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Industrial Processes and Product Use (IPPU)

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3. Industrial Processes and Product Use

The IPPU sector state-level emissions estimates include the following sources consistent with the national-level *GHGIA:*

- Minerals
  - Cement production
  - Lime production
  - Glass production
  - Other process uses of carbonates
- Chemicals
  - Ammonia production
  - Urea consumption for non-agricultural purposes
  - Nitric acid production
  - Adipic acid production
  - Caprolactam, glyoxal, and glyoxylic acid production
  - Carbide production and consumption
  - Titanium dioxide production
  - Soda ash production
  - Petrochemical production
  - HCFC-22 production
  - Production of fluorochemicals other than HCFC-22
  - Non-EOR carbon dioxide utilization
  - Phosphoric acid production
- Metals
  - Iron and steel production and metallurgical coke production
  - Ferroalloy production
  - Aluminum production
  - Magnesium production
  - Lead production
  - Zinc production
- Product use
  - Electronics industry
  - Substitution of ozone depleting substances
  - Electrical equipment

- SF_6 and PFCs from other product use
- Nitrous oxide from product uses

More information on national-level IPPU sector emissions and methods is available in Chapter 4 of the latest national-level *GHGIA*.

Methodology

Table 3-1 summarizes the different approaches used to estimate state-level IPPU sector emissions and completeness across states. The disaggregation approaches applied in developing the 1990–2024 state-level estimates are generally the same as EPA (2024), 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 3-2. 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 (2024). Unless otherwise noted, readers should refer to EPA (2024) 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* that affect state-level estimates are discussed in the national-level *GHGIA* Chapter 4. Geographic completeness is consistent with the national-level *GHGIA* and is summarized in Annex 2 by sector and source.

Table 3-1: Methodology Summary for State-Level IPPU Sector GHG Emission Estimates

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Minerals					
Cement production (*GHGIA* Section 4.1.1)	CO_2	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National clinker production was apportioned evenly on an annual basis among individual states to estimate GHG emissions. **2010–2024:** GHGRP emissions by state were used to apportion clinker production over individual states to estimate their GHG emissions based on 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 (2024).	C-1: USGS Clinker Production (000 short tons 1990–1992, 000 metric tons 1993–2009) C-2: Emissions Data by State from GHGRP (2010–2024), CEMS normalized (metric tons)
Lime production (*GHGIA* Section 4.1.2)	CO_2	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates were apportioned to each state based on the estimated number of facilities for 1990–2009.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	C-3: 1990 - 2009 Estimated Facility Count, used to develop 1990 - 2009 Estimated State Percentage C-4: 2010 - 2024 GHGRP CO_2 emissions data (metric tons), used to develop 2010 - 2024 Estimated State Percentage

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		2010–2024: GHGRP emissions data reported by state were used to directly estimate each state's CO_2 emissions from lime production.			C-5; 1990 - 2009 Count of Facilities where CO_2 Recovered used to calculate % of States where CO_2 Recovered C-6: 2010 - 2024 Estimate of State CO_2 Recovered used to calculate % of States where CO_2 Recovered
Glass production (*GHGIA* Section 4.1.3)	CO_2	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates were apportioned to each state based on the estimated number of facilities. **2010–2024:** GHGRP emissions data reported by state were used to apportion each state's CO_2 emissions from glass production.	Yes	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024). Revisions to the time series are due to updated Annual Average Glass Production Index for historical series at the national level (see Recalculations discussion in national-level *GHGIA* section 4.1.3). The state facility count was updated for 2024.	C-7: 1990 - 2009 Facility Count, used to develop 1990 - 2009 Estimated State Percentage C-8: 2010 - 2024 GHGRP CO_2 emissions data (metric tons), used to develop 2010 - 2024 Estimated state Percentage

