TECHNICAL EVALUATION

APPLICANT

Orlando Utilities Commission
Reliable Plaza, 100 West Anderson
Orlando, Florida 32801

Stanton Energy Center
Facility ID No. 0950137

PROJECT

Project No. 0950137-042-AC
Application for Minor Source Air Construction Permit
Activated Carbon Injection Trial Burn

COUNTY

Orange 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

March 27, 2014

1. GENERAL PROJECT INFORMATION

1.1. Air Pollution 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: 62-4 (Permits); 62-204 (Air Pollution Control – General Provisions); 62-210 (Stationary Sources – General Requirements); 62-212 (Stationary Sources – Preconstruction Review); 62-213 (Operation Permits for Major Sources of Air Pollution); 62-296 (Stationary Sources - Emission Standards); and 62-297 (Stationary Sources – Emissions Monitoring). Specifically, air construction permits are required pursuant to Chapters 62-4, 62-210 and 62-212, F.A.C.

In addition, the U. S. Environmental Protection Agency (EPA) establishes air quality regulations in Title 40 of the Code of Federal Regulations (CFR). Part 60 specifies New Source Performance Standards (NSPS) for numerous industrial categories. Part 61 specifies National Emission Standards for Hazardous Air Pollutants (NESHAP) based on specific pollutants. Part 63 specifies NESHAP based on the Maximum Achievable Control Technology (MACT) for numerous industrial categories. The Department adopts these federal regulations in Rule 62-204.800, F.A.C.

1.2. Facility Description and Location

The Orlando Utilities Commission (OUC) Stanton Energy Center is a nominal 1,876 megawatt (MW) electric generation facility. This facility consists of two fossil fuel fired boiler electrical generating units (Units 1and 2); two combined cycle combustion turbine-electrical generators (Units A and B); solid fuels, fly ash, limestone, gypsum, slag, bottom ash storage and handling facilities; and, fuel oil storage tanks.

The existing Stanton Energy Center is located in Orange County at 5100 South Alafaya Trail in Orlando, Florida. The UTM coordinates of the existing facility are Zone 17, 483.6 kilometers (km) East, and 3151.1 km North. This site is in an area that is in attainment (or designated as unclassifiable) for all air pollutants subject to state and federal Ambient Air Quality Standards (AAQS). **Figure 1** shows the location of OUC Stanton Energy Center in Florida while **Figure 2** shows a view of the Stanton Energy Center.

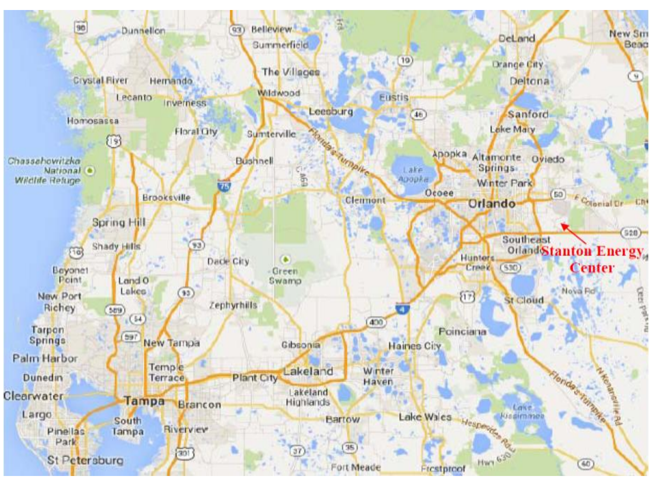


Figure 1. Location of OUC Stanton Energy Center. **Figure 2. OUC Stanton Energy Center.**

Units 1 and 2 fire coal and No. 6 fuel oil and have a combined electrical generating output of 936 MW. Unit A fires pipeline natural gas and diesel fires and has a total nominal capacity of 640 MW and will achieve approximately 700 MW during extreme winter peaking conditions. Unit B fires pipeline natural gas and has a design electrical generating capacity of 300 MW.

