

IMO 2020 and the outlook for marine fuels

In 2020, the global limit on sulfur content for all marine fuels will be lowered dramatically, sending shock waves through global refined-product markets while widening margins and differentials. Most refiners are still trying to come to grips with the potential threats and opportunities that will emerge as a result of this regulation.

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IMO 2020 and lower sulfur-content requirements

In 2016, the International Marine Organization (IMO) agreed to limit the sulfur content in all marine fuels to 0.5 percent beginning in 2020, with the exception of fuel burned in Sulfur Emission Control Area regions, which are already at lower sulfur limits. The volume of oil demand affected by this change is significant. Demand for high-sulfur residual fuel oil for ship bunkers was 3.5 million barrels per day in 2018—out of 7 million barrels per day of total resid demand—and the global refining system is not yet equipped to make this volume of residual fuel oil at 0.5 percent sulfur once the regulation goes into effect.

Traditionally, the bunker-fuel market has been a sink for refiners to put high-sulfur resid material into and thereby avoid the need for expensive upgrading and hydrotreating processes. While there are currently about two million barrels per day of vacuum resid below 0.5 percent sulfur generated from atmospheric distillation, even this limited volume is not readily available for fuel-oil blending. Because many refiners lack hydrotreating capacity, those with conversion capacity are forced to use low-sulfur resid as a feedstock. Finally, most of this low-sulfur material is currently used as fuel in sectors that cannot switch to products with higher sulfur content.

The next-best source of low-sulfur fuel for shippers is marine gasoil, and we expect that this will initially be the path that most shippers take to satisfy IMO requirements. Ship engines can be switched to use marine gasoil with minimal operational change and no significant capital expense or time out of service. As marine gasoil is diesel-range material, the sulfur content can be controlled through the same hydroprocessing steps used to make low-sulfur diesel, and as global diesel sulfur limits have been lowered over the years, refiners have significantly expanded this capacity. However, diesel-range material is far more valuable than resid because of its ability to blend into diesel. Even with no

change in current pricing conditions, switching to marine gasoil would significantly increase fuel costs for shippers.

As a result, many shippers are looking for alternatives, such as adding on-board exhaust scrubbers or switching to liquefied natural gas (LNG) as a fuel. Installing scrubbers would allow shippers to continue to burn high-sulfur fuel oil (HSFO), though it comes at a high conversion cost both from the capital expense of the scrubber equipment and the lost time in service while the ship is in dry dock. Switching to LNG also incurs some significant up-front costs, but the biggest deterrent thus far has been concern about the availability of LNG as a bunker fuel.

For these reasons, we expect the market to—at least initially—shift to using marine gasoil as the new regulation goes into effect. Based on the resulting impact on prices, we foresee subsequent waves of investment in shipping and refining.

Market impact from shifting from resid bunker to marine gasoil

As shippers switch from resid bunker to marine gasoil, we expect to see two key changes. First, the higher demand for gasoil will largely have to be met by higher crude runs, putting upward price pressure on global crude prices, distillate premiums to other fuels, and refining margins in general. We estimate that the switch to marine gasoil will add about 1.5 million barrels per day to distillate demand globally, leading refiners to run an additional 2.2 million barrels per day of crude oil through distillation. This should increase refining utilization in the major hub markets by 2.9 to 6.7 percentage points. Margins will rise as a result, with European Brent cracking margins expected to be up \$3 per barrel.

This should also tighten distillate markets relative to gasoline, adding to the cost of marine gasoil. Recently, the spread between gasoline and diesel prices has been

relatively constant—about \$4–\$6 per barrel—due to the similar growth rates of the two products. However, history shows that when diesel demand accelerates relative to gasoline, diesel prices shift to premiums of \$10–\$12 per barrel over gasoline, which we expect to see in 2020 when diesel/gasoil demand jumps due to the International Convention for the Prevention of Pollution from Ships (MARPOL) (exhibit).

