

LNG Fuelling

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Świnoujście LNG bunker plans progress

The management board of Polish natural gas transmission system operator Gaz-System has issued recommendations for the planned extension of the Świnoujście LNG Terminal, including a new loading berth for LNG bunker vessels.

The framework recommendations were delivered to LNG fuelling firm Polskie LNG for commencement of design and preparation works for the extension of the President Lech Kaczyński LNG Terminal. The work will involve building an additional loading/unloading berth for vessels and a loading berth for LNG bunker vessels.

"This is another important step in the development of the LNG terminal in Świnoujście, and I am happy that we are effectively using the potential of liquefied natural gas, developing the promising market of LNG transshipment and ship bunkering services," Tomasz Stępień, President of the Management Board of Gaz-System, said.

Feasibility study points to expanded LNG bunkering

The decision was taken based on the results of a feasibility study, which was accepted by Gaz-System at the end of August. The expanded site will enable LNG bunkering operations, LNG transshipment operations, loading and



The Świnoujście LNG terminal



Świnoujście sea wall

unloading of LNG bunker vessels as well as of small and medium-scale LNG carriers.

"The LNG Terminal extension project, involving the construction of a loading/unloading berth for vessels and a loading berth for LNG bunker vessels, is part of the construction of the so-called Northern Gate. It also fits in with the objectives of the Programme of the Ministry of Maritime Economy and Inland Navigation aimed at clearing the Oder Waterway and making it fully navigable in the coming years. The project is also a part of the Baltic Energy Market Interconnection Plan (BEMIP) for natural gas," Paweł Jakubowski, Director of the Development Division at Gaz-System, commented.

Earlier in the year, consultations for a new draft code resulted in a framework to manage uncontracted LNG capacity. According to this framework, the proposed extension will include construction of a second jetty, implemented with the use of EU funds awarded

under Measure 7.1. of the Operational Programme "Infrastructure and Environment".

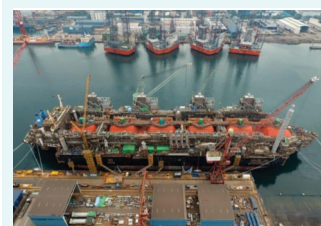
The second jetty of the Terminal is scheduled to be operational by 2021. Once work is complete, the gas port's regasification capacity will increase from the present 5 billion cubic metres to 7.5 billion cubic metres of natural gas per annum.

The Świnoujście LNG terminal comprises a 3 kilometre long breakwater, a berth with mooring system to accommodate and unload methane carriers of 120 to 217 thousand cubic meters capacity, two cryogenic storage tanks - each of 160 thousand cubic meters capacity, regasification installations and an 85 kilometre pipeline connecting the terminal with Polish gas transmission system.

The terminal's proposed regasification capacity of 7.5 billion cubic metres per annum will ensure it retains its position as the largest installation of its size in Northern and Central-Eastern Europe.

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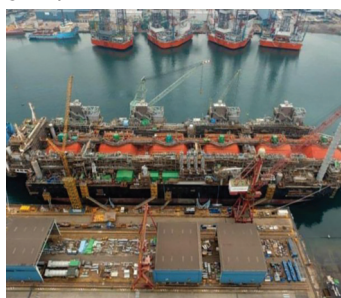
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FueLNG completes Singapore LNG bunker first

Joint venture bunker specialist FueLNG has completed the first commercial truck-to-ship LNG bunkering in Singapore for the Floating Liquefaction (FLNG) vessel, *Hilli Episeyo*.

The bunker transfer operation was carried out in phases over the space of two months and conducted in accordance with the Singapore Chemical Industry Council (SCIC) Technical Reference for LNG Bunkering (TR 56).

"This marks the first LNG trucking operation for FueLNG, following the facilitation of Singapore LNG's (SLNG) successful gas-up/cool-down and reload



The *Hilli Episeyo*

operation at its Jurong Island terminal of the *Cardissa*, Shell's LNG bunker vessel, in June 2017," a spokesperson for FueLNG said.

The world's first converted FLNG, *Hilli Episeyo*, has now departed Singapore for deepwater anchorage before sailing to West Africa for its first project.

Tug bunkering contracts to start in 2018

Alongside its contract for LNG bunkering with the *Hilli Episeyo*, FueLNG has also secured contracts from Keppel Smit Towage and Maju Maritime to provide LNG bunkering services for two dual-fuel LNG harbour tugs. The new contracts are set to commence in 2018 once construction of the tugs is completed.

"This is an exciting milestone

for FueLNG as we establish ourselves as a safe, cost-efficient and reliable LNG bunker supplier. The development of proven LNG bunkering infrastructure will give confidence to the industry that LNG can be widely adopted as a marine fuel and is sustainable for the long-term," Michael Chia, Chairman of FueLNG, said

FueLNG is a joint venture between Singapore conglomerate Keppel and Dutch energy firm Shell Eastern Petroleum.

LBPP backs further LNG investment

Singapore's Maritime and Port Authority of Singapore (MPA) has stated its backing for the planned LNG infrastructure improvements and earlier this year launched its

LNG bunkering pilot programme (LBPP).

Under the LBPP, the MPA has provided various companies with grants of up to S\$2 million per LNG-powered vessel constructed.

"This successful operation by FueLNG attests to Singapore's ability to provide safe, efficient, and reliable LNG bunkering in the Port... As the leading bunkering port in the world, MPA is committed to cater to the future energy needs of the global shipping industry via cleaner, alternative sources of fuels such as LNG. We will continue to work closely with our stakeholders to develop our capabilities in preparation for a larger uptake of LNG bunkering in the future," Andrew Tan, Chief Executive of MPA, said. ■

Okra constructs first Peruvian small-scale LNG facility

Infrastructure developer Okra Energy has installed Peru's first small-scale LNG facility, paving the way for first bunkering of the fuel in the country.

