Town of Middlefield

Government Operations

Greenhouse Gas Inventory

JULY 2025

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Introduction and Purpose

"A greenhouse gas (GHG) emissions inventory is one of the first and most important steps in the local climate action process. A local government operations GHG inventory is an accounting, analysis, and report of the GHG emissions resulting from the day-to-day operations of a village, town, city, or county. It summarizes the GHG emissions from the consumption of energy and materials in government buildings, from wastewater and water treatment facilities, from municipal vehicle fleets, from government-owned outdoor lighting, and from other sources. All Climate Smart Communities should prioritize GHG inventories as a foundational step toward effective action. GHG inventories provide the data needed to set realistic goals and track progress toward reducing operating costs, energy use, and emissions.

GHG inventory reports identify the largest energy users and sources of GHG emissions (e.g., by building, sector, or department). As a result, GHG inventories help local governments select actions that offer a good return on investment and should be highlighted in subsequent climate action planning. Over time, as a local government builds its capacity to conduct GHG inventories on a regular basis, the process helps to increase the ability of the local government to operate efficiently and use taxpayer resources effectively."

-Climate Smart Communities, PE2 Action: Government Operations GHG Inventory

Introduction and Purpose

“Climate change refers to the long-term changes in the average weather patterns that define the earth’s global, regional, and local climates” (New York State Department of Conservation, 2025). A changing climate has brought challenges to municipalities across the state, including increased flash flooding events, more intense storms, and changes in seasonal trends. These environmental effects impact our infrastructure, overall resiliency of our communities, and our day-to-day activities. Wetland loss, deforestation, and the burning of fossil fuels can accelerate these changes, and increase emissions of greenhouse gases to be emitted into our atmosphere.

