Pinellas County
ENVIRONMENT AND INFRASTRUCTURE
Solid Waste

August 14, 2012

Robert Wong
Air Program Administrator
Florida Department of Environmental Protection
Southwest District
13051 N. Telecom Parkway
Temple Terrace, FL 33637
Tel: 813-632-7600, Ext. 124

Re: Pinellas County Resource Recovery Facility, Permit 1030117-008-AV

Dear Mr. Wong,

It was a pleasure to meet with you on July 18, 2012 at the Pinellas County Resource Recovery Facility (PCRRF). As requested in your e-mail dated July 24, 2012, the County is sending you this letter to provide additional information concerning the carbon monoxide (CO) emissions from the PCRRF. Specifically, you requested information concerning the following topics:

1. Long-term corrective plan of action
2. Corrective actions taken (not related to routine maintenance, service or repairs)
3. Reports, studies from consultants to investigate combustion problems that may have led to CO exceedances
4. Updated operation and maintenance manual

You additionally requested that we address the intermittent exceedances of the 100 ppm (4-hr block average) emission limit for CO that occurred from May 13 to the present and were not attributable to start up, shut down or malfunction events. All of these topics are addressed in the following sections of this letter.

Factors Potentially Affecting Recent CO Exceedances

Beginning in mid-May 2012, the PCRRF began to experience some sporadic CO exceedances that were not directly attributable to start up, shut down or malfunction events. In general, these exceedances resulted from short duration, high concentration spikes in CO, which caused the 4-hour block averages to exceed the limit of 100 ppm. The cause of these CO spikes is believed to be the quality and quantity of waste that is currently being received at the PCRRF. There are also certain design and operational factors that, combined with the relatively recent changes in the quality and quantity of the waste, have contributed to the difficulties in consistently controlling CO emissions. These issues are discussed below.

Wet Fuel

The increase in CO emissions corresponds with, and is partially caused by, the recent increase in rainfall in Pinellas County. During the month of June, Pinellas County received a record amount of rainfall – 18.7 inches, much of which was associated with Tropical Storm Debby. The month of June also saw the greatest number of excess CO events at the PCRRF. When the waste gets wet, the water reduces the Btu value of the fuel, and makes it difficult to combust the waste efficiently. Combusting wet waste results in erratic steam production and associated difficulties in controlling CO emissions.

Refuse Pit Size

Managing wet fuel at the PCRRF is a challenge because the refuse storage pit at the PCRRF is relatively small. Most waste-to-energy (WTE) facilities have been designed with 5 to 7 days of storage capacity in the refuse pit. By comparison, the refuse pit in the PCRRF was designed to provide only 3 days of storage capacity for the original plant, which consisted of two boilers. The nominal pit capacity is 6000 tons. The County tries to overcome the handicap of having a small pit by stacking the waste as high as possible in the PCRRF's refuse pit, and by stacking some of the waste on the tipping floor. These efforts can be used to increase the PCRRF's storage capacity to almost 10,000 tons. Nonetheless, this amount is only a little more than 3 days' worth of fuel.

The shortage of storage capacity hinders the County's ability to mix and dry the waste. At a typical WTE facility, when wet waste is received, the wet waste is mixed with dry waste from the refuse pit prior to combustion, or the wet waste is segregated in one section of the refuse pit and allowed to drain and dry out prior to combustion. At the PCRRF, there is insufficient space for segregating and drying the wet waste.

Further, as a result of the economic recession, the amount of waste that is being received at the PCRRF is approximately 27% less than the amount that was received in 2006. The current receipts average between 16,000 and 18,000 tons per week, subject to seasonal variations. These quantities exceed the weekly processing capacity of two of the PCRRF's units, but they are not sufficient to allow the PCRRF to operate all three units continuously, as was normally done before the start of the recession. This reduction in waste deliveries has resulted in frequent

operations when the PCRRF is burning the waste that has been stored at or near the bottom of the refuse storage pit. During wet weather, the waste in the bottom of the pit is saturated and thus is very poor quality fuel.

Boiler Size

The PCRRF has three boilers and each boiler can process 1,050 tons per day of solid waste. These are the largest WTE boilers in use in the United States. The PCRRF is the only currently operating mass burn facility that has boilers of this size. The Miami-Dade County Resources Recovery Facility also has 1000 ton per day boilers, but the Miami-Dade facility uses refuse-derived fuel technology, rather than mass burn. The Miami-Dade facility also experienced problems with CO exceedances, in part due to the large size of its boilers.

