PREVENTION OF SIGNIFICANT DETERIORATION (PSD)

PERMIT SUMMARY SHEET

Permit Number 1890231

Source Name Abengoa Bioenergy Biomass of Kansas, LLC

Source Location Section 18, Township 33S, Range 37W
Latitude 37.179, Longitude -101.386
Stevens County
Hugoton, Kansas 67951

I. Area Designation

K.A.R. 28-19-350, et seq., Prevention of Significant Deterioration of Air Quality, affects new major sources and major modifications to major sources in areas designated as "attainment" or "unclassifiable" under section 107 of the Clean Air Act (CAA) for any criteria pollutant. The State of Kansas is classified as attainment for the National Ambient Air Quality Standards (NAAQS) for all the criteria pollutants.

Stevens County, Kansas is in attainment for all the criteria pollutants.

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 (e.g. 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 (MWe). 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-condensible 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 MMgpy) anhydrous ethanol. The anhydrous ethanol is then denatured prior to shipment offsite, resulting in a total denatured nominal production rate of 23.8 MMgpy. 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

MMgpy and a denatured potential production rate of 31.6 MMgpy can be realized.

III. Significant Applicable Air Emission Regulations

This proposed source will be subject to Kansas Administrative Regulations relating to air pollution control. The application for this permit was reviewed and will be evaluated for compliance with the following applicable regulations:

A. K.A.R. 28-19-11 Exceptions Due to Breakdown or Scheduled Maintenance – as applied to State regulations K.A.R. 28-19-30 through K.A.R. 28-19-32 and K.A.R. 28-19-650

B. K.A.R. 28-19-200a. General provisions; definitions to implement the federal greenhouse gas tailoring rule

C. KAR 28-19-300. Construction Permits and Approvals; Applicability

D. K.A.R. 28-19-350. Prevention of significant deterioration of air quality

E. KAR 28-19-20. Particulate Matter Emission Limitations

F. KAR 28-19-650(a)(3). Opacity Requirements

G. KAR 28-19-30 through KAR 28-19-32. Emission Limitations (Indirect Heating Equipment)

H. KAR 28-19-720. New Source Performance Standards, which adopts by reference, the following:

1. 40 CFR Part 60, Subpart A, Standards of Performance for New Stationary Sources – General Provisions.

2. 40 CFR Part 60, Subpart Kb - Standards of Performance for Volatile Organic Liquid (VOL) Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced after July 23, 1984.

3. 40 CFR Part 60, Subpart Db - Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units.

4. 40 CFR Part 60, Subpart IIII – Standards of Performance for Stationary Compression Ignition Internal Combustion Engines.

5. 40 CFR Part 60, Subpart VVa - Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006.

I. K.A.R. 28-19-750. Hazardous Air Pollutants, Maximum Achievable Control Technology, which adopts by reference, the following:

1. 40 CFR Part 63, Subpart A, National Emission Standards for Hazardous Air Pollutants for Source Categories – General Provisions.

2. 40 CFR Part 63, Subpart ZZZZ, National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines.

3. 40 CFR Part 63, Subpart JJJJJJ - National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources.

IV. Air Emissions From the Project

The potential-to-emit from the new biomass to ethanol manufacturing and biomass to power cogeneration facility is listed in the table below and detailed in the May 19, 2011 Updated Facility Design, Prevention of Significant Deterioration, Air Quality Construction Permit Application ,Source ID No. 1890231. Proposed potential-to-emit of NO_x, SO_2, CO, PM/PM_{10}/$PM_{2.5}$ and VOC were compared with the Significant Emission Rates for PSD applicability for the criteria and non-criteria pollutants. The potential-to-emit of NO_x, SO_2, PM/PM_{10}/$PM_{2.5}$, and CO are above the PSD significance levels and will be reviewed under the PSD regulations.

Therefore, this project will be classified as a major stationary source. This project will be subject to the various aspects of K.A.R. 28-19-350, such as the use of best available control technology, ambient air quality analysis, and additional impacts upon soils, vegetation and visibility.

On June 3, 2010, the U.S. Environmental Protection Agency (EPA) issued the final Greenhouse Gas (GHG) Tailoring Rule (75 FR 31514). This rule established the thresholds for GHG emissions under the PSD permit program for new and existing industrial facilities. GHGs are a single air pollutant defined as the aggregate group of the following six gases:

- carbon dioxide (CO_2)
- nitrous oxide (N_2O)
- methane (CH_4)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)

- sulfur hexafluoride (SF_6)

Starting on July 1, 2011, new sources emitting GHGs in excess of 100,000 ton/yr on a carbon dioxide equivalent (CO_2e) basis and also exceeding 100/250 ton/yr on a mass basis are subject to permitting requirements for their GHG emissions under PSD. For those affected facilities, Best Available Control Technology (BACT) would need to be determined for GHG emissions.

