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RIN 2060–AT82

Renewable Fuel Standard Program: Grain Sorghum Oil Pathway

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: In this action, the Environmental Protection Agency (EPA) determines that biodiesel and heating oil produced from distillers sorghum oil via a transesterification process, and renewable diesel, jet fuel, heating oil, naphtha, and liquefied petroleum gas (LPG) produced from distillers sorghum oil via a hydrotreating process, meet the lifecycle GHG emissions reduction threshold of 50 percent required for advanced biofuels and biomass-based diesel under the Renewable Fuel Standard (RFS) program. Based on these analyses, EPA is adding these pathways to the list of approved renewable fuel production pathways in the RFS regulations. EPA is also amending the RFS regulations by adding a new definition of ''distillers sorghum oil,'' and replacing existing references to ''non-food grade corn oil'' with the newly defined term ''distillers corn oil.''

DATES: The final rule is effective October 1, 2018.

ADDRESSES: The EPA has established a docket for this action under Docket ID No. EPA–HQ–OAR–2017–0655. All the documents in the docket are listed on the *http://www.regulations.gov* website. Although listed in the index, some information is not publicly available, *e.g.,* CBI or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the internet and will be publicly available only in hard copy form. Publicly available docket materials are available electronically through *http://www.regulations.gov*.

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SUPPLEMENTARY INFORMATION:

Outline of This Preamble

I. General Information
A. Does this action apply to me?
B. What action is the agency taking?
C. What is the agency's authority for taking this action?
D. What are the incremental costs and benefits of this action?
II. Introduction
III. Analysis of GHG Emissions Associated With Production of Biofuels From Distillers Sorghum Oil
A. Overview of Distillers Sorghum Oil
B. Analysis of Lifecycle GHG Emissions
1. Livestock Sector Impacts
a. Nutritional Impacts
b. Mass Loss
2. Feedstock Production
3. Feedstock Transport
4. Feedstock Pretreatment
5. Fuel Production
6. Fuel Distribution
7. Fuel Use
8. Results of GHG Lifecycle Analysis
IV. Definition of Distillers Corn Oil
V. Summary
VI. Statutory and Executive Order Reviews
A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review
B. Executive Order 13771: Reducing Regulations and Controlling Regulatory Costs
C. Paperwork Reduction Act (PRA)
D. Regulatory Flexibility Act (RFA)
E. Unfunded Mandates Reform Act (UMRA)
F. Executive Order 13132: Federalism
G. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments
H. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks
I. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use
J. National Technology Transfer Advancement Act (NTTAA)
K. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations
L. Congressional Review Act (CRA)

I. General Information

A. Does this action apply to me?

Entities potentially affected by this action are those involved with the production, distribution, and sale of transportation fuels, including gasoline and diesel fuel or renewable fuels such as ethanol, biodiesel, heating oil, renewable diesel, naphtha and liquefied petroleum gas. Potentially regulated categories include:

Examples of potentially affected entities	NAICS[1] codes
Petroleum refineries (including importers)	324110
Ethyl alcohol manufacturing	325193
Other basic organic chemical manufacturing	325199
Chemical and allied products merchant wholesalers	424690
Petroleum bulk stations and terminals	424710, 424720
Other fuel dealers	454310

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. This table lists the types of entities that the EPA is now aware could potentially be affected by

[1] North American Industry Classification System.

this action. Other types of entities not listed in the table could also be affected. To determine whether your entity is regulated by this action, you should carefully examine the applicability criteria in the referenced regulations. If you have any questions regarding the applicability of this action to a particular entity, consult the person listed in the **FOR FURTHER INFORMATION CONTACT** section.

B. What action is the agency taking?

EPA is amending the RFS regulations to add a new definition of ''distillers sorghum oil'' and to replace existing references to ''non-food grade corn oil'' with the newly defined term ''distillers corn oil.'' This rule also adds the following pathways to rows F and H of Table 1 to 80.1426: (1) Biodiesel and heating oil produced from distillers sorghum oil and commingled distillers sorghum and corn oil via a transesterification process; and (2) renewable diesel, jet fuel, and heating oil produced from distillers sorghum oil and commingled distillers sorghum and corn oil via a hydrotreating process. Pathways for naphtha and LPG produced from distillers sorghum oil via a hydrotreating process are also added to row I of Table 1 to 40 CFR 80.1426. These pathways are approved for biomass-based diesel (D-code 4) or advanced biofuel (D-code 5) renewable identification numbers (RINs), depending on the fuel type and whether the production process involves co-processing renewable biomass and petroleum.[2]

C. What is the agency's authority for taking this action?

Statutory authority for this action comes from Clean Air Act sections 114, 208, 211, and 301.

D. What are the incremental costs and benefits of this action?

There are no incremental costs from this action. This action allows for additional flexibility and feedstock production options for participating in the Renewable Fuel Standard (RFS) program.

II. Introduction

Section 211(o) of the Clean Air Act (CAA) establishes the RFS program, under which EPA sets annual percentage standards specifying the amount of renewable fuel, as well as three subcategories of renewable fuel, that must be used to reduce or replace fossil fuel present in transportation fuel, heating oil, or jet fuel. Non-exempt renewable fuels must achieve at least a 20 percent reduction in lifecycle greenhouse gas (GHG) emissions as compared to a 2005 petroleum baseline.[3] Advanced biofuel and biomass-based diesel must achieve at least a 50 percent reduction, and cellulosic biofuel must achieve at least a 60 percent reduction.

In addition to the lifecycle GHG reduction requirements, there are other definitional criteria for renewable fuel (*e.g.,* produced from renewable biomass as defined in the statute and regulations, and used to reduce or replace the quantity of fossil fuel present in transportation fuel, heating oil, or jet fuel) in CAA section 211(o) and the RFS regulations at 40 CFR part 80 subpart M.

Since the formation of the RFS program, EPA has periodically promulgated rules to add new pathways to the regulations.[4] In addition, EPA has approved facility-specific pathways through the petition process in 40 CFR 80.1416. There are three critical components of approved fuel pathways under the RFS program: (1) Fuel type; (2) feedstock; and (3) production process. Each pathway is associated with a specific ''D-code'' that corresponds to one of the four categories of renewable fuel—general renewable fuel, advanced biofuel, cellulosic biofuel, or biomass-based diesel.

EPA's lifecycle analyses are used to assess the overall GHG emissions of a fuel throughout each stage of its production and use. The results of these analyses, considering uncertainty and the weight of available evidence, are used to determine whether a fuel meets the necessary GHG reductions required under the CAA. Lifecycle analysis includes an assessment of emissions related to the full fuel lifecycle, including feedstock production, feedstock transportation, fuel production, fuel transportation and distribution, and tailpipe emissions. Per the CAA definition of lifecycle GHG emissions, EPA's lifecycle analyses also include an assessment of significant indirect emissions, such as those from land use changes and agricultural sector impacts.

EPA received a petition from the National Sorghum Producers (NSP), submitted under partial claims of confidential business information (CBI), requesting that EPA evaluate the GHG emissions associated with biofuels produced using as a feedstock grain sorghum oil derived from dry mill ethanol production, and that EPA provide a determination of the renewable fuel categories, if any, for which such biofuels may be eligible. EPA issued a proposed rule in December 2017[5] to establish approved pathways for the use of grain sorghum oil, and received comments on this proposal. In this action, EPA is amending the RFS program regulations to define the term ''distillers sorghum oil.'' We are also adding pathways to rows F, H and I of Table 1 to 40 CFR 80.1426 for biodiesel, renewable diesel, heating oil, naphtha, and LPG produced from distillers sorghum oil, via transesterification or hydrotreating processes.

This preamble describes EPA's analysis of the GHG emissions associated with distillers sorghum oil when used to produce specified biofuels via particular processes. The analysis considers a scenario where distillers sorghum oil is recovered from distillers grains with solubles (DGS) at dry mill plants that produce biofuel from grain sorghum and where the remaining reduced-oil DGS co-product is used as animal feed. The distillers sorghum oil is then used as a feedstock for conversion into certain biofuels. As described in section III.B.8 of this preamble, we find that, under these circumstances, biodiesel and heating oil produced from distillers sorghum oil via a transesterification process meets the 50 percent GHG reduction threshold required for advanced biofuel and biomass-based diesel. We also find that, under these circumstances, renewable diesel, jet fuel, naphtha, and LPG produced from distillers sorghum oil via a hydrotreating process meets the 50

[2] The term ''biomass-based diesel'' is defined in the statute to exclude any renewable fuels derived from co-processing biomass with a petroleum feedstock. CAA Section 211(o)(1)(D).

[3] A baseline volume of renewable fuel produced from facilities that commenced construction on or before December 19, 2007, and which completed construction by December 19, 2010, without an 18-month hiatus in construction, is exempt from the minimum 20 percent GHG reduction requirement that otherwise applies to renewable fuel. In addition, a baseline volume of ethanol from facilities that commenced construction after December 19, 2007, and on or before December 31, 2009, qualifies for the same exemption if construction was completed within 36 months without an 18-month hiatus in construction; the facility was fired with natural gas, biomass, or any combination thereof, at all times the facility operated between December 19, 2007, and December 31, 2009; and the baseline volume continues to be produced through processes fired with natural gas, biomass, or any combination thereof.

