# MARPOL 2020

## Transition to a new era

FIPI

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**PROSPECTIVE OF LNG AS BUNKER FUEL POST MARPOL 2020 IN INDIA**

## 1.0 PREFACE

Come January 1st 2020 and shipping community across the globe will be required to follow the MARPOL regulation of using bunker fuels of up to 0.5 % sulfur m/m. The current specification is 3.5 % max. This regulation has brought focus on use of Liquefied Natural Gas (LNG) as bunker fuel , which currently is niche market in restricted regions, over a larger fleet of ships of different size, applications and routes. In Indian marine scenario with more than 7500 kilometres long shore line, use of LNG as bunker fuel needs to be explored to derive its benefits on climate.

To explore the use of LNG as bunker fuel post 1st Jan. 2020 in a larger scope and volumes , it is essential to understand the underlying provisions of MARPOL 2020, their likely impact on international shipping and oil trade with optins for trendsetting and the developments which are taking place in India's Maritime sector

## 2.0 MARPOL 2020

The term MARPOL (short name of '*Marine Pollution'*) is used for 'The **International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978'** of International Maritime Organisation (IMO) , is one of the most significant international convention on marine environment management.

In 1973, the International Maritime Organisation (IMO) agreed a series of measures to prevent pollution from marine and shipping operations (MARPOL Convention). The Convention was modified in 1997 to address sulfur emissions from ships by introducing a global cap on the sulfur content of marine fuel oil and an additional limit in specific waters, referred to as emission control areas (ECAs).

The sulfur limit in marine fuels has been reduced over time for both the global limit and within the ECAs. In 2012, the maximum sulfur level in open sea was reduced to 3.5 % from 4.5%.


**Source: Oil & Gas Journal**

The next step of change as adopted by IMO on 27th October 2016, will reduce the global cap on sulfur content of bunker fuels on board for general shipping (outside ECAs) from 3.50% wt. to 0.50% wt. from 1st January 2020 (Regulation 14 of IMO, Annex VI). **This mandate is commonly referred to as MARPOL 2020**. The interpretation of "fuel oil used on board" includes use in main and auxiliary engines and boilers.

Below is the summary of quality change of bunker fuel.

| Outside an ECA established to limit Sox and particulate matter emissions | Inside an ECA established to limit Sox and particulate matter emissions |
|---|---|
| 4.50% m/m prior to 1 January 2012 | 1.50% m/m prior to 1 July 2010 |
| 3.50% m/m on and after 1 January 2012 | 1.00% m/m on and after 1 July 2010 |
| 0.50% m/m on or after 1 January 2020 | 0.10% m/m on and after 1 January 2015 (NW Europe , US , US – Caribbean)<br>0.5% China Coast 2016-2019 , Taiwan 2019 |

**Source: Technical circular 027/2018 of Indian Register of Shipping; Oil & Gas Journal**

## 3.0 OPTIONS FOR COMPLIANCE

IMO 2020 mandate is different from the traditional practice of implementing the changes in fuel specifications previously.

Earlier, compliance with respect to reduction in sulfur content of fuels was sole action of fuel manufacturer that is refiners and blenders. In present case, the reduction is deep with practically no effective and viable technology to de-sulfurize high sulfur heavy residues to this low level. Blending of low sulfur gas oil is also expected to hit technical and economics issues. Use of low sulfur heavy residues from low sulfur crude may be one way for liquid fuels. Use low sulfur gas oil in limited regions / routes offers some hope.

Shipping industry also has the option to use liquefied natural gas (LNG) which is in use at present with very small percentage in the entire mix. It is evident that whatever is the adaptation of one sole or a hybrid approach, the global trade pattern will see major changes in short and mid term before an equilibrium is achieved. Freights will also see uptrend in similar pattern.

MARPOL 2020 offer options to USERS (read Shippers) as well. They can continue to buy HSFO as long as they install scrubbers on a ship to maintain emission at the same level as with low sulfur fuels.

Above base analysis throws three options for compliance for ship operators by 1st Jan. 2020:

a) Use a fuel with a sulfur content of 0.5% (VLSFO).
b) Use high-sulfur fuel (HSFO) and process the emissions through an exhaust gas cleaning system before release. These systems are routinely called 'Scrubbers'.
c) Use an alternative fuel like LNG, Methanol, LPG, or even batteries.

