2024 Iowa Statewide Greenhouse Gas Emissions Inventory Report

Required by Iowa Code 455B.104

December 23, 2025

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Background

This report is required by Iowa Code 455B.104, which requires the Iowa Department of Natural Resources (DNR) to estimate greenhouse gas (GHG) emissions during the previous year and forecast trends in emissions. The report must be submitted to the Governor and Iowa General Assembly by December 31 each year and is beneficial because it provides an opportunity to evaluate Iowa-specific GHG emissions trends, is more detailed and more accurate than national efforts, and can be used to establish a baseline for tracking emissions reductions progress in Iowa. This report focuses on calendar year 2024 GHG emissions and includes emissions of six GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFC), hydrofluorocarbons (HFC), and sulfur hexafluoride (SF_6).

The emissions are based on statewide activity data from the following sectors:

- agriculture
- fossil fuel combustion
- industrial processes
- natural gas transmission and distribution
- transportation
- solid waste
- wastewater treatment
- land use, land use change, and forestry (LULUCF)

Emissions were calculated using the U.S. Environmental Protection Agency's (EPA) State Inventory Tool (SIT) and self-reported emissions data from landfills, industrial facilities, and power plants. The calculation method and uncertainty for each sector are discussed in depth in the DNR's Technical Support document (TSD), available on the DNR's Greenhouse Gas Emissions webpage.

The DNR previously used the global warming potentials (GWPs) from the Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report (AR4) to estimate emissions through emissions year 2022. Beginning with 2023 emissions, DNR used the GWPs from the IPCC's Fifth Assessment Report (AR5). All values in this report were updated in last year's report to the AR5 GWPs and may not match values previously published. The GWP values used are shown in Table 1.

Table 1: Global Warming Potentials

Pollutant	GWPs used by DNR until 2022	GWPs used by DNR in this report
Carbon Dioxide (CO_2)	1	1
Methane (CH_4)	25	28
Nitrous Oxide (N_2O)	298	265
Sulfur Hexafluoride (SF_6)	22,600	23,500
Hydrofluorocarbons (HFC)	Varies by pollutant – For a complete list, refer to DNR's Greenhouse Gas Emissions Estimation Guidance.	Varies by pollutant – For a complete list, refer to DNR's Greenhouse Gas Emissions Estimation Guidance.
Perfluorocarbons (PFC)		

2024 Statewide GHG Emissions

In 2024, total gross Iowa greenhouse gas emissions were 121.17 million metric tons carbon dioxide equivalent ($MMtCO_2e$) as shown in Table 2 and Figure 1. This is a decrease of 2.80 $MMtCO_2e$ (-2.26%) from 2023 and a decrease of 6.32% from 2015. The 2.80 $MMtCO_2e$ decrease in emissions is largely attributed to the following combination of reductions and partially offsetting increases:

- A 3.63 $MMtCO_2e$ decrease in emissions from residential, commercial and industrial fossil fuel combustion,
- A 0.85 $MMtCO_2e$ decrease in emissions from power plants, due to decreased generation of electricity from coal and natural gas,
- A 0.41 $MMtCO_2e$ increase in emissions from mobile combustion due to an increase in vehicle miles traveled,
- A 1.26 $MMtCO_2e$ increase in emissions from agriculture due to an increase in bushels of grain produced.
- A 0.11 $MMtCO_2e$ increase in emission from industrial processes due to increases in emissions from multiple manufacturing sectors.

Emissions fluctuations from other sectors were smaller in magnitude, as shown in Figure 2, and differed by 0.02 $MMtCO_2e$ or less per sector from 2023.

Table 2: GHG Emissions 2015 – 2024 by Sector (Million Metric Tons Carbon Dioxide Equivalents ($MMtCO_2e$))[1]

Emissions ($MMtCO_2e$)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Change from 2023		
											$MMtCO_2e$	%	Trend
Agriculture	38.89	39.31	40.32	36.59	36.05	35.70	36.60	36.20	36.20	37.45	1.26	3.48%	↑
Power Plants	29.45	25.32	26.61	30.86	24.56	17.07	24.26	20.70	20.21	19.35	-0.85	-4.23%	↓
Residential, Commercial, and Industrial Fuel Use	31.56	29.48	32.08	32.10	37.09	36.76	33.86	32.11	33.25	29.63	-3.63	-10.91%	↓
Industrial Processes	5.46	5.56	7.37	7.38	7.29	7.38	7.03	7.46	7.37	7.47	0.11	1.46%	↑
Natural Gas Transmission and Distribution	1.57	1.58	1.58	1.58	1.59	1.59	1.65	1.66	1.66	1.66	0.00	0.09%	↑
Transportation	20.09	20.20	20.42	19.99	20.35	18.80	20.71	22.70	22.85	23.26	0.41	1.79%	↑
Waste	2.31	2.34	2.33	2.33	2.33	2.23	2.14	2.25	2.32	2.34	0.02	0.65%	↑
Total Gross Emissions	**129.34**	**123.79**	**130.71**	**130.82**	**129.26**	**119.53**	**126.25**	**123.08**	**123.86**	**121.17**	**-2.69**	**-2.17%**	↓
Carbon Stored in LULUCF[2]	-13.17	-11.15	-11.00	-11.61	-11.55	-9.44	-10.02	-10.24	-10.10	-10.18	-0.08	0.78%	↑
Total Net Emissions	**116.17**	**112.63**	**119.71**	**119.21**	**117.71**	**110.08**	**116.24**	**112.84**	**113.76**	**110.99**	**-2.77**	**-2.43%**	↓

[1] Totals may not equal the exact sum of subtotals in this table due to independent rounding. Values may not match values in the previous inventory published by the DNR in December 2024. Any adjustments are described in detail in the Technical Support Document.

[2] Carbon stored by the LULUCF sector is shown as a negative number.