The small facility features three LNG storage tanks and has been constructed by Okra's subsidiary Lanterna Energy. It comprises Okra's proprietary equipment design and technology and has been designed for scalable growth in support of the increasing energy demands.

"Constructing this plant is a significant achievement for both the LNG industry and the greater South American economy. Peruvians will now enjoy the benefits of a virtual pipeline... We are proud to be the industry leader in affordable ssLNG technology, key to the growth of emerging markets, worldwide," Louis Ravenet, CEO of Okra, said.

The first supply of LNG from the facility in northern Peru has

already been pre-sold to one of the largest steel manufacturers in the western hemisphere, with the balance under contract for delivery in early 2018.

Offsite manufacturing process cuts installation complexity

The company's proprietary modular solution can be brought into production rapidly and scaled over time to meet dynamic supply needs thanks to a manufacture process in factory-controlled settings, designed to reduce installation complexity and labour costs.

The firm estimates that the unique manufacturing process can deliver substantial capital and operating expense savings compared

to legacy energy sources, such as compressed natural gas, diesel and heavy fuel oil.

"[Okra Energy] is helping the nation by bringing cleaner-burning energy while significantly reducing operational costs to businesses, industrial manufacturers and power generators as well as to the marine, mining, rail, trucking, and tourism industries," a spokesperson for the firm said.

Additional ssLNG facilities to build on Cryogas acquisition

Subsequent ssLNG facilities are currently under contract negotiation. In July this year,

Okra Energy acquired Cryogas, a Peruvian specialist in LNG and



Installation of LNG tanks at the Lanterna site

installation of regasification plants.

"The purchase of Cryogas is key to our vertical solution for localized, off-grid energy delivery. Acquiring Cryogas ensures that Okra Energy can safely and efficiently transport and regasify LNG throughout Peru... Acquiring Cryogas establishes Okra as a leading source of LNG in Peru, and throughout the greater South American region," Ravenet said. ■

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Sovcomflot signs up for five LNG-fuelled Aframax

Russian shipping firm Sovcomflot has signed an agreement with state oil firm Rosneft to operate five newbuild LNG-fuelled tankers.

The deal will see the Aframax tankers constructed jointly by Korean shipbuilding firm Hyundai Heavy Industries and technology firm Zvezda. The 114,000 dead-weight-tonne vessels are purpose-designed to use LNG as their primary fuel and based on technical specifications designed by SCF's specialists, with the close involvement of the Far Eastern Shipbuilding and Ship Repair Centre (FESRC).

"We hope that the beginning of serial production of cutting-edge large-capacity LNG-fuelled tankers in Russia will facilitate the further development of Russia's port infrastructure that will allow ships to be bunkered with LNG fuel at Russian ports," Sergey Frank, CEO of Sovcomflot, said.

The tankers will operate in the Baltic Sea and subarctic seas and will be classified as ice class 1A/1B, ensuring they can operate year-round in challenging ice conditions.

Industry invests in LNG switch

The new tankers are the result of wide ranging industry collaboration that has included specialists from oil major Rosneft, Russia's State Transport Leasing Company (STLC) and the Federal Agency



Rosneft executives at the signing ceremony

Sovcomflot welcomes the further expansion of mutually beneficial cooperation with Rosneft, Russia's largest oil exporter

Sergey Frank, CEO of Sovcomflot

for Marine and River Transport (Rosmorrechflot).

"Sovcomflot welcomes the further expansion of mutually beneficial cooperation with Rosneft, Russia's largest oil exporter. SCF Group is already operating three Rosneft-owned ice-class 30,000 dwt tankers (*RN Arkhangelsk*, *RN Murmansk*, and *RN Privodino*), all of them transporting oil and petroleum products across the Baltic Sea and in the Arctic,"

Sergey Frank, CEO of Sovcomflot, said.

The country's regulators and maritime authorities are expected to provide further incentives for charterers, ship owners, and fleet operators to switch to LNG, with sources reporting that the country's government has earmarked US\$1.3 billion to spur the switch to LNG for its fleet.

"We are prioritising the switch to the use of LNG as a primary

vessel fuel, a complex solution which we consider to be efficient both environmentally and economically. When compared," Igor Tonkovidov, Executive Vice-President and Technical Director of Sovcomflot, said.

Shell to supply LNG via Gate terminal

Earlier this year, Sovcomflot signed a deal with Dutch energy firm Shell for the supply of LNG fuel to the vessels. Shell Western LNG will provide refuelling capabilities from a specialised LNG bunker vessel at the Dutch Gate terminal at the port of Rotterdam and from a second undisclosed supply point in the Baltics.

The engines for the tankers will be supplied by Winterthur Gas & Diesel (WinGD). The 7X62DF engines will feature X-DF low-pressure gas admission and will comply with IMO Tier III limits for oxides of nitrogen (NOx) in their gas fuel mode, and with IMO Tier II when burning liquid fuel. The 7X62DF are rated 3,800 kilowatts at 86 revolutions-per-minute.



