TECHNICAL EVALUATION

&

PRELIMINARY DETERMINATION

APPLICANT

Pinellas County Board of County Commissioners
Pinellas County Department of Environmental and Infrastructure
3095 114th Avenue North
St. Petersburg, Florida 33716

Pinellas County Resource Recovery Facility
ARMS Facility ID No. 1030117

PROJECT

Draft Permit No. PSD-FL-420
Project No. 1030117-009-AC

Facility Improvement Project
Emission Standards and Process Limits

COUNTY

Pinellas County, Florida

PERMITTING AUTHORITY

Florida Department of Environmental Protection
Division of Air Resource Management
Office of Permitting and Compliance
2600 Blair Stone Road, MS#5505
Tallahassee, Florida 32399-2400

August 2012

1. GENERAL PROJECT INFORMATION

1.1. Facility Description and Location

The Pinellas County Resource Recovery Facility (PCRRF) is categorized under Standard Industrial Classification (SIC) Code No. 4953. The facility is owned by Pinellas County and is currently operated by Veolia ES Pinellas, Inc. Refer to Figure 1. The facility is located at 3001 110th Avenue North in St. Petersburg, Florida. The UTM coordinates are Zone 17, 335.273 km East, and 3084.304 km North.

According to the facility Title V operation permit (1030117-008-AV), Pinellas County Resource Recovery Facility (PCRRF or the Facility) consists of three municipal waste combustors (MWC) with auxiliary burners, lime storage and processing facilities, an activated carbon storage facility, ash storage and processing facilities, a metals recovery system, a cooling tower, ancillary support equipment, and a contiguous municipal solid waste landfill (Bridgeway Acres). Refer to Figure 2, which is an aerial view of the facility.

Figure 1. Location of Pinellas County RRF

Figure 2. Aerial view of Pinellas County RRF

Two of the MWC (Units 1 and 2) share a common steam turbine and the third MWC (Unit 3) has a separate dedicated steam turbine. The electric generating capacity of the facility is 75 megawatts (MW). The three units exhaust through three separate flues contained within a common stack that is 165 feet tall.

The capacity of the Facility is greater than 1,000,000 tons/year of solid waste fuel. A number of short, intermediate or long term process limits apply (waste throughput, heat input and steam production). These are discussed further below. The Bridgeway Acres has a capacity of approximately 8.4 million megagrams (metric tonnes) and accepts municipal solid waste and ash from Units 1, 2 and 3.

1.2. Process Description

The three municipal waste combustors operate 7 days per week and the scale house operates Mondays through Saturdays except Thanksgiving, Christmas and New Years Day. Garbage consisting of food, paper and plastic waste from residences is received at the site (Monday-Saturday), as well as trash consisting primarily of commercial and wood waste and yard waste. Figure 3 is a diagram of the waste-to-energy process at the Pinellas County RRF. Waste (the term refuse is used interchangeably with waste) entering the facility is weighed via electronic truck scales to weigh incoming refuse. The refuse is delivered to one of the 12 tipping bays in the refuse pit. Three overhead cranes lift the material from the refuse fuel pit to the feed hopper of the boiler. The feed hopper opens into a feed chute which maintains a uniform refuse feed rate in direct proportion to steam generation requirements. The refuse is automatically fed onto the combustion grates. The grates operate with reverse reciprocating (tumbling) action, which results in a uniform burnout of the refuse.

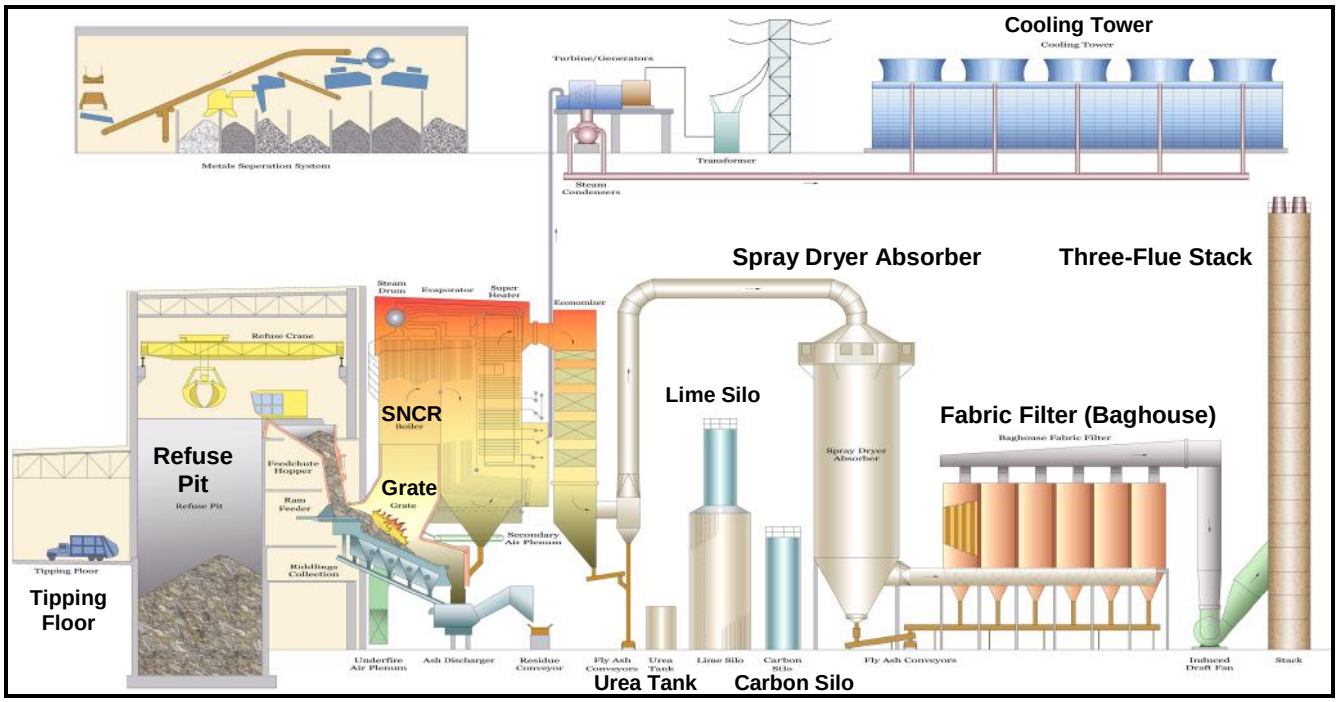


Figure 3. Process Diagram for Waste-to-Energy at the Pinellas County Resource Recovery Facility

Combustion of the refuse in the three waterwall furnaces produces high temperatures (about 1,800 degrees Fahrenheit) and generates high pressure steam. The steam is used to drive the two steam turbine-electrical generators that export power to the grid.

Ash generated from the combustion of solid waste is discharged onto the residue conveyor and transferred to the metals separation system. Here, the ash is size-separated using screens, magnets are used to remove ferrous metals (steel) and electromagnets are used to remove non-ferrous (aluminum) metals from the garbage stream. The recovered metals are sold to steel mills and smelters for recycling, and the remaining ash is used for landfill cover and interior site berms and roadways.

Each furnace is equipped with a urea injection system based on the principle of selective non-catalytic reduction (SNCR) for nitrogen oxides (NO_X) control. After heat recovery for electrical energy production, the exhaust gas from each furnace is further cooled by injection of water and slaked lime slurry in a spray dryer absorber (scrubber) where acid gases react with lime and are converted to solid reaction products.

Activated carbon is injected after the scrubber to bind with mercury and dioxin/furan. Fly ash, including reaction products from the scrubber and the spent activated carbon are removed in a fabric filter baghouse. The exhaust from each unit is conveyed via an induced draft fan into a flue located within the facility stack. The fly ash, stoker grate bottom ash and other wastes are combined and disposed in the on-site landfill.

Odors are minimized by keeping the truck access doors closed during non-use and maintaining negative pressure on the garbage tipping floor and using the collected air to support combustion.

The facility is equipped with continuous emission system (CEMS) for carbon monoxide (CO), sulfur dioxide (SO_2) and NO_X, and a continuous opacity monitoring systems (COMS) for visible emissions. Annual stack testing is required for particulate matter (PM), hydrogen chloride (HCl), mercury, dioxin/furan, cadmium and lead.

Table 1 indicates the emissions units presently assigned to the facility within the Department's Air Resource Management System (ARMS).

Table 1. List of EU at the Pinellas County Resource Recovery Facility

EU No.	Brief Description
001	Municipal Waste Combustor Unit 1
002	Municipal Waste Combustor Unit 2
003	Municipal Waste Combustor Unit 3
004	Hydrated Lime Storage Silo for Water Softening
005	Residue Storage and Processing Building (RSPB)
006	Activated Carbon Storage Silo
007	Lime Storage Silo for Spray Dryer Absorber
008	Ash Conditioning Building
009	Municipal Solid Waste Landfill
011	Emergency Generator - Main Lift Station
012	Emergency Fire Pump Engine (EPA Tier 3 Certified)
013	Cooling Tower
014	Diesel Tub Grinder (primary engine and secondary engine)
015	Portable Emergency Generator - Pond A
016	Emergency Generator - Maintenance Building
017	Emergency Generator - Scale House (EPA Tier 3 Certified)
018	Emergency Generator - Administrative Building (EPA Tier 3 Certified)

1.3. Primary Regulatory Categories

- The existing facility is a major source of hazardous air pollutants (HAP).
- The existing facility does not operate units subject to the Title IV, Acid Rain provisions of the Clean Air Act (CAA).
- The existing facility is a Title V major source as defined in Chapter 62-210, Florida Administrative Code (F.A.C.) and as regulated in Chapter 62-213, F.A.C.
- The existing facility is a PSD major stationary source as defined in Chapter 62-210, F.A.C. and as regulated in Rule 62-212.400, F.A.C. – Prevention of Significant Deterioration (PSD).
- The existing facility is subject to the Standards of Performance for New Stationary Sources (NSPS) pursuant to Section 111, CAA and the National Emissions Standards for Hazardous Air Pollutants (NESHAP) pursuant to Section 112, CAA.
- The existing facility is subject to Rule 62-204.800, Federal Regulations Adopted by Reference, including Rule 62-204.800(9), F.A.C., Title 40, Code of Federal Regulations, Part 60 (40 CFR 60), Emission Guidelines and Compliance Times.
- The existing facility is subject to the Florida Power Plant Siting Act at Sections 403.501-518, Florida Statutes (F.S.) and as implemented in Chapter 62-17, Part I, F.A.C.

1.4. Project Description

August 1, 2006 the County submitted an application for an air construction permit to conduct several projects at the PCRRF. The projects primarily consisted of "in-kind replacements of existing equipment" to "help ensure the safe and reliable operation of the facility". Link to 2006 Application

The key projects included: furnace tube replacements; stoker grate replacements within the furnaces; air preheater replacement; replacement of the ash processing and storage building; and air pollution control and monitoring systems improvements. These projects were collectively known as the "Facility Improvement Project" and were part of the overall capital improvements to the solid waste system identified within the Solid Waste and Resource Recovery Element of the Pinellas County Comprehensive Plan.

The projected solid waste and resource recovery capital improvements for fiscal years 2007-2012 are listed in Table 2 that was taken from Chapter 3 of the described Element. Link to Chapter 3

Table 2. Solid Waste and Recovery Capital Improvement Needs. (As Foreseen in 2006)

Project	Target Year	Total Estimated Cost ($)
Site Roadway Construction and Paving Ongoing	Ongoing	2,950,000
SCADA Bridgeway and Toytown	2007-2009	700,000
New & Replacement Building Construction	2007-2011	12,200,000
New Citizen's Hand Unload Center	2007	2,060,000
Pond "A" Dredging and Embankment	2007	4,680,000
Area "T" Development	2008-2009	5,345,000
Side Slope Closures	2007-2008	5,630,000
BWA Gradient Control System Projects	2007-2010	6,130,000
Replace Scales	2007	20,000
Slurry Wall Realignment for CR 296	2007-2008	2,890,000
Toytown Gradient Improvements	2008-2009	4,915,000
Seawall Restoration and Yard Improvements	2007	110,000
Landfill Gas Collection/Flaring System	2009-2010	660,000
New Residue Processing/Storage Building	2007-2008	7,340,000
Lime Softening System and Pump Replacement	2007-2008	5,550,000
Furnace and Grate Related Work	2007-2010	58,450,000
Turbine Generator Refurbishing	2007	1,150,000
Additional Waste to Energy Construction Work	2007-2010	9,176,000

According to the applicant the project would not "cause an increase in the Facility's short-term emissions or a significant increase in the Facility's annual emissions". The applicant further asserted that the projects "do not constitute a 'modification' or a 'reconstruction' of the facility" and "do not trigger the Department's review process under the Prevention of Significant Deterioration (PSD) program or the requirements of the Department's New Source Performance Standards (NSPS). Accordingly, the Department issued a minor source permit authorizing the requested projects on December 26, 2006 with the standard source obligation and future emission reporting requirements. Link to 2006 Permit

On December 7, 2011 the County submitted a PSD application based on the same (now completed) project. According to the applicant, "the facility is in compliance with all of its emissions limits, but the facility has experienced difficulty in its efforts to ensure that there will be no increase in annual emissions above the applicable PSD significance levels for CO, SO_2 and MWC acid gases (due to SO_2)". Reported emission data from 2011 indicate that PSD has not been triggered. However, it is possible in future years (after the return of utilization to historical greater levels) that the project will trigger PSD. Link to 2011 Application

The applicant also requests a modification of past PSD permits to "provide that the compliance determination for the Facility 'MWC load' (capacity) shall be based on the Facility's monitored steam flow, which is monitored, rather than the weight (i.e. tons/day) of solid waste processed at the Facility, which has to be estimated". Also, "the modification will make the Facility's PSD permits more consistent with PSD permits issued to other MWC facilities in Florida …"

The Department will also revise the original, permanent PSD permit requirements and to harmonize them (in terms of metric units and averaging times) with subsequent and generally more stringent emissions and monitoring requirements of Department Rule 62-204.800(9)(b), F.A.C. These requirements apply to existing facilities with a MWC unit capacity greater than 250 tons/day of municipal solid waste, and for which construction, reconstruction, or modification was commenced on or before September 20, 1994 (the Department's MWC rule). The Department will authorize physical and operational changes as necessary to comply with the emission standards specified in the Department's MWC rule or BACT determinations.

2. AIR POLLUTION REGULATIONS AND APPLICABILITY DETERMINATIONS

2.1. Department Regulations

Projects at stationary sources with the potential to emit air pollution are subject to the applicable environmental laws specified in Section 403 of the Florida Statutes (F.S.). The statutes authorize the Department of Environmental Protection (Department) to establish regulations regarding air quality as part of the Florida Administrative Code (F.A.C.), which includes the following applicable chapters:

Table 3. Applicable Air-Related Rules from the Florida Administrative Code

Chapter	Description
62-4	Permits
62-17	Power Plant Siting
62-204	Air Pollution Control – General Provisions
62-210	Stationary Sources of Air Pollution – General Requirements
62-212	Stationary Sources – Preconstruction Review
62-213	Operation Permits for Major Sources (Title V) of Air Pollution
62-296	Stationary Sources – Emission Standards
62-297	Stationary Sources – Emissions Monitoring

2.2. Federal Regulations

The U.S. Environmental Protection Agency (EPA) establishes air quality regulations in 40 CFR 60 that identify New Source Performance Standards (NSPS) for a variety of industrial activities. EPA also establishes the minimum emission guidelines and compliance schedules for existing facilities of certain industries in 40 CFR 60. 40 CFR 61 generally specifies National Emission Standards for Hazardous Air Pollutants (NESHAP). 40 CFR 63 generally specifies NESHAP provisions based on the Maximum Achievable Control Technology (MACT) for given source categories.

Federal regulations adopted by reference are given in Rule 62-204.800, F.A.C. State regulations approved by EPA are given in 40 CFR 52, Subpart K – Florida; also known as the State Implementation Plan (SIP) for Florida. Link to 40 CFR 52, Subpart K

Department Rule 62-204.800(9)(b), F.A.C. (the Department's MWC Rule) is based on 40 CFR 60, Subpart Cb - Emissions Guidelines and Compliance Times for Large MWC That are Constructed on or Before September 20, 1994 (the Emissions Guidelines). 40 CFR 60, Subpart Cb was promulgated by EPA in accordance with section 111(d) and section 129 of the CAA and 40 CFR 60, Subpart B. Link to Subpart Cb

Many of the definitions and terms used in Subpart Cb are referenced to Subpart Eb, which applies to facilities constructed after September 20, 1994. Link to Subpart Eb

The Department's MWC rule (effective May 31, 2007) was prepared pursuant to 40 CFR 60, Subpart Cb and was approved by EPA. It is listed in 40 CFR 62, Subpart K-Approval and Promulgation of State Plans for Designated Facilities and Pollutants – Florida; specifically Section 40 CFR 62.2355 (adopted by EPA December 30, 2010, amended February 9, 2012), available at the following link: Department's MWC Rule Approval

2.3. General PSD Major Stationary Source Applicability

The Department regulates major stationary sources in accordance with Florida's PSD program pursuant to Rule 62-212.400, F.A.C. PSD preconstruction review is required in areas that are currently in attainment with the state and federal ambient air quality standards (AAQS) or areas designated as "unclassifiable" for these regulated pollutants.

Commonly addressed PSD pollutants include: CO, NO_X, PM, PM smaller than 10 micrometers (µm) (PM_{10}), PM smaller than 2.5 µm ($PM_{2.5}$), SO_2, VOC, SAM, lead (Pb), fluorides (F), and mercury (Hg).

Additional PSD pollutants that are common to facilities with MWC include: MWC organics measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans (dioxin/furan), MWC metals measured as PM, and MWC acid gases measured as SO_2 and hydrogen chloride (HCl).

Other PSD pollutants are: hydrogen sulfide (H_2S), total reduced sulfide (TRS including H_2S), reduced sulfur compounds (RSC including H_2S), and municipal solid waste (MSW) landfill emissions as non-methane organic compounds (NMOC).

As defined in Rule 62-210.200(Definitions), F.A.C., a stationary source is a "major stationary source" (major PSD source) if it emits or has the potential to emit (PTE):

- 250 tons per year (tons/year) or more of any PSD pollutant; <u>or</u>
- 100 tons/year or more of any PSD pollutant <u>and</u> the facility belongs to one of the 28 listed PSD major facility categories.

The list given in the citation includes the category of "municipal incinerators capable of charging more than 250 tons/day of refuse". The Pinellas County Resource Recovery Facility is a major stationary source based on actual emissions of and potential to emit 100 tons/year or more of several individual PSD pollutants.

