**FOSSIL FUEL COMBUSTION – RESIDENTIAL – KEROSENE**

## *a. Source Category Description*

Residential kerosene combustion is kerosene that is burned in residential housing. Common uses of energy associated with this sector include space heating, water heating, cooking, and running a wide variety of other equipment.

The general approach to calculating emissions for this SCC is to take State kerosene consumption from the EIA and allocate it to the county level using methods described below. County-level kerosene consumption is multiplied by the emission factors to calculate emissions.

For this source category, the following SCC was assigned:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SCC** | **Descriptor 1** | **Descriptor 3** | **Descriptor 6** | **Descriptor 8** |
| 2104011000 | Stationary Source Fuel Combustion | Residential | Kerosene | Total: All Combustor Types |

## *b. Activity Data*

The volume of kerosene consumed by residential combustion in the U.S. was used to estimate emissions. Kerosene consumption by energy use sector is presented in State Energy Data 2009 Consumption tables published by the Energy Information Administration (EIA).1 Year 2009 consumption data were used as a surrogate for 2011 emissions because year 2009 data were the latest data available when this inventory was prepared.

State-level kerosene consumption was allocated to each county using the US Census Bureau’s 2000 Census Detailed Housing Information.2 These data include the number of housing units using a specific type of fuel for residential heating. State kerosene consumption was allocated to each county using the ratio of the number of houses burning kerosene in each county to the total number of houses burning kerosene in the State.

## *c. Control Factors*

No control measures are assumed for this category.

## *d. Emission Factors*

Emission factors for distillate oil were used for kerosene, but the distillate oil emission factors were multiplied by a factor of 135/140 to convert them for this use. This factor is based on the ratio of the heat content of kerosene (135,000 Btu/gallon) to the heat content of distillate oil (140,000 Btu/gallon).3 Criteria pollutant emission factors are from AP-42 (see Table 1). 4 Dioxin/furan and HAP emission factors are from “Documentation of Emissions Estimation methods for Year 2000 and 2001 Mobile Source and Nonpoint Source Dioxin Inventories”5 and “Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants,”6 respectively. Distillate sulfur content (0.30%) was used for kerosene as well.7

## *e. Sample Calculations*

Emissions are calculated for each county using emission factors and activity as:

E*x,p* = FC*x* × EF*x,p*

where:

E*x,p* = annual emissions for fuel type x and pollutant p,

FC*x* = annual fuel consumption for fuel type x,

EF*x,p* = emission factor for fuel type x and pollutant p,

And FC*x* = AState x (Hcounty / HState)

where:

AState = State activity data from EIA

HCounty = number of houses in the county using kerosene as the primary heating fuel

HState = number of houses in the state using kerosene as the primary heating fuel

**Example:**

Using Allegheny County, PA as an example:

The State of Pennsylvania had a reported use of 685.1 thousand barrels of kerosene in the residential sector in 2009. Allegheny County, PA had 8,123 houses out of the state total of 1,217,155 that used kerosene as the primary heating fuel. This equates to a share of 0.67% of the kerosene used for residential heating in the state. From Table 1, CO Emission factor is 202.5 lb/thousand barrels.

ECO = 685.1 thousand barrels × (8,123 houses / 1,217,155 houses)

× 202.5 lb/thousand barrels

= 925.9 lbs CO or 0.46 tons CO

## *f. References*

1. U.S. Department of Energy, Energy Information Administration (EIA). [State Energy Data 2009 Consumption](https://www.eia.gov/state/seds/). Washington, DC 2012. Accessed June 2019.

2. U.S. Census Bureau. "[Table H40. House Heating Fuel Type](https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t)", Census 2000: Summary File 3, accessed June 2019.

3. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, 5th Edition, AP-42, Volume I: Stationary Point and Area Sources. Research Triangle Park, North Carolina. 1996.

4. U.S. Environmental Protection Agency. Emission Factor and Inventory Group. [Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion](https://www.epa.gov/air-emissions-inventories). Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002, accessed June 2019.

5. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. “Documentation of Emissions Estimation methods for Year 2000 and 2001 Mobile Source and Nonpoint Source Dioxin Inventories.” Prepared by E.H. Pechan & Associates, Inc., Durham, NC. May 2003.

6. U.S. Environmental Protection Agency, Emission Factors and Inventory Group. “Documentation for the 1999 Base Year Nonpoint Area Source National Emission Inventory for Hazardous Air Pollutants.” Prepared by Eastern Research Group, Inc. Morrisville, NC. September 2002.

