Prepared for:
Wolverine Power Supply Cooperative
Cadillac, Michigan

Supplement to CAA Section 112(g) MACT Auxiliary Boiler Amended Application No. 317-07

Wolverine Clean Energy Venture

Rogers City, MI

ENSR
August 2008
Document No.: 12208001-100 Aux Boiler

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Prepared By: Michael Zebell, PE

Reviewed By: William Campbell

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1.0 Introduction - MACT Supplement for the Auxiliary Boiler

Wolverine Power Cooperative acknowledges its obligation to provide the Michigan Department of Environmental Quality (MDEQ) with information necessary to address the "case-by-case" Maximum Achievable Control Technology (MACT) standards for the planned oil fired auxiliary boiler contained in the air pollution control permit application for the proposed Wolverine Clean Energy Venture (WCEV) project (PTI No. 317-07). This supplement is being provided to the MDEQ in response to a June 24, 2008 letter from MDEQ. The specific request from that letter related to the auxiliary boiler is in ***bold italics*** below followed by a response.

2.0 Auxiliary Boiler

"Also, a MACT Determination will need to be completed for the auxiliary boiler."

Response

The proposed distillate-fired auxiliary boiler has the potential to emit the following hazardous air pollutants (HAPs) regulated under the federal MACT standards: arsenic, beryllium, cadmium, chromium, copper, manganese, nickel, and selenium, and potentially some organic HAPs. Table 1 presents the HAP emissions for the auxiliary boiler operating at capacity of 73 MMBtu/hr, and 4,000 hours per year. The calculations related to the emission rates shown in Table 1 can be found in Appendix 9 of the Permit to Install Application document dated September 26, 2007 and revised January 10, 2008.

There is no add-on control technology available to cost-effectively control the emissions of any of the substances listed in Table 1 and there are currently no No. 2 distillate oil-fired boilers that have such add-on controls installed, operating, or permitted. One could calculate the cost per ton of add-on emission control by estimating cost using various references such as the Coal Utility Environmental Cost (CUECost) model, or USEPA control technology factsheets (i.e., EPA-452/F-03-025 for pulse-jet baghouse cost estimating). Based upon the use of these models, one would find the cost of control to be very excessive. The previously conducted Best Available Control Technology (BACT) review for the auxiliary boiler presented in Section 5.2.3 of the original permit application included emissions of carbon monoxide (CO) and volatile organic compounds (VOC) from the boiler. These two pollutants are related to the combustion performance of the boiler and excessive reduction of CO and VOCs adversely affects the proposed nitrogen oxides (NOx) emission limitation we have selected for BACT.

It is the design and function of such a boiler to, as completely as possible, combust all organic material and oxidize any resulting CO. In addition, the proposed boiler will fire only No. 2 distillate

fuel oil. This fuel contains a minimal amount of trace metals compared to concentrations in lesser grades of fuel oil, such as No. 5 or No. 6 oil.

Table 1: HAP Emissions Auxiliary Boiler

HAP Emitted	HAP Emissions (Est. TPY)	Control Technology
Metal HAPs Compounds[1]		
Arsenic	5.8×10^{-4}	
Beryllium	4.3×10^{-4}	
Cadmium	4.3×10^{-4}	
Chromium	4.3×10^{-4}	**No. 2 Distillate Fuel Oil**
Manganese	8.7×10^{-4}	
Mercury	4.3×10^{-4}	
Nickel	4.3×10^{-4}	
Selenium	2.2×10^{-3}	
Acid Gases		
HCL	1.3×10^{-1}	**No. 2 Distillate Fuel Oil**
Organic HAPs		
Benzo(a)anthracene	9.8×10^{-7}	
Benzo(a)pyrene	1.4×10^{-6}	
Chrysene	1.4×10^{-6}	
Fluoranthene	2.9×10^{-6}	**Good Combustion Control**
Formaldehyde	6.3×10^{-2}	
Naphthalene	3.4×10^{-4}	
Polycyclic organic matter (POM)	3.4×10^{-3}	