The control of CO emissions is hindered by the large size of the boilers in the PCRRF. Despite the operator's best efforts to mix the waste before feeding the waste into the boiler, there is variability in the fuel that is spread across the grate in the boiler. This variability in fuel produces variability in the combustion process, and in emissions, across the 45 foot width of the unit.

Natural Gas Burners

When wet waste is burned in the PCRRF, the steam flow fluctuates and can cause elevated emissions of CO. This fluctuation in the combustion process can often only be mitigated by the use of auxiliary burners that fire natural gas. However, there currently is a twenty (20) minute delay before the auxiliary burners at the PCRRF ignite and begin to provide additional heat to enhance the combustion in the PCRR boilers. This delay is necessary to comply with the NFPA purge requirements for boiler safety, but the delay allows excess CO emissions to occur in the boiler while waiting for the natural gas burners to ignite. The purge cycle also places cold air in the furnace, which exacerbates the CO emissions. Further, at times a burner will "trip" (i.e., turn off) during the purge cycle, requiring a complete restart of the purge cycle. For all of these reasons, when there is a swing in steam flow and CO emissions, the existing burners sometimes are not able to react fast enough to prevent a CO exceedance.

As has been noted in the excess emissions reports for the PCRRF, there have also been some issues with the reliability of the existing natural gas burners. Accordingly, the manufacturer was previously called in to assist with troubleshooting these units. Based on the manufacturer's recommendations, an extensive preventive maintenance program was implemented. Among other things, the burners are now tested on a daily basis.

At times, after completion of the purge cycle, one or more of the burners still will not light or they will light and then immediately trip out of service. When this occurs, it can create a wide temperature differential across the boiler. This temperature differential is particularly significant when one burner remains in service and the other burner either does not ignite or immediately trips and shuts down. Under these conditions, the automated combustion controls for the boiler cannot adequately respond to the temperature differential and varying

combustion conditions in the boiler. The automated combustion control system cannot increase the fuel feed rate on only one side of the unit, and it cannot modify the underfire/overfire air ratio differently on the different sides of the boiler. For these reasons, the problems with the existing auxiliary boilers, and the associated problems with elevated CO emissions, cannot be easily overcome by relying on the automated combustion control system.

Combustion Air Supply

The PCRRF's combustion air management system for Boilers 1 and 2 is different than the system used for Boiler 3, which was constructed 3 years after the other two boilers. Since the PCRRF was one of the first WTE facilities constructed in the United States, the design of the PCRRF is not as sophisticated as the design of some of the more modern WTE facilities. For example, at the PCRRF, the force draft fan is used to supply underfire air, overfire air, and burner air for Boilers 1 and 2. By comparison, Boiler 3 has a separate air supply system for burner air. Newer WTE facilities are typically designed with independent underfire, overfire and burner fans. Since the design of the combustion air management system at the PCRRF is not as robust as the design of newer WTE facilities, the combustion air management system may not be supplying enough air to ensure maximum combustion efficiency at all times throughout all three boilers in the PCRRF.

Summary of Recent Reports and Studies Concerning CO Emissions

- Jansen recently completed computational fluid dynamics (CFD) modeling of the PCRRF boilers. The CFD modeling focused on erosion in the second pass of the boiler, but the modeling is useful for understanding the combustion process and dynamics in the boiler. Jansen recommended modifications to the overfire air nozzles in Boilers 1 and 2, which could help improve combustion efficiency and reduce CO emissions. However, before this recommendation is implemented, there will need to be further analyses of the potential impacts associated with this change and with other changes that are being evaluated as part of the Short and Long Term Corrective Action Plan.

- Wolfgang Schmid - TISKA, an expert on Martin grate technology, and Jim Hasselbauer, a DCS consultant, have been on-site several times to evaluate the PCRRF. Among other things, they have measured the air flow of the underfire grate system, evaluated the combustion system, and modified the programming of the automated combustion control system to improve combustion response during wet weather conditions. Recommendations from their trip reports have been implemented, as discussed under "Corrective Actions Completed," below. Other recommendations are included in the discussion of the "Short and Long Term Corrective Action Plans."

