4.0 Control Measures

Connecticut has a long history of implementing local and regional control measures to reduce NOx and VOC emissions to meet our 1-hour and 8-hour ozone attainment obligations. Similarly, Connecticut has a history of implementing local and statewide measures to reduce particulate and sulfur dioxide emissions to meet particulate matter obligations, including actions under a limited maintenance plan for New Haven. Emissions reductions from these measures, as well as reductions from federal emission control programs, achieved significant reductions in ambient $PM_{2.5}$ levels in Connecticut prior to the 2002 base year. Many of these measures continue to reduce emissions of direct $PM_{2.5}$ and its precursors.

Such previously implemented control measures form the foundation of Connecticut's $PM_{2.5}$ attainment planning and constitute a significant number of Connecticut's reasonably available control measures (RACM). This section of this demonstration addresses the two requirements of CAA Section 172(c)(1) for this plan to include all RACM and to provide for attainment of the annual $PM_{2.5}$ NAAQS through (1) an analysis to demonstrate all RACM have been implemented (Section 4.1); and (2) a catalogue of measures reducing emissions in Connecticut, RACM or not, that contribute to the predicted attainment in 2010 for the NY-NJ-CT area (Sections 4.2 through 4.4). Some of the control measures identified in this section are discussed in Sections 5 and 8 with respect to their use in modeling future year emissions or as weight-of-evidence in support of a conclusion that timely attainment will be achieved in the area.[1]

4.1 RACM Analysis

Although Connecticut has no violating monitors for the annual $PM_{2.5}$ NAAQS and is expected to continue to monitor attainment through 2010, Connecticut is part of the NY-NJ-CT $PM_{2.5}$ nonattainment area and thus a RACM analysis is required. RACM refers to measures that may be applicable to a wide range of sources, including mobile and areas sources, whereas RACT is a type of RACM specifically designed for stationary sources. RACM and RACT measures are considered together, consistent with the $PM_{2.5}$ Implementation Rule, where both RACT and RACM include measures that are economically feasible, technically feasible and contribute to the advancement of the attainment date. The $PM_{2.5}$ Implementation Rule requires measures that reduce three pollutants (directly emitted fine particulate matter ($PM_{2.5}$), nitrogen oxides (NOx) and sulfur dioxide (SO_2)) to be analyzed as potential RACM.[2]

Given Connecticut's currently monitored attainment and the projected attainment of the NY-NJ-CT nonattainment area by 2010, CTDEP concludes that no new measures are necessary as RACM. To reach this conclusion, CTDEP underwent the practical exercise of identifying and evaluating control measures with the potential to create reductions in NOx, SO_2 and direct $PM_{2.5}$. Such measures that were reviewed and rejected as RACM are listed in Appendix 4A. These potential control measures were gathered from a number of sources including EPA's recommendations in the $PM_{2.5}$ Implementation Rule, measures currently planned in other states

[1] Both SIP and non-SIP measures are identified in this section. CTDEP's inclusion of the measures for discussion here is independent of the SIP status and does not indicate a request for approval as such.

[2] 72 FR 20629, April 25, 2007. Although CTDEP has made no finding of significant contribution for emissions of VOC, recently adopted and in-process measures that reduce VOC are discussed as further measures to reduce $PM_{2.5}$ concentrations, by reducing secondary organic aerosols.

in the region, and emission control initiatives in California and other states.[3] A cursory evaluation of the broad list on the basis of technical and economic feasibility significantly reduced the number of potential measures. Based on projected timely attainment in the area, CTDEP could readily determine, without modeling or further analysis, that no new measure alone or in conjunction with other measures will advance the attainment date by one year for the annual $PM_{2.5}$ NAAQS.

While no new RACM are identified as necessary for this demonstration, a number of measures adopted in the past have contributed to Connecticut's monitored attainment and are considered as RACM. Continuing reductions from such measures plus reductions from non-RACM measures will ensure continued compliance with the NAAQS in Connecticut and attainment in the NY-NJ-CT area. Section 4.2 discusses the pre-2002 control strategies that CTDEP considers RACT and RACM, which were implemented prior to the 2002 baseline year used for the $PM_{2.5}$ emissions inventory and modeling. Section 4.3 discusses the post-2002 control strategies that contribute to the modeled $PM_{2.5}$ concentrations to advance the attainment date to 2009 and hence are considered RACM. Section 4.4 identifies additional measures that produce directionally correct emissions reductions. While such measures are not RACM as they are difficult to quantify, are not federally enforceable and may not advance attainment, CTDEP pursues them as weight-of-evidence.

Thus, the remainder of this section identifies all measures that reduce in-state emissions of $PM_{2.5}$ or its precursors, regardless whether or not a measure is considered RACM; whether or not a measure is submitted to the SIP; or whether the emission reductions produced by a measure are included in projecting $PM_{2.5}$ levels in the future. Sections 5 and 8 of this demonstration identify measures with regard to their use in modeling future year emissions or as weight-of-evidence.

4.2 Pre-2002 Control Measures

The pre-2002 control measures that have made contributions to lowering $PM_{2.5}$ concentrations are listed in Table 4-1. These measures include both state and federal requirements that control at least one of the major PM creating pollutants (direct $PM_{2.5}$, NO_x, SO_2) or produce VOC emissions reductions.[4] These measures are considered RACM *in toto* as past implementation is evidence that each measure was economically and technically feasible, and, as a group, the measures reduced emissions to contribute to the advancement of the attainment date.

[3] A precedent to CTDEP's $PM_{2.5}$ RACM review was a regional examination of control measures as RACM for the purposes of demonstrating attainment of the 8-hour ozone NAAQS. CTDEP participated in this regional exercise organized through the Ozone Transport Commission (OTC). The process the OTC used to evaluate and select candidate control measures is summarized in the Technical Support Document that is Appendix 4B to this demonstration. CTDEP had adopted, or is in the process of adopting, several of the candidate control measures chosen in the OTC process; those control measures are discussed in CTDEP's 8-Hour Ozone Attainment Demonstration, which was submitted to EPA on February 1, 2008. Some of those measures are also identified in this section as contributing to $PM_{2.5}$ NAAQS attainment.

[4] Although CTDEP has made no finding of significant contribution for emissions of VOC, recently adopted and in process measures that reduce VOC are discussed as further measures to reduce $PM_{2.5}$ concentrations, by reducing secondary organic aerosols.

Table 4-1. Pre-2002 Control Measures

Control Measure	Pollutant Controlled			
	PM	NO_X	SO_2	VOC
Federal Motor Vehicle Control Program (Tier 0)		X		X
Federal Tier 1 Motor Vehicle Controls	X	X		X
Federal Low Emission Vehicle Program	X	X		
Federal On-board Refueling Vapor Recovery				X
Reformulated Gasoline – Phases I and II		X		X
Federal Non-Road Control Programs	X	X		X
CAA Title IV Acid Rain Program (requirements for the control of acid deposition)		X	X	
EPA Wood Stove Certification Program	X			
Control of Open Burning CGS Section 22a-174(f)	X	X		
New Source Review Permit to Construct and Operate Stationary Sources RCSA Section 22a-174-3	X	X	X	X
Control of Particulate Matter and Visible Emissions RCSA Section 22a-174-18	X			
Control of Sulfur Compound Emissions from Fuel Burning Equipment RCSA Section 22a-174-19			X	
Control of Nitrogen Oxides Emissions from Fuel Burning Equipment RCSA Section 22a-174-22		X		
Connecticut's Enhanced Inspection & Maintenance Program RCSA 22a-174-27		X		X
Dispensing of Gasoline/Stage I and Stage II Vapor Recovery RCSA Section 22a-174-30				X
Low Emission Vehicles RCSA Section 22a-174-36		X		X
Standards for Municipal Waste Combustors (Phase 1) RCSA 22a-174-38	X	X	X	

4.2.1 Federal Control Measures

Federal Tier 0 and Tier 1 Motor Vehicle Controls

Federal emission standards for on-road vehicles have become increasingly more stringent since the CAA was amended in 1990. In June 1991, EPA published a final rule establishing "Tier 1" emission standards to supplement previous federal standards (i.e., "Tier 0" standards established prior to the 1990 CAA Amendments) for light-duty vehicles and trucks.[5] The final rule implemented the mandates of CAA sections 202(g) and 202(h), setting both certification and useful life standards for emissions of NO_X, VOC and PM (as well as carbon monoxide), phased-in over model years from 1994 through 1996.[6]

National Low Emission Vehicle (NLEV) Program

Light-duty vehicle emission standards were reduced from the analogous Tier 0 and Tier 1 standards in 1998 through the National Low Emission Vehicle (NLEV) Program, a voluntary agreement reached among 23 vehicle manufacturers and nine northeastern states, including Connecticut.[7] The NLEV Program required the phase-in of lower emitting vehicles, beginning with model year 1999 in the Northeast, and with model year 2001 throughout the remainder of the country.

