

Note- this instruction manual is an excerpt from a clean version of the final modified version of Attachment C: CA-GREET3.0 Technical Support Documentation, posted on August 13, 2018 as part of the rulemaking process supporting the LCFS amendments in effect from Q1 2019.

# Tier 1 Simplified CI Calculator Instruction Manual

## Starch and Fiber Ethanol

### A. Introduction

This document provides detailed instructions for the use of the Simplified CI Calculator for Tier 1 Starch and Fiber Ethanol pathway applications. This Calculator is to be used to calculate the carbon intensity (CI) for ethanol produced from corn, sorghum, and/or corn/sorghum fiber. Note that all references to sorghum in the Simplified CI Calculator and Instruction manual refer exclusively to grain sorghum. Each required specific input in the Calculator has been numerically labeled (i.e., 1.1, 1.2 etc.) so that users can follow the sequence and enter information as required.

**Download the Simplified CI Calculator here:**

<http://www.arb.ca.gov/fuels/lcfs/ca-greet/ca-greet.htm>

The Calculator has been automated to perform CI calculations using factors from the CA-GREET3.0 model. The Calculator replaces the existing Tier 1 Calculator and the operational data template in pathway application packages. Applicants are required to add facility information and verifiable monthly feedstock, operational energy use, fuel production and co-product data, and transport distances used in calculating the CI of Starch and Fiber Ethanol pathways. **All inputs selected and input by the applicant must meet the requirements of the monitoring plan for entities required to validate or verify pursuant to sections 95491.1(c) and are subject to verification unless specifically exempted.**

The Calculator also includes additional reference material such as greenhouse gas emissions factors used in CA-GREET3.0 and reference fuel specifications. Also included with the Calculator is a detailed breakdown of the calculations used to determine the final CI of each fuel pathway.

The applicant may only enter values or make selections in input fields designated by CARB for user input/selection, and may not change any other values or fields in the Calculator.

### B. Definition

*Conditional Default* - A conservative input value option calculated by CARB staff. Pathway applicants may select a conditional default input value if their operations meet the conditions specified for such a value in this Instruction Manual. Because each conditional default value must be based on reasonable assumptions and be sufficiently conservative to encourage use of site-specific values when feasible, conditional default values are subject to initial validation during the pathway certification process to confirm that the specified conditions are met, but are not subject to subsequent annual verification.

### C. Color Legend Used in the Calculator

The Calculator uses the following color legend to differentiate required inputs, calculated values, etc., described below:

Yellow Cells require user input
Light Blue Cells show CI results
Green Cells show the calculation button
Gray Cells are calculated values

### D. Calculator Overview

The following table provides an overview of the tabs used in the Simplified CI Calculator.

**Table D.1. Overview of Tabs used in the Simplified CI calculator**

Tab Name	Description
<b>EtOH Summary</b>	Summary worksheet. Contains an overall summary of the information entered in the “EtOH” tab of the Calculator and calculated CIs and corresponding denatured ethanol volumes. If desired, a <b>conservative margin of safety</b> may be added to the calculated CI in this tab in order to establish the final CI, pursuant to section 95488.4(a) of the regulation.
<b>EtOH</b>	Main calculation worksheet. Contains an overview of the calculated CIs for a given pathway, and the main components of the Calculator with fields requiring user inputs and those calculated by the sheet. Calculations in grayed out cells are automatically calculated but dependent on input to yellow cells in the corresponding sections of the Calculator. This tab also includes a detailed sample CI calculation (cells B77 through K111).
<b>EF Tables</b>	Reference worksheet. Contains emissions factors from the CA-GREET3.0 model used in calculation of carbon intensities.
<b>Fuel_Specs</b>	Reference worksheet. Contains specifications of fuels, global warming potentials of greenhouse gases, land use change and unit conversion.

## E. EtOH tab

The EtOH tab contains the main CI calculation worksheet which consists of the following major components:

- *Pathway Summary and Estimated CI*
- *Section 1. Applicant Information*
- *Section 2. Feedstock Production Data for Ethanol Production*
- *Section 3. Fuel Production Energy Consumption and Fuel Transport Data*
- *Section 4. CI Calculation Details*

All CI values are calculated based on relevant site-specific inputs which have to be entered in the respective input fields. Only after all site-specific inputs for a given facility have been entered, the calculated CIs will represent the pathway CIs for the various streams as detailed in this tab and the EtOH Summary tab. Details for entering data in all required fields is detailed below. As provided, the EtOH tab has blank values for all applicant-specific inputs and specific input selections (i.e., eGRID subregion) are set to one of the available options in the pull-down menus. Applicants must replace input cell values only for those fields which are applicable to the ethanol plant. Selection of inputs (i.e., eGRID subregion) must be appropriate to the fuel production pathway.