- The manufacturer of the existing natural gas burners (Forney) no longer provides support for the PCRRF burners. Veolia has had representatives from Preferred Utilities (former Forney employees) onsite to assist in evaluating and troubleshooting performance of the natural gas burners. Preferred Utilities also has been evaluating options for replacing the existing natural gas burners. Concurrent discussions have taken place with other burner manufacturers, to evaluate other options for replacement of the existing burners.

Corrective Actions Completed

In addition to the studies discussed above, several actions have been taken to improve combustion control and reduce CO emissions, particularly during wet weather conditions.

- Veolia replaced the pneumatic overfire air and ID fan controllers with electrical/mechanical Beck drives to improve the pneumatic system reliability.

- Improvements have been made to the pyrometer controls and steam flow controls during combustion tuning over the last two years.

- Veolia added CO analyzers on the PCRRF's outlet CEMs, and Veolia continues to evaluate the substitution of this outlet CO data in the combustion control when the inlet CEM is calibrating and data is unavailable.

- Veolia installed monitors in the crane pulpit to display steam flow and CO, as well as camera feeds so that the crane operators can view the furnace cameras.

- Veolia routinely conducts training, including refresher training, for the PCRRF's plant operators and crane operators. This training has focused on wet weather operations, including the management of wet waste, the combustion controls and responses that should be used when dealing with wet waste, and the utilization of the CO and steam flow displays that have been added to the crane pulpit to optimize fuel feed and management. Wolfgang Schmid will also conduct additional training and testing.

- Veolia has increased its preventive maintenance on the natural gas burners. Among other things, the burners now are tested daily. Veolia also has upgraded the flame scanners and ignitions and continues to monitor on a daily basis.

- Veolia has reduced its normal steam flow to operating rates around 220,000 bs/hr. Veolia is trying to determine whether this reduction in steam flow will reduce CO emissions and steam spikes, or facilitate better and quicker responses to the spikes.

Short and Long-term Corrective Action Plan

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.

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).

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.

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.

Updated Operations and Maintenance Manual

The updated Operations and Maintenance Manual was submitted electronically to FDEP on August 8, 2012.

Conclusion

The County and Veolia are committed to operating the PCRRF in compliance with all applicable permit limits, and they have been working diligently to investigate the recent CO exceedances at the PCRRF. The County and Veolia believe the short term measures discussed above will enable the PCRRF to comply with the 100 ppm (4-hr block average) emission limit for CO.

They also intend to evaluate a variety of long term measures that may provide further emissions reductions and other benefits to the PCRRF.

Please let me know if you have any questions or need additional information.

Sincerely,

Kelsi Oswald

Ms. Kelsi Jo Oswald, Waste-to-Energy Program Manager
Solid Waste Division
Pinellas County Department of Environment and Infrastructure
(koswald@pinellascounty.org)

Cc: Mr. Robert Hauser, Director, Solid Waste Division, Pinellas County Department of Environment and Infrastructure (rhauser@pinellascounty.org)
Ms. Beth Burns, Environmental Specialist, Pinellas County Department of Environment and Infrastructure, Solid Waste Division (mburns@pinellascounty.org)
Mr. Chris Neu, Vice President/Facility Manager, Veolia Environmental Services (Christopher.neu@veoliaes.com)
Ms. Rebecca Macionski, Environmental Manager, Veolia Environmental Services (Rebecca.Macionski@veoliaes.com)
Ms. Tamara L. Stankunas, President, Earthshine Environmental, Inc. (tstankunas@earthshineinc.com)
Mr. Max Grondahl, Florida Department of Environmental Protection, Southwest District Max.Grondahl@dep.state.fl.us)
Ms. Danielle Henry, Florida Department of Environmental Protection, Southwest District (Danielle.D.Henry@dep.state.fl.us)
Mr. Robert Wong, Florida Department of Environmental Protection, Southwest District (Robert.Wong@dep.state.fl.us)
Mr. Al Linero, Florida Department of Environmental Protection, Tallahassee (alvaro.linero@dep.state.fl.us)
Mr. David Dee, Esq., Gardner, Bist, Wiener, Wadsworth, Bowden, Bush, Dee, LaVia & Wright, P.A.(ddee@gbwlegal.com)