FINAL DETERMINATION

Air Construction Permit
Jacksonville Lime, LLC
Lime Manufacturing Facility
DEP File No. 0310583-002-AC (PSD-FL-426A)

PERMITTEE

Jacksonville Lime, LLC
Post Office Box 37
Saginaw, AL 35137

PERMITTING AUTHORITY

Florida Department of Environmental Protection (Department)
Division of Air Resource Management
Office of Permitting and Compliance (OPC)
2600 Blair Stone Road, MS #5505
Tallahassee, Florida 32399-2400

PROJECT

DEP File No. 0310583-002-AC (PSD-FL-426A)
Jacksonville Lime, LLC
Lime Manufacturing Facility
Duval County

Jacksonville Lime, LLC (Carmeuse Lime & Stone and Keystone Properties Joint Venture) will construct and operate a lime manufacturing facility, which will be located in Duval County at 1915 Wigmore Street in Jacksonville, Florida.

The project consists of the construction of two vertical lime kilns and associated material and fuel handling equipment. Each kiln will have a maximum lime production rate of 396 tons per day and will be fueled with natural gas, coal, lignite, petroleum coke, and wood chips. The product will be used for purposes such as purification of drinking water, scrubbing of industrial emissions, treatment of waste and wastewater effluent, agriculture, etc.

The project is subject to Rule 62-212.400, Florida Administrative Code (F.A.C), Prevention of Significant Deterioration (PSD) of Air Quality and a Determination of Best Available Control Technology (BACT) was required for Greenhouse Gases (GHGs) as carbon dioxide equivalent (CO_2e).[1] For reference, EPA had jurisdiction over GHG permitting in Florida and was originally processing the permit for this project until EPA approved Florida's program in May 2014. Link to EPA Application Site

NOTICES AND PUBLICATION

The Department distributed a major stationary source air construction (PSD) draft permit package on May 30, 2014. Link to Draft Permit Documents Jacksonville Lime published notice of the Department's Intent to Issue Air Permit in The Florida Times Union on June 3, 2014.

No requests were received for a public meeting or an administrative hearing.

COMMENTS

No comments were received from EPA Region 4, who was provided with the draft permit package. No comments were received from the applicant, other agencies or members of the public. Comments were received from Alpha Three Consulting, LLC (Alpha3) on July 3, 2014. Link to Alpha3 Comments

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[1] PSD review and BACT determinations were previously conducted by the Department for carbon monoxide (CO), nitrogen oxides (NO_X), sulfur dioxide (SO_2), particulate matter (PM), PM with a mean particle diameter of 10 microns or less (PM_{10}) and PM with a mean particle diameter of 2.5 microns or less ($PM_{2.5}$). Reference Permit No. 0310583-002-AC. February 20, 2014. http://www.dep.state.fl.us/Air/emission/construction/Jacksonville/Final_Permit.pdf

REVIEW OF COMMENTS FROM ALPHA THREE CONSULTING, LLC

The comments of Alpha3 are provided *(in italics)* below in their entirety and followed by the Department's response.

1. BACT Analysis Incomplete and Inaccurate.
   We believe the BACT analysis performed on the proposed facility is incomplete and possibly inaccurate as outlined below. Inconsistencies and ambiguity between the Final PSD permit document, the "Draft" GHG Air Permit and the Technical Evaluation and Preliminary Determination (TEPD) warrant a review of the emissions estimates, calculations, and previously completed dispersion modeling of the proposed facility. We offer our comments as follows (refer to comments 2-7 below):

   Department Response. Refer to the responses to comments 2-7 below.

2. Applicant Failed to Properly Evaluate Alternative Fuels.
   The applicant has failed to adequately evaluate alternative fuels in addition to petcoke in the BACT analysis. Alternative fuels, and in particular natural gas, should have been reviewed on the basis of cost per ton of GHG avoided. The selection of petcoke as the primary fuel for the kilns is solely based upon economic decisions (i.e., the cost of the selected fuel, petcoke, is less expensive than natural gas fuel) and is not based upon environmental impact.

   Department Response. According to the application, the applicant proposed "to combust petcoke as the primary fuel with the option to combust coal, lignite, natural gas, and wood chips as secondary fuels". Link to Jax Lime GHG Application

   The Department did not specify a primary fuel or limit the use of any other fuel (except for wood chips by request of the applicant) in the original PSD permit or in the draft GHG permit. Refer to Table 6 of the Department's TEPD document. Link to Department's TEPD The applicant included "cost estimates for natural gas control of GHGs" in terms of cost per ton of GHGs avoided ($36-66/ton CO_2e removed).

