MARYLAND DEPARTMENT OF THE ENVIRONMENT

AIR AND RADIATION MANAGEMENT ADMINISTRATION
1800 WASHINGTON BOULEVARD
BALTIMORE MARYLAND 21230

FINAL DETERMINATION OF A PREVENTION OF SIGNIFICANT DETERIORATION APPROVAL APPLICATION

FREDERICK COUNTY/CARROLL COUNTY RENEWABLE WASTE-TO-ENERGY FACILITY PSD Approval PSD-2014-01

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I. INTRODUCTION

Major new or modified sources of air pollution to be located in areas of attainment are subject to Prevention of Significant Deterioration (PSD) regulations promulgated in 40 CFR §52.21. On February 15, 2011, the Northeast Maryland Waste Disposal Authority (NEA) submitted to the Maryland Department of the Environment (Department) an application for a PSD approval to construct a nominal 1,500-ton per day (tpd) waste-to energy project known as the Frederick/Carroll County Renewable Waste-to-Energy Facility (FCCRWTE). Wheelabrator Technologies, Inc. (WTI) has entered into a contract with NEA to develop, construct, and operate the facility.

Additional information was submitted as follows:

(a) Supplemental Air Quality Impact Analysis for 1- hour NO_2 and SO_2 Impacts received on August 25, 2011;

(b) Response to ARMA comments and corrected pages to the application received on September 16, 2011 and May 23, 2012;

(c) Class II Area Plume Visibility and Air Quality Analysis dated November 2011; and

(d) Revised Greenhouse Gas BACT determination received on May 23, 2012.

The MDE-ARMA deemed the PSD application complete on September 28, 2011. Maryland is authorized, as part of its State Implementation Plan, to issue PSD approvals.

The Department has reviewed the application and has made a tentative determination that the proposed FCCRWTE is expected to comply with all applicable air quality control regulations. In accordance with the Environment Article, Section 1-604, Annotated Code of Maryland, the Department will schedule a public hearing and ask the public to comment on the application, the Department's tentative determination, the draft approval conditions, and other supporting documents. A notice will be published at least once in the legal section of a daily or weekly newspaper of general circulation in Frederick County.

If the Department has not received any comments adverse to the tentative determination, the Department will issue the Approval after the comment period expires. If the Department receives adverse comments, it will review them and will make a final determination as to whether to issue or deny the permit. A notice of final determination, if required, will be placed in a newspaper of general circulation in the area.

II. PROJECT DESCRIPTION

The project will be located on an 11-acre site in the McKinney Industrial Park (near the intersection of English Muffin Way and Buckeystown Pike) in Frederick County, Maryland and will serve the long term solid waste disposal needs of both Frederick and Carroll Counties (the Counties).

The FCCRWTE project will consist of two nominal 750 tpd municipal solid waste combustors. The combustion gases will be sent to the vertical convection pass boilers and will be capable of producing approximately 51 megawatts (MW) gross (45 MW net) of electricity. FCCRWTE will also combust a small amount of wastewater treatment sludge (i.e., sewage sludge) and tires. Combustor burners will fire pipeline quality natural gas during startup and shutdown events, and to maintain minimum temperatures in the combustors.

The major air pollutant-emitting equipment and operations of the FCCRWTE consist of the following:

(1) Two water-walled combustors feeding two vertical convection, four-pass boilers;
(2) Gas-fired startup/auxiliary burners integral to the combustors;
(3) Reagent material-handling systems;
(4) Flyash and bottom ash-handling and metals recovery systems;
(5) One wet mechanical draft cooling tower; and
(6) One emergency firewater pump diesel engine.

III. PREVENTION OF SIGNIFICANT DETERIORATION APPLICABILITY

The basic goal of the PSD program is to ensure that economic growth will occur in harmony with the preservation of existing clean air quality. The primary provisions of the PSD program require major new stationary sources or major modifications to an existing major stationary source located in the air quality attainment areas to comply with the National Ambient Air Quality Standards (NAAQS), the applicable PSD air quality increments and Best Available Control Technology (BACT) requirements.

With the exception of ozone and fine particulate matter equal to or less than 2.5 microns in size ($PM_{2.5}$), Frederick County is in attainment for all other NAAQS criteria pollutants. Therefore, emissions of nitrogen oxides (NO_X), carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with particle size equal to or less than 10 microns in size (PM_{10}), and lead (Pb) must be evaluated if applicable emission thresholds are exceeded.

Effective April 12, 2010, the U.S. Environmental Protection Agency (EPA) established new 1-hour primary and secondary NAAQS for NO_2. EPA set the level of this new 1-hour NO_2 standard at 100 parts per billion (ppb). Final area designations with respect to this new 1-hour NO_2 standard have not been finalized; however, facilities subject to PSD applicability for NO_2 must demonstrate compliance with the 1-hour NO_2 NAAQS.

Effective August 23, 2010, EPA established a new 1-hour primary SO_2 NAAQS that will eventually replace the current 24-hour and annual NAAQS. EPA set the level of this new 1-hour SO_2 standard at 75 ppb. Final area designations with respect to the new 1-hour SO_2 standard have also not been finalized; however, facilities subject to PSD applicability for SO_2 must demonstrate compliance with this 1-hour SO_2 NAAQS.

Effective January 2, 2011, EPA established Greenhouse Gas PSD permitting requirements for new major GHG emission sources such as FCCRWTE. The major source thresholds for GHG emissions are different than for other regulated pollutants and are discussed in more detail later.

In addition to GHG emissions, the proposed project was evaluated to determine whether potential emissions of other regulated pollutants will be above the PSD major source thresholds for this type of source. Tables 1-A and 1-B are summaries of the potential annual air emissions from the project. Municipal incinerators, capable of charging more than 250 tons per day of refuse, are one of the listed 28 source categories that trigger PSD at the 100 ton per year (tpy) threshold. Potential annual emissions of NO_X and CO exceed the 100 tpy PSD major source threshold. Therefore, if a new source is major for at least one regulated attainment pollutant, then all other criteria pollutants for which the area is not classified as nonattainment and which are emitted in amounts greater than the PSD Significant Emission Rates (SER), are also subject to PSD review. Table 2 provides a summary of the PSD applicability analysis for the proposed project, including the PSD SER.

As indicated in Table 2, potential emissions of CO, NO_X/NO_2, SO_2, PM, PM_{10}, sulfuric acid mist (SAM), Municipal Waste Combustor (MWC) Organics, MWC metals, MWC Acid Gases and greenhouse gases (GHG) exceed the significance thresholds, and are, therefore, subject to PSD review.

TABLE 1-A
POTENTIAL ANNUAL EMISSIONS – CRITERIA POLLUTANTS[a]

Emission Unit	NO_X (tpy)	CO (tpy)	VOC (tpy)	SO_2 (tpy)	PM (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	Pb (tpy)
Combustors	229.5	248.0	11.7	99.4	26.8	64.2	64.2	0.20
Material Handling Point Sources	N/A	N/A	N/A	N/A	2.3	2.3	2.3	N/A
Material Handling Fugitive Sources	N/A	N/A	N/A	N/A	5.3	1.03	0.15	N/A
Cooling Tower	N/A	N/A	N/A	N/A	2.0	0.52	0.0032	N/A
Emergency Firewater Pump Diesel Engine	0.37	0.24	0.021	<0.01	0.02	0.02	0.02	<0.01
TOTALS:	229.8	248.3	11.8	99.4	36.3	68.1	66.7	0.20

[a] Inclusive of normal operations, startup and shutdown

TABLE 1-B
POTENTIAL ANNUAL EMISSIONS – GREENHOUSE GASES (GHG)[a]

Emission Unit	GHG	TPY	GWP (1)	CO_{2e} (2) (tpy)
Combustors (Burning MSW)	CO_2	837,944	1	837,944
	CH_4		21	4,462
	N_2O		310	8,645
Emergency Firewater Pump Diesel Engine	CO_2	86	1	86
	CH_4		21	0.1
	N_2O		310	0.2
		TOTALS:		851,144
(1) GWP is Global Warming Potential relative to CO_2 (2) CO_{2e} is CO_2 equivalent				

[a] Inclusive of normal operations, startup and shutdown

TABLE 2
SUMMARY OF PSD APPLICABILITY ANALYSIS FOR PROPOSED PROJECT

Pollutant	Potential Emissions (tpy)	PSD Significant Emission Rates (tpy)	PSD Review?
NO_X	229.8	40	Yes
CO	248.3	100	Yes
PM	36.3	25	Yes
PM_{10}	68.1	15	Yes
$PM_{2.5}$	66.7	N/A (non-attainment Pollutant)	N/A (non-attainment Pollutant)
SO_2	99.4	40	Yes
Pb	0.20	0.6	No
Total Fluorides	9.5	3	Yes
Sulfuric Acid Mist H_2SO_4	39.1	7	Yes
Total Reduced sulfur (including H_2S)	---	10	No
Reduced Sulfur Compounds (including H_2S)	---	10	No
MWC Acid Gases (measured as HCl)	80.8	40	Yes
Municipal Waste Combustor Metals (measured as PM)	26.8	15	Yes
MWC Organics (measured as total tetra-through octa-chlorinated dibenzo-p-dioxins and dibenzofurans)	3.5 E 10^{-5}	3.5 E 10^{-6}	Yes
GHG Emissions (CO_{2e})	851,144	75,000	Yes

IV. PREVENTION OF SIGNIFICANT DETERIORATION REQUIREMENTS

For regulated pollutants with potential emissions that exceed the PSD significance thresholds, FCCRWTE must:

(1) Demonstrate use of BACT for pollutants with significant emissions;
(2) Assess the ambient impact of emissions through the use of dispersion modeling;
(3) If the impact is significant, evaluate (through the use of dispersion modeling) compliance with the NAAQS and consumption of air quality increments; and
(4) Conduct additional impact assessments which analyze impairments to visibility, solids, and vegetation as a result of the modification, as well as impacts on Class I areas.

V. BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

(1) BACT Requirements and Analysis

BACT for any source is defined in COMAR 26.11.17.01(B)(5) as:

(a) "Best available control technology" means an emissions limitation, including a visible emissions standard, based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed major stationary source or major modification which the Department, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for that source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combination techniques for control of the pollutant.
(b) Application of best available control technology may not result in emissions of any pollutant which would exceed the emissions allowed by an applicable standard under 40 CFR 60 and 61.
(c) If the Department determines that technological or economic limitations on an application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination of these, may be prescribed instead to satisfy the requirement for the application of best available control technology. These standards shall, to the degree possible, set forth the emissions reduction achievable by implementation of the design, equipment, work practice, or operation, and shall provide for compliance by means which achieve equivalent results."

BACT analyses are conducted using EPA's "top-down" BACT approach as described in EPA's *Draft New Source Review Workshop Manual* (EPA 1990). The five basic steps of a top-down BACT analysis are listed below:

Step 1: Identify potential control technologies
Step 2: Eliminate technically infeasible options
Step 3: Rank remaining control technologies by control effectiveness
Step 4: Evaluate the most effective controls and document results
Step 5: Select BACT

The first step is to identify potentially "available" control options for each emission unit triggering PSD, for each pollutant under review. Available options consist of a comprehensive list of those technologies with a potentially practical application to the emission unit in question. The list includes technologies used to satisfy BACT requirements, innovative technologies, and controls applied to similar source categories.

For this analysis, the following sources were investigated to identify potentially available control technologies:

(1) EPA's RACT/BACT/LAER Clearinghouse (RBLC) database;
(2) In-house experts;
(3) EPA's New Source Review website;
(4) Other State air regulatory agency contacts;
(5) Technical articles and publications; and
(6) Recently issued waste-to-energy permits.

After identifying potential technologies, the second step is to eliminate technically infeasible options from further consideration. To be considered feasible for BACT, a technology must be both available and applicable.

The third step is to rank the technologies not eliminated in Step 2 in order of descending control effectiveness for each pollutant of concern. If the highest ranked technology is proposed as BACT, it is not necessary to perform any further technical or economic evaluation. Potential adverse impacts, however, must still be identified and evaluated.

The fourth step entails an evaluation of energy, environmental, and economic impacts for determining a final level of control. The evaluation begins with the most stringent control option and continues until a technology under consideration cannot be eliminated based on adverse energy, environmental, or economic impacts. The economic or "cost-effectiveness" analysis is conducted in a manner consistent with EPA's OAQPS Control Cost Manual, Fifth Edition (EPA 1996) and subsequent revisions.

The fifth and final step is to select as BACT the emission limit from application of the most effective of the remaining technologies under consideration for each pollutant of concern.

(2) BACT Determination for Municipal Waste Combustor Units

(a) BACT for NO_X

FCCRWTE is required to apply for and obtain a Non-Attainment New Source Review (NA-NSR) for NO_X (an ozone precursor) because it will be located in an ozone non-attainment area. LAER under NA-NSR by definition must be at least as stringent as a BACT under PSD. Since the proposed combination of selective catalytic reduction (SCR), flue gas re-circulation (FGR), water-cooled combustion grate, and good combustion practices (GCP) (i.e. combustion air optimization) has been determined to meet the LAER requirement as discussed in the MDE-ARMAs tentative determination for NA-NSR approval, it automatically meets the BACT requirement. Therefore, FCCRWTE is required to comply with the BACT emission limit of 45 ppmvd corrected to 7% oxygen on a 24-hour block average.

(b) BACT for PM and PM_{10}

Available control technologies for PM and PM_{10} emissions include fabric filters, venturi-scrubber, electrostatic precipitators, and multiple cyclones. NSPS Subpart Eb, applicable to the FCCRWTE project, requires that PM emissions not exceed 20 mg/dscm, corrected to 7% oxygen. For MWC units, fabric filters have been demonstrated nationally to provide the most stringent level of control for PM/PM_{10} emissions. Additionally, FCCRWTE is proposing to use ePFTE membrane fabric filter bags which are a more efficient control technology. Therefore, the MDE-ARMA has determined that FCCRWTE's proposal to use fabric filters and natural gas for start-up operation meets the BACT requirement. The proposed PM BACT emission limit is 10 mg/dscm corrected to 7% oxygen (based on a minimum of 3 stack test) for filterable portion only; and the proposed PM_{10} BACT emission limit is 24 mg/dscm corrected to 7% oxygen (based on a minimum of 3 test run average) including filterable and condensable portions.

(c) BACT for CO

Complete combustion (oxidation) of a carbon-containing material would result in emissions of only CO_2 and water vapor; however, 100% combustion efficiency is achievable only in theory. With even the most efficient, real-world combustion processes, there is always some degree of incomplete combustion experienced. As a result of incomplete combustion, there are emissions of CO and other incomplete combustion products.

There are generally two ways to control CO emissions from combustion sources: (1) combustion controls, such as implementing good combustion practices (GCP) to ensure high combustion efficiency; and (2) add-on air pollution control systems, including catalytic and thermal oxidizers, to convert CO present in the flue gas to CO_2. It is extremely impractical to use another combustion process to control CO emissions from a combustion process.

Historically, the implementation of GCP has been adopted universally at MWC units in the United States as an effective means for minimizing CO emissions. NSPS Subpart Eb, applicable to the FCCRWTE project, requires the use of GCP for CO emissions control. There is currently no add-on technology available for further control of CO emissions that has been demonstrated to be technically feasible at a MWC unit.

Therefore, CO emissions from the FCCRWTE project will be controlled by implementation of GCP. The proposed CO BACT emission limit for each of the FCCRWTE units during normal operation is twofold: 100 ppmvd corrected to 7% O_2 (4-hour block average) and 80 ppmvd corrected to 7% O_2 (30-day block average). The proposed CO BACT emission limit during periods of startup and shutdown is 100 ppmvd corrected to 7% oxygen (contiguous 24-hour average). Continuous emission monitors will be installed to collect CO emissions data for compliance determination.

(d) BACT for SO_2

Technologies available for control of SO_2 emissions from MWC units are: (1) Dry injection of alkaline reagent into the MWC unit furnace; (2) Dry injection of alkaline reagent into the flue gas; (3) Flue-gas wet scrubbing; and (4) Semi-dry flue gas scrubbing followed by fabric filtering.

While wet flue gas desulfurization (FGD) systems are technically feasible for MWCs and have been applied in Europe to MWC units, they have not been installed or demonstrated on a MWC facility in the United States because of many drawbacks. Disadvantages of wet FGD systems include increased water use, discharges of waste water and associated sludge, decreased energy efficiency, and potential of a visible water vapor plume. Dry FGD systems with fabric filters, however, are a proven control technology for MWC combustors to effectively control SO_2 emissions.

FCCRWTE is proposing a spray dryer absorber (SDA) dry lime injection system with a fabric filter to meet an SO_2 BACT emission limit of 24 ppmvd corrected to 7% O_2 (24-hour geometric block average) and 14 ppmvd corrected to 7% O_2 (annual average). Continuous emission monitors will be implemented to collect SO_2 emissions for compliance determination.

(e) BACT for MWC Organics (Dioxins and Furans)

The PSD pollutant MWC Organics is measured as the total mass emissions of dioxins and furans, specifically, the tetra through octa congeners of those compounds. The regulated dioxin and furan compounds are referred to here collectively as “dioxin.”

Dioxin can form in the MWC unit as a result of chemical reactions between precursor organic and chlorine compounds generated in the combustion zone. This is most likely to occur if there is poor combustion efficiency. Hence, the first approach for dioxin control is to reduce emissions of its precursor organic compounds by maintaining Good Combustion Practices (GCP) for better combustion efficiency as discussed in the section under BACT for CO emissions from MWC.

After minimizing emissions of precursor organic compounds, the second step is to prevent formation of dioxin by optimizing fabric filter inlet temperature. Dioxin synthesis occurs in the temperature range of 250 to 600 degrees F. NSPS Subpart Eb (to which the FCCRWTE project is subject) requires monitoring and regulation of flue gas temperature at the inlet to the particulate control device for control of dioxin emissions.

The last “polishing” step is an add-on control system to capture dioxin present in combustion flue gases. Carbon-based sorbent can be effectively injected into a Turbosorp dry circulating fluid bed scrubber to adsorb dioxins which would be captured by a down-stream fabric filer. Such controls were assumed by EPA when it set a new and more stringent dioxin emission limit in 2006, under NSPS Subpart Eb of 13 ng/dscm at 7% O_2.

MDE-ARMA concurs with FCCRWTE’s proposal to implement GCP, temperature control, carbon-based sorbent injection into a SDA with fabric filter to meet the BACT requirement for MWC Organics (Dioxin). However, based on the PSD approval issued to the Palm Beach Renewable Energy Facility (PBREF) on December 23, 2010, a BACT limit of 10 ng/dscm has been established as a federally enforceable limit while using similar control measures. Therefore, MDE-ARMA has concluded that a BACT emission limit of 10 ng/dscm corrected to 7% oxygen (based on a minimum of 3 test runs with a minimum sampling time of 4 hours per test run) represents BACT for this project.

(f) BACT for MWC Metals

The PSD pollutant MWC Metals refers to heavy metals emitted by MWC units. Under NSPS Subpart Eb, EPA uses emissions of total filterable PM as a surrogate indicator of potential metals emissions. The NSPS sets a numeric emission standard for total PM emissions, as well as numeric emission standards for three specific MWC metals: Pb, Cd, and Hg. Because the potential emissions of total PM from the proposed FCCRWTE project would exceed the PSD significant emission level, a BACT analysis must be prepared for MWC Metals, which entails performing BACT analyses for control of PM, Pb, Cd, and Hg. Because the most effective control methods differ for total PM versus Pb/Cd versus Hg, BACT is addressed separately for these pollutants regulated as MWC Metals.

(1) BACT for MWC Metals - PM

BACT for PM and PM_{10} emissions were addressed above. The fabric filter proposed as BACT for PM and PM_{10} emissions would also provide BACT emissions control for total PM as the surrogate for MWC Metals. The proposed BACT emission limits are as follows: (1) 10 mg/dscm at 7% O_2 (based on a minimum of 3 stack test) PM filterable; and (2) 24 mg/dscm at 7% O_2 (based on a minimum of 3 stack test) PM filterable and condensable.

