



GIBSON

SHIPPING ENERGY

LNG Presentation

IMSF 2017



LNG Pros & Cons

Pros:

Reduced emissions

NOx 89%

SOx 100%

CO₂ 20%

Particles 100%

Cons:

Methane Slip (Emissions)

CO₂-methane

Set-up costs

Bunker capacity

Refrigeration Temperature




Using LNG will help us to tackle legislation requiring Shipping to reduce CO₂ & NOx emissions.



Comparing the Alternatives

Environmental features compared to the traditional HFO alternatives

Factors influencing viability compared to the traditional HFO alternative

Alternative	Sox	Nox	PM	CO2	Cargo Capacity	Capital Investment	Operating Costs
LNG					Restricted	Very High	Low
MGO					Not Restricted	Low	Very High
HFO/Scrubber					Slightly Restricted	High	Medium*

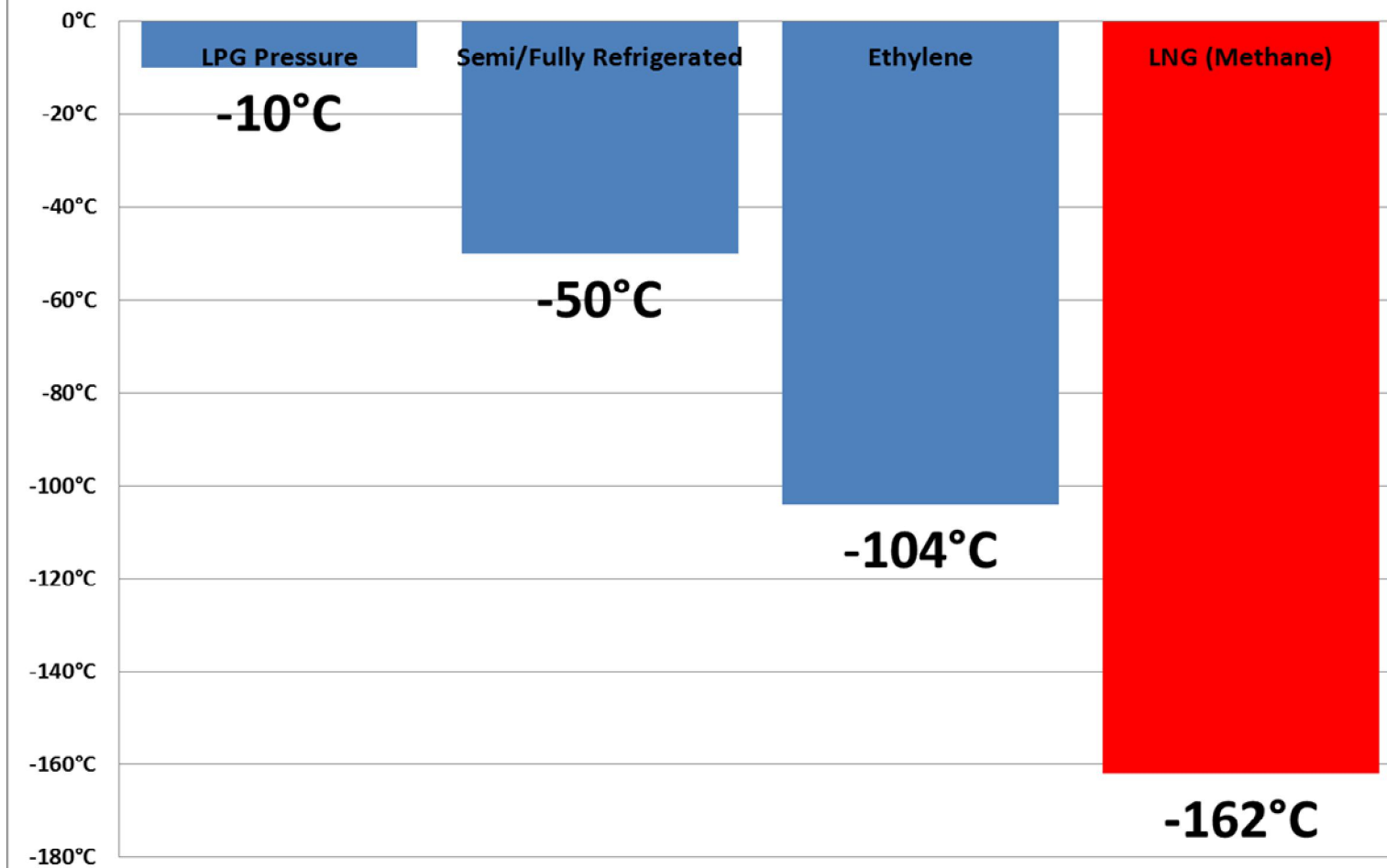


* Fuel costs remain unchanged, a small increase (1-2%) can be expected. Cost for Scrubber maintenance and waste handling are yet unknown but may add to the total operating costs.

Source: North European LNG Infrastructure Project



Temperature Chart for the Carriage of Gas Cargoes



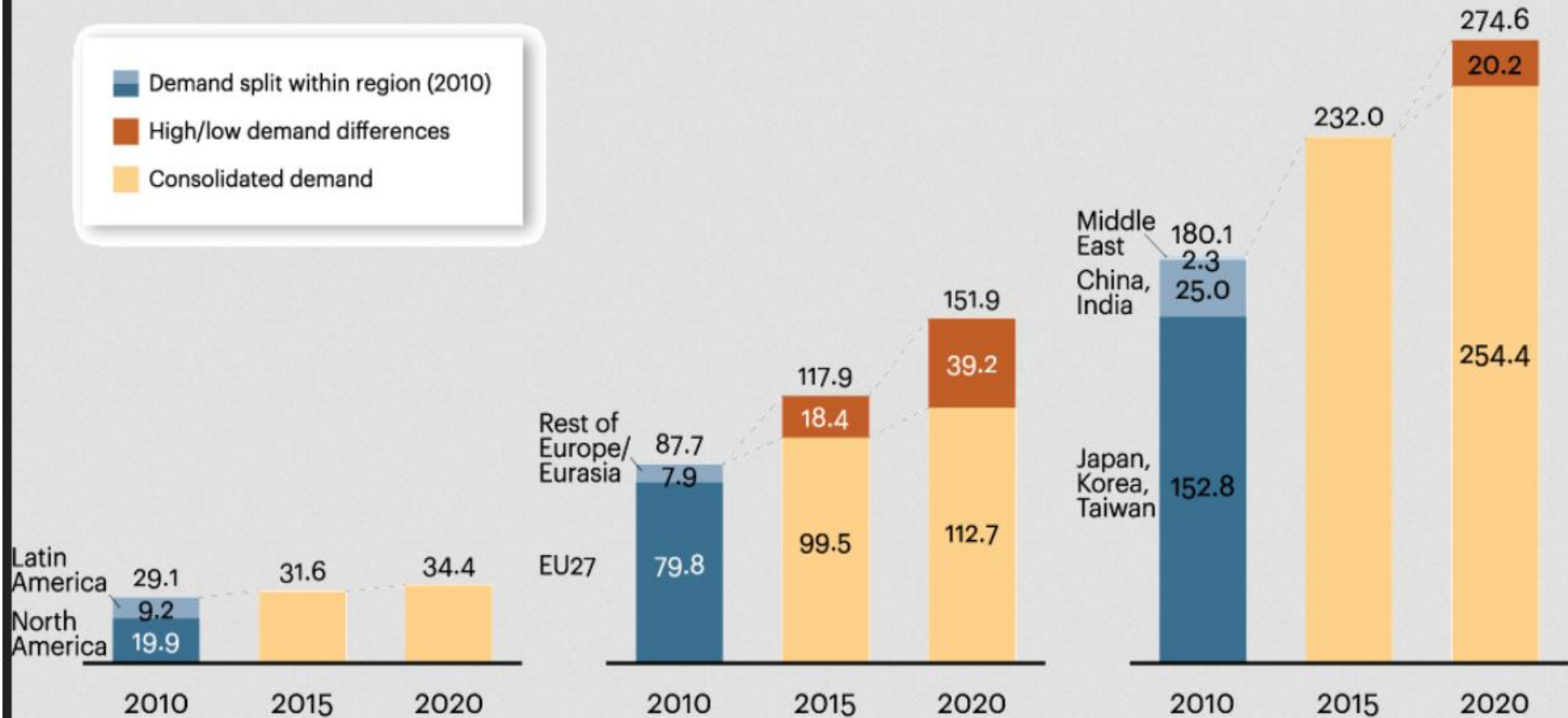
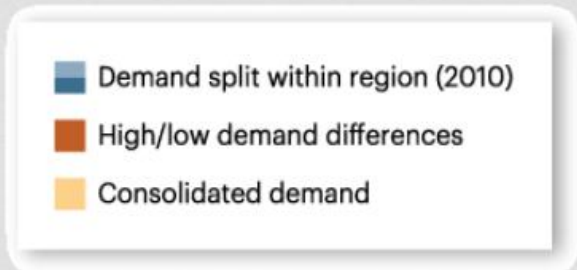
Projected LNG demand by region, through 2020

