

Responsiveness Summary

Abengoa Bioenergy Biomass of Kansas, LLC
Stevens County, Kansas

Prevention of Significant Deterioration Permit



Kansas Department of Health and Environment

Bureau of Air

Air Permitting Section

May 27, 2014

I. KDHE Decision

The Kansas Department of Health and Environment (KDHE) Bureau of Air (BOA) has made the decision to issue an Air Quality Construction Permit to Abengoa Bioenergy Biomass of Kansas, LLC (ABBK) for the installation and operation of a biomass-to-ethanol and biomass-to-energy production facility near Hugoton, Stevens County, Kansas..

The construction permit issued for the project identifies the applicable rules governing emissions from the facility, and establishes enforceable limitations on its emissions. The permit also establishes appropriate compliance procedures, including requirements for emissions testing, monitoring, recordkeeping and reporting. ABBK will be required to carry out these procedures on an ongoing basis to demonstrate that the facility is operating within the limitations established by the permits and that emissions are being properly controlled.

The permit related documents can be found at the KDHE BOA website address:

<http://www.kdheks.gov/bar/abengoa/abbk2/abbk2.html>

II. Project Description

Abengoa Bioenergy Biomass of Kansas, LLC (ABBK) intends to install and operate a biomass-to-ethanol and biomass-to-energy production facility near Hugoton, Kansas. The biomass-to-ethanol manufacturing facility, employing an enzymatic hydrolysis alcohol production process, will utilize cellulosic feedstock (biomass) such as wheat straw, milo (sorghum) stubble, corn stover, switchgrass, and opportunity feedstocks that are locally available. The cogeneration plant will consist of one (1) steam turbine electrical generator nominally rated up to a total of 22 Megawatts (MW). Electrical power will be supplied exclusively to ABBK. Steam will be generated from one (1) water-cooled vibrating grate stoker boiler that will use solid biomass feedstocks, enzymatic hydrolysis residuals, particles collected during biomass grinding, non-condensable gases (NCG) vent streams from plant processes, wastewater treatment sludge, biogas and natural gas as fuel. Natural gas will be used during boiler start-up periods as required per manufacturer recommendations.

Nominal production for the enzymatic hydrolysis alcohol production process is based on a designed production rate of 23,300,000 gallons per year (23.3 MGPY) anhydrous ethanol. The anhydrous ethanol is then denatured prior to shipment offsite, resulting in a total denatured nominal production rate of 23.8 MGPY. By implementing a 20 percent increase in plant efficiency and operating on 365 days per year production schedule, a maximum potential anhydrous production rate of 30.0 MGPY and a denatured potential production rate of 31.6 MGPY can be realized.

On September 16, 2011, the KDHE issued a Prevention of Significant Deterioration (PSD) Air Emission Source Construction Permit (C-9600) to Abengoa Bioenergy Biomass of Kansas, LLC (ABBK) for the installation and operation of a biomass-to-ethanol and biomass-to-energy production facility near Hugoton, Kansas. Since issuance of the September 16, 2011 Air Emission Source Construction Permit, ABBK was issued an Air Emission Source Construction Permit on January 22, 2013 (C-10550) that was an appended PSD Air Emission Source Construction Permit to the September 16, 2011 permit for the addition of four (4) emergency spark ignition internal combustion generator engines to the construction project.

On August 26, 2013, KDHE received a Prevention of Significant Deterioration Air Construction Permit Application from ABBK to amend the September 16, 2011 and January 22, 2013 PSD Permits. The *Conforming Prevention of Significant Deterioration, Air Quality Construction Permit Modification Application* dated January, 2014 was submitted by ABBK as a corrected update to the application received on August 26, 2013.

