice-breaking Arc-7 class LNG carriers. The Sovcomflot-Novatek venture called Smart

LNG has simultaneously signed long-term time-charter agreements for these 10 vessels with the Novatek-led Arctic LNG II project. In total, contracts for 15 such vessels have now been signed, including shipbuilding, financing with Russian bank Veb.Rf Group, leases and time-charter contracts. The Arctic LNG II project being developed with three gravity-based platforms and the estimated capital expenditure for the joint venture is now put at the equivalent of US\$21.3 billion.

Arctic LNG will produce 19.8 MTPA of LNG as well as gas concentrate from the principal feed-gas resources, the Utrenneye gas field. Novatek holds 60 percent of the Arctic LNG project and four other 10 percent stakes are shared between various shareholders. The 10 percent holdings belong to French major Total, which is also a shareholder in the Novatek company, China National Petroleum Corp., China National Offshore Corp. and a Japanese investor group comprising Mitsui & Co. and the government institution, the Japan Oil, Gas and Metals National Corporation (Jogmec). The contracts for the lead ship in the series were signed by Sovcomflot in October 2019 and the contracts for another four sister ships were signed by Smart LNG in January 2020. Sovcomflot, also known as SCF, continues to implement its strategy, with the goal of steadily growing the company's value through expanding its portfolio of long-term industrial shipping contracts.

"The company point as a special focus on operations in challenging climatic and ice conditions," said Sovcomflot. "With 10 long-term time charters added to this portfolio, SCF \$20 billion in contracted future earning and receivables," stated the Russian shipping line. The vessels will be operated under the Russian Federation flag and the Russian Maritime Register of Shipping (RS) will provide supervision during the construction of the vessel series. The Zvezda complex is located at Bolshoi Kamen on the coast of the Sea of Japan and about 12 miles northeast of the city of Vladivostok. The shipbuilder is owned by a consortium of Russian energy companies, including Rosneftegaz, Rosneft and the financial affiliate of Gazprom, Gazprombank. "Shipbuilding and time charter contracts for 15 Arc7 LNG carriers, signed between 2019-2020, enable the Russian shipping community to play a role in transporting cargoes of strategic importance for the Russian economy, which are generated by

large-scale energy projects in the Russian Arctic," said Igor Tonkovidov, President and Chief Executive of Sovcomflot.

SANTOS, the operator of the Gladstone LNG plant in Queensland and now the majority owner of the Darwin plant in the Northern Territory, said it welcomed the Australian Government's announcement that it planned to unlock new natural gas supply sources and to improve the connectivity of the gas and power markets. Santos Chief Executive Kevin Gallagher said the plans recognise the crucial role that the natural gas industry will play in creating jobs as the Australian economy comes out of hibernation from Covid-19. "More gas supply and more competition equals lower prices for customers, and we must keep the cost of supply down as well," added Gallagher. Australian Prime Minister Scott Morrison launched a three-point programme for the energy industry to boost jobs.

Morrison's "JobMaker" plan is led by proposals for affordable, reliable and more secure energy and has three key objectives. "The first is to maintain that downward pressure on electricity prices while simultaneously developing the backbone of a reliable, lower emissions National Electricity Market for the next decade and beyond," said Morrison. "The second is to get more gas, more often and more reliably by resetting our East Coast gas market, unlocking additional gas to drive recovery and paving the way, ultimately, for a world-leading Australian Gas Hub to support high-wage jobs, including and especially in manufacturing," added the PM. "I aim to reinforce Australia's sovereign fuel security - recognising that government must play an active, strategic role to ensure Australians have unbroken access to the essentials of our way of life," he stated.

Santos said it was excited about the government plans and the Adelaide-based company's prospects of developing the Narrabri Gas Project, a 100 percent domestic gas project that will be the cheapest source of gas for customers in the state of New South Wales. The Narrabri Gas venture is expected to be approved before the end of September by the Independent Planning Commission. "The Prime Minister's National Gas Infrastructure Plan is very welcome because there are missing pipeline links that are needed to connect new projects like Narrabri and new basins like the North Bowen, South Nicholson in

Queensland and Beetaloo in the Northern Territory," explained Gallagher. "We also know that the existing pipeline route to southern markets from Queensland is constrained and long. Therefore transport is expensive, so we need more pipeline options to get Queensland gas south by the middle of this decade," explained Gallagher. "If you want to keep transport costs, and therefore gas prices as low as possible, then underwriting projects through transportation contracts, for example, or the establishment of a special purpose vehicle for low-cost financing," added the Santos CEO. "Additional pipeline infrastructure and new supply sources will also obviously build the liquidity the Government and customers are looking for at both the Wallumbilla (Queensland) and Moomba (South Australia) hubs," stated Gallagher.

Santos said that as well as developing Wallumbilla, the Moomba Hub is very important as an additional Australian Gas Hub, not only because it is already the central connection to the whole East Coast gas market and strategically located to receive new supply from the Beetaloo Basin in the Northern Territory, but also because it is the location where we can decarbonise energy at its source with large-scale carbon capture and storage. "We welcome the Prime Minister's comments highlighting the importance of carbon capture and storage and how vital it is to reach our climate aspirations," said Gallagher. "These announcements are good for jobs, good for consumers, good for regional development and good for future resource development and manufacturing in Australia," the Santos CEO concluded. Gallagher said gas producers would work constructively towards an industry-led code of conduct for gas contract negotiations, but that it must apply to all parties, including customers.

PM Morrison pledged to keep coal use in Australia and stated that it would continue to play an important role in the economy for decades to come. "With new technologies such as carbon capture and storage continuing to improve, it will have an even longer life, not just here in Australia, but in our export markets as well," said the PM. He added that Australia had seen an unprecedented influx of renewable generation. "This is not something we have sought to hold back, rather we have encouraged it," he said in reference to wind and solar power. "To back up intermittent renewables, we need firming capacity. Firing keeps the

lights on when the sun isn't shining and the wind isn't blowing. It's a very practical proposition," said Morrison. "Every megawatt of dispatchable generation - coal, gas, pumped hydro batteries - can firm around 2 megawatts of renewables," he said.

SOVCOMFLOT, the Russian shipping line with 31 gas carriers in operation or on order in an overall fleet of almost 150 vessels, has taken delivery of its latest LNG carrier "SCF Barents", chartered to Royal Dutch Shell and named after the 16th-century Dutch Arctic explorer Willem Barents. The ship with capacity of 174,000 cubic metres was handed over at the Hyundai Heavy Industries shipyard in South Korea. After the vessel's naming ceremony, it embarked on its maiden voyage under a long-term time charter agreement with one of Shell's subsidiaries. Sovcomflot President and Chief Executive Igor Tonkovidov, attended the ceremony along with Cederic Cremers, Chairman of the Shell subsidiary in Russia.

Also representatives at the event were the executives of the three European banks which provided the shipping finance, ING Bank of the Netherlands, France's Crédit Agricole and KfW IPEX-Bank GmbH of Germany. Shell executive Catherine Hall, the General Manager of Global Operations and Commercial Services at Shell Trading & Supply was the vessel's sponsor at the ceremony. "SCF Group and Shell have enjoyed a long-standing partnership, which both parties seek to consistently expand and reinforce," said CEO Tonkovidov of Sovcomflot, also known as SCF Group. "For many years, Shell has been amongst the largest charterers of SCF's vessels," he added. "The delivery of 'SCF Barents' is important as growing our fleet of gas carriers is a strategic priority for SCF," stated Tonkovidov. "With the delivery, we now have 15 gas carriers in operation, with another 16 under construction. Thus, two-thirds of all vessels currently ordered by SCF are destined to expand our gas fleet," he explained.

The "SCF Barents" is the second vessel in a series of three with 174,000 cubic metres capacity in the new-generation Atlanticmax series ordered by SCF in 2018. The first vessel of the series, "SCF La Perouse", was delivered in February 2020. "All vessels in the series are designed to maximise their energy efficiency and meet the most stringent environmental standards, with their fuel

consumption substantially reduced compared to the preceding generation of vessels,” said SCF. “Each LNG carrier is equipped with an advanced Mark III Flex cargo containment system, slow-speed dual-fuel X-DF engine, and a system that reduces nitrogen-oxide emissions while the vessel sails in liquid fuel mode,” the shipping line added. “In addition, all vessels of the series are among the first globally to feature a boil-off gas partial re-liquefaction system, which significantly reduces cargo losses while on long voyages or awaiting cargo operations,” said SCF. SCF is developing into one of the world’s premier energy shipping companies, specialising in crude oil, petroleum products and liquefied gas, as well as the servicing of offshore oil and gas production. The Group’s fleet has total deadweight of over 12.7 million tonnes, including vessels owned through joint ventures. More than 80 vessels are of ice class for Arctic waters.

TELLURIAN Inc., the developer of the proposed Driftwood LNG export plant in Louisiana, is making new pitches to investors and buyers as it pointed to a likely surge in demand in China and India as well as nations in Southeast Asia as it pledged to have feed-gas at a price lower than the Henry Hub. In its latest report filed with the US Securities Exchange Commission, Tellurian forecasts that 100 million tonnes per annum of additional construction is needed because of LNG capacity constraints by 2021 as demand increases. Analysts said the company may be keen to still bring India’s Petronet LNG on board or other potential investor-buyers from Asia or elsewhere.

“Haynesville shale gas production of 46 million cubic feet per day from current assets of 1.2 trillion cubic feet will enable Driftwood to supply LNG at a free-on-board (FOB) price of \$3.50 million tonnes per annum,” said Tellurian in its presentation. “Haynesville gas can be supplied at a lower cost than Henry Hub at \$2.00 per MMBtu and delivered to the plant regardless of Henry Hub market index prices,” said Tellurian. “The company’s model for investors ensures interest alignment for joint venture partners who own their share of the LNG at a cost of \$3.50 per MMBtu, comprising \$2.00 per MMBtu for gas delivery, \$0.75 of operating expenses and \$0.75 for debt service,” explained the Houston-based company listed on the Nasdaq global exchange.

Tellurian stated that its integrated model would help avoid the effects of price volatility. “Driftwood LNG will come at a lower cost and will have less price volatility than other LNG price indexes,” the company noted. Tellurian’s Driftwood facility would provide more than 27 MTPA of supply to meet new demand, particularly in China and India. “China and India LNG demand is resilient and imports were up 8 percent and 21 percent respectively through July 2020 on a year-on-year basis,” said Tellurian. The company stated that new Asian markets will also see demand growth of around 41 MTPA by 2025 and these emerging markets could add the equivalent of another South Korean market in the next four years.

Bangladesh, Malaysia, Pakistan and Thailand are facing domestic gas demand increases because of the need for power amid declining indigenous gas production and strong economic growth prospects. The Philippines, Taiwan, Vietnam and Indonesia so far have only 17 percent gas market penetration and with growing gas demand for power, especially as coal and nuclear options fall out of favour. Tellurian additionally expressed its confidence in engineering, procurement and construction contractor Bechtel Inc. of the US, which had also invested \$50M in the project. The company said its fully-wrapped EPC contract had already seen 30 percent of engineering completed and the project was shovel-ready.

The presentation stated that the Driftwood project would be brought to fruition by an experienced team, several of whom helped develop Cheniere Energy’s Sabine Pass LNG export plant, the largest in the US. The executives listed are Executive Chairman and co-founder of Tellurian Charif Souki, who launched Cheniere in 1996 and Meg Gentle, the current President and Chief Executive of Tellurian. They will be aided by former UK BG Group head of LNG, Martin Houston, who is also a co-founder and Vice Chairman of Tellurian. Another key member of the management team is named as Keith Teague, Chief Operating Office and another recruit from Cheniere.

TOTAL and one of its fuel subsidiaries have started construction of a multiple-energy trucking station at the new A1 business park in Deventer in the Netherlands. Total said that alongside the traditional fuels on offer, this multiple-energy station will sell cleaner liquefied natural gas aimed at trucking customers.

The new station is under the auspices of Total unit, PitPoint.LNG, and is the company’s first LNG station in the Netherlands. The multiple-energy truck station, planned to be operational December 2020, is being built on the grounds of the business park, which is within 500 metres of the A1 motorway, via exit 24. “This is an advantageous location for road transportation in the Netherlands and cross-border transport heading to Germany,” explained Total. The station will be open at all times 24 hours a day with two LNG-pumps allowing trucks to fill up. “The most recent LNG innovations are also included: extra cold LNG especially for Volvo trucks and a digital display with LNG filling instructions in 11 languages so that drivers from many different countries can follow the instructions,” explained the French major.

The station is located next to a secured freight parking lot that also gives access to showers and Wi-Fi, making the station a full-service stop. “This project fulfils our objective to grow in low carbon solutions. The transportation sector really needs to become cleaner,” said Marja Versleijen, Director of Mobility and New Energies at Total Nederland NV. “We see LNG as the right transition fuel for heavy road transport and it can be used now to start reducing carbon-dioxide emissions,” added Versleijen. “Our Total Card already allows truck drivers to fill up at four different LNG locations in the Netherlands owned by other companies,” Versleijen explained. “We’re proud that - together with PitPoint.LNG - we will soon be able to offer cleaner fuel for road transport ourselves as well,” she added. Total noted that a full tank from the A1 station at Deventer is enough to reach every corner of Germany, where trucks driving on LNG are free of motorway toll charges until the end of December 2023. This saves €0.187 cents per kilometre in trucking costs.

TURKEY faces huge energy benefits from the Tuna-1 Black Sea natural gas discovery, with estimates suggesting the country could save up to \$20 billion in import costs for LNG and pipeline natural gas deliveries. Turkey currently imports pipeline gas from Russia, Azerbaijan and Iran, while LNG imports have continued to grow with Algeria, Nigeria and Qatar all having long-term Turkish LNG supply contracts while the US has been shipping an increasing number of cargoes. The discovery was reported to have had an

initial gas reserve volume of around 320 billion cubic metres, though the size of its actual recoverable reserves is still uncertain. “A successful development of the field would represent a substantial reduction to the country’s import costs of between \$200 million and \$1.5 billion per year, based on the field’s break-even price range and Turkey’s average gas import price for 2020,” according to a report from energy consultants Rystad Energy. “The timing of the discovery could hardly be better, as nearly 40 percent of Turkey’s contracted import volumes, representing 24 Bcm out of the country’s 59 Bcm per annum imports of pipeline gas and LNG, are set to expire in 2020 and 2021,” said Sindre Knutsson, Rystad Energy’s Vice President Gas Markets.

A successful development of the Tuna-1 discovery could offer Turkey significant natural gas supplies at much more competitive terms, taking effect from the field’s estimated start-up date of 2028. Rystad estimates that the break-even price for the field to be between \$3.00 per million British thermal units and \$3.50 per MMBtu, significantly below the cost of imported gas. The report noted that the import price for LNG to Turkey in 2020 will average about \$4.70 per MMBtu, including both Brent-indexed contracts and spot volumes. “We further estimate that the average price of Brent-indexed pipeline imports to Turkey will be about \$6.40 per MMBtu this year,” said Knutsson. “The effect of weak Brent prices this year will be seen in the second half of 2020, as Brent-indexed gas prices are normally priced with a lag of three to six months,” he added. “We do not expect the volumes from the Tuna-1 field to come online before 2028, but the prospect of a new competitive source of gas, and the confidence that Turkey will be less reliant on imports in the future, will increase the country’s bargaining power in relation to its current suppliers,” he explained.

The report stated that Turkish buyers will likely be keen to move away from oil-indexed contracts and instead use a European price benchmark, such as the Dutch Title Transfer facility (TTF), to which they can index their contracts. Meanwhile, Turkey’s natural gas demand is set to recover after seeing two consecutive years of falling gas consumption. This development was driven primarily by declining demand from the power sector, where gas has been displaced by renewable energy, including hydro, wind and solar. Total natural gas demand declined to 44 Bcm in 2019 after

reaching a record of 52 Bcm in 2017. Rystad forecasts that Turkish demand for gas will rebound to 59 Bcm by 2030 and 71 Bcm by 2040. The two main sectors contributing to this increase are the industrial sector, driven by high economic growth, and the residential sector.

Natural gas demand in the power sector, however, is expected to continue to slide gradually as both renewables and coal-fired power plants are poised to displace gas in the coming decade. “We forecast that demand for natural gas in the power sector will decline from 14 Bcm in 2019 to 13 Bcm in 2030,” said Rystad. Turkey is entirely reliant on imports at present to meet its natural gas demand, as domestic production stood at only about 0.3 Bcm in 2019, thereby representing less than 1 percent of domestic demand. “Turkey remains heavily dependent on pipeline imports of gas from Russia, Iran and Azerbaijan, which collectively accounted for about 33 Bcm, or 73 percent of total imports, in 2019,” added the report. The growth in the LNG market has, however, allowed Turkey to diversify its supply sources,

opening the market to a long list of LNG exporting countries. “US LNG cargoes are attractive for Turkey, replacing supplies from other traditional sources of pipeline gas such as Russia and Iran, both of which have Brent-indexed long-term contracts with the country,” the report noted. Rystad estimates that Turkey’s pipeline imports will fall from 33 Bcm in 2019 to 30 Bcm in 2020, while total LNG imports will increase by 50 percent from 12 Bcm in 2019 to 18 Bcm in 2020.

US Department of Energy data published in September illustrated mixed monthly liquefied natural gas prices, lower volumes and two Asian nations, Japan and India, overtaking two continental neighbours Mexico and Chile in volume terms in the overall standings of cargo recipients. US cargo prices were mixed in July 2020 compared with June, according to the new DoE report. Two of five large US facilities operating had higher prices in July, while three others had lower prices. The Corpus Christi plant in Texas, belonging to Cheniere Energy, had higher prices compared with

the previous month along with Sempra Energy’s Cameron LNG plant. The proportion of spot cargoes compared with the contracted and other tolling-based deliveries has declined in 2020. The number of overall spot cargoes dropped in July to 8.8 percent.

The total volumes shipped since February 2016 came to 5,107.8 Bcf of which 449.6 Bcf were spot shipments.