[4] Please see information on Pathways I and Pathways II in 40 CFR part 80 subpart M, and in the **Federal Register** at 78 FR 14190 (March 5, 2013) and 79 FR 42128 (July 18, 2014). More information on these can be found at: *https://www.epa.gov/renewable-fuel-standard-program/final-rule-identify-additional-fuel-pathways-under-renewable-fuel* and *https://www.epa.gov/renewable-fuel-standard-program/renewable-fuel-pathways-ii-final-rule-identify-additional-fuel.*

[5] 82 FR 61205 (December 27, 2017).

percent GHG emission reduction threshold required for advanced biofuel.

As discussed in section IV of this preamble, EPA is also amending the RFS regulations to add a new definition for ''distillers corn oil'' that is consistent with the new definition of distillers sorghum oil. The definitional change for distillers corn oil was proposed in the November 2016 Renewable Enhancement and Growth Support proposed rule (the ''November 2016 REGS proposed rule'').[6] Although that rule proposed to revise the definition of corn oil extraction, after considering the comments received, we decided it was more appropriate to leave the definition of corn oil extraction unchanged, and instead add and define the term distillers corn oil. This new term, distillers corn oil, will replace the existing term, non-food grade corn oil (which some parties have found unclear) in rows F and H of Table 1 to 40 CFR 80.1426. The primary difference between the existing and new terms is that the new definition of distillers corn oil allows for the recovery of corn oil at additional points in the ethanol production process (provided certain conditions are met). Thus, although the new definition allows additional corn oil to be used as a feedstock in the relevant pathways, the same life cycle considerations apply and the analyses for those pathways are unaffected.[7] The purpose and practical effect of this final rule, to allow corn oil extraction at more stages of ethanol production, closely match the notice of proposed rulemaking on this topic. In light of the practical similarity between ''non-food grade corn oil'' and ''distillers corn oil'' and to avoid implementation difficulties from continuing to administer registrations with obsolete terms, fuel producers who are currently registered for pathways that include non-food grade corn oil as a feedstock will need to update their registration to include distillers corn oil feedstock through a company update in EPA's Central Data Exchange (CDX). After the effective date of this final rule, including a reasonable transition period to allow for adequate time for registration updates to be initiated and processed, the non-food grade corn oil feedstock code will be removed and RINs will not be able to be generated using that feedstock code.[8] Fuel producers will be instructed on how and when to remove the non-food grade corn oil feedstock from their registration.

With no known exceptions, ethanol plants that recover grain sorghum oil also, and in most cases simultaneously, recover corn oil by the same methods. Thus, for practical implementation purposes, it is important to finalize the distillers corn oil definitional changes in this rulemaking, to provide consistency between these regulatory definitions. Finally, we also include in this rulemaking pathways for biodiesel and heating oil produced from commingled distillers sorghum oil and distillers corn oil via a transesterification process, and renewable diesel, jet fuel, and, heating oil produced from commingled distillers sorghum and corn oil via hydrotreating processes.

III. Analysis of GHG Emissions Associated With Production of Biofuels From Distillers Sorghum Oil

A. Overview of Distillers Sorghum Oil

Sorghum is native to Africa, but was introduced to the U.S. in the early 17th century. Grain sorghum belongs to the species *Sorghum bicolor* (L.) Moench,[9] which has been bred for different purposes including use as a grain (grain sorghum), a source of sugar (sweet sorghum), and animal forage (biomass sorghum). In the U.S., grain sorghum is commonly used as animal feed similar to feed corn, although in some parts of the world it is more often grown for human consumption. Pathways for ethanol produced from grain sorghum were approved in a rule published on December 17, 2012 (77 FR 74592). We also discussed biomass sorghum in a **Federal Register** Notice published on December 31, 2014 (79 FR 78857). In that notice, we stated that EPA does not consider hybrids of *Sorghum bicolor* and Johnsongrass (*Sorghum halepense)* to be biomass sorghum. We would also not consider such hybrids to be grain sorghum. Johnsongrass hybrids are explicitly excluded due to concerns regarding their potential to behave as an invasive species.

Dry mill ethanol and butanol[10] plants grind and ferment grain sorghum,[11] produce ethanol or butanol from the fermented grain sorghum starch, and also produce a DGS co-product (made of non-fermentable solids, solubles syrup, and sorghum oil) that is sold as a type of livestock feed. A portion of the oil that would otherwise reside in the DGS can be recovered at the biofuel plant, typically through mechanical extraction. Sorghum oil is recovered through methods identical to that of corn oil recovered from DGS, and corn and sorghum oil recovery can occur at the same facilities.

The recovered distillers corn and sorghum oils contain a high concentration of free-fatty acids, greater than ten percent by weight,[12] and are unsuitable for human consumption without further refining. It can, however, be used without further refining as a biofuel feedstock or as an ingredient in animal feed. There are existing approved RFS fuel pathways for biofuels produced from distillers corn oil[13] to qualify for advanced biofuel (D-code 5) or biomass-based diesel (D-code 4) RINs, depending on the production process used (see rows F and H of Table 1 to 40 CFR 80.1426). This rulemaking establishes similar pathways for the use of distillers sorghum oil as currently exist for the use of distillers corn oil, and also establishes an additional pathway in row I of Table 1 to 40 CFR 80.1426, as discussed further below.

In previous actions, EPA has approved pathways for the production of ethanol from grain sorghum made through a dry mill process as qualifying for renewable fuel (D-code 6) RINs, and in some cases advanced biofuel (D-code 5) RINs, depending on process energy sources used during production.[14] In December 2016, EPA also approved (with conditions) a facility-specific pathway for advanced butanol (qualifying for (D-code 5) RINs)

[6] 81 FR 80828 (November 16, 2016).

[7] *See* 81 FR 80828, 80900 (''[W]e believe that the precise timing and method of corn oil extraction is not relevant for GHG reductions to be accomplished pursuant to pathways F and H, provided that: (1) The corn is converted to ethanol; (2) The corn oil is extracted at a point in the dry mill ethanol production process that renders it unfit for food uses without further refining; and (3) The resulting DGS from the dry mill operation is marketable as animal feed.'')

[8] For more information on EPA's guidelines for registration updates see memo to the docket, ''Registration Approach for Fuel Producers Transitioning from Non-Food Grade Corn Oil to Distillers Corn Oil Feedstock,'' in Air Docket EPA–HQ–OAR–2017–0655.

[9] See, U.S. Department of Agriculture Natural Resource Conservation Service, *https://plants.sc.egov.usda.gov/core/profile?symbol=SOBI2,* accessed July 02, 2018.

[10] Given that ethanol production far exceeds that of butanol, for the sake of brevity, this preamble often refers only to dry mill ethanol plants, but butanol plants are implied to be included in such references, unless stated otherwise.

[11] Grain sorghum refers to Sorghum bicolor (L.) Moench ssp. Bicolor, see: *https://plants.usda.gov/core/profile?symbol=sobib*.

[12] A Moreau, Robert & B Hicks, Kevin & Johnston, David & P. Laun, Nathan. (2010). The Composition of Crude Corn Oil Recovered after Fermentation via Centrifugation from a Commercial Dry Grind Ethanol Process. *Journal of the American Oil Chemists' Society*. 87. 10.1007/s11746–010–1568–z.

[13] This rulemaking replaces the term ''non-food grade corn oil'' in the feedstock column of rows F and H of Table 1 to 40 CFR 80.1426 with ''distillers corn oil.'' See section VI of this preamble for further discussion.

[14] Table 1 to 40 CFR 80.1426, Rows R and S.

produced from grain sorghum as a feedstock.[15]

Currently about 30 percent of grain sorghum grown, or 120 million bushels a year, goes towards ethanol production.[16] Most of this production occurs in Texas, Oklahoma, and Kansas.[17] For comparison, in recent years over 5,200 million bushels of corn have been used for ethanol production annually.[18] Distillers sorghum oil can be produced at these facilities and used for biofuel production or other uses. However, it is still a relatively niche product, and the NSP petition anticipates that with approval of an RFS pathway, a potential of 12 to 21 million ethanol-equivalent gallons of biofuel would be produced from the distiller sorghum oil per year.

