EPA United States Environmental Protection Agency New England

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FACT SHEET

UNIVERSITY OF MASSACHUSETTS CENTRAL HEATING PLANT

Draft PSD Permit Number

050-026-MA11

I. GENERAL INFORMATION

Name of Source:	University of Massachusetts Central Heating Plant
Location:	University of Massachusetts Amherst Campus Amherst, Massachusetts
Applicant's Name and Address:	University of Massachusetts Building Authority 225 Franklin Street – 12th Floor Boston, MA 02110
Application Prepared By:	Earth Tech, Inc. 300 Baker Avenue, Suite 290 Concord, MA 01742
PSD Permit Number:	050-026-MA11
EPA Contact:	Brendan McCahill Air Permits, Toxics and Indoor Air Programs (CAP) (617) 918-1652

II. INTRODUCTION

In March 2008, the University of Massachusetts Building Authority (the Authority) in accordance with the Clean Air Act (CAA), Subchapter I, Part C (42 U.S.C. Section 7470, *et seq.*), filed an application with the Environmental Protection Agency (EPA) Region 1 office for a Prevention of Significant Deterioration (PSD) permit under 40 CFR 52.21. The Authority asked EPA to revise its current PSD permit to incorporate several changes that the Authority made in the design of a new central heating plant (CHP) located at the University of Massachusetts, Amherst, Massachusetts. After reviewing the March 2008 application entitled "Prevention of Significant Deterioration Permit Application for the University of Massachusetts, Amherst Central Heating Plant," EPA Region 1 prepared the following Fact Sheet and draft PSD permit for the CHP project.

EPA's permit decisions are based on the information and analysis provided by the applicant and its (EPA's) own technical expertise. This Fact Sheet documents the information and analysis

EPA used to support the PSD permit decisions. It includes a description of the existing facility, the proposed changes, the applicable PSD requirements, and an analysis demonstrating how the permit decisions comply with those requirements.

EPA Region 1 has concluded that the Authority's application is complete and provides the necessary information showing that the revisions to the CHP project meet the federal PSD regulations. As such, EPA is making the March 2008 permit application and supplemental materials part of the official record for this Fact Sheet and PSD permit. The permit application is available on-line at EPA Region 1's web site.

Please note that this project is also subject to the Massachusetts Department of Environmental Protection's (DEP) *Plan Approval* requirements under *Commonwealth of Massachusetts Regulations* (CMR); specifically 310 CMR 7.00 *et seq*. The DEP is issuing the Authority a Plan Approval that regulates all pollutants emitted by the proposed facility, including *particulate matter less than 10 micrometers* (PM_{10}) emissions regulated under this permit. EPA has worked closely with the DEP to ensure this PSD permit does not conflict with the DEP's Plan Approval requirements. The Authority must comply with both the federal PSD permit and the DEP's Plan Approval.

III. DESCRIPTION OF THE REVISED CENTRAL HEATING PLANT FACILITY

In August 2004, the University of Massachusetts Building Authority (the Authority) filed an application with the Environmental Protection Agency (EPA) Region 1 office for a Prevention of Significant Deterioration (PSD) permit in accordance with the Clean Air Act (CAA), Subchapter I, Part C (42 U.S.C. Section 7470, *et seq.*). The Authority proposed to construct and operate a new central heating plant (CHP) at the University's Amherst, Massachusetts campus. The proposed CHP project included a combustion turbine (CT) nominally rated at 10 megawatts, a heat recovery steam generator (HRSG) with a duct burner rated at 77.4 million Btu per hour, and four low-pressure boilers each rated at 131,250 pounds per hour of steam. The CT and boilers are equipped with selective catalytic reduction (SCR) systems and oxidation catalyst (OC). On July 25, 2005, after reviewing the information provided in the application and other supporting documents, EPA issued a PSD permit that allowed the authority to construct and operate a CHP as outlined in the August 2004 application.

In March 2008, the Authority submitted a new PSD application to reflect several design changes

that the Authority made in the construction of the CHP. In brief, the Authority replaced two of the four low-pressure boilers with a single high-pressure boiler and increased the heat input of the HRSG's duct burner. The Authority also redesigned the CHP's smoke stacks.

