

DNV GL SERVING THE LNG INDUSTRY

Global experience

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DNV GL provides services throughout the entire LNG value chain, from gas production, processing, and liquefaction, through shipping and re-gasification, to downstream consumption, including the use of LNG as a fuel for ships.

SERVING THE LNG INDUSTRY

DNV GL is a competent and trustworthy partner serving the LNG industry.

Our LNG activities started almost 50 years ago when we established an LNG ship research team. Since then DNV GL has been at the forefront of technology development within this sector. DNV GL's expertise was closely associated with the development of the Moss spherical tank system and the first double corrugated membrane cargo containment system was developed by DNV GL's research team in 1962. DNV GL's services, competencies and experience cover all the links in the LNG chain.

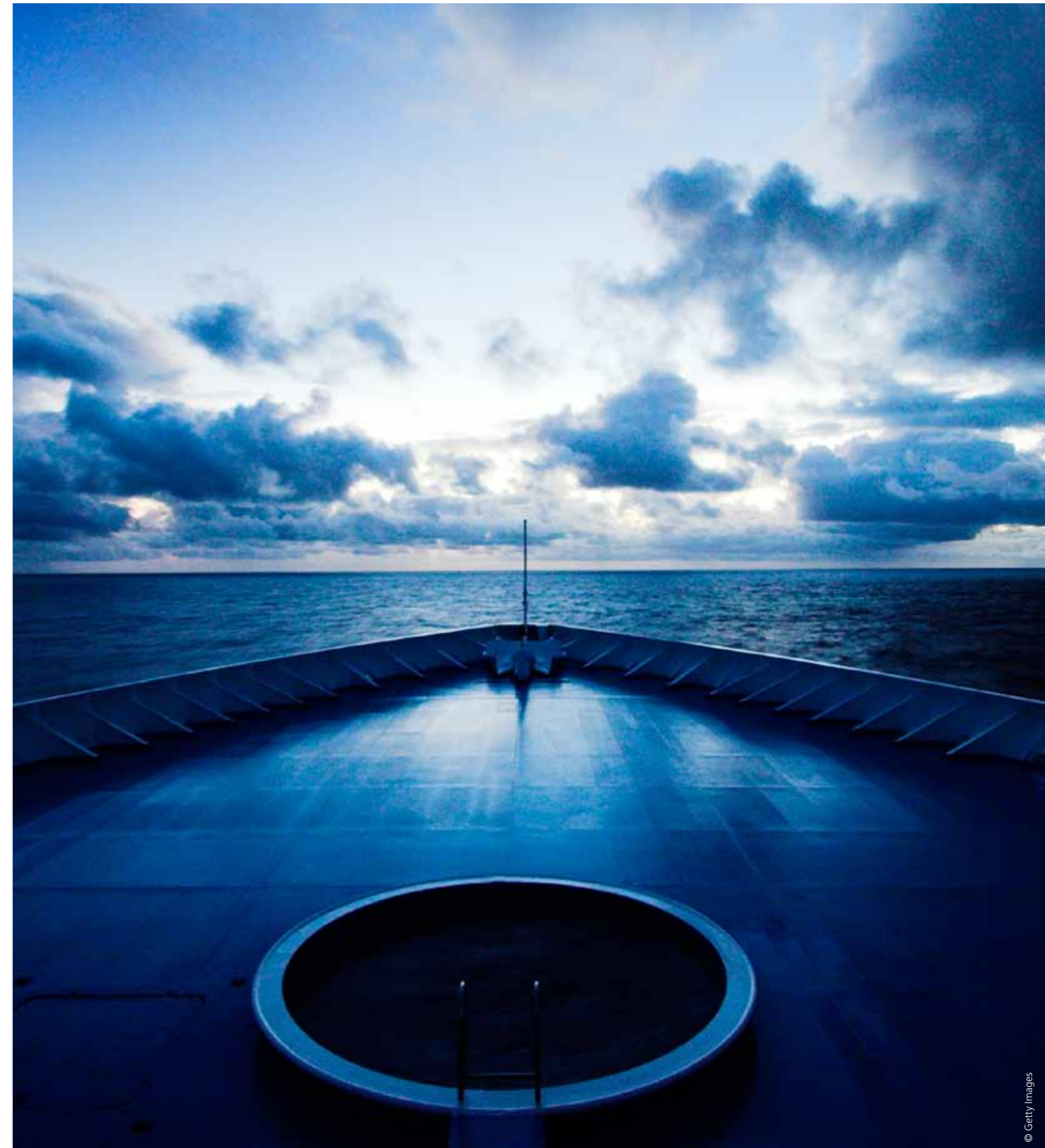
We are today deeply involved in both research and technology development as well as being a service provider to new project developments.

We are currently involved in more than one third of the ongoing LNG terminal developments, and classify more than one fifth of the LNG carrier fleet on order. There is a fleet of LNG carriers to DNV GL class, ranging from the smallest LNG carrier in the world, the *Pioneer Knutsen* (1,100 m³) to Q-flex size LNG carriers (216,000 m³).

