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1. I am a Records Request Processor at the Internet Archive. I make this declaration of my own personal knowledge.

2. The Internet Archive is a website that provides access to a digital library of Internet sites and other cultural artifacts in digital form. Like a paper library, we provide free access to researchers, historians, scholars, and the general public. The Internet Archive has partnered with and receives support from various institutions, including the Library of Congress.

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6. Attached hereto as Exhibit A are true and accurate copies of browser screenshots of the Internet Archive's records of the archived files for the URLs and the dates specified in the attached coversheet of each screenshot.

7. Attached hereto as Exhibit B are true and accurate copies of the Internet Archive's records of the archived files for the URLs and the dates specified in the attached coversheet of each file.

8. I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

DATE: 01/13/2025

Tanya Zeif

Tanya Zeif

Please see attached All Purpose Jurat form for additional Notary Events

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EXHIBIT A

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Air Quality, Global Climate Change & Renewable Energy
January 24-26, 2005
Westin La Paloma Resort, Tucson, Arizona

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200 Presentations
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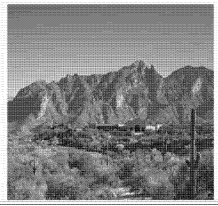
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15 captures
3 Sep 2000 - 4 Jan 2004
2001 06 2003 2004
About this capture



Prevention

The mission of the Massachusetts Department of Environmental Protection is to protect and enhance the quality of the Commonwealth's natural resources -- its air, water and land -- in order to provide for the health, safety, welfare of its citizens.

The Department's Bureau of Waste Prevention furthers this mission by administering air, water and land protection programs as prescribed by federal and state laws. The Bureau uses environmental monitoring, planning, education, tracking, permitting, compliance and enforcement to ensure protection of the environment through application of the following Waste Prevention Principles:

- Encourage practices which eliminate or reduce waste at its source
- Maximize opportunities for safe recycling of wastes/emissions which can not be eliminated at the source
- Direct the use of the most advanced treatment technology of wastes/emissions which can not be eliminated at the source or recycled, reducing wastes/emissions to a level which will enable the Commonwealth to protect the public health and environment
- Ensure the appropriate parties take full responsibility for safe management of wastes from the point of generation until ultimate disposition
- Ensure environmentally sound disposal capacity exists for the liquid, solid and hazardous wastes which can not be feasibly eliminated at the source, recycled or treated
- Coordinate programs to achieve a coherent, effective, consistent and beneficial impact on affected facilities and persons

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[Waste Prevention Home] [Waste Prevention Divisions and Programs] [MA DEP Home] [Contact: Thomas.Higgins@state.ma.us]

Last Updated: February 17, 998

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Bureau of Waste Prevention

Divisions and Programs

Jim Colman, Assistant Commissioner
Sarah Weinstein, Deputy Assistant Commissioner

The Bureau of Waste Prevention consists of four Divisions: Planning and Evaluation, Business Compliance, Consumer and Transportation and Program Support.

Planning and Evaluation Division

Barbara Kwetz, Director

The Division is responsible for long range planning for the traditional, water, and waste programs, while moving toward an integrated Bureau-wide approach to pollution prevention planning and evaluation, based on shared and integrated environmental, engineering and program data, which will be accessible to all. The Division consists of three programs:

1. Air Program Planning Unit
2. Waste Programs Planning Unit
3. Systems Integration and Data Analysis Unit

Business Compliance Division

Steve DeGabriele, Director

The Division's mission is to ensure all businesses operate in a manner which protects the environment and human health. Tools (e.g. certifications, permits, assessments, enforcement, and outreach) will be used selectively to achieve desired outcomes. Goals include holistic, multimedia approaches, greater involvement with DEP regional staff, customer orietnation, efficiency and effectiveness, while maintaining and enhancing program expertise. The Division consists of three programs.

1. Special Projects
2. Regulatory Standards and Outreach
3. Enforcement and Audits

Consumer and Transportation Division

Nancy Seidman, Division Director

Future environmental gains from changes in public behavior depend upon the Department's ability to educate and influence, not solely on control through traditional enforcement efforts. The mission of this division is to promote environmental citizenship so that each resident realizes the part the each can play in creating clean air, water and land. The Division consists of three programs:

1. Transportation Program Units
2. Consumer Programs Unit
3. Education and Communication Unit

Program Support Division

Debra Thomas, Acting Division Director

This Division is responsible for providing administrative and financial support services to the Bureau, including contract management, federal grants, and processing of asbestos notifications and hazardous waste manifests. The Division consists of three programs:

1. Fiscal Management Unit
2. Program Support
3. Federal Grants

[Waste Prevention Home] [Waste Prevention Publications] [MA DEP Home] [Contact: Thomas.Higgins@state.ma.us]

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Bureau of Waste Prevention

Publications By Program

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Planning and Evaluation Division, including

1. Air Program Planning Unit
2. Waste Programs Planning Unit, including

   Pollution Prevention/Toxics Use Reduction (TURA)
   Waste Planning and Evaluation Services Branch
3. Systems Integration and Data Analysis

Business Compliance Division, including

1. Special Projects
2. Regulatory Standards (formerly Hazardous Materials)
3. Enforcement and Audits

Consumer and Transportation Division

[Contact: Thomas.Higgins@state.ma.us]
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Revised March 10, 2000

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Bureau of Waste Prevention

Air Program Planning Unit Publications

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Air Toxics

Annual Air Quality Reports

Asbestos

Carbon Monoxide

Daily Ozone Forecast

Emission Control Plans

Forms

Low Emission Vehicles

Massachusetts Ozone SIP

NOx Budget Program

Regulations and Public Notices

Stage II Vapor Recovery

State Implementation Plan Steering Committee

Other Air Quality Reports and Publications

Air Toxics

Addressing Air Toxics in Massachusetts	The air we breathe can become contaminated with pollutants from a variety of natural and man-made sources. When federal law addressing air quality was enacted in 1970, air pollution control had focused on "criteria" pollutants, including sulfur dioxide, carbon monoxide, nitrogen oxides, ozone, and particulate matter...
Risk and Risk Assessment risksum.doc 47 KB	Information on risk assessment, and the role it plays in environmental decision-making at the Massachusetts DEP.
EPA's NATA Data cepfac.doc 44 KB	Background information and Massachusetts-specific findings of EPA's National Air Toxics Assessment (NATA). March 2002.
EPA's NATA Data avgofc.xls 36 KB	This table provides, by county, a list of the NATA modeled ambient air concentrations that were predicted to exceed a Massachusetts Allowable Ambient Limit in more than one county. March 2002.
Source Contribution to Average Predicted MA 1996 Ambient Air Concentrations Using NATA Data siccon.ppt 1 MB	These charts provide a percent contribution of five source categories (background, non-road mobile, on-road mobile, area, and major) to average predicted MA 1996 ambient air concentrations using EPA's NATA data. March 2002. PLEASE NOTE: The U.S. EPA released its final 1996 National Air Toxics Assessment (NATA) report on May 31, 2002. For further information about the 1996 NATA report visit EPA's website at http://www.epa.gov/ttn/atw/nata/natsaov.html

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Annual Air Quality Reports Commonwealth Of Massachusetts

2001 Air Quality Report 01aqrpt.pdf 573 KB	Summary of 2001 air quality data obtained from our air monitoring network.
2001 Site Directory and Location Tables sitedir.pdf 26 KB	Directory of monitorings stations and locations
2000 Annual Air Quality Report 00aqrpt.pdf 918 KB Maps for the: Central Region central.htm	Report on 2000 ambient air quality. Maps showing the DEP regions for the 2000 Annual Air Quality Report

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Western Region western.htm Southeast Region south.htm Northeast Region north.htm	
The 1999 Annual Air Quality Report 99aqrpt.pdf 900 KB	Available as a portable document file (PDF). Please Note: The considerable size of this file may make downloading it with a slower modem difficult. To request a printed copy, please contact John Lane at 978-975-1138 x 304 or via e-mail at John.Lane@state.ma.us
Maps and Cover Page 99covmap.pdf 916 KB	Maps showing the DEP regions for the 1999 Annual Air Quality Report.
The 1998 Annual Air Quality Report 98aqrpt.pdf 2.34 MB	Information and data about outside air quality monitoring in Mass. Published Nov. 1999. Please Note: The considerable size of this file may make downloading it with a slower modem difficult. To request a printed copy, please contact John Lane at 978-975-1138 x 304 or via e-mail at John.Lane@state.ma.us
The 1997Annual Air Quality Report 97aqrpt.pdf 295 KB	Information and data about outside air quality monitoring in Mass. Published Sept. 1998. Please Note: The considerable size of this file may make downloading it with a slower modem difficult. To request a printed copy, please contact John Lane at 978-975-1138 x 304 or via e-mail at John.Lane@state.ma.us

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Carbon Monoxide

Background Document and Technical Support cotsd.doc 672 KB insert images: Figure 1 and Figure 8	Proposed Revision to State Implementation Plan for Carbon Monoxide. Technical support document dated September 2000.

