

Addendum 3 to the Illinois Greenhouse Gas Emissions Inventory and Projections Overview **Report: Greenhouse Gas Emissions in Top Interstate Electricity Exporting States**

Prepared for the Illinois Climate Change Advisory Group

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World Resources Institute

Overview

At the request of the members of the Illinois Climate Change Advisory Group (CCAG), the World Resources Institute (WRI) assembled this addendum to the Illinois greenhouse gas (GHG) emissions inventory, which presents GHG data for states that, like Illinois, are large net interstate exporters of electricity. The states included in this review are: Alabama, Arizona, Indiana, North Dakota, Pennsylvania, Texas, Washington, West Virginia, and Wyoming. Net interstate electricity exports are calculated as the difference between a state's net total generation and its total retail electricity sales. Both datasets were obtained from the Energy Information Administration (EIA). Only GHG emissions reports for the top ten net exporters are included here.

All emissions data presented in this document come from the U.S. module of WRI's Climate Analysis Indicators Tool (CAIT-US). Please see Appendix A of the "Illinois Greenhouse Gas Emissions Inventory and Projections" report for a complete description of the CAIT tool, its data sources, and relevant caveats and data uncertainties.

Using 2003 data for each state, a series of four figures is presented: GHG emissions by gas, GHG emissions by sector, total and annual growth rates in GHG emissions in each sector from 1990 to 2003, and sectoral GHG emissions trends from 1990 to 2003. State data overviews are presented in order of their rank as net exporters of electricity. This analysis and accompanying tables are presented in order to provide a broad, yet relevant, assessment of GHG emissions in each "exporter" state and to allow for ease of comparability between state's emissions data. These figures are also directly comparable to those previously produced in the "Illinois Greenhouse Gas Emissions Inventory and Projections" report (i.e., figures 2 and 3, and table 3).

This document is by no means comprehensive and is intended only for use as background information by CCAG members and stakeholders. The states included here as top net interstate exporters of electricity are from different regions and have diverse economies and emissions trends. The discussion below provides only a framework for comparison and a general overview of state-level GHG emissions rather than a complete inventory analysis such as the "Illinois Greenhouse Gas Emissions Inventory and Projections."

Summary

In 2003, Illinois produced 275 million metric tons of GHGs on a carbon dioxide (CO₂) equivalent basis (MtCO₂), making it the 5th largest emitting state in the U.S. In addition, at 52.8 million MWH, Illinois ranked 5th in net electricity exports in 2003. Illinois net generation totaled approximately 189 million MWH, with exports accounting for roughly 28 percent of this total. Three additional top electricity exporter states (from here on in referred to as, exporter states) are also among the top ten emitters according to 2003 data: Texas (1st, 773 MtCO₂), Pennsylvania

(4th, 299 MtCO₂), and Indiana (6th, 272 MtCO₂). The ten exporter states (including Illinois) account for approximately 33 percent of total U.S. emissions. Texas emissions constitute roughly one-third (11 percent) of this total, while no other state contributes more than 4.5 percent. Given the diversity of emissions profiles among these states as outlined below it is fairly clear that net interstate exporters of electricity generally do not share any distinct, unifying traits.

Emissions by Gas

According to 2003 estimates, in all exporter states except North Dakota, carbon dioxide (CO₂) constitutes an equivalent or larger percentage of total emissions when compared to its 85 percent share of national emissions. North Dakota's significantly smaller CO₂ contribution (77 percent) is attributable to the relatively large share of emissions from the agriculture sector.

Contributions to total emissions from methane (CH₄) and nitrous oxide (N₂O) vary widely. For example, in Arizona, GHG data show approximately zero percent of total emissions coming from CH₄, while in West Virginia, CH₄ accounts for roughly 11 percent of total emissions. Most exporter states have CH₄ contributions of 3-5 percent, slightly below the U.S. average of 8 percent. Likewise, N₂O contributions range from 1 percent in West Virginia to 17 percent in North Dakota (again due to the agriculture sector), with an average of 2-5 percent. Illinois N₂O emissions also lie outside of this range at 9 percent (see "Illinois Greenhouse Gas Emissions Inventory and Projections"). For all states assessed here, gases with high global warming potentials (f-gases) contribute less than 4 percent to total GHG emissions, comparable to national figures.

Emissions by Sector

Energy sectors contribute approximately 87 percent of total U.S. GHG emissions. Most exporter states have energy sectors that contribute a greater percentage than this total, up to 95 percent for West Virginia. Illinois, Indiana, and Washington each have energy sectors that contribute slightly less than the national average. North Dakota's lower total emissions from energy sectors (78 percent of total GHGs) is due to the significant contribution of GHG emissions (21 percent) from the agriculture sector.

In all exporter states, GHG emissions produced by the energy sector are principally due to electricity generation, industry, and transportation, although the relative contributions of each of these sectors is hardly uniform between exporter states. This is in large part due to the diversity of locally available resources for electric power generation. In Washington, for instance, where zero-emitting hydro power is plentiful, electricity generation contributes only 15 percent of total emissions, approximately half of this sector's share of national emissions, while the transportation sector contributes 45 percent of emissions, a proportion that is 50 percent greater than the national percentage. Conversely, in West Virginia, a top coal-producing state, electricity generation accounts for 64 percent of GHGs, while transportation adds only 9 percent. Illinois, and all other exporter states, fall somewhere between these two points with Illinois' exceptional use of nuclear power setting it apart from most other coal producing, exporter states such as Indiana, Pennsylvania and West Virginia.

Contributions to total state emissions by the industrial sector in exporter states are largely similar (and also similar to the national value), comprising 10-20 percent of GHGs. Arizona (4 percent) and Texas (33 percent), however, are outside this range. In all exporter states, commercial and residential sectors contribute less than 5 percent and 10 percent of total emissions, respectively. Illinois and Pennsylvania are the only exporter states where residential emissions contribute more than 5 percent, however, both states have overall sectoral emissions breakdowns for 2003 that are closest to that of the nation as a whole.

Emissions Trends

Between 1990 and 2003, total U.S. GHG emissions grew by approximately 14 percent. The total emissions growth over this same time period for exporter states was as follows:

- Illinois 16 percent
- Alabama 20 percent
- Arizona 38 percent
- Indiana 20 percent
- North Dakota 22 percent
- Pennsylvania 3 percent
- Texas 18 percent
- Washington 11 percent
- West Virginia 1 percent
- Wyoming 13 percent

Some of the stark regional disparities in emissions growth trends—for example, Pennsylvania and West Virginia emissions growth compared to emissions growth in Alabama, Arizona, and Texas—may be largely a function of overall population trends, although growth in specific sectors (e.g., electricity generation, transportation, agriculture) clearly play a role as well.

Sectoral emissions trends vary significantly between exporter states and can differ greatly from national trends. Brief synopses of trends within each sector are provided below, but it is strongly encouraged that readers examine the accompanying tables and charts for a more thorough understanding of sector emissions trend variability across states. Though some states may be similar to others, overall, there are no clear unifying trends in emissions profiles for this group of top electricity exporting states.

GHG emissions from electricity generation between 1990 and 2003 increased less than the national rate (26 percent) in Indiana (20 percent), North Dakota (14 percent), Pennsylvania (9 percent), Texas (21 percent), West Virginia (21 percent), and Wyoming (8 percent), and increased significantly more than the national rate in Alabama (52 percent), Arizona (41 percent), Illinois (53 percent), and Washington (85 percent).

Most exporter states experienced changes in emissions from the residential sector that approximated the national trend of a 12 percent increase. Some states, however, stand out; estimates show a 35 percent increase in emissions from this sector in Washington, while West Virginia and Alabama figures show an overall decrease in residential emissions.

Commercial sector emissions trends of exporter states vary: Indiana, North Dakota, and Texas show emissions growth values several times greater than national totals; Illinois, Pennsylvania, Washington, and Wyoming show little change in emissions from this sector between 1990 and 2003; and Alabama and West Virginia show declines in emissions on the order of 15 percent.

Major decreases in industrial sector emissions output occurred in Pennsylvania (-25 percent) and West Virginia (-37 percent), and increased significantly in North Dakota (20 percent).

For all exporter states except Washington, emissions from the transportation sector grew. The greatest increases occurred in North Dakota (28 percent), Wyoming (45 percent), and Arizona (52 percent). At the national level, transportation sector emissions grew by 25 percent between 1990 and 2003.

GHGs from fugitive emissions generally declined in exporter states, while emissions from industrial processes increased (35-562 percent). Both sectors comprise a significantly smaller percentage of total emissions than energy sectors and due to significant uncertainties and incomplete data in the underlying emissions data, any emissions trends in this sector should be considered questionable (see Appendix A of the “Illinois Greenhouse Gas Emissions Inventory and Projections”).

State emissions from agriculture decreased everywhere except Arizona (3 percent growth), Wyoming (31 percent growth), and North Dakota (43 percent growth). GHG emissions trends in the waste sector also varied substantially, ranging from an approximately 200 percent decrease in Arizona to a 50 percent increase in Wyoming.

Additional Notes

Owing to anomalies in the underlying data, 2003 emissions from agriculture have been replaced by 2001 data when computing totals.

Charts of sectoral emission trends have different Y-axis scales to accommodate as much detail as possible within the plots.

Due to rounding, some percentage totals may not add up to 100 percent.

West Virginia

Net Electricity Exporter Rank: 1 (66,414,561 MWH)

Net Electricity Generation: 94,711,554 MWH

Exports as a % of Net Generation: 70.1%

2003 Emissions

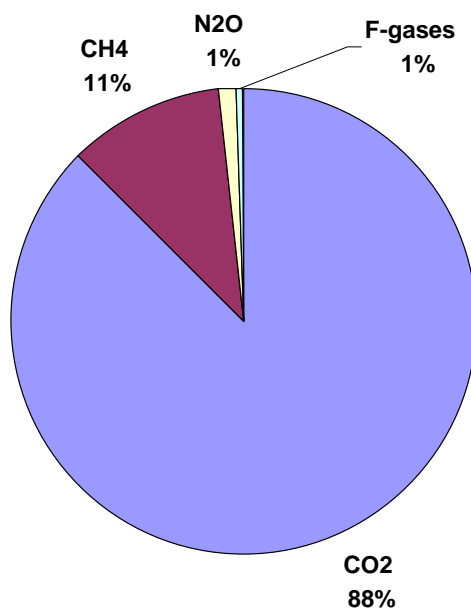
Total GHG Emissions: 131.1 MtCO₂ eq.