   To put the cost-effectiveness value into better perspective, the Department translated the cost per ton CO_2e avoided into the additional cost per ton of lime produced. On page 18 of the TEPD, the Department stated:

   > *"Assuming a GHG emission factor of roughly 1.0 to 1.3 tons CO_2e/ton of lime produced and that the values in Table 6 are correct, then a limitation to natural gas at times when other fuels are indicated would cost $25 to 55/ton of lime produced for the Jacksonville Lime project".*

   Whereas the value $36-66/ton CO_2e removed is somewhat difficult for most readers to understand, an increased cost range of $25 to 55/ton of product is readily understandable in the mineral and products markets and by most readers. In addition to the economic basis for not limiting fuel use to natural gas, the Department justified its BACT decision as follows:

   > *"The Department's conclusion is that BACT limits for an efficient PFR kiln (as discussed below) can be specified for each fuel without causing inordinately greater total project emissions when burning one fuel compared with another in such a kiln".*

   And:

   > *"The project emissions while using solid fuels will only be 15-18% greater compared with natural gas while at the same time providing flexibility in product slate and fuel sources. By comparison, total emissions from a power project can be 100-200% greater when using solid fuels compared with natural gas. The Department expects that the applicant will actually use much more natural gas than other fuels under foreseeable market conditions."*

As documented in the Department's TEPD, EPA Region 4 evaluated the possibility of using only natural gas for the project prior to withdrawal of the application by Jacksonville Lime and submittal to the Department. According to the EPA Region 4 pre-draft technical document:

> *"The use of natural gas as the sole fuel source, while most desirable, may present challenges for Jacksonville's product quality. The combustion of natural gas would result in the lowest amount of GHG emissions. However, due to the need to meet customer and market demands (e.g. high and or low sulfur products or specialty markets), natural gas as a sole fuel source may limit the intended market for the kiln. Consequently,* ***EPA has determined that the sole use of natural gas is technically infeasible for this project****". (Emphasis added by the Department)*

As documented in the Department's TEPD, Virginia Department of Environmental Quality (DEQ) reviewed the economic analysis that was prepared by Carmeuse for the similar Winchester, VA project based on comparisons similar to those shown in Table 6. In its final engineering evaluation issued April 22, 2014 for the only other lime kiln BACT for GHGs conducted to-date, Virginia DEQ stated:

> *"DEQ agrees that BACT does not require Carmeuse to select one fuel over other alternatives, given the company's intent to produce multiple grades of lime having different sulfur content. DEQ also agrees that the estimated cost of the fuel restriction of \$80/ton of CO_2e is economically infeasible. Accordingly, and for both reasons, DEQ rejects fuel restrictions as an element of BACT".*

To underscore the Department's conclusion from the TEPD, BACT limits for an efficient parallel flow regenerative (PFR) lime kiln can be specified for <u>each</u> fuel without causing inordinately greater total project emissions when burning one fuel compared with another in such a kiln.

3. <u>Compliance Verification and Reporting of GHG Emissions</u>.
The "draft" GHG permit provides flexible emission limitations depending upon the type of lime product produced; however, it does not specify how the source will determine compliance with any particular limit. Additionally, the permit fails to provide a clear definition of the specific "corrective actions" that need to be taken when the emissions standards are exceeded.

   <u>Department Response</u>. The draft permit precisely describes the limits by product in Section 3.A., specific condition 6. Link to Draft Jax Lime GHG Permit Determination of compliance takes into consideration the amount of each fuel burned and limit applicable to each fuel over a 12-month period. The method is given in specific conditions 8 through 15 and is clearly explained in pages 22-24 of the TEPD.

   The applicant is required to comply with the permit and the Department has reasonable assurance of compliance with the emission standards for GHGs. It is premature to specify "corrective actions". Compliance with the emission standards for GHGs will be determined on the basis of a 12-month period, rolled monthly. Early during the first 12-month compliance period, it will be possible for the operator to develop and implement corrective actions in consultation with the supplier to ensure compliance with the 12-month standard and with the specific fuel input standard given in specific condition 7.

