OFFICE OF AIR AND RADIATION
WASHINGTON, D.C. 20460

September 11, 2024

Mr. Chris Cavote
President, Manufacturing Chevron U.S.A. Inc.
6001 Bollinger Canyon Road
San Ramon, California 94583

Dear Mr. Cavote:

You petitioned the Agency on behalf of Chevron U.S.A. Inc. (Chevron) to approve a facility-specific pathway for the generation of advanced biofuel (D code 5) renewable identification numbers (RINs) for renewable gasoline, renewable gasoline blendstock, renewable jet fuel and non-ester renewable diesel fuel (“renewable diesel”) produced from soybean oil through co-processing with petroleum feedstocks in the fluid catalytic cracking (FCC) unit at Chevron’s refinery in El Segundo, California (the “Chevron El Segundo Soy FCC D5 Pathways”).

Through the petition process described under 40 CFR 80.1416, Chevron submitted data to the EPA to perform a lifecycle greenhouse gas analysis of the renewable gasoline, renewable gasoline blendstock, renewable jet fuel and renewable diesel produced through the Chevron El Segundo Soy FCC Process. Although, the EPA has not previously evaluated soybean oil co-processing in an FCC unit as part of a public notice and comment process, this analysis involved a straightforward application of the same methodology and much of the same modeling used for the March 2010 RFS2 rule (75 FR 14670). The primary difference between this analysis and the modeling completed for the March 2010 RFS2 rule is the consideration of the facility-specific mass and energy balance data for the Chevron El Segundo FCC process.

Based on our assessment, renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and renewable diesel produced through the Chevron El Segundo Soy FCC D5 Pathways qualify under the Clean Air Act (CAA) for D code 5 RINs, provided Chevron adheres to all of the conditions specified in the attached determination document and the fuels meet the other definitional and RIN generation requirements for renewable fuel specified in the CAA and its implementing regulations.

Based on the results of our lifecycle analysis, Chevron’s fuel may be able to satisfy the 50% GHG reduction requirement for D code 5 RIN eligibility. As specified in the enclosed determination document, before generating D5 RINs for this fuel, Chevron will need to use data collected from their process and demonstrate that their fuel satisfies the 50% GHG reduction requirement.

This approval applies specifically to the Chevron refinery facility in El Segundo, California and to the processes, materials used, fuels produced, and process energy types and amounts outlined and described in the petition request, and subsequent updates, submitted by Chevron.

The EPA's electronic registration and transaction systems will be modified to allow Chevron to register and generate conventional biofuel RINs for renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and renewable diesel produced through the Chevron El Segundo Soy FCC D5 Pathways.

Sincerely,

Byron J. Bunker, Director
Implementation, Analysis and Compliance Division
Office of Transportation and Air Quality

Chevron El Segundo Soy FCC D5 Fuel Pathway Determination under the RFS Program

Office of Transportation and Air Quality

**Summary:** Chevron U.S.A Inc. (Chevron) petitioned the agency under the Renewable Fuel Standard (RFS) program to approve a pathway that would allow Chevron to generate advanced biofuel (D code 5) renewable identification numbers (RINs) for renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and non-ester renewable diesel fuel ("renewable diesel") produced from co-processing soybean oil at approximately 10% by volume with petroleum feedstocks in the fluid catalytic cracking (FCC) unit of Chevron's refinery in El Segundo, California (the "Chevron El Segundo Soy FCC D5 Pathways").

Based on the data submitted by Chevron and our previous modeling of the greenhouse gas (GHG) emissions associated with producing and transporting soybean oil, we conducted a lifecycle assessment and estimated lifecycle GHG reductions compared to the petroleum baseline of 52% for renewable gasoline and renewable gasoline blendstock, 53% for renewable jet fuel and 45% for renewable diesel produced through the Chevron El Segundo Soy FCC D5 Pathways. Based on the results of our lifecycle GHG assessment, renewable gasoline, renewable gasoline blendstock, renewable jet fuel and renewable diesel produced from soybean oil through the Chevron El Segundo Soy FCC Pathways qualifies for advanced biofuel (D code 5) RINs, provided all associated regulatory requirements are satisfied, including the conditions specified in this pathway determination document. The conditions include monthly data collection, analysis and lifecycle analysis (LCA) modeling to calculate a 12-month rolling average LCA value for each of the renewable fuels. Each fuel will be eligible for advanced biofuel (D code 5) RINs when the 12-month rolling average LCA indicates the fuel satisfies the 50% GHG reduction requirement. Otherwise, the fuels will be eligible to generate renewable fuel (D code 6) RINs through the D code 6 pathways approved for this facility on September 26, 2022, provided all of the conditions specified in that approval are satisfied. Based on our analysis, renewable diesel produced through this process does not satisfy the 50% GHG reduction threshold; however, it may be possible for this fuel to be eligible for D code 5 RINs in the event that Chevron demonstrates it satisfies the 50% GHG reduction threshold in accordance with the conditions specified in Section IV of this document.

The fuel pathways for which Chevron requested our evaluation are the type of new pathways that the EPA described in the preamble to the March 2010 RFS2 rule (75 FR 14670) as capable of being evaluated by comparing the applicant's fuel pathways to pathways that have already been analyzed. Our analysis of the Chevron El Segundo Soy FCC D5 Pathways involved a straightforward application of the same methodology and much of the same modeling used for the March 2010 RFS2 rule. However, we have not previously estimated the lifecycle GHG emissions of co-processing soybean oil in a refinery FCC unit as part of a notice and comment rulemaking. Thus, the main difference between this analysis and the analyses completed for previous rulemaking assessments was the evaluation of process data

from Chevron's El Segundo facility. Our lifecycle analysis is described below in Section III of this document.

This document is organized as follows:

- *Section I. Required Information and Criteria for Petition Requests*: Information on the background and purpose of the petition process, the criteria the EPA uses to evaluate petitions and the information that is required to be provided under the petition process as outlined in 40 CFR 80.1416. This section applies to all petitions submitted pursuant to 40 CFR 80.1416.
- *Section II. Available Information*: Background information on Chevron's El Segundo refinery, the information that they provided and how it complies with the petition requirements outlined in Section I.
- *Section III. Analysis and Discussion*: Description of the lifecycle analysis done for this determination and how it differs from the analyses done for previous assessments. This section also describes how we have applied the lifecycle results to determine the appropriate D codes for renewable gasoline, renewable gasoline blendstock, jet fuel and diesel fuel produced through the Chevron El Segundo Soy FCC D5 Pathways.
- *Section IV. Conditions and Associated Regulatory Provisions:* Registration, reporting, and recordkeeping requirements for renewable fuel produced through the Chevron El Segundo Soy FCC D5 Pathways.
- *Section V. Public Participation*: Description of how this petition is an extension of the analyses done as part of prior notice and public comment rulemakings.
- *Section VI. Conclusion*: Summary of our conclusions regarding the Chevron El Segundo petition.

## I. Required Information and Criteria for Petition Requests

### A. Background and Purpose of Petition Process

The RFS program is contained in CAA 211(o). The EPA's regulations implementing this program are published at 40 CFR Part 80. The RFS regulations implement the statutory requirements regarding the types of renewable fuels eligible to participate in the RFS program and specify the procedures by which renewable fuel producers and importers may generate RINs for the qualifying renewable fuels they produce through approved fuel pathways.[1]

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.

[1] See the EPA's website for information about the RFS regulations and associated rulemakings: https://www.epa.gov/renewable-fuel-standard-program

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 comprises a fuel pathway and is assigned a D code. The EPA-approved generally applicable fuel pathways are also contained in Table 1 to 40 CFR 80.1426. Pursuant to 40 CFR 80.1426(f)(6) renewable fuel producers qualified in accordance with 40 CFR 80.1403(c) and (d) for an exemption from the 20 percent GHG emissions reduction requirement of the Act for a baseline volume of fuel ("grandfathered fuel") may generate RINs with a D code of 6 for that baseline volume, assuming all other regulatory requirements are satisfied.[2]

In addition, the EPA may independently approve additional generally applicable fuel pathways into Table 1 for participation in the RFS program, or a third party may petition for the EPA to evaluate a new facility-specific or generally-applicable fuel pathway in accordance with 40 CFR 80.1416. The petition process under 40 CFR 80.1416 allows parties to request that the EPA evaluate a potential new fuel pathway's lifecycle GHG emissions and provide a determination of the D code for which the new pathway may be eligible.