Artist's rendition of SCF tanker



LNG VALUE CHAIN SOLUTIONS

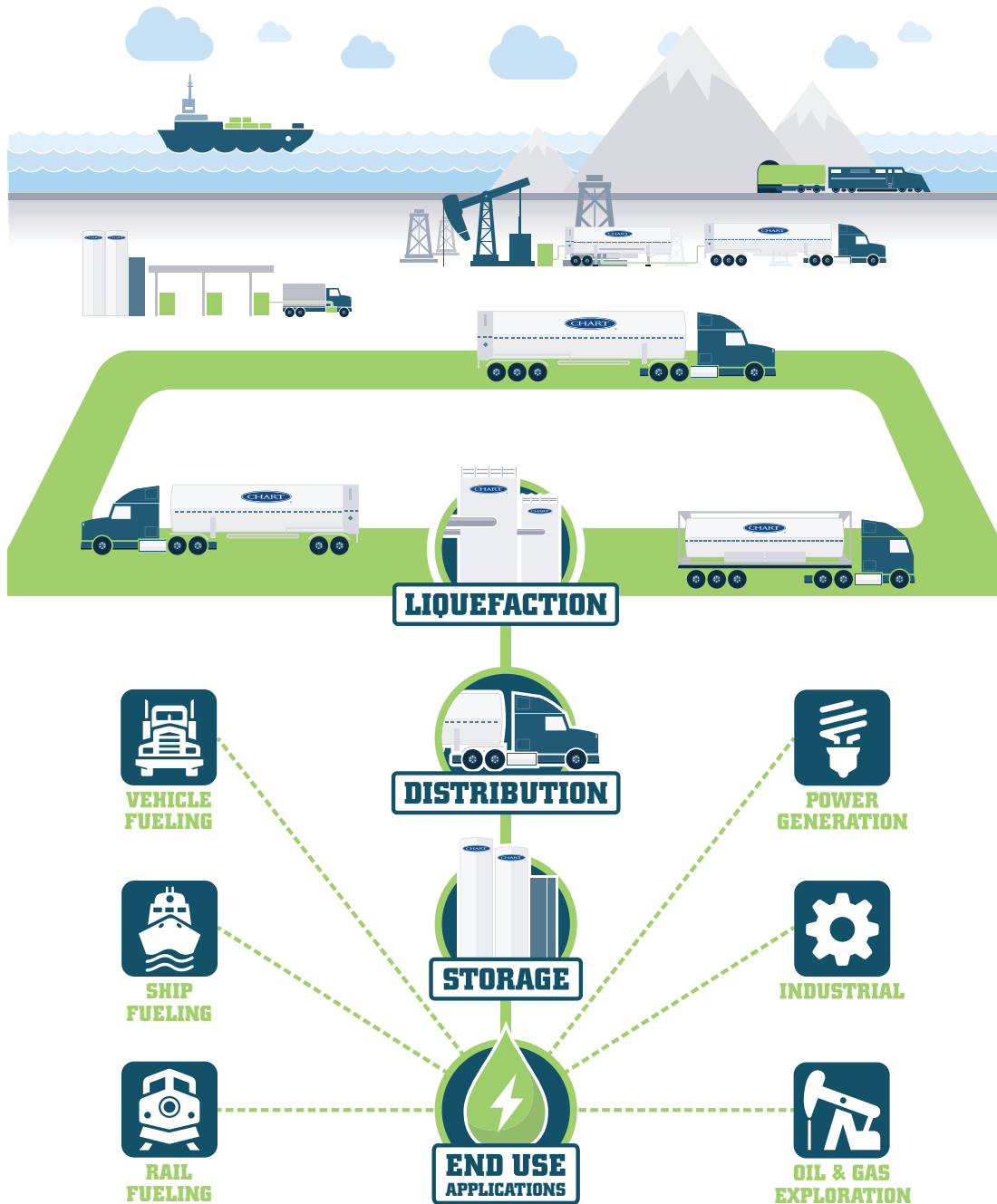


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LR approves HMD LNG vessel cargo system

Standards agency Lloyd's Register has approved designs by Korean shipyard Hyundai Mipo for an LNG vessel cargo handling system.

The approval in principle (AiP) certification paves the way for commercial production of the 6,600 cubic-meter-capacity cargo handling system by Hyundai Mipo Dockyard (HMD). The design was jointly developed by HMD and the Hyundai Heavy Industries (HHI) Corporate Research Centre.

"We are pleased that LR LNG carrier specialists and Busan Technology Support Office, headed by

Y.D. Kim, have provided and facilitated their vast experience through the entire gas technology supply chain to support HMD and the HHI Corporate Research Centre to achieve the required level of compliance with the international regulations for HMD's design, and this is endorsed by issuing the AiP certification," Jin-Tae Lee, Marine Manager at LR, said.

Expanding LNG bunkering options

The cargo handling design allows for management of Boil-Off Gas (BOG) and supply of fuel gas to a dual-fuel main engine aboard the vessel as well as providing for bunkering to a secondary LNG-fuelled ship.

The pumps on the vessel are capable of bunkering to a LNG-fuelled ship at a maximum of 1,100 cubic metres per hour while supplying fuel gas to the ship's own engine via BOG compression or LNG vaporizing.

The unique system allows Boil-Off Gas returned from the LNG-fuelled ship during bunkering to either be burnt in the dual-fuel engine or collected inside the Type C cargo tank. The tank's insulation has been designed so that the BOG rate is less than the main

engines fuel gas consumption rate at normal continuous rating.

"This means that all BOG can be utilised by burning in the main engine so that the cargo tank pressure and temperature can be managed in a stable manner," an LR spokesperson explained.

Larger design already planned

As the next phase of work, designers from HMD and HHI are already planning improvements to the system to increase capacity and efficiency.

"HMD and the HHI Corporate Research Centre expect that a cargo handling system for larger LNG bunkering vessels and LNG carriers can also be developed based on this approved design for a 6,600 m³ LNG bunkering vessel," a spokesperson said. ■



Representatives of Hyundai Mipo Dockyard

MannTek announces lighter LNG bunkering system

Swedish coupling manufacturer and supplier MannTek has announced a lighter and safer LNG bunkering system, that promises to reduce weight by up to 50%.

The novel system has successfully completed a factory acceptance test and is now being used on Sirius Shipping and the Anthony Veder Group's LNG bunker vessel, the *Coralius*.