4. <u>Overestimated Cost of Natural Gas, Incomplete Estimates of GHG Emissions Associated with Solid Fuels</u>.
The applicant has overestimated the cost of natural gas relative to coal, petcoke, and wood waste fuels. As noted in our comments on the criteria pollutant PSD permit, during the period January 1, 2010 through December 13, 2013, delivered natural gas prices in Jacksonville, Florida have averaged \$5.22 per MMBtu (information provided by Schneider Electric, an energy consulting firm). This cost estimate is significantly less than the natural gas fuel cost estimated by the applicant. Furthermore, natural gas prices are projected to remain low due to the significant increase in natural gas production across the US (see attached excerpt from a February 2011 report prepared by the US Energy Information Administration).

The effect of overestimating natural gas costs is to favor solid fuels versus natural gas. The use of solid fuels will increase GHG emissions relative to the natural gas baseline due to the greater GHG emissions intensity of solid fuels relative to natural gas. The use of solid fuels will also increase on-site GHG emissions associated with fuel storage (fugitive methane) and fuel combustion emissions associated with the mobile equipment used during handling of the solid fuels. Additionally, emissions resulting from the fuel "drying" process for coal, petcoke and wood waste fuels should be included in the GHG BACT analysis.

The applicant should be required to conduct the GHG BACT analysis utilizing more appropriate estimates of natural gas costs as well as ensuring that the operational GHG emissions associated with solid fuels are fully considered. This review would result in a more objective evaluation of the project and ultimately may impact the fuel selection decision. Each of the alternative fuels will have different GHG emission profiles and the GHG BACT analysis should consider each fuel relative to natural gas.

Department Response. The excerpt mentioned by Alpha3 is actually a slide from a presentation given at a February 2011 Saudi Arabia-U.S. Energy Consultation.[2] Link to Presentation The excerpt attached to the Alpha3 submittal was truncated and the complete chart (obtained from the presentation) is shown below.

[2] Presentation. Richard G. Newell, Administrator, U.S. Energy Information Agency. "The Long-Term Outlook for Natural Gas". Saudi Arabia-US Energy Consultation. Washington, D.C. February 2, 2011.

The Department notes that the presentation is dated (more than 3 years old). It was given at a time when almost no consideration had yet been given to the possibility of massive liquefied natural gas (LNG) exports. According to the Federal Energy Regulatory Commission (FERC), six LNG projects have already been approved (as of June 20, 2014). Link to Approved LNG Projects Another 16 projects have been proposed (including three in Canada). Link to Proposed LNG Projects The Jordan Cove, Oregon Project recently received conditional approval.

The capacity of the six approved Gulf coast LNG export terminals is approximately 9.5 billion standard cubic feet per day (bscfd). That value is about 2.5 times the present gas transmission capacity into Florida (<4 bscfd). Link to Florida PSC Facts and Figures

The graph included by Alpha3 shows historical natural gas prices as high as $10 per million Btu ($/MMBtu). It is not surprising that a lime producer will prefer to keep other traditional fuel options open notwithstanding present low prices of a particular fuel. If the natural gas prices were indeed overestimated by the applicant, the reality is that natural gas will actually be favored by prevailing market conditions when the plant starts up.

Fugitive GHG emissions from solid fuel storage are minimal compared with process emissions. The PFR kiln design minimizes solid fuel use and is a practicable control of fugitive emissions from storage of such fuel.

5. Change to the Primary Equipment Supplier/Design.
The data provided by the applicant presents estimated GHG emissions only from the Maerz PFR Shaft kilns. In their PSD application and BACT analysis, the applicant frequently references the performance of the kilns at the Winchester, Va. site, which we understand to be the Maerz PFR kilns. Yet, in the submitted GHG Permit application for the Keystone site in Jacksonville, it appears the applicant has selected another manufacturer and kiln type, the Cimprogetti "Cim-Reversy TSR" kiln. The change in kiln supplier creates questions as to whether the current BACT Analysis in the GHG Permit Submission is, in fact, credible.

The applicant should provide information from both kiln manufacturers quantifying the impact of any design and operational changes on GHG emissions and any criteria pollutant. Additionally, the applicant should reconcile any differences between the approved PSD Permit for criteria pollutants and the GHG permit submission.

Department Response. The applicant referred to a Cimprogetti Cim-Reversy Twin Shaft Regenerative (TSR) kiln in the application (e.g. Tables HC-1 and DL-1). Link to Application The Cimprogetti TSR kilns fall within the general designation of Parallel Flow Regenerative (PFR) kilns specified in the Department's BACT determination. Link to Cimprogetti TSR Kilns

Refer to Table 11 of the TEPD. On May 17, 2014 the applicant provided updated emission estimates. The Department used that information together with the information in Table 9 to establish BACT emission standards for GHGs from the Jacksonville Lime project.

