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

August 24, 2021

OFFICE OF
AIR AND RADIATION

Mr. Michael Chisam
President and CEO
Kansas Ethanol, LLC
1630 Avenue Q
Lyons, Kansas 67554

Dear Mr. Chisam:

You submitted a petition to the Agency through the Efficient Producer Petition Process (EP3) on behalf of Kansas Ethanol, LLC (Kansas Ethanol) to approve a pathway for the generation of advanced biofuel (D-code 5) Renewable Identification Numbers (RINs) under the Renewable Fuel Standard (RFS) program for the production of grain sorghum ethanol. The ethanol is produced through a dry mill process at your production facility located in Lyons, Kansas, using grain sorghum as feedstock (the "Kansas Ethanol Lyons Sorghum D5 Process"). Kansas Ethanol also uses the same dry mill process to produce ethanol from corn starch (the "Kansas Ethanol Lyons Corn D6 Process"). Together we call the two requested ethanol pathways the "Kansas Ethanol Lyons Advanced EP3 Pathways."

Through the petition process described under 40 CFR 80.1416, Kansas Ethanol submitted data to the U.S. Environmental Protection Agency to perform a lifecycle greenhouse gas (GHG) emissions analysis of the fuel produced through the Kansas Ethanol Lyons Advanced EP3 Pathways. This analysis involved a straightforward application of the same methodology and much of the same modeling used for the final rules published on March 26, 2010 (75 FR 14670) (the "March 2010 RFS rule") and December 17, 2012 (77 FR 74592) (the "December 2012 Grain Sorghum Ethanol rule"). The difference between this analysis and the analyses completed for these rules was the evaluation of a more efficient fuel production process.

The attached document, "Kansas Ethanol Lyons Fuel Pathway Determination under the RFS Program," describes the data submitted by Kansas Ethanol, the analysis conducted by the EPA, and our determination of the lifecycle greenhouse gas emissions associated with the fuel production pathways described in the Kansas Ethanol petition.

Based on our assessment, the grain sorghum ethanol produced through the Kansas Ethanol Lyons Sorghum D5 Process qualifies under the Clean Air Act (CAA) for advanced biofuel (D-code 5) RINs

and corn starch ethanol produced the Kansas Ethanol Lyons Corn D6 Process qualifies for conventional biofuel (D-code 6) RINs, assuming the fuel meets the conditions and associated regulatory provisions discussed in the attached document, and the definitional and other criteria for renewable fuel and RIN generation (e.g., production from renewable biomass and used to reduce or replace petroleum-based transportation fuel, heating oil or jet fuel) specified in the CAA and EPA implementing regulations.

This document approves the Kansas Ethanol Lyons Advanced EP3 Pathways, allowing this facility to generate advanced biofuel RINs for grain sorghum ethanol and conventional biofuel RINs for corn starch ethanol. These advanced EP3 pathways replace and supersede the standard EP3 pathways approved for Kansas Ethanol Lyons on May 13, 2015 and August 9, 2016. They apply specifically to the Kansas Ethanol Lyons facility, and to the process, materials used, fuel produced, and process energy sources as outlined and described in the petition request submitted by Kansas Ethanol.

For the pathways described above, the EPA's electronic registration and transaction systems will be modified to allow Kansas Ethanol to register and generate D-code 5 RINs for the grain sorghum ethanol and D-code 6 RINs for the corn starch ethanol provided the conditions specified in the attached determination document are satisfied.

Sincerely,

Sarah W Dunham

Sarah Dunham, Director
Office of Transportation and Air Quality

Enclosure

Kansas Ethanol Lyons Advanced EP3 Pathways Determination under the RFS Program
Office of Transportation and Air Quality

Summary: Kansas Ethanol, LLC (Kansas Ethanol) submitted an *Efficient Producer* petition (the "Kansas Ethanol Lyons petition"), dated April 15, 2020, to the Agency to approve their generation of advanced biofuel (D-code 5) Renewable Identification Numbers (RINs) under the Renewable Fuel Standard (RFS) program for ethanol produced through a dry mill process[1] at their production facility located in Lyons, Kansas, using grain sorghum as feedstock (the "Kansas Ethanol Lyons Sorghum D5 Process"). Kansas Ethanol also uses the same dry mill process to produce ethanol from corn starch (the "Kansas Ethanol Lyons Corn D6 Process"). This document approves two Advanced Efficient Producer Petition Process (EP3) pathways for Kansas Ethanol Lyons (the "Kansas Ethanol Lyons Advanced EP3 Pathways"), allowing this facility to generate advanced biofuel RINs for sorghum ethanol and conventional biofuel RINs for corn starch ethanol. These advanced EP3 pathways replace and supersede the existing EP3 pathways associated with Kansas Ethanol Lyons. It applies specifically to the Kansas Ethanol Lyons facility, and to the process, materials used, fuel produced, and process energy sources as outlined and described in the petition request submitted by Kansas Ethanol.

EPA has performed a threshold lifecycle analysis to determine, based on the information in the petition, whether the ethanol produced at the facility achieves the required greenhouse gas (GHG) reductions. Kansas Ethanol intends to document on an ongoing basis that the ethanol it produces at the Kansas Ethanol Lyons facility satisfies the GHG reduction requirements before any RINs are generated through the Kansas Ethanol Lyons Advanced EP3 Pathways. This documentation must be done in accordance with the conditions and calculations specified below in this document.

The lifecycle analysis conducted by EPA, the results of which are explained in this document, involved a straightforward application of the same methodology and modeling used for the final rules published on March 26, 2010 (75 FR 14670) (the "March 2010 RFS2 rule") and on December 17, 2012 (77 FR 74592) (the "December 2012 Grain Sorghum Ethanol rule"). The difference between this analysis and the analyses completed for these two rules was the evaluation of a more efficient fuel production process, in terms of the amount of feedstocks and amount/type of energy used to produce a certain quantity of ethanol. Based on the data provided in the Kansas Ethanol petition, our analysis found that grain sorghum ethanol produced through the Kansas Ethanol Lyons Sorghum D5 Process is capable of satisfying the minimum 50% lifecycle GHG reduction requirement of the Clean Air Act (CAA) for advanced biofuel.[2] Similarly, our analysis found that corn starch ethanol produced through the Kansas Ethanol Lyons Corn D6 Process is capable of satisfying the 20% GHG reduction requirement for conventional biofuel.

[1] For purposes of this decision document a "dry mill process" is a process as defined in section I.C of this document.
[2] Per the RFS regulations at 40 CFR 80.1401, ethanol derived from corn starch does not qualify as advanced biofuel, but grain sorghum ethanol may qualify as advanced biofuel if it satisfies the 50% GHG reduction requirement.

In this determination EPA is specifying certain conditions designed to ensure that RINs are only assigned to volumes of ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways if the fuel satisfies the corresponding GHG reduction requirements. The EPA is specifying the condition that to generate advanced biofuel (D-code 5) RINs for grain sorghum ethanol produced through the Kansas Ethanol Lyons Sorghum D5 Process, Kansas Ethanol must demonstrate that all grain sorghum ethanol produced during an averaging period (defined as the prior 365 days or the number of days since EPA activated the D-code 5 pathway associated with the Kansas Ethanol Lyons Sorghum D5 Process, whichever is less)[3] meets the 50% GHG reduction requirement. Analogous conditions are specified to ensure that corn starch ethanol produced through the Kansas Ethanol Lyons Corn D6 Process satisfies the 20% GHG reduction requirement for D-code 6 RINs. To make these demonstrations, Kansas Ethanol must keep records on the feedstocks used and the lifecycle GHG emissions associated with all the fuel ethanol (including both corn and grain sorghum ethanol) produced by Kansas Ethanol Lyons, based on the monitoring requirements, emissions factors, and lifecycle analysis methodology and other requirements specified in this document.