"The lighter design makes for a more manoeuvrable design which in turn makes the role of the system's operators easier, and more importantly, safer," Markus Bäckström, CEO of MannTek, said.

Installation process optimised

Prior to installation aboard the *Coralius*, MannTek worked closely with Sirius Shipping, the Anthony Veder Group and Skangas, to ensure the installation process was fully optimised.

"During the project we have made design suggestions that we felt would improve the way the system is fitted to the vessel. We were involved from a very early

stage in design as bunking activities on a vessel need to be able to take place at four different locations," Markus said.

The *Coralius* started operations in the Baltic Sea and the North Sea in September.

Based on CBC and DCC couplings

The system is based on MannTek's Dry Cryogenic Coupling (DCC) and Cryogenic break-away Coupling (CBC) with the addition of LNG hoses, an Emergency Shut Down (ESD) signaller and High Pressure Nitrogen System (HPN2). The system is currently available in 4-inch, 6-inch and 8-inch variants.

"The company's DCCs have connected and transferred LNG 20,000 times, we believe we have the most experience in cryogenic transfer in the industry. This includes the first Ferry for LNG *Viking Grace* and the First container ship Tote



MannTek LNG coupling

Maritime," Marcus added.

To operational safety, the system was designed to stringent international standards and meets the requirements of a range of reg-

ulatory bodies including SIGTTO, SGMF, ISO, EN, Class approval with DNV, BV and Lloyds. The Transfer system can also be provided with a SIL 2 classification. ■

DNV GL predicts LNG to fuel shipping future

The use of LNG as a fuel for shipping is set to grow as natural gas becomes the world's primary energy source by 2035, according to standards agency DNV GL.

The agency forecasts that natural gas will be the last fossil fuel to experience peak demand as renewable penetration steadily increases and LNG grows in importance as a fuel, especially in the maritime sector.

"The numbers support our long-held view that gas can have a strong role alongside renewables in decarbonizing the world energy system. Indeed, our model shows how the stage is set for gas to become the leading carrier of energy towards 2050," the report's authors comment.

Gas to fuel 32% of shipping demand

The findings are published as part of DNV GL's Energy Transition Outlook (ETO) 2017 report which includes detailed scenarios of several possible energy landscapes for the coming decades. Amongst these forecasts the firm predicts that shipping will see a significant growth in natural gas as a fuel, with 32% of the sector fuelled by gas and 18% by biofuel by 2050.

An upsurge in maritime transport of gas by LNG carrier is also expected to help spread availability of the fuel and create mobile infrastructure for greater use of LNG to power shipping as Floating LNG (FLNG) vessels become more prevalent and technology improves to ease ship-to-ship bunkering.

"Transport of gas as LNG is



Shipping is predicted to see LNG demand increase

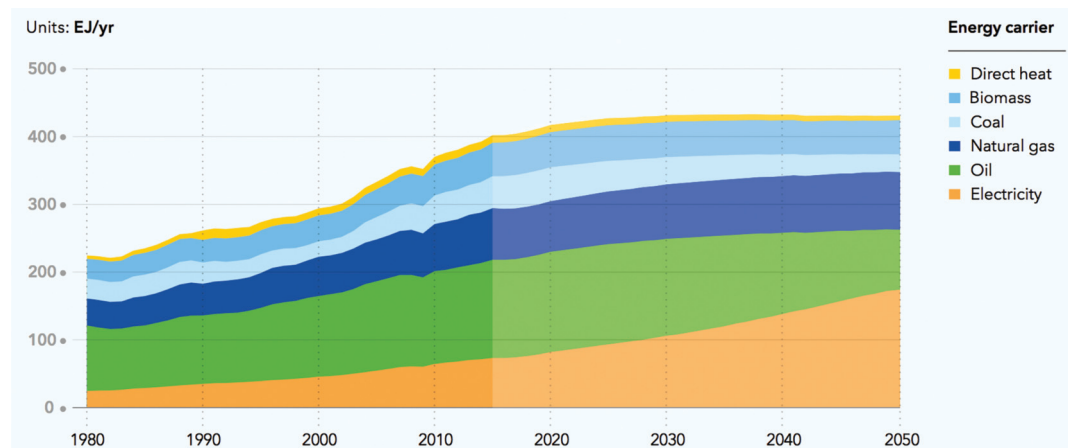
expected to exceed pipeline gas transportation by 2035...availability of production solutions such as Floating LNG (FLNG) allowing LNG transport will also assist in making the case for continued new development," the report states.

Electrification to see off LNG for road transport

While shipping is expected to see a strong switch to rise in gas use as a fuel, the ETO report suggests that electrification will play a larger role overall as cars switch from hydrocarbon to battery technology and remain the largest source of energy demand in the transport sector.

"Transport energy demand today is dominated by road transport, followed by aviation and shipping, and this picture does not change significantly over the forecast period... We expect [electric vehicles] to reach cost parity with conventional light vehicles (on the basis of full lifecycle costs, including fuel and maintenance) in 2022," the report's authors state.

DNV GL is the world's largest classification society responsible for 13,175 vessels and mobile offshore units. Headquartered in Bærum in Norway the organization also provides technical consultancy to the energy and transport sectors.



World final energy demand by energy carrier. Source DNV GL

NEWS NUDGES

Tacoma defends LNG bunker plans

Officials at the Port of Tacoma have issued a statement to assuage concerns around the construction of an LNG bunkering facility by Puget Sound Energy (PSE).

The decision has met some opposition locally over potential disruption environmental disruption, leading to the response by port commissioners Clare Petrich and Don Johnson.

