

**Staff Summary**  
**Method 2A Application**  
**Pacific Ethanol, Inc., Stockton, California**  
**Corn and Sorghum Ethanol**  
**(Pathway Codes: ETHC117, ETHC118, ETHC119, ETHG018, and ETHG019)**

Deemed Complete Date: December 08, 2015  
Posted for Comment Date: December 17, 2015  
Certified Date: December 30, 2015

**Pathway Summary**

Pacific Ethanol operates an ethanol plant in Stockton, California. Pacific Ethanol has applied for five Method 2A pathways for this plant under the California Low Carbon Fuel Standard (LCFS) utilizing the CA-GREET1.8b model. The plant is a dry mill, natural-gas-fired facility capable of producing 62.5 million gallons anhydrous ethanol from corn and grain sorghum per year. Corn sourced from California counties for the production of ethanol do not use lime in corn farming. This is due to high soil pH levels in these counties and is attested to by analysis from the University of California at Davis and other supporting documentation. In addition, the sorghum sourced from the Midwest Great Plains region by Pacific Ethanol also do not use lime in the production of grain sorghum. This is attested to by separate documentation provided by the applicant. The plant also sources corn from the Midwest Great Plains regions where lime is required as a supplement to maintain soil pH levels for maximum productivity. The plant uses local grid electricity and natural gas (NG) for its process energy. It can also use North American Landfill Gas (LFG)<sup>1</sup> as an alternative to natural gas as process fuel. The facility produces wet distillers grains with solubles (WGDS) and corn oil as co-products from the ethanol production process.

**Carbon Intensity of Ethanol Produced**

The applicant has requested three corn ethanol pathways and two grain sorghum pathways. Details of these pathways are provided in Table 1.

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<sup>1</sup> California Air Resources Board, 2013. LCFS Life Cycle Fuel Pathway Report: North-American Landfill Gas to Compressed Natural Gas, January 28, 2013: <http://www.arb.ca.gov/fuels/lcfs/2a2b/internal/nalfg-cng-rpt-031513.pdf>

**Table 1. Details of Pathways Requested by Pacific Ethanol**

<b>Pathway No.</b>	<b>Pacific Ethanol Pathways</b>
1	California corn, no lime use, 100% NG
2	California corn, no lime use, 100% North American LFG
3	Midwest grain sorghum, no lime use, 100% NG
4	Midwest grain sorghum, no lime use, 100% North American LFG
5	Midwest corn, with lime use, 100% North American LFG

The California corn and Midwest grain sorghum no lime use pathways specify that no more than two percent of ethanol would be sourced from fields which require use of lime for corn and sorghum farming. The applicant provided two years of natural gas and electricity invoices covering the months of October 2013 through September 2015. Using average energy consumption values calculated from these invoices and other facility-specific CA-GREET inputs, the applicant calculated the CI of these pathways as shown in Table 2.

Proposed Method 2A pathways must be evaluated against reference pathways from the LCFS Lookup table. A Method 2A pathway must be very similar to its reference pathway and must achieve at least a five gram CO<sub>2</sub>e/MJ CI improvement over the reference pathway.<sup>2</sup> The reference pathways for the proposed Pacific Ethanol Method 2A pathways are ethanol from corn (California; Dry Mill; Wet DGS, NG) pathway (ETHC003) with a CI of 80.70 gCO<sub>2</sub>e/MJ and the ethanol from grain sorghum (Midwest; Dry Mill; Wet DGS, NG) pathway (ETHG002) with a CI of 85.81 gCO<sub>2</sub>e/MJ. Pacific Ethanol's pathways improve upon its reference pathways CI by more than the requisite five grams of gCO<sub>2</sub>e/MJ.

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<sup>2</sup> In the LCFS regulation, this 5 gCO<sub>2</sub>e/MJ threshold is referred to as the "substantiality requirement."

