UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

APR 6 2011

OFFICE OF
AIR AND RADIATION

Mr. Christopher Frantz - Principal
Endicott Biofuels II, LLC.
2 Northpoint Drive, Suite 660
Houston, Texas 77060

Dear Mr. Frantz:

You requested a determination of whether Endicott's proprietary biodiesel product, when made with feedstocks such as soybean oil, would qualify as biomass-based diesel and advanced biofuel under the Renewable Fuel Standard Program (RFS2).

The Endicott fuel pathway is not described under the existing approved fuel pathways in the RFS2 regulations. Through the petition process described under 40 CFR 80.1416, Endicott submitted data to EPA necessary to perform a lifecycle greenhouse gas analysis of the Endicott fuel pathway. In conducting our detailed assessment, my staff largely relied on the soy biodiesel modeling that we conducted for the RFS2 final rule, adjusting the analysis to account for Endicott's unique production process. The enclosed document "Endicott Biofuels Request for Fuel Pathway Determination under the RFS2" describes the data submitted by Endicott, the analysis conducted by EPA, and our determination of the lifecycle greenhouse gas emissions associated with the fuel production pathway described in Endicott's petition.

Based on our assessment, the proposed Endicott biodiesel pathway qualifies for Biomass-Based Diesel and Advanced Biofuel (D-codes 4 & 5, respectively) RINs under the RFS2. The pathway has been determined to qualify based on an analysis of soybean oil as a feedstock. However, our approval also covers certain other feedstocks that have been analyzed as part of the RFS2 rule and determined to have lower GHG emissions than soybean oil. These additional feedstocks are:

- Oil from annual cover crops;
- Algal oil;
- Biogenic waste oils/fats/greases;
- Non-food grade corn oil

This approval applies specifically to Endicott Biofuels II, LLC, and to the process, materials used, fuel produced, and process energy sources as specified in the petition request submitted by Endicott.

The OTAQ Reg: Fuels Programs Registration and OTAQEMTS: OTAQ EMTS Application will be modified to allow Endicott to register and generate RINs for the production of biodiesel from the above feedstocks using a production process identified in EMTS as "Endicott Process."

If you have additional questions about this or related issues, please contact Robert Larson of my staff at 734-214-4277.

Sincerely,

Margo Tsirigotis Oge
Director
Office of Transportation and Air Quality

Enclosure

Endicott Biofuels Request for Fuel Pathway Determination under the RFS2
Office of Transportation and Air Quality
March 23, 2011

Summary: Endicott Biofuels II, LLC ("Endicott") petitioned the Agency to approve their generation of biomass-based diesel and advanced biofuel RINs (D-codes 4 & 5) under the RFS2 program for the production of biodiesel fuel using a unique production process, specified feedstocks (soybean oil, oil from annual cover crops, algal oil, biogenic waste oils/fats/greases and/or non food grade corn oil), natural gas and electricity for process energy, and generating co-products pitch and glycerin (the proposed "Endicott biodiesel pathway").

Through the petition process described under 40 CFR 80.1416, Endicott submitted data to EPA to perform a lifecycle greenhouse gas emissions analysis of the Endicott biodiesel pathway. This involved a straightforward application of the same methodology, and much of the same modeling used for the RFS2 final rule published on March 26, 2010 (75 FR 14670). The minor difference between this analysis and the analyses completed for the RFS2 final rule is the evaluation of a new fuel production process. Endicott utilizes a unique biofuel production process that is unlike those used in pathways modeled as part of the final RFS2 rulemaking and generates an additional co-product (pitch). As outlined in the preamble to the final RFS2 rule, this is the type of new pathway that EPA envisioned would be evaluated by comparing the applicant fuel pathway to pathway(s) that have already been analyzed. EPA performed its assessment based on the modeling done for the soybean biodiesel pathways performed as part of the RFS2 rulemaking (the "RFS2 soybean biodiesel pathways"). The GHG impacts related to soybean oil feedstock production for the Endicott biodiesel process is slightly higher than the RFS2 soybean biodiesel process because the Endicott biodiesel process uses more oil per Btu fuel produced. However, the Endicott biodiesel process also produces multiple co-products (pitch and glycerin) so it had lower GHG impacts related to the fuel production process compared to the RFS2 soybean biodiesel pathways. Overall, the combined impacts result in the Endicott biodiesel pathway having approximately equal GHG impacts as the RFS2 soybean biodiesel pathways. Based on the data submitted and the existing soybean modeling for the RFS2 soybean biodiesel pathways, EPA conducted a lifecycle assessment and determined that the Endicott biodiesel pathway meets the 50% lifecycle GHG threshold requirement defined in EISA for biomass-based diesel and advanced biofuels. For the Endicott biodiesel pathway, the midpoint of the range of results is a 56% reduction in GHG emissions compared to the diesel fuel baseline. Based on our assessment, the Endicott biodiesel pathway qualifies for generating RINs for Biomass-Based Diesel and Advanced Biofuel (D-codes 4 & 5, respectively).