### B. Required Information in Petitions

As specified in 40 CFR 80.1416, petitions must include all of the following information, as well 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 (Registration of refiners, importers or oxygenate blenders).
- A technical justification that includes a description of the renewable fuel, feedstock(s), biointermediate(s), and production process. The justification must include process modeling flow charts.
- A mass balance for the pathway, including feedstocks and biointermediates, fuels produced, co-products, and waste materials production.
- Information on co-products, including their expected use and market value.
- An energy balance for the pathway, including a list of any energy and process heat inputs and outputs used in the pathway, including such sources produced off site or by another entity.
- Any other relevant information, including information pertaining to energy saving technologies or other process improvements.

[2] "Grandfathered fuel" refers to a baseline volume of renewable fuel produced from a facility that commenced construction before December 19, 2007, and which completed construction within 36 months without an 18-month hiatus in construction and is exempt from the minimum 20 percent GHG reduction requirement that applies to general renewable fuel. A baseline volume of ethanol from a facility 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-month hiatus in construction and the facility is fired with natural gas, biomass, or any combination thereof. "Baseline volume" is defined in 40 CFR 80.1401.

- Other additional information as requested by the Administrator to complete the lifecycle greenhouse gas assessment of the new fuel pathway.

The petition must be signed and certified as meeting all the applicable requirements of 40 CFR 80.1416 by the responsible corporate officer of the applicant company. 40 CFR 80.1416(c)(2).

In addition to the requirements stated above, parties who use a feedstock not previously evaluated by the EPA must also include additional information pursuant to 40 CFR 80.1416(b)(2). This information was not required for the Chevron El Segundo petition because the proposed pathways use a feedstock, soybean oil, that the EPA has previously evaluated.

## II. Available Information

### A. Background on Chevron El Segundo

Chevron petitioned the agency to approve pathways that would allow them to generate advanced biofuel (D code 5) RINs for renewable gasoline, renewable gasoline blendstock, renewable jet fuel and renewable diesel produced from soybean oil feedstock through an FCC process at Chevron's refinery in El Segundo, California. A petition is required because these are not approved pathways in Table 1 to 40 CFR 80.1426.

### B. Information Available Through Existing Modeling

The pathways described in the Chevron El Segundo petition would produce fuel from a feedstock, soybean oil, that the EPA previously evaluated in the March 2010 RFS2 rule (75 FR 14670) (see Table 1). Therefore, no new feedstock modeling was required other than routine data updates as described below in Section III. Similarly, no new modeling of the emissions associated with the combustion of renewable gasoline, renewable gasoline blendstock, renewable jet fuel or renewable diesel was required because that was previously evaluated as part of prior rulemakings.[3] Compared to previous rulemakings, this petition only required the EPA to evaluate a specific fuel production process whereby soybean oil is co-processed with petroleum in the FCC unit of the El Segundo refinery.

The new component of this analysis was the evaluation of Chevron El Segundo's fuel production process. We have not evaluated the GHG emissions associated with an FCC process that co-processes renewable biomass and petroleum in previous RFS rulemakings. However, our analysis of baseline gasoline and diesel included modeling of the FCC refinery process using only petroleum feedstock. Furthermore, some of the renewable fuel production processes that we have modeled (e.g., pyrolysis and upgrading) have similarities with the Chevron El Segundo Soy FCC Process.[4] Given the similarities

[3] See Section III of this document for details.

[4] In the March 2010 RFS2 rule, the EPA analyzed and approved an advanced biofuel (D code 5) pathway for the production of renewable diesel through a hydrotreating process that co-processes soybean oil and petroleum. In the March 2013 RFS Pathways I rule (78 FR 14190), the EPA analyzed and approved a similar pathway for jet fuel co-produced with renewable diesel through a hydrotreating process that co-processes soybean oil and petroleum. In the same rule, the EPA evaluated

with prior modeling, this was a relatively straightforward analysis based on existing modeling done for previous rulemakings for the RFS program, but substituting Chevron's specific fuel production process data into the analysis.

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

| Row | Fuel Type | Feedstock | Production Process Requirements | D code |
|---|---|---|---|---|
| H | Biodiesel, renewable diesel, jet fuel and heating oil | Soybean oil;<br>Oil from annual covercrops;<br>Oil from algae grown photosynthetically;<br>Biogenic waste oils/fats/greases;<br>*Camelina sativa oil*;<br>Distillers corn oil;<br>Distillers sorghum oil;<br>Commingled distillers corn oil and sorghum oil | One of the following:<br>Trans-Esterification with or without esterification pre-treatment, or<br>Hydrotreating;<br>includes only processes that co-process renewable biomass and petroleum | 5 (advanced) |
| M | Renewable Gasoline and Renewable Gasoline Blendstock; Co-Processed Cellulosic Diesel, Jet Fuel and Heating Oil | Crop residue, slash, pre-commercial thinnings, tree residue, and separated yard waste; biogenic components of separated MSW; cellulosic components of separated food waste; and cellulosic components of annual cover crops. | Catalytic Pyrolysis and Upgrading, Gasification and Upgrading, Thermo-Catalytic Hydrodeoxygenation and Upgrading, Direct Biological Conversion, Biological Conversion and Upgrading utilizing natural gas, biogas, and/or biomass as the only process energy sources providing that process used converts cellulosic biomass to fuel; any process utilizing biogas and/or biomass as the only process energy sources which converts cellulosic biomass to fuel. | 3 (cellulosic biofuel) |

## C. Information Submitted by Chevron

Chevron supplied all the information as required in 40 CFR 80.1416 that the EPA needed to analyze the lifecycle GHG emissions associated with the renewable gasoline, renewable gasoline

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and approved cellulosic biofuel (D code 3) for renewable gasoline produced from cellulosic feedstocks through a range of production processes, including catalytic pyrolysis and upgrading.

blendstock, renewable jet fuel and renewable diesel produced through the Chevron El Segundo Soy FCC Pathways. Under claims of confidential business information, Chevron provided detailed schematics of their FCC process. They also provided data, submitted under claims of confidential business information, from commercial and pilot scale testing of FCC co-processing with vegetable oil, including three months of commercial-scale operating data from all of the relevant units in the El Segundo refinery. These data included the results of carbon-14 testing on the inputs and outputs of the co-processing tests to estimate the biogenic carbon in these materials. As part of their petition, Chevron provided a spreadsheet model estimating the lifecycle GHG emissions associated with their soybean-oil based fuels based on three months of operational data at the El Segundo refinery. The spreadsheet model includes assumptions related to the biogenic content of the products and co-products based on carbon-14 analyses from other FCC co-processing test runs. The spreadsheet model uses unit process-level energy allocation to attribute emissions to the different product streams moving through the refinery. It also uses emissions factors and other data that align with the EPA's previous lifecycle GHG analyses for the RFS program, including emissions factors for natural gas and upstream and indirect GHG emissions associated with producing soybean oil and transporting it to a refinery for biofuel production. The EPA conducted a detailed review of the spreadsheet model and had multiple technical exchanges with Chevron. Based on our questions, Chevron supplied additional information that we have reviewed and considered as part of the petition record. Based on our review, Chevron made a number of revisions, and we confirmed that the estimates contained in the spreadsheet model utilize the same fundamental modeling approach as was used in previous rulemakings for the RFS program. In summary, Chevron provided us with a spreadsheet model and we independently evaluated it to verify that it comports with the applicable requirements.

## III. Analysis and Discussion

### A. Lifecycle Analysis

Determining a fuel pathway's compliance with the lifecycle GHG reduction thresholds specified in CAA 211(o) 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 CAA 211(o), the lifecycle GHG emissions assessments must evaluate the aggregate quantity of GHG emissions (including direct emissions and significant indirect emissions such as significant emissions from land use changes) related to the full lifecycle, including all stages of fuel and feedstock production, distribution, and use by the ultimate consumer.