In addition, after reviewing the March 2008 application, EPA asked the Authority to explore the use of the new transportation grade fuel oil with a sulfur content lower than the 0.05% by weight sulfur content allowed under the existing permit. The transportation grade fuel oil now generally available has a sulfur content of 0.0015% by weight. Since sulfur is a significant contributor to PM emissions, limiting the sulfur content from 0.05% to 0.0015% by weight should significantly reduce the potential PM emissions from the CHP by more than 40%. On April 28, 2008, the Authority received notice that the new transportation grade fuel was available in sufficient quantities to support the CHP operations.

Considering the benefits of the new CHP design and the use of lower sulfur fuel, EPA is proposing to revise the PSD permit to include the new high pressure boiler and new limits for sulfur in fuel.

IV. PSD PROGRAM APPLICABILITY

As shown in 40 CFR 81.322, EPA currently classifies Western Massachusetts as a *moderate nonattainment area* for ground level ozone and *attainment* for all other criteria pollutants. Under these classifications, the Massachusetts Department of Environmental Protection (DEP) administers the nonattainment NSR program to regulate emissions of Volatile Organic Compounds (VOC) and Nitrogen Oxides (NOx) as a precursor to ground level ozone. EPA Region 1 administers the PSD program that applies to significant emission increases of all other regulated criteria pollutants.

The federal PSD program at 40 CFR 52.21 includes several procedures to determine whether a new source or modification to a source is subject to the PSD program. In the 2005 PSD permit, EPA used the applicability procedures outlined in 40 CFR 52.21(a)(2)(iv)(d) "Actual-to Potential test for projects that only involve the construction of a new emission unit(s)." In brief, EPA calculated the maximum allowable annual emissions from the proposed CHP project. EPA then subtracted the actual emissions associated with the removal of the existing coal/oil fired heating plant from the CHP's maximum allowable emissions. If the difference in emissions exceeds the PSD threshold levels, the CHP is subject to PSD review. The calculation showed that the CHP

was subject to PSD review for PM_{10} emissions only. EPA's preliminary determination for the 2005 PSD permit provides the full PSD applicability calculation for the CHP project.

Using the emission estimates for the revised equipment and the procedures used in the 2004 PSD permit applicability, the Authority determined that the revised CHP project remains subject to the PSD program for PM_{10} emissions only. As noted, the Authority has replaced two of the low-pressure boilers previously permitted under the existing PSD permit with a single high-pressure boiler. In addition, the Authority increased the heat input of the duct burner located in the HRSG from 77.4 MMBtu/hr to 91.8 MMBtu/hr. Table 1 provides the results of the Authority's PSD applicability calculations including the allowable emissions from the revised CHP project, the actual emission from the existing CHP, the net change in emissions, and the significance levels. The complete PSD applicability calculations are found in Section 3.3 of the March 2008 PSD application. EPA reviewed the Authority's PSD applicability calculations and agrees with the results.

Table 1. PSD Applicability Determination

Pollutant	Proposed CHP Potential Emissions (tpy)[a]	Existing Plant Actual Emissions (tpy)[b]	Net Change in Emissions (tpy)	Significant Emission Rates (tpy)[c]
PM_{10}	97.6	4.14	+93.46	15
SO_2	85.9	388.94	-303.07	40
NO_2	44.5	174.31	-129.81	40
CO	66.5	44.11	+22.39	100

[a] Based on potential emissions from the CTG and three new package boilers operating at maximum load oil and the duct burner operating at maximum load firing natural gas in any 12-month rolling period.
[b] Based on actual emissions from the existing boilers averaged over calendar years 2001 and 2002.
[c] Significant emission rates triggering PSD.

