TECHNICAL EVALUATION
AND
PRELIMINARY DETERMINATION

Orlando Utilities Commission

Curtis H. Stanton Energy Center Units 1 & 2

Temporary Operational Trial to use Coal Additive

Orange County

DEP File No. 0950137-028-AC

Florida Department of Environmental Protection
Division of Air Resource Management
Bureau of Air Regulation
Special Projects Section

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1. GENERAL PROJECT INFORMATION

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 Rules 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 on a quarterly basis in Rule 62-204.800, F.A.C.

Facility Description and Location

The Orlando Utilities Commission (OUC) operates the Curtis H. Stanton Energy Center (OUC Stanton), which is categorized under Standard Industrial Classification Code No. 4911, Electrical Services. OUC Stanton is located in Orange County at 5100 South Alafaya Trail. The UTM coordinates of the existing facility are 483.6 km East and 3151.1 North. The location of the OUC Stanton Energy Center is shown in Figure 1.

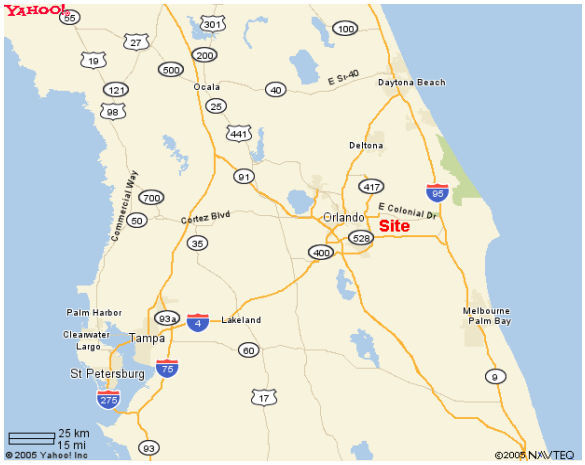

Figure 1 - OUC Stanton Location.

Figure 2 - OUC Stanton Units 1 and 2.

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).

Facility Regulatory Categories

- The facility is a potential major source of hazardous air pollutants (HAP).
- The facility operates existing 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 213, F.A.C.

- The facility is a major stationary source in accordance with Rule 62-212.400, F.A.C. for the Prevention of Significant Deterioration (PSD) of Air Quality.
- The facility is subject to the Clean Air Interstate Rule (CAIR) set forth in Rule 62-296.470, Florida Administrative Code (F.A.C.).
- The facility operates units subject to the Standards of Performance for New Stationary Sources (NSPS) pursuant to 40 CFR Part 60.
- The facility was originally certified pursuant to the power plant siting provisions of Chapter 62-17, F.A.C.

Project Description

OUC Stanton consists of two bottom fired, fossil fuel steam electrical generating units (Stanton 1 and 2) and two combined cycle units. Stanton 1 and 2 (shown in Figure 2 above) began operation in 1987 and 1996 respectively and each is rated at 468 megawatts (MW). Coal is the primary fuel used in Stanton 1 and 2.

OUC and Chem-Mod LLC, an environmental services company based in Stow, Ohio, are exploring the use of additives to reduce emissions. The concept is to inject two additives described as MerSorb and S-Sorb on the coal feed belt before combustion. The approach is marketed as the "The Chem-Mod™ Solution".

According to the material safety data sheet (MSDS), S-Sorb (specifically the S-Sorb III formulation) is made from materials mined from the earth and is processed using energy provided by fuels. It is a mineral composite primarily consisting of: calcium compounds such as gypsum, lime and calcium carbonate (CaO, $CaSO_4$, $CaCO_3$); calcium silicates; and iron (Fe) and aluminum (Al) compounds. The mineral contains trace amounts of naturally occurring compounds such as: free crystalline silica (SiO_2), potassium and sodium compounds (Na and K); heavy metals including cadmium (Cd), chromium (Cr), nickel (Ni) and lead (Pb); and organic compounds. The second additive, MerSorb, is a halide salt solution, consisting of approximately 50 percent calcium bromide (CaBr) and 50 percent water.

According to Chem-Mod LLC literature, the following can be achieved by their dual additive injection system:

- Reduction of sulfur dioxide (SO_2) and nitrogen oxides (NO_X);
- Reduction of heavy metals such mercury (Hg) and arsenic (As);
- Reduction of chlorides;
- Increased furnace efficiency through reduced slagging of the coal-fired plant's boiler tubes; and
- Generation of fly ash that can be sold as a bulk ingredient in the production of concrete as a partial replacement to Portland cement.