In case the equivalent arrangement (option-c above) has been chosen as a method to comply with the requirements, an approval has to be obtained from the Flag Administration.

Fourth approach, which can not be termed as 'OPTION' is **Non- Compliance** to the regulations. The trend depends on the effective regulatory mechanism of Port States and Flag States.

Uncertainty surrounding fuel availability, quality, and price, as well as regulatory issues and costs related to alternative fuels, will impact the decisions of suppliers and users both and market trends.

**3.1 USE OF VLSFO**

This option will cause upsurge in the VLSFO demand leaving high sulfur residues surplus for disposition in the other markets. Assuming 100 % compliance, this shift will affect almost 3.5 million barrel per day (mbpd) of HSFO bunker fuel consumption which is about 4% of global oil demand. This statement is ideal and in fact, impact in the overall context will be less as LS residues which may also form the part of HSFO will shift to VLSFO. Blending HS residues with gas oil distillates to cut sulfur may not be technically viable due to deep cut in sulfur in MARPOL2020 fuel.

This option is the least disruptive from shipping point of view as long as the quality parameters, specially 'Viscosity' are maintained. From the Refinery side, this shift will alter the product pattern significantly and hence growth rate depends on demand of distillates in other sectors where heavy fuels can not be substituted. It also depends on emerging price pattern of low sulfur crude oils and products specially cracks in HSFO and VLSFO in the international market.

Market news in media indicate that China Petroleum and Chemical Corp, Sinopec is raising its capacity to produce VLSFO for marine use to 10 million MT (0.2 mbpd) by 2020 and 15 (0.3 mbpd) million MT by 2023 with related expansion in global sales network to 50 key overseas ports including Singapore.

Oil major ExxonMobil has announced that it will make IMO 2020 compliant low sulphur fuels available by the third quarter of 2019.ExxonMobil has named the ports of Antwerp, Rotterdam, Genoa, Marseilles, Singapore, Laem Chabang and Hong Kong, where compliant fuels would be available, with locations in North America to follow. Singapore is highlighted as the obvious choice to get the drive going. Shell also has given its plans to supply MARPOL compliant fuels to meet the deadline.

In India also, Indian Oil Corp. (IOCL) announced its plans to produce 1.0 Million MT per annum VLSFO from its Gujarat refinery and make it available along Indian coast.

Availability of approx.3.5 mbpd of VLSFO by 1$^{st}$ Jan. for present global demand is highly unlikely. IEA Oil Market Report 2019 estimates that HSFO demand will fall to 1.4 mbpd from 3.5 mbpd after Jan. 2020 with rise in demand for marine gasoil (MGO) to double from 900 kbpd to 2 mbpd. VLSFO is estimated to reach up to 1 mbpd in 2020 but initial pick up may be slow due to availability of blending stock and technical compatibility issues among components which may impact quality (stability , catalyst fine particles , pour point and flash point)

IEA further estimates that these challenges will be overcome quickly. VLSFO is the fastest growing marine fuel in 2020-24, increasing from 1 mb/d in 2020 to 1.8 mb/d, due to its price advantage over gasoil. MGO demand reaches a peak in 2020 then eases to 1.8 mb/d by 2024, keeping a solid base of usage in smaller vessels and due to its wide availability.

**3.2 USE OF HSFO**

This scenario is the least disruptive for the Refiners. For Shippers, it however means installation of exhaust Gas Cleaning Systems (Scrubbers) and release the emissions at the same SOx level as from the use of VLSFO. Provision of scrubbers again bring different options before the shippers 9 see figure given below) and selection may have to be made for each individual case considering tanker size , age, route coverage , cost of scrubbers , retrofit scope, facilities at port to discharge scrubbed water , local marine pollution regulations etc.

