

LNG Fuelling

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LNG bunker sales soar at Rotterdam

The sale of LNG bunker fuel at the port of Rotterdam increased over ten-fold year-on-year in 2017, according to the latest figures from the port authority.

The Port of Rotterdam Authority reported that LNG demand reached 1,500 tonnes in 2017, up from just 100 tonnes in 2016.

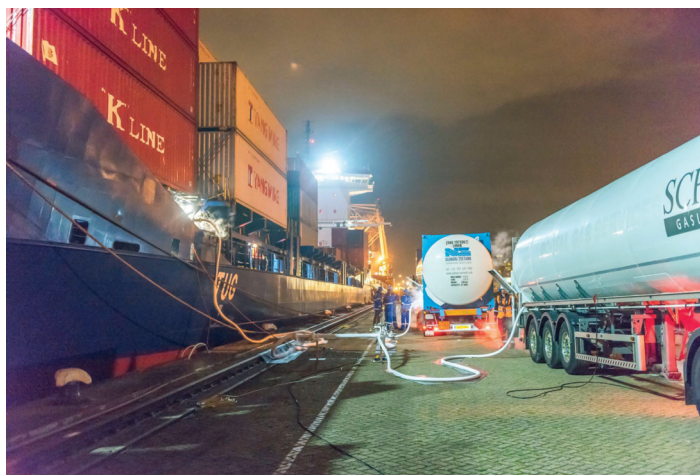
“Enormous step” in LNG transition

The PRA highlighted several factors leading to the growth in demand, ranging from larger LNG-fuelled vessels docking at the port, a general increase in LNG shipping traffic and the arrival of a dedicated bunker vessel *Cardissa* at the port which helped to attract vessels to Rotterdam.

“The commissioning of the *Cardissa* is an enormous step in the transition from fuel oil to LNG as fuel for shipping and is in line with the policy of the Port Authority which focuses on this,” the PRA said.

The ocean-going vessel *Cardissa* has Rotterdam as its work location and supplies customers throughout Europe with LNG from the Gate terminal in Rotterdam.

Gate terminal is Rotterdam’s main LNG import site and handles a throughput capacity of 12 billion cubic meters per annum (bcma), with further plans to extend this



The *Wes Amelie* bunkering LNG at City Terminal

to 16 bcma in future. The Port of Rotterdam is the largest port in Europe

Wes Amelie boosts LNG demand

The arrival of the *Wes Amelie*, the world’s first container ship that has been converted to LNG propulsion, was also highlighted as a key driver for LNG uptake in 2017. The *Wes Amelie* now regularly bunkers at the City Terminal at the Prins Willem Alexanderhaven.

While LNG demand rose in 2017, the sale of bunker oil

diminished from 10.1 million cubic metres to 9.9 million cubic metres. Tighter restrictions of permissible sulfur content in fuel oil throughout the emission control areas (ECA) of the North Sea and the Baltic Sea in part helped drive the switch from fuel oil to LNG.

“According to market parties, approximately 1 to 1.5 million cubic metres of bunkered fuel oil consists of so-called ‘ultra-low sulfur fuel oil’ with a sulfur content lower than 0.1% (ULFSO),” the PRA stated.



Gate terminal, Rotterdam

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Nauticor sets LNG bunkering record at Brunsbüttel

Fuel supplier Nauticor has completed the first LNG bunkering operations for the dual-fuel dredger vessel *Scheldt River* at Brunsbüttel Port, Germany.

The trailing suction hopper dredger was loaded with approximately 85 tonnes of LNG, marking the largest LNG bunkering operation in Germany to date.

"The bunker operation for *Scheldt River* in the Elbehafen shows that LNG is increasingly establishing itself as an environmentally-friendly fuel alternative, and that LNG bunker operations can be

integrated into daily port operations without apprehension," Carsten Lorleberg, Project Manager for LNG at Brunsbüttel Ports, said.

The refuelling operation was completed using five bunker trucks, two of which were unloaded simultaneously.

DEME plans further LNG investment

The *Scheldt River* is owned by dredging multinational DEME and is the second dredger in the DEME fleet equipped with dual-fuel engines. It has capacity of 8,400 cubic meters and was built at the Royal IHC shipyard

in the Netherlands.

