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HOW THE IMO 2020 REGULATION WILL IMPACT THE LNG MARKET

Jeffrey Moore

S&P Global Platts

Upcoming regulation from the IMO will drastically change fuel usage from the world's shipping fleet as new specifications for sulfur are implemented in 2020. The changes will have ripple effects across many industries, including the LNG sector. From an LNG perspective, areas impacted most are likely to be in the LNG bunkering space as well as potentially an increase in dual-fuel vessels to comply with the new regulations.

However, with the expected increase in prices for marine gasoil and blended fuels, there will be an even more significant price decrease of high-sulfur fuel oil (HSFO) in the years immediately following the implementation of these regulations. LNG has been introduced as a major alternative for fuel oil consumption because it tends to compete on an economic and environmental perspective. However, if prices for HSFO fall in the early part of next decade, could it impact the outlook for LNG as a fuel in emerging economies?

This paper seeks to explore the relationship between the IMO's regulation and demand for LNG in Asia, from both a bunkering perspective and a competitive fuels perspective compared to HSFO. We will explore fuel oil consumption in emerging economies that are expected to increase LNG imports over the next several years to see what impact (if any) these regulations might have for the outlook of LNG demand.

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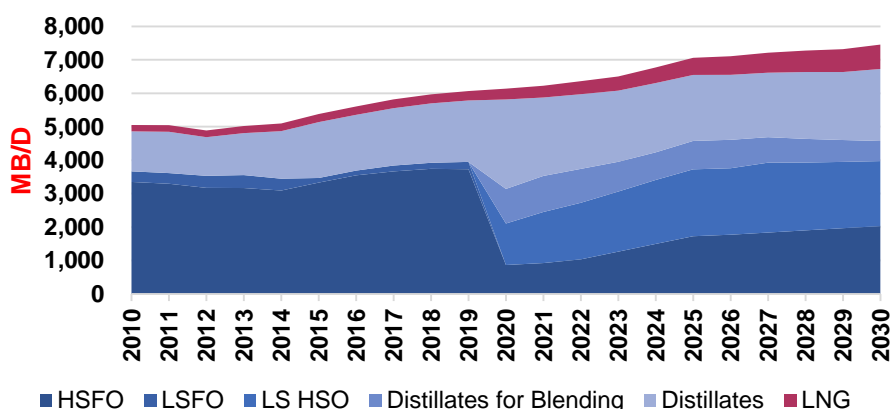
Introduction and overview

The upcoming regulation from the IMO will reduce the Sulphur cap limit on marine fuel from 3.5% to 0.5% and inflict broad impacts on the global shipping industry, the commodities markets and the global economy. The changes will have ripple effects across different industries, including the LNG industry. The LNG sector will see significant impacts in three areas: 1. Demand creation from the increased use of LNG as a bunkering fuel 2. Potential fuel switching due to changes in competitive fuel economics, and 3. A significant change in LNG price relationships between contract and spot, which is expected to see a strong disconnect during this period.

To fully understand how IMO 2020 will impact the LNG industry, it's important to understand the broader impacts of the regulation. The IMO previously set caps on Sulphur content for marine fuels, including the most recent reduction from a 4.5% limit to 3.5% in 2012. It is also important to note that limits on Sulphur content already exist in waters around the ECAs (emission control areas), particularly near the US and in Europe and Asian OECD countries, meaning the largest impact for the new regulations will likely be in developing Asia, except for China which started its own, full-scale ECA rule starting January 1, 2019 where the sulfur limit in coastal waters is 0.5%, ahead of IMO 2020. Of course, the vast majority of the high Sulphur bunker use is in high seas. That is where the IMO regulation will impact the most.

Ship owners will have several options for conforming to the new regulations from the IMO, however each option offers different pros and cons as well as costs associated with the decision. These generally fall into a few key categories. Ship owners can decide to switch to a lower Sulphur fuel oil (LSFO), to install a scrubber to limit their emissions, to switch to a different fuel altogether such as LNG or to risk non-compliance. The option that ship owners can decide to continue using high Sulphur fuel oil (HSFO), combined with a scrubber, to help clean up the emissions is unlikely to be adopted without strong economics indicating a significant disconnect between HSFO and LSFO to justify the costs. However, it is expected that these prices will diverge toward the end 2019, and this option will become an increasingly popular. However, in the meantime, it likely means that higher demand for crudes that have a low Sulphur content will emerge because the demand for low Sulphur fuels will increase. This adjustment will drastically change the mix for marine fuels, as a significant increase in distillates and low Sulphur fuel oil use will offset a dramatic decline in HSFO.

