1990–2023

Connecticut Greenhouse Gas Emissions Inventory

Connecticut Department of
Energy & Environmental Protection

August 2025

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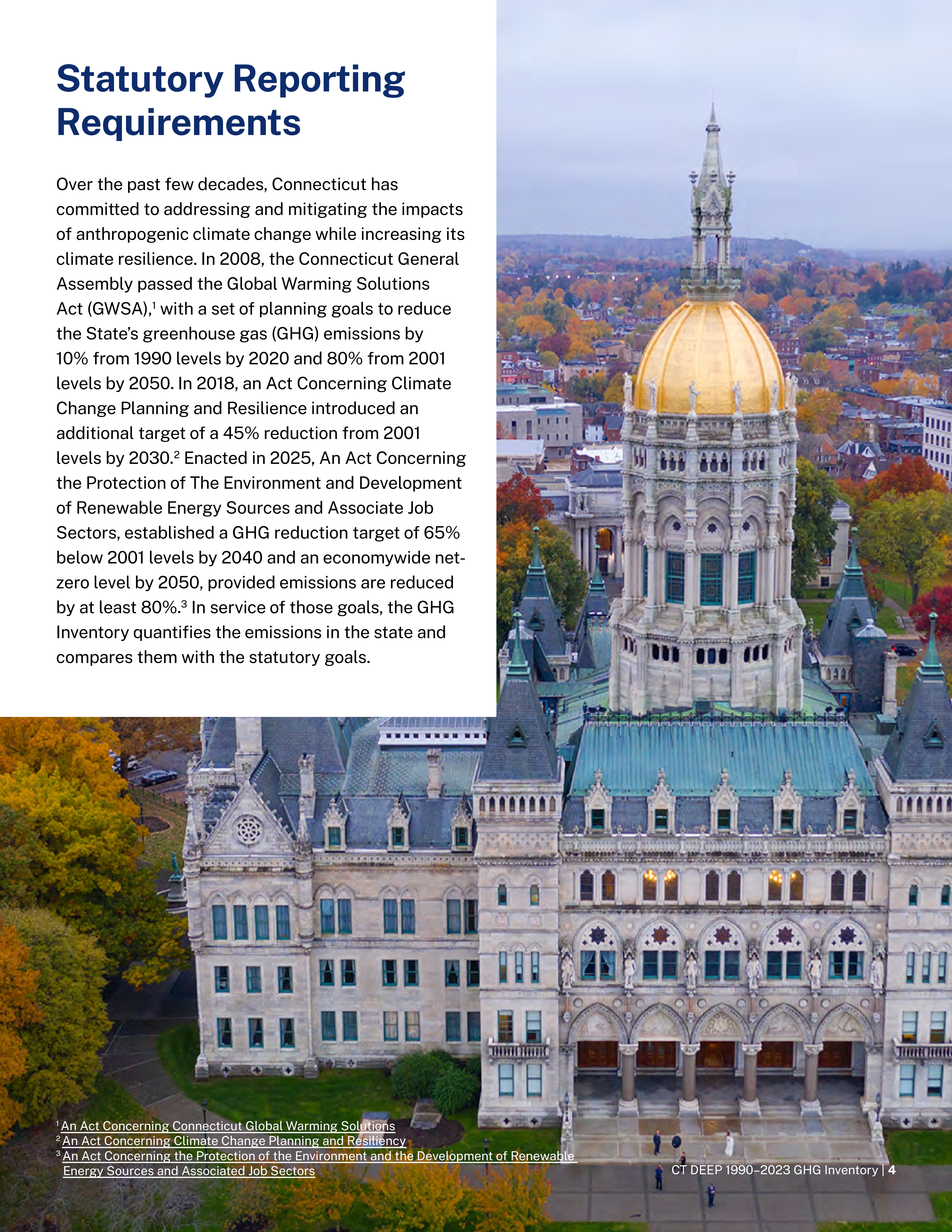
Abbreviations

Chlorofluorocarbon **(CFC)**
Conservation and Load Management **(C&LM)**
Department of Energy and Environmental Protection **(DEEP)**
Electric Vehicle **(EV)**
Energy Information Administration **(EIA)**
Environmental Protection Agency **(EPA)**
Greenhouse Gas **(GHG)**
Global Warming Solutions Act **(GWSA)**
Inflation Reduction Act **(IRA)**
Materials Innovation and Recycling **(MIRA)**
Megawatt hour **(MWh)**
Million Metric Tons of Carbon Dioxide equivalent **(MMTCO2e)**
Miles per gallon **(MPG)**
Millstone Power Station Unit 3 **(MPS3)**
Municipal solid waste **(MSW)**
Natural and Working Lands **(NWL)**
Ozone Depleting Substance **(ODS)**
Pipeline and Hazardous Materials Safety Administration **(PHMSA)**
Renewable Energy Certificate **(REC)**
Renewable Portfolio Standards **(RPS)**
State Energy Data System **(SEDS)**
State Inventory Tool **(SIT)**
Vehicle Miles Traveled **(VMT)**

Statutory Reporting Requirements

Over the past few decades, Connecticut has committed to addressing and mitigating the impacts of anthropogenic climate change while increasing its climate resilience. In 2008, the Connecticut General Assembly passed the Global Warming Solutions Act (GWSA),[1] with a set of planning goals to reduce the State's greenhouse gas (GHG) emissions by 10% from 1990 levels by 2020 and 80% from 2001 levels by 2050. In 2018, an Act Concerning Climate Change Planning and Resilience introduced an additional target of a 45% reduction from 2001 levels by 2030.[2] Enacted in 2025, An Act Concerning the Protection of The Environment and Development of Renewable Energy Sources and Associate Job Sectors, established a GHG reduction target of 65% below 2001 levels by 2040 and an economywide net-zero level by 2050, provided emissions are reduced by at least 80%.[3] In service of those goals, the GHG Inventory quantifies the emissions in the state and compares them with the statutory goals.



[1] An Act Concerning Connecticut Global Warming Solutions
[2] An Act Concerning Climate Change Planning and Resiliency
[3] An Act Concerning the Protection of the Environment and the Development of Renewable Energy Sources and Associated Job Sectors

Summary of Findings

In this report, the Department of Energy and Environmental Protection (DEEP) provides an annual update in emissions tracking for the years 1990-2023 for all sources and sinks of GHG emissions. It provides an in-depth analysis of the contributing factors to emissions levels in each sector, such as average annual temperatures and adoption of technologies. It concludes with an assessment of progress towards emissions reductions in each sector compared to the state's goals.

The main findings from the report are that in 2023, total emissions were 35.0 million metric tons of carbon dioxide equivalent (MMTCO2e)–an increase of 1.5% from 2022 levels–but remain 9.5% below pre-pandemic levels in 2019.