Units 1 and 2 consist of the following control equipment: nitrogen oxide (NO_X) emissions are controlled by low NO_X burners (LNB), overfire air system (OFA) and a selective catalytic reduction (SCR) system to further control

NO_X; particulate matter (PM) emissions are controlled by dry electrostatic precipitator (ESP), while sulfur dioxide (SO_2) emissions are controlled by wet flue gas desulfurization (FGD). These units are equipped with continuous opacity monitoring systems (COMS) and continuous emissions monitoring systems (CEMS) to measure carbon monoxide (CO), NO_X and SO_2. Unit 1 began operation in 1987 and Unit 2 began operation in 1996.

Units A and B are equipped with dry low-NO_X (DLN) combustors as well as SCR to control NO_X emissions. These units are equipped with CEMS to measure CO and NO_X. Unit A began operation in 2003 and Unit B began operation in 2009.

1.3. Facility Regulatory Categories

- The facility is a major source of hazardous air pollutants (HAP).
- The facility operates units subject to the acid rain provisions of the Clean Air Act.
- The facility is a Title V major source of air pollution in accordance with Chapter 62-213, Florida Administrative Code (F.A.C).
- The facility is a Prevention of Significant Deterioration (PSD) major stationary source of air pollution in accordance with Rule 62-212.400, F.A.C.
- The facility operates units subject to the New Source Performance Standards (NSPS) of Title 40 Code of Federal Regulations (CFR) Part 60.
- The facility operates units subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP) of 40 CFR Part 63.
- The facility is subject to the Federal Clean Air Interstate Rule (CAIR) as implemented by FDEP in Rule 62-296.470, F.A.C.

1.4. Project Description

On March 18, 2018, the Department received an application from OUC to install and operate a calcium bromide ($CaBr_2$) and activated carbon injection demonstration project at the Stanton Energy Center. The purpose of this project is to explore mercury mitigation measures by activated carbon injection testing and $CaBr_2$ spray application to the coal to reduce emissions of mercury to meet the applicable Mercury and Air Toxics (MATS) compliance standards in 40 CFR Part 63, subpart UUUUU - National Emission Standards for Hazardous Air Pollutants: Coal- and Oil-Fired Electric Utility Steam Generating Units.

The proposed technology will consist of powered activated carbon (PAC) that will be injected via an activated carbon injection (ACI) system in the flue gas downstream of the air preheater in Stanton Unit 1 using the existing dry sorbent injection ports. In the flue gas duct, the injected carbon acts as a surface catalyst to convert the elemental mercury to oxidized mercury. The carbon particles are captured predominantly by the ESP. The remaining carbon particles are removed in the wet FGD system. In addition, for a temporary period, $CaBr_2$ will be sprayed applied to the coal to determine if this application reduces mercury emissions.

ACI equipment will consist of a blower conveying PAC from bulk bags through injection lances into the boiler, ESP or ductwork. Unit 1 is scheduled to come down for an outage on April 26, 2014, and 8-days of testing is scheduled to start prior to outage in order to create a specification for the silo, which is the longest lead time item. Testing will last for 90 non-consecutive day's total. **Table 1** shows the emission unit (EU) at the OUC Stanton Energy Center effected by this project.

TABLE 1 – EFFECTED EMISSION UNITS.

EU ID No.	Emission Unit Description
001	Fossil Fuel Fired Steam Generator No. 1

2. PSD APPLICABILITY

2.1. General PSD 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 certain regulated pollutants. Commonly addressed PSD pollutants for electrical generating facilities such as the Stanton Energy Center include: CO, NO_X, PM, PM with a mean diameter of 10 microns or less (PM_{10}), PM with a mean diameter of 2.5 microns or less ($PM_{2.5}$), SO_2, volatile organic compounds (VOC), sulfuric acid mist (SAM), and mercury.

Additional PSD pollutants that are more common to certain other industries include: lead (Pb), hydrogen sulfide (H_2S), TRS including H_2S, reduced sulfur compounds (RSC) including H_2S, municipal waste combustor (MWC) organics measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans (dioxin/furan), MWC metals measured as PM; MWC acid gases measured as SO_2 and HCl, 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; or
- 100 tons/year or more of any PSD pollutant and the facility belongs to one of the 28 listed PSD major facility categories.

The list given in the citation includes the category of "Electric Services". This category applies to the OUC Stanton Energy Center before and after the proposed project. Consequently, the Stanton Energy Center 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 Stanton Energy Center, 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 tons/year (TPY) as applicable) for only one PSD pollutant, a project must include Best Available Control Technology (BACT) controls for any PSD pollutant that exceeds the corresponding significant emission rates given in Error! Reference ource not found. below.