In addition, for determining PSD applicability and drafting the PSD permit, EPA relied on the May 16, 2008 rules implementing the NSR program for fine particulate matter (particles with an aerodynamic diameter less than or equal to 2.5 microns). See Implementation of the New Source Review (NSR) Program for Particulate Matter Less Than 2.5 Micrometers (PM[2.5]), 73 FR 28,321. As stated in section V.H.2. of the preamble to that rule, submitted applications for NSR permits that are complete prior to July 15, 2008 can continue to be processed using EPA's memorandum "Interim Implementation of New Source Review Requirements for $PM_{2.5}$" (October 23, 1997). This guidance allows the use of PM_{10} as a surrogate for $PM_{2.5}$. This

grandfathering provision is codified at 40 CFR 52.21(i)(1)(xi). See 73 FR at 28340. EPA finds that the Authority's application is complete and has used PM_{10} as a surrogate for $PM_{2.5}$ when determining PSD applicability and for designing the permit terms and conditions.

V. APPLICABLE PSD REQUIREMENTS

The PSD program requires the applicant to demonstrate that the CT and the low and high pressure boilers will incorporate air pollution control technologies representative of BACT, and that the resulting emissions will not cause or contribute to a violation of applicable ambient air quality standards or PSD allowable increments. The applicant is also required to assess the project's impacts on soils, visibility and secondary growth. The applicable federal PSD program regulations are listed below:

- 40 CFR 52.21(j) Control Technology Review (Best Available Control Technology)
- 40 CFR 52.21(k) Source Impact Analysis (Air Quality Impact Assessment)
- 40 CFR 52.21(l) Air Quality Models
- 40 CFR 52.21(m) Air Quality Analysis
- 40 CFR 52.21(n) Source information
- 40 CFR 52.21(o) Additional Impact Analysis (Additional Impact Analysis)
- 40 CFR 52.21(p) Federal Class I Area Impacts (Air Quality Impact Assessment)

EPA notes that the Authority has already applied the control technology requirements (i.e., BACT as determined in 2004) to those emission units that the Authority built to the original specifications. EPA requested that the Authority reevaluate the BACT analysis for these units to determine if there are any new emission control options available that could further reduce emissions. EPA also requested that the Authority perform additional air quality modeling that takes into account the existing configuration of the buildings and smoke stack and any changes to other PSD sources or ambient conditions since 2004.

VI. BEST AVAILABLE CONTROL TECHNOLOGY (BACT) (40 CFR 52.21(j))

Major new sources and major modifications to existing major sources are required to apply BACT pursuant to the PSD regulations at 40 CFR 52.21(j)(2) and (3). BACT is defined as *"an*

emissions limitation... based on the maximum degree of reduction for each pollutant subject to regulation under [the Clean Air] Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems and techniques... for control of such pollutant." 40 CFR 52.21(b)(12); Clean Air Act (CAA) 169(3). In addition, BACT can be no less stringent than any applicable NSPS or MACT standard. *Id.*

In determining BACT for the revised CHP, EPA used a top-down approach as outlined in the *draft 1990 New Source Review Workshop Manual* as guidance. The top-down approach includes the following five steps: a) Identify all control technologies, b) Eliminate technically unfeasible control options, c) Rank remaining control technologies by control effectiveness, d) Evaluate most effective controls and document results, e) Select BACT.

Combustion Turbine and Low Pressure Boilers:

As previously noted, EPA asked the Authority to determine if further improvements could be made to the July 2005 permit's control requirements and emission limits.

As documented in the 2005 BACT analysis for the CT and low-pressure boilers, EPA concluded that BACT was the use of natural gas and low-sulfur transportation fuel oil, low ammonia emissions or "slip" from the SCR systems, and good combustion practices. EPA found that traditional PM flue gas add-on controls were not technically feasible for the control of the fine PM emissions emitted by these types of sources. The Authority's 2008 application did not identify any new control options for these sources. EPA also is not aware of any new control options.

