

LNG Fuelling

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Shell, Qatar Petroleum sign LNG marine fuelling JV

Energy firms Shell and Qatar Petroleum have formed a joint venture partnership focused on the development of LNG marine fuelling infrastructure.

The newly formed partnership builds on previous agreements between the two firms to explore LNG bunkering opportunities in the Middle East. Following the success of these Memoranda of Understanding both firms will now target opportunities worldwide.

"We are pleased to team up with our long-term partner and industry pioneer, Shell, on this important initiative. We view LNG bunkering as a promising opportunity for LNG to further grow as a clean energy source," Saad Sherida Al-Kaabi, Qatar Petroleum's President and CEO, said.

The joint venture structure was formed between Shell's Gas & Power Developments division and Qatar Petroleum's Wave LNG Solutions subsidiary.

Qatari officials welcomed the deal as a sign of the country's continued strength in LNG development following tough sanctions from other Gulf states that have damaged its international standing in recent weeks.

Next phase to "evaluate and progress"

The global LNG partners will now "evaluate and progress" the development of LNG bunkering facilities at various locations across



Ben van Beurden and Saad Sherida Al-Kaabi

Europe, the Middle East and East Asia in response to an "increasing numbers of ship owners and operators" turning to LNG over traditional marine fuels.

"As two of the world's leading LNG suppliers, Shell and Qatar Petroleum have the capability and experience to deliver LNG as a marine fuel to ship owners and operators who must meet tougher emissions regulations from 2020. We look forward to working with Qatar Petroleum to increase the availability of LNG as a fuel for transport," Ben van Beurden, CEO of Shell, said.

JV to support Shell's LNG supply strategy

The commitment by Shell to develop LNG infrastructure is part of the firm's global strategy to establish LNG as the fuel of choice for

marine transport. This has included recent deals to supply the fuel for the world's first LNG-powered Aframax crude oil tankers and the world's largest passenger cruise ships.

An agreement with Russia's Sovcomflot, signed earlier this year, will see Shell supply LNG for four Aframax crude oil tankers, setting a new precedent for the size of vessel operating on LNG. The four Aframax tankers will operate in the Baltic Sea and Northern Europe, transporting crude oil and petroleum products.

"This is an important next step for gas as part of the energy mix. We are proud to work with SCF Group to make these LNG-fuelled Aframax crude oil tankers a reality," Maarten Wetselaar, director of Integrated Gas and New Energies at Shell, commented.

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As two of the world's leading LNG suppliers, Shell and Qatar Petroleum have the capability and experience to deliver LNG as a marine fuel to ship owners and operators who must meet tougher emissions regulations from 2020.

Ben van Beurden, CEO, Shell

Wärtsilä LNG engines to power next-generation tankers

Finnish equipment manufacturer Wärtsilä is to supply LNG-fuelled engines and supply systems for four next-generation tankers ordered by Swedish shipping line Erik Thun.

The four newbuild tankers will be supplied with 6-cylinder Wärtsilä 34DF dual-fuel main engines, Wärtsilä LNGPac fuel supply systems, a Wärtsilä Gas Valve Unit (GVU), and a Controllable Pitch Propeller (CPP) with HP nozzle.

"The fuel efficiency of the Wärtsilä 34DF engine, whether in gas or diesel mode, was a prime consideration in its selection for these 'next generation' tankers," Aaron Bresnahan, Vice President at Wärtsilä Marine Solutions, said.

The tankers will be built at the Scheepswerf Ferus Smit yard in the Netherlands and will each be 115 metres in length. The ice-class 1A vessels will be capable of handling year round sailing conditions in the Baltic Sea.

"We have worked closely with Wärtsilä on many projects for more than 45 years, and we recognise their technical expertise and the reliability of their products. We are pleased, therefore, to have Wärtsilä as a partner for this project where efficiency and sustainability are the key essentials," says Anders Källson, Managing Director, Erik Thun AB.