- Transportation sector emissions, the state's largest source of emissions, decreased by about 0.3 MMTCO2e (or 2%) despite vehicles miles traveled increasing. The continued increase in the share of light-duty vehicles with higher fuel efficiency to the total of light-duty vehicles on the road likely drove emissions reductions in the transportation sector, with electric vehicle adoption and biodiesel consumption also contributing.
- Residential buildings sector emissions declined by about 0.6 MMTCO2e (or 5.6%). The mild winter in 2023 likely drove the reduction in emissions in the residential buildings sectors, complemented by weatherization and energy efficiency measures.
- Electric power sector emissions increased by 1.1 MMTCO2e while electricity consumption in Connecticut decreased from 28.4 million MWh in 2022 to 27.2 million MWh in 2023 (or 4.2%). The increase in electric power sector emissions appears to be largely due to the Millstone nuclear plant having a prolonged outage in 2023 due to refueling, resulting in a lower energy production in 2023. As a result, the state's electric power consumption relied more on fossil fuels during this period.
- Emissions from industrial processes, agriculture, wastewater and solid waste, and natural gas remains relatively constant.
- Connecticut's natural and working lands sequestered approximately net 4.9 MMTCO2e.

While the state met its 2020 goal,[4] deeper cuts to emissions must be made to reach the 2030 target of 45% below 2001 levels by 2030. If emissions were assumed to continue declining at the average rate achieved in the two decades since peaking in 2004, the state would be 40% below 2001 levels by 2030.

[4] 1990-2021 Connecticut Greenhouse Gas Emissions Inventory

Inventory Highlights

Transportation

14.6 MMTCO2e. Transportation emissions decreased 0.3 MMTCO2e from 2022 while vehicle miles traveled increased largely due to the continued increase in the share of light-duty vehicles with higher fuel efficiency to the total of light-duty vehicles on the road. Transportation remains Connecticut's largest source of emissions.

Industrial Processes

4.3 MMTCO2e, comparable to 2022.

Wastewater and Solid Waste

1.5 MMTCO2e, comparable to 2022.

Natural Gas

0.2 MMTCO2e, comparable to 2022.

Residential Buildings

6.7 MMTCO2e. A decrease of 0.6 MMTCO2e from the previous year driven primarily by a milder winter.

Commercial Buildings

4.3 MMTCO2e, comparable to 2022.

Electric Power

3.6 MMTCO2e. Emissions increased by 1.1 MMTCO2e due to lower output from Millstone requiring Connecticut to rely more on fossil fuels for its electricity demand.

Agriculture

0.3 MMTCO2e, comparable to 2022.

Sector Emissions (MMTCO2e)	1990	2001	2010	2019	2022	2023
Transportation	15.1	17.3	16.0	15.40	14.9	14.6
Residential Buildings	8.3	8.6	7.7	7.41	7.1	6.7
Commercial Buildings	3.8	4.3	3.4	3.82	4.3	4.3
Electric Power (Consumption)	11.9	12.3	12.0	5.69	2.5	3.6
Industrial Processes	3.0	3.4	3.4	3.15	3.7	3.8
Wastewater and Solid Waste	1.4	1.6	1.8	2.25	1.6	1.5
Agriculture	0.3	0.3	0.3	0.37	0.2	0.3
Natural Gas Leakage	0.8	0.5	0.3	0.24	0.2	0.2
Total-w/ Electric Consumption	**44.7**	**48.3**	**44.8**	**38.71**	**34.5**	**35.0**

Table 1: Emissions from each economic sector in Connecticut for select years

1990–2023 Emissions

Figure 1 shows that, assuming the trend will follow a linear regression of the total annual emissions since 2004, emissions are declining, but not yet at a rate that would meet the 2030 goal. At current trends, Connecticut's economy-wide emissions will be higher than the 2030 emissions target by 2.2 MMTCO2e, with the state achieving approximately a 40% cut from 2001 emissions–about 5 percentage points lower than the 2030 goal.

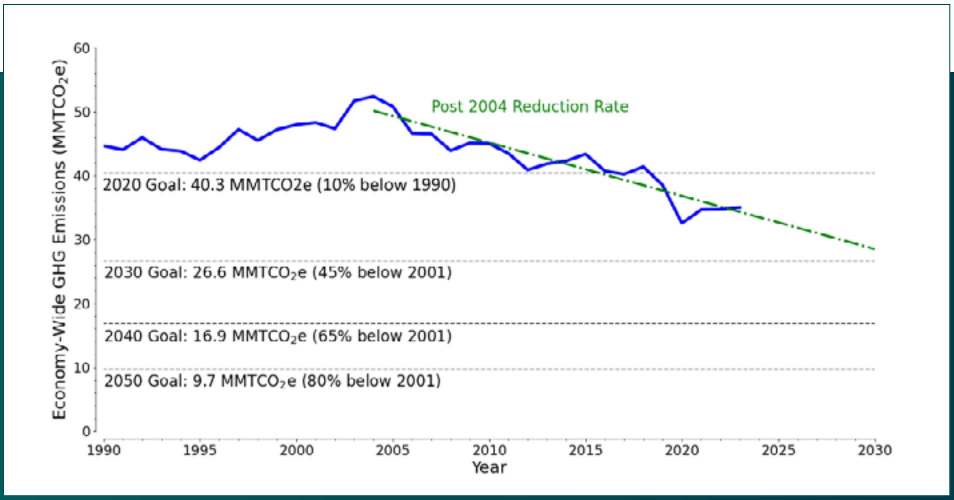


Figure 1: Connecticut's Economy-wide GHG Emissions for the years 1990-2023.

Figures 2 and 3 show that the relative contribution of individual sectors to total GHG emissions remains largely unchanged between 2022 and 2023. Transportation continues to be the largest emitting sector in Connecticut and has nearly the same carbon footprint as the next three sectors (residential, commercial, and electric power) combined. Transportation emissions for 2023 make up more than half of the emissions that comprise the level in the 2030 GWSA target. Industry is the next highest source of emissions, followed by wastewater and solid waste, agriculture and natural gas leakage.

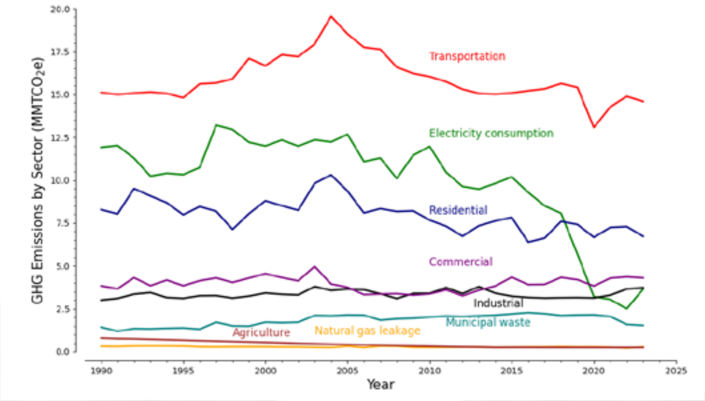


Figure 2: Breakdown of 1990-2023 GHG emissions by sector.