The average year-to-date prices for each plant (from the export point) from highest to lowest in May 2020 were: Cove Point (Maryland) \$6.34 per million British thermal units, Cameron (Louisiana) \$5.70 per MMBtu, Sabine Pass (Louisiana) \$4.97 per MMBtu, Freeport (Texas) \$4.71 per MMBtu, Corpus Christi (Texas) \$4.30 per MMBtu and Elba Island (Georgia) \$2.99 per MMBtu (just two cargoes shipped (by July) since December 2019). Since US LNG exports began more than four years ago in February 2016, the DoE said a total of 1,568 cargoes had been shipped on LNG carriers and 489 in ISO containers through July 2020 to 38 different countries, including to four

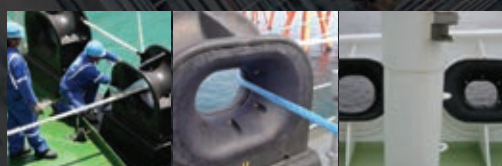
nations in the Caribbean who receive ISO containers. The top five countries of destination represented 54.7 percent of total US LNG exports in July 2020 and China remained in the top five group as India also arrived. The top five destinations for cargoes in July were: Spain (13.7 billion cubic feet - five cargoes); Japan (10.6 Bcf - three cargoes); South Korea (10.5 Bcf - three cargoes); China (10.4 Bcf - three cargoes), and India (7.4 Bcf - two cargoes).

A total of 31 cargoes were shipped in July compared with 34 in June 2020 and 51 shipments in July 2019. The list of the Top 10 countries of destination overall since 2016 through July 2020 showed two Asian nations, Japan and India, overtaking Mexico and Chile respectively in volume terms and for the Japanese in numbers of cargoes as well. The Top 10 recipients of US LNG by numbers of cargoes, are: 1) South Korea 239 cargoes. 2) Japan 154. 3) Mexico 150. 4) Spain 112. 5) China 82. 6) UK 78. 7) India 74 (252.2 Bcf). 8) Chile 75 (236.7 Bcf). 9) France 63. 10) Turkey 53. The Sabine Pass plant dispatched 11 cargoes in July, Cameron

AN EVOLUTION IN MOORING TECHNOLOGY WITH SAFETY IN MIND

The patented low friction Nylacast Chock Liner® delivers safe and reliable moorings and can be fitted to new vessels or retro fitted to existing vessels with NO hot works resulting in

**REDUCED ROPE WEAR
INCREASED SAFETY
CORROSION RESISTANCE
MAINTENANCE REDUCTION
LOAD BALANCING
OCIMF COMPLIANCE**



www.chockliner.com | chockliner@nylacast.com

(10) Cove Point (6), Corpus Christi (3), Freeport (1) and Elba Island (0). The average year-to-date price of US LNG through July 2020 was \$5.05 per MMBtu versus June's \$5.39 per MMBtu. Prices of shipments from the Sabine Pass export point in July averaged \$4.63 per MMBtu (\$4.93 per MMBtu in June). Shipments from the Cove Point plant in July cost an average of \$6.09 per MMBtu (\$6.29 per MMBtu in June). Prices at Corpus Christi in July averaged \$5.33 per MMBtu (\$3.90 per MMBtu in June). Cameron plant exports cost an average price of \$5.79 per MMBtu in July (\$5.37 per MMBtu in June). The Freeport facility posted average July prices of \$4.68 per MMBtu (\$5.07 per MMBtu in June). The Elba Island plant shipped no cargoes in July and just its second cargo in January 2020 at a price of \$2.57 versus \$3.77 per MMBtu for the December 2019 cargo. The US also sends regular ISO containers by cargo ship to the Caribbean nations of Barbados, the Bahamas and Haiti. In July, a total of 16 containers were delivered versus 15 in June. The recipients were Bahamas eight, Barbados four and Haiti four while no ISO containers reached Jamaica in July.

VIETNAM is making progress on several liquefied natural gas import projects to support associated power plants and one such venture in Bac Lieu Province in the southern Mekong Delta has signed a technology license agreement with Stena Power and LNG Solutions for jetty-less LNG receiving and regasification technology. The Bac Lieu terminal development company, Singapore-based Delta Offshore Energy, will employ Stena's Autonomous Transfer System (ATS) and Self-installing Regas Platform (SRP) solutions to provide energy for its 3,200 megawatts power plant project. "We are honored to play a key part in this important and large-scale energy infrastructure project in Vietnam," said Svein Hellesmark, Chief Technology Officer of Stena Power and LNG, whose

head office is Gothenburg, Sweden. Delta Offshore had received an investment policy decision and registration certificate to be the exclusive owner of the project in Bac Lieu Province which is the largest foreign direct investment in Vietnam in 2020. "The project is also the first coal-to-gas conversion in Vietnam, the first integrated LNG-to-power project in Vietnam, Vietnam's first approved 100 percent foreign IPP in thermal power plant as well as the country's first floating LNG terminal," Stena noted. "We have been cooperating closely with Delta Offshore on this groundbreaking project for more than two years," added CTO Hellesmark. "At Stena we offer innovative solutions across the LNG value chain. Our Jetty-Less LNG technology is complemented by considerable LNG competence and experience in new-building project support, ship management and marine engineering," he stated.

Bobby Quintos, Managing Director for Engineering at Delta Offshore explained that the metocean and tidal conditions in Bac Lieu are "very challenging" from a traditional FSRU deployment perspective. "The additional benefits of a lower Capex and modular design also fits nicely to the Delta Offshore model of innovation and efficiency in our LNG-to-Power solutions," added Quintos. The first phase of the Bac Lieu project will see investments of around \$1 billion in Vietnam's power sector with construction expected in four distinct phases through to 2026. The Vietnamese government has also mentioned three other LNG-for-Power projects with import facilities, including a 4,000MW plant in the northern port city of Haiphong. A third LNG terminal is envisaged adjacent to a gas-fired power station in Ninh Thuan province, south of Cam Ranh Bay. A fourth project is at Long An, also on the Mekong Delta, and this will see the development of yet another 3,000MW power plant.

WINTERSHALL Dea, German oil and gas major, has expressed confidence various projects bringing pipeline natural gas supplies from Russia and Norway in the face of no competition as yet in the largest European Union economy from LNG shipments. Wintershall Dea noted in a business update that Germany had experienced a fuel switch so far in 2020 with 70 percent of electricity is now supplied by natural gas and renewables, while coal only contributes 12 percent. Mario Mehren, Chief Executive of Wintershall Dea noted that the past quarter had been one of the most difficult for the energy industry in a long time with oil and gas prices 50 percent below the previous year and the global economy struggling due to Covid-19. "There's no doubt that the past quarter has been the most difficult for our industry in a long time," said Mehren in his statement. "That makes it all the more important to create stability even under the greatest pressure," he added. "We've succeeded in this as Wintershall Dea continued to keep production stable in the second quarter and we even managed to reduce our production costs to a record low. This gives us a good, resilient cost structure," stated the CEO.

Wintershall Dea has close ties with Russia's Gazprom, the largest pipeline gas producer to Europe and a competitor to LNG which Germany is planning to start importing in the next couple of years. The German North Sea coast LNG terminal project at Wilhelmshaven has just invited market participants to express binding interest in terminal capacities. Wilhelmshaven LNG, a unit of German utility Uniper, is seeking binding booking requests starting from the 14th of September 2020. The Wilhelmshaven terminal will be a floating storage and regasification unit (FSRU) with of send-out capacity of more than 9.5 billion cubic metres per annum. A second German LNG terminal is being developed by a Dutch-led joint venture onshore at Brunsbuettel on the Elbe River near

Hamburg. That project expects to make a final investment decision soon after binding import contracts have been finalised at the end of 2020. RWE, Germany's largest utility and power producer and whose headquarters are in the city of Essen, has secured potentially 5 Bcm of import capacity at Brunsbuettel as it also seeks a wider role for the facility.

Brunsbuettel's developers are Dutch gas network operator Gasunie, German tank storage provider Oiltanking GmbH, and Dutch storage company Royal Vopak. On the German pipeline gas front and outwith the controversial Nord Stream II project under the Baltic Sea from Russia opposed by the US, Wintershall Dea said that for its part it was successfully delivering important exploration and production projects for pipeline natural gas even under the current difficult conditions. Wintershall Dea is one of the European companies co-financing the 55 Bcm per annum Nord Stream I gas pipeline from Russia to Germany and CEO Mehren has said he was confident the project would be commissioned soon. The others are French utility Engie, Austria's OMV, Anglo-Dutch major Royal Dutch Shell and Uniper. Achimgaz, Wintershall Dea's own joint venture with Gazprom in Siberia, reached another landmark and produced its 50 billionth cubic metre of natural gas. The Block 1A of the Achimov formation is the gas field with the largest reserves in Wintershall Dea's portfolio. "Production started in 2008 and provides a model example of the German-Russian energy partnership," said Mehren.

The E&P projects also include the Dvalin natural gas project in Norway, which will commence production on schedule around the start of 2021. The German company said its production during the last quarter amounted to 606,000 barrels of oil equivalent per day. "We've managed to further reduce our production costs, which were already low compared with the rest of the industry, to \$3.5 per boe. This is particularly important given the sharp drop in prices," explained Mehren.

WOOD MACKENZIE, the energy consultants, said import terminals for liquefied natural gas currently under construction are expected to hit a 10-year high at 144 million tonnes per annum of capacity in 2020 to prepare for increasing LNG demand in the years ahead. A report from UK-based energy consultants Wood Mackenzie said the regasification

Diary of events

November 2020
Abu Dhabi International Petroleum Exhibition & Conference 2020 (ADIPEC)
Nov 9-12 2020
Abu Dhabi National Exhibition Centre (ADNEC), Abu Dhabi, UAE
<https://www.adipec.com>

December 2020
23rd World Petroleum Congress
6 - 10 December 2020
George R. Brown Convention Center
1001 Avenida De Las Americas,
Houston, Texas, USA
<https://www.wpc2020.com>

February 2021
2nd American LNG Forum
09-10 February 2021
Hotel Marriott Marquis Houston
1777 Walker St, Houston, Texas,
77010 USA
<https://americanlngforum.com>

capacity includes 33 new terminals which will add 92.8 MTPA and expansions to existing terminals, adding 51.0 MTPA. “The world’s fastest growing demand centre, China, is unsurprisingly leading the regas capacity additions, accounting for over a third or 52.6 MTPA of total regas capacity including 22.4 MTPA at 10 new terminals,” said Wood Mackenzie.

Wood Mackenzie research director Giles Farrer said access to capacity in China was being shaken up, with the new national pipeline company, PipeChina, likely to take ownership of a number of national oil company-owned terminals soon. “China also suffered from delays in capacity additions due to Covid-19, with expected expansion of the Caofeidian and Rudong terminals facing risks of slipping to 2021,” added Farrer. The report said schedules in South Asia had also been impacted by Covid-19 with delays to construction of pipeline infrastructure, limiting send-out from some of the terminals. It noted that India was also building five new terminals with 20.0 MTPA of total capacity. Europe may see up to 13.0 MTPA of additional capacity from expansion projects until 2025 across the Netherlands, Poland, France, Greece and the UK. Wood Mackenzie said it expected a total of seven regasification terminals to take final investment decisions (FID) this year.

Three new terminals projects, Cyprus LNG, and China’s Yantai LNG and Tianjin LNG, were given the green light in the first half of 2020. “We think a further four terminals have a good chance of reaching FID before the end of the year: Alexandropoulos LNG, in Eastern Greece, Hong Kong LNG, Vila do Conde terminal from Golar, located in North Brazil and Puerto Sandino, in Nicaragua,” said Farrer. A total of four new projects have started receiving cargoes in this year. These include Brazil’s Sergipe LNG, India’s Mundra LNG, Puerto Rico’s San Juan project and most recently Myanmar’s Thanlyin project. Wood Mackenzie’s Asia LNG Research Analyst Otavio Veras added that Southeast Asia had been an important region for terminal development this year. “Vietnam and Myanmar have both completed terminals in record time to help stave off looming power shortages,” said Veras. “The Hai Linh Company has completed construction of a terminal in Vung Tau, Southeast Vietnam, and plans to begin commercial operations by in the second quarter of 2021.” Added Veras. “In Myanmar, a small-scale terminal, located

in Thanlyin, near the capital Yangon, received its first LNG cargo from Petronas in May 2020,” he stated.

The report said the developers of both the Vietnam and Myanmar terminal projects had taken more risk to deliver their projects. “Both terminals are privately owned and started construction before any sales and purchase agreements were signed,” it explained. “In Myanmar, novel offloading systems, operated by LNG-Easy have also been used to begin imports before terminal construction is complete.” Stated the report. Wood Mackenzie said that perhaps the most interesting development is the proposed global terminal developments in Southern Mozambique where an import facility is targeted for construction in the first quarter of 2021. “Although demand in Southern Mozambique is presently modest, the terminal will also target demand in Northern South Africa to replace decline at the Pande and Temane fields, which currently supply gas to more than 30 industries in the Maputo-Matola area and also to South Africa, through the 865-km ROMPCO pipeline,” said Farrer.

WOODSIDE Petroleum, the Australian liquefied natural gas operator, plans to make the proposed Burrup Hub in Western Australia a globally competitive LNG venture with measures such as debottlenecking the offshore Scarborough gas field. “The debottlenecking we are looking at is aimed at increasing the capacity of the offshore part of the system for Scarborough and we can do that for a modest amount of anywhere between \$100 million to \$200 million of capital,”

explained Chief Executive Peter Coleman in a recent briefing to analysts. “It’s mainly around increasing the pipeline size and so telescoping the pipeline,” said Coleman. “Some parts of the pipeline are limited in diameter because of the water depth they are in, but as we get into the shallower waters, we have identified an opportunity to increase the diameter, therefore decreasing the backpressure on the platform,” the CEO added.

Coleman stated that this move has the potential to take the project from an offshore LNG equivalent of 6.5 million tonnes up to 8 million tonnes, plus the company’s domestic natural gas commitments. The CEO added that minor modifications to the onshore plant would also be necessary. “The assumption is that we’ve got two options that we are still optimising,” said Coleman. “One is a closed loop option within the Pluto site itself where we would potentially back out Pluto Train 1 volumes,” he added. “The other option there on that side is increasing the capacity of Train 2 and this type of design of Train has a history of being able to produce above nameplate capacity so we’re looking to see if we can bring that opportunity forward,” stated Coleman.

He also explained that there was a second main option to side stream it across to the North West Shelf (field). Coleman also noted that the foundation contract holders for Pluto LNG Train 1, the Japanese utilities Tokyo Gas and Kansai Electric, would face changes to their plant status. Coleman said the company had chosen not to extend the contract of one of the buyers and was in negotiations with the second one.

Coleman also mentioned progress on the Sangomar field development offshore Senegal in West Africa for which a final investment decision was made at the start of the first half. “We moved straight into project execution to support our targeted first oil in 2023,” said Coleman. “A number of activities have progressed, although we’ve also been closely managing the risks of Covid-19 on the supply chain and project schedule,” he added.

He mentioned advances made on the Sangomar field’s floating production, storage and offloading (FPSO) unit. “The oil tanker, which will be converted to the FPSO, was purchased by our contractor in February and will undergo tank inspection and cleaning this year, with modifications targeted to commence in the fourth quarter,” he added. “Technical work is steaming ahead with detailed design engineering for the FPSO and the commencement of major topsides equipment fabrication,” said the CEO. “Our contracting and procurement team has also been busy with purchase orders for long lead items being awarded in readiness for drilling operations targeted to commence in mid-2021,” he concluded. Woodside has also given notice of exercising its pre-emption rights on the sale by UK oil and gas developer Cairn to Russian company Lukoil of its Sangomar assets. Lukoil agreed to purchase the entire Cairns participating interest in Senegal’s Rufisque Offshore, Sangomar Offshore and Sangomar Deep Offshore (RSSD) joint venture. In accordance with the joint operating agreement, the terms of Woodside’s acquisition of Cairn’s entire stake will reflect those of the Cairn-Lukoil transaction. ■

LNG Journal Subscription Package

LNG Journal is a ten-in-one subscription product with end-to-end insight into liquefied natural gas. The LNG Journal platform includes:

LNG JOURNAL	Monthly Online + optional print magazine
LNG UNLIMITED	Online every Tuesday + PDF
GAS TO POWER JOURNAL	Online every Friday + PDF
LNG MARKET TRACKER	Online every Wednesday + PDF
LNG SHIPPING NEWS	Online every second Thursday + PDF
LNG MONTHLY MARKETS	Online Monthly + PDF
LNG CHINA	Online every second month + PDF
LNG NORTH AMERICA	Online every second month + PDF
LNG FUELLING	Online every quarter + PDF
DAILY UPDATES and Newsletters	

Different multi-user options are available on request.
GBP price - UK only
EUR price - Europe only
US\$ price - Rest of the World.



Subscription Contacts

For new subscriptions or general subscription queries please contact:
 Stephan Venter
 +44 207 017 3407
 venter@lngjournal.com

To renew an existing subscription or to upgrade your package, please contact:
 Gabi Weck
 gabi@lngjournal.com

Svanehøj sees success with deepwell cargo (gas) pumps

One piece of equipment that is indispensable for a vessel carrying liquids is a cargo pump and LNGCs are no exception.

LNG Journal's Technical Editor, Ian Cochran, spoke with Danish pump manufacturer Svanehøj, which has successfully marketed deepwell (DW) pumps for small-scale LNGCs.

The company's Rasmus Gregersen explained that the first DW LNG cargo pumps were delivered in 2008. They were fitted on board Anthony Veder's 'Coral Methane'.

To date, Svanehøj has delivered pumps to 46 LNGCs, the largest of which was the 45,000 cu m 'Saga Dawn'.

Gregersen said that the market for LNGCs is mainly divided into two segments - smaller vessels under 40,000 cu m, or large vessels of over 170,000 cu m.

Svanehøj has traditionally focused on developing cargo pumps for smaller vessels under 45,000 cu m and has gained a strong position in this sector.

"But in collaboration with some of our large customers, we are currently working on solutions for the very large LNGCs. The interest has arisen because we have recently developed a pump solution for six new second generation very large ethane carriers (VLECs) which are to be built LNG ready," he said.

He claimed that this was the first time that DW cargo pumps were chosen over submerged pumps for such large tankers. The results showed that Svanehøj's solution helped to ensure 15% more

ethane shipments per year, compared to first generation VLECs.

