(11) Pathways for Mitigation

Buildings

Summary Statement

Vermont's buildings pose both a challenge and opportunity to equitably meeting Global Warming Solutions Act (GWSA) emission reduction goals. The state's housing stock is dominated by homes built before 1975, with over a quarter of them built before 1939.[1] Thermal energy use for these buildings produces over a third of the state's GHG emissions and represents roughly 35 percent of our energy expenditures.[2] Commercial and industrial buildings produced nearly 14% of the state's GHG emissions in 2017.[3] Importing fuel to heat our buildings is a significant drain on Vermont's economy. It also exposes Vermont families and businesses to substantial global fuel-price volatility, and disproportionately burdens lower-income Vermonters with energy related expenses.[4]

Replacing carbon intensive fossil fueled heating sources with available, lower carbon alternatives will significantly mitigate these challenges and contribute to Vermont meeting its climate goals. It will also stimulate Vermont's economy because more of the money Vermonters spend on heating will stay in state. According to the Energy Information Administration (EIA), in 2018, Vermont spent over $769 million on fossil fuels for heating. The Vermont Agency of Commerce and Community Development reports that 67% of those expenditures left the Vermont economy entirely.[5] By spending energy dollars on relatively lower carbon-intensive electricity and wood, a greater share of that money will stay in-state, help employ Vermonters, and strengthen our economy.[6]

[1] Vermont Housing Needs Assessment, Vermont Housing Finance Agency ("VHFA Housing Needs Assessment"), February 2020, p. 2.
[2] Energy Action Network "Annual Progress Report for Vermont ANNUAL 2020/2021," p. 24 (EAN 2021); see also, https://dec.vermont.gov/sites/dec/files/aqc/climate-change/documents/_Vermont_Greenhouse_Gas_Emissions_Inventory_Update_1990-2017_Final.pdf
[3] "Vermont Greenhouse Gas Emissions Inventory and Forecast 1990-2017" May 2021
[4] Energy Action Network Clean Heat Working Group. October 2021. Review Draft "Clean Heat for a Cooler Planet: The Clean Heat Standard"
[5] EAN 2021, p. 25
[6] For wood heat, an average of 80 cents per dollar stays in state. EAN 2021, p. 25

In addition to increasing reliance on fuels with a lower carbon intensity, improving the efficiency of Vermont's buildings will help reduce the heating demands facing Vermonters. Thermal modernization of our buildings is a key to reducing GHG emissions and doing so in a way that recognizes the economic challenges faced by the most vulnerable Vermonters in keeping homes, businesses, and other buildings heated and comfortable. With a focus on the most burdened households and businesses, Vermont can begin to address its climate challenges and pair up clean fuels options and weatherization programs to deliver comprehensive low-carbon building solutions.

Ability to Pay – Burdened Vermonters

Taking these steps can be expected to benefit the Vermont economy broadly but must also be designed to minimize adverse effects on low-income households, especially Vermonters most burdened by energy and housing-related costs. The expressions "energy burden" and "housing burden" describe the percent of household income that one spends on energy or on housing.[7] While a central goal of the GWSA is to reduce GHG emissions, it will be critical to understand the effects of various GHG reduction policies on all Vermonters, especially those who struggle with the costs associated with housing and energy use.

Efficiency Vermont has studied energy burden in the state and determined that, on average, Vermonters spend 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%.[8]

When one considers the cost of housing and energy, Vermonters face an even greater challenge. According to the Vermont Housing Finance Agency (VHFA), over 35% of all Vermont households (90,000) in the state are "cost-burdened" by their *housing* costs, meaning that either rent or mortgage, insurance, taxes and utilities consume at least 30% of their income.[9]

[7] "What is the impact of energy burden in Vermont?" ("Energy Burden in Vermont") Rebecca Foster, Director Efficiency Vermont October 13, 2019.
[8] Ibid
[9] VHFA Housing Needs Assessment, p. 2

Furthermore, of these cost-burdened Vermont households, over a third (39,000) spend in excess of 50% of their income for housing.[10]

Renters

Of Vermont's roughly 330,000 homes, about a quarter of them (80,000) are used or intended for renters.[11] Chittenden County has the highest rate (36%) of rental housing in the state. While the median construction year for owned homes in Vermont is the mid-1970s, 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.[12] One quarter of all Vermont's renters pay between 30-49% of their income for housing, and another quarter pays 50% or more of their income for housing, i.e., rent and the cost of utilities.