(2) BACT for MWC Metals - Pb and Cd

Various heavy metals are present in municipal solid waste, and under high-temperature conditions when waste is combusted, the metals can exhaust with the flue gas in the form of a fume and/or bound to tiny particles. Pb and Cd are two MWC Metals requiring BACT analysis and are addressed here. Mercury also requires a BACT analysis, and is addressed in the next section below.

Where solid waste is combusted, the Pb and Cd present in the fuel will partially volatilize in the combustion zone. From the combustion zone, Pb and Cd tend to partition partly to the MWC unit's bottom ash, and partly to the fly ash that leaves the MWC unit with the flue gas. A fraction of Pb and Cd could also potentially enter the flue gas in a volatilized form, where it would condense, adsorb, or absorb onto fine particulate matter. NSPS Subpart Eb, applicable to the FCCRWTE project, imposes an emission limitation of 140 µg/dscm for Pb and 10 µg /dscm for Cd, corrected to 7% oxygen.

FCCRWTE is proposing to use a SDA with a fabric filter to meet the BACT requirements for both Pb and Cd emissions. The proposed emission limit for Pb is 75µg/dscm at 7% O_2 (based on a minimum of 3 test run average). The proposed emission limit for Cd is 10 µg/dscm at 7% O_2 (based on a minimum of 3 test run average). These limits are consistent with other recently permitted MWC projects such as Energy Answers and PBREF.

(3) BACT for MWC Metals – Hg

MSW often includes small quantities of discarded consumer goods containing Hg. Examples of such Hg-containing discards are used fluorescent lamps, glass thermometers and mercury switches. When solid waste is combusted as a fuel, the Hg present in the solid waste is readily volatilized and presented in combustion flue gas where it can be emitted to the atmosphere if not effectively controlled.

The most effective means to prevent Hg emissions from MWC units is to prevent Hg-containing consumer goods from being discarded into the solid waste in the first place. Even presuming the most aggressive Hg diversion programs, Hg discards will continue to occur at some level. Accordingly, there will still be the potential for Hg emissions when MSW is combusted.

During combustion, most mercury (up to 98%) is volatized and emitted in the gaseous phase either in the metallic or in the oxidized form. The Hg in the flue gas exiting the MWC unit is mainly found as gaseous phase mercuric chloride ($HgCl_2$) due to the chlorine content in the waste stream. As such, there is very little elemental mercury present in the MWC flue gas. A portion of the gaseous mercury will be adsorbed on flyash and collected by the fabric filter. In addition, activated carbon is added to adsorb gaseous mercury for subsequent removal in the fabric filter. The combination of carbon-based sorbent injection into a dry scrubber followed by a fabric filter has been demonstrated to be the most effective means of controlling Hg at MWC units.

The MDE-ARMA has determined that the FCCRWTE proposal to use a SDA with a fabric filter meets the BACT requirement for mercury emissions. The proposed BACT emission limit for Hg is 17µg/dscm at 7% O_2 (based on a minimum 3 test run average). This limit is consistent with recently permitted Energy Answers project.

(g) BACT for Other MWC Acid Gases

MWC units emit a number of acid gases as a result of combusting municipal solid waste. The principal acid gases emitted from MWC units include SO_2 and hydrogen chloride (HCl). Other acid gases emitted in much smaller amounts are sulfuric acid mist (SAM) and hydrogen fluoride (HF). NSPS Subpart Eb regulates MWC Acid Gases, measured as SO_2 and HCL, and establishes numeric emission standards for SO_2 and HCl. In addition, SO_2, SAM, and HF MWC Acid Gases are regulated as individual PSD pollutants.

The control strategies for HCl, SAM, and HF would be the same as SO_2 emission control. As previously discussed in the justification for SO_2 BACT, the MDE-ARMA agrees with FCCRWTE proposal to implement a SDA with a fabric filter to meet the BACT requirements for HCl, SAM, and HF. The proposed BACT emission limits are listed below:

(1) HCl - 20 ppmvd corrected to 7% O_2 (based on a minimum of 3 test run average) for HCl;
(2) HF - 4.3 ppmvd corrected to 7% O_2 (based on a minimum of 3 test run average) for HF; and
(3) SAM - 3.6 ppmvd corrected to 7% O_2 (based on a minimum of 3 test run average) for H_2SO_4.

(h) BACT for Greenhouse Gases

The MSW that will be combusted at the FCCRWTE facility is estimated to contain approximately 60% renewable, biogenic fuel on a heat content basis. The remaining 40% of the MSW fuel will be of a non-biogenic origin. The percentages are estimates based on data from Wheelabrator

Baltimore. Data from the Authority's Montgomery County facility is consistent, showing the biogenic fraction to range from 64% to 66%.

Potential GHG emissions (both biogenic and non-biogenic) for the FCCRWTE municipal waste combustor project are estimated to be 851,137 tpy as CO_2 equivalent (CO_{2e}) using MWC vendor emissions data and EPA GHG Mandatory Reporting Rule procedures. Accordingly, the non-biogenic portion of the FCCRWTE GHG emissions will exceed the 75,000 tpy CO_{2e} PSD applicability threshold and the FCCRWTE project remains subject to the PSD requirements (i.e., a BACT review) for all non-biogenic GHG emissions as well as for biogenic methane and nitrous oxide GHG emissions.

Although assessment of biogenic CO_2 BACT was not required at the time of application submittal due to the EPA 3-year deferment, the GHG BACT analysis for the FCCRWTE project provided in Section 4.2.10 of the February 2011 PSD air construction permit application (as revised In September 2011 and May 2012) nevertheless addresses both biogenic and non-biogenic GHG emissions.

The available control technologies for GHG emissions at FCCRWTE are carbon capture and sequestration (CCS), clean fuels, and energy efficiency. CCS consists of the separation and capture of CO_2 from the flue gas, pressurization of the captured CO_2, transportation of the CO_2 as a fluid via pipeline, and injection and long term geologic storage. In recent GHG guidance, EPA has stated that:

> "CCS may be eliminated from a BACT analysis in Step 2 if it can be shown that there are significant differences pertinent to successful operation for each of these three main components (capture and/or compression, transport, and storage) from what has already been applied to a different source type ….. (or) if the three components working together are deemed technologically infeasible for the proposed source, taking into account integration of the CCS components with the base facility and site specific considerations ….." (US EPA PSD and Title V Permitting Guidance for Greenhouse Gases at 35-36, March 2011)

In order to capture CO_2 emissions from the flue gas, CO_2 must first be separated from the exhaust stream. Capture technologies applicable for fossil fuel combustion include the following:

(1) Pre-combustion systems designed to separate CO_2 and hydrogen in the high-pressure syngas typically produced at integrated gasification combines cycle power plants;
(2) Post combustion systems designed to separate CO_2 from the flue gas produced by the combustion process; and

(3) Oxy-combustion systems that use high-purity oxygen rather than air in the combustion process to produce a highly concentrated CO_2 stream.

While numerous carbon capture, storage and beneficial CO_2 use demonstration projects are in various stages of planning and implementation across the globe, including several in the U.S. that are funded by the Department of Energy (DOE), the technologies needed for a full-scale generating facility are not yet commercially available. In fact, President Obama formed an Interagency Task Force on Carbon Capture and Storage, co-chaired by DOE and EPA, in early 2010 to develop a federal strategy for overcoming the barriers to the widespread, cost-effective deployment of CCS within 10 years, with an ultimate goal of bringing five to ten commercial demonstration projects online by 2016. Technologies in the pilot scale testing stages are not considered "available" for purposes of a BACT review.

After CO_2 is separated, it must be prepared for beneficial reuse or transported to a sequestration or storage facility, if a storage facility is not locally available for direct injection. In order to transport CO_2, it must be compressed and delivered via pipeline to a storage facility. Although beneficial reuse options are developing with solutions such as the use of captured material to enhance oil or gas recovery from well fields in the petroleum industry, regionally, the demand for CO_2 for such applications is well below the quantity of CO_2 which is available for capture.

Without a market to use the recovered CO_2, the material would instead require sequestration, or permanent storage. Sequestration of CO_2 is generally accomplished via available geologic reservoirs that must be either local to the point of capture, or accessible via pipeline to enable the transportation of recovered CO_2 to the permanent storage location. The State of Maryland is involved in studies of carbon capture, sequestration, storage and use. To date, these studies show that there are no sequestration or storage opportunities in the general vicinity of the project and no permitted sites regionally. Further, there is no pipeline infrastructure that could convey CO_2 to potential receiving sites. Finally cost effective capture technology is not currently available.

The Power Plant Research Program (PPRP) at the Maryland Department of Natural Resources (DNR) is currently developing a report titled "Summary of Carbon Capture and Storage (CCS) and CO_2 Use and Their Potential in the State of Maryland" that will summarize and assess the potential for the collection of CO_2 from a point source to either its injection into an appropriate geologic formation for sequestration or its utilization in other beneficial uses. These uses could potentially include injection to increase yield in abandoned oil or natural gas wells, recovering coal-bed methane from un-mineable seams, and as a replacement for fluids in deep well fracturing. Research is currently underway between PPRP and a variety of partners regarding the preferential displacement of methane molecules from organic molecules of shale and coal by CO_2, as well as the integrity of certain formations, including the Deer Park Anticline and the Taylorsville Basin, for CO_2 storage.

Available technologies for MWCs focus on energy efficiency solutions. FCCRWTE has proposed the use of renewable fuels (MSW) and an energy efficient MWC and facility design as BACT for GHG emissions.

FCCRWTE has proposed the following technologies to increase the energy efficiency of the MSW combustors:

(1) Water-cooled grates, which allow the primary air in the combustion zones to be controlled exclusively by the requirements of the combustion process and not on the need for grate cooling, thereby reducing the amount of excess air in the combustion process;
(2) Combustion air preheat system to increase combustion cycle efficiency;
(3) Flue gas re-circulation system, which increases boiler efficiency and reduces the amount of flue gas requiring treatment; and
(4) High steam cycle. Steam will be produced in the boilers at 1,305 psia and 932º F to provide higher steam turbine efficiency that will produce more than 670 net kilowatt-hours (kWh) per ton of MSW combusted.

