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Energy

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2. Energy

The energy sector includes state-level emissions estimates from the following source categories consistent with the national-level *GHGIA*:

- Fossil fuel combustion (FFC): emissions associated with fuel use, including combustion and non-energy use (NEU) of fuels
  - Fossil fuel combustion
  - Carbon emitted from non-energy use of fossil fuels
  - Geothermal
  - Incineration of waste
  - International bunker fuels
  - Wood biomass and biofuels consumption
- Fugitive emissions, mainly from fuel production
  - Coal mining
  - Abandoned underground coal mines
  - Petroleum and natural gas systems
  - Abandoned oil and gas wells

More information on national-level energy sector emissions and methods is available in Chapter 3 of the latest national-level *GHGIA*.

Methodology

Table 2-1 summarizes the different approaches used to estimate state-level energy emissions. Overall, the specific methods used to develop state-level estimates for 1990–2024 are the same as EPA (2024a), and any relevant updates are described under "Additional Information". For users seeking a comprehensive technical understanding of the compilation of *GHGIA by State* emission and sink estimates, this methodology report is best read in conjunction with the corresponding sections of the three references provided in Table 2-2. The *GHGIA by State* emission and sink estimates are compiled to be consistent with the latest national-level *GHGIA* data and largely apply and extend methodologies and data previously published by EPA at the national and state levels. Methodological detail is only included in this document for new sources not included in EPA (2024a). Unless otherwise noted, readers should refer to EPA (2024a) for detailed descriptions of disaggregation methodologies. Where previously published methods remain unchanged, CGS summarizes the disaggregation approaches rather than repeating information from the latest national-level inventory report or the previous state-level methodology report. Recalculations at the national-level *GHGIA* (2026) that affect state-level estimates are discussed in the national-level *GHGIA* Chapter 3. Geographic completeness is consistent with the national-level *GHGIA* and is summarized in Annex 2 by sector and source.

Table 2-1: Methodology Summary for State-Level Energy Sector GHG Emission Estimates

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Fossil fuel combustion (FFC)					
Fossil Fuel Combustion (FFC) (*GHGIA* Section 3.1)	CO_2 CH_4 N_2O	For most fuels and sectors, state-level emissions are estimated by allocating national emission estimates to states using the same method as the national-level *GHGIA* (2026). For some fuels and sectors (e.g., fuel use adjustments in the industrial sector due to emissions being accounted for as part of IPPU), proxy data is used to allocate national totals (e.g., IPPU data on total emissions by state).	Yes	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024a). Revisions to the time series are due to use of updated data. Recalculations also reflect updates at the national level. See the *GHGIA* Section 3.1 for more details.	Includes activity data and information on how data was proxied across states. Appendix A: National 2024 FFC CO_2, State FFC CO_2 (Table A-1), FFC CO_2 Residential (Tables A-2 to A-8), FFC CO_2 Commercial (Tables A-9 to A-18), FFC CO_2 Industrial (Tables A-19 to A-47), FFC CO_2 Transportation (Tables A-48 to A-51), FFC CO_2 Electricity (Tables A-52 to A-58), Stationary non-CO_2 (Tables A-89 to A-104), Mobile non-CO_2 (Tables A-105 to A-116), Ag Stationary (Tables A-130 to A-133), Ag Mobile (Table A-134) & Ag CO_2 (Table A-135) Tabs
NEUs of fossil fuels (*GHGIA* Section 3.2)	CO_2	State-level emissions are estimated by allocating national emission estimates to states using proxy approaches (e.g., non-energy use of petrochemical feedstock emissions is allocated to states based on petrochemical production emissions by state from IPPU).	Yes	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024a). Revisions to the time series are due to use of updated data. Recalculations also reflect updates at the national level. See the *GHGIA* Section 3.2 for more details.	Includes activity data and information on how data was proxied across states. Appendix A: National 2024 NEU CO_2, NEU (Tables A-59 to A-77) and NEU Adj (Tables A-82 to A-88)-Tabs