For major stationary sources such as the Pinellas County Resource Recovery Facility, PSD applicability for modification projects is based on thresholds known as the significant emission rates (SER) as defined in Rule 62-210.200(Definitions), F.A.C. Any "net emissions increase" as defined in Rule 62-210.200(Definitions), F.A.C. of a PSD pollutant from the project that equals or exceeds the respective SER is considered "significant". SER also means any emissions rate or any net emissions increase of a PSD pollutant associated with a major stationary source or major modification which would construct within 10 km of a Class I area and have an impact on such area equal to or greater than 1 gram per cubic meter, 24-hour average.

Although a facility may be "major" (i.e. emits or has the potential to emit 100 or 250 TPY as applicable) for only one PSD pollutant, a project must include BACT controls for any PSD pollutant that exceeds the corresponding significant emission rates given in Table 4.

Table 4. List of Significant Emission Rates by PSD-Pollutant Relevant to the Facility [2]

Pollutant	SER (tons/year)	Pollutant	SER (tons/year)
PM	25	PM_{10}	15
$PM_{2.5}$	10	MWC metals as PM	15
$PM_{2.5}$ (NO_X)	40	$PM_{2.5}$ (SO_2)	40
CO	100	NO_X	40
Ozone (NO_X) [1]	40	Ozone (VOC) [1]	40
SO_2	40	MWC acid gases as HCl and SO_2	40
fluoride	3	lead	0.6
mercury	0.1	Sulfuric acid mist (SAM)	7
MWC organics as dioxin/furan	3.5×10^{-6}	MSW Landfill Emissions as NMOC	50

1. $PM_{2.5}$ is also regulated through precursors (NO_X and SO_2); Ozone (O_3) is regulated through precursors (VOC and NO_X).
2. There is federal SER of 75,000 tons/year for Greenhouse Gases (GHG) as carbon dioxide equivalent (CO_2e) that has not been incorporated into Department rules.

According to 40 CFR 52.21, six greenhouse gases (GHG), are also be subject to regulation at new stationary sources that will emit or have the potential to emit 100,000 tons/year (SER equal to 75,000 tons/year) expressed as the carbon dioxide equivalent emissions (CO_2e). This requirement has not been incorporated into Department rules but is a separate requirement of the EPA. Federal PSD applicability to the CO_2 contribution to GHG emissions from bioenergy and biogenic stationary sources was recently deferred by EPA until the second half of 2014. Refer to: Link to Final CO2 PSD Deferral

In addition to triggering the PSD rules by physical or operational changes, it is also possible to do so as a result of relaxation of enforceable conditions such as emissions, hours of operation and process rates or by exceeding projected actual emissions (designed to avoid PSD). These situations are addressed by the "Source Obligation" provisions in Rule 62-212.400(12), F.A.C. which states:

(a) At such time that a particular source or modification becomes a major stationary source or major modification (as these terms were defined at the time the source obtained the enforceable limitation) solely by virtue of a relaxation in any enforceable limitation which was established after August 7, 1980, on the capacity of the source or modification otherwise to emit a pollutant, such as a restriction on hours of operation, then the requirements of subsections 62-212.400(4) through (12), F.A.C., shall apply to the source or modification as though construction had not yet commenced on the source or modification.

(b) At such time that a particular source or modification becomes a major stationary source or major modification (as these terms were defined at the time the source obtained the enforceable limitation) solely by exceeding its projected actual emissions, then the requirements of subsections 62-212.400(4) through (12), F.A.C., shall apply to the source or modification as though construction had not yet commenced on the source or modification.

The reason paragraph (a) is relevant in the present analysis is because the County has that Facility's capacity be based on the Facility's monitored steam flow rather than solid waste throughput. The requested steam limitation must be evaluated to determine how strict and stringent it will be compared with any existing steam, waste or heat input limitations that will be replaced.

Prior to determining the project-specific PSD applicability, it is important to review the past permitting history to establish the relevant federally enforceable limitations and regulations.

2.4. Permitting History and Applicable Emission Standards.

The relevant permitting history is included in Attachment 1 to this technical evaluation. The permanently applicable federally enforceable emission standards and process capacities or limitations were derived by evaluating the previous permits, with special focus on the previously issued PSD permits. These limits are summarized in Table 5 together with the most recent requirements of the Department's MWC Rule (based on latest EPA Emissions Guidelines).

2.5. PSD Applicability for the Project

The project is located in Pinellas County, which is in an area that is currently in attainment with the state and federal AAQS or otherwise designated as unclassifiable.

Methodology for Calculations of Baseline Actual Emissions and Projected Actual Emissions

To determine whether the project causes net emissions increases equal to or greater than the respective SER (triggering PSD) requires a comparison of recent "baseline actual emissions" with future "projected actual emissions". According to Rule 62-210.200(Definitions), F.A.C., for an existing unit (other than an electric steam generating unit):

"Baseline Actual Emissions" means the rate of emissions, in tons/year of a PSD pollutant, at which the emissions unit actually emitted the pollutant during any consecutive 24-month period selected by the owner or operator within the 10-year period immediately preceding the date a complete permit application is received by the Department.

Table 5. Emissions Standards from PSD Permits and Department's MWC Rule Applicable to the PCRRF

Parameter	Units 1, 2 (PSD-FL-011)	Unit 3 (PSD-FL-098)	All Units (MWC Rule)
PM	180 mg/dscm @12% CO_2 [1] ~66 lb/hour/unit	~68 mg/dscm @12% CO_2 [2] ~25 lb/hour	25 mg/dscm @7% O_2 [2] ~13 lb/hour
NO_X	No numerical limit [9]	254 lb/hour (BACT)	205 ppmvd @7% O_2 [3] ~205 lb/hr
CO	No numerical limit [9]	66 lb/hour (BACT)	100 ppmvd @7% O_2 [4] ~61 lb/hour
SO_2	No numerical limit [9, 10]	170 lb/hour (BACT)	29 ppmvd @7% O_2 [4] ~40.4 lb/hour
HCl	Not applicable	Not applicable	29 ppmvd @7% O_2 [4] ~23.0 lb/hour
Pb	No limit	2.8 lb/hour (BACT)	400 µg/dscm @7% O_2 [5] ~0.21 lb/hour
Hg	No limit	0.294 lb/hour [6] (BACT)	50 µg/dscm @7% O_2 [7] ~0.026 lb/hour
Fluoride	No limit	8.31 lb/hour (BACT)	No Standard
Beryllium	No limit	9.0×10^{-5} lb/hour (Avoid PSD)	No Standard
Cadmium	Not applicable	Not applicable	35 µg/dscm @7% O_2
Dioxin/furan	Not applicable	Not applicable	30 ng/dscm @7% O_2 [8]
Visible Emissions	No Limit [11]	15% Opacity	10% Opacity [11]
Process Rate	No limit [11] (Review based on 1,050 tons/day)	43.75 tons/hour (1,050 tons/day) 275,000 lb steam/hour	All are $\geq$ 250,000 [12]

1. mg/dscm @12% CO_2 - milligrams per dry standard cubic meter at 12 percent carbon dioxide. BACT for PM.
2. This BACT value is converted from stated value of 0.03 grains PM/per dry standard cubic foot (gr/dscf) @12% CO_2
3. ppmvd @7% O_2 – parts per million by volume, dry @7% oxygen. Averaging time is 24 hours.
4. Based on 24-hour geometric mean. Alternative standard is 75% removal efficiency. Least stringent standard applies.
5. µg/dscm – micrograms/dscm.
6. Applicable when more than 2,205 lb/day of municipal sludge is fired.
7. Alternative standard is 85% removal efficiency. Least stringent standard applies.
8. ng/dscm – total nanograms per dscm. "Total" refers to total mass of dioxin/furan instead of "toxic equivalent".
9. EPA concluded "the systems proposed by the applicant represent BACT for PM, SO_2, NO_X and CO".
10. State enforceable standards for SO_2 and rated capacity were included in the applicable Site Certification Order.
11. Compliance by annual test. Requirement to operate continuous opacity monitoring system (COMS).
12. Equals "maximum demonstrated MWC unit load" – 110% percent of the highest 4-hour average MWC unit load achieved during 4 consecutive hours during the most recent dioxin/furan performance test.

A different consecutive 24-month period can be used for each PSD pollutant. However, where more than one unit is involved, all units must rely on the same 24-month period selected for the given PSD pollutant. The Department shall allow the use of a different time period upon a determination that it is more representative of normal source operation. According to Rule 62-210.200(Definitions), F.A.C., for an existing unit (other than an electric steam generating unit):

"Projected Actual Emissions" means the maximum annual rate, in tons/year, at which an existing emissions unit is projected to emit a PSD pollutant in ***any one*** *of the 5 years following the date the unit resumes regular operation after the project, or in* ***any one*** *of the 10 years following that date, if the project involves increasing the emissions unit's design capacity or its potential to emit that PSD pollutant and full utilization of the unit would result in a significant emissions increase or a significant net emissions increase at the major stationary source. One year is one 12-month period. In determining the projected actual emissions, the Department:*

(a) Shall consider all relevant information, including historical operational data, the company's own representations, the company's expected business activity and the company's highest projections of business activity, the company's filings with the State or Federal regulatory authorities, and compliance plans or orders, including consent orders; and
(b) Shall include fugitive emissions to the extent quantifiable and emissions associated with startups and shutdowns; and
(c) Shall exclude that portion of the unit's emissions following the project that an existing unit could have accommodated during the consecutive 24-month period used to establish the baseline actual emissions and that are also unrelated to the particular project including any increased utilization due to product demand growth; or
(d) In lieu of using the method set out in paragraphs (a) through (c) above, may be directed by the owner or operator to use the emissions unit's potential to emit, in tons per year.

Applicant's Updated Estimates of Baseline and Projected Actual Emissions and Increases (Decreases)

On May 23, 2012 the applicant submitted updated estimates of baseline actual emissions and projected future actual emissions in place of the estimates previously submitted for the December 2006 permit authorizing the Facility Improvement Project. The update of the 2006 projections is provided in Table 6.

Table 6. Revised Baseline Actual Emissions, Projected Actual Emissions and 2011 Measured Emissions

Pollutant	24-Month Baseline Period Selected (month/year)	Baseline Actual Emissions (tons/year)	Applicant Projected Actual Emissions (tons/year) [1]	Projected Increase (tons/year) [2]	2011 Emissions (tons)	Increase (decrease) (tons/year) [4]
NO_X	11/2005 – 10/2007	1,651	1,690	39	1,413	(238)
CO	01/2006 – 12/2007	141	240	99	178	37
PM	11/2005 – 10/2007	18	42	24	25 [3]	7
PM_{10}	11/2005 – 10/2007	18	32	14	25 [3]	7
MWC metals	11/2005 – 10/2007	18	32	14	25 [3]	7
SO_2	01/2006 - 12/2007	142	181	39	159	17
HCl	11/2005 – 10/2007	77	77	0	29	(48)
MWC acid gases	11/2005 – 10/2007	217	256	39	166	(51)
MWC organics	01/2004 – 12/2005	$4.2x10^{-6}$	$6.7x10^{-6}$	$2.5x10^{-6}$	$2.1x10^{-6}$	($2.1x10^{-6}$)
Lead	11/2005 – 10/2007	0.04	0.63	0.59	0.05	0.01
Waste Processed	2006-2007	~892,000	Not projected	Not projected	~822,000	~(70,000)

1. Applicant did not calculate any projected future mission increases from the project or from demand-based utilization increases and simply a value marginally less than the respective SER to each PSD pollutant baseline actual emission estimate. The Department recalculated projected future emissions below.
2. Estimate of projected net emissions increases for comparison with respective SER.
3. Filterable Emissions only. Initial 2011 estimate was 53 tons based on biased PM testing conducted in 2011. Results were corrected with Department approval for low temperature induced condensation on filters based on comparison of EPA Method 5 with EPA Method 29 conducted in 2012.
4. Increases measured during first year following date that units resumed normal operation. PSD not triggered in 2011.

The updated estimates are provided within Attachment 4 of the response dated May 25, 2012 to a Department request for additional information (RAI). Link to RAI Response

The applicant had previously submitted baseline actual emissions calculations based on the years immediately before submitting the Facility Improvement Program application in 2006. The work related to Units 1, 2 and 3 was actually conducted in 2008-2010. The Department accepts the updated submittal of the baseline actual emissions estimates including the operation in 2006 and 2007 (as allowed by the rules with Department approval) for the purposes of the present application (basically for the same project).

With the exception of the MWC organics (as dioxin/furan) baseline estimate, the rest of the baseline estimates were generally based on 24 consecutive month periods within the 26-month period from November 2005 and December 2007. Very roughly speaking, the baseline years (prior to actual work on the units) were 2006 and 2007.

The applicant estimated future actual emissions based on adding a value marginally less than the respective SER for each pollutant to the baseline actual emissions of each PSD pollutant. The applicant did not forecast or correct for demand increases or any increases (or decreases) caused by the Facility Improvement Project. Basically the applicant expected no changes caused by the project.

The table includes the latest retrospective analysis indicating that for 2011 (the first full year following date that units resumed normal operation) emissions were less than the respective projected future emissions estimates submitted by the County. The applicant asserts that the project has not (at least not yet) triggered PSD. While the Department does not concur with the procedure used to calculate projected actual emissions and projected increases, the Department concurs that the updated submittal does not indicate that PSD was triggered.

Recalculated Estimates of Baseline and Projected Actual Emissions and PSD Applicability

The Department recalculated projected actual emissions in accordance with the definition above. At the Department's request, the applicant provided the historical waste throughput and power generation that is summarized in Table 7.

Table 7. Waste Processed, Power Generated at Pinellas County Resource Recovery Facility (2002-2011)

Unit	Waste Throughput in tons/year and Electric Power Generation in Gigawatt-hours (GWH)									
	2011	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**	**2003**	**2002**
Unit 1 (tons/year)	283,872	321,004	202,052	222,482	310,906	309,065	306,722	315,753	326,436	183,908
Unit 2 (tons/year)	239,151	253,998	202,646	178,762	262,584	282,749	287,570	310,039	320,220	315,246
Unit 3 (tons/year)	297,018	271,853	289,433	258,597	308,705	311,028	300,553	334,400	232,194	309,238
Total (tons/year)	822,052	846,855	694,131	659,841	**882,195**	**902,842**	894,845	960,192	878,850	808,392
Generation (GWH)	435,489	455,295	369,846	261,679 [1]	480,525	487,436	509,769	539,892	482,648	440,658

1. In 2008, some waste was burned without electric power production when Turbine Generator 1 was replaced.

The approximate baseline years (2006-2007) selected by the applicant to estimate baseline actual emissions reflect lower waste process rates (~892,500 tons/year) compared with the highest year (2004) on record (~960,200 tons). Much less waste was processed during 2008-2009 during which time the units were taken out of service as required and improved. The project was completed during 2010. The throughput based on 2011 data (~822,000 tons) has not yet returned to pre-project levels due to the economic recession.

While the project did not increase the capacity of the units, it is reasonable to assume that in the future the amount of waste processed will return or even exceed pre-project levels. The present Title V permit limits the loading of the units to 3,000 tons/day on a rolling 12-month average. This equals 1,095,000 tons/year compared with the level achieved in 2004 of approximately 960,000 tons.

Pursuant to paragraph (a) above, a reasonable future scenario is that utilization will eventually reach 1,000,000 tons/year, representing an increase of approximately 12% beyond the process rate representative of the baseline years (2006-2007). Thus, it is reasonable to consider and exclude corresponding emissions increases related to increased utilization in future emissions in accordance with paragraph (d).

The applicant may instruct and has instructed the Department through the present application to use the Unit 1, 2 and 3 potentials to emit, in tons/year to calculate projected actual emissions as allowed pursuant to paragraph (d) above for SO_2 and CO. They prefer to undergo PSD review and a BACT determination now rather than attempt to make a demonstration each year that the project did not trigger PSD (whether or not explainable by demand).

The present application includes future potential SO_2 and CO emissions of 439 and 642 tons/year, respectively based on requested BACT and emission limitations that are less than those presently in force for these units. The Department re-evaluated the applicant's estimates, considering the likelihood that at a future date demand will return to historical levels (back to 960,000 tons/year) and that SO_2 and CO will be limited by BACT-based potential-to-emit. Table 8 is a summary of PSD applicability by pollutant based on the latest submittal and updated Department rules (that now consider $PM_{2.5}$ to be a PSD pollutant and SO_2 as $PM_{2.5}$ precursor).

Table 8. PSD Applicability Calculations for the Present Application (including applicability for $PM_{2.5}$)

Pollutant	Baseline Actual Emissions (tons/year)	Unadjusted Future Emissions (tons/year) [1]	Projected Actual Emissions (tons/year) [2]	Net Emission Increases(decreases) (tons/year)	≥ PSD SER? (tons/year) Yes/No
NO_X	1,651	1,949	1,651	0	≥ 40? No
CO	141	157	642 [3]	**501**	≥ 100? **Yes**
SO_2	142	159	439 [3]	**297**	≥ 40? **Yes**
HCl	77	86	77	0	There is no SER
MWC acid gases	217	243	516 [3]	**297**	≥ 40? **Yes**
PM	18	20	18	0	≥ 25? No
$PM_{2.5}$ [4]	~47 [5]	~52 [5]	~47, ~223 [5]	**176**	≥ 10? **Yes** [4]
$PM_{2.5}$ precursor	142 (SO_2)	159 (SO_2)	439 [3] (SO_2)	**297 (SO_2)**	≥ 40? **Yes**
MWC metals	18	20	18	0	≥ 15? No
MWC organics	$4.2x10^{-6}$	$4.7x10^{-6}$	$4.2x10^{-6}$	0	≥ $3.5x10^{-6}$? No
Lead	0.040	0.045	0.040	0	≥ 0.60? No
Past and Future Waste Throughput Projections					
Waste Processed	~892,000	Basis of future actual emissions is projected annual waste throughput of 1,000,000 tons/year			

1. Premised on 1,000,000 tons/year of future waste throughput - 12% above baseline production of 892,000 (2006-2007). Other possible excludable increases were not considered – e.g. CO in years with particularly wet waste such as from hurricanes or pollutants that might have non-linear relation with process rate.
2. After exclusion of utilization-based emission increases or as directed by applicant to use potential to emit (CO, SO_2, MWC AG).
3. Projected actual emissions equal BACT-based potential to emit as directed by applicant.
4. PSD is triggered for $PM_{2.5}$ (including condensable fraction) through the significant increase of precursor SO_2 emissions.
5. ~47 tons $PM_{2.5}$/year as baseline to projected actual emissions = 2.57xPM emissions. Relation established based on 2012 testing. ~ 223 tons/year is BACT-based $PM_{2.5}$ potential to emit.