Figure 1: Global Bunker Demand

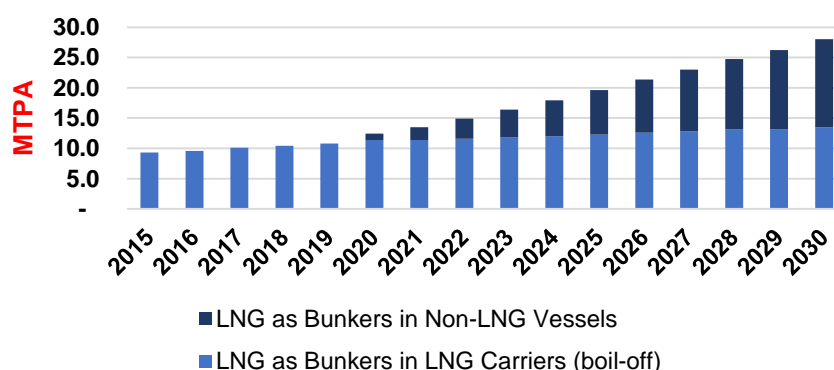


Demand for LNG as a bunkering fuel

Since using HSFO as a marine fuel will be banned without a scrubber, one of the other potential options for compliance will be to install an engine that runs off a cleaner burning fuel. This should accelerate the usage of other fuels for bunkering, which includes the use of LNG. In fact, Platts Analytics forecasts that LNG will be the fastest growing bunkering fuel from annual growth perspective from 2020 through 2030. However, the outright numbers remain relatively small in terms of total bunkering demand, and LNG is expected to make up just 10% of total bunkering demand by 2030.

Even with the relatively small amount of consumption, compared to the global bunkering market, the demand created for LNG by shipping is still an important demand driver. Countries are starting to recognize the significance of using LNG as a shipping fuel and are starting to build bunkering facilities. Various hubs around the world, where LNG bunkering will become popular, are already seizing on this change as a commercial opportunity. These hubs include Rotterdam, Singapore, Houston and coastal areas in China. Naturally, the most reasonable places for LNG bunkering are where LNG infrastructure is already in place, however as more confidence grows it is possible that other major ports such as Fujairah adopt the ability for LNG bunkering. Ships that operate in regions near these ports are the most likely to generate demand for LNG as a marine fuel, and we will likely see the markets continue to grow. Total demand for LNG for bunkering non-LNG carriers is expected to grow to just shy of 15 MTPA by 2030, which is about the equivalent of the 2018 imports for France and the Netherlands combined.

Figure 2: LNG as a Bunkering Fuel



Several LNG-powered vessels are already on the order book, including nine of the world's largest container ships, which are expected to single-handedly consume up to 0.3 million tonnes per annum (MTPA) of LNG. This represents an important and significant new form of LNG demand that will likely continue to accelerate as LNG represents a relatively cost-effective fuel solution for new builds. One other important factor when thinking about LNG as a shipping fuel is that it represents the cleanest burning of all the fossil fuels, meaning that it will likely continue to be compliant with other IMO regulation changes that might crop up in the future. In this way, ship builders might start to view LNG as a significant long-term contender to be a viable alternative fuel.

Alternative fuel substitution in power generation

As LNG eats into fuel oil's market share in bunkering, the situation will arise when fuel oil will commercially challenge LNG in power generation. With the massive change in the demand profile for marine fuel oils, it is

expected that the world will see up to 3 million barrels per day (MMB/D) of HSFO without a market. Platts Analytics believes that this loss of market share in bunkering should cause the price of high Sulphur fuel oil to plummet. Differentials between LSFO and HSFO are expected to widen out to around \$20-25/Bbl in 2020. High Sulphur fuel oil prices in Asia are forecast to fall close to \$300/MT in 2020 and 2021, which would create a relatively competitive position versus forecasted spot LNG prices of close to \$7/MMBtu on an annual basis during this time. If high Sulphur fuel oil prices were to fall below these expected levels, it would imply a competitive advantage over LNG in legacy markets still burning fuel oil for power generation.

