# Guidance for County and Regional Inventories

## Energy Sector Data Source

## Appendix to Local Greenhouse Gas Inventory Tool: Community Module

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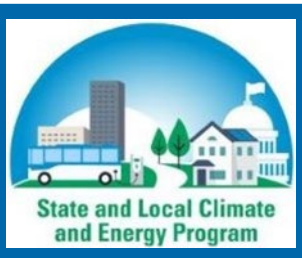

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# 1. Tool Overview

This Guidance for County and Regional Inventories User's Guide accompanies EPA's Local Greenhouse Gas Inventory Tool: Community Module. It explains how to obtain energy activity data at the city- and county-level to support users with entering data into the Community Module. For more information on using the Modules, please refer to the Local Greenhous Gas Inventory Tool User's Guides, which are available to download here: https://www.epa.gov/statelocalenergy/download-local-greenhouse-gas-inventory-tool.

# 2. Energy Consumption Data Entry Sheets

The Local Greenhouse Gas Inventory Tool: Community Module may be used to calculate emissions associated with energy consumption within your community's boundary. Energy sector emissions sources covered by the tool include stationary fuel combustion, mobile fuel combustion, and electricity usage, as shown in Table 1.

Once you enter consumption information in the entry sheet for each respective source, emissions from each source will be calculated in the Summary sheet. Alternatively, emissions can be entered directly into the Additional Sources sheet.

**Table 1. Required Data Inputs for Energy Sector Inventory Sheets**

| GHG Emissions Source Sector | Inventory Sheet | Input Data (unit) |
|---|---|---|
| Energy | Stationary – Entry | Stationary fuel combustion (fuel dependent[1]) |
| | Mobile – Entry | Mobile fuel[2] combustion (gallons) |
| | Electricity – Entry | Electricity purchased (kWh) |

# 3. Obtaining Input Data

The Community Module requires inputting activity data, and users are encouraged to enter energy consumption activity data from utility bill records or other local sources. However, if energy consumption data are not collected or otherwise available locally, there are existing, publicly available databases that may be used for some energy sector emissions sources. This guidance document outlines how one such database may be used to pull in data to the Stationary – Entry and Electricity Use – Entry sheets of the Module.

The U.S. Department of Energy (DOE), in collaboration with the National Renewable Energy Laboratory (NREL), publishes energy activity data and emissions estimates on the State and Local Planning for Energy (SLOPE) platform. The SLOPE platform is a comprehensive tool for accessing energy sector data across various geographies and timescales. The key differences between the two datasets (the Data Viewer and the Scenario Planner) are outlined in Table 2 below.[3,4]

[1] Units for stationary fuel combustion are dependent on fuel type (e.g., mcf for natural gas, gallons for liquid fuels [e.g., propane, diesel, gasoline], short tons for coal).
[2] E.g., gasoline, diesel.
[3] Data sources and methodology documentation for the SLOPE Scenario Planner can be found here: https://gds-files.nrelcloud.org/auto-sync/slope/SLOPE-Scenario-Planner-Methodology.pdf.
[4] Data sources and methodology documentation for the SLOPE Data Viewer can be found here: https://www.nrel.gov/docs/fy19osti/72748.pdf.

**Table 2. SLOPE Data Source Comparison**

| Category | SLOPE Scenario Planner | SLOPE Data Viewer |
|---|---|---|
| Data Types Offered | Energy consumption data and $CO_2$ emissions estimates from energy consumption | Energy consumption data |
| Geographic Disaggregation | County- and state-level | City-, county-, and state-level |
| Non-Electricity Energy Consumption Data for Residential and Commercial Sectors | Aggregated energy consumption and emissions estimates from all fuels | Natural gas consumption |
| Data Download Options | One state or county at a time | Bulk download |

While SLOPE includes energy and emission data from both stationary and mobile sources, the SLOPE platform is primarily recommended for obtaining data on stationary energy consumption and emissions. Mobile emissions data are available at the county-level from the National Emissions Inventory (NEI).