Based on the use of clean fuel, energy efficient technology, and a high steam cycle design, FCCRWTE is proposing a GHG BACT emissions limit of 241 tons of CO_2e per million pounds of steam produced, computed on a 12 month rolling average. This limit is inclusive of normal operations, malfunctions, startup, and shutdowns. Steam production was chosen as a measure of energy efficiency because it is directly and accurately measured. Furthermore, it provides the system operators the flexibility they need to provide steam for electrical generation and/or supply steam for local district heating.

FCCRWTE is proposing to demonstrate compliance with the GHG BACT limit by using CO_2 CEMS during period of normal operation when burning MSW and during periods of startup and shutdown when burning natural gas in accordance with EPA's Mandatory Greenhouse Gas Reporting Rule (MGGRR). Other GHG emissions such as methane and nitrous oxides will also be calculated in accordance with the MGGRR and multiplied by their potential global warming potential to determine total CO_2e emissions.

MDE-ARMA concurs with the GHG BACT proposed by FCCRWTE.

(3) BACT Determination for Cooling Tower

The major air pollutant from a cooling tower is particulate matter (PM). PM emissions from cooling towers are generated from the "drift" that is discharged into the atmosphere. Drift is comprised of water droplets created during the cooling process that are carried out in the exhaust stream. These water droplets generally have the same concentration of Total Dissolved Solids (TDS) as the circulating water used in the cooling system. As the water droplets evaporate, particulate matter is generated in the atmosphere.

Actual drift loss from wet cooling systems, including those proposed by FCCRWTE for this project, are affected by a variety of factors, including the type and design of the cooling system, capacity, velocity of air flow, density of the air in the cooling tower, and the TDS concentration in the circulating water.

Drift eliminators are incorporated into cooling tower systems to remove as many water droplets from the air leaving the system as possible. Drift eliminators are considered standard approaches to reduce the rate of drift as a percentage of circulating water flow rate, which varies with the specific project and can range from about 0.01 to 0.0005 percent of circulating water flow rates. Higher efficiency drift eliminators can achieve drift loss rates of 0.0005 percent of the circulating water flow rates.

FCCRWTE is proposing to install and operate high efficiency drift eliminators with a maximum drift rate not to exceed 0.0005 percent of circulating water flow rate to minimize PM and PM_{10} emissions from the cooling tower. The MDE-ARMA has determined that FCCRWTE's proposed control method meets the BACT requirement. Therefore, the BACT emission rate from its cooling tower is the drift rate certified by the equipment manufactured and which is not to exceed 0.0005 percent of the circulating water flow rates.

(4) BACT Determination for Emergency Firewater Pump Diesel Engine

FCCRWTE is proposing to install an emergency firewater pump diesel engine rated at 305 bhp. The air emissions, subject to BACT review, include NO_X, SO_2, PM/PM_{10}, and CO. The BACT determination and BACT emission limits are described below.

(a) BACT for NO_X

NO_X emissions from the proposed emergency firewater pump diesel engine are subject to both BACT and LAER (as an ozone precursor) and LAER by definition must be at least as stringent as BACT. The control technology presented with the LAER determination as part of the non-attainment New Source Review (NSR) Approval would meet the BACT requirements.

(b) BACT for PM/ PM_{10} Control

PM/ PM_{10} emission controls for emergency engines include fuel selection such as low sulfur fuels, combustion controls (such as fuel injection systems, combustion air management design, and combustion system design), and post-combustion controls (such as diesel oxidation catalysts and catalyzed diesel particulate filters).

However, feasibility and effectiveness of both types of controls are affected by engine size and rating. Additionally, in the preamble to NSPS Subpart IIII, EPA states that the use of add-on controls for emergency engines could not be justified due to the cost of the technology relative to the emission reduction that would be obtained.

The MDE-ARMA has determined that the FCCRWTE's proposed controls that include the following meet the BACT requirements and BACT emission limits:

(1) using ultra low sulfur diesel fuel with a maximum sulfur content of 0.0015 percent by weight;
(2) combustion controls complying with the NSPS Subpart IIII limit of 0.15 g/bhp for a 2009 model year or later stationary firewater pump diesel engine with a 305-bhp rating; and
(3) a cap on annual operating hours of 100 hours per year (excluding emergencies).

(c) BACT for CO

For CO emissions from emergency engines, the feasible and effective emission control is good combustion practice to achieve better combustion efficiency. FCCRWTE proposes to use combustion controls complying with the NSPS Subpart IIII specifications for a 2009 model year or later, and a cap on annual operating hours of 100 hours per year (excluding emergencies) to meet the BACT requirements. In addition, the MDE ARMA has determined that the BACT emissions for the proposed firewater pump diesel engine shall not exceed 2.6 g/bhp.

(d) BACT for SO_2 and H_2SO_4

For SO_2 and H_2SO_4 emissions from emergency engines, the feasible and effective emission control is to reduce sulfur content in fuel. The firewater pump diesel engine will be subject to NSPS Subpart IIII for stationary compression ignition combustion engines. The NSPS requires the use of ultra low sulfur diesel fuel oil beginning October 1, 2010.

The MDE-ARMA concurs with the FCCRWTE's BACT assessment to use ultra low sulfur diesel fuel with a maximum sulfur content of 0.0015 percent by weight and limiting the annual operating hours to 100 hours per year (excluding emergencies).

(e) BACT for Greenhouse Gases

There is currently no technically feasible add-on control technology to reduce GHG emissions from an emergency engine of this size. Therefore, FCCRWTE proposes to limit GHG emissions from the Emergency Firewater Pump Diesel Engine by the use of ultra low sulfur diesel fuel and good combustion practices. FCCRWTE shall maintain the emergency firewater pump diesel engine in accordance with the manufacturer's specifications.

(5) BACT Determination for Material Handling Operations

The major air pollutants from the material handling operations are PM/PM_{10} emissions from the following emission points:

(1) Ash/residue transfer conveyors and transfer points;
(2) The fly ash bin enclosure;
(3) The ash and metal recovery processes;
(4) The reagent storage silos (lime and carbon-based sorbent); and
(5) Plant roadways.

The MDE-ARMA has determined that the following control strategies proposed by FCCRWTE meet the BACT requirements:

(a) PM/PM_{10} BACT for Conveyors/Transfer Points

Material handling conveyors/transfer points will be enclosed and vented to the ash and metal recovery building scrubber with a design outlet PM/PM_{10} concentration of no more than 0.001 gr/dscf.

(b) PM/PM_{10} BACT for Fly Ash Surge Bin

The fly ash surge bin will be enclosed and its exhaust vented to a wet scrubber with a design outlet PM/PM_{10} concentration of no more than 0.001 gr/dscf.

(c) PM/PM_{10} BACT for Ash and Metal Recovery Processes

The ash and metal recovery processes will be located inside a building and the building exhaust will be vented to a wet scrubber with a design outlet PM/PM_{10} concentration of no more than 0.001 gr/dscf. The building doors will be normally closed during loading/unloading operations to reduce fugitive emissions.

(d) PM/PM_{10} BACT for Reagent Storage Silos

Silos storing dry reagent materials will be located inside the air quality control system (AQCS) building and each silo will be equipped with bin vent filters with a design outlet PM/PM_{10} concentration of no more than 0.01 gr/dscf.

(e) PM/PM_{10} BACT for Roads

Fugitive emission control strategies include sweeping, applying water as necessary and reducing vehicle speeds. In addition, the ash building will have an exit tire wash to keep trucks from tracking fugitive particulate onto the roads.

6) Summary of Proposed BACT

A summary of proposed BACT control technologies and BACT emission limits for the FCCRWTE combustor units is presented in Table 3. A summary of proposed BACT control technologies and BACT emission limits for the cooling tower, emergency firewater pump diesel engine and material handling operations is presented in Table 4.

TABLE 3
PROPOSED BACT REQUIREMENTS FOR MUNICIPAL WASTE COMBUSTORS

Pollutant	Control Technology	Proposed BACT Limit (averaging period)
NO_X also subject to LAER	• Selective Catalytic Reduction (SCR) • Flue gas re-circulation (FGR) • Water-cooled combustion grate • Combustion air optimization (GCP)	45 ppmvd corrected to 7% O_2 (24-hour daily block average)
CO Normal Operation	• Good Combustion Practices (GCP) • Use of natural gas for start-up operation	**During Normal Operations** 100 ppmvd corrected to 7% O_2 (4-hour block average) 80 ppmvd corrected to 7% O_2 (30 day block average)
Startup and Shutdown		**During Periods of Startup and Shutdown** 100 ppmvd corrected to 7% O_2 (Contiguous 24-hour block average)
PM	• Fabric Filter • Use of natural gas for start-up operation	**PM Filterable** 10 mg/dscm corrected to 7% O_2 (minimum 3-test run average)
PM_{10}	• Fabric Filter • Use of natural gas for start-up operation	**PM Filterable and Condensable** 24 mg/dscm corrected to 7% O_2 (minimum 3-test run average)
SO_2	• Spray dryer absorber (SDA) • Fabric Filter	24 ppmvd corrected to 7% O_2 (24-hour block average)
		14 ppmvd corrected to 7% O_2 (annual average)

TABLE 3 - CONTINUED
PROPOSED BACT REQUIREMENTS FOR
MUNICIPAL WASTE COMBUSTORS

Pollutant	Control Technology	Proposed BACT Limit (averaging period)
MWC Organics (Dioxin)	• GCP • Spray dryer absorber (SDA) • Fabric Filter	10 ngdscm corrected to 7% O_2 (Average of 3 test runs (40 CFR 60.58b (g)(9) with a minimum sampling time of 4 hours per test run (40 CFR 60.58b(g)(3)(i))
MWC Metals Pb	• Spray dryer absorber (SDA) • Fabric Filter	75 µg/dscm corrected to 7% O_2 (minimum 3-test run average)
MWC Metals Cd	• Spray dryer absorber (SDA) • Fabric Filter	10 µg/dscm corrected to 7% O_2 (minimum 3-test run average)
MWC Metals Hg	• Spray dryer absorber (SDA) • Fabric Filter	17 µg/dscm corrected to 7% O_2 (minimum 3-test run average)
MWC Acid Gases HCl	• Spray dryer absorber (SDA) • Fabric Filter	20 ppmvd corrected to 7% O_2 (3-hour block average)
MWC Acid Gases HF	• Spray dryer absorber (SDA) • Fabric Filter	4.3 ppmvd at7% O_2 (3-hour block average)
MWC Acid Gases H_2SO_4	• Spray dryer absorber (SDA) • Fabric Filter	3.6 ppmvd at7% O_2 (3-hour block average)
GHG	• Use of renewable fuels as primary fuel • Energy efficient MWC design	241 tons CO_2e per MM lb steam (12-month rolling average)

