Statement of Basis

Construction Permit

Great Plains Ethanol, LLC d.b.a.
POET Biorefining
Chancellor, South Dakota

South Dakota Department of Environment and Natural Resources

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1.0 Background

On May 24, 2002, the South Dakota Department of Environment and Natural Resources (DENR) issued Great Plains Ethanol, LLC d/b/a POET Biorefining – Chancellor (POET Chancellor) Title V air quality permit #28.0501-61 to construct and operate a dry corn mill ethanol production plant located near Chancellor, South Dakota. Great Plains was permitted to produce 62 million gallons of undenatured ethanol per 12-month rolling period. Since the initial permit, Great Plains permitted production capacity has increased to 120 million gallon of undenatured ethanol per 12-month rolling total.

On November 27, 2012, the Title V operating permit was renewed. Since the renewal two permit amendments have been issued to update the Responsible official and to remove an opacity requirement that is no longer applicable to the facility under a federal subpart.

1.1 Existing Equipment Under the Title V Operating Permit

Table 1-1 provides a list of the units presently permitted which was taken from the current Title V air quality operating permit issued August 23, 2013.

Table 1-1 Description of Permitted Units, Operations, and Processes

Unit	Description	Maximum Operating Range	Control Device
#1	Enclosed truck and railcar grain handling system	840 tons per hour	Baghouse
	Elevator legs transport corn from receiving pits to seven grain storage bins		
	Elevator legs transport dried distiller grain and solubles (DDGS) from DDGS silo to bulk weigh and load out stations	220 tons per hour	
	DDGS load out into trucks and railcars in enclosed grain handling building		
#2	Elevator legs transport the grain from the storage bins to a scalper	140 tons per hour	Baghouse
	Corn scalper to clean corn		
	Elevator legs transports cleaned corn to surge bin		
#4	Fermentation process #1 consists of six fermenters. Liquid beer stored in a beer well	207 tons of corn mash, yeast and water per hour	Wet scrubber – Exhaust gases may be routed to Unit #6b or #6c
	Distillation process #1 distills the liquid beer and consists of the beer stripper, rectifier, side stripper, one set of three molecular sieves, and one	35,730 gallons of beer per hour	

Unit	Description	Maximum Operating Range	Control Device
	set of evaporators		
#6	Dryer A equipped with a multi cyclone to collected product and fired with natural gas and landfill gas	23 tons dried distiller grain and solubles per hour and 60 million Btus per hour heat input	Unit #6b or #6c
	Dryer B equipped with a multi cyclone to collected product and fired with natural gas and landfill gas	23 tons dried distiller grain and solubles per hour and 34 million Btus per hour heat input	
	Dryer C equipped with a multi cyclone to collected product and fired with natural gas and landfill gas	23 tons dried distiller grain and solubles per hour and 60 million Btus per hour heat input	
	Dryer D equipped with a multi cyclone to collected product and fired with natural gas and landfill gas	23 tons dried distiller grain and solubles per hour and 60 million Btus per hour heat input	
	One set of four centrifuges and one set of five centrifuges	50 tons of whole stillage per hour per centrifuge	
	Fermentation and distillation process #1	See Unit #4	
	Fermentation and distillation process #2	See Unit #29	
#6b	Three chambered regenerative thermal oxidizer fired with natural gas, landfill gas, and off gases generated from the ethanol production process	14.5 million Btus per hour	Three chambered regenerative thermal oxidizer
#6c	Seven chambered regenerative thermal oxidizer fired with natural gas, landfill gas, and off gases generated from the ethanol production process	42 million Btus per hour	Seven chambered regenerative thermal oxidizer
#7	Industrial cooling tower #1	18,000 gallons per minute	Not applicable
#8	Ethanol truck load out	39,000 gallons per hour	Flare
	Ethanol rail car load out	150,000 gallon per hour	
	Flare fired with natural gas and off gases from the load out process	25 million Btus per hour	
#9	DDGS fluid bed cooler #1	23 tons of DDGS per hour	Baghouse
#10	DDGS silo #1	46 tons per hour	Baghouse
#11	DDGS silo bypass receiver #1	46 tons per hour	Baghouse

Unit	Description	Maximum Operating Range	Control Device
#12	Elevator leg transports corn from surge bin to hammer mill #1 and ground corn to fermentation process	22 tons of grain per hour	Baghouse
#13	Elevator leg transports corn from surge bin to hammer mill #2 and ground corn to fermentation process	22 tons of grain per hour	Baghouse
#14	Elevator leg transports corn from surge bin to hammer mill #3 and ground corn to fermentation process	22 tons of grain per hour	Baghouse
#15	Elevator leg transports corn from surge bin to hammer mill #4 and ground corn to fermentation process	22 tons of grain per hour	Baghouse
#16	Diesel generator #1 fired with distillate oil	1,000 kilowatts	Not applicable
#18	Tank #1 – Above ground storage tank equipped with an internal floating roof	192,500 gallons	Not applicable
#19	Tank #2 – Above ground storage tank equipped with an internal floating roof	60,000 gallons	Not applicable
#20	Tank #3 – Above ground storage tank equipped with an internal floating roof	2,000,000 gallons	Not applicable
#21	Tank #4 – Above ground storage tank equipped with an internal floating roof	2,000,000 gallons	Not applicable
#22	Tank #6 – Above ground storage tank equipped with an internal floating roof	192,500 gallons	Not applicable
#23	Corn surge bin loading	140 tons per hour	Baghouse
#24	Elevator leg transports corn from surge bin to hammer mill #5	22 tons of grain per hour	Baghouse
#25	Elevator leg transports corn from surge bin to hammer mill #6	22 tons of grain per hour	Baghouse
#26	Elevator leg transports corn from surge bin to hammer mill #7	22 tons of grain per hour	Baghouse
#27	Elevator leg transports corn from surge bin to hammer mill #8	22 tons of grain per hour	Baghouse
#28	Flour conveyor and receiver	88 tons per hour	Baghouse
#29	Fermentation process #2 consists of four fermenters and the liquid beer is stored in a beer well.	207 tons of corn mash, yeast and water per hour	Wet scrubber – Exhaust gases may be routed to Unit #6b or #6c
	Distillation process #2 distills the	40,500 gallons of beer per	