## SLOPE Scenario Planner (for Counties)

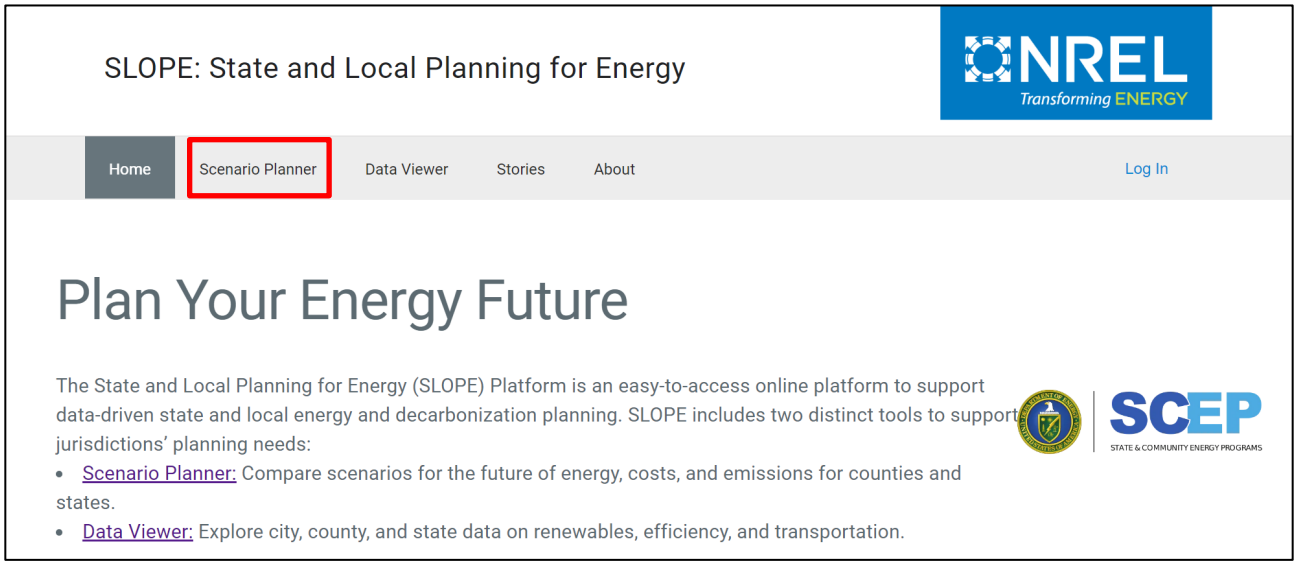
The SLOPE platform offers aggregated, county-level energy consumption and emissions data through the Scenario Planner. Because Scenario Planner aggregates energy consumption and emissions from all fuel types, users may choose to use Scenario Planner non-electricity emissions estimates to supplement, or replace, Data Viewer consumption data (discussed in the next section).

***Example Scenario Planner use case:*** *A user developing a county-level inventory without access to residential and commercial electricity and non-electricity energy consumption data from other sources (i.e., non-natural gas fuel consumption from other data sources) may elect to use the Scenario Planner to estimate aggregated energy emissions.*

### *Using SLOPE Scenario Planner for Emissions Estimates*

**Step 1.** ***To use the Scenario Planner, first navigate to the website:*** https://maps.nrel.gov/slope/***, and select the "Scenario Planner" tab (Figure 1).***

**Figure 1. SLOPE Platform**



***Step 2. Then, select the data type (i.e., $CO_2$ emissions), case scenario (Reference Case), and search for a particular county of interest in the Control Panel (see Figure 2). To view emissions for a certain year, select the year in the axis at the bottom of the page (see Figure 3).***