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

- Feedstock production – based on agricultural sector and other models that include direct and indirect impacts of feedstock production.
- Biointermediate production (when applicable).

- Fuel production – including process energy requirements, impacts of any raw materials used in the process, and benefits from co-products produced.
- Feedstock, biointermediate (when applicable), and fuel 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.

The EPA's evaluation of the lifecycle GHG emissions related to the renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and renewable diesel produced through the Chevron El Segundo Soy FCC Pathways under this petition request is consistent with the CAA's applicable requirements, including the definition of lifecycle GHG emissions and threshold evaluation requirements.

**Feedstock Production and Transport** – The Chevron El Segundo Soy FCC D5 Pathways use a feedstock, soybean oil, that the EPA previously evaluated in the March 2010 RFS2 rule. Thus, no new agricultural sector feedstock modeling was necessary to evaluate Chevron's petition. Based on our analysis for the March 2010 RFS2 rule, we estimated that producing and using soybean oil as a biofuel feedstock produces 646.0 grams of carbon dioxide-equivalent emissions (g$CO_2$e) per pound of soybean oil.[5] This estimate of the "upstream" feedstock emissions includes direct and indirect emissions (including indirect emissions from land use change) associated with growing soybeans, crushing the soybeans to extract the soybean oil and transporting the soybean oil to the Chevron El Segundo refinery.

For our evaluation of Chevron's petition we made straightforward updates to our original estimate of the upstream GHG emissions associated with soybean oil production and transport. As a result of these updates, the estimated upstream emissions associated with soybean oil changed from 646.6 g$CO_2$e to 646.0 g$CO_2$e per pound of soybean oil delivered. These updates did not involve any revisions to the agricultural sector (FASOM or FAPRI) modeling conducted for the March 2010 RFS2 rule. We implemented four categories of updates. First, in places where the original analysis used data from a prior version of the R&D GREET model, we replaced these data with the default estimates from the R&D GREET-2023-Rev1 Fuel Cycle Model.[6] The GREET data updates were applied to the following elements: emissions factors for natural gas production and use, LPG production and use, coal production and use, nitrogen fertilizer production, phosphate fertilizer production, hydrogen

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[5] March 2010 RFS2 rule (75 FR 14788-90). See also EPA (2010). Renewable fuel standard program (RFS2) regulatory impact analysis. Washington, DC, Environmental Protection Agency Office of Transportation and Air Quality. (EPA-420-R-10-006). Section 2.6.1.3.

[6] Wang, Michael, Elgowainy, Amgad, Lee, Uisung, Baek, Kwang H., Balchandani, Sweta, Benavides, Pahola T., Burnham, Andrew, Cai, Hao, Chen, Peter, Gan, Yu, Gracida-Alvarez, Ulises R., Hawkins, Troy R., Huang, Tai-Yuan, Iyer, Rakesh K., Kar, Saurajyoti, Kelly, Jarod C., Kim, Taemin, Kolodziej, Christopher, Lee, Kyuha, Liu, Xinyu, Lu, Zifeng, Masum, Farhad, Morales, Michele, Ng, Clarence, Ou, Longwen, Poddar, Tuhin, Reddi, Krishna, Shukla, Siddharth, Singh, Udayan, Sun, Lili, Sun, Pingping, Sykora, Tom, Vyawahare, Pradeep, and Zhang, Jingyi. Greenhouse gases, Regulated Emissions, and Energy use in Technologies Model ® (2023 Excel). Computer Software. USDOE Office of Energy Efficiency and Renewable Energy (EERE). 09 Oct. 2023. Web. doi:10.11578/GREET-Excel-2023/dc.20230907.1.

production, herbicide and pesticide production and use, energy inputs and efficiency of soybean crushing, and feedstock transport energy use and emissions. Second, we updated the foreign land use change emissions factors based on more recent data on forest carbon stocks in Latin America, Sub-Saharan Africa, parts of Africa and Europe. We have used and explained these data updates in prior rules and Federal Register publications.[7] Third, we updated our estimates of the GHG emissions associated with changes in foreign on-farm energy use.[8] Finally, we updated from using GWP values from the IPPC Second Assessment Report to values from the Fifth Assessment Report.[9]

**Fuel Production** – Chevron intends to co-process soybean oil at approximately 10% by volume in the FCC unit of the Chevron El Segundo refinery to produce renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and renewable diesel. While some gasoline blend components are produced directly from the FCC unit, much of the output from the FCC is directed to other refinery units for additional conversion and processing (e.g., alkylation unit, jet hydrotreating unit, hydrocracking unit, etc.). As part of their petition, Chevron submitted a spreadsheet model that calculates the lifecycle GHG emissions associated with fuels produced through the Chevron El Segundo Soy FCC Pathways. We reviewed the spreadsheet model in detail and, after discussion with Chevron, made several modifications to make the spreadsheet model consistent with our existing approach to lifecycle GHG analysis for the RFS program. The resulting spreadsheet model (the "Chevron El Segundo Soy FCC GHG Model") estimates the lifecycle GHG emissions associated with renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and renewable diesel produced through co-processing soybean oil in the Chevron El Segundo FCC unit and other downstream units. This subsection describes the FCC process, the Chevron El Segundo Soy FCC GHG Model and our evaluation of the GHG emissions associated with the fuel production stage of the Chevron El Segundo Soy FCC Pathways.

A typical FCC unit produces gasoline blendstocks and other high value products from hydrocarbons by "cracking" the feed (i.e. converting larger hydrocarbon chains into smaller components) at approximately 1000˚F in the reactor. Cracking takes place when the catalyst is fluidized at a high temperature and contacted with the gas oil feed. During the cracking reaction the catalyst surface becomes coated with coke. The coke is a temporary catalyst poison which reduces catalyst activity. The coke-coated "spent" catalyst then goes into a regenerator where the coke is burned off at temperatures above 1100˚F, thus restoring catalyst activity and providing process heat to drive the

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[7] These updates are described in the following technical report available in a public docket: Harris, N.L. 2011. Revisions to Land Conversion Emission Factors since the RFS2 Final Rule. Report submitted to EPA. EPA-HQ-OAR-2011-0542-0058. They have been applied in the following actions: January 2012 Palm Oil NODA (77 FR 4300), December 2012 grain sorghum rule (77 FR 74592), October 2015 Jatropha Oil Notice (80 FR 61406), July 2015 Sugar Beets Notice (82 FR 34656), April 2022 Canola Oil Pathways NPRM (87 FR 22823)

[8] These updates are explained in the April 2022 Canola Oil Pathways NPRM (87 FR 22834-22835). Data and estimates are available on the docket: "Canola RD Intl Ag Energy GHG NPRM v2" (EPA-HQ-OAR-2021-0845-0014).

[9] IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi:10.1017/CBO9781107415324.

cracking reaction and excess heat that is recovered to generate steam. Separators inside the regenerator remove the regenerated catalyst from the gas stream. The catalyst is maintained in a fluidized state and is continually cycled back and forth between the reactor and regenerator.

Products from the FCC include gasoline boiling range components that are used directly for gasoline blendstocks as well as products routed to downstream units for further conversion and processing. The lighter components from the FCC reactions are separated and routed to the refinery fuel gas system and are either burned or routed to the Alkylation unit where gasoline components are produced. The middle distillate stream from the FCC is routed to the naphtha hydrotreater (NHT) to produce jet fuel. Light cycle oil (LCO) from the FCC is routed to the "Isomax" unit, the refinery's hydrocracker used to produce gasoline and jet fuel. Output from the Isomax unit feeds both the continuous catalytic reformer (CCR) unit to produce gasoline blendstock and the jet hydrofinishing plant (JHP) to produce low aromatic blendstock for jet and diesel blending. Finally, a small amount of renewable material from the CCR is expected to be fed to the Penex isomerization unit, resulting in additional renewable gasoline blendstock. Heavy cycle oil (HCO) from the FCC is sold and is generally used as a fuel-oil blendstock.

