Green Plains
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December 8, 2010

Re: Method 2A Application– Excluding Confidential Business Information

California Air Resources Board
Stationary Source Division
Criteria Pollutants Branch - 6th Floor
1001 I Street
P.O. BOX 2815
Sacramento, CA 95812

To: The Executive Officer

Herewith, please find our application and supporting documents for a fuel lifecycle GHG emissions pathway using the Method 2A application process described in "Establishing New Fuel Pathways under the California Low Carbon Fuel Standard Procedures and Guidelines for Regulated Parties" report by ARB (California Air Resources Board) issued on March 25, 2010.

We request a new pathway for our Ord, Nebraska ethanol plant as a sub-pathway of the existing LCFS Lookup Table pathway: Ethanol from Corn Midwest; Dry Mill; Dry DGS, NG. The fuel lifecycle pathway of our Ord ethanol plant is the same as the referenced existing pathway except for lower power and energy consumption due to our modern plant design and production of modified distillers grain solubles (Modified DGS or MDGS) at an average moisture content of 54%wt. as well as nominal 10%wt. moisture dry distillers grains solubles (Dry DGS or DDGS).

The CARB LCFS regulations stipulate that only pathways lower in carbon intensity value than main pathway that they deviate from can use the Method 2A application. Our pathway is a sub-pathway of the Corn Ethanol (Midwest; Dry Mill; Dry DGS, NG) Pathway because, except for the points of deviation summarized above, our pathway is identical to the Corn Ethanol

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(Midwest; Dry Mill; Dry/Wet DGS, NG) Pathway described in the Detailed California-Modified GREET Pathway for Corn Ethanol Well-to-Wheel (WTW) lifecycle analysis.[1]

We have used the CA-GREET Model 1.8b to calculate the lifecycle greenhouse gas emissions from this sub-pathway. Based on the input changes to the model described in the attachments, the carbon intensity value of this new pathway is **88.29 gCO2e/MJ**. This CI intensity value more than meets the "5-10" substantiality rule and the other requirements for a new pathway under Method 2A.

The following attachments to this application support document provide the details and documentation of our application for a new pathway under Method 2A. Portions of the following information that we consider Confidential Business Information have been clearly marked as such on each page. Pages in the attachment with Confidential Business Information have been clearly marked as such, *but are not included in this non-confidential version of the application. In this version of the application, the points where elements of Confidential Business Information have been removed from the text or accompanying tables are indicated so as to inform the public that the complete application to the ARB contained additional information to support this application, but that such information is considered by us to be Confidential Business Information.*

We request your approval and would be glad to answer any questions you may have about our application. Following please find the names and contact information of the persons who are available to answer any questions about our application. Please note that Houston BioFuels Consultants LLC are assisting us with the application and may be contacted if you have questions or comments about our application

[1] Detailed California-Modified GREET Pathway for Corn Ethanol Well-to-Wheel (WTW) lifecycle analysis, Version 2.1, published February 27, 2009.

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Sincerely,

Jeff Briggs, COO

Attachments

Attachments

Section Number and Contents

I. WTW Diagram of Company Sub-Pathway of the Corn Ethanol (Midwest; Dry Mill; Dry DGS, NG) Pathway

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I. WTW Diagram of GPRE Ord Ethanol Plant Sub-Pathway of the Midwest Corn Ethanol Pathway

Figure 1: WTW Components of the Ord Pathway are Identical to the Corn Ethanol (Midwest; Dry/Wet Mill; Dry DGS, NG) Pathway[2]

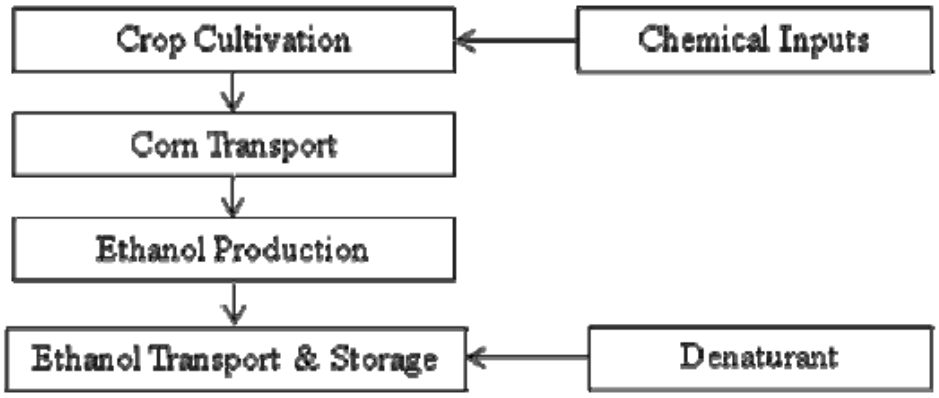


Figure 1. WTT Components for Ethanol Transported to California

[2] Detailed California-Modified GREET Pathway for Corn Ethanol Well-to-Wheel (WTW) lifecycle analysis, Page 4, Version 2.1, published February 27, 2009.

