

Appendix

Additional Exhibits for Bunkering

LNG Bunkering Locations – Current and Planned – Part 1

Port	Type	Capacity	Operator	Status	Start Date	Comments
Dunkerque	Ship-to-Ship		Total Marine - Fuels	Planned	2020?	Infrastructure being developed to support Ship-to-Ship LNG bunkering of CMA-CGM containerships by Total Marine Fuels. Plan to adapt existing LNG jetty and then construction of dedicated LNG jetty for small-scale LNG operation.
Marseille	Truck-to-Ship, Ship-to-Ship planned	TBD	Molgas	Operational	January 2018	Currently, Truck-to-Ship for weekly call of Aida Perla cruise ship. Cold ironing operation. Ship-to-Ship under negotiation for LNG fueled cruise ships and ferries to Corsica.
Le Havre	Truck-to-Ship	TBD	Shell	Operational	May 2016	Weekly call of Aida Prima cruise ship. Cold ironing operation.
Amsterdam	Truck-to-Ship since 2013; Ship-to-Ship planned for Q4 2018	TBD	TBD	Operational	2013	Port of Amsterdam has an annual bunker fuel throughput of approximately 2.5 million tonnes per annum. Production of bio-LNG planned for the port in the near future.
Vancouver	Truck-to-Ship	78 cum/hour delivery per truck; multiple truck capabilities	Fortis BC	Operational		FortisBC provides Truck-to-Ship bunkering to BC Ferries. LNG is supplied from Fortis BC's Mount Hayes liquefaction plant.
Vancouver	Truck-to-Ship	78 cum/hour delivery per truck; multiple truck capabilities	Fortis BC	Operational		FortisBC provides Truck-to-Ship bunkering to BC Ferries. LNG is supplied from Fortis BC's Tilbury liquefaction plant.

Vancouver	Truck-to-ship	78 cum/hour delivery per truck; multiple truck capabilities	Fortis BC	Operational		Fortis BC truck-to-ship bunkering of Seaspans ferries. LNG supplied from Fortis BC's Tilbury liquefaction plant.
Bilbao	Ship-to-Ship	Bunkering vessel capacity of 600 cum	ITSAS Gas, part owned by Vasco de la Energía	Operational	February 2018	LNG is sourced from the Bay of Biscay Gas regasification plant owned by Enagás and the EVE. Dock and terminal have been remodeled to facilitate the loading of LNG for the ITSAS Gas vessel Pilot Ship-to-Ship transfer of approximately 90 cum of LNG from the Oizmendi to the cement ship M.V. Ireland moored in the port of Bilbao completed in early February 2018.
Isle of Grain	TBC	TBC	Grain LNG	Proposed	2019	Grain LNG is looking at developing break-bulk facilities for smaller LNG carriers and LNG bunkering.
Chubu region	TBC	TBC	Toyota Tsusho / NYK Line	Planned	TBC	NYK Line is in joint discussions with 'K' Line, Chubu Electric Power Co, and Toyota Tsusho Corporation to develop a new business to supply LNG bunkers to ships in the Chubu region (January 2018).