In the following, we have compiled a selection of references that illustrates our broad service portfolio. Due to strict confidentiality clauses imposed upon DNV GL by some of our clients, we have not revealed the names of our clients or the precise nature of our involvement. The LNG terminal projects to which we have provided services over the past years are listed, sorted by export and import terminals and alphabetically by country.

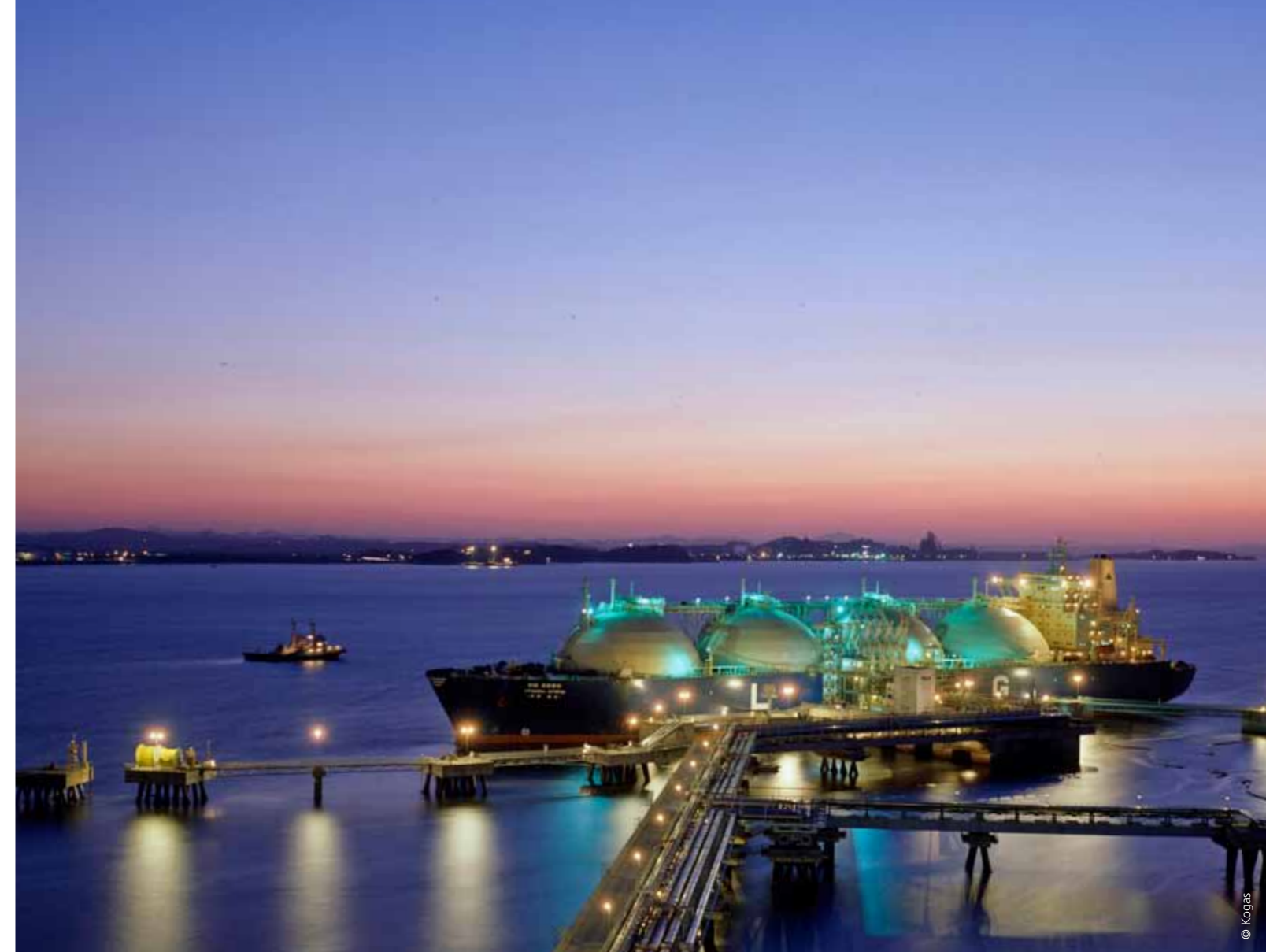
The abbreviations used for the services provided are:

- SHE - Safety, Health and Environment Risk Management
- TQ - Technology Qualification
- MC - Maritime Classification
- OCS - Offshore Classification Services
- RBV - Risk Based Verification/Certification
- ARM - Asset Risk Management
- ERM - Enterprise Risk Management
- IC - Independent Advisor, Independent Engineer or Independent Technical Consultant
- MC - Maritime Classification
- TA - Technical Analysis