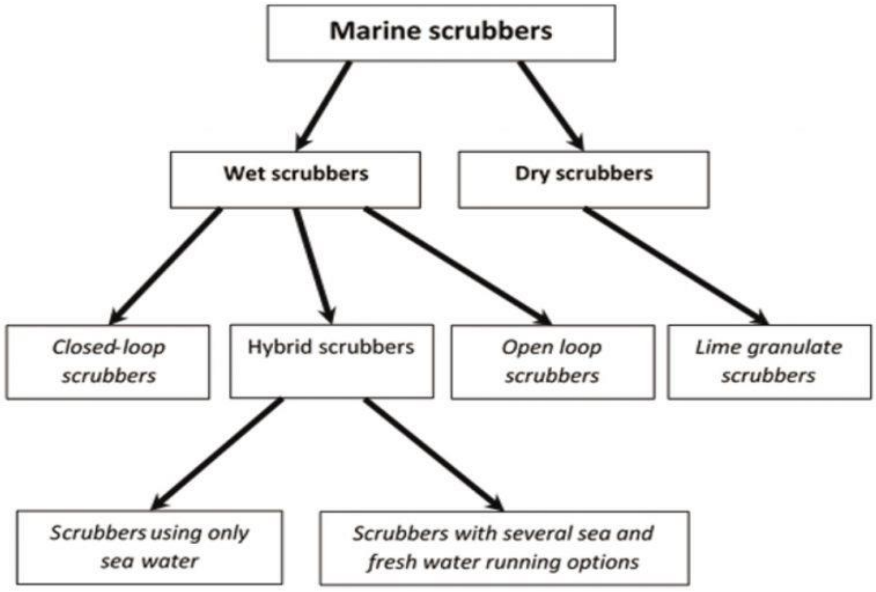



Figure 1: Classification of Marine Scrubbers based on their operational principle.

IHS Markit is of the view that scrubbers will be a preferred solution for very large size ships which accounts for most of HSFO bunker consumption. Investment in scrubbers started to increase from mid 2018 and it is estimated that around 2760 ships, out of total fleet of 12000 will have scrubbers fitted by 2020. IEA projects 4000 numbers of ships with scrubbers by 2020. Shipyard space may be key constraint in expediting the process.

The cost of installation of scrubbers is around 1.5 to 3.5 million USD even with retrofit (KBC PTQ Q2 2019). With the predicted crack of about 40$ per barrel between HSFO and VLSFO in the first year of regulation (Oil & Gas Journal – July 2019) and the small OpenX for a scrubber with use of caustic soda or lime with sea water, the payback for a ship consuming 250 bpd fuel and operate 250 days in sea, will be much less than 2 years or even closer to one year. Even with crack squeeze in subsequent period, the proposition to install a scrubber will remain attractive for ship having life more than five years.

Though economic to install scrubber appears attractive , shippers may exercise caution while selecting the type of scrubber as some of the nations like China and Singapore have indicated their intentions to ban discharge scrubbed sludge from the ships in their maritime regions.

### 3.3 NON - COMPLIANCE

Trends of non compliance , specially in the initial period depends on the availability of compliant fuels across the globe , enforcement mechanism of the member states and some other technical issues like delays in retrofits etc.

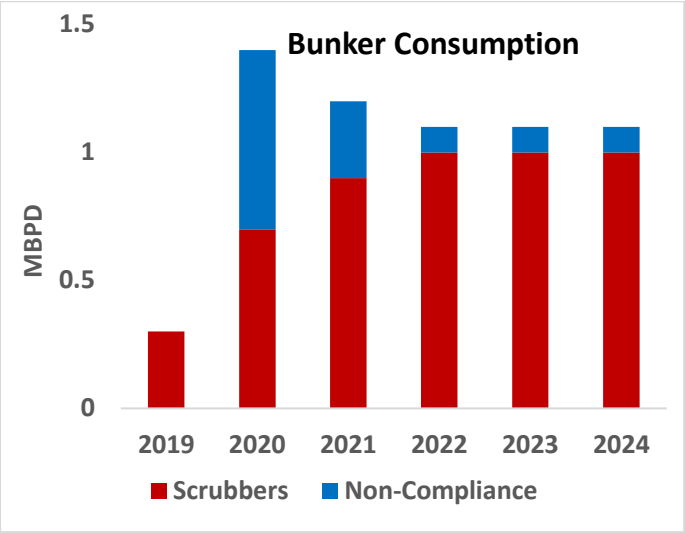
Compliance in the European ports is expected to be the highest because of enforcement, traffic and political will for implementation. The same is expected in Singapore and China. US, though expressed its reservation about MARPOL 2020 as it will increase the price of diesel in 2020, the election year in USA. Since US coasts are already in ECA, this policy even if not adopted, will not impact MARPOL 2020 future across globe. much adverse impact on global In the rest of the world , initial compliance levels may be low but are expected to improve considerably with time which may be up to 3-5 years.