This document is organized as follows:

- *Section I. Required Information and Criteria for Petition Requests*: This section contains information on the background and purpose of the petition process, the criteria EPA uses to evaluate the petitions and the information that is required to be provided under the petition process as outlined in 40 CFR 80.1416. This section is not specific to Endicott's request and applies to all petitions submitted pursuant to 40 CFR 80.1416.

- *Section II. Available Information*: This section contains background information on Endicott and describes the information that Endicott provided and how it complies with the petition requirements outlined in Section I.
- *Section III. Analysis and Discussion*: This section describes the lifecycle analysis done for the Endicott biodiesel pathway and identifies how it differs from the analysis done for the RFS2 soybean biodiesel pathways. This section also describes how we have applied the lifecycle results to determine the appropriate D-Codes for the Endicott biodiesel pathway.
- *Section IV. Public Participation*: This section describes how this petition is an extension of the analysis done as part of the RFS2 final rulemaking.
- *Section V. Conclusion*: This section summarizes our conclusions regarding Endicott's petition, including the D-codes Endicott may use in generating RINs for fuel produced using the Endicott biodiesel pathway.

I. Required Information and Criteria for Petition Requests

A. Background and Purpose of Petition Process

As part of changes to the Renewable Fuel Standard program required by the Energy Security and Independence Act of 2007 (EISA), EPA adopted new regulations that specified the types of renewable fuels eligible to participate in the RFS2 program and the procedures by which renewable fuel producers and importers could generate Renewable Identification Numbers (RINs) for the qualifying renewable fuels they produce through approved fuel pathways. See 75 FR 14670 (March 26, 2010); 75 FR 26026 (May 10, 2010); 75 FR 37733 (June 30, 2010); 75 FR 59622 (September 28, 2010); 75 FR 76790 (December 9, 2010); 75 FR 79964 (December 21, 2010).

Pursuant to § 80.1426(f) (1) of the RFS2 regulations:

Applicable pathways. D codes shall be used in RINs generated by producers or importers of renewable fuel according to the pathways listed in Table 1 to this section, subparagraph 6 of this section, or as approved by the Administrator.

Table 1 to § 80.1426 of the RFS2 regulations lists the three critical components of a fuel pathway: (1) fuel type, (2) feedstock, and (3) production process. Each specific combination of the three components, or fuel pathway, is assigned a D code. EPA may also independently approve additional fuel pathways not currently listed in Table 1 for participation in the RFS2 program, or a third party may petition for EPA to evaluate a new fuel pathway in accordance with § 80.1416. In addition, producers of facilities identified in 40 CFR 1403(c) and (d) that are exempt from the 20% GHG emissions reduction requirement of the Act may generate RINs with a D code of 6 pursuant to 80.1426(f)(6) for a specified baseline volume of fuel.

The petition process under § 80.1416 allows parties to request that EPA evaluate a new fuel pathway's lifecycle GHG reduction and provide a determination of the D code for which the new pathway may be eligible.

B. Required Information in Petitions

As specified in 40 CFR 80.1416(b)(1), petitions must include all of the following information, and should also include as appropriate supporting documents such as independent studies, engineering estimates, industry survey data, and reports or other documents supporting any claims:

- The information specified under § 80.76 (Registration of refiners, importers or oxygenate blenders).
- A technical justification that includes a description of the renewable fuel, feedstock(s), and production process. The justification must include process modeling flow charts.
- A mass balance for the pathway, including feedstocks, fuels produced, co-products, and waste materials production.
- Information on co-products, including their expected use and market value.
- An energy balance for the pathway, including a list of any energy and process heat inputs and outputs used in the pathway, including such sources produced off site or by another entity.
- Any other relevant information, including information pertaining to energy saving technologies or other process improvements.
- Other additional information as requested by the Administrator to complete the lifecycle greenhouse gas assessment of the new fuel pathway.

In addition to the requirements stated above, parties who use a feedstock not previously evaluated by EPA must also include the following, and should also include as appropriate supporting information such as state, county, or regional crop data, commodity reports, independent studies, industry or farm survey data, and reports or other documents supporting any claims:

- Type of feedstock and description of how it meets the definition of renewable biomass.
- Market value of the feedstock.
- List of other uses for the feedstock.
- List of chemical inputs needed to produce the renewable biomass source of the feedstock and prepare the renewable biomass for processing into feedstock.

- Energy needed to obtain the feedstock and deliver it to the facility. If applicable, identify energy needed to plant and harvest the source of the feedstock and modify the source to create the feedstock.
- Current and projected yields of the feedstock that will be used to produce the fuels.
- Other additional information as requested by the Administrator to complete the lifecycle greenhouse gas assessment of the new fuel pathway.

II. Available Information

A. Background on Endicott

Endicott submitted a petition requesting authorization to generate D code 4 and 5 RINs for fuel produced through the Endicott biodiesel pathway.[1] A petition is required because the Endicott biodiesel process is not included as an approved process under the Advanced Biofuel or Biomass-Based Diesel categories in Table 1 to § 80.1426 of the RFS2 regulations. The Table includes biodiesel and renewable diesel from certain feedstocks for production processes only using transesterification or hydrotreating. Endicott's process is not transesterification or hydrotreating. Endicott has a proprietary process that subjects specified feedstocks (e.g., soybean oil, oil from annual cover crops, algal oil, biogenic waste oils/fats/greases and/or non food grade corn oil) to a reactive distillation and direct esterification process using methanol, producing a biodiesel fuel that meets the ASTM D6751 specifications.