ONSHORE REGASIFICATION, STORAGE AND IMPORT TERMINALS

COUNTRY	PROJECT	PROJECT STATUS	DNV GL SERVICES PROVIDED
Albania	TAP LNG	Planned	IC
Bahamas	AES Ocean LNG	Planned	RBV
Belgium	Zeebrugge LNG	In operation	SHE
Canada	Canaport	In operation	SHE, IC
Canada	Cacouna Energy LNG	Shelved	SHE, IC
Canada	Rabaska	Shelved	SHE, IC, TA
Chile	Chile LNG	In operation	TA
China	Guangdong Dapeng LNG	In operation	SHE
China	Macau LNG	Under construction	SHE
China	Zhejiang LNG	In operation	SHE, ARM, ERM, IC
China	Rudong	In operation	SHE, ERM, IC
China	Dalian LNG Project	In operation	SHE, ARM
China	Shenzhen	Planned	SHE
China	Zhuhai LNG	In operation	SHE
China	Tangshan LNG	Under construction	SHE, ARM
China	Tianjin LNG	Under construction	IC
China	Fujian LNG	In operation	ARM
China	Shanghai LNG	In operation	IC
Croatia	Adria LNG	Shelved	SHE, ARM
France	Fos Faster	Planned	SHE
Germany	Rostock LNG	Shelved	SHE
Greece	Revythoussa	In operation	ERM, IC
Hong Kong	Hong Kong LNG	In operation	SHE
Hong Kong	Black Point	Shelved	SHE
India	Dahej	In operation	SHE
Italy	Adriatic LNG	In operation	SHE, IC, ARM
Netherlands	Gate LNG	In operation	SHE, IC, TQ
Poland	Polskie LNG	Under construction	SHE
Portugal	Madeira LNG	Planned	SHE, IC
Portugal	Sines LNG Terminal	In operation	SHE
Singapore	Singapore LNG	In operation	SHE, ARM
Slovenia	Koper LNG	Planned	SHE
Spain	Canary Island	Planned	IC
South Africa	Coega Integrated LNG	Planned	SHE
Taiwan	Taochiung	In operation	RBV
UK	Dragon LNG	In operation	SHE, ARM
UK	Grain LNG	In operation	TA
UK	South Hook LNG	In operation	SHE, ARM, RBV
USA	Bay Crossing LNG	Shelved	SHE, IC
USA	Beacon Port	Shelved	SHE
USA	Cove Point	In operation	SHE, IC, ARM, ERM
USA	Cameron LNG	In operation	SHE
USA	Compass Port	Shelved	SHE, IC



ONSHORE REGASIFICATION, STORAGE AND IMPORT TERMINALS (CONTINUED)

COUNTRY	PROJECT	PROJECT STATUS	DNV GL SERVICES PROVIDED
USA	Crown Landing	Shelved	SHE, IC
USA	Gulf LNG	In operation	SHE
USA	Keyspan LNG	Shelved	SHE
USA	Sparrows Point LNG	Shelved	SHE
USA	Downeast LNG	Shelved	SHE
Vietnam	Thi Vai	Planned	SHE
Japan	Osaka Gas Terminal	In operation	ARM

FLOATING LNG IMPORT FACILITIES

COUNTRY	PROJECT	PROJECT STATUS	DNV GL SERVICES PROVIDED
Brazil	Pecém Port Terminal (FSRU)	In operation	SHE, OCS, RBV, IC, MC
Brazil	Guanabara Bay (FSRU)	In operation	SHE, OCS, RBV, MC
Chile	Atacama FSRU	Under construction	MC
China	South China Sea FSRU	Planned	ARM
China	Tianjin LNG	In operation	SHE, ARM
Dubai	Golar Freeze FSRU	In operation	ARM, MC
Italy	Triton FSRU	Planned	TA, TQ, SHE, OCS
Italy	Livorno (OLT) FSRU	In operation	SHE, ARM, ERM, IC
Italy	Adriatic GBS LNG	In operation	SHE*
Italy	Zaule LNG	Shelved	SHE
Indonesia	Sumatra FSRU	Under construction	MC
Indonesia	West Java FSRU	In operation	OCS
Lithuania	Klaipeda FSRU	Under construction	MC
UK	Port Meridien	Planned	ARM
USA	Neptune SRV	In operation	RBV, MC
USA	Woodside OceanWay FSRU	Shelved	OCS
USA	Broadwater LNG FSRU	Shelved	SHE
USA	Torp Bienville LNG	Shelved	OCS, SHE, TQ
Unknown	Golar FSRU	Under construction	MC
Unknown	Høegh FSRU	Under construction	MC
Unknown	Høegh FSRU	Under construction	MC
Unknown	BW Maritime FSRU	Under construction	MC