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Other process uses of carbonates (*GHGIA* Section 4.1.4)	CO_2	Facility-level consumption of magnesite for non-metallurgical magnesia production is used to develop state estimates. For all other categories, total national-level *GHGIA* emissions are allocated to all applicable U.S. states and territories using state-level consumption of limestone and dolomite for other uses of carbonates, state-level consumption of clay for ceramics production, and state population as a proxy for other uses of soda ash, due to limitations in availability of state-specific data.	Yes	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024). Revisions to the time series are due to updated state-level population data (see references to this chapter).	C-9: 1990 - 2024 - Limestone Consumption Data from USGS Mineral Yearbooks C-10: 1990 - 2024 - Limestone Consumption With Estimated Values for Missing/Withheld Data C-11: 1990 - 2024 - Dolomite Consumption Data from USGS Mineral Yearbooks C-12: 1990 - 2024 - Dolomite Consumption With Estimated Values for Missing/Withheld Data C-13: 1990 - 2024 - Ceramics Production from USGS Mineral Yearbooks C-14 1990 - 2024 - Non-Metallurgical Magnesia Production from USGS Mineral Yearbooks
Non-EOR carbon dioxide utilization (previously named CO_2 Consumption) (*GHGIA* Section 4.2.12)	CO_2	National-level *GHGIA* emission estimates were allocated to states using U.S. population statistics as a proxy for CO_2 utilization data.	Yes	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024). Revisions to the time series are due to updated state-level population data (see references to this chapter).	

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Chemicals					
Ammonia production (*GHGIA* Section 4.2.1)	CO_2	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates were apportioned to each state based on ammonia production capacity by state and year. **2010–2024:** GHGRP emissions data by state were used as a surrogate for ammonia production data by state to apportion national emissions to each state.	No	No changes were made to the disaggregation methods, and the approach used is consistent with that used in EPA (2024).	D-1: 1990 - 2009 Estimated Capacity (thousand short tons per year of ammonia), used to develop 1990 - 2009 Estimated State Percentage D-2; 2010 - 2024 GHGRP CO_2 emissions data (metric tons), used to develop 2010 - 2024 Estimated State Percentage
Urea consumption for nonagricultural purposes (*GHGIA* Section 4.2.2)	CO_2	National-level *GHGIA* emissions were apportioned to each state using state population as a proxy for urea consumption for nonagricultural purposes.	Yes	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024). Revisions to the time series are due to incorporation of a new data source to adjust for agricultural uses of urea consistent with Chapter 5 – Agriculture and updated state-level population data (see references to this chapter).	N/A

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Nitric acid production (*GHGIA* Section 4.2.3)	N_2O	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates were apportioned to each state based on nitric acid production capacity by state and year. **2010–2024:** GHGRP emissions data by state were used as a surrogate for nitric acid production data by state to apportion national emissions to each state.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024). The facility count was updated for 2024.	D-3: 1990 - 2009 Estimated Capacity (tons/day), used to develop 1990 - 2009 Estimated State Percentage D-4; 2010 - 2024 GHGRP CO_2 emissions data (metric tons CO_2e), used to develop 2010 - 2024 Estimated Emissions by State
Adipic acid production (*GHGIA* Section 4.2.4)	N_2O	National-level *GHGIA* emissions estimates were apportioned to each state based on facility-level GHGRP process emissions reported by the four U.S. adipic acid facilities (located in Florida, Texas, and Virginia).	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	D-5: 1990 - 2024 GHGRP emissions data (Tg N_2O)

