State of New Jersey
Department of Environmental Protection

State Implementation Plan (SIP)
For Regional Haze

Appendix M: Control Measure Descriptions

July 2009

CONTROL MEASURE DESCRIPTIONS

This Appendix discusses the regional haze related control measures implemented, or that may be implemented in New Jersey.

New Jersey Existing Rules

NO_x RACT Rule (2006): The NJDEP adopted amendments to N.J.A.C. 7:27-19, Control and Prohibition of Air Pollution from NO_x, on September 8, 2005. The amendments were based on the OTC's March 6, 2001 model rules to control NO_x emissions tied to shortfall measures. The OTC model rules were created as the result of the agreement formally set forth in a "Memorandum of Understanding Among the States of the Ozone Transport Commission Regarding the Development of Specific Control Measures to Support Attainment and Maintenance of the Ozone National Ambient Air Quality Standards" (MOU), which was approved by the OTC on June 1, 2000. Specifically, the New Jersey amendments apply to owners and operators of certain stationary sources of NO_x emissions, including industrial/commercial/institutional (ICI) boilers, combustion turbines, and reciprocating engines. Owners and operators of such sources are required to achieve the emission limit specified in the rules or to comply instead with alternative requirements, such as an emission averaging plan, an alternative maximum allowable emission rate or a plan for phased compliance (repowering or use of innovative technology). The amendments also regulate distributed generation[1] of electricity, consistent with the OTC recommendation in its March 28, 2001 "Resolution of the States of the Ozone Transport Commission Concerning the Creation of incentives for Additional Distributed Generation of Electric Power." The USEPA issued final approval of the New Jersey SIP revision, including these rule amendments on July 31, 2007.[2] The rules became effective August 30, 2007.

Diesel Idling Rule Changes: Since diesel engines are significant contributors of ozone and fine particulate precursors in the State of New Jersey, any efforts to control and reduce those emissions contribute to the State's attainment of the ozone and fine particulate matter NAAQS. On September 18, 2006, the NJDEP proposed amendments to the existing diesel idling rules.[3] The rules became effective July 25, 2007. These rules address the allowable idling duration for diesel-powered motor vehicles, and exemptions to that maximum idling limit. The changes reduce the allowable exemptions to a three-minute diesel idling standard. There were exemptions to the idling limit which allowed qualified vehicles to idle for an unlimited length of time under certain conditions. The revisions to the rule modify these exemptions to further limit idling in cold weather; limit the idling time for vehicles that transport people; clarify the idling rules regarding trucks waiting in line; clarify the type of vehicle which would be considered an "emergency motor vehicle," and the times which would be considered "an emergency situation;"

[1] Distributed generation is a system composed of generation located near the energy consumer's site that may be integrated with the electric grid to provide multiple benefits on both sides of the utility meter. Source: CECA. Distributed Generation Facts, Consumer Energy Council of America, http://www.cecarf.org/Programs/DG/DGFacts.html.

[2] 72 Fed. Reg. 41626-41629 (July 31, 2007).

[3] Control and Prohibition of Air Pollution from Diesel-Powered Motor Vehicles Air Administrative Procedures and Penalties Proposed Amendments: N.J.A.C. 7:27-14.1, 14.3, 7:27A-3.10(m)14. New Jersey Department of Environmental Protection. September 18, 2006.

eliminate the exemption for idling while a vehicle is in for repairs that do not require the engine to be engaged to complete; eliminate the exemption for idling while attaching or detaching a trailer, should it take longer than the allowed three consecutive minutes; and phase out the exemption for sleeper berths.

Asphalt Production Plants: The NJDEP adopted amendments to its rules at N.J.A.C. 7:27-19.9 on March 20, 2009, in order to lower NO_x emissions from asphalt production facilities. The amendments, based on an OTC model rule, would pursue control measures to achieve at least a 35 percent reduction of NO_x emissions from asphalt production plants from current levels, with the inclusion of emission limits based on type of fuel combusted and implementation of Best Management Practices (BMP) requirements. The OTC guidance is based on emission rates and percent reductions typically achieved from the installation of low NO_x burners (LNB) and flue gas recirculation (FGR) to reduce NO_x emissions from asphalt plants. A low NO_x burner reduces NO_x by staged combustion. In flue gas recirculation, the flue gas is used to assist in cooling the combustion temperature, which in turn reduces the NO_x generated. The implementation of Best Management Practices would allow for substantial reductions in fuel consumption and corresponding reductions in the products of combustion, including NO_x. Best Management Practices include annual combustor tune-ups, effective stockpile management to reduce aggregate moisture content, lowering mix temperature, and other maintenance and operational best practices.

Industrial/Commercial/Institutional (ICI) Boiler Rule 2009:[4] ICI boilers combust fuel to produce heat and process steam for a variety of applications, including chemical, metals, paper, petroleum, and food production industries, and for space heating in office buildings, hotels, apartment buildings, hospitals, and universities. Industrial boilers are generally smaller than boilers in the electric power industry, and typically have heat inputs in the 10-250 MMBtu/hr range; however, industrial boilers can be as large as 1,000 MMBtu/hr or smaller than 1 MMBtu/hr. Most commercial and institutional boilers have a heat input less than 100 MMBtu/hr. In New Jersey, 70 percent of the population is smaller than 50 MMBtu/hr.