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 for EP3 petitions. This section is not specific to the request submitted by Kansas Ethanol.
- *Section II. Available Information*: This section contains background information on Kansas Ethanol and describes the information that Kansas Ethanol 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 ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways and identifies how the analysis conducted differs from the analyses done for prior rules. This section also describes how we have applied the lifecycle results to determine the appropriate D-codes for ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways.
- *Section IV. Conditions and Associated Regulatory Provisions*: This section describes the conditions and associated regulatory provisions that must be satisfied to generate RINs for ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways.
- *Section V. Public Participation*: This section describes our administrative process to consider the Kansas Ethanol petition and explains how this petition analysis is an extension of the analysis done as part of prior notice and comment rulemaking processes.
- *Section VI. Conclusion*: This section summarizes our conclusions regarding the Kansas Ethanol petition, including the D-codes Kansas Ethanol may use in generating RINs for ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways.

[3] The full definition of the "averaging time period" is specified in section IV of this document.

I. Required Information and Criteria for Petition Requests

A. Background and Purpose of Petition Process

As a result of changes to the RFS program in Clean Air Act section 211(o), as amended by the Energy Independence and Security Act of 2007 (EISA), EPA adopted new regulations, published at 40 CFR Part 80 Subpart M. The RFS regulations specify the types of renewable fuels eligible to participate in the RFS program and the procedures by which renewable fuel producers and importers may generate RINs for the qualifying renewable fuels they produce through approved fuel pathways.[4]

Pursuant to 40 CFR 80.1426(f)(1):

> *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 40 CFR 80.1426 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 RFS program, or a party may petition for EPA to evaluate a new fuel pathway in accordance with 40 CFR 80.1416. In addition, producers of facilities identified in 40 CFR 80.1403(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 40 CFR 80.1426(f)(6) for a specified baseline volume of fuel ("grandfathered fuel"[5]) assuming all other requirements are satisfied.

The petition process under 40 CFR 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.

On September 30, 2014, EPA announced a new expedited Efficient Producer petition process (EP3) for corn starch and grain sorghum ethanol producers using a dry mill process that can demonstrate superior process efficiency through reduced onsite energy consumption, increased fuel

[4] See EPA's website for information about the RFS regulations and associated rulemakings: http://www2.epa.gov/renewable-fuel-standard-program/statutes-and-regulations-under-renewable-fuel-standard-program

[5] "Grandfathered fuel" refers to a baseline volume of renewable fuel produced from facilities that commenced construction before December 19, 2007 and which completed construction within 36 months without an 18 month hiatus in construction and is thereby exempt from the minimum 20% GHG reduction requirement that applies to general renewable fuel. A baseline volume of ethanol from facilities that commenced construction after December 19, 2007, but prior to December 31, 2009, qualifies for the same exemption if construction is completed within 36 months without an 18 months hiatus in construction and the facility is fired with natural gas, biomass, or any combination thereof.

output and/or use of biomass or biogas from certain sources to reduce process energy greenhouse gas emissions. For example, the EP3 covers a subset of the petitions received pursuant to 40 CFR 80.1416, provides a streamlined, facility-specific review for certain ethanol producers petitioning to generate RINs for the production of ethanol beyond their grandfathered volume. EPA considers EP3 petitions to be those seeking EPA evaluation of fuel pathways involving certain fuel types, feedstocks and fuel production technologies that EPA has evaluated previously. Petitions that seek EPA evaluation of new/creative fuel production technologies will require additional analysis, and therefore will not be able to use this expedited review process. Initially, EP3 approvals were limited to pathways for conventional biofuel (D-code 6) RINs for corn starch ethanol demonstrating a 20% GHG reduction.

As of August 2021, EPA is providing a framework for approving advanced EP3 pathways for facilities that can demonstrate a 50% GHG reduction for grain sorghum ethanol and a 20% reduction for corn starch ethanol. Given that advanced EP3 pathways cover generation of both D5 and D6 RINs, when a facility is approved for advanced EP3 pathways any existing non-advanced EP3 pathways associated with that facility are deactivated. Corn and sorghum ethanol producers who seek a new pathway approval on terms substantially different than are specified herein may petition the Agency pursuant to 40 CFR 80.1416 and request different treatment. However, such petitions will not be eligible for the expedited EP3 process, and therefore may take significantly longer to review. The review time will depend on the number and type of other higher priority petitions under review by the EPA.[6]

B. Information to be Provided in Petitions

As specified in 40 CFR 80.1416(b)(1), petitions are to 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 40 CFR 1090.805 (e.g., company name, address, location of records).
- 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.

[6] The prioritization criteria are explained on EPA's website: http://www2.epa.gov/renewable-fuel-standard-program/renewable-fuel-petition-review-process#step3

- 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.

C. Information Needed for Efficient Producer Petitions

Given that EP3 petitions are limited to the dry mill process that EPA has evaluated many times, EP3 petitions must include detailed mass and energy balance data, but do not require descriptive information about how the process works or the nature of the co-products. In the context of an EP3 petition, the regulatory requirements for information on the production process and co-products can be satisfied by submission of the following certifications (with appropriate facility-specific adjustments reflecting feedstocks and energy sources used by the facility and/or to be used in the proposed pathway to be evaluated):

- Certification by the petitioner that the production process for the requested pathway is an ethanol production process where corn and/or grain sorghum feedstock is ground into a coarse flour, also known as "meal"; the meal is cooked into a hot slurry with the addition of enzymes to produce a mixture commonly known as "mash"; the mash is fermented with the addition of yeast to produce ethanol, carbon dioxide and solids from the grain and yeast, known as "fermented mash"; the fermented mash is distilled to produce a mixture of ethanol and water, and a residue of non-fermentable solids, also known as "stillage"; the mixture of ethanol and water is dehydrated to produce 200-proof ethanol; and co-products produced include distillers grains, but may also include carbon dioxide, solubles syrup and vegetable oil (a "dry mill process").
- Certification by the petitioner that the co-product distillers grains are intended for use as animal feed.
- Certification by the petitioner that the dry mill process for the requested pathway uses one or a combination of the following sources for all of its process energy: electricity from the grid, natural gas, biogas or biomass, and that any biomass used as process energy meets the RFS regulatory definition for crop residue at 40 CFR 80.1401.
- Certification by the petitioner that the ethanol production facility uses only corn starch, only grain sorghum or only corn starch and grain sorghum as feedstocks to produce ethanol.
- Certification by the petitioner that all of the information provided in the petition is accurate and complete.

II. Available Information

A. Background on the Petitioner

Kansas Ethanol submitted an EP3 petition, requesting approval for their generation of advanced biofuel (D-code 5) RINs for ethanol produced from grain sorghum and conventional biofuel (D-code 6) RINs for ethanol produced from corn starch using a dry mill process at their facility in Lyons, Kansas. A petition is required because all or some of the requested pathways are not included in Table 1 to 40 CFR 80.1426, and have not otherwise been approved by EPA.

B. Information Submitted in the Petition

Kansas Ethanol provided all of the required information in the petition, including all of the data needed for EPA to perform a threshold lifecycle analysis that ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways satisfies the applicable GHG reduction requirements. Kansas Ethanol included information on their process yield (bushels of feedstock per gallons of fuel) and the energy used. In addition, Kansas Ethanol certified that their requested fuel pathways involve the use of grain sorghum and corn starch feedstock, a dry mill process, ethanol fuel, distillers grain co-products, and the types of process energy that EPA previously modeled for the March 2010 RFS2 rule and the December 2012 Grain Sorghum Ethanol rule. Kansas Ethanol certified that the only feedstocks used to produce ethanol at the Kansas Ethanol Lyons facility are corn starch and grain sorghum.

C. Information Available Through Existing Modeling

For the pathways addressed in their petition, Kansas Ethanol would use feedstocks (grain sorghum and corn starch) that have already been analyzed as part of the March 2010 RFS2 rule and the December 2012 Grain Sorghum Ethanol rule. As a result, no new feedstock modeling was required to evaluate the Kansas Ethanol petition. Similarly, no new emissions impact modeling of using ethanol as a transportation fuel was required as that was already done as part of the March 2010 RFS rule. This petition only requires EPA to evaluate a modified fuel production process for an existing fuel type.

