

LNG Fuelling

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SEA\LNG launches Bunker Navigator tool

Cross-sector industry coalition SEA\LNG has launched a new online tool to map the LNG bunkering infrastructure landscape worldwide.

The new Bunker Navigator Tool was launched at the recent IQPC 6th LNG Bunkering Summit in Amsterdam and utilises data from a wide-array of sources to improve understanding of the LNG bunkering landscape.

"The coalition's mission since inception has been to further the shipping industry's knowledge of the viability and sustainability of LNG as a marine fuel. A key barrier has been a general lack of understanding of current and forthcoming LNG bunkering infrastructure," Peter Keller, SEA\LNG chairman and executive vice president, Tote said.

Overview of LNG fuelling worldwide

Built on statistics from SEA\LNG members, marine information services, and publicly available data the Bunker Navigator app is based around a map-based tool, constantly updated to give an overview of key developments in LNG fuelling around the world.

"What we sought to achieve with the Bunker Navigator Tool is a quick, easy-to-access platform that includes relevant, up-to-date,



The new app will identify LNG bunkering locations

and free-to-access information on LNG infrastructure and bunker development," Keller added.

By mapping the availability of LNG fuel and common trade routes the app is designed to provide a platform to trace how infrastructure relates to major global shipping routes, traditional oil bunkering ports, and the bulk LNG infrastructure which will provide the foundation for future bunkering services.

LNG in bulk at around 150 locations

Data from the app suggests that LNG is readily available in bulk at around 150 locations worldwide, and there is a huge bulk LNG infrastructure of regasification terminals and liquefaction plants globally.

"Of the world's top oil-bunkering ports, nine of the top ten offer

LNG bunkering, or will do so by 2020. However, it is the movement of LNG from bulk facilities to the ships, more commonly known as the 'last mile', where efforts are being concentrated to enable easy access to LNG as a marine fuel," the consortium states.

"A collaborative approach to understanding the opportunities - and then tackling the associated commercial barriers - to LNG is crucial to fulfil its potential as an alternative to traditional bunker fuels. The reality is that LNG bunkering infrastructure is expanding at pace, and with the launch of the Bunker Navigator Tool, SEA\LNG hopes to raise awareness of, and build industry confidence in, the rapidly growing global availability of LNG bunkering," Keller commented.

SEA\LNG includes ABS, Bureau Veritas, Carnival Corporation, Clean Marine Energy, DNV GL, Eagle LNG Partners, ENGIE, Gas Natural Fenosa, GE, GTT, JAX LNG, Keppel Gas Technology, Lloyd's Register, Marubeni, Mitsubishi, Mitsui, Novatek Gas & Power, NYK Line, Petronet LNG, Port of Rotterdam, Qatargas, Shell, Société Générale, Sumitomo Corporation, Total, TOTE, Toyota Tsusho, Uyen Transtech, Yokohama-Kawasaki International Port Corporation (YKIP), and Wärtsilä.

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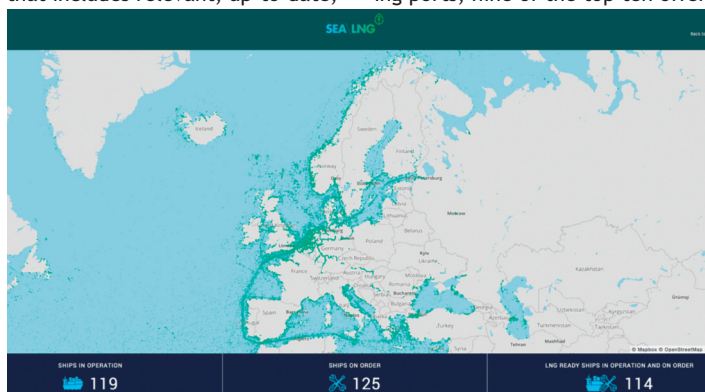
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LNG's Bunker Navigator Tool

EMSA publishes LNG bunkering guidance

The European Maritime Safety Agency (EMSA) has published a guidance document outlining best practice for the planning and operational stages of LNG bunkering.

Aimed at port authorities and administrations, the paper highlights a number of steps to ensure safe implementation of LNG bunker solutions and guidance to plan for upcoming regulation.