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Emission Control Plans

Amended Emission Control Plan for USGen New England Salem Harbor Station Draft Approval salemame.doc 132 KB salemame.pdf 70 KB	December 13, 2002.
Final Approval of ECP for USGen New England Salem Harbor Station salemfin.doc 113 KB	June 7, 2002
Proposed Approval of ECP for USGen New England Salem Harbor Station usgsalem.doc 122 KB	March 2002.
Final Approval of ECP for Brayton Point Station brytnfin.doc 116 KB	June 7, 2002
Proposed Approval of ECP for Brayton Point Station pgebrytn.doc 121	March 2002.
Final Approval of ECP for NRG Somerset Station nrgfinal.doc 112 KB	June 7, 2002
Proposed Approval of ECP for NRG Somerset Station nrgsomer.doc 118	March 2002.
Final Approval of ECP for Mt. Tom Station mttomfin.doc 127 KB	June 7, 2002
Proposed Approval of ECP for Mt. Tom Station mounttom.doc 133 KB	March 2002.
Final Approval of ECP for Mirant Canal Station mirfinal.doc 105 KB	June 7, 2002
Proposed Approval of ECP for Mirant Canal Station mircanal.doc 113	March 2002.
Final Approval of ECP for Sithe Mystic Station	June 7, 2002

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sithenn.doc 116 KB	
Proposed Approval of ECP for Sithe Mystic Station sithemys.doc 123 KB	March 2002.

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Forms

Form A: Installation/Susbstantial Modification Certification s2forma.doc 171 KB Form B: Vacuum Assist System 120-Day In-Use Compliance Certification s2formb.doc 187 KB Form C: Annual In-Use Compliance Certification s2formc.doc 200 KB Form D1: Alternative Annual In-Use Compliance Certification (No Testing Required) s2formd1.doc 165 KB Form D2: Alternative Annual In-Use Compliance Certification (Testing Required) s2formd2.doc 200 KB Form E: Change of Owner, Operator, Lessee or Controller Notification s2forme.doc 139 KB Form F: System Closure Notification s2formf.doc 121 KB	June 25, 2002 - Forms for Stage II System Responsible Officials
Form G: Compliance Testing Company Notification s2formg.doc 155 KB Form H: Change of Compliance Testing Company Documentation s2formh.doc 176 KB	June 25, 2002 - Forms for Stage II Compliance Testing Companies
Emissions Notification Form aqemis.pdf 192KB	50% or 25% Facility Emissions Cap
Source Registration Forms and Instructions Greeting Letter: sr02let.doc 40 KB Cover Page: sr01cov.doc 34 KB Instructions: sr01table.doc 692 KB Referenced information: sr01app.doc 1.5 MB List of Hazardous Air Pollutants: aqcaalist.doc 266 KB Feul Utilization Equipment: aqap1.doc 177 KB Process Description: aqap2.doc 171 Incinerator: aqap3.doc 177 KB Organic Material Storage: aqap4.doc 151 KB Organic Compound Usage: aqap5.doc 167 KB Solvent Data Registration: aqap6.doc 134 KB Source Registration: aqapsr.doc 152 KB Typical Ozone Day: aqapes.doc 138 KB	Source Registration/Emission Statement. Now available in Microsof Word format with fillable form fields. December 2001.
Air Quality Permits	Links to DEP's permit applications page

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Low Emission Vehicles

Hearing Notice	Hearing Notice (public hearing on 3/13/02) on Amendments to the Low Emission Vehicle Program regulations adopting the California ZEV mandate in MY 2005 and the Alternative Compliance Plan in MY 2004. 2/12/02
Technical Support Document and Regulation	Technical Support and Background Document and Amendments to the Low Emission Vehicle Program regulations adopting the California ZEV mandate in MY 2005 and the Alternative Compliance Plan in MY 2004. The amendments were adopted as an emergency regulation on December 31, 2001. 2/12/02

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zevtsd.doc 240 KB	
Program Contacts	Christine.Kirby@state.ma.us Chief, Transportation Management Programs (617) 292 - 5631 Annette.Widener@state.ma.us Environmental Analyst (617) 292 - 5762
Final Regulation 7.40final.doc 120 KB	Final amendments to the Low Emission Vehicle Program regulations to adopt the California "NTE" standards for diesel engines.12/21/01
Response to Comments rtc.doc 69 KB	Summary of Comments and Response to Comments on the Proposed Regulation12/21/01
The Low Emission Vehicle Program	The Massachusetts Low Emission Vehicle (LEV) law, enacted in 1990, requires that all new passenger vehicles sold and registered in Massachusetts meet cleaner California motor vehicle emission standards. This fact sheet will tell you what you need to know before buying a new car.
Emission Requirements for Importing Vehicles into Massachusetts	Emission requirements for importing vehicles into Massachusetts from another state or from another country.

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Massachusetts Ozone SIP

Cover Letter to EPA Region I (9/02/02) epalet.doc 43 KB Narriative for Final Eastern MA Attainment SIP (9/02/02) narritiv.zip 73 KB Appendixes for Final Eastern MA Attainment SIP (9/02/02) appendix.zip 1.4 MB	Cover Letter to EPA Region I for Final Eastern Massachusetts 1-Hour Ozone NAAQs Attainment Demonstration SIP 9/02/02 Narrative for Final Eastern Massachusetts 1-Hour Ozone NAAQs Attainment Demonstration SIP 9/02/02 Appendixes 1-5 for Final Eastern Massachusetts 1-Hour Ozone NAAQs Attainment Demonstration SIP 9/02/02.
Proposed Eastern MA Attainment SIP (6-02) EMAtD602.zip 78 KB Appendices 1-4 to Proposed Eastern MA Attainment SIP (6-02) Apend602.zip 1.3 MB	This is proposed SIP revision for Eastern MA demonstrating attainment of the 1-hour ozone standard by 2007. June 2002.
Proposed SIP Revision for Eastern MA (1-02) public hearing notice ema_tsd.doc 84 KB ema_nox.xls 40 KB ema_voc.xls 64 KB newtrgt.xls 167 KB	The Proposed SIP Revision includes: • Technical Support Document for Proposed Eastern MA SIP Revision, January 2002 • Tables for Appendix A • Table showing the calculation of new Target Levels of Emissions
Background and Technical support document (1998) siptech.zip 500 KB	These compressed files contain the 1998 Mass submittal for ozone (total of 181 files) and include public hearing proposal and hearing notice. The proposal includes two approaches for dealing with the attainment demonstration. The proposal asks for comments on the two approaches and any commitments. Public hearings were held on June 1 and 2, 1998, in Springfield and Boston, respectively.
Appendix A and technical modeling discussion (1998) mdl_docs.zip 265 KB	
Plot files in GIF (1998) diffplts.zip 2.4 MB	
Episode maximum plot GIF files (1998) maxplots.zip 2.5 MB	
Final Attainment Submittal (1998) attain.pdf 73 KB	This is Massachuestts' 1998 Final Attainment Submittal for the one-hour ozone standard. It includes as attachments: the technical support documents listed above, DEP responses to comments received during the public hearing process, and a list of commitments made by DEP to attain the one-hour ozone standard..

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NOx Budget Program Information

Testing and Reporting Requirements for 310 CMR 7.28 testreq.doc 45 KB	Testing and Reporting Requirements guidance for facilities applying under 310 CMR 7.28 "NOx Allowance Trading Program"; September 26, 2001

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Net Output Monitoring Guidance for 310 CMR 7.28 output.doc 68 KB	Net Electrical and Steam Output Monitoring Guidance for facilities applying under 310 CMR 7.28; November 20, 2000
Revision to DEP's NOx Allowance Trading Program for seasons 2003-2005 728amend.pdf (30 KB)	This is the Massachusetts DEP's proposed SIP revision and proposed revision to 310 CMR 7.28 "NOx Allowance Trading Program." This minor revision addresses a seven-ton deficiency, in the allocation for three municipal power companies for the first three control periods of the program (2003-2005).
DEP's NOx Allowance Trading Program for 2003 728rtc.pdf 94 KB 728table.pdf 8 KB 728reg.pdf 62 KB	These are documents associated with the Massachusetts regulation (310 CMR 7.28) to implement a NOx Allowance Trading program in 2003, and to distribute Massachusetts NOx allowances to sources within the state. The regulation is designed to fulfill Massachusetts' commitments under the Ozone Transport Commission's Memorandum of Understanding for Regional NOx Reductions, and conform to the EPA's 22-state NOx SIP Call. The documents include: (1) 728reg -- The regulation, 310 CMR 7.28 (2) 728table -- Table of unit allowance allocations for the year 2003 (3) 728rtc -- DEP's responses to comments received at public hearings
Modified Proposal: Response to EPA's NOx SIP Call and the OTC NOx MOU tsdsup.doc (75 KB) regsup.doc (155 KB)	This is the Massachusetts DEP's modified public hearing draft SIP revision to implement a NOx Allowance Trading Program in 2003, and to distribute Massachusetts NOx allowances to sources, in response to EPA's NOx SIP Call and Massachusetts' commitments under the OTC NOx MOU.
DEP Public Hearing Proposal: SIP Revision in Response to EPA's NOx SIP Call and the OTC NOx MOU: Technical Support Document deptsd.doc 174 KB Attachments to the Technical Support Document, including proposed regulatory amendments depatt.doc 112 KB	This is the Massachusetts DEP's public hearing draft SIP revision to implement a NOx Allowance Trading Program in 2003, and to distribute Massachusetts NOx allowances to sources, in response to EPA's NOx SIP Call and Massachusetts' commitments under the OTC NOx MOU.