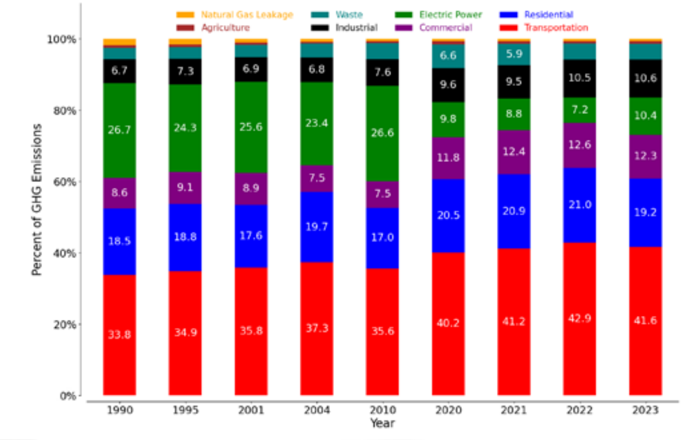


Figure 3: Relative contribution of each economic sector to Connecticut's total GHG emissions for selected years. Emissions peaked in 2004.

Sector by Sector Review of Emissions 1990-2023

Transportation

Transportation Sector Results

Emissions in the transportation sector arise from the combustion of fossil fuels in personal vehicles, rail, aviation, buses, and vehicles used for transporting goods across the state. For the first time since the COVID-19 pandemic, emissions from this sector decreased by 0.3 MMTCO2e (or 2%) in 2023. The drop occurred despite a 2% rise in vehicle miles traveled between 2022 and 2023 (Figure 4). Data suggests the emissions reduction rate from 2022-2023 aligns with the declining trend in annual transportation sector emissions since transportation emissions peaked in 2004 (Figure 4).

Transportation Sector Analysis

The significant increase in the real-world fuel economy for the entire vehicle fleet experienced in recent years seems to be the predominant driving force behind the emissions decline in the transportation sector. An increase in electric vehicle registrations and consumption of biodiesel also contributed to the reduction in emissions but were not as significant a factor as the role of fuel economy.

Gasoline is by far the largest source of emissions by fuel type, accounting for almost 73% of the total emissions in the transportation sector.

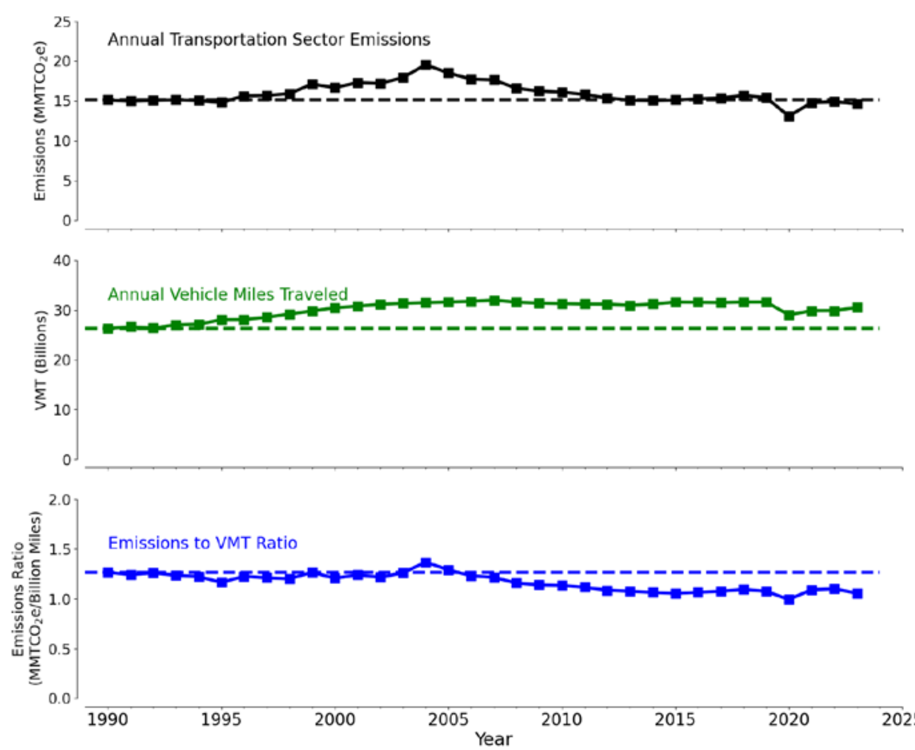


Figure 4: Top: Total transportation sector GHG emissions, 1990–2023. Middle: Annual vehicle miles traveled (VMT), 1990–2023. Bottom: Ratio of emissions to VMT. The dashed line represents 1990 values in all three panels. Source: CT DOT, USDOT.

Gasoline consumption in transportation fell by 3.4% in 2023 while the ethanol blending percentage remained the same at 7.4% by energy content, according to EIA data,[5] and vehicle miles traveled increased. In 2012, the EPA and the US Department of Transportation finalized a rule requiring higher fuel efficiency standards in conventional vehicles applying to model years 2017-2025.[6]

After implementing the new rule, the 2024 update to the EPA's annual automotive trends report[7] shows that the real-world fuel efficiency for model year 2023 vehicles in aggregate increased to 27.1 miles per gallon (MPG) from 26.0 MPG for model year 2022 vehicles. In 2023, the average age of a light-duty vehicle nationwide was 12.5 years[8] and was manufactured when the average real-world fuel efficiency was 22.3 MPG. As a newer population of light-duty vehicles with higher fuel economy replaces older vehicles in the fleet, these gains in fuel economy may be seen in lower total emissions. An examination of light-duty vehicles registered in Connecticut shows that the fraction of the in-state light-duty vehicles manufactured for model years 2017 and later increased from 31.6% to 40.6% during the period 2021-2023.

Electric Vehicle (EV) registrations increased from 30,186 in 2022 to 44,313 in 2023 (or by 46.8%), which contributes to reducing GHG emissions. However, given the still marginal share of EVs in total light-duty vehicles (1.3% in 2022 and 2% in 2023),[9] the impact of EV adoption on the sector's total emissions is modest at this point.

Biodiesel blending into petroleum-based diesel consumed by the transportation sector may also be playing a small, complementary role in the sector's GHG emissions reduction. According to the EIA, the consumption of biodiesel by CT's transportation sector increased by more than 35% in 2023 whereas the consumption of diesel decreased by 2%. As a result, the share of biodiesel in the total diesel and biodiesel consumed by the sector grew from 2.2% to 3.1%. The EV and biodiesel data discussed above corroborate the interpretation that the bulk of the sector's emissions reductions are due to a continued larger share of vehicles with better fuel economy on the roads.

Residential Buildings

Residential Buildings Sector Results

Residential buildings sector emissions declined by about 0.6 MMTCO2e in 2023 (or 5.6%) as shown in Figure 2.

[5] State Energy Data System (SEDS): 1960-2023 (complete)
[6] Federal Register / Vol. 77, No. 199
[7] The 2024 EPA Automotive Trends Report
[8] Average Age of Automobiles and Trucks in Operation in the United States | Bureau of Transportation Statistics
[9] EV Registration Factsheet

Residential Buildings Sector Analysis

Emissions from this sector result mainly from the combustion of fossil fuels to heat dwellings but also arise from fossil fuel combustion for heating water and, to a smaller extent, cooking. Emissions reductions were predominantly due to reduced demand for heating due to a milder winter in Connecticut in 2023. Other factors that contributed to a lesser extent were weatherization and energy efficiency measures, including heat pump adoption for home and water heating.