“Port Authorities are here seen as fundamental players in the middle of a two-fold driver for the development of LNG as fuel in ports. On one hand the expected increase in demand from LNG fuelled ships and, on the other hand, the regulatory requirements,” the EMSA report’s authors state.

Wide-spread consultation

Based on extensive consultation with stakeholders, including port authorities, maritime administrations, terminal, gas suppliers and

government representatives and with the LNG experts sub-group of the European Sustainable Shipping Forum (ESSF), the document aims to guide authorities through all stages of LNG bunkering process.

EMSA notes that guidance was prepared in close cooperation with the European Commission (DG MOVE), member states and industry within the context of the European Sustainable Shipping Forum and Directive 2014/94/EU on the ‘Deployment of an Alternative Fuel Infrastructure’

LNG bunkering growth forecast

In review of existing solutions for small scale LNG bunkering installations, involving LNG fuel trucks, barges and small scale fixed shore installations, and several challenges which have



EMSA forecasts LNG bunkering demand will grow

been addressed recently, EMSA estimates that the sector is now primed for growth.

“An increase in LNG bunkering activities is therefore foreseen, with more ports offering LNG bunkering, also as a competitive advantage... Notwithstanding industry preparations for LNG Bunkering it is important to provide Port Authorities with the necessary information and suggested good practice for this type of operation,” the agency states.

EMSA also notes that the functional and technical requirements that have been developed are key to creating a procedural framework both for LNG bunkering operations and for LNG bunkering equipment. ■

Itsas completes LNG bunkering first at Bilbao

Energy company Itsas Gas has performed the first ship-to-ship LNG bunkering at the port of Bilbao in Northern Spain, marking the first such operation in the Atlantic Arc and Mediterranean region.

A test cargo of 90 cubic meters of LNG, supplied by the Bay of Biscay regasification plant, was transferred from the bunker vessel *Oizmendi*, formerly called *Monte Arucas*, to the cement carrier *Ireland*.

“This is the first time that this operation...has been carried out in

the entire Atlantic Arc and the Mediterranean and represents a milestone in the advance towards a cleaner energy supply in the naval sector, which is very dependent on petroleum derivatives,” a spokesperson for the port of Bilbao said.

The project is backed by the

European Commission’s Core LNGas Hive project.

Seven-month redesign for *Oizmendi*

The *Oizmendi* has been radically redesigned to store LNG, alongside conventional fuel oil, with redesign work completed at the Murueta Shipyard over a period of seven months.

Upgrade work included, among other equipment, the installation of two large LNG tanks of 300 cubic-metre-capacity each and Itsas invested an estimated €5.5 million in the transformation.

“With this, a new gas supply service is started for those ships that operate with natural gas and that, precisely, do not have a wide network of refueling points in Eu-

ropean ports,” the port of Bilbao said in a statement.

Ibaizabal invests in gas-powered tugboat

Alongside the work to start the new LNG supply vessel, the long-term investment in LNG infrastructure at the port has also included adaption of the Bay of Biscay regasification plant pontoon to cater for small boats and construction and start-up of a natural gas tugboat.

The new tugboat is under development by Grupo Financiero Ibaizabal and construction is slated to begin in 2018.

Itsas Gas is a fully-owned subsidiary of the Basque Government’s energy agency, Ibaizabal Remolcadores and Naviera Murueta. ■



The *Oizmendi* docked at the port of Bilbao

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Gothenburg breaks ground on LNG Bunker facility

Authorities at the port of Gothenburg have broken ground on a new LNG bunker facility which is set to become operational later this year.

Construction of the scalable land-based LNG facility has now started at the Gothenburg Energy Port, near the mouth of the river Göta älv, and will be developed in collaboration with Nordic fuel specialist Skangas and Swedish gas transmission network operator Swedegas.

“With both Skangas and Swedegas operating at the Port of Gothenburg, we have two companies that complement each other with different offerings. Shipping lines now have a further incentive to consider switching to LNG,” Jill Söderwall, Head of Commercial Operations at the Port of Gothenburg Energy Port, said.

The partners have announced plans to “expand the number of LNG options” at the port and “ensure safe, rapid and effective land-side LNG bunkering” whilst vessels are loading and discharging.

