

LNG Fuelling

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Joint study to explore LNG fuelling for bulk carriers

A consortium of energy, shipping and mining companies has launched a joint study into the commercial feasibility of using LNG to fuel future Capesize bulk carriers.

The consortium consists of global mining firms Rio Tinto and BHP Billiton, Australian petroleum exploration and production company Woodside Energy and shipping line Mitsui O.S.K. Lines and the Shanghai Merchant Design and Research Institute (SDARI). The research effort will be led by industry classification body DNV GL and will focus on LNG use for Australian sea routes.

"As we approach the entry into force date for sulphur emissions, we are seeing interest in LNG as a ship fuel start to climb again. As one of the largest LNG exporters in the world and with bunkering infrastructure coming online, Australia is well placed to support the bulk trade on the west coast with LNG as fuel," Morten Lovstad, business director for bulk carriers at DNV GL, said.

Capesize bulkers are amongst the biggest ships in the world and developing LNG-fuelled system to power them poses unique challenges. The largest bulkers currently are up to 300,000 dead-weight-tonnes and almost 400 meters in length.

LNG to create 'Green Corridor'

The partners in the joint study plan



Woodside will explore the introduction of LNG-fuelled iron ore bulkers

to examine the introduction of LNG fuel along 'Green Corridor' trade routes between Australia and China. These routes are some of the busiest in the world with raw materials travelling from Western Australia to meet demand from China's growing industrial sector.

"We commend DNV GL for leading this project. We think the trade routes from northern Western Australia are the perfect place to drive the transition to LNG as a marine fuel, with exporting industries in close proximity to world-class LNG supplies," Peter Coleman, CEO of Woodside, said.

Woodside recently took delivery of the first LNG-fuelled marine support vessel in the southern hemisphere, the *Siem Thiima* and will now assess the viability of further adoption of

LNG-fuelling for its fleet.

DNV GL renews agreement with MPA

Classification society DNV GL also announced that it has strengthened links with the Maritime and Port Authority of Singapore (MPA) with the renewal of the memorandum of understanding between the two organisations. The MoU will promote research into intelligent shipping systems and the use of LNG as an alternative fuel.

"I am excited to renew the MOU with the Maritime and Port Authority of Singapore. Five per cent of our annual group revenue is harvested in a wide set of R&D projects - often together with our customers and trusted partners," Remi Eriksen, CEO of DNV GL, said.

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Signing ceremony for the joint study

ARTA to develop LNG bunker systems with MSC Cruises

Cryogenic equipment manufacturer ARTA is to progress plans for an LNG bunkering system in partnership with shipping firm MSC. The system follows over twelve months of research and analysis by ARTA and MSC subsidiary, MSC Cruises.

The deal will see ARTA work closely with MSC Cruises, to set standards and create bunkering equipment for the firm's fleet of LNG-powered vessels. Research to date has examined issues related to LNG fuelling in the cruise industry and developed several new fuelling mechanisms which the firms will now seek to put into practice.

"We are exceptionally glad of the new system that we have developed to suit the cruise industry's specific bunkering needs. Thanks to our partnership with MSC Cruises we have been able to fully understand these needs and have put over 40 years of our bunkering engineering experience to good use. The result is a technologically advanced solution that

will help ensure that the double wall principle is maintained across the entire LNG bunkering supply chain," Andreas von Keitz, ARTA's Managing Director, said.

Four LNG-fuelled vessels on order

MSC Cruises currently has 11 ships on order of which four will be LNG-powered. The firm is the world's largest privately owned cruise company and the fourth largest overall after Carnival Corporation, Royal Caribbean Cruises and Norwegian Cruise Line.

"With up to four LNG-powered cruise ships scheduled to join our fleet, we are highly committed to developing the best possible technologies and systems to support

the introduction of LNG to cruising. In ARTA, we have found a partner that matches our focus on innovation and the best maritime technology at sea and that understands our industry's specific needs," Yves Bui, MSC Cruises' LNG Project Director, said.

Coupling technology to improve operability

The system that the two firms aims to implement will feature innovative connection technology that is designed to reduce leakage and improve safety as well as refinements to re-engineer connec-



The system is designed for MSC Cruises fleet of LNG-fuelled vessels

tor hoses and improve operational uptime for the sector.

"The result is a system that features a newly developed coupling and decoupling mechanism as well as a double-walled hose that will allow us to conduct bunkering operations without disrupting the activities taking place on board the ship," Bui commented.