However, EPA notes that the current transportation grade fuel oil with a sulfur content of 0.0015% by weight is now available for use by CHP, as opposed to the older, higher sulfur (0.05%) fuel oil that was generally available in 2004. In an April 28, 2008 letter, the University's physical plant director informed the Authority that the lower sulfur fuel oil was available in sufficient quantities to meet the demand of the CHP project. Therefore, based on this information, EPA is proposing to limit the sulfur content of the distillate fuel oil used by the CT and low-pressure boilers to 0.0015% sulfur by weight. In addition, EPA will retain the 2005

BACT emission rate for ammonia slip of 2.00 parts per million, on a dry volumetric basis, corrected to 3% oxygen.

In addition, EPA notes that the Authority increased the heat input of the duct burner. However, the Authority will continue to operate the duct burner only while the CT is operating and only with natural gas. EPA concludes that these operational restrictions are BACT for the duct burner.

EPA is also proposing to revise the BACT PM_{10} for the CT and low-pressure boilers to the following emission limits:

CT and duct burner

Natural gas: PM_{10} (1- hour block average): 0.030 lbs/MMBtu and 6.89 lbs/hr (4.14 lbs/hr without the duct burner)

Distillate oil: PM_{10} (1- hour block average): 0.036 lbs/MMBtu and 7.96 lbs/hr (4.71 lbs/hr without the duct burner)

Low-pressure boilers:

Natural gas: PM_{10} (1- hour block average): 0.020 lbs/MMBtu and 3.24 lbs/hr

Distillate oil: PM_{10} (1- hour block average): 0.030 lbs/MMBtu and 4.68 lbs/hr

The 0.030 lbs/MMBtu emission limit for the CT and duct burner firing natural gas is based on the CHP's current PSD emission limits. The RACT/BACT/LAER clearinghouse data base again identifies similar emission units with lower BACT emission limits. However, the Authority notes that most of the units identified in the database are not equipped with an OC. The Authority maintains that the OC increases the formation of ammonia sulfate salts resulting in greater PM emissions.

The 0.036 lbs/MMBtu emission limit for the CT and duct burner firing distillate oil is based on emissions information that the Authority obtained from the CT's vendor, recently issued permits and various emissions databases. The Authority proposed the emission limit in a May 29, 2008

E-mail message to EPA.

The 0.020 lbs/MMBtu emission limit for the low-pressure boilers firing natural gas is based on the CHP's current PSD emission limits. The RACT/BACT/LAER clearinghouse data base identifies similar emission units with lower BACT emission limits. However, the Authority notes that all of these units except for one are not equipped with an OC and SCR systems. The Authority maintains that the SCR and OC would result in the formation of ammonia sulfate salt that would increase PM emissions.

The 0.030 lbs/MMBtu emission limit for the low-pressure boilers firing distillate oil is based on the use of the new lower sulfur fuel oil. The SOB for the 2005 permit explained that the higher emission limit was due to the relatively high rate of ammonia sulfate formation caused by the higher sulfur content of the distillate fuel oil. By proposing to restrict the sulfur content of the distillate fuel oil to 0.0015% by weight, EPA believes that the low-pressure boilers can now meet the lower emission rate of 0.030 lbs/MMBtu.

In addition, the permit includes the emission rate for the CT operations and for the combined operations of the CT and the duct burner. EPA notes that the duct burner's heat input emission rate expressed as lbs/MMBtu is below the CT's heat input emission rate. Therefore, the heat input emission rate for the combined CT/duct burner operations is below the emission rate for the CT alone. For simplicity, EPA will use the CT's heat input emission rate for the CT/duct burner operation. However, since the potential heat input for the combined CT/duct burner operations is higher than the CT operation alone, the CT/duct burner operation will have a higher total hourly emission rate. The permit did not include the emission rates for the duct burner alone since it does not operate independently.

High-Pressure Boiler:

Since the high pressure boiler was not authorized by the 2005 PSD permit, EPA required the Authority to conduct a new BACT analysis for this emission unit.

In brief, the Authority concluded that BACT for the high-pressure boilers was the use of natural gas and low-sulfur transportation grade fuel oil, low ammonia slip from the SCR systems, and good combustion practices. Similar to the low-pressure boilers, the Authority determined that current add-on PM emission control devices are not technically feasible for the control of the type of PM

emissions emitted by the high-pressure boiler. EPA has reviewed the Authority's BACT analysis and agrees with the findings. The Authority's complete BACT analysis is found in Appendix A of the application.