The characteristics of the Cimprogetti and Maerz PFR are similar in principle though not identical in engineering and construction. According to a review (Barrie Jenkins Consulting Engineers) of double shaft kilns, Maerz and Cimprogetti offered comparable designs. Link to Shaft Kiln Comparisons The products of the two companies are described in Section 4 of the document. The Cimprogetti Cim-Reversy product was described as follows:

> *"The Cim-Reversy kiln operates in a similar manner to the Maerz kiln, but is formed from two D shaped chambers, flat sides adjacent, which gives a very short gas transfer duct, thus reducing the propensity for dust settling and deposition. These kilns have also been designed for small stone operation".*

Numerical characteristics of the Maerz and Cimprogetti double shaft products are provided in Section 7 of the Jenkins report. At the time the review was performed, the two lines had comparable characteristics with respect to energy consumption which is directly related to emissions of GHGs. The range for energy consumption by the Maerz product was 3.6 to 4.2 gigajoules/metric ton of lime (GJ/tonne) whereas the range for the Cimprogetti kilns was 3.8 to 4.2 GJ/tonne. On the other hand, the Cimprogetti kilns required less electrical energy to operate.

There is no requirement to further compare or reconcile differences among the comparably efficient PFR kilns available in the market prior to issuance of the Jacksonville Lime GHG permit. The Department's BACT analysis is complete and credible.

6. Additional Comments Regarding Selected Equipment Provider/Design.
If the applicant has, in fact, decided that the "Cim-Reversy" TSR is the lime kiln of choice for this specific project in Duval County, FL, the impacts on various other parameters needs to be addressed. The physical parameters that require evaluation include: stack gas exit temperature, stack gas volume, stack height, stack diameter, flue gas dispersion and pollutant concentrations resulting from the TSR kiln design. It is currently unclear in the GHG Permit and the TEPD document which equipment manufacturer has been selected and also which is being approved by FDEP. It is our opinion that the applicant needs to quantify the impact of any equipment changes and that additional dispersion modeling should be required to ensure these changes will not result in modeled violations of the NAAQS & PSD limits.

Department Response. The permit authorizes the applicant to install and operate two vertical twin-shaft PFR lime kilns that will have the capability of firing petcoke, coal (including lignite), natural gas, and wood chips.

Emissions of GHGs on the bases of "total" and "per ton of product" are straightforward calculations based on the amount of fuel used, limestone magnesium and calcium content, degree of calcination, and amount of product made. No modeling is required for the issuance of the PSD permit for GHGs because there is no National Ambient Air Quality Standard (NAAQS) for GHGs.

The Department specified capacity, fuels, hours of operation, emissions standards in tons CO_2e/ton lime, specific fuel input (MMBtu/ton lime) and compliance calculation methods. The applicant will have to comply with those parameters regardless of past or future changes in selected manufacturer.

Comments regarding further modeling of the conventional pollutants were addressed in the Final Determination accompanying the Final Permit No. 0310583-001 (PSD-FL-426) issued on February 20, 2014. Link to Final Determination PSD-FL-426 Regardless of kiln selected (or changes), the conditions of both permits apply and the Department has reasonable assurance that the applicant will comply with those conditions and that the project will not cause or contribute to a violation of any NAAQS.

7. Stack Emissions Monitoring.
Although the "draft" GHG Air Permit requires the applicant to determine source emissions in accordance with 40 CFR 98 Sub Parts, A C & S it is not clear to us why the installation of "in-situ" CEMS for CO_2e are not required within the permit.

Department Response. The methodologies are derived from 40 Code of Federal Regulation (CFR) Part 98 – Mandatory Greenhouse Gas Reporting. Link to 40 CFR Part 98 The methods given in Subpart A, C and S are accurate and precise for the purposes of determining total 12-month CO_2e total emissions and emissions per ton of product from calcination of limestone and fuel combustion.

Continuous emissions monitoring systems (CEMS) were required in the previously issued PSD permit for NO_X and SO_2; pollutants for which NAAQS have been established on a short-term basis. There is no clear benefit from a CO_2 CEMS instrument for compliance assurance. It is even possible that such a

CEMS would be less accurate and precise when calculating long-term emissions and emission factors compared with the methodologies described in 40 CFR Part 98.

CONCLUSION

The final action of the Department is to issue the final permit with no changes from the draft permit.