New Jersey ICI boilers were regulated according to size, fuel and boiler type. New Jersey's NO_x limits generally applied only to ICI boilers at least 50 MMBtu/hr located at major sources (i.e., point sources). ICI boilers at minor sources (i.e., area sources) were not subject to the maximum allowable emission rates, but were required to adjust the combustion process annually in boilers as small as 5 MMBtu/hr, effective as of 2010.

New Jersey adopted amendments to its ICI boiler rules at N.J.A.C. 7:27-19.7 on March 20, 2009. The amendments would revise the NO_x emission limits for both point and area source ICI boilers. Under the adopted amendments, owners and operators of any ICI boilers as small as 25 MMBtu/hr are required to achieve emission limits specified in the rules. For more details on this rulemaking, see Ozone RACT – New Rules and amendments for 14 source categories.[5]

Coal-Fired Boilers Serving Electric Generating Units (EGU): Electric Generating Units produce electricity by turning a generator. Some generators are turned by steam produced from a boiler.

[4] Some categories have 2009 compliance dates; remainder has 2012 compliance dates.
[5] Available at http://www.nj.gov/dep/rules/adoptions/adopt_090420.pdf

Other generators are turned by combustion gasses produced by a turbine. Boilers and turbines typically use coal, oil, or gas as fuel. Some EGUs operate only on days on which there is a very high demand for electricity, such as during hot summer days when there is an increased use of air conditioners. For the purpose of these rules, High Electric Demand Days (HEDD) units are EGUs that are capable of generating 15 Megawatts (MW) or more and have been operated less than or equal to an average of 50 percent of the time during the immediately preceding three ozone seasons. The adopted rules do not address nuclear powered EGUs.

In New Jersey there are ten coal-fired boilers serving EGUs. These coal-fired boilers are not HEDD units. Coal-fired boilers are the highest emitting sources of particles, sulfur dioxide (SO_2) and oxides of nitrogen (NO_x) in New Jersey. These ten boilers and their locations are:
B.L. England Generating Station unit 1 - Upper Township, Cape May County,
B.L. England Generating Station unit 2 - Upper Township, Cape May County,
Carney's Point Generating Station unit 1 - Carney's Point, Salem County,
Carney's Point Generating Station unit 2 - Carney's Point, Salem County,
Deepwater Generating Station unit 6/8 - Pennsville, Salem County,
Hudson Generating Station unit 2 - Jersey City, Hudson County,
Logan Generating Plant - Logan Township, Gloucester County,
Mercer Generating Station unit 1 - Hamilton Township, Mercer County,
Mercer Generating Station unit 2 - Hamilton Township, Mercer County, and
Vineland Municipal Electric Utility unit 10 - City of Vineland, Cumberland County

The adopted amendments to N.J.A.C. 7:27-4.2, N.J.A.C. 7:27-10, and N.J.A.C. 7:27-19.4 on March 20, 2009, would implement a multi-pollutant control strategy to reduce allowable particle, SO_2, and NO_x emissions, respectively, from all New Jersey coal-fired boilers. The rules lower the maximum allowable emission rates of NO_x, particles and SO_2 from coal-fired boilers to help the State reach the Federal NAAQS for $PM_{2.5}$ and to reduce regional haze. More stringent maximum allowable emission rates will cause non-compliant facilities to achieve compliance by installing reasonably available control technology. N.J.A.C. 7:27-4.2, N.J.A.C. 7:27-10, and N.J.A.C. 7:27-19.4 set forth a December 15, 2012 compliance date to provide reasonable time to install the necessary pollution control equipment and to be consistent with the compliance deadline for the existing multi-pollutant provisions of the mercury rule for coal-fired boilers at N.J.A.C. 7:27-27.7(d).

Promulgating maximum allowable emission rates in rules for all existing coal-fired boilers serving EGUs meets the requirements of the Federal Clean Air Act and communicates to other states the emission rates that New Jersey considers reasonable for existing EGUs with respect to ozone nonattainment, $PM_{2.5}$ nonattainment, and control of regional haze. The adopted rules will reduce NO_x emissions because it has a more stringent maximum allowable NO_x emission rate than the previous rule.

High Electric Demand Day (HEDD) Units: In March 2007, following a year long process, six of the OTC states committed to pursue reductions in NO_x emissions from electrical generating units that primarily operate on high electrical demand days (HEDD) starting with the 2009 ozone

season.[6] On these high electric demand days, increased power generation is needed, usually on short notice. In Connecticut, Delaware, Maryland and Pennsylvania, boilers and turbines that primarily run to follow electrical load needs supply HEDD power generation. In New Jersey and New York, combustion turbines primarily supply HEDD power generation. The majority of the HEDD units in the six states are not controlled and produce significant NO_x emissions on HEDDs. For example, on a typical summer day (June 4, 2005), NO_x emissions for the six states for all Electric Generating Units (EGUs) were 551 tons per day (tpd). On a HEDD (July 26, 2005), NO_x emissions were 1,349 tpd. Most of this increase in emissions is due to power production from uncontrolled HEDD units.