Federal On-Board Refueling Vapor Recovery (ORVR)

Pursuant to CAA Section 202(a)(6), EPA promulgated regulations that require passenger car and light truck manufacturers to meet refueling emission standards. For passenger cars, the onboard control requirements were phased-in over three model years with 40 percent, 80 percent and 100 percent of new car production being required to meet the standard in model years 1998, 1999 and 2000, respectively. The regulations establish a refueling emission standard of 0.20 grams VOC per gallon of dispensed fuel, which will yield a 95 percent emission reduction over uncontrolled levels. After phase-in, EPA estimates the ORVR requirements result in capture of 95 percent of refueling emissions, thereby reducing VOC and toxic emissions from vehicle refueling by 300,000 to 400,000 tons nationwide.[8]

Reformulated Gasoline - Phase II

The federal reformulated gasoline (RFG) program is a two-phased program designed to provide reductions of both VOC and NOx emissions. Phase I was implemented in 1995 and Phase II went into effect in 2000. Phase II RFG performance standards require a minimum emission reduction of 27% for VOC and 7% for NOx from baseline levels. Reformulated gasoline is sold statewide in Connecticut.

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[5] 56 FR 25724, June 5, 1991.

[6] *See* http://www.epa.gov/otaq/stds-ld.htm.

[7] 40 CFR Part 86 Subpart R; See http://www.epa.gov/oms/regs/ld-hwy/lev-nlev/subpt-r.pdf.

[8] With adoption by EPA of the onboard rule, moderate ozone nonattainment areas are relieved of the CAA requirement to implement Stage II, but many of these areas continue to implement Stage II to satisfy other air quality requirements. Connecticut continues to implement its Stage II program, in part due to uncertainty about the lifespan of ORVR canisters and in recognition that only light-duty vehicles have ORVR systems.

CAA Title IV – Acid Rain Program

The Acid Rain Program was established to achieve significant environmental and public health benefits through reductions in emissions of SO_2 and NO_x, the primary causes of acid rain. The Program required a two-phase tightening of the restrictions placed on fossil fuel-fired power plants. Phase I began in 1995 and affected 263 units at 110 mostly coal-burning electric utility plants located in 21 eastern and Midwestern states. An additional 182 units joined Phase I of the program as substitution or compensating units, bringing the total of Phase I affected units to 445. Emissions data indicate that 1995 SO_2 emissions at these units nationwide were reduced by almost 40 percent below their required level. Phase II, which began in the year 2000, tightened the annual emissions limits imposed on large, higher emitting plants and also set restrictions on smaller, cleaner plants, to regulate over 2,000 units in all. By 2002, the Program achieved significant reductions in SO_2 and NO_x emissions. Over 40 Acid Rain Program Units in Connecticut follow the national trend in reducing SO_2 and NO_x emissions.

Wood Stove Certification Program

Since 1988, EPA has required manufacturers of wood stoves to certify that each model line of wood stoves offered for sale in the United States comply with the EPA particulate emissions limits specified in the new source performance standard for residential wood heaters. EPA-certified wood stoves are cleaner and more efficient than a wood stove manufactured before 1988. As part of the certification process, each wood stove model line is required to undergo emissions testing in accordance with EPA Reference Method 28 and sampling methods 5G or 5H by an EPA-accredited laboratory.

Federal Non-Road Control Programs

Non-road engines are used in a variety of applications such as construction equipment, outdoor power equipment, farm equipment, lawn and garden equipment, marine vessels, locomotives and aircraft. Prior to the mid-1990's, emissions from these engines were largely unregulated. EPA has since issued regulated emissions from a number of categories of new non-road engines.[9] As listed in Table 4-2[10] and described below, non-road mobile source controls contained in this attainment demonstration include the adoption of a number of different standards for compression-ignition engines, spark-ignition engines, marine diesel engines, locomotives and aircraft; as well as relevant changes to fuels used to power engines in the non-road source category.

[9] *See* http://www.epa.gov/nonroad/index.htm.

[10] Table 4-2 lists both pre-and post-2002 federal non-road control programs. The discussion addresses each measure since these programs create reductions for years after implementation as older engines are replaced.

Table 4-2. Non-Road Mobile Sources Control Measures

Non-Road Engine Category	Date of Final Rule	*NOx*	$PM_{2.5}$	SO_2	VOC	Implementation Phase-In Period
Compression Ignition (diesel) Engines						
Tier 1: Land-Based Diesel Engines > 50 hp	06/17/1994 (59 FR 31306)		●			1996-2000
Tier 1: Small Diesel Engines < 50 hp	10/23/1998 (63 FR 56968)	●	●		●	1999-2000
Tier 2: Diesel Engines (all sizes)	10/23/1998 (63 FR 56968)	●	●		●	2001-2006
Tier 3: Diesel Engines 50 - 750 hp	10/23/1998 (63 FR 56968)	●	●		●	2006-2008
Tier 4: All Diesel Engines (Except locomotive and marine vessels)	06/29/2004 (69 FR 38958)	●	●		●	2008-2015
Spark-Ignition (e.g., gasoline) Engines						
Phase 1: SI Engines < 25 hp (except marine & recreational)	07/03/1995 (60 FR 34581)		●		●	1997
Phase 2: Non-Handheld SI Engines < 25 hp	03/30/1999 (64 FR 15208)		●		●	2001-2007
Phase 2: Handheld SI < 25 hp	04/25/2000 (65 FR 24268)		●		●	2002-2007
Gasoline SI Marine Engines (outboard & personal watercraft)	10/04/1996 (61 FR 52088)				●	1998-2000
Large Spark-Ignition Engines >19 kW (or >25 hp)	11/08/2002 (67 FR 68242)		●		●	2004/2007
Recreational Land-Based Spark-Ignition Engines	11/08/2002 (67 FR 68242)		●		●	2006-2012
Marine Diesel Engines **MARPOL: New/Old Engines on Vessels Constructed Starting 1/1/2000**	09/27/1997 MARPOL (Annex VI of International Convention on Prevention of Pollution from Ships)	●	●		●	2000
Commercial Marine Diesel Engines[1] (US-flagged vessels)	12/29/1999 (64 FR 73300)	●	●		●	2004/2007
Recreational Marine Diesel Engines >37 kW (or >50 hp)	11/08/2002 (67 FR 68242)	●	●		●	2006-2009
Marine Diesel Engines (US-flagged vessels) >30 liters/cylinder	02/28/2003 (68 FR 9746)	●	●		●	2004
Locomotives **New & Remanufactured Locomotives and Locomotive Engines[2]**	04/16/1998 (63 FR 18978)	●	●		●	(see note 2) Tier 0: 1973-2001 Tier 1: 2002-2004 Tier 2: 2005 +
Non-Road Diesel Fuel **(phased into all non-road sectors by 2012)**	06/29/2004 (69 FR 38958)	●	●	●		2007/2010/2012
Aircrafts **Control of Air Pollution From Aircraft and Aircraft Engines 1** **Control of Air Pollution From Aircraft and Aircraft Engines 2**	 05/08/1997 (62 FR 25356) 11/17/2005 (70 FR 69664)		●			 1997 2005
Future Control Measures **Final Locomotive & Marine Diesel Rule** **Proposed Spark-Ignition Engines, Equipment, and Vessels Rule**	 03/14/2008[3] (signed) 05/18/2007[4] (72 FR 28098)	●	●		●	 2008-2015 2009, 2011-2012

[1] Only applies to commercial marine diesel engines with displacements under 30 liters per cylinder.

[2] EPA established three sets of locomotive standards, applied based on the date of first manufacture (i.e. during the Tier 0, Tier 1, or Tier 2 periods). The standards take effect when the locomotive or locomotive engine is first manufactured and continue to apply at each periodic remanufacture.

[3] This rule, finalized March 2008, will start achieving reductions from remanufactured engines in 2008, with phase-in for new engines from 2009-2015. See: http://www.epa.gov/otaq/regs/nonroad/420f08004.htm. Emissions calculations in this SIP do not account for reductions from this measure.

[4] This is a proposed rule, not yet finalized. Emissions calculations in this SIP do not account for reductions from this measure.

- *Non-Road Compression Ignition (Diesel) Engines*

EPA rules have established four tiers of emission standards for new non-road diesel engines. EPA's first non-road regulations were finalized in 1994,[11] when Tier 1 emission standards were issued for most large, greater than 50 horsepower (hp), land-based non-road compression-ignition (CI, or diesel) engines used in applications such as agricultural and construction equipment. These standards were phased in between 1996 and 2000.

In 1998, EPA subsequently promulgated Tier 1 standards for smaller (< 50 hp) diesel engines, including marine propulsion and auxiliary engines, which required phase-in between 1999 and 2000.[12] At the same time, EPA also issued more stringent Tier 2 emission standards for all non-road diesel engine sizes to be phased in from 2001 to 2006 and Tier 3 standards requiring additional reductions from new diesel engines between 50 and 750 hp to be phased in from 2006 to 2008.

EPA's Clean Air Non-Road Diesel Rule was published in 2004. The rule integrates new diesel engine emission standards (Tier 4 standards) with fuel requirements that will decrease the allowable levels of sulfur in non-road diesel fuel.[13] This rule establishes a comprehensive national program that regulates nonroad diesel engines and diesel fuel as a system.

The Clean Air Non-Road Diesel Tier 4 Final Rule sets new emission standards for diesel engines used in most construction, agricultural, industrial and airport equipment, beginning with new 2008 engines and phasing-in fully by 2014. Larger engines (greater than 750 hp) have one year of additional flexibility to meet the Tier 4 emission standards. These emission standards do not apply to diesel engines used in locomotives and marine vessels, although low-sulfur fuel requirements do apply to such engines. However, fuel requirements for these categories are covered in this rule.

