2021 GHG Inventory Executive Summary

The 2021 Greenhouse Gas (GHG) Inventory Report presents the annually updated GHG emissions estimates and projections for the state of Delaware. The inventory includes GHG emission estimates from 1990 to 2021 as well as emission projections from 2022 to 2050 in a business-as-usual (BAU) scenario. This inventory is the primary tool from which state policy makers can track progress of emissions over time and determine whether Delaware is meeting long term emission reduction goals. The Delaware Climate Change Solutions Act of 2023[1] sets ambitious but attainable GHG emission reduction targets of 50.0% by 2030 and net-zero by 2050 from a 2005 baseline. The law also stipulates that Department of Natural Resources and Environmental Control update its inventory on an annual basis to track progress towards these targets.

This inventory report estimates GHG emissions from various sources across economic sectors in Delaware. The data provided in this report were estimated using the United States Environmental Protection Agency (EPA) State Inventory Tool (SIT) and Projection Tool (PT).

IPCC's Fifth Assessment Report Update

Delaware's previous inventory used global warming potential (GWP) values from the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4). For the 2020 inventory, Delaware updated its inventory using GWP values from the Fifth Assessment Report (AR5) to provide the most updated science and ensure that Delaware's inventory is comparable to the nationwide U.S Greenhouse Gas Inventory. Updating GWP values result in slight differences in emissions values. This is why total gross emissions in 2005, the baseline year from which Delaware's GHG reduction goals are set, has changed from 23.3 $MMTCO_2e$ under the previous methodology to 23.1 $MMTCO_2e$ in the current inventory. This update reflects Delaware's effort to use the most scientifically accurate data when evaluating emissions in Delaware sectors.

The emissions estimates in this inventory are represented in million metric tons of carbon dioxide equivalent ($MMTCO_2e$). In comparison to Delaware's 2005 baseline year emissions levels (23.1 $MMTCO_2e$), Delaware's gross total GHG emissions in 2021 were estimated at 17.6 $MMTCO_2e$, which represents a 23.8% decrease in emissions from the baseline year. This indicates that Delaware is making steady progress towards its emission goals.

This inventory report also includes a BAU scenario extending out to 2050. This scenario is generated using the EPA PT and is intended to represent a future in which the state takes no further actions on climate change, current energy consumption trends continue, and Delaware's population and economy continue to grow. Under the BAU scenario, in the absence of state policy and program interventions called for in Delaware's Climate Action Plan, total gross emissions are projected to increase to 19.7 $MMTCO_2e$ in 2030 and 21.6 $MMTCO_2e$ in 2050. This BAU scenario provides a useful baseline for

[1] Delaware Climate Change Solutions Act of 2023, 99 (2023). https://legis.delaware.gov/BillDetail/130272

comparison when assessing estimated emissions reductions for various energy policies and programs but should not be considered the "expected" future outcome for Delaware.

In 2021, emissions in many sectors decreased compared to 2005 levels, except for the commercial buildings, agriculture, and waste management sectors. Overall, the emissions increased in 2021 compared to 2020, likely due to economic recovery from the coronavirus (COVID-19) pandemic. The 2022 inventory is expected to provide a more accurate assessment of Delaware's GHG emission reductions following COVID-19, allowing for a better evaluation of reaching the emission reduction targets outlined in the 2023 Climate Solutions Act.

Key Findings

- In 2021, gross GHG emissions in Delaware were 17.6 $MMTCO_2e$, a 23.8% decrease from Delaware's 2005 baseline year.
- The increase in emissions from 2020 to 2021 was largely due to the impact of economic rebound post COVID-19 pandemic.
- The sectors with the largest contribution to Delaware's GHG emissions remain the transportation, electric power, and industrial sectors accounting for almost 79.8% of all gross GHG emissions in 2021.