## Section 1: Applicant Information

Begin by selecting the EtOH tab and entering information regarding the company, the fuel production facility and the feedstock production location.

**Table E.1. List of input fields for Section 1 of the simplified CI calculator**

Field Name	Description
<b>1.1. Company Name</b>	Registered name of the company. Example "ABC Company, LLC" or "ABC Company, Inc."
<b>1.2. Application Number</b>	Enter the application number provided by the AFP.
<b>1.3. Company ID</b>	Enter U.S. EPA Company ID. If not available, contact CARB staff for LCFS Company ID.
<b>1.4. Facility ID</b>	Enter the Company's Facility ID. If not available, contact CARB for LCFS Facility ID.
<b>1.5. Ethanol Production Location</b>	Enter City and State for ethanol production
<b>1.6. Application Description</b>	<p>For starch ethanol pathways, enter: Feedstock source, fuel type, Dry/Wet Mill, Coproducts applied for (WDGS, MDGS, DDGS), and process fuels. Example: Midwest Corn, Ethanol, Dry Mill, MDGS, DDGS, NG.</p> <p>For corn/sorghum fiber ethanol pathways, also enter: Cellulosic ethanol produced from [list feedstock] using [list ethanol production process].</p>
<b>1.7. Electricity Mix Region for Feedstock</b>	Electricity mix for feedstock; set to single value: "1-U.S Ave Mix" and cannot be changed by the applicant
<b>1.8. Provisional Pathway?</b>	If available data is less than 24 months, select "Yes", else "No", and click "Calculate". If "Provisional" a minimum three months of operational data required to meet provisional requirements.

Section 2: Feedstock Production Data for Ethanol Production

The following table lists the fields used in Section 2 of the calculator. Additional details are provided below Table E.2.

**Table E.2. List of input fields for Section 2 of the simplified CI calculator**

Field Name	Description
<b>2.1. Monthly Data</b>	Input the months and year(s) corresponding to the operational data provided.
<b>2.2. Beginning Corn Inventory</b>	Input monthly total beginning corn inventory data (in bushels) in this field for all 24 months of operation. The input must be in bushels (with 15 percent standard moisture). If alternate approaches are used to inventory corn, applicant must provide conversion factor used to report inventory in bushels. Additional details for feedstock production are provided below this table.
<b>2.3. Corn Used (Calculated)</b>	Monthly corn used data (in bushels) is automatically calculated in section 2.3. No inputs are required for this field.
<b>2.4. Corn Received</b>	Input monthly total corn data (in bushels) received in this field for all 24 months of operation. If alternate approaches are used to inventory corn, applicant must provide conversion factor used to report inventory in bushels.
<b>2.5. Ending Corn Inventory</b>	Input monthly total ending corn inventory data (in bushels) in this field for all 24 months of operation. If alternate approaches are used to inventory corn, applicant must provide conversion factor used to report inventory in bushels. Click <b>“Select”</b> (green button) in cell J29 after completing Field 2.5.
<b>2.6. Corn Transport Data Category</b>	Field 2.6 provides three options for corn transport in a drop down menu: 1) Conditional Default for Ethanol Plants in the 9 Midwest States, and 2) Conditional Default for Ethanol Plants in CA and 3) User-Defined for Corn Transport Applicant must select one of these options and click <b>“Select”</b> (green button) in cell J29.
<b>2.7. Corn Transport from Collection Center to Ethanol Plant (Monthly weighted average)</b>	Field 2.7 is designated for corn transport. Additional details for feedstock transport are provided below this table.