Decreasing the sulfur levels in non-road diesel fuel will prevent damage to emission-control systems used to meet the new Tier 4 engine exhaust emission standards. The Non-Road Diesel Rule will reduce current sulfur levels in two steps. First, current sulfur levels of about 3,000 ppm were limited to a maximum of 500 ppm in 2007. This limit also covers fuels used in locomotive and marine applications (though not to the marine residual fuel used by very large engines on ocean-going vessels). The second step consists of reducing fuel sulfur levels in non-road diesel fuel to 15 ppm in 2010 (except for locomotive and marine diesel fuel which will be reduced to 15 ppm in 2012).

- *Non-Road Spark Ignition Engines*

Non-road spark ignition engines, which usually burn gasoline, are used primarily in lawn and garden equipment. EPA rules regulate small (less than 25 hp) non-road spark-ignition (SI) engines (except marine and recreational engines) in two phases. EPA's Phase 1 standards for

[11] 59 FR.31306 (1994).

[12] 63 FR 56968 October 23, 1998.

[13] 69 FR 38958, June 29, 2004.

new small (< 25 hp) non-road spark-ignited (SI) engines were issued in 1995.[14] The Phase 1 standards apply to model year 1997 and newer engines.

EPA subsequently issued more stringent Phase 2 emission standards for both small non-handheld engines (e.g., lawn mowers, generator sets, air compressors) and small handheld engines (e.g., leaf blowers, chain saws, augers) in 1999[15] and 2000,[16] respectively. Phase 2 standards were phased-in from 2001 to 2007 for non-handheld engines and from 2002 to 2007 for handheld engines.

EPA finalized emission standards for new gasoline spark-ignition marine engines in 1996[17] which were phased-in between 1998 and 2000. These engines, typically based on simple two-stroke technology, are used for outboard engines, personal watercraft, and jet boats.

On November 8, 2002, EPA published a final rule which includes new engine emission standards for large spark-ignition engines rated over 19 kilowatts (kW), or >25 hp.[18] Large spark-ignition engines are used in a variety of commercial and industrial applications, including forklifts, electric generators, airport baggage transport vehicles, and a variety of farm and construction applications, as well as in non-road recreational vehicles. Most large spark-ignition engines are fueled with liquefied petroleum gas, with others operating on gasoline or natural gas. The standards were implemented in two tiers: Tier 1 standards started in 2004 and Tier 2 standards in 2007. Tier 2 engines must also have engine diagnostic capabilities that alert the operator to malfunctions in the engine's emission-control system, ensuring that engine emissions are controlled during normal operating conditions.

EPA's 2002 rulemaking also includes exhaust emission standards for non-road recreational spark-ignition engines and vehicles.[19] These recreational land-based engines are found in snowmobiles, off-highway motorcycles, and all-terrain-vehicles (ATVs). These standards were phased-in between 2006 and 2007, except for snowmobiles, which have until 2009 to be fully phased-in. In addition, snowmobiles will have to meet more stringent standards that will be in effect in 2010 and 2012. Beginning in 2008, plastic fuel tanks and rubber hoses available on recreational vehicles will also be regulated for permeation, to minimize the fuel lost through the component walls.

- *Marine Diesel Engines*

Marine diesel engines include small auxiliary and propulsion engines, medium-sized propulsion engines on coastal and harbor vessels and very large propulsion engines on ocean-going vessels. Both new and modified marine diesel engines rated above 175 hp must adhere to international standards (i.e., MARPOL convention) if vessel construction or engine

[14] 60 FR 34581 (1995).
[15] 64 FR 15208, March 30, 1999.
[16] 65 FR 24268, April 25, 2000.
[17] 61 FR 52088 (1996).
[18] 67 FR 68242, November 8, 2002.
[19] Ibid.

modification commences on or after January 1, 2000. Furthermore, U.S.-flagged commercial vessels with new marine diesel engines rated over 37 kW (or >50 hp, with displacements up to 30 liters per cylinder) produced after 2003 (after 2006 for very large engines) must comply with EPA standards issued in 1999.[20]

EPA published a final rule in 2002 that includes new engine emission standards for recreational marine diesel engines.[21] These are marine diesel engines rated over 37 kW, or >50 hp, which are used in yachts, cruisers, and other types of pleasure craft. The standards are phased-in, beginning in 2006, depending on the size of the engine. By 2009, emission standards will be in effect on all recreational, marine diesel engines.

On February 28, 2003, EPA finalized emission standards for exhaust emission from U.S.-flagged vessels with new marine diesel engines rated over 37 kW with displacements over 30 liters per cylinder (also known as Category 3 Marine Diesel Engines).[22] This marks the first time that emissions from very large marine diesel engines have been regulated. These diesel engines are used primarily for propulsion power on ocean-going vessels such as container ships, tankers, bulk carriers, and cruise ships. Most Category 3 marine diesel engines are used for propulsion on vessels engaged in international trade. The standards were implemented in two tiers: Tier 1 standards, which match internationally negotiated standards, took effect in 2004; and Tier 2 standards will be established in a future rulemaking.

- *Locomotives*

EPA's final rule establishing emission standards for new and remanufactured locomotives and locomotive engines was published in 1998.[23] Three sets of standards were adopted, with applicability of the standards tied to the date a locomotive is first manufactured (i.e., 1973 through 2001, 2002 to 2004, and 2005 and later).

- *Aircraft*

Control of air pollution from aircraft and aircraft engines was covered in a final rule published by EPA in 1997.[24] The 1997 rule adopts the international aircraft emissions standards of the United Nations International Civil Aviation Organization (ICAO), which had been in place since 1986 and amended in 1993. This rule brings the U.S. aircraft standards into alignment with the international standards and applies to newly manufactured and newly certified commercial aircraft gas turbine engines with rated thrust greater than 26.7 kilonewtons. ICAO adopted revised standards in 1999 for implementation beginning in 2004. In November of 2005, EPA finalized the adoption of the revised ICAO standards, to once again bring U.S. aircraft standards into alignment with international standards.[25]

[20] 64 FR 73300, December 29, 1999.
[21] 67 FR 68242, November 8, 2002.
[22] 68 FR 9746, February 28, 2003.
[23] 63 FR 18978, April 16, 1998.
[24] 62 FR 25356, May 8, 1997.
[25] 70 FR 69664, November 11, 2005.

4.2.2 State of Connecticut Control Measures

Control of Open Burning

Since 1976, Connecticut has had in place statutory restrictions on open burning. The statute, Section 22a-174(f) of the Connecticut General Statutes (CGS) applies to open burning on residential property as well as municipal landfills and other municipal facilities. Notable provisions of the statute include an obligation on a private property owner to obtain a permit from a local municipal official before conducting open burning; prohibitions on open burning on forecasted NAAQS exceedance days, when an air pollution advisory is in effect, and when the forest fire danger is extreme; and restrictions on the burning of leaves and demolition waste in municipal landfills. Such restrictions work to reduce particulate matter emissions from open burning.

Pre-2002 New Source Review (NSR) Construction and Operation Permit Program

RCSA section 22a-174-3, in effect from 1972 through March 15, 2002, implemented the federal prevention of significant deterioration (PSD),[26] federal nonattainment NSR and the state NSR programs by requiring the owners and operators of stationary sources in Connecticut to obtain a permit to construct and operate the source. The program includes best available control technology (BACT) and lowest achievable emission rate (LAER) requirements that apply to sources with potential emissions of at least 5 tons per year or maximum uncontrolled emissions of at least 100 tons per year or emissions of NOx greater than 25 tons per year, SO_2 greater than 40 tons per year, particulate matter greater than 25 tons per year or VOC greater than 25 tons per year; and offset requirements for new sources in ozone nonattainment areas.

Control of Particulate Matter and Visible Emissions

Beginning in 1972, CTDEP has restricted emissions of particulate from stationary and mobile sources through visible emissions standards. The pertinent regulation, RCSA section 22a-174-18, achieves this purpose through a number of provisions including work practices to control fugitive emissions from construction, demolition and transportation activities and a three-minute restriction on mobile source idling.

TSP RACT requirements were added to the regulation in 1981 for fuel-burning equipment and process sources including hot mix asphalt plants, iron foundry cupolas, foundry sand operations and concrete batching operations.

Control of Sulfur Compound Emissions from Fuel-Burning Equipment

Since 1972, CTDEP has regulated sulfur compound emissions from fuel burning via the requirements of RCSA section 22a-174-19 (Section 19). Section 19 includes a general restriction on the use of fuel with a sulfur content greater than one percent (1.0%), except in specified situations. Section 19 also includes corresponding sales restrictions on fuels.

Control of Nitrogen Oxides Emissions from Fuel-Burning Equipment

Since May 1995, RCSA section 22a-174-22 has required a variety of fuel-burning sources to limit NOx emissions by meeting NOx emissions limits.. The regulation includes ozone season

[26] The Connecticut program did not address Prevention of Significant Deterioration requirements to EPA's satisfaction until 1979 (47 FR 762).

requirements for fuel-burning equipment locating in a nonattainment area, if the equipment exceeds certain daily NOx emission thresholds.