Figure 1: Iowa Gross GHG Emissions 2015 – 2024 ($MMtCO_2e$)

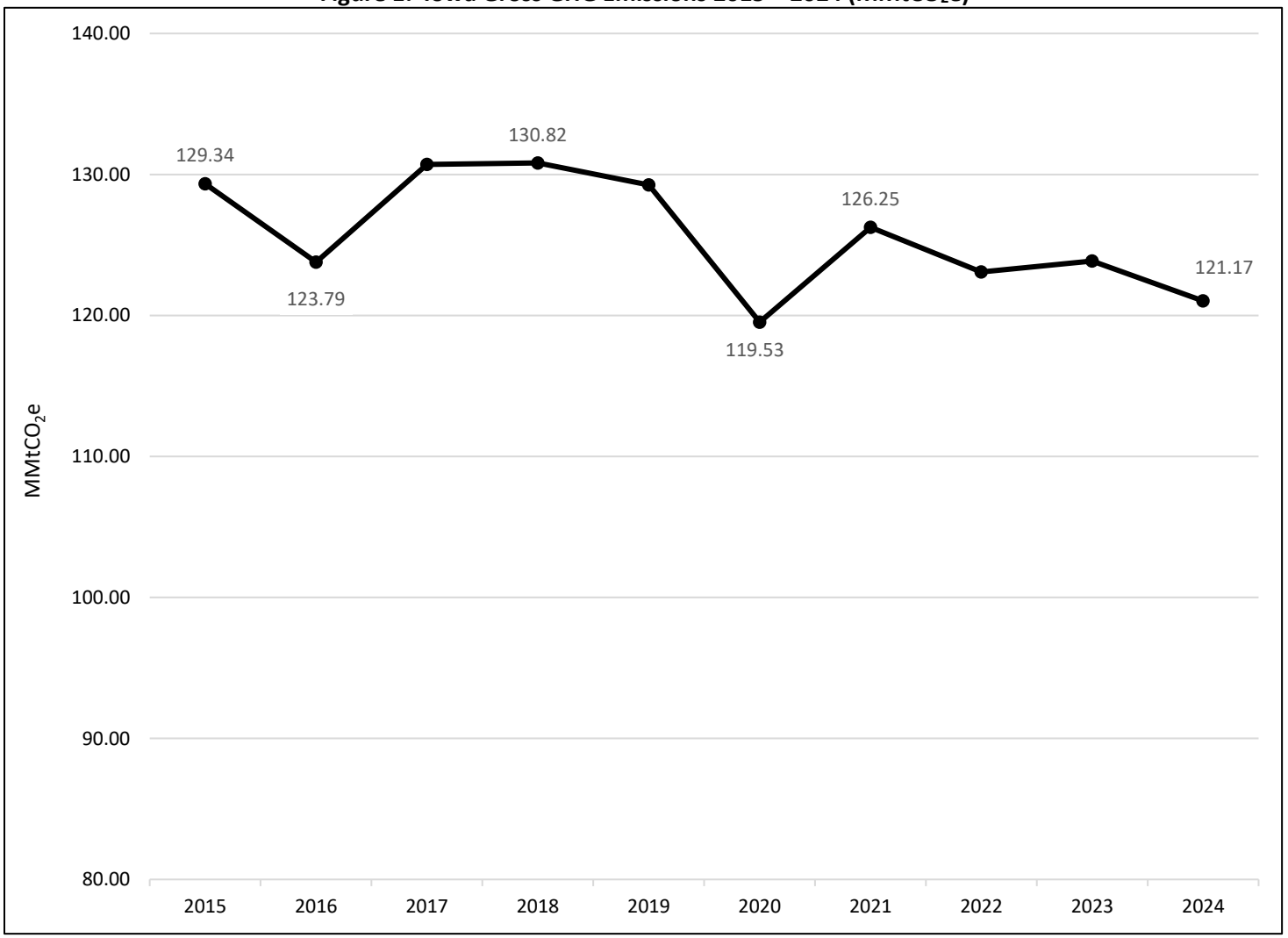
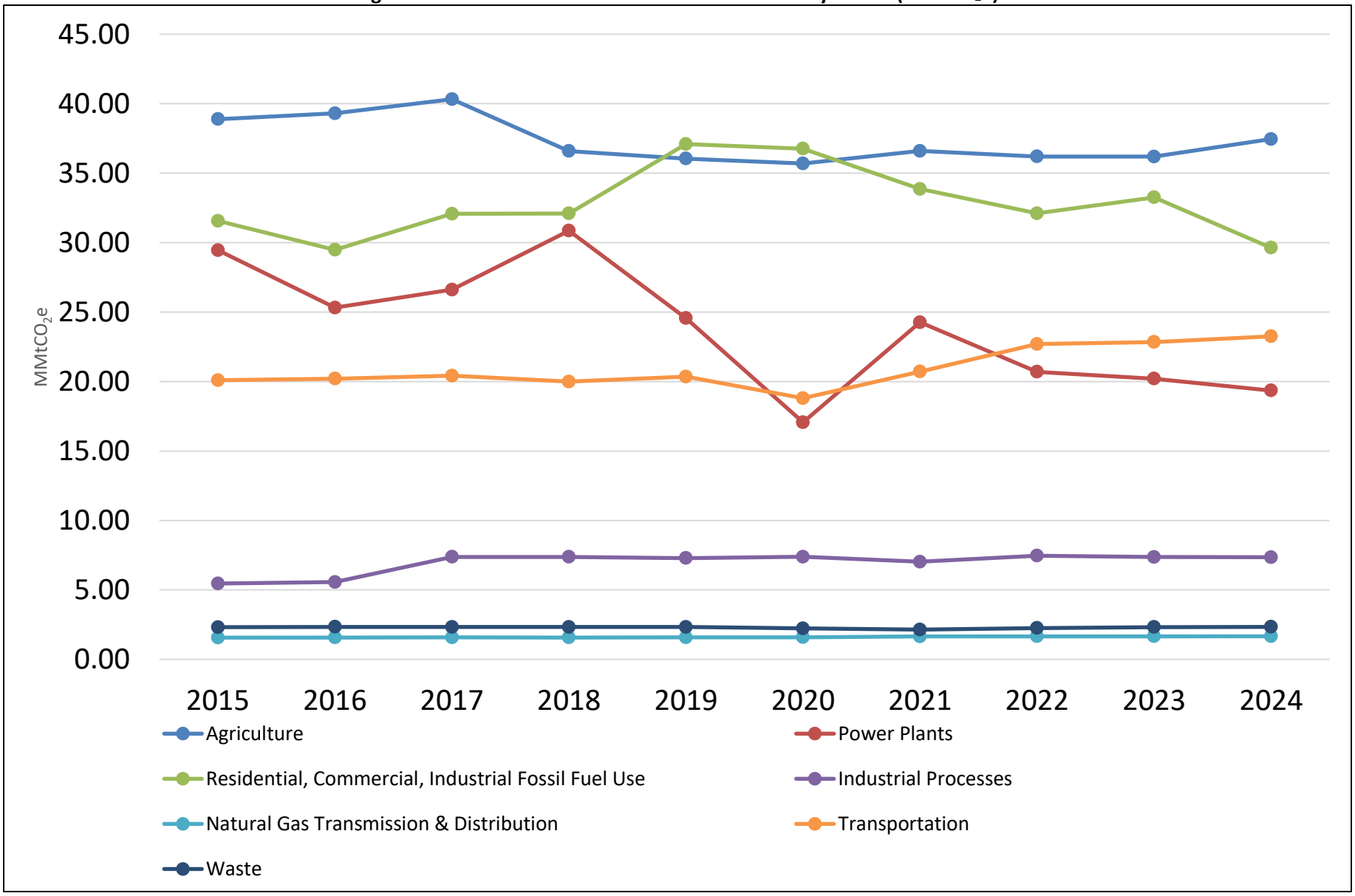


