

## 2020 Marine Fuel Regulations Set to Make Waves in Global Fuel Markets

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*UN regulations that took effect on January 1, 2020 require all ships in international waters to use fuels with a lower sulfur content or be equipped with scrubbers to reduce sulfur oxide emissions. These regulations directly affect about 4 percent of the global petroleum product market. U.S. exports of non-compliant fuel oil to major ports, particularly Singapore, declined in the first three quarters of 2019; trade flows will likely shift further in 2020, as effects spread to refineries' sourcing of crude oil inputs as well as the markets for other transportation fuels and power generation fuels.*

### Background on New Sulfur Content Requirements for Bunker Fuels

In October 2016, the United Nation's International Maritime Organization (IMO) announced that it would be reducing the sulfur content limit for fuels used by ships in international waters from 3.5 percent by volume to 0.5 percent, effective starting January 1, 2020. Demand for fuels used to power ship engines—referred to as bunker fuels—totals about 4.3 million barrels per day, or 4 percent of global petroleum product consumption. The global bunker fuel market was estimated to be valued over \$100 billion in 2017 and has mostly consisted of high sulfur residual fuel oil (HSFO, about 80 percent of the market) and marine gasoil (a type of middle distillate that is compliant with the new sulfur limits).<sup>1</sup> Shippers using HSFO have several options for compliance: switching to lower sulfur fuels, installing scrubbers to filter HSFO, or switching to alternative fuels such as liquefied natural gas (LNG). The International Energy Agency (IEA) is also anticipating that there will be a significant level of non-compliance when the rules first take effect. Uncertainty among petroleum refiners, shippers, and other stakeholders over future demand for different compliance options, along with initial expectations that the rules would be delayed past 2020, has limited investments in ship retrofits and refinery units (e.g., to increase desulfurization capabilities). The methods of complying with the IMO 2020 fuel regulations are summarized in the table below.

**Table 1: IMO 2020 compliance methods: Challenges and expected adoption rates**

Method of Compliance	Key Challenges	Expected Share of Adoption
<b>Switching to compliant fuels</b> low sulfur residual fuel oil and some middle distillates	- Many specifications are available and may not blend well if mixed - Uncertain availability at ports	Over 65% in 2020, declining moderately as scrubbers and LNG adoption increases
<b>Installing exhaust gas scrubbers</b>	- Requires retrofitting ships (or new builds) <sup>a</sup> - Open-loop scrubbers face port bans <sup>b</sup>	5-20% in 2020; increasing through 2022, then slowly declining
<b>Switching to alternative fuels</b> (mostly LNG)	- Requires retrofitting ships (or new builds) - Limited availability at ports	Very low through 2020; about 7% by 2030
<b>Non-compliance</b>	- Ports are directed to penalize ships carrying non-compliant fuel without scrubbers, starting March 1, 2020	Over 10% in first few months of 2020; very low by 2023

Source: Based on public estimates by IEA and others; forecasted adoption rates may vary.

<sup>a</sup> Scrubber costs (including installation) can vary from \$2 million to \$8 million per ship. IHS Markit, "[IMO 2020: What Every Shipper Needs to Know](#)," March 2019, 10.

<sup>b</sup> By one estimate, about 80 percent of ships with scrubbers have open-loop systems. Ports issuing bans include Singapore, Fujairah (UAE), and parts of China; ships in these waters must use a closed-loop scrubber or switch to compliant fuel. Izbicki, Griffiths, and Washington, "[Feature: Global Debate on Open-Loop Scrubbers](#)," May 8, 2019.

<sup>1</sup> Middle distillates refers to products derived from crude at mid-range boiling points, such as diesel and jet fuel.