MAN Cryo to deliver LNG fuel system for Sefine

Power equipment manufacturer MAN is to deliver a marine LNG fuel-gas supply system (FGSS) and auxiliary equipment for an Italian ferry, currently under construction at Sefine Shipyard in Turkey.

The contract was signed between Sefine and Man subsidiary, MAN Cryo, and includes provision of a vacuum-insulated storage tank with capacity of 150 cubic meters along with an LNG vaporizer, pressure build-up unit, bunker station and heat exchanger.

"The MAN Cryo system will supply gas to the ferry's three

dual-fuel propulsion engines and is scheduled for delivery in November 2017. The vessel will be the first of its kind with LNG propulsion," a spokesperson for MAN Cryo said.

Dual-deck layout

The system will be used in the construction of a ferry for Italian

ship owner Caronte & Tourist. Aftermarket services will be delivered in association with MAN PrimeServ, MAN Diesel & Turbo's after-sales division.

The Caronte & Tourist vessel will be 133 meters in length once complete and 21.5 meters in width. It feature capacity for 1,500 passengers and up to 290 cars on two vehicle decks.

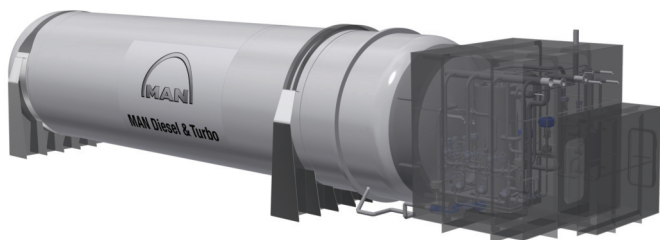
Caronte & Tourist to utilise LMG Marin design

The fuel system and ancillary equipment will be installed aboard a double-ended RoPax ferry, designed by LMG Marin, that will primarily operate on the strait of Messina between the city of

Messina and Villa San Giovanni, the main access point to Sicily from the Italian mainland.

"MAN Cryo was chosen as supplier for this new order due to its experience and well-proven products within the field of vacuum technology and cryogenic tank engineering," a spokesperson for MAN Cryo said.

MAN Cryo is based in Gothenburg, Sweden and was formed in 2016 after German manufacturer MAN Diesel & Turbo acquired Swedish industrial firm Cryo AB in 2016. Situated in Gothenburg, Sweden, MAN Cryo develops and manufacturers cryogenic equipment for the storage, distribution and handling of LNG.



Rendering of the MAN Cryo vacuum insulated storage tank plus auxiliary equipment to be installed aboard the new ferry

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German ports establish position on LNG fuelling map

The German ports of Rostock and Brunsbüttel have completed first LNG fuelling operations for vessels as part of a strategy to develop both locations into bunkering hubs.

In early February, bunkering specialist Bomin Linde LNG conducted first LNG fuelling operations in the German port of Rostock for the tanker vessel *Fure West* while authorities at Brunsbüttel Elbe Port oversaw the refueling of the cement carrier *Ireland*.

"The bunkering of the *Fure West* by the experienced German LNG supplier Bomin Linde LNG establishes Rostock as a prime location for the supply of alternative ship fuels. We are pleased to see that not only supply by truck, but also by a bunker vessel might be an option in the long-run," Jens Aurel Scharner, managing director of Rostock Port, said.

The bunkering process was conducted via four LNG trucks on the quayside at Germany's largest Baltic Sea port. The tanker was retrofitted to accept LNG fuel last

year and is operated by Swedish shipping company Furetank Rederi.

"We are happy that we are able to bunker LNG in an increasing number of ports, including Rostock. Jointly developing the LNG market is the basis for successfully establishing LNG as ship fuel," Lars Höglund, managing director of Furetank, said.

Authorities at Brunsbüttel reported the successful bunkering of the 110 meter *Ireland* with approximately 19 tonnes of LNG transferred via truck-to-ship method.

"We expect that the demand for LNG bunkering will increase seen in the coming years," Frank Schnabel, CEO of Brunsbüttel Ports, said.

'Seamless' start to Bomin Linde, Furetank JV

Bomin Linde LNG signed a partnership agreement with Furetank in

November last year to explore LNG fuelling in the Baltic region. The new joint venture will focus on developing LNG solutions for Furetank's existing fleet and for several newbuild vessels currently under order.