* GBS in Isola di Porto Livante

ONSHORE LIQUEFACTION, STORAGE AND EXPORT TERMINALS

COUNTRY	PROJECT	PROJECT STATUS	DNV GL SERVICES PROVIDED
Abu Dhabi (UAE)	Adgas (Das Island)	In operation	SHE, ARM
Algeria	Gassi Touil	Planned	SHE
Algeria	Skikda	In operation	SHE, ARM, ERM, IC
Angola	Angola LNG	In operation	ARM
Australia	Greater Gorgon Australia LNG	Under construction	ERM, RBV
Australia	Pluto LNG	In operation	ARM, TA, RBV, TQ, SHE
Australia	Browse LNG	Planned	TQ, ARM
Australia	Sunrise LNG	Planned	SHE, TQ, ARM
Australia	Darwin LNG	In operation	SHE, ARM
Australia	Gladstone LNG	Under construction	ARM
Australia	Wheatstone LNG	Under construction	ARM, RBV, SHE, IC
Australia	Ichthys LNG	Under construction	SHE, TA, IC
Australia	QCLNG	Under construction	TA, RBV, ARM
Canada	LNG Kitimat	Planned	SHE, IC
China	Hubei LNG	Under construction	SHE
Egypt	Egyptian LNG	In operation	SHE, ARM
Equatorial New Guinea	Alba LNG	In operation	ARM
Indonesia	PT Badak NLG	In operation	SHE, ARM
Indonesia	BP Tangguh	Under construction	SHE, TA, ARM
Iran	Persian LNG	Planned	RBV
Iran	North Pars	Planned	SHE
Malaysia	Train Satu	In operation	SHE, ERM, ARM, IC
Nigeria	NLNG	In operation	ARM
Nigeria	Brass LNG	Planned	ARM, SHE, TQ, TA
Nigeria	Olo Kola LNG	Planned	SHE
Norway	Risavika LNG	In operation	SHE, ARM, RBV
Norway	Snøhvit LNG	In operation	ERM, ARM, SHE, TQ, TA
Oman	Oman LNG	In operation	ARM
Papua New Guinea	PNG LNG	Under construction	ARM
Qatar	RasGas 2	In operation	ARM
Qatar	Al-Shaheen	In operation	ARM
Russia	Sakhalin II	In operation	SHE, ARM, ERM, IC
Russia	Shtokman	Planned	SHE, ARM, ERM, IC, RBV
Trinidad & Tobago	Atlantic LNG	In operation	SHE, ARM



LNG CARRIERS ON ORDER

HULL NO.	BUILDER	CAPACITY	TYPE	PROPULSION	OWNER/MANAGER	DELIVERY	REMARKS
2022	Samsung	161,900	Mark III Flex	DFDE	Golar LNG	2013	
2023	Samsung	161,900	Mark III Flex	DFDE	Golar LNG	2013	
2027	Samsung	161,900	Mark III Flex	DFDE	Golar LNG	2014	
2047	Samsung	161,900	Mark III Flex	DFDE	Golar LNG	2014	Winterized Basic
2048	Samsung	161,900	Mark III Flex	DFDE	Golar LNG	2014	Winterized Basic
2046	Samsung	161,900	Mark III Flex	DFDE	Thenamaris	2014	
2049	Samsung	161,900	Mark III Flex	DFDE	Thenamaris	2014	
2024	Samsung	161,900	Mark III	DFDE	Golar LNG	2014	FSRU Jordan
2031	Samsung	170,000	Mark III	DFDE	Golar LNG	2013	FSRU Kuwait
2056	Samsung	170,000	Mark III	DFDE	Golar LNG	2015	FSRU
2074	Samsung	170,000	Mark III	DFDE	BW Gas	2015	FSRU
2118	Samsung	170,000	Mark III	DFDE	BW Gas	2016	FSRU
2548	Hyundai	170,000	Mark III	DFDE	Höegh LNG	2013	FSRU Indonesia
2549	Hyundai	170,000	Mark III	DFDE	Höegh LNG	2014	FSRU Lithuania
2550	Hyundai	170,000	Mark III	DFDE	Höegh LNG	2014	FSRU
2551	Hyundai	170,000	Mark III	DFDE	Höegh LNG	2015	FSRU
2571	Hyundai	162,000	Mark III Flex	DFDE	BW Gas	2014	
2572	Hyundai	162,000	Mark III Flex	DFDE	BW Gas	2015	
S688	Hyundai Samho	174,000	Mark III Flex	DFDE	Maran Gas	2015	
S735	Hyundai Samho	174,000	Mark III Flex	DFDE	Maran Gas	2016	
S658	Hyundai Samho	162,000	Mark III Flex	DFDE	Golar LNG	2014	
S659	Hyundai Samho	162,000	Mark III Flex	DFDE	Golar LNG	2014	
2291	DSME	159,800	NO96 L03	DFDE	Maran Gas	2014	
2406	DSME	159,800	NO96 L03	DFDE	Maran Gas	2015	
2297	DSME	159,800	NO96 L03	DFDE	Cardiff	2014	
2290	DSME	155,900	NO96	DFDE	AWILCO LNG	2013	
6302	DSME	177,000	NO96	Barge	Petronas	2015	FLNG
2407	DSME	173,400	NO96 GW	MAN ME-GI	Teekay	2016	
2408	DSME	173,400	NO96 GW	MAN ME-GI	Teekay	2016	
2411	DSME	173,400	NO96 GW	MAN ME-GI	Teekay	2017	
2416	DSME	173,400	NO96 GW	MAN ME-GI	Teekay	2016	
2417	DSME	173,400	NO96 GW	MAN ME-GI	Teekay	2016	