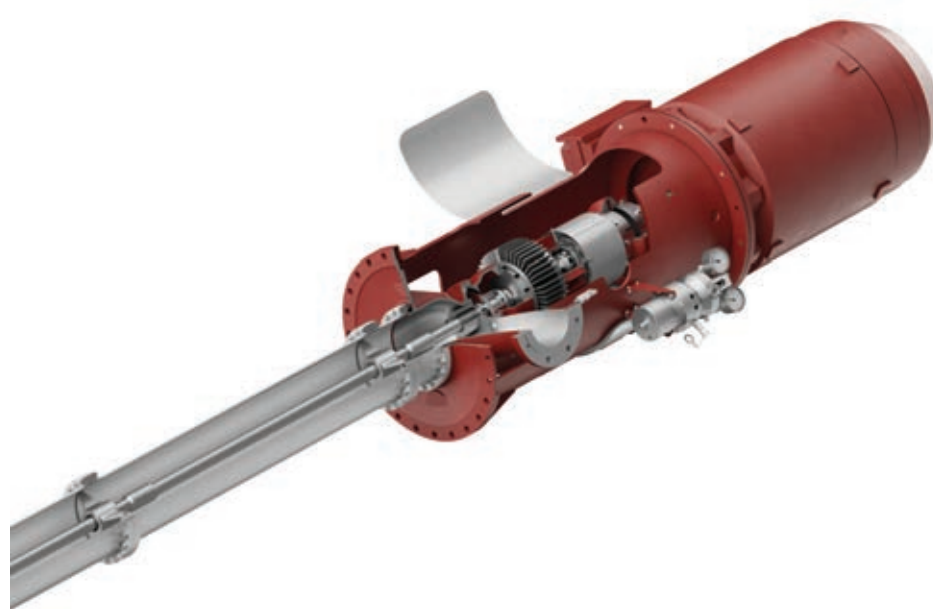
A DW pump is chosen over a submerged pump, because 1) the DW pump can help reduce service time and reduce maintenance costs, as the pumps are accessible from the deck and 2) the DW pump reduces what are termed un-pumpable cargoes and are fully multi-gas capable from LPG to LNG without any extra costs incurred.

Since 'Saga Dawn' was fitted, Svanehøj has supplied DW LNG cargo pumps for 19 projects, including several FSRB's and LNG bunkering vessels. The customers have included Bergen Tankers, Avenir LNG and Stolt-Nielsen Limited.

When it comes to marketing the pumps, the company sells most of the DW LNG cargo pumps to gas contractors, but also trades directly with shipyards.

Gregersen said; "Svanehøj's DW cargo pump is a true multi-gas pump designed to handle all types of liquefied gases; LNG, ethane, LPG, ammonia, ethylene etc. Only minor adjustments in materials are required. Therefore, it is basically the same pump, whether it is installed in an LPG tank or an LNG tank.

"We have built on the experience from the cargo pump to design a DW fuel pump that can also handle all types of liquefied gases including the future fuels, such as ammonia. The fuel pump was launched four years ago and has so far been



A cutaway of a Svanehøj deepwell cargo (gas) pump

installed on 90 vessels, of which 52 are LNG-powered. In several cases, we have delivered both cargo pumps and fuel pumps for the same vessel," he said.

As for servicing the pumps, he explained that although the company does not sell service/after-sales contracts together with the pumps, Svanehøj has experienced increased interest from the market and expects to develop new service concepts in the near future.

Indeed, Svanehøj offers 24/7 support and service worldwide. The global service department offers a wide range of repair and maintenance services; spare parts, replacement pumps and field service.

"The company invests heavily in the service aspect, because we want to make it easier for our customers to purchase original spare parts and authorised services. That is why we opened a large service centre in Singapore in 2019, together with our sister company Hamworthy Pumps," Gregersen said.

'Saga Dawn' project

Svanehøj was involved in the 'Saga Dawn' project as a supplier of six DW cargo (Gas) pumps, three DW fuel (spray) pumps and two DW fuel (marine) pumps – in close collaboration with Wärtsilä, who was responsible for delivering the ship's cargo handling and fuel supply systems.

She is fitted with a patented containment system, called LNT A-BOX, which was developed by LNG New Technologies, whose aim was to open up the construction of mid-size LNGCs to a wider range of shipyards.

According to Wärtsilä Gas Solutions, Lars Nygaard; "With their experience, Svanehøj has been a good sparring partner in the sales phase and they have helped us figure out which pumps would be best to use in relation to, for example, capacity and VFD.

"During gas trials, Svanehøj's engineers were on-site to ensure that the pumps were started up and cooled down optimally. They were also ready to provide advice to the control logic and use of VFD," he said.

'Saga Dawn' was one of the first ships to be fitted with Svanehøj's new DW fuel (marine) pump, built on the technology and design of the the company's DW cargo (gas) pump. One of the major advantages of this DW fuel pump is that the electric motor is located outside of the fuel tank.

"It eliminates the excess heat and pressure, which may otherwise result in a significant energy loss when motors are located inside the fuel tank. At the same time, the pump is much faster and cheaper to install, and service and repairs can be carried out without emptying the tank," said Jens Peter Lund, Svanehøj's Sales Director, Asia.

With the six Svanehøj DW cargo (gas) pumps on board, 'Saga Dawn' can achieve a full-load discharge within 15 hours.

"Our DW cargo (gas) pump handles all types of liquid gases at all temperatures and gravities. It is significantly less sensitive to impurities in the cargo. The motor is located on deck. This means there is no electrical installation or heat source below liquid level," Lund said. ■



'Saga Dawn' seen on gas trials

Jetty-less receiving solution gains traction

There have been a few jetty-less type discharge systems designed for oil and gas sectors down the years. Technical Editor, Ian Cochran investigates

One example was the Hi-Load, which has seen service in the oil sector.

However, a further step down this road was taken in the past few weeks by Stena Power & LNG Solutions, which signed a Technology License Agreement with Singapore-based Delta Offshore Energy (DOE).

This will allow DOE to use Stena's proprietary Jetty-Less LNG receiving and regas technology for an offshore LNG-to-power project to be located in the Bac Lieu Province in Southern Vietnam.

DOE will employ Stena's floating Jetty-Less Autonomous Transfer System (ATS) and Self-installing Regas Platform (SRP) solutions to provide energy for a 3,200 MW power plant project located at Bac Lieu in the Mekong Delta.

Svein Hellesmark, Stena Power & LNG Solutions CTO, said at the signing: "We are honoured to play a key part in this important and large-scale energy infrastructure project in Vietnam. This award demonstrates the trust DOE and its partners have in our Jetty-Less LNG technology.

"We have been co-operating closely with DOE on this ground breaking project for more than two years, which has been an extraordinarily interesting and inspiring journey.

"At Stena we offer innovative solutions across the LNG value chain. Our Jetty-Less LNG technology is complemented by considerable LNG competence and experience in newbuilding project support, shipmanagement and marine engineering," he said.

Bobby Quintos, DOE's Managing Director - Engineering, explained: "The metocean and tidal conditions in Bac Lieu are very challenging from a traditional FSRU deployment perspective, so we had to collaborate with Stena to think of 'out of the box solutions' in order to make this work, thus the development of the Jetty-Less solution for our project.

"The additional benefits of a lower CAPEX and modular design also fits nicely to the DOE model of innovation and efficiency in our LNG to Power Solutions. We are very pleased to work with Stena to usher in the next technological evolution in offshore LNG re-gas terminals," he said.

Stena claimed that the ATS meets the



Artist's impression of Stena's solution operating in the Mekong Delta

industry's demand for lower cost and more flexible LNG import and export transfer solutions. The unit contains all the required equipment, systems and safety features normally installed on a jetty.

All LNGC types

It can be adapted for all LNGCs from small distribution/bunker vessels to the largest existing vessels. Designed to cope with high wave conditions, the semi-submersible unit ensures high operational regularity, and requires low operational expenditure, as no propulsion, additional large machinery or manpower between loading operations, is required.

In addition, an SRP offers a cost effective, flexible and robust LNG regasification solution, capable of meeting increasing demand for small, mid and conventional size LNG receiving terminals.

This solution involves robust jack-up platform technology combined with an industry proven LNG regasification system.

With the legs rooted to the seabed and the platform situated well above the waterline, the SRP is not exposed to wave loads and motions, as is common with traditional LNG regasification barges and FSRUs.

This ensures optimum regasification and gas delivery regularity, Stena said.

Stena Power & LNG Solutions is a Stena Sphere subsidiary located within Stena's Ship Management and Marine

Services entity - Northern Marine Group.

This subsidiary company is the owner of the Jetty-Less LNG to power solutions, including the ATS and the SRP and also a self-installing power plant (SPP).

These solutions are claimed to be particularly suited for the emerging LNG to power market where there may be limited or no existing infrastructure in place. This technology enables the possibilities of importing LNG and providing power to new markets without the need for any fixed infrastructure - no jetty - no breakwater.

They are also ideal for flexible financing and lease offerings.

The solution may also be relocated if the demand or other local conditions should change over time. The Jetty-Less technology is covered under a US Patent granted by the US Patent Authorities in 2018.

Singapore-based DOE is the owner of the 3.2 GW Bac Lieu LNG-to-power project, which comes under Vietnam's national Power Development Plan 7 revised.

Delta received the Investment Policy Decision and the Investment Registration Certificate to be the exclusive owner of the project, which is the largest foreign direct investment agreed in Vietnam this year.

This project is also the first coal-to-gas conversion, the first integrated LNG-to-power project, the first approved 100% foreign IPP in thermal power plant,

as well as the country's first floating LNG terminal.

Talking with Glasgow-based Northern Marine, *LNG Journal* was told that this was the first contract won for this solution.

The company said that it had received considerable interest in the technology and was confident that it was able to fulfil the demand for lower cost and more flexible LNG import and export terminals.

One of the major selling points was that it could operate in harsher conditions than a more traditional FSRU.

Also, in comparison with fixed jetty infrastructure, the Jetty-Less solutions offer cost, safety, availability and uptime, flexible redeployment and environmental advantages, Northern Marine stressed.

In addition, the technologies are available to purchase, lease or sub-lease, offering clients considerable commercial advantage.

When asked if Stena will construct the system on a contractual basis, ie - when a contract is placed, as the dimensions and capacities could be different for each contract, the company replied that the technologies are fairly standardised but each project is unique, both from a technical requirement (such as capacity), site and commercial influences.

"As such we do not plan on building systems on speculative basis," Northern Marine explained.

The Vietnamese solution will be built at a selected shipyard and once built, it will be towed to the final location. ■

LNG bunker training responds to pandemic restrictions

As the Covid-19 pandemic has reconfigured workforces the world over, training for LNG bunker operations has also had to adapt with courses moving online and new forms of engagement emerging, Ray Gillett, General Manager at GTT Training tells LNG Journal's fuelling editor Malcolm Ramsay.

Since the first national lockdowns emerged at the start of the year, companies have faced major restrictions moving employees around the world and as a result face-to-face instruction has largely stopped. For LNG bunker training this has meant a rapid move to create virtual classrooms, bringing trainees together through video streaming platforms.

"All traditional training has had to move online, meaning there has been a move from the classroom to online courses, with all training now conducted by instructors over video," Gillett explains.

Based in the UK, GTT Training is a wholly-owned subsidiary of French gas specialist Gaztransport & Technigaz and until the start of this year its business had centred around a dedicated training centre in Paris, which students would travel to from around the world.

With travel restrictions in place, GTT Training was quick to move courses online, delivering existing content via dedicated video streams and allowing seafarers and other staff in remote locations to continue training on all aspects of LNG bunkering and fuelling from home.

"The only technical aspect of moving the simulator online has been to transfer the software to the cloud so students can access it remotely but all our training was PC-based anyway so it has been relatively straight-forward," Gillett commented.

Changing interactions

While the technology to deliver remote training has generally been easy for students to adapt to, there remain some major differences in the way that training takes place, notably the lack of face-to-face interaction and the impact on the nature of discussion between students.

"One big challenge for trainers has been the lack of face-to-face interaction with the students and the way they control the class. Trainers can't see body language so well and there is a loss of the collaboration effect. It is difficult for students to cut in or have a general discussion around topics," Gillett says.

This lack of a collaboration effect has resulted in instructors subtly changing their interactions and altering the rhythm of classes to ensure that trainees get the maximum benefit from exchanges.

"One limit of online training we have noticed is the length of sessions. Where in the classroom we would typically have an eight-hour day, there is roughly a three-hour limit for online sessions. This means we realistically might do six hours per day and as a result we have changed the format of some modules so a three-day course might then be spread over four days," Gillett explains.

This adaptive approach has proven successful with clients and trainees equally as many now see the benefits for online training going forward, not only in the costs savings associated with a reduction in travel but in the ease of scheduling and planning.

"The key for online is that it must be

simple for end-users to use. There are obviously some hiccups with connections and occasionally users drop out but they are usually back in a few minutes and so far the feedback has been very positive," Gillett states.

Time zone issues

Another important change in training schedules with the advent of travel restrictions has been the fact that students are no longer all in one location. Where trainees and instructors previously travelled to GTT Training facilities for training they may now be spread out across numerous time zones.

This has driven a more flexible approach in training, with courses now arranged by time zone and instructors responding to the challenge by working outside of normal hours.

"A main issue from lockdown has been the inability of clients to move people around and get seafarers to physical locations in the same time zone for training. As a result, we have had to be flexible in offering our training. This has meant adjusting our timings so for example we are now starting trainings at 6am CET for the Far East or running into the evening for U.S. training," Gillett commented.

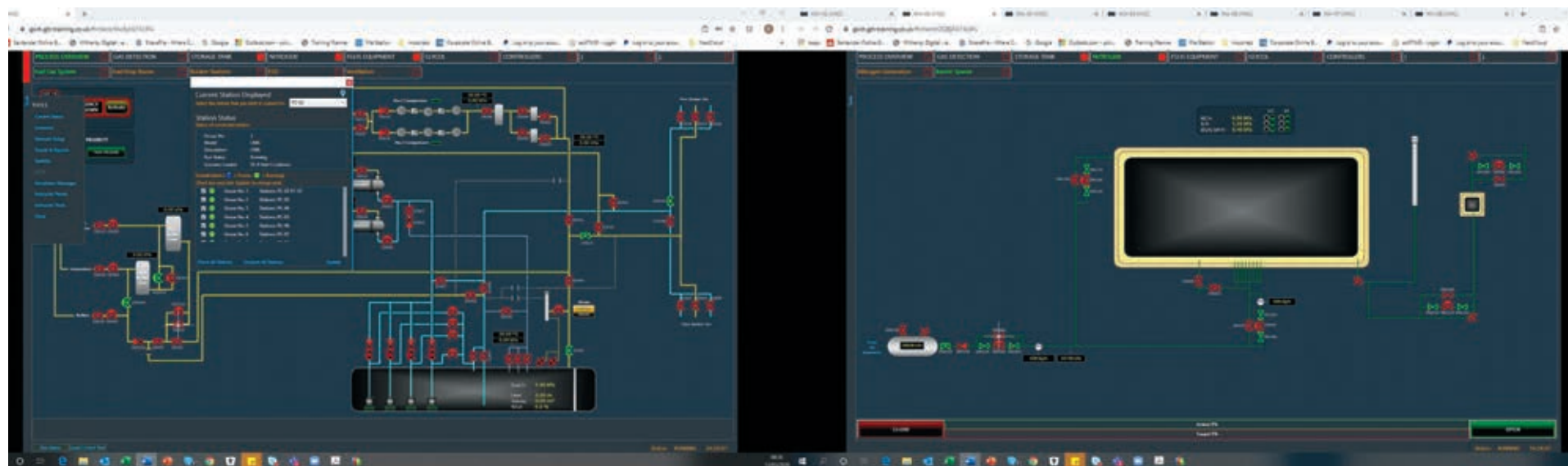
While current travel restrictions arrived as an unexpected blow for shipping lines and travel restrictions remain an unwanted burden for most firms, the outlook for training may not require a full-scale return to the traditional classroom.



Ray Gillett

Near the start of lockdown GTT Training announced a tie up with Singapore-based education provider Wavelink Maritime Institute (WMI), facilitating the delivery of GTT Training's LNG industry related courses at WMI's training facility in Jurong, Singapore and with the success of online courses in the first half of this year the firm now expects remote learning and regional collaborations such as with WMI to play a central part of LNG training in the future.