In 2023, 78% of Connecticut's home heating requirements were met by natural gas, heating oil, or propane, while 19% were met by electricity either through electric resistance heating or heat pumps. This translates to approximately 285,000 of Connecticut's 1.5 million households meeting their heating needs through electricity. This is not appreciably different from 2022, where 79% of households met their heating demand with fossil fuels. The drop in emissions in this sector is likely therefore attributable to the milder winter for the year. Additionally, Connecticut consumed 8,590 billion BTU of wood products for home heating in 2023 (a reduction from 2022), resulting in approximately 800,000 metric tons of biogenic CO2e emissions. Heating degree days, defined as the difference between a day's average temperature and 65 degrees Fahrenheit, represents a way to quantify heating demand during cold days. The total number of heating degree days in any given year is experiencing a noticeable decline over several decades, but the months of the 2023 heating seasons were even warmer than this trend would indicate. Cumulative heating degree days were at the lowest level seen in a decade (see Figure 6) resulting in less heating demand to maintain buildings at a comfortable temperature.

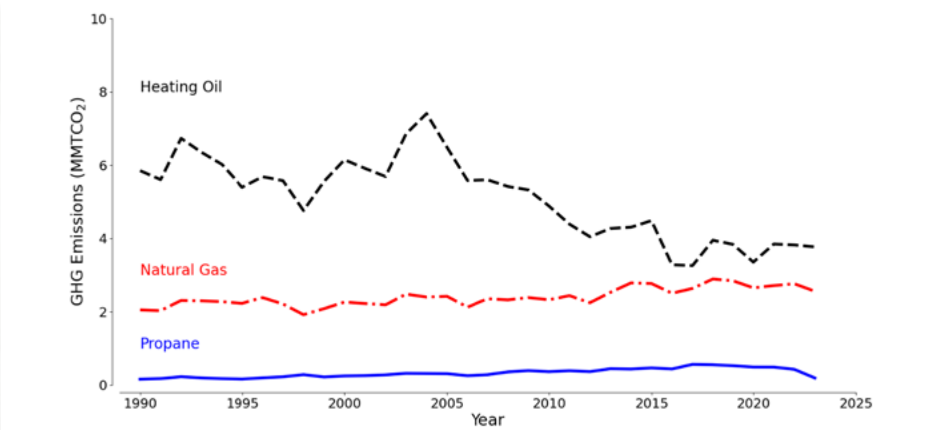


Figure 5: GHG Emissions in the residential buildings sector by fuel type for 1990-2023.

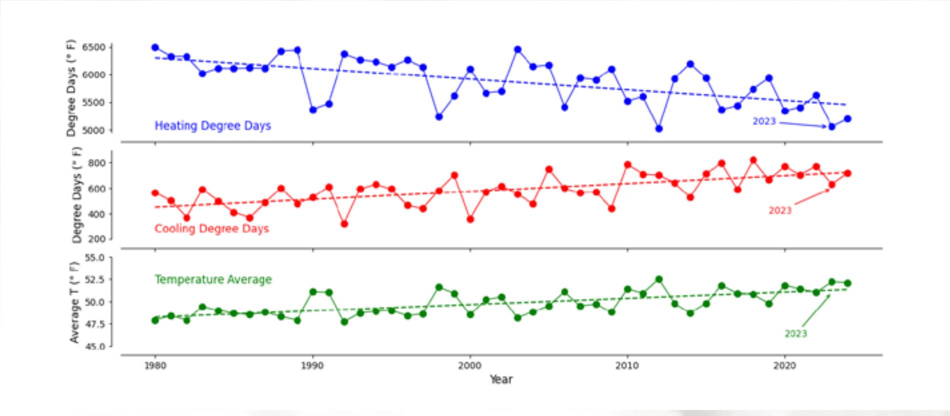


Figure 6: Heating degree days statewide 1980-2024. Middle: Cooling degree days 198-2024. Bottom: Average temperature 1980-2024. Source: NOAA National Center for Environmental Information.[11]

[11] NCEI Climate at a Glance

Weatherization and energy efficiency measures, including heat pump adoption for home and water heating, contributed to emissions reductions as well, albeit to a modest extent. In 2023, nearly 23,000 rebates for heat pumps for home heating were claimed through the state's Conservation and Load Management (C&LM) program – a 51.5% increase from 2022. This amount is comparable to approximately 8% of the total number of households heating with electricity. Over 2,000 additional rebates were claimed for the installation of heat pump water heaters.[12] While these numbers do not translate to a significant reduction in 2023 residential sector emissions, this is a significant increase in the level of adoption of heat pumps and could have more substantial impacts if sustained over time.

Commercial Buildings

Commercial Buildings Sector Results

Emissions from the commercial sector amounted to about 12 percent of all emissions in 2022 and 2023. After some decline in the mid-2000s, commercial emissions began to rise again in the mid-2010s and plateaued over recent years.

Commercial Buildings Sector Analysis

The growth in emissions during the mid-2010s appears to arise from an increase in natural gas heating demands in newer buildings (Figure 7). As a result, the use of heating oil has declined which has led to the plateau of emissions in the commercial buildings sector over recent years.

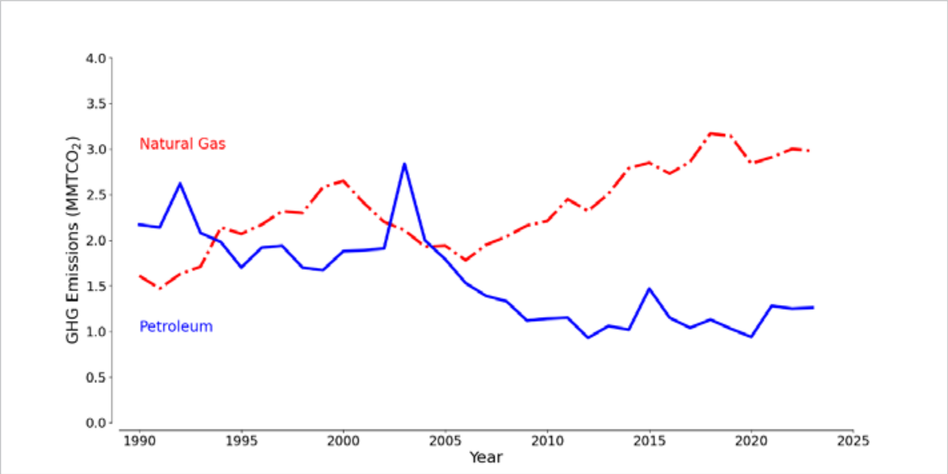


Figure 7: Commercial sector emissions by fuel type.

