

Buildings & Thermal Pathways for Mitigation

Heating reforms can make housing more affordable and less polluting

The infrastructure of Vermont consists not just of public facilities like roads and bridges, but is predominantly made up of buildings. The heating and cooling requirements of those buildings impose substantial energy costs and produce nearly a third of the state's GHG emissions.¹ This Chapter tackles thermal costs and emissions problems through three main strategies: improving the thermal integrity of **buildings**, lowering the carbon intensity of **heating fuels**, and improving the performance of **equipment** we use for space and water heating.

Importing fossil fuels to heat our buildings is a significant drain on Vermont's economy. In 2024, Vermont families and businesses spent \$767 million on fossil heating fuels, the vast majority of which left the state's economy.² Dependence on fossil fuels also exposes Vermont families and businesses to global fuel-price volatility; between 2021 and 2022, for example, the cost of heating fuels jumped from \$694 million to \$930 million, a 34% increase. The cost of heat disproportionately burdens lower-income Vermonters with high energy related expenses relative to their income.

Vermont's thermal challenge is in part due to the age of the housing stock, which is dominated by homes built before 1975, before more modern building codes began to address energy issues. Indeed, over a quarter of Vermont homes were built before 1939.³ Energy use in homes dominates the thermal sector, but commercial and industrial buildings produced roughly 14% of the state's GHG emissions in recent years.⁴ Vermonters rely on a variety of resources to heat

¹ Vermont Agency of Natural Resources, "Vermont Greenhouse Gas Emissions Inventory and Forecast: 1990-2021." (2024)

² Energy Action Network, Annual Report (2023) pg. 7. The following year \$1.7 billion spent on fossil fuel left the state. Energy Action Network, "Annual Progress Report" (2024), p.7.

³ Vermont Housing Needs Assessment, Vermont Housing Finance Agency ("VHFA Housing Needs Assessment"), February 2020, p. 2.

⁴ "Vermont Greenhouse Gas Emissions Inventory and Forecast 1990-2017" May 2021

water and buildings. Heat in Vermont comes predominantly from fossil fuels (72%) with smaller fractions from wood heat (24%), electricity (3%), and some alternative fuels.

Replacing carbon intensive fossil-fueled heat with lower carbon alternatives can greatly lower costs over time and contribute to Vermont's meeting its climate commitments. It will also support Vermont's economy because more of the money Vermonters spend on heating will stay in state.⁵ Moreover, by focusing on the most burdened households and businesses, Vermont can pair up clean fuel options and weatherization programs to deliver low-carbon building solutions to those who need them the most.

Affordability and the Ability to Pay

While the policy recommendations in this Chapter would lower the state's total cost of heat and total climate emissions, they must be designed and applied to address two financial challenges.

The first challenge is affordability. Vermonters routinely spend over \$750 million each year on fossil heating fuels, a cost that contributes to the state's housing affordability challenge. Vermont's annual fuel bills are obviously expensive. While many climate-friendly options will lower costs over time, some of the solutions require significant investments to be made. Weatherizing homes and transitioning away from fossil heat requires investments in buildings, heat pumps, pellet stoves and the like. The challenge is often one of timing: how to finance investments *now* in order to lower energy bills *over time*? The economic analyses that have been done to date show long-term savings from reduced fossil fuel bills, but vary considerably in their assumptions about the cost of clean heat measures and resulting shorter-

⁵ Energy Action Network, "Annual Progress Report" (2024), p.7. Fossil fuel spending: Vermont Department of Taxes, 2024; VGS, 2024. Dollar recirculation share: Ken Jones, EAN Senior Fellow for Economic Analysis, 2024.

term cost impacts⁶. For this reason, we recommend including clear cost caps or price caps in the design of the thermal policies included in the Plan.