TABLE 2 – LIST OF SER BY PSD-POLLUTANT. [A, C]

Pollutant	SER (TPY)	Pollutant	SER (TPY)
CO	100	NO_X	40
$PM/PM_{10}/PM_{2.5}$	25/15/10	Ozone (VOC) [b]	40
$PM_{2.5}$ (NO_X)	40	$PM_{2.5}$ (SO_2)	40
Ozone (NO_X) [b]	40	SAM	7
SO_2	40	Pb	0.6
Hg	0.1	GHG (CO_2e)	75,000 [c]

a. Excluding fluoride and those pollutants defined for Pulp and Paper, MWC, MSW landfills.
b. Ozone (O_3) is regulated by its precursors (VOC and NO_X). PSD for $PM_{2.5}$ can be triggered by its precursors (NO_X and SO_2).
c. Federal SER of 75,000 TPY for GHG (as CO_2e) for PSD sources and 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.

2.2. PSD Applicability for Project

The project is located in Orange County which is in an area that is currently in attainment with the AAQS or is otherwise designated as unclassifiable. As provided in the application, **Table 3** below summarizes potential emissions and PSD applicability for the project

TABLE 3 – SUMMARY OF THE APPLICANT'S PSD APPLICABILITY ANALYSIS.

Pollutant	Potential Emissions (TPY) [a]	Significant Emissions Rate (TPY)	Subject to PSD?
PM [b]	2.3	25	No
PM_{10} [c]	1.1	15	No
$PM_{2.5}$ [d]	0.2	10	No

a. Tons/year = TPY
b. PM emissions calculations are based on a maximum control efficiency or Unit 1 FGD.
c. PM_{10} emissions rate conservatively assumes 50% of total PM is PM_{10}.
d. $PM_{2.5}$ emission rate conservatively assumes that 10% of total pm is $PM_{2.5}$.

As shown in **Table 3**, total project emissions will not exceed the PSD significant emissions rates; therefore, the project is not subject to PSD preconstruction review.

3. DEPARTMENT REVIEW

The $CaBr_2$ and ACI demonstration project is a trial burn to evaluate the effectiveness of these technologies in reducing emissions of mercury. The project will comply with the states implementation plan and all other requirements necessary to attain and maintain the national ambient air quality standards during the project and after it is terminated.

3.1. Fossil Fuel Fired Steam Generator No. 1 (EU 001)

Unit No. is a 4,800 million British thermal unit per hour (MMBtu/hour) coal-fueled Babcock and Wilcox water-tube wall fired boiler/steam generator (Model RB 611) and steam turbine, which drives a generator with a nameplate rating of 468 MW. No. 6 fuel oil is used for startup and flame stabilization. Air pollution control equipment consists of an ESP for PM/ PM_{10}, LNB and OFA for NO_X control; and a wet FGD system, (i.e., a scrubber) for SO_2 control. A Dry Sorbent Injection (DSI) System was recently installed that is used to inject hydrated lime into the exhaust gas ductwork upstream of the ESP to minimize SO_3 formation and ultimately to control sulfuric acid (H_2SO_4) emissions. This unit is equipped with COMS to measure opacity and a CEMS to measure CO, NO_X, SO_2, and mercury.

3.2. ACI System

The temporary ACI testing will last approximately 90 non-consecutive operational days to evaluate the technology and accumulate enough mercury CEMS data to determine if this process will reduce mercury emissions.

Equipment will consist of a blower conveying PAC from bulk bags through injection lances into the boiler, ESP or ductwork. The sorbent injection system will utilize bulk bags (900 to 1,000 pounds (lb) each). These bulk bags will be sealed to a day hopper on a gravimetric feeder and then be discharged directly to the duct. There is no bulk material transfer or bin vents with the ACI system that is intended to be used for the project. Therefore, there is no emission point or vented emissions from the proposed sorbent storage system.

The PAC will be delivered to the injection points in the flue gas stream via a pneumatic conveying system. The location of the PAC injection points will be prior to the ESP, with a typical location shown in **Figure 3** below. The PAC injection rates will vary during the demonstration period based on emission control levels and operational parameters, but is estimated to be up to a maximum of 700 pounds per hour (lb/hour) for mercury mitigation. The PAC will react with mercury in the flue gas stream to form particulate matter that will be removed in the ESP, with additional removal in the wet FGD downstream of the ESP. During the testing program, mercury emissions will be continuously monitored with the existing CEMS and PM testing will be conducted.