Updated Conclusion Regarding PSD Applicability for the Facility Improvement Project

Based on the application submitted December 2011, the applicant's additional information until May 25, 2012 and the Department's analysis, the Facility Improvement Project is a major stationary source modification (triggers PSD review) and requires BACT determinations for CO, SO_2, MWC-acid gases, and $PM_{2.5}$ (including condensables). This is the first project since the Department established definitions, SER and test methods for $PM_{2.5}$ (including precursors and condensables). PM_{10} is also affected by these changes.
Link to PSD PM2.5, PM10 Changes Link to PM2.5, PM10 Definition Changes

3. DETERMINATION OF PROCESS CAPACITY

3.1. Review of Permanent Federally Enforceable Capacity Limitations

On September 27, 1978 EPA issued permit PSD-FL-011 to construct Units 1 and 2. Although the permit did not specify process limits, the EPA evaluation referenced the application dated July 12, 1978 *"to construct two solid waste resource recovery units. These units are **two 1,050 tons/day** traveling grate boilers"*.

On May 22, 1987 EPA issued a federally enforceable permit PSD-FL-098 to construct Unit 3.
Link to PSD-FL-098 Section VII, Part I, Specific Condition 1.b., states:

*"The municipal solid waste (MSW) incinerator shall not be loaded in excess of its rated capacity of **87,500 lb/hour** MSW or operated in excess of its **maximum steam rate of 275,000 lb/hour**"*. For reference, 87,500 lb/hour equals **1,050 tons/day**.

The Florida Power Plant Site Certification Order for Unit 3 (containing modifications applicable to Units 1 and 2) was issued February 29, 1984 and modified on July 30, 1986. Although not federally enforceable, the Conditions of Certification included the following limitations (reference Condition XIV.A.1.):

d. **Units 1, 2 and 3** "shall not be loaded in excess of their rated capacity of **87,500** pounds of municipal solid waste per hour each". (equals 1,050 tons/day);

e. The incinerator boilers **shall have a metal name plate affixed** in a conspicuous place on the shell showing manufacturer, model number, type waste, rated capacity and certification number; and

f. Compliance with the limitations ….. The stack test be conducted at **±10% of the maximum steam rate of 250,000 pounds per hour**. (i.e. between 225,000 and 275,000 lb/hour).

The Department reviewed the actual Power Plant Site Certification application prepared by Henningson, Durham and Richardson (HDR) for Unit 3 and submitted to the Department in July 1983. It is clearly the basis of the applications submitted to both the Department and EPA for permit PSD-FL-098. Section 3.0 describes the expansion as follows: *"The expansion features a third Martin combustion unit capable of handling 1,050 tons/day of solid waste **at 5,000 Btu/lb**"*.

3.2. Name Plate Information

Two of name plates required by the Conditions of Certification are shown in Figures 4 and 5 below.

Figure 4. One of three Boiler Nameplates at Facility

Figure 5. One of three Boiler Nameplates at Facility

Inspection of the nameplates reveals that the boiler efficiency of each is 66% when tested at 244,000 lb/hour of steam. It includes a steam capacity of 256,000 lb/hour.

3.3. Confirmation of Steam Capacity

Given that Unit 3 is capable of handling 1,050 tons/day of solid waste @5,000 Btu/lb, the corresponding heat input is calculated as follows:

(1,050 tons/day)(day/24 hours)(5,000 Btu/lb)(2,000 lb/ton)(MMBtu/1,000,000 Btu) = 437.5 MMBtu/hour.

Note that to achieve 437.5 MMBtu/hour may require feeding the unit at a value greater than 1,050 tons/day. For example if the average heat content of the waste burned is 4,500 Btu/lb during the rainy season, it may be necessary to burn as much as 1,167 tons of waste/day to achieve the heat input corresponding to the stated steam capacity.

To calculate the steam capacity of the boilers, the Department first obtained the boiler steam temperature and pressure as well as the feedwater temperature, which are 750 pounds per square inch (psi), 615 °F and 250 °F, respectively. These were obtained from a publication by Babcock Power (formerly D.B. Riley) regarding a previous refurbishment project conducted at the Facility. Link to Capital Replacement Project

Based on the boiler steam/feedwater parameters, nameplate efficiency and operation at 1,050 tons/day throughput at 5,000 Btu/lb, the Department determined the corresponding enthalpies (from steam tables) and calculated the corresponding steam generation rate as summarized in Table 9.

Table 9. Steam Rate Corresponding to 1,050 tons/day @5,000 Btu/lb and 66% Nameplate Efficiency

Parameter	Value
Permitted Waste Throughput per Unit	1050 tons/day/unit
Waste Heating Value	5,000 Btu/lb
Calculated Heat Release per Unit	437.5 MMBtu/hour
Nameplate Boiler Efficiency	66%
Calculated Heat Absorbed by Steam	288.75 MMBtu/hour
Steam Enthalpy @750 psi/615 °F (steam tables)	1,343 Btu/lb
Feedwater Enthalpy @250 °F (steam tables)	219 Btu/lb
Calculated Heat Absorbed/lb Steam	1,124 Btu/lb
Calculated Steam Generated	256,895 lb/hour

The calculated value of 256,895 lb/hour agrees with the name plate steam capacity value of 256,000 lb/hour/unit.

3.4. Review of other References to Capacity

The Department accessed a paper that was prepared by Ogden-Martin (the predecessor of Covanta Energy and American partner of the grate supplier, Martin GmbH). The paper described a methodology to measure steam, heat and waste production and develop site-specific ratios of steam to waste. The paper included data collected from many Covanta facilities including the Pasco County Resource Recovery Facility. Table 10 is a summary of the Pasco data taken from the paper with slight changes made by the Department in presenting the results.
Link to Ogden Martin Paper

The information is relevant to the Pinellas County Resource Recovery Facility since both use Martin GmbH grate technology. Using the steam to heat ratios developed for the Pasco facility, one would calculate that a similar unit with a heat input of 437.5 MMBtu would produce approximately 274,750 lb/hour of steam. It is noteworthy that the example Pasco units were tested using waste with a heat content in the range of 4,338 to 4,742 Btu/lb. According to the table, it would require 1,150 tons/day to maintain 275,000 lb/hour of steam for an entire day. Thus during a rainy month or if practicing significant (high heat content) plastics recycling, higher than design or nominal waste throughput rates are required to meet the steam production objectives.

Table 10 – Specific Steam to Waste Ratios for the Pasco County Resource Recovery Facility

Date	Steam Flow (lb/hour)	Waste Flow (tons/day)	Steam/Waste (lb/lb)	HHV (Btu/lb)	Heat Input (MMBtu/hour)	Steam/Heat (lb/MMbtu)
04/15/1991	274,717	1,143	2.89	4,574	435.5	631
04/17/1991	282,051	1,134	2.99	4,742	448.0	630
04/19/1991	279,919	1,141	2.94	4,640	441.2	634
04/22/1991	270,865	1,213	2.68	4,338	438.7	617
Average/unit	92,296/unit	386/unit	2.87	4,574	147.0/unit	628

3.5. Maximum Continuous Rating (MCR) and Peak Rating

In the industry, the term "design rating" with respect to waste throughput means the "nominal load" and is the terminology used by the stoker grate manufacturers, Martin GmbH. For this facility it is 1,050 tons/day/unit @5,000 Btu/lb. The corresponding design or nominal rating for the boiler is the name plate steam capacity of 256,000 lb/hour.

The term "maximum continuous rating" (MCR) is used by boiler manufacturers. MCR is the load at which the boiler can operate without any problems and is equal to the name plate steam capacity for Units 1, 2 and 3. Usually a 2 to 4-hour peak rating is specified, which is typically 110% of MCR. The peak rating of each unit would therefore be approximately 281,600 lb steam/hour. This compares well with the Unit 3 PSD process limit and the Units 1, 2, and 3 Certification Condition of 275,000 lb steam/hour/unit.

The previously Babcock Power document states that the MCR is 244,000 lb/hour. Thus the peak rating would be approximately 268,400 lb/hour based on the Babcock Power assessment. The average value between the Babcock Power citation and 110% of name plate capacity is approximately 275,000 lb/hour. The Department concludes that the 275,000 lb/hour value cited in the EPA PSD and the Department's Conditions of Certification corresponds to a peak 4-hour value and is a proper permanently enforceable limitation.

3.6. Maximum Demonstrated MWC Unit Load Requirements of the Department's MWC Rule

The Department's MWC Rule defines "maximum demonstrated MWC unit load" as 110% percent of the highest 4-hour average MWC unit load achieved during 4 consecutive hours during the most recent dioxin/furan performance test. The Department reviewed steam production logs from the stack emission tests conducted during April 2012. According to the compliance report, the most recent dioxin/furan tests were conducted on Units 1, 2 and 3 at 231,000 lb/hour, 232,000 lb/hour and 231,000 lb/hour, respectively. Therefore until the 2013 compliance testing campaign, the maximum demonstrated MWC loads for Units 1, 2, and 3 are 254,100 lb/hour, 257,400 lb/hour and 254,000 lb/hour, respectively. These values insure that the units will operate at steam production rates closer to the MCR rather than the peak ratings.

3.7. Present Title V Permit Capacity Limitations

The present Title V permit (valid through 2015) includes the following condition regarding capacity:

A.4. Capacity. The following maximum values (capacities) shall not be exceeded:

(a) 1,100 tons/day individual MWC unit throughput of MSW; and

(b) 275,000 lb/hour individual MWC unit steam production on a 4-hour block arithmetic average.

The MWCs shall not be loaded in excess of their maximum operating capacity, equivalent to 3,300 TPD total, but no more than 3,000 TPD on a rolling 12-month average. See 40 CFR 60.31b of Appendix 40 CFR 60, Subpart Cb and 40 CFR 60.58b(j) of Appendix 40 CFR 60, Subpart Eb for additional restrictions on capacity.

[Rules 62-4.160(2) & 62-210.200 (PTE), F.A.C.; 40 CFR 60.31b & 40 CFR 60.58b(j); and, Permit Nos. 1030117-007-AC, PSD-FL-011 & PSD-FL-098, as amended.]

Sections 40 CFR 60.31b and 40 CFR 60.58(j) refer to procedures that shall be used for calculating municipal waste combustor unit capacity as defined under §60.51b. These procedures are used to establish rule applicability and not necessarily to establish permitted waste throughput or steam limits. Also the procedures use a "universal" waste heat content equivalent to 4,510 Btu/lb. In fact, heat content is greatly variable and the factor cannot be used in general to infer actual waste throughput.

The waste throughput limitation of 1,100 tons/day/unit and 3,300 tons/day for the facility do not originate from a federally enforceable condition or a rule requirement. Similarly, the waste throughput limitation of 1,000 tons/day on a 12-month basis does not originate in a federally enforceable condition or rule requirement.

3.8. Conclusion Regarding Unit Permitted Capacities

The only permanent requirement that is actually necessary is a peak (4-hour) steam production rate of 275,000 lb/hour requirement. This requirement will be retained and re-established in the permit under consideration. The permit will note the design waste throughput rate of 1,050 tons/day @5,000 Btu/lb.

These changes will not as a practical matter cause increased utilization or increased emissions. For example, the present 12-month limitation of 3,000 tons/day/unit is equal to 1,095,000 tons/year. That annual value has never been reached. Physical, operational, maintenance, waste characteristics and other permit limitations are among the reasons, rather than the effectiveness of the 12-month limitation.

4. BACT REVIEW

BACT determinations are required for the pollutants that are subject to PSD review, CO, SO_2, $PM_{2.5}$, and MWC-acid gases as SO_2 and HCl.

4.1. Definition of BACT

Rule 62-210.200, F.A.C. defines "BACT" as:

An emission limitation, including a visible emissions standard, based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account:

1. *Energy, environmental and economic impacts, and other costs;*
2. *All scientific, engineering, and technical material and other information available to the Department; and*
3. *The emission limiting standards or BACT determinations of Florida and any other state;*

determines is achievable through application of production processes and available methods, systems and techniques (including fuel cleaning or treatment or innovative fuel combustion techniques) for control of each such pollutant.

If the Department determines that technological or economic limitations on the application of measurement methodology to a particular part of an emissions unit or facility would make the imposition of an emission standard infeasible, a design, equipment, work practice, operational standard or combination thereof, may be prescribed instead to satisfy the requirement for the application of BACT. Such standard shall, to the degree possible, set forth the emissions reductions achievable by implementation of such design, equipment, work practice or operation.

Each BACT determination shall include applicable test methods or shall provide for determining compliance with the standard(s) by means which achieve equivalent results.

In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60, 61, and 63.

4.2. Generation of Pollutants from MWC

A very basic description of the mass burn process and planned air pollution control equipment was provided in Section 1.2 above. A waste-to-energy (WTE) facility is a complete industrial installation containing most or all of the following features:

- Waste receiving and separation;
- Waste storage and handling;
- Waste feeding;
- Furnace for combustion;
- Heat recovery equipment followed by steam and electricity generation;
- Air pollution control devices (flue gas treatment); and
- Residue (ash and wastewater) handling installations.

A schematic of a mass-burn MWC with steam electrical power production is shown in Figure 6. Some of the points where pollutants can be removed or formation prevented are shown.

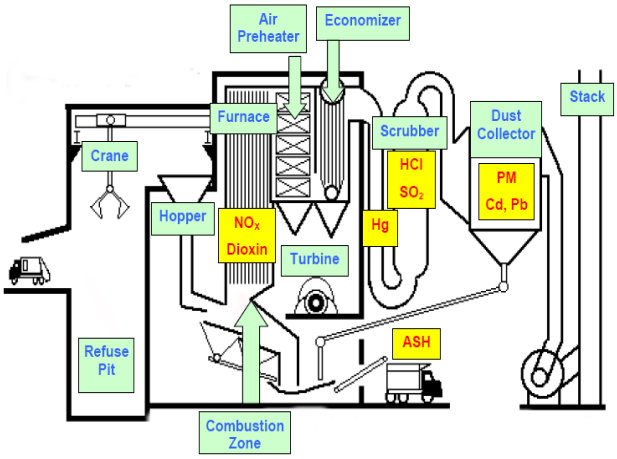


Figure 6. Pollutant Generation/Control Points **Figure 7. Refuse pit at Brescia facility, Italy**

Waste is delivered, weighed, sorted/separated if necessary, and tipped into the refuse pit, such as the one shown in Figure 7, where it is temporarily stored. The tipping hall and refuse pit are closed buildings to minimize dust and odor releases. The waste is mixed in the refuse pit which is designed to hold sufficient fuel for several days of combustion as waste is typically delivered during normal working hours while the plant operates "24/7". Air is continually extracted from the pit to maintain a negative pressure and serves as combustion air for the furnace.

A crane system lifts the waste from the refuse pit and transports it to the feed chute, which consists of a hopper and chute. Hydraulic-driven feed rams push the waste onto the horizontal combustion grate.

4.3. Summary of Existing Air Pollution Control Equipment on Units 1, 2 and 3

When originally constructed, the air pollution control measures and controls consisted of good combustion practices (GCP) for burning waste on the Martin GmbH grates and electrostatic precipitators (ESP) to control PM. In June 2000, the County completed a four-year Air Pollution Control Retrofit Project to comply with the Department's MWC Rule (consistent with EPA Emission Guidelines). Link to Air Pollution Control Project

This $90,000,000 project replaced the original ESP on each unit with an emissions control system consisting of:

- Spray Dry Absorbers (SDA) based on lime slurry injection wherein acid gases in the furnace exhaust such as HCl and SO_2 are neutralized and captured as particulate matter (PM);
- Powered Activated Carbon Injection (ACI) systems to serves to capture (adsorb) certain metals such as mercury and organic hazardous air pollutants (HAP) such as dioxin/furan and then remove them in the PM control devices;
- Fabric filters (FF - baghouses) to capture PM originating from the combustion, the acid gas reactions and the spent activated carbon; and

- Urea-based Selective Non-Catalytic Reduction (SNCR) systems in each furnace to control NO_X emissions.

The shorthand notation for the final air pollution control equipment arrangement is GCP/SDA/FF/ACI/SNCR. It is still the basis for BACT determinations except for the advent of selective catalytic reduction (SCR) in addition to or in lieu of SNCR to accomplish further NO_X and dioxin/furan reductions. Examples include the recently permitted Palm Beach Renewable Energy facility No. 2 and the recently noticed Energy Answers Arecibo Waste-to-Energy Facility in Puerto Rico. Link to Palm Beach Project Link to Arecibo Fact Sheet

Figure 8 is a diagram of the typical Martin GmbH mass burn grate stoker MWC with the typical air pollution control equipment configuration of GCP/SDA/FF/ACI/SNCR.

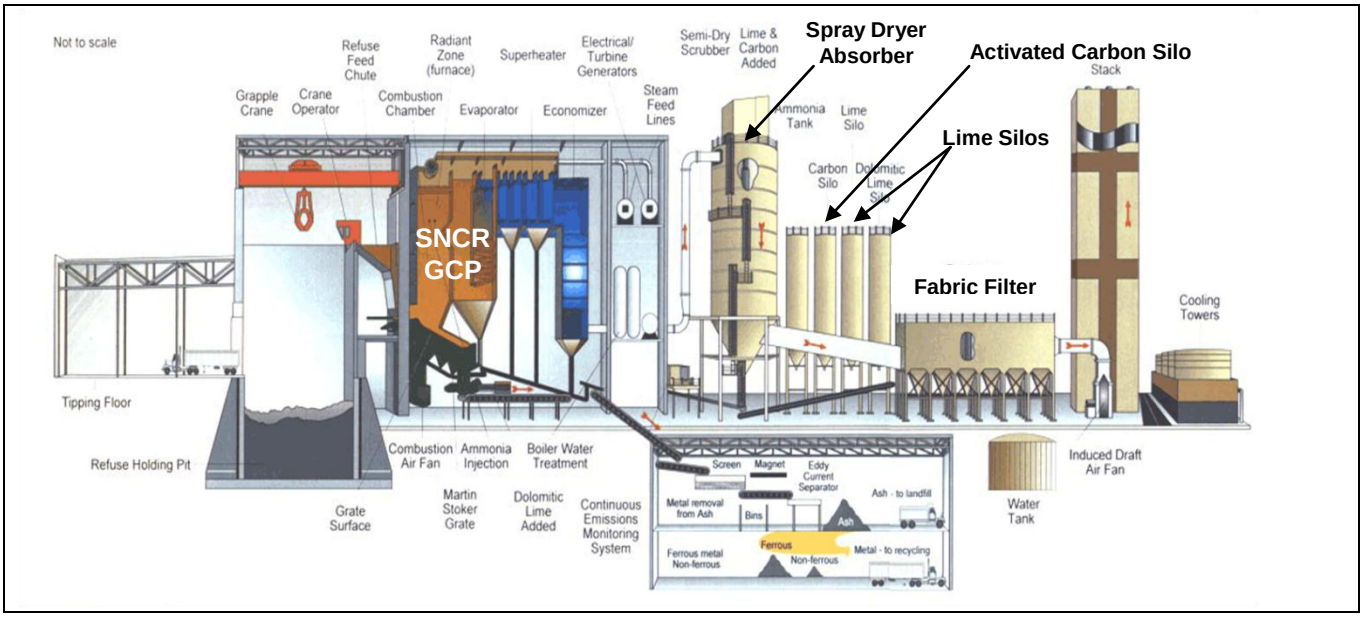


Figure 8 – Typical Martin GmbH Mass Burn MWC with GCP/SDA/FF/ACI/SNCR Configuration

4.4. CO BACT Determination

CO Control Techniques - Good Combustion Practices (GCP)

Refer to Figure 9. CO is a product of incomplete combustion. Initial combustion occurs on the grate and lower furnace in substoichiometric conditions. As a result, a great deal of CO is evolved. Options for GCP exist regarding the manner by which the waste is mixed on the grates, number of zones, the way underfire air is introduced and the manner by which grate cooling is accomplished. The waste begins to burn at the grate front end and the fuel bed temperatures reach over 1,000°C. The waste is combusted to inert mineral bottom ash through the slow and uniform mixing and agitating motion of the fuel bed.