The purpose and scope of the PSD Air Emission Source Construction Permit amendment is to correct and clarify existing regulatory requirements of the September 16, 2011 (C-9600) Air Emission Source Construction Permit; to authorize two (2) of the four (4) spark ignition internal combustion generator emergency engines previously permitted in the January 22, 2013 (C-10550) Air Emission Source Construction Permit to operate in an unrestricted manner; to incorporate air emission limitations and requirements for new equipment to be installed; to incorporate regulations applicable to Major Sources of Hazardous Air Pollutants (HAPs); and to incorporate a Best Achievable Control Technology (BACT) for Volatile Organic Compounds (VOCs) emission units.

III. KDHE Permit Considerations

The project proposed by ABBK is defined as a new major stationary source because at least one regulated pollutant will be emitted in excess of the Prevention of Significant Deterioration (PSD) major source threshold of 250 tons per year (tpy) for the source category applicable to ABBK. Therefore, KDHE permit considerations must follow the PSD Air Quality Construction Permit requirements.

PSD does not prevent sources from increasing emissions. PSD is designed to:

- protect public health;

- preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value;
- insure that economic growth will occur in a manner consistent with the preservation of existing clean air resources; and
- assure that any decision to permit increased air pollution in any area to which this section applies is made only after careful evaluation of all the consequences of such a decision and after adequate procedural opportunities for informed public participation in the decision making process.

PSD applies to new major sources or major modifications at existing sources for pollutants where the area the source is located is in attainment or unclassifiable with the National Ambient Air Quality Standards (NAAQS). It requires the following:

- installation of the “Best Available Control Technology” (BACT);
- an air quality analysis;
- an additional impacts analysis; and
- public involvement.

A. Best Available Control Technology (BACT)

BACT is an emissions limitation which is based on the maximum degree of control that can be achieved. It is a case-by-case decision that considers energy, environmental, and economic impacts. BACT can be add-on control equipment or modification of the production processes or methods. This includes fuel cleaning or treatment and innovative fuel combustion techniques. BACT may be a design, equipment, work practice or operation standard if imposition of an emissions standard is infeasible.

BACT applies to each new or modified affected emissions unit and pollutant emitting activity at the source for each pollutant having a potential to emit, or an increase in potential to emit, above the PSD significance level(s). The ABBK facility is new major stationary source for at least one regulated pollutant (NO_x, CO, SO₂, VOCs, PM, PM₁₀, PM_{2.5}, and CO_{2e}) and is subject to the requirements of 40 CFR 52.21 as adopted under K.A.R. 28-19-350.

For the ABBK facility, BACT is listed in the PSD Permit Summary, Section VI.

B. Ambient Air Quality Analysis

The proposed facility is a major source as defined by K.A.R. 28-19-350, Prevention of Significant Deterioration and the facility must demonstrate that allowable emission increases from the proposed facility would not cause or contribute to air pollution in violation of:

1. any NAAQS in any air quality control region; or
2. any applicable maximum allowable increase over the baseline concentration in any area (increment).

This demonstration was made and is presented in the PSD Permit Summary, Section VII.

C. Additional Impact Analysis

In accordance with 40 CFR 52.21(o)(1), the owner shall provide an analysis of the impairment to visibility, soils and vegetation that would occur as a result of this project and to what extent the emissions from the proposed modification impacts the general commercial, residential, industrial and other growth. This analysis is presented in the PSD Permit Summary, Section VII.

D. Public Involvement

Following the initial application review, the KDHE BOA made a preliminary determination that the application met the standards for issuance of a construction permit and prepared a draft permit for public review and comment.

The draft permits were available for public review from February 20, 2014 through March 24, 2014. No requests were made for a public hearing, therefore, no public hearing was conducted.

KDHE received written comments from the U.S. Environmental Protection Agency (EPA) Region 7 in a letter dated March 19, 2014. Section IV of this document includes the KDHE responses to EPA.

IV. Response to EPA Region 7

A. EPA Comment:

This is a revision to a PSD permit that the Kansas Department of Health and Environment (KDHE) issued on September 16, 2011 and amended in January 13, 2013. At this time, the facility is nearing completion of its construction. In situations like this we would recommend that KDHE only take comments on the revisions to the permit not the entire permit. For example, KDHE could provide a redline/strikeout version of the permit and only request comment on the revisions. We are limiting our comments to section so the permit that are related to the permit revisions.