As part of the HEDD initiative, New Jersey plans to reduce NO_x emissions by 19.8 tpd on the nominal high electrical demand days. Specifically, power generators in New Jersey will be responsible for securing these reductions and will be required to submit a plan on how they will reduce NO_x. The generators will have flexibility in securing the 2009 reductions. New Jersey adopted amendments to N.J.A.C. 7:27-19 on March 20, 2009. The rules require that all HEDD units meet performance standards that reflect modern low NO_x technology by May 1, 2015.

Glass Manufacturing: New Jersey adopted amendments to its current glass manufacturing rules at N.J.A.C. 7:27-19.10 on March 20, 2009. The amendments, based on OTC guidance, would revise the NO_x emission rates to reduce emissions consistent with the installation of oxy-fuel firing, or equivalent measures, at the time of the next furnace re-build. Although several alternative NO_x control technologies exist, including combustion modifications (low NO_x burners, oxy-fuel firing, oxygen-enriched air staging), process modifications (fuel switching, batch preheat, electric boost), and post combustion modifications (fuel reburn, SNCR, SCR), oxyfiring is considered the most effective because it not only reduces NO_x emissions by as much as 85 percent, but also reduces energy consumption, increases production rates by 10-15 percent, and improves glass quality by reducing defects. In addition, oxyfiring is demonstrated technology for the glass industry. Of New Jersey's 25 glass manufacturing furnaces, five are already equipped with oxy-fuel firing and nine are electric. For more information on glass furnaces, see the Reasonably Available Control Technology (RACT) Analysis for the Attainment and Maintenance of the Annual Fine Particulate Matter ($PM_{2.5}$) National Ambient Air Quality Standard.[7]

Case-by-Case NO_x Limit Determinations (FSELs/AELs): Existing RACT rules set performance standards for many source categories. Major NO_x facilities with emission sources having a potential to emit more than 10 tons of NO_x per year where no previous NJDEP RACT limit has been established in the RACT Rules (N.J.A.C. 7:27-16 and N.J.A.C. 7:27-19), i.e., sources without performance standards, must apply to the NJDEP for a Facility-Specific Emission Limit (FSEL). When a performance standard exists and the source determines it is not reasonable, they apply to the NJDEP for an Alternative Emission Limit (AEL). FSELs and AELs are determined on a case-by-case basis.

[6] Memorandum of Understanding Among the States of the Ozone Transport Commission Concerning the Incorporation of High Electrical Demand Day Emission Reduction Strategies into Ozone Attainment State Implementation Planning. Ozone Transport Commission, March 2, 2007.
[7] Available at http://www.state.nj.us/dep/baqp/pm25sip/Appendix%20A7_%20PM2.5%20RACT.pdf

Currently, New Jersey has about 40 of these case-by-case FSEL/AEL determinations for sources throughout the State. New Jersey's FSEL and AEL provisions for oxides of nitrogen are found at N.J.A.C. 7:27-19.13.

As part of its RACT analysis, the NJDEP reviewed all of its existing FSELs and AELs and found that many were approved as long ago as 1997. In many cases, control technologies have advanced sufficiently since that time, warranting the reevaluation of these case-by-case determinations. The NJDEP adopted amendments to N.J.A.C. 7:27-19 on March 20, 2009, requiring all facilities with existing FSELs or AELs to either comply with the existing or revised RACT limits, where applicable, or demonstrate that a new FSEL/AEL is warranted. The NJDEP further proposes that the newly issued AELs will terminate after a certain number of years, requiring periodic re-evaluations and determinations, in an effort to keep these limits current until compliance with specific rule emission limits are achieved.

Municipal Waste Combustor (Incinerator) NO_x Rule: New Jersey has five resource recovery facilities (RRF) located in Essex, Union, Camden, Gloucester, and Warren Counties, respectively. There are 13 municipal waste combustors (MWC) at these five facilities. The NJDEP approved facility specific emission limits (FSELs) pursuant to N.J.A.C. 7:27-19.13 for each of these MWCs to meet the 1-hour ozone NAAQS, because these facilities qualified as major facilities (i.e., those facilities with the potential to emit more than 25 tons of NO_x per year containing a source operation that has the potential to emit greater than 10 tons per year) and the State did not establish specific RACT source requirements for MWCs. The USEPA has adopted Federal Plans for both large and small MWCs. New Jersey is the delegated state authorized to implement and enforce those plans, in accordance with Memoranda of Agreement (MOAs) between the State and the USEPA. The Federal standard for emissions of NO_x from MWCs, as reflected in the Federal rules dated May 10, 2006, and previous Federal plans, is 205 ppm.[8] Currently, all New Jersey MWCs are in compliance with the Federal standard.

As part of its ozone RACT analysis, the NJDEP reviewed the Municipal Waste Combustor FSELs and determined that, when equipped with selective non-catalytic reduction (SNCR), NO_x controls are capable of more NO_x reductions than are currently being achieved by some of the municipal solid waste facilities. The ozone RACT rulemaking, adopted March 20, 2009, eliminates the various MWC FSELs and sets a more stringent source category NO_x emission limit, which will result in further NO_x emission reductions from this source category.