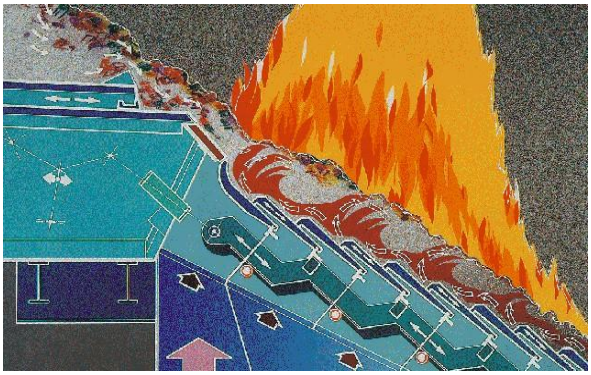


Figure 9. Martin GmbH Grate System

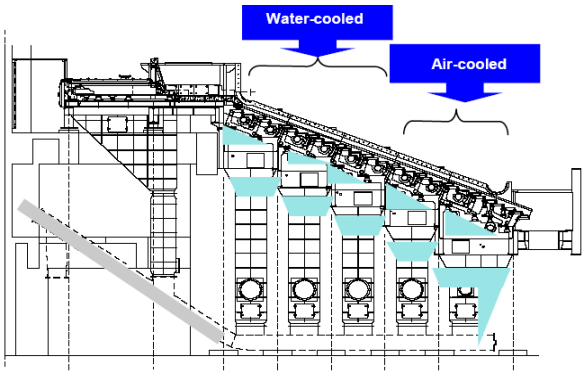


Figure 10. Seghers Water and Air Cooled Grate

Refer to Figure 10. Rows of water-cooled tiles can be added to rows of air cooled tiles in a hybrid grate arrangement based on the characteristics of the waste (i.e. high calorific value, or wet, etc.). Additional GCP options include the overfire air arrangement, flue gas recirculation (FGR) or other sophisticated combustion techniques. Basically, the temperature is maintained high enough to destroy hazardous organic compounds such as D/F but low enough to reduce the potential for refractory damage and minimize thermal NO_X emissions.

Overfire air is injected into the furnace above the fuel bed via nozzles arranged opposite each other in the front and rear furnace walls. The flue gases are thus subject to turbulence, mixed in an extremely efficient manner, and char and CO effectively burn out. By controlling NO_X using an ammonia or urea-based SNCR system in the furnace, it becomes more feasible to control CO using GCP (without add-on controls).

CO Control Techniques – Oxidation Catalyst

If GCP are not sufficient to achieve low CO, oxidation catalyst (ox-cat) is an option. The preferred location of an ox-cat system is after the baghouses if the temperature regime is acceptable.

Refer to Figure 11. The information in the curves suggests that ox-cat is effective for CO removal at temperatures as low as 300 °F.[1] This allows installation downstream of the PM device and obviates the necessity of reheat. The exit stack temperature from the Pinellas County Facility is estimated 300 to 315 °F.

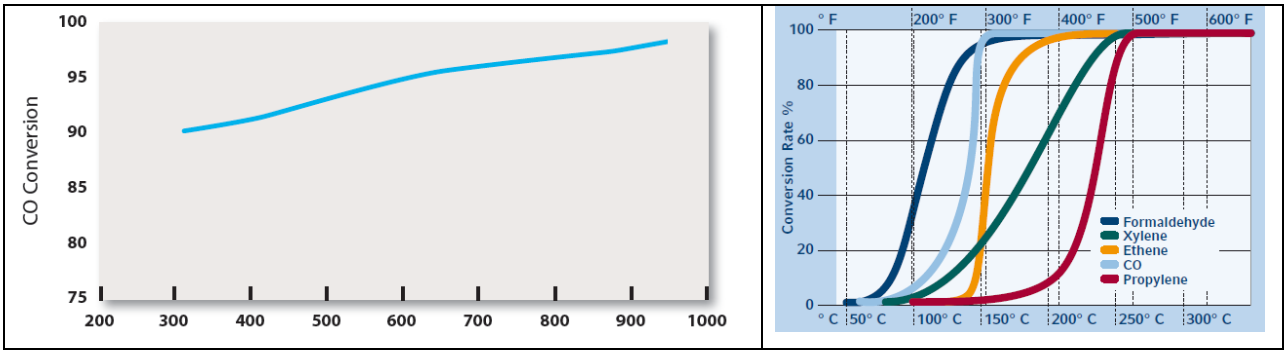


Figure 11. Ox-cat Performance vs. Temperature (^oF) Ox-cat Performance vs. Temperature (^oC)

Applicant's CO BACT Proposal

The applicant proposed BACT CO emission limits of 100 ppmvd (4-hour basis and equal to the Subpart Eb MACT requirement) and 80 ppmvd (30-day rolling average). These limits will be achieved by GCP as discussed above. According to the applicant:

"Thermal oxidizers as a post-combustion control cannot be installed on sulfur-containing exhaust streams as they produce secondary pollutants. Further, these systems consume electrical energy. Oxidation catalysts are constructed of precious and semi-precious metals that are easily fouled by contaminants in the flue gas stream, such as sulfur, phosphorus, and trace metals. Consequently, post-combustion controls are not considered BACT for the MWCs."

Review of Facility CO Emissions

CO emissions from Units 1, 2 and 3 are limited through application of GCP by the Department's MWC Rule and applicable permits to 100 ppmvd @7% O_2 on a 4-hour basis. This value is roughly equal to 0.14 lb/MMBtu, which is a relatively low value for wet, heterogeneous fuels.

The present PSD avoidance requirements effectively limits CO emissions to less than 50 ppmvd @7%O_2 on a long-term basis or approximately 0.07 lb/MMBtu. During 2011, average emissions were less than 40 ppmvd @7% O_2 and less than 0.05 lb/MMBtu.

[1] Brochures. Sud-Chemie and Johnson-Matthey.

Avoidance of PSD adds a key constraint that impacts the day-to-day operation of the facility in addition to any or all of the following:

- Need to process delivered waste;
- Occasional very low waste fuel heat content; and
- Requirement to produce enough steam to meet minimum contractual electrical generation.

Figure 12 is a summary in 15-minute increments of steam flow, grate speed, CO and O_2 on May 13, 2012.

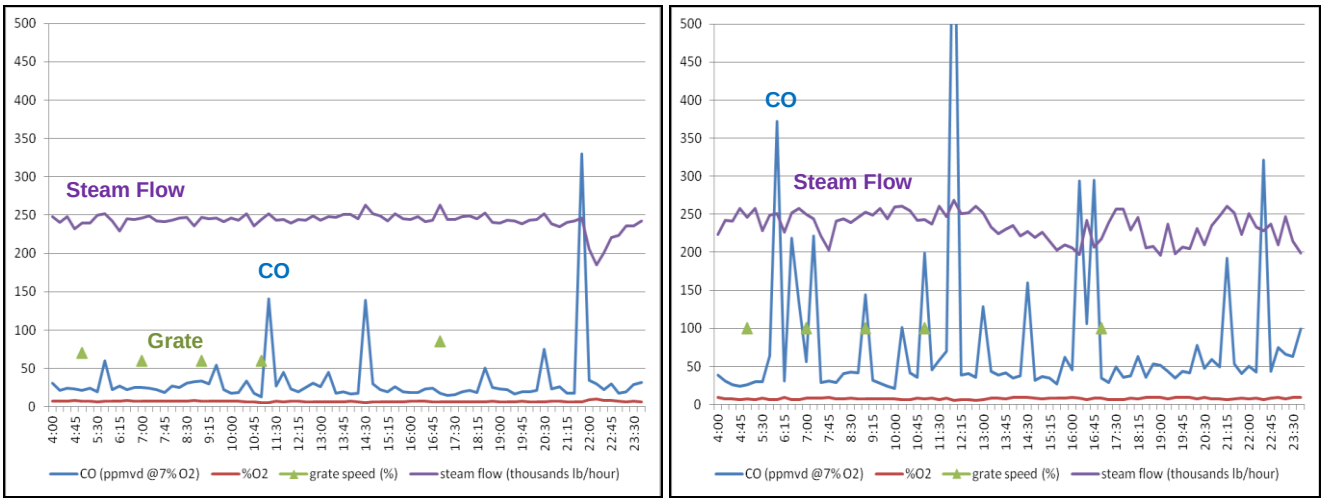


Figure 12. Steam Production, Grate Speed, CO and O_2 – Units 2 and 3 (0400 to 23:45 on May 13, 2012)

On that date, the operator reported to the Department an event resulting in CO emissions from **Unit 3** in excess of the 4-hour limit of 100 ppmvd @7% O_2. Per the right hand side of Figure 12, Unit 3 apprears to have been maintained at a constant grate speed while steam and CO emissions fluctuated. During much of the day, the CO emissions were nevertheless within 100 ppmvd on a 4-hour basis. The exception was due to a 15-minute excursion to 736 ppmvd @7% O_2 which caused the report of emissions in excess of 100 ppmvd @7% O_2 during the period 1200 to 1600 hours.

The process parameters from **Unit 2** show that it was operated in a steady manner with respect to steam flow and in a stable manner with respect to CO emissions. The grate speed was varied throughout the day, possibly as needed to maintain the steam and CO emissions within the permitted limits. A spike in CO emissions immediately occurred at approximately 2145 hours followed by a drop in steam production from 2200 through at least 2300 hours. However, the 4-hour CO emission limit was not exceeded. During the rest of the day, CO emissions from Unit 2 were typically less than 50 ppmvd @7% with short spikes over 100 ppmvd @7% O_2.

Refer to Figure 13. On May 27, 2012 the operator reported to the Department an event resulting in CO emissions from **Unit 2** in excess of the 4-hour limit of 100 ppmvd @7% O_2. At 2330 hours there was a significant drop in steam production and a simultaneous increase in CO emissions. During the following 30 minutes steam production fell by half and CO emissions spiked as high as 3,400 ppmvd @7% O2 over 15 minutes. Thereafter production and CO emissions returned to stable levels.

Unit 3 appears to have experienced similar behavior at a slightly earlier time (2230) but the steam flow and CO changes were attenuated. Production and CO emissions returned to stable levels following a slight adjustment in grate speed. Later in the day both units experience sudden steam flow drops with relatively small increases in CO.

This analysis shows that even during some "difficult days" CO emissions are low almost all of the time. With good operation and fuel characteristics, good combustion practices (GCP) are sufficient to achieve low CO emissions without add-on control equipment.

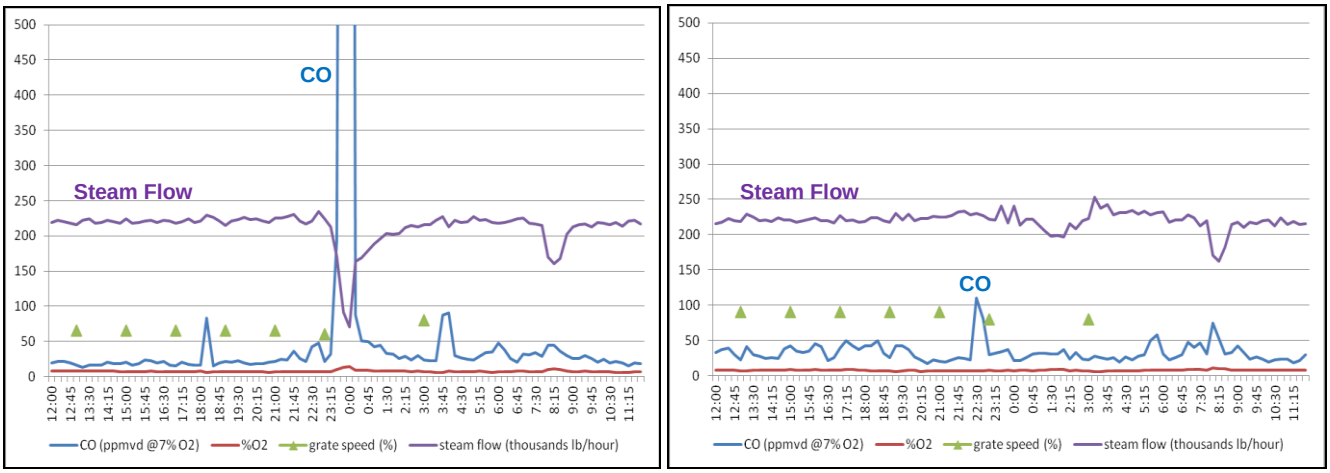


Figure 13. Steam Production, Grate Speed, CO and O_2 – Units 2 and 3 (1200 to 1200 on May 27-28, 2012)

Department's CO BACT Determination

The Department does not concur with the applicant's reasons that post-combustion controls are not considered BACT for the MWCs. In fact, the EPA's draft permit for the Energy Answers Arecibo, Puerto Rico project specifies a BACT limit of 75 ppmvd @7% O_2 on a 24-hour basis. The limit that will be achieved by oxidation catalyst included as part of a regenerative selective catalytic reduction system for joint NO_X and CO control.

The value of 75 ppmvd CO @7% O_2 ***on a 24-hour*** basis is approximately as stringent as 100 ppmvd CO @7% O_2 on a ***4-hour basis***. The Department has determined that oxidation catalyst (alone) as an add-on control to an existing unit (already required to meet 100 ppmvd @7% O_2 by GCP) is not cost-effective.

The Department will specify the applicant's short-term CO proposal of 100 ppmvd @7% O_2 on a 4-hour block as BACT. This value is as stringent as the requirement in the Department's MWC Rule and in 40 CFR 60, Subpart Eb applicable to new MWC.

The applicant's long term CO proposal of 80 ppmvd @7% O_2 on a 30-day basis is not necessary. For units relying on GCP, it is statistically improbable and practically impossible to exceed 80 ppmvd CO @7% O_2 on a 30-day basis while complying with the 4-hour block limit of 100 ppmvd @7% O_2 on a 4-hour basis.

As mentioned above, the 4-hour limit is already approximately as stringent as the 24-hour value applicable to the Energy Answers Arecibo Puerto Rico project. The ground level ambient air quality standards (AAQS) are specified on a 1-hour or 8-hour basis. There are no PSD increments (i.e. concentrations by which clean air is allowed to degrade) for CO.

The CO emission limit will be accomplished by GCP beyond those practiced at the present time. The Department requested reasonable assurance (as required by Rule 62-4.070, F.A.C.) of compliance with the present (same as proposed) CO emission limit pursuant to the Department's MWC rule and the BACT determination. The approach to development of further GCP is summarized in Attachment B. Compliance will continue to be demonstrated using the CO-CEMS required by the MWC Rule.

4.5. MWC-Acid Gases BACT Determination

Discussion

SO_2 is a PSD-pollutant by itself as well as in conjunction with HCl as MWC-Acid Gases. Emissions of SO_2 from MWC are generally low before control except when burning higher sulfur materials such as tires. The presently applicable SO_2 emission standard based on the Department's MWC Rule is 29 ppmvd @7% O_2, geometric mean on a 24-hour basis.

In 2006 the Department set a BACT limit of 26 ppmvd @ 7%O_2, geometric mean on a 24-hour basis, for the new Hillsborough County WTE Unit 4 project using the strategy of GCP/SDA/FF/ACI/SNCR.

In 2010 the Department set a BACT limit of 24 ppmvd @7% O_2, geometric mean on a 24-hour basis, for the Palm Beach Renewable Energy Facility No. 2. The most recent BACT proposal is 24 ppmvd @7% O_2, geometric mean on a 24-hour basis, in the draft permit for the Energy Answers Waste to Energy Facility, Arecibo, Puerto Rico.

For reference, the emission standards given in the Department's MWC Rule and in Subpart Eb are 30 and 29 ppmvd@7% O_2, respectively. All of the mentioned emission standards are based on 24-hour geometric means and have an alternative efficiency standard of 80% such that the least stringent of the concentration and efficiency requirement applies.

Because of the past restrictions to avoid PSD, the applicant operated Units 1, 2 and 3 at approximately 11.8, 11.6 and 15.0 ppmvd on a long term basis. This has required injection of a great deal of lime at high expense. The applicant has requested relief in the form of a BACT determination.

HCl is not a PSD pollutant except in conjunction with SO_2 as MWC-AG. Emissions of HCl from MWC are generally very high in the absence of control due to the presence in MSW of chlorinated plastics and other chlorine compounds, salts, yard waste, etc.

The presently applicable HCl emission standard based on the Department's MWC Rule is the least stringent of 29 ppmvd @7% O_2 or based on an annual test or 95% efficiency. According to the most recent compliance tests, the results for Units 1, 2 and 3 were 13, 13 and 4 ppmvd @7% O_2, respectively. The results of the HCl removal efficiency tests were 98, 97 and 99%, respectively.

Applicant's MWC-Acid Gases BACT Proposal

The applicant proposes the same values as the recent BACT for SO_2 and MWC-AG that were determined for the Palm Beach Renewable Energy Facility No. 2 and the Energy Answers, Arecibo, Puerto Rico project. These values are the least stringent of 24 ppmvd of SO_2 or 80% reduction and the least stringent of 20 ppmvd of HCl or 95% reduction. The technology is the GCP/SDA/FF/ACI/SCR arrangement (specifically the SDA/FF portion).

Department's MWC-Acid Gases BACT Determination

It is possible to conduct a "co-incident analysis" of (SO_2 + HCl) to set a BACT for MWC-AG that is less than the sum of the individual limits for SO_2 and HCl. However, the Department has determined that the individual limits for SO_2 and for HCl proposed by the applicant are adequate as BACT for SO_2 and MWC-AG and will not include a separate limit to track as MWC-AG. Furthermore, the Department notes that the inclusion of ACI within the GCP/SDA/FF/ACI/SCR arrangement will further reduce SO_2 although this fact is not typically highlighted.