**Figure 2. Control Panel Data Inputs**

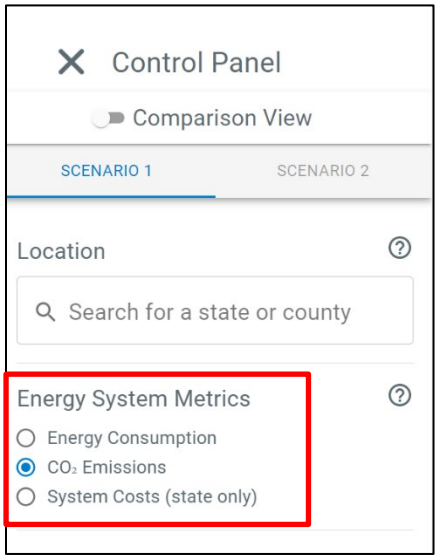



**Figure 3. Select Year**

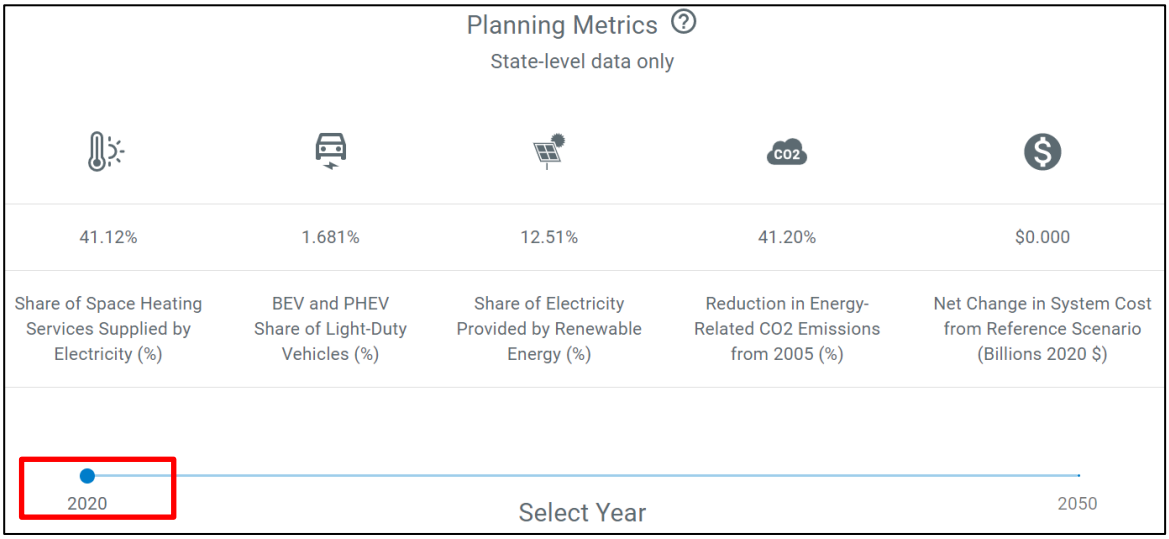
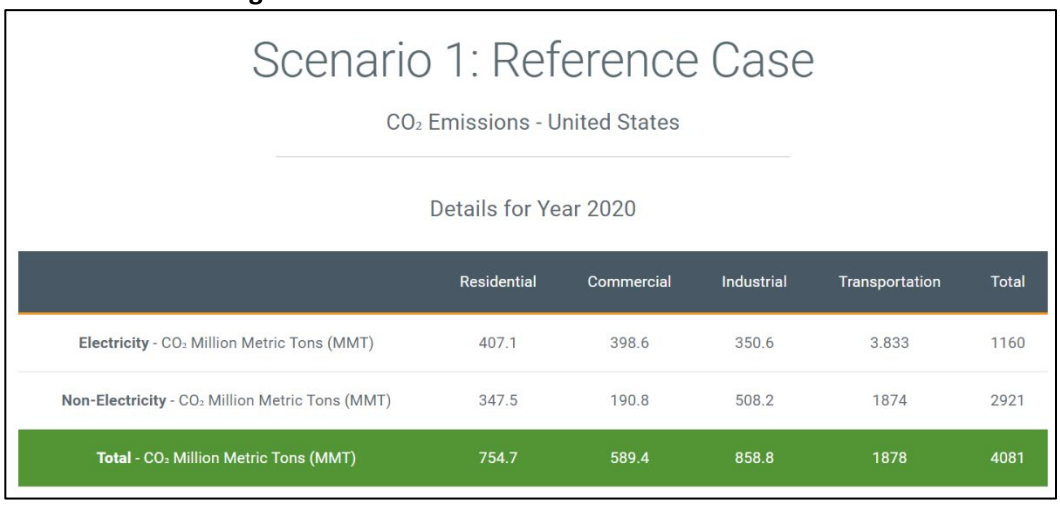