To the extent that distillers sorghum oil is used as a biofuel feedstock, it will often be produced together with distillers corn oil at ethanol plants using a combination of grain sorghum and corn as feedstocks for ethanol production. The commingled distiller sorghum and corn oils will then be shipped as a mixture to a different biofuel production facility for use as a feedstock.[19] Due to the recovery process of the oils from the DGS, where the ethanol plant is using a feedstock that combines grain sorghum and corn, it is not possible to physically separate the distillers sorghum and corn oils into two streams, nor is it possible to account for the volume of sorghum oil or corn oil in this mixture. Due to this specific recovery process and inability to separate or allocate volume associated with each oil in the mixture, we are allowing the mixture of distiller sorghum and corn oil to be reported together as one volume. For example, the RFS regulations at 40 CFR 80.1451(b)(ii)(K) require renewable fuel producers to submit RIN generation reports that include the ''types and quantities of feedstocks used'' for each batch of renewable fuel produced or imported. The regulations do not specify a method for fuel producers to use in determining the quantity of each feedstock when the feedstocks are received as a commingled shipment, as would likely be the case for distillers corn oil and distillers sorghum oil. A number of commenters recommended that EPA clarify the treatment of mixed distillers corn and sorghum oil in the final rule. Based on these comments, we believe it is appropriate to clarify the treatment of commingled distillers corn and sorghum oils in this rule. Given our expectation that a large share of distillers sorghum oil will be mixed with distillers corn oil when it is recovered, from a practical standpoint, approving a distillers sorghum oil pathway without clearly allowing for the use of commingled shipments would unnecessarily constrain the use of these potential feedstocks. Further, we acknowledge that it is not practical to require parties to separate the oils from this mixture and report the distillers sorghum and corn oils as individual feedstocks. Taking these factors into consideration and for ease of implementation, we are adding ''Commingled distillers corn and sorghum oils'' as a feedstock to rows F and H of Table 1 to 40 CFR 80.1426. Thus, facilities producing fuel through these pathways can treat commingled distillers corn oil and distillers sorghum oil as a single feedstock and report the combined volume of these oils in RIN generation reports under 40 CFR 80.1451(b)(ii)(K). They may also generate RINs in accordance with the formula in 40 CFR 80.1426(f)(2) for renewable fuel that can be described by a single pathway.

At this time, EPA is not adding ''commingled distillers corn and sorghum oil'' as a feedstock to row I of Table 1 to 40 CFR 80.1426 for the production of naphtha and LPG via a hydrotreating process. Non-food grade corn oil is not currently listed in that row, nor has EPA proposed to add it (or distillers corn oil). Thus, it would be premature for EPA to add either distillers corn oil or commingled distillers corn and sorghum oil as feedstocks in row I. Through the fuel pathway petition process, EPA previously approved two petitions allowing the generation of advanced biofuel (D-code 5) RINs for naphtha and LPG produced from non-food grade corn oil via a hydrotreating process.[20] We intend to inform companies with existing facility-specific pathway approvals for non-food grade corn oil, granted through the 40 CFR 80.1416 petition process, that such pathway approvals will be interpreted by EPA as approvals for distillers corn oil. (This gives such producers the same treatment as producers who registered for non-food grade corn oil feedstock without first being approved for a facility-specific petition.) In order to generate (D-code 5) RINs for naphtha and/or LPG produced from distillers corn oil and/or commingled distillers corn and sorghum oil, a fuel producer would first need to petition EPA pursuant to 40 CFR 80.1416, have EPA review and approve their requested pathway, and then submit and have EPA accept the registration for the new pathway.

EPA sought comment in the December 2017 sorghum oil proposed rule on a proposed definition for distillers sorghum oil. We summarize comments received below, with a more detailed summary and analysis included in the docket for this rulemaking. EPA received one comment on the proposed definition, asking that EPA clarify the phrase ''rendered unfit for food uses'' to specify that this means human food uses and not animal food uses. In this comment EPA was also asked to finalize revisions to the definition of corn oil extraction that was proposed in the November 2016 REGS proposed rule. The requested clarification is consistent with EPA's intended meaning, and we are finalizing a definition that says, ''the oil is unfit for human food use without further refining.'' We are also removing the word ''rendered'' from this part of the definition, as it is unnecessary and seemed to raise questions for commenters without any clear benefit.

EPA received a number of comments on the November 2016 REGS proposed rule related to the proposed changes to the definition of corn oil extraction contained in that proposed rule. Based on these comments, we have made a number of changes to the proposed definition of distillers sorghum oil to ensure that it aligns with the definition of distillers corn oil. These comments and associated changes are discussed in section IV, and in more detail in a response to comment document in the docket for this rulemaking.

As part of this rule, we are adding a definition of distillers sorghum oil in 40 CFR 80.1401. So long as the criteria in the definition are met, a variety of recovery methods could be

[15] December 22, 2016 pathway approval for Gevo, Inc., *https://www.epa.gov/renewable-fuel-standard-program/gevo-inc-approval.*

[16] Sorghum Checkoff, ''Renewables,'' *http://www.sorghumcheckoff.com/market-opportunities/renewables,* accessed 09-05-2017, (EPA-HQ-OAR-2017-0655-0015).

[17] USDA, NASS, ''Sorghum for Grain 2016 Harvested Acres by County for Selected States,'' *https://www.nass.usda.gov/Charts_and_Maps/graphics/AS-HA-RGBChor.pdf,* (EPA-HQ-OAR-2017-0655-0019).

[18] USDA, ERS, ''Table 5—Corn supply, disappearance, and share of total corn used for ethanol,'' *U.S. Bioenergy Statistics, https://www.ers.usda.gov/data-products/us-bioenergy-statistics/us-bioenergy-statistics/#Feedstocks,* accessed 09–05–2017, (EPA–HQ–OAR–2017–0655–0021).

[19] See comment from the Renewable Fuels Association (EPA–HQ–OAR–2017–0655–0039) and NSP petition, (EPA–HQ–OAR–2017–0655–0005), pp. 8.

[20] Renewable Energy Group's facility in Geismar, LA (*https://www.epa.gov/renewable-fuel-standard-program/reg-geismar-approval-0*) and Diamond Green Diesel's facility in Norco, LA (*https://www.epa.gov/renewable-fuel-standard-program/diamond-green-diesel-llc-approval*).

implemented. For example, this would include recovery of sorghum oil before fermentation from the slurry or from liquefaction tanks. It would also include recovery of sorghum oil after fermentation from the thin stillage and/or DGS. Further, it would also include recovery of sorghum oil by a third-party, and/or at a separate location from the biofuel plant. The definition of distillers sorghum oil is consistent with the definition of distillers corn oil, which is also being finalized in this rule (see section IV of this preamble).

B. Analysis of Lifecycle GHG Emissions

EPA evaluated the GHG emissions associated with using distillers sorghum oil as a biofuel feedstock based on information provided by the petitioner, input from the U.S. Department of Agriculture (USDA), public comments, and other available data sources. GHG emissions include emissions from production and transport of grain sorghum, the production and transport of distillers sorghum oil; the processing of the oil into biofuel; transport of the biofuel from the production facility to the fuel-blender; and, ultimately the use of the biofuel by the end consumer.

EPA's lifecycle analyses include significant direct and indirect GHG emissions (including such emissions from land use changes) associated with producing a feedstock and transporting it to the processing facility. All of the emissions associated with growing, harvesting, and transporting grain sorghum as a biofuel feedstock were calculated and taken into account in EPA's evaluation of the lifecycle GHG emissions associated with grain sorghum ethanol and butanol.[21]

In the proposed rule we described our preliminary finding that biofuels produced from distillers sorghum oil reduce lifecycle GHG emissions by approximately 80 percent compared to the petroleum baseline. These results assumed zero indirect GHG emissions related to compensating for oil removal from DGS, based on the premise that certain types of livestock benefit from lower-fat DGS and therefore removing the sorghum oil would not result in significant indirect impacts. EPA received two comments arguing that extracting distillers sorghum oil from DGS reduces the mass, calorific, and fat content of the DGS, and that there would be significant indirect GHG emissions associated with replacing these losses with other sources of livestock feed. As discussed below, we have adjusted our analysis based on these comments and conducted further analysis to estimate the potential indirect GHG emissions associated with replacing the extracted distillers sorghum oil. After accounting for these emissions, based on available information and reasonable assumptions to account for uncertainties, our revised analysis continues to show that biofuels produced from distillers sorghum oil satisfy the 50 percent lifecycle GHG reduction threshold required to qualify as advanced biofuel or biomass-based diesel. Finally, some commenters on the proposed distillers sorghum oil rule suggested that EPA has an obligation to engage in consultation with the United States Fish and Wildlife Service and/or that National Marine Fisheries Service under Section 7 of the Endangered Species Act prior to finalizing the rule. Such consultation is required for actions in which the Agency has discretion to tailor its actions for the benefit of threatened or endangered species, or their critical habitat, and where the action in question ''may effect'' listed species. However, as described in the Response to Comments Document accompanying this rule, EPA does not have discretion under the statute to take into consideration possible impacts to threatened or endangered species or their critical habitat in determining which biofuels qualify under the renewable fuel standard program as advanced biofuel or biomass-based diesel and, even if it did have such discretion, today's rule will have no effect on threatened or endangered species. As a result, Section 7 consultation is not required.

1. Livestock Sector Impacts

During a typical dry mill fermentation process, DGS are produced. These DGS are then used as animal feed, thereby displacing feed crops and the GHG emissions associated with growing and transporting those feed crops. After distillers sorghum oil is removed, DGS continue to be produced and sold as livestock feed, but with reduced oil content.