"I am glad that we were able to bring the partnership agreement between our two companies to life just weeks after it was signed," Sonja Nesshoever, director at Bomin Linde LNG, said.

Furetank currently has four newbuild ships developed in partnership with Gothenburg-based Gothia Tanker Alliance alongside the retrofitted tanker *Fure West*.

Furetank's has scheduled to launch its newbuild vessels in late



The cement carrier *Ireland* docked at Brunsbüttel

2018 and early 2019. The firm is also working with Bomin Linde to investigate offshore refuelling using DP2 equipment

"We are glad to have Bomin Linde LNG as our partner, with whom we will not only extend our truck-to-ship supply but also ship-to-ship bunkering," Höglund added

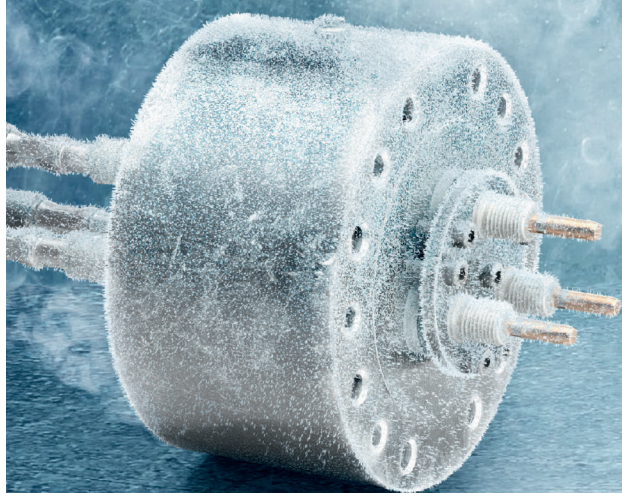
Following a buyout by Linde of Bomin Group's stake in Bomin Linde LNG Linde will replace the current operating name by the end of March 2017 to reflect the change in ownership. ■

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Houlder, KLAW sign LNG transfer MoU

Engineering firm Houlder has signed a memorandum of understanding with LNG transfer specialist KLAW to collaborate on the development of new “hybrid” bunkering and fuel transmission solutions.

The planned hybrid solutions will be designed as an alternative to existing rigid fixed arm solutions to deliver LNG through flexible hoses. The aim will be to integrate motion compensating handling equipment and proven LNG components with existing transfer technology developed by KLAW.

“Houlder has expertise in marine design, engineering and equipment supply across the energy sector. Our Marine Design Consultancy business is already at the forefront of LNG bunkering system and vessel design. KLAW LNG adds an unrivalled track record of safe and effective operation,” Simon Harris, chief commercial officer at Houlder, said.

Partners to meet increased LNG demand

Alongside any new equipment, the collaboration will offer clients a full set of services available world-wide including vessel installation and integration, site assis-



Simon Harris and David Hill signed the MoU

tance and support and crew training. The memorandum was signed by Harris and David Hill, CEO of Signum Technology, the parent company of KLAW.

The firms state that the agreement was established in response to increased demand from the LNG small to mid-scale market and both firms will now work together to create new Ship-to-Ship and Shore-to-Ship transfer products.

“The team at KLAW LNG is proud to be in the forefront of hose based LNG transfer systems. We also recognise the development and engineering prowess Houlder has gained through long

experience across the offshore energy industry,” Hill said.

Headquartered in Wiltshire in the UK, KLAW develops LNG transfer systems designed to minimise risk of LNG spillage. The firm’s LNG Emergency Release

System provides emergency flow shutdown technology which prevents risk of injury and helps maintain the integrity of bunkering systems.

“Hundreds of LNG commercial transfers are safely and efficiently conducted every year using their components. Combining their know-how with Houlder’s marine and mechanical engineering experience is very exciting,” Harris said.

Houlder hosts SGMF working group

The technology partnership comes in parallel to work carried out by Houlder towards the development

of industry standards for LNG fuelling. Last month, Houlder hosted a workshop for the 6th Society of Gas as Marine Fuel (SGMF).

The workshop included senior managers from KLAW LNG, Wärtsilä, Bomin Linde, ENGIE, Shell, GTT, FMC Technologies, Babcock International, ARTA, Mann-Tek and Lloyd’s Register and focused on functional design requirements and the need for consistency in small to mid-scale bunkering operations.