The table on the following page is a summary of tests conducted by Chem-Mod LLC and its partners at other locations and the claimed reductions of Hg, sulfur (presumably as SO_2 and sulfuric acid mist) and NO_X. The tests were conducted on boilers rated between 30 to 190 MW, with stoker, cyclone or tangential-fired configurations, firing Powder River Basin (PRB) coal and Northern Appalachian coals.

The Department has not reviewed the results and neither agrees with nor disputes the claims. Clearly the same level of performance would not be expected at OUC Stanton because the units already have wet scrubbers, low NO_X burners (LNB), overfire air (OFA) and selective catalytic reduction (SCR) for further NO_X reduction on Unit 2. This equipment already accomplishes significant reductions in SO_2, NO_X and Hg. To achieve similar performance, it would be necessary at the very least to turn down the operation of some of the existing add-on control equipment.

Testing Site	Timing Of Tests	Mercury (%)	Sulfur (%)	NO_X (%)
Commercial Test # 1	October 2005	98	40	21
Commercial Test # 2	November 2005	90	75	10
Commercial Test # 3	December 2005	86	48	18
Commercial Test # 4	August 2006	87	68	31
Commercial Test # 5	October 2006	98	65	13

The main purpose of the present tests is to demonstrate nitrogen oxides (NO_X) removal by The Chem-Mod™ Solution at OUC Stanton Units 1 and 2. The tests will also be conducted to evaluate the effects on unit performance, slagging and fly ash loss on ignition (LOI).

The general manner by which the additives would be introduced at a permanent installation can be seen at the following link:

http://www.chem-mod.com/chemmodsolution_animation.html

For the OUC Stanton tests, the following temporary operations and equipment are required:

- Truck transportation of additives to site;
- Solid S-Sorb storage silo with vent baghouse and pneumatic blower;
- S-Sorb day silo with rotary air lock;
- Three screw conveyers;
- 950 ton per hour (TPH) coal mixer;
- Liquid MerSorb storage tank;
- Liquid MerSorb day tank with feed pump; and
- A 500 kilowatt (kW) electrical generator to provide power to the test system.

Use of sorbents is a common practice for a variety of reasons at coal-fueled plants. One example is the Gainesville Regional Utilities (GRU) Deerhaven Generation Station where pebble lime is used to reduce arsenic in the furnace exhaust to protect the selective catalytic reduction (SCR) system. The lime injection system is visible below. The system is equipped with its own bin filter and vacuum system to minimize dust emissions.

Department staff visited the GRU site on December 3, 2009 and no visible emissions were noticed from the arrangement shown in Figure 3.

A flow diagram of the test system setup planned at OUC Stanton is shown on the following page.

Figure 3 - Sorbent Injection System at GRU.