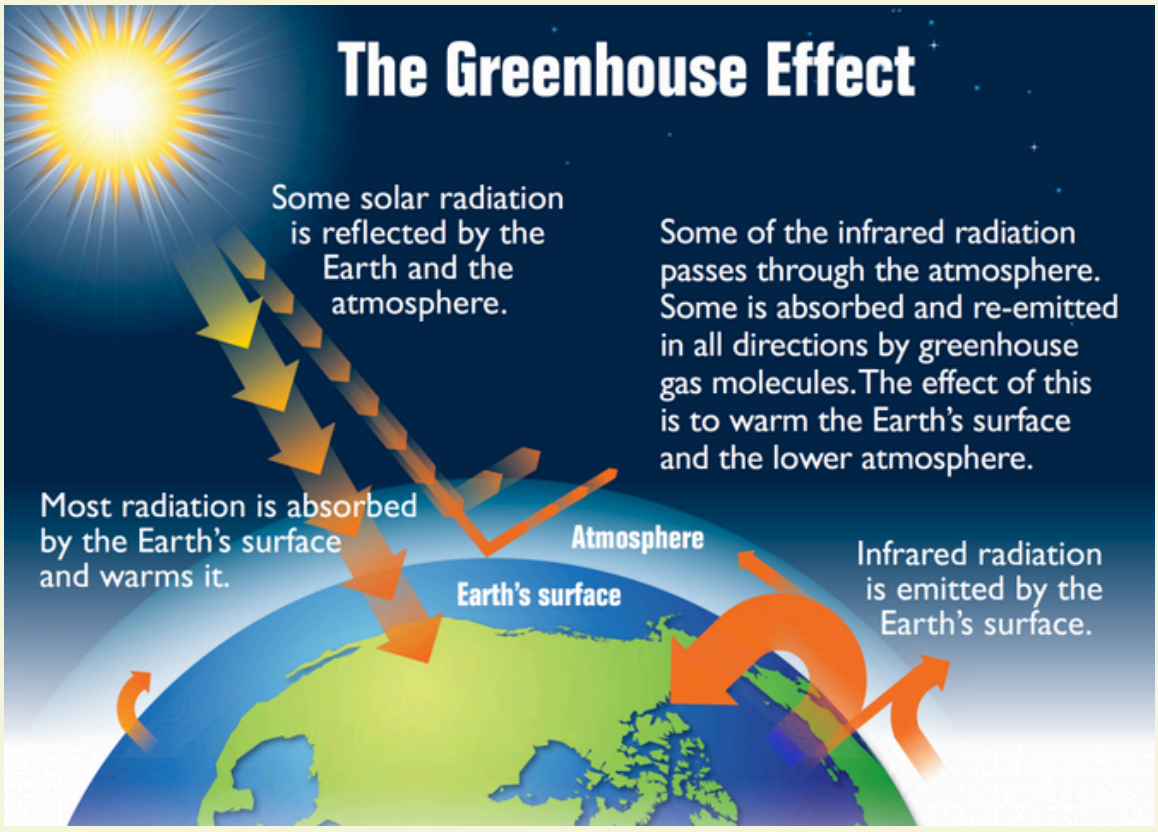


Figure 1: EPA.gov/climatechange-science

Introduction and Purpose

Greenhouse gases are heat-trapping gases that are naturally present in small amounts in our atmosphere. These gases include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and fluorinated gases. When greenhouse gases are emitted, they accumulate in our atmosphere. This accumulation then traps heat, causing global temperatures to rise. The rise in temperature has been exacerbated in recent years due to dependence on fossil fuels and a reduction in carbon-capturing environments such as forests and wetlands. Middlefield has committed to looking into actionable steps to address these issues on a local level. The creation of this GHG inventory is one of the first steps the Town can take to understand the Town's current emissions, which will then inform future action to reduce these emissions.