LNG CARRIERS BUILT TO DNV GL CLASS AND CLASS ENTRIES

NAME	OWNER/MANAGER	CAPACITY	TYPE	PROPULSION	BUILDER	DELIVERY	REMARKS
Norman Lady		87,600	Moss	Steam turbine	Rosenberg Verft	1973	Historic
Margaret Hill		87,600	Moss	Steam turbine	Rosenberg Verft	1974	Historic
Hilli	Golar Wilhelmsen Management	125,000	Moss	Steam turbine	Rosenberg Verft	1976	
Havfru		29,500	Moss	Diesel engine	Moss Verft	1973	Historic
Century		29,500	Moss	Diesel engine	Moss Verft	1975	Historic
Nusantara Regas Satu	Golar Wilhelmsen Management	125,000	Moss	Steam turbine	Rosenberg Verft	1977	FSRU Indonesia
Gimi	Golar Wilhelmsen Management	125,000	Moss	Steam turbine	Rosenberg Verft	1976	
Gandria	Golar Wilhelmsen Management	125,800	Moss	Steam turbine	HDW	1977	
Golar Freeze	Golar Wilhelmsen Management	125,800	Moss	Steam turbine	HDW	1977	FSRU Dubai
Golar Spirit	Golar Wilhelmsen Management	128,600	Moss	Steam turbine	Kawasaki	1981	FSRU Brazil
Seagas	Sirius Shipping AB	180	Type C	Diesel	Løland Verft	2013	Bunker ship
Al Khaznah	National Gas Shipping	137,500	Moss	Steam turbine	Mitsui	1994	
Shahamah	National Gas Shipping	137,500	Moss	Steam turbine	Kawasaki	1994	
YK Sovereign	SK Shipping	128,350	Moss	Steam turbine	Hyundai	1994	
Ghasha	National Gas Shipping	137,500	Moss	Steam turbine	Mitsui	1995	
Ish	National Gas Shipping	137,500	Moss	Steam turbine	Mitsubishi	1995	
Hyundai Cosmopia		135,000	Moss	Steam turbine	Hyundai	2000	Transfer to KR
SK Summit	SK Shipping Co. Ltd.	137,500	NO96	Steam turbine	DSME	1999	
Hyundai Oceanpia		135,000	Moss	Steam turbine	Hyundai	2000	Transfer to KR
BW Suez Boston	BW Fleet Management	138,000	NO96	Steam turbine	DSME	2003	
BW Suez Everett	BW Fleet Management	138,000	NO96	Steam turbine	DSME	2003	
Golar Frost		137,000	Moss	Steam turbine	Hyundai	2004	Transfer to RINA
Methane Princess	Golar Wilhelmsen Management	138,000	NO96	Steam turbine	DSME	2003	
Berge Arzew	BW Fleet Management	138,000	NO96	Steam turbine	DSME	2004	

LNG CARRIERS BUILT TO DNV GL CLASS AND CLASS ENTRIES (CONTINUED)

NAME	OWNER/ MANAGER	CAPACITY [m ³]	TYPE	PROPULSION	BUILDER	DELIVERY	REMARKS
Golar Viking	Golar Wilhelmsen Management	140,000	MK III	Steam turbine	Hyundai	2005	
Golar Winter	Golar Wilhelmsen Management	138,000	NO96	Steam turbine	DSME	2004	FSRU Brazil
Pioneer Knutsen	Knutsen OAS Shipping	1,100	Type C	Gas engines	Bijlsma	2004	
Arctic Discoverer	K Line LNG Shipping (UK)	140,000	Moss	Steam turbine	Mitsui	2006	
Stena Bluesky	V.Ships LNG	145,700	NO96	Steam turbine	DSME	2006	
Arctic Voyager	K Line LNG Shipping (UK)	140,000	Moss	Steam turbine	Kawasaki	2006	
Arctic Princess	Höegh LNG Fleet Management	145,000	Moss	Steam turbine	Mitsubishi	2006	Winterized Basic
Arctic Lady	Höegh LNG Fleet Management	145,000	Moss	Steam turbine	Mitsubishi	2006	Winterized Basic
Rasgas Asclepius	Maran Gas Maritime Inc.	145,000	NO96	Steam turbine	DSME	2005	
Golar Grand	Golar Wilhelmsen Management	145,000	NO96	Steam turbine	DSME	2006	
Golar Maria	Golar Wilhelmsen Management	145,700	NO96	Steam turbine	DSME	2006	
Iberica Knutsen	Knutsen OAS Shipping	138,000	NO96	Steam turbine	DSME	2006	
LNG Lokoja	BW Fleet Management	148,300	NO96	Steam turbine	DSME	2006	
LNG Kano	BW Fleet Management	148,300	NO96	Steam turbine	DSME	2007	
LNG Ondo	BW Fleet Management	148,300	NO96	Steam turbine	DSME	2007	
Al Gattara	OSG Gas	216,200	MK III	Diesel engines	Hyundai	2007	Re-liq. + GCU
Al Gharrafa	OSG Gas	216,200	MK III	Diesel engines	Hyundai	2008	Re-liq. + GCU
Neva River	K Line LNG Shipping	145,000	Moss	Steam turbine	Kawasaki	2007	
LNG Imo	BW Fleet Management	148,300	NO96	Steam turbine	DSME	2008	
Tembek	OSG Gas	216,200	MK III	Diesel engines	Samsung	2007	Re-liq. + GCU
Al Hamla	OSG Gas	216,200	MK III	Diesel engines	Samsung	2008	Re-liq. + GCU
Maran Gas Coronis	Maran Gas Maritime Inc.	148,300	NO96	Steam turbine	DSME	2007	
Tangguh Towuti	NYK LNG Shipmanagement	148,300	NO96	Steam turbine	DSME	2008	
Tangguh Batur	NYK LNG Shipmanagement	148,300	NO96	Steam turbine	DSME	2008	
Al Thumama	NYK LNG Shipmanagement	216,200	MK III	Diesel engines	Hyundai	2008	Re-liq. + GCU
Al Sahla	NYK LNG Shipmanagement	216,200	MK III	Diesel engines	Hyundai	2008	Re-liq. + GCU
Al Utouriya	NYK LNG Shipmanagement	216,200	MKIII	Diesel engines	Hyundai	2008	Re-liq. + GCU
Al Huwaila		217,000	MK III	Diesel engines	Samsung	2008	Transfer to ABS