Figure 2: Iowa Gross[3] GHG Emissions 2015 – 2024 by Sector ($MMtCO_2e$)

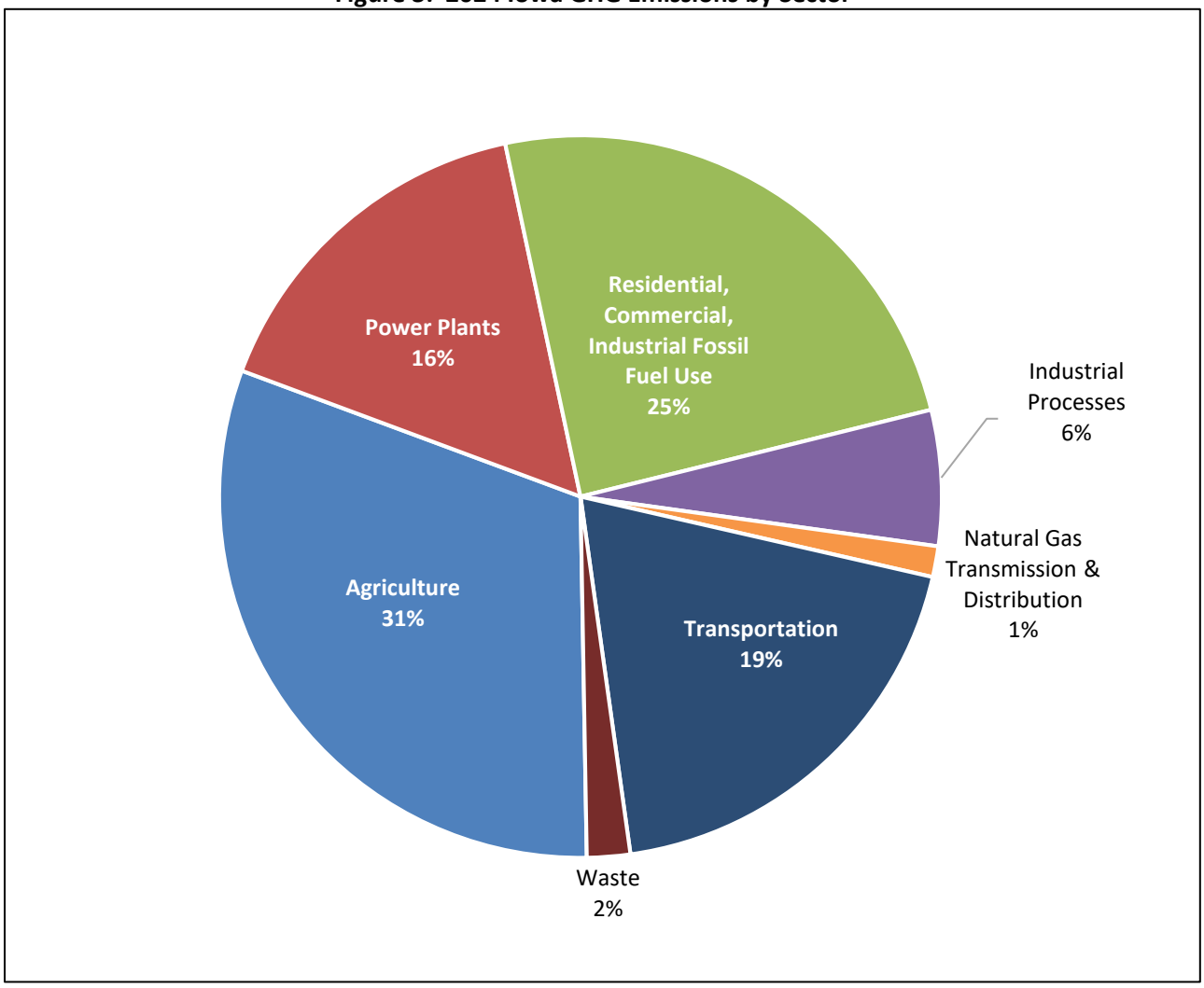


[3] Does not include carbon storage from land use, land use change, and forestry (LULUCF).