Billion cubic meters

Americas

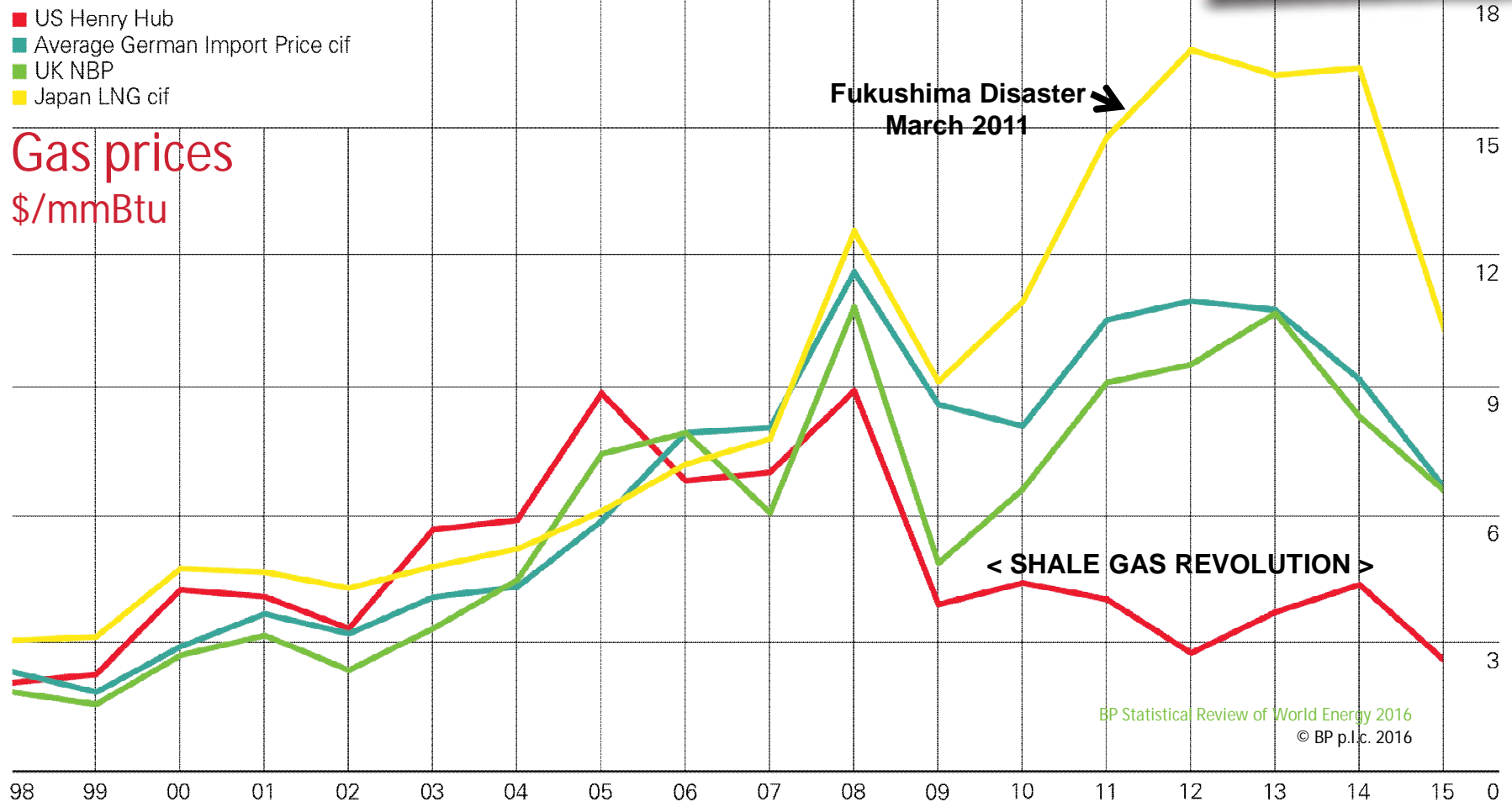
Europe and Eurasia

Asia Pacific¹



¹Includes Singapore, Thailand, and Pakistan

Sources: Energy Information Administration, International Energy Agency, BP, Facts Global Energy; A.T. Kearney analysis



U.S. and Japanese gas prices are based on different fundamentals that became strongly apparent starting in 2009. U.S. prices depend on domestic gas production, marked in recent years by a flood of shale gas output. Japan LNG prices depend on oil markets, marked in recent years low oil prices.



National Natural Gas Market Overview: World LNG Landed Prices

Federal Energy Regulatory Commission • Market Oversight • www.ferc.gov/oversight

World LNG Estimated Landed Prices: Mar-17



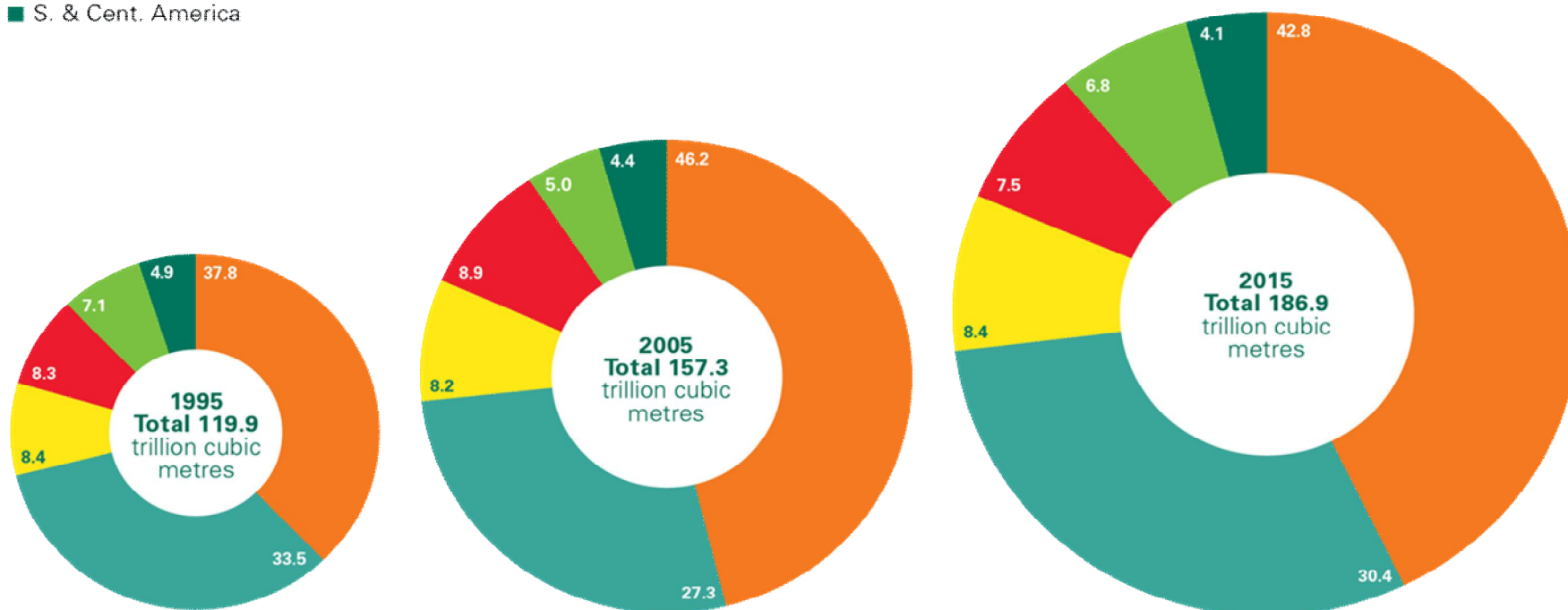
Source: Waterborne Energy, Inc. Data in \$US/MMBtu. Landed prices are based on a netback calculation.
 Note: Includes information and data supplied by IHS Global Inc. and its affiliates ("IHS"); Copyright (publication year) all rights reserved.
 Prices are the monthly average of the weekly landed prices for the listed month.