PSD applies to the GHG emissions from ABBK's facility because the potential emissions of GHGs from ABBK are equal to or greater than 100,000 ton/yr on a CO_2e basis and 250 ton/yr on a mass basis.

Air Emissions Estimates from the Proposed Activity		
POLLUTANT	**Potential to Emit[1] Emissions (tons per year)**	
	Pre-Permit	**Post-Permit**
PM	> 250	130.5
PM_{10}	> 250	118.6
$PM_{2.5}$	> 250	77.0
NO_x	> 250	668.5
CO	> 250	519.5
SO_2	> 250	483.4
VOC	> 250	<40
Lead	0.11	0.11
Sulfuric Acid (H_2SO_4)	67.7	3.0
Hydrogen Chloride (HCl)	569.5	5.7
Hydrogen Fluoride (HF)	0.66	0.01
CO_2e	> 100,000	590,297 CO_2e based
Total HAPs	> 25	20.21
Largest Single HAP	> 10	5.7

[1] Potential-to-emit means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable.

V. Technical Considerations for the Selection of the Stoker Boiler Type Over theBubbling Fluidized Bed Type Boiler for the ABBK Hugoton Project

The original PSD air quality construction permit application was submitted to KDHE on July 21, 2008 for a traditional grain-to-ethanol production process, enzymatic hydrolysis (EH) ethanol production process and gasification process (syngas production). Between that date and the present, the project changed several times. The bubbling fluidized bed boiler had been proposed in the previous projects. The latest redesign was proposed in April, 2011 for the 22 MW stoker boiler and the 30 MMgpy enzymatic hydrolysis alcohol process.

The main changes affecting the biomass boiler system were the size reduction of the cogeneration which allows for the use of one 22 MW boiler; and the change in the fuel composition due to the lower power generation need. The proposed boiler must be capable of burning a combination of raw biomass (consisting of corn stover, wheat straw, milo (sorghum) stubble, corn stover, switchgrass, and other opportunity feedstocks that are available), enzymatic hydrolysis residuals (including lignin-rich stillage cake and thin stillage syrup), particles collected during biomass grinding, NCG vent streams, wastewater treatment sludge and biogas. Burning the cellulosic ethanol process residuals would provide significant boiler fuel needs and reduce the amount of additional corn stover or other fuels. The fundamental consequence of this change was to increase the alkali content of the boiler fuel.

ABBK provided documentation showing high concentrations of alkaline metals in biomass boiler fuel have been determined to be responsible for boiler slagging and fouling problems during combustion. These problems are foreseen as the major causes of boiler down time. The alkali content in ABBK's boiler fuel is expected to be about 3 times higher then recommended levels to prevent BFB boiler slagging and fouling problems.

ABBK has discussed with both stoker-type boiler vendors and fluidized bed combustion (FBC) boiler vendors and has decided that due to the inherent high alkalinity, the ash content of the fuel, and use of enzymatic hydrolysis residuals consisting of lignin-rich stillage cake and thin stillage syrup as the primary boiler fuel, that the stoker-type boiler poses the lowest overall risk to the success of the project. The technical issue that has driven the decision to select a stoker boiler versus a BFB has been to minimize fouling and slagging, and avoid agglomeration risks inherent to a BFB boiler and the intended fuel blend.

VI. Best Available Control Technology (BACT)

The BACT requirement applies to each new affected emissions unit and pollutant emitting activity. Also, individual BACT determinations are performed for each pollutant emitted from the same emission unit. Consequently, the BACT determination must separately address, for each regulated pollutant with a significant emissions increase at the source, air pollution controls for each emissions unit or pollutant emitting activity subject to review. ABBK was required to prepare a BACT analysis for KDHE's review according to the process described in Attachment A. KDHE's evaluation of the BACT for the proposed ethanol facility is presented in Attachment B.

KDHE has concurred with ABBK for the following:

A. Stoker Biomass Boiler (EP-20001)

The stoker biomass boiler shall burn a combination of wheat straw, milo (sorghum) stubble, corn stover, switchgrass, other opportunity feedstocks that are available, enzymatic hydrolysis residuals (including lignin-rich stillage cake and thin stillage syrup), particles collected during biomass grinding, NCG vent streams, wastewater treatment sludge and biogas. Natural gas will be used during startup periods as required per manufacturer recommendations.