"The ability to carry out the LNG bunkering of a larger vessel was proven today. However, further improvements will be made in the near future when ship-to-ship bunkering of LNG will be possible," a spokesperson for DEME said.

The *Scheldt River* is part of a multi-year fleet investment programme by DEME that will introduce two additional LNG vessel - the *Bonny River* in 2018 and *Spartacus* in 2019.

Collaborative development of LNG dredging technology

DEME now plans to build on its experience at Brunsbüttel to collaborate with Nauticor and other LNG

specialists over the course of the next half-year, to gather further knowledge about the technical and economic aspects related to operating a dredging vessel powered by LNG.

"The new vessel is part of DEME's multi-year fleet investment programme, which is focused on further increasing efficiency, both in terms of productivity and environmental performance," a spokesperson for DEME said.

Located in Hamburg, Germany, Nauticor is one of the leading LNG infrastructure suppliers in Northern Europe and the Baltics. The business is a subsidiary of the Linde Group and was rebranded after the buyout of joint venture Bomin Linde LNG.



Scheldt River bunkering with LNG

Hexagon to supply Babcock Schulte LNG bunker vessel

Engineering component supplier Hexagon Composites has been awarded a contract to supply fuel storage tanks for a newbuild LNG supply vessel being built for Babcock Schulte Energy.

The contract includes supply and installation of Hexagon Composites' high-pressure CNG Titan cylinders to store compressed boil-off-gas from the LNG tanks and flash gas from cargo operations.

FGSV0 boil-off-gas recovery system

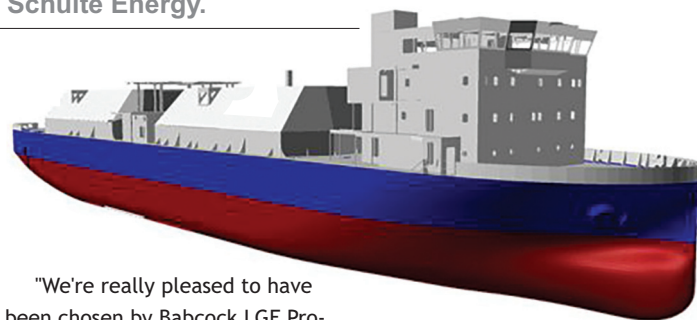
The cylinders are expected to play an integral part in the ship's patent-pending FGSV0 boil-off-gas recovery system. Designed by the UK-based company Babcock LGE Process, the novel FGSV0 system will enable the LNG bunker vessel to meet strict emission limits in force throughout IMO Emission Control Areas (ECA).

"By compressing the boil-off and flash gas and supplying it

as fuel to the ship's engines, our clients will save distillate fuel costs and at the same time reduce the vessel's emissions of sulphur oxides (SOx) and particulate matter (PM)... In addition, we eliminate fugitive emissions of LNG from the cargo systems, providing a true zero emissions solution," Andrew Scott, General Manager at Babcock LGE Process, said.

Cost-effective response to emission regulations

The tanks will be fabricated and supplied by Hexagon Lincoln, based in Lincoln, Nebraska - a subsidiary of Norwegian composite pressure cylinder and gas applications specialist Hexagon Composites.



Rendition of LNG bunker vessel

"We're really pleased to have been chosen by Babcock LGE Process to work on this cutting-edge project. Babcock's boil-off-gas recovery system is an innovative way of meeting stringent emission regulations. It is a cost-effective way for vessel operators to address environmental concerns, and our TITAN® tanks are a key enabler for achieving this," Miguel Raimao, Vice President Mobile Pipeline Americas at Hexagon Lincoln, said.

Hexagon Lincoln welcomed the expansion of its Mobile Pipeline technology into high-horsepower fuel systems and the maritime application, with president Jack Schimenti calling the LNG power sector "a great future market opportunity".

Maritime class acceptance for the project will be performed by Lloyds Register.

LNG Fuelling

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Scrubber costs boost LNG fuel prospects

Increases in maintenance costs associated with exhaust gas scrubber systems may give a boost to demand for LNG fuel, according to underwater repair specialist Hydrex.

The outlook is based on findings by Hydrex technicians correlating the use of scrubber systems and corrosion of pipework.

"These systems remove harmful sulphur oxide compounds from the exhaust gasses of marine diesel engines burning high-sulphur heavy fuel oils. However, the resulting residue removed from these gases can have a rapid and highly corrosive effect on the scrubbers' internal pipework and outlets," Dave Bleyenbergh, production executive at Hydrex, said.