<b>2.7a Corn Transported</b>	Input the monthly total quantity of corn (in bushels) transported by HDD Truck to the Ethanol Plant if “User-Defined” is selected. If option 1) or 2) is selected in field 2.6, no user input is required for this field. Additional details for corn transport are provided below this table.
<b>2.7.b By HDDT, miles</b>	Input monthly weighted average transported mileage if applicant selects “User-Defined” option in field 2.6. If option 1) or 2) is selected in field 2.6 no user input is required for this field. Additional details for corn transport are provided below this table.
<b>2.7.c Corn Transported</b>	Input the monthly total quantity of corn (bushels) transported by rail to the Ethanol Plant if “User-Defined” is selected. If option 1) or 2) is selected in field 2.6, no user input is required for this field. Additional details for corn transport are provided below this table.
<b>2.7.d By Rail, miles</b>	Input monthly weighted average transport mileage if applicant selects “User-Defined” option in field 2.6. If option 1) or 2) is selected in field 2.6, no user input is required for this field. Additional details for corn transport are provided below this table.
<b>2.8. Beginning Sorghum Inventory</b>	Same as field 2.2 if sorghum is used as a feedstock. Additional details for feedstock production are provided below this table.
<b>2.9. Sorghum Used (Calculated)</b>	Monthly sorghum used data in this field will be automatically calculated. No inputs are required for this section.
<b>2.10. Sorghum Received</b>	Same as field 2.4 if sorghum is used as a feedstock.
<b>2.11. Ending Sorghum Inventory</b>	Same as field 2.5 if sorghum is used as a feedstock.
<b>2.12. Sorghum Transport Data Category</b>	Same as field 2.6 if sorghum is used as a feedstock. Click the “Update” button in cell R29 after choosing an option in field 2.12.
<b>2.13. Sorghum Transport from Collection Center to Ethanol Plant (Monthly weighted average)</b>	Field 2.13 is designated for sorghum transport. No inputs are required for this section. Additional details for feedstock transport are provided below this table.
<b>2.13.a Sorghum Transported</b>	.Input the monthly total quantity of sorghum (in bushels) transported by HDD Truck to the Ethanol Plant if “User Defined” is selected. If option 1) or 2) is selected in field 2.12, no user input is required for this field. Additional details for sorghum transport are provided below this

	table.
<b>2.13.b By HHDT, miles</b>	Input monthly weighted average transport mileage by HDD truck if applicant selects “User Defined” option in field 2.12. If option 1) or 2) is selected in field 2.12, no user input is required for this field. Additional details for sorghum transport are provided below this table.
<b>2.13.c Sorghum Transported</b>	Input the monthly total quantity of sorghum (in bushels) transported by rail to the Ethanol Plant if “User Defined” is selected. If option 1) or 2) is selected in field 2.12, no user input is required for this field. Additional details for sorghum transport are provided below this table.
<b>2.13.d By Rail, miles</b>	Input monthly weighted average transport mileage by rail if applicant selects “User Defined” option in field 2.12. If option 1) or 2) is selected in field 2.12, no user input is required for this field. Additional details for sorghum transport are provided below this table.
<b>2.14. Dry DG Beginning Inventory</b>	Input monthly total Dry Distiller Grains inventory data (in tons) in this field for all 24 months of operation. If facility does not produce dry DGS, the applicant must enter zero in Fields 2.14-2.19. Additional details regarding coproducts are provided below this table.
<b>2.15. Dry Distiller Grains Produced (Calculated)</b>	Monthly total Dry Distiller Grains produced data (in tons) under section 2.15 will be automatically calculated. No inputs are required for this field.
<b>2.16. Dry Distiller Grains Sales</b>	Input monthly Total Dry Distiller Grains sales data (in tons) for all 24 months of operation.
<b>2.17. Dry DG Ending Inventory</b>	Input monthly Total Dry Distiller Grains ending inventory data (in tons) for all 24 months of operation
<b>2.18. Moisture Content</b>	Input monthly weighted average moisture content (in percentage) for dry DGS for all 24 months of operation. Moisture measurements must utilize an industry standard moisture measurement protocol.