Source: SEA/LNG

LNG Bunkering Locations – Current and Planned – Part 2

Port	Type	Capacity	Operator	Status	Start Date	Comments
Valencia	Land-based initially	TBC	Gas Natural Fenosa	Planned	2019	Gas Natural Fenosa has announced that it will be developing bunkering infrastructure to support the 10-year LNG supply deal it concluded in January 2018 with shipping company Baleària.
Jacksonville-Talleyrand Marine Terminal	Tank-to-Ship	500,000 gallon storage tank and loading jetty	Eagle LNG	Under construction	Q32019	Eagle LNG (SEA) LNG members LNG bunkering infrastructure case study available at https:// sea-lng.org/wp-content/uploads/2018/01/FINAL_SEALNG-case-study_Eagle-LNG_Shore-to-ship-LNG-bunkering-in-Jacksonville.pdf . Case Study Summary: Eagle LNG and Crowley Maritime have developed an innovative supply chain for LNG bunkering in the space of 2 years. Their success has been based on choosing the right experienced partners, and the right business models, enabling risks to be shared, which is vital in the early stages of market development when infrastructure is scarce.
Tacoma	Tank-to-Ship	30,000 cum storage	Puget Sound Energy	Planned	2019	LNG will be supplied from Puget Sound Energy's planned liquefaction plant.
Vancouver	Shore-to-Ship and Ship-to-Ship		Seaspan	Planned	TBC	Seaspan is planning an LNG bunkering jetty / bunkering vessel. LNG for Seaspan bunkering project will be supplied from the FortisBC Tilbury liquefaction plan.
Jacksonville - Dames Point Terminal	Truck-to-Ship and Barge-to Ship (planned for 1H 2018)	Liquefaction plant capacity 120,000 gallons per day; two storage tank capacity 2	JAX LNG are the LNG supplier; Clean Marine Energy will be the commercial manager of the Clean Jacksonville bunker barge	Operational	2016	Truck-to-ship bunkering to tote Marine containerships using ISO containers via a custom-built transfer skid.

		million gallons				<p>LNG currently sourced by JAX LNG, from AGL Resources' LNG production facility in Macon, Georgia. In 2018, Barge to-Ship LNG bunkering will commence via the Clean Jacksonville bunker barge, operated by Clean Marine Energy. In the space of just over 3 years, Jacksonville has gone from a port with limited experience of LNG, no existing infrastructure, and a relatively small market in marine fuel bunkering, to become the leading LNG bunkering operation in the US and one of the first movers globally. The Jacksonville case study illustrates the importance of a forward-looking anchor customer and strong leadership. This is what provided the catalyst for innovative supply chain investments, with both customer and supply chains collaborating closely with the port, regulatory authorities, local emergency services, and communities.</p>
Incheon	Truck-to-Ship		KOGAS	Operational	2013	LNG sourced from KOGAS's Pyeong-Taek LNG re-gas terminal.

Source: SEA/LNG

LNG Bunkering Locations – Current and Planned – Part 3

Port	Type	Capacity	Operator	Status	Start Date	Comments
Ulsan				Proposed	2019	Ulsan Port Authority signed a 3-year co-operation agreement in August 2016 amongst 14 public and private organisations to develop LNG bunkering. Companies include KOGAS, Korea Gas Technology Corporation, Hyundai Heavy Industries, SK Shipping, Korea Research Institute of Ships and Ocean Engineering, Ulsan University, Korea Elenji Solutions, NK, South Korea LNG Bunkering Industry Association, Energy Innovation Partners, Daechang Solutions, and Unisys International.
Kochi	Tank-to-Ship	2x155,000 cum storage tanks	Petronet LNG	Operational	2015	Petronet LNG (SEA \neq LNG member) LNG bunkering infrastructure case study available to view at https://sea-lng.org/wp-content/uploads/2018/01/FINALrevised_SEALNG-case-study_Petronet-LNGs-Kochi-Terminal.pdf . Case Study Summary: The Kochi case study illustrates how LNG bunkering may evolve outside traditional deep-sea bunkering locations on the back of strategically located bulk LNG infrastructure. It shows how opportunities may be captured by new entrants who are prepared to move quickly and work with experienced bunkering partners, as well as emphasising the importance of effective education and collaboration.
Yokohama	Truck-to-Ship, Plans for Ship-to-Ship by 2020	TBC	Gas4Sea, Tokyo Gas	Operational	2015	Truck-to ship bunkering started in 2015. Strategic plan to turn Port of Yokohama into an LNG bunkering hub. Ship-to-ship bunkering planned for 2020 based on the Sodegaura LNG regas terminal in Tokyo Bay.
Shanghai (Zhejiang Zhoushan)	Tank-to-Ship, Ship-to-Ship	Ship-to-Ship	ENN Group	Under construction	2018	ENN is constructing an LNG receiving and bunkering terminal of 3Mtpa capacity. ENN has ordered an LNG bunker vessel due to be delivered in 2018
Hamburg	Truck-to-Ship, Tank-to-Ship	5,500 cum storage	Nauticor	Under construction	2017	
Göteborg	Ship-to-Ship		Skangas	Operational	September 2016	LNG bunkering available from LNG carrier Coral Energy.
Hammerfest (Polarbase)	Tank-to-Ship	90 tonnes/h	Barents Naturgass AS	Operational	April 2017	Norway's biggest LNG bunkering facility. LNG sourced from Statoil's liquefaction LNG plant at Melkøya.
Stockholm	Tank-to-Ship, Ship-to-Ship	20,000 cum storage tank	Nauticor, AGA	Operational	2011	LNG terminal in Nynäshamn in operation since 2011 LNG bunkering vessel Seagas in operation since 2013.

