1 Other Non-energy Emissions Pathways for Mitigation

The Climate Action Plan (CAP) continues to focus on pathways that advance the reduction of 2 non-energy emissions. Non-energy encompasses emissions from industrial processes, solid 3 waste, wastewater, and other sectors that contribute significantly to the state's greenhouse gas 4 (GHG) footprint. Key sources include the use of ozone-depleting substance substitutes, 5 semiconductor manufacturing, and fugitive methane emissions, among others. Unlike carbon 6 dioxide (CO2), the majority of these emissions consist of gases such as methane (CH4), nitrous 7 oxide (N2O), and various fluorinated gases, which have a much higher global warming potential 8 (GWP). For instance, sulfur hexafluoride (SF6) is approximately 22,800 times more potent than 9 CO2 over a 100-year period. Given the potency and, in some cases, the short atmospheric 10 lifetimes of these gases, reducing emissions of high GWP short-lived climate pollutants (SLCPs) 11 is a priority for achieving impactful GHG reductions in the near term. This chapter outlines 12 strategic pathways to mitigate emissions from the wastewater sector, high GWP refrigerants, and 13 semiconductor production, and solid waste. 14

15 Reducing Refrigerants Emissions

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 leakdetection systems to minimize emissions from existing systems.

Additionally, the plan recommends providing incentives for businesses to voluntarily transition 29 from high GWP refrigerants to lower GWP alternatives. This initiative would use data from 30 outreach for Refrigerant Management Program (RMP) development to target appropriate 31 facilities, supplementing reductions achieved through the Act 65 rulemaking. Furthermore, the 32 plan suggests considering the inclusion of heat pumps in Act 65 to provide a comprehensive 33 approach to managing refrigerant emissions. Moving forward on these strategies outlined above 34 will support the reduction of emissions from refrigeration systems in the industrial processes 35 36 sector.

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 39 emissions, accounting for approximately 34% of the total emissions in the Industrial Processes 40 sector. Global Foundries, the state's sole semiconductor manufacturer, relies on several high 41 global warming potential (GWP) fluorinated gases, such as sulfur hexafluoride (SF6), 42 hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and nitrogen trifluoride (NF3). These 43 gases are integral to the etching and chemical vapor deposition (CVD) processes, as well as their 44 45 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. 46 Semi-Conductor Manufacturing strategies focus on exploring efficiencies and alternatives to 47

high GWP fluorinated gases in semiconductor manufacturing. To achieve this, Global Foundries 48 is advancing the adoption emission reduction technologies, such as combustion abatement units. 49 These technologies aim to destroy high GWP gases or substitute them with less harmful 50 chemicals during the manufacturing process. Additionally, Global Foundries is actively seeking 51 funding through the CHIPS Act to support research, development, and implementation of these 52 technologies. It is through these strategic investments in sustainable technologies and the 53 application of federal funding that Global Foundries will continue to make progress in reducing 54 emissions within the semiconductor manufacturing sector. 55

Further reduce fugitive emissions from Wastewater Treatment Facilities by ensuring flares are operational at existing Anaerobic Digesters at Wastewater Treatment Facilities

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 66 (WWTFs) is by ensuring the functionality of flares at existing anaerobic digesters. The Vermont 67 Department of Environmental Conservation's Watershed Management Division has completed a 68 survey of WWTFs with anaerobic digestors, providing valuable data on their operational status. 69 70 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-71 72 functional flare that needs fixing, while Newport City lacks a flare altogether, prompting a 73 recommendation to design and install one during the next upgrade.

Additionally, the requirement of waste heat recovery capabilities in new wastewater system

75 projects and significant expansions, are cost-effective. These projects can be funded through

state wastewater programs, including those associated with state designation programs.

77 Implementing these actions and strategies will enable Vermont to significantly reduce methane

remissions from wastewater treatment facilities.

79 Waste Prevention and Reduction

80 In broadening the scope of non-energy emission reductions, the Plan has introduced new

81 pathways which focus on waste prevention and reduction. The Vermont Department of

82 Environmental Conservation (DEC) has begun taking action to reduce the environmental impact

83 of waste and contribute to overall non-energy emission reductions. This includes strategies

centered on general waste reduction, such as hosting a statewide conference and establishing a 84 Reduce, Reuse, and Repair Network. The goal of the Reduce, Reuse, Repair Network is to form 85 a group of individuals and organizations who promote waste reduction in order to keep materials 86 out of landfills and reduce the resources needed to make new things. They will support the reuse 87 of materials more than once before being recycled or discarded and help Vermonters share, 88 89 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, 90 including maintaining the ScrapFoodWaste.org website, which serves as a central hub for food 91 waste reduction and composting information and resources. Additionally, Vermont DEC and 92 Solid Waste Management Districts and towns conduct outreach efforts to businesses and schools 93 to further education on food waste reduction and management. Social media platforms, including 94 95 the VTRecycles Facebook and The Vermont DEC Instagram pages are also utilized to spread awareness and encourage action on food waste reduction. To advance strategies in recycling, 96 Vermont DEC is actively promoting both general and special recycling through comprehensive 97 social media campaigns aimed at reaching a broad audience and encouraging recycling 98 99 behaviors. Special recycling programs, which are manufacturer-funded, focus on items like batteries, paint, and electronics that require specialized handling. Furthermore, Vermont DEC's 100 101 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 102 103 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 104 105 to build upon the momentum of waste prevention and reduction strategies to continue contributing to overall non-energy emissions reductions. 106

107 Next steps in Other Non-Energy Emissions Reductions

108 The expansion of scope and strategies to reduce non-energy emissions represents a critical

109 component of the state's comprehensive plan to meet requirements of the Global Warming

110 Solutions Act (GWSA). By addressing emissions from refrigerants, semiconductor

111 manufacturing, wastewater, and waste management, Vermont is taking decisive steps to reduce

its greenhouse gas footprint. The collaborative efforts of state agencies, businesses, and

113 communities are essential to achieving these goals. Moving forward, Vermont must continue to

- 114 foster partnerships, expand outreach, and engage stakeholders across all sectors. Through
- 115 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-
- 117 lasting.