T1 CI Calculator for Wastewater Sludge Biomethane

Instruction Manual

~~*December 19, 2023*~~ August 12, 2024

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I. Introduction

This document provides detailed instructions for the Tier 1 CI Calculator for Wastewater Sludge Biomethane (T1 WWS Calculator) to calculate the carbon intensity (CI) of compressed biomethane (Bio-CNG), liquified biomethane (Bio-LNG), or liquified biomethane that has been gasified at the fueling station (Bio-L-CNG) for use as a transportation fuel in California.

Click here to download the T1 WWS Calculator

The T1 WWS Calculator requires the applicant to enter monthly operational data for feedstock types and quantities, fuel production quantities, and transport distances.

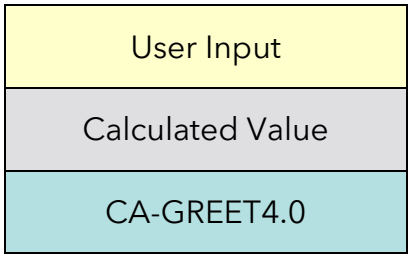
II. T1 WWS Calculator Overview

Table 1 provides an overview of the worksheets used in the T1 WWS Calculator.

Table 1: T1 WWS Calculator Worksheet Overview

Worksheet Name	Description
Introduction	Introduction to the Tier 1 WWS Calculator.
Site-Specific Inputs	Worksheet for feedstock and fuel production data entry.
Pathway Summary	Worksheet that displays fuel production quantities, calculates CIs, and site-specific operating conditions.
CA-GREET4.0	Worksheet for predefined input values, emission factors, fuel specifications, and unit conversion values from the CA-GREET4.0 model.

The cells in the T1 WWS calculator have various fill colors per the legend below:



To calculate the fuel pathway CI, the user must enter site-specific data into "User Input" fields if that field is relevant to the fuel pathway. If the input field is not relevant to the fuel pathway, it may be left blank or hidden by deselecting the input checkboxes located in Section 2.

All User Inputs are subject to verification as part of initial pathway certification and annual fuel pathway reporting. If a fuel pathway has additional emissions inside the system boundary that are not captured in the User Input fields, a Tier 2 application is required to document and account for those emissions.

"Calculated Value" cells contain formula that provide a calculated value based on user input data or CA-GREET4.0. In some instances, a "Calculated Value" cell may display a blank value if that input is not relevant or insufficient user input data has been entered.

"CA-GREET4.0" cells contain input values from the CA-GREET4.0 model. Calculated Value formula and CA-GREET4.0 values cannot be modified without prior approval from CARB and may elevate the pathway to a Tier 2 application.

III. Site-Specific Inputs Worksheet

The Site-Specific Inputs worksheet contains the main CI calculation worksheet which consists of the following major components:

- Section 1. Applicant Information
- Section 2. Pathway Inputs
- Section 3. Static Operational Data
- Section 4: Monthly Operational Data

All relevant site-specific inputs must be entered in the respective input fields. Once all site-specific inputs for a given facility have been entered, the pathway CIs for the various streams will be displayed in the Pathway Summary worksheet.

Table 2: Input Field Instructions for Section 1 of the T1 WWS Calculator

Field Name	Instructions
1.1 Application Number	Enter the application number provided by the AFP.
1.2 Company Name	Enter the company name as entered in the AFP.
1.3 Company ID	Enter the company ID as generated by the AFP. If not available, contact CARB staff.
1.4 Facility ID	Enter U.S EPA Facility ID. If not available, contact CARB staff.

Section 2 (Table 3) provides the option to select only input fields that apply to a given pathway, which hides irrelevant inputs in Section 4 of the worksheet.

Table 3: Input Field Instructions for Section 2 of the T1 WWS Calculator

Field Name	Instructions
2.1 Process Energy	Select the type(s) of process energy used at the fuel production facility.
2.2 Blended Fossil Fuels	Select the type(s) of fossil fuels blended with biomethane prior to pipeline injection, if applicable.
2.3 Finished Fuels	Select the type(s) of finished fuels

Table 4: Input Field Instructions for Section 3 of the T1 WWS Calculator

Field Name	Instructions
3.1 Electricity Grid Region	If the WWS biogas upgrading facility uses grid electricity, select the electricity mix corresponding to the region where the facility is located. A map of eGRID zones is provided in the "CA-GREET4.0" worksheet. The eGRID region may also be determined using the eGRID Power Profiler tool.[1]
3.2 Grid CI (gCO_2e/kWh)	The grid electricity CI will be displayed based on the selection for Field 3.1. If User-Defined is selected in Field 3.1, consult with CARB to develop an emission factor for a user-defined grid electricity mix.