### 3.4 BUNKER FUEL CONSUMPTION – GLOBAL SCENARIO

Considering the impact of scrubbers, use of VLSFO, MGO and non-compliance factor, IEA Oil Market Report 2019 forecast the bunker fuel consumption given here.

(Figs. in mbpd)

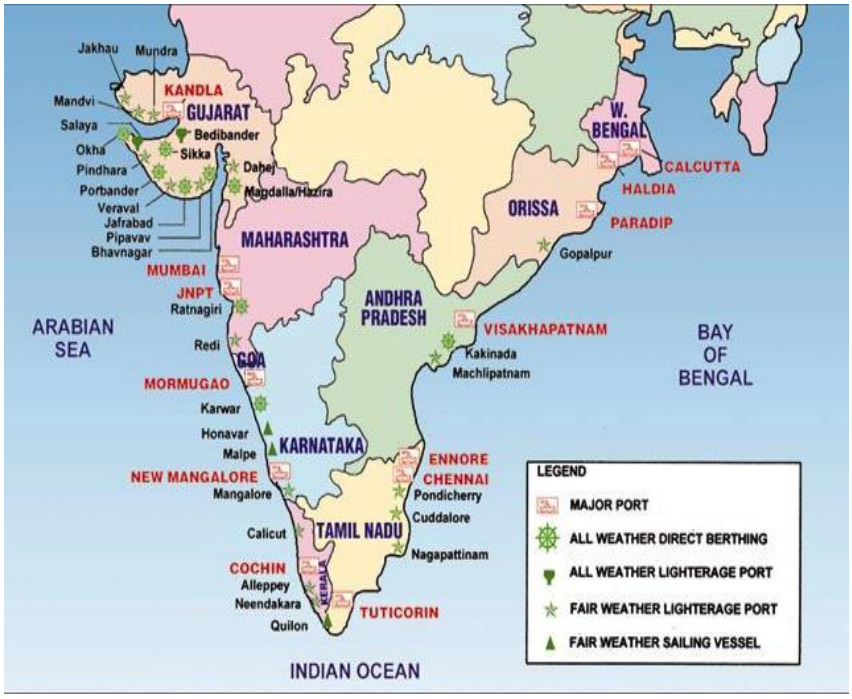
| Fuel | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|---|---|
| High Sulfur FO | 3.5 | 1.4 | 1.2 | 1.1 | 1.1 | 1.1 |
| Of which : Scrubbers | 0.3 | 0.7 | 0.9 | 1.0 | 1.0 | 1.0 |
| Of which : Non-Compliance | 0.0 | 0.7 | 0.3 | 0.1 | 0.1 | 0.1 |
| Very Low Sulfur FO | 0.0 | 1.0 | 1.4 | 1.6 | 1.7 | 1.8 |
| Marine Gas Oil | 0.9 | 2.0 | 1.9 | 1.9 | 1.8 | 1.8 |
| Total Bunker Fuels | 4.4 | 4.4 | 4.5 | 4.6 | 4.6 | 4.7 |




## 4.0 MARPOL 2020 – INDIAN POSITION

India has been one of the earliest members of the IMO, having ratified its convention and joined it as a member-state in the year 1959. DG (Shipping), the competent authority on the subject, issued engineering circular (05 of 2018) no. ENG/OPP-MARPOL-38(5)/04-pt. II on 14th December 2018 giving guidelines and requirements for Indian Flagships regarding compliance with the provision of MARPOL Annex VI Regulation 14 and applicability of MARPOL 2020 in Indian waters .