US State Emissions Rank: 19

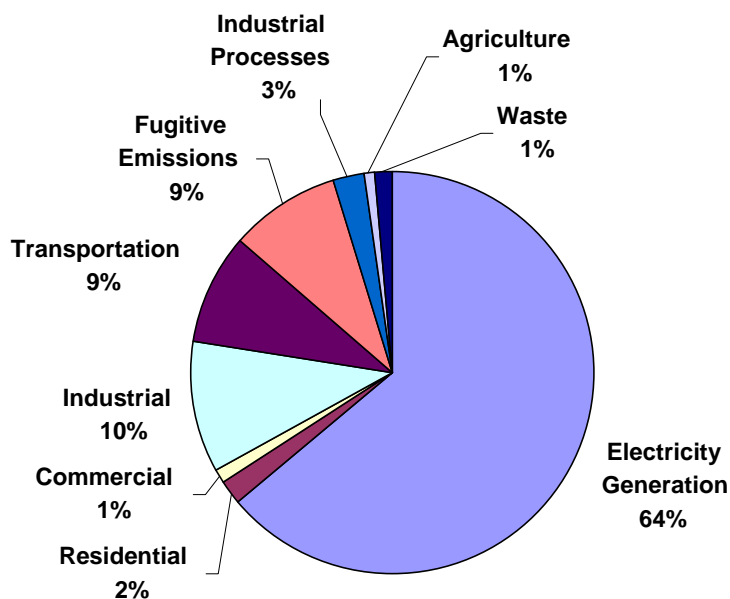
% of US Total Emissions: 1.9%

West Virginia Emissions by Gas and Sector

West Virginia Emissions by Gas (2003)	MtCO ₂ eq.	%
Total – All Sectors	131.1	
CO ₂	114.8	88%
CH ₄	14.1	11%
N ₂ O	1.3	1%
High-GWP Gases (HFCs, PFCs, SF ₆)	0.9	1%

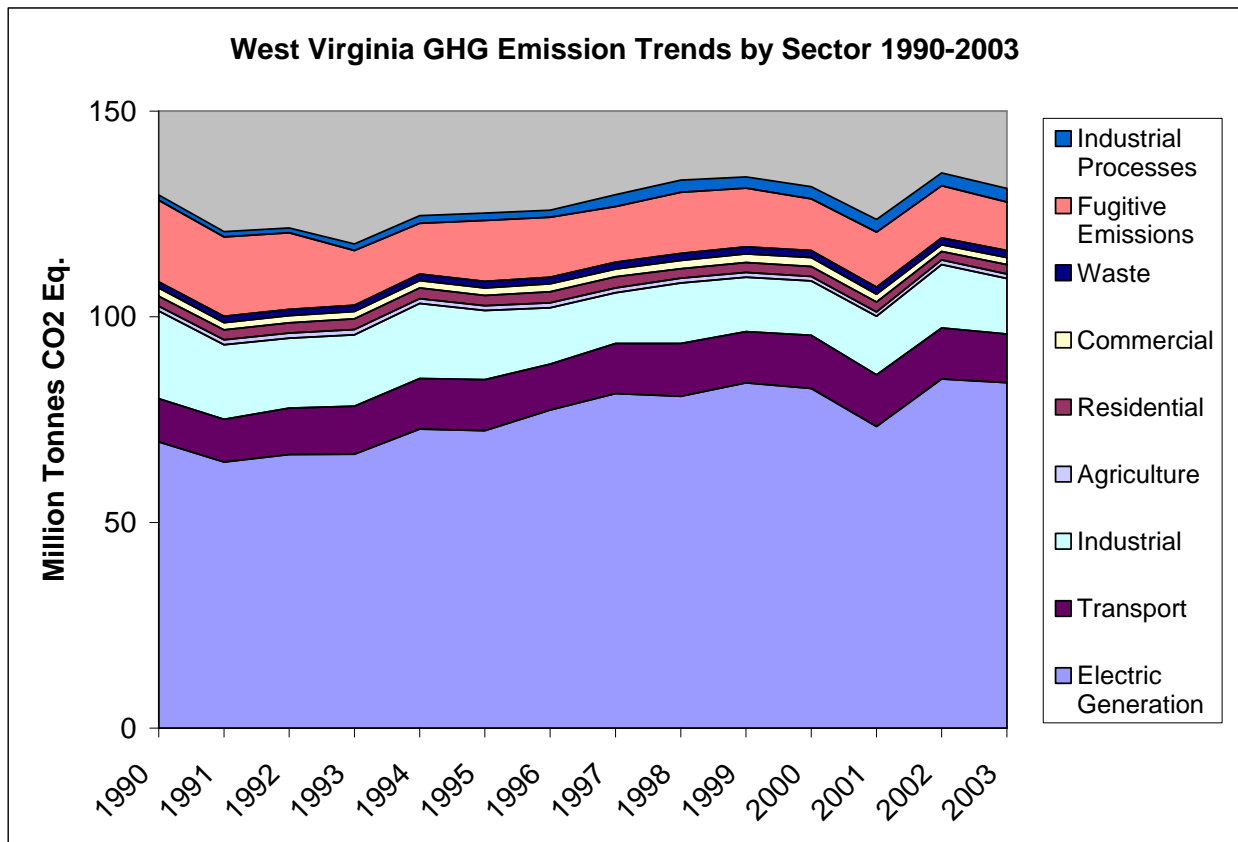


West Virginia Emissions by Sector (2003)	MtCO ₂ eq.	%
Total – All GHGs	131.1	
Total Energy	125.1	95%
Electricity Gen.	84.0	64%
Residential	2.3	2%
Commercial	1.7	1%
Industrial	13.5	10%
Transportation	11.8	9%
Fugitive Emissions	11.8	9%
Industrial Processes	3.3	3%
Agriculture	1.1	1%
Waste	1.7	1%



Emissions Growth in West Virginia

West Virginia	1990	2003	Growth	Annual Rate
Total (MtCO₂Eq)	129.6	131.1	1.2%	0.1%
Electricity Generation	69.6	84.0	20.7%	1.5%
Residential	2.4	2.3	-4.2%	-0.3%
Commercial	2.0	1.7	-15.0%	-1.2%
Industrial	21.3	13.5	-36.6%	-3.4%
Transportation	10.5	11.8	12.4%	0.9%
Fugitive Emissions	19.8	11.8	-40.4%	-3.9%
Industrial Processes ¹	1.3	3.3	153.8%	7.4%
Agriculture ²	1.2	1.1	-8.3%	-0.7%
Waste	1.5	1.7	13.3%	1.0%



¹ State level emissions data in the Industrial Processes sector is highly uncertain and is considered unreliable. As this sector is the major source of F-gases it remains in this inventory; however, trends in this category are considered to be questionable.

² Owing to anomalies in the underlying data, 2001 emissions from agriculture are used in the 2003 column of this table.

Pennsylvania

Net Electricity Exporter Rank: 2 (65,980,385 MWH)

Net Electricity Generation: 206,349,513 MWH

Exports as a % of Net Generation: 32.0%

2003 Emissions

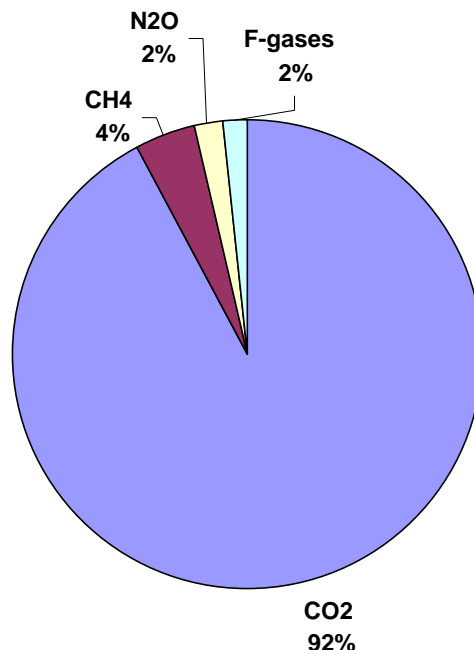
Total GHG Emissions: 298.7 MtCO₂ eq.

US State Emissions Rank: 4

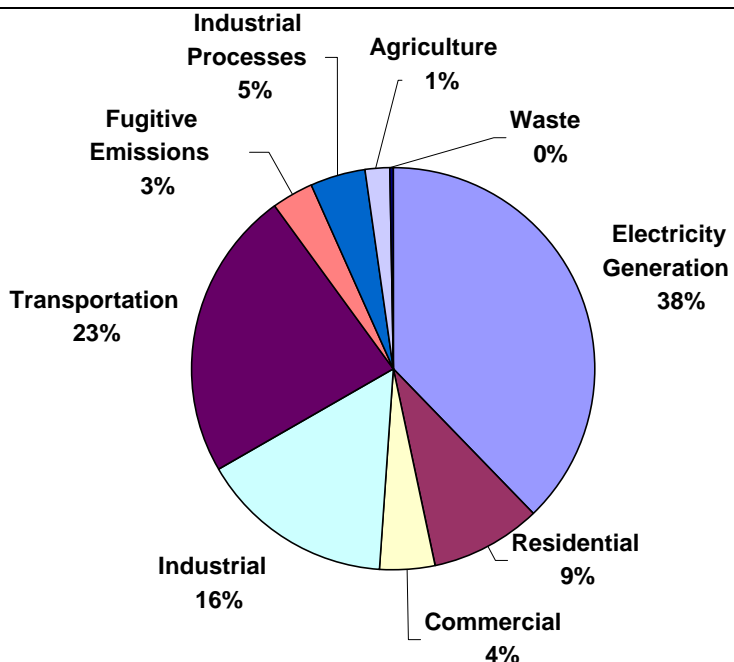
% of US Total Emissions: 4.4%

Pennsylvania Emissions by Gas and Sector

Pennsylvania Emissions by Gas (2003)	MtCO ₂ eq.	%
Total – All Sectors	298.7	
CO ₂	275.1	92%
CH ₄	12.6	4%
N ₂ O	6.2	2%
High-GWP Gases (HFCs, PFCs, SF ₆)	4.8	2%