GHG Emissions by Sector

The majority of GHG emissions in Iowa in 2024 were from the agriculture sector (31%), followed by emissions from the residential/commercial/industrial (RCI) sector (25%), transportation (19%), and fossil fuel use by power plants (16%) as shown in Figure 3. The emissions from these, and other sectors, are summarized below and are ordered as presented in the TSD. Please refer to the 2024 GHG Inventory Technical Support Document for more information on a specific sector, such as sources of input data, calculations, and uncertainty.

Figure 3: 2024 Iowa GHG Emissions by Sector[4,5]



Agriculture

This sector includes GHG emissions from livestock and crop production, such as enteric fermentation, manure management, and agricultural soils. Enteric fermentation includes emissions from the digestive systems of ruminant animals. Emissions from agricultural soils include emissions from manure, runoff, plant fertilizers, plant

[4] Industrial fossil fuel use refers to GHG emissions from fossil fuels combusted by industrial facilities. Industrial processes mean GHGs emitted during the production of or use of specific products such as ammonia, urea, nitrogen, cement, iron, steel, lime, etc.

[5] Does not include Land Use, Land Use Change, and Forestry (LULUCF). LULUCF sequestered carbon in 2024.

residues, and cultivation of highly organic soils. GHG emissions from fossil-fuel fired agricultural equipment (such as tractors) are included in the transportation sector. As shown in Table 3, total agriculture emissions increased by 1.15 $MMtCO_2e$ between 2023 and 2024.

Emissions from enteric fermentation and ag soil management exhibited the largest percentage change. The number of cattle in Iowa have the largest influence on enteric fermentation emissions, and in 2024 the number of cattle increased 2.29%. The amount of grain produced has the largest influence on ag soil management and in 2024 the bushels of corn and soybeans produced increased by 1.14% and 4.29%, respectively. Total manure management emissions decreased by 0.87%.

Table 3: GHG Emissions from Agriculture ($MMtCO_2e$)[6]

Category	2023	2024	% Change
Enteric Fermentation	9.03	9.00	-0.30%
Manure Management	9.13	9.24	1.26%
Agricultural Soil Management	18.14	19.21	5.87%
Total	**36.30**	**37.45**	**3.17%**

Fossil Fuel Combustion

This sector includes GHG emissions from fossil fuels combusted in four categories: power plants, residential, commercial, and industrial (the residential, commercial, and industrial categories combine into one category called RCI). Together, these four categories account for 40.42% of Iowa's total GHG emissions. Table 4 shows a decrease of 10.91% in emissions from RCI and a decrease of 4.23% in power plant emissions between 2023 and 2024.

Table 4: GHG Emissions from Fossil Fuel Combustion ($MMtCO_2e$)

Category	2023	2024	% Change
Residential, Commercial, Industrial (RCI)	33.25	29.63	-10.91%
Residential	5.12	5.05	-1.27%
Commercial	4.19	4.13	**-1.50%**
Industrial	23.95	20.45	-14.61%
Power Plants	20.21	19.35	-4.23%
Total	**53.46**	**48.98**	**-8.38%**

Residential, Commercial, and Industrial (RCI)

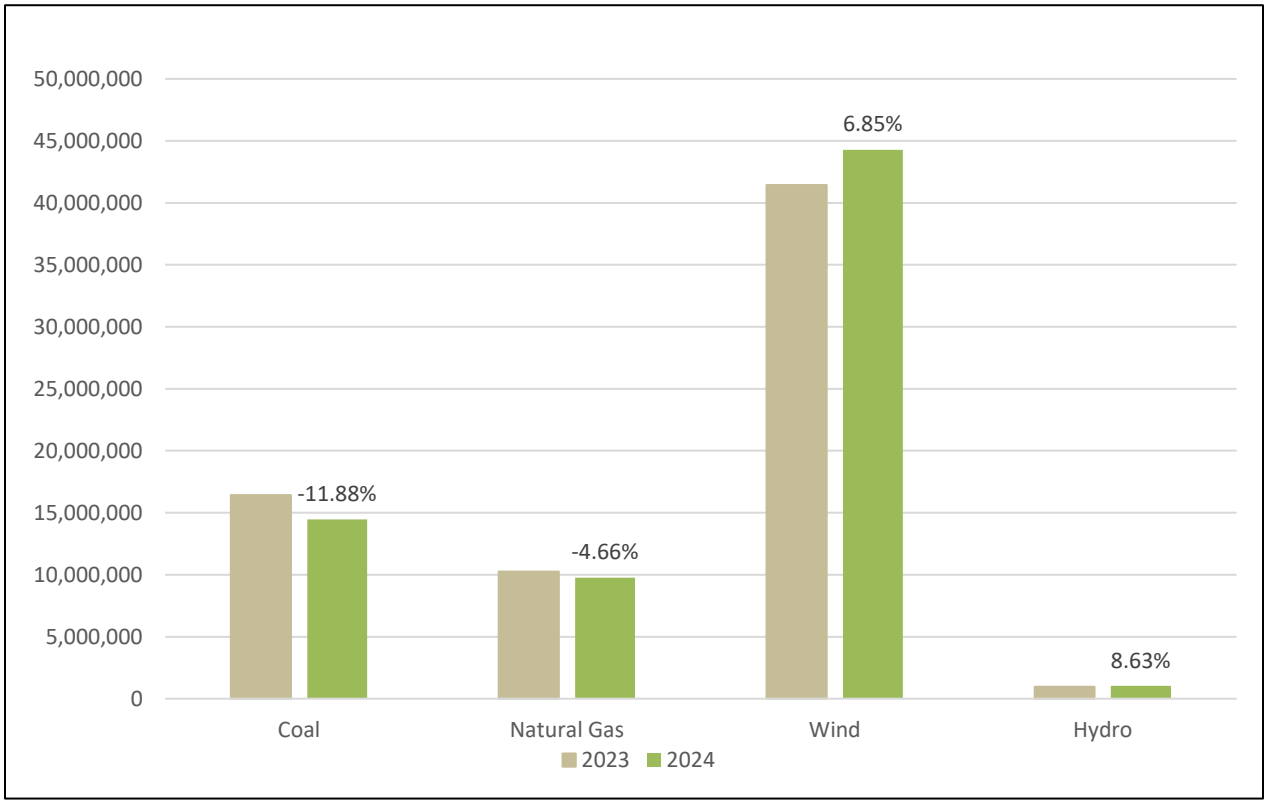
Actual fuel use data for 2024 for the RCI sector was not available from the U.S. Energy Information Administration (EIA), so emissions were calculated based on projected energy consumption values from the EIA's *Annual Energy Outlook 2025 with Projections to 2050.*[7] Emissions predicted for 2023 from the RCI sector in last year's inventory (34.59 $MMtCO_2e$) were replaced with actual 2023 consumption values now available from EIA. The resulting recalculated 2023 emissions were 33.25 $MMtCO_2e$.