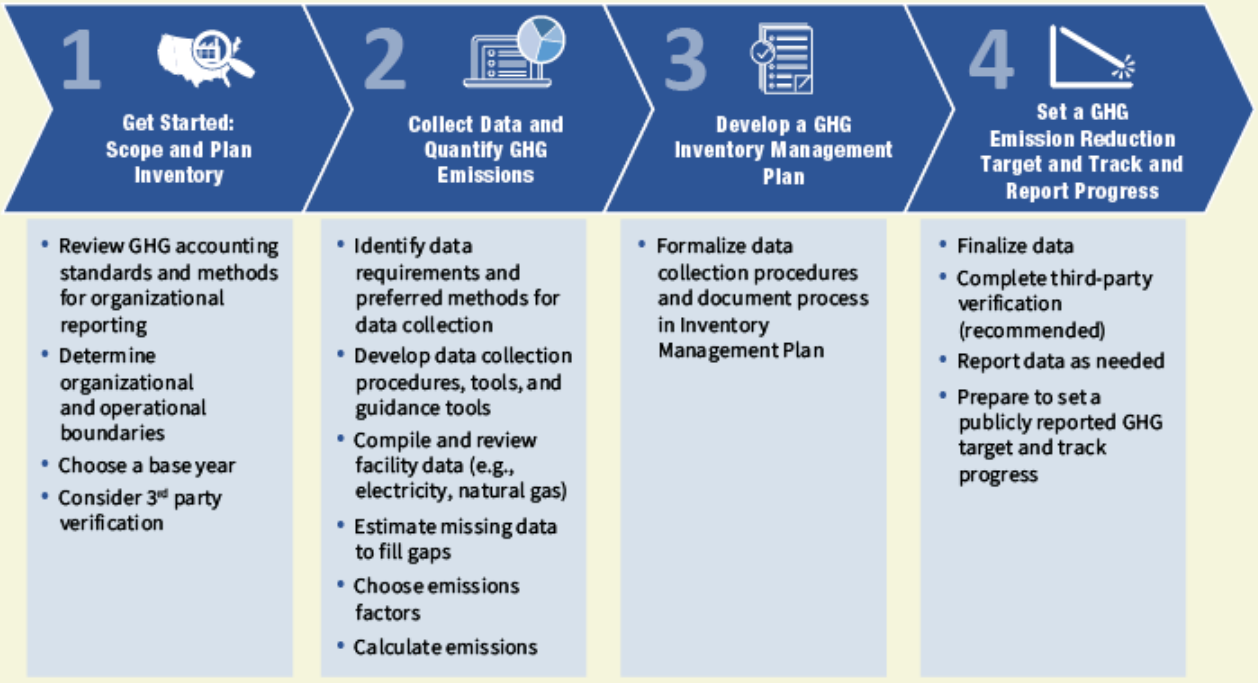


Figure 2: EPA.gov/climateleadership

Methodology

In 2025, the Town of Middlefield completed a local government operations greenhouse gas inventory using 2022 as the baseline year. This inventory includes the total scope 1 and 2 emissions produced from municipal operations within the town's boundary. The 2025 CSC Government Operation Greenhouse Gas Inventory tool, created by Jim Yienger, was used to calculate the town's emissions.

Scope 1 emissions are direct GHG emissions. For the Town of Middlefield, this includes emissions produced from government-owned vehicles and onsite fuel combustion (natural gas, propane, and fuel oil).

Scope 2 emissions are indirect GHG emissions. For the Town of Middlefield, this includes purchased electricity for streetlights and indoor lighting for municipal buildings.

Climate Smart Communities additionally recommends that GHG inventories comply with established protocols. ICELI's Local Government Operations Protocol (LGOP) was followed to ensure the Town incorporates a variety of sources while providing important strategies for conducting research.

Scope 1 - Stationary Combustion of Fossil Fuels

Methods and Inputs

Stationary combustion includes the direct emissions from the combustion of natural gas, fuel oils, and propane used within the town boundary. For the Town of Middlefield, the primary use of stationary combustion is the consumption of fuel oil that is used to heat municipal buildings. The town does not own a landfill, mass refrigeration, or wastewater facility, so these sectors are exempt.

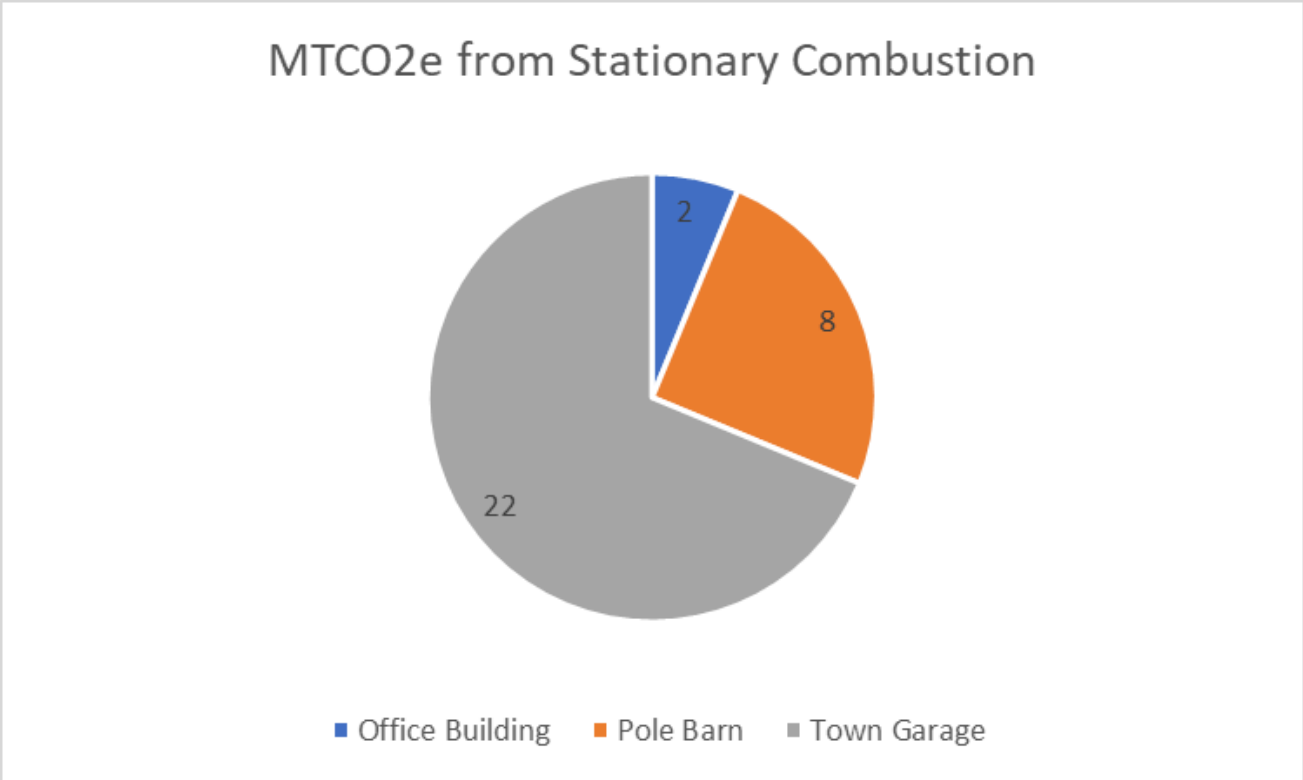
The buildings that are included in this data are the Office Building and two highway buildings (Pole Barn and Town Garage).