1. The NO_X emissions from the stoker biomass boiler shall be controlled with the installation of a Selective Catalytic Reduction System (SCR). The NO_X emissions from the stoker biomass boiler shall also be controlled with the implementation of over-fire air (OFA) and good combustion practices (GCP). The owner or operator must operate and maintain the SCR system to assure proper and effective operation. If the emission rate results from the initial performance test are less than the limit described below and deemed consistently achievable, the emission rate determined during the performance test will be the limit imposed. The BACT emissions of NO_x proposed for the stoker biomass boiler are limited as follows:

    a. 0.30 lb/MMBtu on a 30 day rolling average, including periods of startup, shutdown, or malfunction, and

    b. 150 pounds per hour (lbs/hr) on a 1-hour average, including periods of startup and shutdown, and excluding malfunction.

2. The SO_2 emissions from the stoker biomass boiler shall be controlled the injection of sorbent (lime) in combination with a dry flue gas desulfurization (FGD) system. The owner or operator must operate and maintain the FGD system to assure proper and effective operation. If the emission rate results from the initial performance test are less than the limit described below and deemed consistently achievable, the emission rate determined during the performance test will be the limit imposed. The BACT emissions of SO_2 proposed for the stoker biomass boiler are limited as follows:

    a. 0.21 lb/MMBtu (8 percent (0.08) of the potential SO_2 emission rate or 92 percent reduction) on a 30 day rolling average including periods of startup, shutdown, and malfunction [40 CFR60.42b(g)], and.

b. 106.16 pounds per hour (lbs/hr) on a 1-hour average, including periods of startup and shutdown, and excluding malfunction.

3. The CO emissions from the stoker biomass boiler shall be controlled by implementation of good combustion practices (GCP). If the emission rate results from the initial performance test are less than the limit described below and deemed consistently achievable, the emission rate determined during the performance test will be the limit imposed. The BACT emissions of CO proposed for the stoker biomass boiler are limited as follows:

- 0.22 lb/MMBtu (260 ppmv@3% O_2) on a 30 day rolling average, including periods of startup, shutdown, or malfunction.

4. The PM emissions from the stoker biomass boiler shall be controlled with the installation of a baghouse (DC-20001) equipped with fabric filter bags. If the emission rate results from the initial performance test are less than the limits described below and deemed consistently achievable, the emission rate determined during the performance test will be the limit imposed. The BACT emissions of filterable PM proposed for the stoker biomass boiler are limited as follows:

- 0.015 lb/MMBtu, on a 30 day rolling average including periods of startup, shutdown, and malfunction.

5. The PM_{10} emissions from the stoker biomass boiler shall be controlled with the installation of a baghouse (DC-20001) equipped with fabric filter bags. If the emission rate results from the initial performance test are less than the limit described below and deemed consistently achievable, the emission rate determined during the performance test will be the limit imposed. The BACT emissions of filterable PM_{10} proposed for the stoker biomass boiler are limited as follows:

- 0.013 lb/MMBtu on a 30 day rolling average including periods of startup, shutdown, and malfunction.

6. The $PM_{2.5}$ emissions from the stoker biomass boiler shall be controlled with the installation of a baghouse (DC-20001) equipped with fabric filter bags. If the emission rate results from the initial performance test are less than the limit described below and deemed consistently achievable, the emission rate determined during the performance test will be the limit imposed. The BACT

emissions of filterable $PM_{2.5}$ proposed for the stoker biomass boiler are limited as follows:

- 0.011 lb/MMBtu on a 30 day rolling average including periods of startup, shutdown, and malfunction.

B. Cooling Water Tower (EP-04001)

The BACT emissions of $PM/PM_{10}/PM_{2.5}$ for the cooling water tower (EP-04001) is the installation of high efficiency mist eliminators that will limit drift to 0.0005% and a maximum total dissolved solids (TDS) limit of 1,575 ppm. Compliance with this requirement is demonstrated by maintaining records of the vendor-guaranteed maximum total liquid drift. Total dissolved solids in the circulating water shall not exceed 1,575 ppm by volume. The method of demonstrating compliance with the PM emission limit is limiting the TDS content of the cooling water. This results in a PM BACT limit of 0.17 lb/hr, PM_{10} BACT limit of 0.12 lb/hr and a $PM_{2.5}$ BACT limit of 0.07 lb/hr.

C. Boiler materials handling:

The boiler materials handling will consist of a hydrated lime handling and injection system, a boiler bottoms ash collection system, and a boiler fly ash collection system.

The BACT emissions of PM/PM_{10} from the following baghouses are limited to 0.004 gr/dscf based on the average of at least three test runs conducted at each baghouse. Negative pressure shall be maintained on all baghouse systems.