<p><b>2.19. Drying Energy</b></p>	<p>Input monthly total drying energy data (MMBtu of NG expressed in HHV) for all 24 months of operation. Dedicated meters must be installed to quantify natural gas used for drying DGS. If the applicant is requesting a composite carbon intensity score, dedicated meters are not required. If alternate measurement units are used to quantify natural gas use, applicant must provide conversion factor used to report NG use in HHV.</p>
<p><b>2.20. Modified DG Beginning Inventory</b></p>	<p>Same as field 2.14 but for Modified DGS.</p>
<p><b>2.21. Modified Distiller Grains Produced (Calculated)</b></p>	<p>Same as field 2.15 but for Modified DGS.</p>
<p><b>2.22. Modified Distiller Grains Sales</b></p>	<p>Same as field 2.16 but for Modified DGS</p>
<p><b>2.23. Modified DG Ending Inventory</b></p>	<p>Same as field 2.17 but for Modified DGS</p>
<p><b>2.24. Moisture Content</b></p>	<p>Same as field 2.18 but for Modified DGS</p>
<p><b>2.25. Drying Energy</b></p>	<p>Same as field 2.19 but for Modified DGS</p>
<p><b>2.26. Wet DG Beginning Inventory</b></p>	<p>Same as field 2.14 but for Wet DGS.</p>
<p><b>2.27. Wet Distiller Grains Produced (Calculated)</b></p>	<p>Same as field 2.15 but for Wet DGS.</p>
<p><b>2.28. Wet Distiller Grains Sales</b></p>	<p>Same as field 2.16 but for Wet DGS</p>
<p><b>2.29. Wet DG Ending Inventory</b></p>	<p>Same as field 2.17 but for Wet DGS</p>
<p><b>2.30. Moisture Content</b></p>	<p>Same as field 2.18 but for Wet DGS</p>
<p><b>2.31. Syrup Beginning Inventory</b></p>	<p>Input monthly total syrup inventory data (in tons) in this field for all 24 months of operation. If facility does not produce syrup, the applicant must input zero in Fields 2.31-2.35.</p>

<b>2.32. Syrup Produced (Calculated)</b>	Monthly total syrup produced data (in tons) in field 2.32 will be automatically calculated. No inputs are required for this field.
<b>2.33. Syrup Sales</b>	Input monthly total syrup sales data (in tons) for all 24 months of operation.
<b>2.34. Syrup Ending Inventory</b>	Input monthly total syrup ending inventory data (in tons) for all 24 months of operation.
<b>2.35. Moisture Content</b>	Input monthly weighted average moisture content (in percentage) for syrup for all 24 months of operation. Moisture measurements must utilize an industry standard moisture measurement protocol.
<b>2.36. Beginning Oil Inventory</b>	Input monthly total Corn/Sorghum Oil inventory data (in lbs.) in this field for all 24 months of operation. If facility does not produce corn or sorghum oil, the applicant must enter zero for Fields 2.36-2.39. Corn and sorghum oil are considered equivalent in the Calculator.
<b>2.37. Oil Produced (Calculated)</b>	Monthly total oil produced data in field 2.36 will be automatically calculated. No inputs are required for this field.
<b>2.38. Oil Sales</b>	Input monthly total Corn/Sorghum Oil sales data (in lbs.) for all 24 months of operation.
<b>2.39. Ending Oil Inventory</b>	Input monthly total Corn/Sorghum Oil ending inventory data (in lbs.) for all 24 months of operation.
<b>2.40. Co-product Yield (Calculated)</b>	Co-product Yield (dry matter basis, expressed in lbs./gallon of ethanol) data in field 2.40 will be automatically calculated. No inputs are required for this field.
<b>2.41. Beginning Undenatured Ethanol</b>	Input monthly total beginning undenatured ethanol inventory data (in gallons at 60F.) for all 24 months of operation. Additional details for ethanol production are provided below this table.
<b>2.42. Denatured Ethanol Sales</b>	Input monthly total denatured ethanol sales data (in gallons at 60F) for all 24 months of operation.
<b>2.43. Undenatured Ethanol Sales</b>	Input monthly total undenatured ethanol sales data (in gallons at 60F) for all 24 months of operation.