Vacuum-insulated infrastructure

Once complete the facility will feature a 450-metre vacuum-insu-

lated cryogenic pipeline at quay-side to bunker LNG fuel to vessel, with fuel delivered to the site via

“As is the case with the gas transmission network, in which both natural gas and biogas can be transported, the new facility will be flexible and can also be used for the storage and transport of renewable gas. Customers with access to the transmission network can already choose biogas, and this is something we are looking to extend to the shipping sector as the next step in their transition to environmentally correct alternatives,” Johan Zettergren, CEO of Swedegas, said.

Swedegas owns the gas transmission network from Dragør in Denmark to Stenungsund in Sweden and is in the process of developing new infrastructure for biogas, hydrogen gas and LNG throughout the 33 municipal areas it currently supplies with gas.

EU assigns PCI status

The Gothenburg bunker project has been designated Project of



The port of Gothenburg

Common Interest (PCI) status by the EU making it among the most prioritised infrastructure projects in Europe. The EU's Innovation and Networks Executive Agency has also instituted support measures to ensure the project will reach fruition.

“LNG as marine fuel is increasingly used in the world as global sulphur regulations become increasingly stringent. The Port of Gothenburg has made considerable progress in promoting its use,” a spokesperson for the port said. ■



Swedegas' LNG facility at the Port of Gothenburg

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Titan LNG signs Amsterdam bunkering pontoon deal

Fuelling technology firm Titan LNG has signed a long-term rental agreement with the Port of Amsterdam to site an LNG bunkering pontoon at the port.

The contract is part of a strategy by the port to “facilitate the development of the LNG bunkering market” and will see Titan’s bunkering pontoon *FlexFueler001* make its home base at the port’s America Harbour.

“We believe in LNG as a shipping fuel and Titan LNG’s solution fits very well with our strategic focus on becoming a sustainable port and our transition to renewable energy. We strive to connect the port seamlessly to the fast growing metropolitan area, and lowering pollution is a top priority!” Koen Overtoom, CEO of the Port of Amsterdam, said.

Flexible LNG bunkering and reloading

The *FlexFueler* is designed to supply both inland waterway vessels and larger sea-going vessels and will be deployed initially through-

out the Amsterdam-Rotterdam-Antwerp (ARA) region. With draft of 9.70 metres the America Harbour will accommodate bunkering of types of vessels, with seagoing ships expected to be bunkered as concurrent cargo operations occur alongside.

The *FlexFueler* is also designed to be capable of receiving LNG fuel from either trucks or LNG transport vessels, allowing it greater operational range, and the central location of the America Harbour will allow for flexible access.

“We are very pleased with the support of Port of Amsterdam. Their trust has enabled us to realise a long-term supply solution for vessels that run on LNG...LNG as a marine fuel has a great future and provides one of the building blocks of a more sustainable shipping industry,” Niels den Nijs CEO of Titan LNG, said.



Titan LNG's bunkering pontoon

Cargo capacity increase to delay launch

The vessel was initially scheduled to become operational the start of 2018 but will now launch at the end of this year following a slight delay due to upgrades to the design that will increase capacity and flexibility.

“Due to the substantial increase in upcoming demand for LNG as a bunker fuel in the ARA region, we had the opportunity to outfit the pontoon directly with four tanks. It was an easy trade-off between becoming operational slightly deferred and reaching

maximum capacity of 1,480 cubic meters from the start directly,” Michael Schaap, commercial director at Titan LNG, said.

Titan LNG is part of the IVECO Schouten Group and provides fuel solutions for industrial companies and shipping lines. Its sister company Rolande LNG, serves LNG fuelling station operator for road transportation.

The port of Amsterdam is Western Europe’s fourth largest port and part of the North Sea Canal Area which transhipped approximately 100 million tonnes of goods last year. ■

Total signs long-term LNG bunker vessel charter

Energy firm Total Marine Fuels Global Solutions has signed a long-term charter contract with shipping line Mitsui O.S.K. Lines for the first bunker vessel capable of supplying large quantities of LNG in a single bunkering operation.

The large LNG bunker vessel will have a capacity of 18,600 cubic metres and is scheduled for delivery in 2020. Slated for deployment in Northern Europe, Total intends the vessel to serve the emerging marine LNG market for container ships, including those sailing on the Europe-Asia trade.

“This pioneer agreement offers

a major contribution to the development of LNG as a marine fuel and illustrates Total’s strong commitment towards the use of this new fuel,” Olivier Jouny, Managing Director of TMFGS, said.