Source: SEA \neq LNG

LNG Bunkering Locations – Current and Planned – Part 4

Port	Type	Capacity	Operator	Status	Start Date	Comments
Klaipeda	Truck-to-Ship, Ship-to-Ship(from 2H2017)	5,000 cum storage	Port of Klaipeda, Blue LNG, (Nauticor/Klaipeda Nafta JV)	Under construction	2H 2017	LNG supplied from Klaipedos Nafta's LNG FSRU terminal. LNG bunkering vessel Seagas.
Barcelona	Truck-to-Ship; Ship-to-Ship in 2019	TBC	Gas Natural Fenosa	Operational	January 2017	LNG supplied from ENAGAS's Barcelona re-gas terminal. Gas Natural Fenosa has announced that it will be an LNG bunkering vessel to support the 10-year liquefied natural gas (LNG) supply deal it agreed in January 2018 with shipping company Baleària.
Zeebrugge	Truck-to-Ship, Tank-to-Ship, Ship-to-Ship	TBD	Gas4Sea/Fluxys	Operational	2015	The Port of Zeebrugge has been pioneering the development of LNG bunkering in Northwest Europe. LNG is supplied from Fluxys LNG re-gas terminal at Zeebrugge. The ENGIE Zeebrugge, the world's first purpose-built LNG bunker vessel, was delivered to Gas4Sea (Engie Mitsubishi and NYK Line) in February 2017. Gas4Sea (SEA \neq LNG members) LNG bunkering infrastructure case study available at https://sea-lng.org/wp-content/uploads/2018/01/FINAL_SEALNG-case-study_Gas4Sea-ENGIE-Zeebrugge.pdf . Case Study Summary: The ENGIE Zeebrugge LNG bunker vessel case study illustrates the first mover challenges Gas4Sea needed to address to develop LNG bunkering services in northwest Europe. These included the design of the bunkering vessel, absence of relevant regulation, the need to create customer confidence, and the lack of understanding in the shipping industry of LNG as a marine fuel. Overcoming these challenges required close collaboration with a variety of stakeholders.
LA/Long Beach				No plans yet		No announcements at present.
Algeciras	Land based initially	TBC	Gas Natural Fenosa	Proposed	2019	Considering LNG as a bunker fuel. Participant in Core LNGas Hive initiative. Gas Natural Fenosa has announced that it will be developing infrastructure to support the 10-year liquefied natural gas (LNG) supply deal it agreed in January 2018 with shipping company Baleària.
Panama	Port of Colon	TBC	Engie/AES	Planned	2018	Engie and AES to develop LNG bunkering service based on the Costa Norte LNG re-gas terminal due online in 2018.