[12] Connecticut Heat Pump and Water Heater Data

Electric Power

Electric Power Sector Results

Overall electric power sector emissions increased by 1.1 MMTCO2e to 3.6 MMTCO2e in 2023 while electricity consumption in Connecticut decreased from 28.4 million MWh in 2022 to 27.2 million MWh (or 4.2%). An analysis of electricity consumed in Connecticut may be found in Appendix A.

Electric Power Sector Analysis

In 2023, electric power emissions increased in the state, predominantly due to an episodic decrease in available zero-carbon electricity as further described below. Connecticut's Renewable Portfolio Standard (RPS) mandates an increasing percentage of the State's electric energy supply to be met by power plants producing energy from certain renewable resources and are grouped into three distinct classes. Class I consists of renewables like wind and solar but also contains various emitting resources like biomass and fuel cells. Class II consists of electricity generated from trash that is incinerated, and Class III renewables contain energy derived from combined heat and power systems. As part of the GHG Inventory methodology, emissions from the electricity Connecticut purchases to satisfy RPS compliance are also accounted for.[13]

Non-biogenic emissions are calculated for the portion of Connecticut's electricity consumption that is used toward compliance with the RPS. Additionally, due to Connecticut's power purchase agreement with the Millstone nuclear power plant, environmental attributes owned by the state are credited as if they were a portion of the RPS profile. The rest of Connecticut's electricity emissions are assumed to be the proportion of the residual emissions that equals the fraction of the residual load on the grid that Connecticut demands.

In 2023, Millstone experienced more frequent and longer outages than in 2022.[14] Millstone Unit 3 underwent an unplanned longer maintenance from May 30 to July 3 and a planned refueling from October 19 to December 1. Millstone 2 also underwent a planned outage from April 6 to July 4. Both units did not produce electricity during these periods.[15] As a result, the annual output of Millstone was lower than in previous years, and the fraction of emissions determined through the calculations outlined above increased.

It should be noted that other carbon-free resources declined in 2023. The quantity of renewable energy certificates (RECs) from wind energy decreased from 1.9 million MWh in 2022 to 1.2 million MWh in 2023 (nearly 37%), partially explained by a decline of nearly 487,000 RECs being imported into New England from New York State and Canada. The total amount of solar RECs remained steady at 1.3M MWh for the year.

[13] Prior to the 1990-2018 GHG Inventory released in 2021, the electric sector methodology did not adequately incorporate emissions from the electricity that Connecticut purchases from sources included in order to satisfy RPS compliance. In 2021 DEEP altered its methodology in order to address this. An overview of the process can be found in previous inventory reports and their supplementary material (CT Greenhouse Gas Inventory Reports).

[14] See Connecticut's Nuclear Energy Advisory Council Reports for the years 2022 and 2023.

[15] See Connecticut's Nuclear Energy Advisory Council Report for 2023

Industrial Processes

Industrial Processes Sector Results

DEEP's 2022 GHG Inventory reported 3.9 MMTCO2e GHG emissions from the industrial sector.[16] This number needs to be revised to 3.7 MMTCO2e for 2022 based on a refined approach that accounts for some fossil fuel usage in this sector for non-energy (non-combustion) reasons and, thus, does not get emitted into the atmosphere. Some examples include the use of liquid propane in the production of industrial solvents and oil that is used in the production of asphalt.[17] Calculations for 2023 from the State Energy Data Systems (SEDS) data results in emissions remaining steady at 3.7 MMTCO2e for 2022 for 2023.

Industrial Processes Sector Analysis

Emissions due to industrial processes occur from the combustion of fossil fuels as well as from the use of carbon-containing raw materials as inputs for industrial processes. Fugitive emissions of various refrigerants also contribute to emissions in this sector. In 2023, about 1.5 MMTCO2e (about 40%) were emitted through industrial processes involving the combustion of petroleum and natural gas. The remainder of emissions from this sector arise mainly from the use of substitutes for ozone depleting substances, including refrigerants. Some minor use of limestone and dolomite contribute as well along with iron and steel production.

Wastewater and Solid Waste

Wastewater and Solid Waste Sector Resuts

Similar to previous years, 2023 emissions in the wastewater and solid waste sector were 1.5 MMTCO2e.

[16] 1990-2021 Connecticut Green House Gases Inventory
[17] User's Guide For Estimating Direct Carbon Dioxide Emissions From Fossil Fuel Combustion Using The State Inventory Tool

Wastewater and Solid Waste Sector Analysis

Emissions associated with this sector come from methane generated and released during the treatment of wastewater as well as off-gassing of landfilled solid waste within the state's borders. The combustion of non-organic materials in the waste stream also contributes to emissions in this sector. In the case of both vectors for emissions, Connecticut currently sees diminishing emissions due to the absence of in-state landfilling for the past decade and a reduction in trash incineration due to the closing of the Materials Innovation and Recycling (MIRA) facility in Hartford.

Closing MIRA led to a reduction of GHG emissions in this sector because the state is no longer incinerating trash at this facility within its borders and is instead disposing of that waste outside of the state. Under the conventions of GHG inventory accounting, the emissions from trash that is landfilled or incinerated outside Connecticut's borders should be accounted for in the inventory of the jurisdictions where these activities occur. These emissions are therefore not included in Connecticut's GHG Inventory. Connecticut disposes of 2.2 million tons of solid waste annually and approximately 40% of this waste is organic material.[18] DEEP estimates that in excess of 860,000 tons per year, or 40% of municipal solid waste (MSW) generated in the state requiring disposal, are being exported to other states, traveling an average of 407 miles primarily to landfills in Pennsylvania, New York, and Ohio.[19] DEEP estimates that the increase in Connecticut waste exports will contribute an additional 100,000-150,000 MTCO2e to emissions in those states (equivalent to about 10% of Connecticut's waste disposal emissions).

Agriculture

Agriculture Sector Results

Emissions in the agriculture sector were 300,000 MTCO2e in 2023, an increase of approximately 100,000 MTCO2e from 2022 levels. Agricultural emissions comprise only about one-half of a percent of the total economywide emissions.

Agriculture Sector Analysis

Connecticut's agriculture sector contributes GHG emissions through three main vectors:

1. Methane that is generated via enteric fermentation of organic material in the digestive tracts of farm animals (mainly cattle);
2. Methane emitted from manure management practices; and
3. Emissions associated with soil runoff.

[18] CT Commercial Organics
[19] sb-11---fact-sheet---aac-waste-management.pdf

Additional sources of emissions, such as the combustion of agricultural residue, soil amendments, and cultivation of certain crops, are difficult to measure because they do not significantly contribute to Connecticut's agricultural emissions. Enteric fermentation produces the bulk of GHG emissions in Connecticut's agricultural sector. Therefore, the emissions produced because of enteric fermentation fluctuate almost solely on the number of cattle being raised in the state for any particular year.

Natural Gas Distribution System

Natural Gas Distribution System Results

Emissions from leaks in the natural gas distribution system was 0.2 MMTCO2e in 2023, which was a negligible change from 2022.