Unit	Description	Maximum Operating Range	Control Device
	liquid beer and consists of the beer stripper, rectifier, side stripper, one set of three molecular sieves, and one set of evaporators	hour	
#30	DDGS fluid bed cooler #2	23 tons per hour	Baghouse
#31	DDGS silo #2	46 tons per hour	Baghouse
#32	DDGS silo bypass receiver #2	46 tons per hour	Baghouse
#33	Boiler #1 – 2006 Erie Power/Keystone boiler fired with natural gas	100 million Btus per hour heat input	Not applicable
#34	Boiler #2 – 2006 Erie Power/Keystone boiler fired with natural gas	100 million Btus per hour heat input	Not applicable
#35	Boiler #3 – 2006 Erie Power/Keystone boiler fired with natural gas	100 million Btus per hour heat input	Not applicable
#36	Boiler #4 – 2007 Factory Sales boiler fired with natural gas, wood waste, syrup, landfill gas, corn cobs, agriculture waste products, native grasses, cellulose ethanol waste, anaerobic digester biosolids, waste corn, dried distillers grain and solubles, wet cake, and used toner	178 million Btus per hour heat input	Electrostatic precipitator
#37	Diesel generator #2 fired with distillate oil	2,000 kilowatts	Not applicable
#38	Trona storage bin	33 tons per hour	Baghouse
#39	Solid fuel receiving and storage building, conveyors, screener and metal separator	250 tons per hour	Baghouse
#40	Industrial cooling tower #2	18,000 gallons per minute	Not applicable
#41	Ash storage and load out.	1 ton per hour	Baghouse
#42	Dried distillers grain bypass to boiler #4	46 tons per hour	Baghouse

1.2 Construction Permit 28.0501-61-03C

Table 1-2 provides a list of the units presently permitted to be constructed and operated under a quality construction permit #28.0501-61-03C issued January 29, 2015. It should be noted that Unit 6b and 6c have been removed from this list as they have not changed from Table 1-1

Table 1-2 Description of Permitted Units, Operations, and Processes

Unit	Description	Maximum Operating Rate	Control Device

Unit	Description	Maximum Operating Rate	Control Device
#29	Fermentation process #2 consists of six fermenters and the liquid beer is stored in a beer well.	207 tons of corn mash, yeast and water per hour	Wet scrubber – Exhaust gases may be routed to Unit #6b or #6c
	Distillation process #2 distills the liquid beer and consists of the beer stripper, rectifier, side stripper, one set of three molecular sieves, and one set of evaporators	40,500 gallons of beer per hour	
#43	Hammermill #9	22 tons per hour	Baghouse

1.3 Proposed Revisions

On October 22, 2015, POET Chancellor submitted an application to make a number of changes to their operation they are listed in the following sections.

1.3.1 Ethanol Production Increase

POET Chancellor included a request to increase the amount of permitted undenatured ethanol production limit from 120 million gallons per 12 month rolling total to 128 million gallons per 12 month rolling total. The basis of this request is incremental efficiency improvements. Examples provided by the facility are:

1. Increase in fermentation time thus allowing an increase in yield;
2. Use of new yeast strains that optimize fermentation;
3. System improvements in processing 190 proof into 200 proof ethanol;
4. Mechanical upgrades reducing downtime;
5. Upgrade to pumps to move fluid more quickly throughout the plan.

To facilitate this change POET Chancellor requested the following limit increases to facility:

1. Increase the grain processing limit from 1,226,400 to 1,342,322 tons per year;
2. Institute a grain receiving limit of 1,442,322 ton per year;
3. Increase the total suspended particulate, particulate matter with a diameter less than or equal to 10 microns, and particulate matter with a diameter less than or equal to 10 microns short term limits for the regenerative thermal oxidizers (Units 6b and 6c) from 12 pounds per hour to 15 pounds per hour;
4. Increase beer feed rate on Unit #4 from 35,730 to 43,200 gallons of beer per hour;
5. Increase beer feed rate on Unit #29 from 40,500 to 43,200 gallons of beer per hour
6. Increase the volatile organic compound limit on wet scrubber #1 (Unit 4) short term limit form 10.0 pounds per hour to 21.3 pounds per hour; and
7. Increase the volatile organic compound limit on wet scrubber #2 (Unit 29) short term limit form 20.0 pounds per hour to 21.3 pounds per hour.

No increases to other process rates have been requested. However the facility did note that

potential emissions from ethanol storage, denaturant use, and load out of denatured ethanol may increase due to the increase volume throughput.

1.3.2 New Scrubber Operating Scenarios

POET Chancellor has requested alternate scrubber operating scenarios be added to the facility. POET Chancellor currently has two operating scenarios for each fermentation/distillation system (i.e. Unit #4 and Unit #29) for the existing facility. Those scenarios are as follows:

Scenario 1A - The emissions from Unit #4 are routed to its independent wet scrubber, the emissions from the wet scrubber are routed to a system of two regenerative thermal oxidizers, and then the emissions from the thermal oxidizers are routed to the ambient air; and

Scenarios 1B -The emissions from Unit #4 are routed to its independent wet scrubber and then the emissions from the wet scrubber are routed to the ambient air. This scenario is limited to 500 hours of operation per year.

Scenario 2A - The emissions from Unit #29 are routed to its independent wet scrubber, the emissions from the wet scrubber are routed to a system of two regenerative thermal oxidizers, and then the emissions from the thermal oxidizers are routed to the ambient air; and

Scenarios 2B -The emissions from Unit #29 are routed to its independent wet scrubber and then the emissions from the wet scrubber are routed to the ambient air. This scenario is limited to 500 hours of operation per year.

POET Chancellor has proposed a scenario where during times of maintenance to a wet scrubber the emissions from fermentation/distillation system would be routed to the other fermentation/distillation system's wet scrubber.