The cogeneration facility at El Segundo supplies the electric power and steam used at the facility. The Chevron El Segundo Soy FCC GHG Model estimates the facility-specific electricity and steam GHG emissions for El Segundo. Both natural gas and refinery fuel gas are used in the Cogen units – natural gas is used to fuel the turbines, while refinery fuel gas is used in the duct burner to extract more steam from the system. The Chevron El Segundo Soy FCC GHG Model uses operational data to estimate total emissions, steam output and electricity output from the cogeneration unit. GHG emissions from the cogeneration unit are allocated to the steam and electricity assuming 80% efficiency for steam production and 35% for electricity production. The resulting emissions factors used in the model are 491 $gCO_2e$/kWh of electricity and 63,695 $gCO_2e$/mmBtu for steam.

Refineries use hydrogen to lower the sulfur content of diesel fuel, as a key input for hydrotreating processes and for other purposes. There are three sources of hydrogen at the El Segundo refinery: (1) the steam naphtha reformer (SNR) plant within the refinery; (2) the steam methane reformer (SMR) plant adjacent to the refinery; and (3) the CCR unit within the refinery. The Chevron El Segundo Soy FCC GHG Model includes operational data to estimate the emissions associated with hydrogen production from the SNR. For purchased SMR hydrogen the Chevron El Segundo Soy FCC GHG Model uses an average emissions factor for SMR hydrogen from the GREET model. The purpose of the CCR unit is to upgrade low octane gasoline to high octane reformate for gasoline blending, and it produces hydrogen as a co-product. The Chevron El Segundo Soy FCC GHG Model includes operational data for the CCR unit and an emissions factor for hydrogen produced from this unit is estimated using the unit process level energy allocation approach (this allocation approach is discussed below).

The Chevron El Segundo refinery uses sulfuric acid as a catalyst and purchases isobutane for Alkylation. The EPA reviewed the data and assumptions used in the Chevron El Segundo Soy FCC GHG Model to estimate these emissions factors and confirmed that they are reasonable and based on the best available information.

The FCC is a net producer of fuel gas that is used in other refinery units. It also generates coke (also referred to as catalyst make-up) that is burned for process heat. The final outputs from feeding soybean oil to the FCC unit, including all of the processing in units downstream of the FCC, are renewable gasoline, renewable gasoline blendstock, renewable jet fuel, renewable diesel, light cycle oil (LCO), heavy cycle oil (HCO), FCC light bottoms, propane and n-Butane.[10] Only the portion of these fuels that are demonstrated to be produced from renewable biomass are eligible to generate RINs.[11] Chevron intends to generate RINs for the renewable gasoline, renewable gasoline blendstock, renewable jet fuel and renewable diesel, and these fuels are assigned differing levels of refining GHG emissions (i.e., fuel production GHG emissions) in the Chevron El Segundo Soy FCC GHG Model based on how they are processed in different refinery units. The Chevron El Segundo Soy FCC GHG Model assumes that the excess LCO and HCO will be sold as marine cutter stock (i.e., marine fuel), the FCC light bottoms will be sold to another entity for sale as gasoline blendstock, and the propane and n-Butane are used onsite as process fuel. Chevron has not requested RIN eligibility for these co-products (i.e., LCO, HCO, FCC light bottoms, propane, n-Butane) as they do not intend to sell or distribute them for uses that would qualify them as renewable fuels under the RFS program. Should Chevron wish, in the future, to sell or distribute any of these products for qualifying use(s) and generate RINs, it would have to submit a new petition to the EPA in order to obtain the relevant pathway(s).

In the Chevron El Segundo Soy FCC GHG Model, a process unit level allocation approach is used to estimate GHG emissions from FCC co-processing. In this approach, total emissions from each refinery unit (e.g., FCC unit) are allocated to individual products and co-products based on the energy content of the products from each processing unit. The total emissions are allocated to all of the co-products from each unit process, including co-products that are eligible to generate RINs and co-products that are not eligible to generate RINs. In effect, this approach carries “upstream” energy and emissions inputs along with the intermediate products and process units until a final product is made.

The EPA has used the process unit level approach for lifecycle GHG analysis of gasoline and diesel refining for the March 2010 RFS2 rule, including the modeling used to estimate the lifecycle GHG emission associated with the statutory 2005 gasoline and diesel baselines. Furthermore, process unit

[10] In this instance we call these products “renewable” insofar as they are produced from soybean oil. We are making no judgment here about the eligibility of these fuels or products as “renewable fuel” as that term is defined in CAA 211(o) or the RFS implementing regulations.

[11] See Section IV.B of this document for more information on the conditions related to the RIN generation protocol and carbon-14 testing to demonstrate the portion of the fuel produced from renewable biomass.

level allocation has also been applied[12] and recommended[13] in multiple peer reviewed scientific journal articles on the lifecycle GHG emissions associated with petroleum refining. The process unit level allocation approach is also appropriate for analysis of refineries that co-process petroleum and biomass, provided the biomass co-processing does not substantially alter the energy inputs and outputs from the process units being evaluated. The California Air Resources Board (CARB) proposed the process unit level approach for purposes of evaluating the carbon intensity of co-processing triglycerides in FCC units.[14]

One possible drawback of process unit level allocation for co-processing is that it may underestimate energy use and emissions when a biogenic feedstock consumes (i.e., requires for processing) disproportionately more energy and inputs, such as hydrogen, in which case an incremental allocation approach may be more appropriate.[15] However, when using the incremental allocation approach it is often difficult to determine the most appropriate baseline. Thus, for practical and technical reasons, in cases where the process unit level allocation approach can be justified it is generally preferred.

When co-processed at approximately 10% in a refinery FCC unit, soybean oil processing may not consume exactly the same energy inputs as the petroleum feed, but the differences are relatively small. The information we reviewed, including data from Chevron and peer reviewed journal articles, indicates that, in the case of approximately 10% soybean oil co-processing, once the oxygen in the soybean oil is removed what remains is a poly-unsaturated hydrocarbon that is relatively similar to conventional petroleum FCC feed, and produces a generally similar yield of products. The removed oxygen forms a mixture of inerts in the form of $H_2O$, CO and $CO_2$. The carbon “removed” with the inert CO and $CO_2$ results in a lower renewable carbon content by volume percent in the products relative to the feedstock. However, studies indicate that the effect of inert formation on product formation is muted as the oxygen in the vegetable oils is converted primarily to water.[16] Data provided by Chevron, under claims of confidential business information from commercial and pilot scale FCC co-processing tests, shows that soybean oil, when co-processed at approximately 10% by volume in the FCC unit, reacts similarly to the petroleum-based vacuum gas oil (hereafter referred to as “petroleum”)

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[12] See for example: Gregory Cooney, Matthew Jamieson, Joe Marriott, Joule Bergerson, Adam Brandt, and Timothy J. Skone Environmental Science & Technology 2017 51 (2), 977-987 DOI: 10.1021/acs.est.6b02819; Pingping Sun, Ben Young, Amgad Elgowainy, Zifeng Lu, Michael Wang, Ben Morelli, and Troy Hawkins. Environmental Science & Technology 2019 53 (11), 6556-6569 DOI: 10.1021/acs.est.8b05870

[13] Wang, M., Lee, H. & Molburg, J. Allocation of energy use in petroleum refineries to petroleum products. Int J LCA 9, 34–44 (2004). https://doi.org/10.1007/BF02978534. The last sentence in this article is, “When possible, process-level allocation should be used in life-cycle analyses.”

[14] California Air Resources Board (CARB). 2017. “Co-processing of Low Carbon Feedstocks in Petroleum Refineries.” Draft Discussion Paper. May 30, 2017. p. 10-14.

[15] Ibid., p. 15

[16] See Bielansky et al. (2011). “Catalytic conversion of vegetable oils in a continuous FCC pilot plant.” Fuel Processing Technology. (92) 2305-2311. doi:10.1016/j.fuproc.2011.07.021. See in particular Figure 3 and the statement in the Conclusion section, “The decrease in conversion was mainly caused by the oxygen content of the vegetable oils.”

feedstock. Based on our review of this information, we believe the process unit level allocation approach is appropriate for evaluating the Chevron El Segundo Soy FCC D5 Pathways.