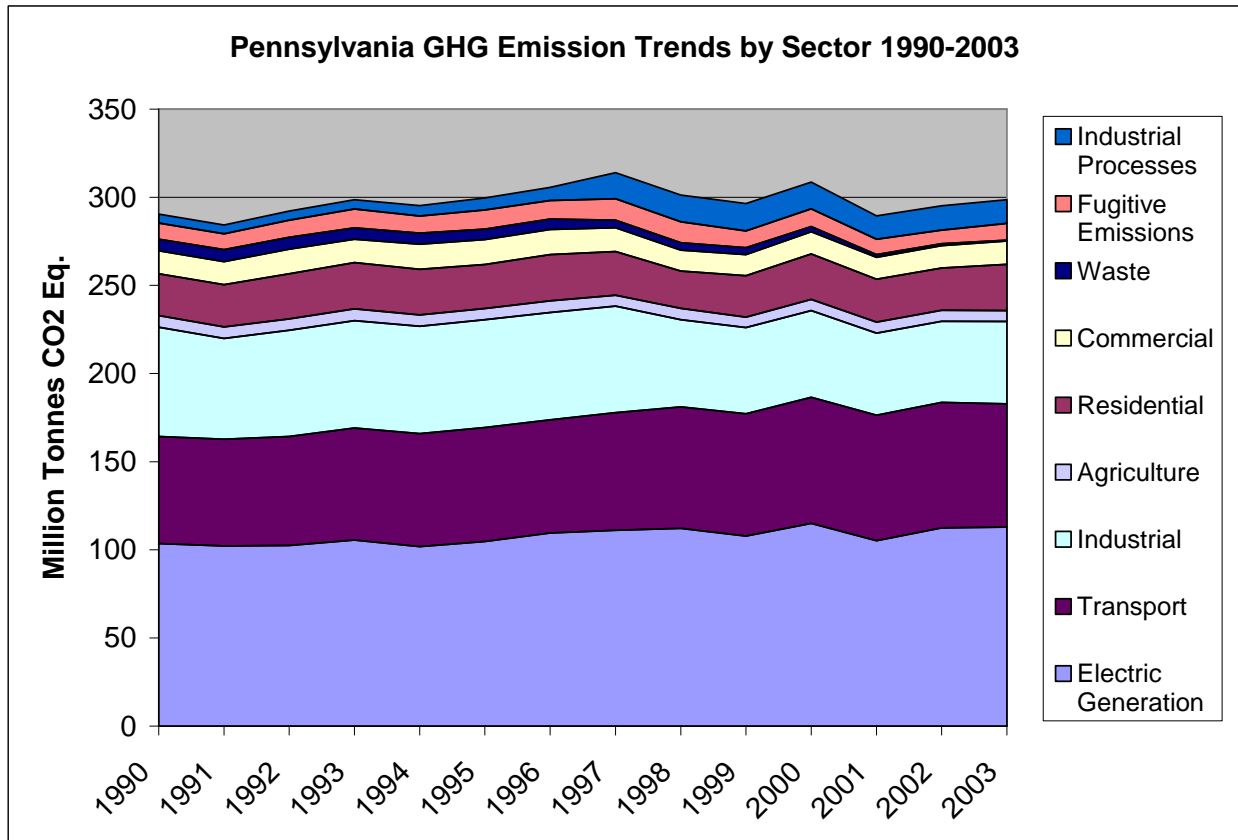


Pennsylvania Emissions by Sector (2003)	MtCO ₂ eq.	%
Total – All GHGs	298.7	
Total Energy	278.5	93%
Electricity Gen.	112.9	38%
Residential	26.3	9%
Commercial	13.2	4%
Industrial	46.7	16%
Transportation	69.9	23%
Fugitive Emissions	9.5	3%
Industrial Processes	13.5	5%
Agriculture	6.2	2%
Waste	0.5	0%



Emissions Growth in Pennsylvania

Pennsylvania	1990	2003	Growth	Annual Rate
Total (MtCO₂Eq)	290.4	298.7	2.9%	0.2%
Electricity Generation	103.6	112.9	9.0%	0.7%
Residential	23.7	26.3	11.0%	0.8%
Commercial	13.1	13.2	0.8%	0.1%
Industrial	62.1	46.7	-24.8%	-2.2%
Transportation	60.6	69.9	15.3%	1.1%
Fugitive Emissions	9.2	9.5	3.3%	0.2%
Industrial Processes ¹	5.1	13.5	164.7%	7.8%
Agriculture ²	6.6	6.2	-6.1%	-0.5%
Waste	6.4	0.5	-92.2%	-17.8%



¹ State level emissions data in the Industrial Processes sector is highly uncertain and is considered unreliable. As this sector is the major source of F-gases it remains in this inventory; however, trends in this category are considered to be questionable.

² Owing to anomalies in the underlying data, 2001 emissions from agriculture are used in the 2003 column of this table.

Texas

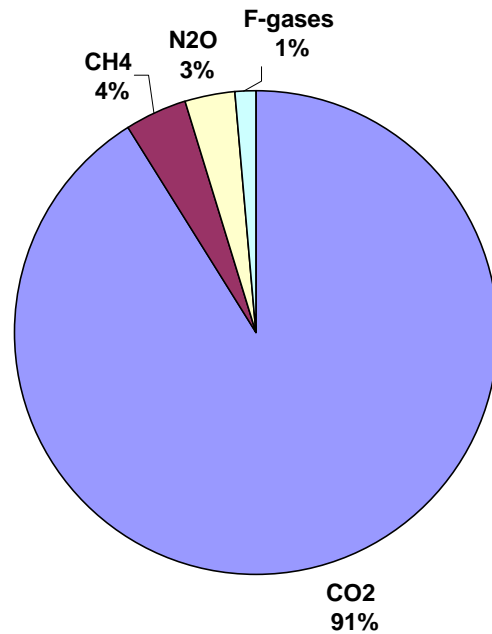
Net Electricity Exporter Rank: 3 (56,513,730 MWH)
 Net Electricity Generation: 379,199,685 MWH
 Exports as a % of Net Generation: 14.9%

2003 Emissions

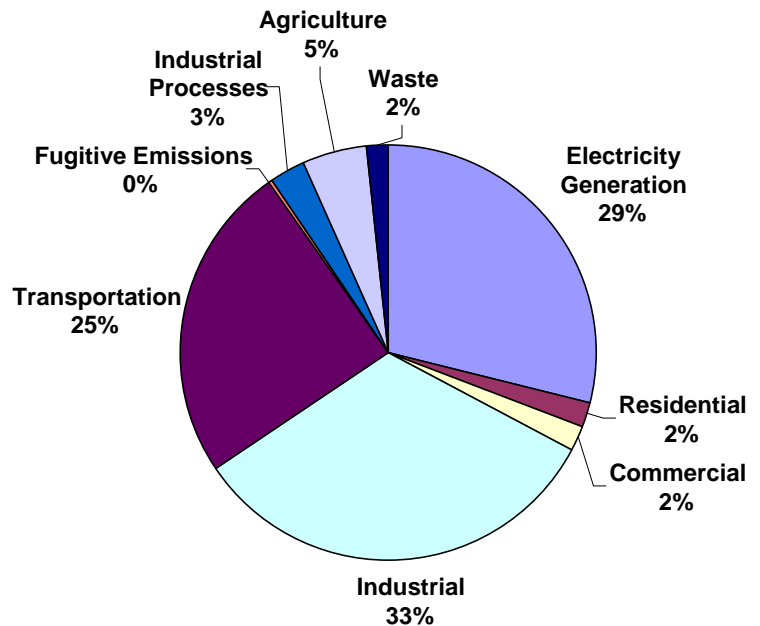
Total GHG Emissions: 773.4 MtCO₂ eq.
 US State Emissions Rank: 1
 % of US Total Emissions: 11.5%

Texas Emissions by Gas and Sector

Texas Emissions by Gas (2003)	MtCO ₂ eq.	%
Total – All Sectors	773.4	
CO ₂	704.4	91%
CH ₄	32.9	4%
N ₂ O	26.3	3%
High-GWP Gases (HFCs, PFCs, SF ₆)	9.8	1%