"Much has been said over the past year about the Port of Tacoma and our decision to enter into a lease with Puget Sound Energy to develop a liquefied natural gas facility. We, as two of the port's elected commissioners, would like to make our position clear. We moved forward with this project after careful consideration, including the future of the shipping industry, environmental benefits and safety of the Tideflats and surrounding community," the commissioners state.

Last modules loaded for Yamal LNG

The last modules for Russia's giant Yamal LNG project have now been loaded on-shore, paving the way for first liquefaction later this year.

The Yamal LNG project promises to become a major global source of LNG fuel with a projected output capacity of 16.5 million metric tons of gas per year.

WORLD LNG-FUELLED CONFIRMED NEWBUILDS

Year	Type of Vessel	Owner	Class
2017	Car/passenger ferry	Society of Quebec ferries	LR
2017	Car/passenger ferry	Society of Quebec ferries	LR
2017	Tug	Drydocks World	
2017	PSV	Siem Offshore	DNV GL
2017	Gas carrier	Evergas	BV
2017	PSV	Siem Offshore	DNV GL
2017*	Ro-Ro	TOTE Shipholdings	ABS
2017	Car/passenger ferry	BC Ferries	LR
2017	Gas carrier	Ocean Yield	DNV GL
2017	Gas carrier	Ocean Yield	DNV GL
2017	Gas carrier	Ocean Yield	DNV GL
2017	Gas carrier	Navigator Gas	ABS
2017	Dredger	DEME	BV
2017	Dredger	DEME	BV
2017*	Container ship	Wessels Reederei	BV
2017	Hopper Barge	Bremenports	DNV GL
2017	HSLC	Fred. Olsen	DNV GL
2017	PSV	Harvey Gulf Int.	ABS
2017	PSV	Harvey Gulf Int.	ABS
2017	Cable layer	DEME Tideway	DNV GL
2017	Gas carrier	Evergas	BV
2017	Gas carrier	Evergas	BV
2017	Tug	Østensjø Rederi	
2017	Tug	Østensjø Rederi	
2017	Tug	Østensjø Rederi	
2017*	Car/passenger ferry	BC ferries	ABS
2017	RoPax	Rederi AB Gotland	DNV GL
2017	Car/passenger ferry	Caronte & Tourist	RINA
2017	Oil/chemical tanker	Groupe Desgagnés	BV
2017	Oil/chemical tanker	Groupe Desgagnés	BV
2017	Oil/chemical tanker	Groupe Desgagnés	BV
2017	Oil/chemical tanker	Groupe Desgagnés	BV
2017	Car/passenger ferry	BC Ferries	LR
2017	Oil/chemical tanker	Terntank	BV
2017	Container ship	Crowley Maritime Corp.	DNV GL
2017	Container ship	Crowley Maritime Corp.	DNV GL
2017	RoPax	Tallink	BV
2017	Container ship	Brodosplit	DNV GL
2018	Container ship	Brodosplit	DNV GL
2018	Bulk ship	ESL Shipping	DNV GL
2018	Bulk ship	ESL Shipping	DNV GL
2018	Tug	Keppel Smit Towage	ABS
2018	Tug	Maju Maritime	ABS
2018*	Car/passenger ferry	BC ferries	ABS
2018	PSV	Harvey Gulf Int.	ABS
2018	Container ship	Brodosplit	DNV GL
2018	Container ship	Brodosplit	DNV GL
2018	Car/passenger ferry	Royal Doeksen	LR
2018	Car/passenger ferry	Royal Doeksen	LR
2018	Car/passenger ferry	CHFS	LR
2018	Car/passenger ferry	CHFS	LR
2018*	Ro-Ro	TOTE Shipholdings	ABS
2018	RoPax	Rederi AB Gotland	DNV GL
2018	General cargo ship	Nordnorsk Shipping	DNV GL
2018	Container ship	Containerships	ABS

Year	Type of Vessel	Owner	Class
2018	Container ship	Containerships	ABS
2018	Container ship	GNS Shipping	ABS
2018	Container ship	GNS Shipping	ABS
2018	Container ship	GNS Shipping	ABS
2018	Container ship	GNS Shipping	ABS
2018	Heavy lift vessel	Heerema Offshore	LR
2018	Oil/chemical tanker	Furetank Rederi	BV
2018	Oil/chemical tanker	Furetank Rederi	BV
2018	Oil/chemical tanker	Furetank Rederi	BV
2018	Dredger	DEME	BV
2018	Bulk ship	POSCO	KR
2018	Dredger	van der Kamp	DNV GL
2018	Car/passenger ferry	Torghatten	
2018	Car/passenger ferry	Torghatten	
2018	Car/passenger ferry	Torghatten	
2018	Car/passenger ferry	Torghatten	
2019	Car/passenger ferry	Torghatten	
2019	Cruise ship	Carnival Corporation	RINA
2019	Cruise ship	Carnival Corporation	RINA
2019	Oil/chemical tanker	Älvtank	BV
2019	Oil/chemical tanker	Älvtank	BV
2019	Oil/chemical tanker	Thun Tankers	BV
2019	RoPax	Baleària	BV
2019	Car carrier	Siem Car Carriers	
2019	Car carrier	Siem Car Carriers	
2019	Emergency response ship	German Transport Ministry	
2019	Emergency response ship	German Transport Ministry	
2019	RoPax	Brittany Ferries	
2019	RoPax	Baleària	
2019	RoPax	Baleària	
2019	Oil/chemical tanker	Rosneft	
2020	Oil/chemical tanker	Rosneft	
2020	Oil/chemical tanker	Rosneft	
2020	Oil/chemical tanker	Rosneft	
2020	Research ship	German Transport Ministry	
2020	RoPax	Viking Line	
2020	Cruise ship	Carnival Corporation	RINA
2020	Cruise ship	Carnival Corporation	
2021	Cruise ship	Carnival Corporation	
2021	Cruise ship	Carnival Corporation	
2022	Cruise ship	Carnival Corporation	RINA
2022	Cruise ship	MSC Cruises	
2022	Cruise ship	RCCL	
2024	Cruise ship	MSC Cruises	
2024	Cruise ship	RCCL	