1 Emission factors from AP42 – Compilation of Air Pollutant Emission Factor, Table 1.3-10.

Furthermore, on September 13, 2004, USEPA promulgated MACT standards for industrial, commercial, and institutional boilers and process heaters in 40 CFR 63 Subpart DDDDD (Boiler

MACT). This rule was later vacated on July 30, 2007 by the U.S. Court of Appeals for the District of Columbia Circuit (Natural Resources Defense Council v. EPA, D.C. Cir., No. 04-1385) on the basis that USEPA's definition of "commercial or industrial waste" was too narrow in scope and inconsistent with the plain language of Section 129 of the CAA. This improperly limited the number of solid waste incineration units subject to Section 129 and subsequently those subject to Boiler MACT. However, this decision did not address the emission limitations and work practice standards established in Boiler MACT unrelated to commercial and industrial solid waste incineration (CISWI).

The recently vacated Boiler MACT established emission limitations for mercury, selected metals, inorganic HAPs (mainly acid gases), and organic HAPs based on a subcategory determined by fuel type and use. The auxiliary boiler proposed for WCEV will not exceed 73 MMBtu/hr and is planned to be operated less than 50% of the time. Accordingly, this unit would have been subject to emission limitations consistent with 40 CFR 63.7500 (a)(1) and Table 1 to 40 CFR 63 Subpart DDDDD if the regulation had not been vacated. The vacated regulation contained the following emission limitations that would have applied to the auxiliary boiler:

Particulate matter (PM) - 0.03 lb/MMBtu
Hydrogen chloride (HCl) - 0.0009 lb/MMBtu
CO – 400 ppmv (@3% oxygen).

These limits were initially set by USEPA following the requirements of establishing a MACT “floor” value. The PM emission limits are indicative of controls on trace metal HAPs and HCl is identified as a control parameter and is a surrogate for other acid gases. Because CO is a good indicator of incomplete combustion, there is a reasonable correlation between CO and organic HAP formation. Thus, a CO limit can serve as a surrogate for organic HAP including dioxin-furans (see 69 FR 55223).

As a consequence of the vacation of the Boiler MACT rule, the National Association of Clean Air Agencies (NACAA) recently published a report entitled Reducing Hazardous Air Pollutants from Industrial Boilers: Model Permit Guidance (June 2008). This guidance continues the use of CO as a surrogate for organic HAP emissions from distillate oil-fired boilers. The guidance suggests a limit for new boilers for CO emissions in the guidance is 3 – 10 ppm (0.002 - 0.007 lb/MMBtu). The NACAA recommendations concerning CO give no consideration to the increase in emissions of NOx trade-off for achieving low CO emissions. The NACAA database used to develop the CO emission rate target does not include a representative NOx emission rate measured at these low CO emitting levels. Only by tuning the burners to create more NOx emissions can an oil-fired boiler achieve 0.007 lb/MMBtu emission level without installing a CO oxidation catalyst – a control technology shown to be technically infeasible for control of CO emissions from the auxiliary boiler in the BACT review for the project (Section 5.2.3 of the Permit To Install Application for a 600 Megawatt (Net) Solid Fuel Steam Electric Power Plant). In addition, through consultation with burner vendors we found that the current lowest CO emission offered as a guarantee on distillate oil-firing is equivalent to 0.039 lb/MMBtu while still maintaining the level of NOx emissions we proposed as BACT for the auxiliary boiler. This level is lower than the limit currently proposed for the auxiliary boiler at WCEV of 0.084 lb/MMBtu.

The NACAA guidance recommends the continued use of PM as a surrogate for metal HAP emissions in determining MACT. The recommended PM limit is in the range of 0.015 to 0.025 lb/mmBTU for filterable particulate. This compares well with the total PM emission BACT limit of 0.03 lb/mmBTU proposed for the auxiliary boiler and represents the MACT floor emission rate for PM.

The vacated boiler MACT uses HCL as a control parameter for inorganic HAPs. No beyond the floor controls have been identified. The project is proposing the use of No. 2 fuel oil which will assure achievement of the HCL floor emission rate of 0.0009 lb/MMBtu for HCL as the inorganic MACT emission rate for the auxiliary boiler.