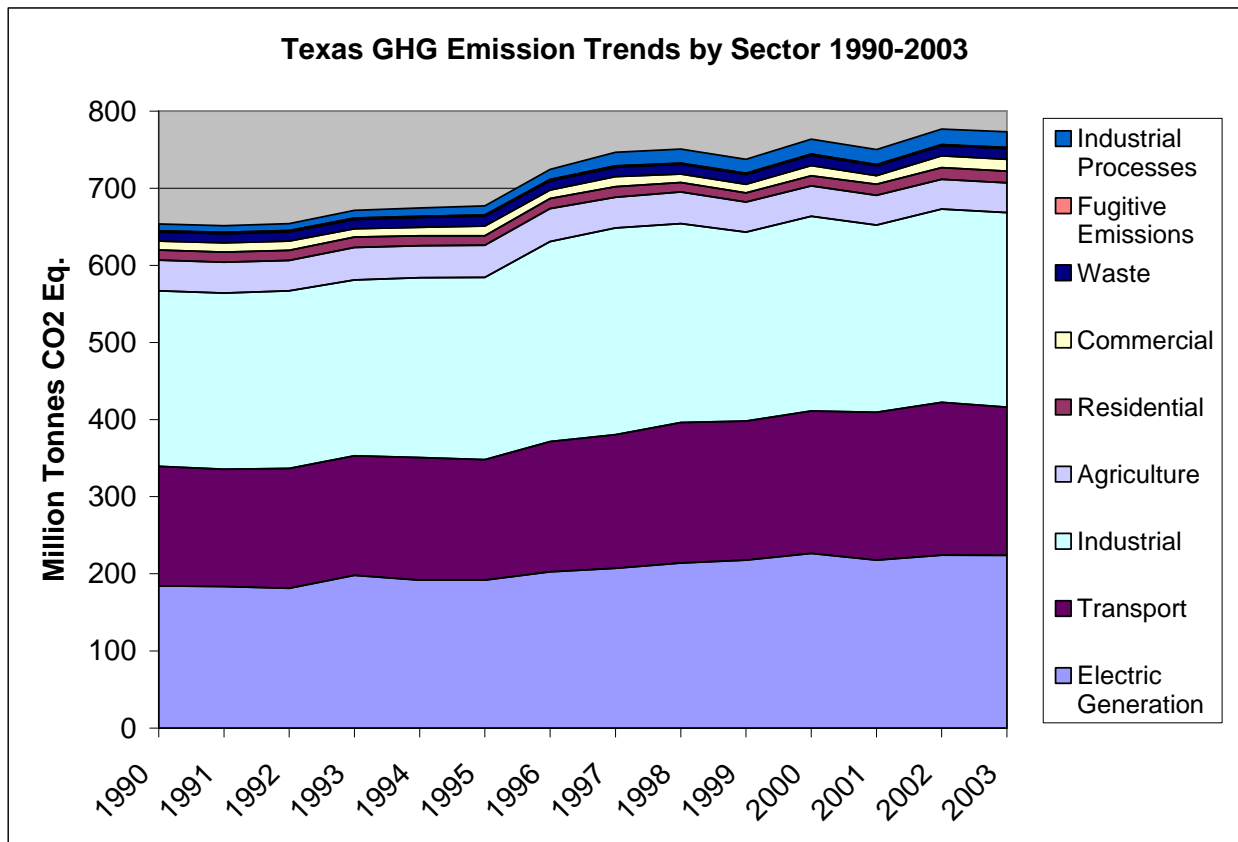


Texas Emissions by Sector (2003)	MtCO ₂ eq.	%
Total – All GHGs	773.4	
Total Energy	700.2	91%
Electricity Gen.	224.0	29%
Residential	15.1	2%
Commercial	15.2	2%
Industrial	252.4	33%
Transportation	192.0	25%
Fugitive Emissions	1.5	0%
Industrial Processes	20.6	3%
Agriculture	38.7	5%
Waste	13.9	2%



Emissions Growth in Texas

Texas	1990	2003	Growth	Annual Rate
Total (MtCO₂Eq)	653.5	773.4	18.3%	1.3%
Electricity Generation	184.5	224.0	21.4%	1.5%
Residential	13.1	15.1	15.3%	1.1%
Commercial	11.6	15.2	31.0%	2.1%
Industrial	227.6	252.4	10.9%	0.8%
Transportation	154.8	192.0	24.0%	1.7%
Fugitive Emissions	1.7	1.5	-11.8%	-1.0%
Industrial Processes ¹	8.8	20.6	134.1%	6.8%
Agriculture ²	39.8	38.7	-2.8%	-0.2%
Waste	11.6	13.9	19.8%	1.4%



¹ State level emissions data in the Industrial Processes sector is highly uncertain and is considered unreliable. As this sector is the major source of F-gases it remains in this inventory; however, trends in this category are considered to be questionable.

² Owing to anomalies in the underlying data, 2001 emissions from agriculture are used in the 2003 column of this table.

Alabama

Net Electricity Exporter Rank: 4 (53,643,002 MWH)

Net Electricity Generation: 137,487,222 MWH

Exports as a % of Net Generation: 39.0%

2003 Emissions

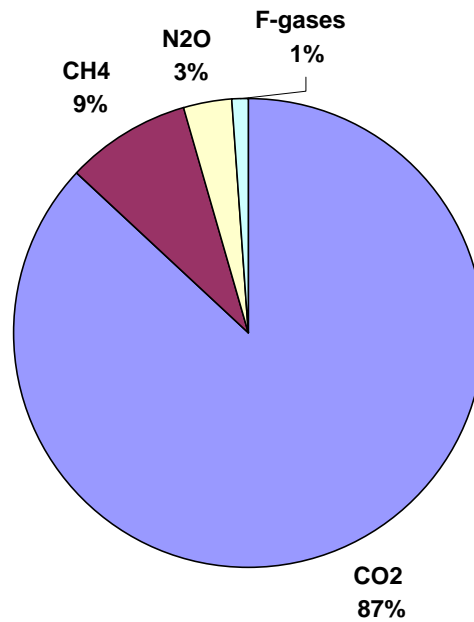
Total GHG Emissions: 163.1 MtCO₂ eq.

US State Emissions Rank: 15

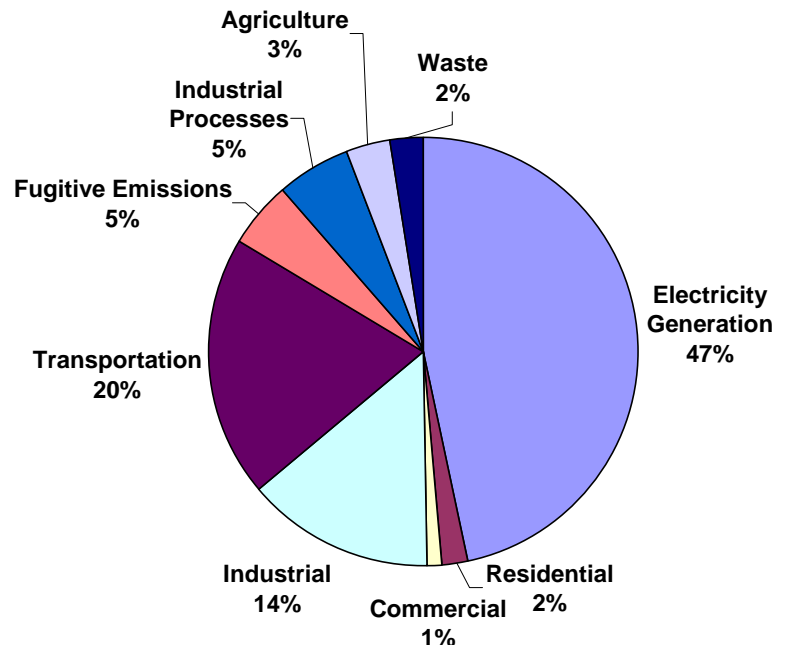
% of US Total Emissions: 2.4%

Alabama Emissions by Gas and Sector

Alabama Emissions by Gas (2003)	MtCO ₂ eq.	%
Total – All Sectors	163.1	
CO ₂	141.8	87%
CH ₄	14.2	9%
N ₂ O	5.2	3%
High-GWP Gases (HFCs, PFCs, SF ₆)	1.9	1%

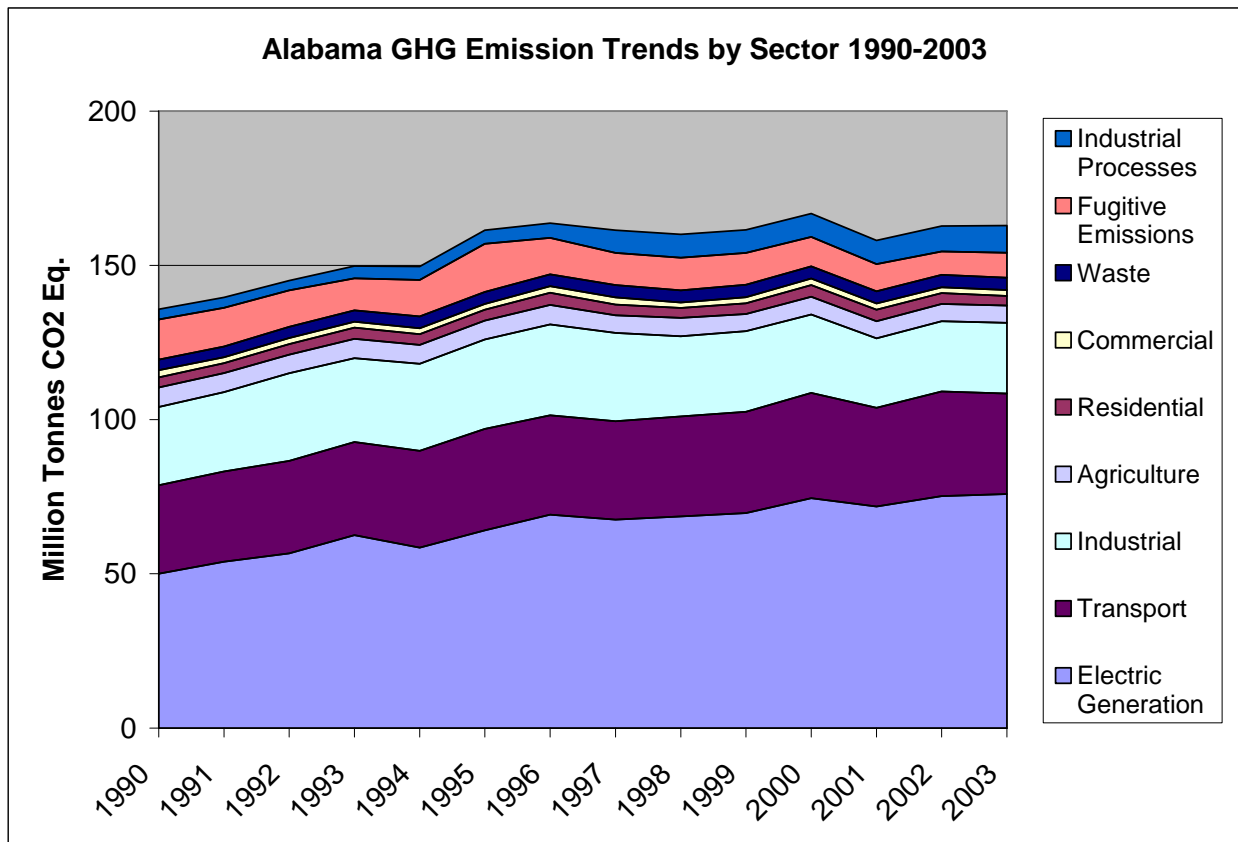


Alabama Emissions by Sector (2003)	MtCO ₂ eq.	%
Total – All GHGs	163.1	
Total Energy	144.6	89%
Electricity Gen.	75.9	47%
Residential	3.1	2%
Commercial	1.9	1%
Industrial	23.0	14%
Transportation	32.5	20%
Fugitive Emissions	8.1	5%
Industrial Processes	8.8	5%
Agriculture	5.6	3%
Waste	4.0	2%



Emissions Growth in Alabama

Alabama	1990	2003	Growth	Annual Rate
Total (MtCO₂Eq)	135.8	163.1	20.0%	1.4%
Electricity Generation	50.0	75.9	51.8%	3.3%
Residential	3.3	3.1	-6.1%	-0.5%
Commercial	2.3	1.9	-17.4%	-1.5%
Industrial	25.4	23.0	-9.4%	-0.8%
Transportation	28.7	32.5	13.2%	1.0%
Fugitive Emissions	13.0	8.1	-37.7%	-3.6%
Industrial Processes ¹	3.4	8.8	158.8%	7.6%
Agriculture ²	6.3	5.6	-11.1%	-0.9%
Waste	3.4	4.0	17.6%	1.3%



¹ State level emissions data in the Industrial Processes sector is highly uncertain and is considered unreliable. As this sector is the major source of F-gases it remains in this inventory; however, trends in this category are considered to be questionable.