While it's a tough challenge, we know it can be done. Vermont has a long and successful track record of earned energy savings through Efficiency Vermont and other utility efficiency programs, the Weatherization Assistance Program, Tier 3 of the RPS, and the cap-and-invest policy of RGGI. These programs have saved Vermonters billions of dollars, based on moderate but persistent year-after-year investments in energy efficiency and weatherization. In this CAP we recommend an extension of this type of investment program, targeted to reducing fossil fuel costs and emissions.

This Chapter contains recommendations that would provide one or more stable sources of revenue to help Vermonters to invest in buildings and heating systems that would pay off in savings over time. Those policies -- including weatherization at scale, thermal efficiency programs, energy performance standards and cap-and-invest options -- can be implemented gradually. They can be designed to leverage program revenues to maximize private investments. And they can be designed to include cost caps to minimize near-term impacts on the price of fossil fuels and promote affordability.

The second challenge is the ability to pay. Programs to reduce climate pollution should be designed to minimize adverse effects on low-income households, especially Vermonters most burdened by energy and housing-related costs.

While a central goal of the GWSA is to reduce GHG emissions, we must also limit the effects of various GHG reduction policies on all Vermonters, especially those who struggle

⁶ See, e.g. [The Analysis of Buildings/Thermal Energy Sector Emissions Reduction Policies for Vermont](#), (2023, commissioned by the ANR); and <https://puc.vermont.gov/sites/psbnew/files/documents/second-checkback-report-on-clean-heat-standard-act-18-011525.pdf> (2024, PUC analysis delivered to the legislature).

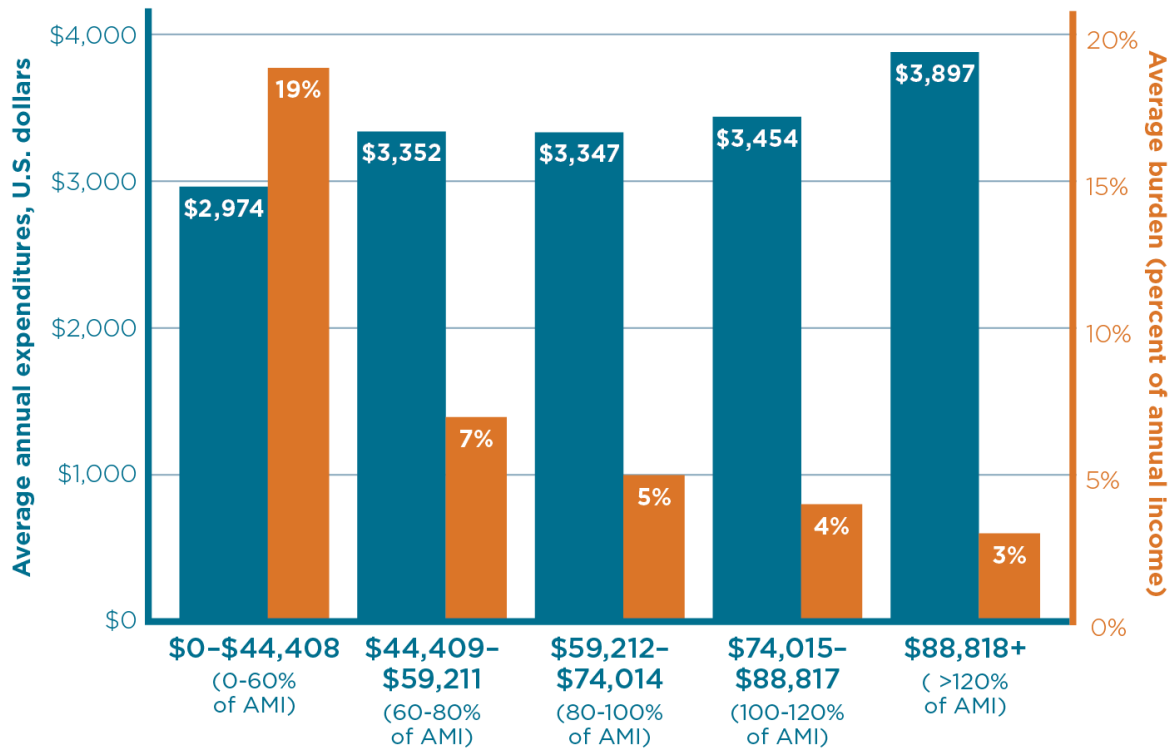
with the cost burdens associated with housing and energy use. In 2019 Efficiency Vermont studied energy burdens in the state and determined that, on average, Vermonters spent about 10 percent of their income, or roughly \$5,800 annually, on energy expenses. However, the actual energy burden that Vermonters face ranges statewide from 6% to as much as 20%.⁷