We do not expect sorghum oil removal to have significant impact on the types and quantities of feed used in the livestock market. EPA's modeling for the December 2012 grain sorghum ethanol final rule assumed average dried DGS yield of 17 pounds per bushel of grain sorghum feedstock.[22] The oil content of full oil DGS is approximately 1.71 pounds per bushel,[23] of which approximately 0.67–0.88 pounds per bushel of grain sorghum feedstock can be recovered using commercially available mechanical extraction technologies.[24] When oil is recovered from the DGS, the total mass of DGS produced could be reduced by up to approximately 6 percent. However, DGS from grain sorghum represents less than 3 percent of DGS fed to domestic livestock.[25] Even if all distillers sorghum oil were removed from livestock feed, the overall impact on the livestock sector would be extremely small. To the extent that sorghum DGS are likely to be fed in combination with corn DGS and other livestock feed ingredients, the changes in oil content on the combined feed could potentially be too small to discern.[26] In that case, it is unlikely that feedstock suppliers would find a need to replace the distillers sorghum oil with other oils. As mentioned previously, EPA has an existing pathway approved for non-food grade corn oil, now referred to as distillers corn oil. Much of the current corn DGS on the feed market is already de-oiled, and because all known current facilities using sorghum blend with corn DGS, we do not expect any significant changes in oil concentrations from what already exists on the market. However, based on the comments received, we have conducted additional analysis on the potential indirect GHG emissions impacts on a per pound of oil extracted basis.

Chemically, full-oil and reduced-oil sorghum DGS share similar compositions; they are primarily made up of crude protein, fat, and natural and acid detergent fibers.[27] Where the two products differ most significantly is in their acid detergent fiber and fat concentrations.

[21] See the December 17, 2012 grain sorghum ethanol final rule (77 FR 74592).

[22] See 77 FR 74592 (December 17, 2012).

[23] NSP petition (EPA–HQ–OAR–2017–0655–0005), Attachment 4, pp. 7.

[24] 0.88 pounds removal is at the highest end of the information NSP provided and corresponds to a fat content in reduced-oil distillers grains of 3.91% rather than 7.2% which NSP considers as a more likely outcome.

[25] NSP petition (EPA–HQ–OAR–2017–0655–0005), pp. 19. And, AgMRC, ''Estimated U.S. Dried Distillers Grains with Solubles (DDGS) Production & Use,'' *https://www.extension.iastate.edu/agdm/crops/outlook/dgsbalancesheet.pdf*, (EPA–HQ–OAR–2017–0655–0006).

[26] See Air Docket EPA–HQ–OAR–2017–0655, U.S. Department of Agriculture, Office of the Chief Scientist and Office of the Chief Economist, ''Memorandum: Technical responses on EPA assumptions related to the lifecycle GHG assessment of the proposed grain oil sorghum biofuel pathway,'' March 15, 2018, pp. 4.

[27] Neutral detergent fibers measure the amount of structural component of plants, while acid detergent fibers measure the least digestible plant components.

Table III.1 shows the key constituents that make up dried full-oil and reduced-oil DGS.

TABLE III.1—KEY NUTRIENT MAKE-UP OF FULL-OIL AND REDUCED-OIL DRIED DISTILLERS GRAINS WITH SOLUBLES (DDGS) DERIVED FROM GRAIN SORGHUM [28]

Nutrient	Full-oil sorghum DDGS	Reduced-oil sorghum DDGS
Crude Protein, %	30.80	31.36
Crude Fat, % (aka Ether Extract)	9.75	3.91
Neutral Detergent Fiber (NDF), %	33.60	37.23
Acid Detergent Fiber (ADF), %	22.68	31.91
Ash, %	6.62	7.60
Calcium, %	0.12	0.08
Phosphorus, %	0.76	0.96
Lysine, %	0.82	0.62
Methionine, %	0.54	0.47
Cystine, %	0.53	0.61
Tryptophan, %	0.25	0.23

EPA received two comments [29] regarding the potential greenhouse gas impacts on the livestock sector if the distillers oil is removed. One potential impact is based on whether a lower crude fat concentration would require changes in the livestock feed composition to make up for the nutritional loss to the livestock (nutritional impacts). The second potential impact is related to the physical reduction in DGS mass resulting from the oil recovery (mass loss). We address both of these potential impacts in the following sections.

a. Nutritional Impacts

The key issue associated with the first potential impact is whether the reduced calories would impact the amount of feed displaced through the use of sorghum DGS. Should fat content not be at sufficient levels, livestock producers might need to add nutrients or other types of feed to meet appropriate nutritional targets. This is reflected in the ''displacement rate'' of a DGS, which indicates how much weight a pound of distillers grain can replace of another feed. A lower feed displacement rate for a reduced-oil distillers grain as compared to a full-oil distillers grain could result in additional GHG emissions as it suggests that additional feed is required to replace the missing oil. Displacement rates are calculated by taking into account nutrient and energy requirements of livestock and their respective recommended DGS inclusion rates to maintain animal performance.[30] The next section (III.B.1.b. Mass Loss), describes how we used the displacement rate to analyze the emissions impacts associated with the removal of oil from sorghum DGS.

Research suggests that for several livestock types there are performance improvements, per pound of DGS, when oil content of fed-DGS is removed. For instance, for poultry and swine, ''increased concentrations of free fatty acids have a negative impact on lipid digestion and energy content.'' [31] Free fatty acids are a class of acids that form part of a lipid molecule. Full-oil DGS typically contain higher levels of free fatty acids and thus may have a negative impact on the fat digestion of poultry and swine. Thus, while the fat content may be lower for reduced-oil DGS, per pound feeding values of this product may not be lower than full-oil DGS for poultry and swine and the feed displacement rate may not be lower for reduced-oil versus full-oil DGS.

For dairy, there are also benefits from feeding reduced-oil DGS as compared to full-oil DGS. Research on dairy cows shows that reduced-oil DGS produce a lessened likelihood of the onset of milk fat depression.[32] Milk fat depression occurs when milk fat is reduced by 0.2 percent or more.[33] If milk fat depression occurs over the long term, a decline in overall milk production may occur as well as worsened health conditions of the herd. High fat diets have been linked with this condition and have been shown to worsen the rumen environment of dairy cattle.[34] Therefore, dairy producers seek to avoid high fat diets. Given the benefits of reduced-oil DGS over full-oil DGS for milk fat production, it is expected that reduced-oil DGS will be preferred over full-oil DGS by dairy producers and that feed displacement rates will be no lower than those of full-oil DGS.

An impact on displacement rates may occur when reduced-oil instead of full-oil DGS are used for beef cattle, which require additional fat. Table III.2 shows the displacement ratios for the livestock sectors where dried DGS (DDGS) are used. In this table, for instance, 1 pound of reduced-oil DDGS fed to beef cattle displaces 1.173 pounds of corn, as opposed to 1.196 pounds of corn for full-oil DDGS. A pound of full-oil and reduced-oil DDGS also displaces equal amounts (0.056 pounds) of urea. Urea is a non-protein nitrogen compound that is typically fed to cattle for aiding the production of protein by rumen microbes.[35] These values show that for dairy, swine, and poultry, reduced-oil DDGS replace the same amounts of alternative feed despite containing less oil than full-oil DDGS. This is not the case, however, with respect to beef cattle.

[28] The chart lists the most prominent constituents in distillers grains. Data provided by the National Sorghum Producers, see Air docket EPA–HQ–OAR–2017–0655. Data for full-oil sorghum DDGS is sourced from *Nutrient Requirements of Swine,* 2012 National Academies Press, Washington, DC, pp 329. Data for reduced-oil Sorghum DDGS was calculated by National Sorghum Producers using the ratio of (1) corn DDGS, between 6 to 9 percent Oil; and (2) corn DDGS, less than 4 percent oil from *Nutrient Requirements of Swine,* 2012 National Academies Press, Washington, DC, pp. 266 and 267.

[29] EPA–HQ–OAR–2017–0655–0041, 0042.

[30] For more detail see, Arora et al., (2008). Argonne National Laboratory. ''Update of distillers grains displacement ratios for corn ethanol life-cycle analysis'' (EPA–HQ–OAR–2017–0655–0007).

[31] Kerr, B.J., W.A. Dozier, and G.C. Shurson. (2016). ''Lipid digestibility and energy content of distillers' corn oil in swine and poultry,'' *Journal of Animal Science.* 94:2900–2908. doi:10.2527/jas.2016–0440, pp. 2905 (EPA–HQ–OAR–2017–0655–0010).

[32] H.A. Ramirez-Ramirez, E. Castillo Lopez, C.J.R. Jenkins, N.D. Aluthge, C. Anderson, S.C. Fernando, K.J. Harvatine, P.J. Kononoff, (2016). ''Reduced-fat dried distillers grains with solubles reduces the risk for milk fat depression and supports milk production and ruminal fermentation in dairy cows,'' *Journal of Dairy Science,* Volume 99, Issue 3, Pages 1912–1928, ISSN 0022–0302, *http://dx.doi.org/10.3168/jds.2015-9712.* (*http://www.sciencedirect.com/science/article/pii/S0022030216000515*), (EPA–HQ–OAR–2017–0655–0014).