The same analytical approach that was used to evaluate the lifecycle GHG emissions of the existing grain sorghum and corn starch ethanol pathways was used to analyze the pathways described in the Kansas Ethanol petition. The preamble to the March 2010 RFS2 rule and the December 2012 Grain Sorghum Ethanol rules describe the modeling approach used to estimate lifecycle GHG emissions from corn starch and grain sorghum ethanol. The preamble describes the models and data used as well as the input and output streams from those models to calculate the emissions for each of the lifecycle stages. To modify the prior analyses to reflect the process described in the Kansas Ethanol petition, the only changes required were replacing the production process data with the Kansas Ethanol Lyons process data. This resulted in the following changes to the modeling (described in more detail in the following sections):

- Amount of grain sorghum and corn starch used in the fuel production process was modified to reflect the Kansas Ethanol Lyons process yield in terms of bushels of feedstock input per gallons of ethanol produced; and
- Amount of energy used by the fuel production process was changed to reflect data provided in the Kansas Ethanol Lyons energy balance.

This was a straightforward analysis based on existing modeling done for prior rules and substituting the Kansas Ethanol Lyons process data, which only altered the amounts of certain inputs and outputs of the fuel production process.

III. Analysis and Discussion

A. Lifecycle Analysis

Determining a fuel pathway's compliance with the lifecycle GHG reduction thresholds specified in the CAA for different types of renewable fuel requires a comprehensive evaluation of the renewable fuel, as compared to the gasoline or diesel fuel that it replaces, on the basis of its lifecycle GHG emissions. As mandated by the CAA, 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 fuel's 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 RFS 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 for the pathways described in the Kansas Ethanol petition is consistent with the CAA's applicable requirements, including the definition of lifecycle GHG emissions and threshold evaluation requirements. It was based on information provided in the petition, including mass and energy balance data for the pathways associated with the Kansas Ethanol Lyons process.

The lifecycle GHG emissions of fuel produced using the pathway associated with the Kansas Ethanol Lyons Advanced EP3 Pathways were determined as follows:

Feedstock production and transport (upstream emissions) – Kansas Ethanol Lyons uses only corn starch and grain sorghum as feedstocks for the production of ethanol. As these feedstocks have already been evaluated by EPA, no new feedstock production modeling was required for EPA to evaluate the Kansas Ethanol Lyons Advanced EP3 Pathways. Kansas Ethanol Lyons has certified through its petition that it uses a dry mill production process that is consistent with the definition of "dry mill process" specified in section I.C. of this decision document. Thus, the Kansas Ethanol Lyons process is the same type of dry mill process as that modeled for the March 2010 RFS2 rule and the December 2012 Grain Sorghum Ethanol rule, and the existing agricultural sector modeling analyses for corn starch and grain sorghum as feedstock remains valid for use in estimating the lifecycle impact of ethanol produced using the Kansas Ethanol Lyons process.

The Forest and Agricultural Sector Optimization Model (FASOM) and Food and Agricultural Policy Research Institute (FAPRI) models were used to analyze the GHG impacts of the feedstock production portion of the ethanol lifecycle. Our analysis relies on the FASOM and FAPRI results for corn starch conducted as part of the March 2010 RFS2 rule, and the results for grain sorghum generated as part of the December 2012 Grain Sorghum Ethanol rule.

In the analysis for the December 2012 Grain Sorghum Ethanol rule, we projected approximately 37 million bushels of grain sorghum (assuming 56 pounds per bushel at 13 percent moisture) used to produce 100 million additional gallons of ethanol compared to a baseline scenario (based on a yield of 2.71 gallons per bushel), and we calculated GHG emissions from feedstock production for that amount of grain sorghum. The FASOM and FAPRI agricultural sector GHG results were divided by the total energy value of fuel produced to get emissions per mmBtu of ethanol.[7] For the modeled scenario we estimated lifecycle GHG emissions of 8.93 $kgCO_2e$ per bushel of grain sorghum used to make ethanol. This includes the upstream emissions associated with producing the grain sorghum feedstock and transporting it to the ethanol production facility, and also includes significant direct and indirect emissions (such as emissions from land use change). Therefore, to estimate the lifecycle GHG emissions from the grain sorghum feedstock used to make ethanol in the Kansas Ethanol Lyons Sorghum D5 Process, the bushels of grain sorghum used as feedstock provided in the Kansas Ethanol petition were multiplied by the emissions factor of 8.93 $kgCO_2e$ per bushel. In the same manner as described in section IV.D. of this document, these emissions were then normalized by the mmBtu of ethanol produced from the same amount of bushels of grain sorghum.

[7] For the purposes of this determination document, Btus are expressed on a lower heating value (LHV) basis, gallons of ethanol are expressed on an undenatured (neat) basis, and bushels of grain sorghum are expressed in terms of 13% moisture content unless otherwise specified.

In the corn ethanol analysis for the March 2010 RFS rule, we projected approximately 960 million bushels of corn (assuming 56 pounds per bushel at 15.5 percent moisture) used to produce 2.6 billion additional gallons of ethanol compared to a baseline scenario (based on a yield of 2.71 gallons per bushel), and we calculated GHG emissions from feedstock production for that amount of corn. The FASOM and FAPRI agricultural sector GHG results were divided by the total energy value of fuel produced to get emissions per mmBtu of ethanol. For the modeled scenario we estimated lifecycle GHG emissions of 9.73 kgCO2e per bushel of corn used to make ethanol. This includes the upstream emissions associated with producing the corn feedstock and transporting it to the ethanol production facility, and also includes significant direct and indirect emissions (such as emissions from land use change). Therefore, to estimate the lifecycle GHG emissions from the corn feedstock used to make ethanol in the Kansas Ethanol Lyons Corn D6 Process, the bushels of corn used as feedstock provided in the Kansas Ethanol petition were multiplied by the emissions factor of 9.73 kgCO2e per bushel. In the same manner as described in section IV.D. of this document, these emissions were then normalized by the mmBtu of ethanol produced from the same amount of bushels of corn.

EPA's analysis for this determination considers the amount of corn starch and grain sorghum used by Kansas Ethanol Lyons and the total amount of all ethanol produced at the facility in order to establish the yield of ethanol per bushel of grain sorghum and corn starch feedstock used in the process. Specifically, EPA used a mass-based allocation approach over all ethanol gallons to determine the yield of ethanol per standard bushel of grain sorghum and corn. For example, if three hundred bushels of grain sorghum and one hundred bushels of corn (assuming standard 56 pounds per bushel) were used to produce 1,000 gallons of ethanol, EPA would consider three quarters of the ethanol (750 gallons) to be derived from grain sorghum feedstock and the other quarter (250 gallons) to be derived from corn feedstock, and EPA's analysis would consider the grain sorghum ethanol yield to be 2.5 gallons per bushel of grain sorghum.[8] This approach is valid because per EPA's analysis for the March 2010 RFS rule and the December 2012 Grain Sorghum Ethanol rule, the average ethanol yield for corn starch and grain sorghum is the same at 2.71 gallons per standard bushel, at 56 pounds per bushel.

Fuel production (process emissions) – The fuel production method used by Kansas Ethanol Lyons involves the production of ethanol from corn starch and grain sorghum in a dry mill process. The process described in the Kansas Ethanol petition is more efficient in terms of energy use than the average dry mill ethanol production technologies analyzed for the March 2010 RFS2 rule or the December 2012 Grain Sorghum Ethanol rule.