Federal Existing Rules

Small Offroad Engine Rule: On May 18, 2007, the USEPA proposed new rules that would set stricter standards for most lawn and garden equipment and small recreational watercraft.[9,10] Specifically, the proposal would establish new exhaust emission standards that manufacturers are expected to meet using catalytic converters in many types of small watercraft, lawn, and garden

[8] 70 Fed. Reg. 75348-69 (May 10, 2006).
[9] 72 Fed. Reg. 28098-146 (May 18, 2007).
[10] For more information about the proposal, visit USEPA's websites at Lawn and Garden http://www.epa.gov/otaq/equip-ld.htm for lawn and garden equipment and http://www.epa.gov/otaq/marinesi.htm for gasoline boats and personal watercraft.

equipment. This proposed rule also includes fuel evaporative standards for all the types of equipment and watercraft covered in the rulemaking. The new standards would apply as early as 2011 for most lawn and garden equipment (under 25 horsepower) and 2009 for watercraft.

Locomotive Engines and Marine Compression-Ignition Engines Less Than 30 Liters per Cylinder: On March 14, 2008, the USEPA adopted more stringent exhaust emission standards for locomotives and marine diesel engines.[11] The standards include: tightening emission standards for existing locomotives when they are remanufactured; setting near-term engine-out emission standards (Tier 3 standards) for newly-built locomotives and marine diesel engines; and setting longer-term standards (Tier 4 standards) for newly-built locomotives and marine diesel engines that reflect the application of high-efficiency aftertreatment technology. The USEPA is also proposing provisions to eliminate emissions from unnecessary locomotive idling.

The standards for remanufactured locomotives will take effect as soon as certified remanufacture systems are available (as early as 2008). Tier 3 standards for newly-built locomotive and marine engines would phase in starting in 2009. Tier 4 standards for newly-built locomotives and marine diesel engines would phase in beginning in 2014 for marine diesel engines and 2015 for locomotives.

Tier 1 Vehicle Program: Pursuant to 42 U.S.C. §7521, the USEPA promulgated regulations which revised the tailpipe standards of the Federal Motor Vehicle Control Program (FMVCP) for light duty vehicles and light duty trucks.[12] These standards, known as Tier 1, were implemented in phases beginning with the 1994 model year. The Tier 1 standards encompassed pollutants previously regulated (that is, carbon monoxide, nitrogen oxides, and particulate matter), as well as the addition of non-methane hydrocarbons (NMHC). The standards themselves are a function of vehicle class, pollutant, useful life, engine cycle, and fuel. The Tier 1 rulemaking also established new intermediate and full useful life[13] levels for air pollution control devices on light-duty vehicles and light-duty trucks, as well as new vehicle weight classes. The regulation affected petroleum and methanol-fueled motor vehicles.

National Low Emission Vehicle Program (NLEV): The NLEV[14] program required automobile manufacturers to meet more stringent new car standards, starting with the 1999 model year in the OTC states and starting with the 2001 model year in the remainder of the nation, except for California. New Jersey participated in the NLEV program for the model year 2006, after which New Jersey came under the Federal Tier 2 program. New Jersey subsequently adopted the Low Emission Vehicle II (LEV II) program, which becomes effective for vehicles delivered for sale in New Jersey on and after January 1, 2009.

Tier 2 Vehicle Program/Low Sulfur Fuels: On February 10, 2000, the USEPA promulgated rules for its comprehensive Tier 2/Low Sulfur Gasoline program.[15] These regulations are designed to treat a vehicle and its fuel as a system, resulting in multiple efforts to reduce highway source

[11] 73 Fed. Reg. 25097 (May 6, 2008).
[12] 56 Fed. Reg. 25724 (June 5, 1991).
[13] Useful life is the number of years that the vehicle is expected to be in use.
[14] For more information on NLEV, see USEPA website at http://www.epa.gov/otaq/lev-nlev.htm.
[15] 65 Fed. Reg. 6698-746 (February 10, 2000).

emissions. In addition to requiring new tailpipe emissions standards for all passenger vehicles, sport utility vehicles (SUVs), minivans, vans and pick-up trucks, the USEPA simultaneously promulgated regulations to lower the sulfur standard in gasoline. These regulations phased in between 2004 and 2007.

Heavy Duty Diesel Vehicle (HDDV) Defeat Device Settlement: On October 22, 1998, the U.S. Department of Justice and the USEPA announced a settlement with seven major diesel engine manufacturers to resolve claims that they installed computer software on 1993 through 1998 model year heavy-duty diesel engines which was designed to disengage the engine's emission control system during highway driving.[16] The settlement, involving Caterpillar, Inc., Cummins Engine Company, Detroit Diesel Corporation, Mack Trucks, Inc., Navistar International Transportation Corporation, Renault Vehicles Industries, S.A., and Volvo Truck Corporation, included an $83.4 million total penalty. The settlement also required the manufacturers to offer software updates (chip reflash) at no cost to the truck owners at the time of engine rebuild.