[33] University of Kentucky, ''Preventing Milk Fat Depression in Dairy Cows,'' *https://afs.ca.uky.edu/dairy/preventing-milk-fat-depression-dairy-cows.* Accessed September 08, 2018, (EPA–HQ–OAR–2017–0655–0017). On the herd level milk fats range from 3 to 5 percent normally. Oetzel, Garret R., ''Subacute Ruminal Acidosis in Dairy Herds: Physiology, Pathophysiology, Milk Fat Responses, and Nutritional Management.'' Preconference Seminar 7A: Dairy Herd Problem Investigation Strategies: Lameness, Cow Comfort, and Ruminal Acidosis, American Association of Bovine Practitioners, 40th Annual Conference, September 17, 2007—Vancouver, BC, Canada, *https://www.vetmed.wisc.edu/dms/fapm/fapmtools/2nutr/sara1aabp.pdf* pp.98. (EPA–HQ–OAR–2017–0655–0012).

[34] Penn State Extension, ''Troubleshooting Problems with Milkfat Depression,'' August 14, 2017, *https://extension.psu.edu/troubleshooting-problems-with-milkfat-depression.* Accessed September 08, 2017, (EPA–HQ–OAR–2017–0655–0016).

[35] Penn State Extension, ''Urea in Beef Cattle Rations,'' August 08, 2017, *https://extension.psu.edu/urea-in-beef-cattle-rations.* Accessed October 18, 2017, (EPA–HQ–OAR–2017–0655–0018).

TABLE III.2—FULL-OIL AND REDUCED-OIL SORGHUM DISTILLERS GRAINS WITH SOLUBLES DISPLACEMENT RATIOS [36]

[lb of ingredient/lb of sorghum distillers grains with solubles, dry matter basis]

Ingredient	Beef cattle		Dairy cattle		Swine		Poultry [37]	
	Full-oil	Reduced-oil	Full-oil	Reduced-oil	Full-oil	Reduced-oil	Full-oil	Reduced-oil
Corn	1.196	1.173	0.731	0.731	0.890	0.890	0.292	0.292
Soybean Meal			0.633	0.633	0.095	0.095		
Urea	0.056	0.056						

b. Mass Loss

The second issue raised by the commenters on potential livestock indirect GHG impacts [38] relates to the potential impacts of mass reduction from the removal of oil from sorghum DGS. The commenters also suggested that EPA consider the impacts of feeding reduced-oil sorghum DGS to all types of livestock rather than those where performance gains were likely to be seen. In evaluating these comments, EPA has undertaken additional analysis to account for the potential indirect GHG emissions associated with this ''mass loss'' effect. Since sorghum accounts for less than 3 percent of the domestically consumed distillers grains, there is very little market data on the impacts of removing oil from the sorghum DGS on the livestock sector. EPA, therefore, has relied on the expertise of USDA to inform the livestock sector impact analysis described below.[39]

When oil is removed from the sorghum DGS, the distillers grains decrease in mass. Although feed rations are complex, for the purposes of conducting this analysis, in USDA's judgement it is a reasonable assumption to use corn to substitute for the mass loss due to sorghum oil recovery. Corn is a relatively low cost primary product that is readily available in the locations where sorghum oil is produced.[40] Furthermore, USDA experts noted that to the extent that other materials such as crop residues or waste from the human food supply system were available and used instead, they would likely have a lower GHG profile than corn.[41] To the extent that these other materials may be used, assuming corn substitutes for mass loss is a conservative assumption for a GHG emissions perspective.[42]

To calculate the impact of the mass loss and the greenhouse gas emission impacts from the substitution of corn for sorghum DGS, EPA used data obtained from a study conducted by Argonne National Laboratory and estimates from NSP for the displacement of feed by DGS by livestock type (see Table III.2). Using these data, we calculated a substitution rate for how much corn would be needed for every pound of grain sorghum oil diverted to biofuel production, by livestock type (see Table III.3 below).[43]

TABLE III.3—FEED SUBSTITUTION RATIO

Livestock type	Feed substitute	Substitution ratio (lb feed substitute/lb oil extracted)
Beef	Corn	1.551
Dairy	Corn	0.731
Swine	Corn	0.890
Poultry	Corn	0.292

Using the national average shares for DDGS use by livestock type,[44] we calculated a weighted average 1.2 pounds of corn substituted per pound of distillers sorghum oil removed. Based on our modeling for the March 2010 RFS rule, we have used an emissions factor of 0.27 kgCO_2e per pound of corn produced, transported and consumed.[45] The product of these values gives a livestock sector impact of 0.31 kgCO_2e per pound of distillers sorghum oil, which represents the potential indirect emissions resulting from additional corn produced to substitute for a loss in sorghum DGS on a per pound of oil extracted basis. The product of this value and the yield for each type of biofuel (pounds of distillers sorghum oil per mmBtu of fuel) results in the livestock sector GHG impacts listed in the results table in section III.B.8 of this preamble.

[36] Information provided by National Sorghum Producers, see Air docket EPA–HQ–OAR–2017–0655, using the following sources Arora et al., (2008). Argonne National Laboratory. ''Update of distillers grains displacement ratios for corn ethanol life-cycle analysis,'' (EPA–HQ–OAR–2017–0655–0007); Kerr et al., (2016). ''Lipid digestibility and energy content of distillers' corn oil in swine and poultry,'' *Journal of Animal Science* 94:2900–8, (EPA–HQ–OAR–2017–0655–0010); Opheim et al., (2016). ''Biofuel feedstock and blended coproducts compared with deoiled corn distillers grains in feedlot diets: Effects on cattle growth performance, apparent total tract nutrient digestibility, and carcass characteristics,'' *Journal of Animal Science* 94:227, (EPA–HQ–OAR–2017–0655–0013); Ramirez et al., (2016). ''Reduced-fat dried distillers grains with solubles reduces the risk for milk fat depression and supports milk production and ruminal fermentation in dairy cows,'' *Journal of Dairy Science* 99:1912–28, (EPA–HQ–OAR–2017–0655–0014). Poultry displacement ratios were provided by the National Sorghum Producers and calculated based on data from the Iowa State Extension Services, Agricultural Marketing and Resources Center, ''Estimated U.S. Dried Distillers Grains with Solubles (DDGS) Production and Use,'' *https://www.extension.iastate.edu/agdm/crops/outlook/dgsbalancesheet.pdf* (EPA–HQ–OAR–2017–0655–0006).

[37] Protein sources such as soybean meal can be used to supplement sorghum DGS for poultry.

[38] EPA-HQ-OAR–2017–0655–0041, 0042.

[39] See, U.S. Department of Agriculture, Office of the Chief Scientist and Office of the Chief Economist, ''Memorandum: Technical responses on EPA assumptions related to the lifecycle GHG assessment of the proposed grain oil sorghum biofuel pathway,'' March 15, 2018, Air Docket EPA–HQ–OAR–2017–0655.

[40] Corn is demonstrably cheaper than other feedstock replacements. For instance, in the U.S. corn in the 2016/2017 season averaged $0.06/lb whereas, soy oil in 2017 averaged $0.32/lb and corn oil averaged $0.28. See USDA ERS, Feed Grains Yearbook, *https://www.ers.usda.gov/data-products/feed-grains-database/feed-grains-yearbook-tables.aspx* (accessed on June 14, 2018) and USDA Vegetable Oils and Animal Fats, Oil Crop Yearbook, *https://www.ers.usda.gov/data-products/oil-crops-yearbook.aspx* (accessed on June 06, 2018).

[41] See, U.S. Department of Agriculture, Office of the Chief Scientist and Office of the Chief Economist, ''Memorandum: Technical responses on EPA assumptions related to the lifecycle GHG assessment of the proposed grain oil sorghum biofuel pathway,'' March 15, 2018, Air Docket EPA–HQ–OAR–2017–0655.

[42] The purpose of lifecycle assessment under the RFS program is not to precisely estimate lifecycle GHG emissions associated with particular biofuels, but instead to determine whether or not the fuels satisfy specified lifecycle GHG emissions thresholds to qualify as one or more of the four types of renewable fuel specified in the statute. Where there are a range of possible outcomes and the fuel satisfies the GHG reduction requirements when ''conservative'' assumptions are used, then a more precise quantification of the matter is not required for purposes of a pathway determination.

[43] See, Summary for the Final Rule of Key Assumptions for EPA's Analysis of the Lifecycle Greenhouse Gas Emissions Associated with Biofuels Produced from Distillers Sorghum Oil and Distiller Sorghum Oil LCA Spreadsheet, Air Docket EPA–HQ–OAR–2017–0655.

[44] The data comes from the medium projections for the year 2016–2017 from AgMRC, ''Estimated U.S. Dried Distillers Grains with Solubles (DDGS) Production & Use,'' *https://www.extension.iastate.edu/agdm/crops/outlook/dgsbalancesheet.pdf,* (EPA–HQ–OAR–2017–0655–0006).

[45] See the docket memo ''Summary for the Final Rule of Key Assumptions for EPA's Analysis of the Lifecycle Greenhouse Gas Emissions Associated with Biofuels Produced from Distillers Sorghum Oil,'' Air Docket EPA–HQ–OAR–2017–0655, for more details.