TMFGS to supply LNG mega container ships

The vessel will be used to supply

CMA CGM’s new build LNG mega container ships, following the 10 years contract of 300 kilotonne per annum signed between the cargo shipping line and TMFGS in December 2017.

Construction is scheduled to take place at Hudong-Zhonghua Shipbuilding’s yard in China and the bunker vessel will be fitted with a Mark III membrane containment system provided by the French company GTT.

“Highly manoeuvrable by design, with a length of about 135 meters, she will be able to operate safely in the considered harbours and terminals. She will meet the highest environmental standards through the use of LNG as fuel and a complete reliquefaction of the boil-off gas,” Total states.

Technical expertise to cement partnership

The deal follows a Memorandum of Understanding signed by both partners to combine their expertise in the development of marine LNG infrastructures and serve MOL’s future LNG needs. In line with this partnership the newbuild vessel will be managed by MOL (Europe Africa), a UK subsidiary of MOL.

“This is a key milestone for MOL and also a stepping stone to further enhancement of the two companies’ relationship of not only in conventional fuels but also LNG as a marine fuel. We are confident that our joint technical and operational expertise will contribute positively to this new business development,” Takeshi Hashimoto, MOL Senior Managing Executive Officer, said. ■



Total and MOL in charter deal for LNG bunker vessel

NEWS NUDGES

Hyundai, MAN collaborate on dual-fuel engine

Engineering firms Hyundai Heavy Industries and MAN Diesel & Turbo are to collaborate to develop a dual-fuel engine.

The proposed two-stroke-propulsion engine will be designed to operate on liquefied petroleum gas as a common alternative to LNG in many land-based fuelling stations.

"LPG holds great potential as a fuel since it contains no sulphur, is widely available, and easy to bunker. It is therefore becoming an increasingly attractive alternative to other, low-sulphur fuel types. We have a long tradition of technical cooperation with our licensees and we are looking forward to working with Hyundai on this exciting project," Bjarne Foldager, Vice President at MAN Diesel & Turbo, said.

LNG Fuelling station market set for rapid growth

The LNG Fuelling Station market is set for continued rapid development over the next four years, according to research firm Absolute Reports.

The findings presented in the firm's Fuelling Station Market Regional Analysis 2022 report suggests that technological advancements combined with changes in investment will help drive the trend.

The report segments the market into mobile and permanent stations and by major application of road vehicle or ship.

C-Job explores wind-assisted LNG power

Netherlands-based naval architect C-Job has wind-assisted Flettner Freighters for Dutch

Japanese shipping lines plot LNG bunkering future

Japanese shipping firms K Line, Chubu Electric, Toyota Tsusho, and NYK Line have initiated plans to create a joint LNG bunkering business.

The four companies have now begun joint discussions on the commercialization of LNG as a transport fuel and will study potential business opportunities related to specific LNG customers and supply methods.

"LNG is expected to become an important alternative to heavy fuel oil, because of its relatively low emissions of air-polluting substances and greenhouse gases... The group hopes that the use of LNG will enable their ships to meet increasingly stringent international regulations on emissions," the shipping firms said in a joint statement.

MOL orders first LNG-fuelled tugboat

Fellow Japanese shipping firm Mitsui O.S.K. Lines (MOL) has meanwhile signed a deal with Kanagawa Dockyard to construct the first LNG-fuelled tugboat to operate in Osaka Bay, Japan.

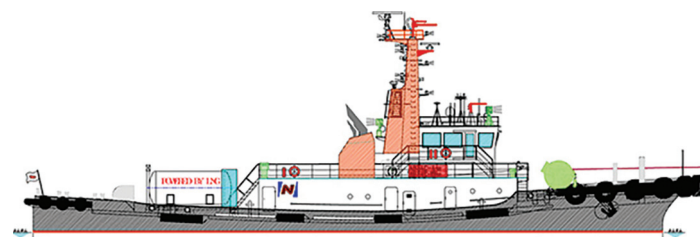
The agreement will see Kanagawa construct the high-performance dual-fuel vessel at Hyogo-ku, Kobe, the first LNG-fuelled tugboat to be owned by MOL. Construction is set to commence in February 2018 and,



NYK Line is one of four partners exploring LNG bunkering

when it launches in April 2019, the tugboat will be used to escort large-scale freighters in Osaka Bay and the Seto Inland Sea.