Support for LNG cost savings

The data from Hydrex provides further support for LNG as a fuel in advance of IMO emissions limits, set to enter force on 1 January 2020. The new legislation will establish a global limit for sulphur in fuel oil used on board ships of 0.50% mass by mass.

At present shippers are faced with the choice to either switch to low emission fuels such as LNG or else fit expensive retroactive scrubber systems to remove the pollutants from the exhaust mix.

Although a switch to LNG has generally been accepted as the



Water ingress as a result of a corroded scrubber pipe

better option throughout the industry there are some shippers that have chosen to opt for scrubber systems instead, citing the high-cost of retrofitting the engines in their existing fleet.

If proven correct across the industry, Hydrex findings add further support for the costs benefits of LNG when compared to retrofitting scrubbers.

Advanced repairs required

As a result of corrosion, Hydrex reports that additional repairs included fabrication and installation of new flanges and diffusers and

resurfacing pipework with highly chemical resistant coatings.

The outlook from Hydrex suggests that water which has been used to scrub exhaust gases in some systems then corrodes pipework, leading to water ingress.

"Corroded scrubber pipework and discharge outlets is a serious problem, and we're seeing more and more of it... We have noted an increase in repairs to corroded pipework and outlets, which does appear to correspond with the increase in the number of ships fitted with scrubbers," Bleyenbergh added.

NEWS NUDGES

Woodside raises for Burrup LNG bunker hub

Australia's largest independent oil and gas company Woodside Petroleum has embarked on a programme to raise US\$2 billion that will be used in part to fund development of the Burrup LNG Hub in northwestern Australia.

The Burrup LNG Hub comprises the adjacent liquefaction plants of North West Shelf (NWS) LNG and Pluto LNG on the Burrup Peninsula and the nearby port of Dampier. The firm is exploring the option of installing interconnector pipeline between the Pluto and NWS plants and providing the NWS terminal with a new supply of gas, via pipeline, from the offshore Browse field.

"Woodside believes Pluto LNG has a key role to play as a supplier of LNG bunker fuel in the region. Woodside has stated its intention to have its entire fleet of offshore support vessels (OSVs) operating off Australia's northwest coast running on LNG by 2022," a spokesperson for Woodside said.



Corrosion on scrubber diffuser

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Gazprom backs LNG-fuelled Russian rail fleet

Global energy company Gazprom has announced plans to build two small-scale LNG production facilities to provide fuel for locomotives operated by Sverdlovsk Railway in Russia.

The firm signed a cooperation agreement with state rail operator Russian Railways, the parent company of Sverdlovsk, to support expansion of its fleet of LNG-fuelled trains in the country.

“The Implementation Program under the Agreement of Cooperation in the natural gas vehicle (NGV) sector was signed today... In accordance with the Program,

Russian Railways plans to increase the fleet of mainline gas turbine locomotives and gas turbine shunters powered by LNG,” a spokesperson for Gazprom said.

The NGV agreement signed between Gazprom, Russian Railways, Sinara Group, and Transmashholding in 2016 and aims to promote natural gas use in railway and motor transport

and facilitate NGV market growth.

Distribution stations in Tobolsk and Surgut

To support this growth Gazprom now aims to develop gas distribution stations in Tobolsk and Surgut, as well as platforms for mobile refuellers at the Voynovka and Surgut stations.

The new refuelling stations are designed to maximise the range of LNG-powered trains operating on the Sverdlovsk Railway network which comprises part of the Trans-Siberian Railway and covers the regions of Perm, Sverdlovsk, Tyumen, Yugra, and Yamalo-Nenetsregions.

Russian Railways is among the world's top three railway companies by size and its latest investments in LNG-fuelled assets have positioned it for further growth of its LNG fleet.

LNG fleet to hit 22 by 2023

With the growth of a nationwide refuelling network for LNG, Sverdlovsk Railway expects to increase its fleet of LNG-powered trains from the current three to as much as 22 units or more by 2023.

“Pursuant to the Program, manufacturers (Sinara Group and Transmashholding) will take measures to improve the designs of gas-powered locomotives. In addition, new series of gas-powered vehicles will be developed,” a Gazprom representative commented.