<b>2.44. Ending Undenatured Ethanol</b>	Input monthly total undenatured ethanol ending inventory (in gallons at 60F) for all 24 months of operation.
<b>2.45. Undenatured Ethanol Produced (Calculated)</b>	Monthly total undenatured ethanol produced data (in gallons at 60F) in this field will be automatically calculated. No inputs are required for this field.
<b>2.46. Denaturant Data Category</b>	Field 2.46 includes options for denaturant data category in a drop down menu: 1) Denaturant as Standard Value; and 2) User-Defined Denaturant. Applicant must select one of these options and click the "Update Denaturant" green button in cell AX30. Data must be input in this section only if the user-defined option is selected; monthly total quantity of denaturant used (in gallons at 60F) must be input in this field for all 24 months of operation.
<b>2.47. Beginning Cellulosic Enzyme</b>	Input monthly total cellulosic enzyme inventory data (in lbs.) in this field for all 24 months of operation. Additional details for inputs related to corn/sorghum fiber ethanol production are provided below this table.
<b>2.48. Cellulosic Enzyme Purchase</b>	Input monthly total cellulosic enzyme purchase data (in lbs.) for all 24 months of operation.
<b>2.49. Cellulosic Enzyme Use (Calculated)</b>	Monthly total cellulosic enzyme use data (in lbs.) in field 2.49 will be automatically calculated. No inputs are required for this field.
<b>2.50. Ending Cellulosic Enzyme</b>	Input monthly total cellulosic enzyme ending inventory (in lbs.) for all 24 months of operation.
<b>2.51. Corn/Sorghum Fiber Allocation</b>	Input monthly average corn/sorghum fiber percentage data in this section.
<b>2.52. Undenatured Corn/Sorghum Fiber Ethanol (Calculated)</b>	Monthly total undenatured corn/sorghum fiber ethanol production (in gallons at 60F) will be automatically calculated in this field to correspond to value in field 2.51. No inputs are required for this field. Only the quantity of ethanol produced from corn as feedstock (not including ethanol quantity attributable to sorghum, if used as a feedstock) is used to calculate total quantity of corn/sorghum fiber ethanol in this field.

## *Additional Details for Section 2*

### Feedstock Production (Fields 2.2 to 2.5 for corn and 2.8 to 2.11 for sorghum)

For feedstock production, enter data for site-specific inputs for feedstock (corn or sorghum) inventory to enable calculation of quantity of feedstock used in ethanol production. Cells which are grayed out are calculated values and do not require applicant input. The applicant must enter monthly totals for corn or sorghum received (as purchased) in bushels and total monthly beginning and ending corn or sorghum inventory in bushels. The monthly totals must be inclusive of moisture (15% moisture and not to be reported on a dry basis). If corn or sorghum inventory is not quantified in bushels, the applicant must convert to bushels using a conversion factor of 56 lbs./bushel before reporting in these input cells.

### Feedstock Transport (Fields 2.7 and 2.13)

For both corn and sorghum transport, the calculator offers two conditional-default options. For ethanol production facilities in one of nine corn growing states as specified by Argonne National Lab (ANL) known as “corn belt states” (South Dakota, Minnesota, Iowa, Nebraska, Illinois, Michigan, Ohio, Indiana, and Wisconsin)<sup>1</sup> a conditional default value of 40 miles for corn transport by HDD truck is available for selection. Sorghum transport from these regions is assigned a conditional default value of 80 miles by HDD truck. If the applicant selects this option (and is appropriate based on physical location of the ethanol production facility), transport distance will be subject to one-time validation during initial certification. For ethanol plants located in California, a conditional default selection will include 50 mile by HDD truck transport and 1,400 mile by rail transport to California. If an ethanol production facility located in California uses this option, transport distance will be subject to one time validation during initial certification. Applicants selecting one of the conditional default options do not need to enter any data in fields 2.7a-d or 2.13a-d, respectively. Click the green “Update” button after selecting one of the two conditional default options to see the pre-populated conditional default values.

The Calculator also includes a User-Defined option for sorghum transport, in addition to the two conditional default options. Applicants who elect to use the user-defined option for sorghum transport must enter the weighted average feedstock transport distance by HDD truck and rail in Fields 2.13a-d, respectively. Inputs will be subject to initial validation and periodic verification.

To facilitate calculation of monthly weighted average transport distance for User-Defined sorghum transport, staff suggests a calculation methodology as detailed below. The monthly weighted average for each mode (feedstock transport in a given month

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<sup>1</sup> Shapouri et al. USDA July 2002 - “The Energy Balance of Corn Ethanol: An Update” –Table 2 - Extracted May 2017

may include more than one mode of transport) is included in the cell for feedstock transport for a given month. This methodology is suggested for use in the Calculator sheet, because it clearly derives the calculation of the weighted average transport distance for each month.