B. Information Available Through Existing Modeling

A fuel pathway under RFS2 is defined by three components: (1) fuel type, (2) feedstock, and (3) production process. For the Endicott biodiesel pathway addressed in Endicott's petition, Endicott would use feedstock and produce a fuel that has already been analyzed as part of the RFS2 final rule, see Table 1. Therefore no new feedstock modeling was required as that was already done as part of the RFS2 final rule. Similarly, no new emissions impact modeling of using biodiesel as a transportation fuel was required as that was already done as part of the RFS2 final rule. This petition only requires EPA to evaluate a new fuel production process.

[1] The D-Code 5 that is relevant for this petition is for biodiesel. This should not be confused with the other D-Code 5 pathways (e.g., ethanol, renewable diesel, jet fuel, heating oil, and naptha from non-cellulosic portions of separated food wastes, or sugarcane ethanol from fermentation).

Table 1: Excerpts of Existing Fuel Pathways from 40 CFR 80.1426

Fuel Type	Feedstock	Production Process Requirements	D-Code
Biodiesel, and renewable diesel	Soy bean oil; Oil from annual covercrops; Algal oil; Biogenic waste oils/fats/greases; Non-food grade corn oil	One of the following: Trans-Esterification Hydrotreating *Excluding processes that co-process renewable biomass and petroleum*	4 (Biomass-Based Diesel)
Biodiesel, and renewable diesel	Soy bean oil; Oil from annual covercrops; Algal oil; Biogenic waste oils/fats/greases; Non-food grade corn oil	One of the following: Trans-Esterification Hydrotreating *Includes only processes that co-process renewable biomass and petroleum*	5 (Advanced Biofuel)

The same analytical approach that was used to evaluate the lifecycle GHG emissions of the two existing pathways noted above was used to analyze the Endicott biodiesel pathway. The only difference is that the fuel production process step was adjusted to reflect the Endicott process. The Endicott fuel production process was evaluated for its direct emissions and its impact on the amount of feedstock and fuel produced which in turn impacts other parts of the analysis as described in the following sections. Figure 1 describes the modeling approach used and highlights the changes that were made from the analysis used in the RFS2 final rule to analyze the Endicott petition request.

The left side of Figure 1 shows the models and data used (boxes) as well as the input and output streams (arrows) from those models to calculate the emissions for each of the lifecycle stages shown on the right of the figure. The biggest change highlighted in the figure was replacing the biodiesel production process data with the Endicott process data. This resulted in the following changes to the modeling (described in more detail in the following sections):

- Amount of soybean oil used in the fuel production process increased to reflect Endicott's efficiency in terms of oil input per Btu of fuel produced
- Amount of soybeans needed in feedstock transport and production also increased to reflect Endicott's yield efficiency

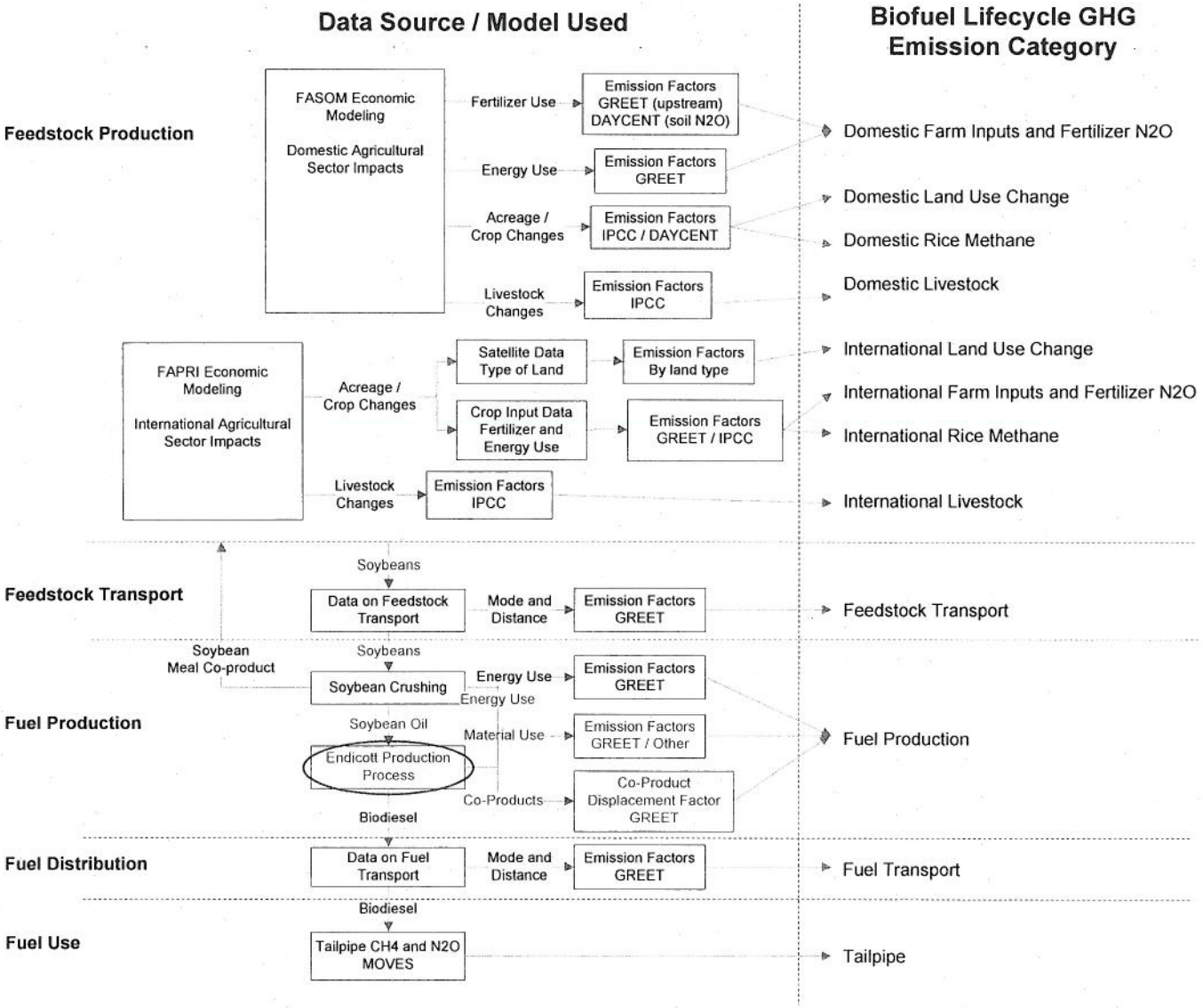
- Amount of energy used by the fuel production process and associated emissions from fuel production and use changed to reflect Endicott's data provided in their energy balance
- Amount and type of materials used in the fuel production process and associated emission factors for production of those materials changed to reflect Endicott's data provided in their mass balance
- Inclusion of co-products (pitch and glycerin) produced in the fuel production process to reflect the Endicott process
- Amount of fuel product produced changed to reflect Endicott's yield