## 5.0 INDIA MARITIME SECTOR – OVERVIEW

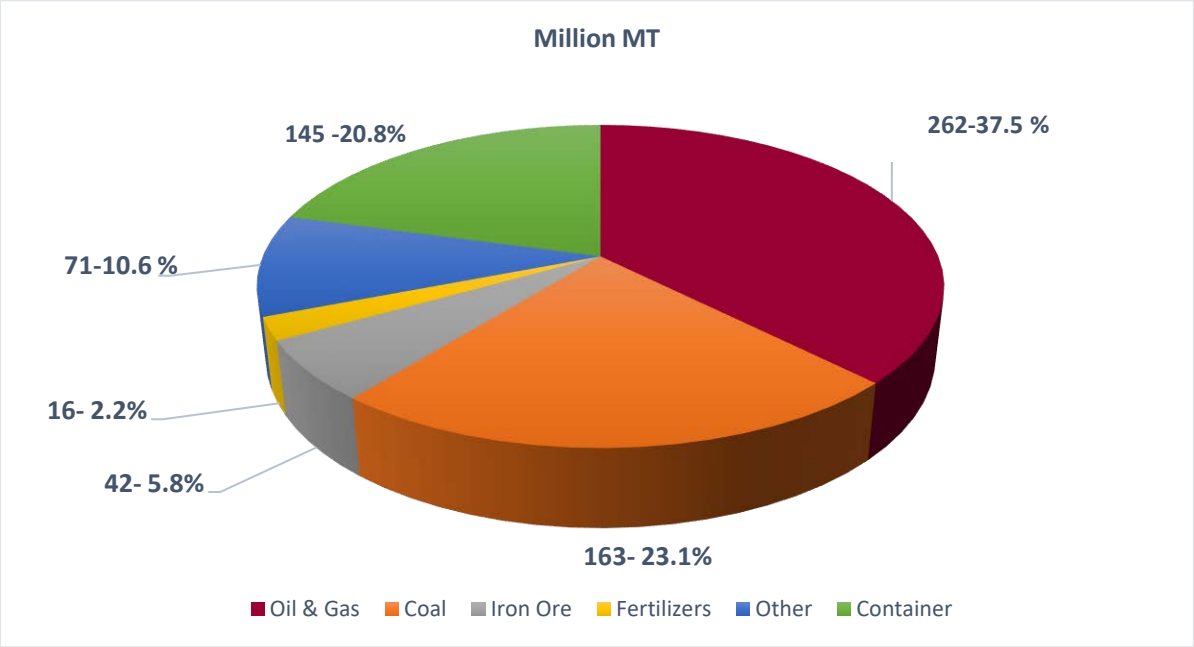



With a coast line 7517 kilometres, India is the sixth largest maritime country. According to the data from Ministry of Shipping, 90 % of India's trade by volume and 70% by value is through maritime transport.

India has 13 major ports; 12 in Government sector and one as a corporate organisation (Ennore)

Along with major ports, India has total 205 minor and intermediate ports. In FY 19, major port handled 699.04 million MT of cargo up by about 2.9 % over 679.36 million MT of FY18. Total 22464 ships called on 13 major and 7 non-major ports in India during 2018-19 (Source: Quarterly News Letter of M/S J M Baxi). Cargo wise distribution is given below

| Service Area | No. of vessels | Gross Tonnage Million MT |
|---|---|---|
| Coastal | 947 | 1.50 |
| Foreign Going | 458 | 11.29 |
| Total | 1405 | 12.79 |




As per the studies conducted under the Sagarmala Programme, it is expected that by 2025, cargo traffic at Indian ports will be approximately 2500 MMTPA while the current cargo handling capacity of Indian ports is only 1500 MMTPA. A roadmap has been prepared for increasing the Indian port capacity to 3500+ MMTPA by 2025 to cater to the growing traffic. This includes port operational efficiency improvement, capacity expansion of existing ports and new port development.

Total number of vessel registered with DG Shipping as on 31st march 2019 are 1405 with following break up.

| Service Area | No. of vessels | Gross Tonnage Million MT |
|---|---|---|
| Coastal | 947 | 1.50 |
| Foreign Going | 458 | 11.29 |
| Total | 1405 | 12.79 |