To analyze the GHG impacts of the ethanol production process used by Kansas Ethanol Lyons, EPA utilized the same analytical approach that was used in the March 2010 RFS2 and December 2012 Grain Sorghum Ethanol rules, taking into account differences in the types and amounts of process

[8] The numbers provided in this example are for illustrative purposes only.

energy used. Our analysis also accounts for the fact that Kansas Ethanol Lyons sometimes co-processes corn and grain sorghum.

Kansas Ethanol submitted average annual mass and energy balance data for operations at Kansas Ethanol Lyons, including all of the process energy used from the point of delivery of the feedstock through feedstock processing, and fuel and co-product production, to the point of final storage of the end product fuel and co-products at the fuel production facility. This includes the energy used to produce all of the ethanol (regardless of feedstock origin or regulatory characterization) produced by Kansas Ethanol Lyons.

To evaluate the fuel production GHG emissions (i.e., the emissions associated with Kansas Ethanol Lyons's use of grid electricity and process heat fuels) per gallon of ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways, EPA determined the amount of electrical and thermal energy used to produce corn ethanol relative to grain sorghum ethanol. For the December 2012 grain sorghum rule, EPA found, based on process modeling developed by USDA, that on average a sorghum ethanol plant uses 96.3% of the thermal process energy of a corn ethanol plant (3.7% less), and 99.3% of the electrical energy (0.7% less). This is the best information available to EPA on the relative energy requirements for corn and sorghum ethanol processing. Therefore, we applied these efficiency adjustment factors to the data provided in the Kansas Ethanol petition to determine how much of the electrical and thermal energy to allocate to the corn ethanol and grain sorghum ethanol produced by Kansas Ethanol Lyons. Specifically, the total amount of thermal and electrical energy used for ethanol feedstock, fuel, and co-product operations at Kansas Ethanol Lyons was multiplied by the corresponding average GHG emissions factor for each type of energy (see below). Then, the amount of energy used for ethanol was assigned based on the relative amounts of corn and grain sorghum feedstock used, and adjustments were made so that each gallon of grain sorghum ethanol produced used 3.7% less thermal energy and 0.7% less electrical energy than each gallon of corn ethanol.[9]

The lifecycle GHG emissions factors used for process energy were the same emissions factors used in the modeling for the March 2010 RFS2 and December 2012 Grain Sorghum Ethanol rules.

- Natural gas = $6.86*10^{-5}$ $kgCO_2e/Btu$
- Biogas CH_4 = $3.64*10^{-7}$ $kgCO_2e/Btu$
- U.S. average grid electricity = 0.750 $kgCO_2e/kWh$
- Crop residue biomass used onsite for process energy upstream emissions = $5.40*10^{-3}$ $kgCO_2e$ per dry pound (based on the corn stover lifecycle analysis for the March 2010 RFS rule)

[9] For details on how this calculation was performed see the equation to calculate GHG_{Pc} in section IV of this document.

Fuel distribution and use (downstream emissions) – The fuel type, ethanol, and hence the fuel distribution and use for ethanol, was already considered as part of the March 2010 RFS rule. Therefore, we applied the existing fuel distribution and use lifecycle GHG impacts for ethanol to our analysis of the Kansas Ethanol petition. The emissions factor for ethanol distribution and use, otherwise known as downstream emissions, is 2.1 $kgCO_2e$ per mmBtu of ethanol.

Lifecycle GHG emissions – The lifecycle GHG emissions associated with Kansas Ethanol Lyons's fuel were then compared to the baseline lifecycle GHG emissions, using the same value for baseline gasoline as in the March 2010 RFS rule analysis. Based on the data submitted by Kansas Ethanol, our analysis indicates that grain sorghum ethanol produced using the Kansas Ethanol Lyons Sorghum D5 Process would result in at least a 50 percent GHG emissions reduction and corn starch ethanol produced through the Kansas Ethanol Lyons Corn D6 Process would result in at least a 20 percent GHG emissions reduction compared to the baseline lifecycle GHG emissions.

Table 2 below breaks down by stage the lifecycle GHG emissions for grain sorghum and corn starch ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways, compared to such emissions for a corn starch and grain sorghum ethanol analyzed for prior RFS rules for a dry mill process that dries all of the co-product DGS, and compared to the 2005 gasoline baseline. This table demonstrates the contribution of each stage in the fuel pathway and its relative significance in terms of GHG emissions.

In the table, upstream emissions include the GHG emissions associated with producing the grain sorghum and corn starch feedstocks and transporting them to the fuel production facility. Process emissions include the GHG emissions associated with the dry mill ethanol production process. Downstream emissions include the GHG emissions associated with distributing and using the finished fuel. Table 2 provides EPA's mean estimate of GHG emissions for each of these stages of the lifecycle.

Table 2: Lifecycle GHG Emissions for Ethanol Produced through the Kansas Ethanol Lyons Advanced EP3 Pathways (kgCO2e/mmBtu)[10]

	Grain Sorghum Ethanol, Natural Gas Fired Dry Mill, Dry DGS, No Advanced Technologies	Grain Sorghum Ethanol Produced Through the Kansas Ethanol Lyons Sorghum D5 Process	Corn Starch Ethanol, Natural Gas Fired Dry Mill, Dry DGS, No Advanced Technologies	Corn Starch Ethanol Produced Through the Kansas Ethanol Lyons Corn D6 Process	Baseline Lifecycle GHG Emissions for Gasoline
Upstream Emissions	43.3	40.1	47.6	43.7	*
Process Emissions	31.4	7	32.4	7.6	19.2
Downstream Emissions	2.1	2.1	2.1	2.1	79.0
Lifecycle Emissions	76.8	49.1	81.7	53.4	98.2
Percent Reduction	21.8%	50%	16.8%	45.6%	--

* Emissions included in Process Emissions stage.

B. Application of the Criteria for Petition Approval

Based on the information provided in the Kansas Ethanol petition, and the requirements specified in section IV limiting RIN generation to ethanol for which ongoing monitoring and assessment allow documentation of compliance with appropriate lifecycle GHG reduction requirements, EPA is approving this petition request. Specifically, we have determined that ethanol produced pursuant to the Kansas Ethanol Lyons Sorghum D5 Process using grain sorghum feedstock satisfies the minimum 50% greenhouse gas reduction threshold required in the CAA for advanced biofuel if the ethanol is produced in accordance with the fuel yield and energy use information specified in the Kansas Ethanol petition. We have also determined that ethanol produced pursuant to the Kansas Ethanol Lyons Corn D6 Process using corn starch feedstock satisfies the minimum 20% greenhouse gas reduction threshold required in the CAA for conventional biofuel if the ethanol is produced in accordance with the fuel yield and energy use information specified in the Kansas Ethanol petition. As detailed in section IV, EPA is specifying certain conditions that must be satisfied for ethanol produced through the approved pathways to be eligible for D-code 5 or D-code 6 RIN

[10] Net emissions may not be the sum of the rows due to rounding.

generation. Where all the conditions are satisfied, EPA is authorizing the generation of advanced biofuel (D-code 5) RINs for grain sorghum ethanol produced through the Kansas Ethanol Lyons Sorghum D5 Process, and the generation of conventional biofuel (D-code 6) RINs for corn ethanol produced through the Kansas Ethanol Lyons Corn D6 Process, provided that the fuel also meets the other criteria for renewable fuel specified in the CAA and EPA implementing regulations.

IV. Conditions and Associated Regulatory Provisions

The authority for Kansas Ethanol to generate RINs for ethanol produced pursuant to the Kansas Ethanol Lyons Advanced EP3 Pathways is expressly conditioned on Kansas Ethanol satisfying all of the following conditions as detailed in this section, in addition to other applicable requirements for renewable fuel and advanced biofuel producers set forth in the RFS regulations. Failure to satisfy the conditions in this section is a prohibited activity under 40 CFR 80.1460(b)(7) and the conditions enforceable under the CAA. They are established pursuant to the informal adjudication reflected in this decision document, and also pursuant to regulations cited below and 40 CFR 80.1416(b)(1)(vii), 80.1450(i), 80.1451(b)(1)(ii)(W) and 80.1426(a)(1)(iii). In addition or in the alternative to bringing an enforcement action under the CAA, EPA may revoke this pathway approval if it determines that Kansas Ethanol has failed to comply with any of the conditions specified herein.[11]

The pathways for grain sorghum and corn starch ethanol approved in this document are in addition to the existing pathways in Table 1 to 40 CFR 80.1426. This document does not impact the ability of Kansas Ethanol to generate RINs for volumes of fuel pursuant to the approved pathways in Table 1 to 40 CFR 80.1426.