II. GPRE Ord Ethanol Plant Information

Green Plains Ord LLC Pathway Description/Background

1. Plant Location: This facility is located at 48267 Val-E Road, Ord, Nebraska.
2. History – The facility started operation on May 2007 with a capacity of 40 million gallons per year (MGY) of denatured ethanol. The facility was purchased by Green Plains Ord LLC on July 07, 2009.
3. Feedstock Type – Corn.
4. Product – Anhydrous Ethanol (denatured for fuel use).
5. Co-Products – Dried Distillers Grains with Solubles with approximately 10% moisture and Modified Wet Distillers Grains with Solubles with approximately 50-55% moisture.
6. Process fuel – Natural Gas supplied by US Energy through the Kinder Morgan Interstate Gas Transmission pipeline.
7. Power supply – Supplied by Loup Valleys Rural Public Power District based in Ord, Nebraska.
8. Corn and Ethanol Transportation and Distribution – Corn is received by truck from local Midwest growers. Ethanol is shipped via rail to distant customers and by truck to local customers.
9. Technology – Dry Mill, Natural Gas Fired to produce anhydrous ethanol licensed from ICM Inc.
10. Process Flow Description – The following description and diagram of the dry mill process is from the ICM Inc. web site.

Delivery/Storage

Grain is delivered by truck or rail to the ethanol plant where it's loaded in storage bins designed to hold enough grain to supply the plant for 6-8 days.

Milling

The grain is screened to remove debris and ground into course flour.

Cooking (Hot Slurry, Primary Liquefaction, and Secondary Liquefaction)

During the cook process, the starch in the flour is physically and chemically prepared for fermentation.

Hot Slurry
The milled grain is mixed with process water, the pH is adjusted to about 5.8, and an alpha-amylase enzyme is added. The slurry is heated to 180–190°F for 30–45 minutes to reduce viscosity.

Primary Liquefaction
The slurry is then pumped through a pressurized jet cooker at 221°F and held for 5 minutes. The mixture is then cooled by an atmospheric or vacuum flash condenser.

Secondary Liquefaction
After the flash condensation cooling, the mixture is held for 1–2 hours at 180–190°F to give the alpha-amylase enzyme time to break down the starch into short chain dextrins. After pH and temperature adjustment, a second enzyme, glucoamylase, is added as the mixture is pumped into the fermentation tanks.

Simultaneous Saccharification Fermentation
Once inside the fermentation tanks, the mixture is referred to as mash. The glucoamylase enzyme breaks down the dextrins to form simple sugars. Yeast is added to convert the sugar to ethanol and carbon dioxide. The mash is then allowed to ferment for 40-50 hours, resulting in a mixture that contains about 15% ethanol as well as the solids from the grain and added yeast.

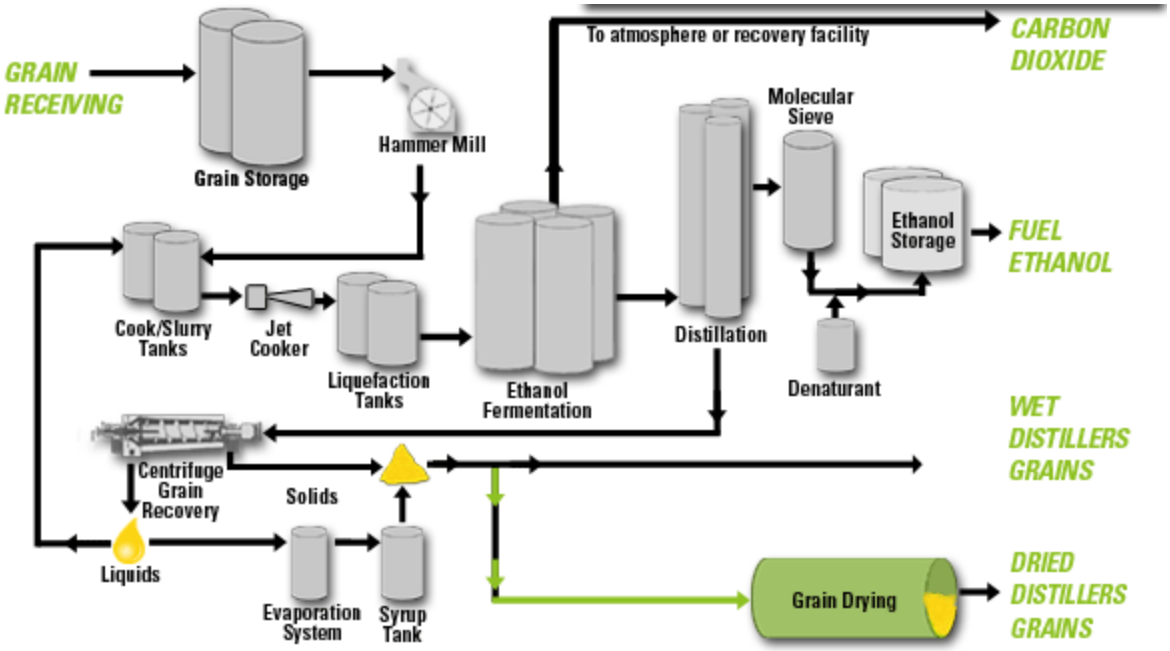
Distillation
The fermented mash is pumped into a multi-column distillation system where additional heat is added. The columns utilize the differences in the boiling points of ethanol and water to boil off and separate the ethanol. By the time the product stream is ready to leave the distillation columns, it contains about 95% ethanol by volume (190-proof). The residue from this process, called stillage, contains non-fermentable solids and water and is pumped out from the bottom of the columns into the centrifuges.