Excluding LNG carriers and inland waterway vessels. For more information please visit www.dnvgl.com

Data last updated : 15 February 2017

* = conversion projects

LNG-FUELLED SHIPS IN OPERATION WORLDWIDE

Year	Type of Vessel	Owner	Class
2000	Car/passenger ferry	Fjord1	DNV GL
2003	PSV	Simon Møkster	DNV GL
2003	PSV	Eidesvik	DNV GL
2006	Car/passenger ferry	Fjord1	DNV GL
2007	Car/passenger ferry	Fjord1	DNV GL
2007	Car/passenger ferry	Fjord1	DNV GL
2007	Car/passenger ferry	Fjord1	DNV GL
2007	Car/passenger ferry	Fjord1	DNV GL
2008	PSV	Eidesvik Shipping	DNV GL
2009	PSV	Eidesvik Shipping	DNV GL
2009	Car/passenger ferry	Tide Sjø	DNV GL
2009	Car/passenger ferry	Tide Sjø	DNV GL
2009	Car/passenger ferry	Tide Sjø	DNV GL
2009	Patrol vessel	Remøy Management	DNV GL
2009	Car/passenger ferry	Fjord1	DNV GL
2010	Patrol vessel	Remøy Management	DNV GL
2010	Car/passenger ferry	Fjord1	DNV GL
2010	Patrol vessel	Remøy Management	DNV GL
2010	Car/passenger ferry	Fjord1	DNV GL
2010	Car/passenger ferry	Fjord1	DNV GL
2010	Car/passenger ferry	Fosen Namsos Sjø	DNV GL
2011	PSV	DOF	DNV GL
2011*	Oil/chemical tanker	Tarbit Shipping	DNV GL
2011	Car/passenger ferry	Fjord1	DNV GL
2011	PSV	Solstad Rederi	DNV GL
2012*	Car/passenger ferry	Fjord1	DNV GL
2012	PSV	Eidesvik	DNV GL
2012	PSV	Olympic Shipping	DNV GL
2012	PSV	Island Offshore	DNV GL
2012	General Cargo	Nordnorsk Shipping	DNV GL
2012	PSV	Eidesvik Shipping	DNV GL
2012	PSV	Island Offshore	DNV GL
2012	Car/passenger ferry	Torghatten Nord	DNV GL
2012	Car/passenger ferry	Torghatten Nord	DNV GL
2012	Car/passenger ferry	Torghatten Nord	DNV GL
2013	PSV	REM	DNV GL
2013	RoPax	Viking Line	LR
2013	Car/passenger ferry	Torghatten Nord	DNV GL
2013	Tug	Incheon Port Authority	KR
2013	General Cargo	Eidsvaag	DNV GL
2013	RoPax	Fjordline	DNV GL
2013	High speed RoPax	Buquebus	DNV GL
2013	Tug	CNOOC	CCS
2013	Tug	CNOOC	CCS
2013	Car/passenger ferry	Norled	DNV GL
2014	Car/passenger ferry	Norled	DNV GL
2014	Tug	Buksér & Berging	DNV GL
2014	RoPax	Fjordline	DNV GL
2014	Patrol vessel	Finish Border Guard	DNV GL
2014	Tug	Buksér & Berging	DNV GL
2014	Gas carrier	Anthony Veder	BV
2014	Gas carrier	Anthony Veder	BV
2014	PSV	Remøy Shipping	DNV GL
2014	General Cargo	Egil Ulvan Rederi	DNV GL
2014	General Cargo	Egil Ulvan Rederi	DNV GL
2014	PSV	Siem Offshore	DNV GL
2015	PSV	Harvey Gulf Int.	ABS
2015	Ro-Ro	Norlines	DNV GL
2015	Car/passenger ferry	Samsøe municipality	DNV GL
2015	PSV	Simon Møkster Shipping	DNV GL
2015	PSV	Siem Offshore	DNV GL
2015	Ro-Ro	Norlines	DNV GL
2015*	Oil/chemical tanker	Bergen Tankers	LR
2015	Car/passenger ferry	Society of Quebec ferries	LR