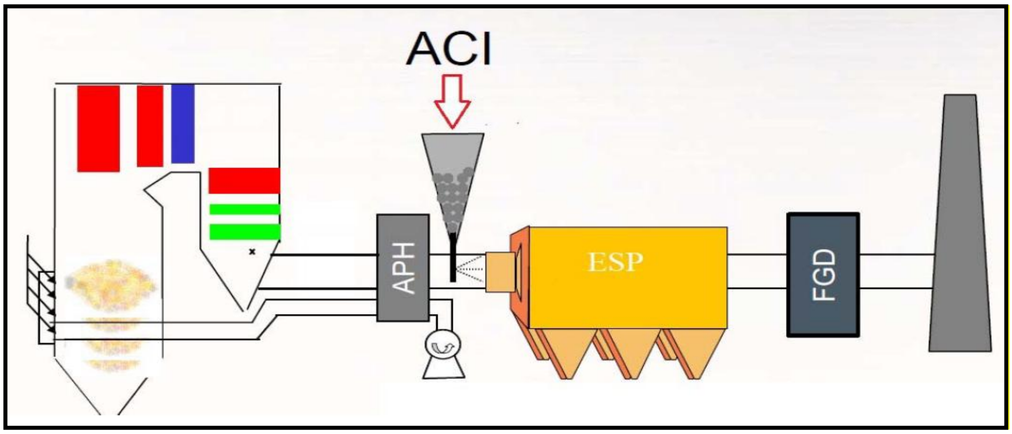


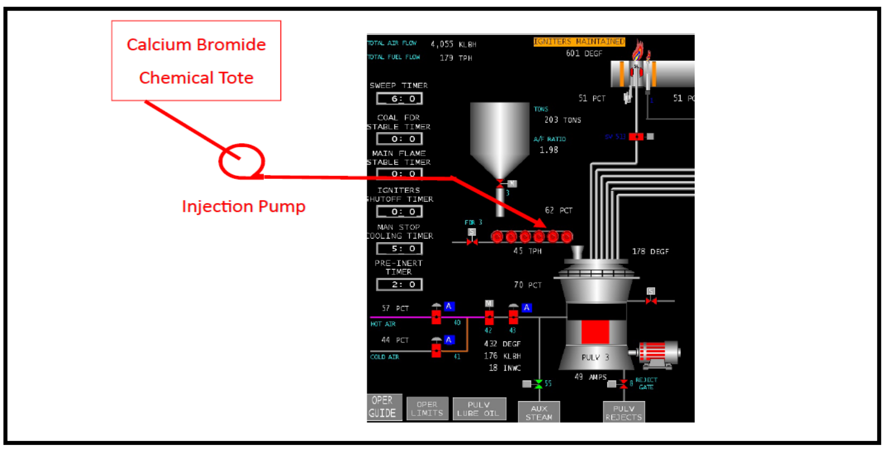
Figure 3. Typical ACI Injection System Configuration.

3.3. Calcium Bromide Spray Application

The temporary $CaBr_2$ spray application to the coal (see **Figure 4**) will also last approximately 90 non-consecutive operational days to accumulate enough mercury CEMS data to determine if this application reduces mercury emissions. The application specifications and rates consist of:

- Maximum per hour application rate would be 222 lb/hr of 7895 solution or 15.6 gallons/hour (gal/hr);
- MERCONTROL® 7895 application is used for mercury control and consists of 52% $CaBr_2$ solution, which indicates an hourly maximum average of 115.4 (lb/hour of $CaBr_2$);
- Ancillary equipment emission source – none.

Figure 4. Calcium Bromide Spray Application Demonstration Project.



In the boiler, CaBr2 converts to hydrogen bromide (HBr), which is effectively removed in the wet FGD system.

3.4. Emissions

The applicant did a comparison of potential air emission rates to compare the air emissions resulting from the proposed project. The results showed that the proposed project will have a reduction in mercury emissions. However, the project will potentially result in a slight increase emissions of PM, PM_{10}, and $PM_{2.5}$. The effect on other criteria pollutants is considered to be neutral.