Source: SEA \neq LNG

LNG Bunkering Vessels – Current and Planned – Part 1

Location	Vessel	Start Date1	Capacity	Operator	Comments
Singapore	FueLNG LNG bunker vessel - to be named	Q3 2020	7,500 cum	FueLNG (Keppel O&M - Shell Eastern Petroleum JV)	Being built by Keppel Offshore & Marine (Keppel O&M) SGD50m contract Maritime and Port Authority of Singapore (MPA) co-funding - SGD3m (US\$2.3m)
Bilbao, Spain	Oizmendi	February 2018	600	ITSAS Gas (part owned by Vasco de la Energía)	Oizmendi is a 3,200 dwt former pollution control vessel converted with two 300 cum, deck-mounted, Type C LNG tanks Pilot Ship-to-Ship transfer of approximately 90 cum of LNG, from Oizmendi to the cement ship M.V. Ireland, moored in the port of Bilbao, completed at beginning of February 2018
US Southern East Coast	Shell US East Coast LNG Bunker Barge (to be named)	2020 - TBC	4,000	Shell	Shell Trading (US) has finalised a long-term charter agreement with Q-LNG Transport, LLC for a US-flag 4,000 cum LNG bunker barge.
Sardinia - TBC	Stolt-Nielsen LNG Bunkering Vessel (Mediterranean, to be named)	2Q 2019	7,500	TBC	Stolt-Nielsen Gas BV has signed a contract with Keppel Singmarine for the construction of two LNG carriers capable of ship-to-ship bunkering. Slated for operations in the Mediterranean and northwest Europe.
NW Europe	Stolt-Nielsen LNG Bunkering Vessel (NW Europe, to be named)	3Q 2019	7,500	TBC	Stolt-Nielsen Gas BV has signed a contract with Keppel Singmarine for the construction of two LNG carriers capable of ship-to-ship bunkering. Slated for operations in the Mediterranean and northwest Europe.
South Korea - TBD	Korea Line LNG Bunkering Vessel (to	2019	7,500	Korea Line	Korea Line has ordered two small-scale 7,500m ³ LNG carriers from Samsung Heavy Industries for delivery in May and Decem-

	be named)				ber 2019, to be deployed on domestic coastal trades. The first vessel will deliver small-scale shipments of LNG Jeju island for a 20-year contract and the second will supply LNG as marine fuel.
Rotterdam, Netherlands	Shell Rotterdam LNG Bunker Barge (to be named)	2H 2018	3,000	Shell	Shell entered into an agreement with Victrol NV and CFT for a vessel that will operate on Europe's inland waterways from its base in Rotterdam, the Netherlands.
Rotterdam, Netherlands	Total LNG Bunkering Vessel	2019 TBC	18,600	Total Marine Fuels	Total is looking to charter an 18,600 cum capacity LNG bunkering vessel from MOL to supply CMA-CGM's recent order of nine 22,000 TEU box ships.
TBC	Coral Methane	TBD	7,551	Shell	Plans to convert the 2009 LNG/LPG/LEG multi-gas carrier, developed for Gasnor (Shell subsidiary), enabling it to function as an LNG bunker vessel, by adding a specialised LNG bunker arm.

Source: SEA&LNG

LNG Bunkering Vessels – Current and Planned – Part 2

Location	Vessel	Start Date ¹	Capacity	Operator	Comments
Barcelona, Spain	Gas Natural Fenosa LNG Bunker Vessel	2020 TBC	TBD	Gas Natural Fenosa	Dedicated LNG bunker vessel to service the 10-year LNG supply deal signed in January 2018 with Baleària, for their operations out of Barcelona.
Amsterdam, Netherlands	FlexFueler001	2018	760 initially, increasing to 1,480	Titan LNG	LNG Bunkering Pontoon - will supply fuel to inland barges and small seagoing vessels
Zhoushan, China	ENN LNG Bunker Vessel - To be named	2018 (TBC)	8,000	ENN Group	
Klaipeda, Lithuania	Blue LNG	1H 2018	7,500	Blue LNG (Nauticor/ Klaipeda Nafta JV)	
Port of Jacksonville, Florida	Clean Jacksonville	1H 2018	2,200	Jax LNG / Clean Marine Energy	
Port of Zeebrugge	Engie Zeebrugge	April 2017	5,000	Gas4Sea	
Port of Rotterdam	Cardissa	August 2017	6,500	Shell	
Kiel Canal to Southern Norway	Coralius	September 2017	5,800	Skangas	
Stockholm	SEAGAS	2013	187	AGA / Nauticor	

Source: SEA-LNG