Chevron would only be eligible to generate RINs for fuel produced from soybean oil that meets the definition of renewable fuel. For this reason, our lifecycle analysis estimates the GHG emissions associated with only the fraction of fuel produced from soybean oil (i.e., not an average of all fuel produced from soybean oil and petroleum). Using the process level allocation approach, it is straightforward, with few exceptions, to assign the energy use and GHG emissions to the products produced from the soybean oil. However, emissions associated with refinery fuel gas and coke are less straightforward given uncertainties about whether soybean oil produces and consumes disproportionate amounts of coke and fuel gas relative to the petroleum feed. Fuel gas and coke are produced in the FCC unit and also combusted for process energy within the refinery. Coke is combusted to heat the FCC process and fuel gas is exported from the FCC to other refinery units. Fuel gas and coke combustion are a source of refinery GHG emissions. However, fuel gas and coke produced from soybean oil feed is composed of biogenic carbon, and our analysis assigns a value of zero to the $CO_2$ emissions from combusting these biogenic materials.[17] This treatment of the fuel gas and coke $CO_2$ emissions is consistent with our previous lifecycle GHG analyses for the RFS program.

Based on the information we reviewed, including data from pilot and commercial testing provided by Chevron and peer reviewed journal articles, we assume that 100% of the fuel gas produced from FCC processing of soybean oil is produced from the soybean oil. We also assume that 90% of the coke combusted to heat FCC soybean oil processing is produced from the soybean oil. In other words, we assume that biogenic carbon contained in the soybean oil forms fuel gas at the same rate and coke at almost the same (90%) rate as carbon in the conventional petroleum feed. For safety reasons it is infeasible to sample and test the biogenic carbon content of refinery fuel gas and coke from the FCC unit of a commercial refinery. Thus, our assumptions are based on indirect evidence from the FCC co-processing test data provided by Chevron.

The assumption for fuel gas is based on data showing that co-processing approximately 10% soybean oil does not significantly alter the FCC heat balance and outputs.[18] The 90% biogenic assumption for the coke is based on the EPA's review of FCC co-processing test data provided by Chevron under claims of confidential business information. While there is uncertainty in this

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[17] Following the methodology developed for the March 2010 RFS2 rule, after notice, public comment, and peer review, the carbon in the fuel derived from renewable biomass is treated as biologically derived carbon originating from the atmosphere. In the context of a full lifecycle analysis, the uptake of this carbon from the atmosphere by the renewable biomass and the $CO_2$ emissions from combusting it cancel each other out. Therefore, instead of presenting both the carbon uptake and $CO_2$ combustion emissions, we leave both out of the results. Note that our analysis also accounts for all significant indirect emissions associated with soybean oil, such as from land use changes, meaning we do not simply assume that biofuels are "carbon neutral."

[18] Furthermore, our lifecycle GHG estimates are not sensitive to this assumption on biogenic carbon in fuel gas produced from the FCC unit. For example, if we assume none of the fuel gas carbon is biogenic (an extreme assumption), the percent GHG reduction estimates change by 1% or less for renewable gasoline, renewable gasoline blendstock, jet fuel and diesel.

assumption, we believe it is reasonable based on the available information. Furthermore, the lifecycle GHG estimates are not very sensitive to this assumption about coke formation.[19]

**Fuel Distribution** – We used data from R&D GREET-2023-Rev1 to estimate emissions associated with renewable fuel transportation and distribution. We assume fuel is transported by barge, rail, pipeline, and truck from Chevron El Segundo to a distribution location and then trucked to retail locations via truck. We based these assumptions on the R&D GREET-2023-Rev1 data for transportation and distribution of renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and renewable diesel. R&D GREET includes energy intensity (Btu per ton-mile) for each of the transport modes and back-haul emissions for trucks and barges.

**Fuel Use** – For this analysis we applied non-$CO_2$ fuel use emissions factors from R&D GREET-2023-Rev1.[20] For renewable gasoline and renewable gasoline blendstock we used the factors for renewable gasoline consumed in a spark-ignition vehicle. For renewable jet fuel we used the factors for hydrotreated renewable jet fuel consumed in a single aisle passenger aircraft. For renewable diesel we used the factors for renewable diesel used in a compression ignition direct injection vehicle.

In previous RFS rulemakings we have selected appropriate approaches for estimating fuel use emissions depending on the fuels and pathways being evaluated. For the March 2010 RFS2 rule we estimated the GHG emissions associated with ethanol, biodiesel, baseline gasoline and baseline diesel fuel use based on results from the EPA MOVES model.[21] In the March 2013 Pathways I rule, we used the non-$CO_2$ tailpipe emissions estimates for baseline gasoline in our analysis of renewable gasoline and renewable gasoline blendstock (78 FR 14208). In the 2018 Sorghum Oil rule we used the non-$CO_2$ tailpipe emissions estimates for baseline diesel in our analysis of renewable diesel and jet fuel (83 FR 37743). More recently, the December 2022 Canola Oil Pathways rule uses emissions factors from GREET for renewable diesel, renewable jet fuel, renewable naphtha, and renewable LPG (87 FR 73956). The tailpipe emissions estimates from these various sources are all similar, within approximately one $kgCO_2e$/mmBtU, and the results of our evaluation of the Chevron El Segundo Soy FCC Pathways are not sensitive to the minor differences between tailpipe emissions estimates across these data sources. Thus, we believe the approach used here of applying emissions factors from R&D GREET is generally consistent with prior RFS rulemakings and appropriate for the purposes of this evaluation.

**Co-product Allocation –** As discussed above, the final outputs from feeding soybean oil to the FCC unit, including all of the processing in units downstream of the FCC, are renewable gasoline, renewable gasoline blendstock, renewable jet fuel, renewable diesel, light cycle oil (LCO), heavy cycle

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[19] For example, assuming soybean oil forms coke at 50% the rate of petroleum feed (instead of our 90% assumption) would increase the lifecycle GHG estimate for renewable gasoline from 47.8 (51.7% reduction) to 49.3 $kgCO_2e$/mmBtu (50.2% reduction).

[20] See footnote above about treatment of CO2 emissions including explanation that we do not simply assume that biofuels are "carbon neutral."

[21] EPA (2010). Renewable fuel standard program (RFS2) regulatory impact analysis. Washington, DC, Environmental Protection Agency Office of Transportation and Air Quality. (EPA-420-R-10-006). See section 2.5.6 for gasoline and diesel. See section 2.4.9 for biodiesel and ethanol.

oil (HCO), FCC light bottoms, propane, and n-Butane. As also discussed above, process unit level energy allocation is used to estimate GHG emissions from FCC co-processing of soybean oil. For each refinery process unit (e.g., FCC, Alky, Isomax) we use energy allocation to assign GHG emissions to each of the product that is output from that process unit. We also use energy allocation to assign the upstream GHG emissions associated with soybean oil production and transport (including significant indirect emissions such as land use changes) to the products and co-products from FCC co-processing. That is, the total upstream emissions are allocated to all of the products and co-products on an energy basis. While we are not making a determination about the proper allocation approach in all cases, our use of the energy allocation approach here is consistent with our approach in the December 2022 canola oil pathway rule.[22]

**Lifecycle GHG Results** – Based on our analysis described above, including the refinery estimates in the Chevron El Segundo Soy FCC GHG Model, we estimated the lifecycle GHG emissions associated with renewable gasoline, renewable gasoline blendstock, renewable diesel, and renewable jet fuel produced through the Chevron El Segundo Soy FCC Pathways. Table 2 shows the lifecycle GHG emissions associated with the fuels produced through these pathways. To determine if these fuels satisfy the GHG reduction requirements, we compared the lifecycle GHG emissions for renewable gasoline and renewable gasoline blendstock with the statutory 2005 average gasoline baseline.[23] We compared the lifecycle GHG emissions for renewable jet fuel and renewable diesel with the statutory 2005 average diesel baseline.[24]

**Table 2: Lifecycle GHG Emissions for Fuels Produced Through the Chevron El Segundo Soy FCC Pathways (kg$CO_2$e/mmBtu)**[25]

| | 2005 Gasoline Baseline | 2005 Diesel Baseline | Renewable Gasoline[26] | Renewable Jet Fuel | Renewable Diesel |
|---|---|---|---|---|---|
| Feedstock Upstream | 9.2 | 8.4 | 44.2 | 44.2 | 44.2 |
| Refining | 9.8 | 9.6 | 2.6 | 1.6 | 8.6 |
| Fuel Distribution | 1.1 | 0.9 | 0.6 | 0.4 | 0.4 |
| Fuel Use | 78.8 | 78.8 | 0.3 | 0.1 | 0.0 |
| Total | 99.0 | 97.7 | 47.8 | 46.3 | 53.3 |
| Reduction from Baseline | -- | -- | 52% | 53% | 45% |

[22] See 87 FR 73958 for the preamble discussion on this topic.