POET Chancellor's alternative scenario request produces two additional operating scenarios for each fermentation/distillation system. Those scenarios are as follows:

Scenario 1C - The emissions from Unit #4 are routed to the wet scrubber associated with Unit #29, the emissions from Unit #29's wet scrubber are routed to a system of two regenerative thermal oxidizers, and then the emissions from the thermal oxidizers are routed to the ambient air; and

Scenario 1D - The emissions from Unit #4 are routed to the wet scrubber associated with Unit #29 and then the emissions from Unit #29's wet scrubber are routed to the ambient air. POET Chancellor has requested the scenarios 2B and 1D be limited to a combined 500 hours of operation per year.

Scenario 2C - The emissions from Unit #29 are routed to the wet scrubber associated with Unit #4, the emissions from Unit #4's wet scrubber are routed to a system of two regenerative thermal oxidizers, and then the emissions from the thermal oxidizers are routed to the ambient air; and

Scenario 2D - The emissions from Unit #29 are routed to the wet scrubber associated with Unit

#4 and then the emissions from Unit #4's wet scrubber are routed to the ambient air. POET Chancellor has requested the scenarios 1B and 2D be limited to a combined 500 hours of operation per year.

1.3.3 New Grain Bin and Receiving Pit

POET Chancellor has requested to construct a second grain receiving building. This will involve the construction of an additional receiving pit, conveying systems and a grain storage bin. The new construction will be controlled by an additional baghouse. This will control the new operation plus two of the grain storage bins and handling operations currently associated with Unit #1. The facility has requested that this new grain receiving operation be designated as Unit #44.

1.3.4 E-85 Loadout

POET Chancellor has requested the ability to load out E-85 ethanol from their facility. The facility has requested that 10 percent of the permitted ethanol production be available for E-85 loadout or 12.8 million gallons of denatured ethanol. This is equivalent to 18.29 million gallons of potential E-85 load out.

2.0 New Source Performance Standards

DENR reviewed the New Source Performance Standards listed in 40 CFR Part 60 to determine if any of the federal New Source Performance Standards are applicable to this facility. The following may be applicable.

2.1 Standards Applicable to Storage Tanks

There are three New Source Performance Standards for storage vessels. The three standards are applicable to the following storage vessels:

1. 40 CFR Part 60 Subpart K: applicable to storage vessels for petroleum liquids capable of storing greater than 40,000 gallons and commenced construction after June 11, 1973 but prior to May 19, 1978;
2. 40 CFR Part 60 Subpart Ka: applicable to storage vessels for petroleum liquids capable of storing greater than 40,000 gallons and commenced construction after May 18, 1978; and
3. 40 CFR Part 60 Subpart Kb: applicable to storage vessels for volatile organic liquids capable of storing 75 cubic meters (approximately 19,813 gallons) or greater and commenced construction after July 23, 1984.

It has been determined in previous reviews that the facility has a number of tanks applicable to Subpart Kb. POET Chancellor has not requested installation of an additional tank subject to this subpart. However, throughput will increase to the applicable tanks at the facility with an increase in production. This will not cause any additional requirements under these subparts. Therefore the facility will only be required to comply with their requirements under their existing Title V

air quality operating permit.

2.2 Standards for Grain Elevators

The provisions under 40 CFR Part 60 Subpart DD is applicable to the following grain elevators:

1. The provisions of this subpart are applicable to any grain terminal elevator, which has a permanent grain storage capacity of 2,500,000 bushels. A grain terminal storage elevator means any grain elevator except those located at animal food manufacturers, pet food manufactures, cereal manufacturers, breweries, and livestock feedlots; or
2. The provisions of this subpart are applicable to any grain storage elevator, which has a permanent grain storage capacity of 1,000,000 bushels. A grain storage elevator means any grain elevator located at any wheat flour mill, wet corn mill, dry corn mill (human consumption), rice mill, or soybean oil extraction plant; and
3. Commences construction, modification, or reconstruction after August 3, 1978.

It has been determined that POET Chancellor is applicable to Subpart DD. According to previous documents the facility has 2,608,000 bushels of permanent grain storage capacity. The proposed grain receiving operation will add 565,000 bushels for a total of 3,173,000 bushels permanent grain storage capacity. The proposed grain receiving operation is applicable to this subpart. Subpart DD has contains emission limits on grain receiving units. Both receiving operations will be applicable to this subpart.

2.3 Standards for Synthetic Organic Chemical Manufacturing Industries

There are two New Source Performance Standards for synthetic organic chemical manufacturing industries. The two standards are applicable to the following:

1. 40 CFR Part 60, Subpart VV is applicable to affected facilities in the synthetic organic chemical manufacturing industry, of which ethanol is included; and commence construction, reconstruction or modification after January 5, 1981, but before November 8, 2006 and the capacity of the plant is more than 1,000 megagrams per year of ethanol; and
2. 40 CFR Part 60, Subpart VVa is applicable to affected facilities in the synthetic organic chemical manufacturing industry that commence construction, reconstruction, or modification after November 7, 2006 and the capacity of the plant is more than 1,000 megagrams per year of ethanol.

It has already been determined in previous reviews that POET Chancellor will comply with 40 CFR Part 60, Subpart VVa. The proposed change will increase the possible instantaneous flow rate through applicable pumps, valves, and connections. However, no physical change is being made to those pumps, valves, and connections. Therefore the proposed construction does not require the Subpart VVa language to be placed in the construction permit. POET Chancellor will be required to continue their Subpart VVa program as described in their existing Title V air quality operating permit.

2.4 Other Applicable New Source Performance Standards

DENR reviewed the other New Source Performance Standards and determined there are no other standards applicable to POET Chancellor.

3.0 New Source Review

In accordance with ARSD 74:36:10:01, the new source review regulations apply to areas of the state which are designated as nonattainment pursuant to the Clean Air Act for any pollutant regulated under the Clean Air Act. This facility is located near Chancellor, South Dakota, which is in attainment or unclassifiable for all the criteria air pollutants regulated under the Clean Air Act. Therefore, POET Chancellor is not subject to new source review.