Dehydration
The 190-proof ethanol still contains about 5% water. It's passed through a molecular sieve to physically separate the remaining water from the ethanol based on the different sizes of the molecules. This step produces 200-proof anhydrous (waterless) ethanol.

Ethanol Storage
Before the ethanol is sent to storage tanks, a small amount of denaturant is added, making it unfit for human consumption. Most ethanol plants' storage tanks are sized to allow storage of 7–10 days' production capacity.

11. Process Flow Diagram (From ICM Inc. web-site)

Note that the diagram indicates Dried Distillers Grains co-product. In the case of Green Plains Ord LLC, the distillers grains are only partially dried in the Grain Drying equipment.



12. Current State of Nebraska Air Permit and Most Recent Air Permit Application – These documents are in separate files submitted together with this application file.

13. Energy and Material Balance Diagram

The energy and material balance for the design case used for the expansion of Green Plains Ord is shown in the diagram on the following page. This energy and material diagram contains **Confidential Business Information and is not included in this non-confidential version of the application.**

III. Table of CA-GREET Model Inputs for GPRE Ord Ethanol Plant Pathway -

Table 1: CA-GREET Model Inputs for the GPRE Ord Ethanol Plant Pathway

CA-GREET Model Sheet Name	Cell number	Default Pathway Value	GPRE Ord Pathway Value	Units	Description	Comments
Regional LT	C2	U.S. Average	Midwest	n/a	Region for Analysis	Using Midwest corn and Midwest power
Fuel_Prod_TS	L277	36,000	Confidential Business Information	btu/gal	Corn Ethanol Plant Energy Use, Dry Mill	With modern plant, lower power use
Fuel_Prod_TS	H277	2.72	Confidential Business Information	gal/bu	Ethanol yield of Corn Ethanol Plant, Dry Mill	With modern plant, optimized yield
Inputs	C247	10.19%	Confidential Business Information	%	Share of process energy for Electricity	With modern plant, lower power use
Inputs	C254	32,330	Confidential Business Information	btu/gal	Process fuel	Shown here for reference only. This cell is calculated based on cell L277 in Fuel_Prod_TS and Inputs C247
Inputs	C258	1.08	Confidential Business Information	kwh/gal	Electricity used for ethanol production	Shown here for reference only. This cell is calculated based on cell L277 in Fuel_Prod_TS and Inputs C247

IV. Basis for the Input Values -

The input values presented in this application are based on the total natural gas and power consumed by the GPRE Ord ethanol plant from November 1, 2009 through October 31, 2010, (the "Production Period"). Since the input values are in terms of per gallon of anhydrous ethanol, the total of each utility value has been divided by the total gallons of anhydrous ethanol produced during the Production Period.

Table 2: Calculation of the Input Values

Table 2 is considered Confidential Business Information and is not included in this non-confidential version of the application.

V. CA-GREET Model Output and Analysis of Results

The GPRE Ord Ethanol Plant pathway carbon intensity value is a sub-pathway of the Midwest, Dry-Mill, 100% DDGS Co-product, 100% natural gas fuel ethanol plant pathway. The carbon intensity value of the base pathway is 98.4 gCO2e/MJ. The carbon intensity value of the GPRE Ord Ethanol Plant ethanol is 88.3 gCO2e/MJ.