**Figure 4. Scenario Planner Emissions Results**



Scenario 1: Reference Case

$CO_2$ Emissions - United States

Details for Year 2020

| | Residential | Commercial | Industrial | Transportation | Total |
|---|---|---|---|---|---|
| **Electricity** - $CO_2$ Million Metric Tons (MMT) | 407.1 | 398.6 | 350.6 | 3.833 | 1160 |
| **Non-Electricity** - $CO_2$ Million Metric Tons (MMT) | 347.5 | 190.8 | 508.2 | 1874 | 2921 |
| **Total** - $CO_2$ Million Metric Tons (MMT) | 754.7 | 589.4 | 858.8 | 1878 | 4081 |

***Step 3. Emissions results shown in Figure 4 can then be entered directly on the Additional Sources Inventory Sheet of the Community Module, where they will be summed alongside emissions estimated elsewhere in the Module. Please see the Local Greenhouse Gas Inventory Tool User's Guides for additional information on entering emissions into the Additional Sources sheet.***

## SLOPE Data Viewer (for Cities or Counties)

The SLOPE Data Viewer contains nationwide electricity and natural gas consumption projections for 2017-2050, developed from a 2016 baseline. Energy consumption data are available at the state-, county-, and city-level and are disaggregated by economic sector (e.g., residential, commercial, industrial). SLOPE Data Viewer energy consumption data can be pulled directly into the data entry sheets of the Community Module, as detailed below.

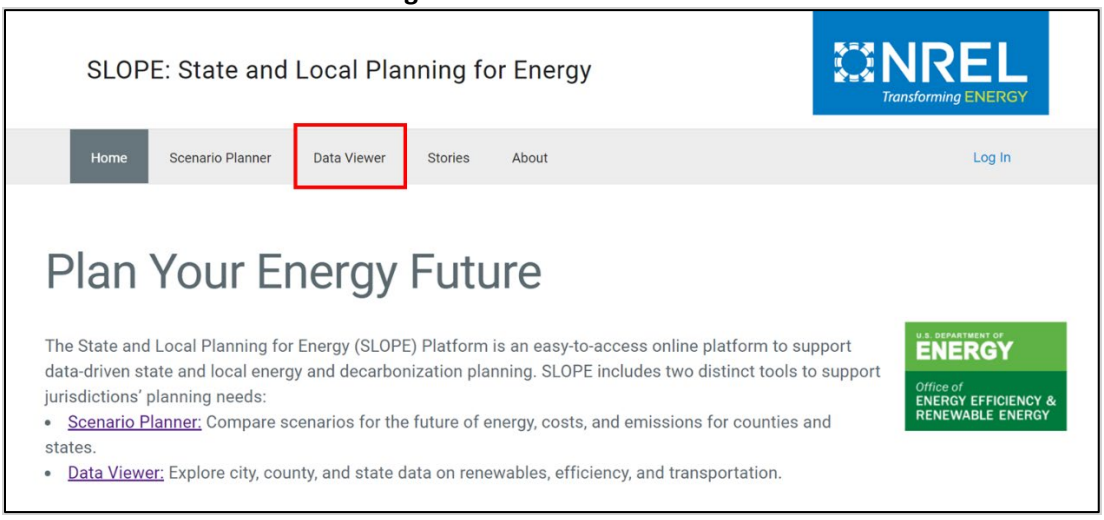
***Example Data Viewer use case:*** *A user developing a city- or county-level inventory without access to energy or electricity consumption data may elect to use the Data Viewer.*

### *Using SLOPE Data Viewer for Consumption Estimates*

The following figures illustrate how to download natural gas and electricity consumption data by county from SLOPE Data Viewer.