Updated: Apr-17

Distribution of proved gas reserves: 1995, 2005 and 2015

Percentage

- Middle East
- Europe & Eurasia
- Asia Pacific
- Africa
- North America
- S. & Cent. America

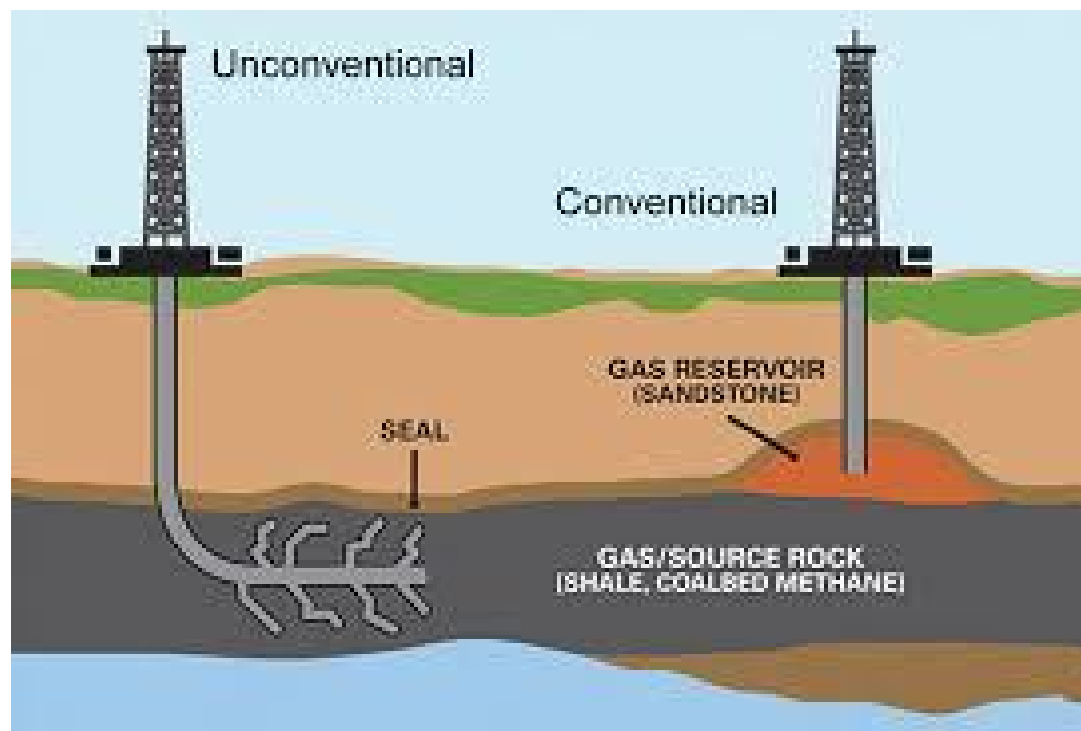


World Major Gas Reserves

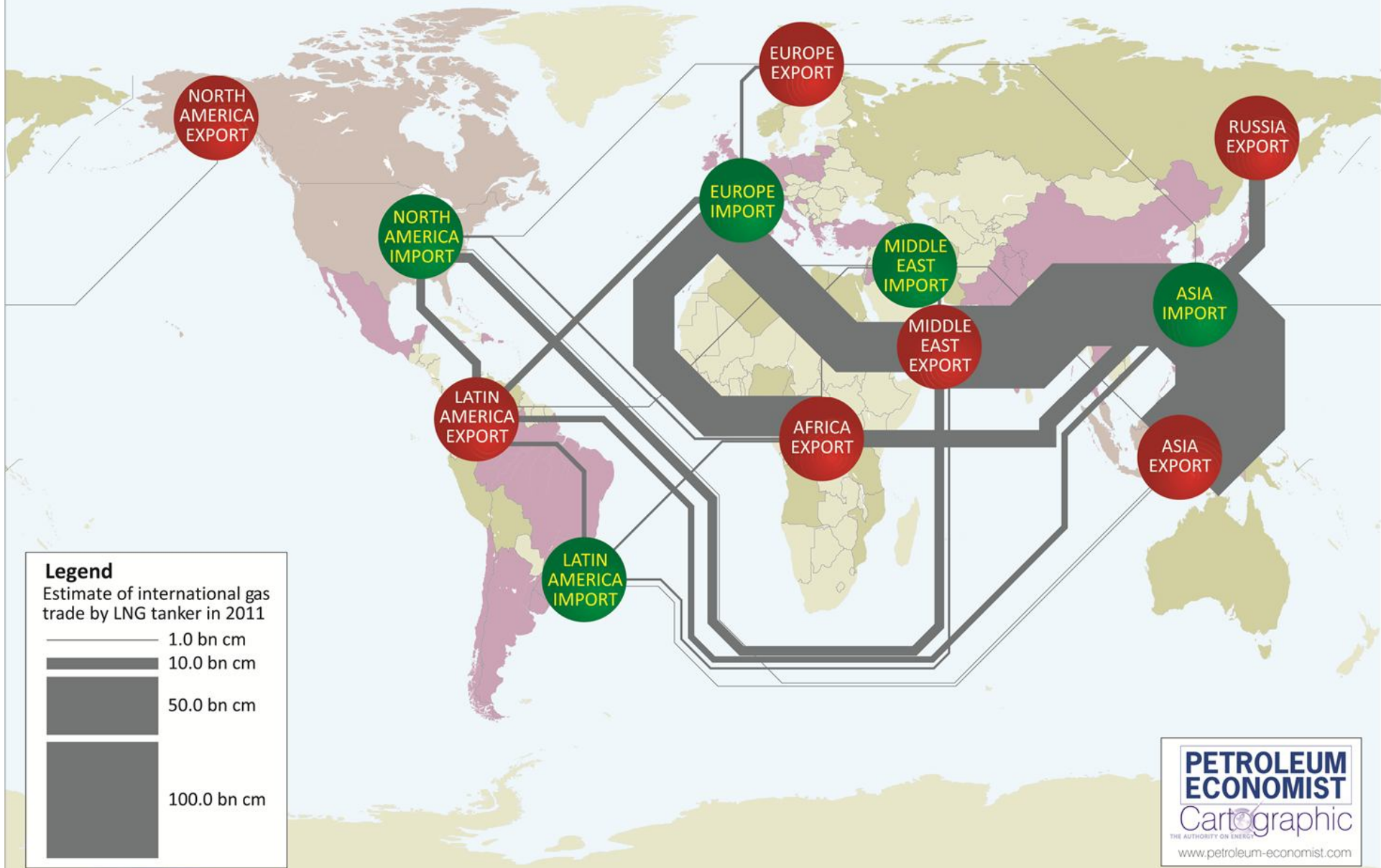
BP Statistical Review of
World Energy June
2015

Trillion cubic feet

		Percentage
Iran	1,201.4	18.2
Russia	1,139.6	17.3
Qatar	866.2	13.1
Turkmenistan	617.3	9.4
USA	386.7	5.9
Saudi Arabia	294.0	4.5
UAE	215.1	3.3
Venezuela	198.4	3.0
Nigeria	180.5	2.7
Algeria	159.1	2.4
China	135.7	2.1
Iraq	130.5	2.0
Australia	122.6	1.9
Indonesia	100.3	1.5
Kuwait	63.0	1.0
Kazakhstan	33.1	0.5
Egypt	65.2	1.0
Norway	65.6	1.0
Canada	70.2	1.1
Libya	53.1	0.8
Uzbekistan	38.3	0.6
Azerbaijan	40.6	0.6
Malaysia	41.3	0.6
Netherlands	23.2	0.4
Oman	24.3	0.4
Ukraine	21.3	0.3
UK	7.3	0.1
Other	305.5	4.6
Total	6,599.4	100.0