The Department's MWC Rule has an alternative control efficiency standard of 80% for SO_2 applicable to all of the existing large units in the State. However, the alternative standard does not constitute BACT and would not actually put an upper limit on the potential to emit from the three Pinellas units. Otherwise, the Department accepts the rest of the applicant's SO_2 BACT proposal of 24 ppmvd @7% O_2, geometric mean, on a 24-hour basis. Compliance shall be determined by the SO_2-CEMS required by the Department's MWC Rule.

HCl is probably the pollutant governing the actual design of the SDA/FF part of the control technology. Based on the results at the Hillsborough County WTE Unit 4 (11.5 ppmvd and 98.1% reduction), the Department believes that 20 ppmvd is an appropriate limit for HCl. Although the 95% alternative limit is adequate as well, it would not provide an actual limit on emissions and will not be included. Compliance will be based on the annual test required by The Department's MWC Rule.

The overall rationale of the BACT determinations is as follows:

- The requirements are more stringent than those given in the Department's MWC Rule and Subpart Eb;
- The technology of lime-based spray dryer absorber (SDA) followed by fabric filter (FF) is well-established as the equipment indicated to achieve BACT nationwide; and

- Overall, the MWC-AG emission standards are as stringent as those determined as BACT for the most recent new units permitted at the Palm Beach Renewable Energy Facility No. 2 and the Energy Answers, Arecibo, Puerto Rico project.

4.6. $PM_{2.5}$, BACT Determination

Background on $PM_{2.5}$ Rules

According to Rule 62-210.200(Definitions), F.A.C., $PM_{2.5}$ emissions shall include condensable $PM_{2.5}$. Condensable $PM_{2.5}$ is defined as gaseous emissions from a source or activity which condense at ambient temperatures to form $PM_{2.5}$. For the purposes of PSD, including determinations of applicability and establishment of limitations to avoid PSD, $PM_{2.5}$ emissions shall include condensable $PM_{2.5}$.

Rule 62-297.401, F.A.C specifies EPA Method 202 – Determination of Condensable Particulate Emissions from Stationary Sources, contained in 40 CFR 51, Appendix M, as the compliance method when a $PM_{2.5}$ limit is required by a Department rule or permit.

Nature of $PM_{2.5}$ from Municipal Waste Combustors

$PM_{2.5}$ is now defined as consists both of filterable fine PM and condensable PM. $PM_{2.5}$ is comprised of:

- The products of complete combustion and incomplete combustion;
- Vaporized inorganic material that can condense on other particles and be carried out of the furnace;
- Pyrolyzed organic material that is emitted as char if insufficient time is provided to insure complete burnout;
- Excess reagents and reaction products from lime, NH_3 and activated carbon injection used in the pollution control equipment; and
- Ammoniated chlorides, sulfates, nitrates and other such species condensing at low temperatures.

PM and $PM_{2.5}$ Emissions from the Pinellas County Facility

In April 2012, the applicant conducted the required compliance tests on Units 1, 2 and 3. Refer to Figure 14.

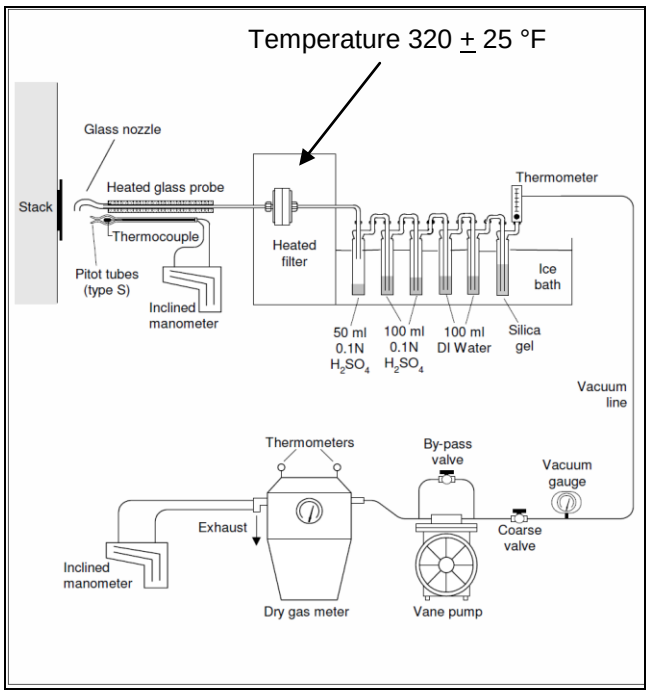


Figure 14. EPA Methods 5/26A - PM/HCl Train

The procedure used was a hybrid arrangement that included Method 5 for PM and Method 26A – Determination of Hydrogen Halide and Halogen Emissions; the latter to demonstrate compliance with the HCl emission standard. The sampling train shown is used to collect filterable PM (consistent with the definition of PM) and does not include a condensable fraction. The temperature in the heated filter was maintained within the indicated range of 320 ± 25 °F specified for testing municipal waste combustor units. The results from the compliance tests are summarized in Table 11.

Table 11. PM Emissions from Units 1, 2 and 3 - April 2012 Compliance Tests [1]

Unit 1 PM Emissions		Unit 2 PM Emissions		Unit 3 PM Emissions		Average [2]	
mg/dscm	lb/hour	mg/dscm	lb/hour	mg/dscm	lb/hour	mg/dscm	lb/hour
7.8	3.2	8.2	3.6	8.6	3.5	8.2	3.4

1. Concentration based emissions are corrected to 7% O_2.
2. Most stringent PM limits applicable to Units 1, 2 and 3 is 25 mg/dscm and approximately 13 lb/hour.

The applicant performed some preliminary testing of the $PM_{2.5}$ emissions after the baghouses of Units 1 and 3. The baghouses of Units 1 and 3 were equipped with fiberglass bags. The fiberglass bags on the Unit 1 baghouse included a membrane of expanded polytetrafluoroethylene (ePTFE – a Teflon related compound).

Refer to Figure 15. The typical $PM_{2.5}$ sampling train is a hybrid of EPA Methods 201A and 202. The first portion (left hand side) is used to sample the gas stream and, by inertial separation, remove filterable PM larger than 10 µm and then filterable PM between 10 and 2.5 µm in aerodynamic diameter.

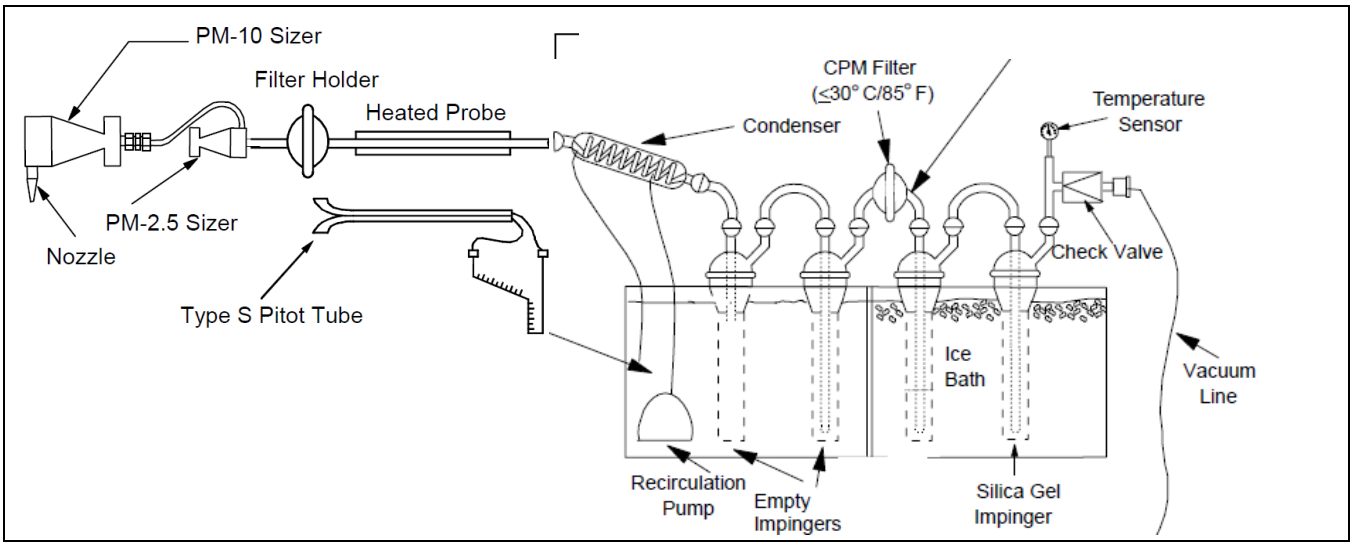


Figure 15. EPA Hybrid Method 201A/202 Filterable and Condensable $PM_{2.5}$ Sampling Train

A filter is then used to remove by mechanical impaction, interception and diffusion virtually all the filterable $PM_{2.5}$ existing at near-stack temperature conditions. The exhaust gas sample (cleansed of filterable $PM/PM_{10}/PM_{2.5}$) is maintained at relatively high temperature in a heated probe and then passed through a condenser to nucleate condensable species and convert them into filterable PM. The sample is then passed through the condensable PM (CPM) filter that is operated at a "defined ambient temperature" ≤ 30°C (85°F).

The results of the preliminary $PM_{2.5}$ tests conducted on Units 1 and 3 are summarized in Table 12. For these two units, filterable $PM_{2.5}$ emissions were approximately 6.6 mg/dscm, whereas the emissions of PM using the sampling train in Figure 14 were approximately 8.2 mg/dscm. A reasonable conclusion is that when using the prescribed methods for filterable PM (Method 5 @320°F) and filterable $PM_{2.5}$ (Method 201A), measurements of filterable $PM_{2.5}$ will be approximately equal to 80% of filterable PM.

Table 12. Results of Experimental $PM_{2.5}$ Tests Conducted on Units 1 and 3 – April 2012 [1]

Unit 1 $PM_{2.5}$ Emissions (fiberglass bags and ePTFE layer)						**Unit 3 $PM_{2.5}$ Emissions (fiberglass bags)**					
Filterable		Condensable		Total		Filterable		Condensable		Total	
mg/dscm	lb/hr	mg/dscm	lb/hr	mg/dscm	lb/hr	mg/dscm	lb/hr	mg/dscm	lb/hr	mg/dscm	lb/hr
6.8	3.0	15.3	6.7	22.1	9.6	6.4	2.6	13.8	5.6	20.1	8.2
1. Concentration based emissions are corrected to 7% O_2.											

This does not necessarily mean that within a given sample that filterable $PM_{2.5}$ comprises 80% of filterable PM because the filter temperature within the respective sampling trains appears to be different. But the relationship is still useful.

The results of the preliminary tests on Units 1 and 3 also indicate that condensable $PM_{2.5}$ is more than double the filterable $PM_{2.5}$ for this specific facility and with the installed control equipment and applicable emission standards for at least PM, SO_2 and NO_X.

Following is a possible explanation for the seemingly high condensable $PM_{2.5}$ relative to filterable PM.

Urea is injected into the furnace through the SNCR ports. Ammonia (NH_3) is liberated and reacts with NO_X to form molecular nitrogen and water. Excess NH_3 is typically required to achieve significant NO_X reduction due to inefficient mixing with exhaust gases or insufficient residence time within the in the injection zone. The excess NH_3 (commonly known as slip) ultimately comes into contact with waste combustion acid gases such as SO_2, SO_3, and HCl to form ammoniated sulfites/sulfates and ammonium chloride (NH_4Cl) as follows:

$$NH_3 + SO_2 + H_2O \rightarrow NH_4HSO_3 \quad \text{(ammonium bisulfite)}$$

$$NH_3 + SO_3 + H_2O \rightarrow NH_4HSO_4 \quad \text{(ammonium bisulfate)}$$

$$2NH_3 + SO_3 + H_2O \rightarrow (NH_4)_2SO_4 \quad \text{(ammonium sulfate)}$$

$$NH_3 + HCl + H_2O \rightarrow NH_4Cl \quad \text{(ammonium chloride)}$$

Such ammoniated species and sulfuric acid mist (SAM or H_2SO_4) can pass through the fabric filter (baghouse) in gaseous form and thereafter condense at lower temperature outside of the stack. At sufficient concentrations, these emissions can cause a visible plume. In fact, the previous operator, Wheelabrator, performed several evaluations of the SNCR system to optimize urea usage and minimize formation of plumes caused by excess NH_3 slip.[2]

Similarly, these species can, to a large extent, pass through the front portion (Method 201A) of the hybrid sampling train shown in Figure 15. Figure 16 is a graph (developed by Verhoff and Banchero, 1974) indicating the dew point variation of power plant exhaust gases at different concentrations of SAM and water. Link to Babcock Power Document It only takes a concentration of 1 ppm of SAM to cause condensation at 250 °F and 15% H_2O. Figure 17 is from a Siemens brochure showing a non-steam visible plume caused by NH_3 slip and sulfur-laden gases. Siemens Brochure

Similarly, the influence of NH_4HSO_4 on dew point is as high as 27°F, while NH_4Cl and $(NH_4)_2SO_4$ cause a dew point rise of 90 °F. Link to SNCR and Boiler Corrosion NH_4HSO_4 has a melting point of 297°F and some fraction would be in the gaseous state (and not collected) in a filter operated at high temperature. Thus, the drop in sampling train temperature in the condenser and capture of the nucleated species at ambient temperature that would not be gaseous at higher temperature) is sufficient to account for the much greater $PM_{2.5}$ emissions from Units 1 and 3 compared with the PM emissions measured by EPA Method 5 as specified for MWCs.

[2] Report. Re-evaluation of SNCR Design to Optimize Operation at the Pinellas County Resource Recovery Facility. Prepared for Wheelabrator Pinellas by Quinapoxet Solutions. September 2004.

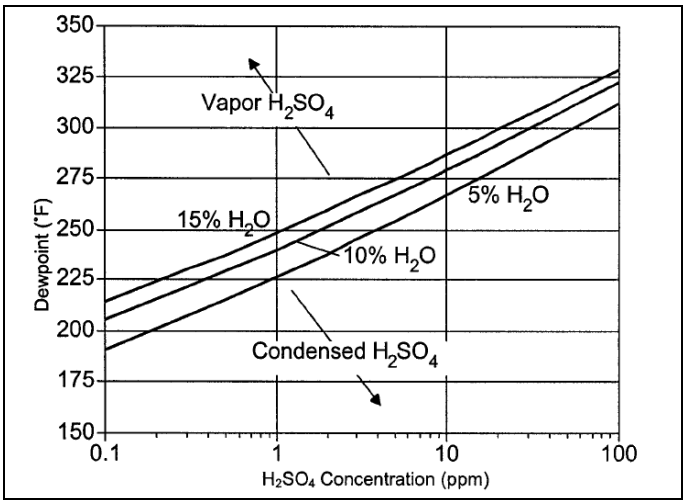


Figure 16. Dew Point versus H_2SO_4 Concentration

Figure 17. Power Plant Condensing Visible Plume

Inferences Regarding $PM_{2.5}$

The Unit 1, 2 and 3 fabric filters (baghouses) are characterized by high collection efficiency for discrete filterable PM. The EPA Method 5 high temperature train as specified for MWCs is efficient at capturing discrete, fine PM, but is inefficient (purposely so) in capturing condensable PM of all sizes. Actual emissions of filterable PM/PM_{10} and $PM_{2.5}$ are all less than approximately 10 mg/dscm from the three MWCs compared with the applicable filterable PM limit of 25 mg/dscm. The actual emissions (based on the 2012 testing) were shown by the applicant to be sufficiently low to avoid triggering PSD on the basis of baseline actual to projected actual emissions.

Actual total $PM_{2.5}$ emissions (filterable plus condensable) are less than 25 mg/dscm @7% O_2 for this facility of which roughly 70% are condensable $PM_{2.5}$.

Applicant's $PM_{2.5}$ BACT Proposal

The applicant proposes a BACT emission limit for $PM_{2.5}$ emissions from of 30 mg/dscm @ 7% O_2. Because condensable $PM_{2.5}$ emissions from MWCs have not been widely quantified, the applicant believes there is a possibility that the actual condensable portion of $PM_{2.5}$ will cause the above emission limit for PM $_{2.5}$ to be exceeded. In the event that the emission limit of 30 mg/dscm @ 7% O_2 is not achieved because of the condensable $PM_{2.5}$, the applicant proposes that the Department increase the emission limit for $PM_{2.5}$ to a level not to exceed 35 mg/dscm @7% O_2, based on Department's future review of the stack test results.

The basis for the limit is the result of the actual tests conducted on Units 1 and 3 with a margin of safety. The form of 30 mg/dscm with a possible reset to 35 mg/dscm @7% O_2 is similar to the condition included by EPA in a draft only proposed emission limit for $PM_{2.5}$ is contained in the draft permit for the Energy Answers Arecibo Puerto Rico Renewable Energy Project (22 mg/dscm with a possible reset to 30 mg/dscm).

In its analysis, Energy Answers states:

"Unfortunately there are no comparable MSW combustor facility permits that currently contain an emission limit for the condensable portion of emission and there are currently no stack test data available for MSW facilities to use as a basis for evaluating BACT level of control for condensable PM. At the present time, the control equipment vendor for this project will guarantee an outlet concentration of 30 mg/dscm for PM_{10} and $PM_{2.5}$, which is based on conservative engineering calculations. The guaranteed outlet concentrations represent the emissions level that could occur if all the theoretical condensable fractions materialize in the stack."

Department's $PM_{2.5}$ BACT Determinations

The only $PM_{2.5}$ BACT limit applicable to MWCs is the 22 mg/dscm @7% O_2 (filterable+condensable) value (with possible reset) at the Arecibo project. There is at least one key difference between the Arecibo and Pinellas facilities that affects the condensable part of $PM_{2.5}$. The Arecibo facility will be equipped with a selective catalytic reduction system for NO_X that will likely emit less NH_3 emissions (slip) than the Pinellas facility. SCR would be cost-prohibitive as a retrofit for the Pinellas facility if the purpose is simply to reduce NH_3 as a "precursor" to $PM_{2.5}$ condensable emissions. On the other hand, SCR causes additional conversion of SO_2 to SO_3 and formation of more $PM_{2.5}$ including condensable $PM_{2.5}$.

It is possible that improved bags can help to reduce at least the filterable portion or help to promote reaction and collection of the condensable portion on the filter cake. However, the initial comparison between the standard fiberglass bags with the bags equipped with ePTFE showed little, if any, difference in condensable $PM_{2.5}$.

The Department will specify a limit of 30 mg/dscm @7% O_2 as the BACT $PM_{2.5}$ limit. The BACT SO_2 emission standard specified above of 24 ppmvd @7% O_2, geometric mean, on a 24-hour basis limit is an element as well of the $PM_{2.5}$ BACT determination because SO_2 triggered the requirement to perform a $PM_{2.5}$ BACT determination.

The Department will specify a visible emissions limit of 10% opacity equal to the value in the Department's MWC Rule as BACT for Facility Improvement Project. Compliance will be by annual test. There is a requirement to operate continuous opacity monitoring systems (COMS) and to report excess emissions.