For more information please visit www.dnvgl.com

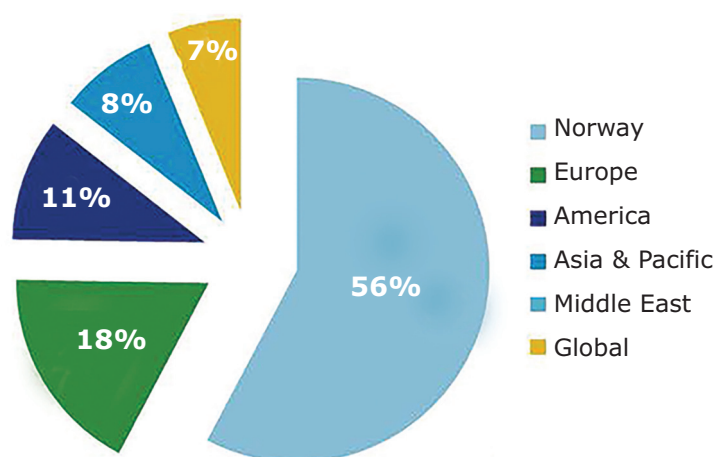
Data last updated: 15 February 2017

* = conversion projects

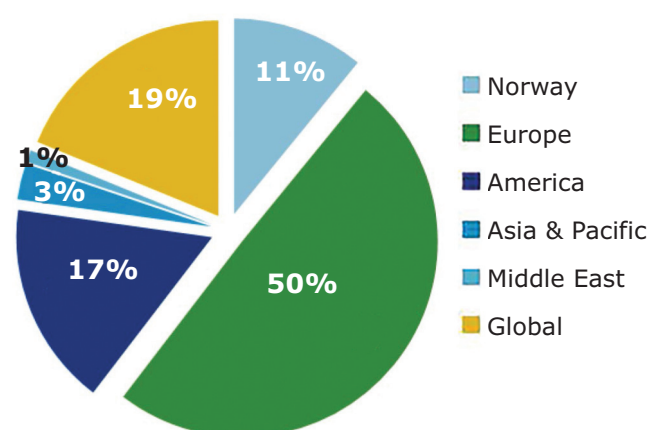
Year	Type of Vessel	Owner	Class
2015	Gas carrier	Evergas	BV
2015	Gas carrier	Evergas	BV
2015	Tug	CNOOC	CCS
2015*	Car/passenger ferry	AG Ems	DNV GL
2015	Tug	NYK	NK
2015	Gas carrier	Chemgas Shipping	BV
2015	Gas carrier	Evergas	BV
2015	PSV	Harvey Gulf Int.	ABS
2015	Container ship	TOTE Shipholdings	ABS
2015	Car/passenger ferry	AG EMS	DNV GL
2015	Bulk ship	Erik Thun	LR
2016	Container ship	TOTE Shipholdings	ABS
2016	Gas carrier	Evergas	BV
2016	PSV	Harvey Gulf Int.	ABS
2016	Bulk ship	Erik Thun	LR
2016	Oil/chemical tanker	Terntank	BV
2016	Gas carrier	Navigator Gas	ABS
2016*	Oil/chemical tanker	Furetank Rederi	BV
2016	Icebreaker	Arctica Shipping	LR
2016	Car/passenger ferry	Boreal Transport Nord	DNV GL
2016	Car/passenger ferry	Boreal Transport Nord	DNV GL
2016	Tug	CNOOC	CCS
2016	Gas carrier	Chemgas Shipping	BV
2016	Car carrier	UECC	LR
2016	Oil/chemical tanker	Terntank	BV
2016	Oil/chemical tanker	Terntank	BV
2016	Car/passenger ferry	BC Ferries	LR
2016	Gas carrier	Evergas	BV
2016	PSV	Siem Offshore	DNV GL
2016	Car/passenger ferry	Seaspan Ferries Corp.	BV
2016	Gas carrier	Navigator Gas	ABS
2016	Ro-Ro	Searoad Holdings	DNV GL
2016	Car carrier	UECC	LR
2017	Gas carrier	Navigator Gas	ABS
2017	Car/passenger ferry	Seaspan Ferries Corp.	BV
2017*	RoPax	Baleària	BV