Actual feedstock sourcing and corresponding mode of transport and miles transported				
Modes of Transport				
	Truck	Miles	Rail	Miles
1	100,000	50	100,000	1,200
2	200,000	150		
3			200,000	800
4			100,000	200
5			50,000	1,000
6				
7				
8				
Weighted average distance and corresponding quantities to be used for monthly reporting of feedstock				
	300,000	117	450,000	778

Example in sheet above:

Entry 1 For the month, the facility received 100,000 bushels by a mode which included 50 miles by truck followed by 1200 miles by rail

Entry 2 For the month, the facility also received 200,000 bushels by truck only with a transport distance of 150 miles

Entry 3 For the month, the facility also received 200,000 bushels by rail only with a transport distance of 800 miles

Entry 4 For the month, the facility also received 100,000 bushels which included 200 miles by rail.

Entry 5 For the month, the facility also received 50,000 bushels using only rail transport for a distance of 1000 miles

For these scenarios, the facility shall report 300,000 bushels with a weighted average distance of 117 miles by HDD truck, 450,000 bushels with a weighted average distance of 778 miles by rail.

For transport of feedstock, applicants must calculate the appropriate mileage for each mode of transport as described below. For rail transport, mileage must be based on the rail network maps from either BNSF Railway<sup>2</sup> or Union Pacific.<sup>3</sup> For facilities which are not directly located on the BNSF or Union Pacific rail network, applicants may use a publicly available web-based driving distance estimator for the distance between the facility and the nearest rail depot. Truck transport distance between two points may be determined using a publicly available web-based driving distance estimator.

### Co-products (Fields 2.14 to 2.40)

These fields contain input information related to reporting quantities of co-product produced during ethanol production. The co-products include distillers' grains solubles, distillers' corn oil/sorghum oil, and syrup. The Calculator allows producers to account for co-product streams of dry, modified and wet distillers' grain solubles. Facilities must include only streams applicable to their production cycles over the 24 months for which data is submitted. Facilities which report dry or modified DGS co-product streams will be required to report monthly total drying energy by installing dedicated energy meters in their facilities if applicants want separate CIs for different DGS types. Meters must record energy use for the entire duration in which dryers are utilized to dry DGS and all

<sup>2</sup> BNSF railway system: <http://www.bnsf.com/customers/where-can-i-ship/>

<sup>3</sup> Union Pacific system: <https://www.up.com/aboutup/usguide/index.htm>

records to demonstrate energy use for drying must be electronically archived.

**Note:** If co-product streams or other energy sources are used for drying, the applicant must declare it in the supplemental documentation. The Simplified CI Calculator is not capable of estimating GHG emissions when energy sources other than natural gas are used for drying energy. Applicants may be required to use a Tier 2 approach using the CA-GREET3.0 model and it is recommended that they consult staff regarding the appropriate method of accounting for this parameter in the application.

Inputs for all co-product inventory streams must be reported in tons except for distillers' corn oil/sorghum oil which must be reported in pounds (lbs.). Energy use must be reported in MMBtu using higher heating values (HHV).

For inputting co-product quantities, the applicant must include monthly total quantities for all co-products detailed in the input sheet. For all DGS reporting:

- Monthly beginning dry DGS inventory;
- Monthly DGS sales;
- Monthly ending inventory;
- Monthly weighted average moisture content;
- Monthly total drying energy, consistent with the metering requirements listed above for dry and modified DGS streams if applicable to the facility.

For the syrup and distiller's corn/sorghum oil co-product streams, the required inputs are similar. Moisture content for corn oil is set to a standard value of 1% and does not require an input. For syrup, monthly weighted average moisture content must be reported in the appropriate field.

#### Ethanol Production (Fields 2.41 to 2.52)

For ethanol production, the applicant must input (at volumes standardized at 60F):

- Monthly beginning inventory for undenatured ethanol;
- Monthly total denatured ethanol sales;
- Monthly total undenatured ethanol sales;
- Monthly ending undenatured ethanol inventory;
- For monthly denaturant volumes (gallons), the sheet offers two options: Standard Value or User-Defined. If user selects Standard Value denaturant, a value of 2.5% is used as denaturant volume blended with ethanol. If User-Defined denaturant is selected, monthly total denaturant values (in gallons at 60F) must be input in field 2.46. Click the green "Update Denaturant" button after selecting either the Standard or User-Defined option.