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Regulations and Notices

Public Hearing Notice	Public Notice for Hearings on Proposed Revisions to 310 CMR 60.02, Regulations for the Enhanced Motor Vehicle Inspection and Maintenance Program to Establish an On-Board Diagnostics Test (August 14, 2002).
Draft Proposed Revisions to 310 CMR 60.02 for OBD Testing obdrev.doc 143 KB obdrev.pdf 63 KB Background Document obdbkgr.doc 150 KB obdbkgr.pdf 92 KB	Proposed Revisions and Background Document for 310 CMR 60.02, Regulations for the Enhanced Motor Vehicle Inspection and Maintenance Program to Establish an On-Board Diagnostics Test and Other Revisions (August 14, 2002)
310 CMR 60.00: Air Pollution Control For Mobile Sources 310cmr60.htm	These Regulations include three Sections: 310 CMR 60.02 - Enhanced Motor Vehicle Inspection and Maintenance Program; 310 CMR 60.03 - Transportation Conformity; and 310 CMR 60.04 - City of Cambridge Vehicle Trip Reduction Program. These Regulations were last corrected on 10/1/99. Note: Other regulations for the control of air pollution for mobile sources are included in 310 CMR 7.00, Air Pollution Control Regulations.
Air Pollution Control Regulations 310 CMR 7.00 airnav.htm	These Regulations address the control of point and non-point sources of air pollution. This version of the Regulations is intended to reflect changes in the following areas made since 1/22/99: Municipal Waste Combuster changes - 7.08(2) Stage II amendments - 7.24(6) New Boiler changes - Definitions, 7.02, 7.26, 7.278/3/01 Air Regs changes - 310 CMR 7.00, 310 CMR 7.02, 7.03, 7.04, 7.05, 7.06, 7.12, 7.18 and 7.19 NOx allowance Trading - 7.28 Emission Standards for Power Plants - 7.29 Appendix A 7.00 and Appendix C 1/4/02 Corrected Errors 12/24/99 - Revision to 310 CMR 7.40 to adopt LEV II. 12/22/00 - Modifications to 310 CMR 7.30 and 7.31 the Logan Airport and East Boston Parking Freezes 12/21/01 - Revision to 310 CMR 7.40 to adopt the California NTE requirments for heavy duty diesel engines 12/31/01 - Revision to 310 CMR 7.40 to adopt the California Zero Emission Vehicle revisions This version of the Air Pollution Control Regulations is not currently available in PDF.
Enhancement of the Air Pollution Control Regulations eairreg.doc 211 KB Enhancement of the Air Pollution Control	The Final Regulations - Amendments to 310 CMR 7.00, 7.02, 7.03, 7.04, 7.05, 7.06, 7.12, 7.18 and 7.19. August 3, 2001 are now available. See also, DEP's consideration of public hearing testimony on the Enhancement of the Air Pollution Control Regulations proposed rewrite. June 28, 2001

Regulations: Response to Comments eairrtc.doc 63 KB Regulatory Guide eairrg.doc 46 KB	The index of regulations as revised - Enhancement of the Air Pollution Control Regulations. August 6, 2001
310 CMR 7.29 Emissions Standards for Power Plants 729final.doc 66 KB	FINAL regulation requiring emission reductions at existing power plants.
Statement Of Reasons And Response To Comments For 310 CMR 7.00 Et Seq.: 310 CMR 7.29 - Emission Standards For Power Plants finalrsn.doc 300 KB	Additional Statement of Reasons for 310 CMR 7.29, Emissions Standards for Power Plants
Response To Comments 310 CMR 7.29 finalrtc.doc 154 KB	DEP Resopnses to Public Comments on 310 CMR 7.29, Emissions Standards for Power Plants
List of Commenters rtcnames.doc 45 KB	List of Commenters for 310 CMR 7.29, Emissions Standards for Power Plants
Draft Regulations mwireg.doc 101 KB	The regulation package establishes standards for Hospital/Medical Waste Incinerators (HMIWIs) to satisfy EPA requirements.
Background Document mwibkg.doc 41 KB	The background document discusses state plan and regulation to set new standards for HMIWIs.
State Plan mwistpl.doc 70 KB	The proposed state plan for HMIWIs for submittal to EPA.
Proposed Amendments To 310 CMR 7.00 appcrcgfx.doc 45 KB	This regulation package contains the changes required to obtain full approval of the Department's operating permit program, 310 CMR 7.00:Appendix C from the USEPA The amendments include several clarifying changes to further the effective implementation of the program.
Background Document On The Proposed Amendments To 310 CMR 7.00, Et Seq. apcbkgrd.doc 41 KB	The background document discussing the regulation changes required to obtain full approval of the Department's operating permit program as well as several clarifying changes to further the effective implementation of the program.
Ambient Air Quality Standards for the Commonwealth of Massachusetts 310 CMR 6.00 also available to download: 310cmr6.pdf 14 KB	These Regulations state the Primary and Secondary Ambient Air Quality Standards. These Regulations were last updated on 4/1/94.
The Prevention and/or Abatement of Air Pollution Episode and Air Pollution Incident Emergencies 310 CMR 8.00 also available to download: 310cmr8.pdf 32 KB	These Regulations list actions to be taken in the event of an air pollution emergency. These Regulations were last updated on 4/19/96.
Proposed revisions to the Air Pollution Control Regulations - 310 CMR 7.00 files to download: regenh.pdf 163 KB background information: bidaqreg.pdf 95 KB	Proposed revisions to the Air Pollution Control Regulations - 310 CMR 7.00 are now available. See also the proposed revisions and background information. For more information please contact Bob Donaldson at (617) 292-5619 or E-mail at Robert.Donaldson@state.ma.us
Proposed Revisions to 310 CMR 7.24(6) offered in both Word 6.0 and Acrobat formats: stage2.zip Zipped Word 6.0 file (56KB; or stage2.pdf 149 KB	The Proposed Revisions to 310 CMR 7.24(6) cover the Dispensing of Motor Vehicle Fuel (The Stage II Vapor Recovery Program).
Proposed Amendments to Regulations 310 CMR 7.00 ap-d-ri.pdf 30 KB Background Information And Technical Support On The Proposed Amendments To 310 CMR 7.00 Appendix A tsd2.pdf 25 KB	The amendments restore nonattainment new source review requirements in Eastern Massachusetts. This satisfies a requirement of the federal Clean Air Act.
Municipal Waste Combustor Regulations mwcregs.pdf 196 KB	The Complete Package for the Municipal Waste Combustor Regulations (Changes to 310 CMR 7.00 and 310 CMR 4.00) is now available.
Final Settlement Agreement, Municipal Waste Combustor Rule, IWSA et. al. v. Liss, Civil Action No. 99-11906EFH mwcsum3.doc 40 KB	Summary of Agreement settling a lawsuit brought by two municipal waste combustors and their trade association about the 1998 Municipal Waste Combustor Rule
Settlement Agreement mwcagree.doc 58 KB	Agreement settling a lawsuit brought by two municipal waste combustors and their trade association about the 1998 Municipal Waste Combustor Rule

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Stage II Vapor Recovery

Form A: Installation/Susbstantial Modification Certification s2forma.doc 171 KB Form B: Vacuum Assist System 120-Day In-Use Compliance Certification s2formb.doc 187 KB Form C: Annual In-Use Compliance Certification s2formc.doc 200 KB Form D1: Alternative Annual In-Use Compliance Certification (No Testing Required) s2formd1.doc 165 KB Form D2: Alternative Annual In-Use Compliance Certification (Testing Required) s2formd2.doc 200 KB Form E: Change of Owner, Operator, Lessee or Controller Notification s2forme.doc 139 KB Form F: System Closure Notification 2formf.doc 121 KB	June 25, 2002 - Forms for Stage II System Responsible Officials
Form G: Compliance Testing Company Notification s2formg.doc 155 KB Form H: Change of Compliance Testing Company Documentation s2formh.doc 176 KB	June 25, 2002 - Forms for Stage II Compliance Testing Companies
Stage II Vapor Recovery Regulations (310 CMR 7.24(6)) finalsii.doc 128 KB	Final Amendments to the Stage II Vapor Recovery Regulations. September 29, 2000

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State Implementation Plan Steering Committee

Massachusetts State Implementation Plan Steering Committee Meeting Notice	Agenda for November 14, 2002 SIP Steering Committee Meeting. Updated agendas will be posted here approximately two weeks before the next scheduled meeting date.

