TECHNICAL EVALUATION
&
PRELIMINARY DETERMINATION

APPLICANT

Polk Power Partners, L.P.
(Northern Star Generation LLC)

3600 County Road 555
Bartow, Florida 33830

Mulberry Cogeneration Facility
Facility ID No. 1050217

PROJECT

Project No. 1050217-012-AC
Application for Minor Source Air Construction Permit
Replacement of Air Chilling System

COUNTY

Polk 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

June 2, 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 Mulberry Cogeneration Facility is an existing power plant, which is categorized under Standard Industrial Classification Code No. 4911. The existing power plant is located in Polk County at 3600 County Road 555 in Bartow, Florida. The map coordinates are: Zone 17, 413.6 km East and 3080.6 km North; Latitude 27° 50’ 56” North and Longitude 81° 52’ 39” West. 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).

The Mulberry Cogeneration Facility has a capacity of 126 megawatts (MW) and consists of the following equipment:

- One natural gas-fueled General Electric Model No. PG-7111EA combustion turbine rated at 82 MW. The combustion turbine is fueled with natural gas. New No. 2 fuel oil is used as backup fuel. The CT is equipped with dry low NO_X (DLN) burners and water injection for the control of nitrogen oxides (NO_X).
- An unfired heat recovery steam generator (HRSG) uses the turbine exhaust gas to produce steam.
- A steam turbine-electrical generator rated at 44 MW uses steam generated by the HRSG.
- One natural gas-fueled Foster Wheeler Limited boiler rated at 99 million Btu per hour (MMBtu/hr).
- One fuel oil tank with a capacity of approximately 720,000 gallons.
- One 175 horsepower (hp) emergency fire pump.

1.3. Facility Regulatory Categories

- The facility is not major source of hazardous air pollutants (HAP).
- This facility operates units subject to the National Emissions Standards for Hazardous Air Pollutants (NESHAP) of 40 Code of Federal Regulations (CFR) 63.
- The fire pump engine is subject to 40 CFR 63 Subpart ZZZZ, NESHAP for Stationary Reciprocating Internal Combustion Engines (RICE).
- This facility operates units subject to the New Source Performance Standards (NSPS) of 40 Code of Federal Regulations (CFR) Part 60.
- The combustion turbine unit is regulated under NSPS - 40 CFR 60 Subpart KKKK, Standards of Performance for Stationary Combustion Turbines.

- The secondary boiler is subject to NSPS - 40 CFR 60, Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units.
- The facility is subject to the Title IV Acid Rain provisions of the Clean Air Act.
- This facility is subject to the Clean Air Interstate Rule (CAIR) in accordance with Rule 62-296.470, F.A.C.
- The facility is a Title V major source of air pollution in accordance with Chapter 213, F.A.C.
- The facility is major stationary source in accordance with Rule 62-212.400, F.A.C. for the Prevention of Significant Deterioration (PSD) of Air Quality.

1.4. Project Description

Polk Power Partners proposes to replace the existing turbine ammonia-based inlet air chilling system with a water-based evaporative chilling and injection system.

1.5. Processing Schedule

05/21/2014: Department received complete application for an air construction permit.

06/02/2012: Distributed Intent to Issue Air Permit package.

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 these regulated pollutants.

Commonly addressed PSD pollutants include: CO, NO_X, PM, PM_{10}, $PM_{2.5}$, SO_2, VOC, SAM, Pb, fluorides (F), and Hg. Additional PSD pollutants that are more common to certain other industries include: 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; <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 "fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input". The given category applies to the Mulberry Cogeneration Facility because the HRSG produces steam that is used in a steam turbine-electric generator. The Mulberry Cogeneration 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.

Greenhouse gases (GHGs) is defined at section 40 CFR 86.1818-12(a) as the aggregate group of gases including CO_2, nitrous oxide (N_2O), methane CH_4, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). GHGs is expressed as CO_2-equivalent (CO_2e). For the special case of GHGs, the facility must first be shown to emit or have a PTE of 100,000 tons/year of GHGs as carbon dioxide equivalent (CO_2e) to be subject to regulation. In making this calculation, the values listed in 40 CFR 98, subpart A, Table A-1 are used to weight emissions by their respective Global Warming Potential (GWP). For example, the current GWP factors for four of the GHGs are: $CO_2 = 1$; $CH_4 = 25$; $N_2O = 298$ and $SF_6 = 22{,}800$.

If GHG emissions expressed as CO_2e emissions are greater than 100,000 tons/year, then the total (unweighted) GHG mass emissions are compared with the 100 and 250 tons/year thresholds to determine whether the source is a major stationary source.

Once a new facility is considered a major stationary source based on one PSD pollutant, then other PSD pollutants are reviewed for PSD applicability based on the respective Significant Emission Rate (SER) defined and specified in Rule 62-210.200, F.A.C. Each pollutant projected to be emitted at a rate equal to or greater than its respective SER is also considered to be "*significant*" and subject to PSD preconstruction review, including a BACT determination.

Refer to Table 1. Although a new stationary source may be "major" for only one PSD pollutant, the project must include BACT controls for any PSD pollutant that exceeds the corresponding significant emission rates (SERs) listed in the table below. For a modification of an existing major stationary source, the project must include BACT controls for any PSD pollutant that exceeds the SERs. In the case of GHGs, it becomes subject to regulation at a modification if project emissions as CO_2e are greater than 75,000 tons/year and mass GHGs exceed zero tons/year.