This was a straightforward analysis based on existing modeling done for the RFS2 final rule and substituting Endicott's proprietary process data, which for the most part only altered the amounts of inputs and outputs. The analyses completed for this petition utilizes the same fundamental modeling approach as was used in the RFS2 final rule analyses.

C. Information Submitted by Endicott

Endicott has supplied all the required information on their production process that EPA needs to analyze their product and make a determination. Information submitted includes a technical justification that has a description of the fuel, feedstocks used, and their proprietary production process with modeling flow charts, a detailed mass and energy balance of the process with information on co-products as applicable, and other additional information as needed to complete the lifecycle greenhouse gas assessment.

Figure 1: Description of the Endicott Biodiesel Pathway Modeling Approach and Changes Made (Highlighted in Red) From the RFS2 Final Rule Analysis of Soybean Biodiesel Pathways as listed in Table 1 to 80.1426.



III. Analysis and Discussion

A. Lifecycle Analysis

Determining a fuel pathway's compliance with EISA's lifecycle GHG reduction thresholds requires a comprehensive evaluation of the renewable fuel, as compared to the gasoline and diesel that it replaces, on the basis of its lifecycle GHG emissions. As mandated by EISA, the GHG emissions assessments must evaluate the aggregate quantity of GHG emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes) related to the full lifecycle, including all stages of fuel and feedstock production, distribution, and use by the ultimate consumer.

In examining the full lifecycle GHG impacts of renewable fuels for the RFS2 program, EPA considers the following:

- Feedstock production – based on agricultural sector models that include direct and indirect impacts of feedstock production.
- Fuel production – including process energy requirements, impacts of any raw materials used in the process, and benefits from co-products produced.
- Fuel and feedstock distribution – including impacts of transporting feedstock from production to use, and transport of the final fuel to the consumer.
- Use of the fuel – including combustion emissions from use of the fuel in a vehicle.

EPA's evaluation of the lifecycle GHG emissions of the Endicott biodiesel pathway under this petition request is consistent with EISA's applicable requirements, including the definition of lifecycle GHG emissions and threshold evaluation requirements. It was based on information regarding Endicott's production process that was submitted under a claim of Confidential Business Information (CBI) by Endicott on May 11, 2010. Clarifications were provided in a subsequent amended memorandum on May 12, 2010. The information provided included the mass and energy balances necessary for EPA to evaluate the lifecycle GHG emissions of the Endicott biodiesel pathway.

The lifecycle GHG emissions of fuel produced pursuant to the Endicott biodiesel pathway were determined as follows:

Feedstock production – The Endicott biodiesel pathway involves the use of feedstocks noted above in Table 1 to § 80.1426 of the RFS2 regulations, which have already been evaluated as part of the RFS2 final rule and, therefore, no new feedstock production modeling was required. EPA chose soybean oil to use as the base feedstock from which to analyze the Endicott biodiesel pathway because it is the feedstock proposed for use by Endicott with the highest GHG emissions that is also one of the existing feedstocks already analyzed under the final RFS2 rule. This conservative approach of using soybean oil as a feedstock assumes that if Endicott's biodiesel pathway satisfies the 50% lifecycle

GHG reduction thresholds for biomass-based diesel and advanced biofuel with soybean oil, it could be determined that the pathway would also qualify using other lower GHG emitting feedstocks.