The fuel oil consumption records for 2022 were acquired from the monthly municipal Buell Fuel bills, distinguished by each municipal building.

Results

Municipal Source	Quantity Combusted	MTCO2e
Office Building	165	2
Pole Barn	804	8
Town Garage	2198	22
Totals	3167	32

In 2022, 3,167 gallons of fuel oil were consumed by the Town of Middlefield, which equals 32 metric tons of carbon dioxide equivalent.



Mobile Combustion Fuels

Methods and Inputs

Mobile combustion includes the direct emissions from municipal vehicle fleets used by the town. The Town of Middlefield's fleet consists of 13 vehicles: 12 running on diesel and one running on gasoline. The highway department utilizes all of the vehicles in the inventory.

The data to calculate emissions from each vehicle was not accessible. However, the tank fuel data for gasoline and diesel were available through the town's 2022 Buell Fuel bills.

Results

Department	Fuel Type	Gallons	MTCO2e
HWY Dept	Diesel	13055	133
HWY Dept	Gasoline	1143	11
Totals			144

The total amount of diesel fuel used is equal to 13,055 gallons.

The total amount of gasoline used is equal to 1,143 gallons.

This amounts to 144 metric tons of carbon dioxide equivalent produced from diesel and gasoline usage.

Refrigerant Usage

Methods and Inputs

The Town of Middlefield's Office Building and Highway Department use appliances and vehicles that contain refrigerants. Refrigerants must be included in this GHG inventory because, when used, leaks can occur. Refrigerant leaks can cause fugitive emissions to be released into the atmosphere. To calculate these emissions, a new refrigerant tab of the CSC Government Operations GHG inventory tool was used.

The exact refrigerant leakage rate for each appliance was not available, so the EPA's default leakage rates were used to calculate estimates of MTCO2e from refrigerant leakage.

For a detailed list of the EPA's default leakage rates, see Appendix A.

Results

The types of appliances used by the Town include HVAC systems and a refrigerator in the Town Office Building.

Additionally, the AC units within the vehicle fleet were included.

Source	MTCO2e
Buildings	1.2
Vehicles	6.6
Totals	7.8

The Town emitted 7.8 MTCO2e from refrigerant usage. 1.2 MYTCO2e came from building appliances, and 6.6 came from AC usage from the vehicle fleet.