² Owing to anomalies in the underlying data, 2001 emissions from agriculture are used in the 2003 column of this table.

Wyoming

Net Electricity Exporter Rank: 6 (30,372,766 MWH)

Net Electricity Generation: 43,626,602 MWH

Exports as a % of Net Generation: 69.6%

2003 Emissions

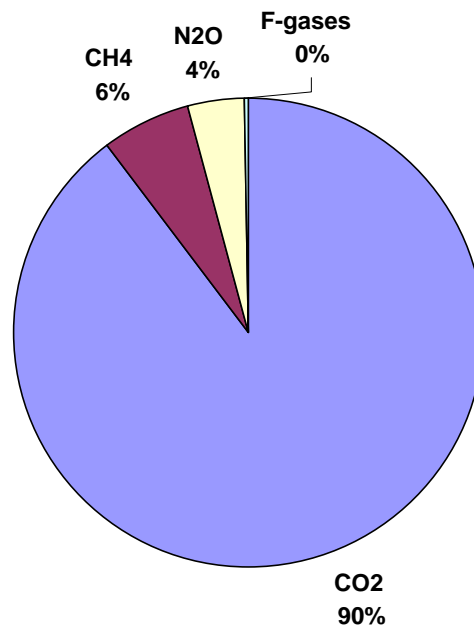
Total GHG Emissions: 72.7 MtCO₂ eq.

US State Emissions Rank: 32

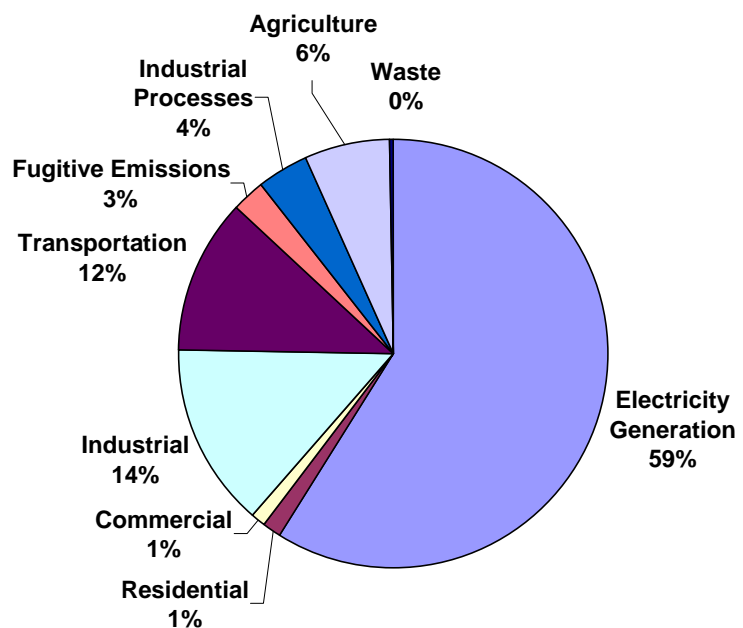
% of US Total Emissions: 1.1%

Wyoming Emissions by Gas and Sector

Wyoming Emissions by Gas (2003)	MtCO ₂ eq.	%
Total – All Sectors	72.7	
CO ₂	65.2	90%
CH ₄	4.4	6%
N ₂ O	2.9	4%
High-GWP Gases (HFCs, PFCs, SF ₆)	0.2	0%

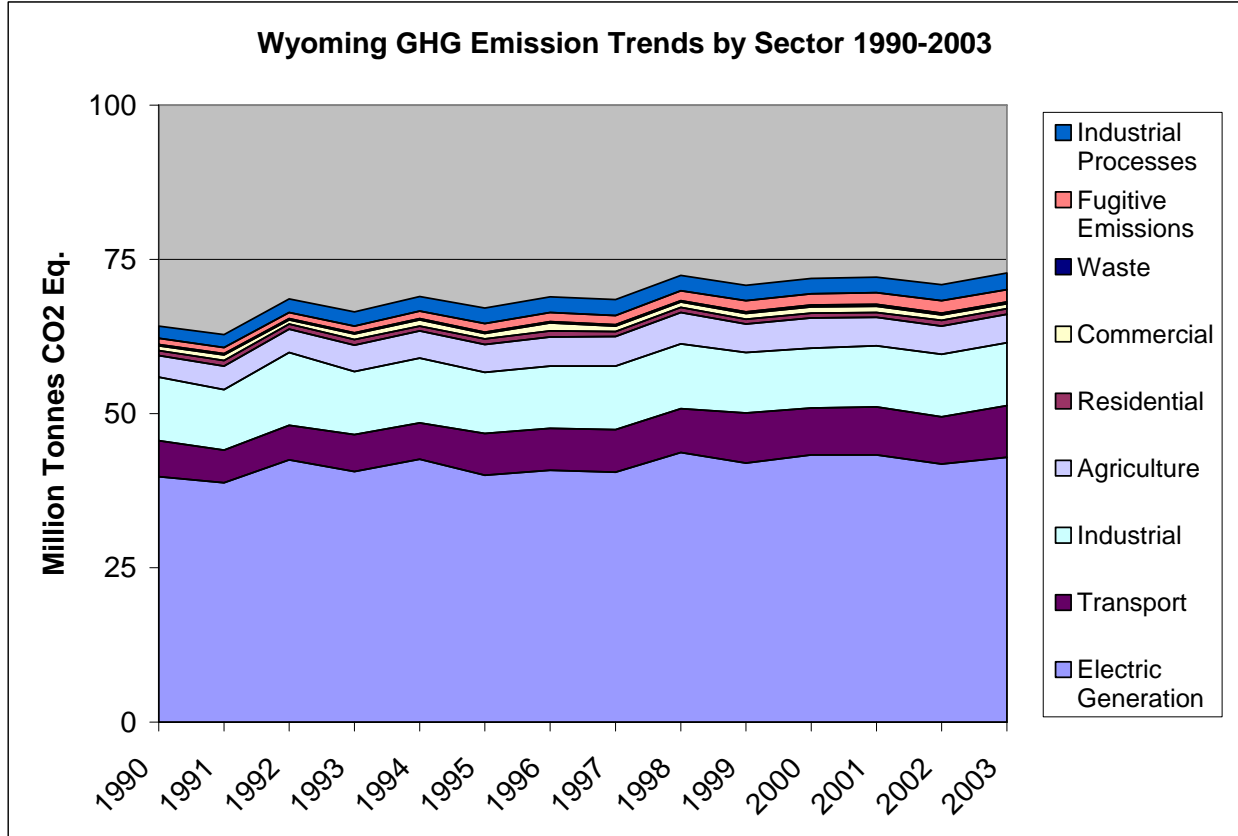


Wyoming Emissions by Sector (2003)	MtCO ₂ eq.	%
Total – All GHGs	72.7	
Total Energy	65.1	89%
Electricity Gen.	42.9	59%
Residential	0.9	1%
Commercial	0.8	1%
Industrial	10.2	14%
Transportation	8.4	12%
Fugitive Emissions	2.0	3%
Industrial Processes	2.7	4%
Agriculture	4.6	6%
Waste	0.3	0%



Emissions Growth in Wyoming

Wyoming	1990	2003	Growth	Annual Rate
Total (MtCO₂Eq)	64.2	72.7	13.4%	1.0%
Electricity Generation	39.8	42.9	7.8%	0.6%
Residential	0.8	0.9	12.5%	0.9%
Commercial	0.8	0.8	0.0%	0.0%
Industrial	10.3	10.2	-1.0%	-0.1%
Transportation	5.8	8.4	44.8%	2.9%
Fugitive Emissions	1.0	2.0	100.0%	5.5%
Industrial Processes ¹	2.0	2.7	35.0%	2.3%
Agriculture ²	3.5	4.6	31.4%	2.1%
Waste	0.2	0.3	50.0%	3.2%



¹ State level emissions data in the Industrial Processes sector is highly uncertain and is considered unreliable. As this sector is the major source of F-gases it remains in this inventory; however, trends in this category are considered to be questionable.

² Owing to anomalies in the underlying data, 2001 emissions from agriculture are used in the 2003 column of this table.

Arizona

Net Electricity Exporter Rank: 7 (30,316,658 MWH)

Net Electricity Generation: 94,396,218 MWH

Exports as a % of Net Generation: 32.1%

2003 Emissions

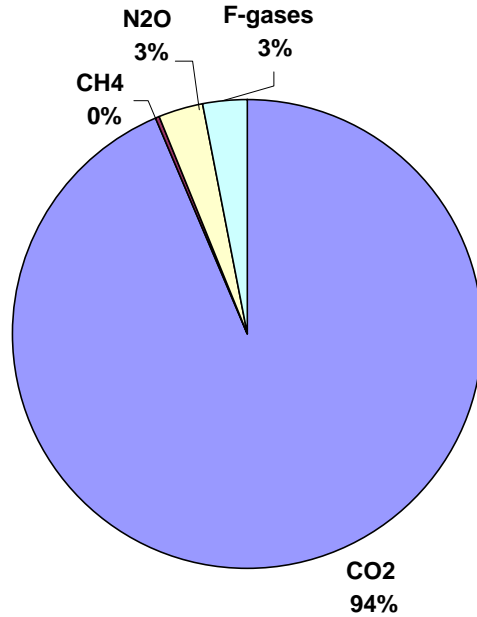
Total GHG Emissions: 95.6 MtCO₂ eq.