Natural Gas Distribution System Analysis

DEEP calculates emissions from the natural gas distribution system using emission factors developed by a Washington State University study in which direct measurements of methane emissions were sampled from thirteen urban natural gas distribution systems across the United States.[20] These emission factors are paired with data from the Pipeline and Hazardous Materials Safety Administration (PHMSA)[21] which includes the length of distribution pipeline in the state as well as the pipeline‘s construction material to calculate fugitive methane emissions. In addition to calculating emissions from PHMSA pipeline data, emissions from natural gas service stations located throughout the system are calculated using the Washington State University study results. While Connecticut has reduced fugitive emissions from older gas infrastructure by replacing older cast iron gas lines with newer PVC distribution lines, fugitive emissions have risen imperceptibly since the previous year. It is also noteworthy that emissions associated with natural gas distribution occur at a much larger scale before the gas arrives in Connecticut. The EPA estimates that half of the methane that escapes does so in the extraction process.[22] This inventory does not capture the full effect of methane leaks into the atmosphere from the natural gas distribution system because natural gas consumed in Connecticut is produced and stored out of state.

[20] Direct Measurements Show Decreasing Methane Emissions from Natural Gas Local Distribution Systems in the United States | Environmental Science & Technology
[21] Pipeline and Hazardous Materials Safety Administration
[22] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022

Natural and Working Lands

Natural and Working Lands Sector Results

In forests, carbon is stored not only in the wood that makes up the trees, but also in leaf litter and organic matter that is locked up in the soil. These two components of the natural and working lands (NWL) profile removed a net total of 2.8 MMTCO2e and 2.0 MMTCO2e, respectively, from the atmosphere in 2023. With other minor sources of carbon sequestration, Connecticut's natural and working lands sequestered approximately net 4.9 MMTCO2e in 2023.

Natural and Working Lands Sector Results

NWLs may act as a carbon sink by absorbing carbon from the atmosphere and storing it long-term inside biomass. These lands can also serve as a source of carbon emissions by releasing carbon from dead and decaying biomass into the atmosphere or through combustion either from wildfires or controlled burns. Connecticut's natural and working lands (NWL) are comprised of forests and woodlands, urban tree canopies, grasslands, wetlands and urban green spaces. In Connecticut, the dominant vectors for storing carbon in the NWL sector are net carbon flux from forests, which cover approximately 60% of the state's land, followed by urban trees.

Progress towards Connecticut's Emissions Reduction Targets

Economywide Emissions Reduction Progress

Figure 8 depicts economy-wide emissions along with the 2001-2023 trend extrapolated to 2050 along with the state's targets for 2030, 2040, and 2050. A linear best fit for emissions between the years 2001 (the baseline for all future reduction targets) indicates the state is not on track to meet those targets. If the current rate of emissions decline were to hold to 2050, the state would emit over 5.6 MMTCO2e more than the statutory targets, or approximately 50% of the total emissions target for 2050.

Compared to the established 1990 baseline, Connecticut's emissions in 2022 and 2023 decreased by over 20%. For the state to meet its goal of reducing 45% of emissions from 2001 levels by 2030, the average annual emissions decline between 2001 and 2023 must increase by a factor of nearly 1.6 and 1.3 to meet the 65% below 2001 levels by 2040.

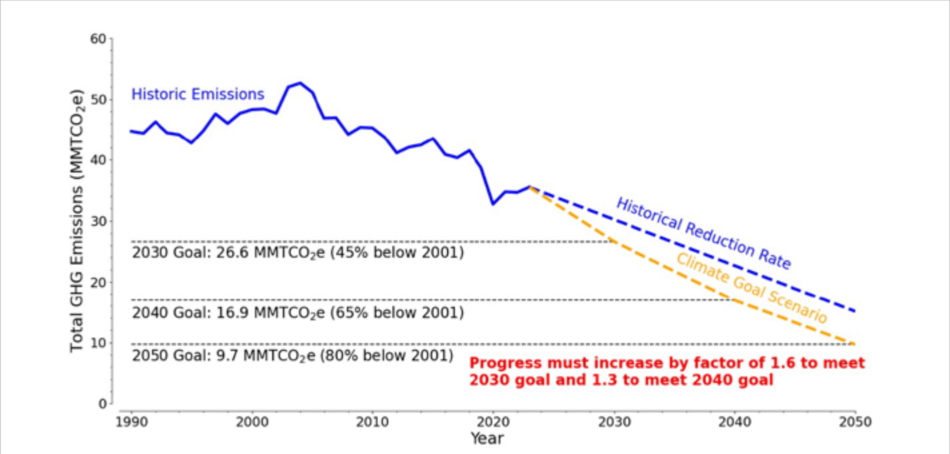


Figure 8: Economywide emissions reductions compared with GWSA goals

Assessing Progress in Individual Sectors

The GWSA does not explicitly set emissions level targets for reductions in specific sectors; however, it is instructive to consider how emissions trends for certain sectors relate to the economywide targets. In the following section, DEEP treats the highest emitting sectors as if the economywide goals for 2030, 2040, and 2050 applied to each sector. In the case of the electricity sector, the zero emissions electric supply by 2040 goal supersedes previous climate targets.[23]

In the previous version of this analysis in the 1990-2021/2022 GHG Inventory, the annual reduction in emissions for each sector was computed by extrapolating the line connecting emissions between 2001 and 2022. In this report, DEEP performs a linear regression to the dataset between 2001 and 2023 to determine historical trends, rather than just the two endpoints. The best fit linear rate of change between 2001 and 2023 serves as the basis for projecting GHG emissions to the year 2050.

[23] Chapter 446c-Air Pollution Control

Assessing Progress in the Transportation Sector

Transportation Sector Emissions Reduction Progress Results

Figure 9 shows that at current trends, transportation emissions in 2050 are expected to be about 63% of current levels. For the state to meet a 2030 goal of reducing transportation emissions by 45% of emissions from 2001 levels, the average annual emissions decline rate must increase by a factor of 3.6 to achieve the 2030 goals and increase 1.7 times faster to meet the 2040 goal.

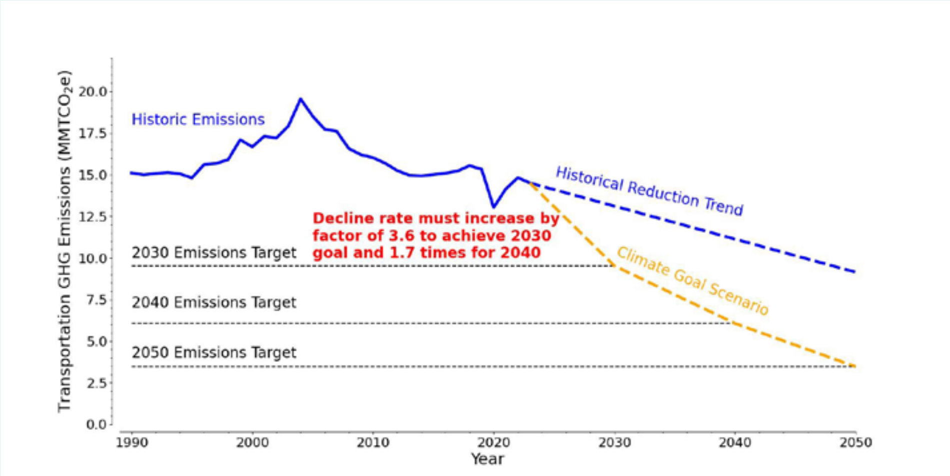


Figure 9: Trends in transportation sector emissions

Transportation Sector Emissions Reduction Progress Analysis

The transportation sector has shown a significant decrease in emissions since they peaked in 2004. Recent progress is predominantly driven by a larger share of more efficient light-duty vehicles on roads (see Transportation Sector Analysis section above for a detailed discussion of contributing factors to a decrease in transportation emissions). The declining trend and the emissions reduction in 2023 despite vehicle miles traveled increasing are encouraging because transportation remains Connecticut's largest contributor to GHG emissions. Reducing emissions in this sector is critical to achieving the state's economywide GHG reduction goals.