#### Facilities which have incorporated a Corn/Sorghum Fiber Ethanol Process (Fields 2.47 to 2.52)

For facilities which utilize a corn/sorghum fiber conversion technology process for conversion of corn/sorghum fiber to cellulosic ethanol, the calculator includes fields labeled under the heading, "Cellulosic Ethanol Production". These include fields from 2.47 through 2.52. Applicants must input monthly beginning inventory of cellulosic enzymes, monthly total cellulosic enzyme purchases, and monthly total ending cellulosic enzyme inventories (all enzyme quantities to be reported in lbs.). Under the Federal RFS program administered by the Environmental Protection Agency (U.S. EPA), entities that perform chemical analysis tests to determine the fraction of fiber that is converted to ethanol are required to demonstrate, upon initiation of cellulosic fiber ethanol production, percentage of cellulosic ethanol production attributable to their process modification. Applicants must input this value in the corn/sorghum fiber allocation percentage<sup>4</sup> field (i.e., 2.51) and all entries must remain the same until updated as part of the periodic validation required under the RFS program.

Corn/sorghum fiber pathways for which cellulosic ethanol yield is determined by a representative sampling and chemical analysis method to determine the converted fraction must include the method with the application for approval by the Executive Officer.

The RFS program requires facilities approved for D3 RINs to demonstrate, at periodic intervals (i.e., every 500,000 gallons or one year, whichever is more frequent), that cellulosic volumes produced meet or exceed the originally certified level for a given facility. CARB requires this same demonstration as a condition of pathway certification. At the time of initial registration, applicants must provide a copy of the RFS approval for the facility. Ongoing reports<sup>5</sup> must be submitted to CARB staff periodically as required by the RFS program. If any periodic demonstration shows that the cellulosic converted fraction is lower than previously calculated, all cellulosic volumes reported after the most recent prior analysis must be updated to reflect production volumes determined using the most recent prior analysis.

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<sup>4</sup> This value is used to calculate cellulosic ethanol production and is subtracted from total ethanol production to enable attribution of starch ethanol to other streams in the ethanol plant.

<sup>5</sup> Link to section 80.1426 of RFS code: <https://www.epa.gov/sites/production/files/2015-08/documents/2014-16413.pdf>

Section 3: Fuel Production Energy Consumption and Fuel Transport Data

Table E.3 lists the fields in Section 3 of the calculator.

**Table E.3. List of Input Fields for Section 3 of the Simplified CI Calculator**

Field Name	Description
<b>3.1. Electricity Mix Region for Fuel</b>	Choose the electricity mix corresponding to the zip code for the region where the ethanol plant is located. The Calculator includes 26 eGRID zone mixes, Brazilian average mix, Canadian average mix and User Defined Mix included in the pull down menu. For facilities in the U. S., select one of 26 eGRID zones available for the U. S. These are selected based on zip code of the upgrading facility location. After selecting an electricity mix option, click on “ <b>Calculate CI</b> ” in Cell B130. If user-defined mix is selected, input is required for electricity mix emission factor and is detailed in Field 3.6.
<b>3.2. NG Use</b>	Input monthly total natural gas consumption data (in MMBtu HHV) for all 24 months of operation. Additional details for energy consumption are provided below this table.
<b>3.3. Biogas Use</b>	Input monthly Biogas consumption data (in MMBtu HHV) for all 24 months of operation.
<b>3.3.a. Biogas Emission Factor</b>	Consult with CARB staff to develop an appropriate emission factor (gCO <sub>2</sub> e/MMBtu.) for the biogas and input in Field 3.3.a. Pipeline transmission distance must be incorporated into the emission factor. The biogas source and all data sources used in calculating emission factors must be described in detail in the Supplemental Documentation submitted with the Simplified CI Calculator.
<b>3.4. Biomass Use</b>	Input monthly Biomass consumption data (in tons) for all 24 months of operation.
<b>3.4.a. Biomass Emission Factor</b>	Consult with CARB staff to develop an appropriate emission factor (gCO <sub>2</sub> e/dry ton) for the biomass and input in Field 3.4.a. Alternate fuel sources and data sources used in calculating emission factors must be described in detail in the Supplemental Documentation submitted with the Simplified CI Calculator. This description must at a minimum identify the biomass and the source.