Scope 2 - Electricity Consumption

Methods and Inputs

Electricity usage produces indirect emissions associated with municipal buildings, streetlights, and traffic lights.

Middlefield does not have any traffic lights; therefore, the data obtained was limited to the town's Office Building, Highway Buildings, and streetlights.

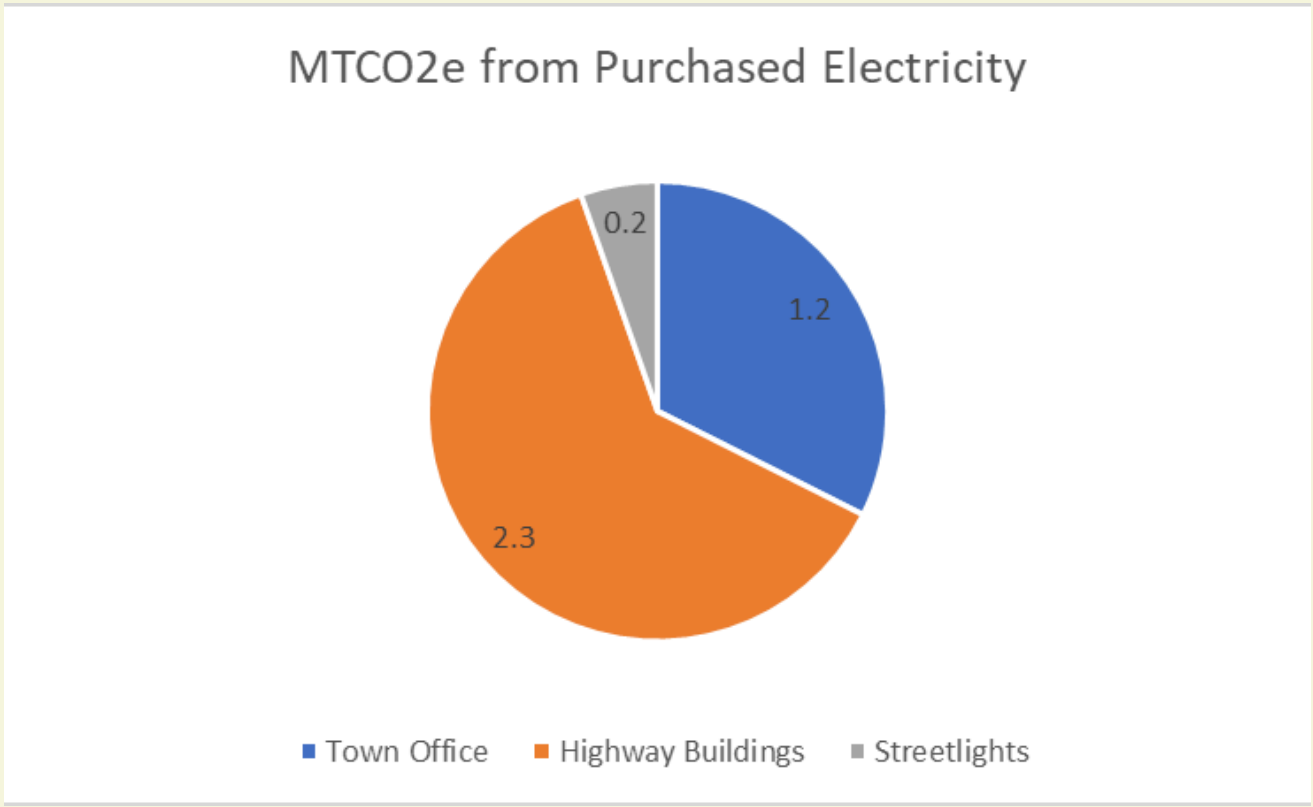
Data was collected from the Town of Middlefield's 2022 NYSEG bills.

