

IMO 2020

Reducing sulfur emissions from vessels in the open ocean

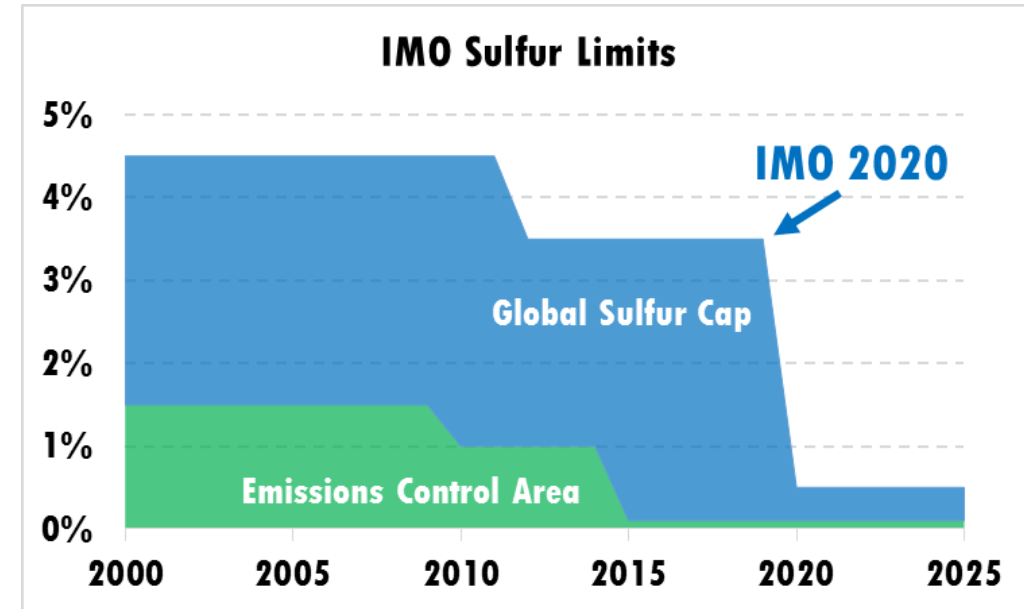


IMO & MARPOL: BACKGROUND

- IMO is a specialized agency of the United Nations that sets global standards for the safety, security and environmental performance of international shipping
- Regulatory framework for shipping with respect to safety, environment, legal matters, technical co-operation, maritime security and efficiency of shipping
- In 1973, following a series of oil spills, IMO adopted the MARPOL convention to address preventing pollution of the marine environment by ships from operational or accidental causes. MARPOL is short for Marine Pollution
- MARPOL is made up of a series of annexes that address different pollution concerns. Annex I was agreed in 1983; Annex VI, which address sulfur dioxide emissions, was agreed in 1997 and effective in 2005
- U.S. accepted convention, signed Annex VI, and incorporated it in U.S. law by the Act to Prevent Pollution from Ships, 33 U.S.C. Secs. 1901-1905.