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Caprolactam, glyoxal and glyoxylic acid production (*GHGIA* Section 4.2.5)	N_2O	National-level *GHGIA* emission estimates were apportioned to each state based on caprolactam production capacity by state and year. Emissions from glyoxal and glyoxylic acid production are not currently estimated because of a lack of publicly available data.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	D-6: 1990 - 2024 Estimated Capacity, used to develop 1990 - 2024 Estimated State Percentage
Carbide production and consumption (*GHGIA* Section 4.2.6)	CO_2 CH_4	State-level emissions were estimated using a combination of approaches. Production: National-level *GHGIA* SiC production data were evenly distributed between Illinois and Kentucky, the two states identified as home to SiC production facilities. Consumption: National-level *GHGIA* SiC consumption emissions were apportioned to all states using state population as a proxy for SiC consumption data.	Yes	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024). Revisions of the time series are due to updated production and consumption data for 2022 and 2023 and updated state-level population data (see references to this chapter).	D-7: Data for Disaggregating Silicon Carbide Production Emissions
Titanium dioxide production (*GHGIA* Section 4.2.7)	CO_2	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	D-8: 1990 - 2009 Estimated Capacity (metric tons), used to develop 1990 - 2009 Estimated State Percentage

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		were apportioned to each state based on facility production capacity. **2010–2024:** GHGRP emissions data by state were used as a surrogate for TiO2 production data by state to apportion national-level *GHGIA* emissions to each state.		There were no changes to the 1990–2023 time series.	D-9: 2010 - 2024 GHGRP CO_2 emissions data (metric tons), used to develop 2010 - 2024 Estimated State Percentage
Soda ash production (*GHGIA* Section 4.2.8)	CO_2	All national-level *GHGIA* emissions were attributed to Wyoming for the entirety of the 1990–2024 time series, because Wyoming is the only state with emissive (trona ore-based) soda ash production; the non-emissive processes used in California and Colorado do not generate emissions.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024). There were no changes to the 1990–2023 time series.	D-10: U.S. Emissions from Soda Ash Production, from GHGI: 1990–2019 (Million Metric tons CO_2 Eq.)
Petrochemical production (*GHGIA* Section 4.2.9)	CO_2 CH_4	National-level *GHGIA* emissions estimates were apportioned to each state based on facility-level production capacity for acrylonitrile, carbon black, ethylene, ethylene dichloride, ethylene oxide, and methanol production. The emission factor used to calculate CO_2 emissions for methanol production in 1990–2014 is based on the	Yes	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024). Revisions of the time series are due to an updated data source for petrochemical production and the use of a new implied	D-11: Acrylonitrile production capacity per State per year (kmt) D-12: Carbon Black production capacity per State per year (kmt) D-13: Ethylene production capacity per State per year (kmt) D-14: Ethylene Dichloride production capacity per State per year (kmt)

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		production rate reported by the American Chemistry Council (ACC) in 2015–2024 rather than the total production reported to the GHGRP in those years.		emission factor. The ethylene production capacity for expansion was updated at one facility for RY 2017.	D-15: Ethylene Oxide production capacity per State per year (kmt) D-16: Methanol production capacity per State per year (kmt)
HCFC-22 production (*GHGIA* Section 4.2.10)	HFC-23	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** Facility-specific information on emissions-control efforts and production capacities, combined with facility-specific GHGRP data for 2010, were used to estimate emissions by state. **2010–2024:** Facility-specific GHGRP data on HFC-23 emissions were compiled by state.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	
Production of fluorochemicals other than HCFC-22 (*GHGIA* Section 4.2.11)	HFCs PFCs SF_6 NF_3	State-level emissions were estimated using a combination of approaches across the time series. For a set of 17 facilities, facility-specific estimates were compiled directly by state across the full-time series. For the remaining facilities (five for 1990–2010; five to seven for 2011–2023),	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		the combined national estimate for that group was divided evenly and allocated to each state where those facilities were located.			
Phosphoric acid production (*GHGIA* Section 4.2.13)	CO_2	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates were apportioned to each state based on facility production capacity by state. **2010–2024:** GHGRP process emissions data by state were used as a surrogate for phosphoric acid production data by state to apportion national emissions to each state.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	D-17: 2010 - 2024 GHGRP CO_2 emissions data (metric tons) - FL/NC Rock Type, used to develop 2010–2019 Estimated State Percentage D-18: 2010 - 2024 GHGRP CO_2 emissions data (metric tons) - ID/UT Rock Type, used to develop 2010–2019 Estimated State Percentage D-19: 2010 - 2024 GHGRP CO_2 emissions data (metric tons) - Import Rock Type, used to develop 2010–2019 Estimated State Percentage D-20: 1990 - 2009 Phosphoric Plant Capacity (10^3 ton/year) - FL/NC Rock Type, used to develop 1990–2009 Estimated State Percentage D-21: 1990 - 2009 Phosphoric Plant Capacity (10^3 ton/year) - ID/UT Rock Type, used to develop 1990–2009 Estimated State Percentage

