

# **BACT Review for PM<sub>2.5</sub> for the Pinellas County Resource Recovery Facility**

August 10, 2012

At the request of the Florida Department of Environmental Protection (FDEP), Pinellas County (County) prepared this BACT analysis concerning the PM<sub>2.5</sub> emissions from the Pinellas County Resource Recovery Facility (PCRRF). This BACT analysis supplements the modeling reports and other information that already has been submitted to the FDEP in support of the County's application for a PSD permit modification for the PCRRF.

## ***Non-precursor Emissions***

Electrostatic precipitators (ESPs) and baghouses (Fabric Filters-FF) are the most widely used control systems for reducing particulate matter emissions from municipal waste combustor (MWC) units. In the United States, wet scrubbers have been used for the reduction of particulate and sulfur dioxide emissions from coal-fired boilers, but wet scrubbers have rarely been used for particulate matter control on MWC facilities. Wet scrubbers normally are not used at MWC facilities because of the problems associated with wet sludge and wastewater discharges, high energy requirements, and the total system costs for wet scrubbers, especially as a retrofit technology. At most modern MWC facilities, ESPs or FFs are used to control particulate matter because ESPs and FFs are the most effective types of control that have been demonstrated to operate reliably on MWC facilities.

FFs have an advantage over ESPs at those MWC facilities that use a spray dryer/absorber (SDA) to control acid gas emissions. With a FF/SDA system, the filter cake builds up on the fabric bags, thus providing reaction sites for acid gas removal and enhanced particulate recovery. The removal of SO<sub>2</sub> and other sulfur species reduces the subsequent downwind formation of PM<sub>2.5</sub>.

It has been demonstrated repeatedly in individual applications for MWC units, and it was officially acknowledged by the U.S. Environmental Protection Agency

(USEPA) when USEPA promulgated the 2006 MACT standards for new and existing MWC units (70 FR 75351, 2005), that a SDA combined with a FF provides the highest level of consistent control for the emissions of particulate matter (including PM<sub>2.5</sub>) from a modern MWC facility. In this case, the PCRRF already is equipped with a SDA/FF system for the control of PM and PM<sub>2.5</sub> emissions.

### ***Precursor Emissions***

The PCRRF may emit gaseous compounds that are precursors to the formation of PM<sub>2.5</sub>. The primary gaseous precursor compounds potentially emitted in a significant amount by the PCRRF by the requested PSD modification are oxidized sulfur species, predominately SO<sub>2</sub>. These gaseous precursor compounds have the ability to eventually react downwind of the PCRRF and form fine particulate matter, including PM<sub>2.5</sub>.

A BACT analysis for SO<sub>2</sub> was submitted to the FDEP with the County's application for a PSD permit modification on December 7, 2011. The BACT analysis concluded that an SO<sub>2</sub> emission limit of 24 ppm<sub>dv</sub> @ 7% O<sub>2</sub>, based on a 24 hour geometric mean, represents BACT for the PCRRF. The proposed BACT limit for SO<sub>2</sub> should minimize the potential for PM<sub>2.5</sub> to be generated from the PCRRF's SO<sub>2</sub> emissions.

Please note that the proposed BACT limit of 24 ppm<sub>dv</sub> is lower than the current PSD permit limit of 29 ppm<sub>dv</sub>. Consequently, if the proposed BACT limit for SO<sub>2</sub> is adopted in the PSD permit modification, the potential for PM<sub>2.5</sub> to be created from the PCRRF's emissions of SO<sub>2</sub> will be less than it is now.

### ***Selection of BACT for PM<sub>2.5</sub>***

Unfortunately, there is very little data available concerning the PM<sub>2.5</sub> emissions from MWC facilities. None of the existing MWC facilities have permit limits for PM<sub>2.5</sub>. The only proposed emission limit for PM<sub>2.5</sub> is contained in a draft permit (dated May 8, 2012) for the Arecibo Puerto Rico Renewable Energy Project (Arecibo). The proposed Arecibo facility will be comprised of two MWC units, which will burn refuse-derived fuel at a maximum design rate of 2106 tons per day. The proposed PM<sub>2.5</sub> emission limit for Arecibo is 90 tons per year, which is equivalent to 22 mg/dscm @ 7 % O<sub>2</sub>. Compliance with the proposed emission

limit will be determined by using the average of three test runs, according to Section X.A.8. of the draft permit.

In the draft permit for the Arecibo facility, EPA candidly acknowledges that the proposed PM<sub>2.5</sub> emission limit may need to be raised after stack test data are collected for the Arecibo facility, because EPA does not have sufficient data at this time to determine an appropriate emission limit. Section X.A.8.d.i of the draft permit for Arecibo provides:

d. Special PM<sub>2.5</sub> Emission Limit Provisions.

i. Because condensable PM<sub>2.5</sub> emissions from municipal waste combustors have not been widely quantified, there is a possibility that the actual condensable portion of PM<sub>2.5</sub> would cause the above emission limits to be exceeded. In the event that the Permittee cannot meet the 22 mg/dscm @ 7% O<sub>2</sub> because of the condensable PM<sub>2.5</sub>, EPA may adjust the PM<sub>2.5</sub> emissions to a level not to exceed 30 mg/dscm @7% O<sub>2</sub>, 15.28 lb/hr, and 61 TPY (*per unit*) based on EPA's review of the stack test results. This change in the permit will be accomplished administratively.