Given the quality of buildings, the cost of fuels, and the number and income status of Vermonters who rent, it is critical that GWSA buildings and thermal policies incorporate social equity into all recommendations. These solutions will need to minimize adverse effects on low-income households and those most burdened by high energy bills.

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) on:

- Developing and periodically updating building energy codes
- Explaining the importance of code enforcement and seeking to ensure codes are being enforced
- Training architects, engineers, and builders on energy-efficient new construction and renovation practices

[10] U.S. Census Bureau 2017 American Community Survey 5-year estimates from housingdata.org
[11] VHFA Housing Needs Assessment, p. 1
[12] "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

- Benchmarking buildings to increase awareness of building performance
- Including training on the economic and comfort advantages of energy efficient buildings in realtor training
- Offering weatherization, energy efficiency, and clean energy rebates, incentives, and services through Efficiency Vermont, electric and gas utility companies serving Vermont, and the Home Weatherization Assistance Program administered by the Office of Economic Opportunity and delivered by the four Community Action Agencies and the Northeast Employment Training Organization
- And much, much more.

All these initiatives should be continued and potentially expanded and enhanced in the future. However, it is clear from multiple analyses completed by EAN and others that aggressive, bold new initiatives are needed in addition to what is already underway in order to meet the GHG reduction targets established in the GWSA.

Presented below are two major pathways recommended for reducing GHG emissions from buildings in Vermont. One focuses on improving building efficiency and the other focuses on setting a pathway to lower the carbon content of the fuels Vermonters have been using. In keeping with the GWSA's focus on ensuring equitable access to affordable energy for all Vermonters, these strategies and actions will both reduce GHG emissions from energy used in new and existing buildings and will address inequities in energy costs, energy burdens, and those underserved by current offerings. The two major pathways are complementary; each makes the other work more effectively. One final note, it is important to recognize that because this is a plan, it is designed to create an outline for action. It does not go into the level of detail that will be required for actual program development and implementation.

Pathway 1 – Reduce energy use in buildings by at least 25% through cost-effective and affordable weatherization and energy efficiency improvements, as well as through use and enforcement of energy codes.

Weatherization delivers multiple benefits for residents: lower monthly energy bills; improved housing affordability; reduced GHG emissions; enhanced home comfort; boosted health outcomes; improved resilience during temporary energy disruptions; reduced building

maintenance cost; and, for homeowners, increased home value. Weatherization also provides immediate cost savings to residents and improves the effectiveness of other energy improvements.

Vermont has extensive experience delivering weatherization, fuel assistance, housing, funding, and financing programs. However, many more buildings need to be weatherized, creating the need to scale and to increase coordination among programs and offerings. Vermont also needs to support the expansion of a workforce capable of delivering the amount of weatherization services required.

Strategy 1 - Develop and implement a multi-year statewide Weatherization at Scale initiative

Weatherization at Scale builds upon Vermont's deep technical expertise delivering weatherization services to nearly 30,000 homes during the past several decades. Modeling conducted for this Climate Action Plan indicates that at least 90,000 additional homes need to be weatherized by 2030 to contribute to meeting the GWSA reduction target for that year. The Weatherization at Scale initiative identifies feasible strategies for recapitalizing Vermont's weatherization investment to fund home retrofits for low and moderate income households over the next decade, including:

- Coordinated Workforce Development - To deliver the necessary level of weatherization, Vermont will need to further develop its weatherization workforce. This will require a long-term, stable, and growing funding stream that gives the private sector certainty to invest in training crews and purchasing equipment knowing a market will exist to support long term investments. Workforce development is a cross-cutting issue and should be coordinated with workforce needs in other sectors.
- Enhance Energy Coaching and Navigation Services - In order to better inform all Vermonters of available energy programs and services, the state should provide outreach, coaching, and navigation services to Vermonters with low and moderate incomes for the

State's energy savings programs, including thermal and transportation energy efficiency programs.