The BACT emissions of $PM_{2.5}$ from the following baghouses are limited to 0.002 gr/dscf based on the average of at least three test runs conducted at each baghouse. Negative pressure shall be maintained on all baghouse systems.

1. The hydrated lime injection system includes one hydrated lime storage silo (T-20512), pneumatic truck off-load system and handling conveyors. The emissions from the hydrated lime handling conveyors shall be controlled by the following baghouse:

    - Lime Handling Dust Collector Baghouse #1 (EP-20512) – emissions of PM/PM_{10} are limited to 0.07 lb/hr and $PM_{2.5}$ is limited to 0.03 lb/hr.

2. The boiler bottoms ash collection system shall consist of one (1) bottoms ash roll-off box T-20514 controlled by the following baghouse:

- Boiler Bottoms Ash Handling Dust Collector Baghouse #1 (EP-20514) – emissions of PM/PM_{10} are limited to 0.96 lb/hr and $PM_{2.5}$ is limited to 0.48 lb/hr.

3. The boiler fly ash collection system shall consist of ash handling pneumatic conveyors, one 15-ft diameter x 20-ft high interim storage silo and a combined truck/rail load-out system. The fly ash collection system shall be controlled by the two following baghouses:

   a. Boiler Fly Ash Handling Dust Collector Baghouse #1 (EP-20510) – emissions of PM/PM_{10} are limited to 0.48 lb/hr and $PM_{2.5}$ is limited to 0.24 lb/hr.

   b. Boiler Fly Ash Handling Dust Collector Baghouse #2 (EP-20520) – emissions of PM/PM_{10} are limited to 0.48 lb/hr and $PM_{2.5}$ is limited to 0.24 lb/hr.

4. The bulk fly ash silo shall consist of one 40-ft diameter x 55-ft high storage silo T-02710. The bulk fly ash silo shall be controlled by the two following baghouses:

   a. Bulk Fly Ash Load-out Silo Dust Collector Baghouse (EP-02710) – emissions of PM/PM_{10} are limited to 0.96 lb/hr and $PM_{2.5}$ is limited to 0.48 lb/hr.

   b. Bulk Fly Ash Load-out Silo Spout Dust Collector Baghouse (EP-02711) – emissions of PM/PM_{10} are limited to 0.96 lb/hr and $PM_{2.5}$ is limited to 0.48 lb/hr.

D. Crop Residues and Energy Crops Handling - Truck Unloading

The biomass (e.g., agricultural residues and energy crops) handling operations such as receiving, loading and unloading are sources of fugitive $PM/PM_{10}/PM_{2.5}$ (EP-11110FUG). Biomass will be delivered in bale form primarily on flatbed / module / custom trucks. The baled biomass will either be unloaded directly onto conveyors supplying the grinding lines or unloaded at the biomass overnight staging area or biomass storage field.

The proposed BACT is good work practices with no additional controls.
A Fugitive Dust Control Plan will be developed and will detail the work practices to be implemented to reduce fugitive emissions from agricultural residues and energy crops receiving operations.

E. Biomass Grinding/Milling, Handling, and Storage Operations prior to use as Feedstock in Ethanol Production Plant and as Biomass Fuel in the Cogeneration Plant

The BACT proposed for the biomass receiving, handling, grinding and silo storage operation is a work place standard requiring a closed system except for the module grinding conveyor lines which will be open at the loading end due to the large size of the biomass loaves.

The BACT emissions of PM/PM_{10} from the following baghouses are limited to 0.004 gr/dscf based on the average of at least three test runs conducted at each baghouse.

The BACT emissions of $PM_{2.5}$ from the following baghouses are limited to 0.0007 gr/dscf based on the average of at least three test runs conducted at each baghouse.

1. Biomass Grinding Line Dust Collector (DC) (CE-11110) – emissions of PM/PM_{10} are limited to 4.93 lb/hr and emissions of $PM_{2.5}$ are limited to 0.84 lb/hr.

2. Floor Sweep System Dust Collector (DC) (CE-11120) – emissions of PM/PM_{10} are limited to 0.27 lb/hr and emissions of $PM_{2.5}$ are limited to 0.05 lb/hr.

3. Classifier Cyclone Dust Collector (DC) #1 (CE-11170) – emissions of PM/PM_{10} are limited to 0.75 lb/hr and emissions of $PM_{2.5}$ are limited to 0.13 lb/hr.