[7] U.S. EIA, Annual Energy Outlook 2025 with Projections to 2050, April 15, 2025.

Power Plants

This category includes emissions from fossil fuels that are combusted at power plants to generate electricity. The DNR used CO_2 emissions reported by power plants to EPA as required by the federal Acid Rain Program (40 CFR Part 75). Continuous emission monitoring systems (CEMS) measure the CO_2 emissions from these facilities. Emissions from power plants decreased 0.85 $MMtCO_2e$ (-4.23%) from the previous year. As shown in Figure 4, from 2023 to 2024 electricity generation from wind increased by 6.85%; electricity generated by wind does not contribute to GHG emissions. Electricity generated from coal decreased by 11.88% from 2023 to 2024, and electricity generated from natural gas decreased by 4.66%.

Figure 4: 2023 and 2024 Net Iowa Electric Generation by Energy Source (Million Megawatt Hours)[8]



Industrial Processes

This sector includes non-combustion GHG emissions from a variety of processes including cement production, lime manufacturing, limestone and dolomite use, soda ash use, iron and steel production, ammonia production, nitric acid production, substitutes for ozone depleting substances (ODS), and electric power transmission and distribution. GHG emission trends in each process category vary, but overall total industrial process emissions increased 1.46% from 2023 to 2024, as shown in Table 5. GHG emissions reported by industrial facilities to EPA as required by the federal GHG reporting program were used for these categories: ammonia and urea production, cement manufacturing, iron and steel production, lime manufacturing, and nitric acid production. Emissions from the other categories were calculated using EPA's SIT.

[8] U.S. EIA, Net Generation by State by Type of Producer by Energy Source, November 24, 2025.

Table 5: GHG Emissions from Industrial Processes ($MMtCO_2e$)

Category	2023	2024	% Change
Ammonia and Urea Production	3.20	3.29	2.74%
Cement Manufacturing	1.28	1.30	1.43%
Electric Power Transmission & Distribution Systems	0.07	0.07	NA[9]
Iron and Steel Production	0.12	0.13	5.31%
Lime Manufacturing	0.11	0.08	-29.46%
Limestone and Dolomite Use	0.31	0.31	NA[9]
Nitric Acid Production	0.76	0.79	3.52%
Ozone Depleting Substances Substitutes	1.49	1.49	NA[9]
Semiconductor Manufacturing	0.0007	0.0007	NA[9, 10]
Soda Ash Consumption	0.02	0.02	NA[9]
Total	**7.37**	**7.47**	**1.46%**

Natural Gas Transmission and Distribution (T & D)

This sector includes emissions from natural gas transmission and distribution systems in the state. GHG emissions increased 0.09% from 2023 as shown in Table 6, mainly due to an increase in Iowa's number natural gas service connections.

Table 6: GHG Emissions from Natural Gas Transmission and Distribution ($MMtCO_2e$)[10]

Category	2023	2024	% Change
Transmission	0.9437	0.9423	-0.15%
Distribution	0.7184	0.7213	0.41%
Total	**1.6622**	**1.6636**	**0.09%**

Transportation

The transportation sector includes GHG emissions from both highway and non-highway vehicles. Non-highway vehicles include aviation, boats, locomotives, tractors, other utility vehicles, and alternative fuel vehicles. Emissions from highway vehicles are calculated based on vehicle miles traveled, while emissions from non-highway vehicles are calculated based on fuel consumption.

DNR recalculated 2023 emissions from the transportation sector with updated gasoline fuel activity data from the FHWA. For the vehicles that operate using distillate fuel, DNR continued to use 2020 or 2021 as a proxy for fuel usage in 2022, 2023 and 2024 because updated fuel usage was not available. The estimated emissions for 2023 increased by 0.15 $MMTCO_2e$ to 22.85 $MMTCO_2e$.

Total vehicle miles traveled by Iowans increased 2.29% between 2023 and 2024, which contributed to the overall 1.79% increase in transportation GHG emissions shown in Table 7.

[9] Due to lack of current data, the DNR assumed 2024 emissions are equal to 2023 emissions.

[10] DNR generally uses two decimal places throughout this report for consistency. However, in this sector four decimal places are needed to show the difference in emissions from year to year.

Table 7: GHG Emissions from Transportation ($MMtCO_2e$)

Category	2023	2024	% Change
Gasoline Highway	12.96	13.41	3.50%
Diesel Highway	5.15	5.11	-0.75%
Non-Highway	4.67	4.67	0.00%
Alternative Fuel Vehicles	0.01	0.01	0.00%
Total	**22.85**	**23.26**	**1.79%**

Waste

The waste sector includes GHG emissions from both solid waste landfills and the treatment of municipal and industrial wastewater. DNR used facility-specific emissions data calculated by facilities to report to EPA by both solid waste landfills and industrial wastewater facilities. EPA's LandGEM model was used to estimate emissions from smaller landfills that did not calculate their emissions. Additionally, DNR used 2023 emissions as a proxy for 2024 emissions for some facilities that reported to EPA in 2023 but for which the data was not publicly available.