4.0 Prevention of Significant Deterioration

A prevention of significant deterioration (PSD) review applies to new major stationary sources and major modifications to existing major stationary sources in areas designated as attainment under Section 107 of the Clean Air Act for any regulated air pollutant. The following is a list of regulated air pollutants under the PSD program:

1. Total suspended particulate (PM);
2. Particulate with a diameter less than or equal to 10 microns (PM10);
3. Particulate with a diameter less than or equal to 2.5 microns (PM2.5);
4. Sulfur dioxide (SO_2);
5. Nitrogen oxides (NOx);
6. Carbon monoxide (CO);
7. Ozone – measured as volatile organic compounds (VOCs);
8. Lead;
9. Fluorides
10. Sulfuric acid mist;
11. Hydrogen sulfide;
12. Reduced sulfur compounds;
13. Total reduced sulfur; and
14. Greenhouse gases (carbon dioxide, methane, nitrous oxide, etc.).

If the source is considered one of the 28 named PSD source categories listed in Section 169 of the federal Clean Air Act, the major source threshold is 100 tons per year of any regulated air pollutant, except for greenhouse gases. The major source threshold for all other sources is 250 tons per year of any regulated air pollutant, except for greenhouse gases.

The Environmental Protection Agency (EPA) published and implemented a final rule that no longer lists ethanol plants as a chemical manufacturing plant. Therefore, POET Biorefining – Chancellor is not classified as a chemical manufacturing plant or one of the 28 listed source

categories for PSD regulations and the major source threshold is 250 tons per year, except for greenhouse gases.

On June 23, 2014, the Supreme Court of the United States issued a ruling that the EPA could not require facilities to obtain a PSD permit based solely on greenhouse gas emissions. The Supreme Court of the United States ruling states that in order for a PSD evaluation for greenhouse gas to occur, a facility must trigger one of the major source thresholds for another regulated pollutant before a greenhouse gas emissions can be considered under the PSD permitting program. This ruling applies to both new PSD sources as well as major source modifications.

4.1 Potential to Emit Criteria Pollutants

DENR uses stack test results to determine air emissions whenever stack test data is available from the source or a similar source. When stack test results are not available, DENR relies on manufacturing data, material balance, EPA's Compilation of Air Pollutant Emission Factors (AP-42, Fifth Edition, Volume 1) document, the applicant's application, or other methods to determine potential air emissions.

POET Chancellor's Title V air quality operating permit requires the facility to maintain its emissions to less than 238 tons per year per pollutant by operating emission controls and by complying with emission and operational limitations which allows the facility to be considered a minor PSD source. If the specified control equipment and the emission limits were not required, POET Chancellor would be considered a major source under the PSD program and would have required a PSD permit.

It should be noted that total suspended particulate is a regulated pollutant under the PSD program. Limits for this pollutant are not currently included in POET Chancellor's Title V air quality operating permit. Therefore they will be added to this permit to ensure the facility is properly limiting its pollutants. These limits will be the same as the currently permitted particulate matter less than 10 microns in diameter limits.

4.1.1 Current Short-Term Limits and Operational Limits

The current permit contains enforceable short term limits to ensure actual emissions from the ethanol plant do not exceed the major source threshold under the PSD program. Table 4-1 lists POET Chancellor's short term emission limits as taken from chapter 7.0 of the current permit.

Table 4.1 – Current Short Term Emission Limits

Unit	Description	TSP (lbs/hr)	PM10 (lbs/hr)	PM2.5 (lbs/hr)	SO_2 (lbs/hr)	NO_x (lbs/hr)	VOCs (lbs/hr)	CO (lbs/hr)
#1	Grain receiving	1.0 [1]	1.0 [1]	1.0 [1]				
#2	Grain cleaning	0.1	0.1	0.1				
#4	Fermentation and distillation #1						10.0	
#6	Dryers, centrifuges, and fermentation and	12.0	12.0	12.0	4.2	16.3	18.0	14.0

	distillation #1 and #2							
#7	Industrial cooling tower #1							
#8	Ethanol load out/flare							
#9	Fluid bed cooler #1	1.0	1.0	1.0			2.8	
#10	DDGS silo #1	0.4	0.4	0.4				
#11	DDGS silo #1 bypass	0.2	0.2	0.2				
#12	Hammer mill #1	0.4	0.4	0.4				
#13	Hammer mill #2	0.4	0.4	0.4				
#14	Hammer mill #3	0.4	0.4	0.4				
#15	Hammer mill #4	0.4	0.4	0.4				
#16	Generator #1	0.9	0.9	0.9	5.4	32.2	0.9	7.4
#23	Surge bin	0.2	0.2	0.2				
#24	Hammer mill #5	0.4	0.4	0.4				
#25	Hammer mill #6	0.4	0.4	0.4				
#26	Hammer mill #7	0.4	0.4	0.4				
#27	Hammer mill #8	0.4	0.4	0.4				
#28	Flour conveyor	0.2	0.2	0.2				
#29	Fermentation and distillation #2						20.0	
#30	Fluid bed cooler #2	1.0	1.0	1.0			3.5	
#31	DDGS silo #2	0.4	0.4	0.4				
#32	DDGS silo #2 bypass	0.2	0.2	0.2				
#33	Boiler #1	0.8	0.8	0.8	0.1	3.0	0.5	2.5
#34	Boiler #2	0.8	0.8	0.8	0.1	3.0	0.5	2.5
#35	Boiler #3	0.8	0.8	0.8	0.1	3.0	0.5	2.5
#36	Boiler #4	5.4	5.4	5.4	122.0 [2]	85.0 [2]	3.0	106.0 [2]
#37	Generator #2	0.4[3]	0.4[3]	0.4[3]	10.7	54.2	1.0	1.2
#38	Trona storage bin	0.1	0.1	0.1				
#39	Solid fuel receiving and storage	1.1	1.1	1.1				
#40	Industrial cooling tower #2							
#41	Ash storage building	0.1	0.1	0.1				
#42	Dried distillers grain bypass	0.4	0.4	0.4				
#43	Hammer mill #9	0.4	0.4	0.4				

[1] – In addition to a 1.0 pounds per hour emission limit, Unit #1 is also subject to a 0.01 grains per dry standard cubic foot limit which is derived from 40 CFR Part 60 Subpart DD.

