

LNG fuel demand/supply and forecast

Ecobunker Shipping Co., Ltd

Director, Kazutaka Kawanishi



- 1 . Ship-To-Ship LNG bunkering in Tokyo Bay
- 2 . STS LNG bunkering bases in the world
- 3 . Surge in LNG fueled vessels
- 4 . Payback for LNG fueled vessels
- 5 . Long term forecast for LNG fuel



1 . Ship-To-Ship LNG bunkering in Tokyo Bay



<Company Profile>

Name	Ecobunker Shipping Co., Ltd
Foundation	5 th Nov 2018
Address	Yokohama
Share Holders	Uyeno Transtech Ltd. Sumitomo Corporation Yokohama-Kawasaki International Port Corporation
Business	Owning of LNG bunkering vessel

<Share Holders` contribution>



Ship Management of LNG bunkering vessel,
Supporting of Marketing etc.



Sales and Purchase of LNG fuel,
Marketing for shipping companies etc.

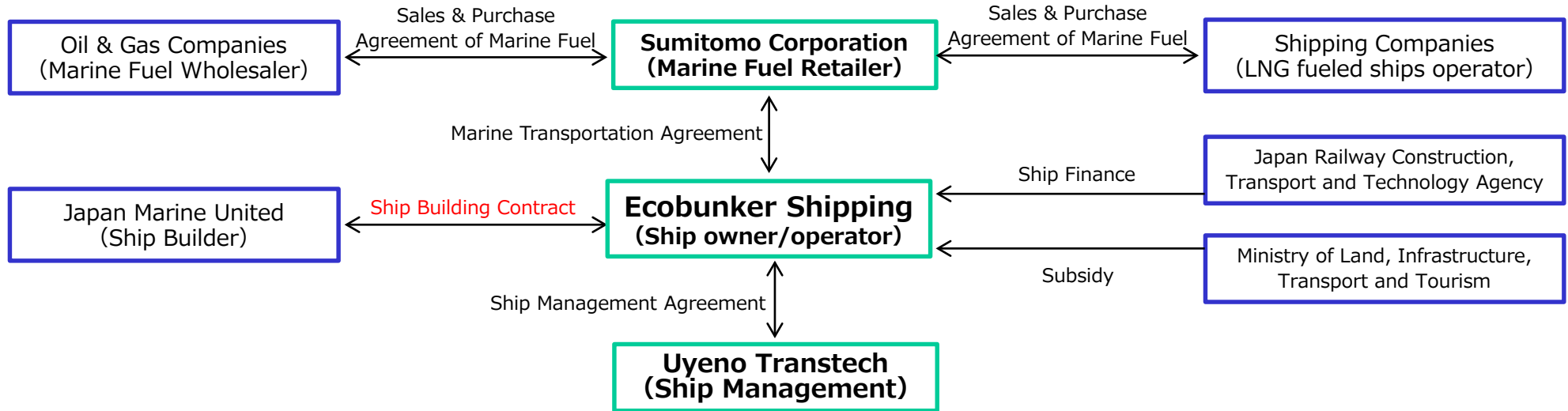


Coordination with authorities,
Supporting of Marketing etc.

1. Ship-To-Ship LNG bunkering in Tokyo Bay



<Business Structure>



LNG Bunkering Vessel Building Schedule

Feb 2019 : Contract Execution

Oct 2019 : Start of LNG tank construction@AG&P·Phillipines

Apr 2020 : Start of ship building@Fukuoka Shipbuilding·Fukuoka

Jul 2020 : Launch

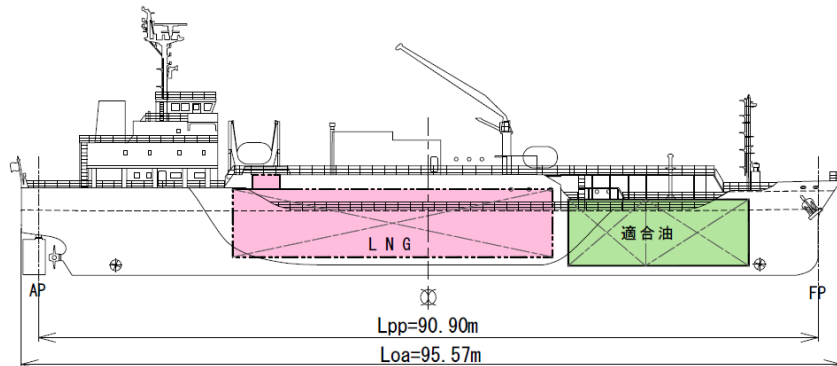
Mar 2021 : Delivery

1. Ship-To-Ship LNG bunkering in Tokyo Bay

<Main Spec>

LOA	Abt. 95.57 m	
Beam	Abt. 15.80 m	
Depth	Abt. 7.50 m	
Draft	Abt. 4.40 m	
GT	Abt. 4,100 mt	
Tank Capacity	LNG	Abt. 2,500 m ³
	LSFO	Abt. 1,500 m ³
LNG Pumping Rate	600 m ³ /h(=270 mt/h)	