US State Emissions Rank: 26

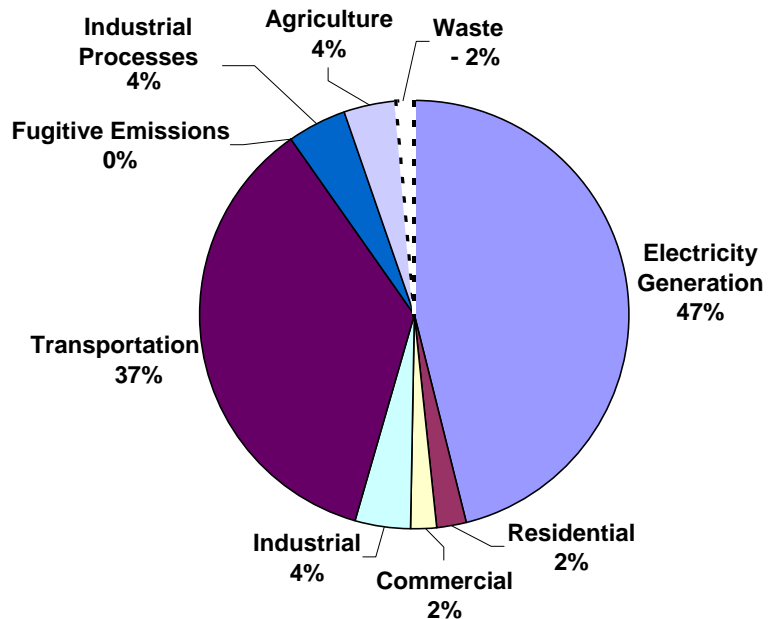
% of US Total Emissions: 1.4%

Arizona Emissions by Gas and Sector

Arizona Emissions by Gas (2003)	MtCO ₂ eq.	%
Total – All Sectors	95.6	
CO ₂	89.4	94%
CH ₄	0.3	0%
N ₂ O	3.0	3%
High-GWP Gases (HFCs, PFCs, SF ₆)	2.9	3%

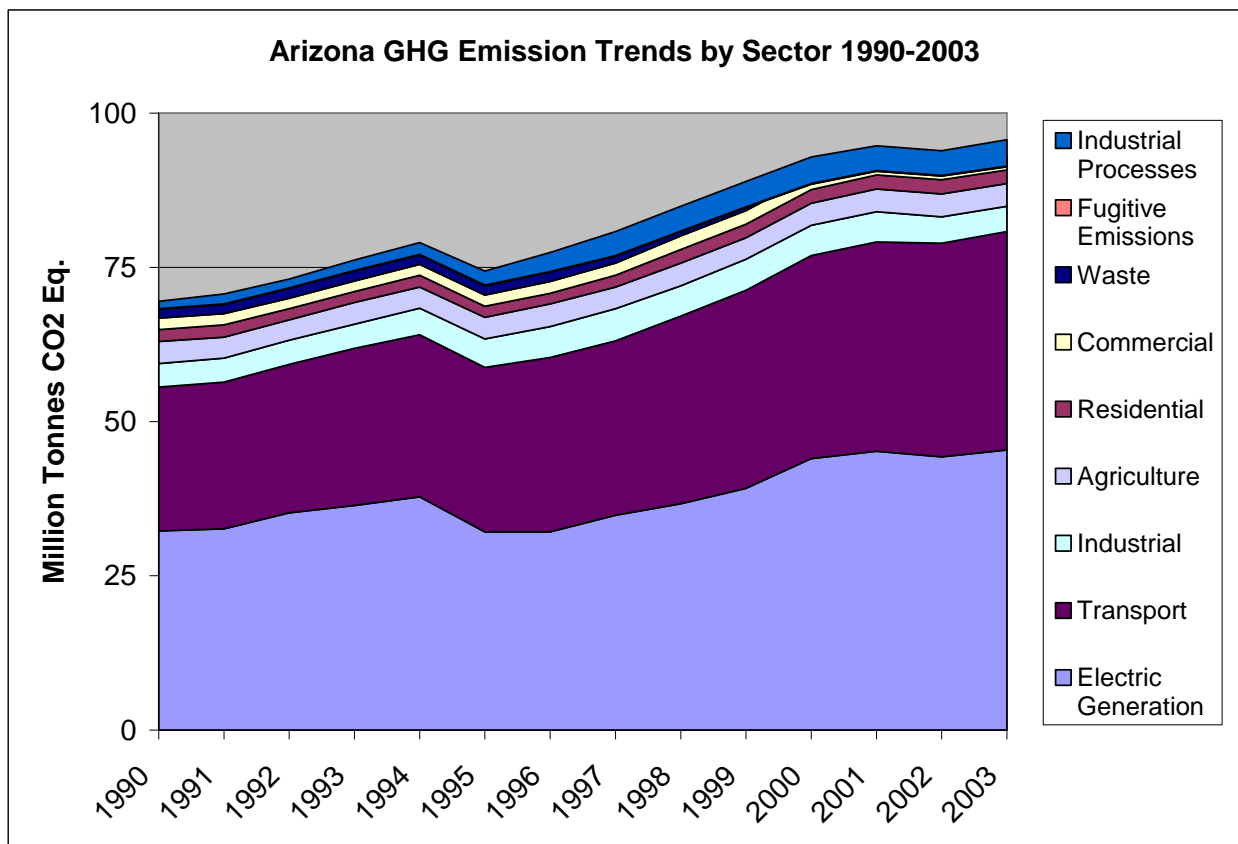


Arizona Emissions by Sector (2003)	MtCO ₂ eq.	%
Total – All GHGs	95.6	
Total Energy	89.1	93%
Electricity Gen.	45.4	47%
Residential	2.2	2%
Commercial	2.0	2%
Industrial	4.1	4%
Transportation	35.4	37%
Fugitive Emissions	0.1	0%
Industrial Processes	4.3	4%
Agriculture	3.7	4%
Waste	-1.5	-2%



Emissions Growth in Arizona

Arizona	1990	2003	Growth	Annual Rate
Total (MtCO₂Eq)	69.5	95.6	37.7%	2.5%
Electricity Generation	32.3	45.4	40.6%	2.7%
Residential	1.9	2.2	15.8%	1.1%
Commercial	1.9	2.0	5.3%	0.4%
Industrial	3.8	4.1	7.9%	0.6%
Transportation	23.3	35.4	51.9%	3.3%
Fugitive Emissions	0.1	0.1	0.0%	0.0%
Industrial Processes ¹	1.2	4.3	258.3%	10.3%
Agriculture ²	3.6	3.7	2.8%	0.2%
Waste	1.4	-1.5	-207.1%	-200.5%



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² Owing to anomalies in the underlying data, 2001 emissions from agriculture are used in the 2003 column of this table.

Indiana

Net Electricity Exporter Rank: 8 (24,420,438 MWH)

Net Electricity Generation: 124,888,217 MWH

Exports as a % of Net Generation: 19.6%

2003 Emissions

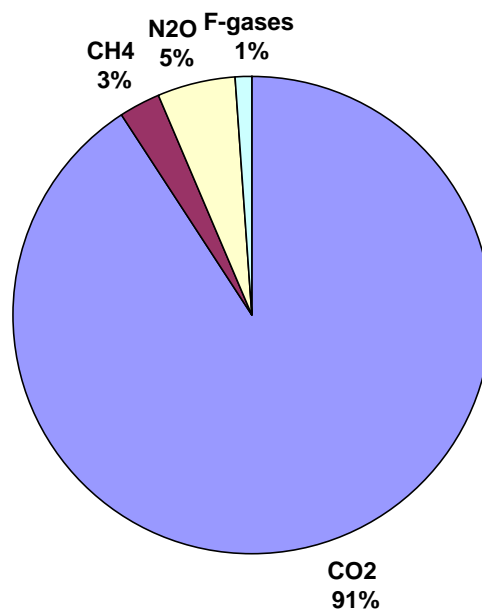
Total GHG Emissions: 272.1 MtCO₂ eq.

US State Emissions Rank: 6

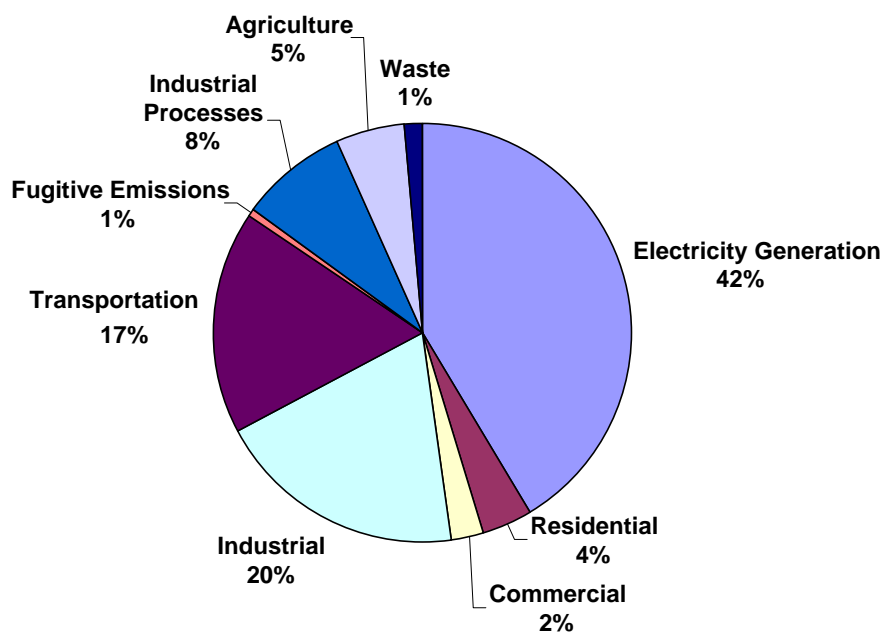
% of US Total Emissions: 4.0%

Indiana Emissions by Gas and Sector

Indiana Emissions by Gas (2003)	MtCO ₂ eq.	%
Total – All Sectors	272.1	
CO ₂	247.4	91%
CH ₄	7.3	3%
N ₂ O	14.6	5%
High-GWP Gases (HFCs, PFCs, SF ₆)	2.8	1%