"I think a lot of companies have realised they can deliver training just as efficiently online, so while there will naturally be some move back to the classroom once travel restrictions are relaxed, the trend towards online is likely to remain," Gillett concludes. ■



View of Instructor desktop for 'G-Sim Online'



World LNG Carrier Fleet

LNG carrier	Capacity m ³	Owned or Ordered by	Builder	Delivery Date	Flag	Power Plant	Cargo System	No. of tanks	Ship built for Export plant
Aamira	266,000	QGTC	Samsung	Dec-10	Liberia	DRL	GTT	5	Qatargas IV
Abadi	135,000	Brunei Gas Carriers	Mitsubishi Nagasaki	Jun-02	Brunei	S	Moss	5	Brunei LNG
Abalamabie	174,900	Bonny Gas	Samsung	June-16	Bermuda	DFDE	GTT	4	Nigeria LNG
Adam LNG	162,000	Oman LNG	Hyundai	Dec-14	Marshall Is.	DFDE	GTT	4	Oman LNG
Adriano Knutsen	180,000	Knutsen	Hyundai	Jul-19	Spain	MEGI-DF	GTT	4	charter
Al Aamriya	210,100	J5 Consortium	Daewoo	Feb-08	Marshall Is.	DRL	GTT	4	Qatargas
Al Areesh	151,700	Teekay LNG	Daewoo	Jan-07	Qatar	S	GTT	4	Ras Gas II
Al Bahiya	210,185	QGTC	Samsung	Oct-09	Liberia	DRL	GTT	5	Qatar-Atlantic
Al Biddah	135,275	J4 Consortium	Kawasaki Sakaide	Nov-99	Japan	S	Moss	5	Qatargas
Al Daayen	151,700	Teekay LNG	Daewoo	Apr-07	Qatar	S	GTT	4	RasGas II
Al Dafna	266,000	QGTC	Samsung	Oct-09	Marshall Is.	LR DRL	GTT	4	Qatar-Atlantic
Al Deebel	145,000	Peninsular LNG	Samsung	Dec-05	Bahamas	S	GTT	4	Qatargas
Al Gattara	216,200	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	GTT	4	Qatargas II
Al Ghariya	210,100	ProNav	Daewoo	Feb-08	Bahamas	DRL	GTT	4	Qatargas
Al Gharaffa	216,200	OSG/Nakilat	Hyundai	Jan-08	Marshall Is.	DRL	GTT	4	Various
Al Ghashamiya	216,000	QGTC	Samsung	Mar-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Al Ghuwairiya	261,700	QGTC	Daewoo	Aug-08	Marshall Is.	DRL	GTT	5	Qatar-Atl'c Basin
Al Hamla	216,000	OSG	Samsung	Feb-08	Marshall Is.	DRL	GTT	4	QatarGas
Al Hamra	137,000	National Gas Shipping	Kvaerner-Masa	Jan-97	Liberia	S	Moss	4	ADGAS
Al Huwaila	217,000	Teekay	Samsung	May-08	Bahamas	DRL	GTT	4	RasGas III
Al Jasra	137,100	J4 Consortium	Mitsubishi Nagasaki	Jul-00	Japan	S	Moss	5	Qatargas
Al Jassasiya	145,700	Maran-Nakilat	Daewoo	May-07	Greece	S	GTT	4	RasGas
Al Kharaitiyat	216,200	QGTC	Hyundai	May-09	Liberia	DRL	GTT	4	Qatargas III
Al Kharaana	210,000	QGTC	Daewoo	Oct-09	Marshall Is.	DRL	GTT	4	Qatargas IV
Al Kharsaah	217,000	Teekay	Samsung	May-08	Bahamas	DRL	GTT	4	RasGas III
Al Khatiya	210,000	QGTC	DSME	Oct-09	Marshall Is.	DRL	GTT	4	Qatargas IV
Al Khaznah	135,500	National Gas Shipping	Mitsui Chiba	Jun-94	Liberia	S	Moss	5	ADGAS
Al Khor	137,350	J4 Consortium	Mitsubishi Nagasaki	Dec-96	Japan	S	Moss	5	Qatargas
Al Khuwair	217,000	Teekay LNG	Samsung	Jul-08	Korea	DRL	GTT	4	RasGas
Al Mafyar	266,000	OSG/Nakilat	Hyundai	Oct-07	Marshall Is.	DRL	GTT	4	Qatargas II
Al Marrouna	151,700	Teekay	Daewoo	Nov-07	Bahamas	S	GTT		Ras Gas I
Al Mayeda	266,000	QGTC	Samsung	Jan-09	Liberia	DRL	GTT	5	Qatar-US/Var.
Al Nuaman	210,000	QGTC	DSME	Dec-09	Marshall Is.	DRL	GTT	4	Qatargas IV
Al Oraiq	210,000	J5 Consortium	Daewoo	Apr-08	Marshall Is.	DRL	GTT	4	Various
Al Rayyan	135,360	J4 Consortium	Kawasaki Sakaide	Mar-97	Japan	S	Moss	5	Qatargas
Al Rekayyat	216,200	QGTC	Hyundai	Jun-09	Bahamas	DRL	GTT	4	Qatar-Atlantic
Al Ruwais	210,100	ProNav	Daewoo	Nov-07	Germany	DRL	GTT	4	Qatargas II
Al Sadd	210,100	QGTC	Daewoo	Mar-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Al Safliya	210,100	ProNav	Daewoo	Dec-07	Bahamas	DRL	GTT	4	Qatargas II
Al Sahla	216,200	J5	Hyundai	Jun-08	Japan	DRL	GTT	4	Ras Gas III
Al Samriya	261,700	QGTC	Daewoo	Sep-08	Marshall Is.	DRL	GTT	5	Qatargas II
Al Sheehaniya	210,100	QGTC	Daewoo	Feb-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Al Shamal	217,000	Teekay LNG	Samsung	Jun-08	Qatar	DRL	GTT	4	RasGas
Al Thakhira	145,000	Peninsular LNG	Samsung	Sep-05	Bahamas	S	GTT	4	Qatargas
Al Thumama	216,000	J5 Consortium	Hyundai	Apr-08	Japan	DRL	GTT	4	Rasgas
Al Utouriya	215,000	J5	Hyundai	Sep-08	Panama	DRL	GTT	4	RasGas
Al Utourma	215,000	J5	Hyundai	Sep-08	Panama	DRL	GTT	4	Ras Gas III
Al Wajbah	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-97	Japan	S	Moss	5	Qatargas
Al Wakrah	135,360	J4 Consortium	Kawasaki Sakaide	Dec-98	Japan	S	Moss	5	Qatargas
Al Zhubarah	137,570	J4 Consortium	Mitsui Chiba	Dec-96	Japan	S	Moss	5	Qatargas
Alto Acrux	147,000	LNG Marine Transport	Mitsubishi	Mar-08	Bahamas	S	Moss	4	Various
Amali	148,000	Brunei-Shell	DSME	Jul-11	Brunei	DFDE	GTT	4	Brunei LNG
Amanl	154,800	Brunei-Shell	Hyundai	Nov-14	Brunei	DFDE	GTT	4	Brunei LNG
Aman Bintulu	18,928	Perbadanan / NYK Line	NKK Tsu	Oct-93	Malaysia	S	GTT	3	Petronas
Aman Hakata	18,800	Perbadanan / NYK Line	NKK Tsu	Nov-98	Malaysia	S	GTT	3	Petronas
Aman Sendai	18,928	Perbadanan / NYK Line	NKK Tsu	May-97	Malaysia	S	GTT	3	Petronas
Arctic Aurora	160,000	Dynagas	Hyundai	Jul-13	Marshall Is.	DFDE	GTT	4	Various
Arctic Discoverer	140,000	K Line	Mitsui Chiba	Jan-06	Bahamas	S	Moss	4	Various
Arctic Lady	147,200	MOL/Hoegh LNG	Mitsubishi Nagasaki	Apr-86	Norway	S	Moss	4	Various
Arctic Princess	147,200	MOL/Hoegh LNG	Mitsubishi Nagasaki	Jan-06	Norway	S	Moss	4	Various
Arctic Sun	89,880	Arctic LNG Shipping	IHI Chita	Dec-93	Liberia	S	IHI SPB	4	ConocoPhillips/Marathon
Arctic Voyager	140,000	K Line	Kawasaki	Jul-06	Bahamas	S	Moss	4	Statoil
Arkat	148,000	Brunei-Shell	DSME	Feb-11	Brunei	DFDE	GTT	4	Brunei LNG
Arwa Spirit	165,000	Teekay LNG	Samsung	Sep-08	Marshall Is.	DFDE	GTT	4	Various

CARRIER FLEET



Aseem	154,850	K Line-Petronet	Samsung	Nov-09	Malta	S	GTT	4	Qatar-India
Asia Endeavour	160,000	Chevron	Samsung	Dec-14	Bahamas	DFDE	GTT	4	Various
Asia Energy	160,000	Chevron	Samsung	Sept-14	Bahamas	DFDE	GTT	4	Various
Asia Excellence	160,000	Chevron	Samsung	Sept-13	Bahamas	DFDE	GTT	4	Various
Asia Venture	160,000	Chevron	Samsung	Sept-17	Bahamas	DFDE	GTT	4	Various
Asia Vision	160,000	Chevron	Samsung	June-14	Bahamas	DFDE	GTT	4	Various
Bahrain Spirit	173,000	Teekay	Daewoo	Sept-18	Bahamas	DFDE	GTT	4	Various
Barcelona Knutsen	173,400	Knutsen	Daewoo	May-10	N.I.S.	DFDE	GTT	4	Various
Bebatic	75,060	Brunei Shell Tankers	Atlantique	Oct-72	Brunei	S	GTT	6	Brunei LNG
Beidou Star	172,000	MOL	Hudong	Oct-15	Hong Kong	DRL	GTT	4	Various
Berge Arzew	138,088	BW Gas	Daewoo	Jul-04	Norway	S	GTT	4	Sonatrach
Bilbao Knutsen	138,000	Knutsen / Marpetrol	IZAR Sestao	Jan-04	Spain	S	GTT	4	Atlantic LNG
Bilis	77,730	Brunei Shell Tankers	La Seyne	Mar-75	Brunei	S	GTT	5	Brunei LNG
Bishu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Dec-15	Panama	S	Moss	4	Australia-Japan
Boris Davydov	172,600	Dynagas	Daewoo	Sept-18	Cyprus	DFDE	GTT	4	Yamal LNG
Boris Vilkitsky	172,600	Dynagas	Daewoo	Jan-17	Cyprus	DFDE	GTT	4	Yamal LNG
British Achiever	173,644	BP Shipping	Daewoo	June-18	Isle of Man	MEGI-DF	GTT	4	Various
British Contributor	173,644	BP Shipping	Daewoo	Oct-18	Isle of Man	MEGI-DF	GTT	4	Various
British Diamond	155,000	BP Shipping	Hyundai	Sep-08	Isle of Man	DFDE	GTT	4	Indonesia-Various
British Emerald	155,000	BP Shipping	Hyundai	Jun-07	UK	DFDE	GTT	4	Tangguh LNG
British Innovator	138,200	BP Shipping	Samsung	Jul-03	Isle of Man	S	GTT	4	Various
British Listener	173,644	BP Shipping	Daewoo	June-19	Isle of Man	MEGI-DF	GTT	4	Various
British Mentor	173,644	BP Shipping	Daewoo	July-19	Isle of Man	MEGI-DF	GTT	4	Various
British Merchant	138,000	BP Shipping	Samsung	Apr-03	Isle of Man	S	GTT	4	Various
British Partner	173,644	BP Shipping	Daewoo	Mar-18	Isle of Man	MEGI-DF	GTT	4	Various
British Ruby	155,000	BP Shipping	Hyundai	Jan-08	U.K.	DFDE	GTT	4	Various
British Sapphire	155,000	BP Shipping	Hyundai	Sep-08	Isle of Man	DFDE	GTT	4	Tangguh
British Sponsor	173,644	BP Shipping	Daewoo	Sept-19	Isle of Man	MEGI-DF	GTT	4	Various
British Trader	138,000	BP Shipping	Samsung	Dec-02	Isle of Man	S	GTT	4	Engas
Broog	135,466	J4 Consortium	Mitsui Chiba	May-98	Japan	S	Moss	5	Qatargas
Bu Samara	266,000	QGTC	Samsung	Dec-08	Qatar	DRL	GTT	5	Qatargas
BW GDF Suez Boston	138,059	BW Gas	Daewoo	Jan-03	Norway	S	GTT	4	Suez LN
BW GDF Suez Everett	138,028	BW Gas	Daewoo	Jun-03	Norway	S	GTT	4	Suez LNG
BW Integrity	170,000	BW Gas	Samsung	May-17	Singapore	DFDE	GTT	4	FSRU
BW Lilac	173,400	BW Gas	Daewoo	Mar-18	Malta	MEGI-DF	GTT	4	various
BW Magna	173,400	BW Gas-Acu Brazil	Daewoo	Mar-19	Singapore	DFDE	GTT	4	FSRU-Brazil
BW Pavilion Aranda	173,400	BW Gas	Daewoo	Oct-19	Singapore	MEGI-DF	GTT	4	Various
BW Pavilion Leeara	161,880	BW Gas	Hyundai	Feb-15	Singapore	DFDE	GTT	4	Various
BW Pavilion Vanda	161,880	BW Gas	Hyundai	Feb-15	Singapore	DFDE	GTT	4	Various
BW Singapore	170,000	BW Gas	Samsung	May-15	Singapore	DFDE	GTT	4	FSRU
BW Suez Brussels	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GTT	4	Yemen-Atlantic
BW Suez Paris	162,400	BW Gas	Daewoo	May-09	N.I.S.	DFDE	GTT	4	Yemen-Atlantic
BW Tulip	173,400	BW Gas	Daewoo	Jan-18	Malta	MEGI-DF	GTT	4	various
Cadiz Knutsen	138,826	Knutsen / Marpetrol	IZAR Puerto Real	Jun-04	Spain	S	GTT	4	Engas
Cape Ann	145,000	Hoegh LNG/MOL	Samsung	May-10	Liberia	DFDE	GTT	4	Various
Castillo de Santisteban	173,600	Elcano	STX	Aug-10	Malta	S	GTT		Various
Castillo de Villalba	138,000	Elcano	IZAR	Nov-03	Spain	S	GTT	4	Sonatrach
Catalunya Spirit	138,000	Teekay LNG Partners	IZAR Sestao	Mar-03	Liberia	S	GTT	4	Atlantic LNG
Celestine River	145,000	KLNG	Kawasaki	Dec-07	Bahamas	S	Moss		Various
Cesi Beihai	174,100	MOL-China LNG	Hudong	June-17	Hong Kong	S	GTT	4	Australia-China
Cesi Gladstone	174,100	MOL-China LNG	Hudong	Oct-16	Hong Kong	S	GTT	4	Australia-China
Cesi Lianyungang	174,100	MOL-China LNG	Hudong	June-18	Hong Kong	S	GTT	4	Australia-China
Cesi Qingdao	174,100	MOL-China LNG	Hudong	Nov-16	Hong Kong	S	GTT	4	Australia-China
Cesi Tianjin	174,100	MOL-China LNG	Hudong	Sept-17	Hong Kong	S	GTT	4	Australia-China
Challenger FSRU	263,000	MOL LNG	Daewoo	Oct-17	St Kitts	DFDE	GTT	4	Various
Cheikh Bouamama	75,500	Skikda LNG Transport	USC	Jul-08	Bahamas	S	GTT	4	Sonatrach
Cheikh El Mokrani	75,500	Med LNG Corp	USC	Jun-07	Bahamas	S	GTT	4	Sonatrach
Christophe de Margerie	172,600	SCF	Daewoo	Nov-16	Cyprus	DFDE	GTT	4	Various
Clean Energy	150,000	Dynagas	Hyundai	Mar-07	Marshall Is.	S	GTT	4	Various
Clean Force	150,000	Dynagas	Hyundai	Jan-08	Marshall Is.	S	GTT	4	Various
Clean Ocean	155,900	Dynagas	Hyundai	Mar-14	Marshall Is.	DFDE	GTT	4	Various
Clean Planet	155,900	Dynagas	Hyundai	Mar-14	Marshall Is.	DFDE	GTT	4	Various
Clean Vision	160,000	Dynagas	Hyundai	Jun-15	Marshall Is.	DFDE	GTT	4	Various
Cool Explorer	160,000	Thenamaris	Samsung	Oct-13	Bermuda	DFDE	GTT	4	Various
Cool Runner	160,000	Thenamaris	Samsung	May-14	Bermuda	DFDE	GTT	4	Various
Cool Voyager	160,000	Thenamaris	Samsung	Oct-13	Bermuda	DFDE	GTT	4	Various
Corcovado LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GTT	4	Various
Creole Spirit	174,000	Teekay	Daewoo	Jan-16	Bahamas	MEGI-DF	GTT	4	Cheniere