"It will be the first LNG-fuelled tugboat in Japan conforming to the IGF code. It is also Japan's first LNG-fuelled tugboat with the LNG fuel tank mounted on the exposed deck at the stern of the ship. This enhances convenience in bunkering, maintenance, and inspection," a spokesperson for MOL said.



Artist's rendition of LNG-fuelled tugboat

shipping company Switjnk Shipping.

The 8,500 deadweight-tonne vessel is equipped with two Norsepower Rotor Sails to supplement the main engines and C-Job is exploring the potential

to fuel the vessel with LNG.

"Switjnk has a well-defined vision of sustainable shipping and we are glad to sit down and share our knowledge with them... we have looked at all the options available to help them

MOL, Osaka Gas partner on LNG fuel supply system

MOL states that LNG fuel for the tugboat will be supplied by Osaka Gas using a truck-to-ship system and that both firms will collaborate to establish an LNG fuel supply system for vessels, which will be the first in Osaka Bay.

"MOL and Osaka Gas will... cooperate in the measures of LNG fuel supply development project conducted by Port and Harbor Bureau of Osaka Prefectural Government at the Sakaisenshoku Port," a spokesperson for MOL said.

MOL also plans to move ahead with research on practical use of an LNG fuel supply system with a detachable, portable LNG fuel tank, by adapting this design to the tugboat.

achieve their ambitions. We have reserved space for LNG engines; although this will be dependent on LNG bunkering infrastructure along their sailing routes," Jelle Grijpstra, C-Job Business Manager, said.

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

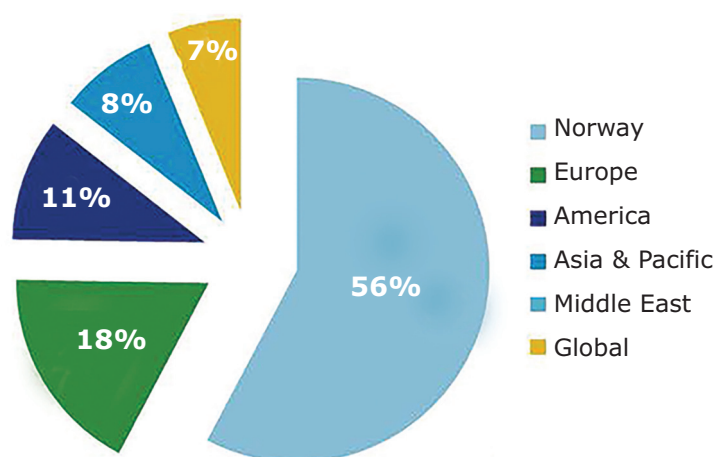
Data last updated: 15 February 2017

* = conversion projects

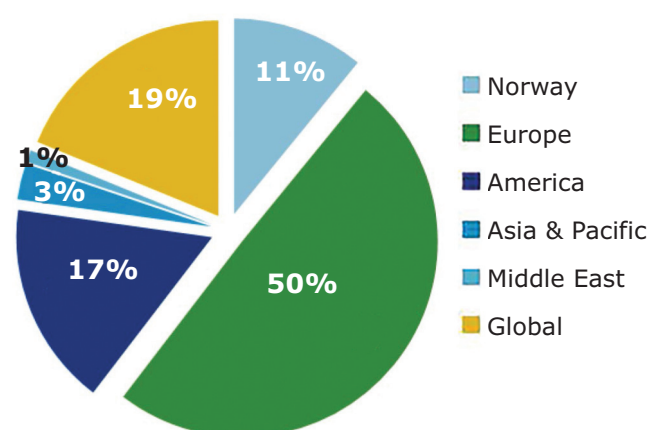
Year	Type of Vessel	Owner	Class
2015	Gas carrier	Evergas	BV
2015	Gas carrier	Evergas	BV
2015	Tug	CNOOC	CCS
2015*	Car/passenger ferry	AG Ems	DNV GL
2015	Tug	NYK	NK
2015	Gas carrier	Chemgas Shipping	BV
2015	Gas carrier	Evergas	BV
2015	PSV	Harvey Gulf Int.	ABS
2015	Container ship	TOTE Shipholdings	ABS
2015	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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