LNG CARRIERS BUILT TO DNV GL CLASS AND CLASS ENTRIES (CONTINUED)

NAME	OWNER/ MANAGER	CAPACITY [m ³]	TYPE	PROPULSION	BUILDER	DELIVERY	REMARKS
Al Kharsaah		217,000	MK III	Diesel engines	Samsung	2008	Transfer to ABS
Al Shamal		217,000	MK III	Diesel engines	Samsung	2008	Transfer to ABS
Al Khuwair		217,000	MK III	Diesel engines	Samsung	2008	Transfer to ABS
STX Kolt	STX Pos Ship Management	155,000	MK III	Steam turbine	Hanjin	2008	
Gaslog Chelsea	GasLog LNG Services	153,000	MK III	DFDE	Hanjin	2010	
Mesaimeer	STASCO Ship Management	216,200	MK III	Diesel engines	Hyundai	2009	Re-liq. + GCU
Al Kharaitiyat	STASCO Ship Management	216,200	MK III	Diesel engines	Hyundai	2009	Re-liq. + GCU
Al Rekayyat	STASCO Ship Management	216,200	MK III	Diesel engines	Hyundai	2009	Re-liq. + GCU
BW Suez Paris	BW Fleet Management	162,400	NO96	DFDE	DSME	2009	
BW Suez Brussels	BW Fleet Management	162,400	NO96	DFDE	DSME	2009	
GDF Suez Neptune	Höegh LNG Fleet Management	145,000	MK III	DFDE	Samsung	2009	Re-gas + STL
GDF Suez Cape Ann	Höegh LNG Fleet Management	145,000	MK III	DFDE	Samsung	2010	FSRU Tianjin
Barcelona Knutsen	Knutsen OAS Shipping	173,400	NO96	DFDE	DSME	2010	
Sevilla Knutsen	Knutsen OAS Shipping	173,400	NO96	DFDE	DSME	2010	
Valencia Knutsen	Knutsen OAS Shipping	173,400	NO96	DFDE	DSME	2010	
Ribera Del Duero Knutsen	Knutsen OAS Shipping	173,400	NO96	DFDE	DSME	2010	Winterized Basic ICE-1A
Wilgas	Awilco LNG	125,000	Moss	Steam turbine	Mitsubishi	1984	Transfer from NK
Woodside Rogers	Maran Gas Maritime Inc.	159,800	NO96GW	DFDE	DSME	2013	
Wilforce	Awilco LNG	155,900	NO96	DFDE	DSME	2013	
Golar Seal	Golar Wilhelmsen Management	161,900	MK III Flex	DFDE	Samsung	2013	
Golar Celsius	Golar Wilhelmsen Management	161,900	MK III Flex	DFDE	Samsung	2013	
Woodside Goode	Maran Gas Maritime Inc.	159,800	NO96GW	DFDE	DSME	2013	
Maran Gas Apollonia	Maran Gas Maritime Inc.	162,000	MK III Flex	DFDE	HSHI	2014	
Cool Voyager	Thenamaris LNG	161,900	MK III Flex	DFDE	Samsung	2013	