Your Partner in
SHIP PERFORMANCE MONITORING AND ANALYSIS
www.kyma.no



Cubal	160,400	Mitsui/NYK/Teekay	Samsung	Jan-12	Bahamas	DFDE	GTT	4	Various
Cygnus Passage	145,400	Cygnus LNG	Mitsubishi	Feb-09	Panama	S	Moss	4	Various
Dapeng Moon	147,000	China Ships	Hudong	Jul-09	China	S	GTT	4	Various
Dapeng Star	147,000	China Ships	Hudong	Nov-09	China	S	GTT	4	Various
Dapeng Sun	147,000	China Ships	Hudong	Jul-07	China	S	GTT	4	Woodside Energy
Diamond Gas Orchid	165,000	MOL-Jera	MHI-Nagasaki	Aug-18	Japan	S-gas	Moss	4	US-Japan
Diamond Gas Rose	165,000	MOL-Jera	MHI-Nagasaki	Aug-18	Japan	S-gas	Moss	4	US-Japan
Disha	136,000	Petronet LNG Ltd.	Daewoo	Jan-04	Malta	S	GTT	4	Qatargas
Doha	137,350	J4 Consortium	Mitsubishi Nagasaki	Jun-99	Japan	S	Moss	5	Qatargas
Duhail	210,100	ProNav	Daewoo	Jan-08	Germany	DRL	GTT	4	Various
Dukhan	135,000	J4 Consortium	Mitsui Chiba	Oct-04	Japan	S	Moss	4	Qatargas
Dwiputra	127,385	Humpuss Consortium	Mitsubishi Nagasaki	Mar-94	Bahamas	S	Moss	4	Pertamina
Ebisu	147,547	Golar LNG	Kawasaki	Sep-08	Bahamas	S	Moss	4	Various
Eduard Toll	172,000	Teekay-CLNG	Daewoo	Dec-17	Bahamas	MEGI-DF	GTT	4	Various
Ejnan	145,000	4J	Samsung	Jan-07	Bahamas	S	GTT		RasGas
Ekaputra	136,400	Humpuss Consortium	Mitsubishi Nagasaki	Jan-90	Liberia	S	Moss	5	Pertamina
Energy Advance	145,000	Tokyo LNG Tankers	Kawasaki Sakaide	Mar-05	Japan	S	Moss	4	Darwin
Energy Atlantic	159,924	Alpha	STX Jinhae	Sep-15	Malta	DFDE	GTT	4	Various
Energy Confidence	155,000	Tokyo LNG Tankers	Kawasaki	Apr-09	Panama	S	Moss	4	Various
Energy Frontier	147,600	Tokyo LNG Tankers	Kawasaki Sakaide	Sep-03	Japan	S	Moss	4	Darwin
Energy Glory	165,000	Tokyo LNG Tankers	JMU	Sept-18	Japan	S	Moss	4	Various
Energy Horizon	177,000	Tokyo LNG Tankers	Kawasaki	Jul-11	Japan	S	Moss	4	Pluto LNG
Energy Innovator	165 000	MOL-Tokyo gas	JMU Tsu	April-19	Japan	TFDE	IHI-SPB	4	Cove Point-Japan
Energy Liberty	165 000	MOL	JMU Tsu	Oct-18	Japan	TFDE	IHI-SPB	4	Various
Energy Navigator	147,000	Tokyo LNG Tankers	Kawasaki Sakaide	May-08	Japan	S	Moss	4	Various
Energy Progress	145,000	MOL	Kawasaki	Nov-06	Japan	S	Moss	4	Bayu Undan LNG
Energy Universe	165,000	MOL-Tokyo Gas	JMU Tsu	Sept-19	Japan	TFDE	IHI-SPB	4	Cove Point-Japan
Enshu Maru	165,257	K Line	Kawasaki	June-18	Japan	S	Moss	4	Various
Esshu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Dec-14	Panama	S	Moss	4	Australia-Japan
Excalibur	138,200	Exmar/ Excelerate	Daewoo	Oct-02	Belgium	S	GTT	4	Various
Excel	138,106	Exmar/ MOL	Daewoo	Sep-03	Belgium	S	GTT	4	Various
Excelerate	138,000	Exmar/Excelerate	Daewoo	Oct-06	Belgium	S	GTT	4	Various
Excellence	138,000	GKFF Ltd.	Daewoo	May-05	Belgium	S	GTT	4	Excelerate Energy
Excelsior	138,000	Exmar	Daewoo	Jan-05	Belgium	S	GTT	4	Various
Exemplar	150,900	Excelerate	Daewoo	Jun-10	Belgium	S	GTT	4	Various
Expedient	151,000	Excelerate	Daewoo	Nov-09	Belgium	S	GTT	4	Various
Experience RV	174,000	Exmar/Excelerate	Daewoo	Jul-14	Marshall Is.	DFDE	GTT		Various
Explorer	150,900	Exmar/Excelerate	Daewoo	Mar-08	Belgium	S	GTT	4	Excelerate
Express	151,000	Exmar/Excelerate	Daewoo	May-09	Belgium	S	GTT	4	Various
Exquisite	150,900	Excelerate	Daewoo	Sep-09	Belgium	S	GTT	4	Various
Fedor Litke	172,636	Dynagas	Daewoo	Nov-17	Cyprus	DFDE	GTT	4	Various
Flex Endeavour	173,400	Flex LNG	Daewoo	Jan-18	Marshall Is.	MEGI-DF	GTT	4	Various
Flex Enterprise	173,400	Flex LNG	Daewoo	Jan-18	Marshall Is.	MEGI-DF	GTT	4	Various
Flex Rainbow	174,000	Flex LNG	Samsung	July-18	Marshall Is.	MEGI-DF	GTT	4	Various
Flex Ranger	174,000	Flex LNG	Samsung	April-18	Marshall Is.	MEGI-DF	GTT	4	Various
Fraiha	210,100	J5 Consortium	Daewoo	Sep-08	Marshall Is.	DRL	GTT	4	Qatargas
FSRU Independence	170,000	Hoegh	Hyundai	Feb-14	NIS	DFDE	GTT	4	Various
FSRU Lampung	170,000	Hoegh	Hyundai	May-14	Indonesia	DFDE	GTT	4	Various
Fuji LNG	147,895	TMSC Gas	Kawasaki	Jun-04	Malta	S	Moss	4	Various
Fuwairit	138,000	Peninsular LNG	Samsung	Jan-04	Bahamas	S	GTT	4	RasGas II
Galea	134,425	Shell Shipping	Mitsubishi Nagasaki	Oct-02	Singapore	S	Moss	5	Shell
Galicia Spirit	140,620	Teekay LNG Partners	Daewoo	Jul-04	Liberia	S	GTT	4	Engas
Gaselys	153,500	GdF/NYK	Atlantique	Mar-07	France	DFDE	CS 1	4	Engas
Gallina	134,425	Shell Shipping	Mitsubishi Nagasaki	Oct-02	Singapore	S	Moss	5	Shell
GasLog Chelsea	153,000	GasLog	Hanjin Korea	Dec-09	Panama	TFDE	GTT	4	Various
Gaslog Geneva	174,000	GasLog	Samsung	Sept-16	Bermuda	TFDE	GTT	4	Shell charter
Gaslog Genoa	174,000	GasLog	Samsung	Jun-18	Bermuda	TFDE	XDF	4	Various
Gaslog Gibraltar	174,000	GasLog	Samsung	Oct-16	Bermuda	TFDE	GTT	4	Shell charter
Gaslog Glasgow	174,000	GasLog	Samsung	Jun-16	Bermuda	TFDE	GTT	4	Shell charter
Gaslog Gladstone	174,000	GasLog	Samsung	May-19	Bermuda	XDF	GTT	4	Various
Gaslog Greece	174,000	GasLog	Samsung	Mar-16	Bermuda	TFDE	GTT	4	Shell charter
GasLog Hongkong	174,000	GasLog	Hyundai	Jun-18	Bermuda	XDF	GTT	4	Various
GasLog Houston	174,000	GasLog	Hyundai	Jan-18	Bermuda	XDF	GTT	4	Various
GasLog Salem	165,000	GasLog	Samsung	Apr-15	Liberia	TFDE	GTT	4	Various
GasLog Santiago	155,000	GasLog	Samsung	Mar-13	Liberia	TFDE	GTT	4	Various
GasLog Saratoga	155,000	GasLog	Samsung	Dec-14	Bermuda	TFDE	GTT	4	Various
Gaslog Savannah	155,000	GasLog	Samsung	May-10	Bermuda	DFDE	GTT	4	Various
GasLog Seattle	155,000	GasLog	Samsung	Oct-13	Bermuda	TFDE	GTT	4	Various



GasLog Shanghai	155,000	GasLog	Samsung	Jan-13	Liberia	TFDE	GTT	4	Various
Gaslog Singapore	155,000	GasLog	Samsung	Jul-10	Bermuda	DFDE	GTT	4	Various
Gaslog Skagen	155,000	GasLog	Samsung	Oct-13	Bermuda	DFDE	GTT	4	Various
Gaslog Sydney	155,000	GasLog	Samsung	May-13	Bermuda	DFDE	GTT	4	Various
Gaslog Warsaw	174,000	GasLog	Samsung	May-19	Bermuda	TFDE	GTT	4	Various
GDF-Suez Global Energy	74,000	Gaz de France	Chantiers	Dec-06	France	DFDE	CS1	4	Sonatrach
GDF-Suez Point Fortin	154,200	LNG Japan	Imabari/Koyo	Feb-10	Panama	DFDE	GTT	4	Various
Gemmata	138,100	Shell Shipping	Mitsubishi Nagasaki	Mar-04	Singapore	S	Moss	5	Shell
Georgiy Brusilov	172,000	Dynagas	Daewoo	Jun-18	Cyprus	DFDE	GTT	4	Yamal LNG
Georgiy Ushakov	172,600	Teekay-China	JV Daewoo	Oct-19	Bahamas	MEGI-DF	GTT	4	Various
Ghasha	137,510	National Gas Shipping	Mitsui	Jun-95	Liberia	S	Moss	5	ADGAS
Gigira Laitebo	177,000	MOL-Itochu	Hyundai	Feb-09	Panama	DFDE	GTT	4	Various
Golar Arctic	140,645	Golar LNG	Daewoo	Dec-03	Marshall Is.	S	GTT	4	Shell Spot
Golar Bear	160,000	Golar	Samsung	Mar-14	Bermuda	TFDE	GTT	4	Various
Golar Celsius	160,000	Golar LNG	Samsung	Sep-13	Bermuda	DFDE	GTT	4	Various
Golar Crystal	160,000	Golar LNG	Samsung	Oct-13	Bermuda	TFDE	GTT	4	Various
Golar Eskimo (FSRU)	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	GTT	4	Various
Golar Freeze	125,850	Golar LNG	HDW	Feb-77	UK	S	Moss	5	Various
Golar Glacier	162,000	Golar LNG	Hyundai	Sep-14	Marshall Is.	TFDE	GTT	4	Various
Golar Grand	145,880	Golar LNG	Daewoo	2006	IoM	S	GTT	4	Various
Golar Ice	160,000	Golar LNG	Samsung	Feb-15	Bermuda	DFDE	GTT	4	Various
Golar Igloo (FSRU)	160,000	Golar LNG	Samsung	Oct-13	Bermuda	DFDE	GTT	4	Various
Golar Kelvin	160,000	Golar LNG	Samsung	Jan-15	Bermuda	DFDE	GTT	4	Various
Golar Maria	145,950	Golar LNG	Daewoo	2006	Marshall Is.	S	GTT	4	Various
Golar Mazo	135,225	Golar LNG/PPP	Mitsubishi	Jan-00	Liberia	S	Moss	5	Pertamina
Golar Penguin	160,000	Golar LNG	Samsung	Mar-14	Marshall Is.	TFDE	GTT	4	Various
Golar Seal	160,000	Golar LNG	Samsung	Aug-13	Bermuda	TFDE	GTT	4	Various
Golar Singapore (FSRU)	160,000	Golar LNG	Samsung	June-15	Bermuda	TFDE	GTT	4	Various
Golar Snow	160,000	Golar LNG	Samsung	Jan-15	Bermuda	TFDE	GTT	4	Various
Golar Tundra (FSRU)	160,000	Golar LNG	Samsung	Dec-15	Bermuda	TFDE	GTT	4	Various
Golar Viking	140,000	Golar LNG	Hyundai	Jan-05	Marshall Is.	S	Moss	4	Various
Golar Winter	138,250	Golar LNG	Daewoo	Apr-04	Marshall Is.	S	GTT	4	Petrobras
Grace Acacia	150,000	Algaet Shipping	Hyundai	Jan-07	Japan	S	GTT	4	Various
Grace Barleria	150,000	Swallowtail Ship	Hyundai	Oct-07	Japan	S	GTT	4	Various
Grace Cosmos	150,000	AGH Shipping	Hyundai	Mar-08	Japan	S	GTT	4	Various
Grace Dahlia	177,000	Tokyo Gas	Kawasaki	Oct-13	Japan	S	Moss	4	Various
Gracilis	138,830	Golar LNG	Hyundai	Jan-05	Marshall Is.	S	GTT	4	Shell BG
Granatina	140,645	Shell Shipping	Daewoo	Dec-03	Singapore	S	GTT	4	Shell
Grand Aniva	147,200	Sovcomflot/NYK	Mitsubishi	Jan-08	Japan	S	Moss	4	Various
Grand Elena	147,200	Sovcomflot/NYK	Mitsubishi	Oct-07	Japan	S	Moss	4	Various
Grand Mereya	147,200	Primorsk/MOL/K Line	Chiba	May-08	Japan	S	Moss	4	Sakhalin II
Hanjin Muscat	138,200	Hanjin Shipping	Hanjin	Jul-99	Panama	S	GTT	4	Oman Gas
Hanjin Pyeong Taek	130,600	Hanjin Shipping	Hanjin	Sep-95	Panama	S	GTT	4	Pertamina
Hanjin Ras Laffan	138,214	Hanjin Shipping	Hanjin	Jul-00	Panama	S	GTT	4	QatarGas
Hanjin Sur	138,333	Hanjin Shipping	Hanjin	Jan-00	Panama	S	GTT	4	Oman Gas
Hispania Spirit	140,500	Teekay LNG Partners	Daewoo	Sep-02	Spain	S	GTT	4	Atlantic LNG
Hoegh Esperanza FSRU	170,000	Hoegh	Hyundai	April-18	Norway	DFDE	GTT	4	Various
Hoegh Gallant FSRU	170,050	Hoegh LNG	Hyundai	May-14	Marshall Is.	DFDE	GTT	4	chartered
Hoegh Giant FSRU	170,050	Hoegh LNG	Hyundai	Jan-18	Marshall Is.	DFDE	GTT	4	various
Hoegh Grace FSRU	170,050	Hoegh LNG	Hyundai	May-15	Marshall Is.	DFDE	GTT	4	various
Hyundai Aquapia	135,000	Hyundai MM	Hyundai	Mar-00	Panama	S	Moss	4	Oman Gas
Hyundai	135,000	Hyundai MM	Hyundai	Jan-00	Panama	S	Moss	4	RasGas
Hyundai Ecopia	145,000	Hyundai	Hyundai	Nov-08	Panama	S	GTT	4	Various
Hyundai Greenpia	125,000	Hyundai MM	Hyundai	Nov-96	Panama	S	Moss	4	Pertamina
Hyundai Oceanpia	135,000	Hyundai MM	Hyundai	Jul-00	Panama	S	Moss	4	Oman Gas
Hyundai Technopia	135,000	Hyundai MM	Hyundai	Jul-00	Panama	S	Moss	4	RasGas
Hyundai Utopia	125,182	Hyundai MM	Hyundai	Jun-94	Panama	S	Moss	4	Pertamina
Iberica Knutsen	138,000	Knutsen OAS	Daewoo	Aug-06	Norway	S	GT 96	4	Gas Natural
Ibra LNG	147,100	Oman Gas	Samsung	Jun-06	Panama	S	GTT	4	Oman LNG
Ibri LNG	145,000	Oman Gas	Mitsubishi	Jul-06	Panama	S	GTT	4	Oman LNG
Ish	137,540	National Gas Shipping	Mitsubishi Nagasaki	Nov-95	Liberia	S	Moss	5	ADGAS
K Acacia	138,017	Korea Line	Daewoo	Jan-00	Panama	S	GTT	4	Oman Gas
K Freesia	135,256	Korea Line	Daewoo	Jun-00	Panama	S	GTT	4	RasGas
Kinisis	173,400	K-Line	Daewoo	Jan-18	Liberia	MEGI-DF	GTT	4	Various
K Jasmine	145,700	Korea Line	Daewoo	Mar-08	Panama	S	GTT	4	Kogas offtake
K Mugungwha	152,000	K Line	Daewoo	Nov-08	Panama	S	GTT	4	Various
Kita LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GTT	4	Various
Kotawaka Maru	125,200	J3 Consortium	Kawasaki Sakaide	Jan-84	Japan	S	Moss	5	Darwin



Your Partner in
SHIP PERFORMANCE MONITORING AND ANALYSIS
www.kyma.no



Kumul	172,000	MOL	Hudong	May-16	Hong Kong	DRL	GTT	4	PNG-Asia
Lalla Fatma N'Soumer	145,000	Algeria Nippon Gas	Kawasaki Sakaide	Dec-04	Bahamas	S	Moss	4	Various
Lijmilya	261,700	QGTC	Daewoo	Sep-08	Marshall Is.	DRL	GTT	5	Various
LNG Abalamabie	174,900	Bonny Gas	Samsung	Nov-16	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Abuja	126,530	Bonny Gas Transport	GD Quincy	Sep-80	Bahamas	S	Moss	5	Nigeria LNG
LNG Abuja II	174,900	Bonny Gas	Samsung	Oct 16	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Adamawa	141,000	Bonny Gas Transport	Hyundai	Jun-05	Bermuda	S	Moss	4	Various
LNG Akwa Ibom	141,000	Bonny Gas Transport	Hyundai	Nov-04	Bermuda	S	Moss	4	Various
LNG Aquarius	126,300	MOL/LNG Japan	GD Quincy	Jun-77	Marshall Is.	S	Moss	5	Various
LNG Barka	153,000	NYK	Kawasaki	Jan-09	Bahamas	S	Moss	4	Various
LNG Bayelsa	137,500	Bonny Gas Transport	Hyundai	Feb-03	Bermuda	S	Moss	4	Nigeria LNG
LNG Benue	145,700	BW Gas	Daewoo	Mar-06	Bermuda	S	GTT	4	Nigeria LNG
LNG Bonny	177,000	Bonny Gas Transport	Hyundai	Oct-15	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Borno	149,600	NYK Line	Samsung	Aug-07	Japan	S	GTT	4	Nigeria LNG
LNG Capricorn	126,300	MOL/LNG Japan	GD Quincy	Jun-78	Marshall Is.	S	Moss	5	Pertamina
LNG Cross River	141,000	Bonny Gas Transport	Hyundai	Sep-05	Bermuda	S	Moss	4	Various
LNG Dream	145,000	Osaka Gas	Kawasaki	Sep-06	Japan	S	Moss	4	Woodside Energy
LNG Dubhe	174,000	MOL-Cosco	Hudong	Sept-19	China	S	GTT	4	Russia-Asia
LNG Ebisu	147,500	MOL	Kawasaki	Sep-08	Bahamas	S	Moss	4	Various
LNG Edo	126,530	Bonny Gas Transport	GD Quincy	May-80	Bahamas	S	Moss	5	Nigeria LNG
LNG Enugu	145,000	BW Gas	Daewoo	Oct-05	Bermuda	S	GTT	4	Nigeria LNG
LNG Fimina	175,000	Bonny Gas Transport	Samsung	Oct-15	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Flora	127,700	J3 Consortium	Kawasaki Sakaide	Mar-93	Japan	S	Moss	4	Pertamina
LNG Fukurokuju	165,000	MOL	Kawasaki	June-15	Japan	S	Moss	4	Various
LNG Gemini	126,300	MOL/LNG Japan	GD Quincy	Sep-78	Marshall Is.	S	Moss	5	Pertamina
LNG Imo	148,300	BW Gas	Daewoo	Jun-08	Bermuda	S	GTT	4	Nigeria LNG
LNG Jamal	135,330	Osaka Gas/J3 Consortium	Mitsubishi Nagasaki	Oct-00	Japan	S	Moss	5	Oman Gas
LNG Juno	177,300	MOL-Osaka	Mitsubishi	Oct-18	Marshall Is.	DFDE	Moss	4	Freeport LNG/Various
LNG Jupiter	145,000	NYK Line	Kawasaki	Jul-09	Bahamas	S	Moss	4	Various
LNG Jurojin	155,300	MOL	MHI Nagasaki	Nov-15	Japan	S	KM	4	Various
LNG Kano	148,471	BW Gas	Daewoo	Jan-07	Bermuda	S	GTT	4	NLNG
LNG Lagos	177,000	Bonny Gas	Hyundai	Oct-15	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Leo	126,400	MOL/LNG Japan	GD Quincy	Dec-78	Marshall Is.	S	Moss	5	Pertamina
LNG Lerici	65,000	Exmar	Italcantieri Sestri	Mar-98	Italy	S	GTT	4	Sonatrach
LNG Libra	126,400	Hoegh LNG	GD Quincy	Apr-79	Marshall Is.	S	Moss	5	Various
LNG Lokoja	148,300	BW Gas	Daewoo	Dec-06	Bermuda	S	GTT	4	Nigeria LNG
LNG Mars	155,000	MOL/Osaka Gas	Mitsubishi	Oct-16	Marshall Is.	S	Moss	5	Various
LNG Merak	174,000	MOL-Cosco	Hudong	Nov-19	China	S	GTT	4	Russia-Asia
LNG Ogun	148,300	NYK Line	Samsung	Aug-07	Japan	S	GTT	4	Nigeria LNG
LNG Ondo	148,300	BW Gas	Daewoo	Sep-07	Bermuda	S	GTT	4	Nigeria LNG
LNG Oyo	140,500	BW Gas	Daewoo	Dec-05	Bermuda	S	GTT	4	Nigeria LNG
LNG Pioneer	138,000	MOL	Daewoo	Jul-05	Bahamas	S	GTT	4	Idku
LNG Port Harcourt	175,000	Bonny Gas	Samsung	Oct-15	Bermuda	DFDE	GTT	4	Nigeria LNG
LNG Portovenere	65,000	Exmar	Italcantieri Sestri	Jun-96	Italy	S	GTT	4	Sonatrach
LNG River Niger	141,000	Bonny Gas Transport	Hyundai	May-06	Bermuda	S	Moss	4	Various
LNG River Orashi	145,910	BW Gas	Daewoo	Nov-04	Bermuda	S	GTT	4	Nigeria LNG
LNG Rivers	137,231	Bonny Gas Transport	Hyundai	Jun-02	Bermuda	S	Moss	4	Nigeria LNG
LNG Sakura	177,000	NYK-Kepco	Kawasaki	Mar-18	Bahamas	DFDE	GTT	4	Various
LNG Saturn	153,000	MOL	MHI	Nov-15	Japan	S	Moss	4	Various
LNG Schneeweisschen	180,000	MOL-Itochu	Daewoo	Aug-18	Panama	XDF	GTT	4	Various
LNG Sokoto	137,231	Bonny Gas Transport	Hyundai	Aug-02	Bermuda	S	Moss	4	Nigeria LNG
LNG Taurus	126,300	MOL/LNG Japan	GD Quincy	Aug-79	Marshall Is.	S	Moss	5	Various
LNG Venus	155,000	Osaka/MOL	MHI	Oct-14	Japan	S	Moss	4	Various
LNG Vesta	127,547	Tokyo Gas Consortium	Mitsubishi Nagasaki	Jun-94	Japan	S	Moss	4	Pertamina
LNG Virgo	126,400	MOL/LNG Japan	GD Quincy	Dec-79	Marshall Is.	S	Moss	5	Pertamina
Lobito	160,400	Mitsui/NYK/Teekay	Samsung	Oct-11	Bahamas	DFDE	GTT	4	Various
Lusail	138,000	Peninsular LNG	Samsung	May-05	Bahamas	S	GTT	4	Qatar
Macoma	173,400	Teekay	Daewoo	Oct-17	Bahamas	DFDE	GTT	4	Various
Madrid Spirit	138,000	Teekay LNG Partners	IZAR Puerto Real	Jan-05	Spain	S	GTT	4	Engas
Magdala	173,400	Teekay	Daewoo	Feb-18	Bahamas	DFDE	GTT	4	Various
Magellan Spirit	165,500	Teekay LNG Partners	Samsung	Sep-08	Denmark	DFDE	GTT	4	Various
Malanje	160,400	Mitsui/NYK/Teekay	Samsung	Jul-11	Bahamas	DFDE	GTT	4	Various
Maran Gas Achilles	174,000	Maran	Hyundai Samho	Feb-16	Greece	DFDE	GTT	4	Various
Maran Gas Agamemnon	174,000	Maran	Hyundai Samho	May-16	Greece	DFDE	GTT	4	Various
Maran Gas Alexandria	161,870	Maran	Hyundai Samho	Sep-15	Greece	DFDE	GTT	4	Various
Maran Gas Amphipolis	173,400	Maran	Daewoo	Aug-16	Greece	DFDE	GTT	4	Various
Maran Gas Apollonia	161,870	Maran	Daewoo	Jan-14	Greece	DFDE	GTT	4	Various
Maran Gas Asclepius	145,000	Kristen Navigation	Daewoo	Jul-05	Bermuda	S	GTT	4	Qatar