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Other Air Quality Publications

Evaluation of the Technological and Economic Feasibility of Controlling and Eliminating Mercury Emissions from the Combustion of Solid Fossil Fuel mercfeas.doc 728 KB mercfeas.pdf 534 KB	Mercury Control Feasibility Evaluation prepared in accordance with 310 CMR 7.29(5)(a)3.a. (December 2002)
Final Draft Aggregate Impact Study For Inhalation Exposures To Air Toxics Emitted From Incinerators In The Merrimack Valley: Post Retrofit Case. mais.pdf 144 KB	This study was prepared by DEP to determine whether post-retrofit emissions from the two municipal waste combustors in the Merrimack Valley will meet the DEP's existing ambient air guidelines and risk management criteria. This study reviewed the post-retrofit emissions from the two municipal waste combustors in North Andover and Haverhill as well as the medical waste incinerator in Lawrence. (Please note that the Lawrence medical waste incinerator is not being required to retrofit at this time. Regulations regarding the upgrade of medical waste incinerators will be issued in 1999.)
Clean Air and Massachusetts Utilities: Eight Years of Cleaning Up Power Plant Emissions in the Commonwealth u-govfs.pdf 44 KB	June 1998 Report
Implementation of the 1990 Clean Air Act Amendments: A Massachusetts Status Report	This document focuses on programs being implemented by the Massachusetts Department of Environmental Protection to attain the ambient air quality standards.
1990 Base Year Inventory • Overview • Graphics	The Overview of 1990 Base Year Inventory including graphics is now available
1996 Draft Massachusetts Periodic Emission Inventories emissinv.pdf 248 KB	This document contains the Executive Summary for the Draft 1996 Periodic Emission Inventories for the precursors of ground level ozone: Volatile Organic Compounds (VOC), Nitrogen Oxides (NOx), and Carbon Monoxide (CO).

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Bureau of Waste Prevention
Division of Planning and Evaluation

EVALUATION OF THE TECHNOLOGICAL AND ECONOMIC FEASIBILITY OF CONTROLLING AND ELIMINATING MERCURY EMISSIONS FROM THE COMBUSTION OF SOLID FOSSIL FUEL

Pursuant to 310 CMR 7.29 – Emissions Standards for Power Plants

December 2002

This information is available in alternate format. Call Aprel McCabe, ADA Coordinator at 1-617-556-1171. TDD Service - 1-800-298-2207.

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EXECUTIVE SUMMARY

Purpose and Scope of This Report

Massachusetts' regulation 310 CMR 7.29, "Emissions Standards for Power Plants," which went into effect in May 2001, establishes emissions standards for sulfur dioxide (SO_2), oxides of nitrogen (NO_x) and carbon dioxide (CO_2) from the six affected power plants and caps emissions of CO_2 from the facilities. It caps mercury emissions from solid-fuel-fired affected facilities by limiting annual mercury emissions to the average annual emissions calculated using the results of required stack tests. The regulation also provides a framework for establishing emission standards for mercury from the affected facilities by requiring that the Department of Environmental Protection (the Department), by December 1, 2002, "complete an evaluation of the technological and economic feasibility of controlling and eliminating emissions of mercury from the combustion of solid fossil fuel in Massachusetts." The regulation also states: "within 6 months of completing the feasibility evaluation, the Department shall propose emission standards for mercury." This document constitutes the evaluation of the technological and economic feasibility of controlling mercury emissions from power plants called for in the regulation.

Conclusions As to Feasibility of Mercury Control

Based on a wide range of research, data and experience, the Department has concluded that control of mercury emissions from solid-fossil-fuel fired facilities is indeed feasible. The Department plans, therefore, to proceed with the development of a proposed a mercury emissions standard for power plants within six months of the date of this report.

As discussed in the report, U.S. Environmental Protection Agency (EPA) data demonstrates that some coal-fired facilities are already removing 98% of mercury from flue gas. Data from the stack tests required at the affected Massachusetts facilities indicate that a number of these facilities are already removing close to 90% of flue gas mercury. EPA has also demonstrated the economic feasibility of mercury control at up to 90% removal rates. Based on this information, and on other factors discussed in the report, the Department believes that the removal of 85-90+% of mercury in flue gas has been demonstrated to be technologically and economically feasible. The Department will continue to discuss with stakeholders the appropriate level and form of the mercury standard that will be proposed. The Department has not concluded that removal of 85-90+% of mercury is technologically and economically feasible for any of the Massachusetts facilities.

This report provides important background for development of the standard by assessing the general availability and effectiveness of a range of control measures. However, the Department recognizes that the feasibility of mercury controls for a specific facility will depend on a range of facility characteristics including: type of coal used; configuration of the plant; existing pollution controls and proposed additional controls. The Department also recognizes that the feasibility of control at each facility will be influenced by the form and level of the standard ultimately adopted, the time frame for implementation, and the state of control technologies at the time that the facilities are required to meet the standard.

The Department will begin discussing how the background information presented in this report can and should be used when developing a standard for Massachusetts' facilities with stakeholders at a meeting to be held in January 2003. The Department anticipates holding additional public meetings prior to proposing a draft regulation with a mercury standard. At these meetings it will continue to address issues related to the applicability of the findings of this report to the affected facilities. This will include consideration of factors unique to the affected Massachusetts facilities including the technical feasibility of certain control measures at individual facilities and the costs of implementation of various measures at each facility.

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Next Steps

The Department plans to propose standards for mercury emissions within six months of the issuance of this report, with a proposed compliance date of October 1, 2006, as required by 310 CMR 7.29. The proposed standards will be subject to a full regulation review process with a formal public comment period and a public hearing. At the January stakeholder meeting, as the first step in the development of a standard, the Department will take comment on this report as well as begin the discussion of the technological and economic feasibility of the control measures discussed in the report for specific Massachusetts facilities.

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INTRODUCTION

On May 11, 2001, Massachusetts regulation 310 CMR 7.29, "Emissions Standards for Power Plants," went into effect. This regulation establishes emissions standards for sulfur dioxide (SO_2), oxides of nitrogen (NO_x) and carbon dioxide (CO_2) from the six affected power plants and caps emissions of CO_2 from the facilities. It also caps mercury emissions from solid-fuel-fired affected facilities by limiting annual mercury emissions to the average annual emissions calculated using the results of required stack tests. The regulation, at 310 CMR 7.29(5)(a)3, also provides a framework for establishing emission standards for mercury from the affected facilities by requiring that the Department of Environmental Protection (the Department or DEP), by December 1, 2002, "complete an evaluation of the technological and economic feasibility of controlling and eliminating emissions of mercury from the combustion of solid fossil fuel in Massachusetts in accordance with the Mercury Action Plan of the Conference of New England Governors and Eastern Canadian Premiers." The regulation also states: "within 6 months of completing the feasibility evaluation, the Department shall propose emission standards for mercury."

PURPOSE AND SCOPE OF REPORT

At the time that DEP promulgated 310 CMR 7.29, it had not compiled the technical data to support emission standards for mercury. The regulation, therefore, required that DEP evaluate the technical and economic feasibility of controlling mercury emissions from the combustion of solid fossil fuel and issue this evaluation prior to proposing mercury standards. This document constitutes the evaluation of the technological and economic feasibility of controlling mercury emissions from power plants called for in 310 CMR 7.29(5)(a)3.a.

The Department plans to propose standards for mercury emissions within 6 months of the issuance of this report, with a proposed compliance date of October 1, 2006, as required by 310 CMR 7.29. The proposed standards will be subject to a full regulation review process in accordance with Chapter 30A, with a formal public comment period and a public hearing. The Department will likely hold one or more informal rule review meetings prior to issuing a proposed rule for comment.

The Department conducted three public stakeholder meetings, on August 1, September 20 and October 11, 2002, to solicit input from interested parties prior to the creation of this report. The Department appreciates the participation of the parties who attended those meetings and has carefully considered the comments and suggestions that the participants offered.

Many points raised during those public meetings related to issues other than the technological and economic feasibility of controlling mercury emissions. This report addresses only issues directly related to the technological and economic feasibility of controlling mercury emissions. This report does not address issues that had already been resolved with the promulgation of 310 CMR 7.29, such as the need for DEP to propose a mercury standard, nor does this report address other points not directly related to the technological and economic feasibility of controlling mercury emissions, such as the form of a mercury standard, mercury transport from out-of-state sources, or health impacts related to mercury contamination.