Overall, GHG emissions from waste increased 0.65% from 2023 as shown in Table 8. Regarding solid waste emissions, it is important to note that the relationship between emissions and the cumulative amount of waste stored in landfills in not linear. Emissions vary as the decomposition rate of the waste fluctuates according to the amount of waste in the landfill and the length of time the waste is in the landfill. Also, the quantity of CH_4 that is recovered and used as renewable natural gas or flared changes from year to year.

Table 8: GHG Emissions from Waste ($MMtCO_2e$)

Category	2023	2024	% Change
Solid Waste	1.94	1.96	1.02%
Wastewater	0.38	0.38	-1.22%
Total	**2.32**	**2.34**	**0.65%**

Land Use, Land Use Change, and Forestry (LULUCF)

The LULUCF sector includes emissions from liming agricultural soils and fertilizing lawns, golf courses, and other landscaping (settlement soils). It also includes carbon sequestered by forests and urban trees, carbon stored in yard trimmings and food scraps sent to landfills, and agricultural soil carbon flux.

DNR recalculated 2023 LULUCF emissions due to changes in the data source EPA used to calculate agricultural soil carbon flux. 2023 LULUCF emissions were updated from sequestering 8.15 $MMTCO_2e$ to sequestering 10.10 $MMTCO_2e$.

Overall, 10.18 $MMtCO_2e$ of carbon was stored in the LULUCF sector in 2024, as shown in Table 9. This is a 0.78% increase in the amount of CO_2e being stored compared to 2023. This is attributed to a decrease in emissions from liming of agricultural soils partially offset by an increase in emissions from settlement soils.

Table 9: GHG Emissions by LULUCF ($MMtCO_2e$)

Category	2023	2024	% Change
Forest Carbon Flux	-4.60	-4.60	NA[11]
Liming of Agricultural Soils	0.65	0.53	-17.88%
Urea Fertilization	0.14	0.15	0.34%
Urban Trees	-0.42	-0.42	N/A[12]
Yard Trimmings & Food Scraps in Landfills	-0.11	-0.11	0.42%
Fertilization of Settlement Soils	0.42	0.46	9.73%
Agricultural Soil Carbon Flux	-6.19	-6.19	NA[13]
Total	**-10.10**	**-10.18**	**-0.78%**

GHG Emissions by Pollutant

The GHGs included in the inventory are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFC), hydrofluorocarbons (HFC), and sulfur hexafluoride (SF_6). Table 10 shows the distribution of GHGs by pollutant in Iowa while Figures 5-8 show the distribution by both pollutant and by category.

Carbon dioxide is the greenhouse gas emitted in the highest amounts in Iowa, accounting for 63.19% of gross greenhouse gas emissions in 2024. Nearly all CO_2 emissions are from stationary fossil fuel combustion (at power plants and in the RCI sector) and transportation as shown in Figure 5, with a small percentage coming from industrial processes such as the production of cement, lime, ammonia, urea, iron and steel, as well as the use of limestone, dolomite, and soda ash in manufacturing.

Methane and nitrous oxide were emitted in smaller amounts, and the majority of these two pollutants are from agriculture as shown in Figures 6 and 7. Methane emissions were 21.38 $MMtCO_2e$ or 17.58% of total 2024 GHG emissions. Nitrous oxide emissions in 2024 were 21.83 $MMtCO_2e$ or 17.95% of total GHG emissions.

Emissions of HFCs, PFCs and SF_6 are accounted for in sub-sectors of the Industrial Processes sector as shown in Figure 8. They are emitted either from substitutes for ODS or from insulation (SF_6) in electric power transmission and distribution systems. In 2024, emissions of these three pollutants totaled 1.56 $MMtCO_2e$, or 1.28% of Iowa's 2024 total GHG emissions.

[11] For forest carbon flux, the DNR assumed 2022-2024 values equal 2021 values due to a lack of more current data.

[12] For urban trees, DNR assumes 2022-2024 are equal to 2021 due to a lack of more current data.

[13] For agricultural soil carbon flux, DNR assumes 2023 and 2024 are equal to 2022 due to a lack of more current data.

Table 10: 2024 Gross GHG Emissions by Pollutant ($MMtCO_2e$)

Pollutant	2024
CO_2	76.86
CH_4	21.38
N_2O	21.83
HFC/PFC/SF_6	1.56
Total	**121.63**[14]