KDHE Response:

KDHE appreciates EPA's advice and will take it into consideration for future permitting actions.

B. EPA Comment:

Permit conditions V.G.13.d. and V.G.14.h and i. establish particulate (PM), PM₁₀ and PM_{2.5} best achievable control technology (BACT) emission limits for the reheat burner. Since the reheat burner's and boiler's emissions exit through the same stack it is not possible to determine compliance with these emission limits. The permit also contains BACT limits for the combined emissions of the boiler and reheat burner making the reheat burner limits unnecessary.

KDHE Response:

The reheat burner BACT limits will be removed from the permit. The reheat burner BACT limits will be the same as the BACT established for the boiler.

C. EPA Comment:

The permit does not specify the length or number of test runs for the testing to determine compliance with the volatile organic compound (VOC) BACT limit in V.G.17. We recommend the permit specify the minimum test length and the number of test runs used to determine compliance with the limit. The test length must be long enough for compliance to be determined with the averaging period. Considering the difficulties of testing to determine compliance with a 30-day averaging period, KDHE should consider either requiring a VOC continuous emission monitoring system (CEMS) or establish a VOC BACT limit with a shorter averaging period.

KDHE Response:

KDHE has edited Section V.G.17 to read as follows:

17. The BACT VOC Emission Limitations and Controls

The BACT VOC emission limitations and controls for the biomass-fired stoker boiler (EP-20001) and boiler reheat burner (EP-20002) are as follows:

- a. The owner or operator shall not emit or cause to be emitted any gases that contain VOC emissions in excess of the BACT emission limit of 0.005 lb/MMBtu (2.55 lb/hr), including periods of startup, shutdown, and malfunction.*
- b. This BACT limit is based upon the installation of an oxidation catalyst and implementation of good combustion practices (GCP). If the emission rate results from the initial performance test are less than the limit described above and deemed consistently achievable, the emission rate determined during the performance test will be the limit imposed.*
- c. Demonstration of compliance with the VOC BACT will be performed through successful performance testing. The source will utilize EPA Reference Method 320 performing three, one (1) hour runs, the average of which will not be in excess of the VOC BACT emission limit.*

- d. *Continuous compliance shall be demonstrated by following the subsequent testing requirements of **Section XI.F**.*

D. EPA Comment:

The permit contains BACT PM, PM₁₀ and PM_{2.5} limits for the fly ash truck and rail loadout slide gates, bottoms ash loadout, and the fugitive emissions from washed sand, dirt production, dirt offloading, wet cake production, and wet cake emergency pad and reclaim. The permit does not contain any testing or monitoring to verify compliance with these limits. Note that BACT allows for design, equipment, work practice, operational standard or combination thereof when technological or economic limitations on the application of measurement methodology make emission standard feasible.

KDHE Response:

KDHE has removed references to the lb/hr limits, and maintained the operational limits and work practices that define the monitoring for these units for BACT compliance.

E. EPA Comment:

The VOC BACT limit for the enzymatic hydrolysis CO₂ scrubber in V.J.7 needs to specify the averaging period and testing and monitoring requirements.

KDHE Response:

KDHE has edited Section V.J.7 to read as follows:

- 7. *The VOC BACT limit for the enzymatic hydrolysis CO₂ scrubber shall be 2.71 lb/hr of VOC emissions.*
 - a. *Demonstration of compliance with the VOC BACT will performed through successful performance testing. The source will utilize EPA Reference Method 320 performing three, one (1) hour runs, the average of which will not be in excess of the VOC BACT emission limit.*
 - b. *Continuous compliance shall be demonstrated by following the subsequent testing requirements of **Section XI.G**.*

F. EPA Comment:

The VOC BACT limit in V.L.1 for lignin storage and loadout is unclear. It specifies the BACT limit as less than or equal to 1.29 tons per year (0.39 lb/hr) in each consecutive 12 month period. The 0.39 lb/hr would equal 1.7 tons per year. Is the 0.39 lb/hr a limit that must be achieved on a shorter averaging period?

