

FACT SHEET

University of Massachusetts Central Heating Plant (CHP)

**United States Environmental Protection Agency - Region I
1 Congress Street, Suite 1100
Boston MA 02114-2023**

Introduction

On August 2004, the University of Massachusetts Building Authority (the Authority) filed an application with the U.S. Environmental Protection Agency (EPA) Region I office for a Prevention of Significant Deterioration (PSD) permit under 40 CFR Part 52.21. The Authority proposes to construct and operate a new central heating plant (CHP) at the University's Amherst Massachusetts campus. After reviewing the August 2004 PSD permit application, EPA finds that the project meets the requirements of the PSD program and has prepared a preliminary determination and draft permit for public review and comment.

Description of Project

The Authority proposes to construct and operate a new Central Heating Plant (CHP) at the University's campus in Amherst, Massachusetts. The proposed CHP will consist of a combustion turbine nominally rated at 10 megawatts, a heat recovery steam generator (HRSG) with a duct burner rated at 77.4 million Btu per hour (MMBtu), and four conventional package boilers each rated at 131,250 pounds per hour of steam. Because of limitations on the availability of natural gas, the combustion turbine and package boilers will be designed to burn either natural gas or low sulfur distillate fuel oil; the duct burner will be fired exclusively with natural gas. Upon startup and certification of the CHP, the Authority will decommission the seven boilers fired with coal, fuel oil and/or natural gas at its existing steam plant, as well as the coal handling and storage facilities elsewhere on campus.

Western Massachusetts is currently classified a serious nonattainment area for ground level ozone and attainment for all other criteria pollutants. Under these classifications, the Massachusetts Department of Environmental Protection administers the nonattainment New Source Review (NSR) program that applies to emissions increases in Volatile Organic Compounds (VOC) and Nitrogen Oxides (NOx). EPA Region I administers the PSD program that applies to significant emission increases for the remaining pollutants.

To determine if the proposed project is subject to the PSD program, EPA subtracted the existing boilers' actual emissions from the potential emissions associated with the proposed project. If the resulting net emission difference is greater than the significance levels set out by the PSD program, the project is subject to the PSD program. The actual emissions from the existing boilers are based upon the average emissions over calendar years 2001 and 2002. To determine potential emissions from the proposed source, it was assumed that:

- the combustion turbine and package boilers are operated at maximum load firing transportation grade fuel oil for 8760 hours per year;
- the duct burner is operated at maximum load firing natural gas for 8760 hours per year; and
- the emergency generator and fire pump engine are operated at maximum load firing diesel fuel oil for 300 hours per year.

The following table shows the net change in emissions for each criteria pollutant.

| Pollutant | Proposed CHP Potential Emissions (tpy) | | | | Existing Plant Actual Emissions (tpy) | Net Change in Emissions (tpy) | Major Source Threshold (tpy) |
|------------------|--|-----------------|-----------------------|-------|---------------------------------------|-------------------------------|------------------------------|
| | Combustion Turbine /HRSG | Package Boilers | Generator & Fire Pump | Total | | | |
| PM ₁₀ | 42 | 142 | <<1 | 184 | 4 | +180 | 15 |
| SO ₂ | 26 | 146 | <<1 | 172 | 389 | -217 | 40 |
| NO _x | 19 | 31 | 8 | 58 | 174 | -116 | 25 |
| CO | 10 | 53 | <<1 | 63 | 44 | +19 | 100 |
| VOC | 3 | 14 | <<1 | 17 | 23 | -6 | 25 |

Using this information, the CHP project resulted in a significant emission increase of PM₁₀ emissions and is therefore subject to PSD review for this pollutant only.

Emission limitations

The PSD program requires that the permit apply best available control technology (BACT) to reduce PM₁₀ emissions for each emission unit. 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.*

The majority of PM₁₀ emissions from this project result from ammonia used in the SCR controls reacting with the sulfur in the fuel oil to form a fine ammonia sulfate particulate. Based upon review of the application, existing BACT determinations and recent federal standards, EPA finds

that BACT is to limit ammonia slip from the SCR and to burn low sulfur distillate fuel oil. The following table summarizes the BACT emission limits for each emission unit:

| Emission unit | Natural Gas | Motor Vehicle Diesel Fuel |
|----------------------------------|-----------------------------|--|
| Turbine/HRSG without duct burner | 0.03 lb/MMBtu 4.12 lb/hr | 0.04 lb/MMBtu 5.46 lb/hr |
| Turbine/HRSG and duct burner | 0.03 lb/MMBtu 6.45 lb/hr | 0.04 lb/MMBtu 8.56 lb/hr |
| Package Boiler (per unit) | 0.02 lb/MMBtu 3.40 lb/hr | 0.04 lb/MMBtu 4.87 lb/hr |
| Package Boiler (per unit) | | 0.03 lb/MMBtu Filterable emissions only |

Air Quality Impacts:

The PSD program requires that the permit prohibit the CHP project from emitting pollutants that would cause or contribute to a violation of the applicable National Ambient Air Quality Standard (NAAQS) or PSD increment. The NAAQS are maximum concentration “ceilings” measured in terms of total concentration of a pollutant in the atmosphere. A PSD increment is a maximum allowable increase in concentration that is allowed to occur above a baseline concentration for a pollutant. Using non-guideline modeling systems, EPA found that the PM₁₀ emissions were well under the applicable NAAQS standard and increment for PM₁₀. In addition, the air modeling indicated that the CHP emissions will not adversely affect air quality related values in any Class I area (national parks and wilderness areas). The following table summarizes the maximum predicted impacts from the proposed project as compared to the allowable PSD increment.

Maximum Predicted AERMOD Concentrations Compared with the PSD Allowable Increments

Projected Concentration (ug/m³)

| Pollutant | Averaging Period | Proposed Plant | Other PSD Sources | Total | Increment (ug/m ³) |
|------------------|------------------|----------------|-------------------|-------|--------------------------------|
| PM ₁₀ | 24-hour | 0.02 | 24.59 | 24.61 | 30 |
| | Annual | 0.21 | 2.47 | 2.68 | 17 |