DEP will use this final feasibility report as part of its technical support for the mercury standards to be proposed. The Department will accept comments on this final report, or additional information that interested persons would like the Department to consider as it develops the proposed standard, at any time. The Department will also accept comments on the content of this final report during the formal rule making for the proposed mercury standard.

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BACKGROUND

Mercury is a persistent, bioaccumulative toxic metal that exists at trace levels in the earth's crust. It is released to the environment by airborne emissions, direct discharges to surface water and soil, accidental spills, and natural activities. Although all releases of mercury are of concern, air emissions play a significant role in the transport and dispersion of mercury. The health and environmental effects of mercury are well documented in other publications.[1]

Mercury is present as a naturally occurring trace element in coal. As coal is burned in electric utility boilers, the mercury (Hg) in the coal volatilizes to form gaseous elemental mercury (Hg^0). In the subsequent cooling of the combustion gases, interaction with other combustion products results in a portion of the elemental mercury being converted into gaseous oxidized forms of mercury (Hg^{2+}). A portion of Hg^0 and Hg^{2+} adsorbs onto particulate, forming particle-bound mercury (Hg_p). Thus, mercury exists in three different forms in coal combustion gas – elemental, oxidized, and particulate-bound – with the gaseous forms being the most prevalent in stack emissions. The form and amount of mercury emitted from specific coal-fired units is affected by coal type as well as numerous other factors, such as combustion variables and the presence of other chemicals in the coal.

The Department estimates that mercury emissions from the power plants covered under 310 CMR 7.29 are approximately two hundred pounds per year based on the stack test data that the facilities were required to collect and submit to DEP pursuant to 310 CMR 7.29.[2]

MERCURY REDUCTION INITIATIVES

Because there were no limits on air emissions of mercury from power plants in the U.S. prior to the adoption of 310 CMR 7.29, the electric utility industry has not had a strong incentive to control mercury emissions. However, there are currently a number of initiatives underway that are aimed at reducing mercury emissions from power plants, which, like the Massachusetts regulation, will provide incentive for further development of control technologies. These initiatives are outlined below.

EPA Utility MACT Development

In December 2000, EPA made a finding that the regulation of hazardous air pollutant emissions from electric utility steam generating units is necessary and that mercury is the hazardous air pollutant with the greatest potential concern for public health.[3] At that time, EPA added coal-and-oil-fired electric utility steam generating units to the list of source categories in section 112(c) of the Clean Air Act for which "maximum achievable control technology" (MACT) regulations must be developed. Pursuant to a settlement agreement, the utility MACT regulations are to be proposed by December 15, 2003 and promulgated by December 15, 2004 with a compliance date of December 15, 2007.

EPA indicates that it expects to propose and finalize a MACT regulation for power plants according to this timeframe. However, the Bush Administration has proposed legislation that would limit the emissions of SO_2, NO_x and mercury from power plants and replace the utility MACT rule requirement

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[1] See: U.S. Environmental Protection Agency. December 1997 Mercury Study: Report to Congress. U.S. EPA-452/R-97-0013 at: http://www.epa.gov/ttnatw01/112nmerc/volume1.pdf; Northeast States and Eastern Canadian Provinces Mercury Study: A Framework for Action, February 1998; Massachusetts Department of Environmental Protection. Mercury in Massachusetts: An Evaluation of Sources, Emissions, Impacts, and Controls. June 1996.
[2] From emission testing reports submitted to the Department to comply with 310 CMR 7.29(5)(a)3.d.
[3] See EPA Utility Air Toxics Study Report to Congress at: http://www.epa.gov/mercury/actions.htm#utility and EPA December 14, 2000 Fact Sheet at http://www.epa.gov/ttn/oarpg/t3/fact_sheets/fs_util.pdf.

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with a nation-wide mercury cap and trade program. Other multi-pollutant legislative proposals that contain nation-wide caps for mercury emissions from power plants have also been introduced. The extent to which any of these proposals, if enacted, would reduce emissions from Massachusetts' power plants cannot be determined. Furthermore, the prospect of enactment of any of these legislative initiatives is uncertain as of the date of this report. In the face of these uncertain federal requirements, and as required by 310 CMR 7.29(5)(a)3.b, the Department plans to propose emission standards for mercury within six months of completing this feasibility evaluation, notwithstanding the federal MACT process.

In support of the MACT development process, EPA undertook an evaluation of the mercury control performance of various emission control technologies that are either currently in use on coal-fired units for pollutants other than mercury or that could be applied to such units for mercury control. DEP's review and assessment of available control technologies draws heavily on EPA's evaluation.

Other States

A number of other states are taking steps to address mercury emissions from power plants. New Hampshire's Clean Power Act, signed into law in May 2002, calls for a cap on mercury emissions to be recommended to the legislature by the Department of Environmental Services by early 2004. New Jersey's Mercury Task Force released a January 2002 report containing reduction recommendations for mercury emissions from numerous source categories, including power plants. North Carolina has recently passed legislation calling for a study of mercury emissions from power plants and the feasibility of controlling those emissions. Wisconsin has established a task force to study issues related to the control of mercury emissions from power plants.

New England Governors and Eastern Canadian Premiers Mercury Action Plan

The Conference of New England Governors and Eastern Canadian Premiers (NEG/ECP) adopted a Mercury Action Plan in 1998. Massachusetts is a signatory to this agreement. The NEG/ECP action plan established a long-term regional goal of virtual elimination of anthropogenic mercury emissions, with an interim goal of a 50% reduction in regional emissions by 2003. In 2001, after an evaluation of the interim goal, the NEG/ECP adopted another interim goal of an overall reduction of 75% or greater by 2010, with an evaluation in 2005 to allow for new information to be taken into account and to revise the target if necessary.[4]

The Mercury Action Plan includes commitments to establish mercury emissions limits for large municipal waste combustors and large medical waste incinerators, evaluating the feasibility of emission limits for municipal sludge incinerators, and implementing regional strategies to promote the maximum economically and technically feasible reduction in mercury emissions from electric generating facilities and other boilers in the Northeast.

With regard to electric generating facilities, the NEG/ECP Mercury Action Plan makes the following recommendations:[5]

- promote the establishment of national and international strategies to reduce mercury emissions from utility and non-utility boilers;
- identify mercury emission control options and regional emission reduction targets for these sources within one year, using best available information;

[4] "Technology Recommendations for Reducing Mercury and Acid Rain Precursor Emissions from Boilers" (the "Joint Boiler Report"). http://www.scics.gc.ca/pdf/850084012_e.pdf

[5] Listed under Action Item 2.d for Utility and Non-Utility Boilers, recommendations 10, 11, and 12; and under Action Item 5 for Research, Analysis and Strategic Monitoring, recommendation 36.

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- develop and implement strategies to promote maximum economically and technically feasible reductions in mercury emissions from utilities and other boilers in the northeast with an implementation target commencement date of 2003; and
- promote collection of more emissions test data for sources such as utility and non-utility boilers, mobile sources, and oil refineries.

In 2000, the NEG/ECP Joint Boiler Workgroup released a report (subsequently accepted by the NEG/ECP) recommending the goal of reducing mercury emissions from coal-fired utility boilers by 20%-50% by 2005 and by 60-90% by 2010. These reduction goals were based on the February 1998 regional inventory, which serves as a baseline for the Mercury Action Plan. In August 2002, the NEG/ECP Joint Boiler Workgroup issued a report finding that the reduction target range of 60-90% from the 1998 baseline for the longer-term 2010 goal is still valid, while achievable reductions for 2005 are more likely to fall in the lower part of the 20-50% target range.

The establishment of mercury emission standards for Massachusetts' power plants is consistent with the goals of the NEG/ECP Mercury Action Plan.

OVERVIEW OF MERCURY CONTROL METHODS AND TECHNOLOGIES

In general, there are two approaches for reducing mercury emissions from coal-fired utility boilers: 1) pollution prevention through fuel switching and/or coal cleaning; and 2) post combustion controls, which remove mercury from the flue gas.

Pollution Prevention

Fuel-switching. Mercury emissions can be reduced by switching to another fuel (such as natural gas) partially or completely, or installing new gas-fired units or integrated gasification combined cycle (IGCC) units. The mercury reduction is incremental and limited to the difference in the mercury emissions of the two fuels. Installation of new gas-fired units or IGCC units would result in significant reduction of Hg. Co-firing or switching to natural gas may be an option for some facilities. Major considerations in switching to natural gas are: the availability of natural gas, the differential cost of natural gas versus coal, and the configuration of the existing units.[6]

Coal cleaning. Certain types of coal are processed to remove mineral matter in order to meet combustion specifications and increase heating value. The coal cleaning processes already used for these purposes result in some reduction of mercury content. The affected Massachusetts facilities use bituminous coal, which typically is cleaned using current technologies. Advanced coal cleaning technologies are being developed and can achieve further reduction of mercury in coal but do not offer the potential of significant additional reductions in the near term.