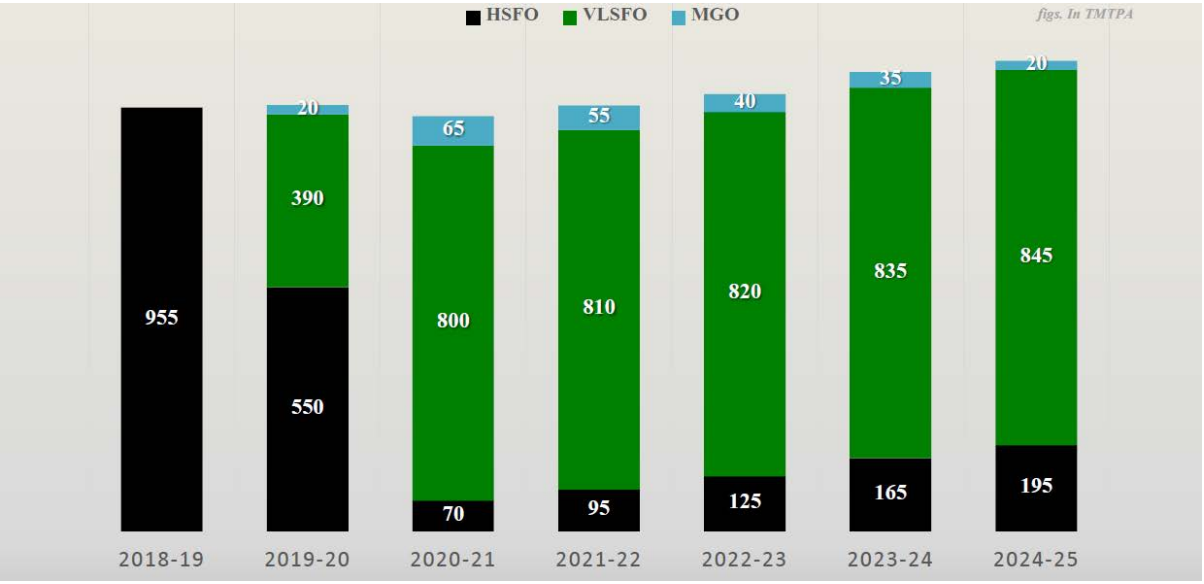
**6.0 BUNKER OUTLOOK IN INDIA**

During 2018-19, sales of marine bunker fuels in India (FO & Marine Gas Oil) is 1840 million MT. The consumption remains at the same level of 2017-18 (1842 million MT). Following summarise the sale of bunker fuel in India during 2018-19 (Source: HPCL Presentation).

(Figs. in Thousand MT)

| | FO | High Flash Gas Oil | Total |
|---|---|---|---|
| PSU Co. | 793 | 845 | 1638 |
| Pvt. Co. | 162 | 40 | 202 |
| Total | 955 | 885 | 1840 |

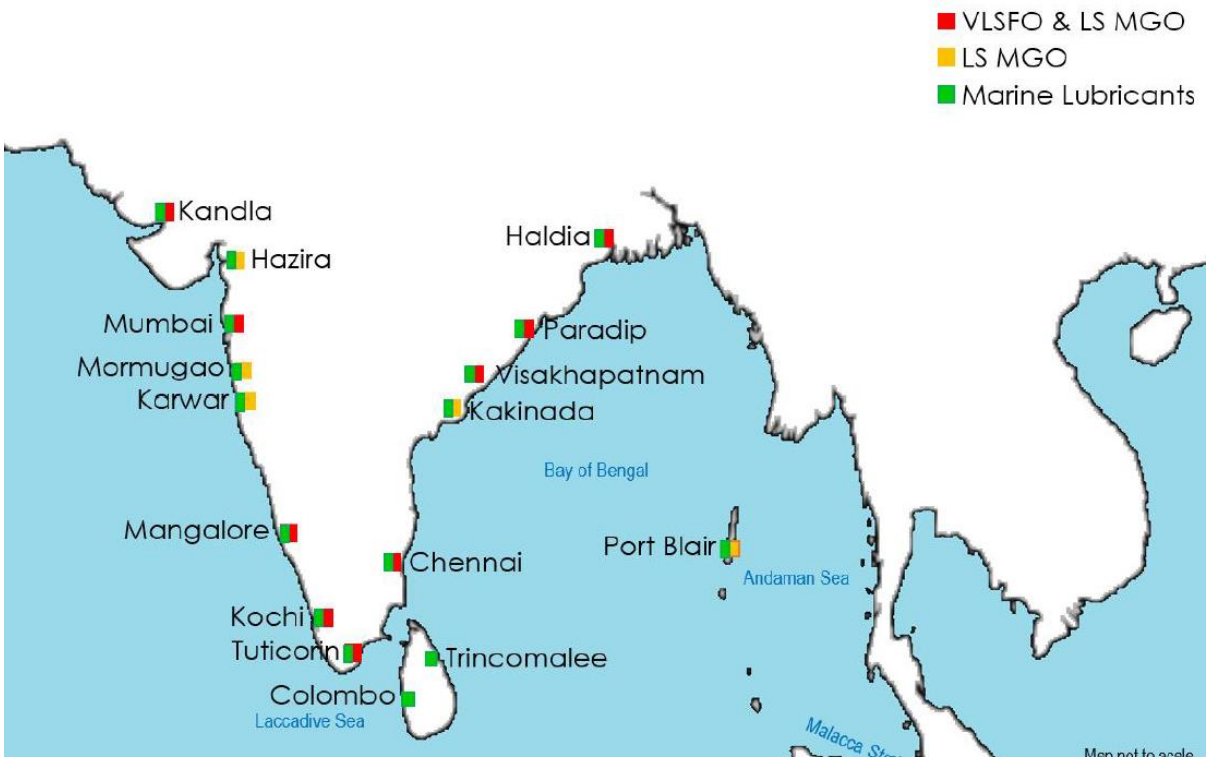
Indian Oil Corp. Ltd. in a presentation presented the outlook of bunker consumption (FO) in India for a period of five years.