Results

Municipal Source	Electricity Purchased (kWh)	MTCO2e
Town Office	9492	1.2
Highway Buildings	18139	2.3
Streetlights	1264	0.2
Total	28895	3.7

In 2022, the Town of Middlefield purchased 28,895 kilowatt-hours of electricity.

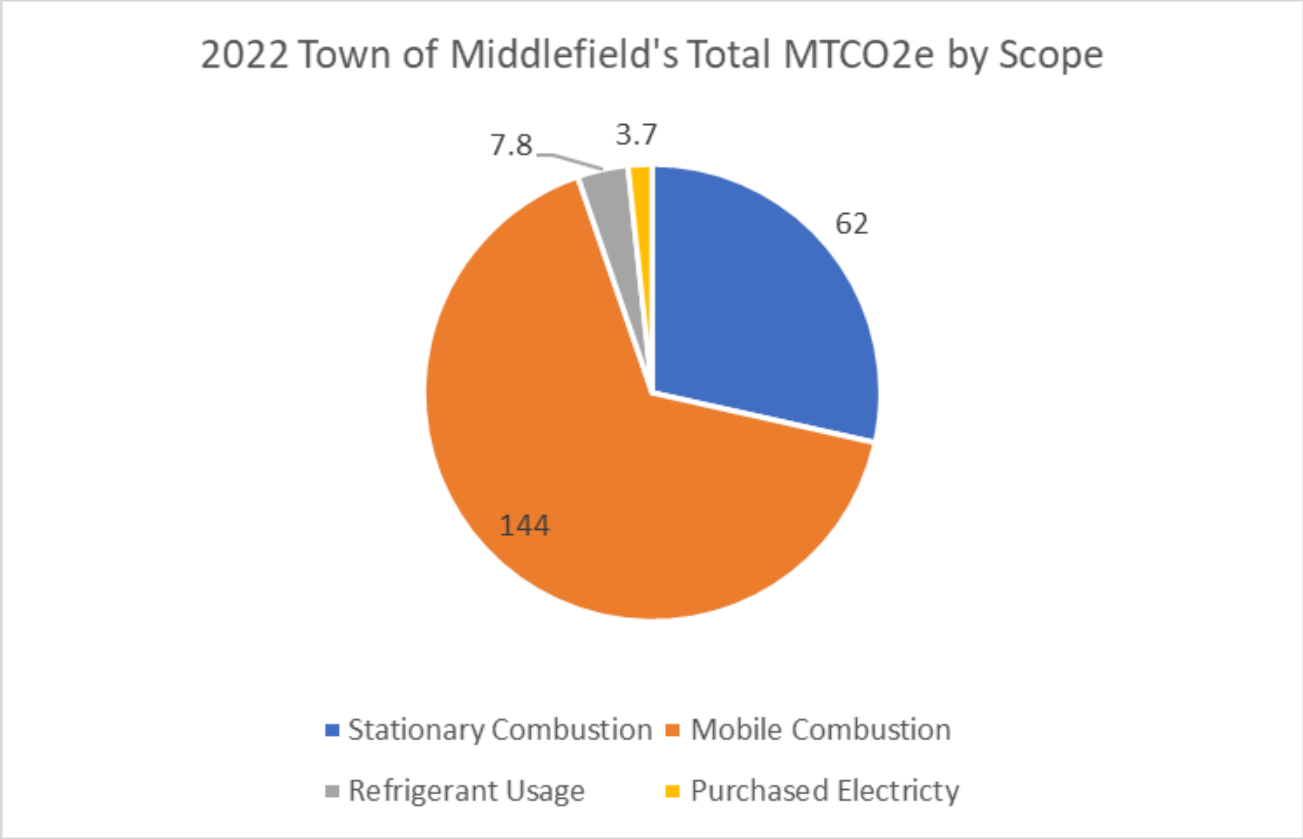
This amounts to 3.7 metric tons of carbon dioxide equivalent produced by the purchased electricity.