2. Feedstock Production

Distillers sorghum oil is removed from DGS at dry mill biofuel plants using the same equipment and technologies used for distillers corn oil recovery. Oil recovery requires thermal energy to heat the DGS and electricity to power centrifuges, pumps and other oil recovery equipment. Our analysis for the March 2010 RFS final rule,[46] the NSP petition, and two studies,[47 48] indicate that although extracting oil from DGS uses thermal energy, it also leads to relatively less thermal energy being used later in the process to dry the DGS, resulting in an overall negligible change in thermal energy requirements for plants that dry their DGS. Our analysis here includes both the thermal and electrical energy requirements to remove the distillers sorghum oil. We do not account for the reduction in thermal energy needed for DGS drying mentioned above, so this can be viewed as a conservative approach (*i.e.,* resulting in higher estimated GHG emissions) for plants that dry their DGS. Based on our review of the data,[49] we assume 200 Btu (British thermal units) of grid electricity and 800 Btu of natural gas are used to recover distillers sorghum oil from DGS, per pound of distillers sorghum oil recovered. These parameters are based on energy requirements associated with extracting oil from DGS at dry mill ethanol plants, but we believe they are also appropriate and conservative in cases where the oil is recovered at any point downstream from sorghum grinding.[50]

3. Feedstock Transport

In our analysis, distillers sorghum oil is transported 50 miles by heavy duty truck from the dry mill ethanol plant to the biodiesel or hydrotreating facility where it is converted to transportation fuel. GHG emissions associated with feedstock transport are relatively small, and modest changes in transport distance would not affect the threshold determinations based on our analysis.

4. Feedstock Pretreatment

For emissions from feedstock pretreatment and fuel production, we perform two analyses. In the first analysis, we calculate the emissions from biodiesel and heating oil produced using transesterification. In the second analysis, we calculate the emissions from renewable diesel, jet fuel, LPG, and naphtha, produced using hydrotreating.

Before distillers sorghum oil is converted to biodiesel via transesterification, it is processed to remove free-fatty acids. This process requires thermal energy. Our evaluation of yellow grease for the March 2010 RFS final rule included 14,532 Btu of natural gas per gallon of biodiesel produced for pretreatment, and we have applied the same assumption for this analysis. According to the NSP petition, distillers sorghum oil has free fatty acid content near or below 15 percent, which is in the range of yellow grease free fatty acid contents (<15 percent).[51] Our assumption on pretreatment thermal energy use for distillers sorghum oil is higher than thermal energy use in other (non-EPA) lifecycle assessments of high free-fatty acid biodiesel feedstocks that we have reviewed,[52] and can be viewed as a conservative assumption (*i.e.,* resulting in higher GHG emissions).

Pretreatment to remove free-fatty acids is not required when distillers sorghum oil is used to produce renewable diesel, jet fuel, LPG and naphtha through a hydrotreating process.

5. Fuel Production

For biodiesel production, we used the transesterification analysis for the March 2010 RFS rule for yellow grease biodiesel.[53] Based on comparison of this yellow grease analysis and the mass and energy balance data in the NSP petition, submitted under claim of CBI, the conversion of yellow grease and distillers sorghum oil are expected to require similar energy inputs and yield similar amounts of biodiesel as output.

For production of renewable diesel, jet fuel, naphtha and LPG via a hydrotreating process, we used the same data and approach as used in the March 2013 Pathways I rule,[54] and subsequent facility-specific petitions involving hydrotreating processes.[55] The March 2013 Pathways I rule evaluated two hydrotreating configurations: One optimized for renewable diesel production and one optimized for jet fuel production. For this analysis we evaluated a hydrotreating process maximized for renewable diesel production, as that is the most common configuration. The jet fuel configuration results in higher emissions (approximately 5 kgCO_2e/mmBtu higher), but the threshold GHG reduction results discussed below are not sensitive to this assumption.

Our previous analyses of hydrotreating processes have applied an energy allocation approach for RIN-generating co-products that qualify as renewable fuel.[56] This approach results in higher lifecycle GHG emissions for each of the fuel products than other approaches considered, such as a displacement approach, and thus can be viewed as a conservative approach. We have used this approach in assessing GHG emissions impacts of fuels derived from distillers sorghum oil.

In the allocation approach, all the emissions from the hydrotreating process are allocated across all co-products. There are a number of ways to do the allocation, for example on the basis of energy, mass, or economic value. Consistent with the approach taken in the hydrotreating analysis for the March 2013 RFS rule, for this analysis of fuels produced from distillers sorghum oil feedstock through a hydrotreating process, we allocated emissions to the renewable diesel, naphtha and LPG based on the energy content (using lower-heating values) of the products produced. Emissions from the process were allocated equally to all of the Btus of fuel produced. Therefore, on a per Btu basis, all of the primary products coming from the hydrotreating facility have the same emissions from the fuel production stage of the

[46] See section 1.4.1.3 of USEPA (2010). Renewable fuel standard program (RFS2) regulatory impact analysis. U.S. Environmental Protection Agency Office of Transportation Air Quality, EPA–420–R–10–006. Washington, DC. *https://www.epa.gov/sites/production/files/2015-08/documents/420r10006.pdf.*

[47] Wang, Z., et al. (2015). ''Influence of corn oil recovery on life-cycle greenhouse gas emissions of corn ethanol and corn oil biodiesel.'' *Biotechnology for Biofuels* 8(1): 178, (EPA–HQ–OAR–2017–0655–0020).

[48] Mueller, S., Kwik, J. (2013). ''2012 Corn Ethanol: Emerging Plant Energy and Environmental Technologies.''

[49] See sources referenced in footnotes 20 and 21 for energy use associated with oil extraction, and California Air Resources Board (2014), (EPA–HQ–OAR–2017–0655–0011). ''California-Modified GREET Fuel Pathway: Biodiesel Produced in the Midwestern and the Western U.S. from Corn Oil Extracted at Dry Mill Ethanol Plants that Produce Wet Distiller's Grains with Solubles.'' Staff Summary, Method 1 Fuel Pathway (EPA–HQ–OAR–2017–0655–0009).

[50] There are limited data on the energy efficiency of alternative oil extraction technologies. Oil extraction earlier in the dry mill process would offer energy efficiency benefits later in the process, as moving oil through the fermentation and ethanol recovery processes tends to increase energy requirements. Recovery further downstream at a separate location would likely include chemical extraction techniques that would yield higher levels of oil. Overall, we expect any differences to be small in the context of this distillers sorghum oil analysis.

[51] See Table 15 in the January 5, 2012 Pathways I direct final rule (77 FR 722).

[52] See for example: California Environmental Protection Agency Air Resources board, *https://www.arb.ca.gov/fuels/lcfs/2a2b/apps/co_bd_wdgs-rpt-102414.pdf,* (EPA–HQ–OAR–2017–0655–0008).

[53] For details see section 2.4 of the RIA for the March 2010 RFS final rule.

[54] See 78 FR 14190 (March 5, 2013).

[55] For determination documents responding to facility specific petitions, see: *https://www.epa.gov/renewable-fuelstandard-program/approved-pathways-renewable-fuel.*

[56] See the March 2013 Pathways I rule, specifically 78 FR 14198–14200 (March 5, 2013).

lifecycle. For this analysis, the energy content was the most appropriate basis for allocating emissions because all of the fuel products are used as sources of energy. Energy content also has the advantage of being a fixed factor as opposed to market prices which fluctuate over time.

6. Fuel Distribution

We used the fuel distribution results from the biodiesel analysis for the March 2010 RFS rule. Fuel distribution emissions are relatively small compared to baseline lifecycle GHG emissions (see Table III.4: Lifecycle GHG Emissions Associated With Biofuels Produced From Distillers Sorghum Oil ($kgCO_2$-eq/MJ) below), and although they may be different for different types of fuel, for the purposes of this analysis we assumed that heating oil, renewable diesel, jet fuel, LPG, and naphtha have the same fuel distribution emissions as biodiesel per mmBtu of fuel used.

7. Fuel Use

For this analysis we applied fuel use emissions factors developed for the March 2010 RFS final rule. We used the biodiesel emissions factor for biodiesel and biodiesel used as heating oil. For renewable diesel and jet fuel we used the emissions factors for non-CO_2 GHGs for baseline diesel fuel. For naphtha we used the emissions factors for non-CO_2 GHGs for baseline gasoline fuel. For LPG we used the LPG non-CO_2 emissions factor developed for the March 2010 RFS rule. The tailpipe emissions are relatively small, and the threshold GHG reduction results are not sensitive to these assumptions. More details on our analysis of fuel use emissions are described in a memo [57] to the rulemaking docket.

8. Results of GHG Lifecycle Analysis

Table III.4 shows the lifecycle GHG emissions associated with biofuels produced from distillers sorghum oil that result from our assessment. The table also shows the percent reduction relative to the petroleum baseline. All of the fuels are compared to the diesel baseline, except for naphtha which is compared to the gasoline baseline. Based on the lifecycle GHG emissions results presented above, all of the pathways evaluated meet the 50 percent GHG reduction threshold required for advanced biofuel and biomass-based diesel.