Enhanced I/M Program

Connecticut implemented a motor vehicle I/M program in 1983. When the CAA was amended in 1990, section 182(c)(3) required Connecticut to adopt an enhanced vehicle emission inspection and maintenance (I/M) program throughout most of the state. In response to this requirement, CTDEP, in cooperation with the Connecticut Department of Motor Vehicles, revised the statewide testing program in January 1998, subjecting most vehicles to Acceleration Simulation Mode (ASM 2525) testing, a tailpipe emission test conducted on a treadmill simulating travel at 25 miles per hour at a 25% load factor. This program enhancement was incorporated into RCSA section 22a-174-27, which had specified the requirements for Connecticut's original motor vehicle I/M program.

Dispensing of Gasoline/Stage I and Stage II Vapor Recovery

Effective in 1993, CTDEP adopted Stage I and II vapor recovery requirements to control VOC emissions from gasoline tanks and stations.

Low Emission Vehicles

CTDEP adopted California's Low Emission Vehicle (LEV) Program in RCSA section 22a-174-36 (Section 36) in 1994. Section 36 applies to all 1998 and subsequent model year passenger cars and light duty trucks sold, leased, offered for sale or lease, imported, delivered, purchased, rented, acquired or received, in Connecticut and required that such vehicles be manufactured to meet exhaust emissions standards for a number of pollutants, including NOx.

Beginning with 1999 model year motor vehicles, Section 36 provided for manufacturers to comply with the requirements of the National LEV Program as an alternative to California LEV. The National LEV Program required compliant vehicles to meet exhaust emissions standards, which EPA estimated would reduce overall light-duty vehicle emissions by 70%.

Standards for Municipal Waste Combustors

Connecticut has six facilities that burn municipal waste to create electricity. These six facilities account for approximately thirty percent of the actual annual NO_X emissions from the major NO_X emitters in the state and are regulated by RCSA section 22a-174-38 (Section 38). Section 38 became effective on June 28, 1999 and included NO_X emission limits equivalent to the emission limits established in the federal emissions guidelines and NSPS for MWCs. Section 38 also requires each municipal waste combustor unit to limit emissions of opacity, particulate matter and sulfur dioxide, at levels established in the federal emissions guidelines and NSPS.

4.3 Post-2002 Control Measures

The control measures discussed in this section and listed in Table 4-3 are federal and state programs that reduce emissions of $PM_{2.5}$ or its precursors after January 1, 2002. These measures can be considered RACT or RACM *in toto* since, as a group, the measures may have lowered ambient $PM_{2.5}$ concentrations enough to advance the attainment date.

Table 4-3. Post-2002 Control Measures

Control Measure	Pollutant Controlled			
	PM	NO_X	SO_2	VOC
Federal Tier 2 Motor Vehicle Controls/Low Sulfur Gasoline	X	X	X	X
Federal On-board Refueling Vapor Recovery				X
Federal Heavy-Duty Diesel Vehicle Controls and Fuels	X	X	X	X
Federal 2007 Highway Rule	X	X	X	X
Federal Highway Motorcycle Exhaust Emission Standards	X	X		X
Federal Non-Road Control Programs (see: http://www.epa.gov/nonroad-diesel/regulations.htm)	X	X	X	X
Federal CAIR Requirements for SO_2 Sources*			X	
Outdoor Wood Burning Furnace Restrictions Section 22a-174k of the Connecticut General Statutes	X			
General Permit to Construct and/or Operate a New or Existing Distributed Generation Resource	X	X		
NSR Permit to Construct and Operate Stationary Sources RCSA Section 22a-174-3a	X	X	X	X
Improvements in the Control of Particulate Matter and Visible Emissions RCSA Section 22a-174-18	X	X		
Control of Sulfur Dioxide and Nitrogen Oxide Emissions from Power Plants and Other Large Stationary Sources RCSA Sections 22a-174-19a and 22a-174-22(e)(3)		X	X	
Proposed Restrictions on Asphalt Paving Operations RCSA Section 22a-174-20(k)				X
VOC Reductions from Metal Cleaning RCSA Section 22a-174-20(l)				X
The Post-2002 Nitrogen Oxides (NOx) Budget Program RCSA Section 22a-174-22b		X		
CAIR NO_X Ozone Season Trading Program RCSA Section 22a-174-22c		X		
Connecticut Enhanced Inspection and Maintenance Program (ASM 2525 final standards and OBD II program) RCSA Section 22a-174-27		X		X
Pressure-Vacuum Gas Station Vent Valves and Increased Testing for Stage II Controls RCSA Section 22a-174-30				X
Heavy-Duty Diesel Engines RCSA Section 22a-174-36a	X	X	X	
CT's California Low Emission Vehicle Phase 2 (CALEV2) RCSA Section 22a-174-36b	X	X		X
Reductions in NOx emissions from Municipal Waste Combustors (Phase 2) RCSA Section 22a-174-38		X		
VOC Reductions from Consumer Products RCSA Section 22a-174-40				X
VOC Reductions from Architectural and Industrial Maintenance (AIM) Coatings RCSA Section 22a-174-41				X
VOC Reductions from Portable Fuel Container Spillage Control RCSA Section 22a-174-43				X
Proposed VOC Reductions from the Manufacture and Use of Adhesives and Sealants RCSA Section 22a-174-44				X

*Although federal CAIR SO_2 requirements do not apply to Connecticut, significant emission reductions are anticipated from upwind sources in other states when Phase 1 annual SO_2 budgets take effect in 2010. Some non-modeled early reductions are expected by 2009, which should help the NY-NJ-CT area achieve timely attainment. Note that CTDEP does not necessarily concur with EPA's interpretation that compliance with CAIR satisfies the RACT requirement for all affected sources.

4.3.1 Federal Control Measures

Federal Tier 2 Motor Vehicle Controls/Low Sulfur Gasoline

EPA adopted final rules requiring more protective emission standards for all new passenger vehicles, including cars, sport utility vehicles (SUVs), minivans, vans, and pick-up trucks. These "Tier 2" standards, published on February 10, 2000,[27] marked the first time that the largest passenger vehicles were subject to the same emission standards as cars. Manufacturers of new vehicles weighing less than 6000 pounds have a phase-in period between 2004 and 2007. Manufacturers of heavier passenger vehicles are provided a longer phase-in period, from 2004 through 2009. EPA's regulatory impact analysis (RIA) for the Tier 2 program[28] estimated reductions in the NY-NJ-CT nonattainment area of 7% VOC, 23% NOx, 78% SOx and 27% $PM_{2.5}$ compared to what light duty vehicle (LDV) emission levels would have been in 2007 under the NLEV program. By 2030, EPA projects Tier 2 will provide LDV emission reductions of 28% VOC, 79% NOx, 78% SOx and 29% $PM_{2.5}$ compared to NLEV.

Federal On-Board Refueling Vapor Recovery

On-board Refueling Vapor Recovery (ORVR) began to be phased in on light-duty cars in model year 1998 (cars on the road in calendar year 1997). By 2005, all 2006 model year light-duty cars and trucks up to 8,500 pounds (lbs) gross vehicle weight rating (GVWR) were equipped with ORVR systems.

Federal Heavy-Duty Diesel Vehicle Engines and Fuels

In October of 2000, EPA published final rules affirming more stringent NO_X and hydrocarbon (HC) emission standards for heavy-duty diesel engines and vehicles (starting with vehicle model year 2004) and establishing tighter NO_X and HC standards for heavy-duty gasoline engines and vehicles (starting with vehicle model year 2005). The October 2000 final rule also requires that heavy-duty vehicles (HDVs), up to 10,000 lbs GVWR, be equipped with ORVR systems. The ORVR systems for HDVs began to be equipped on model year 2004 vehicles and were fully phased-in on HDVs by model year 2006.

On January 18, 2001, EPA published a final rule, referred to as the "2007 Heavy-Duty Highway Rule."[29] The 2007 Heavy-Duty Highway Rule serves as a second phase to the heavy-duty motor vehicle emission standards implemented for heavy-duty vehicles starting with model year 2004. The 2007 Highway Rule required additional, significant reductions of NO_X, PM and HC emissions from heavy-duty engines and vehicles, beginning with vehicle model year 2007. This rule also reduced the sulfur content of diesel fuel to 15 ppm from previous levels of 500 ppm, beginning in 2006. In addition to allowing proper operation of engine pollution control equipment, the cleaner fuel reduces sulfur-related (e.g., SOx, sulfate) emissions from the heavy duty fleet.

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[27] 65 FR 6698, February 10, 2000; see also http://www.epa.gov/otaq/regs/ld-hwy/tier-2/index.htm.

[28] "Regulatory Impact Analysis - Control of Air Pollution from New Motor Vehicles: Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements"; EPA420-R-99-023; December 1999; See Appendix A to EPA's RIA at: http://www.epa.gov/tier2/frm/ria/r99023.pdf.

[29] 66 FR 5001, January 18, 2001, *see* EPA summary at http://www.epa.gov/otaq/highway-diesel/index.htm.