KDHE Response:

The lb/hr emission limitation has been removed from the requirements as it was not KDHE's intention for the source to demonstrate a shorter averaging period.

G. EPA Comment:

A number of emission points were modeled with PM_{2.5} emission rates less than allowed by the permit. Either the permit needs to be revised to reflect the modeled rates or revise the modeling to reflect the permit rates.

Emission Point	Permit Rate	Modeled Rate
Floor Sweep System Baghouse (EP-11700)	0.002 lbs/hr	0.0018 lbs/hr
Biomass Boiler Storage Bin (T-11130 and T-11230) DC (EP-11400)	0.122 lbs/hr	0.120 lbs/hr
Washed Sand (FUG_WSL)	0.0001 lbs/hr	0.000086 lbs/hr
Dirt Production (FUG_DP)	0.0003 lbs/hr	0.000273 lb/hr
Wet Cake Emergency pad and reclaim (FUG_WCE)	0.0004 lbs/hr	0.000362 lbs/hr
Lime Handling baghouse # 1(EP-20512)	0.06 lbs/hr	0.03lbs/hr

KDHE Response:

ABBK revised the modeling for PM_{2.5} and PM₁₀ to reflect the emission rates written in the permit. The following were updates in the revised modeling:

- a. In addition to the south location of the berm, another location for the berm was modeled on the north side of the facility.*
- b. The berm on the south and north locations were offset 20 meters away from the fenceline.*
- c. The berm was modeled using the correct emission rate of 0.00000056172 lb/hr/ft²*
- d. The following emission sources were removed in the revised modeling:*

- i. FUG_FAP (Fly ash production silo entrance), because it is already represented by EP-20143 (Fly ash silo bin vent)
- ii. FUG_FAO (Fly ash offloading), because it is already represented by EP-20111-1 (Fly Ash Truck Load-Out Slide Gate), EP-20111-2 (Fly Ash Rail Load-Out Slide Gate #1), and EP-20111-3 (Fly Ash Rail Load-Out Slide Gate #2)
- iii. EP2002 (Reheat burner), because EP2001A (525 MMBtu/hr) already included the emission rates from the reheat burner

Tables 1 to 3 below show the summary of results of the updated modeling for PM_{2.5} and PM₁₀.

Table 1. Preliminary/Significance Modeling Results

Pollutant	Averaging Period	Modeled Year(s) of met data	UTM Coordinates		Modeled Concentration (Highest, First-Highest, H1H) (µg/m ³)	UPDATED Modeled Concentration (H1H) (µg/m ³)	Increase (ug/m ³)
			Easting (meters)	Northing (meters)			
PM ₁₀	Annual	2012	288265.3	4117998.5	7.10	7.41	0.31
	24-hour	2008	288411.4	4117992.3	35.69	40.89	5.20
PM _{2.5}	Annual	2012	288265.3	4117998.5	1.61	1.61	No increase
	24-hour	2010	288350.0	4118000.0	6.84	7.58	0.74

Table 2. NAAQS Modeling Results

Pollutant	Averaging Period	Modeled Year(s) of met data	UTM Coordinates		Modeled Concentration (H6H for PM ₁₀ ; H1H for PM _{2.5}) (µg/m ³)	UPDATED Modeled Concentration (H6H for PM ₁₀ ; H1H for PM _{2.5}) (µg/m ³)	Increase (ug/m ³)
			Easting (meters)	Northing (meters)			
PM ₁₀	Annual	Revoked					
	24-hour	5 years	288265.3	4117998.5	28.93	29.23	0.3
PM _{2.5}	Annual	2010	293250.0	4115500.0	2.87	2.87	No increase
	24-hour	5 years	293250.0	4115000.0	24.90	24.90	No increase

