Program Update

Designation of Emission Control Area to Reduce Emissions from Ships in the U.S. Caribbean

The International Maritime Organization has officially designated waters off the coasts of Puerto Rico and the U.S. Virgin Islands as an area in which stringent international emission standards will apply for ships. These standards will dramatically reduce air pollution from ships and deliver substantial benefits to the population of those U.S. territories, as well as to marine and terrestrial ecosystems. This fact sheet contains an overview of this geographic emissions control program.

Overview

On July 15, 2011, the International Maritime Organization (IMO) amended the International Convention for the Prevention of Pollution from Ships (MARPOL) designating specific portions of the coastal waters around Puerto Rico and the U.S. Virgin Islands as an Emission Control Area (ECA). This action brings these waters into an international control program for the emission of nitrogen oxides (NOx), sulfur oxides (SOx), and particulate matter (PM) from ships, most of which are flagged outside of the United States. Allowing for the lead time associated with the IMO process, the US Caribbean ECA will become enforceable in January 2014.

Ships are significant contributors to the Territories' emission inventories. The ECA is expected to reduce emissions of NOx by 27 percent, PM2.5 by 86 percent, and SOx by 96 percent, below levels in 2020 absent the ECA.

The area of the U.S. Caribbean ECA includes waters adjacent to coasts of the Commonwealth of Puerto Rico and the U.S. Virgin Islands, up to roughly 50 nautical miles (nm) from the territorial sea baselines of the included islands. The ECA is bounded such that it does not extend into marine areas subject to the sovereignty, sovereign rights, or jurisdiction of any state other than the United States.

EPA United States Environmental Protection Agency

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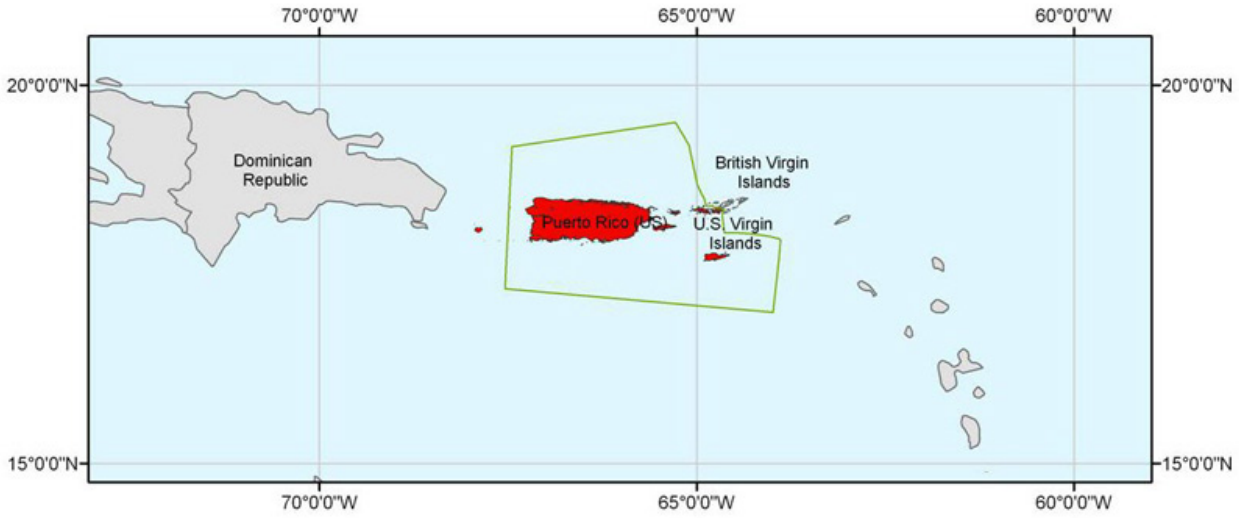

Figure 1: Area of the US Caribbean ECA

The Need to Reduce Emissions from Engines on Ships

The diesel engines that power ships are significant mobile source emitters. The propulsion engines on ships that sail in the ports and waters of Puerto Rico and the U.S. Virgin Islands typically use a thick, heavy fuel that can have extremely high sulfur content. Often the smaller auxiliary engines installed on these ships can also use this same "residual" fuel, which can contain sulfur up to 3 percent. As a result, these ships generate significant emissions of fine particulate matter, NOx, and SOx that cause adverse health effects and harm to public welfare, and contribute to visibility impairment and other detrimental environmental impacts.

The dependency of the islands' economies on marine transportation in combination with the physical and human geography of the territories place these populations and environments at an elevated risk from ship-related pollution. The dependency of the islands' economies on marine transportation in combination with the physical and human geography of the territories place these populations and environments at an elevated risk from ship-related pollution. There are well established links between NOx, SOx, ozone and PM exposure and asthma. The asthma mortality rate in Puerto Rico is 2.5 times higher than the rate in the continental United States. Further, Puerto Rico and the U.S. Virgin Islands are comprised of many highly sensitive ecosystems that are already vulnerable and are threatened by pollution from ships.