Figure 5: 2024 Carbon Dioxide Emissions by Sector

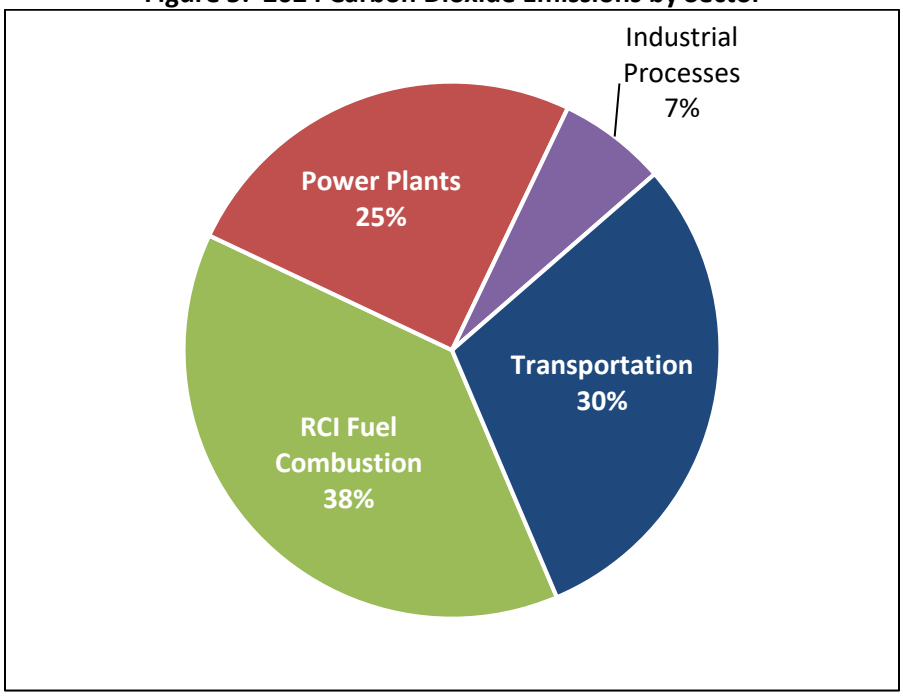


Figure 6: 2024 Methane Emissions by Sector

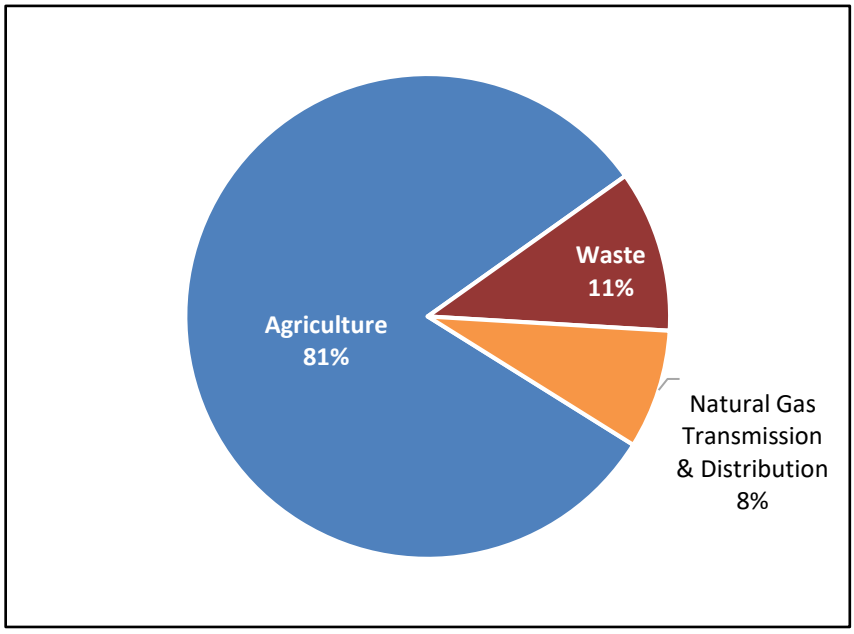


Figure 7: 2024 Nitrous Oxide Emissions by Sector

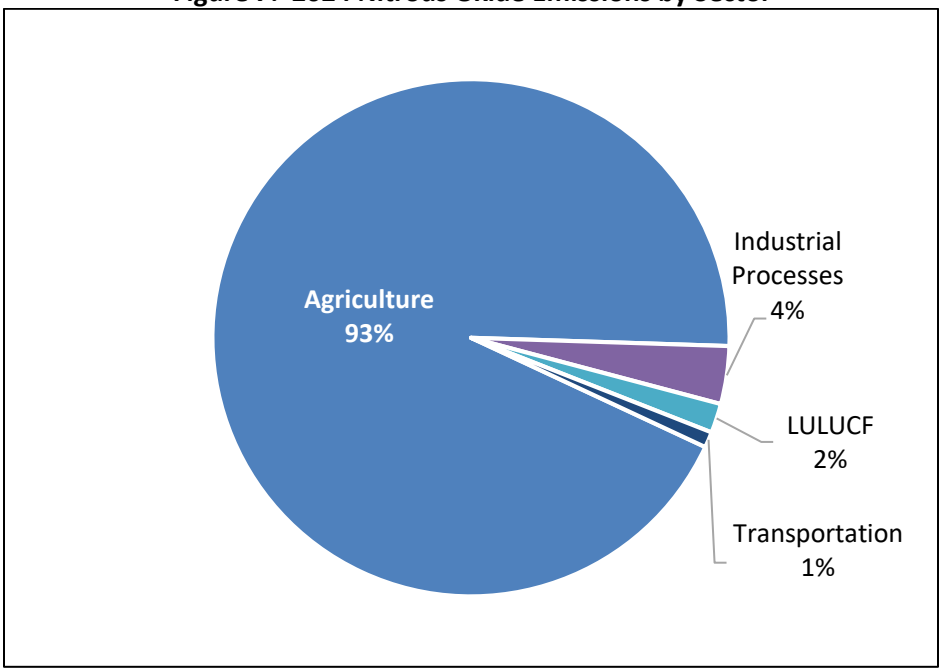
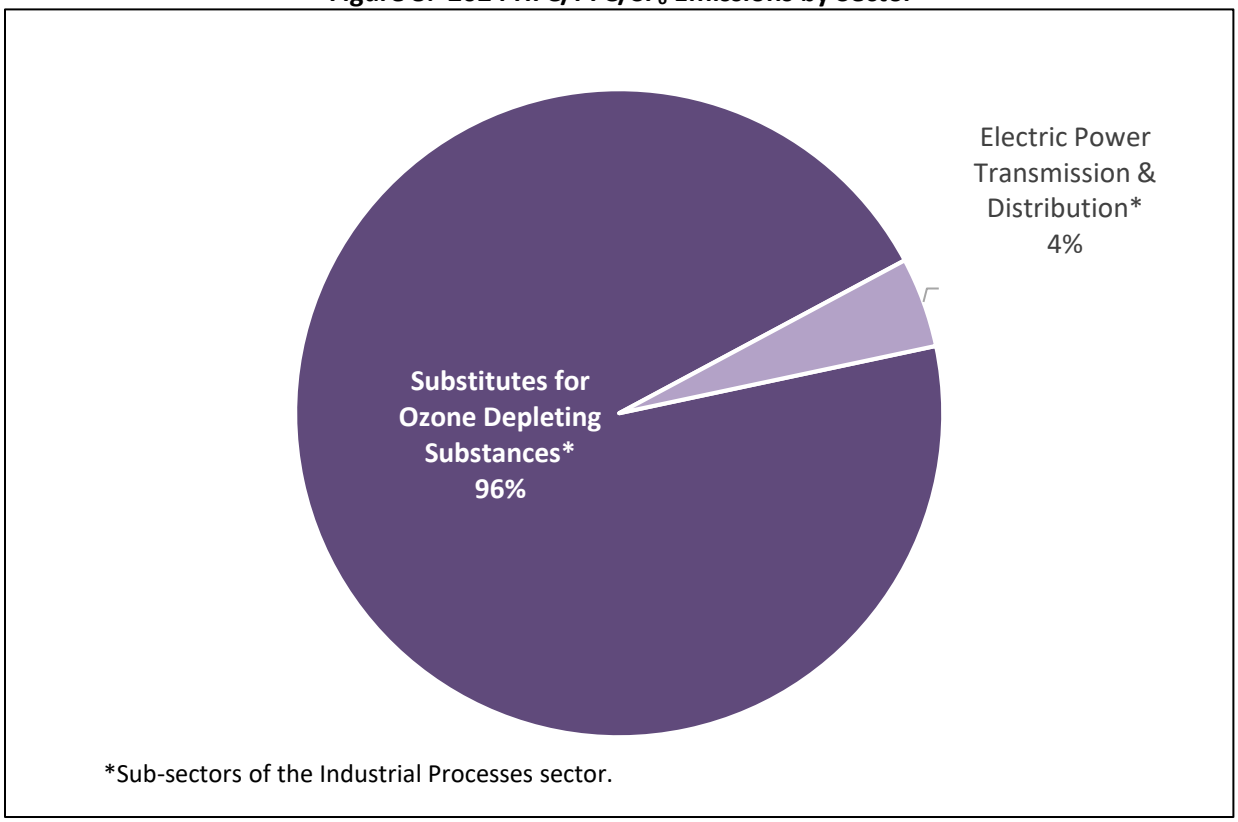