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
					D-22: 1990 - 2009 Phosphoric Plant Capacity (10^3 ton/year) - Import Rock Type, used to develop 1990–2009 Estimated State Percentage
Metal Production					
I&S production and metallurgical Coke Production (*GHGIA* Section 4.3.1)	CO_2 CH_4	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates were apportioned to each state based on a combination of state-level coking coal consumption data and U.S. Census manufacturing data as a proxy for iron and steel production activity. **2010–2024:** National-level *GHGIA* emissions estimates were apportioned for steel, sinter, iron, pellet, and other activities using GHGRP process emissions data by state.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024). The raw steel production capacity was updated for 2024.	H-1: 1990 - 2024 Coke Sales from EIA (Tbtu), used to develop 1990 - 2024 Estimated State Percentage H-2: BOF Data used to develop Estimated State Percentage H-3: EAF Data used to develop Estimated State Percentage H-4: Data, used to develop Estimated State Percentage for "Other" Categories

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Ferroalloys production (*GHGIA* Section 4.3.2)	CO_2 CH_4	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates were apportioned to each state based on the known ferroalloy production facility locations in each state, with any remaining national emissions not attributable to known facilities allocated evenly across the remaining known facilities. **2010–2024:** GHGRP facility process emissions data were used to apportion national emissions to each state, with any remaining national emissions not attributable to known facilities allocated evenly across the remaining known facilities.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	H-5: Emissions by Facility (kt CO_2) H-6: Emissions by Facility (kt CH_4)
Aluminum production (*GHGIA* Section 4.3.3)	CO_2 PFCs	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates were apportioned to each state based on each state's smelter capacity as a share of total U.S. capacity.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	N/A

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		2010–2024: Facility-specific GHGRP process emissions data were used to apportion national emissions to each state.			
Magnesium Production and Processing (*GHGIA* Section 4.3.4)	CO_2 SF_6 HFCs	State-level emissions were estimated using a combination of approaches across the time series. **1990–1998:** National-level *GHGIA* emissions estimates were apportioned to each state based on a single year (1999) of state- and process-level emissions shares. **1999–2010:** Company- and facility-specific cover gas emissions reported through the SF_6 Emission Reduction Partnership for the Magnesium Industry (SF_6 and HFCs) and USGS Minerals Yearbook (CO_2) were used to apportion national emissions to each state. **2011–2024:** Facility-specific GHGRP emissions data were used to apportion national emissions to each state, with emissions from non-reporting processes and facilities allocated proportionally to states with reported emissions.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	N/A

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		2023–2024: National-level *GHGIA* emissions were allocated to states based on reported emissions data from GHGRP and scaling factors by state and gas based on 2022 data.			
Lead Production (*GHGIA* Section 4.3.5)	CO_2	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates were apportioned to each state based on the estimated number and location of primary and secondary lead production facilities. **2010–2024:** GHGRP emissions data by state were used as a surrogate for lead production data by state to apportion national-level *GHGIA* emissions to each state.	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	H-7: 1990 - 2009 Estimated Primary Facility Count, used to develop 1990 - 2009 Estimated State Percentage by Type H-8: 1990 - 2009 Estimated Secondary Facility Count, used to develop 1990 - 2009 Estimated State Percentage by Type H-9: - 2024 GHGRP CO_2 emissions data (metric tons), used to develop 2010 - 2020 Estimated State Percentage
Zinc Production (*GHGIA* Section 4.3.6)	CO_2	State-level emissions were estimated using a combination of approaches across the time series. **1990–2009:** National-level *GHGIA* emissions estimates were apportioned to each	No	No changes were made to the disaggregation methods, and the approach is consistent with that used in EPA (2024).	H-10: 1990 - 2009 Estimated Electrothermic Furnace Unit Count, used to develop 1990 - 2009 Estimated State Percentage by Unit Type H-11: 1990 - 2009 Estimated Waelz Kiln Unit Count, used