CARRIER FLEET



Maran Gas Chios	173,548	Maran	Daewoo	March-19	Greece	DFDE	GTT	4	Various
Maran Gas Coronis	145,700	Maran	Daewoo	Sep-07	Greece	S	GTT	4	Rasgas II
Maran Gas Delphi	159,800	Maran	Daewoo	Feb-14	Greece	DFDE	GTT	4	Various
Maran Gas Efessos	159,800	Maran	Daewoo	Jun-14	Greece	DFDE	GTT	4	Various
Maran Gas Hector	174,000	Maran	Hyundai Samho	Nov-16	Greece	DFDE	GTT	4	Various
Maran Gas Hydra	173,617	Maran	Daewoo	Feb-19	Greece	DFDE	GTT	4	Various
Maran Gas Lindos	159,800	Maran	Daewoo	Jun-15	Greece	DFDE	GTT	4	Various
Maran Gas Mystras	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GTT	4	Various
Maran Gas Olympias	174,500	Maran	DSME	Feb-17	Greece	DFDE	GTT	4	Various
Maran Gas Pericles	174,000	Maran	Hyundai Samho	June-16	Greece	DFDE	GTT	4	Various
Maran Gas Posidonia	161,870	Maran	Daewoo	May-14	Greece	DFDE	GTT	4	Various
Maran Gas Roxana	173,400	Maran	Daewoo	Jan-17	Greece	DFDE	GTT	4	Various
Maran Gas Sparta	161,870	Maran	Hyundai Samho	April-15	Greece	DFDE	GTT	4	Various
Maran Gas Spetses	174,000	Maran	Daewoo	Feb-18	Greece	DFDE	GTT	4	Various
Maran Gas Troy	155,900	Maran Gas	Daewoo	May-15	Greece	DFDE	GTT	4	various
Maran Gas Ulysses	174,000	Maran	Hyundai Samho	Jan-17	Greece	DFDE	GTT	4	Various
Maran Gas Vergina	173,605	Maran	Daewoo	Dec-2016	Greece	DFDE	GTT	4	Various
Maria Energy	174,000	Tsakos	Hyundai	Mar-15	Marshall Is.	TFDE	GTT	4	Various
Marib Spirit	165,000	Teekay LNG	Samsung	May-08	Marshall Is.	DFDE	GTT	4	Various
Marshal Vasilevskiy	174,000	Gazprom	Hyundai	Russia	Jan-2019	DFDE	GTT	4	Russia-FSRU
Marvel Crane	177,000	NYK-Mitsui	Mitsubishi	Mar-19	Singapore	S	Moss	4	US/Various
Marvel Eagle	155,000	MOL-Osaka	Kawasaki	Sept-18	Marshall Is.	S	Moss	4	Cameron LNG/Various
Marvel Falcon	174,000	NYK-Mitsui	Samsung	Dec-18	Singapore	XDF	GTT	4	Cameron LNG/Various
Marvel Hawk	174,000	NYK-Mitsui	Samsung	Dec-18	Singapore	XDF	GTT	4	Cameron LNG/Various
Marvel Kite	174,000	NYK-Mitsui	Samsung	Dec-18	Singapore	XDF	GTT	4	Various
Marvel Pelican	155,000	MOL-Mitsui	Kawasaki	Dec-19	Marshall Is.	DFD	Moss	4	Cameron LNG-Various
Matthew	126,540	Suez LNG Shiping	Newport News	Jun-79	Bahamas	S	GTT	6	Atlantic LNG
Megara	173,000	Teekay	Daewoo	Oct-18	Bahama	MEGI-DF	GTT	4	Various
Mekaines	266,000	Naklilat	Samsung	Mar-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Meridian Spirit	165,500	Teekay LNG	Samsung	Jan-10	Denmark	DFDE	GTT	4	Various
Mesaimeer	210,100	Naklilat	Hyundai	Mar-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Methane Alison Victoria	145,000	GasLog	Samsung	Aug-07	Bermuda	S	GTT	4	Eq.Guinea LNG
Methane Becki Anne	170,000	GasLog	Samsung	Sep-10	Bermuda	TFDE	GTT	4	Various
Methane Heather Sally	145,000	GasLog	Samsung	Jul-07	Bermuda	S	GTT	4	Eq.Guinea LNG
Methane Jane Elizabeth	145,000	GasLog	Samsung	Jun-06	Bermuda	TFDE	GTT	4	Engas
Methane Julia Louise	170,000	GasLog	Samsung	Dec-09	Bermuda	TFDE	GTT	4	Various
Methane Kari Elin	138,200	Shell	Samsung	Jun-04	Bermuda	S	GTT	4	Various
Methane Lake Charles	145,000	Shell	Samsung	Feb-07	Bermuda	S	GTT	4	Marathon Oil
Methane Lydon Volney	145,000	Shell	Samsung	Aug-06	Bermuda	S	GTT	4	Engas
Methane Mickie Harper	170,000	Shell-GasLog	Samsung	Nov-10	Bermuda	TFDE	GTT	4	Various
Methane Nile Eagle	145,000	Shell-GasLog	Samsung	Dec-07	Bermuda	S	GTT	4	Engas
Methane Patricia Camila	170,000	Shell-GasLog	Samsung	Oct-10	Bermuda	TFDE	GTT	4	Various
Methane Princess	138,159	Golar LNG	Daewoo	2003	UK	S	GTT	4	Spot BG
Methane Rita Andre	145,000	GasLog	Samsung	Mar-06	Bermuda	S	GTT	4	Engas
Methane Shirley Elizabeth	145,000	GasLog	Samsung	Apr-07	Bermuda	S	GTT	4	Marathon Oil
Methane Sprit	165,000	Teekay LNG	Samsung	Mar-08	Singapore	DFDE	GTT	4	Various
Milaha Qatar	145,000	Milaha	Samsung	Apr-06	Denmark	S	GTT	4	Qatar
Milaha Ras Laffan	138,270	Milaha	Samsung	Mar-04	Denmark	S	GTT	4	RasGas II
Min Lu	147,000	China Ships	Hudong	Aug-09	China	S	GTT	4	Various
Min Rong	147,000	China LNG Ships	Hudong	Feb-09	Hong Kong	S	GTT	4	Australia-China
Mourad Didouche	126,130	Hyproc Shipping	Atlantique	Jul-80	Algeria	S	GTT	5	Sonatrach
Mozah	266,000	QGTC	Samsung	Aug-08	Qatar	DRL	GTT	5	Qatargas II
Mraweh	137,000	National Gas Shipping	Kvaerner-Masa	Jun-96	Liberia	S	Moss	4	ADGAS
Mubaraz	137,000	National Gas Shipping	Kvaerner-Masa	Jan-96	Liberia	S	Moss	4	Various
Muraq	210,100	J5-K Line	Daewoo	May-08	Marshall Is.	DRL	GTT	4	Qatar-Atlantic Basin
Murex	173,400	Teekay	Daewoo	Oct-17	Bahamas	DFDE	GTT	4	Various
Murwab	210,100	J5 Consortium	Daewoo	May-08	Marshall Is.	DRL	GTT	4	Qatargas
Muscat LNG	149,170	Oman Gas/MOL	Kawasaki Sakaide	Mar-04	Japan	S	Moss	4	Oman Gas
Myrina	173,000	Teekay	Daewoo	Sept-18	Bahamas	MEGI-DF	GTT	4	Various
Neo Energy	149,700	Tsakos	Hyundai	Feb-07	Liberia	S	GTT	4	Various
Neptune	145,000	Hoegh LNG/MOL	Samsung	Dec-09	Liberia	DFDE	GTT	4	Various
Nikolay Urvantsev	172,000	MOL-China Ships	Daewoo	Nov-19	Hong Kong	DFDE	GTT	4	Yamal
Nikolay Yevgenov	172,600	Teekay	Daewoo	Oct-18	Bahamas	MEGI-DF	GTT	4	Various
Nikolay Zubkov	172,600	Dynagas	Daewoo	Nov-18	Cyprus	DFDE	GTT	4	Yamal LNG
Nizwah LNG	145,000	Oryx LNG Carriers	Kawasaki Sakaide	Dec-05	Japan	S	Moss	4	Oman Gas
Northwest Sanderling	127,525	Australia LNG	Mitsubishi Nagasaki	Jun-89	Australia	S	Moss	4	NWS
Northwest Sandpiper	127,500	Australia LNG	Mitsui Chiba	Feb-93	Australia	S	Moss	4	NWS
Northwest Seaeagle	127,450	Australia LNG	Mitsubishi Nagasaki	Nov-92	Bermuda	S	Moss	4	NWS



Your Partner in
SHIP PERFORMANCE MONITORING AND ANALYSIS
www.kyma.no



Northwest Shearwater	127,500	Australia LNG	Kawasaki Sakaide	Sep-91	Bermuda	S	Moss	4	NWS
Northwest Snipe	127,747	Australia LNG	Mitsui Chiba	Sep-90	Australia	S	Moss	4	NWS
Northwest Stormpetrel	127,600	Australia LNG	Mitsubishi Nagasaki	Dec-94	Australia	S	Moss	4	NWS
Northwest Swallow	127,708	J3 Consortium	Mitsui Chiba	Nov-89	Japan	S	Moss	4	NWS
Northwest Swan	138,000	Australia LNG	Daewoo	Mar-04	Australia	S	GTT	4	NWS
Northwest Swift	127,590	J3 Consortium	Mitsubishi Nagasaki	Sep-89	Japan	S	Moss	4	NWS
Noshu Maru	180,000	MOL-Jera	MHI-Nagasaki	Feb-19	Japan	S-gas	Moss	4	US-Japan
Oak Spirit	173,400	Teekay	Daewoo	Jan-16	Bahamas	MEGI-DF	GTT	4	Cheniere
Ob River	150,000	Lance Shipping	Hyundai	Oct-07	Marshall Is.	S	GTT	4	Various
Oceanic Breeze	155,300	K-Line	Mitsubishi-Nagasaki	June-18	Japan	S	Moss	4	Darwin-Japan
Onaiza	210,100	Nakilat	Daewoo	Apr-09	Liberia	DRL	GTT	4	Qatar-Atlantic Basin
Ougarta	171,866	Hyproc Shipping	Hyundai	Mar-17	Algeria	DFDE	GTT	4	Sonatrach
Pacific Arcadia	147,200	NYK Line	MHI	Oct-14	Bahamas	S	KM	4	Various
Pacific Breeze	182,000	K Line	Kawasaki	Mar-18	Marshall Is.	DFDE	Moss	4	Ichthys LNG
Pacific Enlighten	145,000	LNG MT	Mitsubishi	Mar-09	Japan	S	Moss	4	Various
Pacific Eurys	137,000	LNG Marine Transport	Mitsubishi Nagasaki	Mar-06	Bahamas	S	Moss	4	Darwin
Pacific Mimosa	155,300	NYK Line	MHI	Nov-17	Bahamas	S	Moss	4	Australia-Japan
Pacific Notus	137,006	Pacific LNG Shipping	Mitsubishi Nagasaki	Sep-03	Bahamas	S	Moss	5	Darwin
Palu LNG	160,106	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GTT	4	Various
Pan Americas	174,000	Teekay	Hudong	Mar-18	Hong Kong	TFDE	GTT	4	US-Asia
Pan Asia	174,000	Teekay	Hudong-Zhonghua	July-17	Bahamas	TFDE	GTT	4	Cheniere
Pan Europe	174,000	Teekay	Hudong	Sept-18	Hong Kong	TFDE	GTT	4	US-global
Papua	171,800	MOL-China	Hudong	Jan-15	Hong Kong	DFDE	SSD	4	PNG LNG
Patris	173,400	K-Line	Daewoo	Feb-18	Liberia	MEGI-DF	GTT	4	Various
Polar Eagle	89,880	Polar LNG	IHI Chita	Jun-93	Liberia	S	IHI SPB	4	ConocoPhillips/Marathon
Prachi	173,000	NYK-SCI	Hyundai	Nov-16	Singapore	TFDE	GTT	4	Petronet
Prism Agility	180,024	SK Shipping	Hyundai	April-19	Panama	DFDE	GTT	5	Various
Prism Brilliance	180,016	SK Shipping	Hyundai	March-19	Panama	DFDE	GTT	5	Various
Provalys	153,500	Gaz de France	Chantiers	Nov-06	France	DFDE	CS1	4	ELNG
Pskov	170,200	SovComFlot	STX	Mar-14	Liberia	DFDE	GTT	4	Various
Puteri Delima	130,400	MISC	Atlantique	Jan-95	Malaysia	S	GTT	4	Petronas
Puteri Delima Satu	137,100	MISC	Mitsui Chiba	Apr-02	Malaysia	S	GTT	4	Petronas
Puteri Firuz	130,400	MISC	Atlantique	May-97	Malaysia	S	GTT	4	Petronas
Puteri Firuz Satu	137,100	MISC	Mitsubishi Nagasaki	Sep-04	Malaysia	S	GTT	4	Petronas
Puteri Intan	130,400	MISC	Atlantique	Aug-94	Malaysia	S	GTT	4	Petronas
Puteri Intan Satu	137,100	MISC	Mitsubishi Nagasaki	Dec-01	Malaysia	S	GTT	4	Petronas
Puteri Mutiera Satu	137,100	MISC	Mitsui Chiba	Apr-05	Malaysia	S	GTT	4	Petronas
Puteri Nilam	130,400	MISC	Atlantique	Jun-95	Malaysia	S	GTT	4	Petronas
Puteri Nilam Satu	137,100	MISC	Mitsubishi Nagasaki	Sep-03	Malaysia	S	GTT	4	Petronas
Puteri Zamrud	130,400	MISC	Atlantique	May-96	Malaysia	S	GTT	4	Petronas
Puteri Zamrud Satu	137,100	MISC	Mitsui Chiba	Apr-87	Malaysia	S	GTT	4	Atlantic LNG
Raahi	136,000	Petronet LNG Ltd	Daewoo	Dec-04	Malta	S	GTT	4	Qatargas
Ramdane Abane	126,130	Hyproc Shipping	Atlantique	Jul-81	Algeria	S	GTT	5	Sonatrach
Rasheeda	266,000	QGTC	Samsung	Jun-10	Liberia	DRL	GTT		Various
Rias Baixas Knutsen	180,000	Knutsen	Hyundai	Aug-19	Spain	MEGI-DF	GTT	4	Various
Ribera del Duero Knutsen	173,400	Knutsen	Daewoo	Nov-10	Nor-NIS	DFDE	GTT	4	Various
Rioja Knutsen	176,300	Knutsen	Daewoo	Dec-16	Nor-NIS	DFDE	GTT	4	Various
Rudolf Samoylovich	172,652	Teekay-CLNG	Daewoo	Oct-18	Bahamas	MEGI-DF	GTT	4	Various
Salalah LNG	147,000	Oman Gas/MOL	Samsung	Dec-05	Japan	S	GTT	4	Oman
SCF Polar	71,500	Sovcomflot	Kockums	Aug-69	Liberia	S	GTT	6	Sonatrach
Sean Spirit	174,000	Teekay	Hyundai Samho	Feb-19	Bahama	MEGI-DF	GTT	4	Various
Seishu Maru	162,000	K Line-Transpacific	Kawasaki Sakaide	Jan-15	Panama	S	Moss	4	Australia-Japan
Seri Alam	138,000	MISC	Samsung	Oct-05	Malaysia	S	GTT	4	Yemen LNG
Seri Amanah	145,000	MISC	Samsung	Mar-06	Malaysia	S	GTT	4	Yemen LNG
Seri Anggun	145,000	MISC	Samsung	Nov-06	Malaysia	S	GTT	4	Yemen LNG
Seri Angkasa	145,000	MISC	Samsung	Feb-07	Malaysia	S	GTT	4	Petronas
Seri Ayu	145,000	MISC	Samsung	Oct-07	Malaysia	S	GTT	4	Various
Seri Bakti	152,300	MISC	Mitsubishi	Mar-07	Malaysia	S	GTT	4	Petronas
Seri Balhaf	152,000	MISC	Mitsubishi	Sep-08	Malaysia	S	GTT	4	Various
Seri Balquis	152,000	MISC	Mitsubishi	Dec-08	Malaysia	S	GTT	4	Various
Seri Begawan	152,300	MISC	Mitsubishi	Dec-07	Malaysia	S	GTT	4	Various
Seri Bijaksana	152,300	MISC	Mitsubishi	Feb-08	Malaysia	S	GTT	4	Petronas
Seri Camar	150,200	MISC	Hyundai	Feb-18	Malaysia	S	Moss	4	Petronas
Seri Camellia	150,000	MISC	Hyundai	Nov-16	Malaysia	S	Moss	4	Petronas
Seri Cemara	150,200	MISC	Hyundai	Apr-18	Malaysia	S	Moss	4	Petronas
Seri Cempak	150,200	MISC	Hyundai	Feb-18	Malaysia	S	Moss	4	Petronas
Seri Cenderawasih	150,000	MISC	Hyundai	Jan-17	Malaysia	S	Moss	4	Petronas
Sestao Knutsen	138,000	Knutsen	IZAR Sestao	Jan-07	Spain	S	GTT	4	Atlantic LNG