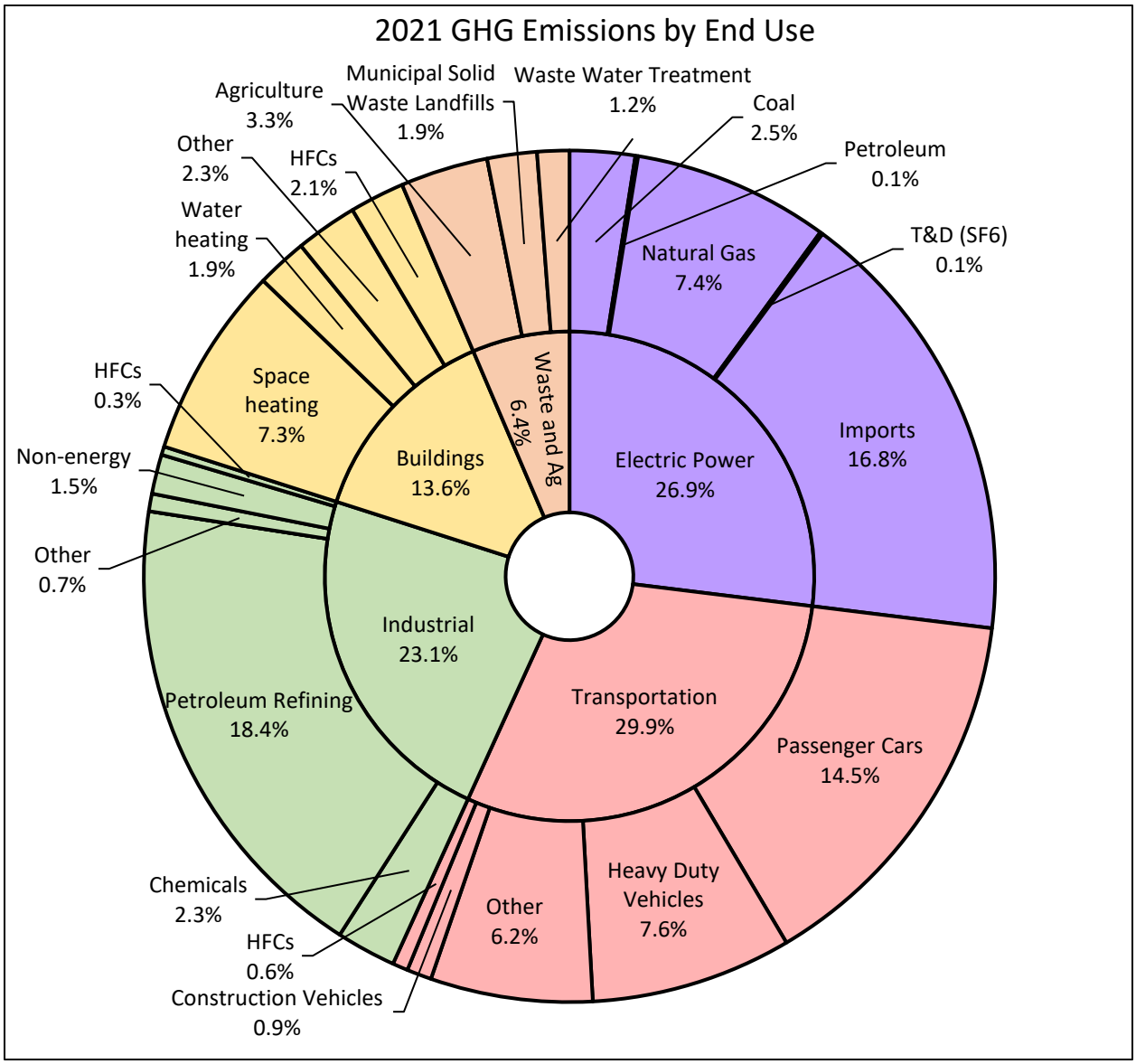
Baseline Year: 2005	Last Inventory: 2020	Current Inventory: 2021
23.1 $MMTCO_2e$	16.2 $MMTCO_2e$ 30.0% reduction from 2005 levels	17.6 $MMTCO_2e$ 23.8% reduction from 2005 levels

Figure 1 shows the breakdown of Delaware's GHG emissions (in $MMTCO_2e$) in 2021 by economic sector and end-use (where available) to provide a high-level overview of sources of GHG emissions. The economic sectors that were assessed are electric power,[2] transportation, industrial, residential and commercial buildings, agriculture, waste management, and land-use, land-use change, and forestry (LULUCF).

The largest source of GHG emissions in Delaware was the transportation sector, which represented 29.9% of the gross GHG emissions. When including electricity consumption-based (imported electricity) emissions, the electric power sector was the second largest contributor of GHG emissions, accounting for 26.9% of gross emissions. More than half of emissions from the electric sector were from imported electricity (16.8% of total) with the rest generated in-state (10.1% of total emissions). The industrial sector was the third largest contributor of GHG emissions, accounting for 23.1% of gross emissions. The buildings sector accounted for a total of 13.6% of statewide GHG emissions, with 6.3% and 7.3% of total emissions from the residential and commercial sectors, respectively.

[2] Including electricity consumption-based GHG emissions.