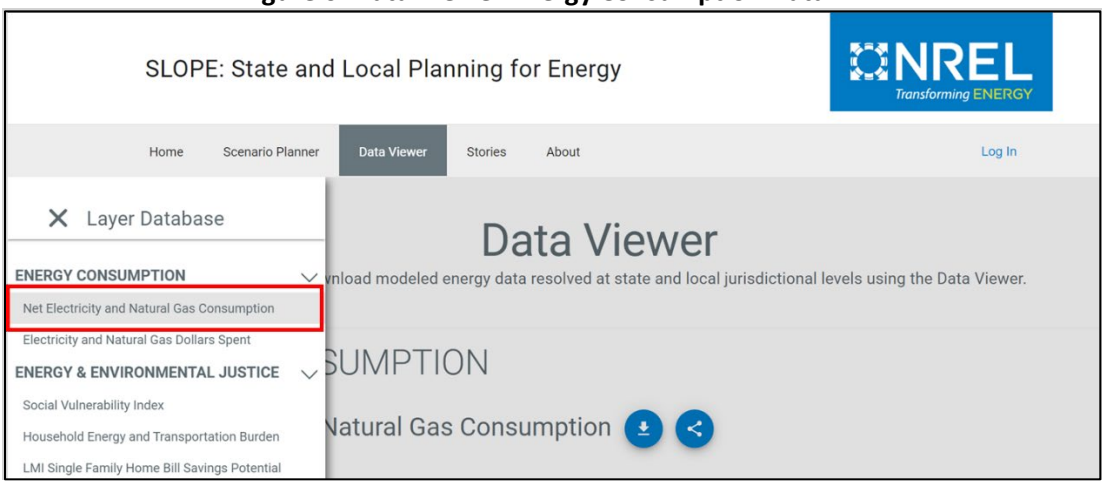
***Step 1. To use Data Viewer, first navigate to the website:*** https://maps.nrel.gov/slope/***, and select the "Data Viewer" tab (Figure 5).***

**Figure 5. SLOPE Platform**



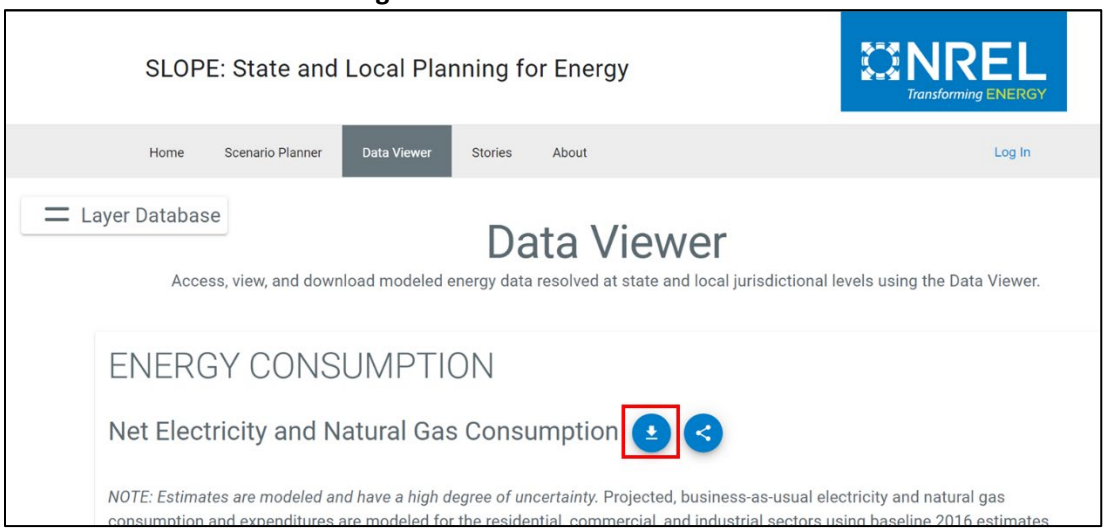

***Step 2. Next, select the "Net Electricity and Natural Gas Consumption" database layer (Figure 6).***

**Figure 6. Data Viewer Energy Consumption Data**




***Step 3. After selecting the correct layer, download the aggregate data by clicking the download icon (Figure 7). A zip folder with three Excel csv files, containing state-, county-, and city-level data, respectively, will automatically download.***