TCS delivers efficiency savings

The power-chain and fuel system design from Wärtsilä includes its proprietary open type Tank Connection Space (TCS) to enable natural ventilation. This system also features a combined cargo heating



Artist's rendition of the LNG-fuelled Thun tanker

medium that controls the temperature both inside the TCS as well as for evaporating the LNG.

"The successful track record of both the CPP and LNGPac solutions, and the proven efficiencies that they have demonstrated,

were [also] convincing arguments in our favour," Bresnahan added.

Further benefits of the novel design include reduced weight, a reduced power supply requirement and less installation work for the yard.

Knutsen selects MAN engines for LNG tankers

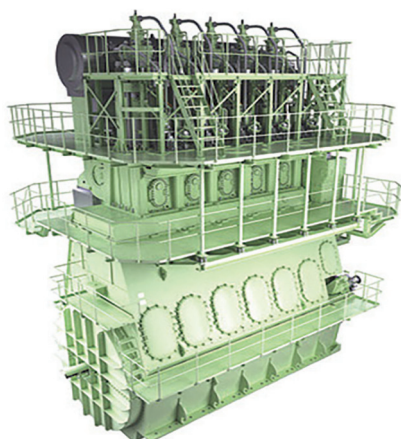
Norwegian firm Knutsen OAS Shipping has selected MAN Diesel & Turbo to supply four dual-fuel engines for the construction of two newbuild LNG tankers.

The tankers will be powered by dual-fuel MAN B&W 5G70ME-GI engines with EGR systems. The new orders stem from Corpus Christi Liquefaction, a subsidiary of Cheniere Energy, which recently entered into 20-year LNG sale and purchase agreements with two Spanish utilities.

"These orders are notable in that they are the 6th and 7th such carriers bound for service for Spanish utilities that have been ordered within the past four years alone. As such, our G70ME-GI engine has become a popular choice for LNG carriers globally," Bjarne Foldager, Vice President Sales & Promotion, at MAN Diesel & Turbo, said.

ME-GI delivers higher power concentration

The engines will be capable of running on LNG fuel but the drive mechanism is based on the diesel principle as opposed to the more common Otto principle.



MAN B&W 5G70ME-GI engine

The ME-GI is a Diesel engine in contrast to the other dual- or triple-fuel engines on the market, which are Otto engines. Simply put, engines that operate according to the Diesel principle have a higher efficiency and power concentration than those following the Otto principle," a spokesperson for MAN said.

"MAN Diesel & Turbo sees significant opportunities arising for gas-fuelled tonnage as fuel prices rise and modern exhaust-emission limits tighten... the ME-GI engine's negligible methane slip makes it the most environmentally-friendly technology available. As such, the ME-GI engine represents a highly efficient, flexible, propulsion-plant solution," a spokesperson for MAN said.

Research broadens operating regime

In May this year, MAN announced an ME-GIE variant passed operational tests running on ethane, broadening the ability of the engine to operate under a range of fuel regimes.

The firm also reports that an ME-LGI counterpart to the ME-GI now runs on LPG, methanol and other liquid gasses and has successfully been introduced to the market.

Headquartered in Augsburg, Germany, MAN Diesel & Turbo produces large-bore diesel engines and turbomachinery for marine and stationary applications, as well as marine propulsion systems, power plant applications and turbochargers.

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Helsinki publishes LNG bunkering manual

Authorities at the Port of Helsinki have published guidelines for the bunkering of LNG, designed to promote the safe use of the fuel.

The 35-page safety manual includes details on the safe handling of LNG at the port as well as sections on regulatory frameworks, emergency procedures and training.

“The physical properties of LNG introduce a number of hazards that must be considered when handling LNG... The safety manual outlines the safety regulations and demands that are required for safe handling in LNG bunkering operations, including ship-to-ship (STS) and truck-to-ship (TTS) operations within the operating area of the Port of Helsinki,” a spokesperson for the port said.

It has been developed by maritime solutions provider SSPA Sweden in collaboration with the port authorities and is available to download from the port’s website.