LNG FUELLED SHIPS BUILT TO DNV GL CLASS

COUNTRY	YEAR	SHIP TYPES	OWNER
Norway	2000	Car/passenger ferry	Fjord1
Norway	2003	PSV	Simon Møkster
Norway	2003	PSV	Eidesvik
Norway	2006	Car/passenger ferry	Fjord1
Norway	2007	Car/passenger ferry	Fjord1
Norway	2007	Car/passenger ferry	Fjord1
Norway	2007	Car/passenger ferry	Fjord1
Norway	2007	Car/passenger ferry	Fjord1
Norway	2008	PSV	Eidesvik Shipping
Norway	2009	PSV	Eidesvik Shipping
Norway	2009	Car/passenger ferry	Tide Sjø
Norway	2009	Car/passenger ferry	Tide Sjø
Norway	2009	Car/passenger ferry	Tide Sjø
Norway	2009	Patrol vessel	Remøy Management
Norway	2009	Car/passenger ferry	Fjord1
Norway	2010	Patrol vessel	Remøy Management
Norway	2010	Car/passenger ferry	Fjord1
Norway	2010	Patrol vessel	Remøy Management
Norway	2010	Car/passenger ferry	Fjord1
Norway	2010	Car/passenger ferry	Fjord1
Norway	2010	Car/passenger ferry	Fosen Namsos Sjø
Norway	2011	PSV	DOF
Norway	2011	Car/passenger ferry	Fjord1
Norway	2011	PSV	Solstad Rederi
Norway	2012	Car/passenger ferry	Fjord1
Norway	2012	PSV	Eidesvik
Norway	2012	PSV	Olympic Shipping
Norway	2012	PSV	Island Offshore
Norway	2012	General cargo	Nordnorsk Shipping
Norway	2012	PSV	Eidesvik Shipping
Norway	2012	PSV	Island Offshore
Norway	2012	Car/passenger ferry	Torghatten Nord
Norway	2012	Car/passenger ferry	Torghatten Nord
Norway	2012	Car/passenger ferry	Torghatten Nord
Norway	2013	PSV	REM
Norway	2013	Car/passenger ferry	Torghatten Nord
Norway	2013	General cargo	Eidsvaag
Argentina	2013	High speed light craft	Buquebus



LAND BASED LNG STORAGE TANKS

CUSTOMER	PROJECT NAME	DNV GL SCOPE OF WORK	TANK CAPACITY (m ³)	TANK TYPE
Unknown	LNG Tank Non-Linear Analysis	Independent nonlinear analysis of the concrete outer tank	~190,000	Full containment
Unknown	LNG Tank Non-Linear Analysis	Independent nonlinear analysis of the concrete outer tank	~160,000	Full containment
Korea Gas Corporation	Samcheok LNG Terminal	Verification of basic design of Full Containment LNG tank	270,000	Full containment
South Hook LNG Terminal Company Ltd	South Hook LNG Tank Inspection	Develop scope and systematics for condition survey of the concrete tank, execute the survey	155,000	Full containment
Unknown	LNG Tank Non-Linear Analysis	Assessment of the design of liner and insulation, and independent nonlinear analysis of the concrete outer tank	~155,000	Full containment
SKANGASS AS	Lysekil LNG Tank	Detail design verification for inner steel tank, slab, outer concrete tank and roof for construction, installation and operation phase	30,000	Full containment
SKANGASS AS	Lysekil LNG Tank	Concept design verification for inner steel tank, slab, outer concrete tank and roof for construction, installation and operation phase	30,000	Full containment
South Hook LNG Terminal Company Ltd	South Hook LNG Tank Verification	Verification of design of concrete tank due to BS-EN 14620. The work included design review and independent analysis of the outer concrete containment tank	155,000	Full containment
South Hook LNG Terminal Company Ltd	South Hook LNG Tank Design GAP analysis	Gap Analysis of South Hook Full Containment LNG Storage Tanks Specification against EN 14620	155,000	Full containment
Berger/Abam Engineers Inc	Design Verification of FEED Documentation for C3T LNG Storage Concept	Verification of FEED documentation proving the feasibility of the C3T LNG Storage concept. A considerable amount of analysis were carried out and subjected for verification.	164,000	Full containment
SKANGASS AS	Verification of RISAVIKA LNG Tank	Verification of detail design and construction of Full Containment LNG Tank	30,000	Full containment

FLEET FROM LEGACY GL

NAME	CBM	TANK TYPE	COUNTRY OF BUILD	DELIVERY
Norgas Orinda**	8,461	E/M	China	2002
Norgas Alameda**	8,461	E/M	China	2003
Norgas Petaluma*	8,461	E/M	China	2003
Norgas Sonoma***	8,461	E/M	China	2003
Norgas Shasta**	10,098	E/M	China	2003
Norgas Napa*	10,098	E/M	China	2003
Norgas Plan 1)	5,820	E/S	China	2009
Norgas Cathinka 1)	5,820	E/S	China	2009
Norgas Camilla 1)	5,820	E/S	China	2010
Norgas Innovation 2)**	10,000	E/LNG/S	China	2010
Norgas Creation 2)*	10,000	E/LNG/S	China	2010
Norgas Invention 2)*	10,000	E/LNG/S	China	2011
Norgas Unikum 2)	12,000	E/LNG/S	China	2011
Norgas Conception 2)**	10,000	E/LNG/S	China	2011
Bahrain Vision 2)	12,000	E/LNG/S	China	2011