The final element of the BACT determination is continued adherence to the very stringent estimates of projected actual emissions applicable to PM that will also suppress $PM_{2.5}$ emissions. Finally, the requirement to control PM within projected actual emissions and $PM_{2.5}$ within the BACT emission standards adequately addresses PM_{10} (including condensable); a pollutant for which PSD was not triggered.

The initial $PM_{2.5}$ compliance stack tests shall be conducted within 7 days of the PM tests conducted in 2013 (pursuant to the Department's MWC Rule) and annually thereafter as described in the attached draft permit.

5. AIR QUALITY IMPACT ANALYSIS

5.1. Introduction

The proposed project will increase emissions of CO, SO_2, MWC-acid gases and $PM_{2.5}$ (based on increases in precursor SO_2) at levels in excess of the respective PSD significant emission rates. For CO and SO_2 the applicant must provide a demonstration using approved air quality models that project emissions will not cause or contribute to a violation of an ambient air quality standard (AAQS) or PSD increment, as applicable. After consultation with EPA Region 4, the Department determined that modeling for $PM_{2.5}$ would not be performed because no increases in direct (filterable) $PM_{2.5}$ were projected. No modeling is required for MWC-acid gases. However, SO_2 is a key component of MWC-acid gases (together with HCl) and is modeled.

PSD increments are defined for SO_2. An increment is the maximum allowable increase in ambient concentrations of a pollutant in an area. Increases above that level are considered to significantly deteriorate air quality. Significant Impact Levels (SIL) and Significant Monitoring Concentrations (SMC) are defined for the CO and SO_2 for certain averaging times and are used to determine the scope of the modeling analysis and the need for additional ambient air monitoring data.

5.2. Major Stationary Sources in Pinellas and Nearby Counties

The largest stationary sources of key air pollutants in Pinellas, Pasco, Hillsborough, Polk and Manatee Counties are listed in Tables 13-16. The pollutants relative to this evaluation include: CO, SO_2 (PSD pollutant, a precursor to $PM_{2.5}$ formation and contributor to condensable $PM_{2.5}$); PM_{10} (conservative indicator of filterable $PM_{2.5}$ emissions); and NO_X (as a precursor to $PM_{2.5}$ formation and contributor to condensable $PM_{2.5}$). The future emissions in tons/year from Pinellas Facility after the project are also shown for comparison.

Table 13. Largest Direct Sources of PM_{10} in Pinellas and Nearby Counties - 2011 (tons/year)

Company	Site Name	County	Emissions
TECO	Big Bend Generating Station	Hillsborough	786
FP&L	Manatee Power Plant	Manatee	215
Lakeland Electric	C.D. McIntosh Power Plant	Polk	186
TECO	Bayside Generating Station	Hillsborough	170
Mosaic Fertilizer	New Wales Facility	Polk	142
Progress Energy	Anclote Power Plant	Pasco	90
Progress Energy	Hines Energy Complex	Polk	80
Seminole Electric	Midulla Generation Station	Hardee	59
Mosaic Fertilizer	Bartow Facility	Polk	55
Pinellas County	**PCRRF**	**Pinellas**	**~53[1]**

1. Future actual emissions are equal to potential to emit of 100 tons/year.

Table 14 – Largest Sources of CO in Pinellas and Nearby Counties – 2011 (tons/year)

Owner	Site Name	County	Emissions
TECO	Big Bend Generating Station	Hillsborough	9,811
FP&L	Manatee Power Plant	Manatee	1,069
Cutrale Citrus Juices	Cutrale Citrus Juices	Polk	1,004
Wheelabrator Ridge Energy	Ridge Generating Station	Polk	638
Progress Energy	Bartow Plant	Pinellas	466
Lakeland Electric	C.D. McIntosh Power Plant	Polk	453
Citrosuco North America	Citrosuco North America	Polk	484
Progress Energy	Hines Energy Complex	Polk	410
Calpine Construction	Osprey Energy Center	Polk	355
EnviroFocus	EnviroFocus Lead Battery Recycling	Hillsborough	350[1]
Bartow Citrus	Bartow Citrus	Polk	299
TECO	Bayside Power Station	Hillsborough	266
Citrus World Inc.	Citrus World Inc.	Polk	266
Progress Energy	Anclote Power Plant	Pasco	257
TECO	Polk Power Station	Polk	196
Pinellas County	**Pinellas County RRF**	**Pinellas**	**193[2]**

1. 2010 actual emissions (2011 unavailable).
2. Future actual emissions are equal to potential to emit of 642 tons/year.

5.3. SO_2 and NO_X Emission Trends from Power Plants in the Southeastern U.S.

There are regional efforts underway through the Federal (Title IV) Acid Rain Program, the Clean Air Interstate Rule (CAIR), the Cross-State Air Pollution Rule (CSAPR), Best Available Retrofit Technology (BART) and Reasonable Further Progress (RFP) to reduce emissions of NO_X and SO_2. These two pollutants are also key contributors to condensable $PM_{2.5}$ emissions and precursors for $PM_{2.5}$ formation in the atmosphere and regional haze. Regional SO_2 emissions from existing power plants in the Southeast U.S. in 2007 and 2010 are listed in Table 17.

Table 15. Largest Sources of SO_2 in Pinellas and Nearby Counties - 2011 (tons/year)

Company	Site Name	County	Emissions
Tampa Electric Company (TECO)	Big Bend Generating Station	Hillsborough	9,106
Mosaic Fertilizer	New Wales Facility	Polk	7,901
Mosaic Fertilizer	Bartow Facility	Polk	4,426
Lakeland Electric	C.D. McIntosh Jr. Power Plant	Polk	4,256
Mosaic Fertilizer	Riverview Facility	Hillsborough	3,034
Progress Energy	Anclote Power Plant	Pasco	2,134
Florida Power & Light (FPL)	Manatee Power Plant	Manatee	1,653
CF Industries	CF Industries – Plant City	Hillsborough	1,609
TECO	Polk Power Station	Polk	1,263
Mosaic Fertilizer	South Pierce Facility	Polk	1,124
Wheelabrator Ridge Energy	Ridge Generating Station	Polk	237
Pinellas County	**Resource Recovery Facility (PCRRF)**	**Pinellas**	**188** [1]

1. Future actual emissions are equal to potential to emit of 439 tons/year.

Table 16. Largest Sources of NO_X in Pinellas and Nearby Counties – 2011 (tons/year)

Owner	Site Name	County	Emissions
TECO	Big Bend Generating Station	Hillsborough	4,630
Lakeland Electric	C.D. McIntosh Power Plant	Polk	1,635
Pinellas County	**Pinellas County RRF**	**Pinellas**	**1,347**[1]
FP&L	Manatee Power Plant	Manatee	1,130
Progress Energy	Anclote Power Plant	Pasco	1,089
Hillsborough RRF	Hillsborough County RRF	Hillsborough	875
Pasco County	Pasco County RRF	Pasco	785
Progress Energy	Bartow Plant	Pinellas	730
Progress Energy	Hines Energy Complex	Polk	628
TECO	Bayside Generating Station	Hillsborough	460
TECO	Polk Power Station	Polk	446
Seminole Electric	Midulla Generation Station	Hardee	368
City of Tampa	Tampa McKay Bay RRF	Hillsborough	330
Wheelabrator Ridge Energy	Ridge Generating Station	Polk	322
Mosaic Fertilizer	New Wales Facility	Polk	310
Mosaic Fertilizer	Riverview Facility	Hillsborough	160
Mosaic Fertilizer	Bartow Facility	Polk	141
Auburndale Power	Auburndale Power	Polk	132
Shady Hills	Shady Hills	Pasco	131
Vandolah Power Company	Vandolah Power Company	Hardee	130

1. Projected actual emissions including increased utilization equals 1,949 tons/year.

Table 17. SO_2 Emission from Power Plants in the Southeast in 2007 and 2011 in tons/year

State	2007	2011	Δ Since 2007 (%)
Alabama	447,189	179,250	267,939 (60%)
Florida	**317,582**	**91,380**	**226,202 (71%)**
Georgia	635,484	186,860	448,624 (71%)
Kentucky	379,837	246,396	133,441 (35%)
Mississippi	69,796	43,211	26,585 (38%)
North Carolina	370,826	73,507	297,319 (80%)
South Carolina	172,726	66,167	106,559 (62%)
Tennessee	237,231	120,325	116,906 (49%)
Total	**2,630,671**	**1,007,096**	**1,623,575 (62%)**

Regional NO_X emissions from existing power plants in the Southeast U.S. in 2007 and 2011 are listed in Table 18.

Table 18. NO_X Emission from Power Plants in the Southeast in 2007 and 2011 (tons/year)

State	2007	2011	Δ Since 2007 (%)
Alabama	122,374	61,398	60,976 (50%)
Florida	**184,171**	**54,748**	**129,423 (70%)**
Georgia	107,471	54,823	52,648 (49%)
Kentucky	174,840	92,051	82,789 (47%)
Mississippi	48,546	25,078	23,468 (48%)
North Carolina	59,417	41,348	18,069 (30%)
South Carolina	46,062	23,262	22,800 (49%)
Tennessee	102,886	26,838	76,048 (74%)
Total	**845,767**	**379,546**	**466,221 (55%)**

NO_X emissions from power plants in the Southeast U.S. during 2011 were reduced by over 466,000 tons/year and 55% referenced to emissions in 2007. No NO_X increases, other than those related to possible increased utilization (~300 tons/year), are projected from the Pinellas Facility.

The Department graphed gross electrical generation and the SO_2 and NO_X emission trends during the period 1998-2011 from power plants in Florida that report their emissions to the EPA Clean Air Markets database. The results are summarized in Figure 18.

By comparison with the overwhelming downtrend of regional and local emissions of SO_2 and NO_X, the emission increases from the Pinellas Facility (whether caused by the project or by increased utilization) are very low.

5.4. Ambient Air Monitoring Surrounding Proposed Facility

The State ambient air monitoring network operated by the Department and its partners (local air pollution control programs) includes monitors in counties containing over 90% of the population. As Figure 19 and 20 indicate, the ambient air monitoring sites are concentrated in areas of high population density, along the coasts and near major highways in the interior portion of the state.

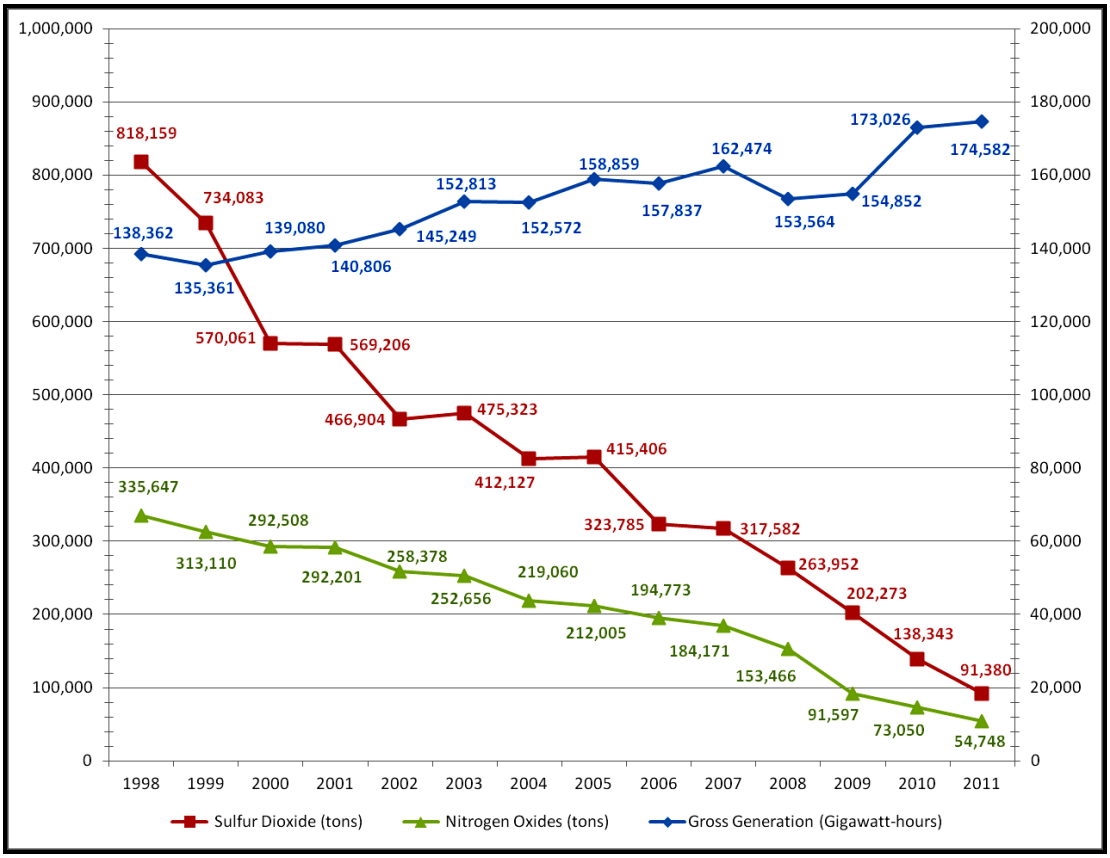


Figure 18. Generation and SO_2, NO_X Emissions from Florida Acid Rain Units, 1998-2011

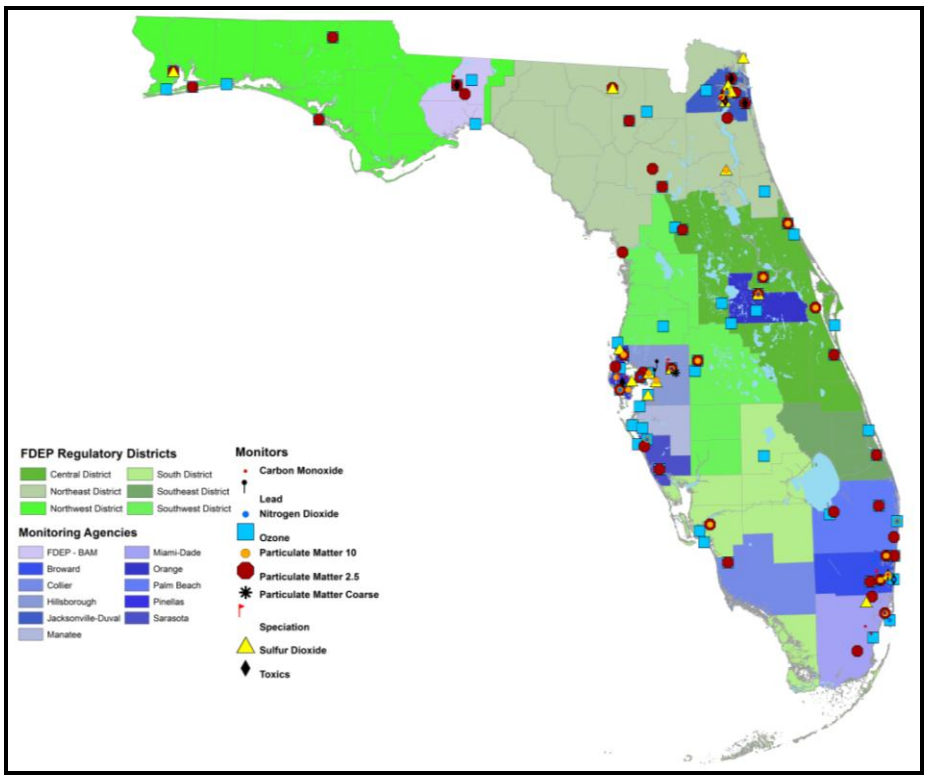


Figure 19. Florida 2012 Ambient Air Monitoring Network

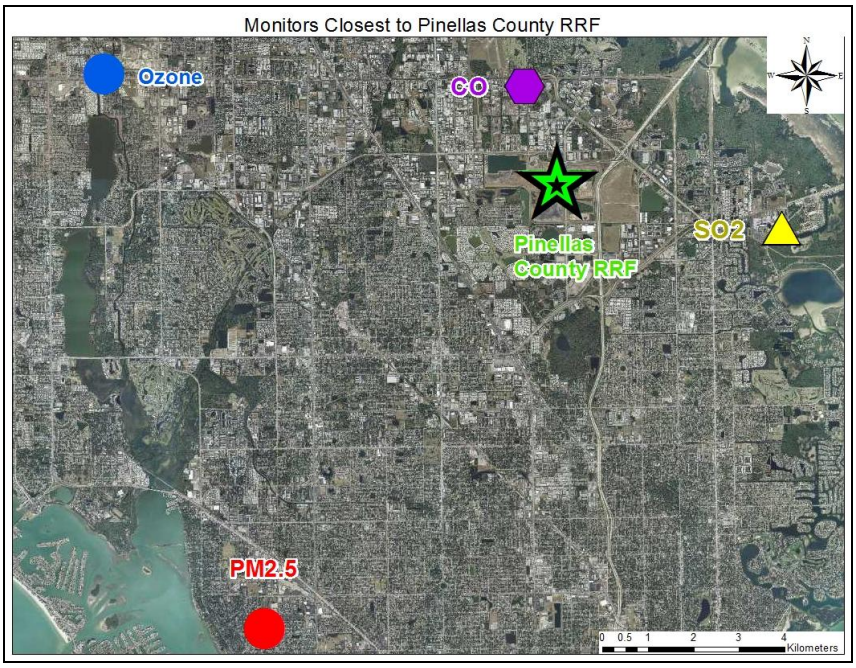


Figure 20. Monitors Closest to Pinellas County Resource Recovery Facility

These monitors are used to estimate the existing air quality in the area of the proposed facility. The CO, SO_2 and $PM_{2.5}$ monitors were chosen due to the close proximity to the Pinellas Facility. Air quality measurements from these monitors are summarized in Table 19.

Table 19. Ambient Air Quality Based on Most Representative Monitors Near the Project Site

Pollutant	Location (Site Number)	Averaging Period	Ambient Concentration			
			Compliance Period	Value	Standard	Units [a]
CO	Pinellas (L1032008)	1-hour [b]	2011	1.5	35	ppm
		8-hour [b]		1	9	ppm
$PM_{2.5}$	Pinellas Co (L1030018)	24-hour [c]	2009-2011	16	35	$\mu g/m^3$
		Annual [d]	2009-2011	7.7	15	$\mu g/m^3$
SO_2	Pinellas Co (L1030023)	1-hour [e]	2011	29	75	ppb
		3-hour [f]	2001	10	500	ppb
		24-hour [f]	2011	3	140	ppb
		Annual [g]	2009-2011	1	30	ppb
Ozone	Pinellas (L1030004)	8-hour [h]	2009-2011	0.066	0.075	ppm

a. Units are in micrograms per cubic meter (µg/m3); parts per billion (ppb); or parts per million (ppm).
b. Not to be exceeded more than once per year.
c. Three year average of the 98th percentile of maximum daily 24-hour concentrations with exceptional events excluded (as approved by EPA).
d. Three year average of the arithmetic annual means with exceptional events excluded (per EPA).
e. Three-year average of the annual 99th percentile maximum daily 1-hour value.
f. Not to be exceeded more than once per year.
g. Arithmetic mean.
h. Three year average of the annual 4th highest daily 8-hour maximum.