Heavy Duty Diesel Vehicle (HDDV) Engine Standards:[17] On July 31, 2000, the USEPA issued a final rule for the first phase of its two-part strategy to significantly reduce harmful diesel emissions from heavy-duty trucks and buses. This rule finalized new diesel engine standards beginning in 2004, for all diesel vehicles over 8,500 pounds. Additional diesel standards and test procedures in this final rule began in 2007. This new rule required heavy-duty gasoline engines to meet new, more stringent standards starting no later than the 2005 model year. According to the USEPA, these new standards require gasoline trucks to emit 78 percent less NO_x and hydrocarbons, and diesel trucks to emit 40 percent less NO_x and hydrocarbons, than current models. The second phase of the program required cleaner diesel fuels and cleaner engines, reducing air pollution from trucks and buses by another 90 percent. The USEPA issued the final rule, to take effect in 2006-2007 on January 18, 2001.[18]

Nonroad Diesel Engines: In June 1994, the USEPA promulgated regulations to control volatile organic compounds (VOCs), NO_x and carbon monoxide (CO) emissions from diesel-powered compression ignition engines at or greater than 50 horsepower (hp), i.e., bulldozers.[19] These Tier 1 standards phased in from 1996 to 2000. In October 1998, the United States Environmental Protection Agency (USEPA) promulgated regulations to control VOC, NO_x and carbon monoxide emissions from diesel-powered compression ignition engines for all engine sizes.[20] This rule includes Tier 1 standards for engines under 50 horsepower (hp) (i.e., lawn tractors), Tier 2 standards for all engine sizes, and more stringent Tier 3 standards for engines rated over 50 hp. The new Tier 3 standards are expected to lead to control technologies similar to those that will be used by manufacturers of highway heavy-duty engines to comply with the 2004 highway

[16] For more information, see the USEPA's web page on Heavy Duty Diesel Engine Consent Decree Documents at www.epa.gov/Compliance/resources/cases/civil/caa/diesel/condec.html.
17 For more information, see the USEPA's Office of Transportation and Air Quality web site at http://www.epa.gov/otaq/hd-hwy.htm.
[18] 66 Fed. Reg. 5002-50 (January 18, 2001).
[19] 59 Fed. Reg. 31306 (June 17, 1994).
[20] 63 Fed. Reg. 56968-7023 (October 23, 1998).

engines standards.[21] The new Tier 1 standards were phased in between the years 1999 and 2000, Tier 2 standards between 2001 and 2006, and Tier 3 between 2006 and 2008.

Large Industrial Spark-Ignition Engines over 19 kilowatts: Spark-ignition nonroad engines are mostly powered by liquefied petroleum gas, with others operating on gasoline or compressed natural gas. These engines are used in commercial and industrial applications, including forklifts, electric generators, airport baggage transport vehicles, and a variety of farm and construction applications.

In September 2002, the USEPA adopted new standards to regulate these engines.[22] The emission standards are two-tiered. The Tier 1 standards, which started in 2004, are based on a simple laboratory measurement using steady-state procedures. The Tier 2 standards, starting in 2007, are based on transient testing in the laboratory, which ensures that the engines will control emissions when they operate under changing speeds and loads in the different kinds of equipment.

Also included is an option for manufacturers to certify their engines to different emission levels to reflect the fact that decreasing NO_x emissions tend to increase carbon monoxide emissions (and vice versa). In addition to these exhaust-emission controls, manufacturers must take steps starting in 2007 to reduce evaporative emissions, such as using pressurized fuel tanks. Tier 2 engines are also required to have engine diagnostic capabilities that alert the operator to malfunctions in the engine's emission-control system. The rule also includes special standards to allow for measuring emissions without removing engines from equipment.

Recreational Vehicles: Recreational vehicles include snowmobiles, off-highway motorcycles, and all-terrain-vehicles (ATVs). In September 2002, the USEPA adopted new standards to regulate nonroad recreational engines and vehicles.[23] The standards that affect $PM_{2.5}$ emissions are presented in Table M1. As shown by this table, only the new standards for off-highway motorcycles and ATVs will reduce NO_x, a $PM_{2.5}$ precursor.

Table M1: Summary of Emission Standards for Recreational Vehicles

Vehicle	Model year	Emission standards		Phase-in
		HC*+NO_x g/km	CO g/km	
Off-highway Motorcycle	2006	2.0	25.0	50%
	2007 and later	2.0	25.0	100%
ATV	2006	1.5	35.0	50%
	2007 and later	1.5	35.0	100%

*HC = Hydrocarbon

[21] USEPA. Regulatory Announcement: New Emission Standards for Nonroad Diesel Engines. United States Environmental Protection Agency Office of Mobile Sources, EPA420-F-98-034, August 1998.
[22] 67 Fed. Reg. 68242-447 (November 8, 2002).
[23] 67 Fed. Reg. 68242-447 (November 8, 2002).

Federal Compression Ignition Marine Engine Regulations (Commercial Marine Engines):[24,25] In 1999, the USEPA promulgated regulations for commercial marine diesel engines over 37 kilowatts (kW), including engines with per cylinder displacement up to 30 liters.[26] This rule established VOC and NO_x emission standards, starting in 2004, for new engines with per cylinder displacement up to 2.5 liters. This rule also established standards in 2007 for engines with per cylinder displacement between 2.5 and 30 liters.[27] The engines covered by this rule are divided into two categories: Category 1: rated power at or above 37 kW - specific displacement of less than 5 liters per cylinder. These engines are primarily found in fast ferries. Category 2: rated power at or above 37 kW - specific displacement greater than or equal to 5, but less than 30, liters per cylinder. These engines are primarily found in tug and towboats.