Several important points need to be made about the ability for fuel oil to potentially compete with LNG in power generation. The most important is that a limited amount of spare power capacity exists for additional fuel oil consumption in the electricity markets in the majority of LNG importing countries. Many of the largest LNG importing countries, such as Japan, South Korea, and even China have limited capacity to burn higher amounts of fuel oil instead of natural gas. The countries that have excess capacity to burn fuel oil include Saudi Arabia, Iraq, Mexico, Pakistan, Iran, and Bangladesh. However, it's important to note Saudi Arabia accounts for more capacity than the next five countries combined with an expected 400 MB/D of spare capacity for fuel oil generation available in 2020 and currently burns roughly 300 MB/D. This is an important distinction when looking at the impact on LNG for several reasons; the first of which is that Saudi Arabia currently does not import LNG, so any increase in fuel oil consumption for electricity generation would not have an impact on global LNG balances. The second important point is that even though HSFO prices are expected to fall significantly in 2020, the strong differentials are not expected to remain in the long term. As more scrubbers are adopted and demand for the fuel picks back up, prices are expected to normalize after only a few years. This means that new infrastructure for fuel oil use in power generation is unlikely to accelerate as a result of the price differential, so only those countries with existing excess capacity are expected to help absorb HSFO during 2020 and 2021.

However, out of these countries several could see a shift in their LNG demand. The most notable are Mexico, Pakistan and Bangladesh. In Mexico's case, their fuel oil demand has been in decline since 2012 from around 235 MB/D to about 165 MB/D in 2018 at the expense of higher use for natural gas. Low enough fuel oil prices could incentivize additional burn in fuel oil. However, Mexico is already expected to see a decline in LNG imports in 2020 compared to 2018 levels, as additional pipeline import capacity from the United States ramps up and pushes the relatively more expensive LNG out of the stack. LNG imports in Mexico have been growing in recent years from 4.1 million tonnes in 2016 to 5.3 in 2018. However, LNG imports are expected to fall to less than 1 million tonnes in 2021 due to higher pipeline imports. With fuel oil forced to then compete with surging and less expensive pipeline gas imports, it's less likely that fuel oil prices would see a significant uptick in consumption within the country in 2020 and even if some additional adoption emerges in that time period, it is unlikely to push LNG imports significantly below where levels are forecast to be.

However, in South Asia a significant possibility will emerge for fuel oil to compete with LNG. Pakistan and Bangladesh represent two of the world's newest LNG importing countries, with Pakistan having first imported in 2016 and Bangladesh in 2018, both via FSRUs. Pakistan in particular has offset a significant amount of fuel oil consumption with LNG imports. In fact, Pakistan accounted for nearly 13% of total LNG demand growth between 2016 and 2018, importing nearly 7 million tonnes in 2018. The country is expected to continue increasing its imports as it will reach FID on a third FSRU in 2019. However, given the wrong price, Pakistan could see LNG import growth slow down for a few years in 2020 and 2021, as fuel oil consumption gets a small boost. The same

is also likely in Bangladesh, which is expecting the startup of new fuel oil powered generation capacity in 2019, and will be capable of consuming up to 150 MB/D of HSFO to help absorb some of the excess balance. However, because both of these countries are still building up their electrification capacity, it's possible that inexpensive fuel oil wouldn't necessarily offset or displace LNG demand, but rather complement it and help build up their top line power consumption. Still, it should be noted that these two countries are expected to import a combined 21 million tonnes by 2020, which could provide some downside risk and slow the growth of total LNG consumption globally during the main periods of excess supply for HSFO. This could have a knock on effect on LNG spot prices and pull them even lower as a result of the slowing supply.