[2] – This unit is subject to a compliance monitoring activity that involved the installation of continuous emission monitors. The limits listed are in tons per 12 month rolling period.

[3]- This emission limit is in grams per horsepower-hour which is equivalent to 0.07 pounds per hour.

In addition to the short term and long term limits, POET Chancellor has accepted operational limits that restrict the operation of certain units. Table 4-2 provides a summary of the operational limits.

Table 4-2 Current Operational Limits

Condition	Unit(s)	Operational Limit
8.9	Facility-Wide	Produce less than or equal to 120 million gallons of undenatured ethanol per 12-month rolling period
8.10	Facility-Wide	Process less than or equal to 1,226,400[1] tons of grain through the hammermills per 12-month rolling period
8.11	Facility-Wide	Produce less than or equal to 351,176 tons of dried distillers grain and solubles per 12-month rolling period
8.12	#4 and #29	Emissions from either fermentation unit may route directly to the atmosphere from the wet scrubber for up to 500 hours each per 12-month rolling period

[1] – POET Chancellor has requested this limit be increased to 1,342,322 tons of grain

4.1.2 Proposed Ethanol Production Increase

POER Chancellor has proposed increasing ethanol production from 120 million gallons of undenatured ethanol per year to 128 million gallons of ethanol per year which may increase emissions from the grain processing and milling operations, fermentation, distillation, product storage, and DDGS storage and shipping operations.

The grain processing and milling operation actual emissions may increase because of additional grain and flour throughput. The facility has not requested an increase to short term limits for the existing operation therefore no increase in potential emissions is expected. It should be noted that increases from the proposed grain receiving process as well as potential emissions from fugitive emissions may occur but will be discussed in a later section of this document.

The fermentation process is controlled by a wet scrubber and the regenerative thermal oxidizers associated with the distillation process. In order to facilitate the ethanol production increase the facility has requested changes to short term limit for total suspended particulate for the regenerative thermal oxidizer system (Unit #6b and #6c) and for volatile organic compounds on the wet scrubbers (Unit #4 and Unit #29). DENR assumes potential emissions for short term limits are calculated on an every hour of every day of the year basis (8,760 hours), unless otherwise limited by an operational limit. Potential emissions will be calculated using Equation 4-1.

Equation 4-1 Potential Emissions

$$\boldsymbol{Potential\ Emissions}\left(\frac{\boldsymbol{Tons}}{\boldsymbol{Year}}\right) = \frac{\boldsymbol{Short\ Term\ Limit}\left(\frac{\boldsymbol{Pounds}}{\boldsymbol{Hour}}\right) \times \boldsymbol{Operational\ Hours}\left(\frac{\boldsymbol{Hours}}{\boldsymbol{Year}}\right)}{\boldsymbol{2,000}\left(\frac{\boldsymbol{Pounds}}{\boldsymbol{Ton}}\right)}$$

Table 4-3 contains a comparison between the current limits and the proposed ones as well as the effect on potential emissions.

Table 4-3 Potential Emissions for Short Term Limits

Unit	Existing Limit (Pounds Per Hour)	Proposed Limit (Pounds Per Hour)	Existing Potential Emissions (Tons per Year)	Proposed Potential Emissions (Tons per Year)	Increase In Potential Emissions (Tons per Year)
#6[1]	12.0	15	52.6	65.7	13.1
#4[2,3]	10.0	21.3	2.5	5.3	2.8
#29[2,3]	20.0	21.3	5	5.3	0.3

[1]-Limit is for total suspended particulate, particulate matter less than 10 microns, and particulate matter less than 2.5 microns.
[2]-Limit is for volatile organic compounds.
[3]-Operation is limited to 500 hours per year

In addition to the increased potential emissions from short term limit increases emissions will also increase from storage of additional product and denaturant usage. DENR uses tanks 4.0.9d program to estimate tank potential emissions. Table 4-4 contains the tank contents, current and proposed potential throughputs, as well as the current and proposed potential emissions. DENR assumes 190 proof ethanol is 95 percent ethanol and 5 percent water, the denaturant has a Reid vapor pressure of 15, and the denaturant rate is 5.0 percent.

The potential throughput of denaturant is also affected by the addition of E-85 as a loadout option. The facility has requested that 10 percent of all the ethanol be available to produce E-85. This would 12.8 million gallons of ethanol. E-85 is at a maximum 70 percent ethanol, therefore the facility could potentially use 5.29 million gallons of ethanol to produce the desired value of E-85. In addition to the E-85 the remaining 115.2 million gallons at the above discussed 5% rate it would require 6.06 million gallons of denaturant. This is 11.35 million gallons of denaturant. The throughput will be assumed to be equal through each tank or 5.675 million gallons of denaturant usage per tank.

Table 4-4 Potential Tank Emissions

Unit	Contents	Current Throughput (gallons per year)	Proposed Throughput (gallons per year)	Current Emission (tons per year)	Proposed Emissions (tons per year)
#18	190 proof ethanol	126,315,790	134,736,842	0.45	0.48
#19	Denaturant	3,000,000	5,675,000	0.78	0.79
#20	200 proof ethanol	60,000,000	64,000,000	0.25	0.25
#21	200 proof ethanol	60,000,000	64,000,000	0.25	0.25
#22	Denaturant	3,000,000	5,675,000	0.91	0.91
			Total	2.64	2.68

Table 4-7 contains a summary of increased potential emissions. It should be noted that fugitive emissions may increase as a result of this change. Those emissions will be discussed in section

4.1.6 of this document. Additionally Emissions from load out operations may increase and will be discussed in section 4.1.5. No other increases to potential emissions are expected as a result of this proposed change.

4.1.3 New Scrubber Operating Scenario

POET Chancellor currently operates what is essentially two ethanol plants that where emissions from fermentation, distillation and drying are controlled by two separate wet scrubbers and then it is routed to a common regenerative thermal oxidizer system. Currently the Title V air quality operating permit contains a provision allowing wet scrubbers to emit to the atmosphere for up to 500 hours each. The facility is now requesting to route all emissions to a single wet scrubber during times of scrubber maintenance. The emissions would then be routed to the regenerative thermal oxidizer or directly to the atmosphere.