Federal 2007 Highway Rule

On January 18, 2001 EPA published a final rule, referred to as the "2007 Heavy-Duty Highway Rule."[30] The 2007 Heavy-Duty Highway Rule serves as a second phase to the heavy-duty motor vehicle emission standards implemented for heavy-duty vehicles starting with model year 2004. The 2007 Highway Rule required additional, significant reductions of NO_X, PM and VOC emissions from heavy-duty engines and vehicles, beginning with vehicle model year 2007.

Federal Highway Motorcycle Exhaust Emission Standards

In 2004, EPA published a final rule to implement improved exhaust emission standards on new highway motorcycles.[31] The new exhaust emission standards apply to all 2006 model year and newer motorcycles. Motorcycles with the largest engines, 280 cubic centimeters (cc) displacement and above, will be subject to more stringent HC and NO_X emission standards beginning with model year 2010, in addition to the emission standards that were required in model year 2006. Prior to this final rule, the exhaust emission standards that applied to motorcycles had not been updated in over 20 years. Thus, a model year 2005 motorcycle produces more harmful emissions per mile than even the largest of passenger cars of the same age. This rule marks the first time that exhaust emissions from motorcycles with engines of less than 50cc displacement (scooters and mopeds) are regulated.

Federal Non-Road Control Programs

Non-road engines are used in a variety of applications such as construction equipment, outdoor power equipment, farm equipment, lawn and garden equipment, marine vessels, locomotives, and aircraft. Many of the measures listed in Table 4-2 and discussed in Section 4.2.1 include requirements that became effective in 2002 or later or that continue to produce new emissions reductions in 2002 and beyond. A corollary to the non-road programs are non-road diesel fuel requirements, which are phased-in for all non-road sectors by 2012.[32] In particular, non-road diesel fuel requirements and certain marine diesel engine, locomotive engine and large spark-ignition engine requirements begin to produce reductions after 2002. Such requirements can be identified by the implementation date in Table 4-2. Future non-road control measures, not included in emissions modeling for this demonstration, are discussed in Section 4.4.2.

Federal CAIR Requirements for SO_2 Sources

Although federal CAIR SO_2 requirements do not apply to Connecticut, significant emission reductions are anticipated from upwind sources in other states when Phase 1 annual SO_2 budgets take effect in 2010. Some non-modeled early reductions are expected by 2009,[33] which should help the NY-NJ-CT area to achieve timely attainment. Note that CTDEP does not necessarily concur with EPA's interpretation that compliance with CAIR satisfies the RACT requirement for all affected sources.

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[30] 66 FR 5001, January 18, 2001, see EPA summary at http://www.epa.gov/otaq/highway-diesel/index.htm.

[31] 69 FR 2398, January 15, 2004.

[32] 69 FR 38958, June 29, 2004.

[33] For a discussion regarding early CAIR emission reductions, see Section XIII of EPA's "Corrected Response to Significant Public Comments on the Proposed Clean Air Interstate Rule"; Corrected April 2005; See: http://epa.gov/oar/interstateairquality/pdfs/cair-rtc.pdf.

4.3.2 State of Connecticut Control Measures

Outdoor Wood Burning Furnace (OWBF) Restrictions

CGS Section 22a-174k prohibits the construction and use of an OWBF unless the OWBF is located more than 200 feet from any residence, meets certain stack height criteria and the owner complies with certain operating practices, including a requirement to burn only clean wood. These requirements are an initial step to ensure proper oversight of the siting and operation of these units in a manner that will work to limit particulate matter emissions.

General Permit to Construct and/or Operate a New or Existing Distributed Generation Resource

CTDEP developed the General Permit to Construct and/or Operate a New or Existing Distributed Generation Resource (General Permit) in response to Public Act 07-242, *An Act Concerning Electricity and Energy Efficiency*. The General Permit covers the construction and operation of new or existing diesel powered emergency engines and distributed generation resources of up to two megawatts for purposes of participation in a pilot program developed by the Connecticut Department of Public Utility Control. The owner of any source operating under the general permit must install and operate selective catalytic reduction or equivalent controls to reduce NOx by 90%, and must meet a particulate matter standard of 0.01 gr/bhp-hr or install a diesel particulate filter, or equivalent particulate matter control, to achieve a design control efficiency of at least 85%. Sources operating under the general permit must use fuel with a sulfur content less than or equal to 15 ppm.

Post-2002 New Source Review (NSR) Permit Program

Effective March 15, 2002,[34] CTDEP made significant revisions to its NSR program, which was initiated in part to address requirements of CAA section 112(g) concerning the pre-construction review of new or reconstructed sources of federally listed hazardous air pollutants (HAPs). The program revision was incorporated into the air quality regulations as a new section, RCSA section 22a-174-3a, and RCSA section 22a-174-3 was repealed.

In addition to establishment of a program pursuant to section 112(g) of the CAA, RCSA section 22a-174-3a reconciles certain applicability provisions under which some sources are required to apply for, but not obtain, an air pollution control permit. The revised NSR program provides the requirements for permit applications, standards for granting permits and permit modifications, and establishes the threshold for which a state-specific air pollution control permit is required at a level of 15 tons per year of potential emissions. Because the state permit threshold is more stringent than the federal program, this amendment also provides for an exemption from the requirement to obtain a new source review permit when a source operates in a manner that restricts actual emissions below the applicability thresholds.

BACT and LAER requirements continue to apply to new sources. CTDEP commits in Section 11 of this demonstration to implement the 40 CFR 51 Appendix S for $PM_{2.5}$ in Fairfield and New Haven counties, as specified in the May 16, 2008 final rule for implementation of the NSR program for the annual $PM_{2.5}$ NAAQS. CTDEP will also: address condensable emissions during the

[34] *See* 68 FR 9009 (February 27, 2003) for federal approval as a SIP revision.

transition period before EPA finalizes Method 202, as provided in the implementation rule; implement the major source thresholds, significant emission rate thresholds and offset ratios as required in the implementation rule; and seek to prepare and submit a revised PSD and non-attainment area NSR SIP, which takes into account $PM_{2.5}$ within Connecticut's air quality regulations, by May 16, 2011.

Improvements in the Control of Particulate Matter and Visible Emissions

RCSA section 22a-174-18 was revised in 2004 to (1) improve the enforceability of the opacity requirements by specifying the form and averaging time of the existing opacity standards for stationary sources and including provisions specific to sources with continuous emissions monitors; (2) add particulate matter standards appropriate to fuel-burning equipment using certain fossil fuels; and (3) add particulate matter emissions standards and requirements for stationary reciprocating internal combustion engines.

Control of SO_2 and NOx Emissions from Power Plants and Other Large Stationary Sources

CTDEP was required by an executive order of the Governor to adopt regulations to reduce emissions of SO_2 and NOx from major stationary sources including power plants. In response, in December 2000, CTDEP adopted RCSA section 22a-174-19a and amended section 22a-174-22, with the requirements taking effect in 2003. The requirements apply in general to the Acid Rain program sources and NOx Budget sources.

The SO_2 emissions reduction requirements include low sulfur fuel requirements (0.5% or 0.3%) and quarterly average emissions limits. The revision with regard to NOx was the addition of a non-ozone season NOx limit of 0.15 pounds per MMBtu, which applied to the owners of all sources subject to the NOx Budget Program of RCSA section 22a-174-22b.

Restrictions on Asphalt in Paving Operations

CTDEP is seeking to amend RCSA section 22a-174-20(k) to further limit VOC emissions from cutback and emulsified asphalt used to pave roads. Adoption of this amendment will allow Connecticut to make a significant stride towards compliance with national health-based standards for ozone.

Beginning in 2009, the amendment reduces emissions of VOC from road paving and maintenance activities during the months from May through September, when the use of cutback asphalt is banned and the VOC content of emulsified asphalt is limited.

CTDEP anticipates adoption of the amendment in fourth quarter 2008.

VOC Reductions from Metal Cleaning

Effective May 1, 2008, CTDEP revised RCSA section 22a-174-20(*l*) to adopt a limitation on the vapor pressure of solvents used in cold cleaning and tightened work practices to further limit VOC emissions from metal cleaning. The limitation and other requirements are consistent with the Ozone Transport Commission's Model Rule for Solvent Cleaning, and the resulting VOC emissions reductions were submitted to EPA for 8-hour ozone NAAQS attainment.

The Post-2002 Nitrogen Oxides (NO_x) Budget Program

Connecticut's NOx Budget Program, implemented through RCSA section 22a-174-22b, was approved by EPA as a SIP strengthening measure on December 27, 2000.[35] RCSA section 22a-174-22b establishes a statewide NOx budget and NOx allowance trading program for large electric generators and other industrial sources beginning with the 2003 ozone season. The budget cap is consistent with EPA's NOx SIP Call and the September 1994 OTC Memorandum of Understanding establishing the OTC NOx Budget Program (NBP). In Connecticut, the OTC program was conducted pursuant to RCSA section 22a-174-22a. As a result of the OTC NBP, the Acid Rain program and other CAA requirements, by 2000 the OTC states had already reduced NOx emissions by approximately 55% from 1990 levels, thereby reducing the level of reductions necessary to meet the federal NBP targets. With the further implementation of the federal NBP in 2003, the OTC states' ozone season NOx emissions from subject sources were reduced 30% from 2002 levels and were 18% less than the number of NBP allowances allocated in 2003. In addition, NOx highest daily emissions and average daily emissions in the OTC states have decreased approximately 25% and 35%, respectively, from 1997 to 2003.[36]

The Clean Air Interstate Rule (CAIR) Nitrogen Oxides (NO_x) Ozone Season Trading Program

Connecticut will comply with CAIR by participating in the federal CAIR ozone-season NOx trading program, and a regulation establishing the program, RCSA section 22a-174-22c, was adopted September 4, 2007 and approved by EPA on January 24, 2008 [73 FR 4105]. Shortly after May 1, 2009, the effective date for the CAIR trading program, the current NOx budget program implemented under RCSA section 22a-174-22b will be repealed. All the sources that now participate in the RCSA section 22a-174-22b NOx budget program will be subject to Connecticut's CAIR ozone season NOx trading program, albeit subject to a reduced statewide ozone season budget and a revised allocation system.