<b>3.5. Biomass Moisture</b>	Input monthly weighted average moisture content (in percentage) for all 24 months of operation. Moisture measurements must utilize industry standard moisture measurement protocol.
<b>3.6. Biomass Transportation Distance</b>	Input monthly weighted average transport distance for all 24 months of operation. For additional details, please see additional details for Section 2 – Feedstock Transport.
<b>3.6.a. Biomass Transportation Emission Factor</b>	Consult with CARB staff to develop an appropriate emission factor (gCO <sub>2</sub> e/dry ton-mile) for the alternate fuel and input in Field 3.6.a. Alternate fuel sources and data sources used in calculating emission factors must be described in detail in the Supplemental Documentation submitted with the Simplified CI Calculator. This description must at a minimum identify the alternative fuel and the source.
<b>3.7. Electricity Use from grid</b>	Input monthly Electricity use (in kWh) from utility grid for all 24 months of operation.
<b>3.8. Direct Electricity Use from Co-located Solar or Wind</b>	Monthly total electricity from Solar or Wind data must be input for all 24 months of operation.
<b>3.9. Finished Fuel Transport</b>	Field 3.9 is designated for finished Fuel Transport and Distribution. Additional details for finished fuel transport are provided below this table.
<b>3.9.a. By Rail</b>	Input distance (in miles) by rail transport from the Ethanol plant to California.
<b>3.9.b. By HDD Truck</b>	Input distance (in miles) by HDD truck from the Ethanol plant to California.
<b>3.10. Enter Electricity Generation Emission Factor (gCO<sub>2</sub>e/kWh)</b>	If User-Defined is selected in Field 3.1, consult with CARB staff and input an emission factor for user-defined electricity mix in cell BK29. Data sources for User Defined electricity mixes must be documented in the Supplemental Documentation attached with the Simplified CI Calculator.

*Additional Details for Section 3*

Energy Consumption (Fields 3.2 to 3.8)

The applicant must input applicable energy inputs in this section. The applicant must input monthly total natural gas usage from utility invoices (in MMBtu reported as higher heating value). The applicant must also input monthly total electricity purchased from

the grid from utility invoices (in kWh). If renewable electricity from solar generation or wind power is available for use by the ethanol production facility, appropriate monthly total electricity dedicated for use by the facility must be input in Field 3.4. Renewable electricity must meet the requirements for such power as detailed in section 95488.8(h)(1) in the regulation.

If a production facility uses biomethane or biogas as process fuel, monthly total biomethane (or biogas) use from invoices must be input in MMBtu reported as higher heating value. The landfill or other source of biomethane must be physically delivered to the ethanol production facility in order to be eligible for consideration as a process fuel. The applicant must also provide details if the biogas is processed at a purification plant prior to transport to the ethanol facility. The transmission distance from the landfill (or other source of biomethane or biogas) to the ethanol production facility must be provided to CARB staff in the supplemental documentation for use in the emission factor. For facilities which use biomass as a process fuel, monthly totals from invoices must be input in dry tons. The applicant must also input monthly weighted average moisture content of the biomass. Monthly weighted average biomass transport distance must be input in miles, and the mode of transport must also be reported. Reporting of miles must conform to the calculation methodology described in the additional details for feedstock transport, detailed below Table E.2.

#### Fuel Transport (Field 3.9)

For transport of finished fuel to California, applicants must input the appropriate transport distance by HDD truck and rail transport as applicable. Emissions from transport modes are additive to reflect all legs of transport of finished fuel to California.

**Note:** For applicants who expect to use various combinations of transport modes to ship fuel to California, staff suggests calculating the CIs for each combination and inputting the combination with the highest CI in the Simplified CI Calculator, to prevent unintentional exceedance of the pathway CI. The supplementary documentation provided with the application must include the CIs for each of the anticipated combinations and highlight the combination used in the Calculator.

#### *Emission Factors and CO<sub>2</sub>e Calculation Details*

Applicant inputs are matched to corresponding emission factors (in CO<sub>2</sub>e) derived from the CA-GREET3.0 model. Total GHG emissions are calculated for each discrete input and all emissions are summed, including ones for standard inputs, beneath Sections 2 and 3.

#### *Section 4. CI Calculation Details*

This section contains an example pathway CI calculation with a detailed breakdown of all calculations used for CI determination based on information entered by the user and applicable reference data.