The facility has requested that when emissions are routed to the regenerative thermal oxidizer the operation be limited to 100 hours per year. POET Chancellor did not request a separate emission limit associated with the thermal oxidizers. Therefore, the additional operational limit is not required. The potential emissions for the affected unit are already calculated on an every hour of every day emissions. Therefore effectively there will be no changes to potential emissions. However, changes in actual emissions could occur; therefore, POET Chancellor may be required to performance test both new operating scenarios.

When emissions are routed to the atmosphere from the scrubber the facility has requested that time counts against their existing 500 hour limit for by passing the wet scrubber. As noted, in section 4.1.2, POET Chancellor requested the short term limits be increased. The increase in emissions associated with these changes may be observed in Table 4-3.

4.1.4 Grain Receiving Operation

POET Chancellor currently operates with a single grain receiving operation designated as Unit #1. The proposed change involves the addition of a new receiving pit, construction of a new grain bin, construction of conveying equipment to carry grain, and changing the current configuration so the new pit feeds into two of the existing grain bins.

Grain receiving operations have the potential to emit particulate matter (total suspended particulate, particulate less than 10 microns in diameter, and particulate matter less than 2.5 microns in diameter). All emissions from this change will be controlled by the existing baghouse and a proposed baghouse for the new operation. Currently Unit #1 has short term limits for particulate matter of 1.0 pounds per hour for each type of particulate matter. The facility has requested the same limits for the new unit. Using Equation 4-1 and operation for 8,760 hours per year, this corresponds to 4.38 tons of additional emissions.

It should be noted that due to applicability to New Source Performance Standard Subpart DD and additional particulate matter emission limit of 0.01 grains per dry standard cubic foot. POET Chancellor will be required to show compliance with both emissions limits for any applicable performance testing.

4.1.5 E-85 and Denatured Ethanol Loadout Operations

POET Chancellor has proposed adding E-85 ethanol load out to their existing load out operations. The facility would mix both denatured ethanol and E-85 in line as the product is loaded out to the trains. 10 percent of the permitted ethanol production has been requested to be available for E-85 loadout, or 12.8 million gallons of undenatured ethanol. E85 at a maximum is 30 percent denaturant which would imply 18.29 million gallons of total throughput.

POET Chancellor submitted documentation in their application that showed calculation based on AP-42 Section 5.2. This section contains Equation 4-2 that is used to calculate loading loss from loadout of volatile products to truck and rail cars.

Equation 4-2 Loading Rack Emissions

$$LoadingLoss\left(\frac{Pounds}{1000\ gallons}\right) = 12.46 \times \frac{SPM}{T}$$

Where:
S= Saturation Factor (Taken From AP-42, Table 5.2-1)
P=True Vapor Pressure (Taken from Tanks 4.0.9d, pounds per square inch absolute)
M=Molecular Weight of Vapors (Taken from Tanks 4.0.9d, pounds per mole pound)
T=Temperature of the bulk liquid loaded (Taken from Tanks 4.0.9d, degree Rankine)

The emissions from loadout depend on the whether a vessel has been cleaned since its last usage therefore a value for the saturation factor will be provided for each scenario. Table 4-5 contains the load out situation as well as the above variables and the resulting loading loss for each scenario.

Table 4-5 Loading Loss

Previous Stored Cargo	Saturation Factor	True Vapor Pressure	Molecular Weight	Bulk Temperature	Loading Loss
Gasoline (RVP 15)	1.0	6.41	92	505.2	14.54
Gasoline Clean (RVP 15)	0.5	6.41	92	505.2	7.11
Denatured Ethanol	0.6	0.57	47.25	505.2	0.42
Denatured Ethanol Clean	0.5	0.57	47.25	505.2	0.35
E-85	0.6	1.48	56.75	505.2	1.24
E-85 Clean	0.5	1.48	56.75	505.2	1.03

The above loading losses are calculated as if you are loading the same liquid into the tank. The facility does not load out gasoline. However, the tanks used for load out may have previously been used for gasoline transfer. Loading into one of these tanks would be the worst case scenario as the loading loss rates are much higher from gasoline. In order to calculate the loading loss when loading into a tank that previously stored gasoline the clean loading value for gasoline will be subtracted from the non-clean tank loading value, this results in the loading loss from the liquid that was already stored in the tank, this values is equal to 7.43 pounds per 1,000 gallons.

Then the value for loading into a clean tank for the given fluid is added. Therefore the Loading loss for denatured ethanol and E-85 will be 7.78 and 8.46 pounds per 1,000 gallons respectively. Throughputs will be considered to be 18.29 million gallons of E-85 and 121.26 million gallons of denatured ethanol.

Loadout to both trucks and rail is required to be controlled by a flare at POET Chancellor. The flare will be assumed to have a destruction efficiency of 98 percent (all but 0.02 percent of emissions destroyed). Equation 4-3 will be used to calculate the potential emissions.

Equation 4-3 Potential Emissions

$$PotentialtoEmit\left(\frac{tons}{year}\right) = \frac{LoadingLoss\left(\frac{Pounds}{1000\ gallons}\right) \times Throughput\left(\frac{1000\ gallons}{Year}\right) \times 0.02}{2000\left(\frac{Pounds}{Ton}\right)}$$

The results of applying this equation can be found in Table 4-8.

In addition to the emissions from load out the flare produces emission from the flame itself. DENR will use the AP-42 values for burning natural gas in order to estimate potential emissions from this operation. The AP-42 emission factor can be found in Table 4-6.

Table 4-6 Natural Gas Emission Factors

Type of Fuel	TSP (lbs/ MMBtu)	PM10 (lbs/ MMBtu)	PM2.5 (lbs/ MMBtu)	SO_2 (lbs/ MMBtu)	NO_x (lbs/ MMBtu)	VOCs (lbs/ MMBtu)	CO (lbs/ MMBtu)
Natural gas	0.007	0.007	0.007	0.0006	0.098	0.005	0.082

Equation 4-4 will be used to calculate fuel burning potential emissions.