4. Classifier Cyclone Dust Collector (DC) #2 (CE-11270) – emissions of PM/PM_{10} are limited to 0.75 lb/hr and emissions of $PM_{2.5}$ are limited to 0.13 lb/hr.

5. Boiler Feed System Dust Collector (DC) (CE-11711) – emissions of PM/PM_{10} are limited to 0.74 lb/hr and emissions of $PM_{2.5}$ are limited to 0.13 lb/hr.

F. Enzymatic Hydrolysis Ethanol Manufacturing Plant

The enzymatic hydrolysis production process consists of pre-treatment and digestion (Area 12000); conditioning (Area 14000); liquefaction, yeast propagation, saccharification and co-fermentation (Area 16000); ethanol recovery (i.e. distillation) (Area 18000); and stillage processing (Area 19000).

The non-condensibles generated in areas 12000, 16000, and 19000 from the biomass process vents will be routed to either the stoker biomass boiler or flare for destruction.

Condensable PM is formed after the stream exhausts from the scrubber and is due to fine particles, including aerosols, condensing at ambient air conditions. NO_2 is a trace containment present in the vent streams ducted to the fermentation packed-tower wet scrubber for control.

1. Enzymatic hydrolysis CO_2 scrubber (S-18185) - BACT emissions of condensable PM are limited to 0.10 lb/hr.

2. Enzymatic hydrolysis CO_2 scrubber (S-18185) - BACT emissions of NO_2 are limited to 0.07 lb/hr.

G. Product Load-out Vapor Recovery/Biogas Flare (EP-9001):

BACT for the flare consists of design and workplace standards since there is no currently feasible method to measure emissions exiting the flare. BACT is using a flare design that meets the requirements of the New Source Performance Standards Subpart A, Section 60.18 (40 CFR 60.18). Workplace standards include continuously monitoring the pilot flame with infrared sensors, maintaining a natural gas purge so that the heating value of gases to the flares is not less than 300 Btu/scf, and using steam assisted mixing at the flare tip for smokeless operation. The hours of operation shall be limited to no more than 3,960 hours per consecutive 12 month period, the pilot fuel shall be limited to exclusively natural gas, the biogas shall be treated to remove sulfur to a maximum value of 100 ppm and the flare shall consist of a low NOx burner.

H. Diesel Firewater Pump Engine (EU-6001):

BACT emissions for the diesel firewater pump engine are being established as the emission limits in 40 CFR Part 60, NSPS Subpart IIII.

1. The BACT emission of NMHC + NO_x for the diesel firewater pump engine is 2.57 g/Hp-hr.

2. The BACT emission of CO for the diesel firewater pump engine is 0.67 g/Hp-hr.

3. The BACT emission of PM/PM_{10} for the diesel firewater pump engine is 0.08 g/Hp-hr.

4. The BACT emissions of SO_2 for the diesel firewater pump engine is a work place diesel fuel standard that meets the following fuel sulfur standard:

    - Beginning October 1, 2010, the facility shall fuel the fire pump engine using diesel fuel that meets 0.0015 % sulfur by weight.

The diesel fire pump shall not be operated for more than 100 hours per year for testing and maintenance. Maintenance and testing hours of operation, except for necessary operational demonstrations to prove completion of maintenance, shall occur between 9:00 AM and 6:00 PM, Monday through Friday. Otherwise, the diesel fire pump shall be used only to provide emergency fire protection water supply to the Abengoa Bioenergy site on occasions when the plant fire protection systems are activated. The diesel fire pump may be operated for up to 50 hours per year for maintenance operations and such hours shall be included in the total 100 hours limitation. Hours of use shall be verified by the use of non-resettable run time meters (RTM).

I. Plant Haul Roads:

1. In-Plant Haul Roads (EP-01000FUG):

   a. The number of trucks hauling feedstock, product and materials into the ABBK plant shall not exceed 148 trucks per day averaged over any consecutive 7-day period.

   b. The number of trucks hauling feedstock, product and materials into the ABBK plant shall not exceed 44 truck arrivals between the hours of 6PM to 6AM (night-time) averaged over any consecutive 7-day period.

   c. The number of trucks entering onsite for shipping and receiving operations in the ABBK plant shall not exceed 47,852 trucks per year over a rolling 365-day period.

   d. The number of trucks entering onsite for shipping and receiving operations in the ABBK plant shall not exceed 14,356 trucks between the hours of 6:00 PM to 6:00 AM (night-time) per year over a rolling 365-day period.

   e. BACT for emissions of $PM/PM_{10}/PM_{2.5}$ is a work place practice to pave all in-plant haul roads and to post and enforce at all times a maximum speed limit of 15 mph. ABBK shall perform frequent washing, vacuuming and sweeping, and enforce a speed limit to reduce fugitive emissions from the paved plant haul roads.