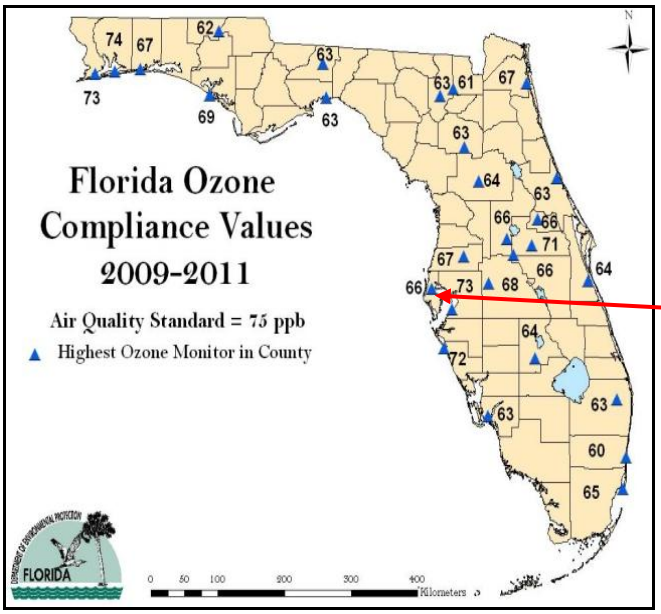
The ambient air measurements listed above are values that have excluded 'exceptional events' excluded. An 'exceptional event' is defined by EPA in accordance with 40 CFR 50.14 as an event that affects air quality, is not reasonably controlled or preventable, is an event caused by human activity that is unlikely to recur at a particular location or natural event. Such events include complex wildfires, driven by prolonged drought conditions and other large-scale meteorological patterns. The Department has evaluated several $PM_{2.5}$ episodes and found that they occur in conjunction with certain meteorological conditions, combined with very high SO_2 emissions and sulfate deposition.

5.5. Existing Ambient Air Quality Near Project Site – $PM_{2.5}$ and Ozone

Ozone is a key indicator of the overall state of regional air quality. It is not emitted directly from combustion processes. Rather it is formed from VOC and NO_X emitted primarily from regional industrial and transportation sources. VOC is also emitted from authorized agricultural fires, natural drought-related fires and natural emissions from vegetation. These two precursors participate in photochemical reactions that occur on an area-wide basis and are highly dependent on meteorological factors.

Ozone limits and measurements are summarized on three year blocks, rolled annually. The reported ozone value was calculated by taking the maximum 8-hour readings recorded each day during the three years. The fourth highest of the recorded maxima were identified for each year and then the average of those three values was reported as the compliance value, and is compared to the standard of 75 parts per billion (ppb).

The ozone and $PM_{2.5}$ monitors, both located in Pinellas County, are most representative of the ambient air quality near the Pinellas County Resource Recovery Facility. The Pinellas County ozone compliance value is 66 ppb. It is shown in Figure 21, which shows the highest compliance values measured in each county where at least one ozone station is located.



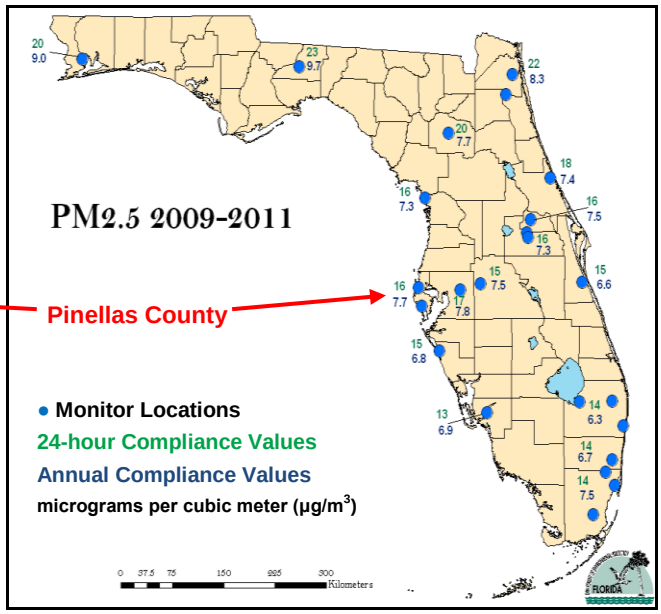


Figure 21. Florida Ozone Compliance Values **Figure 22. Florida $PM_{2.5}$ Compliance Values**

$PM_{2.5}$ (also known as PM_{fine}) is another key indicator of the overall state of regional air quality. Some $PM_{2.5}$ is directly emitted as a product of combustion from transportation and industrial sources as well as fires. Much of it consists of particulate nitrates and sulfates formed through chemical reactions between gaseous precursors such as SO_2 and NO_X from combustion sources and ammonia (NH_3) naturally present in the air or added by other industrial sources.

$PM_{2.5}$ limits and measurements are summarized on three-year blocks, rolled annually. The reported 24-hour compliance value for $PM_{2.5}$ is 16 μg/m^3 as indicated in above in Figure 22 and also in Table 19 for the Pinellas County site, and was calculated by taking the average 24-hour readings recorded each day during the three years (2009-2011). The value for each year that exceeds 98% of all daily measurements within each given year was identified and then the average of those three numbers was reported as the 24-hour compliance value and compared with the standard of 35 μg/m^3.

The simple average of all $PM_{2.5}$ measurements within each three years (2009-2011) was also calculated and then the mean of the three averages (7.7 μg/m^3) was reported as the annual compliance value and compared with the standard of 15 μg/m^3. $PM_{2.5}$ results from the Pinellas County monitors for both averaging periods are also less than the NAAQS. In summary, the results indicate that Pinellas County is in attainment with the applicable ozone and $PM_{2.5}$ AAQS.

5.6. Air Quality Impact Analysis

Significant Impact Analysis

Significant Impact Levels (SIL) are defined for CO and SO_2. A significant impact analysis is performed on each of these pollutants to determine if a project can cause an increase in ground level concentration greater than the SIL for each pollutant.

In order to conduct a significant impact analysis, the applicant has used the proposed project's maximum short-term emissions as inputs to the models. The highest predicted short-term concentrations and highest predicted annual averages predicted by this modeling are compared to the appropriate SIL for the and Class II Areas.

If this modeling for a particular pollutant shows ground-level increases less than its SIL, the applicant is exempted from conducting any further modeling. If the modeled concentrations from the project exceed the SIL, then additional modeling including emissions from all major facilities or projects in the region (multi-source modeling) is required to determine the proposed project's impacts compared to the AAQS and PSD increments for those pollutants.

For the Class II analysis, a combination of fence line, near-field and far-field receptors were chosen for predicting maximum concentrations in the vicinity of the project. The fence line receptors consisted of discrete Cartesian receptors spaced at 50-meter intervals around the facility fence line. The remaining receptor grid consisted of densely spaced Cartesian receptors at 100-meters apart extending out 3 km. A coarser grid with 500 meter spacing was placed from 3 km out to 10 km, followed by a coarser 1,000-meter spaced grid extending from 10 km out to 30 km from the project site.

The results of the applicant's significant impact analysis are shown below in Table 20.

Table 20. Maximum Predicted Air Quality Impacts for Comparison to the PSD Class II SIL

Pollutant	Averaging Time	Max Predicted Impact (μg/m^3)	Significant Impact Level (μg/m^3)	Ambient Air Standards (μg/m^3)	Significant Impact?
SO_2	Annual	0.4	1	80	No
	24-Hour	6	5	365	Yes
	3-Hour	16	25	1300	No
	1-Hour	18	7.8	195	Yes
CO	8-Hour	33	500	10,000	No
	1-Hour	23	2000	40,000	No

Maximum predicted impacts are greater than the applicable SIL for the Class II area for the SO_2 1-Hour and 24-hour averaging periods. Consequently, a full AAQS analysis (in which the PSD Increment analysis considering all sources of these pollutants in the area) is required.

Preconstruction Ambient Monitoring Requirements

A preconstruction monitoring analysis is performed for those pollutants with listed significant monitoring concentrations (de minimus levels). These are levels, which, if exceeded, would potentially require pre-construction ambient monitoring. As shown in Table 21 below, the maximum predicted impacts due to the proposed project are predicted to be below the PSD de minimis concentration levels for SO_2.

Table 21. Maximum Air Quality Impacts for Comparison to De Minimis Concentration Levels

Pollutant	Averaging Time	Max Predicted Impact ($\mu g/m^3$)	De Minimis Level ($\mu g/m^3$)	Impact Greater Than De Minimis?
SO_2	24-hour	6	13	No
CO	8-hour	33	575	No

Because the predicted maximum 24-hour SO_2 and 8-hour CO concentrations are less than the de minimis levels, pre-construction ambient monitoring is not required. Per Figure 19, there are sufficient monitors in the area for all of the pollutants of interest.

Models, Emissions Data, and Meteorological Data Used in the AAQS and PSD Increments Analysis

The EPA-approved AERMOD modeling system was used to evaluate the pollutant emissions from the proposed project in the surrounding Class II Areas. The AERMOD modeling system incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including the treatment of both surface and elevated sources, and both simple and complex terrain. AERMOD contains two input data processors, AERMET and AERMAP. AERMAP is the terrain processor and AERMET is the meteorological data processor.

A series of specific model features, recommended by the EPA, are referred to as the regulatory options. The applicant used the EPA recommended regulatory options. Direction specific downwash parameters were used for all sources for which downwash was considered.

Emissions data used in the modeling analysis were obtained from the Department's ARMS database, permit files, and recent PSD permit reviews. Emissions data for the new proposed facility derive from the proposed maximum permit limits imposed on the facility for each pollutant.

The AERMET meteorological data used for this analysis consisted of a concurrent 5-year period of hourly surface weather observations and twice-daily upper air soundings from the Tampa Airport Automated Surface Observation Station (ASOS), respectively. The 5-year period of meteorological data is from 2006 through 2010. The location of the Pinellas County RRF is less than 12 miles from the Tampa Airport. Because of the close proximity of the two sites, terrain and prevailing synoptic meteorological patterns are generally very similar, and the meteorological data is appropriate to be used for this modeling analysis.

In reviewing this permit application, the Department has determined that the application complies with the applicable provisions of the stack height regulations as revised by EPA on July 8, 1985 (50 FR 27892). Portions of the regulations have been remanded by a panel of the U.S. Court of Appeals for the D.C. Circuit in NRDC v. Thomas, 838 F. 2d 1224 (D.C. Cir. 1988). Consequently, this permit may be subject to modification should EPA revise the regulation in response to the court decision. This may result in revised emission limitations or may affect other actions taken by the source owners or operators. A more detailed discussion of the required analyses follows.

Multi-source PSD Class II Increment Analysis

The PSD increment represents the amount that new sources in an area may increase ambient ground level concentrations of a pollutant from a baseline concentration. A PSD increment analysis was required for SO_2. The maximum predicted annual and maximum predicted high, second high short-term average PSD Class II area impacts from this project and other increment-consuming sources in the vicinity of the proposed facility are shown in Table 22 below.

Table 22. PSD Class II Increment Analysis

Pollutant	Averaging Time	Maximum Predicted Impact ($\mu g/m^3$)	Allowable Increment ($\mu g/m^3$)	Impact Greater Than Allowable Increment?	Percentage of Increment Consumed
SO_2	24-hour	33	91	No	36%

AAQS Analysis

For pollutants subject to an AAQS review, the total impact on ambient air quality is obtained by adding a "background" concentration to the maximum modeled concentration. This "background" concentration is based on existing monitoring data for each pollutant and representative of the area of the proposed source. This background is intended to account for sources of a particular pollutant that are not explicitly modeled. Since no attempt is typically made to subtract out the impacts due to the explicitly modeled sources on these monitored values, there is some amount of double-counting reflected in the total concentration (modeled + background) used to compare with the appropriate AAQS.

An evaluation of the emission inventories for background sources considered in the PSD application for the Pinellas RRF was performed to determine whether the method used to eliminate background sources from NAAQS compliance modeling demonstration was reasonable. All background sources within the significant impact area of the project were included in the modeling demonstration.

For facilities within 60 km of the SIA, the “20D” screening process was applied to exclude sources that would not have a significant impact on those receptors where the SIL was originally exceeded. In this process, regional sources whose potential emissions were less than 20 times the distance to the edge of the SIA were eliminated because they are presumed to have negligible contributions to receptors in the SIA. Regional sources located within close proximity to each other (2 km) were evaluated cumulatively in the 20D analysis to determine whether the combined “source” was still appropriate to exclude.

The sources that are explicitly modeled include the subject facility and nearby sources that are judged to potentially have a significant interaction with the proposed facility. The appropriate calculations for the modeled and background values are different for each pollutant, but generally follow the form for compliance with the AAQS. Table 23 shows the results of this analysis. As shown in the below table, emissions from the proposed facility are not expected to cause or contribute to a violation of an AAQS.

Table 23. Ambient Air Quality Impacts

Pollutant	Averaging Time	Major Sources Impact ($\mu g/m^3$)	Background Conc. ($\mu g/m^3$)	Total Impact ($\mu g/m^3$)	Total Impact Greater Than AAQS?	AAQS ($\mu g/m^3$)
SO_2	1-hour	154	29	183	No	196
	24-hour	33	3	66	No	365

Based on the results of the air quality modeling analysis, the proposed project modification will not cause or contribute to a violation of an ambient air quality standard or maximum allowable concentration increase (PSD increment).

5.7. Additional Impact Analysis

The applicant has modeled to show that the proposed modification will not violate AAQS or increment. However, PSD regulations require additional analyses of air quality impacts to sensitive types of vegetation and soil, air quality impacts related to growth, and visibility in the affected Class I areas.

The maximum predicted ground-level concentrations of CO and SO_2 from the proposed project and all other nearby sources are less than the corresponding AAQS. According to a literature search for a different project very close to the facility (Progress Energy Plant on Wheeden Island), plant species most sensitive to CO showed cellular damage when exposed to 685,000 $\mu g/m^3$ of CO. The applicant's maximum modeled impacts are three orders of magnitude less than this level.

For SO_2, research indicates that plant species most sensitive to SO_2 showed visible injury when exposed to 0.12 ppm (314 $\mu g/m^3$) of SO_2 for eight hours. The applicant's maximum modeled impacts are also significantly less than this level.

Additionally, the proposed modification will not change employment, population, housing, commercial development, or industrial development in the area to the extent that significant air quality impact will result. According to the US Census, population growth in the area of the proposed project, Pinellas County, has increased 26% since 1980. Despite the growth, county-wide air quality has improved in terms of CO (especially due to reductions in transportation emissions) and SO_2 as reported by the County's ambient air monitoring network.

Refer to Table 17 and Figure 18 above. The benefits from the massive SO_2 reductions in the Southeast, in Florida and in the Tampa Bay Area (e.g. the nearby Progress Energy Plant on Weeden Island) since 1977 overwhelm any possible effects from the small proposed increases, or population growth-related increases from the project.

6. PRELIMINARY DETERMINATION

The Department makes a preliminary determination that the proposed project will comply with all applicable state and federal air pollution regulations as conditioned by the Draft Permit. This determination is based on a technical review of the complete application, reasonable assurances provided by the applicant, and the conditions specified in the Draft Permit.

Melody Lovin is the meteorologist responsible for reviewing and preparing the ambient air quality analyses. Alvaro Linero, P.E. is the project engineer responsible for preparing the draft permit and BACT determination. Details of the analyses may be obtained by contacting Ms. Lovin at melody.lovin@dep.state.fl.us and 850-717-9084 or Mr. Linero at alvaro.linero@dep.state.fl.us and 850-717-9076.

7. PERMITTING HISTORY

The Facility was permitted by the EPA and certified under the Florida Power Plant Siting Act. Below is a history of the key permits and certification orders to-date.

7.1. Florida Site Certification Order PA78-11 - Units 1 and 2 (1979)

The original Conditions of Certification for Units 1 and 2 were prepared by the Department and included in the Certification Order issued by the Siting Board on July 20, 1979. Following are some of the key requirements:

- 0.08 grains of PM per dry standard cubic foot at 50 percent excess air (0.08 gr/dscf @50% excess air);
- A three-field electrostatic precipitator (ESP) for each unit with capability of adding an extra field;
- 1.2 pounds of SO_2 per million Btu heat input (lb/MMBtu);
- Visible emissions limited to 20% opacity (except as allowed for start, shutdown and malfunctions per Department rules);
- No objectionable odors; and
- Units 1 and 2 "shall not be loaded in excess of their rated capacity of 83,300 pounds of municipal solid waste per hour each" (equals 41.65 tons/hour and 1,000 tons/day).

These requirements were enforceable by the Department but not by EPA who relied on separate authority to regulate the Facility.

7.2. EPA Permit No. PSD-FL-011 – Units 1 and 2 (1979)

The original permit PSD-FL-011 was issued by the U.S. Environmental Protection Agency (EPA) on September 27, 1979. Following are the key requirements:

- Applicability of 40 Code of Federal Regulations, Part 60 (40 CFR 60), Subpart E-Standards of Performance for Incinerators (Subpart E);
- Best available control technology (BACT) PM limit achievable by ESP and equal to Subpart E limit of 0.18 grams of PM/dry standard cubic meter @12% carbon dioxide (0.18 gm PM/dscm @12% CO_2 equal to 0.08 gr/dscf @12% CO_2);
- EPA concluded that "the systems proposed by the applicant represent BACT for PM, SO_2, NO_X and CO";
- No numerical SO_2 or NO_X emissions standards were specified as EPA concluded "no exhaust gas sulfur removal equipment is known to be used with existing resource recovery facilities" and "there is no data to support a numerical emission level for NO_X emissions for resource recovery facilities"; and

This permit established the first set of Federally enforceable requirements applicable to the Facility. Although no production limits were established in the Federally issued PSD permit, the EPA evaluation was premised on the application dated July 12, 1978 "to construct two solid waste resource recovery units. These units are two 1,050 tons/day traveling grate boilers".

Commercial operation of Units 1 and 2 began in 1983.

7.3. Florida Site Certification Order PA83-11 – Unit 3 and modifications to Units 1 and 2 (1984 and 1986)

The Conditions of Certification for Unit 3 were prepared by the Department and included in the Certification Order issued February 29, 1984 and modified on July 30, 1986.

