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Workgroup Recommendations and Other Potential Control Measures
Homes and Restaurants AND Stationary Combustion Sources Workgroups

HR001 – Regional Sulfur Fuel Oil Controls

Control Measure Summary: The goal of this control measure is to reduce sulfur dioxide (SO_2) emissions in New Jersey by reducing the sulfur content in fuel oil and lowering the emission limits of sources using fuel oil. This control measure entails three parts, all within N.J.A.C. 7:27-9: 1) provide a uniform sulfur content value and maximum allowable SO_2 emissions value for each of the grade of the fuel oil throughout the State; 2) lower the SO_2 emissions limit for #4 fuel oil & heavier; and, 3) lower sulfur content in #2 fuel oil, which does not include the low and ultra low sulfur diesel for mobile already required by United States Environmental Protection (USEPA) rules. The reason for wanting to reduced SO_2 emissions in New Jersey is because SO_2 produces secondary fine particles which accounts for 35% to 70% of all fine particles in the State.[a] The first two parts of this control measure are specific to New Jersey but the third part is a regional effort. Not only should New Jersey pursue this but all the other states in the Ozone Transport Region (OTR)/Northeast States for Coordinated Air Use Management (NESCAUM)/Mid-Atlantic Regional Air Management Association (MARAMA) should also commit to lowering sulfur content in fuel because the $PM_{2.5}$ nonattainment areas are affected by secondary fine particles transported from out of state.

Candidate measure Part 1:

Emission Reductions: The emissions reduction for requiring a sulfur content of 0.2% for #2 fuel oil and 0.3% for #6 fuel oil in the entire State (SO_2 emissions limit of 0.21 lbs/mmBtu for #2 fuel oil and 0.32 lbs/mmBtu for #6 fuel oil) is estimated to be 3,189 tons per year of SO_2.[b]

Control Cost: There is minimal cost associated with changing a rule to have uniform sulfur content and emissions limit especially when the fuels with the suggested sulfur content is widely available and meets the proposed emissions limit.

Timing & Area of Implementation: Immediately; New Jersey

Method of Implementaion: To arrive at a uniform sulfur content and maximum allowable SO_2 emissions for each of the grade of the fuel oil throughout the State, Tables 1 & 2 in N.J.A.C. 7:27-9 would need to be revised so that there would no longer be any zones in the State with differing allowable sulfur content in fuel. Therefore, the percent sulfur by weight and maximum allowable SO_2 emissions limit would be uniform throughout the State. By doing so, the percent sulfur by weight for the different grades of fuel oil would default to the lowest listed in Table 1 for that particular grade of fuel oil, i.e., 0.2% for #2 fuel oil & lighter and 0.3% for #4 fuel oil & heavier. Likewise, the SO_2 emissions limit in Table 2 would be 0.21 lbs/mmBtu for #2 fuel oil & lighter and 0.32 lbs/mmBtu for #4 fuel oil & heavier.

Emissions (tons/year) in New Jersey	
SO_2 2002 Base (proj. to 2009):	17,061
2009 Reduction:	-3,189
2009 Remaining:	13,872

[a] www.state.nj.us/dep/airmon

[b] The emissions reduction estimates for this white paper are based on total state fuel consumption data from EIA and the state population data from the Census Bureau. Therefore, they may be high because they do not include any reductions that may be due to control devices already installed at large point sources.

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Candidate measure Part 2: *Emission Reductions*: The emissions reduction for decreasing the SO_2 emissions limit from the 0.32 lbs/mmBtu in Part 1 of this control measure to 0.21 lbs/mmBtu for #6 fuel oil is estimated to be an additional 736 tons per year. *Control Cost*: The cost associated with lowering the SO_2 emissions limit varies depending on which option is used to meet the requirement. For the fuel switching option, a case study in New Jersey estimated the cost to be $33,000[c] per ton for upgrading the equipment. This does not take into consideration depreciation and cost savings from boiler maintenance for fouling, which can be a substantial cost saving. The SO_2 scrubber option would cost approximately $400 million for a 2,600 MW power plant.[d] Other estimate of the cost for SO_2 scrubbers is $400 per ton of SO_2 removed.[e] *Timing & Area of Implementation*: 2009; New Jersey *Method of Implementaion:* To lower the SO_2 emissions limit for #4 fuel oil & heavier, Table 2 of N.J.A.C. 7:27-9 would need to be further revised so that the limit for #4 fuel oil & heavier is equal to that of #2 fuel oil & lighter, or 0.21 lbs/mmBtu.	SO_2 2002 Base (proj. to 2009): 2009 Reduction: 2009 Remaining:	2,142 -736 1,406