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Geothermal (*GHGIA* Section 3.1)	CO_2	State-level emissions are estimated by allocating national-level *GHGIA* emission estimates to states using geothermal production by state as proxy data.	No	N/A	N/A
Incineration of waste (*GHGIA* Section 3.3)	CO_2 CH_4 N_2O	State-level emissions are estimated by allocating national-level *GHGIA* emission estimates to states using a combination of proxy approaches across the time series. **1990–2010:** State-level emissions are estimated by allocating national emission estimates to states using total MSW combusted in each state as proxy data. **2011–2024:** State-level emissions are estimated by allocating national emission estimates to states using the same method as the national-level *GHGIA*.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024a). Updates were made to use EIA data in 2024 instead of GHGRP data at both the national and state level. See the *GHGIA* Section 3.3 for more details.	Includes activity data and information on how data was proxied across states. Appendix A: Waste Incineration (Table A-117) Tab

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
CO_2 transport, injection, and geological storage (*GHGIA* Section 3.9)	CO_2	State-level emissions are estimated by allocating national-level *GHGIA* emission estimates to states using the same method as the national-level *GHGIA*.	Yes	New source first added in EPA (2025a). The data used matches the national-level *GHGIA* approach, proxied for 2024. See the *GHGIA* Section 3.9 for more details.	N/A
International bunker fuels (IBFs) (memo item) (*GHGIA* Section 3.10)	CO_2 CH_4 N_2O	State-level emissions are estimated by allocating national-level *GHGIA* emission estimates to states using proxy data (e.g., total jet fuel used per state is used to allocate jet fuel bunkers).	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024a). Updates were made only to proxy jet fuel bunker data for 2024. See the *GHGIA* Section 3.10 for more details.	Includes activity data and information on how data was proxied across states. Appendix A: IBF (Tables A-78 to A-81) Tab
Wood biomass and biofuels consumption (memo item) (*GHGIA* Section 3.11)	CO_2	State-level emissions are estimated by allocating national-level *GHGIA* emission estimates to states using proxy data (e.g., total gasoline used per state is used to allocate ethanol use).	Yes	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024a). Revisions were made to the time series based on updated proxy data used. Recalculations also reflect updates at the national level. See the *GHGIA* Section 3.11 for more details.	Includes activity data and information on how data was proxied across states. Appendix A: Biomass CO_2 (Tables A-118 to A-129) Tab

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Fugitive Emissions					
Coal mining (*GHGIA* Section 3.4)	CH_4	State-level emissions are estimated by allocating national-level *GHGIA* emission estimates to states using the same method as the national *GHGIA*.	Yes	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024a). Revisions were made to the time series based on updated data used. Recalculations also reflect updates at the national level. See the *GHGIA* Section 3.4 for more details.	N/A
Abandoned underground coal mines (*GHGIA* Section 3.5)	CH_4	State-level emissions are estimated by allocating national-level *GHGIA* emission estimates to states using a combination of approaches across the time series. **1990–2019:** State-level emissions are estimated by allocating national emission estimates to states using relevant proxy data. **2020–2024:** State-level emissions are estimated by allocating national emission estimates to states using the same method as the national-level *GHGIA*.	No	N/A	See Appendix B (Tables B-1 through B-4) from EPA (2024a) for 1990–2019 data.

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Petroleum and natural gas systems (*GHGIA* Sections 3.6 & 3.7)	CO_2 CH_4 N_2O	**1990–2023:** State-level emissions are estimated by allocating national-level *GHGIA* emission estimates to states using proxy data (e.g., total gas production, transmission pipeline miles). Where basin-level approaches are used in the *GHGIA*, those approaches are also applied here. Refinery emissions are based on GHGRP locations. **2024:** For each segment, the total national emissions were multiplied by the average fraction of total national emissions in that state for years 2022 and 2023.	No	The disaggregation method and estimates for 1990–2023 remain unchanged.	See Appendix B Energy Sector Fugitive Estimates from EPA (2025a), Tables B-5 to B-12 for 1990–2023 data.
Abandoned Oil and Gas Wells (*GHGIA* Section 3.8)	CO_2 CH_4	**1990–2023:** Same approach as national-level *GHGIA*. **2024:** For oil and for gas, the total national emissions were multiplied by the average fraction of total national emissions in that state for years 2022 and 2023.	No	The disaggregation method and estimates for 1990–2023 remain unchanged.	See Appendix B - Energy Sector Fugitive Estimates from EPA (2025a), Table B-13 Annual State-Level Abandoned O&G Well Count Estimates (1990–2023).