**Figure 7. Download Data Files**



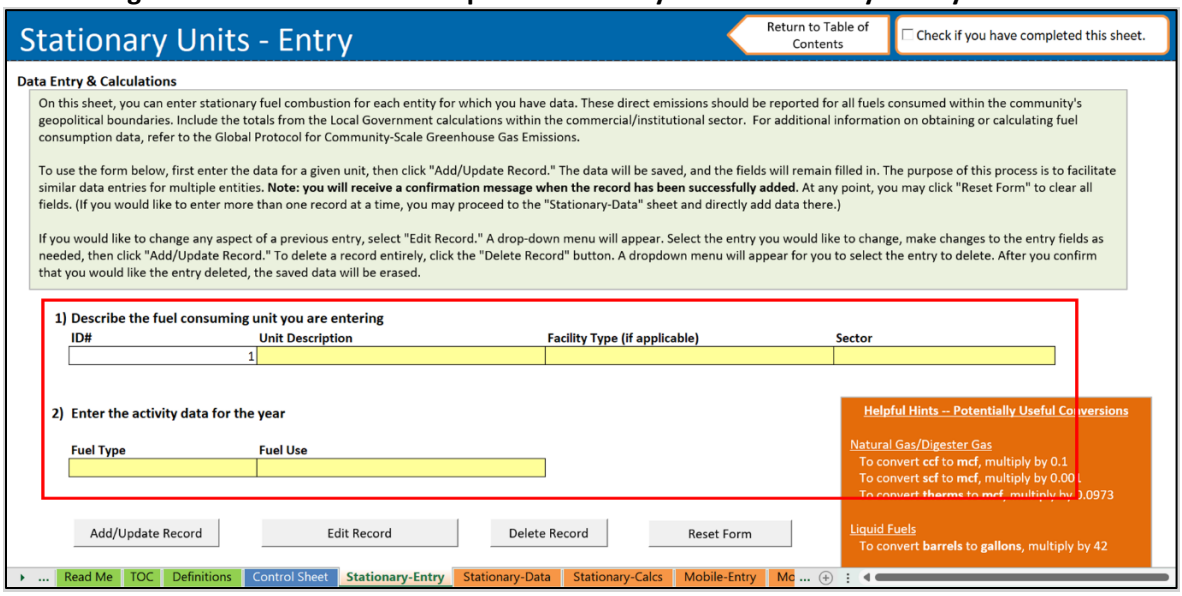

***Step 4. Open the Excel file of interest (for county-level data, the file name is "energy_consumption_expenditure_business_as_usual_county.csv"). Within the file, isolate consumption data by filtering for the county, state, sector, year, and energy source of interest (Figure 8). Natural gas consumption is listed as "ng," and electricity consumption is listed as "elec" in the "Source" column.***

**Figure 8. Selecting a Commodity**

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | County Name | State Name | State Geography ID | Sector | Year | Geography ID | Source | Consumption MMBtu | Expenditure US Dollars | |
| 2 | Autauga | Alabama | G01 | residential | 2050 | G0100010 | ng | 258593.0607 | 4499106.762 | |
| 3 | Autauga | Alabama | G01 | residential | 2049 | G0100010 | ng | 260373.2958 | 4500541.167 | |
| 4 | Autauga | Alabama | G01 | residential | 2048 | G0100010 | ng | 262216.0837 | 4487470.373 | |
| 5 | Autauga | Alabama | G01 | residential | 2047 | G0100010 | ng | 264065.2698 | 4483988.535 | |
| 6 | Autauga | Alabama | G01 | residential | 2046 | G0100010 | ng | 265858.4366 | 4487824.593 | |
| 7 | Autauga | Alabama | G01 | residential | 2045 | G0100010 | ng | 267723.941 | 4493264.754 | |
| 8 | Autauga | Alabama | G01 | residential | 2044 | G0100010 | ng | 269718.4377 | 4495004.67 | |
| 9 | Autauga | Alabama | G01 | residential | 2043 | G0100010 | ng | 271637.6192 | 4502661.889 | |
| 10 | Autauga | Alabama | G01 | residential | 2042 | G0100010 | ng | 273596.1299 | 4506826.152 | |
| 11 | Autauga | Alabama | G01 | residential | 2041 | G0100010 | ng | 275635.3318 | 4517083.652 | |
| 12 | Autauga | Alabama | G01 | residential | 2040 | G0100010 | ng | 277537.0087 | 4535889.654 | |
| 13 | Autauga | Alabama | G01 | residential | 2039 | G0100010 | ng | 279523.4611 | 4545314.454 | |
| 14 | Autauga | Alabama | G01 | residential | 2038 | G0100010 | ng | 281658.7369 | 4564642.928 | |
| 15 | Autauga | Alabama | G01 | residential | 2037 | G0100010 | ng | 283695.3878 | 4589159.175 | |
| 16 | Autauga | Alabama | G01 | residential | 2036 | G0100010 | ng | 285893.3869 | 4596093.496 | |
| 17 | Autauga | Alabama | G01 | residential | 2035 | G0100010 | ng | 288327.7135 | 4607597.325 | |