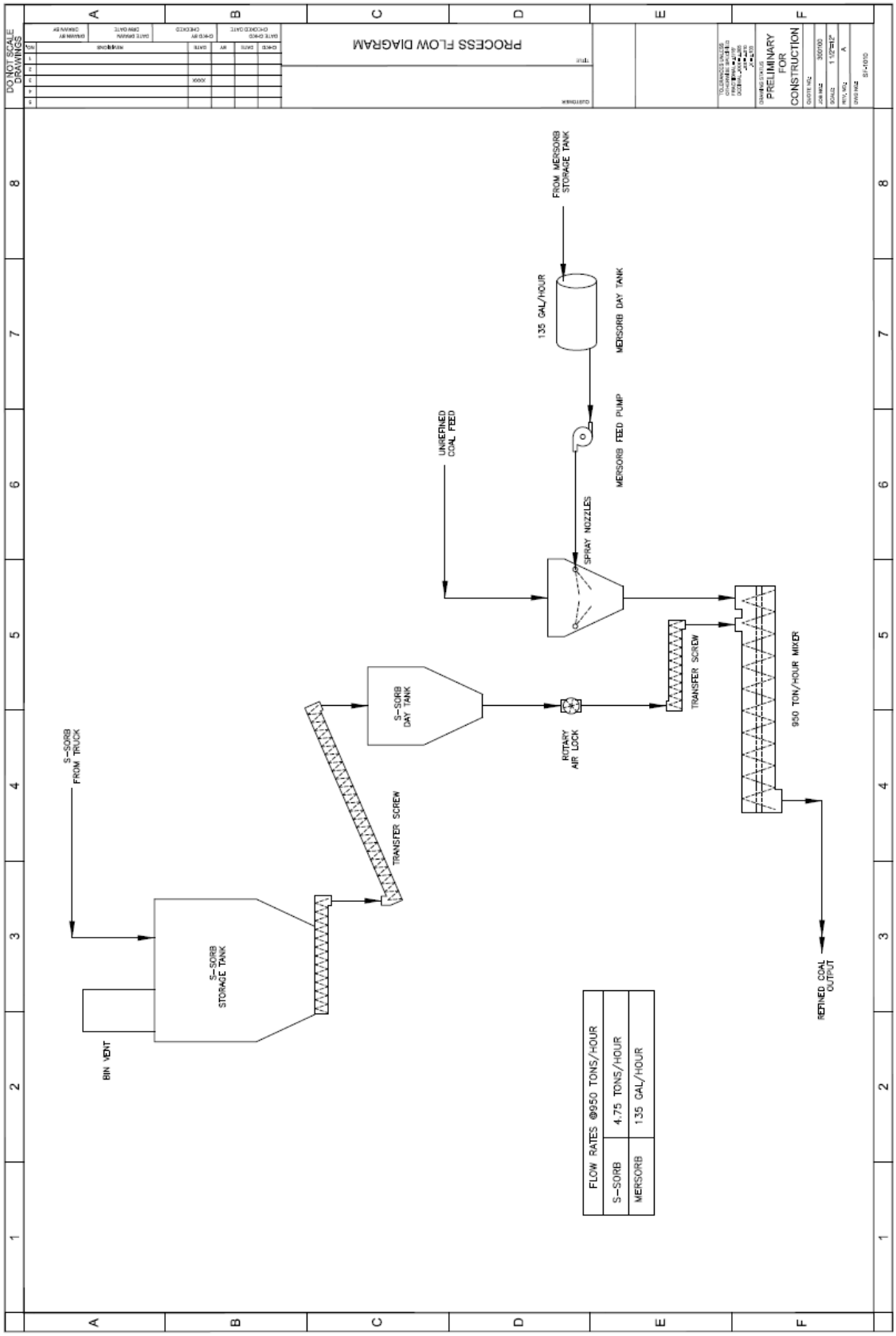

Figure 4 - Flow Diagram of the Chem-Mod™ Solution Test System Setup.

2. PSD APPLICABILITY

General PSD Applicability

For areas currently in attainment with the state and federal AAQS or areas otherwise designated as unclassifiable, the Department regulates major stationary sources of air pollution in accordance with Florida's PSD preconstruction review program as defined in Rule 62-212.400, F.A.C. Under preconstruction review, the Department first must determine if a project is subject to the PSD requirements ("PSD applicability review") and, if so, must conduct a PSD preconstruction review. A PSD applicability review is required for projects at new and existing major stationary sources. In addition, proposed projects at existing minor sources are subject to a PSD applicability review to determine whether potential emissions *from the proposed project itself* will exceed the PSD major stationary source thresholds. A facility is considered a major stationary source with respect to PSD if it emits or has the potential to emit:

- 5 tons per year or more of lead;
- 250 tons per year or more of any regulated air pollutant; or
- 100 tons per year or more of any regulated air pollutant and the facility belongs to one of the following 28 PSD-major facility categories: fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input, coal cleaning plants (with thermal dryers), Kraft pulp mills, Portland cement plants, primary zinc smelters, iron and steel mill plants, primary aluminum ore reduction plants, primary copper smelters, municipal incinerators capable of charging more than 250 tons of refuse per day, hydrofluoric, sulfuric, and nitric acid plants, petroleum refineries, lime plants, phosphate rock processing plants, coke oven batteries, sulfur recovery plants, carbon black plants (furnace process), primary lead smelters, fuel conversion plants, sintering plants, secondary metal production plants, chemical process plants, fossil fuel boilers (or combinations thereof) totaling more than 250 million British thermal units per hour heat input, petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels, taconite ore processing plants, glass fiber processing plants and charcoal production plants.