[c] From a presentation made at a Stationary Combustion Sources Workgroup meeting.
[d] www.envirovaluation.org
[e] www.emissionstrategies.com

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Candidate measure Part 3:

Emission Reductions: The emissions reduction for requiring a sulfur content of 0.05% (500 ppm) for #2 fuel oil is estimated to be 8,821 tons per year in New Jersey by 2009. From 0.05% to 0.0015% (15 ppm), that would be an additional 2,852 tons per year of SO_2 reduction by 2015. Regionally, the SO_2 emission reduction is approximately 33,225 tons per year by going to the 500 ppm #2 fuel oil and an additional 10,611 tons per year by decreasing to 15 ppm[f].

Control Cost: The cost of lowering the sulfur content to 500 ppm for #2 fuel oil is approximately $8.00 per year per household. To go to 15 ppm, it would be an additional $36.00 per year per household. This translates to an increase of 1% to 5% in annual fuel cost for businesses and industries. A cost benefit associated to the reduction of sulfur in fuel oil is the savings from reduced maintenance for boiler fouling. By reducing the sulfur content from 2000 ppm (0.2%) to 500 ppm, the average savings from maintenance is estimated to be $29 per year per house.[g]

Timing & Area of Implementation: 500 ppm by 2009 and 15 ppm by 2015; New Jersey and push for regional effort

Method of Implementaion: To lower sulfur content in #2 fuel oil & lighter, Table 1 of N.J.A.C. 7:27-9 would need to be revised. Currently, NESCAUM is the lead for the regional effort for this control measure and has proposed 500 ppm (0.05%) as the short-term goal and 15 ppm (0.0015%) as the long-term goal. There is no implementation date set for this yet by NESCAUM but it has been discussed that the implementation should be a few years after the low sulfur diesel (500 ppm) and ultra low sulfur diesel (15 ppm) are phased in as required by federal mandate. The low sulfur diesel is required to be available 2007 for all mobile sources. The ultra low sulfur diesel is required to be available by 2012 for all mobile sources. New Jersey should follow NESCAUM recommendation for implementation dates but a reasonable estimate for when the refineries can completely switch over to these sulfur levels for all #2 distillate (fuel oil and diesel) could be 2009 for 500 ppm and 2015 for 15 ppm.

	SO_2
2002 Base (proj. to 2009):	
2009 Reduction:	10,973
2009 Remaining:	-8,230 2,743
2015 Reduction:	-2,661 82
2015 Remaining:	

Policy Recommendation of State/Workgroup: Multiple workgroups recommend that the Department move forward with this control measure because of the significant air quality benefit the State would receive from it. In revising N.J.A.C. 7:27-9, the Department should include provisions for the timing of this control measure. The uniform sulfur content and emissions limit can be implemented right away while lowering the emissions limit for #4 fuel oil & heavier and lowering the sulfur content in #2 fuel oil & lighter should be carefully timed so refineries have sufficient time to install/modify any equipment to comply with the requirements.

[f] The regional reduction was estimated by taking the ratio between New Jersey and the OTC/NESCAUM region and multiplying that with the New Jersey's estimated emissions reduction.

[g] NESCAUM's Low Sulfur Heating Oil in the Northeast States: An Overview of Benefits, Costs and Implementation Issues

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Brief Rationale for Recommended Strategy: 1) Revising Tables 1 & 2 in N.J.A.C. 7:27-9 for uniform sulfur content and maximum allowable SO_2 emissions is simple with minimal cost and no implementation issues. Therefore, the benefits from this definitely outweigh the cost.
2) To reduce the SO_2 emissions limit for #4 fuel oil & heavier, there are several options including fuel switching or add-on control. Both of these have been implemented at different types of sources with great success in the State. The cost is offset by the emissions reduction. Also, this affects only a small number of large facilities, therefore.
3) Reducing sulfur content to in #2 fuel oil should be economically and socially feasible by the dates mentioned above because the refineries would have already had to meet the federal mandate for the low and ultra low sulfur diesel several years ago and the additional time would allow the refineries to meet the required capacity.