2. In-Plant Biomass Laydown Roads and Unpaved Staging Area (EP-01050FUG):

   a. The number of trucks hauling feedstock and materials into the ABBK biomass laydown roads and unpaved staging area shall not exceed 109 trucks per day averaged over any consecutive 7-day period.

b. The number of trucks hauling feedstock and materials into the ABBK biomass laydown roads and unpaved staging area shall not exceed 33 truck arrivals between the hours of 6PM to 6AM (night-time) averaged over any consecutive 7-day period.

c. BACT for $PM/PM_{10}/PM_{2.5}$ for the in-plant unpaved biomass laydown roads and unpaved staging area (EP-01050FUG) is a work place practice to perform frequent water and/or chemical dust suppressant applications and to post and enforce at all times a maximum speed limit of 15 mph.

VII. <u>Ambient Air Impact Analysis</u>

A. Summary

The owner or operator of a proposed source must demonstrate that allowable emission increases from the proposed source would not cause or contribute to air pollution in violation of:

1. any national ambient air quality standard in any air quality control region; or

2. any applicable maximum allowable increase over the baseline concentration in any area.

The AERMOD modeling system, Version 11103, was used to evaluate the impacts of the following emissions that will result from the proposed facility:

1. 1-hour, annual NO_2;

2. 1-hour, 3-hour, 24-hour, annual SO_2; and

3. 1-hour, 8-hour CO.

The AERMOD modeling system, Version 09292, was used by Abengoa to evaluate the impacts of the following emissions that will result from the proposed facility:

1. 24-hour PM_{10}; and

2. 24-hour, annual $PM_{2.5}$.

AERMAP Version 11103 was used to assign elevations. AERMET Version 11059 was used to prepare meteorological data, which was provided by KDHE to Abengoa for the years 2006-2010. AERMINUTE Version 11059 was used to process 1-minute ASOS wind data to generate hourly average winds for input to AERMET in Stage 2.

Unless otherwise noted in this document and/or in the facility's modeling analyses, regulatory default options in the AERMOD model were utilized for this air quality impact analysis. The facility utilized the non-regulatory default option for the following:

1. parallel processing for PM_{10}, $PM_{2.5}$, and 1-hour NO_2;

2. AERMOD Version 09292 instead of AERMOD Version 11103 for modeling PM_{10} and $PM_{2.5}$; and

3. the Plume Volume Molar Ratio Method (PVMRM) method for modeling 1-hour NO_2.

The facility submitted requests for approval of the items above to EPA Region 7. The use of non-regulatory model options is described in Section 3.10 of the Ambient Air Quality Impact Assessment dated June 2011 and in Section 3.2 of the Updated Ambient Air Quality Impact Assessment Supplement dated August 2011. Correspondence concerning non-regulatory model options can be reviewed in Appendix A of the Ambient Air Quality Impact Assessment dated June 2011.

The emission rates, point locations, and stack parameters for the emission sources used in the model were based on the data presented in the permit application. Facility point, area, and volume source information are described in Appendix B from the Ambient Air Quality Impact Assessment dated June 2011. The Updated Ambient Air Quality Impact Assessment Supplement dated August 2011, Section 2.0 and Appendix A provide information about the 1-hour NO_2 emissions from the stoker biomass boiler controlled by SCR (as in the updated BACT analysis, also submitted in August 2011).

The results of the initial significant impact modeling indicated that refined modeling was required for the annual NO_2, 1-hour NO_2, 1-hour SO_2, 24-hour SO_2, annual SO_2, annual PM_{10} (standard has been revoked), 24-hour PM_{10}, annual $PM_{2.5}$, and 24-hour $PM_{2.5}$ averaging periods.

The results of the refined analyses can be found in Section 5.2 of the Ambient Air Quality Impact Assessment dated June 2011, and in Section 3.2 of the Updated Ambient Air Quality Impact Assessment Supplement dated August 2011. The results are summarized in the table below and include the total concentration compared to the NAAQS for each pollutant for which a refined analysis was conducted.