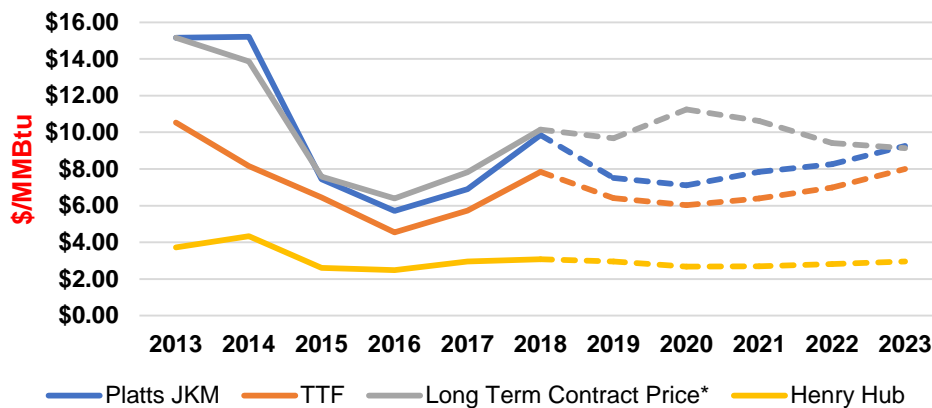
Changes in LNG spot prices versus contract prices

One of the most important aspects of the IMO's new regulation will be its impact on LNG prices. As discussed, potential new demand will develop in the form of bunkering demand. This is expected to be relatively small volumes in the initial years and will not significantly alter global balances in the near term. However, as mentioned previously, this demand will likely be long lasting and has a strong potential to accelerate over the next decade or two, as ship builders gain increasing confidence in LNG as a bunkering solution. Longer term, the IMO's current proposed and potential future regulations will likely create a net demand increase, which will help keep upward pressure on prices, albeit at a relatively small pace due to the volumes discussed.

These long term impacts to prices are an important factor when looking at the growth of the LNG industry as a whole, however there will likely be significant and arguably more important impacts to LNG prices in the near term that are associated with the IMO's regulations. This is expected to materialize in the form of a significant disconnect between spot LNG prices and contract prices. This is expected to be driven by several concurrent factors across several different commodities, many of which have already been outlined.

As explained, the IMO's regulations will impact the global shipping and crude markets because it will change the demand for product slates, which will in turn will change the demand for different types of crudes. Most notably, crudes that have a lower Sulphur content will see higher demand, which should increase their prices. One of the most important crudes, Dated Brent, is expected to see such a price increase. This will have a knock on impact on the LNG industry, as a significant number of contracts are directly or indirectly linked to Dated Brent prices, usually as a lagged percentage of the average monthly price plus some constant. As Dated Brent prices go up due to the fundamentals impacting the oil industry, it will pull up contract LNG prices that are linked to Dated Brent as well.

Figure 3: Global Natural Gas/LNG Prices



*Assumed Long Term Contract Price at 13.5% of Dated Brent plus a \$0.50 constant

Another important factor that will impact LNG prices will be the emergence of non-oil linked contracts as a form of supply. Much of the new supply that is expected to come online in 2019 and 2020 will be linked to Henry Hub and will not be subject to the fundamentals in the oil markets. Furthermore, most of the new supply will have a special characteristic where they are not destination restricted. This means these cargoes can be sold into liquid markets as a form of optimization. In short, if spot prices in Asia, such as the Platts JKM, are pulled higher following contract prices, these destination flexible volumes that are not subject to oil fundamentals can flood the market and pull spot prices lower. These cargoes linked to Henry Hub are expected to increase in volume heading into 2020, right in time for the IMO's regulations to kick in. This supply injection will likely keep a relative maximum on LNG spot prices in Asia as the world's largest demand center, while contract prices linked to crude are pulled higher. This disconnect will be an important factor in the growth and commoditization of LNG, as spot trading and liquidity will increase in an effort to optimize portfolios. It is also possible that this disconnect will widen to a point where contract renegotiations are triggered. It could also incentivize an increase in future contracts to be linked to spot prices as opposed to alternative fuels, especially ones that are not direct substitutes and are subject to a different set of fundamentals.

Even though the IMO's regulations will only have an indirect impact on the LNG industry because it doesn't specifically target LNG-powered vessels, it will still have broad and significant effects both in the near term and long term. These effects are likely to have a positive impact on the commoditization and maturity of LNG as a fuel globally, and help to increase liquidity of trading and the diversification of pricing mechanisms for contracts.