- Tariff On-Bill Financing (TOBF) – This approach provides up-front investment capital for use by a person with a utility account to reduce that person's energy bills, for example for a weatherization project. It is not a loan to the person – i.e., landlord or tenant – but instead an obligation assigned to the utility account itself. The funds provided by the utility or a third-party are paid back over time through a special tariff "attached to the meter" that serves the building. The program can and should be designed to ensure that the energy bill savings that are expected to result from the efficiency measure being financed are greater than the amount that will be charged via the tariff. Utilities adopting a TOBF program and energy coaches working with low and moderate income customers should also consider measures to prevent unintended consequences such as any increased likelihood of service suspension due to unpaid utility bills. A TOBF pilot is currently underway by Burlington Electric Department and successful TOBF programs have been developed and implemented in other jurisdictions that are deemed to provide both energy and cost savings, and adequate consumer protection for utility customers.[13] [14]

As weatherization work proceeds it will be necessary to track the level of progress that programs are making. Real-time information on market activity will help inform program design and implementation adjustments and improvements over time. In addition, program approaches and offerings are expected to change over time as technologies and measures improve and as delivery methods continue to modernize.

Lead Implementer: Legislature, designated state agencies	
Action 1 - Adopt legislative or administrative recommendations consistent with those set out by the Weatherization at Scale Working Group (WWG) with the goal of weatherizing 90,000 additional homes by 2030[15]	**Impact –** To date, approximately 30,000 buildings have been weatherized in Vermont. Modeling indicates that at least 90K additional homes need to be weatherized by 2030 in order to meet the GWSA reduction requirement for the Buildings/Thermal sector

[13] https://www.burlingtonelectric.com/on-bill-financing/
[14] https://www.energy.gov/sites/default/files/2021-07/financing-energy-improvements-utility-bills-market.pdf
[15] EAN Weatherization at Scale Network Action Team "Weatherization at Scale Comments for Comprehensive Energy Plan and Climate Action Plan" memorandum to the Vermont Public Service Department and Vermont Climate Council, October 22, 2021 https://www.eanvt.org/events-and-initiatives/weatherization-action-team/

	Equity – The Weatherization at Scale initiative envisioned by the Working Group would target those most vulnerable and historically underserved as a focus of the State's efforts to significantly ramp-up weatherization activity. In addition, an On-Bill Repayment approach is envisioned that would prioritize homes with the highest energy burden and would scale incentives based on income. Aligning the initiative costs and benefits with low/moderate income residents and communities will ensure that weatherization services will be directed to those who most need to reduce energy costs, increase comfort, improve health impacts, and benefit from improved housing durability.
	Cost-Effectiveness – Expected to be high, but awaiting modeling results from Cadmus/EFG
Timeline to Implement – One calendar year to allow for legislative action and any required rule enactment	**Co-Benefits** - Reduces energy bills - Increases comfort - Improves health
	Technical Feasibility - Yes
Action 2 - Appoint a member of the administration to be responsible for coordinating executive agency weatherization workforce development efforts to: ensure the scaling up of workforce necessary to achieve the GWSA targets; to increase coordination among the wide variety of public and private entities involved in worker recruitment, training, placement, and retention, and; to avoid duplication of efforts across state government (enabling, cross-cutting action)	**Impact** – Enables achievement of weatherization target in Action 1
	Equity – Can improve equity as long priority is placed on measures that address unemployed/underemployed/ displaced workers
	Cost-Effectiveness - N/A
Timeline to Implement – 1st quarter 2022	**Co-Benefits** – Same as Action 1
	Technical Feasibility - Yes
Action 3 - Authorize implementation of a plan for coordinating and enhancing energy and financial coaching services for Vermonters with low and moderate incomes	**Impact -** Enables achievement of the weatherization target in Action 1

who could benefit from the State's energy savings programs that is consistent with recommendations from the Energy Counseling Savings Work Group and their legislative report.	**Equity** – This action is specifically targeted to low/middle income households
	Cost-Effectiveness – N/A
Timeline to Implement – 1st quarter 2022	**Co-Benefits** - Provides support and assistance to those most in need
	Technical Feasibility - Yes
Action 4 - Through legislation, authorize electric and gas utilities to offer their customers on-bill financing tariffs	**Impact** - Enables achievement of weatherization target in Action 1
	Equity – Facilitates performance of retrofits in low/middle income households
	Cost-Effectiveness – TBD based on program design
Timeline to Implement - During upcoming legislative session (No later than May 2021)	**Co-Benefits** – Creates a new funding mechanism that does not require personal debt
	Technical Feasibility - Yes

Strategy 2 - Institute a rental property efficiency standard (RPES)

