**(11) Pathways for Emission Reductions**

The Global Warming Solutions Act defines “mitigation” as the reduction of greenhouse gas emissions caused by humans, as well as the preservation and enhancement of natural systems to sequester carbon, in order to stabilize and reduce greenhouse gas emissions in the atmosphere. The pathways included in this Chapter, when implemented, will constitute a significant step in Vermont’s efforts to reduce emissions of greenhouse gases, and build upon ongoing work to mitigate climate change.

The proposed pathways have been organized by the inventory sector in which the emissions occur (emissions totals and percentages are from 2017):

* *Transportation* (39.1% of total emissions, 3.39 MMTCO2e)
* *Buildings*, including residential and commercial fuel use, and emissions from natural gas distribution (31.3% of total emissions, 2.72 MMTCO2e)
* *Electricity* generation (5.7% of total emissions, 0.49 MMTCO2e)
* *Agriculture* (15.8% of total emissions, 1.37 MMTCO2e)
* *Other Non-energy emissions*, including Industrial Processes and Waste (8% of total emissions, 0.7 MMTCO2e)[[1]](#footnote-2)

Greenhouse gas emissions from the transportation sector have consistently been higher than any other sector. The state has already implemented various pieces of law and policy to require manufacturers to deliver for sale cleaner vehicles to the market, and the legislature has authorized and funded programs to incentivize the purchase and use of these vehicles in Vermont. The success of these policies and programs in driving innovation in the automobile industry to produce cleaner technologies, coupled with the recent development of more robust state vehicle purchase incentives and investments in electric vehicle charging stations has yielded a slow but steady increase in electric vehicles in the Vermont fleet. As of January, 2021 there were 4,360 plug-in hybrid or battery electric vehicles registered in Vermont.[[2]](#footnote-3) However, modeling shows that our current rate of EV adoption and number of EVs on the road is not nearly enough to make necessary reductions in this sector. For example, we will need approximately 170,000 light-duty electric vehicles in the Vermont fleet to meet our 2030 reduction requirements. The pathways in this sector represent a robust set of rules, programs, and policies that will accelerate EV adoption through a variety of approaches aimed at sparking additional innovation in vehicle manufacturing, coordinating emission reductions and investments at the regional level through a proven, market-based approach, and designing more robust vehicle purchase incentives that mitigate the high up-front costs of electric vehicles, ensuring these choices are accessible to all Vermonters, no matter their income.

While acceleration of electric vehicle adoption is a cost-effective, and necessary approach to achieving emission reductions, more research and planning is required to understand and implement strategies to help Vermonters reduce the number of miles they travel annually in single occupancy vehicles. This important work will need to be coordinated with cross-cutting efforts, such as land-use planning and development of Smart Growth policies.

Many of Vermont’s residential and commercial building spaces are poorly insulated, and heated or cooled using carbon intense fossil fuels. It is not surprising then that this sector is the second highest emitter of greenhouse gases in Vermont. Most homes were built before 1975, with a significant portion older than 1939[[3]](#footnote-4). Pathways to reducing emissions in this sector are two-fold: improving thermal efficiency of Vermont’s buildings through weatherization and related activities and switching heating sources to lower carbon alternatives. These pathways need to be closely coordinated to achieve maximum efficiency and to overcome the equity and cost challenges associated with the necessary approaches. This work also incorporates an opportunity to keep more energy dollars in-state by replacing fossil fuel use with electricity for heating needs while also employing an increased workforce of weatherization and home heating technicians. Progress made, however, must align with policies and programs that prioritize those who struggle with the costs associated with housing and energy use.

Greenhouse gas emissions from the electricity sector in Vermont have been variable over time, but have been declining in recent years due to the adoption and implementation of the Renewable Energy Standard (RES) and utility commitments. The electricity sector is currently one of the smallest contributors to greenhouse gas emissions in the state. Because pathways used to reduce emissions from other sectors will rely significantly on vehicle and building heat source electrification, it is important that the low emissions levels in this sector be maintained and improved upon, even as the overall electricity load increases. This must be done while also keeping Vermont’s electric supply reliable and affordable.. Increased reliance on electricity to meet emissions reductions targets in other sectors also means ensuring resilient and adapted electric infrastructure, from upgrading transmission infrastructure and increasing load management capabilities, to upgrading homes and businesses to enable the transition to electric technologies.

While gross emissions from the agricultural sector in Vermont account for approximately 16% of greenhouse gas emissions in the state, many Vermont farmers have already elevated climate change mitigation as a goal in managing their agricultural enterprises. Emissions from agriculture are technically a non-energy source of emissions, however reduction pathways are discussed separately from the non-energy emissions sector for the purposes of this Plan. Pathways in this sector include improving management practices, such as no-till or cover cropping, to prevent emissions of carbon currently stored in soils into the atmosphere, while also increasing the sequestration of carbon from the atmosphere through land use and management decisions on farms. Maintaining and improving soil health as a climate change mitigation strategy also has numerous co-benefits, such as resilience to extreme weather events and improved water quality. In fact, there is an opportunity to leverage existing water quality programming and funding to implement emission-reducing management tools, making pathways in this sector uniquely cost-effective.

Pathways in the final sector, other non-energy related emissions, includes strategies to reduce greenhouse gas emissions from industrial processes and management of solid waste and wastewater. This sector represents around 8% of total emissions statewide, but many of the greenhouse gases emitted are gases other than CO2 that have high global warming potentials (GWPs) but are short-lived in the atmosphere. Because of the short atmospheric lifetimes of these gases, prioritizing emission reductions from this sector is important for near term impacts. Emissions reductions already made from the solid waste sector will further benefit from the continued implementation of Vermont’s Universal Recycling Law, and therefore have not been prioritized in this Plan. Pathways related to the treatment of wastewater, the use of high GWP refrigerants, and semiconductor manufacturing are, however, ripe for emission reductions in this sector.

There is no silver bullet – no single pathway or strategy – that will ensure the necessary transitions required to drastically reduce our emissions. Action will be taken on multiple fronts to reach the required emission reductions in the GWSA. Most importantly, the policies, programs, and rules outlined in each of the following sectors represent a coordinated approach to mitigating greenhouse gas emissions in a way that is equitable and accessible for all Vermonters.

1. https://dec.vermont.gov/sites/dec/files/aqc/climate-change/documents/\_Vermont\_Greenhouse\_Gas\_Emissions\_Inventory\_Update\_1990-2017\_Final.pdf [↑](#footnote-ref-2)
2. https://www.driveelectricvt.com/Media/Default/docs/maps/vt\_ev\_registration\_trends.pdf [↑](#footnote-ref-3)
3. Vermont Housing Needs Assessment, Vermont Housing Finance Agency (“VHFA Housing Needs Assessment”), February 2020, p. 2. [↑](#footnote-ref-4)