Table 2-2: Key References for Data Users

Geographic Scope	Report	Publication Source	Publication Date	What to Read
State	Methodology Report Inventory of U.S. Greenhouse Gas Emissions and Sinks by State: 1990–2022	EPA (2024a)	September 2024	Chapter 1 (Introduction) and Chapter 2 (Energy) sector/source-level "Background", "Methods/ Approach" and "Uncertainty"
National	Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990–2023	EPA (2025b)	May 2025 (FOIA Release)	Chapter 3 (Energy) source category-level upfront discussion and "Methodology and Time-Series Consistency" and "Uncertainty" sections, as appropriate
National	Greenhouse Gas Inventory and Analysis for the United States: 1990–2024 (*GHGIA*)	CGS (Desai et al., 2026)	April 2026	Chapter 3 (Energy) source category-level "Methods" "Recalculation," and "Uncertainty" sections as appropriate, and "Future Areas for Improvement"

Methodology for newly added sources

Starting with 1990–2023 data, state-level emissions for CO_2 Transport, Injection, and Geological Storage were added as a new source. The data used matches the national-level *GHGIA* approach, which relies on data from the EPA GHGRP (EPA, 2024b, 2024c). The GHGRP data is at the state level, so the allocation approach uses the same data as the national estimates. For 2024, since GHGRP data was not available at the time estimates were developed, the 2024 values were proxied to 2023 levels. See the *GHGIA* Section 3.9 for more details.

Comparison to national totals

Quality control procedures were implemented to review changes to the time series and confirm that energy source estimates sum to national estimates. Issues identified during these checks were addressed, and errors were corrected (e.g., computational formula errors, transcription errors, etc.).

The state-level energy source calculations resulted in GHG estimates that generally add up to the total estimates in the national-level *GHGIA*, with small differences occurring at the more disaggregated sector level. The differences are due to the vintage of the different data sources used. The national-level *GHGIA* was based on the February 2026 Monthly Energy Review (MER) (EIA, 2026a), while the state-level values were based on the June 2026 State Energy Data System (SEDS) (EIA, 2026b). The SEDS uses updated information on the sector allocation of some fuels (mostly lubricants and liquefied petroleum gas (LPG), as shown in Figure 2-1, which will be reflected in the next national-level *GHGIA* report. There is also a slight difference in total emissions. The percentage differences in the 2024

sector totals are small: a 0.5% difference in the residential sector and -0.2% in the industrial sector. The percentage difference in total emissions is also very minor, a 0.0004% difference.

There are some small differences in the NEU-calculated state-level emissions totals compared with what is reported in the national-level *GHGIA*. As with FFC, these differences represent a very small percentage of total NEU emissions (the maximum percentage difference over time is around 0.015% of total NEU emissions).



Figure 2-1: Sectoral Differences in Select Fuels

Future areas of improvement

Areas for improving the energy sector state-level estimates are the same as those presented in Section 3.1 of the national-level *GHGIA* (Desai et al., 2026). Additional improvements to reduce uncertainty and provide additional detail consistent with the national-level *GHGIA* are outlined below:

- The approach used to allocate bunker fuels by state based on the total amount of jet fuel used by state could potentially lead to an overestimation or underestimation of bunker fuel emissions for some states. Therefore, CGS will look into better ways to allocate jet fuel bunker data across states, such as flight-level data on departures and destinations.
- The national-level *GHGIA* distributes electricity emissions across end-use sectors to present results with electricity distributed by sector. That calculation was not done at the state level. The national-level *GHGIA* also breaks out transportation sector emissions by vehicle type; that calculation was also not done at the state level. CGS will look into reporting these disaggregated data in future state-level reports.

References

The references listed below only include new references used for compiling and updating the current *GHGIA by State*. Full citations for all references relevant to compiling national-level Energy estimates are found at the end of Chapter 3 (Energy) of the national-level *GHGIA* (2026) and its Annexes 5.1 through 5.11. The national-level *GHGIA* is available online at https://ghgi.cgs.umd.edu/.

General Energy

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