

**ADDENDUM TO
DISPERSION MODELING PROTOCOL – PSD CLASS II
FOR A 600 MEGAWATT (NET) SOLID FUEL
STEAM ELECTRIC POWER PLANT**

WOLVERINE CLEAN ENERGY VENTURE

ROGERS CITY, MICHIGAN

PERMIT TO INSTALL APPLICATION NO. 317-07

**PREPARED FOR:
WOLVERINE POWER SUPPLY COOPERATIVE, INC.**

**FEBRUARY 28, 2011
PROJECT NO. G06783FF**

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LIST OF ABBREVIATIONS/ACRONYMS

AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
CFR	Code of Federal Regulations
FTC&H	Fishbeck, Thompson, Carr & Huber, Inc.
MDNRE	Michigan Department of Natural Resources and Environment
MET	meteorological
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NO ₂	nitrogen dioxide
NO _x	nitrogen oxides
PSD	Prevention of Significant Deterioration
SIL	significant impact levels
SO ₂	sulfur dioxide
USEPA	U.S. Environmental Protection Agency
WCEV	Wolverine Clean Energy Venture

1.0 INTRODUCTION

Fishbeck, Thompson, Carr & Huber, Inc. (FTC&H) was retained by Warner, Norcross, & Judd, LLP on behalf of Wolverine Power Supply Cooperative, Inc. and their Wolverine Clean Energy Venture (WCEV) to submit a Permit to Install Application for a proposed 600 megawatt (MW) (net) solid fuel-fired power plant, which is to be constructed within the existing Carmeuse North America (formerly Oglebay Norton [O-N]) quarry property, directly south of Rogers City, Michigan. The WCEV solid fuel-fired steam electric power plant will generate electricity for distribution to the electric power grid system. This document serves as an addendum to the original *Dispersion Modeling Protocol – PSD Class II for a 600 Megawatt (Net) Solid Fuel Steam Electric Power Plant* (FTC&H, May 12, 2008) and is being submitted to address additional dispersion modeling requirements that became effective after the WCEV permit application was deemed administratively complete and draft permit conditions had been issued. Subsequent to the issuance of Draft Permit No. 317-07 on July 13, 2009, the U.S. Environmental Protection Agency (USEPA) issued two new National Ambient Air Quality Standards (NAAQS): the 1-hour NAAQS for nitrogen dioxide (NO₂) became effective April 12, 2010, and the 1-hour NAAQS for sulfur dioxide (SO₂) became effective August 23, 2010. Dispersion modeling will be conducted to demonstrate compliance with these new NAAQS using the methodology outlined in the May 12, 2008, Dispersion Modeling Protocol, with exceptions noted in this addendum.

The facility will consist of two 300 MW (net) boilers along with associated material handling processes and ancillary equipment including an auxiliary boiler, an emergency generator, a black start generator, and a diesel fire pump. Refer to the May 12, 2008, protocol for the facility location map and plot plan. The potential annual emissions of pollutants regulated under the Prevention of Significant Deterioration (PSD) regulations exceed the significant emission thresholds established pursuant to 40 CFR 52.21 and Michigan Rule 1802 (R 336.1802). Therefore, a dispersion modeling analysis will be performed following the PSD guidelines found in both the Federal and State regulations to demonstrate compliance with the new 1-hour NO₂ and SO₂ NAAQS.

2.0 PSD CLASS II ANALYSIS

2.1 MODEL SELECTION

Consistent with the original protocol, FTC&H proposes to use the default version of the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) for the air dispersion analysis. BEE-line software, which incorporates the USEPA algorithm for the AERMOD program, will be used. The software, referred to as "BEEST," Version 9.83, was developed by a Division of Bowman Environmental Engineering, Inc.

2.2 METEOROLOGICAL DATA

The meteorological (MET) data proposed to be used in the model was from Presque Isle County Airport, Rogers City, 2005 through 2009 (Surface Station No. 97089), and Gaylord, 2005 through 2009 (Upper Air Station No. 14854).

2.3 WCEV EMISSION SOURCE PARAMETERS

The proposed WCEV facility will include the following NO₂ and SO₂ sources: two 300 MW (net) solid fuel-fired boilers along with ancillary equipment including an auxiliary boiler, an emergency generator, a black start generator, and a diesel fire pump.

All of the NO₂ and SO₂ sources at the WCEV facility are considered point sources because emissions are exhausted from a stack. Revised stack parameters for these sources are provided in Table 1. The sources will be modeled for the proposed NO₂ and SO₂ maximum hourly emission rates as presented in Table 2.