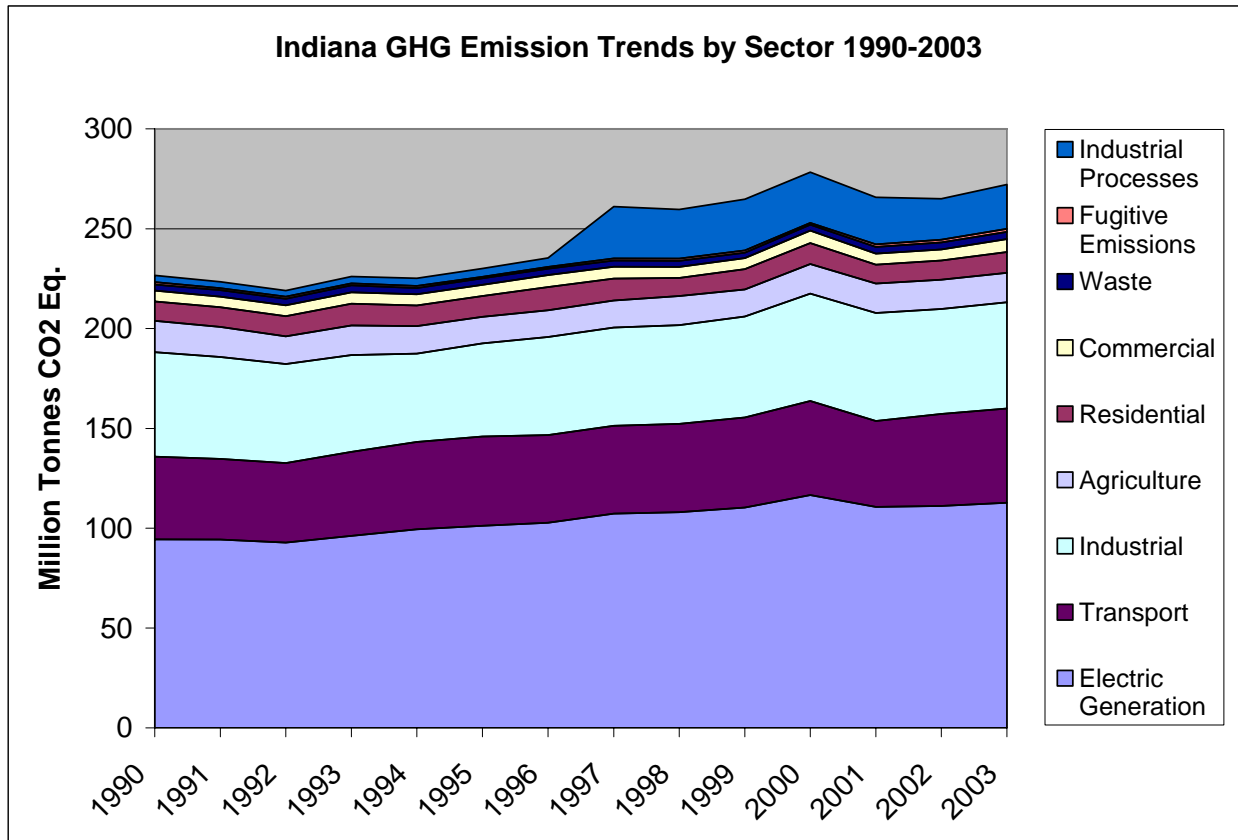


Indiana Emissions by Sector (2003)	MtCO ₂ eq.	%
Total – All GHGs	272.1	
Total Energy	231.6	85%
Electricity Gen.	112.7	42%
Residential	10.5	4%
Commercial	6.4	2%
Industrial	53.2	20%
Transportation	47.2	17%
Fugitive Emissions	1.5	1%
Industrial Processes	22.2	8%
Agriculture	14.7	5%
Waste	3.7	1%



Emissions Growth in Indiana

Indiana	1990	2003	Growth	Annual Rate
Total (MtCO₂Eq)	226.6	272.1	20.1%	1.4%
Electricity Generation	94.4	112.7	19.5%	1.4%
Residential	9.7	10.5	8.4%	0.6%
Commercial	5.5	6.4	18.2%	1.3%
Industrial	52.3	53.2	1.7%	0.1%
Transportation	41.4	47.2	13.9%	1.0%
Fugitive Emissions	1.1	1.5	35.5%	2.4%
Industrial Processes ¹	3.3	22.2	561.8%	15.6%
Agriculture ²	15.7	14.7	-6.4%	-0.5%
Waste	3.2	3.7	17.0%	1.2%



¹ State level emissions data in the Industrial Processes sector is highly uncertain and is considered unreliable. As this sector is the major source of F-gases it remains in this inventory; however, trends in this category are considered to be questionable.

² Owing to anomalies in the underlying data, 2001 emissions from agriculture are used in the 2003 column of this table.

Washington

Net Electricity Exporter Rank: 9 (21,961,190 MWH)

Net Electricity Generation: 100,094,691 MWH

Exports as a % of Net Generation: 21.9%

2003 Emissions

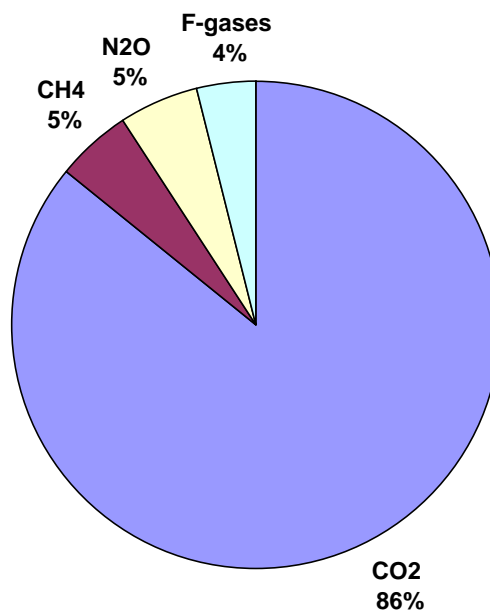
Total GHG Emissions: 94.1 MtCO₂ eq.

US State Emissions Rank: 27

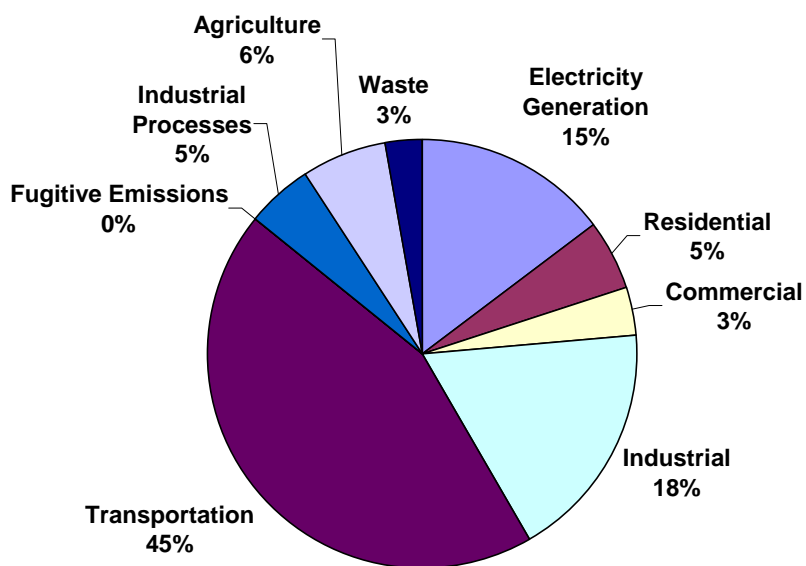
% of US Total Emissions: 1.4%

Washington Emissions by Gas and Sector

Washington Emissions by Gas (2003)	MtCO ₂ eq.	%
Total – All Sectors	94.1	
CO ₂	80.8	86%
CH ₄	4.8	5%
N ₂ O	4.8	5%
High-GWP Gases (HFCs, PFCs, SF ₆)	3.7	4%

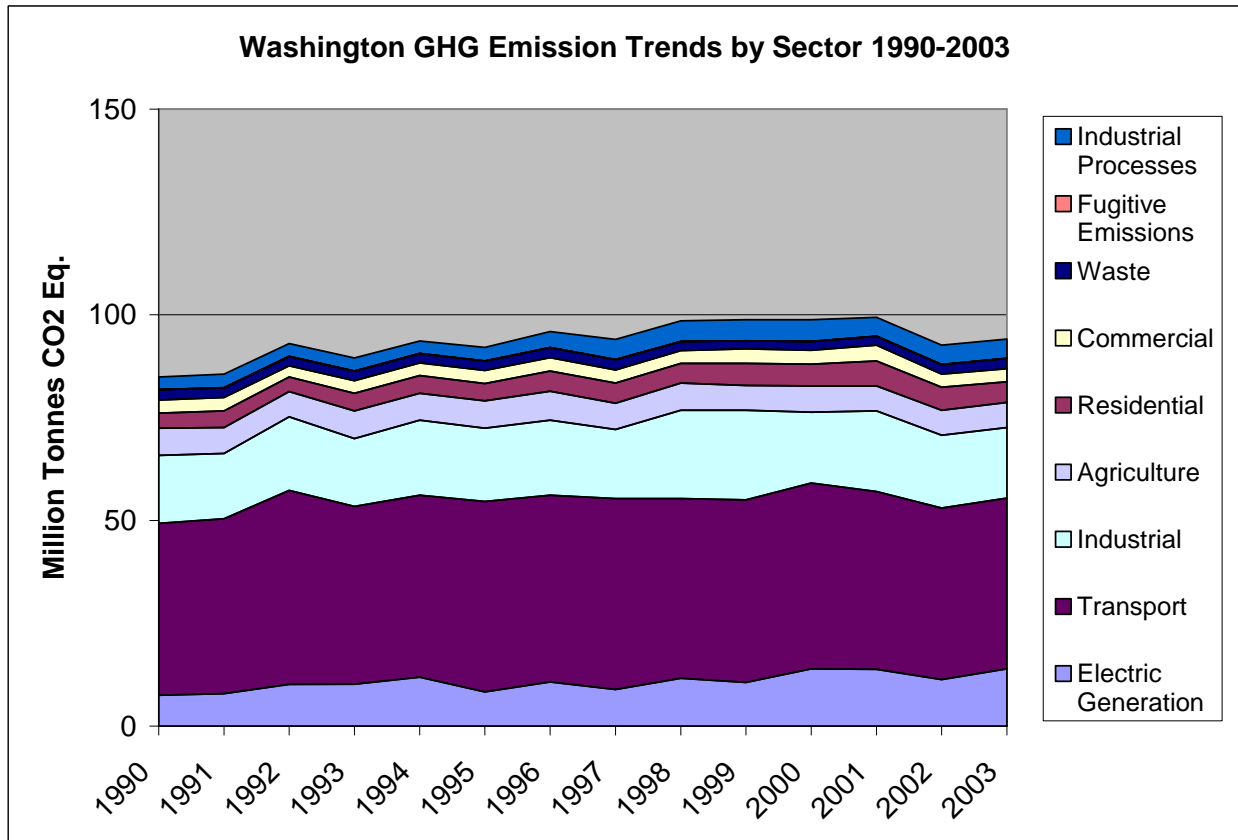


Washington Emissions by Sector (2003)	MtCO ₂ eq.	%
Total – All GHGs	94.1	
Total Energy	80.9	86%
Electricity Gen.	13.9	15%
Residential	5.0	5%
Commercial	3.2	3%
Industrial	17.2	18%
Transportation	41.5	45%
Fugitive Emissions	0.0	0%
Industrial Processes	4.7	5%
Agriculture	6.1	6%
Waste	2.5	3%