NAAQS Compliance Demonstration					
Pollutant	**Averaging Period**	**Modeled Concentration ($\mu g/m^3$)**	**Background Concentration ($\mu g/m^3$)**	**Total Concentration ($\mu g/m^3$)**	**NAAQS ($\mu g/m^3$)**
PM_{10}	24-hour	31.47	89	120.47	150
	Annual	7.55	22	29.55	50
$PM_{2.5}$	24-hour	22.87	17	**39.87**	**35**
	Annual	2.31	7	9.31	15
NO_2	1-hour	643.42	49	**692.42**	**188.7**
	Annual	25.95	7.5	33.45	100
SO_2	1-hour	51.23	8.9	60.13	196
	24-hour	15.97	5.8	21.77	365
	Annual	1.24	0.0	1.24	80

NAAQS exceedances were modeled in the 24-hour $PM_{2.5}$ compliance demonstration. The maximum predicted impact was 22.87 $\mu g/m^3$, for a total concentration of 39.87 $\mu g/m^3$ when background is included. This value exceeds the NAAQS of 35 $\mu g/m^3$. Abengoa performed a temporal and spatial contribution analysis for receptors that exceeded the NAAQS, and demonstrated that this project does not contribute significantly to any modeled NAAQS exceedance. NAAQS exceedances due to other sources will be addressed separately from this permit.

NAAQS exceedances were modeled in the 1-hour NO2 compliance demonstration. The maximum predicted impact was 643.42 $\mu g/m^3$, for a total concentration of 692.42 $\mu g/m^3$ when background is included. This value exceeds the NAAQS of 188.7 $\mu g/m^3$. Abengoa performed a temporal and spatial contribution analysis for receptors that exceeded the NAAQS, and demonstrated that this project does not contribute significantly to any modeled NAAQS exceedance. NAAQS exceedances due to other sources will be addressed separately from this permit.

The analyses indicated that concentration levels of all pollutants resulting from the proposed project, when combined with other sources, would not significantly cause or contribute to an exceedance of the NAAQS.

The results of the increment analyses can be found in Section 5.2 of the Ambient Air Quality Impact Assessment Update dated June 2011, and are summarized in the tables below. Additional information for the increment analysis was submitted in memo format on July 15, 2011.

ABBK Expansion Project Increment Consumption				
Pollutant	**Averaging Period**	**Modeled Concentration ($\mu g/m^3$)**	**Class II Increment ($\mu g/m^3$)**	**% of Increment**
NO_2	Annual	2.33	25	9.3
PM_{10}	Annual	7.05	17	41.5
	24-hour	27.45	30	91.5
$PM_{2.5}$	Annual	2.18	4	54.5
	24-hour	8.31	9	92.3
SO_2	Annual	1.24	20	6.2
	24-hour	9.75	91	10.7
	3-hour	20.84	512	4.1

All Source Cumulative Increment Consumption				
Pollutant	**Averaging Period**	**Modeled Concentration ($\mu g/m^3$)**	**Class II Increment ($\mu g/m^3$)**	**% of Increment**
NO_2	Annual	**25.95**	**25**	**103.8**
PM_{10}	Annual	7.16	17	42.12
	24-hour	27.52	30	91.73
$PM_{2.5}$	Annual	2.30	4	57.50
	24-hour	**22.87**	**9**	**254.11**
SO_2	Annual	1.77	20	8.85
	24-hour	15.97	91	17.55

Allowable increment for all sources was exceeded for annual NO_2. The maximum predicted concentration was 25.95 $\mu g/m^3$, compared to the allowable increment of 25 $\mu g/m^3$. Abengoa performed a temporal and spatial contribution analysis for receptors that exceeded the increment, and demonstrated that this project does not contribute significantly to any modeled increment exceedance. Increment exceedances due to other sources will be addressed separately from this permit.

Allowable increment for all sources was exceeded for 24-hour $PM_{2.5}$. The maximum predicted concentration was 22.87 $\mu g/m^3$, compared to the allowable increment of 9 $\mu g/m^3$. Abengoa performed a temporal and spatial contribution analysis for receptors that exceeded the increment, and demonstrated that this project does not contribute significantly to any modeled increment exceedance.

Increment exceedances due to other sources will be addressed separately from this permit.

The analyses indicated that concentration levels of all pollutants resulting from the proposed project, when combined with other increment consuming sources, would comply with PSD Class II increments.

B. Additional Impact Analysis

ABBK was required to provide an analysis of the impairment to visibility, and impacts on plants, 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.

1. Visibility Impairment Analysis

   The nearest Federal PSD Class I Area is the Great Sand Dunes in southeastern Colorado, located approximately 370 km (230 miles) west of the proposed project location. There is one potential Class II area of concern within 50 km (31 miles) to the proposed facility. The Cimarron National Grasslands is located within Morton and Stevens Counties in southwestern Kansas, approximately 24 km (15 miles) west of the proposed facility location. A visibility analysis was performed on the Class II area to demonstrate if significant deterioration of visibility will result from the operation of the proposed facility. The results of the level 2 VISCREEN analysis indicated that proposed facility will not have any adverse impacts on visibility at this Class II area.