This section details the registration, compliance monitoring, lifecycle GHG computation, recordkeeping, reporting, attest engagement and other requirements that apply to the Kansas Ethanol Lyons Advanced EP3 Pathways; it is organized as follows:

- *Sub-section A*: Definitions
- *Sub-section B*: Registration requirements
- *Sub-section C*: Compliance monitoring
- *Sub-section D*: Lifecycle GHG conditions and associated computational requirements
- *Sub-section E*: Recordkeeping requirements
- *Sub-section F*: Reporting requirements
- *Sub-section G*: Additional requirements

As described in the following sections, one condition for Kansas Ethanol to generate D-code 5 RINs for grain sorghum ethanol produced through the Kansas Ethanol Lyons Sorghum D5 Process

[11] As with all pathway determinations, this approval does not convey any property rights of any sort, or any exclusive privilege.

during a specified averaging period (typically 365 days) is documentation by Kansas Ethanol that RINs are only generated if, on average, all grain sorghum ethanol produced during the specified averaging period satisfies the 50% lifecycle GHG reduction requirement. The same conditions apply for corn starch and grain sorghum ethanol to generate D-code 6 RINs according to the 20% lifecycle GHG reduction requirement. The 365-day (or shorter in certain circumstances) rolling average is calculated based on the daily data monitored and collected by Kansas Ethanol and the formula specified in section IV.D.

A. Definitions

For the purposes of this petition approval, the following terms are defined as follows:

a. *365-day rolling average lifecycle GHG emissions* means the average lifecycle GHG emissions for the ethanol produced by Kansas Ethanol Lyons during the averaging time period, calculated as specified in section IV.D. based on the daily data collected and recorded by Kansas Ethanol through continuous monitoring.[12]

b. *Averaging time period* means the 365 calendar days prior to the day that Kansas Ethanol wishes to generate RINs for fuel produced during the averaging period through the Kansas Ethanol Lyons Advanced EP3 Pathways, or the number of days prior to the day that Kansas Ethanol wishes to generate RINs since EPA activated the pathways,[13] whichever is less.[14] To clarify, Kansas Ethanol may not generate RINs for ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways on the same day that such ethanol is produced.

c. *Continuous monitoring* means the collection and use of measurement data and other information to record the data inputs required to calculate the 365-day rolling average lifecycle GHG emissions, in accordance with the compliance monitoring plan described in section IV.C.

d. *Energy used for feedstock, fuel and co-product operations* means energy used in all buildings or other areas that are used in any part for the storage and/or processing of feedstock (both corn and sorghum), the production and/or storage of fuel intermediates, the

[12] The EPA has provided spreadsheets on its website to help ethanol producers understand the correct calculation of 365-day rolling average lifecycle GHG emissions.

[13] A fuel pathway is activated under the RFS program when EPA accepts the registration application for the pathway, allowing it to be used in EMTS for RIN generation. When EPA accepts a registration application, an email is automatically sent from otaqfuels@epa.gov to the responsible corporate officer (RCO) of the company that submitted the registration application. The subject line of such an email includes the name of the company and the company request (CR) number corresponding with the registration application submission, and the body of the email says the company request "has been activated."

[14] This expedited *Efficient Producer* petition process is intended for facilities that consistently use efficient production methods (i.e., who meet the applicable lifecycle GHG reduction thresholds) throughout the year. Parties who only use efficient methods during part of the year, and wish approval for such partial-year production, may submit a standard petition.

production and/or storage of finished fuel or co-products, and the handling of feedstocks, fuel, co-products and wastes. It includes any energy used offsite for these purposes, including for example energy used offsite to dry the co-product distillers grains produced by Kansas Ethanol Lyons before it is sold to the ultimate consumer. It does not include energy used on days when, due to system maintenance or other disturbances, no fuel ethanol is produced and no DGS are dried at Kansas Ethanol Lyons.

e. *Period of missing data* includes each day for which Kansas Ethanol does not have valid data collected through continuous monitoring for any of the daily data inputs required to calculate the 365-day rolling average lifecycle GHG emissions, as specified section IV.D. It does not include days when no fuel ethanol is produced and no DGS are dried at Kansas Ethanol Lyons due to system maintenance or other disturbances.

B. Registration

Kansas Ethanol Lyons must comply with all registration provisions in 40 CFR Part 80, Subpart M and 40 CFR Part 1090, Subpart I that apply to renewable fuel producers to register for the production of grain sorghum and corn starch ethanol through the Kansas Ethanol Lyons Advanced EP3 Pathways. The description of the Kansas Ethanol Lyons production process that is required for registration pursuant to 40 CFR 80.1450(b)(1)(ii) must contain the following:[15]

a. A Compliance Monitoring Plan including technical specifications detailing how Kansas Ethanol will accurately and reliably measure and record all of the daily data required in section IV.D. and calculate and record the 365-day rolling average lifecycle GHG emissions.

b. A process flow diagram showing all of the following:

    1. The supply and continuous monitoring of all energy used for feedstock, fuel and co-product operations.

    2. The continuous monitoring of bushels of corn and grain sorghum used in fuel production processes for all of the ethanol produced by Kansas Ethanol Lyons.

    3. The continuous monitoring of volume and temperature[16] for all of the ethanol produced by Kansas Ethanol Lyons.

[15] All of the registration materials required by 80.1450(b)(1), including those specifically described in this document, must be reviewed and verified pursuant to the independent third party engineering review required in 80.1450(b)(2).
[16] Temperature readings must take place at the same time the volume is measured.

4. Information for each of the continuous monitoring systems (e.g., scales, fuel flow meters and electricity meters) shown in the process flow diagram including the name of the manufacturer, the manufacture date and all relevant serial numbers.

c. A certification signed by a Responsible Corporate Officer containing the following statement: "I hereby certify that: (1) I have reviewed and understand the process flow diagram submitted with this application for registration as required pursuant to section IV.B.b of the petition approval document for the pathway associated with the Kansas Ethanol Lyons Advanced EP3 Pathways; (2) To the best of my knowledge the process flow diagram is accurate and complete; (3) All monitoring devices specified in the process flow diagram will be calibrated and maintained according to the manufacturer specifications or more frequently (if the manufacturer does not provide calibration or maintenance records then the company must meet standards for similar monitoring devices); and (4) All of the monitoring devices included in the process flow diagram monitor all of the information specified in sections IV.B.b.1, 2 and 3 of the petition approval document for the pathway associated with the Kansas Ethanol Lyons Advanced EP3 Pathways."

d. If Kansas Ethanol wishes to exclude any amount of energy used at Kansas Ethanol Lyons when calculating the 365-day rolling average lifecycle GHG emissions, the description of the facility's production process must include all of the following:

    1. An explanation of why such energy should not be included.

    2. A plan showing how the energy that will not be included in the calculation of the 365-day rolling average lifecycle GHG emissions will be kept completely segregated, separately metered and recorded.[17]

e. If Kansas Ethanol wishes to take credit for exported electricity in calculating GHG_P pursuant to section IV.D, Kansas Ethanol must include a certification signed by a Responsible Corporate Officer stating that any exported electricity would be the result of combined heat and power technology as defined in the RFS regulations at 40 CFR 80.1401.

f. If Kansas Ethanol intends to process corn starch and grain sorghum feedstocks simultaneously, Kansas Ethanol must specify in their accepted registration materials the values they will use for the converted fraction (CF) and energy content (E) parameters in

[17] There are only two valid reasons for excluding any amount of energy used by Kansas Ethanol Lyons when calculating the 365-day rolling average lifecycle GHG emissions. The first is that the energy is used in a stand-alone and separately-metered building that is not involved in the feedstock, fuel and co-product operations. The second is that the energy is used in a stand-alone and separately-metered tower grain dryer to dry the corn kernel feedstock prior to grinding. The lifecycle GHG emissions from energy used at such a tower grain dryer may be excluded because they have been taken into account as part of the feedstock production stage of the EPA's lifecycle assessment of corn starch ethanol as modeled for the March 2010 RFS2 rule and grain sorghum ethanol as modeled for the December 2012 Grain Sorghum Ethanol rule.

the formula to calculate feedstock energy (FE) at 40 CFR 80.1426(f)(3)(vi), and must explain the technical basis for those values.