EPA is proposing the following BACT PM_{10} emission limits for the High-pressure boilers:

Natural gas: PM_{10} (1- hour block average): 0.020 lbs/MMbtu and 3.59 lbs/hr

Distillate oil: PM_{10} (1- hour block average): 0.030 lbs/MMbtu and 5.21 lbs/hr

The proposed emission limits are consistent with the BACT emission limits for low-pressure boilers as stated above.

In addition, EPA is removing from the PSD permit a filterable-only PM emission limit of 0.03 lbs/MMBtu that applied to the boilers while firing distillate fuel oil. As described in the 2005 Preliminary Determination, EPA included this emission limit to show that the BACT was no less stringent than the Industrial, Commercial and Institutional Boilers and Process Heaters Maximum Achievable Control Technology (MACT) standard that applied to boilers firing distillate fuel oil. Since EPA is proposing a limit that includes filterable and condensable PM emissions that is lower than the 0.030 lbs/MMBtu emission limit, the filterable emission limit is no longer required.

Emergency Generator and Diesel Fire Pump

In the 2005 PSD permit, EPA proposed as BACT for the emergency generator and diesel fire pump a 300 hour operational restriction per year for each unit while firing transportation grade fuel oil. Since the applicant has decided not to install the diesel fire pump, EPA will remove the diesel pump from the permit. For the emergency generator, the operational limitation and fuel oil restriction would limit total PM_{10} emissions to under 1 tpy. Given the economic impact of the costs of controlling such a small emission source, which is also intermittent, EPA concluded that additional controls were not necessary. However, similar to the boilers, EPA is proposing to limit the sulfur content of the distillate fuel oil used by the emergency generators to 0.0015% sulfur by weight. Because the only relevant facts that have changed since 2004 are the

availability of lower-sulfur fuel, the 2005 permit's operational and fuel restrictions, plus the additional restriction to use lower-sulfur fuel, are BACT for these units.

VII. AIR QUALITY IMPACT ASSESSMENT (40 CFR 52.21(k) - (p))

Section 52.21(k) of 40 CFR Part 52 requires the applicant to demonstrate that the allowable emissions from the CHP project will not cause or contribute to a violation of the applicable National Ambient Air Quality Standard (NAAQS) or PSD increment. In addition, the applicant must demonstrate that the CHP project emissions will not adversely affect air quality related values in any Class I area (national parks and wilderness areas). 40 CFR 52.21(p).

EPA Region 1 has reviewed and approved the Authority's dispersion modeling demonstration and results. The Authority followed EPA's *Guideline on Air Quality Models*, 40 CFR Part 51, Appendix W. Table 2 compares the maximum modeled impact for PM_{10} to the corresponding NAAQS levels and PSD increment. For NAAQS compliance, the Authority modeled the predicted maximum 24-hour PM_{10} concentrations attributable to the CHP, other existing major sources in the area, and background levels. As shown in Table 2, the maximum modeled concentration is 61.1 ug/m^3, well below the NAAQS concentration level of 150 ug/m^3.

For PSD increment compliance, the Authority modeled the combined impacts from the CHP and other major increment consuming sources in the area. As shown in Table 2, the maximum modeled impact is 9.84 ug/m^3, well below the PSD increment level of 30.0 ug/m^3. The full dispersion modeling analysis is documented in an air quality modeling protocol submitted to EPA Region 1 and is on file.