[23] For the March 2010 RFS2 rule we estimated baseline lifecycle GHG emissions for 2005 average gasoline equals 98.2 kgCO2e/mmBtu using IPCC SAR GWP values. For our analysis of the Chevron FCC petition we updated the baseline emissions with IPCC AR5 GWP values for an estimate of 99.0 kgCO2e/mmBtu.

[24] For the March 2010 RFS2 rule we estimated baseline lifecycle GHG emissions for 2005 average diesel equals 97.0 kgCO2e/mmBtu using IPCC SAR GWP values. For our analysis of the Chevron FCC petition we updated the baseline emissions with IPCC AR5 GWP values for an estimate of 97.7 kgCO2e/mmBtu.

[25] Totals may not be the sum of the rows due to rounding.

[26] By proxy we assume the same approximate results for renewable gasoline blendstock.

### B. Application of the Criteria for Petition Approval

Based on the data submitted and information already available through analyses conducted for previous RFS rulemakings, the EPA conducted a lifecycle assessment with results summarized in Table 2. Based on these estimates, the EPA is determining that the renewable gasoline, renewable gasoline blendstock, and renewable jet fuel produced through the Chevron El Segundo Soy FCC D5 Pathways meet the 50% lifecycle GHG threshold requirement specified in the CAA for renewable fuel, provided the conditions specified in Section IV of this document are satisfied. Based on our analysis, renewable diesel produced through this process does not satisfy the 50% GHG reduction threshold; however, it may be possible for this fuel to be eligible for D code 5 RINs in the event that Chevron demonstrates it satisfies the 50% GHG reduction threshold in accordance with the conditions specified in Section IV of this document. The conditions include calculating rolling average lifecycle GHG emissions with the Chevron El Segundo Soy FCC GHG Model, with data inputs based on future operations at the Chevron El Segundo refinery.

## IV. Conditions and Associated Regulatory Provisions

This approval for Chevron to generate D code 5 RINs for renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and renewable diesel is expressly conditioned on Chevron satisfying all of the following conditions as detailed in this section, in addition to the other applicable requirements for renewable fuel producers set forth in the RFS regulations (40 CFR part 80). Any D code 5 RIN generated through the Chevron El Segundo Soy FCC D5 Pathways without satisfying the conditions in this section would be an invalid RIN. The conditions in this section are enforceable under the CAA. They are established pursuant to the informal adjudication reflected in this decision document and also pursuant to and consistent with the regulations cited in section IV below and 40 CFR 80.1416(b)(1)(vii), 80.1426(a)(1)(iii), 80.1450(i), and 80.1451(b)(1)(ii)(W). In addition or in alternative to bringing an enforcement action under the CAA, the EPA may revoke the pathways approved in this determination document , or deregister Chevron El Segundo for these pathways under 40 CFR 80.1450(h), as appropriate, if it determines that Chevron has failed to comply with any of the conditions specified herein or applicable provisions in 40 CFR part 80.[27] The EPA has authority to bring enforcement action of these conditions under 40 CFR 80.1460(a), which prohibits producing or importing a renewable fuel without complying with the RIN generation and assignment requirements. These conditions are also enforceable under 40 CFR 80.1460(b)(2), which prohibits creating a RIN that is invalid; a RIN is invalid if it was improperly generated. Additionally, pursuant to 40 CFR 80.1460(b)(7) generating a RIN for fuel that fails to meet all of the conditions set forth in this petition determination is a prohibited act. In other words, unless all of the conditions specified in this section are satisfied, Chevron El Segundo must not produce fuel or generate RINs under the pathways approved in this document.

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

This section details the registration, compliance monitoring, lifecycle GHG computation, recordkeeping, reporting, attest engagement and other requirements that apply to Chevron El Segundo Soy FCC D5 Pathways, and it is organized as follows:

- *Sub-section A*: Definitions
- *Sub-section B*: Registration
- *Sub-section C*: Compliance Monitoring
- *Sub-section D*: Lifecycle GHG Emissions
- *Sub-section E*: Recordkeeping
- *Sub-section F*: Attest Auditors
- *Sub-section G*: Additional Conditions

**A. Definitions**

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

a. *12-month rolling average lifecycle GHG emissions* means the average lifecycle GHG emissions associated with each of the fuels produced through the Chevron El Segundo Soy FCC Process during the averaging time period, as calculated with the Chevron El Segundo Soy FCC GHG Model, the formula specified in section IV.D., and the monthly data collected and recorded by Chevron El Segundo through continuous monitoring.

b. *Averaging time period* means the 12 months prior to the month that Chevron El Segundo wishes to generate RINs for fuel produced during the averaging time period through the Chevron El Segundo Soy FCC Process, or the number of months prior to the month that Chevron El Segundo wishes to generate RINs since the EPA activated the pathway,[28] whichever is less.

c. *Chevron El Segundo Soy FCC Process* means the process of co-processing soybean oil and petroleum in the FCC unit of the Chevron El Segundo refinery, and associated downstream refining, to produce renewable gasoline, renewable gasoline blendstock, renewable jet fuel, renewable diesel and associated co-products, as described in Section III.A of this document and the Chevron El Segundo petition inclusive of the supporting documentation. The soybean oil must be co-processed at approximately 10% by volume of the total feed into the FCC unit, not to exceed 20% by volume.

d. *Chevron El Segundo Soy FCC GHG Model* means the Excel spreadsheet model that Chevron provides with its most recent registration application for the Chevron El Segundo Soy FCC D5 Pathways and that is reviewed and accepted by the EPA. The

[28] A fuel pathway is activated under the RFS program when the EPA accepts the registration application for the pathway, allowing it to be used in EMTS for RIN generation. When the 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."

Chevron El Segundo Soy FCC GHG Model shall be updated as specified in Section IV.B.d of this document. This GHG model is used to estimate the 12-month rolling average lifecycle GHG emissions associated with the fuels produced through the Chevron El Segundo Soy FCC Process. The GHG model estimates the lifecycle GHG emissions associated with all stages of fuel and feedstock production and distribution, from feedstock generation or extraction through the distribution and delivery and use of the finished fuel to the ultimate consumer, where the mass values for all greenhouse gases are adjusted to account for their relative global warming potential. The GHG model uses the methods described above in Section III of this document.

e. *Continuous monitoring* means the collection and use of measurement data and other information to record the data inputs required to calculate the 12-month rolling average lifecycle GHG emissions, in accordance with the compliance monitoring plan described in section IV.C.
f. *Energy used for feedstock, fuel and co-product operations* means energy used in the Chevron El Segundo Soy FCC Process, including energy used in all buildings or other areas that are used in any part for the storage or processing of soybean oil feedstock, the production or storage of renewable gasoline, renewable gasoline blendstocks, renewable jet fuel or renewable diesel (including fuel intermediates) produced from soybean oil through the Chevron El Segundo Process, the production or storage of finished fuel or co-products, and the handling of feedstocks, fuel, co-products and wastes.
g. *Month with missing data* means each month for which Chevron El Segundo does not have all valid data collected through continuous monitoring for any of the data inputs required to calculate the 12-month rolling average lifecycle GHG emissions with the Chevron El Segundo Soy FCC GHG Model, and as specified Section IV.D. The required data inputs also include the carbon-14 testing results discussed in paragraph IV.B.e. Fuel produced during a period of missing data is not eligible for D code 5 RINs through the Chevron El Segundo Soy FCC D5 Pathways.