TABLE 4
PROPOSED BACT REQUIREMENTS FOR OTHER EMISSION UNITS

Emission Unit	Pollutant	Control Technology	Proposed BACT Emission Limit
Emergency Firewater Pump Diesel Engine	NO_X	• Good combustion practices • Limit on annual operating hours of 100 hours per year, excluding emergencies • NSPS Subpart IIII for a 2009 Model Year or later	**Total NO_X and Non-Methane Hydrocarbons** 3.0 g/bhp-hr (also LAER limit)
	SO_2/ H_2SO_4 Mist	• Ultra low sulfur diesel fuel • Limit on annual operating hours of 100 hours per year (excluding emergencies)	0.0015 percent maximum sulfur content by weight
	PM	• Ultra low sulfur diesel fuel • Combustion control • Limit on annual operating hours of 100 hours per year (excluding emergencies)	0.15 g/bhp-hr (NSPS Subpart IIII)
	CO	• Good combustion practice • Limit on annual operating hours of 100 hours per year (excluding emergencies)	2.6 g/bhp-hr (NSPS Subpart IIII)
	GHG	• Use of ultra low sulfur diesel fuel • Good combustion practices • Maintain emergency firewater pump diesel engine in accordance with manufacturer specifications	Maintain in accordance with manufacturer specifications
Cooling Tower	PM	• High Efficiency drift eliminators with a drift loss rate of no more than 0.0005 percent of the circulating water flow rates	Design drift loss rate of 0.0005 percent
Material Handling Operations			
Ash and Metal Recovery Building	PM	• Wet Scrubber	Design outlet concentration of 0.001 gr/dscf
Fly Ash Surge Bin	PM	• Wet Scrubber	Design outlet concentration of 0.001 gr/dscf
Conveyors/ Transfer Points	PM	• Vented to ash and metal recovery building or fly ash surge bin scrubbers	Design outlet concentration of 0.001 gr/dscf
Reagent Storage Silos	PM	• Bin Vent Filters	Design outlet concentration of 0.01 gr/dscf
Roads	PM	• Fugitive emission control strategies including sweeping, water spraying, ash building exit tire wash, and reducing vehicle speed	Fugitive emission control strategies

VI. AIR QUALITY ANALYSIS

The main purpose of the air quality analysis in a PSD application is to demonstrate that the proposed facility's emissions will not cause or contribute to a violation of any National Ambient Air Quality Standard (NAAQS) or PSD increment. The NAAQS are concentrations in the ambient air that are established by EPA at levels intended to protect human health and welfare, with an adequate margin of safety. The air quality analysis required for sources subject to PSD includes an evaluation of the impact of a source's emissions on the NAAQS, and also includes an evaluation of the impact on applicable PSD increments. PSD increments established by EPA as allowable incremental increases in ambient air concentration due to new or modified sources in attainment areas, have been set at levels that are substantially less than the NAAQS. PSD increments cannot be exceeded even if the NAAQS evaluation would allow for impacts from sources that are greater than the PSD increments.

An air quality analysis is required for each criteria pollutant subject to a NAAQS with a significant emissions increase. For this project, an air quality analysis is required for the following criteria pollutants with a significant emissions increase: NO_2, CO, SO_2, and PM10. An air quality analysis is not required for non-criteria pollutants, or those pollutants not subject to a NAAQS.

Dispersion models are the primary tools used to project the ambient concentration that will result from the proposed PSD source emissions. The dispersion modeling analysis usually consists of two distinct phases: (1) a preliminary analysis; and (2) a full impact analysis.

With respect to GHG, there are currently no NAAQS or PSD increments established for GHG, and therefore these PSD requirements would not apply to GHG, even when PSD is triggered for GHG.

(1) Preliminary Analysis

The preliminary analysis models criteria pollutants with a significant emissions increase from the project (NO_2, CO, SO_2, and PM_{10}) to determine:

(a) whether pre-construction ambient air monitoring is required;
(b) whether further air quality analyses are required;
(c) where the impact area is located; and
(d) whether a full impact analysis including all the major emission sources in the impact area is required.

Pre-construction Ambient Air Monitoring Determination

PSD regulations require an ambient air quality evaluation that involves the analysis of monitored concentrations in the vicinity of the PSD source if model predicted source impacts are greater than the monitoring *de minimis* value for each criteria pollutant. If representative monitoring data are not available, a PSD source may be required to collect pre-construction ambient data for up to a year.

If impacts are below the *de minimis* values specified in 40 CFR §52.21(i)(5)(i), the regulatory agency may exempt a source from the pre-construction monitoring requirement. Table 5 compares the impacts from the criteria pollutants with a significant emissions increase from the project to the ambient air monitoring de minimis values.

TABLE 5
SUMMARY OF THE *DE MINIMIS* AMBIENT IMPACT ANALYSIS

Pollutant	Averaging Time	Pre-Construction Monitoring De Minimis Level Per 40 CFR §52.21(i)(5)(i) (ug/m^3)	Maximum Impact (ug/m^3)
NO_2	Annual	14	0.26
CO	8-Hour	575	48.64
SO_2	24-Hour	13	2.99
PM_{10}	24-Hour	10	4.88

As shown in Table 5, PSD pre-construction ambient monitoring is not required for the FCCRWTE project because the ambient impact for each criteria pollutant with a significant emissions increase is less than the prescribed *de minimis* level for each pollutant.

Full Impact Analysis Determination
All areas of Maryland are designated as PSD Class II areas. Significant Impact Levels (SIL) for Class II areas have been established by EPA to serve as an initial evaluation of air quality impacts. If the dispersion model predicts that the impact of a criteria pollutant's emissions from the proposed project are less than the applicable Class II SIL for that pollutant, then the pollutant is considered insignificant and poses no threat to the applicable NAAQS or PSD increment. Additional analyses relative to attainment of the NAAQS and PSD increments are not required or necessary for criteria pollutants with predicted impacts less than the SIL.

For criteria pollutants with impacts greater than the SIL, further evaluation is required to determine whether additional modeling or analysis is necessary to demonstrate NAAQS and increment attainment. Table 6 compares the impacts from the criteria pollutants with a significant emissions increase from the project to the Class II SIL for each pollutant.

TABLE 6
FULL IMPACT ANALYSIS DETERMINATION
SIGNIFICANT IMPACT LEVELS (SIL)

Pollutant	Averaging Time	SIL Class II Areas (ug/m^3)	Maximum Impact (ug/m^3)
NO_2	1-Hour	7.5 (1)	30.8 (2,3)
	Annual	1	0.263
CO	1-Hour	2000	82.94
	8-Hour	500	48.64
SO_2	1-Hour	7.8 (1)	28.6 (3)
	3-Hour	25	16.49
	24-Hour	5	2.99
	Annual	1	0.15
PM10	24-Hour	5	4.88
	Annual	1	0.69

(1) The 1-hour SO_2 and NO_2 SIL are based on interim EPA guidance.
(2) For 1-hour NO_2 modeling, the Tier 2 approach with an average ambient NO_2/NO_X ratio of 0.80 was used as allowed in EPA's guidance memorandum entitled, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_X National Ambient Air Quality Standard" dated March 1, 2011.
(3) The 1-hour NO_2 and SO_2 maximum impact is the multiyear average of the highest 1-hour values for each pollutant.

As shown in Table 6, with the exception of the 1-hour NO_2 and 1-hour SO_2 impacts, the maximum facility air quality impacts are below the PSD SIL for all PSD pollutants and all averaging periods. A full impact analysis is required only for the 1-hour NO_2 and 1-hour SO_2 impacts from the project.

(2) Full Impact Analysis

A full impact analysis is required for any criteria pollutant for which the proposed source's estimated ambient pollutant concentrations exceed prescribed SIL. The full impact analysis expands the preliminary analysis in that it considers emissions from (1) the proposed source; (2) existing sources; and (3) residential, commercial, and industrial growth that accompany the new activity at the new source (i.e., secondary emissions). The full impact analysis consists of a separate analysis for the NAAQS and PSD increments.

The 1-hour NO_2 and 1-hour SO_2 impacts from this project exceed the prescribed 1-hour SIL for each pollutant. A full impact analysis was conducted to demonstrate compliance for these pollutants.

Dispersion Model Selection

Air quality modeling was used to evaluate the impact to ambient air quality from the proposed facility. FCCRWTE submitted an air quality modeling protocol to the MDE-ARMA in May 2010 for review. The protocol proposed the use of the current version of the EPA regulatory refined dispersion model AERMOD (version 09292). After initial MDE-ARMA comments on June 9, 2010, the MDE-ARMA subsequently approved the final modeling protocol on July 9, 2010. Subsequent modeling guidance released by EPA on the 1-hour NO_2 and SO_2 NAAQS necessitated that an addendum to the modeling protocol be submitted which would outline how the 1-hour NO_2 and SO_2 modeling analyses would be completed. This Air Quality Impact Analysis Modeling Protocol Addendum 1-hour NO_2 and SO_2 Analyses were submitted to the MDE-ARMA on May 13, 2011. The MDE-ARMA submitted comments on the Protocol Addendum on June 1, 2011 and subsequently approved the Protocol Addendum during an August 17, 2011 phone call.

The following paragraphs summarize the major elements of the project's dispersion modeling analysis.

Data

Five years (2001, 2003, 2004, 2006, and 2007) of NWS meteorological data from the Dulles International Airport (IAD, WBAN No. 93738) were used in the modeling analysis. The MDE-ARMA approved the use of IAD surface data as it was the best representative meteorological data of the project site. The most recent version of the AERMOD meteorological processor, AERMET (version 06341) was used to process the surface meteorological data with the upper air data from the Sterling NWS site (WBAN No. 93734).