Focusing just on household heating and electricity bills, a more recent analysis shows that the percentage of household income spent on those bills is at its highest level (19% of household income) for households in the lowest-income quintile [one-fifth of households, who earn less than 60% of the Area Median Income]. The percentage is 7% to 4% in the middle income categories, and hits a low of 3% among the richest one-fifth of households.⁸ This is true even though average energy consumption is higher in higher-income households.

⁷ “What is the impact of energy burden in Vermont?” (“Energy Burden in Vermont”) Rebecca Foster, Director Efficiency Vermont, October 13, 2019.

⁸ US Census Bureau, 2018-2022 American Community Survey 5-year Public Use Microdata Samples, reported in Energy Action Network, Annual Progress Report for Vermont (2024), p.13.

Vermont combined average household heating and electricity fuel costs and burden by income level, 2018–2022



Source: U.S. Census Bureau, 2018-2022 American Community Survey 5-year Public Use Microdata Samples. **Notes:** Income categories are based on 2018-2022 median household income in Vermont of \$74,014. Energy burden refers to the share of annual household income spent on energy. Costs include fuel only and are not inclusive of equipment and maintenance costs.



Figure 17

The important lesson to be drawn from these numbers is that thermal programs can be designed equitably if they raise revenues in proportion to consumption and target bill assistance and investment supports to the households with the highest energy burdens. We recommend that the thermal energy policies set out in this CAP be implemented in line with these principles.

Specific affordability and climate policies are needed for the rental sector

The challenges of the thermal transition are even greater, and somewhat more complicated in the rental sector. Of Vermont's roughly 340,000 homes, about a quarter of them (80,000) are used or intended for renters.⁹ While the median construction year for owned homes in Vermont is the mid-1970s, the median construction year for Vermont rental housing is significantly older: 1964. In addition to the number of relatively old rental properties, a large portion of the Vermonters who rent, roughly 80%, are categorized as low-income, according to Efficiency Vermont and VHFA.¹⁰ Efficiency and other heating programs in the rental sector must also overcome the so-called "landlord-tenant" problem in cases where tenants are required to pay the heat and utility bills but can't make investments in weatherization or heating equipment that would lower the unit's total energy burden over time.

The thermal challenge is substantial, but Vermont has strong institutions and experience to draw upon

Vermont has decades of experience developing policies and designing and implementing weatherization, energy efficiency, and clean energy initiatives that reduce energy use in buildings throughout the State – including residential, commercial, and industrial buildings of all sizes and types. Substantial work has been done (and is ongoing), including: delivering weatherization, energy efficiency, and clean energy rebates, incentives, and services through Efficiency Vermont, electric and gas utility companies, and the Home Weatherization Assistance Program.

These initiatives should be continued and potentially expanded and enhanced in the future. However, it is clear from multiple recent analyses that significant, additional initiatives are needed beyond what is already underway to meet the GHG reduction obligations established in

⁹ VHFA Housing Needs Assessment, p. 1

¹⁰ "Vermont Energy Burden Report," Justine Sears and Kelly Lucci, October 2019; Vermont Housing Finance Agency. <https://www.housingdata.org/profile/rental-housing-costs/renter-cost-burden>

the GWSA and to do more to reduce Vermont's dependence on high-cost, price-volatile fossil heating fuels.