WCEV has concluded that the capital, and operation and maintenance costs of additional add-on control for HAPs is too expensive and that the cost per ton of emission control is excessive. The cost of installing a baghouse for particulate matter HAP emission control, and an oxidation catalyst for VOC HAP control was performed and these cost estimates are included in the Appendix to this report. The results of the cost estimates show that the cost per ton of particulate matter control, without regard to whether or not the particulate controlled is a HAP, is over $154,000 per ton. The estimated control cost for VOC control with an oxidation catalyst, without regard to whether the VOC controlled is a HAP, is over $2,500,000 per ton of control. Given these excessively high control costs, using PM as a surrogate for the trace metal HAPs and CO as a surrogate for the organic HAPs is the best approach to address the emissions of HAPs from the auxiliary boiler.

By using the PM as a surrogate, the proposed MACT limit for trace metals is the proposed particulate limit of 0.03 lb/MMBtu. In consideration of the MACT limit for organic HAPs, the proposed BACT limit for CO emissions from the auxiliary boiler is 0.039 lb/MMBtu. This value is substantially less than the original MACT floor of 400 ppmv @ 3% oxygen (from the vacated 40 CFR 63 Subpart DDDDD), which was equivalent to 0.3 lb/MMBtu for a boiler combusting distillate fuel oil. Given that this revised CO limit represents BACT and is significantly less than the original MACT floor value, WCEV proposes that the MACT limit for organic HAPs from the auxiliary boiler be set at 0.039 lb/MMBtu for CO. Furthermore, we are also prepared to accept a reduced emission limitation for NOx of 0.074 pounds per MMBTUs based on a recent permit approved in the State of Ohio (OH-0309) that has been denoted as representing lowest achievable emission rate (LAER) in the USEPA's RACT/BACT/LAER Clearinghouse (RBLC) database.

Similar to the other products of incomplete combustion (PICs), CO, VOC and organic HAP emissions from clean fuel-fired auxiliary boilers are a function of oxygen availability (excess air), combustion temperature, residence time at temperature, combustion zone design, and turbulence. All distillate oil-fired boilers utilize front-end methods such as combustion control wherein VOC formation is suppressed within the boiler. All listings in USEPA's RBLC database for distillate oil-fired boilers utilize combustion control techniques for VOC. While gas-fired combustion turbines have been widely equipped with oxidation catalyst control technology, this technology (as well as EMx-SCONOx) is not technically feasible, demonstrated in practice or available for application to distillate oil-fired auxiliary boilers.

Combustion control refers to controlling emissions of organic compounds through the design and operation of the boiler in a manner so as to limit formation of certain substances. In general, a

combustion control system seeks to maintain the proper conditions to ensure more complete combustion through one or more of the following operation design features: providing sufficient excess air, staged combustion to complete burn out of products of incomplete combustion, sufficient residence time, and good mixing. All of these factors contribute to reductions in emissions of products of incomplete combustion such as organic compounds and CO. Distillate oil-fired boilers are designed specifically for efficient fuel combustion with thorough mixing and residence time at temperature.

The only practical or demonstrated in practice measures to control organic HAPs (a subset of VOC) emissions from clean fuel-fired auxiliary boilers is good combustion. Combustion control, and the resulting optimized emission rate to minimize formation of organic HAPs and VOC while also minimizing NO_x, therefore represents the control employed by the best controlled similar source. This *combination of the specific design, equipment, and operational standard* of maintaining good combustion is the case-by-case MACT technology. Using the operational standard of maintaining VOC at PSD BACT levels via periodic stack testing provides the directly measured compliance mechanism to demonstrate that all VOC, including organic HAPs are being controlled equivalently to the best controlled similar source. Compliance with PSD limits for VOC should not be confused with MACT limits for individual organic HAPs nor the establishment of a pseudo "MACT Floor" numerical limit when the applicable MACT limitation is based on the use of the same control technology as the best controlled similar source.

The combination of clean fuel and good combustion control represent case-by-case design and work practice limitations and constitute MACT for the proposed auxiliary boiler.