Equation 4-4 Fuel Burning Potential Emissions

$$PotentialtoEmit\left(\frac{tons}{year}\right) = \frac{EmissionFactor\left(\frac{Pounds}{MMBtu}\right) \times 25\left(\frac{MMBtus}{hour}\right) \times 8{,}760\left(\frac{hours}{Year}\right)}{2000\left(\frac{Pounds}{Ton}\right)}$$

The results of applying Equation 4-4 can be found in Table 4-7.

4.1.6 Fugitive Emissions

DENR does not normally regulate emissions from fugitive sources. However, fugitive emissions that are subject to federal standards are required to be included in any major source evaluation for the prevention of significant deterioration program. POET Chancellor is subject to New Source Performance Standards Subpart DD and Subpart VVa. Therefore fugitive emissions from the units applicable to these subparts will be required to be part of any potential emissions calculation. The facility submitted calculations for these units. DENR reviewed these

calculations and agrees with the methodology. Table 4-7 contains the fugitive emissions submitted to DENR.

It should be noted that the facility submitted fugitive emissions calculation for solid fuel receiving. Based on the above determination this could be interpreted as applicable to Subpart Db. However, the subpart does not have provisions for fugitive emissions from fuel receiving therefore the emissions will not be included in the fugitive emissions calculations.

4.1.7 Summary of Potential Emissions

In addition to the emissions from all sources discussed above the facility submitted calculations for the emissions from the cooling towers. DENR reviewed the calculation and agrees with the methodology. Table 4-8 contains

Table 4-7 Current Short Term Emission Limits

Unit	Description	TSP (lbs/hr)	PM10 (lbs/hr)	PM2.5 (lbs/hr)	SO_2 (lbs/hr)	NO_x (lbs/hr)	VOCs (lbs/hr)	CO (lbs/hr)
#1	Grain receiving	4.4	4.4	4.4				
#2	Grain cleaning	0.4	0.4	0.4				
#4	Fermentation and distillation #1						5.3	
#6	Dryers, centrifuges, and fermentation and distillation #1 and #2	65.7	65.7	65.7	18.4	71.4	78.8	61.3
#7	Industrial cooling tower #1	4.9	4.9	4.9				
#8	Ethanol load out/flare	0.0	0.0	0.0	0.0	0.4	11.5	0.4
#9	Fluid bed cooler #1	4.4	4.4	4.4			12.3	
#10	DDGS silo #1	1.8	1.8	1.8				
#11	DDGS silo #1 bypass	0.9	0.9	0.9				
#12	Hammer mill #1	1.8	1.8	1.8				
#13	Hammer mill #2	1.8	1.8	1.8				
#14	Hammer mill #3	1.8	1.8	1.8				
#15	Hammer mill #4	1.8	1.8	1.8				
#16	Generator #1	0.2	0.2	0.2	1.4	8.1	0.2	1.9
#23	Surge bin	0.9	0.9	0.9				
#24	Hammer mill #5	1.8	1.8	1.8				
#25	Hammer mill #6	1.8	1.8	1.8				
#26	Hammer mill #7	1.8	1.8	1.8				
#27	Hammer mill #8	1.8	1.8	1.8				
#28	Flour conveyor	0.9	0.9	0.9				
#29	Fermentation and distillation #2						5.3	
#30	Fluid bed cooler #2	4.4	4.4	4.4			15.3	
#31	DDGS silo #2	1.8	1.8	1.8				

#32	DDGS silo #2 bypass	0.9	0.9	0.9				
#33	Boiler #1	3.5	3.5	3.5	0.4	13.1	2.2	11.0
#34	Boiler #2	3.5	3.5	3.5	0.4	13.1	2.2	11.0
#35	Boiler #3	3.5	3.5	3.5	0.4	13.1	2.2	11.0
#36	Boiler #4	23.7	23.7	23.7	122.0	85.0	13.1	106.0
#37	Generator #2	1.8	1.8	1.8	2.7	13.6	0.3	0.3
#38	Trona storage bin	0.4	0.4	0.4				
#39	Solid fuel receiving and storage	4.8	4.8	4.8				
#40	Industrial cooling tower #2	4.9	4.9	4.9				
#41	Ash storage building	0.4	0.4	0.4				
#42	Dried distillers grain bypass	1.8	1.8	1.8				
#43	Hammermill #9	1.8	1.8	1.8				
#44	Grain receiving	4.4	4.4	4.4				
Fugitive Emissions from Grain Receiving		47.0	13.2	2.2				
Fugitive Emission from Equipment Leaks							5.2	
	Total	208	174	163	146	218	154	203

Based on the above evaluation POET Chancellor will not exceed its plant wide criteria pollutant limits of 238 tons. The facility will remain a minor source for the Prevention of Significant Deterioration. A greenhouse gas evaluation is not necessary because the facility is not a major source for any criteria pollutant.

5.0 National Emission Standards for Hazardous Air Pollutants

DENR reviewed 40 CFR Part 61 to determine the applicability to this facility to any of the subparts and determined none were applicable.

6.0 Maximum Achievable Control Technology Standards

6.1 Potential HAP Emissions

The federal Maximum Achievable Control Technology Standards are applicable to both major and area sources of hazardous air pollutants. A major source of hazardous air pollutants is defined as having the potential to emit 10 tons or more per year of a single hazardous air pollutant or 25 tons per year or more of a combination of hazardous air pollutants. An area source is a source that is not a major source of hazardous air pollutants.

POET Chancellor has accepted emissions limits of 9.5 tons and 23.8 ton for single hazardous air

pollutants and all hazardous air pollutants. The application and stack testing indicates compliance with these limits. Therefore the facility is considered an area source. The facility will be required to stack test certain sources in order to ensure compliance with the limits. Additionally additional HAPs emitted from E-85 load out will be required to be tracked in order to maintain compliance.

6.2 Maximum Achievable Control Technology Standards

DENR reviewed the other Maximum Achievable Control Technology Standards and determined there are no standards that are affected by the proposed changes at the facility.