IMO 2020 OVERVIEW

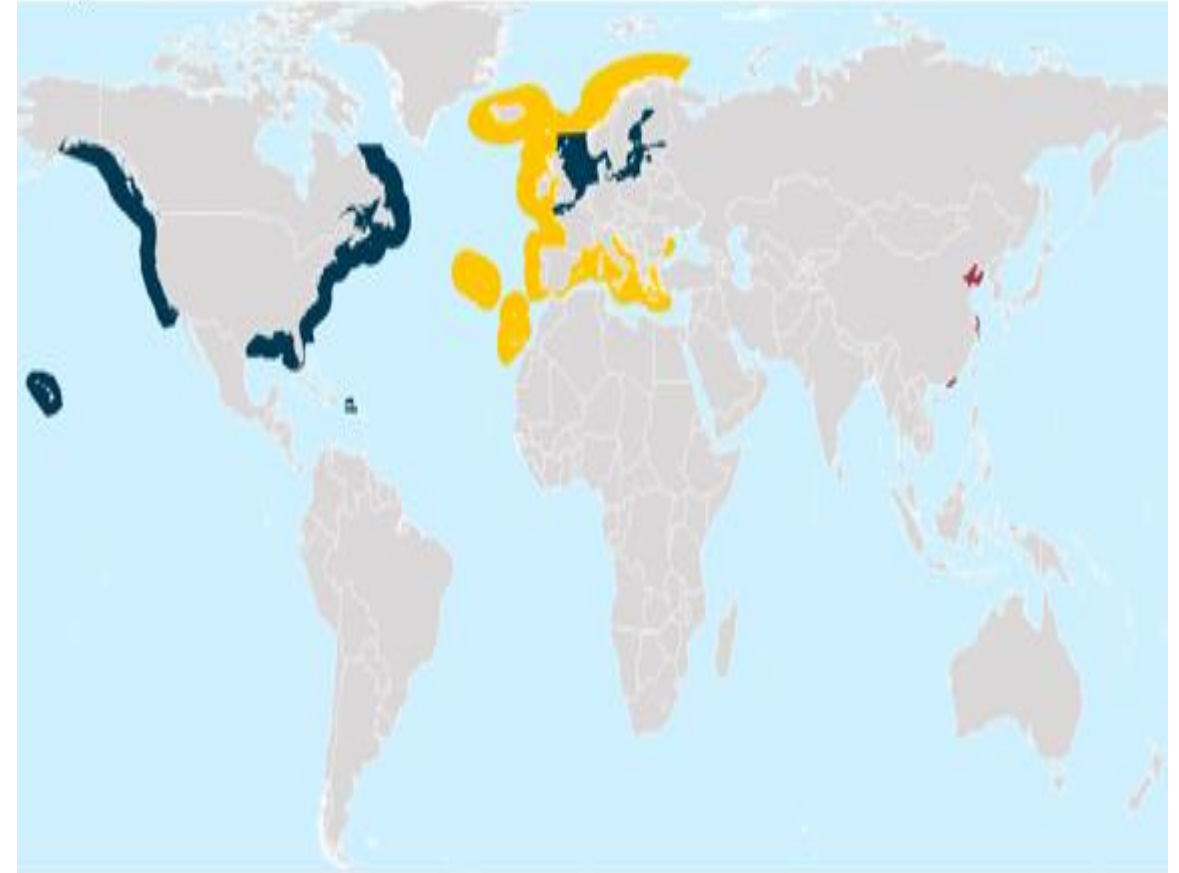
- Sulfur has health effects and can contribute to PM
- Marine Fuels: 7% of transportation fuels, 90% of sulfur
- 15 ships = global auto fleet; 1 cruise ship = 1 mil. autos
- **2008**: IMO mandated sulfur reduction in marine fuel in open ocean from 3.5% to 0.5%.
- **2016**: IMO affirmed January 2020 implementation date.
- American refiners and shipping companies have invested \$100 billion.



IMO 2020 EMISSION CONTROL AREAS

- ECAs include
 - the Baltic Sea area;
 - the North Sea area;
 - the North American area
 - and the United States Caribbean Sea
- United States has had lower sulfur emission requirement (.1%) than new standard (.5%) since 2015

Designated marine sulfur limitation areas



■ International Marine Organization Emission Control Areas
■ European Union Sulfur Directive ■ Chinese Emission Control Areas

IMO 2020 COMPLIANCE OPTIONS

- Ships will have options for complying with the requirement to reduce sulfur oxide emissions
 - 1) Switch to a lower sulfur fuel: 0.5% sulfur fuel oil, marine gasoil which meets the 0.5% sulfur specification, LNG, or methanol
 - 2) Install Scrubbers: Install on-board scrubbing technology to reduce the sulfur content of emissions from HS fuels to a 0.5% sulfur limit



IMO & MARPOL: ENFORCEMENT

- IMO has no enforcement authority; enforcement is by member states
- Flag states and port states share authority to enforce MARPOL
- In the United States, the EPA and USCG jointly and cooperatively enforce the provisions of Annex VI
- Efforts by USCG and EPA include inspections, investigations and enforcement actions if a violation is detected
- The efforts to ensure compliance with Annex VI include oversight of marine fueling facilities, on board compliance inspections, and record reviews.
- IMO is working to ensure consistent implementation/enforcement and expects to finalize enforcement guidelines in early 2019
- IMO adopted carriage ban effective March 1, 2020