## B. Registration

Chevron El Segundo must comply with all registration provisions in 40 CFR Part 80 that apply to register for the production of advanced biofuel. The description of the Chevron El Segundo production process that is required for registration shall include, but not be limited to, the following:[29]

a. A Compliance Monitoring Plan including technical specifications containing the following information:

[29] 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).

1. A description of how Chevron El Segundo will accurately and reliably measure and record all of the monthly data required in section IV.D, including all inputs to the Chevron El Segundo Soy FCC GHG Model.

2. A description detailing how Chevron will record the monthly data collected through continuous monitoring and carbon-14 testing, enter these data into the Chevron El Segundo Soy FCC GHG Model, calculate the 12-month rolling average lifecycle GHG emissions, and record the results.

b. A process flow diagram showing the locations and methods for all of the following:

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

2. The location and methods of continuous monitoring of all of the feedstocks to the Chevron El Segundo FCC unit.

3. A list of each of the monitoring devices (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. Chevron shall submit a copy of the Chevron El Segundo Soy FCC GHG Model as an Excel file. The file shall include data for a 12-month period that is representative of average refinery operations with co-processing to facilitate review by the EPA. Chevron shall include documentation explaining the methodology, formulas and assumptions that go into the GHG model. The documentation shall include a description of each tab in the Excel file. For each and every default assumption in the GHG model, such as GHG emissions factors, or assumptions about unit process energy use, the documentation shall provide a justification that the assumption is conservative (the assumption is likely to produce greater GHG estimates than monitored data) and the underlying data supporting each assumption. Conservative default assumptions for process unit energy or material inputs must only be used for meter readings that contribute to less than 1% of the overall GHG emissions from the Chevron El Segundo Soy Process.

d. Chevron shall provide an updated version of the Chevron El Segundo Soy GHG Model for review by the EPA as part of Chevron El Segundo's required three-year registration updates under 40 CFR 80.1450(d)(3) following the initial activation of the Chevron El Segundo Soy FCC D5 Pathways.[30] In the interim periods, *e.g.*, between three-year registration updates, if there are changes to the Chevron El Segundo Soy FCC Process that necessitate modifications to the Chevron El Segundo Soy FCC GHG Model, Chevron El Segundo shall

[30] The updates to the GHG model shall include the most recent background data and emissions factors from the R&D GREET model and other relevant data sources, and any other updates that the EPA deems appropriate at the time.

submit a registration update under 40 CFR 80.1450(d)(1)(i)(A) that includes the modified GHG Model and an engineering review addendum under 40 CFR 80.1450(d)(1)(ii). The registration update shall also include a description of and justification for each of the modifications to the GHG Model.

e. When registering under 40 CFR 80.1450(b), Chevron El Segundo must submit a RIN generation protocol that specifies how Chevron will meet the requirements in 40 CFR 80.1426(f)(9) and 40 CFR 80.1426(f)(4)(i)(B). The RIN generation protocol must contain a description of how Chevron El Segundo will determine the number of RINs that it can generate through the pathway approved in this document, the locations where samples for carbon-14 testing will be taken, a description explaining how Chevron El Segundo will determine that composite sampling is representative (if applicable), and, if the method for carbon-14 testing is an alternative test method approved by the EPA, the method, the equipment, and the laboratory that will be used for the carbon-14 measurements.

f. 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 Chevron El Segundo Soy FCC D5 Process; (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 specifications then the company must meet standards for similar monitoring devices); and (4) Taken together the monitoring devices included in the process flow diagram monitor all of the information required to calculate the 12-month rolling average lifecycle GHG emissions as defined in Section IV.A of the petition determination document for the Chevron El Segundo Soy FCC D5 Pathways."

### C. Compliance Monitoring

Chevron El Segundo must implement the Compliance Monitoring Plan described in Section IV.B, and must use data obtained in accordance with this plan to calculate the 12-month rolling average lifecycle GHG emissions.

### D. Lifecycle GHG Emissions

Chevron El Segundo may not generate RINs for fuel produced through the Chevron El Segundo Soy FCC D5 Pathways unless 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 Chevron El Segundo for a minimum of five years from the date of RIN generation, that the fuel produced through the Chevron El Segundo Soy FCC Process during the averaging time period meets all of the following requirements:

a. The 12-month rolling average lifecycle GHG emissions for each type of fuel are calculated using the following formula.

$$GHG_f = \frac{\sum_{m=1}^{a}\left(GHG_{f,m} * E_{f,m}\right)}{\sum_{m=1}^{a}\left(E_{f,m}\right)}$$

Where:

$f$ = Type of fuel produced, which is either renewable gasoline or renewable gasoline blendstock, renewable jet fuel, or renewable diesel.

$GHG_f$ = The 12-month rolling average lifecycle GHG emissions associated with fuel type *f*, in $kgCO_2e/mmBtu$.

m = The calendar month

*a* = The number of months in the averaging time period.

$GHG_{f,m}$ = The lifecycle GHG emissions associated with fuel type *f* in month *m* as calculated with the Chevron El Segundo Soy FCC GHG Model, in $kgCO_2e/mmBtu$.

$E_{f,m}$ = The amount of fuel type *f* produced from the Chevron El Segundo Soy FCC Process in month *m*, in mmBtu.

b. The 12-month rolling average lifecycle GHG emissions for each type of fuel shall not exceed the values specified below:
    a. Renewable gasoline or renewable gasoline blendstock 12-month rolling average lifecycle GHG emissions shall not exceed 49.49 $kgCO_2e/mmBtu$.
    b. Renewable jet fuel 12-month rolling average lifecycle GHG emissions shall not exceed 48.84 $kgCO_2e/mmBtu$.
    c. Renewable diesel 12-month rolling average lifecycle GHG emissions shall not exceed 48.84 $kgCO_2e/mmBtu$.
c. For purposes of calculating the 12-month rolling average lifecycle GHG emissions per the formula specified in Section IV.D.a, for each month with missing data (as defined in Section IV.A), the output of each fuel type shall be treated as zero for that month.
d. Fuel produced during a calendar month of missing data or when the compliance monitoring plan is not followed is not eligible for D code 5 RINs through the Chevron El Segundo Soy FCC D5 Pathways.

### E. Recordkeeping

In addition to satisfying the applicable recordkeeping requirements under 40 CFR 80.1454(b), Chevron El Segundo may only generate RINs for fuel produced through the Chevron El Segundo Soy FCC D5 Pathways if it keeps all of the following records:

a. Records documenting the data collected through the compliance monitoring plan specified in Section IV.B.a of this document. This includes, but is not limited to, documentation showing the amount of feedstock and energy used and the amount of fuel produced including meter readings and energy bills that span the entire averaging time period for each instance that RINs are generated for fuel produced through the Chevron El Segundo Soy FCC Process.
b. Records presenting all accurate calculations verifying compliance with the applicable lifecycle GHG reduction threshold on a 12-month rolling average basis in accordance with section IV.D. This includes, but is not limited to, copies of the Chevron El Segundo Soy FCC GHG Model with the final lifecycle GHG calculations for each month, including all inputs to the Chevron El Segundo Soy FCC GHG Model. The information must also include identifiable unique references to all documents and metering data used in the calculations.
c. Records documenting calibration and maintenance of all monitoring devices specified in the process flow diagram or used in the Chevron El Segundo Soy FCC GHG Model.
d. Records documenting the manufacturer's calibration and maintenance schedule for all monitoring devices specified in the process flow diagram or used in the Chevron El Segundo Soy FCC GHG Model, if available. If the manufacturer does not provide a recommended calibration or maintenance schedule, then records documenting the calibration or maintenance schedule for similar monitoring devices.
e. Any other records demonstrating that the Compliance Monitoring Plan was followed.