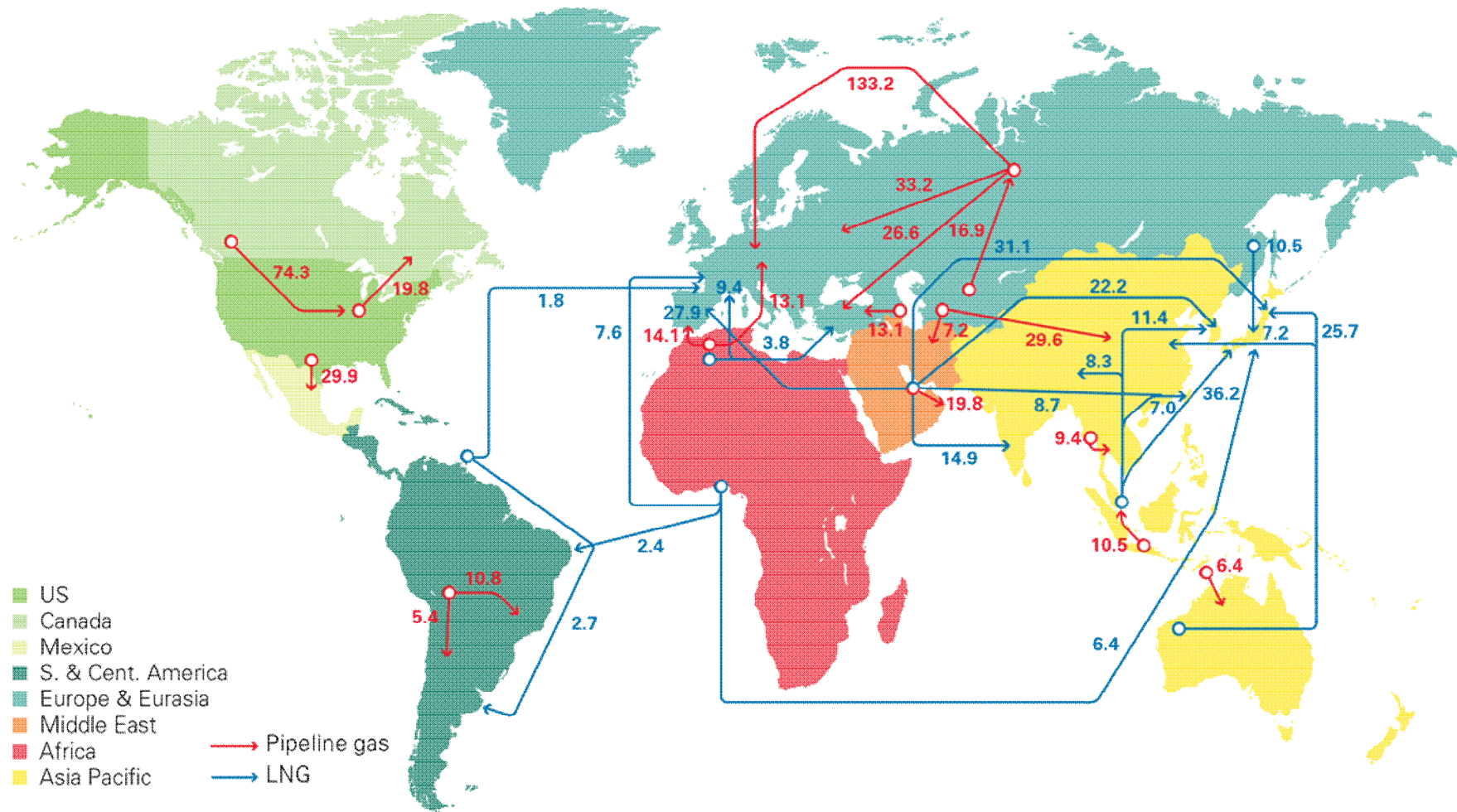


WORLD LNG TRADE (2011)



Major gas trade movements 2015

Trade flows worldwide (billion cubic metres)



Source: Includes data from EOE MENA gas service, OIGNL, IHS Waterborne, PIRA Energy Group, Wood Mackenzie.

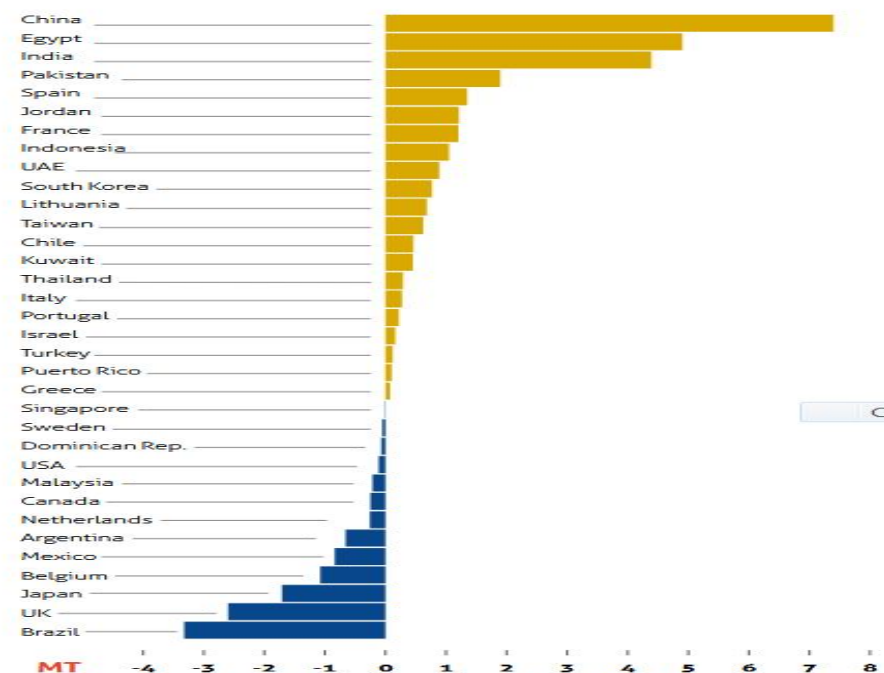
BP Statistical Review of World Energy 2016
© BP p.l.c. 2016

Principal LNG Importers by Country

	2016	2015	2014	2013	2012	2016/2015		2016	2015	2014	2013	2012	2016/2015
Belgium	0.79	1.87	0.97	1.19	1.82	-1.08							
France	5.55	4.35	4.58	5.94	7.17	1.20	Argentina	3.42	4.08	4.42	4.72	3.36	-0.66
Greece	0.53	0.45	0.38	0.45	0.76	0.08	Brazil	1.46	4.78	5.33	4.15	2.70	-3.32
Italy	4.59	4.32	3.27	4.05	5.16	0.27	Chile	3.20	2.74	2.57	2.61	2.77	0.46
Netherlands	0.37	0.63	0.42	0.36	0.56	-0.26	Dominican Rep.	0.80	0.87	0.83	0.84	0.92	-0.07
Portugal	1.31	1.09	0.97	1.49	1.52	0.22	Mexico	4.10	4.94	6.58	5.67	3.52	-0.84
Spain	10.17	8.82	7.90	9.13	14.46	1.35	Puerto Rico	1.25	1.15	1.25	1.16	0.97	0.10
Turkey	5.47	5.35	5.45	4.40	5.63	0.12	Canada	0.23	0.49	0.40	0.76	1.30	-0.26
UK	7.48	10.08	8.40	6.91	10.38	-2.60	USA	1.59	1.70	1.16	1.90	3.09	-0.11
Europe	38.49	37.57	32.44	33.92	47.46	0.92	Americas	16.13	20.75	22.53	21.81	18.63	-4.62

	2016	2015	2014	2013	2012	2016/2015
China	27.42	20.02	18.98	18.60	14.65	7.40
India	18.99	14.60	14.54	13.05	13.27	4.39
Indonesia	3.23	2.18	1.56	1.43	0.72	1.05
Japan	83.34	85.05	89.20	87.98	88.08	-1.71
South Korea	34.12	33.42	37.32	40.39	36.77	0.70
Taiwan	15.07	14.45	13.45	12.72	12.67	0.62
Thailand	2.99	2.70	1.40	1.45	1.02	0.29
Asia	191.57	177.07	180.10	178.04	167.18	14.50
Egypt	7.50	2.60				4.90
Kuwait	3.49	3.04	2.68	1.59	1.99	0.45
UAE	3.10	2.21	1.34	1.15	1.05	0.89
Middle East	17.43	9.82	4.10	3.14	3.04	7.61

Figures: Million Tonnes



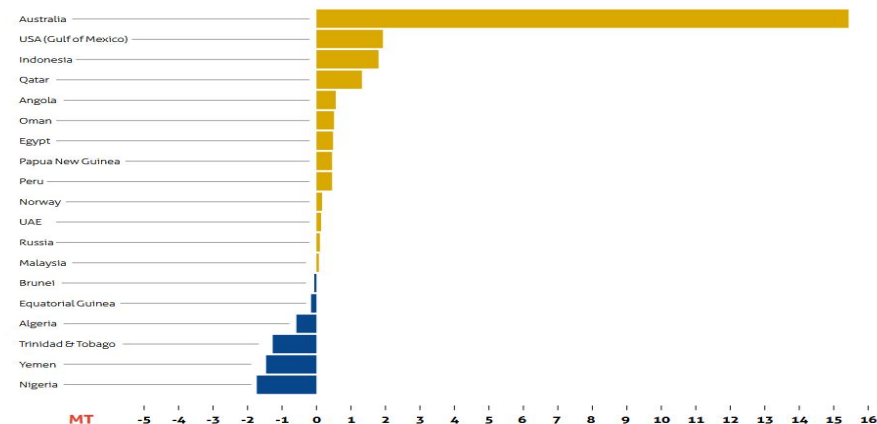
Principal LNG Exporters

	2016	2015	2014	2013	2012	2016/2015		2016	2015	2014	2013	2012	2016/2015
Algeria	11.44	12.13	12.72	10.81	11.21	-0.69							
Egypt	0.51	0	0.31	2.66	4.74	0.51	UAE	5.86	5.70	6.08	5.08	5.66	0.16
Eq. Guinea	3.37	3.65	3.38	3.77	3.62	-0.28	Oman	8.12	7.56	7.73	8.35	8.15	0.56
Libya	0.00	0.00	0.00	0.00		0.00	Qatar	79.62	78.40	76.37	78.02	76.39	1.22
Nigeria	17.78	19.5	19.14	16.47	19.58	-1.72	Yemen		1.52	6.27	6.82	4.89	-1.52
Norway	4.49	4.33	3.55	3.05	3.31	0.16							
Trinidad & Tobago	10.46	11.81	13.09	13.67	13.48	-1.35							
Atlantic Basin	48.05	51.42	52.19	50.77	55.94	-3.37	Middle East	93.60	93.18	96.45	98.28	95.09	0.42