Post Combustion Controls

Post-combustion, flue gas technologies employ three basic methods to capture mercury:

1) capture of particulate-bound mercury in particulate matter control devices;
2) adsorption of elemental and oxidized mercury onto sorbents for subsequent capture in particulate matter control devices; and

[6] One Massachusetts facility, NRG Somerset, has received approval of its 310 CMR 7.29 Emissions Control Plan (ECP) application proposing natural gas reburn as a pollution control measure to comply with 310 CMR 7.29. See Appendix E for a summary of the ECP approvals for the four coal-fired facilities subject to 310 CMR 7.29.

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3) removal of soluble oxidized mercury in wet scrubbers (including processes to convert elemental to oxidized mercury for subsequent capture in wet scrubbers).

It is also useful to categorize mercury control methods in terms of:

1) mercury capture by controls currently designed for the capture of pollutants other than mercury (NO_x, SO_2, and particulates);
2) new combinations of control devices used for these other pollutants specifically intended for increased mercury capture; and
3) new controls designed specifically for mercury capture.

Appendix A reviews multiple mercury control methods and technologies. Table 1 below summarizes a number of the mercury control approaches that are discussed in detail in Appendix A. For a more complete discussion, with references, see Appendix A

Table 1. A selection of approaches demonstrated or under investigation to control mercury. Some approaches could reasonably be considered to fall in more than one category.

Pollution Prevention approaches	Biomass Substitution Coal Cleaning Low Mercury Coal Natural Gas Substitution New Coal Plant (Integrated Gasification Combined Cycle) New Gas Plant
Traditional control technologies for pollutants other than Hg that provide some amount of Hg capture	Electro Static Precipitator (ESP), cold side and hotside Fabric Filter (FF)/baghouse Flue Gas Desulfurization, wet, semi-dry, and dry Particulate Scrubber Selective Catalytic Reduction Selective Non-Catalytic Reduction Sprat dryer Absorber (SDA)
New combinations of, and modifications to, traditional technologies	Activated Carbon (AC) Injection Prior to Existing ESP or FF Adding tubular wet ESP Add-on Compact Fabric Filter + AC Injection Add-on Polishing Fabric Filter Carbon Bags for FF Catalyst Bed Oxidizer + Scrubber Catalytic Bags for FF Chemical Oxidant + Scrubber Convert 1 ESP field to wet Convert 1 ESP field to pulse-jet FF Enhanced Coal Washing Spray Dry Calcium-Based Sorbent Injection
Technologies designed to control Hg (or to control multiple pollutants including Hg)	Alternative Sorbents (e.g., calcium-based, Sodium Tetrasulfide) for Injection, in furnace or SDA Duct Modifications/Contacting Bed Fixed Metal/Activated Carbon Catalyst Bed PowerSpan Electro Catalytic Oxidation

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For reference, the pollution control measures included in the Emission Control Plan (ECP) approvals for the coal-fired Massachusetts facilities subject to 310 CMR 7.29, including control devices currently installed and control devices expected to be installed at those facilities to comply with the 310 CMR 7.29 NO_x and SO_2 requirements, are summarized in Appendix E.

TECHNOLOGICAL FEASIBILITY OF MERCURY CONTROLS

The Department is relying on a wide range of research, data and experience to assess the technological and economic feasibility of mercury control. Based on the following, the Department concludes that the capture of at least 85-90+% of flue gas mercury is technologically feasible.

EPA's Mercury Information Collection Request (ICR) Data
To demonstrate the feasibility of mercury control, the Department points to data collected by EPA in 1999 as part of a nation-wide effort to develop a database to support EPA's development of a MACT standard for power plants. The data collection effort, referred to as EPA's Mercury Information Collection Request (ICR), was designed to gather emissions data from plants representative of the US coal-fired power plant fleet. The US fleet was categorized by 1) combustion technology utilized, 2) type of coals combusted, and 3) control devices installed for PM, NO_x, and SO_2.

The Massachusetts coal-fired units subject to 310 CMR 7.29 employ pulverized coal combustion technology. A summary of EPA's Mercury ICR data from pulverized coal fired boilers is listed below in Table 2. The table further breaks down the results from pulverized coal boilers by the type of coal combusted[7] and by the type of emissions controls installed.[8] The figures represent the three-run average percentage of mercury captured by the installed control devices, calculated from the difference in mercury measured before and after the control devices. The results document that there are US facilities that currently achieve up to 98% removal of mercury from bituminous coal, the kind used by affected facilities.

[7] The coal-fired Massachusetts facilities subject to 310 CMR 7.29 combust bituminous coal.
[8] The pollution control measures included in the ECP approvals for the coal-fired Massachusetts facilities subject to 310 CMR 7.29, including control devices currently installed and control devices expected to be installed at those facilities to comply with the 310 CMR 7.29 NO_x and SO_2 requirements, are summarized in Appendix E.

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Table 2. Mean mercury reduction for pulverized-coal-fired boilers.[9]

Post-combustion Emission Controls Used for Pulverized Coal Boiler		Average Total Mercury Emission Reduction (%)[(a)]		
		Bituminous Coal	Subbituminous Coal	Lignite Coal
PM Control Only	CS-ESP	36 %	3 %	-4 %
	HS-ESP	9 %	6 %	not tested
	FF	90 %	72 %	not tested
	PS	not tested	9 %	not tested
PM Control and Spray Dryer Adsorber	SDA + ESP	not tested	35 %	not tested
	SDA + FF	98 %	24 %	0 %
	SDA + FF + SCR	98 %	not tested	not tested
PM Control and Wet FGD System	PS + FGD	12 %	-8 %	33 %
	CS-ESP + FGD	75 %	29 %	44 %
	HS-ESP + FGD	49 %	29 %	not tested
	FF + FGD	98 %	not tested	not tested

Key: (a) Mean reduction from 3-run averages for each pulverized coal boiler unit in Phase III EPA ICR database.
CS – cold side; ESP – electrostatic precipitator; FF – fabric filter; FGD – flue gas desulfurization; HS – hot side; PM – particulate matter; PS – particulate scrubber; SDA – spray dryer absorber; SCR – selective catalytic reduction

Massachusetts' Test Data

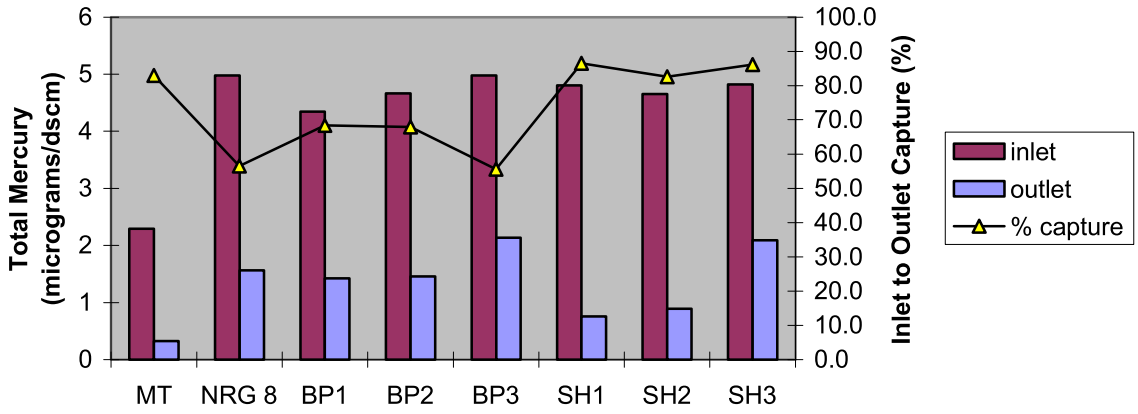
To demonstrate the feasibility of mercury control, the Department points to preliminary results of testing required by 310 CMR 7.29,[10] which indicate that some Massachusetts coal-fired units are achieving mercury capture rates approaching 90% due to existing emission controls and operating conditions.

The regulation required that each of the affected solid-fossil-fuel-fired facilities perform three sets of tests for mercury concentrations and species at two different points in the exhaust stream: 1) before all add-on air pollution control equipment (inlet), and 2) after add-on air pollution control equipment (outlet). This data is a snapshot of actual mercury emissions from each unit tested for the time period covered by the test (generally 2-3 days). Each of the three test sets consists of three runs, for a total of nine runs. The nine-run average amount of total mercury measured at the two required points and the calculated percentage of mercury captured by the installed control devices at Massachusetts coal-fired units subject to 310 CMR 7.29 is shown below in Chart 1. The results document that some Massachusetts coal-fired units are achieving mercury capture rates approaching 90% with the existing emissions controls at the facility.