Outlook project increase in bunker consumption from 955 thousand MT (FO) to 1060 TMT by 2024-25. VLSFO consumption will start from last quarter of 2019-20 and will pick up by 2024-25. HSFO will not only be replaced by VLSFO gradually but some vessels are expected to shift to marine gas oil in 2019-20. Consumption of MGO will increase to 65 in 2020-21 but will start reducing thereafter to reach a level of 20 TMT by 2024-25. HSFO will show sharp decline by 2020-21 to 70 TMT but is expected to increase (after installation of scrubbers pick up the pace) to 195 TMT by 2024-25.

PSU, Indian Oil Corp Ltd. (IOCL) has announced its plan to supply VLSFO in Indian markets from September 2019, ahead of MARPOL 2020 time line. Its Gujarat Refinery will produce MARPOL compliant 1.0 million MT per annum VLSFO from LS residues. VLSFO will be meeting ISO 8217:2017 RMG 380 with viscosity between 220-300 CST. And sulfur 0.5 % m/m. This will be made available at all port locations having bunkering facilities in India through coastal movement from Kandla where it will reach through rail route.

**Positioning Plan of IOCL for Bunker Fuels post MARPOL 2020 in India**




With this plan, VLSFO and MGO, complying with MARPOL guidelines from 1st January 2020 will be available on Indian coast to fulfil the demand. As this appears to be the least disruptive scenario for Refiners as well as Shippers, this has all potential to take off.

**7.0 LNG AS BUNKER FUEL**

**7.1 GLOBAL PERSPECTIVE**

Excluding LNG carriers, use of LNG as bunker fuel is a niche market, currently an estimate base of only 10 Kbpd. According to IEA estimates, less than 200 vessels using LNG bunker fuel were in operation at the end of 2018. Ships used in passenger , car and container transportation operating in NW Europe , Mediterranean and Central America constitute majority among LNG users.

Rise in environmental sensitivity in some regions may be key driver impacting use of LNG. The European Union is considering proposals to extend the Emission Control Area (ECA) s in Europe to include the Mediterranean Sea. Last autumn, SEA\LNG member The Maritime and Port Authority of (MPA) Singapore made a decision to ban vessels discharging scrubber-produced wash-water. Discharge of wash-water from open loop scrubbers is also facing specific restrictions in other regions such as Chinese inland and coastal waters.

IEA considered only new ship building for Container and Cruise Liners for their projections on LNG use as marine fuel. No. of cruise liner with LNG as fuel will increase from 9 to 13 by 2024. Strength of Containers carriers with LNG will double from current 10 by the same period. Retrofitting for LNG is expensive proposition when compared with scrubber installation as of now and not factored in the forecast. Estimated demand for LNG as bunker fuel by 2024 is 90 Kbpd.

| | 2018 | 2020 | 2022 | 2024 |
|---|---|---|---|---|
| Demand of LNG as Bunker Fuel (Kbpd) | 10 | 25 | 55 | 90 |

More than 80 % of 90 Kbpd will be used in Cruise and Container ships in NW Europe, Mediterranean and Central America which are moving relatively short and fixed routes only in already sensitive declared regions.