“Since the handling of LNG as fuel for ships in the Port of Helsinki is expected to increase in the near future, there is a need of a safety manual on LNG bunkering procedures,” the report’s authors note.



LNG trucks at Vuosaari Harbor

Finland backs multi-modal LNG strategy

Finland was amongst the first countries to adopt LNG as a fuel within its transport infrastructure and the latest guidelines are aimed at further strengthening its role both as a marine and land-based fuel.

Last year, the port opened the first LNG filling station for heavy-

duty cargo vehicles at Vuosaari Harbor. The station is part of a country-wide strategy to switch to gas for road transportation and it is expected to drive wider use of LNG as a fuel for breakbulk and project cargo operators.

“We find that opening an LNG filling station here where we have a major hub for truck traffic in Southern Finland is a perfectly

natural move. We’re happy to be involved in efforts to enable new openings for environmentally sound technology,” Jukka Kallio, director of Vuosaari Harbor, said.

LNG refuelling has been conducted at the Port of Helsinki since the summer of 2014, when the Finnish Border Guard’s off-shore patrol vessel Turva was completed. The vessel currently bunkers LNG by truck-to-ship at the Vuosaari Harbour every second week.



The port of Helsinki

NEWS NUDGES

Gasum to acquire further stake in Skangas

Finnish gas specialist Gasum is to increase its stake in small-scale LNG supplier Skangas from 51% to 70%, as it seeks to strengthen its position within the Nordic LNG market.

The share acquisition follows agreement by Norwegian utility Lyse Group to sell a 19% Skangas stake to Gasum.

As a result of the sale, Lyse will retain a 30% stake in Skangas, down from 49%.