AREA OF OPERATION OF LNG-FUELLED SHIPS

Operating area
ships in operation



Operating area
confirmed orderbook



Updated 15 February 2017
Excluding LNG carriers and inland waterway vessels

WORLD SMALL SCALE LNG FLEET*

Built	Name	CBM	Cargo Type	Trading area	Trading in LNG?	Ship Owner / Operator
1974	Seagas	187	LNG	Sweden	Yes	AGA
1988	Kayoh Maru	1,517	LNG	Japan	Yes	Daiichi
1993	Aman Bintulu / Lucia Ambition	18,928	LNG	Malaysia - Japan	Yes	Perbadanan/NYK
1996	Surya Aki	19,475	LNG	Indonesia - Japan	Yes	MCGC
1997	Aman Sendai	18,928	LNG	Malaysia - Japan	Yes	Perbadanan/NYK
1998	Aman Hakata	18,800	LNG	Malaysia - Japan	Yes	Perbadanan/NYK
2000	Tripura (ex Surya Satsuma)	23,096	LNG	Indonesia - Japan	Yes	MCGC
2003	Pioneer Knutsen	1,100	LNG	Norway	Yes	Knutsen
2003	Shinju Maru No.1	2,540	LNG	Japan	Yes	Shinwa
2005	North Pioneer	2,500	LNG	Japan	Yes	Japan Liquid Gas
2007	Sun Arrows	19,531	LNG	Malaysia - Russia - Japan	Yes	Mitsui
2008	Kakurei Maru	2,536	LNG	Japan	Yes	Hogaki Zosen
2008	Shinju Maru No.2	2,540	LNG	Japan	Yes	Shinwa
2009	Coral Methane	7,551	LNG/LPG/Ethylene	Northwest Europe/Baltics	Yes, sometimes	Anthony Veder
2010	Norgas Creation	10,000	LNG/LPG/Ethylene	Worldwide	No	Norgas Carriers
2010	Norgas Innovation	10,000	LNG/LPG/Ethylene	Worldwide	No	Norgas Carriers
2011	Akebono Maru	3,556	LNG	Japan	Yes	Chuo Kaiun
2011	Norgas Bahrain Vision	12,000	LNG/LPG/Ethylene	Worldwide	No	Norgas Carriers
2011	Norgas Conception	10,000	LNG/LPG/Ethylene	Worldwide	No	Norgas Carriers
2011	Norgas Invention	10,000	LNG/LPG/Ethylene	Worldwide	No	Norgas Carriers
2011	Norgas Unikum	12,000	LNG/LPG/Ethylene	Worldwide	No	Norgas Carriers
2012	Coral Energy	15,600	LNG	Northwest Europe/Baltics	Yes	Anthony Veder
2013	Coral Anthelia	6,500	LNG/Ethylene			Anthony Veder
2013	JX Energy TBN	2,500	LNG	Japan	Yes	JX Energy
2013	Kakuyu Maru	2,500	LNG	Japan	Yes	Tsurumi Sunmarine
2014	LNG-Oil combi**	2,000	LNG	Germany	Yes	Veka
2014	Short Sea LNG Tanker **	4,000	LNG	Germany	Yes	Veka
2015	10 small carriers TBN**	5,000	LNG			Bimantara Group
2015	Jahre TBN**	6,200	LNG	Norway	Yes	Donsotank/Jahre Marine
2015	JS Ineos Ingenuity	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2015	JS Ineos Insight	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2015	JS Ineos Intrepid	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2015	LNG Barge TBN	3,000	LNG	US Coast	Yes	LNG America
2015	LNG bunker barge 1†	2,250	LNG	China	Yes	Anhui Huaqiang Natural Gas
2015	LNG bunker barge 2†	2,250	LNG	China	Yes	Anhui Huaqiang Natural Gas
2015	LNG bunker barge 3†	2,250	LNG	China	Yes	Anhui Huaqiang Natural Gas
2015	LNG Inland bunker**	800	LNG	Germany	Yes	Veka
2015	Norgas TBN**	17,000	LNG/LPG/Ethylene	Worldwide		Norgas Carriers
2015	Norgas TBN**	17,000	LNG/LPG/Ethylene	Worldwide		Norgas Carriers
2015	PetroChina TBN	30,000	LNG	China		PetroChina
2015	TBN	14,000	LNG	China	Yes	Zhejiang Huaxiang
2015	TBN 1	27,500	LNG	China?		Danyang?
2015	TBN 2	27,500	LNG	China?		Danyang?
2015	TBN 3	27,500	LNG	China?		Danyang?
2016	Clean Jacksonville	2,200	LNG	US Coast	Yes	CME
2016	Dalian TBN	28,000	LNG	China	Yes	Dalian Inteh Group
2016	Hai Yang Shi You 301	30,000	LNG	Bali FSU	Yes	CETS (CNOOC)
2016	JS Ineos Indepence	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2016	JS Ineos Innvation	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2016	JS Ineos Inspiration	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2016	LNG Prime	2,250	LNG	Northwest Europe	Yes	Veka Deen LNG
2016	Navigator Aurora	35,000	Ethane/Ethylene	Markus Hood - Stenungsund	Ethane, for Borealis	Navigator
2016	Gaschem Beluga	36,000	Ethane/Ethylene	US - Teeside	Ethane, for Sabic	Gaschem Services
2016	Gaschem Orca	36,000	Ethane/Ethylene	US - Teeside	Ethane, for Sabic	Gaschem Services

For more information please visit <http://small-lng.com>

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

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

** = project shelved † = Data to be verified Data last updated = 24th May 2017

Built	Name	CBM	Cargo Type	Trading area	Trading in LNG?	Ship Owner / Operator
2016	Ocean Yield TBN**	36,000	Ethane/Ethylene	US - Teeside	Ethane, for Sabic	Gaschem Services
2016	Shell Bunker Barge TBN 1	6,500	LNG	Northwest Europe	Yes	Shell
2016	Shell Bunker Barge TBN 2	6,500	LNG	Northwest Europe	Yes	Shell
2016	Shell Bunker Barge TBN 3	6,500	LNG	Northwest Europe	Yes	Shell
2016	Shell Bunker Barge TBN 4	3,000	LNG	Northwest Europe	Yes	Shell
2017	Yuan He 1	30,000	LNG	China	Yes	CSR
2017	ENGIE Zeebrugge	5,000	LNG	Northwest Europe	Yes	NYK
2017	CME TBN†	2,200	LNG	US Coast	Yes	CME
2017	CME TBN†	2,200	LNG	US Coast	Yes	CME
2017	Coral EnergiCE	18,000	LNG	Northwest Europe/Baltics	Yes	Anthony Veder
2017	Coralus	5,800	LNG	Northwest Europe/Baltics	Yes, for Skangas	Anthony Veder
2017	JS Ineos Invention	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2017	JS Ineos Intuition	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2017	LNG-Gorskaya TBN	7,300	LNG	Russia	Yes	LNG-Gorskaya
2017	LNG-Gorskaya TBN	7,300	LNG	Russia	Yes	LNG-Gorskaya
2017	LNG-Gorskaya TBN	7,300	LNG	Russia	Yes	LNG-Gorskaya
2017	Navigator Eclipse	35,000	Ethane/Ethylene	US	Ethane	Navigator
2017	Navigator Nova	35,000	Ethane/Ethylene	US	Ethane	Navigator
2017	Navigator Prominence	35,000	Ethane/Ethylene	US	Ethane	Navigator
2018	Bernhard Schulte TBN	7,500	LNG	Baltic	Yes	Bernhard Schulte
2018	CME TBN†	2,200	LNG	US Coast	Yes	CME
2018	Evergas TBN	32,000	Ethane/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2018	Evergas TBN	32,000	Ethane/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2018	Evergas TBN	32,000	Ethane/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2018	Evergas TBN	32,000	Ethane/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2019	KLine TBN	7,500	LNG	Korea	Yes	Korea Line
2019	KLine TBN	7,500	LNG	Korea	Yes	Korea Line
2019	Stolt TBN	7,500	LNG	Mediterranean	Yes	Stolt-Nielsen Gas
2019	Stolt TBN	7,500	LNG	Mediterranean	Yes	Stolt-Nielsen Gas
2020	Stolt TBN (option)	7,500	LNG		Yes	Stolt-Nielsen Gas
2020	Stolt TBN (option)	7,500	LNG		Yes	Stolt-Nielsen Gas
2021	Stolt TBN (option)	7,500	LNG		Yes	Stolt-Nielsen Gas

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