1) 9,600cbm organic chemical capacity or 5,800cbm gas capacity. 2) Advanced LNG/LPG/Eth gas carriers

* 100% owned by IMSPL

** 100% owned by GATX

*** 100% owned by SGPC



LNG BUNKERING PROJECTS

COUNTRY/AREA	PROJECT	DESCRIPTION	DNV GL SERVICES PROVIDED
Sweden	STS Gothenburg	LNG bunkering of ROPAX	SHE
Germany	Bungas	LNG bunkering in the Port of Hamburg	SHE
Netherlands	LESAS	LNG bunkering in the Port of Rotterdam	SHE, ERM
Belgium	LNG bunkering in Flemish ports	Feasibility study for LNG bunkering in three Flemish ports	SHE, ERM
Belgium	Operational procedures	Establish operational procedures for LNG bunkering in key Belgian port	SHE
Singapore	LNG JIP	LNG bunkering in the Port of Singapore	SHE, ERM
Australia	LNG JIP	Feasibility of LNG bunkering in Australia	SHE, ERM
Norway	Operational procedures	Establish operational procedures for LNG bunkering for a offshore supply vessel operator	SHE
Germany	Risk analysis	QRA of LNG bunkering operations in German port	SHE
USA	Operational procedures	Establish operational procedures for LNG bunkering for a passenger ferry operator	SHE
Korea	LNG bunkering in Korea	Feasibility study of LNG bunkering in three ports in Korea	SHE, ERM
China	LNG bunkering in Shanghai	Technical advisory for LNG bunkering in Shanghai	SHE, ERM
Global	ISO guideline	Establish ISO guideline on LNG bunkering	SHE, ERM
Middle East	LNG bunkering in the Arabian Gulf	Feasibility study for LNG bunkering in the Arabian Gulf	SHE, ERM
Netherlands	Harbour toolkit safety distances LNG bunkering	Development of a basic screening tool to identify safety zones around various LNG bunker configurations	SHE, ERM
Denmark	Feasibility study ship to ship LNG bunkering	Show stopper analysis of a temporary bunker solution in a Danish port	SHE
Netherlands	Port of Rotterdam	Review and improvement of a permit QRA for a foreseen bunker station in the Port of Rotterdam	SHE
Sweden	LNG bunker terminal	QRA for a foreseen LNG (bunker) terminal in Sweden	SHE
Netherlands	LNG bunkering	Expert support to the "LNG Platform", an industry collaboration	SHE
Netherlands	LNG bunker terminal	Various risk studies (e.g. QRA, safety zone) for a small scale LNG bunker terminal	SHE
Belgium	LNG fuelled ship	Feasibility study LNG bunkering concept for ro-ro operator	SHE, ERM
Germany	LNG bunkering in Hamburg	Impact assessment study	SHE
Germany	LNG bunkering in Hamburg	Roadmap workshop LNG	ERM
UK	LNG bunkering in Europe	Market assessment	ERM
USA	LNG fuel market	LNG bunkering in US Gulf Coast	SHE, ERM
North America	LNG bunkering in North America	Feasibility study for use of LNG fuel in North America for the IMO	SHE, ERM

LNG BUNKERING PROJECTS (CONTINUED)

COUNTRY	PROJECT	DNV GL SERVICES PROVIDED
Australia	Darwin LNG power study	ARM
China	Review of LNG terminals navigational safety measures	SHE
France	Technology qualification of chicksan loading arms (FMC)	TQ
France	Technology qualification of ALLS aerial hoses for cargo transfer (Technip)	TQ
Germany/Norway	Technology qualification of cargo transfer system (Nexans, Framo, Aker)	TQ
India	Small scale LNG - Indogas	ERM
Monaco	Technology qualification of cargo transfer system (SBM)	TQ
Monaco	Operational review of side-by-side cargo transfer	SHE
Netherlands	Technology qualification of LNG transfer system (Bluewater)	TQ
Netherlands	Technology qualification of LNG transfer system (Gutteling)	TQ
Netherlands	T-Tank shell	TQ
Norway	Technology qualification of vapouriser	TQ
Norway	Research programmes to establish guidelines and criteria for sloshing loads	TA
Norway	Formal safety assessment of platform support vessel built at STX Europe	SHE
Qatar	LNG release consequence modelling	SHE
USA	Technology qualification of LNG pipe in pipe	TQ
USA	Technology qualification of cryogenic pipe (Technip)	TQ
USA	QRA of recondensing unit for regasification terminal (Exxon)	SHE
USA	Technology qualification of cryogenic pipe (Fluor)	TQ
USA	Technology qualification of cryogenic pipe (ITP)	TQ
Germany	Nautical QRA approach to LNG terminal	SHE
Germany	Identification of business risks from LNG power barge operations	ERM
Germany	Identification of hazard from LNG power barge operations	SHE
Germany	Environmental impact assessment LNG power barge	SHE
Germany	LNG inhouse seminar at major bank	ERM
Germany	LNG inhouse seminar at major engine manufacturer	ERM



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