As shown in Figure 1, for the RFS2 final rule the FASOM and FAPRI models were used to analyze the GHG impacts of the feedstock production portion of a fuel's lifecycle. The same FASOM and FAPRI raw results representing the emissions from an increase in soybean oil production that were generated as part of the RFS2 final rule analysis of soybean biodiesel pathways were used in this analysis of the Endicott biodiesel pathway. These results represent agriculture / feedstock production emissions for a certain quantity of soybean oil produced. For the RFS2 analysis, this was roughly 4,100 million pounds of soybean oil used to produce 540 million gallons of fuel.[2] We have calculated GHG emissions from feedstock production for that amount of soybean oil. We do not believe Endicott's alternative process for converting soybean oil into biodiesel will materially affect the total amount of soybean oil used for biofuels and modeled as part of the RFS2 final rule. Therefore, the existing agricultural sector modeling analyses for soybean oil as a feedstock remain valid for use in estimating the lifecycle impact of renewable fuel produced using the Endicott biodiesel pathway.

For the RFS2 soybean biodiesel pathways, the use of 4,100 million pounds of soybean oil resulted in approximately 63,720,000 mmBtu of soybean biodiesel produced, based on a yield of 7.6 pounds of oil per gallon of biodiesel and a lower heating value (LHV) of 118,000 Btus per gallon of biodiesel. The FASOM and FAPRI agricultural sector GHG results were divided by the total energy value of fuel produced to get emissions per mmBtu.

Endicott provided, as part of the information claimed CBI, their process yield in terms of pounds of oil per gallon of fuel produced as well as the heating value of their fuel in Btus per gallon. Based on that data, Endicott's process yield is less efficient than the pathways modeled as part of the RFS2 rulemaking in terms of gallons produced per pound of soybean oil used and the energy content of Endicott's fuel product is the same as the soybean biodiesel produced pursuant to the RFS2 soybean biodiesel pathways. Therefore, compared to biodiesel already analyzed, the Endicott process results in ~9% less Btus of fuel produced for the same amount of soybean oil feedstock. Therefore the FASOM and FAPRI results were scaled up by ~9% based on the smaller amount of energy produced by the Endicott production process compared to the soybean biodiesel production process to get new feedstock production emissions for Endicott.

The scaling up of the agricultural sector results impacted several components of the Endicott fuel lifecycle analysis. It impacted feedstock production, direct and indirect emissions as well as the indirect land use change emissions. The following components were impacted:

- Domestic Livestock
- Domestic Farm Inputs and Fertilizer N2O

[2] The actual amount was slightly different between the FASOM and FAPRI models due to slightly different volumes of fuel modeled. FAPRI results are used for illustrative purposes.

- Domestic Rice Methane
- Domestic Land Use Change
- International Livestock
- International Farm Inputs and Fertilizer N2O
- International Rice Methane
- International Land Use Change

Overall, compared to the RFS2 soybean biodiesel pathways, the feedstock production component of the Endicott biodiesel pathway is slightly less efficient, meaning that there is more land use change (with associated greenhouse gas emissions) and greater agricultural sector impacts per Btu of fuel produced. Table 2 highlights the differences between the agricultural and land use change results of the Endicott biodiesel pathway and the RFS2 soybean biodiesel pathway. As previously mentioned, these results are based on soybean oil used as a feedstock. Land use change impacts may be lower using feedstocks with potentially little or no land use impacts (e.g., oil from annual cover crops, algal oil, biogenic waste oils/fats/greases and/or non food grade corn oil).

Table 2: Comparison of Agricultural Sector and Land Use Change Impacts for Endicott Biodiesel and RFS2 Soybean Biodiesel

Lifecycle Stage	**RFS2 Soybean Biodiesel (g CO_2-eq./mmBtu)**	**Endicott Biodiesel (g CO_2-eq./mmBtu)**
Domestic Livestock	-2,100	-2,296
Domestic Farm Inputs and Fertilizer N_2O	106	116
Domestic Rice Methane	-7,950	-8,692
Domestic Land Use Change	-8,896	-9,727
International Livestock	-6,436	-7,037
International Farm Inputs and Fertilizer N_2O	5,402	5,906
International Rice Methane	2,180	2,383
International Land Use Change	42,543	46,516
Total Feedstock Production Emissions:	**24,848**	**27,168**

Fuel production – Endicott's fuel production method is different than other approved soybean biodiesel / renewable diesel production processes (transesterification and hydrotreating) already analyzed for the RFS2 final rule. The yield of biofuel per pound of soybean oil and the amount of

energy and raw materials used are different than production methods that were analyzed. One difference is that when soybean oil is used as the feedstock, Endicott's biodiesel process results in less fuel product produced per amount of raw materials used. Another difference is that Endicott's biodiesel process only uses methanol[3] in the conversion of the feedstock to biodiesel, whereas other production methods utilize additional chemicals (e.g., sodium hydroxide, HCl, and sodium methoxide). In addition, there is a co-product produced called pitch, which is not produced in the RFS2 soybean biodiesel pathways. To analyze the GHG impacts of Endicott's biodiesel pathway, EPA utilized the same approach that was used to determine the impacts of processes in the RFS2 soybean biodiesel pathways.