Sinara-Transport Machines is the machine building holding of Sinara Group focused on engineering, manufacturing and maintenance of railroad machinery. Transmashholding is a manufacturer of rolling stock for railways and public transport.



Sergey Papin, Alexander Yermovsky, Vitaly Markelov, and Sergey Kobzev at signing ceremony

Crowley signs multi-year LNG fuel contract

LNG specialist Crowley Fuels has signed a multi-year supply contract with a major pharmaceutical company in Puerto Rico.

The services deal will be executed by Crowley subsidiary Carib Energy and will involve transport of fuel from gas company Pivotal's facilities on the U.S. mainland to the island manufacturer.

“Pivotal and Crowley continue to work together to expand the delivery of LNG to companies in Puerto Rico... Liquefied natural gas is a clean, domestically produced alternative fuel that is being used by multiple industries to reduce emissions and energy costs,” Tim Delay, vice president of Pivotal LNG, said.

JAX LNG supply

Crowley will deliver the LNG fuel via 10,000-gallon-capacity international shipping organization (ISO) containers transported via truck and loaded onto Crowley vessels in Jacksonville, Florida. Once operational, Pivotal expects to source

LNG from the JAX LNG plant in Jacksonville.

The JAX LNG plant is being jointly developed with Pivotal's partner, Northstar Midstream, and will be North America's first coastal LNG facility with marine and truck loading capabilities when it goes into operation later in 2018.

“We are very pleased to enhance our relationship by continuing to grow our LNG services and volumes with this critical customer in Puerto Rico... Crowley will continue to provide an uninterrupted supply chain of natural gas to the customer's site,” Greg Buffington, vice president of LNG business development at Crowley, said.

Virtual island LNG pipeline

Crowley's Carib Energy was the first company to receive a small scale, 25-year, LNG export license

from the U.S. Department of Energy. It is part of Crowley Maritime Corporation, a privately held company that provides marine solutions, energy and logistics services.

“To date, Crowley has successfully transported more 6.1 million gallons of LNG as well as provided engineering and other services,” Buffington added.

Pivotal LNG provides liquefied

natural gas to companies and industries throughout the U.S. and is part of Southern Company Gas, a wholly owned subsidiary of Southern Company.

“This transaction serves as another example that the partnership and the virtual LNG pipeline we have created with Crowley delivers an economic, reliable and environmentally friendly fuel to the island,” Delay added.



Crowley LNG truck

NEWS NUDGES

Azores bids for Praia da Vitoria LNG bunkering

Authorities in Azores have highlighted the islands' Port of Praia da Vitoria as the frontrunner for new small or medium-sized LNG-bunkering operations.

João Vargas, a member of the Board of Directors of Portos dos Açores hailed the central Atlantic port an 'ideal' location for LNG bunkering operations and suggested the port could receive a 'medium size' private investment at some point between 2020 and 2030.

Plans to convert the island's Belo Jardim Thermal Power Plant to operate on LNG are expected to drive demand for the fuel in Praia da Vitória but no final investment decisions have yet been taken.

"In any port of the Autonomous Region of the Azores, a system can be carried out through the virtual pipeline, where the ISO containers are supplied and delivered... The advantage of this virtual pipeline is that it is very flexible," Vargas added.

Further studies are set to take place as the islands leaders consider finance options, including applying for funding from the European Union. ■

India plans LNG fuelling surge

India's ruling party has backed measures to drastically upscale LNG imports in the country and drive wide spread adoption of the fuel for transport.

The ambitious plans were outlined by Narendra Taneja, spokesman for the ruling Bharatiya Janata Party, and include strategies to triple LNG imports to 70 million tonnes per year and add 11 import terminals over the next seven years.

"India is looking at LNG in a very strategic manner. Once we get into it, we are talking about 15 terminals but it will be many more as the need is going to be there," Taneja said.

The strategy is part of a push by government to double the share of natural gas in the country's energy mix to 15% by 2022, up from the current level of 6.5%. India currently has four LNG import terminals that import around 20 million tonnes a year.

LNG barges offer 'immense opportunities'

The increase in LNG fuel is required in part to support the Indian government's strategy of support for LNG-fuelled transport networks.