C. Compliance Monitoring

Kansas Ethanol must implement the Compliance Monitoring Plan and must use data obtained and recorded in accordance with this plan to calculate the 365-day rolling average lifecycle GHG emissions.

D. Lifecycle GHG Emissions

Kansas Ethanol may only generate D-code 5 RINs for grain sorghum ethanol produced pursuant to the Kansas Ethanol Lyons Sorghum D5 Process or D-code 6 RINs for corn starch ethanol produced pursuant to the Kansas Ethanol Lyons Corn D6 Process if it can demonstrate through records produced in accordance with 40 CFR 80.1454(b)(3) that are available as of the date of RIN generation and maintained by Kansas Ethanol for a minimum of five years from the date of RIN generation that it has satisfied all of the following requirements:

a. All of the ethanol produced at Kansas Ethanol Lyons was produced by a dry mill process using only corn starch, grain sorghum or a combination of corn starch and grain sorghum as feedstocks during the averaging time period.

b. The 365-day rolling average lifecycle GHG emissions for ethanol produced by Kansas Ethanol Lyons is calculated using the following formulas. For grain sorghum ethanol produced, the 365-day rolling average lifecycle GHG emissions must not exceed 49.10 kgCO2e per mmBtu[18] of grain sorghum ethanol. For corn starch ethanol, the lifecycle GHG emissions must not exceed 78.56 kgCO2e per mmBtu of corn starch ethanol.

$$LC_{GHGgs} = GHG_{Ugs} + GHG_{Pgs} + GHG_{D}$$

$$LC_{GHGc} = GHG_{Uc} + GHG_{Pc} + GHG_{D}$$

Where:

LC_{GHGgs} = Lifecycle GHG emissions, in $kgCO_2e$/mmBtu, of the volume of all grain sorghum ethanol produced at the facility during the averaging time period.

GHG_{Ugs} = Upstream GHG emissions, in $kgCO_2e$/mmBtu, related to the production and transport of the volume of grain sorghum feedstock used to produce all grain sorghum

[18] The statutory petroleum gasoline baseline estimated for the March 2010 RFS final rule was 98.2 $kgCO_2e$/mmBtu. Fuel meeting the fifty percent lifecycle GHG reduction threshold produces 49.10 $kgCO_2e$/mmBtu or less.

ethanol produced at the facility during the averaging time period, calculated per section IV.D.c.

GHG_{Pgs} = Process GHG emissions, in $kgCO_2e$/mmBtu, related to the processes used for conversion of grain sorghum into ethanol during the averaging period, including energy used for feedstock, fuel and co-product operations; calculated per section IV.D.d.

GHG_D = Downstream GHG emissions, in $kgCO_2e$/mmBtu, related to the distribution and use of all ethanol produced during the averaging period, calculated per section IV.D.e.

LC_{GHGc} = Lifecycle GHG emissions, in $kgCO_2e$/mmBtu, of the volume of all corn starch ethanol produced at the facility during the averaging time period.

GHG_{Uc} = Upstream GHG emissions, in $kgCO_2e$/mmBtu, related to the production and transport of the volume of corn starch feedstock used to produce all corn starch ethanol produced at the facility during the averaging time period, calculated per section IV.D.c.

GHG_{Pc} = Process GHG emissions, in $kgCO_2e$/mmBtu, related to the processes used for conversion of corn starch into ethanol during the averaging period, including energy used for feedstock, fuel and co-product operations; calculated per section IV.D.d.

c. For the purposes of the formula in section IV.D.b, GHG_{Ugs} and GHG_{Uc} are calculated according to the following formulas:

$$GHG_{U_{gs}} = \frac{8.93 * B_{GS}}{\left(V_S * 0.076 * \left[\frac{B_{GS}}{B_C + B_{GS}}\right]\right)}$$

$$GHG_{U_C} = \frac{9.73 * B_C}{\left(V_S * 0.076 * \left[\frac{B_C}{B_C + B_{GS}}\right]\right)}$$

Where:

8.93 = Upstream emissions factor for grain sorghum, in $kgCO_2e$ per bushel, based on the lifecycle GHG modeling done by EPA for the December 2012 Grain Sorghum Ethanol rule.

9.73 = Upstream emissions factor for corn, in $kgCO_2e$ per bushel, based on the lifecycle GHG modeling done by EPA for the March 2010 RFS rule.

B_{GS} = Bushels of grain sorghum used by Kansas Ethanol Lyons as feedstock to produce ethanol during the averaging time period in terms of a standard bushel at 13% moisture.

For the purposes of this paragraph, B_{GS}, must be calculated according to the following formula:

$$B_{GS} = B_{GS_m} * \left(\frac{1 - m_{gs}}{1 - 0.13}\right)$$

B_{GSm} = Bushels of grain sorghum used by Kansas Ethanol Lyons as feedstock to produce ethanol during the averaging time period based on measurements recorded by Kansas Ethanol Lyons.

m_{gs} = Average moisture content of grain sorghum, in mass percent, for the grain sorghum delivered to Kansas Ethanol Lyons for use as feedstock to produce ethanol during the averaging time period. The moisture content tests performed by Kansas Ethanol must sample grain sorghum that, based on good engineering judgment, is representative of each delivery of grain sorghum feedstock to Kansas Ethanol Lyons. Kansas Ethanol must test the moisture content of the grain sorghum delivered in each and every truck load, train load, or other delivery of grain sorghum to Kansas Ethanol Lyons, and for any given delivery must measure the grain sorghum moisture content no less frequently than once for every 10,000 bushels. For moisture content, Kansas Ethanol must use a DICKEY-john GAC 2500UGMA or Perten AM 5200-A moisture meter, as certified by the National Type Evaluation Program, and follow the device's operating instructions, or use alternative test methods as specified by Kansas Ethanol in their Compliance Monitoring Plan accepted by EPA. Kansas Ethanol must calculate the average moisture content as a weighted average, by summing the products of the mass and corresponding moisture content of each grain sorghum delivery, and then dividing by the total mass of grain sorghum feedstock delivered to Kansas Ethanol Lyons during the averaging time period.

0.13 = Moisture content of a standard bushel of grain sorghum at 56 pounds per bushel.

B_C = Bushels of corn used by Kansas Ethanol Lyons as feedstock to produce ethanol during the averaging time period in terms of a standard bushel at 15.5% moisture. [19]

For the purposes of this paragraph, B_C, must be calculated according to the following formula:

$$B_C = B_{C_m} * \left(\frac{1 - m_c}{1 - 0.155}\right)$$

B_{Cm} = Bushels of corn used by Kansas Ethanol Lyons as feedstock to produce ethanol during the averaging time period based on measurements recorded by Kansas Ethanol Lyons.

[19] As explained in section III, EPA's analysis in this determination considers the amount of corn used by Kansas Ethanol Lyons in order to establish the yield of ethanol per bushel of grain sorghum feedstock used in the process.

m_c = Average moisture content of corn, in mass percent, for the corn delivered to Kansas Ethanol Lyons for use as feedstock to produce ethanol during the averaging time period. The moisture content tests performed by Kansas Ethanol for corn must meet the same requirements as those specified above for grain sorghum to determine m_{gs}.