Table 2. NAAQS and PSD Increment Compliance

NAAQS Analysis for PM^{10}	Concentration (ug/m^3)	PSD Increment Analysis 24-hour average PM_{10}	Concentration ($\mu g/m^3$)
Combined Impact	10.07	Combined CHP and other Major Sources	9.84
Background	51.0	CHP alone	6.18
Total Concentration	61.1		

VIII: ADDITIONAL IMPACT ANALYSES (40 CFR 52.21(o))

The PSD regulations require the Authority to conduct an additional impact analysis to consider the project's effects on soils and vegetation and the potential impact of secondary growth. In addition, the Authority must also include an analysis of the commercial, residential industrial and other growth associated with the project and the potential air quality impact from this growth. (40 CFR 52.21(o))

The Authority performed a new visibility, soils and vegetation, and growth analysis as part of its March 2008 permit application. EPA Region 1 has reviewed and approved the Authority's visibility, soils and vegetation, and growth analyses and results. In brief, the visibility and the soils and vegetation analyses showed that potential impacts from the project are well below all significant threshold levels. The growth analysis did not predict any significant growth associated with the project or any significant air quality impacts from growth associated with the project.

IX: ENDANGERED SPECIES ACT

Section 7 of the Endangered Species Act (ESA) requires that all federal actions such as federal PSD permits protect endangered species consistent with the ESA. To comply with the ESA for the 2005 PSD permit, EPA Region 1 consulted with the United States Fish and Wildlife

Department-New England Field Office (USFW) to determine if the CHP project posed any risk to endangered species in the Amherst Region of Massachusetts. The USFW concluded that the CHP did not pose a threat to any endangered or proposed endangered species or their habitat in the area, and that no further ESA impact analysis was required.

For this federal action, Region 1 consulted with the United States Fish and Wildlife Service (FWS)-New England Field Office web site at:

http://www.fws.gov/northeast/newenglandfieldoffice/EndangeredSpec-Consultation_Project_Review.htm

to determine if the revised CHP PSD permit posed any risk to endangered species in Hampshire County, Massachusetts. Our consultation is consistent with the direction EPA received from the FWS in an e-mail on another PSD permit EPA is drafting. See the file for an e-mail from Anthony Tur of FWS to Phyllis Nelson of EPA dated November 20, 2007.

The website instructs EPA to review a list of endangered species by county and determine if an endangered species is located in the county for the permitted facility. Amherst is in Hampshire County. According to the table on the web site, the only listed endangered species in Hampshire County is the dwarf wedgemussel. For this species, the website provides a map that shows the range of the dwarf wedgemussel in Hampshire County. The map showed that the proposed CHP was outside the dwarf wedgemussel's range. Two threatened species (the Puritan tiger beetle and the small whorled pogonia) are also present in Hampshire County, but the CHP does not appear to be in their habitat either (for the Puritan tiger beetle, shoreline habitat along the Connecticut River; for the small whorled pogonia, mixed-deciduous or mixed deciduous/coniferous forests that are generally in second- or third-growth successional stages). Therefore, EPA concludes that the proposed PSD permit revisions do not pose a threat to any endangered or proposed endangered species or their habitat in the area subject to FWS jurisdiction, and that no further ESA impact analysis is required. The web site directed EPA to print a letter dated January 1, 2008 and signed by Anthony P. Tur, Endangered Species Specialist for FWS. The letter states that no further review is warranted. The file contains a copy of this letter. In addition, EPA has sent a copy of this fact sheet and draft permit to FWS.

X: Comment Period, Hearings and Procedures for Final Decisions

All persons, including applicants, who believe any condition of the Draft Permit is inappropriate must raise all issues and submit all available arguments and all supporting material for their arguments in full by the close of the public comment period, to Brendan McCahill, U.S. Environmental Protection Agency, Office of Ecosystem Protection, Air Permits, Toxics and

Indoor Air Programs, 1 Congress Street, Suite 1100, Attn. CAP, Boston, MA 02114-2023.

A public hearing will be held on the date stated in the public notice. EPA will, however, consider requests for extending the public comment period for good cause. In reaching a final decision on the Draft Permit, the EPA will respond to all significant comments and make these responses available to the public at EPA's Boston office.

Following the close of the public comment period, and after public hearings, the EPA will issue a Final Permit decision and forward a copy of the final decision to the applicant and each person who has submitted written comments or requested notice. Within 30 days following the notice of the permit decision, any interested parties may submit a petition for review of the permit to EPA's Environmental Appeals Board consistent with 40 C.F.R. § 124.19.