The GHG emissions for the fuel production component of Endicott's fuel lifecycle determination were based on the following emission sources:

- Type and amount of energy used and associated emissions per mmBtu of fuel produced
- Type and amount of raw materials used and associated emissions per mmBtu of fuel produced
- Beneficial use of any co-products produced

The amount and type of energy used was taken from Endicott's mass balance & energy balance submitted to EPA. Endicott submitted energy data on natural gas (in Btus) and electricity (in kWhs) inputs, as well as gallons of fuel produced.

The natural gas use was based on the heat required for process steam. A portion of this natural gas demand was fulfilled using the co-product pitch as process energy (more details described below). The electrical energy use was based on electricity used for pumps, motors, and controls. Natural gas and electricity use was also included for soybean oil extraction (to extract oil and meal from the soybeans).

The emissions from the use of this energy was calculated by multiplying the amount of energy by emission factors for fuel production and combustion, based on the same method and factors used in the RFS2 final rulemaking. The emission factors for the different fuel types are from GREET and were based on assumed carbon contents of the different process fuels. The emissions from producing electricity in the U.S. were also taken from GREET and represent average U.S. grid electricity production emissions.

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[3] The methanol used in the Endicott biodiesel pathway addressed in this petition response is fossil-based methanol. As an alternative, Endicott is proposing to replace fossil-based methanol with ethanol made from renewable sources for selected future operations. The use of ethanol from renewable sources is not addressed in this petition response; if Endicott submits an additional petition proposing the use of renewable ethanol, that different pathway will be addressed in a separate future petition response.

Individual process input and output mass and energy flows within the production plant were not needed for this analysis; rather, as was done for the RFS2 final rulemaking analysis, total input and output mass and energy flows from the entire plant were used.

Emissions from other material used in the Endicott biodiesel process were based on multiplying the amount of material used by emission factors for material production and use. Material use amount was based on Endicott's mass balance submitted to EPA. Endicott provided input data on soybean oil and methanol. The emission factor for Endicott's methanol was based on the emission factor for methanol already developed as part of the RFS2 final rule (as an input to the RFS2 soybean biodiesel pathway).

As previously mentioned, Endicott's biodiesel pathway produces two co-products. The first co-product is glycerin. The glycerin produced from Endicott's biodiesel pathway is equivalent to the glycerin produced from the existing biodiesel pathways from the final RFS2 rule. Therefore, the same assumptions and co-product glycerin credit was applied to Endicott's biodiesel pathway as was used for the biodiesel pathways modeled for the RFS2 final rule. The assumption is that the GHG reductions associated with the replacement of residual oil on an energy equivalent basis represents an appropriate midrange co-product credit of biodiesel produced glycerin. The second co-product is pitch (also known as "distillate bottoms"), which is a residue from the distillation process. Endicott provided information that pitch can either be burned on-site for heat and power or sold off-site to a third party. In this analysis, we considered the more conservative approach that pitch is burned on-site at the biofuel facility to displace a portion of the natural gas that would have otherwise been purchased for heat and power. Alternatively, if pitch were sold off-site to displace residual oil, similar to the assumption made for the other co-product glycerin, a higher emissions credit from pitch would result because residual oil emits higher GHG emissions than natural gas per mmBtu of fuel displaced. Thus, this conservative approach assumes that if Endicott's biodiesel pathway satisfies the 50% lifecycle GHG reduction thresholds for biomass-based diesel and advanced biofuel utilizing pitch for on-site heat and power, it could also be determined that the pathway would qualify if pitch were used off-site to displace higher emitting fossil-fuels like residual oil.

Endicott's process uses less energy than the RFS2 soybean biodiesel processes, which results in a reduction in GHG emissions. This is primarily due to the use of the co-product pitch as an energy source to offset the use of natural gas and use of the co-product glycerin as a residual oil replacement. There are fewer types of materials used in the Endicott biodiesel process (i.e., only methanol is used). However, in terms of total amount of material per gallon of fuel produced there is greater material used compared to the RFS2 soybean biodiesel process. The difference in materials used slightly increases the GHG emissions compared to soybean biodiesel pathway. These slight increases, however, are outweighed by the fossil-based fuels displaced from the utilization of co-products. Overall, based on these differences, the Endicott biodiesel pathway results in lower fuel production GHG emission impacts compared to the RFS2 soybean biodiesel pathway as shown in Table 3.