0.155 = Moisture content of a standard bushel of corn at 56 pounds per bushel.

V_S = Standardized volume of all ethanol produced at the Kansas Ethanol Lyons facility during the averaging time period (including both corn starch and grain sorghum ethanol), in gallons of undenatured ethanol. In determining the standardized volume, the actual volumes of ethanol must be adjusted to a standard temperature of 60 degrees Fahrenheit using the following formula:

$$V_S = V_A * \left(1 - \left(0.00114 * \left(\left[\{T + 459.67\} * \frac{5}{9}\right] - \left[\{60 + 459.67\} * \frac{5}{9}\right]\right)\right)\right)$$

Where:

V_A = Actual volume of undenatured ethanol, in gallons.

T = Actual temperature of ethanol, in degrees Fahrenheit, measured at the same time that V_A is measured.

0.00114 = Coefficient to standardize volumes of undenatured ethanol.

60 = Standard temperature, in degrees Fahrenheit, for volumes of ethanol.

459.67 and 5/9 = Conversion factors for Fahrenheit to Kelvin

0.076 = Energy content of ethanol, in mmBtu/gallon (lower heating value).

d. For the purposes of the formula in section IV.D.b, GHG_{Pgs} and GHG_{Pc} are calculated according to the following formulas:

$$GHG_{P_{gs}} = \frac{\frac{GHG_{THERM}}{(0.963 * R_{GS}) + R_C} * 0.963 + \frac{GHG_{ELEC}}{(0.993 * R_{GS}) + R_C} * 0.993}{V_S * 0.076}$$

$$GHG_{P_C} = \frac{\frac{GHG_{THERM}}{(0.963 * R_{GS}) + R_C} + \frac{GHG_{ELEC}}{(0.993 * R_{GS}) + R_C}}{V_S * 0.076}$$

Where:

GHG_{THERM} = The greenhouse gas emissions, in $kgCO_2e$, associated with thermal energy used for feedstock, fuel and co-product operations, as measured by Kansas Ethanol by continuous monitoring, and calculated according to the following formula:

$$GHG_{THERM} = \sum_{p=1}^{3} \left(PE_p * LHV_{PE,p} * EF_{PE,p}\right) + BIO * EF_{bio}$$

Where:

p = Type of fuel used.

PE_p = Measure of the amount of fuel p used as energy used for feedstock, fuel and co-product operations, as follows:

PE_1 = Standard cubic feet (scf) of natural gas used in feedstock, fuel and co-product operations, as measured by Kansas Ethanol by continuous monitoring.

PE_2 = Standard cubic feet (scf) of biogas CH_4 from landfills, waste treatment plants and/or waste digesters used as energy used for feedstock, fuel and co-product operations, as measured by Kansas Ethanol by continuous monitoring.[20]

$LHV_{PE,p}$ = Lower Heating Value factor for fuel type p, as follows:

$LHV_{PE,1}$ = 983 Btu per scf of natural gas.

$LHV_{PE,2}$ = 983 Btu per scf of biogas CH_4.

$EF_{PE,p}$ = Lifecycle GHG emissions factor for fuel type p, (based on lower heating value) as follows:

$EF_{PE,1}$ = $6.86 * 10^{-5}$ $kgCO_2e$ per Btu of natural gas.

$EF_{PE,2}$ = $3.64 * 10^{-7}$ $kgCO_2e$ per Btu of biogas CH_4.

BIO = Dry pounds (0% moisture) of biomass used as energy used for feedstock, fuel and co-product operations, as measured by Kansas Ethanol by continuous monitoring.

EF_{bio} = $5.40*10^{-3}$ $kgCO_2e$ per dry lbs of crop residue biomass.

0.963 = Adjustment factor for grain sorghum processing using 3.7% less thermal energy than corn ethanol processing.

[20] This shall only represent the methane in the biogas used. If the amount of methane present in the biogas is not metered directly, Kansas Ethanol shall determine the amount of methane present in the biogas used by Kansas Ethanol Lyons, using the monitoring protocols and test procedures specified in the Compliance Monitoring Plan submitted by Kansas Ethanol as part of their registration materials for the Kansas Ethanol Lyons Corn Process.

0.993 = Adjustment factor for grain sorghum processing using 0.7% less electrical energy than corn ethanol processing.

$R_{GS} = \left(\frac{B_{GS}}{B_C + B_{GS}}\right)$ which is the ratio of grain sorghum feedstock used, on a mass basis.

$R_C = \left(\frac{B_C}{B_C + B_{GS}}\right)$ which is the ratio of corn feedstock used, on a mass basis.

GHG_{ELEC} = The greenhouse gas emissions, in $kgCO_2e$, associated with electricity used for feedstock, fuel and co-product operations, as measured by Kansas Ethanol by continuous monitoring, and calculated according to the following formula:

$$GHG_{ELEC} = ELEC * EF_{elec}$$

Where:

ELEC = kWh of Grid electricity used as energy used for feedstock, fuel and co-product operations, as measured by Kansas Ethanol by continuous monitoring.

EF_{elec} = 0.750 $kgCO_2e$ per kWh of grid electricity, based on the United States grid average as evaluated for the March 2010 RFS2 rule and the December 2012 Grain Sorghum Ethanol rule.

e. For the purposes of the formula in section IV.D.b, GHG_D is calculated to be 2.1 kgCO2e per mmBtu of ethanol.

f. For the purposes of section IV.D., for all grain sorghum ethanol produced by Kansas Ethanol during a day where Kansas Ethanol has missing data on any of the factors described in this section, Kansas Ethanol must assess the ethanol produced on all such days as having lifecycle GHG emissions of 98.2 kgCO2e per mmBtu,[21] and use this value in their calculation of the 365-day rolling average lifecycle GHG emissions. Such ethanol and associated lifecycle GHG emissions must be allocated to the corn starch ethanol and grain sorghum ethanol 365-day rolling average lifecycle GHG emissions based on the shares of each type of ethanol produced over the averaging time period.

E. Recordkeeping

In addition to the specific recordkeeping requirements stated at 40 CFR 80.1454(b)(3)(i)-(xii), Kansas Ethanol must produce and maintain the following records related to the generation and

[21] The value of 98.2 kgCO2e/mmBtu was selected because it is the value for baseline lifecycle GHG emissions from gasoline, as evaluated by EPA for the March 2010 RFS rule. We recognize this is a conservative approach for substituting missing data, and we believe a conservative approach is necessary to eliminate any incentive for parties to fail to collect and document accurate data.

assignment of RINs pursuant to 40 CFR 80.1454(b)(3) when Kansas Ethanol generates RINs for ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways.

a. Records documenting the data required to calculate lifecycle GHG emissions per the requirements specified in section IV.D., and which are collected in accordance with the compliance monitoring plan described in section IV.B.a. This includes comprehensive and reliable information with respect to the amount of feedstock and energy used and the amount of fuel produced, such as meter readings and energy bills that span the entire averaging time period for each instance that RINs are generated for ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways.

b. Records presenting accurate calculations verifying compliance with the requirement specified in section IV.D., above, that the 365-day rolling average lifecycle GHG emissions do not exceed 49.10 kgCO2e/mmBtu of grain sorghum ethanol or 78.56 kgCO2e/mmBtu of corn starch ethanol as calculated in accordance with section IV.D.b, and that are prepared on each day that RINs are generated for ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways. The information must include identifiable unique references to all documents and metering data used in the calculations.[22]

F. Reporting

As part of the quarterly RIN generation reports required under 40 CFR 80.1451(b), Kansas Ethanol must follow all of the instructions in the RFS Efficient Producer Data Form (RFS2500) (EPA Form 5900-374) to submit the required information that was prepared during the relevant quarter.[23] Kansas Ethanol must submit reports in accordance with the RFS Efficient Producer Data Form for each and every quarter that it has an activated pathway for ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways.