Please note that the PM<sub>2.5</sub> emission limit for Arecibo is proposed for a new MWC facility, not an existing MWC facility, like the PCRRF. Also note that the PM<sub>2.5</sub> emission limit for Arecibo is based on vendor estimates, rather than stack test data.

Pinellas County has performed some preliminary testing of the PM<sub>2.5</sub> emissions from two of the MWC units at the PCRRF. The test report is attached hereto. During the stack testing, Unit 1 was equipped with 10 ounce fiberglass bags with an EPTFE membrane and Unit 3 was equipped with standard 10 ounce fiberglass bags. Although the testing was very limited, the testing suggests that the PCRRF's emissions were not significantly affected by the type of bags used. The test results may be summarized as follows:

PM<sub>2.5</sub> Stack Test Results

		<i>mg/dscm@7%O<sub>2</sub></i>	<i>lb/hr</i>
<b><u>Unit 1</u></b>			
Filterable <2.5		6.75	2.95
Condensable <2.5		<u>15.30</u>	<u>6.69</u>
Total		<b>22.05</b>	<b>9.64</b>
<b><u>Unit 3</u></b>			
Filterable <2.5		6.35	2.58
Condensable <2.5		<u>13.75</u>	<u>5.59</u>
Total		<b>20.10</b>	<b>8.17</b>
Average		21.08	8.91

These test results demonstrate that EPA’s proposed emission limit for the new boilers at the Arecibo facility is not appropriate for the existing boilers at the PCRRF. The measured PM<sub>2.5</sub> emissions from PCRRF Boiler 1 were 22.05 mg/dscm, which exceeds the proposed Arecibo limit of 22 mg/dscm. The test results suggest that PCRRF Boiler 1 will violate the Arecibo limit.

The County recognizes that the PCRRF’s test results will be averaged when determining whether the PCRRF is in compliance with the PM<sub>2.5</sub> emission limit. Nonetheless, the County and FDEP do not have sufficient data at this time to demonstrate that the PM<sub>2.5</sub> emissions from the PCRRF boilers will comply with the proposed Arecibo emission limit, regardless of how the test results are averaged.

It must be emphasized that there are only two data points concerning the PM<sub>2.5</sub> emissions from the PCRRF. Consequently, we cannot perform a statistical analysis or otherwise account for the normal variability that would be expected in the PCRRF’s operations and emissions. The PM<sub>2.5</sub> emission limit for the PCRRF should not be set at a level that is so low it apparently cannot be met by one of the PCRRF boilers, especially when the proposed limit has not been demonstrated to provide a margin of safety to account for the facility’s normal variability.

Pinellas also investigated the effect of 2 different testing temperatures on the filterable PM<sub>10</sub> levels. This testing demonstrated that the cooler temperature resulted in higher PM<sub>10</sub> levels, primarily in the probe wash. When this data was compared to the PM<sub>2.5</sub> levels measured during the same sampling event (but not concurrently) the PM<sub>2.5</sub> levels were 1.3 to 1.6 times higher than the PM<sub>10</sub> levels.

	Unit	PM <sub>10</sub>	PM <sub>2.5</sub>	Ratio
April 2012	1	17.5	22.05	1.3
	2	16.9		
	3	12.7	20.1	1.6

Given the extremely limited data set for the PCRRF, it would be prudent to use a safety factor when establishing the proposed permit limit for the PCRRF. Accordingly, the proposed BACT emission limit for PM<sub>2.5</sub> emissions from the PCRRF is 30 mg/dscm @ 7% O<sub>2</sub> (approximately 1.42 times the average PM<sub>2.5</sub> measured during the stack test) subject to the same condition for an administrative change that was proposed by EPA for Arecibo:

**Special PM<sub>2.5</sub> Emission Limit Provisions.**

Because condensable PM<sub>2.5</sub> emissions from municipal waste combustors have not been widely quantified, there is a possibility that the actual condensable portion of PM<sub>2.5</sub> will cause the above emission limit for PM<sub>2.5</sub> to be exceeded. In the event that the Permittee cannot meet the emission limit of 30 mg/dscm @ 7% O<sub>2</sub> because of the condensable PM<sub>2.5</sub>, FDEP will increase the emission limit for PM<sub>2.5</sub> to a level not to exceed 35 mg/dscm @7% O<sub>2</sub>, based on FDEP's review of the stack test results. This change in the permit will be accomplished administratively.

The proposed limit of 30 mg/dscm is consistent with the manufacturer's performance representation for a new baghouse as provided in the Arecibo BACT analysis. In addition, the PCRRF uses a shaker type baghouse that is not as comparable to the newer reverse air type proposed for Arecibo. The 35 mg/dscm level is approximately 1.66 times the measured level of PM<sub>2.5</sub> during the April 2012 stack tests.