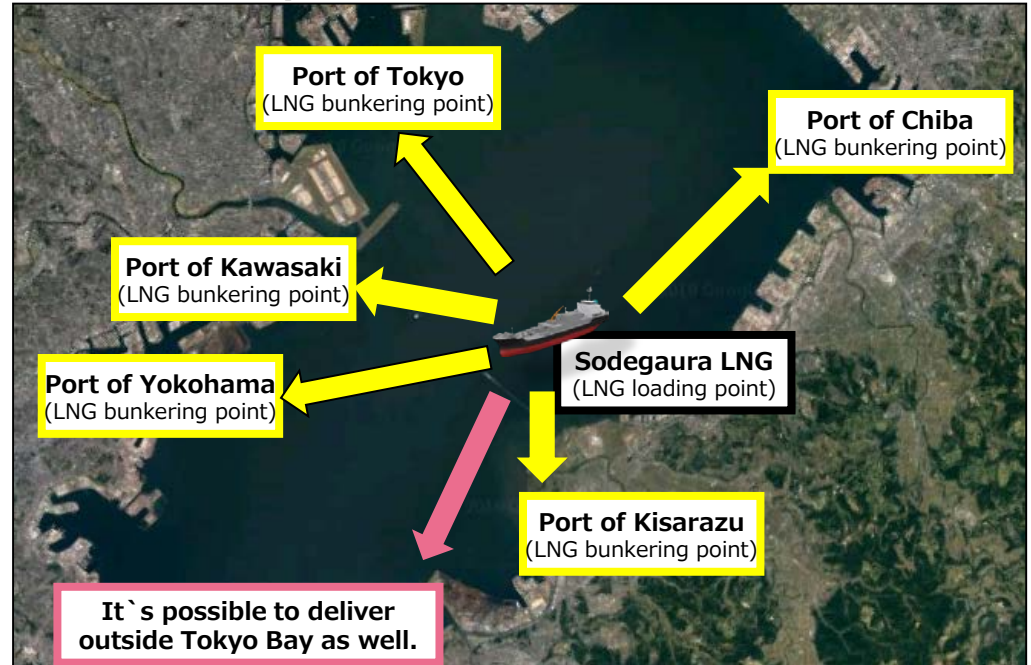
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<STS LNG bunkering at each port>



<Assumed operation>





2. STS LNG bunkering bases in the world



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<Ending `chicken and egg dilemma` >

	Conventional Bunkering Port	Volume Share	LNG Bunkering Vessel	Under operation & construction	Including Under planning
1	Singapore	29%	2 vessels under construction	29%	29%
2	ARA	12%	Some vessels under operation	12%	12%
3	China	7%	1 vessel under construction	7%	7%
4	Fujairah	6%	Under planning	-	6%
5	Korea	5%	1 vessel under construction	5%	5%
6	Hong Kong	4%	-	-	-
7	Gibraltar	4%	Under planning	-	4%
8	US Gulf	4%	-	-	-
9	US West coast	3%	Under planning	-	3%
10	Panama	3%	-	-	-
11	Japan	2%	2 vessels under construction	2%	2%
12	US East coast	2%	1 vessel under operation	2%	2%
13	Russia	2%	Under planning	-	2%
14	Brazil	2%	-	-	-
	Total	84%		57%	72%

- ✓ Almost all of main conventional bunkering ports will be able to supply LNG fuel soon, as FIDs for LNG bunkering vessels have made in succession in Asia, catching up with advanced Europe.