[1] United States Environmental Protection Agency, *eGRID Power Profiler tool.* (Updated June 5, 2023). *https://www.epa.gov/egrid/*

Field Name	Instructions
3.3 Distance to CNG Station (miles)	Enter the distance for biomethane transport by pipeline to the CNG station in California using a publicly available distance estimator tool that reflects the actual transport route. If biomethane is transported to multiple destinations, a weighted average distance may be calculated, or the mileage of the farthest route may be applied.
3.4 LNG Facility ID	Enter U.S EPA Facility ID for LNG or L-CNG production. If not available, contact CARB staff.
3.5 Distance to LNG Facility (miles)	Repeat instructions in Field 3.3 for biomethane transport by pipeline to an LNG facility.
3.6 Liquefaction EF (gCO_2e/gallon)	Enter the most recent validated/verified emission factor for the LNG facility, as calculated using a CARB-approved LNG EF calculation template. Data sources must be documented in the Supplemental Documentation attached with the Simplified CI Calculator.
3.7 Bio-LNG Trucking Distance (miles)	Repeat instructions in Field 3.3 for liquified biomethane transport by truck.
3.8 Bio-LNG Truck Type	Enter the truck type used to transport Bio-LNG to dispensing station(s) in California.

Site-specific data must be entered in Section 4 for each month of the operational data period. Fields that do not apply to the fuel pathway may either be hidden by deselecting the fields in Section 2 or may be left blank. Any gaps in data reporting must comply with the Missing Data Provisions in LCFS Regulation section 95488.8(k).

Quantities entered should be inclusive of the entire fuel production facility; quantities used by the facility that are outside the fuel pathway system boundary may only be excluded with written permission from CARB.

Biogas and biomethane measurements must be recorded at minimum every 15 minutes with instrumentation capable of electronic archival.

Table 5: Input Field Instructions for Section 4 of the T1 WWS Calculator

Field Name	Instructions
4.1 Reporting Month (MM/YYYY)	Enter the 24 consecutive months that reflect the most recent operational data available for the Bio-CNG production facility. Applications must not have an interval of greater than 3 months between the end of the operational data month and the date of submission. For fuel production facilities that have been in operation less than 24 months, or for facilities that CARB determines have met the process change requirements of LCFS Regulation section 95488.9(c), the operational data submitted is permitted to range from 3 to 24 months.

Field Name	Instructions
4.2 WWS Biogas Collected (ft^3 @ 60°F)	Enter the volume of WWS biogas collected at 1 atm pressure and 60°F.
4.3 Methane Content (%V/V CH_4/biogas)	Enter the weighted average methane content of the WWS biogas.
4.4 North American Natural Gas (MMBtu, HHV)	Enter the quantity of natural gas (NG) used by the fuel production facility sourced from a common carrier NG pipeline in North America, excluding natural gas used for blending prior to injection.
4.5 Grid Electricity (kWh)	Enter the quantity of grid electricity used by the fuel production facility.
4.6 LPG or Propane (Gallons)	Enter the quantity of liquified petroleum gas (LPG) or propane used by the facility, excluding any quantity used for blending prior to injection.
4.7 Diesel (Gallons)	Enter the quantity of diesel fuel used by the fuel production facility.
4.8 Natural Gas Blended (MMBtu, HHV)	Enter the metered quantity of fossil natural gas blended with biomethane and injected into the common carrier pipeline.
4.9 LPG / Propane Blended (gallons)	Enter the metered quantity of LPG or propane blended with biomethane and injected into the common carrier pipeline.
4.10 Total Gas Injected	Enter the total metered quantity of gas injected into the common carrier pipeline, including any blended gas in 4.8 and 4.9. Quantities should match financial transaction records between the injecting party and the pipeline operator.

IV. Pathway Summary Worksheet

The Pathway Summary worksheet calculates the CI of each fuel pathway from operational data and user selections in the Site-Specific Inputs worksheet.

The top section of this worksheet provides application identification information and a summary of the total fuel produced by the facility. ~~In the WWS Calculator, the total energy embedded in fossil fuel used as process energy (natural gas, LPG or propane, and diesel) is subtracted from the quantity of injected gas for CI calculation purposes.~~

The Carbon Intensity Calculations section provides a summary of each fuel production stage inputs along with its calculated emissions and stage-specific CI contributions. The CIs are then summed to provide a CI for each ethanol pathway. The applicant may opt to apply a conservative margin of safety to the fuel pathway CI to ensure that the pathway remains compliant with certified CIs.

The final section of this worksheet provides a space for CARB staff to publish Operating Conditions associated with the pathway. A completed version of this worksheet is shared with the applicant for review and approval prior to pathway certification.

V. CA-GREET4.0 Worksheet

The CA-GREET4.0 Worksheet contains predefined input values from the CA-GREET4.0 model. These input values cannot be modified without written permission from CARB, which will elevate the application to a Tier 2 pathway.