Second, falling demand for high-sulfur fuel resid will cause its price to decline, widening the spread between traditional high-sulfur resid bunker and marine gasoil. In recent years, resid markets have been fairly tight, reflecting resid being valued as a

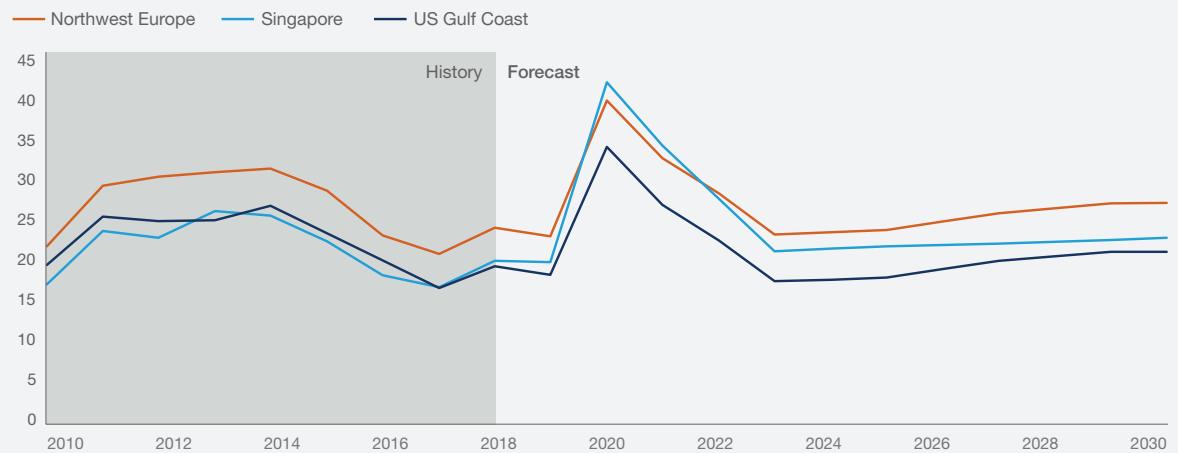
feedstock in marginal refinery-conversion capacity. With an oversupply of resid, the marginal barrel will have to find a home in a lower-valued use.

In the past, such a use has typically been in competition with natural gas in power markets that have the ability to switch to fuel oil. A shift to this level of pricing would widen the fuel-oil spread to Brent from \$6 per barrel in 2019 to \$20 per barrel in 2020. However, given the volume of excess resid predicted and the fact that it will all be very-high-sulfur material, this could overwhelm the traditional substitution market. If it were to do so, then resid would likely have to find a home competing

Exhibit

Light-heavy differentials are expected to spike in all major markets in 2020 due to MARPOL implementation.

Light-heavy product differentials,¹ \$/barrel



¹Average light product (diesel, gasoline) prices minus fuel oil (3.5% sulfur, 380 centistokes).

McKinsey&Company | Source: McKinsey Energy Insights Global Downstream Model

Falling demand for high-sulfur fuel resid will cause its price to decline, widening the spread between traditional high-sulfur resid bunker and marine gasoil.

with even lower-value coal in the Asian power sector, causing HSFO prices to reach as low as \$15 per barrel.

Combined, these market effects mean a potential widening of the spread between gasoil and HSFO in the Singapore market from current levels of \$20 per barrel to as much as \$100 per barrel in the coal-substitution scenario. This would result in refining margins for full-conversion coking/hydrocracking plants going from 2018 levels of \$6–\$7 per barrel to \$30–\$40 per barrel.

Under these market conditions, there would be a huge incentive for shippers and refiners to contemplate capital investments to capture value from this spread. To allow shippers to continue using low-cost HSFO, the payout time for scrubber investments on ships would fall to months. For refiners, the expected rate of return for coking and hydrocracking investments would also be huge.

Opportunities for different sectors

A market shift of this magnitude creates both threats and opportunities for players across the value chain:

- **HSFO marketing.** Current producers of high-sulfur bunker fuel will need to look for alternative end uses, but there will be strong competition to capture the opportunities for power generation and other industrial uses. Some end uses—like substitution against direct crude burn and against coal—may currently be considering fuel oil as an option and could become viable should differentials widen significantly.
- **Low-sulfur fuel oil blending.** If reliable supplies materialize, demand for 0.5 percent resid should grow. Capturing this opportunity will require segregating and aggregating existing volumes of low-sulfur resid material from refiners that are currently feeding it to conversion. This will likely require new commercial agreements and some investment in tankage and logistics.
- **Refinery investment.** Much wider differentials should make investments in conversion (such as coking) attractive, but the time to capitalize on this opportunity has likely passed, given how long it takes to complete a project. History would suggest that a wave of investments is likely to follow a widening of differentials, but many of the projects will come online too late to capture the full upside potential.
- **Bunker-fuel sourcing.** Shippers will face a growing array of options for fueling their fleets, including shifting to marine gasoil, sourcing low-sulfur resid, and investing in scrubbers or LNG. Making the right move at the right time should have big economic consequences. ■

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