Table 3: CI of Existing Midwest Dry Mill, 100% DDGS, 100% Natural Gas Fuel Pathway

CARB Lookup Table Reference Pathway: Midwest Dry Mill Ethanol Plant, 100% DDGS, NG Fuel Pathway							
		CA-GREET Model Output					
	IPPC factors	Corn	Ethanol	Calculations to convert Output to g/CO2e/MJ			
	gCO2e/g	*Btu or Grams per mmbtu of Fuel Throughput*				gCO2e/mmbtu	**gCO2e/MJ**
		US Avg Corn	100% DDGS	Corn w/loss	Total corn + EtOH		
Total energy		187,247	1,469,428	187,434	1,656,863		
VOC		16.8	55.5	17	72		
CO		151.3	31.4	151	183		
CH4	25	17.4	73.7	17	91	2,277.0	2.16
N2O	298	41.7	0.4	42	42	12,571.0	11.92
CO2	1	15,064	41,354	15,079	56,433	56,433.4	53.49
Sub-total lifecycle CI before denaturant and lt. vehicle combustion						71,281.4	67.57
Denaturant and lt. vehicle combustion effects factor							0.80
Total Lifecycle CI before ILUC with denaturant and lt. vehicle combustion effects included							68.37
Indirect Land Use Change Factor (ILUC)							30
Total CI of Pathway including Indirect Land Use Change							98.37
Note: The calculated result of this pathway prior to making the input changes for the GPRE Ord ethanol plant is 67.57 gCO2e/MJ. This matches the Corn Ethanol WTW Analysis result of 67.6 gCO2e/MJ (Table B. GHG Emissions Summary for Dry and Wet Mill Corn Ethanol, page 5) before the denaturant and light vehicle combustion factor of 0.8 gCO2e/MJ is added.							

Table 4: GPRE Ord Ethanol Plant CI Calculation based on the CA-GREET Model Output

GPRE Ord Ethanol Plant Sub-Pathway of the Midwest Dry Mill Ethanol Plant, 63% DDGS/37% MDGS, NG Fuel Pathway							
		CA-GREET Model Output					
	IPPC factors	Corn	Ethanol	Calculations to convert Output to g/CO2e/MJ			
	gCO2e/g	*Btu or Grams per mmbtu of Fuel Throughput*				gCO2e/mmbtu	**gCO2e/MJ**
		Midwest Corn	63% DDGS/37% MDGS	Corn w/ loss	Total Corn + EtOH		
Total energy		192,248	1,317,133	192,440	1,509,573		
VOC		16.817	54.329	17	71		
CO		151.595	23.746	152	175		
CH4	25	18.154	55.997	18	74	1,854.2	1.76
N2O	298	41.753	0.288	42	42	12,540.5	11.89
CO2	1	15,375	30,862	15,390	46,252	46,252.1	43.84
Sub-total lifecycle CI before denaturant and lt. vehicle combustion						60,646.9	57.49
Denaturant and lt. vehicle combustion effects factor							0.80
Total Lifecycle CI before ILUC with denaturant and lt. vehicle combustion effects included							58.29
Indirect Land Use Change Factor (ILUC)							30
Total CI of Pathway including Indirect Land Use Change							88.29

VI. Production Range of GPRE Ord Ethanol Plant Pathway –

The new pathway should be applicable to the GPRE Ord Ethanol Plant facilities for at least 64% to 120% of Nameplate Capacity (32 MGY to 60MGY). **This letter is considered Confidential Business Information and is not included in this non-confidential version of the application.**

VII. Sustainability of GPRE Ord Ethanol Plant Pathway

The GPRE Ord Ethanol Plant facility was designed and constructed using well-established modern designs and equipment and is managed by professional staff well-qualified to assure that over time the energy efficiency of and emissions from the facility do not deteriorate. Any deterioration would result in a less profitable business. Thus the sustainability of the plant is well aligned with the business objectives of the owners.

VIII. Impact on Land Use

There is negligible difference between the land use of this sub-pathway and that of the Corn Ethanol (Midwest; Dry Mill; Dry DGS, NG) Pathway described in the Detailed California-Modified GREET Pathway for Corn Ethanol Well-to-Wheel (WTW) lifecycle analysis.[3].

[3] Detailed California-Modified GREET Pathway for Corn Ethanol Well-to-Wheel (WTW) lifecycle analysis, Version 2.1, published February 27, 2009.

IX. Inputs and Outputs during the Production Period and Documents supporting the Monthly and Annual Quantities

Table 5: Summary of Inputs and Outputs during "Production Period"

Table 5 is considered Confidential Business Information and is not included in this non-confidential version of the application.

Documents (including invoices for natural gas and electricity) authenticating the amounts shown in the table above are included on the following pages. **The pages showing the utility bills are not included in this non-confidential version of the application.**