- BACT PM emission standard of 0.03 gr/dscf @12% CO_2 (more stringent than Subpart E limit of 0.08 gr/dscf) and achievable by an ESP;
- BACT SO_2, NO_X and CO emission standards of 170, 254 and 66 lb/hour, respectively;
- BACT Lead emissions standard of 4.4 lb/hour;
- Mercury emission standard of 3,200 gm/day, applicable when more than 2,205 lb/day of municipal sludge are fired;

- No objectionable odors; and
- Visible emissions limited to 20% opacity (except as allowed for start, shutdown and malfunctions per Department rules).

The SO_2 limit applicable to Units 1 and 2 was modified to 170 lb/hour each unit. The order included the following requirements applicable to all three units:

- Units 1, 2 and 3 "shall not be loaded in excess of their rated capacity of 87,500 pounds of municipal solid waste per hour each" (equals 43.75 tons/hour and 1,050 tons/day); and
- Stack tests be conducted at $\pm$10% of the maximum steam rate of 250,000 pounds per hour (i.e. between 225,000 and 275,000 lb/hour).

Again, these requirements, including the process rate limitations, were enforceable by the Department but not by EPA who relied on separate authority to regulate the Facility.

Construction of Unit 3 was completed September 1986.

7.4. EPA Permit No. PSD-FL-098 – Unit 3 (1987) Link to PSD-FL-098

Although construction on Unit 3 was completed in 1986, it was necessary for EPA to issue a separate "after-the-fact" PSD permit because EPA determined that the Florida Power Plant Siting Act Site Certification does not comply in part with EPA PSD regulations. EPA permit PSD-FL-098 was issued on May 22, 1987. Following are the key requirements:

- Same BACT requirements as Certification Order PA83-11 for PM, SO_2, NO_X and CO;
- BACT mercury emission standard of 0.294 lb/hour instead of 3,200 gm/day, applicable when more than 2,205 lb/day of municipal sludge are fired;
- BACT Fluoride limit of 8.31 lb/hour;
- Beryllium limit of 9.0×10^{-5} lb/hour to avoid PSD;
- BACT Stack visible emissions equal to 15% instead of 20% opacity;
- Visible emissions limited to 10% opacity from the refuse bunker and ash load out areas;
- Excess emissions of CO defined as 4-day rolling average in excess of 150 parts per million by volume, dry corrected to 8% oxygen (ppmvd @8% O_2); and

This permit established the first set of federally enforceable requirements applicable to Unit 3 of the Facility. The permit included the following federally enforceable process rate limitation applicable only to Unit 3:

- The municipal solid waste (MSW) incinerator shall not be loaded in excess of its rated capacity of 87,500 lb/hour MSW or operated in excess of the maximum steam rate of 275,000 lb/hour.

7.5. DEP Permit Nos. PSD-FL-011A and PSD-FL-098A (1995) Link to PSD-FL-011A and PSD-FL-098A

At the request of the applicant, the Department amended the previous EPA PSD permits on October 11, 1995 to allow installation of modern air pollution control equipment. The request was made following EPA's Notice of a proposed version of the EPA Emission Guidelines.

The project was expected to greatly reduce emissions of all pollutants (especially toxic air pollutants) and was authorized in accordance with EPA's 1994 "Pollution Control Project" exemption memorandum applicable to projects in states with delegated PSD programs (such as Florida for projects subject to the Siting Act). No emission standards were added and the permits authorized the following actions:

- Replacement of ESP at Units 1, 2 and 3 with fabric filters (baghouses);
- Installation of spray dryer absorbers for acid gas control; and
- Injection of activated carbon to enhance air toxics emissions reductions and removal by the baghouses.

No production limits were established in the Department's modification of the Federally issued PSD permit.

7.6. Modification of Florida Site Certification Orders PA78-11 and PA83-11 - Units 1, 2 and 3 (1996)

The Conditions of Certification for Units 1, 2 and 3 were modified by the Department on July 29,1996 to reflect PSD-FL-011A and PSD-FL-098A. Since the Conditions of Certification constituted the only "operation permit" (prior to applicability of the Title V Air Program), the requirements of the Emission Guideline were incorporated therein. These requirements are not deemed to be pursuant to PSD or BACT determinations. The emissions standards adopted by the Department based on the Emission Guideline (1995 and 2006 versions).

A condition pursuant to the Emission Guideline as follows:

"Each municipal waste combustor (MWC) shall be allowed to operate up to 110% of the unit's maximum demonstrated load capacity, as achieve during the most recent dioxin/furan compliance test. Maximum capacity shall be based on the steam (or feedwater) flow rate, which shall be continuously monitored according to the American Society of Mechanical Engineers (ASME) Power test Code for Steam Generating Units or as required by USEPA and/or FDEP regulations".

This condition is derived from a federally enforceable regulation (the Department's MWC Rule) and is enforceable by the Department and EPA. However it does not actually place an upper limitation on maximum demonstrated load capacity (in this case steam production). The Facility's ultimate capacity was limited at this point and beyond, by State and not Federally enforceable conditions based on rules and construction permits.

A condition was included that authorized the automatic modification of the Conditions of Certification as follows:

"This certification shall be automatically modified by DEP to conform to any subsequent amendments, modifications, or renewals made by DEP under a federally delegated or approved program to any separately issued PSD permit, Title V Air Permit, or National Pollutant Discharge Elimination System (NPDES) permit for the certified Facility".

7.7. Modification of Florida Site Certification Orders PA78-11 and PA83-11 - Units 1, 2 and 3 (1998)

The Conditions of Certification for Units 1, 2 and 3 were modified by the Department on May 26, 1998 to reflect the final EPA Emissions Guidelines adopted as the Department's MWC Rule. Among the changes was a slightly greater NO_X concentration standard. The conditions included:

- Installation of a scrubber for the ash conditioning building;
- Authorization to use EPA Method 26A to test for hydrogen chloride (HCl) emissions

7.8. DEP Permit No. 1030117-003-AV (2000) Link to Initial Title V Permit

The Department issued the initial Facility Title V Air Operation Permit with an effective date of October 23, 2000. It included requirements from the previously issued PSD permits, Conditions of Certification and the Department's MWC Rule.

The initial Facility Title V permit included a descriptions of Unit 1, 2 and 3 as 1,100 tons/day (maximum) MWC with auxiliary burners. The permitted capacity of Unit was limited by Condition A.7 to 87,500 lb/hour (1050 tons/day) of MSW and 275,000 lb/hour of steam with an averaging time based on "the run time of the test method".

The permitted capacity for Units 1, 2 and 3 was also limited the following manner:

B.9. Capacity

(a) The maximum individual MWC throughput shall not exceed 1,100 tons MSW per day (3,300 tons per day entire facility), 458 MMBtu per hour and 275,000 pounds steam per hour (on a 4-hour block arithmetic average). The MWCs shall not load in excess of their maximum operating capacity, equivalent to 3,300 tons MSW per day total, but no more than 3,000 tons MSW per day on a rolling 12 month average.

(b) The procedures in paragraphs (1) and (2) shall be used for calculating municipal waste combustor unit capacity as defined under CFR 60.51b.

(2) For municipal waste combustor units capable of combusting municipal solid waste continuously for a 24-hour period, municipal waste combustor unit capacity shall be calculated based on 24 hours of operation at the maximum charging rate. The maximum charging rate shall be determined as specified in paragraphs (i) and (ii) as applicable.

(i) For combustors that are designed based on heat capacity, the maximum charging rate shall be calculated based on the maximum design heat input capacity of the unit and a heating value of 12,800 kilojoules per kilogram for combustors firing refuse-derived fuel and a heating value of 10,500 kilojoules per kilogram for combustors firing municipal solid waste that is not refuse-derived fuel.

(ii) (Not reproduced because it is not applicable)

Thus, federally enforceable maximum process limits were established for the first time for Units 1 and 2 with a lifetime of five years (at least until renewal of the Title V permit or establishment by an air construction permit. Note that the stated permitted capacity already applied to Unit 1 in accordance with EPA-issued permit PSD-FL-098 actually applies to Unit 3.

The Title V permit also incorporated the following definition and operational limitations from the Department's MWC rule as conditions:

B.12. "Maximum demonstrated municipal waste combustor unit load" means the highest 4-hour arithmetic average municipal waste combustor unit load achieved during four consecutive hours during the most recent dioxin/furan performance test demonstrating compliance with the applicable limit for municipal waste combustor organics specified under §60.52b(c).

B.15. No owner or operator of an affected facility shall cause such facility to operate at a load level greater than 110 percent of the maximum demonstrated municipal waste combustor unit load as defined in specific condition B.12, except as specified below. The averaging time is specified in specific condition B.17.

Note that these two conditions impose only a temporary operational limitation (within the maximum capacity limitations given in until the subsequent dioxin/furan test is conducted.

7.9. DEP Permit Nos. PSD-FL-011B and PSD-FL-098B (2000): Link to PSD-FL-011B and PSD-FL-098B

The Department further modified the previous EPA PSD permits (reference: DEP File No. 1030117-003-AC) on December 21, 2000 to authorize construction of a Capital Replacement Project. The modifications specifically authorized the following actions:

- Boiler refurbishment consisting primarily of replacement of the components from the furnace gas exit to the economizer gas exit for units 1, 2 and 3;
- Rebuilding the refuse cranes;
- Refurbishment of the cooling tower
- Refurbishment or replacement of feedwater pumps;
- Tipping floor improvements;
- Upgrading the instrument control systems; and
- Upgrading the demineralizer trains in the water regeneration systems.

Pursuant to the PSD rules applicable to steam electrical generating units (and determined to apply to this facility) a condition was included requiring the applicant to submit to the Department for a period of five year representative of normal post-change operations of the units, information demonstrating that the project did not result in a PSD significant increase.

The baseline and estimated future emissions were attached to the permit for the purposes of making future determinations whether the project triggered the PSD rules. Both the actual and projected emissions were much less than allowed by the previous PSD permits, Conditions of certification or the Emission Guideline. No conditions were included regarding process limitations.

The Capital Replacement Project was completed in 2004.

7.10. DEP Permit No. 1030117-003-AV (2005) Link to Title V Permit Renewal

The Department issued the Facility Title V Air Operation Permit Renewal with an effective date of November 15, 2005. It included requirements from the previously issued PSD permits, Conditions of Certification and the Department's MWC Rule.

The permitted capacity of each unit was limited as described in the initial Title V permit Conditions B.9., B.12. and B.15. There was no separate condition applicable to Unit 1.

Thus, another set of federally enforceable process limits were established with a lifetime of five years (at least until subsequent renewal of the Title V permit or establishment by an air construction permit).

7.11. DEP Permit Nos. PSD-FL-011C and PSD-FL-098C (2006) Link to 2006 Permit

As discussed above, the Department again modified the previous EPA PSD permits (reference: DEP File No. 1030117-006-AC) on December 26, 2006 to authorize construction of a Facility Improvement Project. The modifications specifically authorized the following actions:

- Replacement of boiler tubes in the furnace section of the boilers;
- Replacement of stoker grate components within each furnace;
- Replacement of air preheaters for each boiler; and
- Replace the ash processing and storage building and make improvements to the facility's air pollution control systems including the continuous emissions monitoring systems (CEMS).

Pursuant to the Department's PSD rules (adopted in 2006) under New Source Review Reform, the applicant provided estimates of baseline actual emissions before the project and estimates of actual emissions after the projects indicating that PSD will not be triggered. A condition was included in the permit requiring subsequent submittal of emissions information after completion of the project with the estimates provided before initiation of the project and an explanation of differences. Both the actual baseline, projected future emissions and subsequently measured emissions were much less than allowed by the previous PSD permits, Conditions of Certification or the Department's MWC Rule. The Facility Improvement Project was completed in 2010.

7.12. DEP Permit No. 1030117-008-AV (2011) Link to 2nd Title V Permit Renewal

The Department issued the second Title V Air Operation Permit Renewal on August 22, 2011 and which is presently in force. It also included requirements from the previously issued PSD permits, Conditions of Certification and the Department's MWC Rule as updated based on the 2006 revision of the underlying EPA Emissions Guideline. It also includes an updated table with the baseline actual and the future projected emission estimates for the Facility Improvement Project.

The present Title V permit includes the following condition regarding capacity:

A.4. Capacity. The following maximum values (capacities) shall not be exceeded

(a) 1,100 tons/day individual MWC unit throughput of MSW; and

(b) 275,000 lb/hour individual MWC unit steam production on a 4-hour block arithmetic average.

The MWCs shall not be loaded in excess of their maximum operating capacity, equivalent to 3,300 TPD total, but no more than 3,000 TPD on a rolling 12-month average. See 40 CFR 60.31b of Appendix 40 CFR 60, Subpart Cb and 40 CFR 60.58b(j) of Appendix 40 CFR 60, Subpart Eb for additional restrictions on capacity.

[Rules 62-4.160(2) & 62-210.200 (PTE), F.A.C.; 40 CFR 60.31b & 40 CFR 60.58b(j); and, Permit Nos. 1030117-007-AC, PSD-FL-011 & PSD-FL-098, as amended.]

8. SHORT AND LONG-TERM ACTION PLAN

The following was excerpted from the letter report dated August 14, 2012 and transmitted to the Department to establish reasonable assurance of compliance with the Department's MWC Rule, which is the basis upon which the CO BACT determination was conducted.

The County and Veolia have identified some short term corrective actions that can be implemented immediately or in the near future. It is anticipated that these short term actions will help mitigate the impact of swings in the PCRRF's steam load and CO emissions, and thus these short term actions will help the PCRRF maintain compliance with its emission limits until a full evaluation of the root cause(s) and additional potential correction action(s) can be completed. The following paragraphs describe activities that will be included as part of the overall evaluation of the PCRRF' s combustion control system, as well as interim steps that will be taken to assist in minimizing CO emissions.

8.1. Combustion Control Evaluation

The County and Veolia, along with their respective consultants and technical experts, will promptly form a team to evaluate the operating data concerning each event that resulted in excess CO emissions. The team also will evaluate the operating data concerning each event that involved similar CO and steam flow spikes (upward or downward), but did not result in excess CO emissions. This evaluation will more clearly define the conditions and circumstances leading to elevated CO emissions. This evaluation also will help identify the factors that inhibit the PCRRF's ability to respond to elevated emissions in a manner that avoids an exceedance of the CO emission limit. The results of this evaluation will be used to identify the corrective actions that will help ensure the PCRRF' s continued compliance with the CO emission standard.

In addition to these general topics, the evaluation of the PCRRF will include the following specific topics:

- Whether the Martin design associated with the orifice plates for the undergrate air supply system should be changed to allow the PCRRF to balance the air flow to each zone of the undergrate air supply system. The Martin design limits the PCRRF's ability to add additional air to zones 1 & 2 during periods when the waste is wet TISKA is being consulted to determine whether the Martin design should be changed to increase or modify the orifice plate.
- Whether to add cameras to the upper boiler side walls to allow the operators to better monitor the fire in the boilers.
- Whether urea injection should be modified and, if so, how it may affect CO emissions and other plant emissions.
- Whether the air balance calculations established by Martin and TISKA need to be revised.
- Whether wet oxygen analyzers should be installed for use with the combustion control system.
- Whether additional computational fluid dynamics analyses, focusing on CO control, can provide additional steps for improving combustion and reducing CO emissions.
- Whether there are other steps that should be taken to provide for the better management and distribution of the underfire air and overfire air.

The County anticipates that this evaluation of the PCRRF will identify some short term improvements that can be implemented quickly to enhance the combustion process and thus promptly minimize CO emissions. The County also anticipates that some of the recommended improvements to the PCRRF will require capital projects that will be long-term in nature (e.g., changes to the overfire air or underfire air systems).

8.2. Natural Gas Usage

Burning natural gas is one of the primary tools that is available for controlling CO emissions from the PCRRF. Unfortunately, two factors have hindered the PCRRF's ability to eliminate CO exceedances by burning natural gas. First, as noted above, the existing burners require a 20-minute purge time before igniting, which delays the PCRRF s response to elevated CO conditions. Second, the existing burners are not always reliable-i.e., they sometimes trip during start-up and they sometimes trip after they are placed into operation.

The PCRRF is taking steps to overcome both of these factors. For example, when wet fuel is expected, the burners are turned on and kept in operation at low levels until it is determined whether they are needed. This approach ensures that, if the burners are needed, the burners can immediately be operated at higher levels, without incurring any delay due to the 20 minute purge. This approach also reduces the CO emissions during normal operations, thus providing a larger "buffer" in the event that there is a CO spike during wet weather/wet waste conditions.

The County considered the possibility of replacing the existing burners with new, like-kind burners, but this is not an option because the existing burners are no longer commercially available or supported by the vendor. The County now is determining whether the existing natural gas burners should be replaced with new burners and, if so, whether the new burners should be larger than the existing ones.

In any case, whether the PCRRF continues to use the existing burners or it installs new burners, the PCRRF will determine whether a separate air supply system should be provided to the burners on Boilers 1 and 2. Currently, air is taken away from the underfire air system to support the operation of the natural gas burners in Boilers 1 and 2. As noted above, Unit 3 already has a separate burner fan. It is our understanding that the design for Boiler 3 was changed because of the FD fan limitations on the supply of underfire air and overfire air. However, it should be noted that Boiler 3 also has a different overfire air nozzle design than Boilers 1 and 2 These differences will be evaluated, together with the potential replacement of the existing natural gas burners, to determine whether a separate air supply system is advisable.

8.3. Reduce Liquid Content of Waste

As previously discussed, the combustion of wet, low Btu waste is believed to be the primary cause of the CO exceedances that are not related to start up, shut down, or malfunction events. The waste is soaked during heavy rainfall events before being delivered to the PCRRF. The problem is exacerbated when the garbage trucks deliver the waste to the PCRRF, because the garbage trucks often discharge significant quantities of rainwater and other liquids onto the tipping floor. These liquids flow off of the tipping floor and into the refuse storage pit, where the liquids drain through the waste in the pit, and thus further saturating the wet waste.

To address this problem with wet fuel, the County is trying to determine whether the quality of the fuel would be improved by placing absorbent booms next to the pit. The booms will be used to intercept and absorb the liquids that are discharged from the garbage delivery trucks, before the liquids flow into the pit. If the County concludes that intercepting these liquids reduces the PCRRF's CO emissions, the County will determine whether it is appropriate to design and construct a permanent system for capturing these liquids.

Several other options are being evaluated that should enable the County to improve the PCRRF's fuel supply. For example, waste is being stored on the tipping floor, to the extent possible, so that the waste can dry out before it is introduced into the pit (when needed) and mixed with wet waste. Various options are being studied that may increase the amount of storage capacity on the PCRRF's tipping floor. The PCRRF's boilers are being cycled in and out of service to maintain the pit inventory at higher levels, thus allowing the PCRRF to avoid using the wetter waste that is stored in the bottom of the pit. The County has also been hauling mulch (yard trash) to the PCRRF, because the mulch is a drier fuel that can be mixed with the wet waste. Further, the County is also trying to identify other sources of waste that could be brought into the County to supplement the current fuel supply and minimize the need to pull fuel from the lower levels of the pit.