Table 1. List of Significant Emission Rates by PSD-Pollutant. [1]

Pollutant	SER (TPY)	Pollutant	SER (TPY)
CO	100	NO_X	40
$PM/PM_{10}/PM_{2.5}$	25/15/10	Ozone (VOC) [2]	40
$PM_{2.5}$ (NO_X)	40	$PM_{2.5}$ (SO_2)	40
Ozone (NO_X) [2]	40	SAM	7
SO_2	40	Pb	0.6
Hg	0.1	GHGs	0 [3]

1. Excluding fluoride and pollutants specific to the Pulp and Paper industry, MWCs, MSW landfills.
2. 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).
3. Pursuant to 40 CFR 52.21(b)(23)(ii), pollutants with no SER listed at 40 CFR 52.21(b)(23)(i) have a SER of zero tons/year.

The project is located in Polk County, which is in an area that is currently in attainment with the state and federal AAQS or otherwise designated as unclassifiable. The project will emit the following PSD-pollutants: SO_2, NO_X, CO, PM, PM_{10}, $PM_{2.5}$, SAM, VOC, GHGs (CO_2e).

2.2. 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 (existing simple cycle units are not yet electrical steam generating units):

"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.

"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.

Table 2 contains the historical fuel heat input to the combined cycle unit as provided in the application.

Table 2. Past and Projected Annual Heat Input to Mulberry Cogeneration Facility Combined Cycle Unit

Year	2010	2011 [1]	2012 [1]	2013	Future [2]	Capacity [3, 4]
Heat Input (MMBtu)	3,447,931	3,581,423	3,507,681	3,377,730	4,430,690	8,497,200

1. 2011-2012 were selected by the applicant as the baseline years with respect to emissions.
2. Applicant made the conservative assumption that the project will increase annual heat input by 25%.
3. Capacity based on maximum heat input rate of 970 MMBtu/hour, lower heating value (LHV) at ISO conditions (59°F, 60% humidity) and 8,760 hours/year.
4. Construction Permit Nos. 1050217-004-AC and 1050217-006-AC authorized increase in maximum heat input from 868.9 to 912 MMBtu/hour and then to 970 MMBtu/hour (LHV), respectively..

For the purposes of the present request, the applicant assumed an increase of 25% (compared with 2011-2012) in annual heat input to 4,430,690 MMBtu/year and credited the increase to the replacement of the inlet air chilling system using the proposed design.

Refer to Table 2. The applicant extracted the data representative of the highest emissions during a period of 5 years and determined that the highest emissions occurred concurrently with the highest heat input during 2011-2012. It is noteworthy that original project was permitted pursuant to the PSD regulations. However, the actual emissions do not even reach major stationary source thresholds for the traditional (non-GHG) PSD pollutants.

Table 2. Comparison Baseline to Projected Actual Emissions and PSD Applicability Analysis.

Pollutant	Baseline Period Selected (month/year)	Baseline Actual Emissions (tons/year)	Applicant Projected Actual Emissions (tons/year) [1]	Projected Increase (tons/year)	Significant Emission Rate (tons/year)	PSD?
CO	2011 – 2012	1.77	2.22	0.44	100	No
NO_X	2011 – 2012	69.7	89.4	19.78	40	No
PM	2011 – 2012	11.7	14.6	2.93	25	No
PM_{10}	2011 – 2012	11.7	14.6	2.93	15	No
$PM_{2.5}$	2011 – 2012	11.7	14.6	2.93	10	No
SO_2	2011 – 2012	0.15	0.32	0.17	40	No
VOC	2011 – 2012	3.72	4.65	0.93	40	No
Heat Input	2011 – 2012	3,544,552 MMBtu/year	4,430,690 MMBtu/year	25%		

The applicant assumed that emissions will increase by 25% in the future because of the presumed 25% increase in heat input.

Refer to Figure 1 that contains heat input data obtained from the EPA Clean Air Markets Division (CAMD) website. From 2004 to the present, the annual heat input has been steady and has never reached 4,000,000 MMBtu/year. The annual heat input did not increase even after permitted increases of 5 and 6% in short-term heat input limits in 2006 and 2007.

Figure 1. 2004 – 2013 Annual Heat Input Data for the Mulberry Cogeneration Facility (EPA CAMD)

The figure also shows CO_2 emissions over the past 10 years. For this particular type of plant, GHG emissions as CO_2e will be nearly the same as CO_2 emissions. It is clear that the facility is a major stationary source of GHGs. If the project causes an increase in heat input of 25%, then the increase in GHGs as CO_2e will be on the order of 50,000 – 55,000 tons/year (<75,000 tons/year). Therefore GHGs will not be subject to regulation.

2.3. Department Analysis

In the opinion of the Department's experts, the improvement/replacement of the inlet air chilling system is not likely to cause meaningful increase in the capacity factor for the unit or in annual emissions. In fact, the new inlet chilling system is more likely to reduce the maximum heat input capability on a hot day compared with the system it will replace. The reason is that the previous system was an ammonia-based chiller that could reduce the temperature of the inlet air by as much as 40°F degrees on a very hot day whereas the new system will reduce inlet air temperature by only approximately 20°F. With less dense air to handle, there will be less ability to combust fuel.

Overall usage of the unit is more likely affected by the power purchase agreements (PPAs) governing the use of the facility than this physical/operational change. Mulberry Cogeneration Facility is "fully contracted" to Duke Energy through August 2024. Link to Mulberry Cogeneration

2.4. Conclusion Regarding PSD Applicability

The Department accepts the conservative estimates submitted by the applicant as reasonable assurance that the project will not trigger PSD. The applicant is already required by conditions contained in Permit 1050217-006-AC to monitor NO_X and calculate and maintain a record of the annual emissions through 2017 to ensure that PSD was not triggered by previous, more meaningful modifications. No additional monitoring is required under the present permitting action.

3. 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. No air quality modeling analysis is required because the project does not result in a significant increase in emissions. Al Linero is the project engineer responsible for reviewing the application and drafting the air construction permit revision. 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.