**Table 2. Proposed Lookup Table Entries**

Fuel	Pathway Identifier	Pathway Description	Carbon Intensity Values (gCO <sub>2</sub> e/MJ)		
			Direct Emissions	Land Use and Other Indirect Effects	Total
Ethanol from Corn	ETHC117	2A Application*: California Ethanol; California Corn; Dry Mill; Wet DGS; North American LFG; No Lime	35.07	30	65.07
	ETHC118	2A Application*: California Ethanol; California Corn; Dry Mill; Wet DGS; NG; No Lime	43.18	30	73.18
	ETHC119	2A Application*: California Ethanol; Midwest Corn; Dry Mill; Wet DGS; North American LFG	40.56	30	70.56
Ethanol from Sorghum	ETHG018	2A Application*: California Ethanol; Midwest Grain Sorghum; Dry Mill; Wet DGS; North American LFG; No Lime	38.19	30	68.19
	ETHG019	2A Application*: California Ethanol; Midwest Grain Sorghum; Dry Mill; Wet DGS; NG; No Lime	49.97	30	79.97

\*Specific Conditions Apply.

**Operating Conditions**

Operations at the plant will be subject to the following operating conditions designed to ensure that the CI of the corn and grain sorghum ethanol produced at the Pacific Ethanol plant will remain at or below the values appearing in table above. These conditions must be met for every gallon ethanol sold in California:

1. No conditions are placed on the amounts of electricity and natural gas consumed and the ethanol yield at the Pacific Ethanol plant, so long as the CIs reported in the above table are not exceeded. For purposes of determining compliance with this operating condition, the plant’s CI will be calculated based on data from the most recent 12 months of operation, excluding periods of abnormal operations, such as planned maintenance or unpredictable, unavoidable, and uncontrollable force majeure events. The plant’s thermal and electrical energy use and ethanol yield values are classified by the applicant as confidential business information.
2. No more than two percent of the California corn or Midwest grain sorghum used as a feedstock at the Pacific Ethanol plant shall be grown on fields on which lime (or other pH-management soil conditioner) has been applied. This operating condition applies to all gallons produced at the Pacific Ethanol plant regardless of where those gallons are sold. California corn grown in the counties in the immediate vicinity of the Pacific Ethanol plant can be used to produce ethanol

under the ETHC117 and ETHC118 fuel pathway codes (FPCs), so long as it is grown on soils with pH values equal to or greater than 5.0.

3. As long as above five pathways shown in the Lookup Table CI are not exceeded, FPCs of ETHC117, ETHC118, ETHC119, ETHG018, and ETHG019 may be used to report transactions involving volumes from the Pacific Ethanol plant based on 100 percent wet DGS the plant produces.
4. The commingled feedstock<sup>3</sup> accounting method will be used to determine the CIs of mixed feedstock from California and/or Midwest corn and grain sorghum. Producers and regulated parties should use this approach to calculate the volumes based on weighted average of ethanol associated with each feedstock present in the finished fuel storage tank at any given time. Producers should be able to provide records that unequivocally associate specific quantities of feedstock with specific volumes of fuel produced. As volumes are added to and withdrawn from the tank, the volume of each feedstock-related CI will be adjusted to account for those additions and withdrawals. Commingled feedstock CI accounts for mixed-feedstock corn and grain sorghum must be directly determined over an accounting period of no more than a calendar quarter. That is, all volumes of fuel produced must be associated with a specific feedstock within a calendar quarter. Gallons will be associated with feedstocks based on the accepted yields for each fuel.

### **Staff Analysis and Recommendations**

Staff has reviewed the Pacific Ethanol Method 2A application and finds the following:

- Staff has replicated, using the CA-GREET spreadsheet, the carbon intensity value calculated by the applicant;
- Staff has concluded that the plant's actual thermal and electrical energy consumption are not likely to exceed the thermal and electrical energy consumption levels specified in the Pacific Ethanol Method 2A application; and
- Staff has concluded that Pacific Ethanol is capable of operating its plant in a manner such that the ethanol yield is equal to or greater than the corresponding value specified in Pacific Ethanol's Method 2A application, and that compliance with the operating conditions above can be maintained.

On the basis of these findings, ARB staff recommends that Pacific Ethanol application for the above Method 2A pathways be certified.

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<sup>3</sup> California Air Resources Board, 2012. Mixed-Feedstock Bio- and Renewable Diesel Guidance Low Carbon Fuel Standard, December 3, 2012: <http://www.arb.ca.gov/fuels/lcfs/2a2b/internal/mixed-feedstock-bdrd-120112.pdf>