	2016	2015	2014	2013	2012	2016/2015
Australia	44.88	29.45	23.60	22.41	20.88	15.43
Brunei	6.29	6.48	6.12	7.01	6.82	-0.19
USA	2.64	0.32	0.25		0.17	2.32
Indonesia	19.95	18.03	17.38	18.36	18.97	1.92
Malaysia	25.08	24.99	24.83	25.14	23.72	0.09
Peru	4.01	3.57	4.03	4.25	3.86	0.44
Russia	10.70	10.57	10.58	10.69	10.89	0.13
Pacific Basin	113.55	93.41	86.79	87.86	85.31	20.14

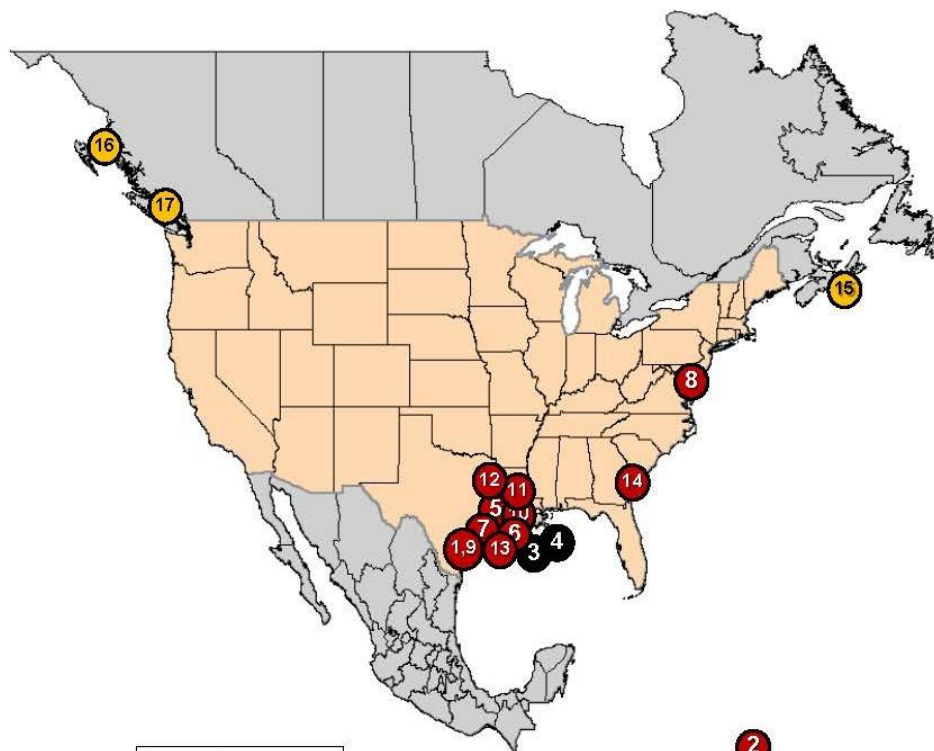
Figures: Million Tonnes

SOURCE OF IMPORTS: 2016 VS 2015





North American LNG Import/Export Terminals *Approved*



US Jurisdiction
 ● FERC
 ● MARAD/USCG

As of August 3, 2016

Import Terminals

U.S.

APPROVED - UNDER CONSTRUCTION - FERC

1. Corpus Christi, TX: 0.4 Bcfd (Cheniere – Corpus Christi LNG) (CP12-507)

APPROVED – NOT UNDER CONSTRUCTION - FERC

2. Salinas, PR: 0.6 Bcfd (Aguirre Offshore GasPort, LLC) (CP13-193)

APPROVED - NOT UNDER CONSTRUCTION - MARAD/Coast Guard

3. Gulf of Mexico: 1.0 Bcfd (Main Pass McMoRan Exp.)
4. Gulf of Mexico: 1.4 Bcfd (TORP Technology-Bienville LNG)

Export Terminals

U.S.

APPROVED - UNDER CONSTRUCTION - FERC

5. Sabine, LA: 2.1 Bcfd (Cheniere/Sabine Pass LNG) (CP11-72 & CP14-12)
6. Hackberry, LA: 2.1 Bcfd (Sempra–Cameron LNG) (CP13-25)
7. Freeport, TX: 2.14 Bcfd (Freeport LNG Dev/Freeport LNG Expansion/FLNG Liquefaction) (CP12-509) (CP15-518)
8. Cove Point, MD: 0.82 Bcfd (Dominion–Cove Point LNG) (CP13-113)
9. Corpus Christi, TX: 2.14 Bcfd (Cheniere – Corpus Christi LNG) (CP12-507)
10. Sabine Pass, LA: 1.40 Bcfd (Sabine Pass Liquefaction) (CP13-552)

APPROVED – NOT UNDER CONSTRUCTION - FERC

11. Lake Charles, LA: 2.2 Bcfd (Southern Union – Lake Charles LNG) (CP14-120)
12. Lake Charles, LA: 1.08 Bcfd (Magnolia LNG) (CP14-347)
13. Hackberry, LA: 1.41 Bcfd (Sempra - Cameron LNG) (CP15-560)
14. Elba Island, GA: 0.35 Bcfd (Southern LNG Company) (CP14-103)

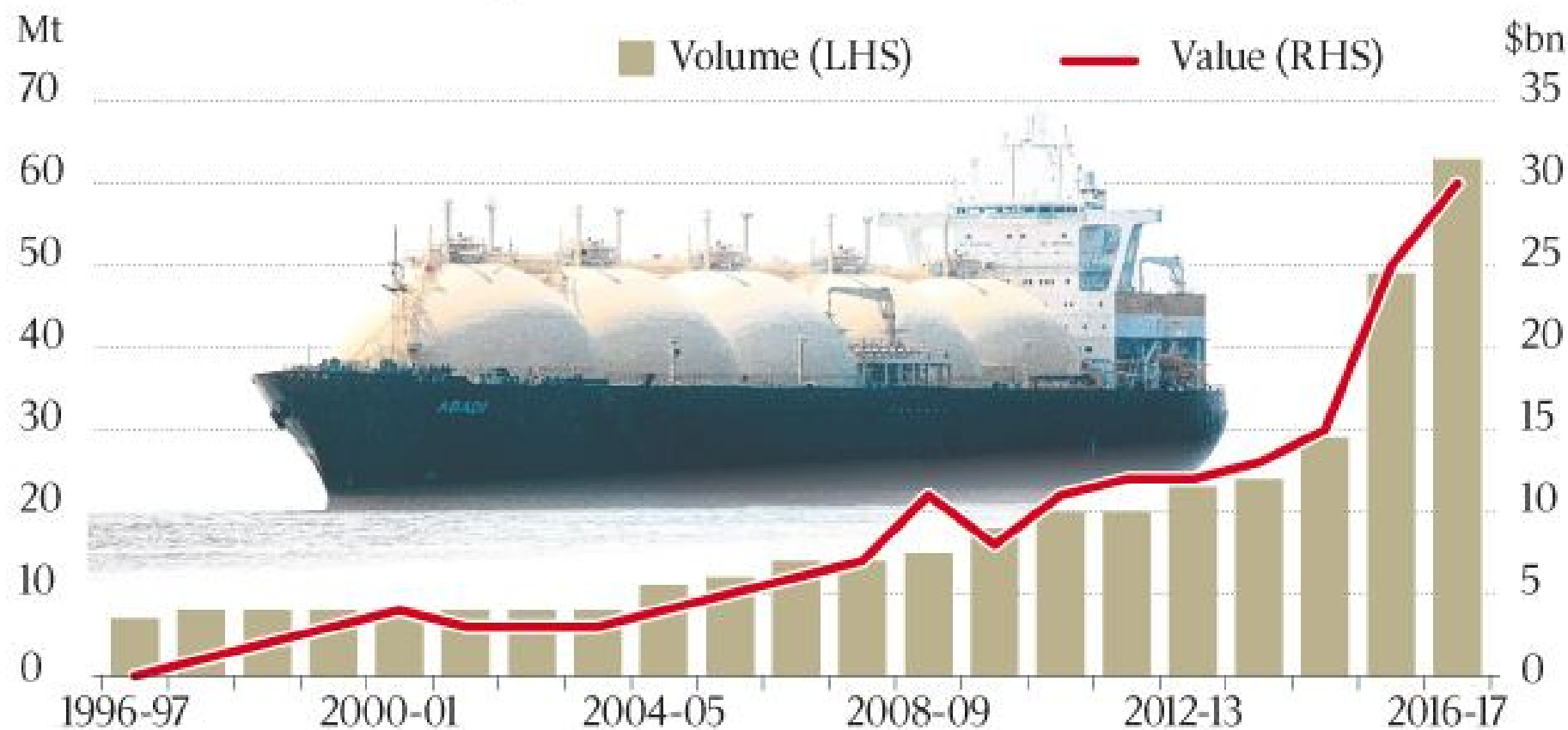
Canada

APPROVED – NOT UNDER CONSTRUCTION

15. Port Hawkesbury, NS: 0.5 Bcfd (Bear Head LNG)
16. Kitimat, BC: 3.23 Bcfd (LNG Canada)
17. Squamish, BC: 0.29 Bcfd (Woodfibre LNG Ltd)