TABLE III.4—LIFECYCLE GHG EMISSIONS ASSOCIATED WITH BIOFUELS PRODUCED FROM DISTILLERS SORGHUM OIL

[$kgCO_2$-eq/MJ]

Fuel	Biodiesel, heating oil	Renewable diesel, jet fuel	Naphtha	LPG	2005 Diesel baseline	2005 Gasoline baseline
Production process	Transesterification	Hydrotreating			Refining	
Livestock Sector Impacts	20.7	19.4	19.4	19.4	....	....
Feedstock Production	6.6	6.2	6.2	6.2	18.0	19.2
Feedstock Transport	0.3	0.3	0.3	0.3		
Feedstock Pretreatment	8.4					
Fuel Production	1.2	8.0	8.0	8.0		
Fuel Distribution	0.8	0.8	0.8	0.8		
Fuel Use	0.7	0.7	1.7	1.5	79.0	79.0
Total	38.7	35.4	36.4	36.2	97.0	98.2
Percent Reduction	60	64	63	63	....	....

IV. Definition of Distillers Corn Oil

In the March 2010 RFS final rule, EPA established two pathways (pathways F and H in Table 1 to 40 CFR 80.1426) for biomass-based diesel (D-code 4) or advanced biofuel (D-code 5) made from ''non-food grade corn oil.'' The lifecycle GHG analyses for these pathways were based on the EPA's modeling of corn oil recovered from DGS produced by a dry-mill corn ethanol plant through corn oil extraction. In the November 2016 REGS proposed rule, EPA proposed to revise pathways F and H in Table 1 to 40 CFR 80.1426 to specify that the feedstock is ''oil from corn oil extraction,'' rather than ''non-food grade corn oil,'' and to include a revised and somewhat broadened definition of ''corn oil extraction'' relative to the 2010 definition.[58]

The proposed definitional change was motivated by the evolution of corn oil extraction technology within the ethanol industry, which allows ethanol producers to recover corn oil at different locations in the ethanol production process, with potential energy efficiency and ethanol yield benefits.

In the November 2016 REGS proposed rule, EPA reasoned that the precise timing and method of corn oil extraction are not relevant for meeting the 50 percent GHG reduction threshold associated with pathways F and H, provided that a number of conditions are satisfied. Specifically, EPA proposed the following definition for corn oil extraction: ''Corn oil extraction means the recovery of corn oil at any point downstream of when a dry mill corn ethanol plant grinds the corn, provided that the corn is converted to ethanol, the oil is rendered unfit for food uses without further refining, and the oil extraction results in distillers grains marketable as animal feed.'' This definitional change was intended to both address the developments in corn oil extraction and to define the conditions under which corn oil qualifies as a feedstock for the purposes of Table 1.

As explained below, rather than the approach proposed in the 2016 REGS proposed rule, which would have revised the term ''corn oil extraction'' and replaced ''non-food grade corn oil'' with ''oil from corn oil extraction'' in rows F and H, EPA is instead leaving the definition of ''corn oil extraction'' as-is and is finalizing a definition for the term ''distillers corn oil'' that will be used in Table 1. The substance of the definition of ''distillers corn oil'' finalized here is consistent with the proposed definition for ''corn oil

[57] See, ''Summary of Key Assumptions for EPA's Analysis of the Lifecycle Greenhouse Gas Emissions Associated with Biofuels Produced from Distillers Sorghum Oil,'' Air Docket EPA–HQ–OAR–2017–0655.

[58] See section VII.B of the November 2016 REGS proposed rule (81 FR 80900–01).

extraction,'' other than changes made in response to comments. Thus, based on the comments received on the November 2016 REGS proposed rule, EPA is taking the following actions in this rulemaking: (1) Table 1 to 40 CFR 80.1426 is revised to replace the term ''Non-food grade corn oil'' with ''Distillers corn oil'' in rows F and H; and (2) 40 CFR 80.1401 is revised to add a definition of ''distillers corn oil''.

The approach taken in this rule preserves the existing meaning of corn oil extraction for the purpose of the second row of Table 2 to 40 CFR 80.1426 (the ''corn oil extraction advanced technology''); our intent was to broaden the non-food grade corn oil pathways listed in Table 1 to 40 CFR 80.1426, not to modify the corn oil extraction advanced technology specified in Table 2, which is relevant for corn starch ethanol pathways. The corn oil extraction advanced technology was included in the regulations based on analysis completed in the March 2010 RFS rule for pathways in rows A and B of Table 1 that can include extracting oil from whole stillage and/or derivatives of whole stillage, thus reducing energy use at dry mill ethanol plants.[59] In order to avoid altering the scope of corn oil extraction for the purpose of Table 2 (which involves different pathways than rows F and H), it is most appropriate to create a new definition for distillers corn oil and to preserve the existing definition of corn oil extraction. Incidentally, we generally anticipate that corn oil recovered through corn oil extraction as listed in Table 2 to 40 CFR 80.1426 should be able to qualify as distillers corn oil (provided it satisfied all of the definitional requirements) for the purpose of the pathways in rows F and H in Table 1; however, not all distillers corn oil will necessarily be recovered by processes that qualify as corn oil extraction. The comments received on EPA's proposed corn oil definitional changes are summarized below, with a more detailed summary and analysis included in the docket for this rulemaking.

Four commenters on the November 2016 REGS proposed rule supported EPA's proposed revision to the definition of corn oil extraction.[60] They said the proposed changes were needed to update the definition based on technological changes in the industry, and to provide a level playing field for new oil extraction methods. Seven commenters supported the proposed revisions and recommended the relatively small revisions discussed below.[61] EPA also received four comments on the December 2017 sorghum oil proposed rule that supported finalizing the expanded definition of corn oil as part of this rulemaking.[62] While EPA is not finalizing the definition of ''corn oil extraction'' that was proposed in the REGS rule, EPA believes that the approach being finalized today addresses the concerns of these commenters, as well as those of other commenters who raised questions about continued use of the term ''non-food grade corn oil.''

While no commenters objected to EPA's overall proposal to revise and expand the types of extracted corn oil that qualify as approved feedstocks in rows F and H of Table 1 to 40 CFR 80.1426, a number of commenters requested clarifications or modifications to EPA's proposed definition. Four commenters suggested that EPA should expand the definition of corn oil extraction even further to include corn oil recovered at butanol plants, because the dry mill process for butanol is very similar to those for dry mill ethanol with respect to conversion of corn to liquefied mash and recovery of distillers grains and thin stillage.[63] Five commenters suggested that EPA should expand the definition of corn oil extraction to include corn oil from wet milling.[64] These commenters stated that all corn oil meets the requirements of the RFS program and thus should be eligible feedstocks under the program. Four commenters requested that EPA expand the definition of corn oil extraction to include corn oil extracted after corn fractionation.[65] These commenters stated that the fractionation process can be set up at a dry grind ethanol plant and the resulting extracted corn oil will still meet all the requirements for corn oil extraction. Two commenters requested that EPA clarify the proposed definition of corn oil extraction by stating that ''the oil is rendered unfit for human food uses without further refining.''[66] One commenter requested that EPA clarify the proposed definition of corn oil extraction to state that the resulting distillers grains include those that have been subjected to further oil recovery by a dry mill or third party.[67] Three commenters stated that EPA's proposed addition of the phrase ''at any point downstream'' is inconsistent with its proposed approach for biointermediates and should be clarified.[68] The commenters also state that the phrase ''oil is rendered unfit'' is unnecessary since all corn oil obtained from extraction is unfit for food uses. One commenter recommended using the term ''distillers corn oil'' as that term is better understood in the industry, and USDA reporting, to reference corn oil from dry mills.

Based on these comments, EPA is finalizing a definition that has been modified in several ways compared to the one proposed in the November 2016 REGS proposed rule. First, EPA has decided to use the term ''distillers corn oil'' because we agree with the commenter that the term is better understood in the industry and thus enhances the clarity of the regulations. Second, the definition has been revised to include corn oil recovered at dry mill butanol plants, given their similarities in terms of the oil recovery technologies used, the characteristics of the oil recovered and the resulting DGS co-products. Third, we have clarified that distillers corn oil is limited to oil that is unfit for *human* food use without further refining. Fourth, we have removed the word ''rendered'' from the definition as it is unnecessary and seemed to raise questions for commenters. Finally, we replaced the word ''extraction'' with ''recovery'' to avoid any confusion about how the definition interacts with the term ''corn oil extraction'' in 40 CFR 80.1401 and Table 2 to 40 CFR 80.1426.

Other modifications recommended by commenters have not been incorporated into the definition finalized by this rulemaking. Corn oil from wet milling remains excluded from the definition. Corn oil produced at wet mills is

[59] EPA has consistently viewed the non-food grade corn oil pathways as only available for facilities that extract corn oil produced at dry mill corn ethanol plants (see letter from Karl Simon of EPA to John W. Bode of the Corn Refiners Association, dated October 24, 2013). The change from ''non-food grade corn oil'' to ''distillers corn oil'' and the associated definition will more clearly articulate this and other requirements for purposes of Table 1.

[60] EPA–HQ–OAR–2016–0041–0231, 0296, 0307 and 0313. For convenience, EPA is providing citations to the docket for the REGS proposed rule for comments that were filed in that docket on proposed changes to the regulations for corn oil, but these comments have also been included in the docket for this action.