Land use characteristics are important in AERMET, as they are used to develop boundary layer micrometeorological variables needed by AERMOD. AERMET also requires that the land use surrounding the meteorological data collection site be characterized and input into the model. Land use is characterized by identifying the surface roughness, Bowen ratio, and albedo of the surrounding land cover. These micrometeorological parameters are used by AERMET, along with the standards surface meteorological data, to determine the stability state of the boundary layer of the atmosphere. FCCRWTE outlined the micrometeorological variables chosen for the area surrounding IAD in its modeling protocol (May 2010). FCCRWTE assigned the values of surface roughness, Bowen ratio, and albedo on a wind direction specific basis, using 12 30-degree wind direction sectors.

The MDE-ARMA approved FCCRWTE treatment of the meteorological variables as outlined in the modeling protocol, and concluded that the AERMET processing conducted by the FCCRWTE was suitable for use in the FCCRWTE project modeling analysis.

Source Characterization

Different load conditions for the FCCRWTE combustors were examined in the air dispersion modeling. The operating scenarios modeled included two combustors at 110-, 100-, 78- and 60-percent of maximum continuous rating (MCR), and one combustor at 78-percent of MCR.

For all combustor loads except the 110-percent MCR scenario, the combustors were conservatively assumed to operate continuously; i.e., 24 hours per day for every day of the year. For the 110-percent MCR scenario, only short-term impacts (i.e., 1-, 3-, 8-, and 24-hour averaging periods) were assessed since the combustors will not operate at this load for a full year. The 110-percent MCR scenario resulted in the highest short-term combustor emission rates, and the single combustor 78-percent MCR operating scenario represents the lowest steady-state load operation of one combustor.

These various load scenarios were modeled because lower operating loads often reduce plume rise relative to the normal operating scenario, and there is a potential that this operating scenario could result in higher predicted impacts despite lower emission rates. A complete set of stack parameters for these scenarios is shown in Table 7-A and a complete set of emission rates are shown in Table 7-B.

TABLE 7-A
SUMMARY OF STACK INFORMATION FOR THE FCCRWTE OPERATING CASES

Operating Case	Load (%)	Merged Stacks	Stack Height (ft)	Stack Diameter (ft)	Exit Velocity (ft/sec)	Stack Temperature (°F)
Two MWCs	110	Yes	270	10.25	62.41	257
	100	Yes	270	10.25	56.74	257
	78	Yes	270	10.25	43.58	257
	60	Yes	270	10.25	25.40	257
One MWC	78	No	270	7.25	43.58	257

TABLE 7-B
SUMMARY OF POLLUTANT EMISSION RATES FOR THE FCCRWTE OPERATING CASES

Operating Case	Load (%)	NO_X (g/sec)	SO_2 (g/sec)	CO (g/sec)	PM_{10} (g/sec)	$PM_{2.5}$ (g/sec)
Two MWCs	110	7.26	5.39	9.82	2.03	0.85
	100	6.60	4.90 [(1)] 2.86 [(2)]	8.93	1.85	0.77
	78	5.18	3.85 [(1)] 2.24 [(2)]	7.01	1.45	0.60
	60	3.88	2.88 [(1)] 1.68 [(2)]	5.26	1.09	0.45
One MWC	78	2.59	1.92 [(1)] 1.12 [(2)]	3.50	0.72	0.30
(1) Averaging period – Short Term (2) Averaging period – Annual						

Downwash

Aerodynamic downwash caused by buildings and structures in the vicinity of exhaust stacks can lead to an increase in ground level concentrations. Downwash effects are modeled within AERMOD by using algorithms derived from the ISCPRIME model. AERMOD requires information about buildings and structures to be input in a prescribed format. FCCRWTE used EPA's Building Profile Input Program for PRIME (BPIPPRM, version 04274 [September 30, 2004]) for this purpose. The BPIP program generates information on the location and size of buildings and structures relative to each stack, and AERMOD uses this information to calculate downwash effects.

BPIP also calculates the good engineering practice (GEP) stack height for a given location. GEP is the height at which downwash effects are considered to be insignificant. BPIP determined the GEP height for the MWC stack as 368 feet (112.3 meters). The height of the MWC stack, 270 feet (82.30 meters), is greater than the maximum regulatory GEP stack height of 213 feet (65 meters). However, based on the height of the MWC boiler building (i.e., 147 feet-agl (44.8 meters-agl)), the MWC stack will be less than GEP. Since the MWC stack height will comply with the EPA promulgated final stack height regulations, the actual stack height was used in the modeling analyses. Since the proposed stack height of the MWC is below GEP, it can potentially be affected by downwash. To account for the effects of downwash, the BPIPPRM program builds a mathematical representation of each building to determine projected building dimensions and its potential zone of influence. These calculations are performed for 36 different wind directions (at 10 degree intervals).

For example, the BPIPPRM building dimensions for a wind orientation of 30 degrees are used for wind directions between 26 and 35 degrees. If the BPIPPRM program determines that a source is under the influence of several potential building wakes, the structure or combination of structures which has the greatest influence (h_b + 1.5 L_b) was selected for input to the AERMOD model. Conversely, if no building wake effects are predicted to occur for a source for a particular wind direction, or if the worst-case building dimensions for that direction yield a wake region height less than the source's physical stack height, building parameters are set equal to zero for that wind direction. For this case, wake effect algorithms are not exercised when the model is run. The building wake criteria influence zone is 5 L_b downwind, 2 L_b upwind, and 0.5 L_b crosswind.

Receptor Grid Development

A receptor grid was developed by FCCRWTE that extended to approximately 50 kilometers (km) from the FCCRWTE project site in each direction. Receptor spacing was set to 25 m along the site fence line; 100 m spacing from the site fence to approximately 3 km; to 250 m spacing from 3 km to approximately 6 km; 500 m spacing from 6 km to approximately 20 km; 1,000 m spacing from 20 km to approximately 35 km; and 1,500 m spacing from 35 km to approximately 50 km. In addition, based on preliminary modeling, the receptor grid was further refined to include a 100 m spacing Cartesian grid to address impacts on elevated terrain (i.e., a ridge) located to the northwest of the FCCRWTE site.

A total of 19,046 receptors were analyzed in the model. Terrain elevations were assigned to each receptor, and a hill scale was calculated with the AERMAP (version 09040) terrain processor. AERMAP is a companion program to AERMOD that utilizes digitized USGS digital elevation model (DEM) data files to assign elevations and hill scales to receptors. The hill scale assigned to each receptor is used by AERMOD to determine the appropriate terrain algorithm to use for the receptor. AERMOD calculates a critical terrain obstacle, and one that passes around the side of the obstacle. Based on the plume height relative to the terrain and relative to the receptor, AERMOD calculates concentration contributions from different parts of the plume following the different flow regimes.

Air Quality Modeling Results and Discussion

The MDE-ARMA evaluated the modeling methodology including the model used, the development and application of the meteorological database, the use and application of BPIPPRM to determine downwash effects, the design of the receptor grid, and the actual model application. The conclusion, based on this evaluation, is that the methodology is adequate to determine the impact of significant emissions from the FCCRWTE project.

The significant impact area (SIA) is the geographical area for which the full impact air quality analyses for the NAAQS and PSD increments are carried out. The SIA includes all locations where a significant increase in the potential emissions of a criteria pollutant from a proposed project will cause a significant ambient impact. The SIA is a circular area with a radius extending from the source to (1) the most distant point where approved dispersion modeling predicts a significant ambient impact will occur, or (2) a modeling receptor distance of 50 km, whichever is less.

The FCCRWTE SIL analyses conducted for this project, determined that the predicted maximum impacts of SO_2 (3-hour, 24-hour, and annual), NO_2 (annual), CO (1-hour and 8-hour), and PM_{10} (24-hour and annual) were all below their respective SIL. However, the maximum predicted 1-hour NO_2 and SO_2 ambient concentrations exceeded EPA's recommend interim SIL of 4 parts per billion (ppb) (7.5 µg/m^3) and 3 ppb (7.8 µg/m^3), respectively. Table 7-C provides the results of the FCCRWTE SIL analyses.

TABLE 7-C
SUMMARY OF FCCRWTE SIL ANALYSES

Pollutant	Averaging Time	Maximum Impact (µg/m^3)	SIL (µg/m^3)	Exceed Class II SIL (Yes/No)
SO_2	1-hour	28.6	7.8	Yes
	3-hour	16.49	25	No
	24-hour	2.99	5	No
	Annual	0.15	1	No
NO_2	1-hour	30.8	7.5	Yes
	Annual	0.26	1	No
CO	1-Hour	82.94	2,000	No
	8-Hour	48.64	500	No
PM_{10}	24-Hour	4.88	5	No
	Annual	0.69	1	No

Since both the 1-hour NO_2 and SO_2 SIL were exceeded, cumulative impact assessment analyses were required. In the past a SIL analysis would involve modeling all receptors that were within the SIA, but now due to the complex nature of the 1-hour analysis it's deemed appropriate and acceptable to limit the cumulative impact analysis only to those receptors that have been shown to have significant impacts from the proposed new source. For this reason only receptors that were found to equal or exceed the 1-hour NO_2 or SO_2 SIL were used in the cumulative NAAQS analyses. Using this methodology, a SIL box was constructed which enclosed all receptors that were equal to or exceeded the 1-hour NO_2 and SO_2 SIL (see Figures 3-1 and 3-2 of the Frederick/Carroll County Renewable Waste-To-Energy Facility Supplemental Air Quality Impact Analyses 1-Hour NO_2 and SO_2 Impacts, ECT No. 100104-0204, August 2011).

Required Emissions Inventory for Full Impact Analysis

The emissions inventory required for the full impact analysis included not only the FCCRWTE's emissions but also off site sources of NO_2 and SO_2 allowable emissions.

The FCCRWTE's NO_2 and SO_2 emissions sources include the two (2) municipal solid waste combustors operating at 110 percent of their maximum continuous rating. This operating scenario represents the maximum hourly NO_x and SO_2 emissions rates for the FCCRWTE facility.