7.0 State Requirements

POET Chancellor's existing operations are covered under a Title V air quality operating permit. In accordance with ARSD 74:36:20:01, a construction permit is required for all modifications to an existing source. In accordance with ARSD 74:36:01:10 defines a modification as a change that causes an increase in the amount of an air pollutant emitted by that source. The State has chosen not to specify potential emissions or actual emissions. The proposed changes may increase actual emissions and potential emissions. Therefore the proposed changes considered modifications. A construction permit is required to make this change at the facility.

7.1 State Emission Limits

The State of South Dakota has established emissions limits for sulfur dioxide and particulate matter. The proposed changes at POET chancellor have the potential to emit sulfur dioxide and particulate matter. However all of the sources with emissions of particulate matter and sulfur dioxide have accepted limits to avoid Prevention of Significant Deterioration pre construction permit or to comply with a federal standard. These limits are more stringent than the state limitations. Therefore no state emission limit applies to the proposed construction is required. It should be noted that the State's 20 percent opacity limit will continue to apply to all new and existing units.

7.2 Performance Tests

Performance tests are used to demonstrate compliance with limits placed in a construction permit.

7.2.1 Proposed ethanol production increase

The proposed ethanol production increase will increase the potential and/or actual emissions in many units across the process. The individual units are listed below along with justification for any recommended stack testing:

1. Unit #1 has limits on particulate matter emissions. A review of DENR's records indicates the unit has not been tested since 2003. Additionally there was no operational

data included in the report. Therefore, due to the age of the test, the lack of operational data, and the potential for increased emissions Unit #1 will be required to be tested for particulate matter.

2. The facility has requested an increase to the short term volatile organic compound limit for Unit #4 due to increased ethanol production. Therefore the facility will be required to test the unit for volatile organic compounds and hazardous air pollutants. It should be noted this testing requirement is to comply with the existing and requested operating scenarios
3. Unit #6 has limits for particulate matter, nitrogen oxides, sulfur dioxide, volatile organic compounds, hazardous air pollutants, and carbon monoxide. The facility has also requested an increase to the particulate matter emission limit. Based on previous reviews DENR does not believe nitrogen oxides and by extension sulfur dioxide should increase due to increased load to a regenerative thermal oxidizer. Additionally based on AP-42 values for combusting natural gas even at the maximum heat input for the unit the facility would not exceed the short term limits. Therefore nitrogen oxide and sulfur dioxide emissions will not be required to be tested. The facility will be required to test for particulate matter, volatile organic compounds, hazardous air pollutants, and carbon monoxide.
4. The facility has requested an increase to the short term volatile organic compound limit for Unit #29 due to increased ethanol production. Therefore the facility will be required to test the unit for volatile organic compounds and hazardous air pollutants. It should be noted this testing requirement is to comply with the existing and requested operating scenarios.

All other units involved in the ethanol production process have previously shown compliance at 90 percent of the operating rate or have been limited due to previous stack testing. If the ethanol production increase would cause a unit to operate in excess of the stack testing rate additional testing requirements may apply.

7.2.2 New wet scrubber operating scenarios

There are two operating scenarios that affect Unit #4, #6, and #29. The first proposal involves routing the emissions from both sides of the ethanol plant two a single wet scrubber and then to the regenerative thermal oxidizer system. Based on the justification in section 7.4.1 the facility will be required to test for particulate matter, volatile organic compounds, hazardous air pollutants, and carbon monoxide.

The second operating scenario involves routing the emissions from the single wet scrubber controlling emissions directly to the atmosphere. The facility will be required to test for volatile organic compounds and hazardous air pollutants during this scenario. Both scrubbers will be required to test for this scenario.

7.2.3 New Grain Receiving Operation

The proposed unit #44 is subject to a Prevention of Significant Deterioration short term limit and a New Source Performance Standard limit therefore they will be required to test for particulate matter in order to demonstrate compliance once the unit has been constructed.

7.3 Volatile Organic Compound Testing

EPA approved a methodology to determine compliance with volatile organic compound emission limits in a consent decree issued to POET. DENR is recommending the following permit language be included in the construction permit regarding stack testing requirements for volatile organic compounds:

1. Required Test Methods. Conduct all volatile organic compound mass emission performance tests in accordance with 40 C.F. R. Part 51, Appendix M; Method 207 and 40 C. F. R. Part 60, Appendix A; Method 18.
2. Treatment of 2,3-Butanediol. Due to difficulties associated with appropriate method detection limit, 2,3-Butanediol will be sampled through the chromatography column approximately 2.5 times faster than the maximum allowable sampling rate for the other volatile organic compounds in the sampling program (e.g. acetaldehyde, acrolein, and ethyl acetate). This requirement applies only if the Method 207 results indicate that 2,3-Butanediol should be sampled as part of the Method 18 testing.
3. Treatment of Non-Detects. When summing analytes per Method 18, non-detect data will be included in the total volatile organic compound mass as one half the compound method detection limit; except that, if all three performance test runs result in a non-detect measurement and the method detection limit is less than or equal to 1.0 part per million by volume on a dry basis, then all such non-detect data will be treated as zero mass.

Additionally, DENR will include a stipulation that another equivalent method may be used if approved by the secretary. Due to the consent decree DENR will not approve an alternative method unless the consent decree is revised by the EPA.

8.0 Recommendation

POET Chancellor will be required to construct and operate within the requirements stipulated in the following regulations:

- ARSD 74:36:06 – Regulated Air Pollutant Emissions;
- ARSD 74:36:07 – New Source Performance Standards;
- ARSD 74:36:11 – Performance testing;
- ARSD 74:36:12 – Control of Visible Emissions; and
- ARSD 74:36:20 – Construction Permits for New Sources or Modifications.

Based on the information submitted in the air quality permit application, DENR recommends

conditional approval of a construction permit for POET Chancellor to the following construction and operational changes at their facility in Chancellor, South Dakota:

- Increase to the ethanol production capacity;
- Additional scrubber operating scenarios;
- A new grain receiving pit and associated equipment; and
- The ability to blend and load out E-85.

Any questions pertaining to this permit recommendation should be directed to Kyrik Rombough, Engineering Manager, Department of Environment and Natural Resources – Air Quality Program.