With the transition to the CAIR program, the ozone season budget will be reduced from 4,466 tons in 2008 to 2,691 tons beginning in 2009. As a result of the decreased ozone season budgets in Connecticut and in states throughout the region, NOx emissions levels are expected to continue to decline beyond the emissions reductions achieved in the NOx SIP Call trading program.

Connecticut Enhanced I/M (ASM 2525 final standards) and OBD-II Enhanced I/M

In August 2004, CTDEP updated the motor vehicle emissions testing program standards implemented by the Connecticut Commissioner of Motor Vehicles to conform to revisions to the underlying federal program standards. Specifically, the revisions to RCSA section 22a-174-27: (1) defined new on-board diagnostic test requirements; (2) added new emissions standards for vehicles subject to a pre-conditioned two speed idle exhaust emissions test procedure; (3) required ASM 2525 exhaust emission standards consistent with federal guidance but for which

[35] 65 FR 81743, December 27, 2000.

[36] 1997 and 1998 data from the Acid Rain Program; 1999-2002 data from the OTC trading program; 2003 data from the NBP.

the federal government has not adopted analogous standards; and (4) added new emissions standards for diesel vehicles subject to a modified snap acceleration smoke opacity test.

In 2003, Connecticut began operating a decentralized I/M testing infrastructure through a new I/M contractor. The revised I/M program requires the use of the on-board diagnostics II (OBDII) test, the ASM 2525 test, the pre-conditioned two-speed idle (PCTSI) test, or one of two types of opacity testing, depending on the age, weight and fuel type of each vehicle. Virtually all vehicles that weigh less than 10,000 pounds (gross vehicle weight rating) and that are between 4 and 25 years of age are subject to the program. The CTDEP filed a SIP revision with EPA on December 20, 2007 to incorporate these changes to the I/M program. Emission estimates in this attainment demonstration account for Connecticut's I/M program.

Pressure Vent Caps and Increased Testing for Stage II Controls

In May 2004, Connecticut amended RCSA section 22a-174-30 to reduce emissions of VOCs by requiring the use of "pressure-vacuum vent caps" on gasoline pumps that are subject to the Stage II vapor control regulation. The amendment also requires the use of a two-point closed system for the transfer of gasoline from a gasoline tanker truck to an underground storage tank; improves Stage II system maintenance; clarifies testing requirements and increases testing frequency. EPA approved that amendment as a 1-hour ozone additional control measure.[37]

Heavy-Duty Diesel Engines

RCSA section 22a-174-36a restricts the sale in Connecticut of all heavy-duty diesel engines produced for the model year 2006 and subsequent model years and to new heavy-duty motor vehicles containing such engines. Any such engines or vehicles sold must meet exhaust emissions limits and other certification requirements of the California Air Resources Board.

This regulation is expected to produce significant reductions in diesel emissions from heavy-duty diesel engines as the fleet is turned over.

California Low Emission Vehicle Phase 2 (CALEV2)

The State of Connecticut will be implementing the light-duty motor vehicle emission standards of the State of California applicable to motor vehicles of model year 2008 and later. California's revision of their Low Emission Vehicle (LEV) standards also includes adoption of green house gas emission standards for passenger cars, light-duty trucks and medium duty passenger vehicles commencing with 2009 and subsequent model year vehicles. The program is implemented through RCSA section 22a-174-36b, which was adopted in Connecticut in December 2005.

Reducing NOx Emissions from Municipal Waste Combustors

Connecticut's regulation to limit air pollutant emissions from the state's municipal waste combustor (MWC) units is described in the previous section. An October 26, 2000 amendment to RCSA section 22a-174-38 reduced the NOx emission limits below the 1999 levels beginning May 1, 2003. EPA approved the amended regulation and associated emissions reductions for 1-hour ozone NAAQS attainment on December 6, 2001.[38]

[37] 71 FR 51761, August 31, 2006.

[38] 66 FR 63311, December 6, 2001.

VOC Reductions from Consumer Products

Most states in the OTR have adopted regulations based on a 2001 OTC Model Rule for Consumer Products. That OTC Model Rule was, in turn, based on consumer product requirements in California. Connecticut opted not to adopt a regulation for 1-hour ozone NAAQS attainment purposes based on that initial OTC model rule.

The OTC states were prompted to revisit the 2001 OTC model rule for consumer products in 2005 when California amended its consumer products program to create additional VOC reductions by reducing the VOC content limits for certain products and specifying new VOC content limits for additional products. This led to the creation of a 2006 OTC model rule for consumer products.

CTDEP has adopted regulation, RCSA section 22a-174-40, consistent with the 2006 OTC model rule for consumer products. The new Connecticut regulation will apply to anyone who sells, supplies, offers for sale or manufactures for sale regulated products sold on or after January 1, 2009.

VOC Reductions from Architectural and Industrial Maintenance Coatings

New RCSA section 22a-174-41 (Section 41) will limit VOC emissions from AIM coatings through VOC content limits developed in 2001 by the OTC as part of a model rule. Section 41 will apply to anyone who sells, supplies, offers for sale or manufactures for sale in the State of Connecticut any AIM coating for use in the State of Connecticut and to any person who applies or solicits the application of any AIM coating within the State of Connecticut on or after the implementation date of May 1, 2008.

VOC Reductions from Portable Fuel Container Spillage Control

RCSA section 22a-174-43, which was adopted on May 10, 2004, reduces emissions of VOCs by requiring the sale of portable fuel containers (PFCs) designed to minimize spillage and fugitive evaporative emissions. This regulation is based on an OTC model rule that requires manufacturers of particular PFCs to reformulate to meet VOC limits. The 2004 regulation and the associated emissions reductions were approved for 1-hour ozone NAAQS attainment on August 31, 2006.[39]

VOC Reductions from Adhesives and Sealants

New RCSA section 22a-174-44 will reduce emissions of VOCs from adhesives, sealants and primers. This section achieves VOC reductions through two basic components: sale and manufacture restrictions that limit the VOC content of specified adhesives, sealants and primers sold in the state; and use restrictions that, in general, apply to commercial/industrial operations. By reducing the availability of higher VOC content adhesives and sealants within the state, the sales prohibition is also intended to address adhesive and sealant usage at area sources. In addition to the VOC content limits and use requirements, this section includes requirements for cleanup and preparation solvents and a compliance alternative in the form of add-on air pollution control equipment.

[39] 71 FR 51761, August 31, 2006.

The associated emissions reductions, which are estimated to be nearly 4 tons per summer day, will support attainment of the 1997 and 2008 national ambient air quality standards for ozone.

RCSA section 22a-174-44 is not yet adopted in the state, and CTDEP anticipates adoption in September 2008. The sales restrictions apply to adhesives and sealants manufactured after January 1, 2009.

4.4 Other Control Measures Producing Directionally Correct Emissions

There are a number of Connecticut control measures that apply to stationary and mobile sources that are not considered RACM as they are not federally enforceable or are difficult to quantify, yet these measures produce directionally correct reductions in $PM_{2.5}$ and precursor emissions. These non-SIP measures are considered as further "weight-of-evidence" that emissions will be declining enough for the nonattainment area to achieve attainment by April 2010. Such state and federal measures are described here and discussed in Section 8 as weight-of-evidence.

4.4.1 Connecticut Control Measures

Efforts to Reduce Peak Electricity Demand

In September of 2006, Connecticut Governor M. Jodi Rell addressed the peak demand issue in her "Energy Vision" for the state,[40] setting a goal of achieving a 20% reduction in electric-peak consumption by 2020. Public Act 07-242, An Act Concerning Electricity and Energy Efficiency (Energy Act),[41] codified three significant peak reduction measures, consistent with the Governor's goals. On the supply side, the Energy Act calls for mandatory decoupling of utility revenue from the sales of each electric and gas company in the next rate proceeding, thereby ending the incentive for electric utilities to sell more energy to increase profits. On the demand side, the Energy Act calls for the development of plans to implement time-of-use pricing with appropriate metering and network support ("smart meters") to provide incentives for consumers to reduce electricity use at times of peak demand. Third, the Energy Act will also reduce peak demand by providing rebates for the replacement of inefficient home air conditioning units with units that meet the federal Energy Star standard.

Reductions in energy demand mean fewer hours of operation for less-efficient "peaking" electric generators that are brought online to meet peak demand. Fewer operating hours means fewer emissions of air pollutants, including SO_2 and NOx.