Assessing Progress in the Residential Buildings Sector

Residential Buildings Sector Emissions Reduction Progress Results

While emissions in this sector declined in 2023, the average rate of reductions must increase nearly threefold between 2023 and 2030 to be consistent with the 2030 emissions reduction goal (Figure 10), while average emission reductions must increase by nearly a factor of 1.5 between 2030 and 2040 to make this sector consistent with the interim reduction target.

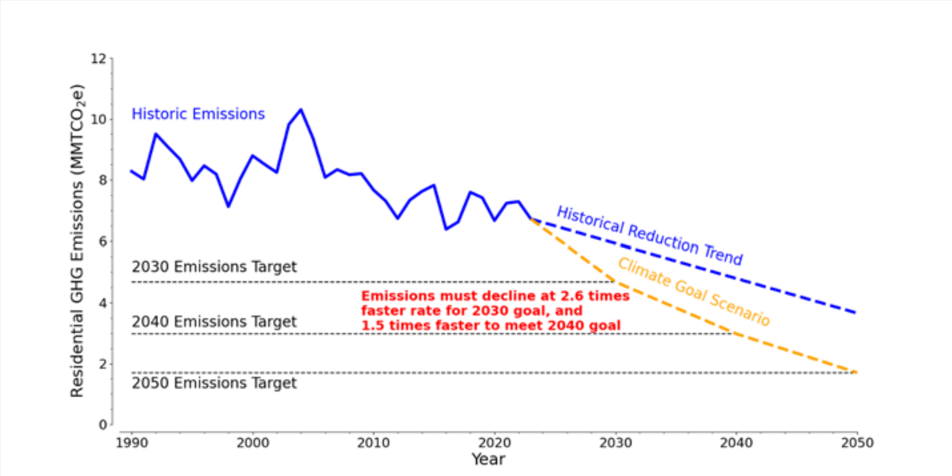


Figure 10: Trends in residential buildings sector emissions

Residential Buildings Sector Emissions Reduction Progress Analysis

As observed previously (Figure 6), winter heating needs have consistently declined over the years while summer cooling needs have significantly increased. As winters become milder, fewer total fossil fuels will be needed to meet the heating demand of Connecticut homes, although cold snaps are likely to continue to persist.[24] As summers become warmer, cooling needs will also increase the demand for electricity in these months.

[24] Cold snaps and climate change-SciLine

Assessing Progress in the Commercial Buildings Sector

Commercial Buildings Sector Emissions Reduction Progress Results

The overall trend in commercial emissions since 2001 is one of stability (see Figure 11), with emissions projected to rise by less than 100,000 metric tons between the present and 2050. If this trend were to continue unmitigated, commercial emissions alone would make up nearly half (45%) of the 2050 target's emissions budget. The current gradually increasing trend must be reversed to meet climate goals.

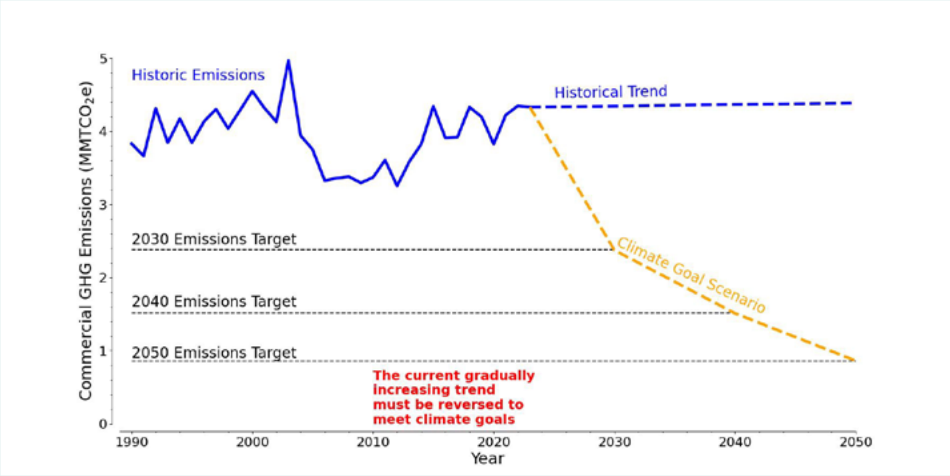


Figure 11: Trends in commercial sector emissions

Commercial Buildings Sector Emissions Reduction Progress Analysis

A sharp decline in commercial emissions occurred during the decade spanning 2005-2015. This is the result of replacing petroleum-fueled furnaces, boilers and other heating infrastructure with their natural gas fired equivalents. In subsequent years, the use of natural gas has grown while the use of heating oil equipment has reached an equilibrium, which results in commercial emissions rising since 2015.

Assessing Progress in the Electric Power Sector

Electric Power Sector Emissions Reduction Progress Results

The best linear fit for electric power sector emissions from 2021 to present indicates that net-zero emissions can be achieved by the 2030s if the contract with Millstone is extended.

Electric Power Sector Emissions Reduction Progress Analysis

While the best linear fit for electric power sector emissions from 2021 to present indicates that net-zero emissions can be achieved by the 2030s, this trend can be deceiving. The dramatic decrease in electricity sector emissions due to the contract with the Millstone nuclear power plant was a one-time event, and additional emissions cuts due to this energy resource for accounting purposes are not possible (Figure 12).