[9] Table from Office of Air Quality Planning and Standards, US EPA: Research and Development, "Control of Mercury Emissions From Coal-Fired Electric Utility Boilers: Interim Report Including Errata Dated 3-21-02," prepared by National Risk Management Research Laboratory, April 2002, EPA-600/R-01-109, pp. ES-10.
[10] From emissions testing reports submitted to the Department to comply with 310 CMR 7.29(5)(a)3.d.

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Chart 1. Average Total Mercury in Flue Gas by Unit



Key: MT – Mount Tom Station; NRG – NRG Somerset Station; BP – Brayton Point Station; SH – Salem Harbor Station

Expected Emissions Controls on Massachusetts Coal-fired Units

To demonstrate the feasibility of mercury control at Massachusetts' facilities beyond the level of control currently achieved, the Department points to the 310 CMR 7.29 Emission Control Plan (ECP) approvals issued by the Department for each of the facilities subject to the regulation.[11] The facilities affected by 310 CMR 7.29 have proposed to comply with the NO_x, SO_2 and CO_2 standards in the regulation by employing a variety of strategies that will also achieve further mercury reductions.

In particular, wet Flue Gas Desulfurization (FGD) is to be installed on Brayton Point unit 3; dry FGD and fabric filters are to be installed on Salem Harbor units 1 and 3; Selective Catalytic Reduction (SCR) is to be installed on Brayton Point units 1 and 3 and Salem Harbor units 1, 2, and 3; and Selective Non-Catalytic Reduction (SNCR) is to be installed on Mt. Tom unit 1. As illustrated in Table 2, mercury capture increases with installation of additional controls. This same result can be expected in Massachusetts facilities that are proposing to install additional controls.[12] Because the facility owners proposed use of these control devices, it is self-evident that these specific control devices are technologically feasible at these specific facilities.

Field Tests of Mercury Specific Controls

To demonstrate the feasibility of mercury control using mercury-specific control technology, the Department points to the full scale pilot tests of sorbent-injection mercury control systems at Brayton Point Station and Alabama Power's Gaston facility, which have produced preliminary results of at least 90% mercury capture.[13]

Under the auspices of the Department of Energy (DOE) National Energy Technology Laboratory, studies of mercury control devices are occurring across the US. One study of particular relevance to

[11] See Appendix E for a summary of the pollution control measures included in the ECP approvals for the coal-fired facilities subject to 310 CMR 7.29.

[12] See Appendix A for a discussion of the details of the physical and chemical mechanisms exploited by various mercury control strategies.

[13] "Mercury Control Pilot Testing at Brayton Point Station," presentation at the Mercury Standards Technology Feasibility Meeting, Massachusetts Department of Environmental Protection, Boston, MA September 20, 2002, Richard Schlager, ADA Environmental Solutions.

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Massachusetts includes testing at four facilities: Alabama Power's Gaston unit 3, Wisconsin Power's Pleasant Prairie unit 2, and two Massachusetts units subject to 310 CMR 7.29, i.e., Brayton Point unit 1 and Salem Harbor unit 1. The goals of the study are to:

- perform the first full-scale evaluations of mercury control on coal-fired boilers,
- evaluate the effectiveness of sorbent-based mercury control (e.g., activated carbon),
- test several different power plant configurations, and
- document all costs associated with mercury control.

The final report on all four facilities will not be ready before summer 2003; however, some preliminary data are available.

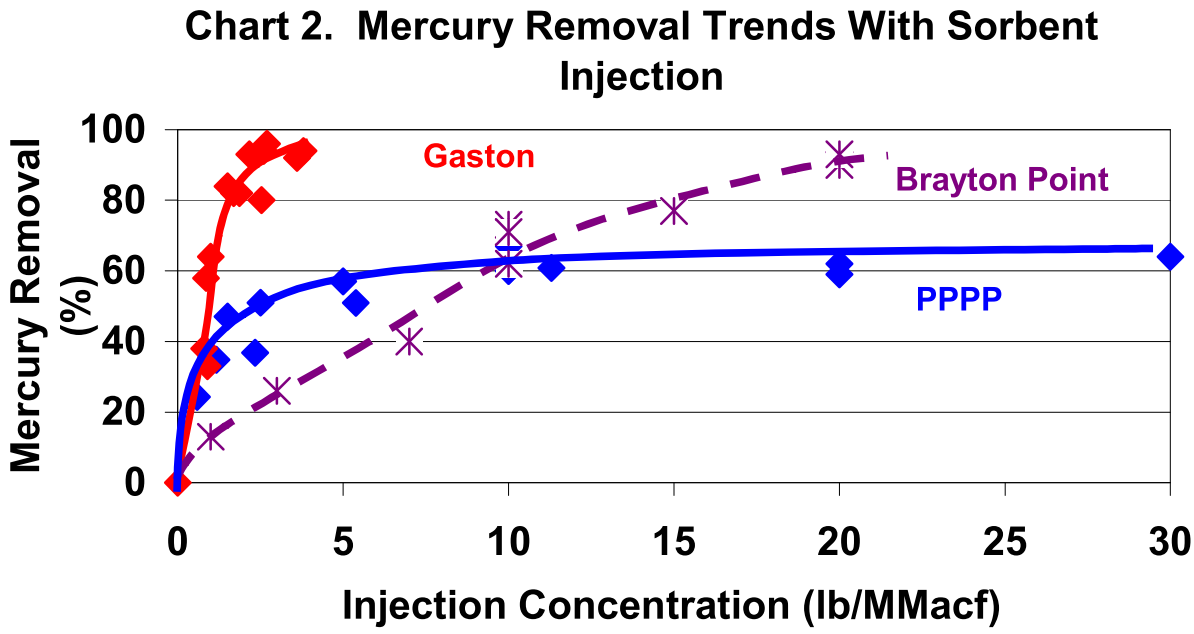
A comparison of the Gaston, Pleasant Prairie, and Brayton Point results shown in Chart 2 below indicates that Gaston showed the highest percentage of mercury removal (i.e., 90+% removal) at the lowest concentration of sorbent injected (i.e., less than 5 pounds of sorbent per million actual cubic feet of flue gas (lb/MMacf)) for those three units for which preliminary data are available. This result is also reflected in cost data indicating Gaston has the highest mercury removal (i.e., 90+% removal) with the lowest sorbent costs at that removal level (i.e., under 0.5 mills/kWh). Gaston's impressive cost results are due in part to a PM control device (COHPAC, to be discussed in the next two sections) that requires less sorbent be injected to achieve a given mercury removal level than does a facility equipped only with an ESP. Gaston was selected for the DOE sorbent-injection tests specifically because COHPAC represents a cost effective retrofit solution to improve particulate matter collection for utilities with existing ESPs.

With respect to both the removal trend and the sorbent costs, preliminary results for Brayton Point indicate that the higher the amount of sorbent injected, the more mercury removed, with the highest removal values during long term tests ranging from 90-93% at the highest sorbent injection rate of 20 lb/MMacf. In contrast to the other two facilities for which data are available, Brayton Point does not exhibit a sorbent injection level at which further injection of sorbent provides no further mercury removal; instead, addition of more sorbent results in additional mercury reductions over the range of sorbent injection levels tested, with an approximately linear trend.

These results are preliminary, and DOE's prime contractor in this study has indicated that extended operation of the sorbent-injection-based system would be needed to determine if there are negative impacts of sorbent injection on downstream hardware. DOE's contractor has estimated that the "first commercial installations at a few early adopters" could occur in 2005-2007.[14] These preliminary results of DOE-funded field tests demonstrate successful application of mercury-specific control technology at mercury removal levels greater than 90%; thus, control of mercury using mercury-specific control technology is technologically feasible.

[14] "Status of Sorbent Injection Mercury Control Technology," Testimony before the US Senate Committee on Environment and Public Works, Michael D. Durham, ADA Environmental Solutions, January 29, 2002.

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COHPAC Experience

Further demonstration of the feasibility of mercury control comes from the experience with fabric filter technology (in particular the Electric Power Research Institute's patented COmpact Hybrid PArticulate Collector (COHPAC) baghouse system). Because mercury adsorbs onto particulate matter, mercury capture can be improved by collecting a larger portion of flue gas particulate matter. As can be seen in the upper portion of Table 2 on page 14, a fabric filter typically captures far more mercury than an electrostatic precipitator; this is due to: 1) increased contact between flue gas and particulate matter on the filter itself, providing additional opportunity for flue gas mercury to adsorb onto particulate matter, and 2) increased collection of the particulates to which mercury has adsorbed.