“The real value of the LNG working group is ensuring suppliers of bunkering equipment engage with each other and end users. The future of LNG as an every-day marine fuel is dependent on the spirit of collaboration fostered by the SGMF. We’re delighted to be part of it,” Gianpaolo Benedetti, project manager at Houlder and chair of the event, commented. ■

AG&P: ‘Significant opportunities’ for Indian LNG fuelling sector

LNG fuelling specialist Atlantic, Gulf and Pacific (AG&P) expects the LNG bunkering sector in India to present ‘significant opportunities’ for growth and has announced a new agreement with developer Hindustan LNG to build infrastructure in the East Godavari region of Andhra Pradesh, India.

The two firms have signed a memorandum of understanding for the provision by AG&P of an integrated solution to deliver re-gasified LNG at the port in Andhra Pradesh. AG&P will also design and build a new LNG import terminal to supply the fuel.

Andhra Pradesh ‘ideal’ for LNG fuel development

“The technical and commercial details of this MOU are being finalized so they remain commercial in confidence. However, we believe bunkering for transport is a growth market in India with significant opportunities.” Christine Jones, vice president at AG&P, said.

Hindustan LNG is a Hyderabad-

based LNG import terminal development company and if successful the new partnership is expected to lead to further similar projects in the region, with AG&P chairman Jose P. Leviste, Jr, calling LNG a ‘crucial element’ of Andhra Pradesh’s future.

“The partnership with AG&P will provide a strong platform to develop a fast-track and low-cost LNG import solution that enables the region to continue on its growth trajectory. Andhra Pradesh is the ideal place for developing an LNG import facility to serve the growing energy demands of the east coast of India,” C.R. Prasad, Chairman of HLNG, said

Partnerships key to LNG growth

Headquartered in Manila, AG&P has backed a strategy for further regional growth through expert partnerships with both technology firms and developers.

“AG&P is committed to forging partnerships with experts who bring new technologies and ideas that will expedite development of the market for LNG. Our MoU with Hindustan LNG is one such example, sitting alongside our successful partnerships with France-based GTT, Korea-based Gas Entec and Indonesia-based Risco Energy,” Derek Thomas, head of advanced research at AG&P, said. ■

NEWS NUDGE

GTT signs services agreement with Teekay

French cryogenic membrane designer Gaztransport & Technigaz (GTT) has signed a Technical Service Agreement with shipping firm Teekay. The agreement covers 23 vessels equipped with the GTT technologies Mark III and NO96.

“Teekay holds one of the major LNG fleets in the world which will reach about 40 vessels by 2019. To assist our clients in the efficient operations of their LNGCs throughout the years, we provide them solutions to fit their new requirements, particularly by proposing tests which can be performed in operation without dry-docking”, Philippe Berterottière, CEO of GTT, said.

Under the agreement GTT will offer Teekay access to its Hotline Emergency Assistance & Response Service (HEARS) advisory and optimization service.

Babcock and BSM partner for 7,500m³ GSV

German maritime solutions firm Bernhard Schulte Shipmanagement (BSM) in partnership with engineering support services firm Babcock has announced plans to construct a new design LNG bunkering vessel.

The two firms aim to build a 7,500 cubic metre capacity Gas Supply Vessel (GSV) that will be used to deliver LNG to fuel ferries, containers, cruise vessels and other shore-based gas consumers in the Baltic Sea.

First of a kind LNG transfer

"For this new sector to come into operation safely and efficiently it requires a new type of ship and we have been working over the last two years with our partner Babcock international to develop a GSV... that is able to deliver LNG ship-to-ship in a way that's never been done before," Angus Campbell, Director of Energy Projects at BSM, said.

The vessel will be the first of its kind to utilise Babcock's patent-

pending FGSV0 technology to manage fuel transfer. The technology claims to deliver zero emissions to the environment during normal operations.

"Working with well-established partners such as the Schulte Group is an exciting prospect for our team. As innovators in LNG technology, working on this 'first of its kind' programme is a great opportunity to further expand our reach into the international LNG arena," Ian Lindsay, Babcock Managing Director for Energy & Marine Technology, said.

Although initially designed for use in the Baltic region, both partners expect the new

design if successful to receive interest globally. Babcock predicts that the market for GSVs is expected to present "growth potential and opportunities" in the near term as new LNG fuelling infrastructure is developed worldwide and stricter IMO regulations come into place.