LNG VALUE CHAIN SOLUTIONS

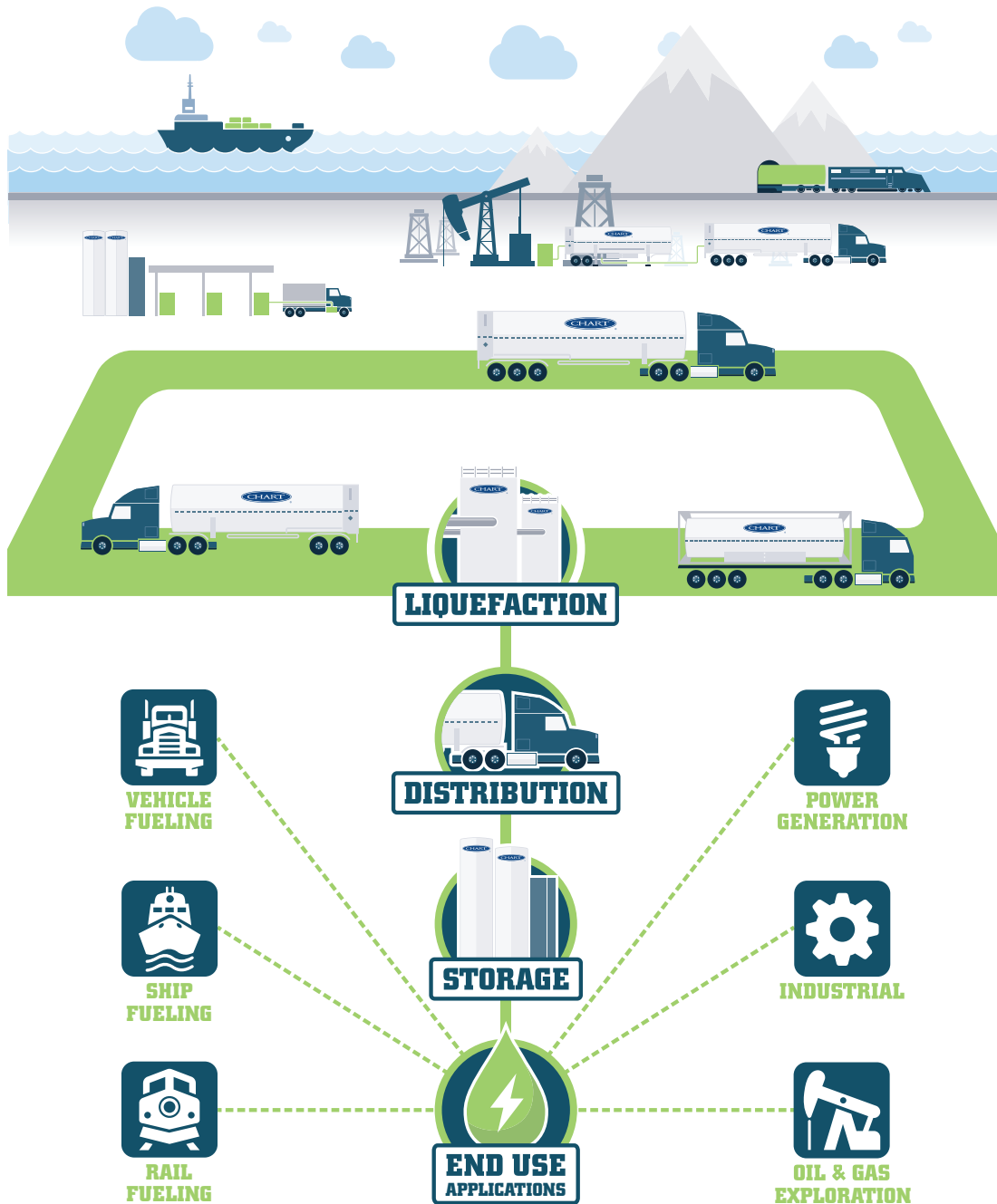


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Vos Logistics Adds LNG Ecocombi Trucks

Logistics service provider Vos Logistics has announced the expansion of its LNG-fuelled fleet with the addition of two new LNG Ecocombi trucks.

The vehicles will operate in the Benelux region on behalf of partner Pipelife, one of Europe's largest manufacturers of plastic piping and fittings, and will be the first Ecocombi design trucks to be powered by LNG, boosting the scope off the fuel.

Also referred to as a maxi-truck or gigaliner, the Ecocombi design measures about 25 metres in length and can transport up to 60 tons. The design allows for up to 60 percent more storage capacity than previous LNG-ready vehicles, providing space for an additional 145 cubic metres per move.

"Up until now there was the choice of either one of the two: employing an LNG truck or making use of the Ecocombi for transporting goods. This combination is quite innovative. The new additions are exclusively deployed for

Pipelife," Roy van Tilburg, Manager Domestic Transport & Service Deliveries at Vos Logistics, said.

Biogas compatible

Alongside the ability to run on LNG the trucks have also been equipped to run on liquefied biogas (LBG) when available making them amongst the first large scale road cargo vehicles to use the fuel.

"At Pipelife we are going to great lengths in order to be a trendsetter in the area of sustain-

ability. We are always on the lookout for innovations in technology and plastics, while at the same time lowering our energy consumption when it comes to our processes," Mark van Loon, Managing Director at Pipelife Benelux, said.

The firms' estimate that the new LNG trucks will drive reductions in CO2 emissions of up to 15% compared to diesel trucks and while the vehicles will initially be operated solely to carry plastic pipes and fitting cargoes the part-

ners highlight the "potential for a wide range of other product areas" such as construction and retail.

LNG fuel central to logistics mindset

Headquartered in Oss, in the southern Netherlands, Vos Logistics provides intermodal cargo and bulk transport as well as managed fleet and logistics services. The group operates a network of 25 group-owned locations, throughout Europe with a fleet of 1,000 Euro 5, EEV and Euro 6 vehicles, 3,200 loading units and 190,000m2 of storage space.

"The use of the LNG Ecocombi fits right into our mindset. We are glad to work with a logistics partner that enables us to contribute positively to the environment, while doing business responsibly at the same time," van Loon added.