3. Surge in LNG fueled vessels



4 . Payback for LNG fueled vessels

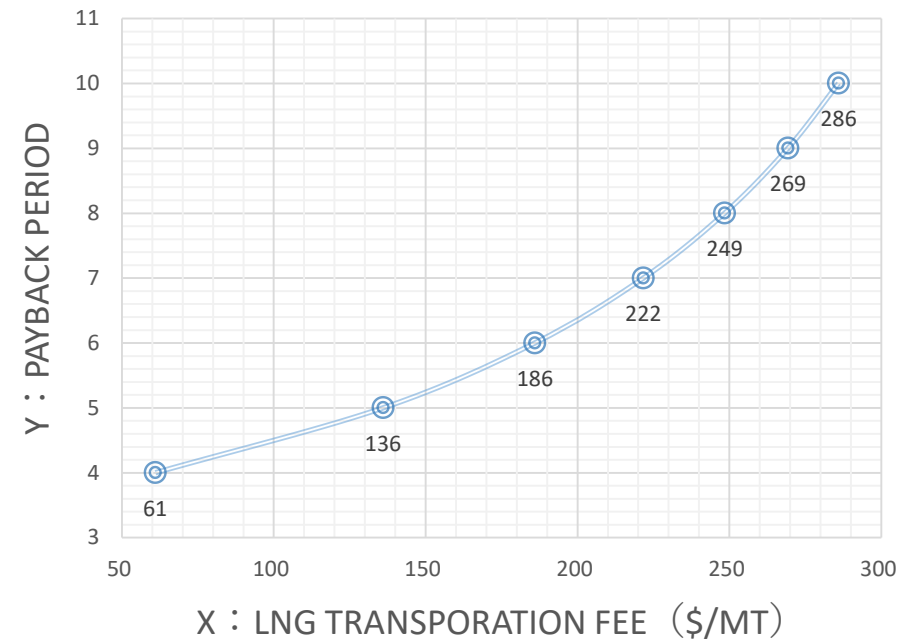
4. Payback for LNG fueled vessels

Assumption			
Vessel Type	Pure Car Carrier		
Capex	Base	Addition	LNG fueled
	\$50mil	\$15mil (+30%)	\$65mil
Annual Fuel Consumption (*)	LSFO	LNG	
	13,000mt	10,000mt	

(*)Unit Conversion: LHV of LSFO : 42.3GJ/mt, LHV of LNG : 55.0GJ/mt

Fuel cost comparison		LSFO	LNG
Yearly Fuel cost	Market Price (**)	Singapore Platts Bunkerwire MGO	Platts Japan Korea Marker
		\$594/mt	\$4.9/mmbtu (= \$284/mt)
	Premium/Discount	-\$40/mt	+ \$X/mt (LNG transportation fee)
	Purchase	\$554/mt	\$284+X/mt
		13,000mt	10,000mt
	Total	\$7.2mil	10,000mt *(\$284+X)
Payback period		-	Y

(**)6 month average from Apr to Sep 2019



- ✓ Increasing LNG fuel demand pushes down LNG transportation fee, and shorten payback period of LNG fueled vessels.
- ✓ It's necessary to consider `sacrificed cargo space`, `LNG tank treatment before/after dock`, `Crew training`, `Port Charge Exemption` etc. for elaborate study.

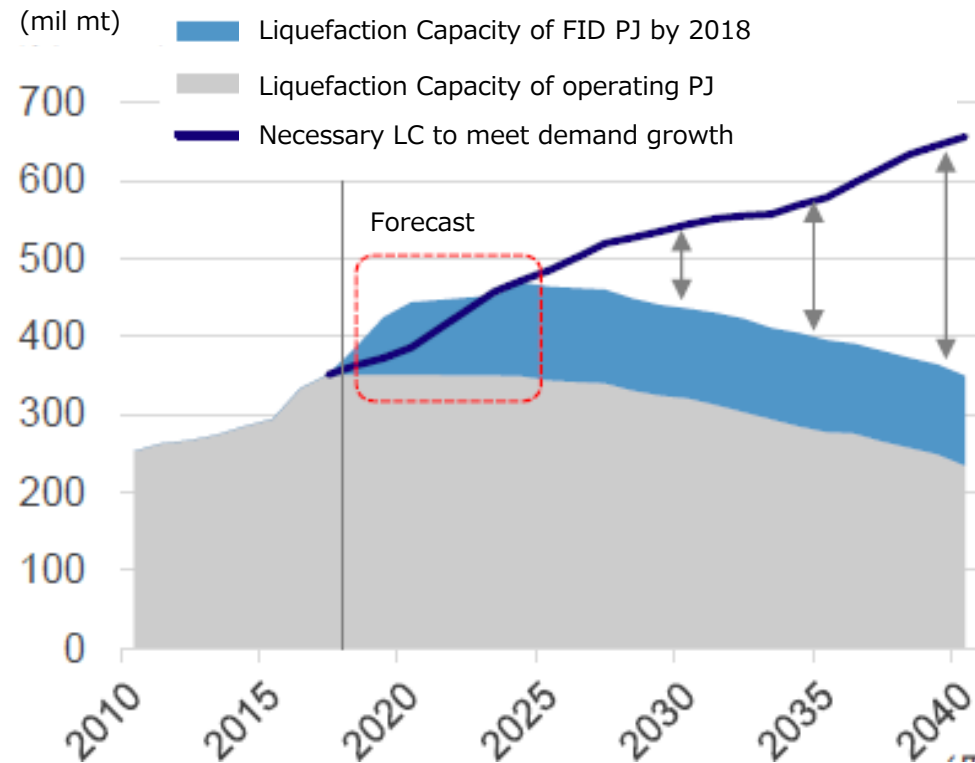


5. Long term forecast for LNG fuel

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<LNG Demand Supply balance (Short Mid term / 2020-2025) >

- ✓ JKM(Asia LNG spot market price issued by Platts) has been stable low, abt. \$4-5/mmbtu (≐\$180-\$220/1mt of Fuel oil) since Mar 2019, because of weak demand caused by slowdown in world economics growth and strong supply from US.
- ✓ IEA said in 'World Energy Outlook 2018', world demand growth will be covered by LNG projects reached at Final Investment Decision by 2018 till around 2025, although 100 mil mt short supply may occur in 2030 if no one makes FID for any potential LNG projects in coming years.