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		state based on the number of facilities and production processes present in each state. **2010–2024:** GHGRP emissions data were used to apportion national-level *GHGIA* emissions to each state.			develop 1990 - 2009 Estimated State Percentage by Unit Type H-12: 1990 - 2009 Estimated Other Furnace Unit Count, used to develop 1990 - 2009 Estimated State Percentage by Unit Type H-13: 1990 - 2009 Estimated Flame Reactor Unit Count, used to develop 1990 - 2009 Estimated State Percentage by Unit Type H-14: 2010 - 2024 GHGRP CO_2 emissions data (metric tons), used to develop 2010 - 2024 Estimated State Percentage
Product Use					
Electronics industry (*GHGIA* Section 4.4)	N_2O NF_3 SF_6 HFCs PFCs	State-level emissions were estimated using a combination of approaches across the time series. *Semiconductor Manufacturing and MEMS:* **1990–2007:** National-level *GHGIA* emissions for semiconductor manufacturing were allocated to states based on the 2008 proportion of emissions. Emissions from	Yes	No changes were made to the disaggregation methods for 1990–2022, and the approach is consistent with that used in EPA (2024). Revisions to 2023 are attributable to the modification in disaggregation approach used for 2023 and 2024.	N/A

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		MEMs between 1991 and 2010 were interpolated between 1991 emissions and 2011 emissions by state. **2008–2010:** Emissions were allocated to states based on the breakdown of TMLA by state applied to national estimates. **2011–2014:** National-level *GHGIA* emissions were allocated based on GHGRP facility locations for reporters. For non-reporters, emissions were allocated based on World Fab Forecast data and the proportion of estimated emissions for non-reporters. For 2013 and 2014, a scaling factor of 0.017% was used for time-series consistency. **2015–2022:** National-level *GHGIA* emissions were allocated to states based on GHGRP facility locations for reporters. For non-reporters, emissions were allocated based on data from the World Fab Forecast dataset and respective emission factors by gas.			

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		2023–2024: National-level *GHGIA* emissions were allocated to states based on the distribution of emissions in 2022. *Heat Transfer Fluids:* **1990–1999:** Emissions did not occur. **2000–2010:** National-level *GHGIA* emissions were allocated to states based on the breakdown of TMLA by state applied to national estimates. **2011–2022:** National-level *GHGIA* emissions were allocated to states based on facility location for GHGRP reporters and based on the percentage of non-reporters in the national inventory. **2023–2024:** National-level *GHGIA* emissions were allocated to states based on the distribution of emissions in 2022. *Photovoltaics:* **1998–2010:** National-level *GHGIA* emissions were allocated to states based on facility manufacturing capacity and interpolated			

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		for years in which capacity data was unavailable. **2011–2022:** National-level *GHGIA* emissions were allocated to states based on a combination of state-level manufacturing capacity and reported facility data. **2023–2024:** National-level *GHGIA* emissions were allocated to states based on the distribution of emissions in 2022.			
Substitution of ozone-depleting substances (*GHGIA* Section 4.5)	HFCs PFCs CO_2	State-level emissions were estimated using a combination of approaches across the time series. **1990–2008:** National-level *GHGIA* emissions were allocated to states based on a combination of Census population data and a 2008 ratio of regional HFC emissions from NOAA derived from atmospheric measurements at sites across the United States. **2009–2023:** National-level *GHGIA* emissions were allocated to states based on a combination of Census population data and regional HFC emission estimates from NOAA derived from	No	No changes were made to the disaggregation methods for 1990–2023, and the approach is consistent with that used in EPA (2024).	