   In addition to the Class II area, one sensitive area, the Hugoton Municipal Airport, was included in this analysis. The results of the level 2 VISCREEN analysis indicate potential adverse visibility impacts. Sun angle analysis concluded that there are minimal visibility impacts at the Hugoton Municipal Airport.

2. Impacts on Vegetation and Soils

   The owner or operator of a proposed source must provide an analysis on the impact on soils and vegetation for pollutants exceeding the PSD significance levels. For evaluating impacts to vegetation and soils from the proposed facility, the screening criteria in the EPA report, A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals, EPA 450/2-81-078, and the secondary NAAQS, were used.

   Modeled concentrations were compared to screening concentrations for exposure to ambient air concentrations. The results are summarized in the table below.

Screening Concentrations for Exposure to Ambient Air Concentrations						
Pollutant	**Avg. Period**	**Vegetation Sensitivity ($\mu g/m^3$)**	**Facility Impacts ($\mu g/m^3$)**	**Background ($\mu g/m^3$)**	**Facility Impacts + Background ($\mu g/m^3$)**	**Exceeds Screening Conc.?**
PM_{10}	24-hour	150	32.61	89	121.61	No
NO_2	4 Hours	3,760	19.51	49	68.51	No
	8 Hours	3,760	19.51	49	68.51	No
	1 Month	564	6.56	49	55.56	No
	Annual	94	2.33	7.5	9.83	No
SO_2	1 Hour	917	23.77	8.9	32.67	No
	3 Hour	786	24.15	6.8	30.95	No
	Annual	18	1.24	0	1.24	No
CO	1 Week	1,800,000	3.38	574	576.38	No

The results indicate that the proposed project will not adversely impact soils and vegetation in the area.

3. Growth in Commercial, Residential and Industrial Activity

The elements of a growth impact analysis include 1) a projection of the associated industrial, commercial, and residential source growth that will occur in the area due to the source; and 2) an estimate of the air emissions generated by the above associated industrial, commercial, and residential growth.

The socioeconomic region of influence consists of Morton, Seward and Stevens counties in Kansas, and Texas county in Oklahoma.

Any influx of capital (spending) or employment opportunities, such as a large construction project, to a region will impact the existing socioeconomic environment to some degree. Socioeconomic variables include population and housing, employment and income, education, and public services (law enforcement, fire protection, and medical services). These variables are interrelated in their response to changes in the environment.

Socioeconomic impacts can be addressed in terms of both direct and indirect impacts. Direct impacts are those changes that are directly attributed to the proposed facility, such as changes in employment, population, or spending (income or earnings) resulting from the construction and operations of the proposed facility. Indirect impacts in the region of influence occur as a reaction to project-induced changes in employment and regional expenditures.

Changes in regional expenditures can occur because of changes in employment levels and the resulting changes in wage income. Changes in regional expenditures also occur from the demand for materials and services associated with operations and maintenance of a facility. Socioeconomic impacts are the sum of the direct and indirect impacts.

The proposed facility would impact socioeconomic variables in the region of influence. Construction and operation activities under the proposed facility would impact the region's population and housing, employment and income, and education and public services. Impacts would be driven by changes (increases) in population that in turn impact other socioeconomic variables. The increase in population during construction activities (from in-migrating construction worker and operations workers employed during construction) would peak at nearly 500 persons, or approximately a 1-percent increase over the region's 2007 population (51,240 persons). The project-induced population increase of an estimated 35 persons during the projected operational life of the facility represents a 0.06- percent increase over the region's 2007 population. Because the increases in population are small, impacts to other socioeconomic variables are also small, that is, less than 1-percent of the baseline or existing conditions.

Construction-related emissions will be limited to fugitive dust and mobile-source combustion emissions. Fugitive dust will be mitigated, as necessary, by the construction contractor. Given the temporary nature of these emissions and the ability to mitigate them as needed, these activities are not expected to significantly impact air quality. Further, it can be concluded that the air quality impacts associated with secondary growth will not be significant because the increase in population due to the proposed facility will be very small (less than one percent).

VIII. Key Steps in the 'Top-Down' BACT Analysis

The four steps in the 'Top-Down' BACT Analysis are presented in Attachment A.

IX. BACT Analysis for PSD Permit

KDHE's evaluation of the BACT for the proposed ABBK facility is presented in Attachment B

X. Greenhouse Gas BACT Analysis for PSD Permit

KDHE's evaluation of the GHG BACT for the proposed ABBK facility is presented in Attachment C.