Vos Logistics' LNG-fuelled truck

AET Wins Statoil contract for LNG-fuelled OLSTs

Norwegian oil and gas firm Statoil has awarded tanker owner and operator AET a long-term contract to operate two LNG-fuelled offshore loading shuttle tankers (OLST).

The agreement will see AET take responsibility for operation of the specialist DP2 OLSTs in oilfields on the Norwegian Continental Shelf of the North Sea, Norwegian Sea and the southern Barents Sea.

The two OSLT vessels will be built by Korean shipbuilder Samsung Heavy Industries and are scheduled for delivery in 2019. AET currently owns and operates two DP2 ships for Statoil under its joint venture company, AET Sea

Shuttle which is 95% owned by AET and 5% by Norwegian ADS Shipping.

"The agreed newbuild state-of-the-art DP2 shuttle tankers will strengthen Statoil's position for safe, efficient and cost competitive transportation of offshore loaded crude oil production to our customers. The fuel efficiency features built into these vessels, including LNG dual fuel capabilities, will significantly reduce

operational costs and climate emissions. As such this contract is strongly aligned with Statoil's sharpened strategy," Grete Birgitte Haaland, senior vice president at Statoil, said.

World's first LNG-fuelled DPSTs

The new twin skeg dynamically positioned shuttle tankers (DPST) will each weigh 125,000 deadweight-tonnes and will be equipped with winterisation features, high power thrusters, shaft generators and the latest generation of bow loading system.

"When in operation from 2019, these two DPSTs are expected to be the world's first LNG fueled DPSTs and most energy efficient," a spokesperson for Statoil said.

Both the main and auxiliary engines will be LNG dual-fuel capable and there will also be

an option to be fitted with a volatile organic compound (VOC) recovery system, further improving fuel efficiency.

During the construction of the vessels OSM Maritime Group will AET's parent company Malaysian energy shipping group, MISC Berhad as lead technical management.

"I am delighted that Statoil has recognised and endorsed the quality of our operations in this most demanding of environments by giving us a further opportunity to support their business with two additional state-of-the-art DPSTs. We believe, as part of the MISC Group, our strategic partnership and our innovative solutions gave us the edge over other operators in the North Sea," Captain Rajalingam Subramaniam, chairman of AET Sea Shuttle, said.



The shuttle tanker Eagle Barents currently on charter for Statoil from AET

Singapore LNG completes first small-scale Jurong reload

Bunker specialist Singapore LNG Corporation (SLNG) has performed its first small-scale LNG gas-up/cool-down and reload at its terminal on Jurong Island

The operation involved refuelling the 6,500 cubic-metre-capacity LNG bunker vessel *Cardissa*. Owned by Shell and co-financed by the European Union's Connecting Europe Facility, *Cardissa* was docked at SLNG Terminal's Secondary Jetty.

"The successful completion of our first small scale LNG reload operation is significant as it demonstrates the SLNG Terminal's ability to play the role of LNG supply hub for the region," John Ng, CEO of SLNG, said.

The move is an important step for the terminal which was originally designed to only accommodate much larger LNG vessels - from 60,000 cubic metres to 265,000 metres in size.

Detailed compatibility studies were carried out prior to the reload procedure to check the vessel's equipment would connect with the Secondary Jetty safely and ensure marine conditions could be conducted smoothly.

Singapore progresses LNG fuelling agenda

The Singapore Government has long backed a strategy to develop



Singapore LNG Corporation facility

the island as a regional LNG bunkering and gas trading hub and earlier this year completed the first port-to-ship bunkering of LNG in Southeast Asia at Jurong Port.

The recent completion of gas-up / cool-down procedures further strengthens operational

expertise at the port and is now expected to drive the development of further infrastructure for general LNG fuelling.

"The Terminal is able to break LNG cargoes into smaller parcels and facilitate deliveries of small volumes of LNG to other terminals

in the region, or as bunker fuel to ships in our port. We are already looking ahead to further enhance our capabilities in this area, by exploring possible modifications to our Secondary Jetty to accommodate LNG vessels as small as 2,000 cubic meters," Ng added.