Table 3: Comparison of Fuel Production Emissions for Endicott Biodiesel and RFS2 Soybean Biodiesel

Lifecycle Stage (soybean crushing and fuel production)	RFS2 Soybean Biodiesel (g CO_2-eq./mmBtu)	Endicott Biodiesel (g CO_2-eq./mmBtu)
On-Site Emissions (pitch co-product credit included)	9,486	7,588
Upstream (natural gas and electricity production)	9,312	9,040
Glycerin Co-Product Credit	-5,645	-5,399
Total Fuel Production Emissions:	**13,153**	**11,229**

Fuel and feedstock distribution – Endicott's feedstock and fuel type were already considered as part of the RFS2 final rule. Therefore, the existing feedstock and fuel distribution lifecycle GHG impacts for soybean oil and biodiesel were applied to Endicott's analysis.

Use of the fuel – Endicott's biodiesel pathway produces a fuel that was analyzed as part of the RFS2 final rule. Thus, the fuel combustion emissions calculated as part of the RFS2 final rule for biodiesel were applied to our analysis of the Endicott biodiesel pathway.

Endicott's fuel was then compared to baseline petroleum diesel, using the same value for baseline diesel as in the RFS2 final rule analysis. The results of the analysis indicate that the Endicott biodiesel pathway would result in a GHG emissions reduction of 56% compared to the diesel fuel it would replace, as discussed in the following section.

B. Application of the Criteria for Petition Approval

Endicott's petition request involved a fuel pathway with a new production process, using feedstocks and producing a fuel product already considered as part of the RFS2 final rule. Endicott provided all the necessary information that was required for this type of petition request.

Based on the data submitted and information already available through analyses conducted for the RFS2 final rule, EPA conducted a lifecycle assessment and determined that the Endicott biodiesel pathway would meet the 50% lifecycle GHG threshold requirement specified EISA for biomass-based diesel and advanced biofuels.

Figure 2 below illustrates the results of the modeling. It shows the percent difference between lifecycle GHG emissions for 2022 for the Endicott biodiesel pathway as compared to the 2005 petroleum diesel fuel baseline. In the figure, the zero on the x-axis represents the lifecycle GHG emissions equivalent to the 2005 petroleum diesel fuel baseline. The y-axis in the figure represents the

likelihood that possible results would have a specific GHG reduction value shown. The area under the curve represents all the possible results. No new uncertainty analysis was done for the Endicott biodiesel pathway; rather the uncertainty ranges developed as part of the RFS2 final rule analyses were scaled based on the differences in the Endicott process as were described previously.

For Endicott's biodiesel pathway, the midpoint of the range of results is a 56% reduction in GHG emissions compared to the diesel fuel baseline. The 95% confidence interval around that midpoint results in a range of an 18% reduction to an 87% reduction compared to the 2005 petroleum diesel fuel baseline. These results justify authorizing the generation of biomass-based diesel and advanced biofuel RINs for fuel produced by the Endicott biodiesel pathway, assuming that the fuel meets the other definitional criteria for renewable fuel (e.g., produced from renewable biomass, and used to reduce or replace petroleum-based transportation fuel, heating oil or jet fuel) specified in EISA.