CARRIER FLEET



Sevilla Knutsen	173,400	Knutsen	Daewoo	Jun-10	N.I.S.	DFDE	GTT	4	Various
Shahamah	135,500	National Gas Shipping	Kawasaki Sakaide	Oct-94	Liberia	S	Moss	5	ADGAS
Shangra	266,000	QGTC	Samsung	Nov-09	Liberia	DRL	GTT	5	Qatargas IV
Shen Hai	147,100	China LNG	Hudong Zhonghua	Sep-12	China	AB/CC Steam	GTT	4	Various
Simaisma	147,700	Maran Gas Maritime	Daewoo	Jul-06	Greece	S	GTT	4	Qatar
SK Audace	180,000	SK-Marubeni	Samsung	Jul-17	Panama	XDF	GTT	4	Various
SK Resolute	180,000	SK-Marubeni	Samsung	Jun-18	Panama	XDF	GTT	4	Various
SK Splendor	138,375	SK Shipping	Samsung	Mar-00	Panama	S	GTT	4	Oman Gas
SK Stellar	138,375	SK Shipping	Samsung	Dec-00	Panama	S	GTT	4	RasGas
SK Summit	138,000	SK Shipping	Daewoo	Aug-99	Panama	S	GTT	4	RasGas
SK Sunrise	138,306	I. S. Carriers	Samsung	Sep-03	Panama	S	GTT	4	RasGas
SK Supreme	138,200	SK Shipping	Samsung	Jan-00	Panama	S	GTT	4	RasGas
Sohar LNG	137,250	Oman Gas/ MOL	Mitsubishi Nagasaki	Oct-01	Malta	S	Moss	5	Oman Gas
Sohshu Maru	180,000	MOL	Kawasaki HI	Nov-19	Japan	S-gas	Moss	4	Various-Japan
Solaris	155,000	GasLog	Samsung	Jul-14	Bermuda	TFDE	GTT	4	Various
Sonangol Benguela	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GTT	4	Angola LNG
Sonangol Etosha	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GTT	4	Angola LNG
Sonangol Sambizanga	160,500	Sonangol	Daewoo	Sep-11	Bahamas	S	GTT	4	Angola LNG
Southern Cross	172,000	MOL	Hudong	May-15	Hong Kong	DRL	GTT	4	Various
Soyo	160,400	Mitsui/NYK/Teekay	Samsung	May-11	Bahamas	DFDE	GTT	4	Various
Spirit of Hela	177,000	MOL	Hyundai	Oct-09	Panama	DFDE	GTT	4	Various
Stena Blue Sky	145,700	Stena	Daewoo	Jan-06	Panama	S	GTT	4	Various
Stena Clear Sky	171,800	Stena	Daewoo	Sep-10	Panama	DFDE	GTT	4	Various
Stena Crystal Sky	171,800	Stena	Daewoo	Jul-10	Panama	DFDE	GTT	4	Various
STX Kolt	145,700	STX Panocean	Korea Hanjin	Nov-08	Panama	DFDE	GTT	4	Various
Suez Point Fortin	154,200	Trinity LNG	Koyo Japan	Nov-09	Panama	S	GTT	4	Yemen LNG
Symphonic Breeze	147,608	K-Line	Mitsubishi Nagasaki	Oct-07	Bahamas	DFDE	Moss	4	Australia-Japan
Taitar No. 1	145,000	NYK Line	Mitsubishi	Oct-09	Liberia	S	Moss	4	Various
Taitar No. 3	145,000	NYK Line	Mitsubishi	Jan-10	Liberia	S	Moss	4	Various
Taitar No. 4	145,000	NYK	Mitsubishi	Jan-10	Liberia	S	Moss	4	Various
Tangguh Batur	145,700	Sovcomflot/NYK	Daewoo	Dec-08	Cyprus	S	GTT		Tangguh
Tangguh Foja	155,000	K Line	Samsung	Jul-08	Panama	DFDE	GTT	4	Tangguh LNG
Tangguh Hiri	155,000	Teekay LNG	Hyundai	Nov-08	Isle of Man	DFDE	GTT	4	Tangguh
Tangguh Jaya	145,700	K Line	Samsung	Nov-08	Panama	DFDE	GTT	4	Tangguh
Tangguh Palung	155,000	K Line	Samsung	Mar-09	Panama	DFDE	GTT	4	Tangguh
Tangguh Sago	155,000	Teekay LNG	Hyundai	Mar-09	Isle of Man	DFDE	GTT	4	Tangguh LNG
Tangguh Towuti	145,700	Sovcomflot/NYK	Daewoo	Oct-08	Cyprus	S	GTT	4	Tangguh
Tembek	216,200	OSG/Nakilat	Samsung	Sep-07	Marshall Is.	DRL	GTT	4	Qatargas II
Tenaga Satu	130,000	MISC	Dunkerque	Sep-82	Malaysia	S	GTT	5	Petronas
Tessala	171,866	Hyproc Shipping	Hyundai	Dec-16	Algeria	DFDE	GTT	4	Sonatrach
Torben Spirit	173,000	Teekay	Daewoo	Feb-17	Bahama	MEGI-DF	GTT	4	Various
Trinity Arrow	154,900	K Line	Imabari Shipbuilding	Mar-08	Panama	S	GTT	4	Various
Umm Al Amad	210,100	J5	Daewoo	Aug-08	Marshall Is.	DRL	GTT	4	Ras Gas III
Umm Al Ashtan	137,000	National Gas Shipping	Kvaerner- Masa	May-97	Liberia	S	Moss	4	ADGAS
Umm Bab	145,000	Kristen Navigation	Daewoo	Nov-05	Bermuda	S	GTT	4	Qatargas
Umm Slaal	266,000	QGTC	Samsung	Nov-08	Qatar	DRL	GTT	5	Qatargas
Valencia Knutsen	173,400	Knutsen	Daewoo	Sep-10	Nor-NIS	DFDE	GTT	4	Various
Velikiy Novgorod	170,200	SovComFlot	STX	Feb-14	Liberia	DFDE	GTT	4	Various
Vladimir Rusanov	172,000	MOL-China Shipping	Daewoo	Mar-18	Hong Kong	DFDE	GTT	4	Yamal
Vladimir Viz	172,000	MOL-China Shipping	Daewoo	Sept-18	Hong Kong	DFDE	GTT	4	Yamal
Vladimir Voronin	172,600	Teekay	Daewoo	Jun-19	Bahamas	MEGI-DF	GTT	4	Various
Wakaba Maru	125,000	J3 Consortium	Mitsui Chiba	Apr-85	Japan	S	Moss	5	Pertamina
WilForce	156,000	Teekay LNG	Daewoo	Aug-13	NIS	DFDE	GTT	4	Various
WilPride	156,000	Teekay	Daewoo	June-13	NIS	DFDE	GTT	4	Various
Woodside Cheney	174,000	Maran	Hyundai Samho	Mar-16	Greece	DFDE	GTT	4	Various
Woodside Donaldson	165,500	Teekay LNG	Samsung	Dec-09	Singapore	DFDE	GTT	4	Various
Woodside Goode	159,800	Maran	Daewoo	Jul-14	Greece	DFDE	GTT	4	Various
Woodside Reeswithers	173,400	Maran	Daewoo	Nov-16	Greece	DFDE	GTT	4	Various
Woodside Rogers	155,900	Maran Gas	DSME	Jul-13	Greece	DFDE	GTT	4	Various
Yakov Gakkal	172,600	Teekay-China JV	Daewoo	Nov-19	Bahamas	MEGI-DF	GTT	4	Various
Yamal Spirit	174,000	Teekay	Hyundai Samho	Jan-19	Bahama	MEGI-DF	GTT	4	Various
Yari LNG	159,983	TMSC Gas	Daewoo	Jun-14	Malta	TFDE	GTT	4	Various
Yenisei River	155,000	Dynagas	Hyundai	Jul-13	Marshall Is.	DFDE	GTT	4	Various
YK Sovereign	127,125	SK Shipping	Hyundai	Dec-94	Panama	S	Moss	4	Pertamina
Zarga	266,000	QGTC	Samsung	Dec-09	Liberia	DRL	GTT	5	Qatar-Atlantic
Zekreet	135,420	J4 Consortium	Mitsui Chiba	Dec-98	Japan	S	Moss	5	Qatargas

Any observations, additions or suggested revisions to the LNG journal World LNG Carrier Fleet list should be sent to editor@lngjournal.com

LNG Import Terminals

Explanatory Notes

- The tables do not include the following types of LNG facilities :
 - ♦ Small marine satellite terminals receiving LNG from liquefaction plants in their own country (such as exist in Norway) or which receive LNG transhipped from nearby reception terminals in their own country (such as in Japan)
 - ♦ Satellite LNG storage facilities that receive LNG transported only by road or rail
- Expansions of LNG reception terminals are only shown if they involve new storage tanks
- Where there is a blank in the table the information is uncertain or unknown.

Any comments on the tables, and corrections / additional information from terminal shareholders and project developers would be most welcome, and should be sent to John McKay e-mail editor@lngjournal.com

Country	Location (Project)	Owners	Start up	Tanks	Storage Capacity
Belgium	Zeebrugge	Fluxys	1987	4	380,000
Canada	Canaport Saint John	Irving Oil, Repsol	2009	3	480,000
Chile	Quintero	ENAP, Metrogas, Enagas	2009	3	334,000
	Mejillones	Engie, Ameris Capital AGF	2010	1	175,000
China	Beihai LNG, Guangxi	Sinopec	2015	4	640,000
	Dalian	PetroChina	2011	3	480,000
	Dapeng ND Guangdong	CNOOC	2018	4	640,000
	Dongguan, Guangdong	Jovo Group	2013	2	160 000
	Fujian LNG (Xiuyu)	CNOOC, Fujian I&D Corp.	2008	2	640,000
	Guangdong	CNOOC,BP	2006	3	480,000
	Haikou, Hainan LNG	CNOOC	2014	3	480,000
	Ningbo, Zhejiang	CNOOC, Zhejiang Energy	2012	3	480,000
	Qidong, Jiangsu	Guanghui Energy	2018	1	60,000
	Qingdao, Shandong	Sinopec	2014	3	480,000
	Rudong	PetroChina	2011	3	530,000
	Shanghai	CNOOC, Shenergy Group	2009	3	495,000
	Shanghai, Mengtougou	Shanghai Gas	2008	3	120 000
	Shenzen, Diefu	CNOOC	2016	2	320,000
	Tangshan, Hebei	PetroChina	2013	3	480,000
	Tianjin North	Sinopec	2017	2	320,000
	Yuedong, Guangdong	CNOOC	2016	2	320,000
	Zhoushan Zhejiang	Enn Group	2018	2	320,000
	Zhuhai, Gaolan	CNOOC	2013	3	480,000
Dominican Republic	Punta Caucedo	AES Andres	2003	1	160 000
Finland	Pori	Gasum Skangas	2016	1	30,000
	Tornio	Gasum Skangas	2018	1	30,000
France	Fos Tonkin	Elengy	1972	3	150,000
	Montoir-de-Bretagne	Elengy	1980	3	360,000
	Fos Cavaou	Engie, Total	2010	3	330,000
	Dunkirk LNG	EDF, Fluxys, Total	2016	3	570,000
Gibraltar	Gasnor	Shell	2018	1	5,000
Greece	Revithoussa	DEPA	2000	3	225,000
India	Dabhol	GAIL, NTPC (Ratnagiri Gas & Power)	2009	3	480,000
	Dahej	Petronet LNG	2004	4	592,000
	Hazira	Shell India, Total	2005	2	320,000
	Kochi, Kerala	Petronet LNG	2013	2	320,000
	Mundra	Gujarat State Petroleum, Adani Group	2018	2	320,000
	Kamarajar (Ennore), Tamil Nadu	Indian Oil, DFC, ICICI Bank	2019	2	360,000
Indonesia	Arun	Pertamina	2015	5	507,000
Italy	Panigaglia	Snam	1969	2	100,000
	Porto Levante (offshore GBS)	ExxonMobil, Qatar Petroleum, Edison Gas	2009	2	250,000
Jamaica	Montego Bay	New Fortress	2018	1	7,000
Japan	Negishi	Tokyo Gas	1969	14	1,180,000
	Sodegaura	Tokyo Gas JERA Co. Inc	1973	35	2,660,000
	Ohgishima	Tokyo Gas	1998	4	850,000
	Higashi-Ohgishima	JERA Co. Inc.	1984	9	540,000
	Futtsu	JERA Co. Inc.	1985	10	1,360,000
	Yokkaichi LNG	JERA Co. Inc.	1988	4	320,000
	Kawagoe	JERA Co. Inc.	1997	6	840,000
	Yokkaichi Works	Toho Gas	1991	2	160,000
	Chita LNG Joint	Toho Gas, Chubu Electric	1978	4	300,000
	Chita LNG	Toho Gas, Chubu Electric	1983	7	640,000
	Chita - Midorihamma	Toho Gas	2001	3	600,000
	Senboku I	Osaka Gas	1972	4	180,000
	Senboku II	Osaka Gas	1977	18	1,585,000
	Himeji	Osaka Gas	1984	8	740,000
	Himeji LNG	Kansai Electric	1979	7	520,000
	Yanai	Chugoku Electric	1990	6	480,000
	Niigata	Nihonkai LNG, Tohoku Electric	1984	8	720,000
	Oita	Oita Gas, Kyushu Electric	1990	5	460,000
	Tobata	Kitakyushu LNG	1977	8	480,000
	Fukuoka	Saibu Gas	1993	2	70,000
	Sodeshi	Shizuoka Gas	1996	3	337,200
	Hatsukaichi	Hiroshima Gas	1996	2	170,000
	Kagoshima	Nippon Gas	1996	2	136,000
	Shin-Minato	Sendai City Gas	1997	1	80,000
	Nagasaki	Saibu Gas	2003	1	36,000
	Sakai	Kansai Electric, Cosmo Oil	2006	3	420,000
	Mizushima	Nippon Oil, Chugoku Electric	2006	2	320,000

LNG Import Terminals (continued)

Country	Location (Project)	Owners	Start up	Storage	
				Tanks	Capacity
Japan (continued)	Sakaide	Shikoku Electric, Cosmo Oil	2011	1	180,000
	Ishikari LNG	Hokkaido Gas, Hokkaido Electric	2012	2	380,000
	Okinawa	Okinawa Electric Power	2012	2	280,000
	Naoetsu	Inpex	2013	2	360,000
	Joetsu	JERA Co. Inc.	2011	3	540,000
	Hachinohe LNG	Nippon Oil	2015	2	280,000
	Hitachi LNG	Tokyo Gas	2015	1	230,000
Korea	Soma Fukushima	Japan Petroleum Exploration	2017	1	225,000
	Boryyeong	GS Energy, SK E&S	2017	3	200,000
	Incheon	Kogas	1996	20	2,880,000
	Kwangyang	POSCO SK E&S	2005	4	530,000
	Pyeong-Taek	Kogas	1986	23	3,360,000
	Samcheok	Kogas	2014	3	600,000
	Tong-Yeong	Kogas	2002	17	2,620,000
Malaysia	Jeju	Kogas	2019	2	90,000
	Pengerang Johor	Petronas Gas	2017	2	400,000
Mexico	Altamira	Vopak, Enagas	2006	2	300,000
	Energia Costa Azul	Sempra LNG	2008	2	320,000
	Manzanillo	Samsung, Kogas, Mitsui	2012	2	300,000
Netherlands	Gate LNG	Gasunie, Royal Vopak	2011	3	540,000
Panama	Costa Norte	AES	2018	1	130,000
Phillipines	Pagbilao LNG	Energy World Corp.	2017	1	130,000
Poland	Swinoujscie	Baltic Gaz System	2015	2	320,000
Portugal	Sines	REN Atlantico	2004	3	390,000
Puerto Rico	Penuelas	EcoElectrica	2000	1	160,000
Singapore	Singapore	Singapore Energy Authority	2013	3	540,000
Spain	Barcelona	Enagas	1969	8	840,000
	Huelva	Enagas	1988	5	610,000
	Cartagena	Enagas	1989	5	587,000
	Bilbao	Enagas, EVE	2003	3	450,000
	Sagunto	GNF, Osaka Gas, Oman Oil	2006	4	600,000
	Mugardos, El Ferrol	Reganosa, Sonatrach, Sojitz Corp.	2006	2	300,000
	El Musel, Gijón,	Enagas	2013	2	300,000
Sweden	Lysekil	Gasum	2014	1	30,000
	Nynashamn	AGA Gas	2011	1	20,000
Taiwan	Yung-An	CPC	1990	6	690,000
	Tai-Chung	CPC	2009	5	800,000
Thailand	Map Ta Phut	PTT LNG	2011	2	320,000
Turkey	Marmara Ereglisi	Botas	1994	3	255,000
	Izmir	EgeGaz	2006	2	280,000
USA	Everett	Suez LNG NA	1971	2	155,000
	Lake Charles	Shell, ETE	1982	4	425,000
	Freeport	Freeport LNG Development	2008	2	320,000
	Golden Pass, TX	Qatar Petroleum, ExxonMobil	2010	5	775,000
	Pascagoula, MS	Gulf LNG, Kinder	2012	2	320,000
UK	Isle of Grain	National Grid	2005	8	1,000,000
	South Hook	ExxonMobil, Qatar Petroleum, Total	2009	5	775,000
	Dragon LNG, Milford Haven	Shell, Petronas	2009	2	310,000