The port expects these smaller facilities to come onstream in 2019.

SLNG was incorporated by the Energy Market Authority of Singapore to build, own and operate Singapore's first open-access, multi-user LNG Terminal.

The successful completion of our first small scale LNG reload operation is significant as it demonstrates the SLNG Terminal's ability to play the role of LNG supply hub for the region

John Ng, CEO, SLNG

NEWS NUDGES

Brittany Ferries orders LNG-fuelled M/V *Honfleur*

Shipping line Brittany Ferries has ordered a new LNG-fuelled cruise ferry from German shipyard Flensburger Schiffbau Gesellschaft.

The vessel - *M/V Honfleur* - will be powered by four main LNG engines paired with alterna-

tors, to reduce noise and vibrations whilst using less fuel at low speed.

The vessel will operate on the Ouistreham - Portsmouth route and will have capacity to accommodate 1,680 passengers on 11 decks.

It is scheduled to be launched in November 2018

CGH progresses with Chongqing LNG Bunker station

China Gas Holdings (CGH) expects to commission its onshore LNG bunkering station in Chongqing in the second half of 2017.

The announcement follows five years after preliminary

work began in 2012 and delays have in part resulted due to the company waiting for a licence from the Ministry of Transport.

CGH is headquartered in Hong-Kong and has been conducting trials at the site since 2015 when the first phase of construction began.

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

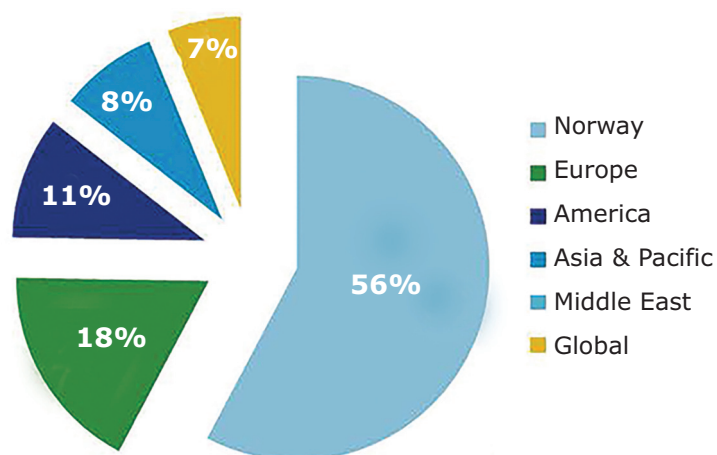
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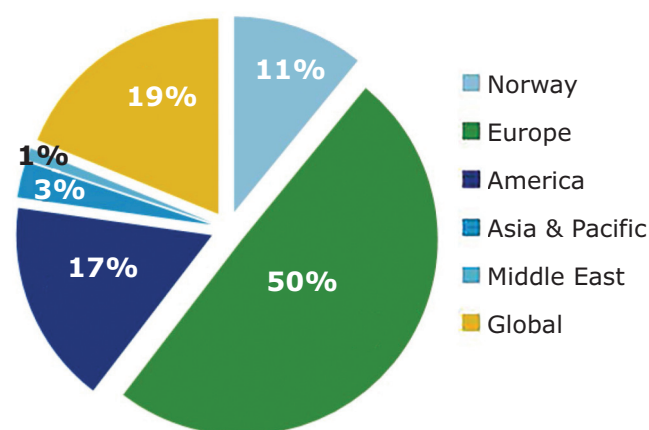
Year	Type of Vessel	Owner	Class
2015	Gas carrier	Evergas	BV
2015	Gas carrier	Evergas	BV
2015	Tug	CNOOC	CCS
2015*	Car/passenger ferry	AG Ems	DNV GL
2015	Tug	NYK	NK
2015	Gas carrier	Chemgas Shipping	BV
2015	Gas carrier	Evergas	BV
2015	PSV	Harvey Gulf Int.	ABS
2015	Container ship	TOTE Shipholdings	ABS
2015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