LNG 'most significant' for the shipping industry

"This new sector will enable Babcock and the Schulte Group to in-

novate and deliver safe, efficient and environmentally responsible fuel delivery to meet demand in this growing sector of our industry," Campbell said.

The planned GSV will be built at Hyundai Mipo Dockyard in Ulsan, South Korea and is scheduled to launch in April 2018 and enter operations in September 2018. Construction begins imminently with the cargo tanks scheduled for delivery in January 2018 and the keel scheduled to be laid down in February 2018.

"The shipping industry is now beginning to change... I think the use of LNG is one of the most significant steps that the shipping industry can take. We see this as an opportunity to deploy the knowledge and the skills that we have," Campbell added.



BSM and Babcock have developed a new GSV design

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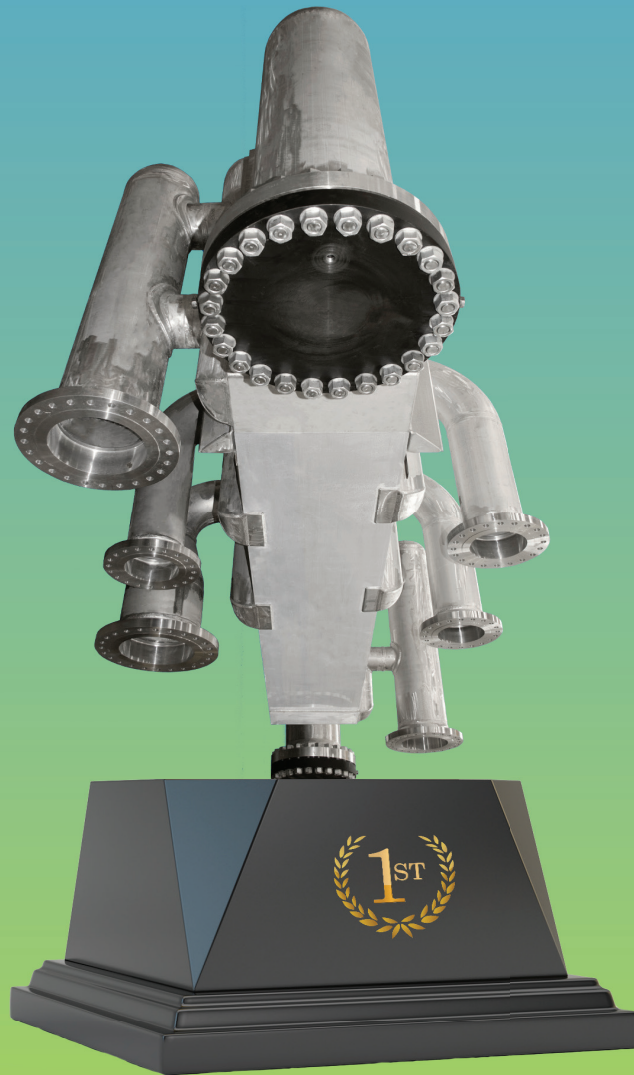
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LNG-FUELLED SHIPS IN OPERATION WORLDWIDE

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

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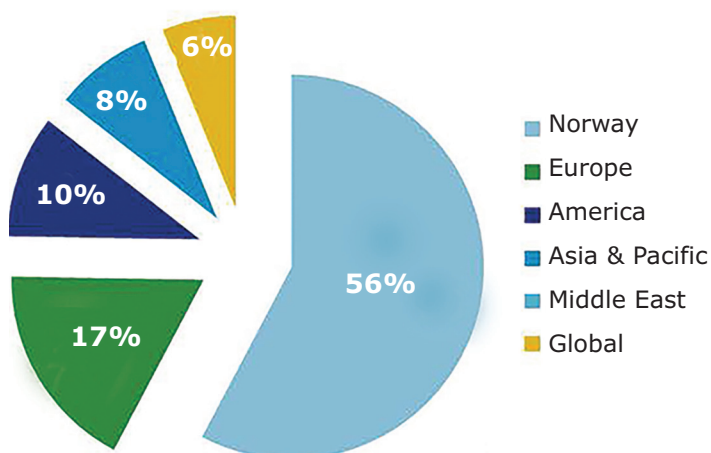
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* = conversion projects