Emissions Growth in Washington

Washington	1990	2003	Growth	Annual Rate
Total (MtCO₂Eq)	84.9	94.1	10.8%	0.8%
Electricity Generation	7.5	13.9	85.3%	4.9%
Residential	3.7	5.0	35.1%	2.3%
Commercial	3.2	3.2	0.0%	0.0%
Industrial	16.5	17.2	4.2%	0.3%
Transportation	41.8	41.5	-0.7%	-0.1%
Fugitive Emissions	0.0	0.0	0.0%	0.0%
Industrial Processes ¹	3.1	4.7	51.6%	3.3%
Agriculture ²	6.6	6.1	-7.6%	-0.6%
Waste	2.5	2.5	0.0%	0.0%



¹ State level emissions data in the Industrial Processes sector is highly uncertain and is considered unreliable. As this sector is the major source of F-gases it remains in this inventory; however, trends in this category are considered to be questionable.

² Owing to anomalies in the underlying data, 2001 emissions from agriculture are used in the 2003 column of this table.

North Dakota

Net Electricity Exporter Rank: 10 (20,861,021 MWH)

Net Electricity Generation: 31,322,129 MWH

Exports as a % of Net Generation: 66.6%

2003 Emissions

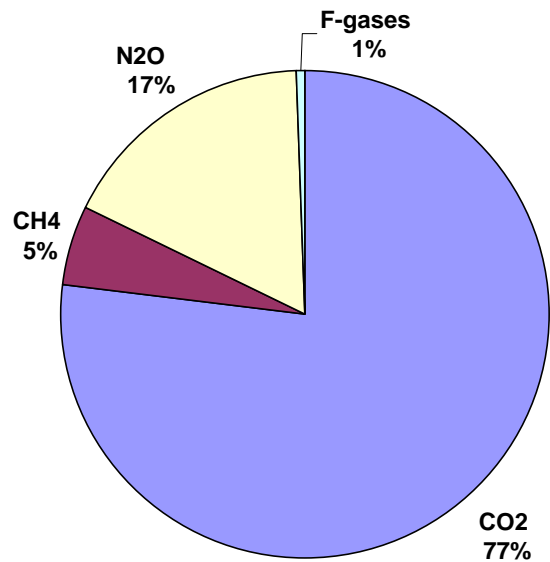
Total GHG Emissions: 60.8 MtCO₂ eq.

US State Emissions Rank: 37

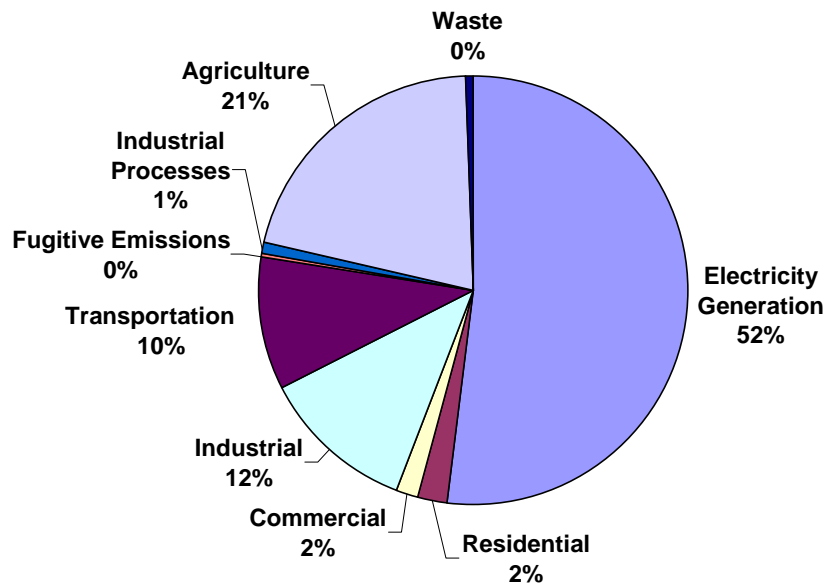
% of US Total Emissions: 0.9%

North Dakota Emissions by Gas and Sector

North Dakota Emissions by Gas (2003)	MtCO ₂ eq.	%
Total – All Sectors	60.8	
CO ₂	46.9	77%
CH ₄	3.2	5%
N ₂ O	10.5	17%
High-GWP Gases (HFCs, PFCs, SF ₆)	0.3	1%

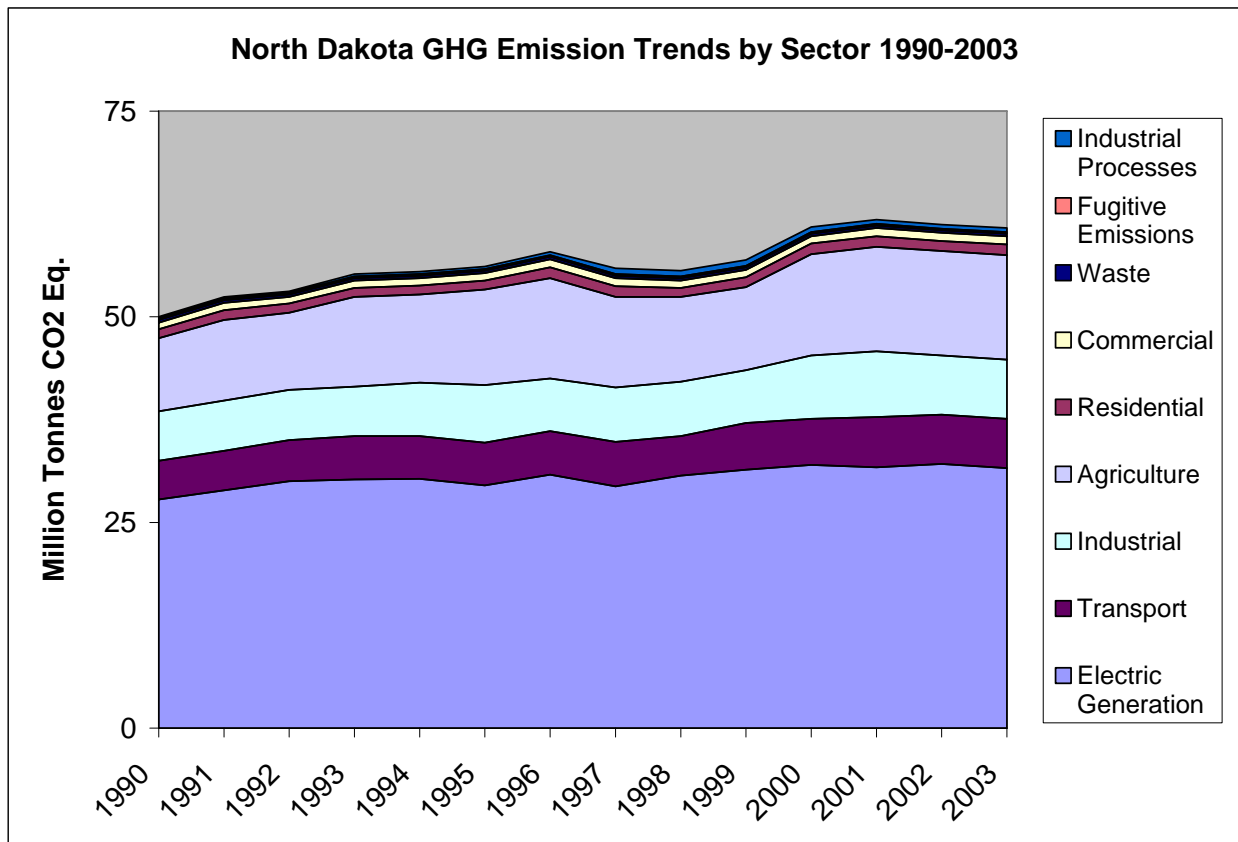


North Dakota Emissions by Sector (2003)	MtCO ₂ eq.	%
Total – All GHGs	60.8	
Total Energy	47.2	78%
Electricity Gen.	31.6	52%
Residential	1.3	2%
Commercial	1.0	2%
Industrial	7.2	12%
Transportation	6.0	10%
Fugitive Emissions	0.2	0%
Industrial Processes	0.5	1%
Agriculture	12.7	21%
Waste	0.3	0%



Emissions Growth in North Dakota

North Dakota	1990	2003	Growth	Annual Rate
Total (MtCO₂Eq)	50	60.8	21.6%	1.5%
Electricity Generation	27.8	31.6	13.7%	1.0%
Residential	1.1	1.3	18.2%	1.3%
Commercial	0.8	1.0	25.0%	1.7%
Industrial	6.0	7.2	20.0%	1.4%
Transportation	4.7	6.0	27.7%	1.9%
Fugitive Emissions	0.2	0.2	0.0%	0.0%
Industrial Processes ¹	0.2	0.5	150.0%	7.3%
Agriculture ²	8.9	12.7	42.7%	2.8%
Waste	0.3	0.3	0.0%	0.0%



¹ State level emissions data in the Industrial Processes sector is highly uncertain and is considered unreliable. As this sector is the major source of F-gases it remains in this inventory; however, trends in this category are considered to be questionable.

² Owing to anomalies in the underlying data, 2001 emissions from agriculture are used in the 2003 column of this table.