LNG Import Terminal Projects

Country	Location/Project	Owners/Project Developers	Start up	Storage	
				Tanks	Capacity
China	Shenzhen	CNPC Yudean Power	2021	2	120,000
	Tianjin (Nangang)	Beijing Energy	2022	10	2,000,000
	Yangjiang	CNPC Yudean Power	2023	2	120,000
	Zhangzhou Fujian	CNOOC	2022	2	160,000
India	Dhamra Odisha	Indian Oil, Adani, GAIL	2020	2	320,000
	Jaigarh	Hiranandani Group	2019	2	320,000
	Kodinar	Hindustan Petroleum Corp.	2022	1	160,000
Japan	Himuka	Diagas Group-Osaka Gas	2022	1	65,000

LNG FSRU Import Facilities

Country	Location (Project)	Owners	Start up
Argentina	Bahia Blanca GasPort	Excelerate/YPF Repsol	2008
	Escobar GasPort	Excelerate/Enarsa	2011
Bangladesh	Moheshkhali	Excelerate, PetroBangla	2018
	Cox's Bazar	Summit Power International, Excelerate Energy	2019
Brazil	Pecem, FSRU	Petrobras	2009
	Guanabara Bay FSRU	Petrobras	2009
	Salvador, Bahia FSRU	Petrobras	2013
China	Tianjin FSRU	CNOOC, Hoegh, various	2013
Colombia	Cartagena FSRU	Promigas, Sociedad Portuaria El Cayao	2016
Egypt	Ain Sokhna, Suez	EGAS, Hoegh	2015
	Ain Sokhna, Suez	EGAS, BW Gas	2015
Indonesia	Lampung	Hoegh LNG, PGN LNG	2014
	Nusantara (Jakarta Bay)	Golar LNG, Pertamina	2012
Italy	Livorno	OLT Offshore LNG Toscana	2013
Jamaica	Old Harbour	Golar FSRU, New Fortress	2019
Jordan	Aqaba, Jordan	Golar LNG	2015
Kuwait	Mina Al-Ahmadi	KPC	2009
Lithuania	Klaipeda	Klaipedos Nafta Hoegh LNG	2014
Malaysia	Malacca FSRU	Petronas	2012
Malta	FSU Armada Mediterranea	ElectroGas	2016
Pakistan	Port Qasim	Excelerate, Engro Corp	2015
	Port Qasim	BW-Mitsui, PGP Consortium	2017
Turkey	Aliaga FSRU, Turquoise FLNG	Etiki LNG	2016
	Dortyol FSRU Challenger	Botas	2018
UAE	Ruwais, Abu Dhabi	Gasco (UAE)	2016
	Jebel Ali Port, Dubai	DSA (UAE)	2010

LNG Export Projects

Country	Location/Project	Project Developers	Planned Start Up	Number of Trains	Capacity In MTPA
AUSTRALIA	Pluto LNG expansion	Woodside	2021+	2	10.0
CANADA	Bear Head LNG, Nova Scotia	LNG Ltd.	2024	4	8.0
	Goldboro LNG, Nova Scotia	Pieridae Energy	2024	2	10.0
	Kitimat LNG, BC	Woodside, Chevron	2024	2	10.0
	LNG Canada, BC	Shell, Mitsubishi, Kogas, PetroChina, Petronas	2024	2	12.0
	Kwispaa FLNG, Vancouver	Steelhead LNG	2024	4	12.0
	Vancouver Tilbury	WesPac Midstream	2021	1	3.25
	Woodfibre LNG, Squamish	Pacific Oil & Gas Co	2020	2	2.1
EQ.GUINEA	Equatorial Guinea Fortuna FLNG	Ophir, Golar LNG, GEPetrol	2020+	1	2.0
INDONESIA	Sengkang LNG	Energy World Corp.	2019	4	2.0
MALAYSIA	Rotan FLNG (Sabah)	Petronas, Murphy Oil	2021	1	1.5
MOZAMBIQUE	Area 1 Onshore	Anadarko Petroleum and partners	2023+	2	10.0
	Area 4 Onshore	Eni and partners	2023+	2	10.0
	Area 4 FLNG	Eni and partners	2022	1	3.4
NIGERIA	NLNG Train 7	NNPC, Shell, Eni, Total	2022+	1	7.0
PAPUA NEW GUINEA	Elk-Antelope LNG	Total, ExxonMobil Oil Search, Petromin	Studies		
RUSSIA	Sakhalin II expansion	Gazprom, Shell, Mitsui, Mitsubishi	2021	studies	
	Vladisvostok LNG	Gazprom, Itochu, various	2023+	2	10.0
	Arctic LNG II Siberia	Novatek, Total	2023	3	19.8
USA	Alaska LNG Nikiski	Alaska Gasline Development Corp.	2023+	3	20.0
	Annova LNG, Brownsville	Exelon Corp.	2023+	6	6.0
	Commonwealth LNG, Louisiana	Commonwealth LNG LLP	2023+	8	9.0
	Delfin LNG, Louisiana	Delfin	2023+	3	9.0
	Driftwood LNG, Louisiana	Tellurian, Total and others	2023	6	27.6
	Galveston Bay LNG	NextDecade	2023+	6	27.0
	Golden Pass, Texas	Qatar Petroleum, ExxonMobil	2024	3	15.6
	Jacksonville, St John's River	Eagle LNG, Ferus Natural Gas Fuels	2021+	small	-1
	Jordan Cove, Coos Bay	Pembina Corp.	2024	2	7.8
	Lake Charles, Louisiana	Shell, ETE	2024	3	15.0
	Magnolia LNG	Louisiana LNG Ltd.	2023+	4	8.0
	Port Arthur LNG	Sempra	2023+	2	10.0
	Rio Grande LNG	NextDecade	2023+	6	27.0
	Sabine Pass LNG, Louisiana	Cheniere	2016-19	1	4.5
	Texas LNG Brownsville	Chandra, Meyer, Samsung, others	2023+	2	4.0
	VG LNG (Cameron Parish)	Venture Global	2022	5	12.0
	VG LNG (Plaquemines)	Venture Global	2022	10	20.0
	VG LNG (Delta-Plaquemines)	Venture Global	2024	36	22.5

LNG Exporters

Country	Location/Project	Shareholders	Start up	Liquefaction		Storage	
				Trains	capacity (nominal) mtpa	No. of tanks	Total capacity m³
ABU DHABI (UAE)	Das Island (Adgas)	ADNOC, Mitsui, BP, Total	1977 1994	2 1	3.2 2.5	3	240,000
ALGERIA	Arzew	Sonatrach GL4Z	1964	3	1.1	3	35,000
	Arzew	Sonatrach GL1Z	1978	6	7.8	3	300,000
	Arzew	Sonatrach GL2Z	1980	6	8.0	3	300,000
	Arzew	Sonatrach	2014	1	4.7		
	Skikda	Sonatrach GL1K II	1980	3	3.0	5	308,000
	Skikda	Sonatrach (rebuild)	2013	1	4.5		
ANGOLA	Soyo	Sonangol, Chevron, BP, ENI, Total	2012	1	5.2	2	370,000
ARGENTINA	FLNG Tango	Bahia Blanca	2019	1	0.5	1	16,100
AUSTRALIA	Karratha	NWS Woodside, Shell, BHP	1989	2	5.0	4	260,000
		(BP, Chevron	1992	1	2.5	1	130,000
		(Mitsubishi/Mitsui)	2004	1	4.4	1	130,000
		NWS partners	2008	1	4.4	1	130,000
		Darwin (Bayu Undan) ConocoPhillips, Santos, Eni, Inpex, TEPCO, Tokyo Gas	2006	1	3.5	1	188,000
	Australia Pacific LNG	ConocoPhillips, Origin Energy, Sinopec	2016	2	7.5	2	320,000
		Gladstone LNG Santos, Petronas, Total, Kogas	2015	2	7.8	2	280,000
		Gorgon LNG Chevron, Shell, ExxonMobil	2016	3	15.6	2	360,000
		Pluto LNG Woodside, Tokyo Gas, Kansei	2012	1	4.8	2	240,000
		QCLNG Shell, CNOOC	2014	2	8.0	2	280,000
		Wheatstone LNG Chevron, Woodside, Kuwait (KUFPEC), Jera, Kyushu	2017	2	8.9	2	300,000
		Ichthys LNG Inpex Corp., Total	2018	2	8.9	2	330,000
		Prelude FLNG Shell, Inpex, Kogas CPC	2019	1	3.5		
BRUNEI	Lumut	Brunei/Shell/Mitsubishi/Total	1972-74	5	7.2	3	176,000
CAMEROON	Hilli Episeyo FLNG	Kribi Perenco	2018	1	1.2	1	125,000
EGYPT	Damietta	Union Fenosa, EGPC, EGAS	2004	1	5.0	2	300,000
	Idku	EGPC, EGAS, Shell, Total, Petronas	2005	2	7.2	2	280,000
EQ.GUINEA	Bioko Island	Marathon, Sonagas, Mitsui, Marubeni	2007	1	3.4	2	272,000
INDONESIA	Bontang I	Pertamina, VICO, JILCO, Total	1977	2	5.2	5	635,000
	Bontang II		1983	2	5.2		
	Bontang III		1989	1	2.8		
	Bontang IV		1993	1	2.8		
	Bontang V		1997	1	2.8		
	Bontang VI		1999	1	3.0		
	Sulawesi LNG	Medco Energi, Pertamina, Mitsubishi	2015	1	2.0	1	170,000
	Tangguh	BP, MI Berau, CNOOC, Nippon, LNG Japan	2008	2	7.6	2	340,000
MALAYSIA	Bintulu (MLNG Satu)	Petronas, Sarawak, Mitsubishi	1983	3	8.1	4	260,000
	Bintulu (MLNG Dua)	Petronas, Shell, Sarawak, Mitsubishi	1995	3	7.8	1	65,000
	Bintulu (MLNG Tiga)	Petronas, Shell, Sarawak, Mitsubishi, Nippon Oil	2003	2	6.8	1	120,000
	Bintulu Train 9	Petronas	2016	1	3.6		
	Kanowit FLNG	Petronas	2016	1	1.2		
NIGERIA	Bonny Island	NNPC, Shell, Total, Eni	1999	2	6.4	2	168,400
		Nigeria LNG (formed by above)	2002	1	3.2	1	84,200
		Nigeria LNG	2006	2	8.2		
		Nigeria LNG	2008	1	4.1	1	84,200
NORWAY	Snøhvit/Melkoya	Equinor, Total, Petoro	2007	1	4.2	2	280,000
OMAN	Oman LNG	Oman Govt., Shell, Total, Korea LNG	2000	2	7.1	2	240,000
		Mitsubishi, Mitsui, Partex and Itochu					
PAPUA NEW GUINEA	PNG LNG	Oman Govt., Oman LNG Union Fenosa, Osaka Gas, & Itochu	2006	1	3.7	2	240,000
		ExxonMobil, Oil Search, Santos, JX Nippon Oil	2014	2	6.9	2	320,000
PERU	Peru LNG	Hunt Oil, Shell, Marubeni, SK Group	2010	1	4.4	2	260,000
QATAR	Qatargas 1-T1&2	QP, ExxonMobil, Total, Marubeni, Mitsui	1997	2	6.4	4	340,000
	Qatargas 1-T3	QP, ExxonMobil, Total, Marubeni, Mitsui	1999	1	3.1		
	Qatargas II-T1	QP, ExxonMobil	2009	1	7.8		
	Qatargas II-T2	QP, ExxonMobil, Total	2009	1	7.8	8	1,160,000
	Qatargas III-T1	QP, ConocoPhillips, Mitsui	2010	1	7.8		
	Qatargas IV-T1	QP, Shell	2010	1	7.8		
	RasGas I- T1&2	QP, ExxonMobil, Kogas, Itochu, LNG Japan	1999	2	6.6		
	RasGas II- T3	QP, ExxonMobil	2004	1	4.7		
	RasGas II- T4	QP, ExxonMobil	2005	1	4.7	6	840,000
	RasGas II- T5	QP, ExxonMobil	2007	1	4.7		
	Rasgas III – T6	QP, ExxonMobil	2009	1	7.8		
	Rasgas III – T7	QP, ExxonMobil	2010	1	7.8		
RUSSIA	Sakhalin Island	(Sakhalin Energy) Gazprom, Shell, Mitsui, Mitsubishi	2009	2	9.6	2	200,000
	Yamal LNG Siberia	Novatek, Total, CNPC, Silk Fund	2017	3	16.5	4	640,000
TRINIDAD & TOBAGO	Point Fortin Train 1	BP, Shell, CIC, NGC	1999	1	3.0	2	204,000
	Train 2	BP, Shell	2002	1	3.3	1	160,000
	Train 3	BP, Shell	2003	1	3.3	1	160,000
	Train 4	BP, Shell, NGC	2005	1	5.2	1	160,000
USA	Cheniere Sabine Pass	Cheniere Energy	2016	5	22.5	5	800,000
	Cove Point LNG	Dominion Energy	2017	1	5.3	7	695,000
	Cheniere Corpus Christi	Texas Cheniere	2018	2	9.0	3	480,000
	Cameron Hackberry	Sempra, Total, Mitsui, Mitsubishi	2019	2	9.8	3	480,000
	Elba Island Georgia	Kinder Morgan, EIG Energy	2019	10	2.5	5	535,000
	Freeport LNG, Texas	Freeport LNG	2019	2	10.2	3	483,000
YEMEN	Bal-Haf	Yemen LNG, Total, Yemen Gas, Hunt Oil, SK Group, Hyundai	2009	2	6.7	2	320,000



BRIGHTER FUTURE

COOLER BY DESIGN™

Did you know Chart's LNG power generation solutions provide natural gas to hundreds of thousands of homes? This is one way Chart facilitates LNG as a safe, clean-burning fuel for energy, transportation and industry.

*Learn more at www.ChartLNG.com
LNG@ChartIndustries.com*



Cooler By Design.™



Electrify Your Fired Process Heaters



HELIMAX™ Electric Heat Exchanger

Zero-Emission Production

- Converts 100% of the power into heat energy with no emissions. Eliminate carbon emissions.
- Eliminates the need for steam and hot oil systems Heat the process directly with electric.

Lowers Operating Cost

- No need for trained operators to monitor and adjust air fuel mixture.

Reduces Footprint and Envelope Size

- Compared to similar gas fired systems with similar outputs, electric heat exchangers are typically half the size or less.

Allows for Remote Unmanned Operation

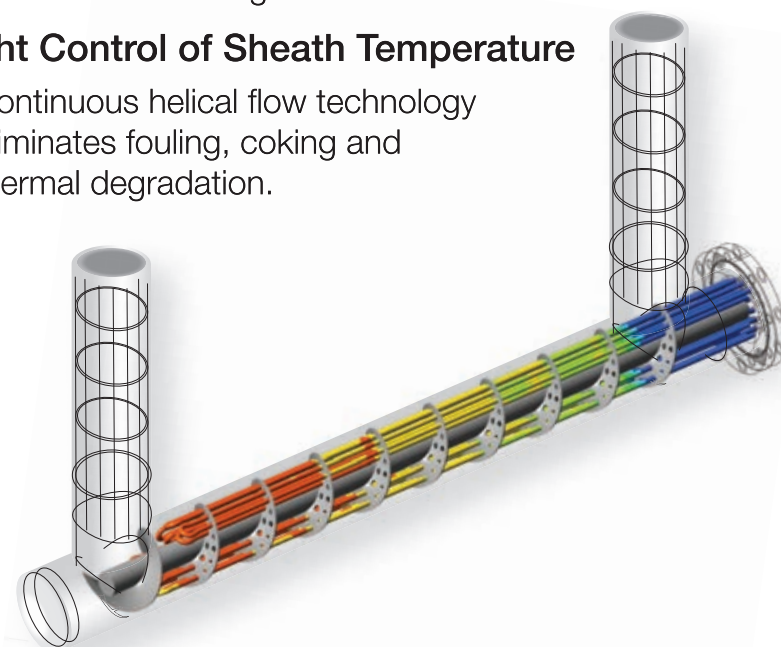
- With proper sensors and controllers, electric heat exchangers are capable of unmanned operations and can be remotely run and automated.

Eliminates Downtime and Associated Expenses

- Lost productivity.
- Labor expenses to dismantle, clean and reassemble fouled heat exchanger.

Tight Control of Sheath Temperature

- Continuous helical flow technology eliminates fouling, coking and thermal degradation.



Go Green, with Watlow's new **HELIMAX™** ultra-efficient electric heat exchanger. **HELIMAX** leverages continuous helical flow™ (CHF) technology to deliver up to 4X better heat transfer compared to traditional heat exchangers using segmental baffles. CHF technology also means that heater fouling is a thing of past saving you the downtime and aggravation often associated with dismantling, cleaning and reassembling fouled heaters. **HELIMAX** is the break through solution solving all your decarbonization concerns.

Powered by Possibility



Find the thermal solution for your application, contact Watlow today.

Contact us at www.watlow.com