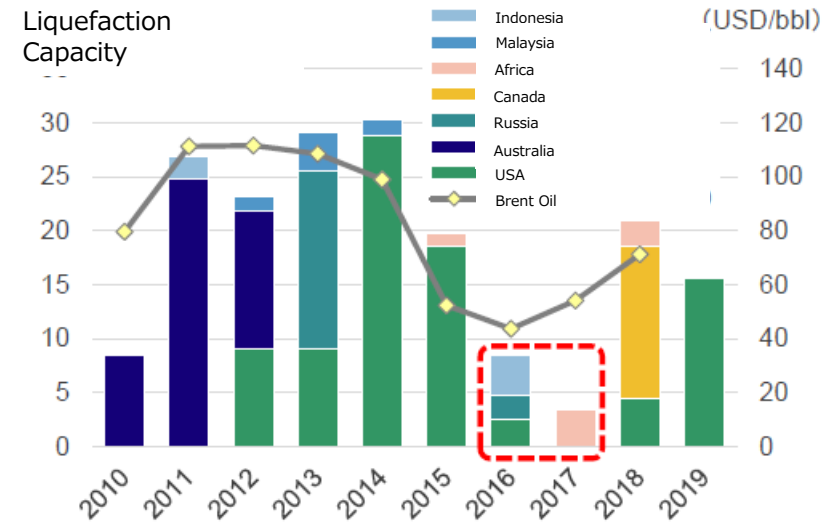
5. Long term forecast for LNG fuel

<LNG Demand Supply balance (Mid Long term/2025-2030) >

✓ Regarding world LNG supply in 2025 onward, large scale projects reached FID in succession since crude recovered in 2018, such as LNG Canada(14mil mt/y, 2025~), US•GoldenPass(16 mil mt/y, 2024~), Mozambique LNG(12 mil mt/y, 2024~), though limited projects reached FID in 2016-17 due to oil price crush.

✓ Including potential projects like Russian Arctic LNG 2 (20 mil mt/y, 2023~) as well, LNG supply capacity reaching FID 2019~20, will total **over 200 mil mt/y**.

✓ Even if the potential PJs don` t reach FID as scheduled, demand growth should be covered by excessive LNG supply from numerous potential projects going forward. This is why it can be forecasted current oversupply market and competitive LNG price continue till 2030 at least.



	FID	Project Name	Capacity	Start Operation
Done	Feb-19	Golden Pass	16	2023
	Jun-19	Mozambique LNG	13	2024
Soon	2019	Arctic LNG 2	20	2024
	2019	Qatar Expansion	31	2024 - 2026
	2019	Rovuma LNG	15	2024
	2019	Cheniere Sabine Pass T6	5	2023
	2019	NLNG 7	8	2023
Planning	2019	Goldboro LNG	10	2023
	2019	Tellurian	28	2023
	2019	Calcasieu Pass (VG)	11	2023
	2019	Costa Azul Conversion	2	2023
	2019	NextDecade	27	2023
	2020	Woodfibre	2	2024
	2020	PNG expansion	8	2024
	2020	Pluto expansion	5	2025
	2020	Port Arthur	11	2024
	As contracted	Freeport T4 expansion	5	4 years after FID
Total (mil mt/year)			216	



Conclusion

- “Bunker fuel conversion” is unavoidable to achieve the IMO goal for GHG reduction (at least 50% reduction by 2050), since effects of other alternatives like “Energy efficiency improvement” and “Slowdown voyage” are insufficient.
- Therefore, “Further fostering EEDI regulation” (being discussed for introducing Phase 4/ Final report in Autumn 2020) and “GHG emission control by introducing “Emission trade system/ Carbon Tax” are likely to be adopted.
- Next generation marine fuel such as Hydrogen/Battery/Ammonia/Wind are not feasible alternative fuel for mid-large size vessels without revolutionary innovations, while LNG alone is not a perfect answer for achieving IMO goal.
- In short-mid term, combination of “main Fuel: LNG, auxiliary fuel: next generation fuel” will be most advantageous based on the above mentioned arguments, and therefore it is highly recommended to consider using LNG fuel or introducing LNG ready specifications when newly ordering vessels. (Retrofit works, which was successful when scrubbers were introduced, can not be applicable for converting conventional design vessel to LNG fuel-type one.)