Federal Small Spark Ignition Engine Regulations: In July 1995, the USEPA promulgated the first phase of its regulations to control emissions from new nonroad spark ignition engines.[28] This regulation established VOC and carbon monoxide emission standards for all model year 1997[29] and newer nonroad spark ignition engines that have a gross power output at or below 19 kilowatts. These engines are used principally in lawn and garden equipment, including, but not limited to, lawn mowers, leaf blowers, trimmers, chainsaws, and generators. In March 1999, the USEPA promulgated Phase 2 regulations to control emissions from new nonroad spark ignition engines.[30] These regulations established tighter VOC and NO_x standards for non-handheld equipment such as lawn mowers and commercial turf equipment. The new standards were phased in between the years 2001 and 2007. In March 2000, the USEPA promulgated additional Phase 2 regulations to control emissions from new nonroad spark ignition engines.[31] This regulation established tighter VOC, NO_x, and carbon monoxide standards for handheld equipment such as string trimmers (i.e., weed whackers), leaf blowers and chainsaws. The new standards were phased in between the years 2002 to 2007.

New Jersey Proposed Rules

Diesel Smoke (I/M Cutpoint) Rule Changes: Like the diesel idling efforts, the NJDEP requirements for the inspection and maintenance (I/M) of diesel vehicles are designed to reduce the emissions from diesel engines, which are significant contributors to ozone, $PM_{2.5}$ and its precursors. The NJDEP proposed amendments to its existing diesel I/M rules on June 16, 2008, to reduce the allowable smoke from heavy-duty diesel vehicles. Smoke opacity, which is used as a surrogate for particulate matter, is the degree to which a plume of smoke will obstruct transmission of visible light. Smoke opacity is used as an indicator for mal-maintenance. New

[24] For more information, see the USEPA's regulatory announcement on Emission Standards for New Commercial Marine Diesel Engines at http://www.epa.gov/otaq/regs/nonroad/marine/ci/fr/f99043.pdf.
[25] The USEPA has not finalized Tier 2 standards for Category 3 commercial marine engines. The USEPA will promulgate final Tier 2 standards for Category 3 engines on or before December 17, 2009. ("Category 3" means relating to a marine engine with a specific engine displacement greater than or equal to 30 liters per cylinder). Source: 40 C.F.R. §§ 94.1, 94.8; 72 Fed. Reg. 20948-52 (April 27, 2007).
[26] 64 Fed. Reg. 73300-73 (December 29, 1999).
[27] USEPA. Technical Highlights: Organization of Gasoline and Diesel Marine Engine Emission Standards. United States Environmental Protection Agency Office of Mobile Sources, EPA420-F-99-046. December 1999.
[28] 60 Fed. Reg. 34582-657 (July 3, 1995).
[29] Ibid; Model year 1997 is defined as "The 1997 model year will run from January 2, 1996 to December 31, 1997."
[30] 64 Fed. Reg. 15208-55 (March 30, 1999).
[31] 65 Fed. Reg. 24268-314 (April 25, 2000).

Jersey's proposed amendments will update and strengthen the existing smoke requirements and update the Pass/Fail Standards for the periodic and roadside inspections.

Currently available technology allows diesel engines to emit smoke at rates much lower than the existing cutpoints, when operating in accordance with the manufacturers' specifications. Therefore, it is appropriate to revise the heavy-duty diesel vehicle inspection program standards to reflect the current diesel engine technology and ensure appropriate maintenance is performed. Although newer diesel-powered vehicles and equipment usually operate more cleanly and may contribute less to air quality problems than their predecessors, diesel-powered trucks and buses tend to remain in service for 20 years or more. Unless the excess emissions due to mal-maintenance or lack of repair are reduced, trucks and buses will continue to emit excess levels of exhaust particles and contribute to air pollution in the State for many years to come. Implementing stricter opacity cutpoints for diesel-powered vehicles will result in appropriate maintenance and reduce emissions.

New Jersey Rules to be Proposed

Low Sulfur Fuel Oil Strategy: Lowering the sulfur content in fuel oil is a part of the strategy established by the MANE-VU states to reduce and prevent regional haze. The MANE-VU states in the inner zone (New Jersey, New York, Delaware and Pennsylvania) plan to reduce the sulfur content of distillate oil to 0.05 percent sulfur by weight (500 ppm) in 2014, the sulfur content of No. 4 residual oil to 0.25 percent sulfur by weight in 2014, the sulfur content of No. 6 residual oil to 0.3 to 0.5 percent sulfur by weight in 2014, and to further reduce the sulfur content of distillate oil to 15 ppm in 2016. The MANE-VU states in the outer zone plan to reduce the sulfur content of distillate oil to 0.05 percent sulfur by weight in 2014, the sulfur content of No. 4 residual oil to 0.25 percent sulfur by weight in 2018, the sulfur content of No. 6 residual oil to no greater than 0.5 percent sulfur by weight by 2018, and to further reduce the sulfur content of distillate oil to 15 ppm in 2018.