★ Trains 5 & 6 with Train 5 under construction

Australia's LNG exports



Source: BREE



WORLD LNG VESSEL TYPES

Q-Max



Q-Max
 Membrane
 Slow speed
 diesel with
 reliquefaction

345 meters
 53.8 meters
 27 meters
 12 meters
 266,000cm

Q-Flex



Q-Flex
 Membrane
 Slow speed
 diesel with
 reliquefaction

315 meters
 50 meters
 27 meters
 12 meters
 210,000cm - 216,000cm

Atlantic-Max



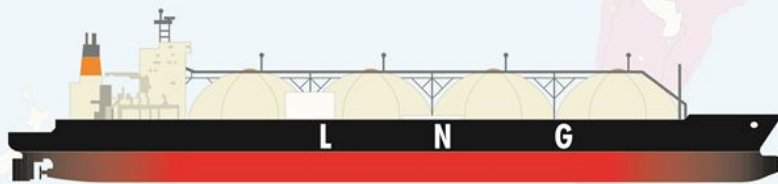
Atlantic-Max
 Membrane
 DFDE

285 - 290 meters
 44 meters
 26 meters
 11.6 meters
 160,000cm - 177,000cm



Conventional
 Membrane
 Steam

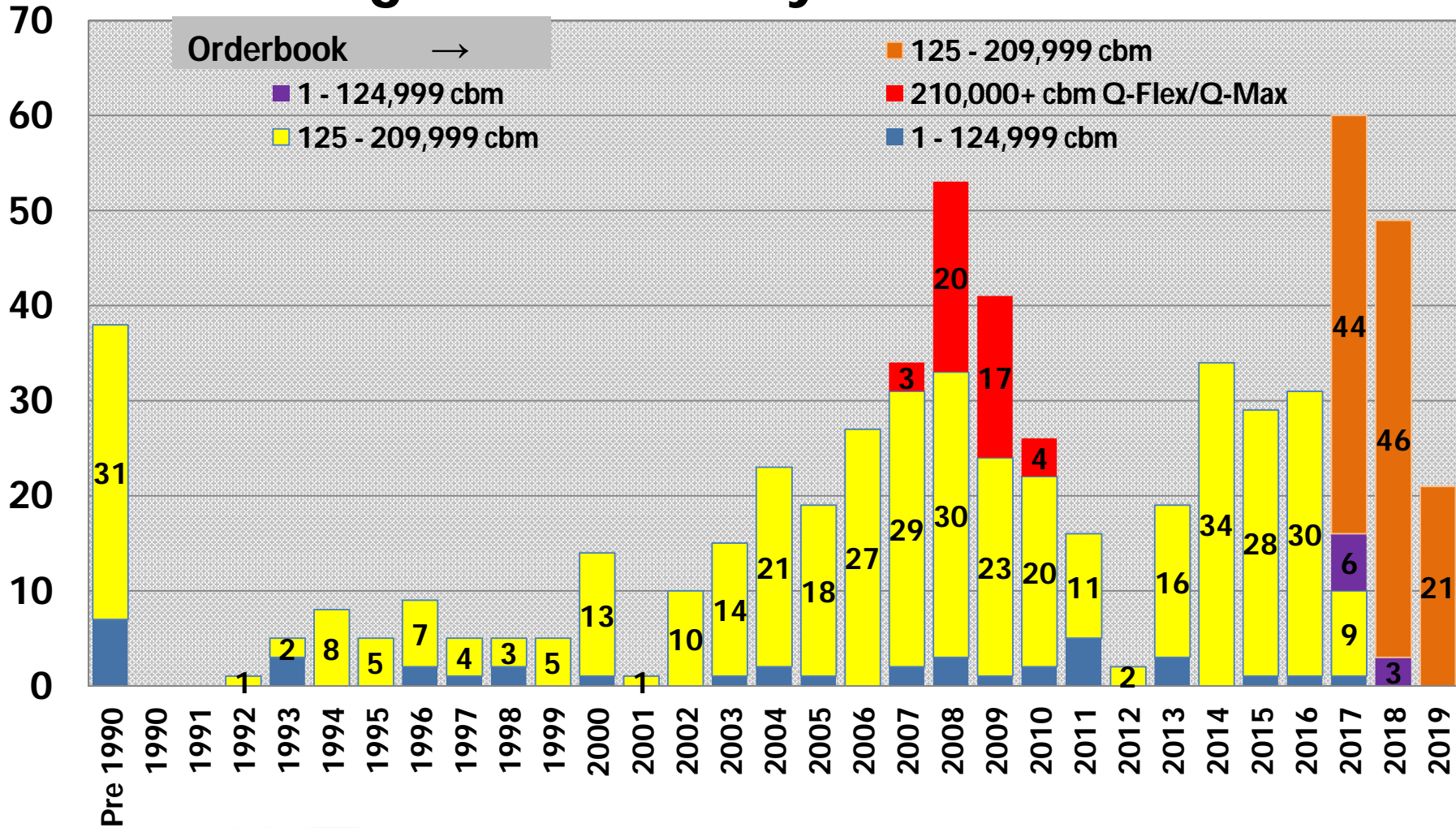
276 - 297.5 meters
 42.5 - 49 meters
 26 meters
 11 meters
 135,000cm - 165,000cm



Conventional
 Moss
 Steam

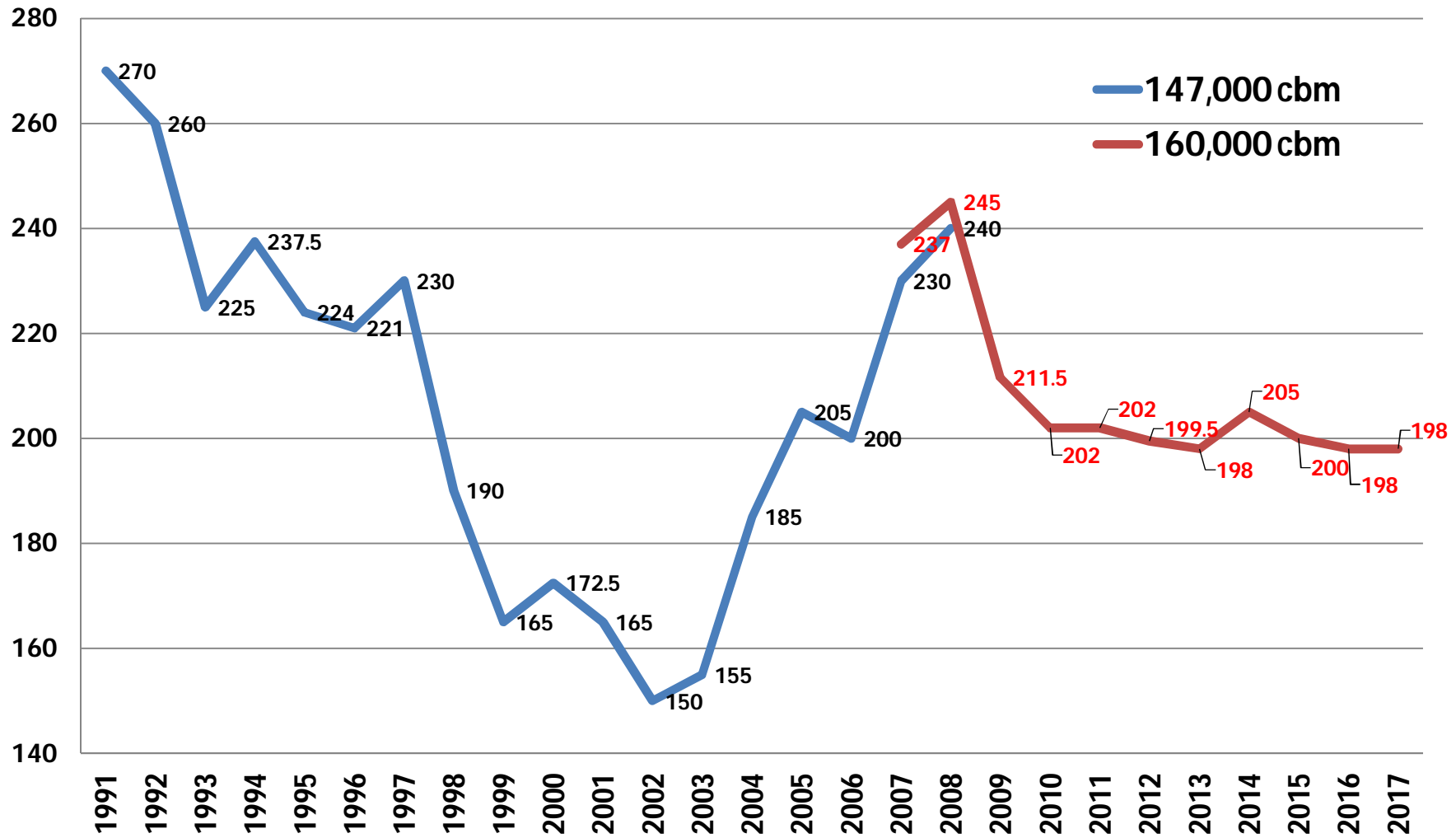
276 - 297.5 meters
 42.5 - 49 meters
 26 meters
 11 meters
 135,000cm - 156,000cm