The country's Ministry of Shipping plans to launch a fleet of LNG-fuelled barges and associated infrastructure on the river Ganges by the end of this year and a Memorandum of Understanding (MOU) signed between Inland Waterways



Hazira LNG terminal, Gujarat

Authority of India (IWAI) and state-run energy firm Petronet LNG is expected to pave the way for widespread use of LNG as a transport fuel on India's National Waterways.

"The agencies responsible for framing and enforcing regulations related to the navigation of LNG Barges have been asked to study best practices and regulations on the subject for implementation in India," a shipping ministry spokesperson said, adding that LNG barges "offer immense opportunities in transportation"

Closer LNG ties with Japan

Late last year, India signalled

closer ties with Japan on LNG import with the approval of an agreement to enable the swapping of LNG cargoes between the two countries. The arrangement was part of a broader bilateral pact to create a gas exchange that could reduce India's logistical costs for natural gas imports.

"With India and Japan, the two major importers, coming closer on all matters pertaining to LNG imports, there are bound to be some ripples in international LNG trade and business. More competitive prices, more balanced long-term contracts will be on the radar for both India and Japan", Narendra Taneja said. ■



India plans to deploy LNG-fuelled barges on the Ganges

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

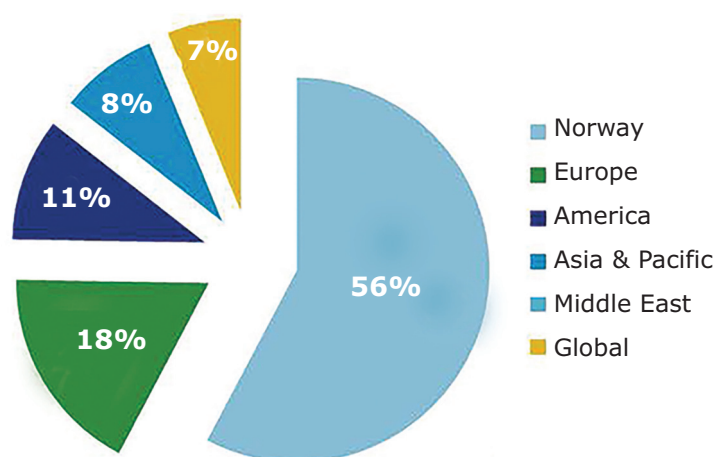
Data last updated: 15 February 2017

* = conversion projects

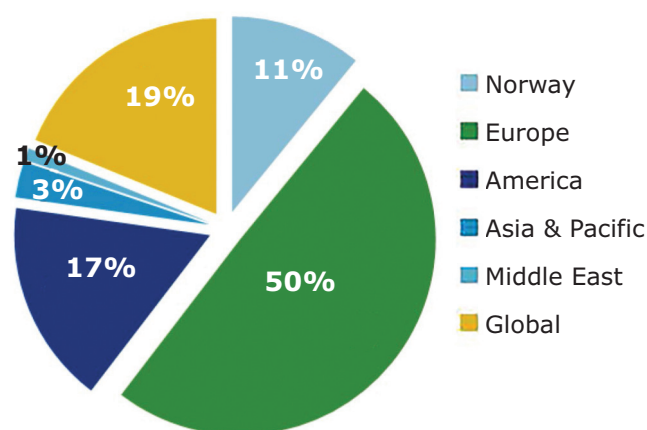
Year	Type of Vessel	Owner	Class
2015	Gas carrier	Evergas	BV
2015	Gas carrier	Evergas	BV
2015	Tug	CNOOC	CCS
2015*	Car/passenger ferry	AG Ems	DNV GL
2015	Tug	NYK	NK
2015	Gas carrier	Chemgas Shipping	BV
2015	Gas carrier	Evergas	BV
2015	PSV	Harvey Gulf Int.	ABS
2015	Container ship	TOTE Shipholdings	ABS
2015	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 = 16th November 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
2017	Cardissa	6,500	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	Coralius	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	Shell Bunker Barge TBN 2	6,500	LNG	Northwest Europe	Yes	Shell
2018	Shell Bunker Barge TBN 3	6,500	LNG	Northwest Europe	Yes	Shell
2018	Shell Bunker Barge TBN 4	3,000	LNG	Northwest Europe	Yes	Shell
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
2020	Shell Bunker Barge	4,000	LNG	US Coast	Yes	Q-LNG Transport / Harvey Gulf
2021	Stolt TBN (option)	7,500	LNG		Yes	Stolt-Nielsen Gas

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