The NJDEP is planning to propose to amend N.J.A.C. 7:27-9, Sulfur in Fuels, specifically section 9.2, which specifies sulfur content standards and maximum allowable sulfur dioxide emissions. The proposed amendments affect those who store, offer for sale, sell, deliver or exchange fuel for use in New Jersey, as well as the users of these fuels. The NJDEP is proposing changes to reduce the maximum allowable sulfur content in fuel and the maximum allowable SO_2 emissions from fuel combustion in order to reduce the emissions of SO_2, direct PM, and other pollutants from the combustion of fuel in New Jersey.

Currently, maximum allowable sulfur levels in No. 2 and lighter fuel oil in New Jersey are either 2,000 parts per million (ppm) or 3,000 ppm. Maximum allowable sulfur levels in No. 4 fuel ranges from 3,000 ppm (0.3 percent) to 20,000 ppm (2.0 percent). Maximum allowable sulfur levels in No. 5 and No. 6 fuels also range from 3,000 to 20,000 ppm. The NJDEP is planning to reduce the maximum allowable sulfur content of No. 2 and lighter fuel oil to 500 ppm (0.05 percent), then 15 ppm (0.0015 percent) statewide; reduce the maximum allowable sulfur content of No. 4 fuel oil to 2,500 ppm (0.25 percent) statewide; and reduce the maximum allowable sulfur content of No. 5, No. 6 and heavier fuel oils to 5,000 ppm (0.5 percent) in Zones 1, 2, 3 and 5 (the standard will remain 3,000 ppm (0.3 percent) in Zones 4 and 6).

New Jersey Potential Future Rules or Programs

Fugitive Dust Emission Regulation: New Jersey has a control strategy in place for the control of stormwater runoff from streets under the New Jersey Municipal Stormwater Regulation program[32] that also has air quality benefits by the removal of fugitive dust. The strategy includes both mandated and voluntary street sweeping. Some streets are required to be swept monthly.

New Jersey also has standards that reduce fugitive emissions from various sources such as tillage and construction. These standards have been adopted by NJDOT and New Jersey Department of Agriculture (NJDOA) under the "Soil Erosion and Sediment Control Standards: Standards for Dust Control."

New Jersey intends to further address fugitive dust[33] emissions in a new rule. The rule as currently envisioned would establish provisions requiring dust management plans for certain source categories and any facility with a history of dust emissions. Requiring dust management plans for these facilities will help control dust emissions to eliminate nuisance dust, improve visibility, and improve the health of the people of New Jersey. As with any rule, the New Jersey Air Pollution Control and Administrative Procedures Act requirements will be followed.

Open Burning Permit Regulation Revisions: New Jersey has one of the most stringent open burning rules in the nation. The existing New Jersey rules limit all types of open burning within the State, N.J.A.C. 7:27-2 et seq. These rules have been in effect since 1956, with subsequent revisions further restricting open burning. The rules prohibit most open burning, limit other types of open burning, and have been successful in minimizing burning throughout the State. The limited instances where open burning is allowed, only after a person obtains an air pollution control and Forest Fire Service permit, include:

- Prescribed burning,
- Limit agricultural management burning as follows:
  - Infested plant life,
  - Herbaceous plant life and hedgerows,
  - Orchard prunings and cullings,
  - Land clearing for farming,
- Emergencies,
- Dangerous material.

New Jersey plans to propose amendments to the current rules to require that any permit issued for open burning in the State would prohibit open burning on days forecasted as unhealthy for air quality. This condition is currently envisioned to apply in all but emergency situations.

Home Wood Heating Advisory Program:

[32] 2006 Annual Report summary on New Jersey's Stormwater Regulation program is available at http://www.state.nj.us/dep/dwq/pdf/2006msrpannualreportlong.pdf (Accessed November 19, 2007)

[33] Fugitive dust is made up of suspended particles caused by human activities and wind. Typical sources of fugitive dust include wind erosion, construction, roads, and agriculture. Industrial activities such as quarries and mineral processing can also emit fugitive dust.

Wood burning is one of the largest sources of direct fine particulate matter, $PM_{2.5}$, emissions in New Jersey. With the high price of conventional heating fuels, the onset of cold weather brings a dramatic increase in the use of fireplaces and woodstoves. This results in large quantities of particulate matter being released into the local air shed. Wood smoke contains over 200 chemicals and compound groups, many considered as air toxics.

New Jersey is considering strategies to reduce the emissions of wood smoke. Implementation of these strategies would reduce fine particle emissions and improve visibility. One strategy under consideration is a Home Wood Heating Advisory Program, similar to those in Oregon and Washington states. In general, these programs require the limitation of burning during times when unhealthy air quality is forecast or monitored. Other control measures under investigation include woodstove and fireplace change-out programs. Financial incentives might be provided to help home owners to replace their older, more polluting fire box or stove with a newer, less polluting one.