Once it is determined that a project is subject to PSD preconstruction review, the project emissions are compared to the "significant emission rates" defined in Rule 62-210.200, F.A.C. for the following pollutants: carbon monoxide (CO); nitrogen oxides (NO_X); sulfur dioxide (SO_2); particulate matter (PM); particulate matter with a mean particle diameter of 10 microns or less (PM_{10}); volatile organic compounds (VOC); lead (Pb); fluorides (F); sulfuric acid mist (SAM); hydrogen sulfide (H_2S); total reduced sulfur (TRS), including H_2S; reduced sulfur compounds, including H_2S; municipal waste combustor organics measured as total tetra- through octa-chlorinated dibenzo-p-dioxins and dibenzofurans; municipal waste combustor metals measured as particulate matter; municipal waste combustor acid gases measured as SO_2 and hydrogen chloride (HCl); municipal solid waste landfills emissions measured as non-methane organic compounds (NMOC); and mercury (Hg). In addition, significant emissions rate also means any emissions rate or any net emissions increase associated with a major stationary source or major modification which would construct within 10 kilometers of a Class I area and have an impact on such area equal to or greater than 1 $\mu g/m^3$, 24-hour average.

If the potential emission exceeds the defined significant emissions rate of a PSD pollutant, the project is considered "significant" for the pollutant and the applicant must employ the Best Available Control Technology (BACT) to minimize the emissions and evaluate the air quality impacts. Although a facility or project may be *major* with respect to PSD for only one regulated pollutant, it may be required to install BACT controls for several "significant" regulated pollutants.

PSD Applicability for Project

According to the applicant:

- Hg emissions should be significantly reduced by as much as 40 percent from baseline levels;
- NO_X emissions should be reduced as much as 20 percent from baseline levels;
- SO_2 emissions should be comparable to baseline levels;
- Carbon monoxide (CO), volatile organic compounds (VOC) emissions and visible emissions (opacity) should be comparable to baseline levels; and
- Particulate matter (PM/PM_{10}) emissions will increase slightly due to the additional project equipment, but may be reduced overall due to the fuel additive causing an increase in combustion efficiency.

The Department agrees with the applicant's assertions with the exception of the claim regarding Hg. The reason is that Hg tests will not actually be conducted at OUC and the Units already achieve significant Hg reduction using the existing add-on controls. The following table summarizes potential emissions and PSD applicability for the test as if it were conducted continuously for an entire year (8,760 hours). However the request is only for 90 days (2,160 hours) of testing.

Pollutant	Emissions for Temporary Trial			Significant Emissions Rate	Subject to PSD?
	Test Equipment	Units 1 and 2 Combustion	Maximum Increase		
CO	16.8 tons	Negligible Change	16.8 tons	100 tons/year	No
NO_X	17.4 tons	Possible Reduction	17.4 tons	40 tons/year	No
PM	11.5 tons	Negligible Change	11.5 tons	25 tons/year	No
PM_{10}	1.1 tons	Negligible Change	1.1 tons	15 tons/year	No
SO_2	0.03 tons	Negligible Change	0.03 tons	40 tons/year	No
VOC	2.1 tons	Negligible Change	2.1 tons	40 tons/year	No
Hg	~0 pounds (lb)	Possible reduction	Possible reduction	200 lb/year	No

3. DEPARTMENT REVIEW

Emissions

The use of the fuel (coal) additive Chem-Mod™ in OUC Units No. 1 and 2 will potentially result in emission decreases of NO_X, while emissions of SO_2, VOC and CO should remain relatively unchanged. PM emissions may increase slightly but not to significant levels. Mercury emissions may be reduced. In summary, except for possible fugitive PM emissions caused by the equipment required to apply the Chem-Mod™ additive to the coal during the test, pollutant emissions increases, if any, should be adequately controlled by the existing add-on controls during testing. Thus, the Department has reasonable assurance that no significant increase in any air pollutant will result from conducting this test.

4. CONCLUSION

The requested trial will burn a small amount of Chem-Mod additive to determine if it is operationally feasible and will result in decreases in air pollutant emissions, if any. Further, the existing add-on pollutant control devices on OUC Units No. 1 and 2 are sufficient to ensure that any possible air pollutant emission increases from testing the fuel additive will be very low. The applicant will be required to comply with all existing valid permit conditions. See the draft permit for the specific conditions that will be enforced during this test.