LNG Fleet Age Profile - May 2017



LNG Newbuilding Price (Estimation)

US\$/Million



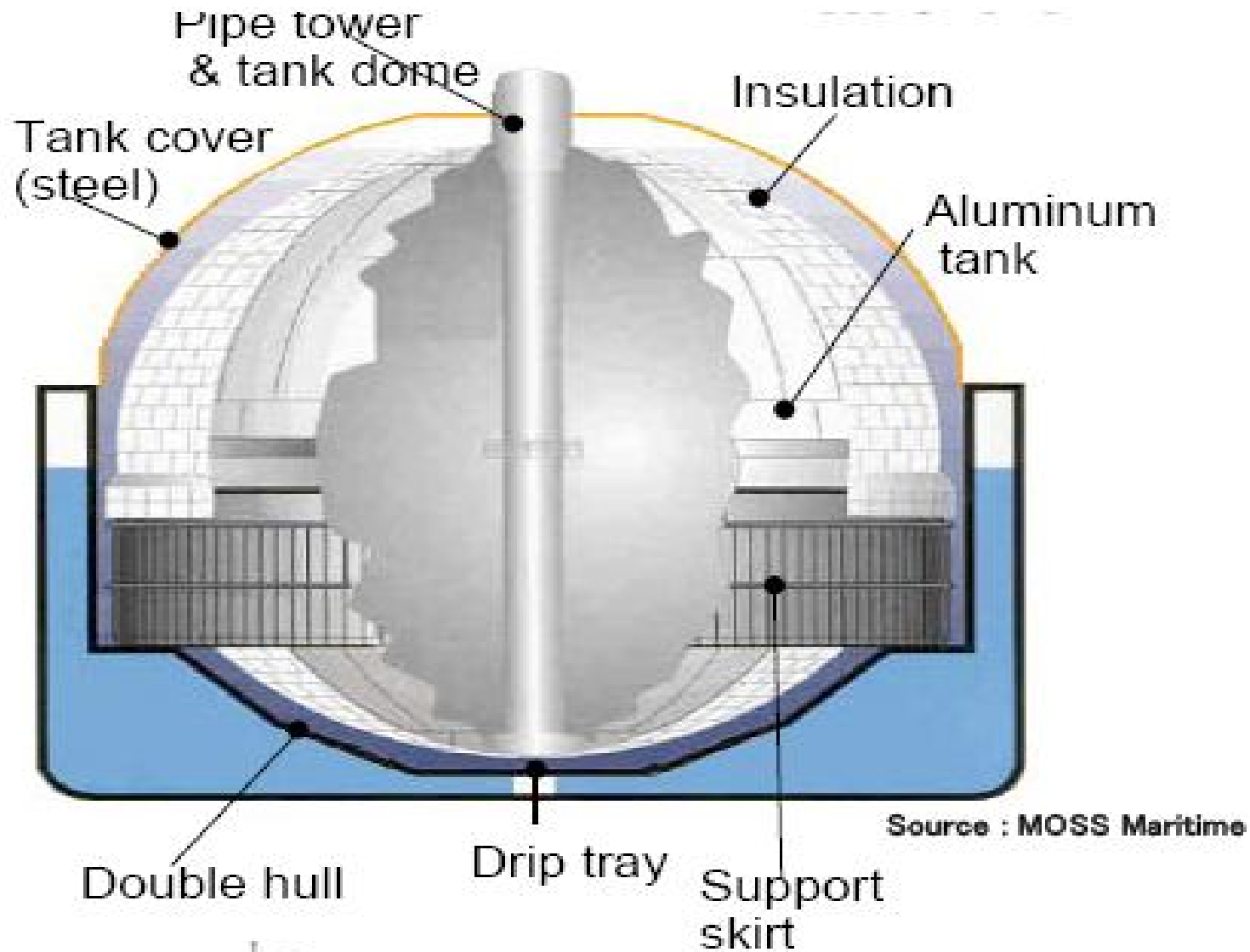
Moss Type

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Moss Type



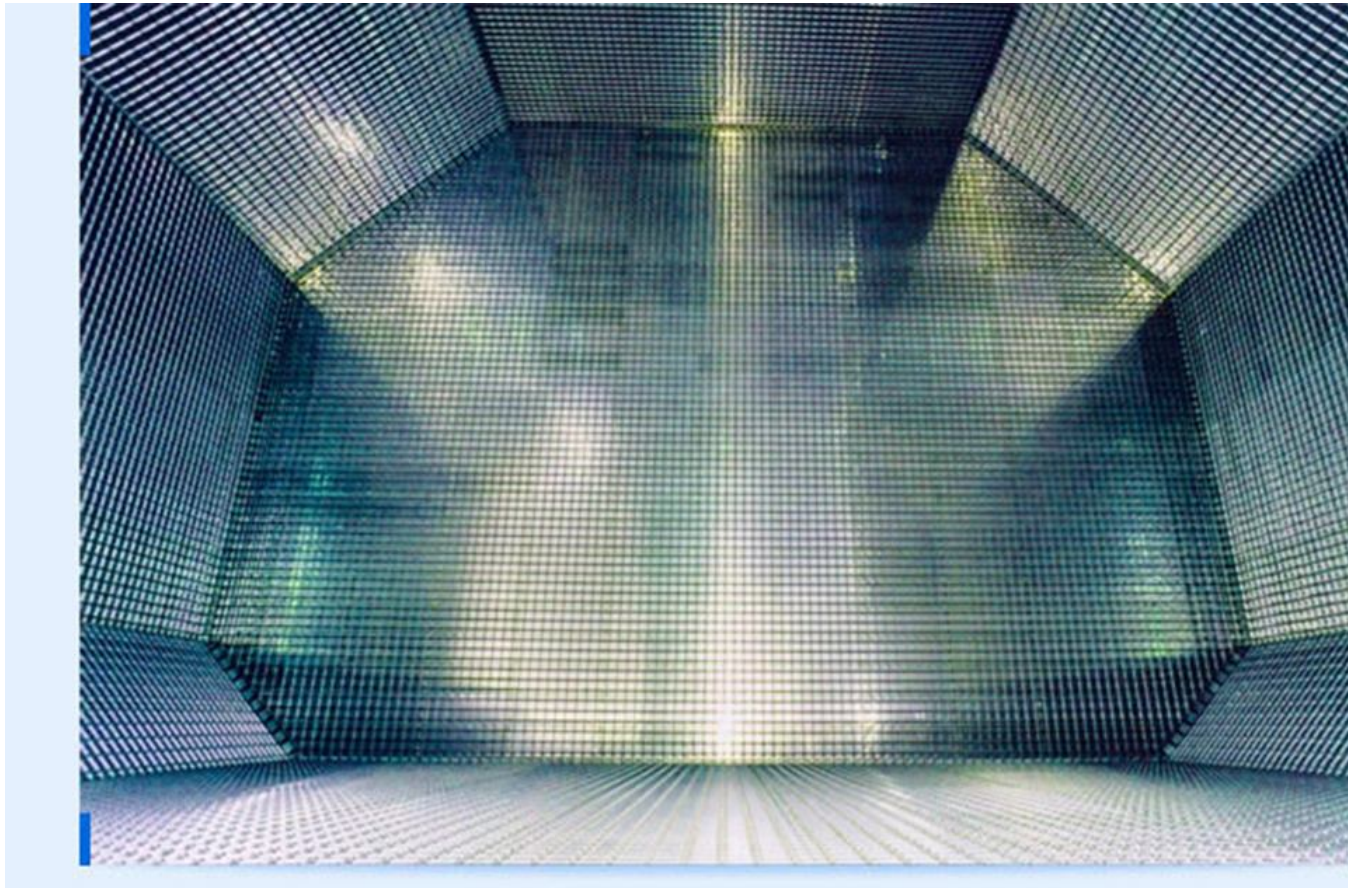
Membrane Type



GT No. 96 Membrane System

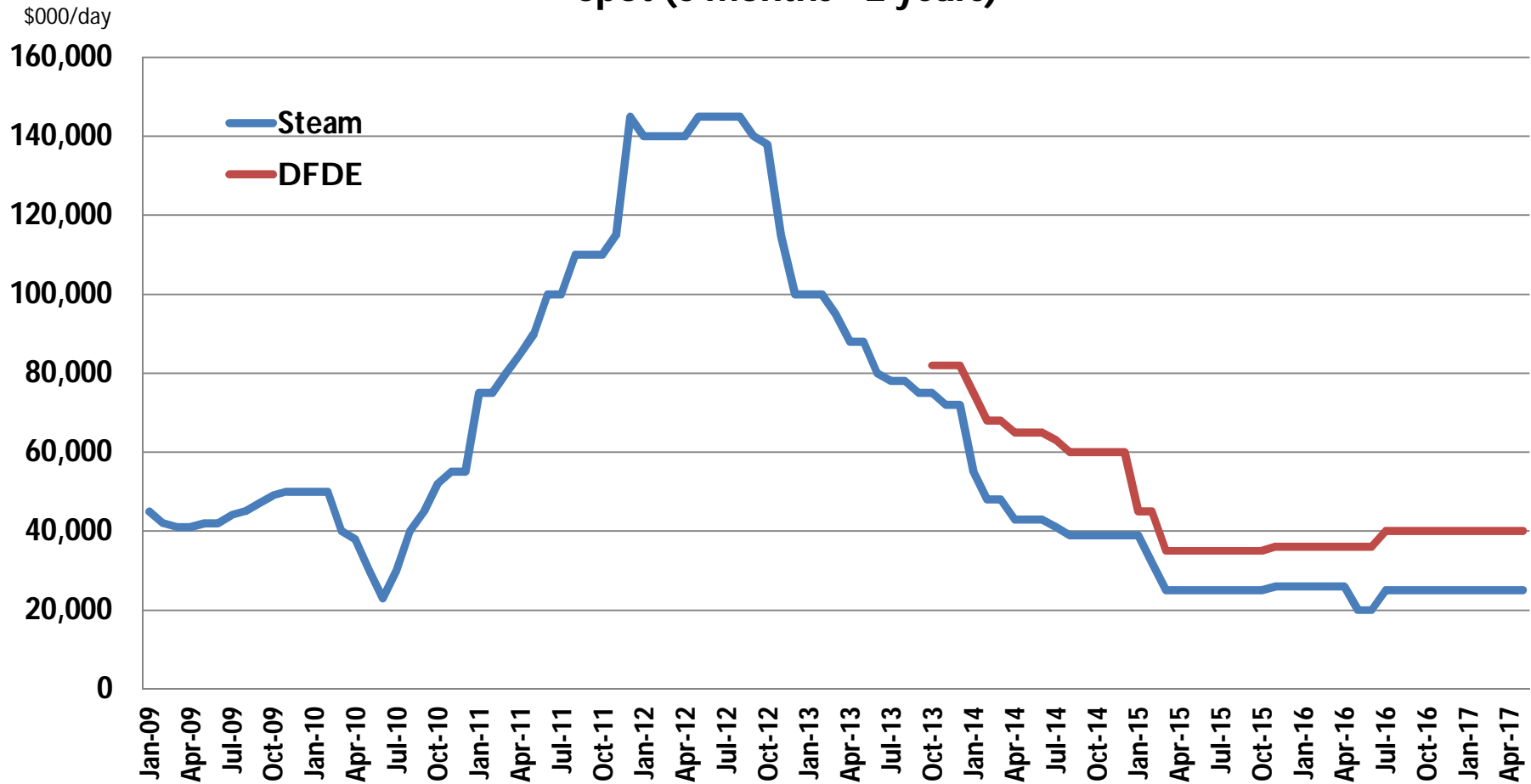


Technigaz Mark III Membrane System