The SEMASS Municipal Waste Combustor (MWC) facility in Rochester, Massachusetts conducted pilot scale testing of COHPAC for a year starting in April 1998 and subsequently installed COHPAC on units 1 and 2 in order to achieve the standards established by the Massachusetts MWC regulation 310 CMR 7.08(2). The pilot testing was initially intended only to assess particulate capture, but the scope was ultimately enlarged to evaluate carbon injection at two boiler locations. Installation of COHPAC saved the municipalities contracting with the MWC for trash disposal an estimated $10,000,000[15] by avoiding the installation of conventional baghouses on units 1 and 2.

The COHPAC technology has been in use to control opacity on two units at Alabama Power's Gaston facility[16] (since December 1996 on unit 3 and since June 1999 on unit 2), showing that the technology has been successfully transferred to the electric power industry. A "sorbent injection plus COHPAC" configuration was also used at Alabama Power's Gaston station during DOE-funded sorbent-injection tests as discussed above in "Field Tests of Mercury Controls." The increased contact between flue gas mercury and sorbent provided by sorbent caught on the fabric filter means that less sorbent must be

[15] SEMASS estimate.
[16] "COHPAC (COmpact Hybrid PArticulate Collector): The Next Generation in Particulate Control Technology, Alabama Power Company's E.C. Gaston Units #2 and #3, 'A Success Story'" Miller, Richard et al.

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injected to achieve a given level of mercury control than is required for a facility equipped only with an ESP, thereby reducing costs.

Fabric filter-based particulate control technology, which will increase mercury capture, has been successfully transferred to the electric power industry; thus, control of mercury at power plants using equipment originally designed for particulate capture is technologically feasible.

MWC Source Sector Mercury Reductions

Massachusetts' experience with Municipal Waste Combustors (MWCs) further demonstrates the feasibility of mercury control. Although the MWCs have characteristics that make them operationally different from power plants,[17] they are an example of another industry sector that has achieved 90% control through the application of a mercury control technology that holds promise for power plants.

The Department established MWC regulation 310 CMR 7.08(2) in 1998 requiring compliance with an annual mercury emissions limit based on the rolling average of four quarterly stack tests. Facilities are complying with the standard and achieving greater than 90% reduction in mercury emissions, using a variety of controls (including PM, SO_2, and NO_x controls), and carbon injection to reduce emissions of both mercury and organics (e.g., dioxins/furans). Gaseous mercury adsorbs onto injected carbon, and the particulate matter is then removed in the PM control device. The MWCs were required to optimize the level of carbon injection by selecting a carbon injection rate above which additional amounts of carbon injection would achieve limited additional mercury control. For reference, certain MA MWC units have mercury stack emissions at the same levels as MA coal-fired units, while other MWC units have mercury stack emissions an order of magnitude higher than MA coal-fired units.[18]

The MA MWC, SEMASS, using the COHPAC baghouse technology injects carbon to achieve control of mercury and organics in a "sorbent injection plus COHPAC" configuration. That MWC has a consistent record of demonstrating compliance with the MWC emissions standards.

Carbon injection systems are widely used to achieve 90% mercury capture on MWCs in Massachusetts and other states, providing a wide base of practical experience with manufacture of sorbents, installation, and material handling, demonstrating that this mercury-specific control technology is technologically feasible.

Mercury Control Research Activities

To demonstrate the feasibility of mercury control, the Department has completed a literature review, summarizing an extensive amount of research activity in the field of mercury control and considerable progress by the private sector towards the commercialization of various mercury controls. Appendix A is an extensive review of technical approaches at various stages of development that could be used to reduce mercury emissions from coal-fired power plants.

Mercury control is the focus of numerous research programs in the United States, that together constitute a multi-million dollar research effort.[19] Public agencies (such as DOE and EPA) and private agencies (such as the Electric Power Research Institute and the Southern Research Institute) have joined with equipment vendors (such as ADA Environmental Solutions, Babcock and Wilcox McDermott

[17] A major difference being the much larger volume of stack gas released from large power plants; other differences include the constituents of the stack gas, temperatures, and fuels.

[18] From emissions testing reports submitted to the Department to comply with 310 CMR 7.29(5)(a)3.d. and 310 CMR 7.08(2).

[19] Please see http://www.fossil.energy.gov/coal_power/existingplants/mercurycontrol_fs.shtml for an overview of the mercury control research that has been undertaken with financial support from the US DOE.

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Technology, Powerspan, Consol, Apogee Scientific and others), universities (such as the University of North Dakota) and a large number of power plant owners to support research activities adding to the information base on control of mercury emissions from power plants. The research areas range from improving traditional control devices to development of new technologies; from the measurement of mercury to creation of more economical sorbent materials. The Department is aware that new results of these research efforts are being released as they become available and will continue to track these developments.

The research underway makes it likely that technologies currently considered experimental will become commercially available, and that new experimental technologies will start down the path to commercialization within the next few years.

Regulatory Drivers

The Department believes that its adoption of mercury emission standards will provide incentives for further research, broader commercialization of existing technologies, and more cost-effective technologies. The ability of regulations to serve as a driver for technology is documented in a September 2000 Report by the New England States for Coordinated Air Use Management (NESCAUM).[20] The NESCAUM report relies on case studies related to the development of technologies for control of: 1) NO_x emissions from power plants, 2) SO_2 emissions from power plants, and 3) the evolution of motor vehicle controls to support the following findings:

- a strong link between regulatory drivers and technological innovation;
- technological improvements and reductions in control costs follow the adoption of regulations; and
- technological improvements and cost reductions have occurred even when control options were limited or largely untested when the regulations were introduced.

The Department believes that past experience, as documented in the NESCAUM report, supports the view that the adoption of a regulatory mercury standard for coal-fired power plants will serve as a strong incentive for the development of additional cost-effective technologies and lead to greater cost-effectiveness of existing technologies. As stated in the NESCAUM report:

> Viewed in the context of the case studies … the present status of mercury controls clearly does not preclude near-term regulation. On the contrary, past experience strongly suggests that the impetus of regulatory drivers is all that is lacking to advance these technologies to full-scale commercial application." (Executive Summary, page 2.)

Demonstration of Compliance with a Mercury Standard

The Department also evaluated options that might be used by facilities to demonstrate compliance with a mercury emission standard. Detailed discussion can be found in Appendix C. There are approaches commercially available now to allow facilities to demonstrate compliance with a mercury emission standard, including fuel and emissions sampling. The specific compliance demonstration technique that would be required must be selected in concert with the form of the emissions limit in the standard. This topic will be considered during development of the Department's proposed standard.

Elimination of Mercury Emissions

With respect to the elimination of mercury emissions, the Department is aware of no pre-treatment or add-on control technology that would eliminate mercury emissions from the combustion of solid fossil

[20] "Environmental Regulation and Technology Innovation: Controlling Mercury Emissions from Coal-Fired Boilers." NESCAUM, September 2000.

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fuel. Eliminating mercury emissions would be possible only by switching to a fuel that does not emit mercury (i.e., wind, solar, nuclear, natural gas), but the technological and economic feasibility of such a switch would be dependent on the specific situation at a facility, including the availability of the alternate fuel source.

ECONOMIC FEASIBILITY OF MERCURY CONTROLS

The Department concludes that mercury control is economically feasible for coal-fired power plants and relies on the points set forth below to support this conclusion. More detailed discussion relating to the costs of mercury controls and the following points is included in Appendix B.

- EPA has demonstrated that various levels of mercury control are economically feasible, including a 90% control level. EPA's projected costs for sorbent-injection based systems, which most likely will reach commercialization for mercury control before other technologies, are similar to those seen and accepted for control of NO_x in the electric power industry.

- Future costs for mercury controls are expected to decline for a number of reasons, including the following:

    - The development of more cost-effective particulate control devices, such as COHPAC;

    - Development of more effective sorbents, such as composite powdered activated carbon (PAC) lime;

    - Economies of scale related to more widespread use of sorbents;

    - Development of cheaper raw materials for the manufacture of sorbents; and

    - Use of ultra fine sorbents with a higher surface area, which allow for use of less sorbent.

- Mercury controls in the context of a multi-pollutant regulation, such as 310 CMR 7.29, allow for improved cost-effectiveness due to co-benefits realized through the implementation of controls that reduce emissions of more than one pollutant.

- Improved methods for controlling mercury and multi-pollutant emissions are under development by DOE, EPA, EPRI, the electric industry, and control technology vendors. (See Appendix A.) As a result of these research and development activities, mercury and multi-pollutant control options are expected to become available with improved cost-effectiveness in the next few years.

- Prior experience indicates that regulations can provide the impetus for more cost-effective pollution control technologies.

The Department recognizes that the actual costs to any facility will be highly dependent on the stringency of the standards ultimately adopted as well as the characteristics of the facility. This report does not attempt to assess the actual costs of mercury reduction at any of the affected facilities. A determination of actual costs to any facility would require an analysis of the applicability of various technologies at a specific facility in concert with a specific emission standard. That analysis is beyond the scope of this report.

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