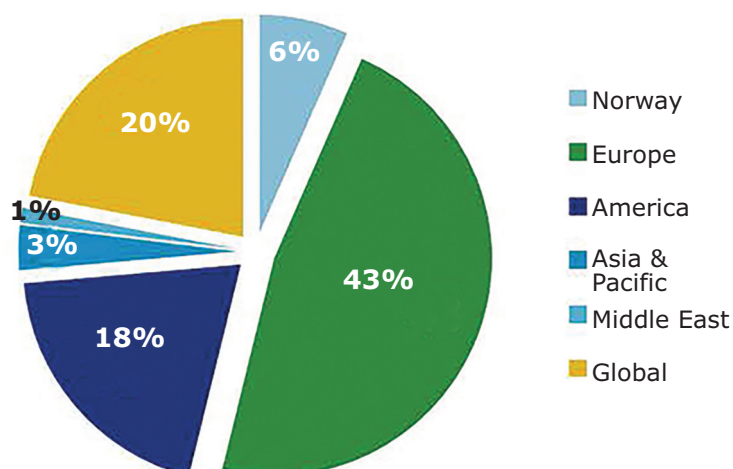
Year	Type of Vessel	Owner	Class
2015	Gas carrier	Evergas	BV
2015	Gas carrier	Evergas	BV
2015	Tug	CNOOC	CCS
2015*	Car/passenger ferry	AG Ems	DNV GL
2015	Tug	NYK	NK
2015	Gas carrier	Chemgas Shipping	BV
2015	Gas carrier	Evergas	BV
2015	PSV	Harvey Gulf Int.	ABS
2015	Container ship	TOTE Shipholdings	ABS
2015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

AREA OF OPERATION OF LNG-FUELLED SHIPS

Operating area
ships in operation



Operating area
confirmed orderbook



Updated 19 December 2016
Excluding LNG carriers and inland waterway vessels

WORLD LNG-FUELLED CONFIRMED NEWBUILDS

Year	Type of Vessel	Owner	Class
2016	Car/passenger ferry	Society of Quebec ferries	LR
2016	Car/passenger ferry	Society of Quebec ferries	LR
2016	Tug	Drydocks World	
2016	PSV	Harvey Gulf Int.	ABS
2016	PSV	Harvey Gulf Int.	ABS
2016	PSV	Siem Offshore	DNV GL
2016	Gas carrier	Evergas	BV
2016	PSV	Harvey Gulf Int.	ABS
2016	PSV	Siem Offshore	DNV GL
2016*	Ro-Ro	TOTE Shipholdings	ABS
2016	Car/passenger ferry	BC Ferries	LR
2016	Gas carrier	Ocean Yield	DNV GL
2016	Gas carrier	Ocean Yield	DNV GL
2016	Gas carrier	Ocean Yield	DNV GL
2016	Car/passenger ferry	Seaspan Ferries Corp.	BV
2016	Gas carrier	Navigator Gas	ABS
2016	Gas carrier	Navigator Gas	ABS
2016*	RoPax	Baleària	BV
2016	Dredger	DEME	BV
2016	Dredger	DEME	BV
2016*	Container ship	Wessels Reederei	BV
2016	Hopper Barge	Bremenports	DNV GL
2016	HSLC	Fred. Olsen	DNV GL
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
2017	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	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
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	Dredger	DEME	BV
2018	Bulk ship	POSCO	KR
2018	Dredger	van der Kamp	DNV GL
2019	Cruise ship	Carnival Corporation	RINA
2019	Cruise ship	Carnival Corporation	RINA
2019	Oil/chemical tanker	Ålvtank	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	Oil/chemical tanker	Rosneft	
2020	Oil/chemical tanker	Rosneft	
2020	Oil/chemical tanker	Rosneft	
2020	Oil/chemical tanker	Rosneft	
2020	Oil/chemical tanker	Rosneft	
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 : 9 December 2016

* = conversion projects

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	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	Triputra (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?
2015	Yuan He 1	30,000	LNG	China	Yes	CSR
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 Innovation	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	NYK Bunker barge TBN	5,100	LNG	Northwest Europe	Yes	NYK
2016	Ocean Yield TBN	36,000	Ethane/Ethylene	US - Teeside	Ethane, for Sabic	Gaschem Services
2016	Ocean Yield TBN	36,000	Ethane/Ethylene	US - Teeside	Ethane, for Sabic	Gaschem Services
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	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 Skargas	Anthony Veder
2017	Evergas TBN	27,500	LNG/Ethylene	Markus Hook - Rafnes	Ethane, for Ineos	Evergas
2017	Evergas TBN	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

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 = 11 January 2017