As specified in EPA's March 1, 2011 guidance memorandum, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_X, National Ambient Air Quality Standard," temporary or intermittent emissions sources can be excluded from the emissions inventory. Emissions from FCCRWTE's emergency diesel firewater pump were deemed intermittent and thus were excluded from the modeling emissions inventory. Similarly, startup/shutdown emissions are also addressed in the EPA memorandum, and can be omitted if they can be considered an "intermittent source". The FCCRWTE will operate continuously (i.e., 24 hours per day, 365 days per year); therefore, startups and shutdowns will be infrequent. Thus emissions from startups and shutdowns were not included in the emissions inventory.

Offsite emissions sources were submitted to and subsequently approved by the MDE-ARMA for use in the NO_2 and SO_2 modeling analyses. A total of 411 NO_2 emissions sources at 148 locations and 138 SO_2 emissions sources at 55 locations in three states (Maryland, Virginia, and West Virginia) were included in the offsite emissions inventory.

In summary, the 1-hour NO_2 and SO_2 emissions inventory included the following:

- FCCRWTE two municipal solid waste combustors operating at 110 percent of their maximum continuous rating.
- Sources outside the SIL box (excluding sources that were located greater than 50 km from the FCCRWTE stack, emergency generators, sources that operated twenty days or less, sources with zero actual emissions, and sources with potential emissions of less than 10 tons per year).
- Sources inside the SIL box (excluding sources that were emergency generators, operated twenty days or less, and sources with zero actual emissions).
- Sources located in Virginia (VA) and West Virginia (WV) (excluding sources that were located greater than 50 km from the FCCRWTE stack, and potential emissions of less than 10 tons per year).

The specific emissions inventory and modeling parameters for each offsite source are provided in Appendix A (Modeled 1 Hour NO_x Emissions Inventory) and Appendix B (Modeled 1 Hour SO_2 Emissions Inventory) (both appendices can be found in the Frederick/Carroll County Renewable Waste-to-Energy Facility Supplemental Air Quality Impact Analysis 1-Hour NO_2 and SO_2 Impacts, ECT No. 100104-0204, August 2011) .

(3) Compliance with the NAAQS

For the 1-hour NO_2 and 1-hour SO_2 impacts from the FCCRWTE project, compliance with the NAAQS is determined by comparing the predicted ground level concentrations (based on the full impact analysis and background air quality data) at each receptor to the applicable NAAQS. If the predicted total ground level concentration is below the applicable NAAQS for each pollutant, then the project is in compliance with the NAAQS.

Additionally, if the predicted total ground level concentration exceeds the NAAQS at one or more receptors, but the contribution from the FCCRWTE source to the exceedance is insignificant (i.e. less than the SIL), the project is in compliance with the NAAQS. The modeling results from the full impact analysis for the 1-hour NO_2 and 1-hour SO_2 impacts from the project are summarized in Table 8.

TABLE 8
1-HOUR MODELING RESULTS

Pollutant	Maximum Modeled Impact (μg/ m^3)	Background Concentration (μg/ m^3)	Total Concentration (μg/ m^3) (1)	NAAQS (μg/ m^3)
NO_2	223 (2)	75 (3)	298	188
SO_2	1,160	63(4)	1,223	195

(1) The total concentration includes the maximum modeled impact plus the background concentration.
(2) For 1-hour NO_2 modeling, the Tier 2 approach with an average ambient NO_2/NO_X ratio of 0.80 was used as allowed in EPA's guidance memorandum, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_X National Ambient Air Quality Standard" dated March 1, 2011.
(3) The 3-year average of 1-hour 98th percentile NO_2 values for 2008, 2009, and 2010 from Station ID: 51-107-1005 (Broad Run High School, Ashburn, Loudoun County, VA).
(4) 3-year average of 1-hour 99th percentile SO_2 values for 2006, 2007, and 2008 from Station ID: 51-059-0005 (Cub Run Lee Road, Cub Run Treatment Plant, Fairfax County, VA).

As shown in Table 8, the modeling results from the full impact analysis show that the total concentration (maximum modeled impact plus the background concentration) exceeds the 1-hour NAAQS for both NO_2 and SO_2. However, the proposed project does not have a significant contribution to the total maximum concentration or any of the modeled NO_2 or SO_2 NAAQS exceedances. The results of these analyses are summarized in Table 9 and Table 10.

TABLE 9
MODELING RESULTS – CONTRIBUTION FROM THE PROJECT TO THE MAXIMUM MODELED CONCENTRATION

Pollutant	Averaging Time	Total Concentration (1) (ug/m^3)	Contribution from the Project (ug/m^3)	Applicable SIL (ug/m^3)
NO_2	1-Hour	298 (2)	0.021	7.5
SO_2	1-Hour	1,223	0.014	7.8

(1) The total concentration includes the maximum modeled impact plus the background concentration.

(2) For 1-hour NO_2 modeling, the Tier 2 approach with an average ambient NO_2/NO_x ratio of 0.80 was used as allowed in EPA's guidance memorandum, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_x National Ambient Air Quality Standard" dated March 1, 2011.

TABLE 10
MODELING RESULTS – MAXIMUM PROJECT CONTRIBUTION TO A MODELED EXCEEDANCE

Pollutant	Averaging Time	Modeled Exceedance Concentration (1) (ug/m^3)	Contribution from the Project (ug/m^3)	Applicable SIL (ug/m^3)
NO_2	1-Hour	190 (2)	0.027	7.5
SO_2	1-Hour	222	6.4	7.8

(1) The total concentration includes the maximum modeled impact plus the background concentration.

(2) For 1-hour NO_2 modeling, the Tier 2 approach with an average ambient NO_2/NO_x ratio of 0.80 was used as allowed in EPA's guidance memorandum, "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_x National Ambient Air Quality Standard" dated March 1, 2011.

Based on the modeling results presented in Table 9, it is shown that the proposed facility does not significantly contribute to the maximum modeled NO_2 or SO_2 concentration. In addition, based on the modeling results presented in Table 10, it is shown that the highest contribution from the FCCRWTE facility to a NAAQS exceedance is below the applicable 1-hour NO_2 and SO_2 SIL.

Based on these modeling results it has been demonstrated that the proposed FCCRWTE facility does not significantly cause or contribute to any modeled violations of the applicable 1-hour NAAQS for NO_2 and SO_2 and compliance with the 1-hour NO_2 and SO_2 NAAQS have been achieved.

(4) Compliance with PSD Increments

The FCCRWTE SIL analyses conducted for this project, determined that the predicted maximum impacts of SO_2 (3-hour, 24-hour, and annual), NO_2 (annual), CO (1-hour and 8-hour), and PM_{10} (24-hour and annual) were all below their respective SILs, so a PSD increment compliance determination was not required. Refer to Table 7-C for the SIL analyses modeling results.

In addition, there are no PSD increment standards for 1-hour NO_2 and 1-hour SO_2 impacts. Although the 1-hour NO_2 and 1-hour SO_2 impacts from this project exceed the prescribed 1-hour SIL for each pollutant and a full impact analysis and compliance with NAAQS is required, a PSD increment compliance determination is not required.

VII. ADDITIONAL IMPACT ANALYSIS

A PSD application must address additional impacts for each pollutant subject to the PSD application. These analyses assess the potential impacts of air, ground, and water pollution on soils, vegetation, and visibility caused by emissions increases of any regulated pollutant emitted from the proposed project and from associated growth.

With respect to GHG and the Additional Impact Analysis, per EPA's March 2011 "PSD and Title V Permitting Guidance for Greenhouse Gases":

> "*EPA believes it is not necessary for applicants or permitting authorities to assess impacts from GHGs in the context of the additional impacts analysis or Class I area provisions of the PSD regulations for the following policy reasons. Although it is clear that GHG emissions contribute to global warming and other climate changes that result in impacts on the environment, including impacts on Class I areas and soils and vegetation due to the global scope of the problems, climate change modeling and evaluations of risks and impacts of GHG emissions is typically conducted for changes in emissions orders of magnitude larger than the emissions from individual projects that might be analyzed in PSD permit reviews. Quantifying the exact impacts attributable to a specific GHG source obtaining a permit in specific places and points would not be possible with current climate change modeling. Given these considerations, GHG emissions would serve as the more appropriate and credible proxy for assessing the considerations reflected in the Class I area and additional impacts analysis is to focus on reducing GHG emissions to the maximum extent. In light of these analytical challenges, compliance with the BACT analysis is the best technique that can be employed at present to satisfy*

the additional impacts analysis and the Class I area requirements of the rules related to GHGs."

(1) Impacts on Class I Areas

PSD Class I areas are those that are designated as requiring special protection from the effects of pollutants emitted by PSD sources due to the pristine quality of their natural resources. Five Class I areas are within 300 kilometers of FCCRWTE. The Class I area closest to the project is Shenandoah National Park which is located at a distance of approximately 85 kilometers. The Dolly Sods and Otter Creek Wilderness Areas are located approximately 170 km and 192 km southwest of FCCRWTE. Brigantine is located 257 km east of the project site and the James River Face is 261 km southwest of FCCRWTE.

On February 9, 2011, FCCRWTE provided notice of the proposed project and a screening assessment to the federal land managers for the National Park Service, the U.S. Forest Service, and the U.S. Fish and Wildlife Service.

On April 8, 2011, Andrea Stacy of the National Park Service sent the following email to FCCRWTE:

> *"Thank you for sending the NPS information regarding the proposed waste-to-energy facility to be located in Frederick County, MD. As indicated in your Feb. 9, 2011 letter, based upon the emission rates and distance from Shenandoah NP, the NPS does not anticipate that modeling would show any significant additional impacts to air quality related values*
>
> *(AQRV) in this Class I area. Therefore, we are not requesting that a Class I AQRV analyses be included in the PSD permit application. However, as John Bunyak indicated below, there are several sensitive Class II NPS parks located within 50 km of the proposed facility. These include Antietam NB, Rock Creek Park and Catoctin Mountain Park. We request that you complete a near-field AQRV analysis for these parks, including a VISCREEN visibility analysis and the addition of several discrete receptors located in each park for the Class II AERMOD modeling runs. The AQRV analyses for these sensitive Class II parks can be included under the "Additional Analyses" section of the PSD permit."*

FCCRWTE conducted a Class II Area Plume Visibility and Air Quality Analysis in November 2011. The plume visibility analysis was conducted using Federal Land Manager (FLM) and U.S. EPA recommended plume visual impact screening procedures for three PSD Class II areas located within approximately 50 kilometers of the FCCRWTE site. The three Class II areas were Rock Creek Park, Antietam National Battlefield and Catoctin Mountain Park. The air quality impact analysis utilized the approved May 2010 dispersion modeling protocol that was used for FCCRWTE's PSD modeling and included the additional discrete receptors for these Class II areas.

