

Non-Energy

The Climate Action Plan (CAP) continues to focus on pathways that advance the reduction of non-energy emissions. Non-energy encompasses emissions from industrial processes, solid waste, wastewater, and other sectors that contribute significantly to the state's greenhouse gas (GHG) footprint. Key sources include the use of ozone-depleting substance substitutes, semiconductor manufacturing, and fugitive methane emissions, among others. Unlike carbon dioxide (CO₂), the majority of these emissions consist of gases such as methane (CH₄), nitrous oxide (N₂O), and various fluorinated gases, which have a much higher global warming potential (GWP). For instance, sulfur hexafluoride (SF₆) is approximately 22,800 times more potent than CO₂ over a 100-year period. Given the potency and, in some cases, the short atmospheric lifetimes of these gases, reducing emissions of high GWP short-lived climate pollutants (SLCPs) is a priority for achieving impactful GHG reductions in the near term.

Taken together, these “non-energy” sources comprise about 10.5% of Vermont’s GHG emissions. This chapter outlines strategic pathways to mitigate emissions from the wastewater sector, high GWP refrigerants, semiconductor production, and solid waste.

Reducing Emissions from Refrigerants

High global warming potential (GWP) hydrofluorocarbons (HFCs) are widely used in commercial and industrial refrigeration systems, such as refrigerators and freezers. When these systems experience leaks or accidental releases, they can significantly contribute to greenhouse gas emissions. To address this issue, the 2025 Climate Action Plan outlines a strategic approach to reducing emissions from high GWP refrigerants. This involves transitioning refrigeration systems to low GWP alternatives, which is a critical step in reducing emissions from the industrial processes sector.

Vermont is actively implementing incentives to encourage the improvement or replacement of refrigeration systems. With state funding, the Vermont Energy Investment Corporation (VEIC) is providing enhanced support through increased project incentives for grocers, convenience stores, and other facilities that require refrigeration for perishable products. This support aims

to facilitate the transition to lower GWP and natural refrigerants, as well as the installation of leak-detection systems to minimize emissions from existing systems.

Additionally, the CAP recommends providing incentives for businesses to voluntarily transition from high GWP refrigerants to lower GWP alternatives. This initiative would use data collected for the Refrigerant Management Program (RMP) to target appropriate facilities, supplementing reductions achieved through the Act 65 rulemaking. Furthermore, the Plan recommends considering the inclusion of heat pumps in Act 65 to provide a comprehensive approach to managing refrigerant emissions. Moving forward on these strategies will support the reduction of emissions from refrigeration systems in buildings, and in the commercial and industrial sectors.

Continue to Explore Efficiencies and Alternatives to High GWP Fluorinated Gases in the Semiconductor Manufacturing Process

In Vermont, semiconductor manufacturing is a significant contributor to greenhouse gas emissions, accounting for approximately 34% of the total emissions in the Industrial Processes sector. Global Foundries, the state's sole semiconductor manufacturer, relies on several high global warming potential (GWP) fluorinated gases, such as sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and nitrogen trifluoride (NF₃). These gases are integral to the etching and chemical vapor deposition (CVD) processes, as well as their use as heat transfer fluids in various tools. While reducing emissions from these high GWP gases presents technological challenges, it is imperative to reaching Vermont's climate goals.

Semi-Conductor Manufacturing strategies focus on exploring efficiencies and alternatives to high GWP fluorinated gases in semiconductor manufacturing. To achieve this, Global Foundries is advancing the adoption of emission reduction technologies, such as combustion abatement units. These technologies aim to destroy high GWP gases or replace them with less harmful chemicals during the manufacturing process. Additionally, Global Foundries is actively seeking funding through the CHIPS Act to support research, development, and implementation of these technologies. It is through these strategic investments in sustainable technologies and the

application of federal funding that Global Foundries plans to make progress in reducing emissions within the semiconductor manufacturing sector.

Reduce fugitive emissions from Wastewater Treatment Facilities by improved methane flaring and waste heat recovery

Greenhouse gas emissions from wastewater treatment facilities (WWTFs) in Vermont primarily consist of methane (CH₄), a potent greenhouse gas that is 25 times more impactful than carbon dioxide (CO₂) on a per mass basis. These emissions occur during the anaerobic decomposition of organic materials in digesters. While methane can be combusted for beneficial uses like generating heat or electricity, it is often flared to convert CH₄ to CO₂, reducing its environmental impact. Ensuring that flares at these facilities are operational is a priority in mitigating methane emissions.

The most effective way to reduce fugitive emissions from Wastewater Treatment Facilities (WWTFs) is by ensuring the functionality of flares at existing anaerobic digesters. The Vermont Department of Environmental Conservation's Watershed Management Division has completed a survey of WWTFs with anaerobic digesters, providing valuable data on their operational status. The 2025 Climate Action Plan prioritizes installing or repairing functional flares at the next facility upgrades for Barre City and Newport City. Specifically, Barre City WWTF has a non-functional flare that needs fixing, while Newport City lacks a flare altogether, prompting a recommendation to design and install one during the next upgrade.

Additionally, the requirement of waste heat recovery capabilities in new wastewater system projects and significant expansions, are cost-effective. These projects can be funded through state wastewater programs. Implementing these actions and strategies will enable Vermont to significantly reduce methane emissions from wastewater treatment facilities.

Waste Prevention and Reduction

In broadening the scope of non-energy emission reductions, this Plan has introduced new pathways which focus on waste prevention and reduction. The Vermont Department of

Environmental Conservation (DEC) has begun taking action to reduce the environmental impact of waste and thus, to reduce non-energy emissions. One set of actions focuses on general waste reduction, such as hosting a statewide conference and establishing a Reduce, Reuse, and Repair Network. The goal of the Reduce, Reuse, Repair Network is to form a group of individuals and organizations who promote waste reduction in order to keep materials out of landfills and reduce the resources needed to make new things. They will support the reuse of materials more than once before being recycled or discarded and help Vermonters share, repair, refurbish, and repurpose as many materials as possible. When it comes to reducing food waste, Vermont DEC is implementing actions that enhance communication on best practices, including maintaining the ScrapFoodWaste.org website, which serves as a central hub for food waste reduction and composting information and resources. Furthermore, Vermont DEC's contractor is about to complete a [Recycling Systems Analysis Report](#), in early 2025. This report will provide critical data on emissions associated with various recycling systems, guiding future discussions on the Vermont Bottle Bill and other recycling policies. Vermont DEC has been actively implementing these strategies, with many initiatives already underway. The Plan seeks to build upon the momentum of waste prevention and reduction strategies to continue contributing to overall non-energy emissions reductions.

Next steps in Other Non-Energy Emissions Reductions

The expansion of scope and strategies to reduce non-energy emissions represents a critical component of the state's comprehensive plan to meet requirements of the [Global Warming Solutions Act](#) (GWSA). By addressing emissions from refrigerants, semiconductor manufacturing, wastewater, and waste management, Vermont is taking steps to reduce its greenhouse gas footprint. The collaborative efforts of state agencies, businesses, and communities are essential to achieving these goals. Through leveraging data-driven insights and promoting sustainable practices, the state can ensure that the strategic pathways outlined to reduce non-energy emissions are both cost effective and long-lasting.