IMPACT

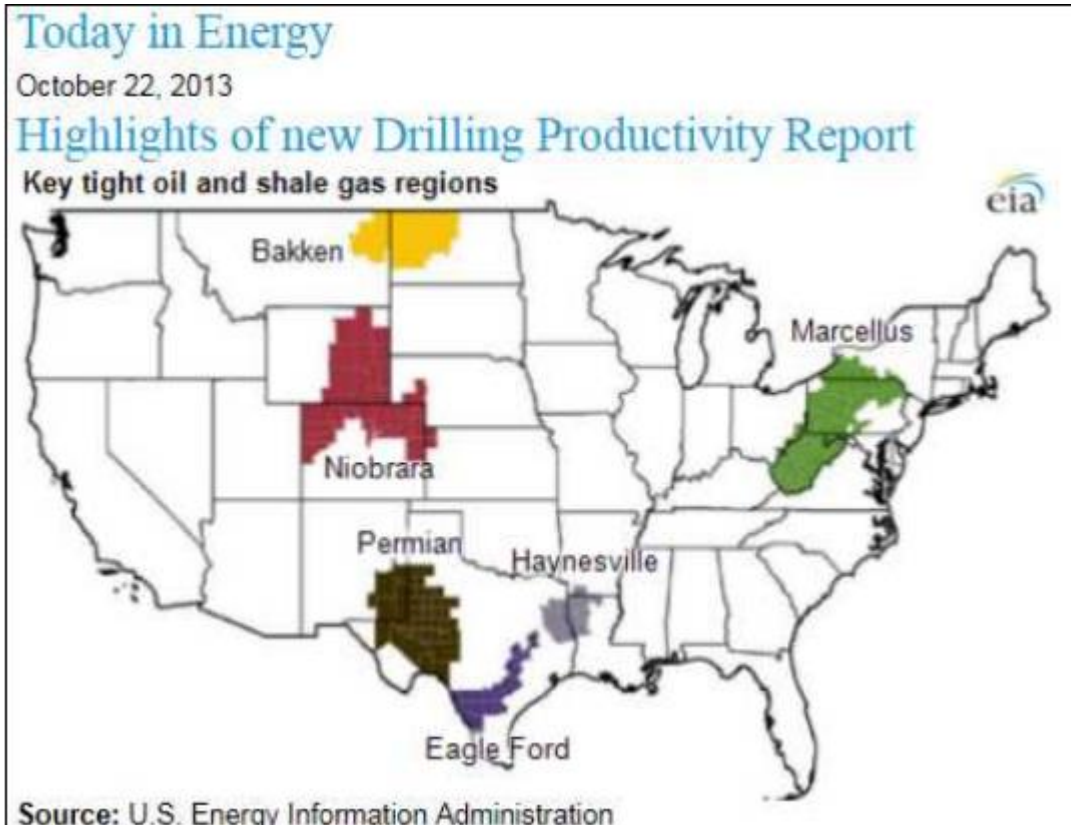
- Marine fuel market ~ 4 million barrels/day HSFO
- Refineries to find new outlets for HSFO
- Refineries can convert HSFO into lower sulfur products (ULSD, LSFO)
- Potential increase in ULSD demand, prices

CONCERNS

- Uneven implementation and compliance
- Potential market distortions from non-compliance
- Expected cost increase creates economic incentive for non-compliance
- Delay or uncertain enforcement unhelpful in spurring investment, hurts those who are prepared to comply

U.S. POSITIONED WELL TO COMPLY

- Once IMO 2020 is implemented, two main shifts are expected to occur
 - Light sweet crude will become more desirable
 - America’s refineries are ready to produce compliant fuels
- Refiners may have to run more crude or lighter crude
- The worldwide crude slate may get lighter
 - North American crude oils are typically light and sweet



Crude	API gravity	Sulfur (wt%)
Bakken	40-43	0.1
WTI	37-42	0.42
LLS	36-40	0.39
Eagle Ford	47.7	0.1
Eagle Ford Light	58.8	0.04

Source: Auers, J. R., R. M. Couture and D. L. Sutton (2014). "The North Dakota Petroleum Council Study on Bakken Crude Properties." Bakken Crude Characterization Task Force. North Dakota Petroleum Council, Bismarck, ND 58501. 4-Aug-2014.

Key Dates

January 15, 2019

Energy Information
Administration (EIA) issues 2019
pricing outlook

May 13 – 17, 2019

Marine Environmental Protection
Committee (MEPC)

Feb. 18 – 22, 2019

Sub-Committee on
Pollution Prevention
and Response

IMO POLLUTION PREVENTION & RESPONSE (PPR) SUB-COMMITTEE

MEPC, London, England, February 18-22

- No real effort to push for delay or relaxed enforcement at PPR
- Japan will allow open-loop scrubbers (right)
- Proposal by Jamaica, IPIECA, IBIA to allow for a 95% confidence interval that a fuel is compliant

Basic understanding of the risks to Human Health and Marine Environment by SO_x emission



SO_x, PM (and others) emission reduction by **Open-looped scrubber**