Energy Efficiency Measures

In Connecticut, the Energy Conservation Management Board (ECMB) advises and assists Connecticut's electric distribution companies in the development and implementation of comprehensive and cost-effective energy conservation and market transformation plans. ECMB utilizes the Connecticut Energy Efficiency Fund (CEEF) to provide financial support to homeowners and renters, small and large businesses, and state and local governments for projects to improve efficient energy use and reduce electric demand. Measures include reducing lighting loads, installing more efficient air conditioning and cooling systems, improving insulation and replacing older motors and pumps with state-of-the-art high efficiency units.

[40] "Connecticut's Energy Vision for a Cleaner, Greener State," September 18, 2006, available at http://www.ct.gov/governorrell/lib/governorrell/ctenergyvisionsept19.pdf .

[41] Public Act 07-242, available at http://www.cga.ct.gov/2007/ACT/PA/2007PA-00242-R00HB-07432-PA.htm.

Energy demand reductions mean fewer hours of operation for less-efficient power plants that are brought online to meet peak loads. Fewer hours of operation means fewer emissions of air pollutants, including SO_2 and NOx. The magnitude of the emissions reductions produced are discussed in detail in Section 8.

Several specific provisions of the Energy Act, when fully implemented, will result in additional emission reductions supplemental to those from ongoing ECMB programs. Some of these provisions include:

- A requirement that energy capacity needs must first be met through all available energy efficiency and demand-side resources that are cost effective, reliable and feasible;
- All state building projects over $5 million must meet Leadership in Environmental Design Silver (LEEDS Silver) standards or better;
- The creation of the first home heating oil conservation and efficiency program;
- The adoption of appliance efficiency standards for nine additional products; and
- The continued ramp-up of renewable energy portfolio requirements under which 20% of Connecticut's energy shall be derived from renewable resources by the year 2020.

Even without this legislative driver to reduce energy costs, per capita energy use in Connecticut, which has been relatively constant at 250 million BTUs (75 MWh), is significantly lower than the average US consumption rate of 340 million BTUs (100 MWh). Only California and New York City have lower per capita consumption, both estimated at 225 million BTUs (65 MWh).[42] Connecticut's low rate was achieved by commitment to demand-side management.

Product Efficiency Standards

Public Act 04-85 establishes energy efficiency standards for a variety of heating, cooling, lighting and other products. The legislation mandates that products that do not meet Connecticut standards cannot be sold, offered for sale or installed in Connecticut on or after the effective date of the standard. Since the legislation was passed, federal energy standards have pre-empted states from establishing standards for certain products. For Connecticut, standards for the three products identified in Table 4-4 are in effect or will soon become effective until they become pre-empted by the federal standards.

Table 4-4. Products Currently Subject to Connecticut Efficiency Standards Until Pre-empted by Federal Standards

Product	Effective date of CT Standards	Date Federal Standards Pre-empt CT standards
Unit heaters	07/01/06	08/01/08
Commercial refrigerators and freezers	07/01/08	01/01/10
Large packaged air conditioning equipment	07/01/09	01/01/10

[42] The Connecticut Academy of Science and Engineering, "Energy Alternatives and Conservation," December 2006.

Public Act 07-242 adds a number of new product categories that are required to meet energy efficiency standards. For these product categories, there are currently no similar federal standards. These categories include: residential furnaces and boilers (only those purchased by state government), residential pool pumps, metal halide lamp fixtures, single voltage external AC to DC power supplies, state regulated incandescent reflector lamps, bottle-type water dispensers, commercial hot food holding cabinets, portable electric spas, walk-in refrigerators and freezers and pool heaters. The Office of Policy and Management is currently developing standards for the additional product categories.

Connecticut's OneThing™ Campaign

A key part of the Governor's Energy Vision is a plan to promote energy efficient behavior among all residents and businesses. This effort is being carried out through the Governor's OneThing™ campaign, a movement designed to capture the state's collective imagination, encourage widespread participation and facilitate real changes in behavior as they relate to energy consumption and environmental attitudes.

The OneThing™ campaign is being implemented through an 18-month intensive television, radio, print and internet (see http://onethingct.com) communications effort that encourages individuals to commit to doing at least "one thing" to reduce their energy use or environmental impact, so that collectively the State of Connecticut can have a positive impact.

Integrated Resource Planning for Energy Solutions

The Connecticut Energy Advisory Board (CEAB) is a statutory entity responsible for representing the state in regional energy planning, participating in the state's annual load forecast proceedings and reviewing procurement plans submitted by electric distribution companies. In collaboration with the state's electric utilities and stakeholders, CEAB identifies key issues (procurement, demand management, renewable energy, environmental compliance, generation, and transmission) and develops processes to improve future energy planning cycles. Such improved planning will promote efficiency in energy procurement, generation and distribution, and thereby work to limit increases in emissions from electric generation that might otherwise occur.

Diesel Retrofit Program

Connecticut is implementing several non-SIP emission control programs targeted at reducing in-use emissions from on-road and non-road vehicles. Table 4-5 summarizes these programs, which are targeted primarily at retrofits of school and transit buses, construction equipment and recycling trucks. These retrofit projects provide localized reductions of direct-$PM_{2.5}$ emissions, primarily in urban areas and locations with sensitive receptor populations such as schools. These retrofit projects implement the recommendations of Connecticut's Clean Diesel Plan, which was finalized in 2006 in response to a mandate of the Connecticut General Assembly.

Table 4-5. Diesel Retrofit Projects.

Project	City	Vehicles	Type of Technology	# of Retrofits or Vehicles Affected	Fuel Type	Status
Bridgeport Public Schools	Bridgeport	School Buses	DOC / DPF	112	ULSD	Complete
Hartford Public Schools	Hartford	School Buses	TBD	70	ULSD	Ongoing
New Haven School Department	New Haven	School Buses	DOC	181	ULSD	Complete
Newington Public Schools	Newington	School Buses	DPF	15	ULSD	Complete
Stamford Public Schools	Stamford	School Buses	DOC	53		Complete
Norwich Public Schools	Norwich	School Buses	DOC / DPF	42	ULSD	Complete
Fairfield Public Schools	Fairfield	School Buses	DOC	50	ULSD	Ongoing
Hamden Public Schools	Hamden	School Buses		25	ULSD	Complete
Hamden Public Schools	Hamden	School Buses		85	ULSD	
Regional School District 18	Lyme/Old Lyme	School Buses	DPF/DOC	20	ULSD	Ongoing
Mansfield Public Schools	Mansfield	School Buses		22		Grant expected 2008
Newtown Public Schools	Newtown	School Buses		60		Grant expected 2008
I-95 New Haven Harbor Q-Bridge Construction Initiative	New Haven	Construction Equipment	DOC	104	Highway diesel	Ongoing
I-95 New Haven Harbor Q-Bridge Construction Initiative	New Haven	Construction Equipment (Pilot Project)	DPF	2+2 (separate contracts)	ULSD	Ongoing
Yale University	New Haven	Shuttle Buses	N/A		electric/ULSD	Complete
Connecticut Transit - Stamford	Stamford	Transit Buses	DPF	31	ULSD	Complete
Connecticut Transit - Hartford	Hartford	Transit Buses	DPF	191	ULSD	May 2009 Completion
Connecticut Transit - New Haven Division	New Haven	Transit Buses	DPF	84	ULSD	May 2009 Completion
Electrified Truck Stop	North Stonington	Truck stops	Electrification technology	116 spaces		Completed 2007
Landfill Retrofits	Hartford	Recycling Trucks, Off-road equipment	TBD	27 Trucks 17 Off-Road Vehicles	TBD	Agreement signed February 2007
Expand Fueling Station	Fairfield	Cars, School Buses, Heavy Duty Vehicles	N/A		CNG	
CNG Trash Trucks	Trumbull	Trash Trucks	N/A	3	CNG	Complete

DOC: diesel oxidation catalyst; DPF: diesel particulate filter; ULSD: ultra-low sulfur diesel; CNG: compressed natural gas; TBD: to be determined.

School Bus Anti-Idling Program

Pursuant to Public Act No. 02-56, which prohibits (with limited exceptions) the idling of school bus engines for more than three consecutive minutes, CTDEP has implemented an extensive public education outreach effort. Outreach has included notifications to bus companies and school districts, as well as the placement of signage at schools to remind drivers of the restriction.

Transportation Control Measures

This section reviews transportation control measures (TCMs) in terms of their contribution to producing reductions in emissions of NOx, SOx and $PM_{2.5}$. This information was developed by the Connecticut Department of Transportation (CTDOT), which produces annual updates to the Statewide Transportation Improvement Program (STIP), documenting projects to be funded under federal transportation programs for a three-year period. Some examples of programs eligible for federal transportation funding include:

- Public transit improvements;
- Restriction of certain roads or lanes to, or construction of such roads or lanes for use by, passenger buses or high-occupancy vehicles (HOV);
- Employer-based transportation management plans, including incentives;
- Traffic flow improvements that reduce air emissions;
- Fringe and transportation corridor parking facilities serving multiple-occupancy vehicle programs or transit service;
- Increased high-occupancy, shared-ride services;
- Motor vehicle-free areas and times in metropolitan areas;
- Secure bicycle storage facilities and other facilities, including bicycle lanes; and
- Employer-sponsored flexible work schedules.