Finally, in 2021 the agriculture sector contributed 3.3% and the waste sector 3.1% of gross GHG emissions. The largest emission sectors are generally made up of one to two significant end-uses. For example, the majority of GHG emissions in the transportation sector are sources from on-road vehicles, such as passenger cars and heavy-duty vehicles. GHG emissions estimated in the industrial sector are primarily sourced from operations at the Delaware City refinery.



*Metals correction: Prior GHG inventories assigned the GHG emissions to metals subcategory in the Industrial category in Figure 1. It was observed that the emissions were inappropriately assigned to the metals category. In future inventories, the emissions will be allocated to a broader chemical category.

Figure 1. Gross GHG emissions in 2021 broken out by sector and end-use (% of MMTCO$_2$e)

GHG emission estimates and projection trends by economic sector from 1990 through 2050 are shown in Figure 2. Projections exclude any federal and state policy interventions. The greatest total increase in

GHG emissions from 2005 to 2050 is a 1.3 $MMTCO_2e$ increase in the transportation sector as population and economic activities continue to grow. There was a sharp decline in GHG emissions from the transportation sector between 2019 and 2020, due to reduced travel during the COVID-19 pandemic. The emissions in transportation sector went up in 2021 due to increased travel activities post COVID.

The combined electric power sector GHG emissions are projected to decrease by 47.6% between 2005 and 2050, or 4.8 $MMTCO_2e$. Emissions from in-state electricity generation show a declining trend from 2005 through 2030 and then generally remain flat through 2050. The electric power sector has shown significant declines from shifts to lower-emitting combustion fuels and zero-emitting sources of power. Emissions from electric power generated in-state are projected to decrease while emissions from electric power imported into Delaware are expected to increase in the future. Projected emissions from in-state electricity generation fall below those in the commercial sector.

Industrial emissions increase 16.7% between 2005 and 2050 to a total of 5.1 $MMTCO_2e$ in 2050. The industrial sector had a sharp decline in 2009 which was primarily caused by the economic recession and the Delaware City refinery shutting down operations. However, emissions from the industrial sector returned to their pre-2009 levels shortly after and are expected to continue increasing in the future.

By 2050, GHG emissions in the building sector are projected to increase 0.8 $MMTCO_2e$, or about 41.0%, compared to 2005 emissions. From 2005 through 2050 agricultural sector and waste management emissions increase 16.5% and 80.3% respectively, although these are smaller contributing sectors to overall GHG emissions. Additional, in-depth methodology and data sources for each sector are provided in the relevant sector section in the 2021 GHG Inventory Report.

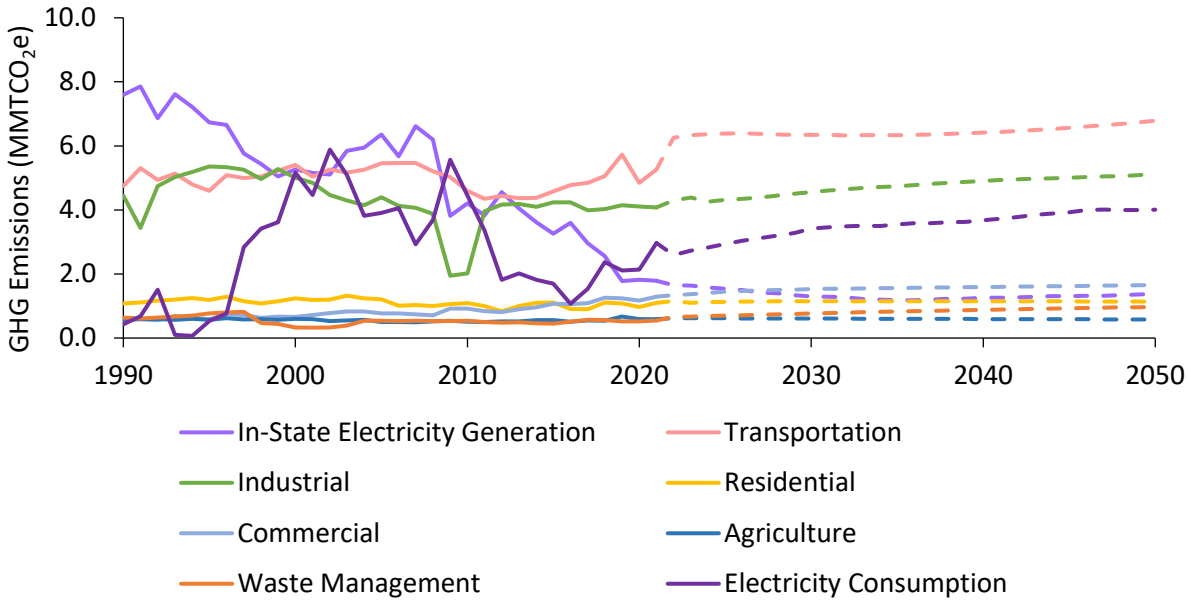


Figure 2. Gross GHG emission and projection trends by economic sector from 1990 to 2050