7. U.S. Environmental Protection Agency. Emission Factor and Inventory Group. [Final Summary of the Development and Results of a Methodology for Calculating Area Source Emissions from Residential Fuel Combustion](https://www.epa.gov/air-emissions-inventories). Prepared by Pacific Environmental Services, Inc. Research Triangle Park, NC. September 2002, June 2019.

**Table 1. National Emission Factors for Residential Kerosene Combustion**

| Pollutant Code | Pollutant Code Description | Factor Numeric Value | Factor Unit Numerator | Factor Unit Denominator |
| --- | --- | --- | --- | --- |
| 120127 | ANTHRACENE | 4.9495E-05 | LB | E3BBL |
| 129000 | PYRENE | 0.00017067 | LB | E3BBL |
| 1746016 | 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN | 1.887E-08 | LB | E3BBL |
| 191242 | BENZO[G,H,I,]PERYLENE | 9.1025E-05 | LB | E3BBL |
| 193395 | INDENO[1,2,3-C,D]PYRENE | 8.5336E-05 | LB | E3BBL |
| 206440 | FLUORANTHENE | 0.00019912 | LB | E3BBL |
| 208968 | ACENAPHTHYLENE | 1.024E-05 | LB | E3BBL |
| 218019 | CHRYSENE | 9.6714E-05 | LB | E3BBL |
| 3268879 | OCTACHLORODIBENZO-P-DIOXIN | 2.2239E-08 | LB | E3BBL |
| 39001020 | OCTACHLORODIBENZOFURAN | 1.0109E-08 | LB | E3BBL |
| 50000 | FORMALDEHYDE | 1.3653684 | LB | E3BBL |
| 51207319 | 2,3,7,8-TETRACHLORODIBENZOFURAN | 1.7859E-08 | LB | E3BBL |
| 53703 | DIBENZO[A,H]ANTHRACENE | 6.8268E-05 | LB | E3BBL |
| 56553 | BENZ[A]ANTHRACENE | 0.00016498 | LB | E3BBL |
| 71432 | BENZENE | 0.00853355 | LB | E3BBL |
| 7439921 | LEAD | 0.05120132 | LB | E3BBL |
| 7439965 | MANGANESE | 0.03413421 | LB | E3BBL |
| 7439976 | MERCURY | 0.01706711 | LB | E3BBL |
| 7440020 | NICKEL | 0.01706711 | LB | E3BBL |
| 7440382 | ARSENIC | 0.02275614 | LB | E3BBL |
| 7440417 | BERYLLIUM | 0.01706711 | LB | E3BBL |
| 7440439 | CADMIUM | 0.01706711 | LB | E3BBL |
| 16065831 | Chromium III | 0.013995026 | LB | E3BBL |
| 18540299 | Chromium (VI) | 0.003072079 | LB | E3BBL |
| 75070 | ACETALDEHYDE | 0.19911623 | LB | E3BBL |
| 7782492 | SELENIUM | 0.08533553 | LB | E3BBL |
| 83329 | ACENAPHTHENE | 0.00085336 | LB | E3BBL |
| 85018 | PHENANTHRENE | 0.00042668 | LB | E3BBL |
| 86737 | FLUORENE | 0.00018205 | LB | E3BBL |
| 91203 | NAPHTHALENE | 0.04608118 | LB | E3BBL |
| NH3 | AMMONIA | 40.5 | LB | E3BBL |
| CO | CARBON MONOXIDE | 202.5 | LB | E3BBL |
| NOX | NITROGEN OXIDES | 729 | LB | E3BBL |
| PM10-PRI | PRIMARY PM10 (INCLUDES FILTERABLES + CONDENSIBLES) | 96.39 | LB | E3BBL |
| PM25-PRI | PRIMARY PM2.5 (INCLUDES FILTERABLES + CONDENSIBLES) | 86.265 | LB | E3BBL |
| PM10-FIL | PRIMARY PM10, FILTERABLE PORTION ONLY | 43.74 | LB | E3BBL |
| PM25-FIL | PRIMARY PM2.5, FILTERABLE PORTION ONLY | 33.615 | LB | E3BBL |
| PM-CON | PRIMARY PM CONDENSIBLE PORTION ONLY (ALL LESS THAN 1 MICRON) | 52.65 | LB | E3BBL |
| SO2 | SULFUR DIOXIDE | 1,725.3 | LB | E3BBL |
| VOC | VOLATILE ORGANIC COMPOUNDS | 28.35 | LB | E3BBL |