LNG Time Charter Rates Spot (6 months - 2 years)



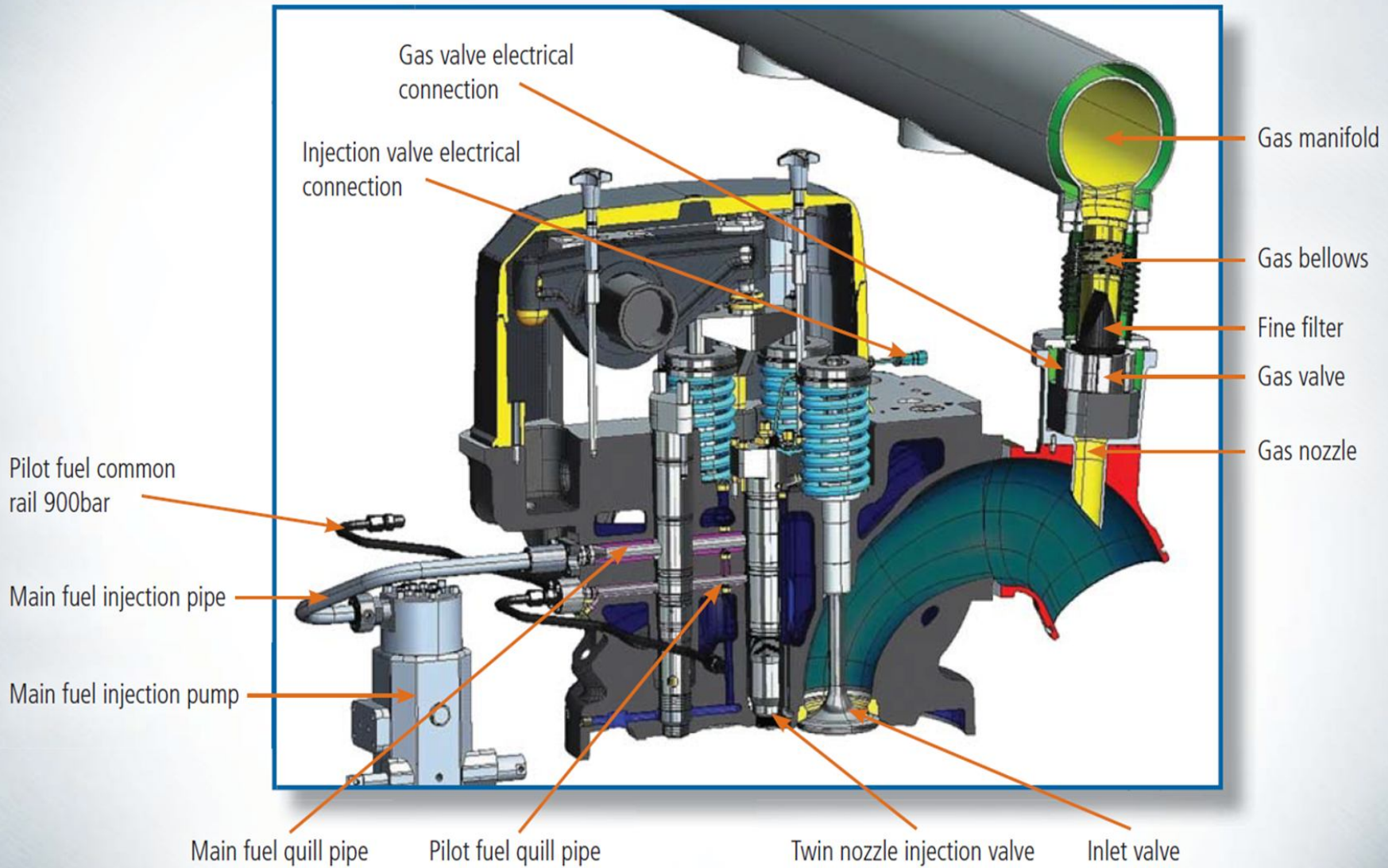
Wärtsilä's - DUAL-FUEL SYSTEM

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Find

Cylinder head and components



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That's all Folks!



FLOATING STORAGE & REGASIFICATION UNIT (FSRU)