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		atmospheric measurements at sites across the United States. **2024:** National-level *GHGIA* emissions were allocated to states based on Census population data.			
Electrical Equipment (*GHGIA* Section 4.6.1)	SF_6	State-level emissions were estimated using a combination of approaches across the time series. **1990–2010:** National-level *GHGIA* emissions were allocated to states based on the proportion of transmission miles by state using Homeland Infrastructure Foundation-Level Data. **2011–2022:** National-level *GHGIA* emissions were allocated to states based on a combination of facility-reported emissions and the proportion of transmission miles by state for reporters. For non-reporters, emissions were estimated based on the proportion of transmission miles by state using HIFLD data. Emissions for California were obtained from CARB's GHG emissions inventory for 2011–2021.	No	No changes were made to the disaggregation methods for 1990–2022, and the approach is consistent with that used in EPA (2024).	N/A

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
		2023–2024: National-level *GHGIA* emissions were allocated to states based on the distribution of emissions in 2022.			
SF_6 and PFCs from other product use (*GHGIA* Section 4.6.2)	SF_6 PFCs	State-level emissions were estimated using a combination of approaches across the time series. **1990–2022:** National-level *GHGIA* emissions were allocated to states based on DOD and DOE data and assumptions regarding the facilities at which these emissions occur. **2023–2024:** National-level *GHGIA* emissions were allocated to states based on the distribution of emissions in 2022 for military applications and particle accelerators, and from 2016 for other scientific applications (the last year with significant emissions from this source).	No	No changes were made to the disaggregation methods for 1990–2022, and the approach is consistent with that used in EPA (2024).	N/A

Category	Gas	Disaggregation Approach	Changes to 1990–2023 estimates from previously published EPA GHGI by State	Additional Information	Data Appendices
Nitrous oxide from product uses (*GHGIA* Section 4.6.3)	N_2O	National-level *GHGIA* emissions estimates were apportioned to each state using state population as a proxy for state-specific N_2O usage.	Yes	No changes were made to the disaggregation methods for 1990–2022, and the approach is consistent with that used in EPA (2024). Revisions to the time series are due to updated state-level population data (see references to this chapter).	I-1: N_2O Product Usage and Emission Factor by End-Use

Table 3-2: 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 (2024)	September 2024	Chapter 1 (Introduction) and Chapter 3 (IPPU) sector/ source-level "Background", "Methods/Approach" and "Uncertainty"
National	Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990–2023	EPA (2025c)	May 2025 (FOIA Release)	Chapter 4 (IPPU) 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*)	Center for Global Sustainability (Desai et al., 2026)	April 2026	Chapter 4 (Industrial Process and Product Use) source category-level "Methodology and Time Series Consistency," "Recalculation," and "Uncertainty" sections as appropriate, and "Future Areas for Improvement"

Methodology for newly added sources

No new sources were added to the IPPU sector for this current report.

Comparison to national totals

The sum of state totals aligns with the national-level *GHGIA*. Quality control procedures were implemented to review changes to the time series and confirm that IPPU 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.).

Future areas of improvement

Areas for improving the IPPU sector state-level estimates are the same as those presented in Section 4.1 of the national-level *GHGIA* (Desai et al., 2026), including improvement of geographic completeness, given that many state-level IPPU category estimates utilize the same methodological approach as the national-level *GHGIA*. Some state-level planned improvements for IPPU include:

- Identifying state-specific data that could allow application of the same methods applied at the national level.
- Identifying other types of proxy data for more significant sources that have stronger correlation to emissions where state-specific data is unavailable to apply the same method applied at the national level.
- Improving time series consistency where hybrid approaches have been applied.

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 IPPU estimates are found at the end of Chapter 4 (IPPU) of the national-level *GHGIA* (2026). The national-level *GHGIA* is available online at https://ghgi.cgs.umd.edu/.

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