Table 3. PSD Increment Modeling Results

Pollutant	Averaging Period	Modeled Year(s) of met data	UTM Coordinates		Modeled Concentration (H1H for Annual averaging; H2H for 24-hour averaging) (µg/m ³)	UPDATED Modeled Concentration (H1H for Annual averaging; H2H for 24-hour averaging) (µg/m ³)	Increase (ug/m ³)
			Easting (meters)	Northing (meters)			
PM ₁₀	Annual	2012	288265.0	4117999.0	7.96	8.26	0.3
	24-hour	5 years	288550.0	4116750.0	29.84	29.84	No increase
PM _{2.5}	Annual	2010	293250.0	4115500.0	2.87	2.87	No increase
	24-hour	5 years	293250.0	4115000.0	23.50	23.50	No increase

Revised modeling indicates the proposed project does not cause or contribute to a NAAQS or increment exceedance.

H. EPA Comment:

We have not verified emission rates for every emission point for PM₁₀ but have discovered several where modeled rates do not match permit limits for PM₁₀. This could impact increment modeling and modeling to determine compliance with the national ambient air quality standard (NAAQS). KDHE should ensure modeled rates for all pollutants equal or exceed permitted limits.

KDHE Response:

ABBK and KDHE verified that all PM₁₀ emission rates used in the revised modeling matched the emission rates in the permit.

I. EPA Comment:

The berm (EP-10002) was modeled at an emission rate of 0.00000001127 lb/hr/ft². The correct rate is 0.00000056172 lb/hr/ft². In addition to this error, the characterization of the berm in the model does not match the facilities construction plan which will have the berm constructed around the fenceline of the facility. Currently the berm is modeled as an area source in a single location. The construction will be ongoing as the facility produces waste. These emissions will occur around the entire facility, including near the receptors controlling increment analysis for PM₁₀. Additional analysis should be performed to ensure the berm emissions occurring around the entire facility will not have adverse air quality impacts.

KDHE Response:

The facility remodeled and used the correct emission rate of 0.00000056172 lb/hr/ft². The berm was also remodeled at two (2) locations, south and north locations, and were offset 20 meters away from the fenceline.

In KDHE increment modeling verification (ran with five (5) single-year meteorological data) for PM₁₀, the H2H modeled impact is 30.27 μg/m³ and is located on one of the nearby sources (Easting: 288,550 meters; Northing: 4,116,730 meters). ABBK's contribution to this exceedance is 0.01 ug/m³.

In the revised modeling, ABBK's contribution to all increment exceedances was less than the SIL. Therefore, ABBK does not cause or contribute to any increment exceedance.

J. EPA Comment:

The reheat furnace (EP-20002) is modeled separately with an emission rate of 7.5 lbs/hr for nitrogen. Our understanding is that both the reheat furnace and the boiler are subject to a combined limit of 157.5 lbs/hr for nitrogen oxides (NO_x). Therefore, it is not clear why both were modeled.

KDHE Response

The EP2002 (Reheat burner) was removed from the revised modeling because EP2001A (525 MMBtu/hr) already included the emission rates from the reheat burner.

K. EPA Comment:

The permit allows no more than 132 linear feet of unstabilized berm which is approximately the size of berm constructed in 32 days. It could be difficult in some periods to stabilize the berm. For example, it will likely not be possible to get vegetation to grow in the winter. Therefore, Abengoa will likely have to store berm materials for months. The permit should specify how these materials can be stored. The modeling should also include any emission points necessary to move the materials into or out of the storage.

KDHE Response:

Abengoa has not submitted an application amendment to incorporate berm material storage areas or buildings. The materials used to build the berm can also be hauled offsite for disposal or in the case of fly ash, be sold as a marketable product. This language was contained in the draft permit for such cases when materials cannot be taken to the berm. Additionally, vegetation is not the only means by which Abengoa can stabilize the berm. Surfactants and other soil stabilizing products are readily available and will be used in lieu of vegetation or during interim times, such as winter, when vegetation will not readily grow.