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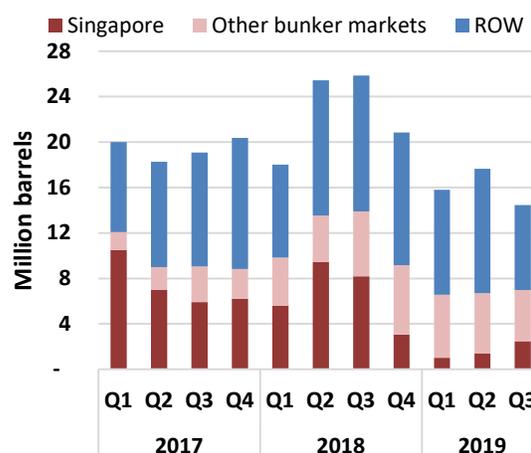
### Implications for Refineries

U.S. refineries contributed about 20 percent of the world’s refining activity in 2018 and are well positioned to supply compliant middle distillates while minimizing HSFO output. Refineries can adjust their product slate in two different ways: 1) processing crude oil with properties that align better with the desired yields and 2) modifying refinery configurations (the combination of process equipment used). In the near term, most refineries will likely rely on the first option, due to the uncertainties about IMO 2020 compliance and the significant time and costs associated with configuration changes. Crude oil with a low density (referred to as light) produces a lower ratio of residual fuel oil (including HSFO) than heavy crudes; crude with a low sulfur content (sweet) naturally produces lower sulfur fuels. Many U.S. refineries process large volumes of heavy sour crudes, but also already have units that can further refine HSFO into higher value products, like gasoline and middle distillates. Globally, refineries that do not have secondary units for HSFO will need to shift their crude inputs to minimize HSFO production or sell HSFO at lower prices.

### Impact on U.S. HSFO Exports Thus Far

Demand for HSFO dropped off in some markets in the first three quarters of 2019 as ports prepared for the new bunker fuel requirements. HSFO is also used in power generation and as an input for asphalt, and can continue to be used as bunker fuel in ships with scrubbers. Certain U.S. export markets—Singapore, the Netherlands, the United Arab Emirates, Gibraltar, and Panama—are likely to primarily use HSFO as a bunker fuel. Meanwhile, other top markets for U.S. HSFO exports such as the Bahamas, Jamaica, and Lebanon primarily use it for power generation. The volume of U.S. exports of HSFO to the major bunker fuel markets listed above already started to decline in late 2018, driven by a significant decrease in exports to Singapore (the world’s largest bunkering hub). At the same time, U.S. HSFO exports to all other markets have remained relatively stable (figure 1).

**Figure 1:** U.S. HSFO exports to major bunker fuel markets and the rest of the world (ROW), quarterly



Source: [USDOC/USITC DataWeb](#), SB 2710.19.0626 and 2710.19.0628 (accessed November 21, 2019).

### Market Effects in 2020

In addition to the direct increase in global demand for compliant bunker fuels and decrease in demand for HSFO, the regulations are likely to have indirect effects on other fuel markets. Increased bunker demand for middle distillates will likely reduce the supply of these fuels available for other industrial and transportation applications. Similarly, the drop in bunker demand for HSFO is expected to substantially reduce HSFO prices, which in turn may increase HSFO consumption in power generation and displace some consumption of coal and other fuels. As discussed above, increased demand for middle distillates and reduced demand for HSFO will also provide an incentive for refineries that do not have secondary units for processing HSFO to shift to sweeter and lighter crude oil inputs. These dynamics could support demand for U.S. crude oil exports (which are typically sweet and light) and U.S. middle distillate exports.

**Sources:** Argus, “[Q&A: IMO 2020 Policing Unlikely Before March](#),” October 2, 2019; Argus, “[Scrubbers Will Keep HSFO in Play for Bunkers: IEA](#),” March 11, 2019; BP, [Statistical Review of World Energy](#), 2019; EIA, “[Changes in Marine Fuel Sulfur Limits](#),” January 15, 2019; EIA, [The Effects of Changes to Marine Fuel Sulfur Limits in 2020 on Energy Markets](#), March 2019; IEA, [Key Findings from Oil 2019](#), March 11, 2019; O’Dell, “[IMO 2020: The Calm Before the Storm](#),” July 23, 2019.

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