Continued and accelerated progress is possible and necessary

Summarized briefly below are the seven major pathways recommended in this Plan for reducing GHG emissions from thermal uses and buildings in Vermont.

In Pathway 1 we recommend adoption of a broad, sector-wide approach to reduce greenhouse emissions from thermal uses in buildings. A variety of approaches could be taken, but the essential purpose of this recommendation is to create an overall structure and a steady pace of emissions reduction consistent with GWSA obligations that can be measured and supported over time. Among the options available, we recommend continued examination of a modified clean heat performance standard, designed for gradual implementation, and containing a price cap to provide assurance that costs on fossil fuels will be moderate and at or below preapproved levels. If the legislature chooses not to adopt a thermal performance standard in the near term, it should create a distinct source of stable funding for heating initiatives. Two options are expanding the current weatherization fund or creating a thermal energy benefits charge on fossil fuel sales, as recommended in the PUC's recent report. Such a source of funding will be essential to make progress on the thermal transition until a more comprehensive performance standard or cap-and-invest program is in place.

We also recommend continued examination of Vermont's joining a multi-state cap-and-invest program that could include coverage of emissions from both the transportation and thermal sectors. Furthermore, we recommend adoption of a rule requiring reporting of fossil fuel sales by fuel dealers to provide the basic information that governmental decisionmakers would need to design effective programs to reduce fossil fuel emissions. This information is needed whether the legislature and regulatory agencies choose to adopt the broad-based programs we recommend or more targeted programs to reduce climate pollution.

Pathway 2 focuses on buildings directly. We recommend ramping up implementation of the Weatherization at Scale Initiative to close the gap between the state's long-term weatherization goals and existing pace of weatherization. To improve the thermal quality of new construction we recommend improvements in building codes and building code compliance. We support increased funding for modern, energy-efficient mobile homes in alignment with the Act 47 Mobile Home Task Force recommendations. And we recommend a study by the Department of Public Service on possible energy efficiency standards for multi-family rental properties, keyed to well-established energy conservation standards.

In Pathway 3 this Plan focuses on the efficiency and emissions of heating equipment. We recommend that the Agency of Natural Resources, in consultation with the Department of Public Service, study the feasibility of adopting emission standards for new water heating and/or space heating equipment in Vermont. A second set of recommendations addresses the problem of refrigerants with high global warming impacts, and supports action by the Agency of Natural Resources to lower their leakage rates and possibly, their use.

Pathway 4 focuses on GHG reduction through increased installations of high-efficiency electric space and water heating equipment. We recommend development of a long-term sustainable source (or sources) of funding to ensure equitable access across all Vermonters to electric heat pumps as replacements for fossil fuel heating equipment. We also recommend improvements in the rules governing low-income heating assistance to permit households with multiple heating sources to qualify for LIHEAP's financial support. And we recommend that utilities and their regulators adopt standards and programs to support geothermal networks and to ensure that electric water heating loads can be managed to reduce grid impacts and peak-load power system costs.

In Pathway 5 we focus on heating fuels, recommending adoption of a performance-based clean fuels standard to reduce the greenhouse gas intensity of fuels used for thermal purposes. This

recommendation is consistent with one of the major recommendations of the Public Utility Commission in their recent report to the legislature and could advance one of implementation options proposed by the legislature in the Affordable Heat Act.

In Pathways 6 and 7, this Plan examines two broad issues affecting a number of specific policy and regulatory areas. The legislature should direct the PUC, or the PUC of its own volition should, open a proceeding to examine how the performance metrics of regulated utilities could be adjusted to better align with the goals of the GWSA. We also recommend a coordinated effort among multiple agencies, educational institutions and employers to ensure the training and availability of the skilled workforce that we know will be needed to achieve the energy transition required to meet Vermont's goals for a modern, climate-responsible energy sector.