G. Additional Conditions

The authority for Kansas Ethanol to generate RINs for ethanol produced pursuant to the Kansas Ethanol Lyons Advanced EP3 Pathways is expressly conditioned on Kansas Ethanol satisfying all of the following additional conditions:

[22] The EPA has provided spreadsheets on its website to help ethanol producers understand the correct calculation of 365-day rolling average lifecycle GHG emissions. These spreadsheets can also be used to help with recordkeeping.
[23] Since the information prepared pursuant to section IV.E. must be included in the Kansas Ethanol quarterly RIN generation reports to EPA, it follows that this information is subject to attest engagement requirements pursuant to 80.1464(b).

a. For any biogas energy used for feedstock, fuel and co-product operations, Kansas Ethanol must satisfy the requirements specified at 40 CFR 80.1426(f)(12)(i) and/or (ii), as applicable, of the RFS regulations.

b. All of the biomass used onsite as process energy used for feedstock, fuel and co-product operations must be one or any combination of the types of biomass that is a crop residue, as defined at 40 CFR 80.1401 in the RFS regulations.[24]

If on any day following the activation of the Kansas Ethanol Lyons Advanced EP3 Pathways, Kansas Ethanol generates grandfathered D-code 6 RINs pursuant to 40 CFR 80.1426(f)(6), Kansas Ethanol may not generate RINs for ethanol through the Kansas Ethanol Lyons Advanced EP3 Pathways for the next 365 calendar days. In other words, use of the Kansas Ethanol Lyons Advanced EP3 Pathways is conditional upon Kansas Ethanol not generating grandfathered RINs. The purpose of this condition is to ensure that EPA is able to track and validate compliance with the statutory GHG reduction requirements for volumes produced under the Kansas Ethanol Lyons Advanced EP3 Pathways. We believe that efficient ethanol producers will have no need to use the grandfathering provisions following their installation of technologies intended to achieve greater than 50% GHG reduction to generate D-code 5 RINs.

If on any day, following the activation of the Kansas Ethanol Lyons Advanced EP3 Pathways, Kansas Ethanol uses coal as a source of energy used for feedstock, fuel and co-product operations,[25] Kansas Ethanol may not generate RINs for ethanol produced through the Kansas Ethanol Lyons Advanced EP3 Pathways for the next 365 calendar days. Based on analyses conducted for prior RFS2 rules, we do not believe a facility using coal for process energy would achieve the 50% reduction. Furthermore, the grain sorghum ethanol pathway in row R of Table 1 to 40 CFR 80.1426 is limited to dry mill processes that do not use coal for process energy. Thus, excluding coal from the advanced EP3 pathways ensures that qualifying grain sorghum ethanol will be eligible for D-code 6 RINs through the existing generally applicable pathway in row R of Table 1 to 40 CFR 80.1426 if it does not meet the 50% GHG reduction threshold. This simplifies the advanced EP3 pathways by eliminating the need for them to include a D-code 6 pathway for grain sorghum ethanol. This condition does not apply to electricity purchased from the grid by Kansas Ethanol Lyons, even though some of that electricity may be generated by coal-fired power plants – the electricity emissions factor used in our evaluation accounts for a share of electricity generation from coal.

Once activated, the Kansas Ethanol Lyons Advanced EP3 Pathways replace and supersede the existing EP3 pathways associated with Kansas Ethanol Lyons. Specifically, on the day the Kansas Ethanol Lyons Advanced EP3 Pathways are activated, EPA will deactivate any existing EP3 pathways

[24] See the July 2014 RFS rule (79 FR 42128) for more details on what EPA considers to be residue.
[25] See the definition of energy used for feedstock, fuel and co-product operations in section IV.A.

associated with Kansas Ethanol Lyons in EPA's electronic registration and transaction systems (EMTS and OTAQREG).

Per the existing RFS regulations, if Kansas Ethanol Lyons generates D-Code 6 RINs for ethanol made from corn starch or grain sorghum feedstock and also generates advanced biofuel (D-Code 5) RINs for grain sorghum ethanol, Kansas Ethanol must allocate RINs in accordance with the applicable subparagraphs of 40 CFR 80.1426(f)(3).

EPA may modify the conditions specified above, as it deems necessary and appropriate to ensure that ethanol produced pursuant to the Kansas Ethanol Lyons Advanced EP3 Pathways achieves the required lifecycle GHG reductions, including to make the conditions align with any future changes to the RFS regulations. If EPA makes any changes to the conditions noted in this document, the Agency intends to explain such changes in a public determination letter, similar to this one, and specify in that letter the effective date for any such changes.

V. Public Participation

In the March 2010 RFS rule, we 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 notice and public comment if we can do so as a reasonably straightforward extension of prior analyses, whereas notice and public comment would be conducted to respond to petitions requiring significant new analysis and/or modeling. *See* 75 FR 14797 (March 26, 2010).

In responding to the petition submitted by Kansas Ethanol, we have relied on the grain sorghum ethanol modeling conducted for the December 2012 Grain Sorghum Ethanol rule and the corn starch ethanol modeling for the March 2010 RFS2 rule, and have simply adjusted the analysis to account for the specific production process used by Kansas Ethanol Lyons. We relied on the same agricultural sector modeling (FASOM and FAPRI results) that was conducted and commented on as part of the previous RFS rules to represent feedstock production. This also includes use of the same emission factors and types of emission sources that were used in the analyses in the prior rules. Thus, the fundamental analyses relied on for this decision have already been made available for public comment as part of the March 2010 RFS2 and December 2012 Grain Sorghum Ethanol rules. Our approach today is also consistent with our description of the petition process in the preamble to the March 2010 RFS rule. Our evaluation in response to this petition is a logical extension of analyses already conducted for the prior RFS rules that involved public participation through the notice and comment process.

VI. Conclusion

This document specifies conditions designed to ensure that D-code 5 RINs are generated for grain sorghum ethanol produced pursuant to the Kansas Ethanol Lyons Sorghum D5 Process only if the ethanol satisfies the 50% lifecycle GHG reduction requirements specified in the CAA for advanced biofuel. Similarly, conditions are specified to ensure that D-code 6 RINs are generated for corn starch ethanol produced pursuant to the Kansas Ethanol Lyons Corn D6 Process only if the ethanol satisfies the 20% lifecycle GHG reduction requirements specified in the CAA for conventional biofuel. The fuel must also meet other applicable requirements specified in the CAA and EPA implementing regulations to qualify for RINs, including being produced from renewable biomass and for use as transportation fuel, heating oil or jet fuel.

This approval applies specifically to the Kansas Ethanol Lyons facility and to the process, materials used, fuel and co-products produced, and process energy sources as outlined and described in the Kansas Ethanol petition. This approval is effective as of signature date. However, RINs may only be generated for ethanol produced pursuant to the Kansas Ethanol Lyons Advanced EP3 Pathways that is produced after the date of activation of Kansas Ethanol's registration for this pathway.

The OTAQ Reg: Fuels Programs Registration and OTAQEMTS: OTAQ EMTS Application (OTAQ Reg and EMTS) will be modified to allow Kansas Ethanol to register to generate D-code 5 RINs for the production of ethanol from grain sorghum feedstock using a production process of "Kansas Ethanol Lyons Sorghum D5 Process" and D-code 6 RINs for the production of ethanol from corn starch feedstock using a production process of "Kansas Ethanol Lyons Corn D6 Process." When EPA activates the Kansas Ethanol Lyons Advanced EP3 Pathways, EPA will deactivate any existing EP3 pathways associated with Kansas Ethanol Lyons in EMTS and OTAQ Reg. This document has no impact on the ability of Kansas Ethanol Lyons to use the OTAQ Reg and EMTS to register and generate RINs for ethanol produced using any of the pathways specified in Table 1 to 40 CFR 80.1426.