[61] EPA–HQ–OAR–2016–0041–0243, 0246, 0260, 0266, 0267, 0277 and 0286.

[62] EPA–HQ–OAR–2017–0655–0034, 0039, 0028, 0038.

[63] EPA–HQ–OAR–2016–0041–0243, 0246, 0267 and 0286.

[64] EPA–HQ–OAR–2016–0041–0259, 0270, 0282, 0300 and 0311.

[65] EPA–HQ–OAR–2016–0041–0278, 0282, 0300 and 0311.

[66] EPA–HQ–OAR–2016–0041–0266 and 0277.

[67] EPA–HQ–OAR–2016–0041–0260.

[68] EPA–HQ–OAR–2016–0041–0282, 0300 and 0311.

commonly sold as cooking oil for human food uses, and thus may have significantly different impacts than distillers corn oil. The GHG emissions associated with substituting for oil removed from animal feed, and specifically DGS, may be significantly different than the GHG emissions associated with substituting for oil removed from cooking oil markets. Thus, we believe the current LCA is insufficient to extend the pathway to corn oil produced at wet mills and it would be more appropriate to address wet mill corn oil through a separate action, such as a new fuel pathway petition submitted pursuant to 40 CFR 80.1416. Fractionation is also not explicitly included, or otherwise mentioned, in the revised definition, as EPA has previously found that oil recovered through fractionation is likely to be sold for human food use;[69] use of such oil for biofuel production would require a modified lifecycle assessment that is beyond the scope of this rule. Finally, EPA does not believe the definition finalized in this rulemaking contradicts the biointermediate provisions in the November 2016 REGS proposed rule. Because it is listed as a feedstock in Table 1 to 40 CFR 80.1426, the current regulations accommodate distillers corn oil used through the pathways in rows F and H unless it is substantially altered at a separate facility before delivery to the fuel production facility.

V. Summary

Based on our GHG lifecycle evaluation described above, we find that biodiesel and heating oil produced from distillers sorghum oil via a transesterification process, and renewable diesel, jet fuel and heating oil produced from distillers sorghum oil via a hydrotreating process meet the 50 percent GHG reduction threshold requirement for advanced biofuel and biomass-based diesel. Based on this finding, and providing that all regulatory requirements are satisfied, these fuels are eligible for biomass-based diesel (D-code 4) RINs if they are produced through a process that does not co-process renewable biomass and petroleum, and for advanced biofuel (D-code 5) RINs if they are produced through a process that does co-process renewable biomass and petroleum. The RFS regulations are also amended to add new and consistent definitions for ''distillers sorghum oil'' and ''distillers corn oil.'' As discussed above, we are allowing commingled distillers sorghum and corn oil to be reported as one volume under the existing registration, reporting and recordkeeping requirements, and therefore are not amending these sections.

VI. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review and Executive Order 13563: Improving Regulation and Regulatory Review

This action is not a significant regulatory action and was therefore not submitted to the Office of Management and Budget (OMB) for review.

B. Executive Order 13771: Reducing Regulations and Controlling Regulatory Costs

This action is not expected to be an Executive Order 13771 regulatory action because this action is not significant under Executive Order 12866.

C. Paperwork Reduction Act (PRA)

This action does not impose any new information collection burden under the provisions of the *Paperwork Reduction Act,* 44 U.S.C. 3501 *et seq.,* and therefore is not subject to these requirements.

D. Regulatory Flexibility Act (RFA)

I certify that this action will not have a significant economic impact on a substantial number of small entities under the RFA. This action will not impose any requirements on small entities. An agency may certify that a rule will not have a significant economic impact on a substantial number of small entities if the rule relieves regulatory burden, has no net burden or otherwise has a positive economic effect on the small entities subject to the rule. This rule enables distillers sorghum oil producers and producers of biofuels from distillers sorghum oil to participate in the RFS program, see CAA section 211(o), if they choose to do so in order to obtain economic benefits.

E. Unfunded Mandates Reform Act (UMRA)

This action does not contain an unfunded mandate of $100 million or more as described in UMRA, 2 U.S.C. 1531–1538, and does not significantly or uniquely affect small governments. The action imposes no enforceable duty on any state, local or tribal governments or the private sector.

F. Executive Order 13132: Federalism

This action does not have federalism implications. It will not have substantial direct effects on the states, on the relationship between the national government and the states, or on the distribution of power and responsibilities among the various levels of government.

G. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

This action does not have tribal implications as specified in Executive Order 13175. This final rule would affect only producers of distillers sorghum oil and producers of biofuels made from distillers sorghum oil. Thus, Executive Order 13175 does not apply to this action.

H. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

The EPA interprets Executive Order 13045 as applying only to those regulatory actions that concern environmental health or safety risks that EPA has reason to believe may disproportionately affect children, per the definition of ''covered regulatory action'' in section 2–202 of the Executive Order. This action is not subject to Executive Order 13045 because it because it does not concern an environmental health risk or safety risk.

I. Executive Order 13211: Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use

This action is not subject to Executive Order 13211 because it is not a significant regulatory action under Executive Order 12866.

J. National Technology Transfer Advancement Act (NTTAA)

This rulemaking does not involve technical standards.

K. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

The EPA believes that this action does not have disproportionately high and adverse human health or environmental effects on minority populations, low-income populations and/or indigenous peoples, as specified in Executive Order 12898 (59 FR 7629, February 16, 1994). This final rule does not affect the level of protection provided to human health or the environment by applicable air quality standards. This action does not relax the control measures on sources regulated by the fuel programs and RFS regulations and therefore will not cause emissions increases from these sources.

[69] See the Regulatory Impact Analysis for the March 2010 RFS rule, section 1.1.3.2 (Corn Oil Extracted During Ethanol Production).

L. Congressional Review Act (CRA)

This action is subject to the CRA, and the EPA will submit a rule report to each House of the Congress and to the Comptroller General of the United States. This action is not a ''major rule'' as defined by 5 U.S.C. 804(2).

List of Subjects in 40 CFR Part 80

Environmental protection, Administrative practice and procedure, Air pollution control, Diesel Fuel, Fuel additives, Gasoline, Imports, Oil imports, Petroleum, Renewable fuel.

Dated: July 24, 2018.

Andrew R. Wheeler,

Acting Administrator.

For the reasons set forth in the preamble, EPA amends 40 CFR part 80 as follows:

PART 80—REGULATION OF FUEL AND FUEL ADDITIVES

■ 1. The authority citation for part 80 continues to read as follows:

Authority: 42 U.S.C. 7414, 7521, 7542, 7545, and 7601(a).

Subpart M—Renewable Fuel Standard

■ 2. Section 80.1401 is amended by adding, in alphabetical order, definitions for ''distillers corn oil'' and ''distillers sorghum oil'' to read as follows:

§ 80.1401 Definitions.

* * * * *

Distillers corn oil means corn oil recovered at any point downstream of when a dry mill ethanol or butanol plant grinds the corn, provided that the corn starch is converted to ethanol or butanol, the recovered oil is unfit for human food use without further refining, and the distillers grains remaining after the dry mill and oil recovery processes are marketable as animal feed.

Distillers sorghum oil means grain sorghum oil recovered at any point downstream of when a dry mill ethanol or butanol plant grinds the grain sorghum, provided that the grain sorghum is converted to ethanol or butanol, the recovered oil is unfit for human food use without further refining, and the distillers grains remaining after the dry mill and oil recovery processes are marketable as animal feed.

* * * * *

■ 3. Section 80.1426 is amended in paragraph (f)(1), in Table 1 to § 80.1426, by revising entries ''F'', ''H'', and ''I'' to read as follows:

§ 80.1426 How are RINs generated and assigned to batches of renewable fuel by renewable fuel producers or importers?

* * * * *

(f) * * *

(1) * * *

TABLE 1 TO § 80.1426—APPLICABLE D CODES FOR EACH FUEL PATHWAY FOR USE IN GENERATING RINS

	Fuel type	Feedstock	Production process requirements	D-code
*	*	*	*	*
F	Biodiesel, renewable diesel, jet fuel and heating oil.	Soy bean oil; Oil from annual covercrops; Oil from algae grown photosynthetically; Biogenic waste oils/fats/greases; *Camelina sativa* oil; Distillers corn oil; Distillers sorghum oil; Commingled distillers corn oil and sorghum oil.	One of the following: Trans-Esterification Hydrotreating Excluding processes that co-process renewable biomass and petroleum.	4
*	*	*	*	*
H	Biodiesel, renewable diesel, jet fuel and heating oil.	Soy bean oil; Oil from annual covercrops; Oil from algae grown photosynthetically; Biogenic waste oils/fats/greases; *Camelina sativa* oil; Distillers corn oil; Distillers sorghum oil; Commingled distillers corn oil and sorghum oil.	One of the following: Trans-Esterification Hydrotreating Includes only processes that co-process renewable biomass and petroleum.	5
I	Naphtha, LPG	*Camelina sativa* oil; Distillers sorghum oil.	Hydrotreating	5
*	*	*	*	*

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