The NJDEP has posted on its website an informational webpage regarding techniques for proper wood burning, health effects of wood burning, and links to other useful web pages.[34]

PM from #6 Fuel Oil-Fired Boilers: Among the combustion sources emitting significant amounts of direct $PM_{2.5}$ are coal and oil-burning boilers. New Jersey has adopted rule that limits multiple pollutant emissions, including NO_x, PM, and SO_2, from coal-fired boilers , and NO_x from boilers burning natural gas, #2 fuel oil and #4 or #6 fuel oil. After reviewing stack test results for PM_{10} from #6 fuel oil-firing boilers, the NJDEP is considering a particulate limit of 0.0300 lb/MMBtu, consistent with the limit adopted for existing coal-fired EGUs, based on the use of lower sulfur oil or the installation of an electrostatic precipitator for control.

Stationary Diesel Engines: Incomplete combustion of diesel fuel results in direct particle emissions. Using New Jersey Environmental Management System (NJEMS) electronic permitting and emissions inventory database as the basis for determining potential reductions, there are at least 350 non-emergency stationary diesel engines greater than or equal to 50 horsepower currently in-use in New Jersey. The actual number is expected to be much higher, perhaps over 1,000 engines. Through the use of add-on particle control, the NJDEP estimates an 85 percent reduction, about 130 tons per year of $PM_{2.5}$ emissions, may be achieved from 350 engines. New Jersey is evaluating an engine control technology retrofit program comparable to California's engine compliance certification program.[35] Provisions of a new rule may include emission limits for PM, NO_x, CO, and VOC. Available retrofit add-on controls, engine timing, feasibility of regulating smaller engines (25 – 50 hp), and compliance dates will be considered during rule development.

Refineries - Process Heaters and Boilers: Process heaters, and boilers operating at petroleum refineries emit significant amounts of NO_x, CO, SO_2, and PM emissions. Boilers are designed to generate steam for use throughout the refinery, while process heaters burn fuels to transfer heat

[34] http://www.state.nj.us/dep/baqp/woodburning.html
[35] California Code Rules, Air Toxic Control Measures (CCT-ATCM: September, 2005)

directly to process materials. Boilers and process heaters are similar in that they are indirect combustion devices that burn fuels such as natural gas, fuel oil, and refinery fuel gas. New Jersey currently regulates NO_x emissions from indirect heat exchangers at N.J.A.C. 7:27-19.7.

Available control technologies for controlling NO_x emissions from these units include Ultra Low NO_x Burners (ULNB) and Selective Catalytic Reduction (SCR). These control technologies have been successfully applied to both types of equipment achieving emission reductions up to 90 percent. Recent enforcement settlements required some refineries to reduce average nationwide NO_x emissions from heaters to 0.04 lbs NO_x/MMBtu.

NJDEP plans to set more stringent maximum NO_x limits for each refinery heater, as well as apply the Federal 0.040 lb per million BTU average limit to each New Jersey refinery, rather than nationwide.

Refineries - Fluid Catalytic Cracking Units (FCCUs): Catalytic cracking units convert middle distillate, gas oil and residuum into gasoline, jet and diesel fuels by using a series of processing steps that literally "crack" large, heavy molecules into smaller, lighter ones. Heat and catalyst are used to convert the heavier oils to lighter products. Fluid catalytic cracking unit systems are the most widely used cracking process in the MARAMA region and are the largest air contaminant emission sources at the refinery. New Jersey has four gasoline-producing refineries with fluid catalytic cracking units. These refineries are major facilities with Title V Operating Permits, and all emit large quantities of criteria pollutants (SO_2, NO_x, VOCs, CO, and coarse particulate matter (PM_{10})), as well as HAPs. New Jersey currently regulates NO_x emissions from fluid catalytic cracking units at N.J.A.C. 7:27-19.13.

MARAMA's model rule for FCCUs, includes emissions limits for particulate matter, SO_2, NO_x, and carbon monoxide.[36] The MARAMA Technical Oversight Committee recommended the most stringent limits in recent Consent Decrees or rules in other jurisdictions. Feasible control technologies are summarized in Table 2-6 of MARAMA's report entitled, "Assessment of Control Technology Options For Petroleum Refineries in the Mid-Atlantic Region, Final Report, January 2007" ("Final Report").

NJDEP will consult with the USEPA concerning the feasibility of further NOx reduction from FCCUs, while maintaining low direct emissions of PM.

Refineries – Flares: Petroleum refinery flares are intended to be last-resort control devices used to safely dispose of flammable waste gases from emergency process upsets, as well as during start-up, shutdown and turnaround operations. The combustion of these gases can emit large quantities of NO_x, SO_2, and carbon monoxide into the atmosphere and are believed to be underestimated. New Jersey currently regulates VOC emissions from refinery flares at N.J.A.C. 7:27-16.13.

MARAMA's model rule for petroleum refinery flares includes control measures designed to reduce NO_x, SO_2, VOC, and carbon monoxide emissions.[37] The model rule includes

[36] The MARAMA model rules are posted at http://www.marama.org for public review.
[37] The MARAMA model rules are posted at http://www.marama.org for public review.

requirements for the owner/operators of refinery flares to eliminate the flaring of routinely generated refinery fuel gases. Other items included in MARAMA's flare model rule include operational requirements, monitoring system requirements, and guidelines for calculating flare emissions. Control technology options for flares are summarized in Table 4-5 of the Final Report.

NJDEP plans to consult with other states and the USEPA in further evaluating the operation and minimization of flare emissions. Substantial efforts are underway in Texas to better quantify flare emissions.