

Cost / Benefit Analysis performed to support the lowering of sulfur in fuel oil - From 41 N.J.R. 4156(a)

The NORA Report

According to the NORA Report, producing low sulfur distillate that meets the proposed 500 ppm standard will cost refineries 5.4 to 6.8 cents per gallon more than producing fuel exceeding the maximum 500 ppm sulfur standard (high sulfur distillate). This figure includes both capital and operating costs of control equipment. Producing 15 ppm-compliant sulfur distillate will cost as much as 8.9 cents per gallon more than producing high sulfur distillate. The cost to refineries that have existing desulfurization facilities that could be revamped for lower sulfur content operation could be as much as four cents per gallon lower.

The API Report

The API Report provides additional support for the feasibility of the low sulfur heating oil supply. It analyzes the availability and cost to produce low sulfur heating oil for 2010 in the U.S. The API Report utilized a proprietary refinery analysis model that accounted for the operations of each domestic refinery that manufactures distillate fuel oil. The API report found that even without any change to the allowable sulfur-by-weight specifications in heating oil the 2010 production of low sulfur heating oil in the eastern U.S. will reach 250 thousand barrels per day (tbd), as compared to 90 tbd for high sulfur heating oil, so that these fuels represent approximately 73 and 27 percent of the total distillate fuel oil production in the eastern U.S. for 2010, respectively. This closely corresponds to the nationwide relative production values for high and low sulfur heating oil in 2010, which the API reports as 423 tbd for low sulfur heating oil as compared to 155 tbd of high-sulfur heating oil.

Based on the API Report modeling results for 2010, assuming that these results will be similar in 2014, and given the adequate notice that will be provided to refiners, the Department anticipates that there will be enough supply to satisfy New Jersey's market for low sulfur heating oil.

NESCAUM Report

NESCAUM used a USEPA Environmental Benefits Modeling and Analysis Program (BENMAP) to estimate the economic benefit of avoided adverse health care episodes, such as hospital admissions and medical treatment, that result from SO₂ emission reductions achieved from the implementation of low and ultra-low sulfur standards in 2018, within the northeast U.S. The analysis showed that the eastern and midwest U.S. will achieve SO₂ emission reductions of 180,000 tons with an economic benefit in reduced health care costs of \$3.63 billion, which corresponds to more than \$20,000 of benefit per ton of SO₂ removed.

No. 2 Oil

The Department used information from the NORA, API, NESCAUM reports and EIA data to determine the costs and benefits of implementing the proposed low and ultra-low sulfur standards. As discussed above, the API report found that the 2010 production of low sulfur heating oil in the eastern U.S. will reach 250 tbd, as compared to 90 tbd for high sulfur heating oil, so that these fuels represent approximately 73 and 27 percent of the total distillate fuel oil production in the eastern U.S. for 2010. To determine the total amount of high-sulfur heating oil consumed in New Jersey in 2007, the Department applied the 27 percent high sulfur heating oil to total heating oil ratio determined from the API Report to the 316,134 thousand gallons per year (tgy) of total residential distillate oil consumed in New Jersey for 2007. (State Energy Data System, Table F4a: Distillate Fuel Oil Consumption Estimates by Sector, 2007, Energy Information Administration, February 13, 2009, http://www.eia.doe.gov/emeu/states/sep_fuel/html/pdf/fuel_use_df.pdf) This yields 85,356 tgy of high sulfur heating oil consumed in New Jersey for 2007. Although the data are from 2007, it is reasonable to assume that they should closely approximate heating oil demand in 2014 and also in 2016, which may well be lower than this amount. This is because heating oil consumption in the State has leveled off from a high of

approximately 430,000 tgy in 2000 to approximately 300,000 tgy in 2006 and 2007. (State Energy Data System, Table 8: Residential Sector Energy Consumption Estimates, Selected Years, 1960-2006, New Jersey, http://www.eia.doe.gov/emeu/states/sep_use/res/use_res_nj.html) Also, energy efficiency improvement efforts should reduce fuel oil consumption.

New Jersey would achieve a SO₂ emission reduction of 1,030 tons per year (tpy) from the implementation of the low sulfur standard in 2014. This estimate is based on the application of USEPA's AP-42 SO₂ emission factor of 142 times S to the 85,356 tgy of high sulfur heating oil projected to be consumed in New Jersey in 2014. This emission factor is expressed in units of pounds of SO₂ per thousand gallons, and the S in the equation is the percent sulfur concentration by weight of the distillate fuel oil. (AP-42 Compilation of Air Pollution Emission Factors, Volume I, External Combustion Sources, Chapter 1.3, Fuel Oil Combustion, USEPA, September 1998) Since there are two different S values for New Jersey under the existing rule depending on the county (0.3 percent and 0.2 percent), the S value of 0.218 percent that the Department used for the calculation is a weighted average based on estimated county population in 2007. Subtracting the SO₂ emission calculated from the 0.218 percent S value and the 0.05 percent low sulfur S value yields a reduction of SO₂ emissions of 1,030 tpy.

The cost to convert the projected 85,356 gallons of high sulfur heating oil to low sulfur heating oil is estimated to be \$5.8 million. This is based on the application of the NORA cost estimate of 6.8 cents per gallon for converting high sulfur heating oil to low sulfur-heating-oil.

In addition to the 1,030 tpy of SO₂ emission reduction from the implementation of the proposed low sulfur rulemaking standard in 2014, the Department projects achieving SO₂ emission reduction of 294 tpy from implementation of the ultra-low sulfur standard in 2016. The Department used the same estimation methodology applied above, but with S representing a reduction of average sulfur-by-weight concentrations in the projected 316,134 tgy of low sulfur heating oil from 0.05 percent (500 ppm) to 0.0015 percent (15 ppm). (Final Regulatory Analysis: Control of Emissions from Nonroad Diesel Engines, EPA420-R-04-007, Table 7.1.6-10 Annual Distillate Fuel Demand and Sulfur Content:

Final NRLM Rule: USEPA, May 2004 (Table 7.1.6-10), <http://www.epa.gov/nonroad-diesel/2004fr/420r04007h.pdf>)

The cost to convert 316,134 tgy of low sulfur heating oil to ultra-low sulfur heating oil is estimated to be \$14.5 million, based on the NORA cost estimate of 4.6 cents per gallon to convert low sulfur heating oil to ultra-low sulfur heating oil. The Department added this amount to the \$5.8 million estimated cost to implement the low sulfur standard to obtain an overall cost estimate of \$20.3 million to implement both the proposed low and ultra-low sulfur standards for residential heating oil (No. 2 fuel oil). This corresponds to a cost of \$15,332 per ton of SO₂ emission reductions, based on the total SO₂ emission reductions of 1,324 tpy achieved from the implementation of both the proposed low sulfur and ultra-low sulfur standards for residential heating oil.