MTCO2e from Purchased Electricity
0.2
1.2
2.3
Town Office
Highway Buildings
Streetlights

Conclusion

GHG Emission Source	MTCO2e
Stationary Combustion	62
Mobile Combustion	144
Refrigerant Usage	7.8
Purchased Electricity	3.7
Totals	217.5

In 2022, the Town of Middlefield emitted a total of 217.5 metric tons of carbon dioxide equivalent.



In 2022, the Town of Middlefield's largest sources of greenhouse gas emissions came from mobile combustion, followed by stationary combustion and purchased electricity.

Scope 1 GHG emissions are equal to 213.8 metric tons of carbon dioxide equivalent

Scope 2 emissions are equal to 3.7 metric tons of carbon dioxide equivalent.

The Town of Middlefield's total 2022 emissions of **217.5 metric tons of carbon dioxide equivalent** will be the baseline of future inventories and reports. With respect to this number, the Town is interested in how this compares to other municipalities across the state, and how weather and climate-related events may impact this number in the future.

Discussion

Weather and Climate:

Precipitation totals

In 2022, Middlefield received 56.13 inches of precipitation

Number of heating degree days

Heating degree days (HDD) measure the demand for energy needed to heat a building. It is defined as the number of degrees that a day's average temperature is below 65°F. The more degree days, the more energy is required to heat a building.

In 2022, Middlefield had 7,262 heating degree days.

7,262 HDD is higher than their average of 6,978 HDD (2000 - 2025 data). One can assume that in 2022, Middlefield had more cold days than average, requiring more energy to heat municipal buildings, causing more MTCO2e to be emitted.

Comparing Data to Similar Municipalities:

(Data from public CSC portal)

Town of Owasco
Population: 3,424
Total (2019): 309 MTCO2e
Stationary Combustion: 91 MTCO2e
Mobile Combustion: 144 MTCO2e
Purchased Electricity: 74 MTCO2e

Town of Lodi
Population: 1,460
Total (2023): 114.9 MTCO2e
Stationary Combustion: 13.5 MTCO2e
Mobile Combustion: 96.8 MTCO2e
Purchased Electricity: 4.6 MTCO2e

Changes implemented since 2022:

- *Through funding from NYSERDA's Clean Energy Communities program, the Town purchased some electric landscaping equipment in 2024.*
- *The Town passed Solar Law No.3 in 2023 to assist in determining the feasibility of new solar installations.*

Appendix A. EPA Default Leakage Rates

Equipment / System	Refrigerant	Avg Charge (lb)	Default Annual Leakage Rate
Household Fridge (1990–	R-134a	0.3	0.005
Household Fridge (2015+	R-600a	0.15	0.005
Household Freezer (pre-2	R-134a	0.39	0.005
Household Freezer (2010	R-600a	0.17	0.005
Residential Dehumidifier	R-600a	0	0.005
Small Commercial Ice Rir	R-134a	300	0.15
Large Ice Rink (Ammonia)	NH_3	5,250	0.02
CO_2 Ice Rink System	CO_2	275	0.05
Small Window AC (5,000	R-410A	1.5	0.03
Medium Window AC (8,0	R-410A	2.5	0.03
Large Window / Wall AC	R-410A	3.5	0.03
Mini-Split / Ductless Res	R-410A	4.5	0.03
Packaged / Rooftop Comr	R-410A	25	0.1
Chiller (Commercial / Inc	R-134a	500	0.03
Walk-in Cooler / Freezer	R-404A	60	0.2
Municipal Vehicle AC – Li	R-134a	2.5	0.15
Municipal Vehicle AC – S	R-134a	3	0.15
Municipal Vehicle AC – T	R-134a	4.5	0.2
Municipal Vehicle AC – E	R-1234yf	1.75	0.1
Refrigerated Trucks / Tra	R-404A	15	0.2
Fire Suppression / Specialty Chillers	R-134a	100	0.03

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