While none of the projects and activities identified here constitute RACM, as in the case of the stationary/area measures described in the previous section, these activities support Connecticut's conclusion that attainment of the annual $PM_{2.5}$ NAAQS will be maintained through the attainment deadline and beyond.

Significant TCMs completed in 2007 are identified in Table 4-6, and projects completed in years 2002 through 2006 are listed in Table 4-7. Both Tables 4-6 and 4-7 provide estimated emissions reductions for NOx and $PM_{2.5}$ [43] and total emissions reductions across projects (tons/day). In addition to all the projects included in Tables 4-6 and 4-7, there are numerous other TCMs that receive federal funding that will result in emission reductions but have yet to be quantified.

Reducing New Haven-New York City Traffic on the I-95 Corridor

The Connecticut Transportation Strategy Board (TSB) is charged with developing strategies to create a balanced, intermodal transportation system to provide for the efficient, cost effective movement of people and goods. Taking into account the goals of the Climate Change Action Plan, the Governor's Energy Vision and the Connecticut Clean Diesel Plan, the TSB has identified key transportation initiatives that integrate Connecticut air quality goals. One such

[43] VOC emissions reductions are provided for information only as CTDEP has not made a finding that VOC makes a significant contribution to ambient $PM_{2.5}$ in Connecticut.

Table 4-6. 2007 Emission Summary Report for Significant TCMs Completed*

State Project Number	Project Description	Geographic Area	Total Emission Benefit (kg/d)		
			VOC	NO_X	$PM_{2.5}$
TRANSIT					
Bus Improvements					
0170-T763	Purchase 7 diesel/electric hybrid buses. Assumption that 3 hybrids will operate in the NY/NJ/CT $PM_{2.5}$ non-attainment area is reflected in $PM_{2.5}$ benefit calculations.	Statewide	0.22	2.00	0.04
0171-0305	New Britain-Hartford busway that will serve 8 other towns: Berlin, Bristol, Farmington, Newington, Plainville, Southington, West Hartford, and Wethersfield. Project to be complete in 2011.	District 1	9.40	19.90	n/a
0301-0060	**New railroad station in Fairfield, potential access from I-95 and Route 1.**	Fairfield	7.69	6.95	0.21
Railroad Station Improvements					
0138-0226	Expand current railroad parking capacity by 400 additional spaces.	Stratford	8.38	7.57	0.23
0161-0136	Expand parking capacity.	Wilton	1.95	1.74	0.10
0310-0039	Construct station parking lot, 141 spaces.	Guilford	3.07	2.91	0.09
SHARED RIDE					
Main Regional Rideshare Program					
Various Projects	Programs to encourage van or carpooling. Projects include: 0170-2709, 0170-T714, 0170-2706, 0170-2708, 0170-TX15, 0170-2711, 0170-2707, and 0170-2710.	Statewide	897.39	737.22	7.34
TRAFFIC FLOW IMPROVEMENTS					
Signal System Upgrades					
0155-0160 0155-0161	Traffic signal adjustments and additions.	Statewide	2.73	2.73	n/a
Incident Management System Design & Construction					
0063-0563	Improve the Travel Information Gateway for managing traffic congestion on I-84.	Hartford	30.70	15.05	n/a
DEMAND MANAGEMENT					
Various Projects	Employee Commute Option program to include Telecommuting, Transportation Days and Travel Demand Management Offices (to promote carpooling, vanpooling and public transportation). Projects include: 0170-2713, 0170-2712, 0063-0634, 0092-0600, 0135-0296, 0015-0325, 0034-0326, 0094-0221, and 0151-0306.	Statewide	192.10	386.01	5.47
EXPERIMENTAL PILOT PROJECTS					
Alternate Fuel Vehicles					
0170-2734 0170-2735	Purchase of four alternate fuel vehicles.	Statewide	1.35	7.63	n/a
	TOTAL of all projects		**1154.98**	**1189.71**	**13.48**
	TOTAL (tons/day)		**1.24**	**1.31**	**0.01**

*** Summary table provided by CTDOT.**

Table 4-7. 2002 – 2006 Emission Summary Report for Significant TCMs Completed*

State Project Number	Project Description	Geographic Area	Total Emission Benefit (kg/d)			CMAQ Report Year
			VOC	NO_X	$PM_{2.5}$	
TRANSIT						
Rail Freight Facilities						
0092-0586	Advancement of the railroad track installation on Waterfront Street and associated utility relocations.	New Haven	0.46	18.44	0.16	2005-09
TRAFFIC FLOW IMPROVEMENTS						
Signal System Upgrades						
Various Projects	Upgrade signal control equipment to a closed loop system. Projects include: 0046-0120, 0048-0180, 0048-0181, 0063-0567, and 0128-0141	Statewide	4.58	4.58	n/a	2005-09
Various Projects	Upgrade signal control equipment to a closed loop system. Projects include: 0007-0178, 0033-0122, 0051-0255, 0051-0256, 0155-0153, 0155-0154, and 0155-0155		16.85	0.85	n/a	2002
Incident Management System Design & Construction						
0014-0170	Construct incident management system on I-95 from exit 56 vicinity to exit 64 vicinity.	Branford	6.11	3.00	0.00	2005-09
0131-0184	Construct incident management system on I-84 in Central Connecticut Region.	Southington	3.91	1.92	n/a	2005-09
0151-0278	Construct incident management system on I-84 in the Waterbury area.	Waterbury	1.03	0.50	0.001	2005-09
0151-0286	Construct incident management system on CT 8.	Waterbury	2.19	1.08	0.002	2005-09
0034-H044	Construct incident management system on I-84 in the Danbury area.	Danbury	6.00	0.18	n/a	2002
0092-0524	Construct incident management system on I-91 in New Haven from I-95 interchange to exit 8.	New Haven	1.70	0.05	n/a	2002
	TOTAL of all projects		**42.83**	**30.60**	**0.17**	
	TOTAL (tons/day)		**0.0472**	**0.0337**	**0.0002**	

*** Summary table provided by CTDOT.**

initiative focuses on reducing vehicle miles traveled between New Haven and New York City on Interstate 95 (I-95). A specific strategy TSB has developed is a Bridgeport to New York feeder barge service that would transport trucks and buses across the Long Island Sound, removing them from this congested section of I-95. More information is available in TSB's 2007 report and recommendations, entitled "Moving Forward: Connecticut's Transportation Strategy"

4.4.2 Federal Control Measures

Locomotives and Marine Diesel Engines

Effective July 7, 2008, EPA promulgated more stringent emission standards for locomotives and marine diesel engines.[44] This proposed rule will reduce emissions from these engines through a three-part program. The first part involves tightening emission standards for existing locomotives when they are remanufactured. These standards are effective as soon as certified remanufacture systems are available (as early as 2008). The new remanufacturing standards would not apply to the existing fleets of locomotives owned by very small railroads, such as those that comprise the bulk of the fleet in Connecticut

The second part includes setting near term engine-out (Tier 3) emission standards for new locomotives and marine diesel engines to be phased-in starting in 2009. The third part of the program entails setting longer-term (Tier 4) emission standards for newly built locomotives and marine diesel engines that reflect the application of high-efficiency emission control technology.

The Tier 4 emission standards would begin to be phased-in starting in 2014 for marine diesel engines and 2015 for locomotives (these standards are enabled due to the availability of diesel fuel capped at 15 ppm sulfur content in 2012). All new marine diesel engines with displacements less than 30 liters per cylinder (Category 1 and Category 2 engines greater than 50 hp) installed on U.S.-flagged vessels are covered in this rulemaking. This proposal also includes provisions to eliminate emissions from unnecessary locomotive idling as well as requesting comments to reduce emissions from existing marine diesel engines when they are remanufactured.

Spark-Ignition Engines

On May 18, 2007, EPA published a rule proposing exhaust emission standards for marine spark-ignition engines (more stringent than those finalized on October 4, 1996)[45] and small land-based non-road spark-ignition engines.[46] The proposed rule also includes new evaporative emission standards for equipment and vessels using these engines. The marine spark-ignition engines and vessels affected by these standards (effective starting with the 2009 model year) include outboard engines and personal watercraft, as well as sterndrive and inboard engines, which are being regulated for the first time.

The small non-road spark-ignition engines and equipment affected by these standards (effective starting with the 2011 and 2012 model years) are those rated below 25 hp (19 kW) used in

[44] 73 FR 37095, June 30, 2008.
[45] 61 FR 52088, October 4, 1996.
[46] 72 FR 28098, May 18, 2007.

household and commercial applications, including lawn and garden equipment, utility vehicles, generators, and a variety of other construction, farm, and industrial equipment.

4.5 Conclusion

Connecticut has implemented all emission control programs mandated by the 1990 CAA, many of which are RACM, and, which, in conjunction with federal requirements now in effect, provide emissions reductions that ensure continuous improvement in ambient $PM_{2.5}$ levels and expeditious attainment in the NY-NJ-CT area. As $PM_{2.5}$ NAAQS violations are not occurring in Connecticut's ambient air and as attainment is projected by 2010 for the NY-NJ-CT area, no additional RACM are available or necessary that will advance attainment in the area by one year.