### F. Attest Auditors

All renewable fuel producers, including Chevron El Segundo, must undergo an annual attest engagement requirement under 40 CFR 80.1464(b). The regulations at 40 CFR 80.1464(b)(1)(iii) requires attest auditors to "[v]erify that the proper number of RINs were generated and assigned pursuant to the requirements of § 80.1426 for each batch of renewable fuel produced or imported." In order for the attest auditor to verify that the proper number of RINs were generated and assigned under 40 CFR 80.1464(b)(1)(iii), the attest auditor must conduct the following attest procedures for each month during the compliance period:

1. Obtain copies of the documents required under Section IV.E.a of this document.
2. Obtain copies of the inputs to the Chevron El Segundo Soy FCC GHG Model under Section IV.E.b of this document for that calendar month.
3. Compare all inputs to the Chevron El Segundo Soy FCC GHG Model obtained in IV.E.b with the underlying documents in IV.E.a. State whether the values are consistent.

4. Report as a finding all inputs to the Chevron El Segundo Soy FCC GHG Model for which documentation supporting the input was not provided to the attest auditor.
5. Report as a finding any discrepancy in the numbers compared in Section IV.E.c.

Annual attest auditors must also conduct the following attest procedures for each month during the compliance period:

6. Obtain copies of the output of the Chevron El Segundo Soy FCC GHG Model, as recorded under Section IV.E.b of this document, in percent reduction over the 12 month rolling average period for renewable diesel, renewable gasoline, and renewable jet fuel.
7. Obtain copies of the RIN generation events, including fuel production date, fuel type, and production process, and D code.
8. For renewable diesel, renewable gasoline, and renewable jet fuel, report as a finding if the RINs were generated with a D code of 5 for that fuel type for production that occurred during a calendar month using the Chevron El Segundo Soy FCC Process for which the Chevron El Segundo Soy FCC GHG Model showed less than 50% reduction in GHG emissions relative to the baseline.

**G. Additional Conditions**

In addition to checking the applicable equations in 40 CFR 80.1426, a professional engineer verifying VRIN under 40 CFR 80.1450(d)(3)(iii) must review all relevant registration information under 40 CFR 80.1450, reporting information under 40 CFR 80.1451, and recordkeeping information under 40 CFR 80.1454, as well as any other relevant information and documentation required under 40 CFR part 80 and this petition. Verification of all relevant information and documentation for VRIN under 40 CFR 80.1450(d)(3)(iii) includes, but is not limited to, the following:

- Reviewing all meter maintenance and calibration records and meter readings for all measurements used in the Chevron El Segundo Soy FCC GHG Model.
- Running the Chevron El Segundo Soy FCC GHG Model to ensuring that the model is accurate and correct while also ensuring that the use of default conservative assumptions did not lead to greater estimated GHG reductions than using actual meter data.

Due to the closeness of the process to the GHG reduction threshold, additional third-party verification of VRIN is necessary to ensure that the fuel is produced in compliance with the applicable Clean Air Act GHG reduction requirement. Chevron can either have a third party verify all batches under the 3 year period or be subject to an approved quality assurance plan under 40 CFR 1469. The QAP shall include, but not be limited to, quarterly monitoring of Chevron El Segundo's use of the Chevron El Segundo Soy FCC GHG Model to ensure that the conditions specified in section IV.D of this document are satisfied. RINs generated under the Chevron El Segundo Soy FCC D5 Pathways that are not verified by the auditor nor are verified under the 3 year engineering review update may be invalid under 80.1431.

When fuel produced through the Chevron El Segundo Soy FCC Process is not eligible for advanced biofuel (D code 5) RINs, such fuel may be eligible for renewable fuel D code 6 RINs through the Chevron El Segundo Soy FCC D6 Pathways approved on September 26, 2022.[31]

The EPA may modify the conditions specified above as it deems necessary and appropriate to ensure that fuel produced pursuant to the Chevron El Segundo Soy FCC D5 Process achieves the required lifecycle GHG reductions, including to make the conditions align with any future changes to the RFS regulations. If the EPA makes any changes to the conditions specified in this document, the Agency will 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

The definition of advanced biofuel in CAA 211(o)(1)(B) specifies that the term means "renewable fuel…that has lifecycle greenhouse gas emissions, as determined by the Administrator, after notice and opportunity for public comment, that are at least 50 percent less than the baseline lifecycle greenhouse gas emissions." As part of the March 2010 RFS rule, we took public comment on our lifecycle assessment of the soybean oil biodiesel, renewable diesel and renewable jet fuel pathways listed in Table 1 to 40 CFR 80.1426,[32] including all models used and all modeling inputs and evaluative approaches. In responding to the petition submitted by Chevron, we have relied to a large extent on the soybean oil modeling that we conducted for the March 2010 RFS2 rule. We made adjustments based on a straightforward application of updated data and emissions factors or approaches that we took comment on in prior rulemakings (see Section III.A above). Thus, our fundamental modeling of soybean oil, renewable diesel, and renewable jet fuel for this decision has already been made available for public comment as part to the March 2010 RFS2 rule, and other relevant subsequent rulemakings.

As part of the March 2013 Pathways I rule, we took public comment on our lifecycle analysis of the renewable gasoline and renewable gasoline blendstock pathways in row M of Table 1 to 40 CFR 80.1426. Thus, our fundamental modeling of renewable gasoline and renewable gasoline blendstock has already been made available for public comment as part to the March 2013 Pathways I rule.

In responding to this petition, we have relied on the same methodology and much of the same modeling used for the March 2010 RFS2 rule and the March 2013 Pathways I rule, and have adjusted the analysis to account for the Chevon El Segundo process data. This includes use of the same emission

[31] https://www.epa.gov/system/files/documents/2022-11/chevron-el-segundo-fcc-deter-ltr-2022-09.pdf

[32] The March 2013 Pathways I rule clarified that the definition of renewable diesel used in the March 2010 RFS2 rule included jet fuel (78 FR 14201).

factors and types of emission sources that were used in previous rules, with straightforward updates as explained above. As we have not previously estimated the lifecycle GHG emissions of co-processing soybean oil in a refinery FCC unit as part of a rulemaking process, the main difference between this analysis and the analyses completed for these previous assessments was the evaluation of process data from Chevron's El Segundo facility. Although this analysis involved evaluation of a new process, the fundamental methodology and much of the analyses relied on for this decision have been made available for public comment as part of previous rulemakings. Our approach today is also consistent with our description of the petition process in the preamble to the March 2010 RFS Rule and our promulgation of 40 CFR 80.1416, as our work in responding to the petition was a logical extension of analyses already conducted.

## VI. Conclusion

Based on our assessment, renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and renewable diesel produced from soybean oil through the Chevron El Segundo Soy FCC Pathways qualifies for D code 5 RINs, provided all the conditions and associated regulatory provisions specified in Section IV of this document are satisfied, and the fuel meets all other definitional and RIN generation criteria for renewable fuel specified in the CAA and its implementing regulations.

This conditional approval applies specifically to Chevron El Segundo, and to the process, materials used, fuels produced, and process energy types and amounts outlined and described in the petition request submitted by Chevron.[33] This approval is effective as of the signature date. D code 5 RINs may only be generated for renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and renewable diesel produced through the Chevron El Segundo Soy FCC Pathways that are produced after the date of acceptance and activation of Chevron El Segundo's registration for the new pathways.[34]

The OTAQ Reg: Fuels Programs Registration and OTAQ EMTS Application will be modified to allow Chevron to register and generate D code 5 RINs for renewable gasoline, renewable gasoline blendstock, renewable jet fuel, and renewable diesel produced from soybean oil produced through the Chevron El Segundo Soy FCC D5 Pathways using a production process of "Chevron El Segundo Soy FCC D5 Process."

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

[34] A fuel pathway is activated under the RFS program when the EPA accepts the registration application for the pathway, allowing it to be used in EMTS for RIN generation. When the 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."