Figure 3 shows the gross GHG emission estimates and projections in Delaware from 1990 to 2050. The state of Delaware has a GHG emissions reduction target of 50.0% reduction below its 2005 baseline emission levels by 2030 and net-zero emissions by 2050 in alignment with the Delaware Climate Change Solutions Act of 2023. Net-zero emissions means that any emissions produced by 2050 will be appropriately offset through carbon sinks or sequestration methods. Gross GHG emissions in Delaware were estimated at 23.1 $MMTCO_2e$ in 2005 and 17.6 $MMTCO_2e$ in 2021. In the absence of any policies, the total gross emissions in 2050 are projected to increase 21.6 $MMTCO_2e$.

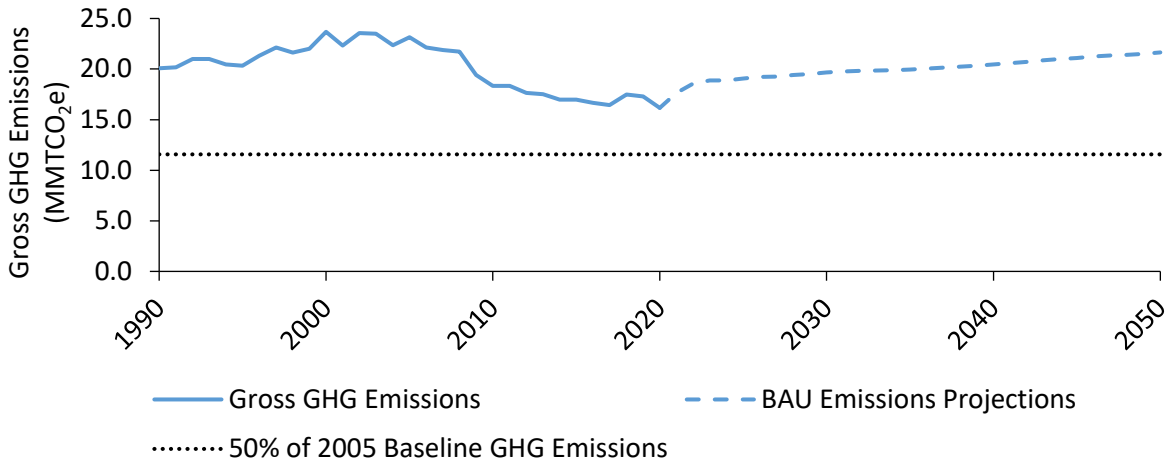


Figure 3. Baseline GHG emission estimates and projections from 1990 to 2050

Overall, gross GHG emissions in 2021 in Delaware increased 9.1% from 2020. However, the emissions have decreased 23.8% from Delaware's 2005 baseline year. Like past reports, the three largest emitting sectors in Delaware are the transportation, electric power (including consumption-based emissions), and industrial sectors. The 2021 GHG Inventory includes the same sources and sinks as in the 2020 Inventory, with updates to the SIT modules used and additional sector specific updates mentioned in the 2021 GHG inventory report. Although Delaware has made progress toward its emissions reduction goals, decreases in emissions in 2020 were largely due to the impacts of the COVID-19 pandemic on travel and economic activities, and are rebound back to pre-pandemic levels in 2021. Further policy intervention will be needed to continue to have meaningful mitigation of GHG emissions in the state.

It is important to continue to reduce GHG emissions by implementing the policies and programs outlined in Delaware's Climate Action Plan to protect Delaware from potential harmful impacts of climate change. A detailed analysis of emission reduction strategies will be completed for the 2025 update to Delaware's Climate Action Plan. This analysis will model emissions and provide policy and program recommendations to reduce the GHG emissions illustrated in the BAU scenarios in this report. Reducing emissions in the transportation, industrial, and electric power sectors will have a meaningful impact on emissions in Delaware and will help meet state goals to reduce emissions by 50.0% from the 2005 baseline by 2030 and to reach net-zero emissions by 2050.