Figure 8: 2024 HFC/PFC/SF_6 Emissions by Sector



[14] Includes 0.46 $MMtCO_2e$ N_2O from settlement soils that is accounted for in the LULUCF category.

Future Emissions

Iowa Code 455B.104 requires that the DNR forecast trends in GHG emissions. Using the SIT Projection Tool, the DNR projected emissions to 2024, 2025, 2030, 2035, 2040, 2045 and 2050 as shown in Table 11. The Projection Tool forecasts emissions from industrial processes, agriculture, and waste based on historical emissions from 1990 – 2023, using a combination of data sources and national projections for activity data. A 2024 "forecast" was produced to help gauge the reasonableness of the projections.

Table 11: Projected Gross GHG Emissions 2024 – 2050 ($MMtCO_2e$)

	Calculated	Projected						
Sector	**2024**	**2024**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Agriculture	37.45	39.28	40.07	44.01	47.95	51.90	55.86	59.82
Power Plants	19.35	12.49	11.77	5.38	5.92	5.74	5.80	5.69
RCI Fossil Fuel Use	29.63	27.66	27.91	28.39	28.18	28.24	28.53	29.11
Industrial Processes	7.47	8.34	9.24	10.68	11.75	12.82	13.89	14.96
Natural Gas T & D	1.66	1.34	1.41	1.41	1.41	1.41	1.41	1.41
Transportation	23.26	21.46	21.22	20.22	19.34	19.00	19.08	19.50
Waste	2.34	3.66	3.71	3.91	4.10	4.26	4.41	4.53
Total	**121.17**	**114.23**	**115.34**	**114.01**	**118.66**	**123.37**	**128.99**	**135.03**

While the DNR cannot predict with certainty what the effects on future emissions will be, the DNR has identified two factors that may affect future GHG emissions:

1. Emissions from Power Plants
   Emissions from power plants are difficult to forecast as the amount and fuel source of electricity generated is influenced by many factors such as:
   - the economy,
   - weather,
   - future environmental regulations,
   - electricity demand by customers (see #2 below),
   - how electricity generation is dispatched by the grid operator, and
   - other market forces.

2. Energy Consumption
   Greenhouse gas emissions are also affected by energy consumption. The U.S. Energy Information Administration (EIA) released its *Short-Term Energy Outlook* (STEO) on December 9, 2025, stating, "Electricity generation has been trending upwards in recent years after a decade of relatively flat growth. Between 2010 and 2020, U.S. electricity generation fell by an average of 0.3% per year. Since 2021, electricity generation has grown about 2% per year. We forecast U.S. generation will grow by 2.4% in 2025 and by 1.7% in 2026."[15] The STEO also states, "Emissions increases in 2026 are associated with relatively higher natural gas-fired electricity generation, associated with rising electricity demand for data centers..." It should be noted that the STEO addresses national emissions, not Iowa-specific emissions.

[15] U.S. EIA, Short-Term Energy Outlook, December 2025.

Uncertainty

As with many forecasts, numerous factors affect the certainty of the predictions. In addition to the factors affecting power plant emissions and energy consumption, GHG emission from other categories may be influenced by energy efficiency and conservation practices, driving practices, use of renewable fuels, and other variables. New electricity customers such as data centers could increase electricity demand.

Future Improvements

The DNR continually strives to make the annual statewide GHG inventory as accurate and timely as possible. Possible areas of enhancement are improved forecasting and more accurately calculating the injection of methane from wastewater digesters into natural gas pipelines.

EPA has released a proposal to reconsider the Greenhouse Gas Reporting Program. DNR uses these data in this inventory and if the program is no longer active, DNR will need to use a different method in the future to estimate emissions from the facilities that are required to report to the program.