The contribution of LNG in bunker mix will be 2% by 2024 but within the segment, the rise in demand will be around ten fold. LNG may find higher thrust if the plans to add infrastructure on a global spectrum come through. World Oil Outlook 2018 (WOO 2018) by OPEC suggest that United Arab Emirates (UAE) is reportedly working on a plan to install LNG storage facility at Fujairah, the second largest bunker hub. In addition to investment plans of EU in LNG pipeline for marine fuels in Italy , WOO 2018 also report that international group formed in 2014 to cooperate on LNG Bunkering expanded its scope in2016 to include the port of Jacksonville (USA) , The Norwegian Maritime Authority , Ministry of Land, Infrastructure , Transport and Tourism of Japan and Ulsan Port Authority (South Korea). Recent introduction to the group are ports from China, France and Canada.

IMO is also considering the strategy on greenhouse gas emissions. With 20-25 % difference in emissions between LNG and Oil, the economics and environmental considerations combined together will be the top of all ship-owners consideration. Impact on LNG will be clearer after that in next five years.

The impracticalities and economics of retrofitting existing vessels with LNG tanks and the lack of ready access to LNG bunkers in some parts of the globe necessitate a portfolio approach to marine fuelling solutions for ship-owners and managers, with different fuels best suited to different vessels and trading routes.

### 7.2 INDIAN PERSPECTIVE

Five LNG terminal importing LNG (four on west coast and one on east) are operating with 37.5 Million MT per annum capacity (ref. table below) About 14 Million MT PA capacity will join the this soon. Plans are on anvil to add more in near future.

| No. | TERMINAL | DEVELOPERS | CAPACITY (MMTPA) |
|---|---|---|---|
| | **Existing Terminal** | | |
| 1 | Dahej | Petronet LNG Limited | 17.5 |
| 2 | Hazira | Royal Dutch Shell | 5.0 |
| 3 | Dabhol | GAIL,NTPC | 5.0 |
| 4 | Kochi | Petronet LNG Limited | 5.0 |
| 5 | Ennore | Indian Oil Corp | 5.0 |
| | **TOTAL EXISTING** | | **37.5** |
| | **Construction Completed** | | |
| 6 | Mundra | GSPC, Adani | 5.0 |
| | **Under Construction** | | |
| 7 | Jaigarh (FSRU) | H Energy | 4.0 |
| 8 | Dhamra | Adani | 5.0 |
| | **TOTAL Construction completed and Under Construction** | | **14.0** |
| | **PLANNED** | | |
| 9 | Jafrabad (FSRU) | Swan | 5.0 |
| | **TOTAL PLANNED** | | **5.0** |
| | **PROPOSED** | | |
| 10 | East Coast | Petronet LNG Limited | 5.0 |
| 11 | Kakinada | GAIL, APGDC, Shell **or** VGS | 2.5 |
| 12 | Kolkata Port | H Energy | 2.5 |
| 13 | Chhara | HPCL & Shapoorji Pallonji | 5.0 |
| 14 | Krishnapatnam | LNG Bharat/others | 2.5 |
| | | | |
| | **TOTAL PROPOSED** | | **17.5** |
| | **GRAND TOTAL** | | **74.0** |

LNG Terminal Capacity (Source: Petronet LNG)

Infrastructure to make LNG available on high traffic ports (major and minor both) is not yet available. The fact that

a) Indian refiners are going to supply MARPOL compliant fuels from January 1st 2020 fuel at a appropriate without any disruptive approach on Indian ports and
b) LNG as global marine fuel is currently having very limited growth with very low base in some regions with fixed route traffic ,
c) Infrastructure for LNG maritime fuel across globe to come up in a larger way
d) Cost of retrofit is high

The perspective of LNG in short (5-7 years) appears to be dim. LNG supplier need to watch the following points very closely to arrive at a considered decision for providing infrastructure for LNG as maritime fuel at the appropriate time.

e) Growth of LNG based fleet specially touching Indian coast
f) Cost of retrofit vis-a vis fuel price advantage
g) Development of global regulatory regime and impact on bunker mix
h) Trends in global oil and gas trade of oil & gas

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