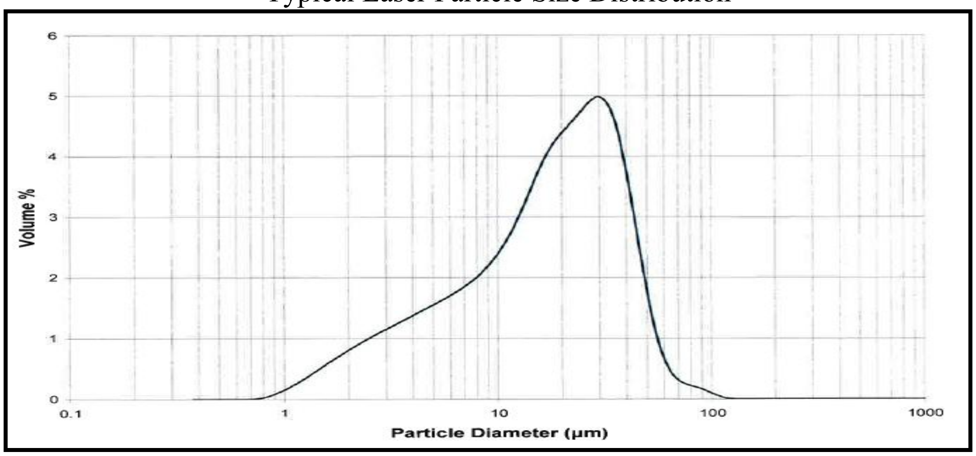
3.4.1. Particulate Matter (see **Table 3**)

Emissions of PM_{10}/$PM_{2.5}$ from the Unit 1 stack are estimated at 1.1 TPY and 0.2 TPY, respectively. The estimated potential emission includes an ESP efficiency of 99.7%. Not included in these estimates are the approximate additional 50% control provided by the wet FGD, which would reduce these estimates to 0.6 TPY for emission of PM_{10} and 0.1 TPY for emissions of $PM_{2.5}$.

The application provided the following particle size distribution graph (see **Figure 5**) used in estimating the PM emissions. The particle size distribution was based on the type of activated carbon expected to be used in the project.

Figure 5. PM Particle Sizes.

Typical Laser Particle Size Distribution



	< 5%	< 10%	< 50%	< 90%	< 95%
Particle Size, µm:	2.402	3.663	18.85	42.48	49.78

According to the study, the mean size of the distribution is 21.6 micron meters (µm), with less than 50% (by volume) of particles below 19 µm and less than 5% (by volume) of the particulates below 2.4 µm. Therefore, OUC conservatively assumed that 50% (by volume) of the particles in the PAC are below 10 microns in size and 10% (by volume) of particles are below 2.5 micron size.

The addition of the temporary sorbent injection system, as well as sorbent spray application to the coal will result in a slight increase in PM emissions due to the sorbent handling and storage. The potential emissions from the proposed ACI system for Unit 1 will be insignificant since the proposed activities will emit less than 5 TPY of any criteria pollutant.

3.4.2. Visible Emissions

The proposed sorbent injection system will utilize bulk bags (900 to 1,000 pounds each). These bulk bags will be sealed to a day hopper on a gravimetric feeder and then be discharged directly to the duct. There is no bulk material transfer or bin vents with the system intended to be used. Therefore, there is no emission point, or vented emissions from the proposed sorbent storage system that will be subject to these standards.

4. CONCLUSION

Pursuant to Rule 62.4.040(1)(b) of the Florida Administrative Code (F.A.C.) and for the reasons previously stated, the Office of Permitting and Compliance determines that the activity will not emit air pollutants, *"... in sufficient quantity, with respect to its character, quality or content, and the circumstances surrounding its location, use and operation, as to contribute significantly to the pollution problems within the State, so that the regulation thereof is not reasonably justified."* Therefore, the project is exempt from the requirement to obtain an air construction permit. This determination may be revoked if the proposed activity is substantially modified or the basis for the exemption is determined to be materially incorrect. Tammy McWade is the project engineer responsible for reviewing the application and drafting the permit. Additional details of this analysis may be obtained by contacting the project engineer at the Department's Office of Permitting and Compliance at Mail Station #5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400.