***Step 5. Stationary – Entry sheet (Figure 9). Residential, commercial, and industrial natural gas consumption data from the "Consumption MMBtu" column can be pulled in here. The modules require fuel consumption to be in units of thousands of cubic feet (mcf), so the SLOPE values need to be converted from millions of British thermal units (MMBtu) (see Table 3).***

**Figure 9. Natural Gas Consumption Data Entry in the Stationary - Entry Sheet**




***Step 6. Electricity Use – Entry sheet (Figure 10). Residential, commercial, and industrial electricity consumption data from the "Consumption MMBtu" column can be pulled in here. The modules require electricity consumption to be in units of kilowatt hours (kWh), so the SLOPE values need to be converted from MMBtu (see Table 3 and Equation 1 for an example calculation).***

**Equation 1. Conversion of MMBtu natural gas to thousand cubic feet (mcf)**

$$1{,}000\ MMBtu\ natural\ gas\ x\ (0.9643) = 964.3\ mcf$$

**Figure 10. Electricity Consumption Data Entry in the Electricity Use - Entry Sheet**

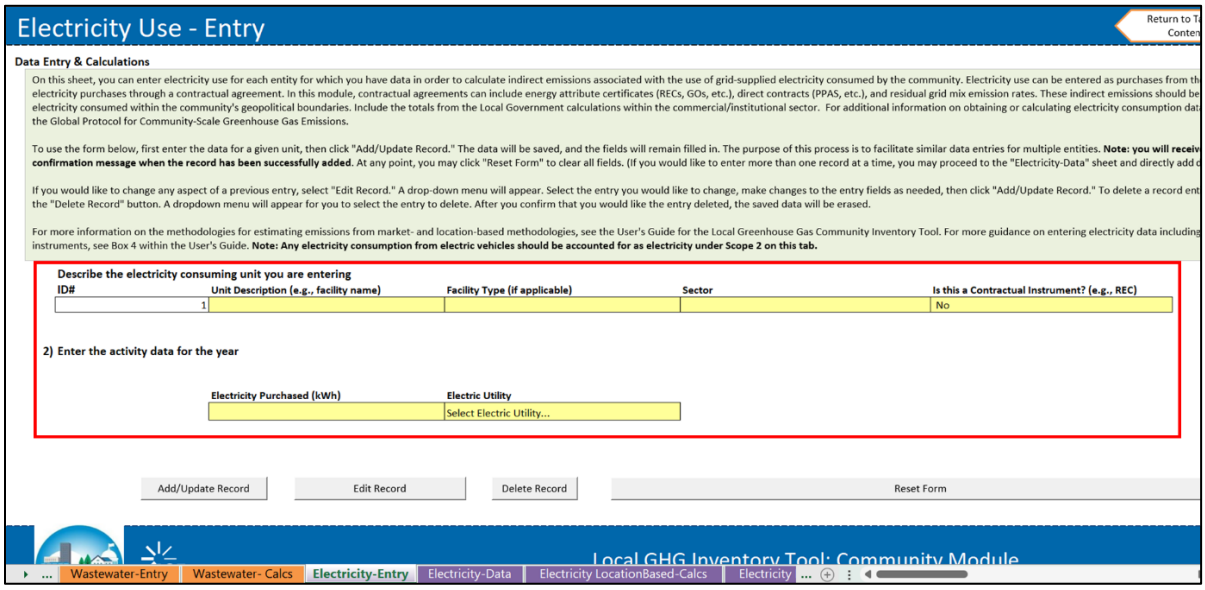



**Table 3. Energy Consumption Conversion Factors**

| Energy Source | SLOPE Units | Community Module Units | Conversion Factor |
|---|---|---|---|
| Natural Gas Consumption | MMBtu | mcf | 0.9643 mcf/1 MMBtu |
| Electricity Consumption | MMBtu | kWh | 293.07 kWh/1 MMBtu |