The contribution of diesel engines to air pollution is expected to grow even more over the next two decades. Designation of the US Caribbean ECA will significantly reduce emissions from ships and deliver substantial benefits to the local population, as well as to marine and terrestrial ecosystems.

The U.S. Government's analysis for this ECA shows populations of these islands are exposed to emissions from ships operating offshore, far beyond the boundaries of the designated ECA, in addition to emissions from ships operating in local ports. These port and offshore emissions affect virtually all people living in Puerto Rico and the U.S. Virgin Islands.

Emission Control Area Standards

In October 2008, the International Maritime Organization (IMO) adopted two additional tiers of NOx and fuel sulfur controls for ships. The most stringent of these standards apply to ships operating in designated Emission Control Areas (ECAs). The table below summarizes the standards and effective dates for the global and ECA standards for fuel sulfur and engine NOx that are found in Annex VI, regulations 13 and 14. The date on which the ECA requirements become enforceable for a specific area relates to its treaty amendment date. The ECA requirements will become enforceable in the U.S. Caribbean ECA in January 2014.

Table 1: International Ship Engine and Fuel Standards (MARPOL Annex VI)

	Effective Date	Fuel Sulfur	NOx
Emission Control Areas	May 2005 to June 2010	15,000 ppm	
	July 2010	10,000 ppm	
	January 2015	1,000 ppm	
	January 2016		Tier III Aftertreatment
Global	Before January 2011		Tier I Engine Controls
	January 2011		Tier II Engine Controls
	Before January 2012	45,000 ppm	
	2012	35,000 ppm	
	2020[a]	5,000 ppm	
Notes: [a] Subject to a fuel availability study in 2018, may be extended to 2025			

The fuel sulfur standards indicated in the above table are the maximum fuel sulfur content allowed under MARPOL Annex VI for ships with diesel engines over 130 kW. More stringent standards may apply under USEPA regulations, depending on the size of engine. To read more about how these engine and fuel standards apply in the United States, see 40 CFR part 1043, available on EPA's web page at http://www.epa.gov/otaq/oceanvessels.htm#engine-fuel.

Ships sailing in the designated area are expected to meet the most stringent ECA fuel standard through fuel switching. In most cases, ships already have the capability to store two or more fuels. However, some vessels may need to be modified for additional distillate fuel storage capacity. As an alternative to using low sulfur fuel, ship operators may choose to equip their vessels with scrubbers that extract sulfur from the exhaust.

The Tier III NOx standards for new engines in 2016 represent an 80 percent reduction below Tier I. We expect ships to meet the Tier III engine standard through the use of technology such as selective catalytic reduction. Other technological approaches may include exhaust gas recirculation, water injection strategies, and dual fuel diesel/natural gas engines.

Costs

The costs of implementing and complying with the US Caribbean ECA are expected to be reasonable in comparison to the costs of achieving similar emissions reductions through additional controls on land-based sources. We estimate the total costs of improving ship emissions from current performance to ECA standards while operating in the ECA will be approximately $70 million in 2020. The costs to reduce a ton of NOx, SOx and PM are estimated at $500, $1,000 and $10,000, respectively.[1] In comparison, the 2007 heavy-duty highway truck rule cost $2,300 per ton for NOx and $15,000 per ton for PM. Improving current ship emission levels to ECA standards is one of the most cost-effective measures available to obtain clean air benefits for these islands.

The economic impacts of complying with the program on ships engaged in international trade are expected to be modest. For example, the impact on the price of a cruise on a medium-sized cruise ship that operates a route between the U.S. mainland and Puerto Rico is estimated to increase by approximately US$0.60 per passenger per day for a 5-day cruise. This represents a less than one percent increase in the price of such a cruise. Container ships operating in the ECA are expected to see a cost increase of less than one percent of the cost of transport of a 20-foot container, or about $0.33 to $1.35 per unit, depending on the size of the ship and the length of the route.

Benefits

Reducing ship emissions from baseline performance to ECA standards will reduce local inventories of NOx, SOx and PM2.5 in 2020 by approximately 11,000, 31,000 and 3,300 short tons, respectively.[2] The emission reductions that will occur as a result of applying ECA controls in the area will help reduce the damage to human health and the environment that is caused by ship emissions and will help Puerto Rico and the U.S. Virgin Islands achieve and maintain healthier ambient air quality. Benefits also include reductions of stressors to areas of environmental and ecological significance, allowing them to begin to recover their natural balance.

For More Information

This ECA designation is the latest component of EPA's coordinated strategy to address emissions from all ships that affect U.S. air quality. You can access the ECA standards, the proposal to the IMO and related documents on EPA's Office of Transportation and Air Quality web site at:

www.epa.gov/otaq/oceanvessels.htm

The above page also contains information about other components of the strategy, including Clean Air Act standards and the North American ECA.

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[1] The proposal to the IMO presented cost effectiveness in units of US$ per metric ton ($/MT): $600/MT for NOx, $1,100/MT for SOx and $11,000/MT for PM.

[2] The proposal to the IMO presented emission reductions in units of metric tons (MT): 10,000 MT NOx, 3,000 MT PM2.5, and 28,000 MT SOx reduced.

For additional information, please contact the Assessment and Standards Division at:

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