(2) Other Impacts

The additional impacts analysis generally has four parts, as follows:

(a) growth;
(b) soils, vegetation, and wildlife impacts;
(c) visibility impairment; and
(d) ambient air quality impact analysis.

Growth Impact Analysis

The purpose of the growth analysis is to quantify associated growth; that is, to predict how much new growth is likely to occur to support the source under review and then to estimate the emissions which will result from that associated growth.

Impacts associated with construction of the FCCRWTE facility will be minor and temporary. While not readily quantifiable, the temporary increase in vehicle-miles traveled in the area would be insignificant, as would any temporary increase in vehicular emissions.

FCCRWTE will employ a total of approximately 50 operational workers. It is expected that many of these workers will be hired from the surrounding area. In 2010, the population of Frederick County was estimated at 235,364 persons. The county population projection for 2015 is 260,350, almost an 11-percent increase (U.S. Census, Frederick County Planning, Maryland Department of Planning, January 2010). The workforce needed to operate the plant represents a small fraction of the population already present in the immediate area. Therefore, while some small increase in area vehicle-miles traveled could occur, the air quality implications for Frederick County will be minimal.

Finally, a new industrial facility can sometimes generate growth in other industrial or commercial operations needed to support the new facility. Given the site's proximity to Baltimore and the Washington, DC metropolitan area, the existing commercial infrastructure should be more than adequate to provide the support services the FCCRWTE facility might require.

Furthermore, the FCCRWTE facility will be constructed to meet general area electric power demands, so no significant secondary growth effects due to operation of the facility would be anticipated. Therefore, no adverse air quality impacts due to associated industrial/commercial growth would be expected. Any significant industrial development resulting from the establishment of the FCCRWTE facility would be independently subject to PSD and other environmental review requirements.

Soils, Vegetation, and Wildlife Impacts Analysis

The analysis of soils, vegetation, and wildlife air pollution impacts should be based on an inventory of soils, vegetation, and wildlife types found in the impact area. This inventory should include all vegetation with any commercial or recreational value.

Potential impacts to soils, vegetation, and wildlife resources at the FCCRWTE facility site and immediate environs resulting from the plant operation include effects of air emissions. Certain air pollutants in acute concentrations or chronic exposures can adversely impact soils, vegetation, or wildlife resources. FCCRWTE will employ state-of-the-art equipment and emission controls and potential air pollutant impacts are less than ambient air quality standards (see Table 11). Ambient concentrations of the criteria pollutants at levels below ambient air quality standards would not be expected to harm most types of soils or vegetation and, therefore, wildlife. No impacts to soils, vegetation, or wildlife in the facility site vicinity are anticipated.

Visibility Impairment Analysis

The visibility impairment analysis pertains particularly to Class I area impacts and other areas where good visibility is of special concern. A quantitative estimate of visibility impairment is conducted, if warranted by the scope of the project.

In November 2011, FCCRWTE submitted the results of a Class II Area Plume Visibility and Air Quality Analysis. Based on the analysis, no visibility impairment at the local level is expected due to the types and quantities of emissions projected from the FCCRWTE facility.

The opacity of combustion exhausts from the FCCRWTE facility will be low, typically at or approaching zero. Combustion emissions (primary particulates, SO_x, and NO_x) that contribute to opacity are expected to be small due to the use of the selected emission controls over the lifetime of the facility. The potential to impair visibility at the local level should be relatively low, given the low expected exhaust opacity.

The contribution of emissions of VOC to the potential for haze formation in the area will be minimal given the low VOC emission rate from the facility. In addition, the aesthetic character of property adjacent to the facility site on the eastern side of the Monocacy River is largely influenced by the commercial/industrial nature of the area. Some portion of the FCCRWTE facility (e.g., stack and rooftops) may be visible from the Monocacy National Battlefield, but the overall aesthetic effect is expected to be minimal. Therefore, FCCRWTE will not adversely affect aesthetic or visual qualities in the area.

Effects of Wet Cooling Tower Operations

FCCRWTE also conducted an analysis of the effects of wet cooling tower operations on visibility, fogging, soils and vegetation. Depending on the meteorological conditions, warm, moist air leaving a cooling tower may become cooled to the point of saturation, causing the water to condense forming a visible plume. Ground level fogging and/or icing may occur if this plume does not rise after being emitted from the cooling tower. The potential frequency of occurrence and magnitude of these potential cooling tower impacts were assessed qualitatively.

For the visibility and fogging analysis, FCCRWTE evaluated the results from a recent study of a wet cooling tower for another facility in Maryland. A 10-cell cooling tower for the Competitive Power Ventures, LLC (CPV), facility to be constructed in Charles County, Maryland was assessed using the CALPUFF model with meteorological data considered to be representative of meteorological conditions at the FCCRWTE facility. The cooling tower at the CPV facility has over twice the airflow as the FCCRWTE cooling tower. Also, the CPV cooling tower has five times the average and three times the maximum heat rejection rate as the FCCRWTE cooling tower.

For the CPV cooling tower, it was predicted that only 2 hours of plume induced fogging and 2 hours of plume induced icing would occur out of 43,824 hours modeled. Furthermore, these events were predicted to occur on a roadway 750 feet downwind of the predominate wind direction. Buckeystown Pike, the nearest roadway of interest, is approximately 1,200 feet to the west of the FCCRWTE cooling tower. The winds from the east are less frequent than those from the west, which would reduce the hours that the cooling tower plume would be transported in the direction of the roadway. Based on the modeling results and a comparison of the two cooling towers, it is reasonable to assume that the occurrence of plume induced icing and fogging on this roadway would be extremely rare, if it were to ever occur.

An additional potential impact from a cooling tower can occur when the drift from a cooling tower carries dissolved and suspended solids (mostly salt), which could be deposited locally and may have the potential to affect soils and vegetation. FCCRWTE used the AERMOD dispersion model to determine salt deposition rates from the cooling tower. A predicted salt deposition rate is presented as the amount of salt deposited over a unit area per season and year at a certain direction and distance away from the cooling tower. Maximum predicted salt deposition rates from the cooling tower are less than the lowest known salt threshold values for plant species in Maryland with low resistance to salt and less than the lowest known salt accumulation threshold value for soil. Based on the modeling results, salt deposition from the cooling tower deposition will not cause any adverse impacts to plants and soils.

Ambient Air Quality Impact Analysis

The ambient air quality analysis projects the air quality that will exist in the area of the proposed source during construction and after it begins operation. In order to demonstrate that the local ambient air quality will not be affected by the proposed project, the combined impact from the proposed project and the established background concentration for each criteria pollutant and averaging time must be less than the applicable NAAQS. Table 11 shows that the combined impact from the proposed project and the background concentration is less than the applicable NAAQS for each criteria pollutant and averaging time.

TABLE 11
AMBIENT AIR QUALITY IMPACT ANALYSIS

Pollutant	Averaging Time	Maximum Impact	Background Concentration [(1)]	Maximum Total Impact [(2)]	NAAQS [(3)] Primary	NAAQS [(3)] Secondary	Compliance With NAAQS
NO_2	1-Hour [(4)]	30.8 µg/m³	75 µg/m³	105.80 µg/m³	189 µg/m³		Yes
		16.3 ppb	40 ppb	56.3 ppb	100 ppb		
	Annual	0.263 µg/m³	14.42 µg/m³	14.683 µg/m³	100 µg/m³	100 µg/m³	Yes
		0.00014 ppm	0.00767 ppm	0.00781 ppm	0.053 ppm	0.053 ppm	
CO	1-Hour	82.94 µg/m³	5,371 µg/m³	5453.94 µg/m³	40,000 µg/m³		Yes
		0.0726 ppm	4.67 ppm	4.7426 ppm	35 ppm		
	8-Hour	48.64 µg/m³	2,680 µg/m³	2728.64 µg/m³	10,000 µg/m³		Yes
		0.0426 ppm	2.33 ppm	2.3726 ppm	9 ppm		
PM_{10}	24-hour	4.88 µg/m³	51 µg/m³	55.88 µg/m³	150 µg/m³	150 µg/m³	Yes
SO_2	1-Hour [(4)]	28.6 µg/m³	63 µg/m³	91.60 µg/m³	196 µg/m³		Yes
		11 ppb	24 ppb	35 ppb	75 ppb		
	3-Hour	16.49 µg/m³	58 µg/m³	74.49 µg/m³		1,300 µg/m³	Yes
		0.0063 ppm	0.022 ppm	0.0283 ppm		0.5 ppm	
	24-Hour	2.99 µg/m³	26 µg/m³	28.99 µg/m³	365 µg/m³		Yes
		0.0011 ppm	0.010 ppm	0.0111 ppm	0.14 ppm		
	Annual	0.15 µg/m³	7.9 µg/m³	8.05 µg/m³	80 µg/m³		Yes
		0.000057 ppm	0.003 ppm	0.003057	0.03 ppm		
Lead (Pb)	Calendar Quarter Arithmetic mean	Emissions Not Significant	--	--	1.5 µg/m	1.5 µg/m	Yes
	Rolling 3-Month Average	Emissions Not Significant	--	--	0.15 µg/m	0.15 µg/m	Yes

(1) Based on ambient monitoring data.
(2) Maximum Total Impact = Maximum Modeled Impact + Background Concentration
(3) National Ambient Air Quality Standard
(4) The maximum 1-hour concentration exceeded the PSD SIL, so a full impact modeling analysis was completed. Based on the full impact analysis it was determined that the FCCRWTE didn't significantly contribute to any 1-hour exceedances.

VIII. FINAL DETERMINATION

Based on the above analyses, the MDE-ARMA has concluded that the proposed FCCRWTE project will comply with all applicable Federal, State, and local air quality requirements and has made a tentative determination to issue the PSD Approval. Enclosed with the final determination is a copy of the final PSD Approval conditions.