2.4 SIGNIFICANT IMPACT ANALYSIS

The first step in the significant impact analysis will be to model the emissions for NO₂ and SO₂ and determine if the increases will exceed the significant impact levels (SIL) defined in the USEPA's guidance memoranda (June 28, 2010, for NO₂ and August 23, 2010, for SO₂). If the impact for a pollutant exceeds the SIL, compliance with the new 1-hour NAAQS must be demonstrated for that pollutant.

2.4.1 MODEL INPUT PARAMETERS

To determine if the impacts from the criteria pollutants will exceed the SIL, the grid to be used in the model will include a fence line grid with 25-meter spacing along the WCEV fence and a dense grid of 50-meter spacing up to 1,800 meters from the facility. A sparser grid of 250-meter spacing will surround

the facility out to 6,000 meters and 1000-meter spacing out to 50 kilometers, which is the limit of AERMOD.

The model will be run for a combined impact from all WCEV sources for each pollutant.

2.5 PSD INCREMENT ANALYSIS

No PSD increments have been established for 1-hour averaging times for NO₂ or SO₂. Therefore, an increment analysis will not be conducted.

2.6 NAAQS ANALYSIS

The sources to be included in the NAAQS modeling analysis are the WCEV sources and all of the offsite sources included in the inventory received from the Michigan Department of Natural Resources and Environment (MDNRE). In addition to the sources, the background concentrations must also be included. The appropriate background concentrations were obtained from Mr. James Haywood of the MDNRE via e-mail (February 25, 2011) and are provided as follows:

The current most representative regional monitor for the Rogers City area, which represents the Lake Huron air shed, is the Tiverton, Ontario, Canada, monitor located on the east side of Lake Huron.

The following design background concentrations are based on a 3-year average (2007-2009) of the appropriate percentile of the daily 1-hour maximums.

NO₂:

3-year average of the 98th percentiles: 42.4 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)
3-year average of the 99th percentiles: 51.9 $\mu\text{g}/\text{m}^3$
3-year average of the 100th percentiles: 69.6 $\mu\text{g}/\text{m}^3$

SO₂:

3-year average of the 99th percentiles: 48.7 $\mu\text{g}/\text{m}^3$
3-year average of the 100th percentiles: 72.5 $\mu\text{g}/\text{m}^3$

2.6.1 MODEL INPUT PARAMETERS

The emissions from all WCEV sources and all offsite sources provided by the MDNRE will be modeled for a combined impact. (Refer to the May 12, 2008, protocol for information regarding offsite sources.) Receptors that are determined to have significant impacts during the SIL analysis will be included in the NAAQS modeling analysis.

2.6.2 MODEL RESULTS

The 0.75 national default NO₂/NO_x ratio will be applied to the modeled NO_x impacts to obtain NO₂ impacts. This is considered Tier 2 modeling as described in 40 CFR 51 Appendix W¹ and in the USEPA's June 28, 2010, guidance memorandum.² FTC&H proposes to apply the national default NO₂/NO_x ratio to the 5-year average of the 98th percentile model impacts and add this value to the 3-year average of the 100th percentile monitoring value. The total will then be compared to the NAAQS.

For SO₂, FTC&H proposes to add the 5-year average of the 99th percentile model impacts to the 3-year average of the 100th percentile monitoring value. This total will then be compared to the NAAQS.

¹ Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions; Final Rule, Appendix W, USEPA, November 9, 2005.

² Fox, Tyler. Memorandum – Applicability of Appendix W Modeling Guidance for the 1-hour NO₂ National Ambient Air Quality Standard, USEPA Office of Air Quality Planning and Standards, North Carolina 27711, June 28, 2010.

Table 1 – Revised Stack Parameters

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WCEV, Rogers City, Michigan

Source	Height (ft)	Diameter (ft)	Temperature (°F)	Flow Rate (acfm)	Exit Velocity (fps)
CFB1	450	19	160 startup 165 full load	535,000 startup 947,000 full load	31.4 startup 55.7 full load
CFB2	450	19	160 startup 165 full load	535,000 startup 947,000 full load	31.4 startup 55.7 full load
Black Start Generator	450	14	989	823,573	89.1
Fire Pump	55	0.67	907	2,064	98.5
Auxiliary Boiler ¹	450	3	446	41,774	98.5
Emergency Generator ¹					

acfm = actual cubic feet per minute

fps = feet per second

¹The auxiliary boiler and the emergency generator will have a combined flue.

Table 2 – Emission Rates for 1-Hour NAAQS Demonstration
 Addendum to Dispersion Modeling Protocol
 WCEV, Rogers City, Michigan

Source	NO ₂ (lb/hr)	SO ₂ (lb/hr)
CFB1	328	303
CFB2	328	667
Black Start Generator	86	0.8295
Fire Pump	2.8	0.0049
Auxiliary Boiler ¹	47.4	0.157
Emergency Generator ¹		

lb/hr = pounds per hour

¹The auxiliary boiler and the emergency generator will have a combined flue.