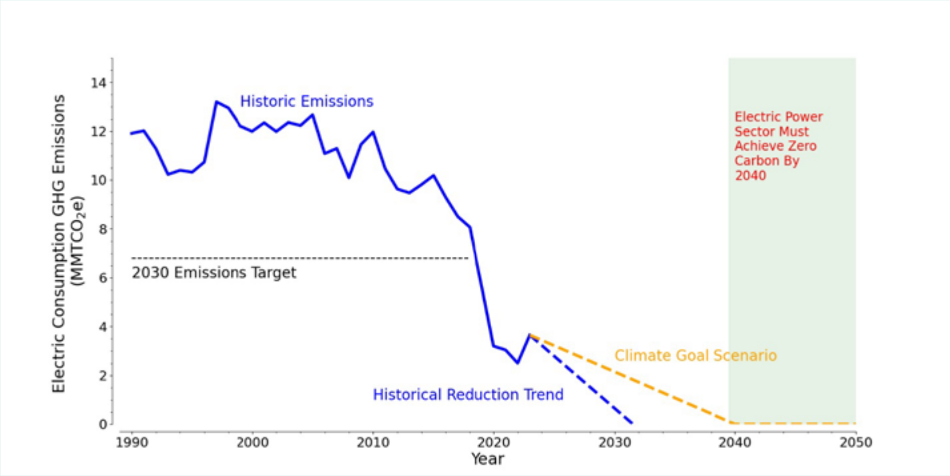


Figure 12: Trend in electric power sector emissions

Assessing Progress in the Industrial Processes Sector

Industrial Processes Sector Emissions Reduction Progress Results

Figure 13 shows that total industrial emissions remain near 2001 levels. The current rate of emissions decline must be increased by a factor of greater than 30 to meet the climate goals.

Industrial Processes Sector Emissions Reduction Progress Analysis

Emissions in this sector have risen by approximately 700,000 metric tons per year since the 1990 emissions baseline. This is the case even after direct CO2 emissions from the combustion of fossil fuels declined by 80% within this same time frame. The rise in emissions appears to be driven by the escape of ozone depleting substances (ODS) into the atmosphere. In 1987, the Montreal Protocol[25] called for phasing out the production and consumption of ODS, mainly chlorofluorocarbons (CFCs). These substances were replaced by ODS substitutes. While these substitutes do not have an impact on ozone levels in the upper atmosphere, they do have high global warming potentials (GWP), meaning they contribute to climate change at a rate many times greater than the equivalent amount of carbon dioxide. Since 1990, Connecticut's carbon dioxide equivalent of emissions from ODS substitutes climbed from 6,000 metric tons to nearly 2 million metric tons.

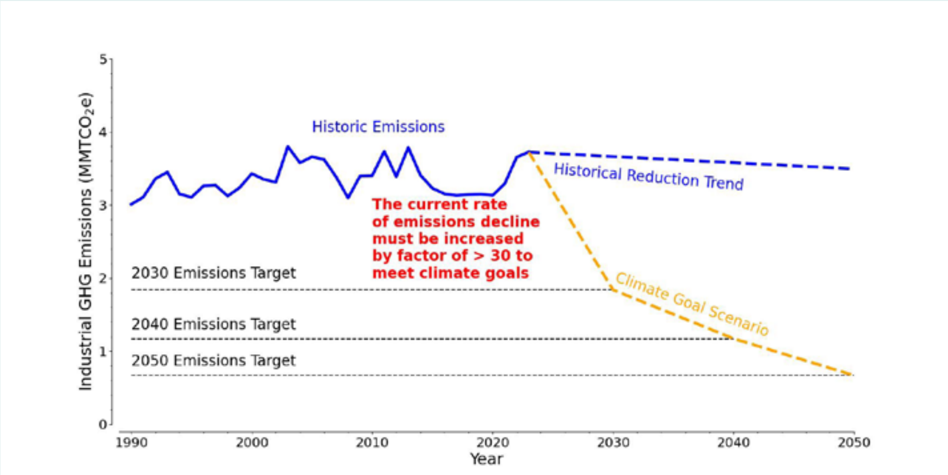


Figure 13: Trends in industrial processes sector emissions

[25] About Montreal Protocol

Appendix A: Electric Power Sector Calculations

Fuel	RECS (MWH)	Emissions (Metric Ton)
Biogas	1,967	1,298
Biomass	644,300	1,217,458
Digester gas	11,216	7,402
Fuel cell	888,677	322,477
Hydroelectric/Hydropower	769,980	-
Landfill gas	280,281	184,973
Solar Photovoltaic	1,276,964	-
Wind	1,185,240	-
Wood	529,862	989,039
Nuclear	12,022,282	-
Diesel	9,541	8,131
Natural Gas	1,109,195	444,984
Oil	1,095	1,005
Trash-to-energy	775,238	1,311,246

Emission Tyle	MMT CO_2
Biogenic Emissions	3.31
Non Biogenic Emissions	1.170

Appendix B: Calculating Biogenic Emissions

Beginning with the inventory released in 2021, DEEP started following international standards for tabulating biogenic emissions within the report. This standard requires biogenic sources to be reported separately from fossil sources. In Connecticut, this shift will be noticeable in the following ways:

1. The state's RPS treats many biofuels such as wood and biodiesel as Class I renewable resources. This international standard also treats biofuels as favorably as non-carbon emitting energy sources such as nuclear power or solar photovoltaics. While the biomass share of the state's electricity profile is being phased down in anticipation of a transition to truly renewable sources, GHG emissions still occur when these fuels are combusted.
2. Most of the gasoline consumed in the state is a ten percent ethanol blend.
3. Connecticut has a biodiesel blending mandate for all home heating oil in Connecticut. The minimum biodiesel blending percentage was 5% in July 2022 and increased to 10% in July 2025.

Electricity generated from biogenic fuels, and hence not counted toward GWSA emission targets, emitted 3.7 MMTCO2 in 2022 and 3.3 MMTCO2 in 2023. Emissions from burning ethanol in gasoline in 2022 and 2023 amounted to 0.8 MMTCO2. Beginning in 2025, the EIA SEDS contains estimates for biodiesel consumed either in transportation diesel fuel or in home heating oil. In 2023, combusted biodiesel released approximately 0.1 MMTCO2 in the residential buildings sector and another 0.1 MMTCO2 in the transportation sector. Furthermore, consumption of wood products in the residential buildings sector contributed 0.8 MMTCO2 emissions for that sector.

Appendix C: Emission Factors for Renewable Portfolio Standards

Each supplier of electricity for the state of Connecticut must purchase a minimum quantity of renewable energy certificates to satisfy the state's renewable portfolio standards statute. In 2025, a minimum of at least 38% of electricity purchased in Connecticut must be derived from a combination of renewables with at least 30%, 4.0%, and 4.0% being derived from Class I, Class II, and Class III sources, respectively. Electric suppliers may also offer customers packages that purchase voluntary RECS from these resources in order to obtain a greater percentage of their energy use from renewable resources. In Connecticut, many of these renewable resources are derived from a spectrum of biofuels whose carbon emissions are not directly counted toward Connecticut's GHG emissions but nevertheless do contribute carbon dioxide emissions at the stack. Tables 4 and 5 below present emission factors for these sources derived from Connecticut's 2023 RPS profile.

Emission Factors for Renewables 2023

	Fuel	Emission Factor (lb/MWH)
Class I	Biogas	1,455
	Biomass (Wood)	4,166
	Digester gas	1,455
	Fuel cell	800
	Hydroelectric/Hydropower	-
	Landfill gas	1,455
	Solar Photovoltaic	-
	Wind	-
Class II	Trash-to-energy	3,729

Emission Factors in 2023

Fuel	Emission Factor (lb/MWH)
Natural Gas	884
Nuclear	0
Renewable	1,322

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