Figure 2: Distribution of LCA Results for Endicott's Biodiesel Pathway

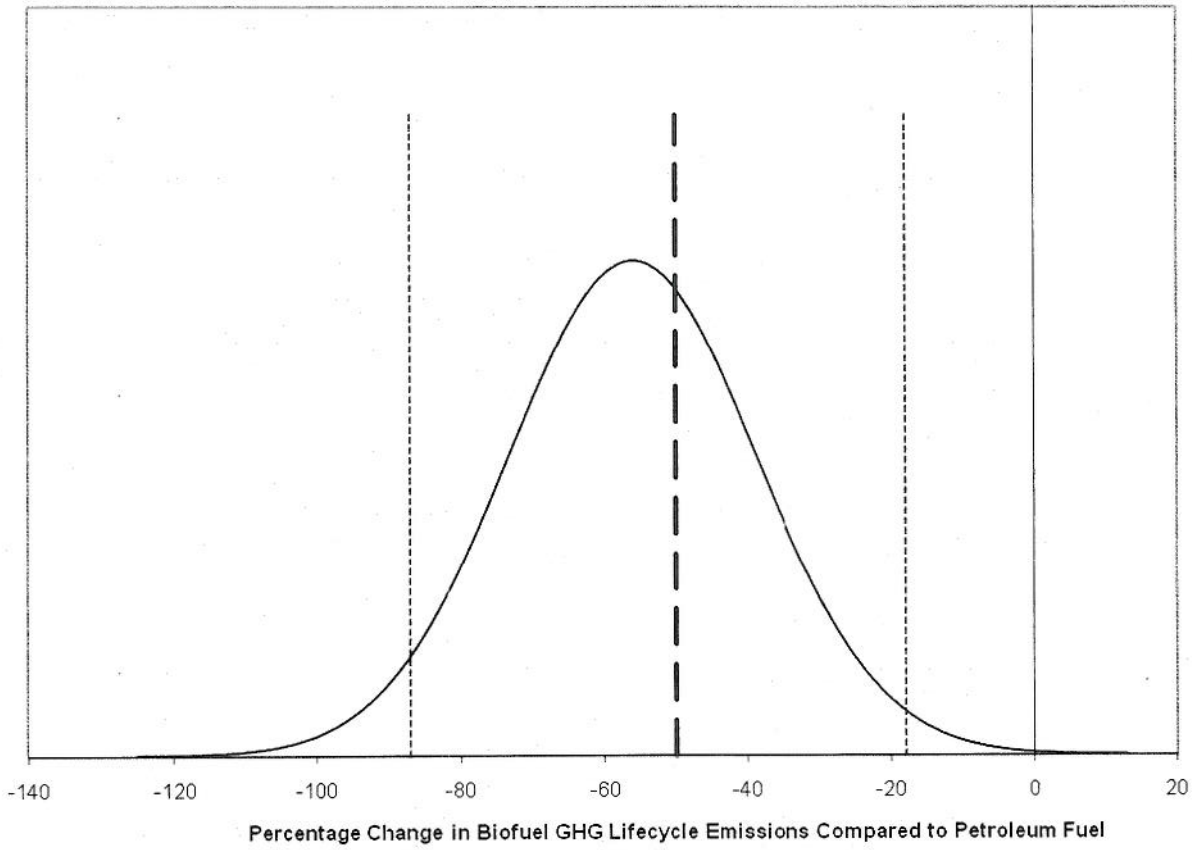

Table 4 below breaks down by stage the lifecycle GHG emissions for the Endicott biodiesel pathway, the soybean biodiesel fuel pathway done as part of the RFS2 final rule, and the 2005 diesel baseline. This table demonstrates the contribution of each stage in the fuel pathway and its relative significance in terms of GHG emissions.

Table 4: Lifecycle GHG Emissions for Endicott Biodiesel Pathway, 2022 (kg CO2-eq./mmBtu)

Fuel Type	RFS2 Soybean Biodiesel	Endicott Biodiesel	RFS2 2005 Diesel Baseline
Net Domestic Agriculture (w/o land use change)	-10	-11	
Net International Agriculture (w/o land use change)	1	1	
Domestic Land Use Change	-9	-10	
International Land Use Change, Mean *(Low/High)*	43 *(15/76)*	47 *(16/83)*	
Fuel Production	13	11	18
Fuel and Feedstock Transport	3	4	*
Tailpipe Emissions	1	1	79
Total Emissions, Mean *(Low/High)*	**42 *(14/76)***	**43 *(12/80)***	**97**

*Emissions included in fuel production stage.

IV. Public Participation

The definitions of biomass-based diesel and advanced biofuel in CAA 211(o)(1) each specify that the terms mean renewable fuel that have " lifecycle greenhouse gas emissions, as determined by the Administrator, after notice and opportunity for comment, that are at least 50 percent less than the baseline lifecycle greenhouse gas emissions. . .." As part of the RFS2 rulemaking process, we took public comment on our lifecycle assessment of the RFS2 soybean biodiesel pathways, including all models used and all modeling inputs and evaluative approaches. We also acknowledged that it was unlikely that our final regulations would address all possible qualifying fuel production pathways, and we took comment on allowing the generation of RINs using a temporary D code in certain circumstances while EPA was evaluating such new pathways and updating its regulations. After considering comments, we finalized the current petition process, where we allow for EPA approval of certain petitions without going through additional rulemaking if we can do so as a reasonably straightforward extension of the assessments conducted as part of the RFS2 rule, whereas rulemaking would be conducted to respond to petitions requiring new modeling. See 58 FR 14797 (March 26, 2010).

In responding to this petition, we have largely relied on the same soybean biodiesel modeling that we conducted for the RFS2 final rule, and have simply adjusted the analysis to account for Endicott's unique production process. This includes relying on the same agricultural sector modeling (FASOM and FAPRI results) that was conducted and commented on as part of the RFS2 final rule to represent feedstock production. This also includes use of the same emission factors and types of

emission sources that were used in the RFS2 final rule analysis. Thus, the fundamental analyses relied on for this decision have been made available for public comment as part of the RFS2 rulemaking, consistent with the reference to notice and comment in the statutory definitions of "biomass-based diesel" and "advanced biofuel." Our approach today is also consistent with our description of the petition process in the preamble to the final RFS2 rule, as our work in responding to the petition was a logical extension of analyses already conducted.

V. Conclusion

Based on our assessment, fuel produced using the Endicott biodiesel pathway qualifies under RFS2 for Biomass-Based Diesel and Advanced Biofuel (D-codes 4 & 5, respectively) RINs. The pathway has been determined to qualify based on an analysis of soybean oil as a feedstock. However, our approval also covers certain other feedstocks that have been analyzed as part of the RFS2 rule and determined to have lower GHG emissions than soybean oil. These additional feedstocks are:

- Oil from annual cover crops;
- Algal oil;
- Biogenic waste oils/fats/greases;
- Non-food grade corn oil

This approval applies specifically to Endicott Biofuels II, LLC, and to the process, materials used, fuel produced, and process energy sources as outlined and provided in the petition request submitted by Endicott. EPA will extend a similar approval to other petitioners utilizing the same fuel pathway as Endicott upon verification that the pathway is indeed the same.

The OTAQ Reg: Fuels Programs Registration and OTAQEMTS: OTAQ EMTS Application will be modified to allow Endicott to register and generate RINs for the production of biodiesel from the above feedstocks using a production process of "Endicott Process."