Addressing rental property thermal efficiency is a complementary strategy to Weatherization at Scale. It specifically seeks to ensure that the market for rental property contributes to meeting the GWSA GHG emissions reduction goals. Expecting to equitably improve the efficiency of Vermont's rental housing cannot wait for efficiency investments to occur at the time of sale. Nor can Vermont expect building energy performance labeling alone to spur sufficient improvements in the efficiency of rental housing. Renters, by definition, are not in a position to invest in improving the efficiency of buildings owned by others, even with improved access to information or incentives. And because the typical lease has the renter assume responsibility for energy costs, landlords have limited motivation to make such investments in the absence of an efficiency standard. Addressing rental property thermal efficiency by providing support to landlords for a period of years can help them reduce emissions without creating undue harm to tenants, many of whom are cost-burdened Vermonters. It not only emphasizes solutions that mitigate the high energy burden experienced by low to moderate income households living in rented properties. It recognizes that landlords are better positioned to make basic improvements to the efficiency of the buildings they lease.

Legislature, designated state agency	
Action 1 – Authorize the adoption of efficiency standards for rental properties, beginning with expanding the definition of "fit for human habitation" in 9 V.S.A. § 4457(a) by developing and passing legislation requiring owners of [a TBD minimum number of units] of rental housing to ensure that the efficiency of their rental units meets minimum standards [TBD efficiency code level] by December 31, 2030	**Impact –** Complementary policy to Weatherization at Scale (Strategy 1/Action 1)
	Equity – Designed to benefit the approximately 80% of VT renters who are characterized as low income
	Cost-Effectiveness – Not modeled yet. Will depend on specifications in the rental property efficiency standard
Timeline to Implement - During upcoming legislative session (No later than May 2022)	**Co-Benefits** - Creates a new mechanism and technical assistance for landlords to improve livability and affordability for their tenants - Reduces energy bills - Increases comfort - Improves health - Creates local jobs
	Technical Feasibility - Yes

Strategy 3 - Improve the energy performance of all new buildings in Vermont

New buildings, and their associated energy use, last for decades. New construction offers either an opportunity for gains in building efficiency and related energy savings, or a potential lost opportunity for new housing stock. High efficiency construction techniques are well established and easier and less costly to implement than efficiency retrofits in existing buildings. High efficiency/low leakage building envelopes are also much better suited to support non-combustion technology such as heat pumps.

Public Service Department	
Action 1 - Regularly update the statewide residential building energy code, resulting in achieving a Zero Energy Ready building energy code by 2030.	**Impact -** Complementary policy to Weatherization at Scale (Strategy 1/Action 1)
	Equity - Compliance with and enforcement of building energy codes results in more energy efficient buildings and can result in lower emissions as well as reduced energy

	bills. However, complying with codes may increase construction or renovation costs. Especially for affordable housing, incentives or grants may be needed to help ensure that increased construction or renovation costs do not result in higher rental fees.
	Cost-Effectiveness - Not modeled
Timeline to Implement – Next update scheduled for September 2023; every three years after that	**Co-Benefits** - Ensures new construction will incorporate new energy efficient and clean energy options as best practices and technology continuously improve - Reduces energy bills - Increases comfort - Improves health - Creates local jobs
	Technical Feasibility - Yes
Action 2 - Develop and fund a state-level Energy Code Circuit Rider initiative that provides code training and enforcement assistance to municipalities throughout the state to ensure awareness of and compliance with existing and future building energy codes	**Impact** - Complementary policy to Weatherization at Scale (see Strategy 1/Action 1). Impact could be further enhanced if additional and expanded training were offered as well to engineers, architects, and builders. However the need for municipal assistance was deemed a priority for most urgent action during development of this CAP.
	Equity – Does not directly address equity. However, improved building efficiency resulting from increased code compliance and enforcement will reduce energy use, decrease energy bills, and increase comfort and health. However, complying with building energy codes may increase construction or renovation costs. Especially for affordable housing, incentives or grants may be needed to help ensure that increased construction or renovation costs do not result in higher rental fees.
	Cost-Effectiveness – N/A
Timeline to Implement - by September 2023	**Co-Benefits**

	- Provides technical assistance and support needed especially by small municipalities that do not have the capacity and staffing to achieve this on their own.
	Technical Feasibility - Yes

Pathway 2 - Reduce building-related carbon emissions by reducing the carbon content of the fuels they use

Today, over 70 percent of Vermont's thermal energy use is fossil-based. About 40 percent of this is fossil gas and propane, while nearly a third is heating oil. For the last decade, Vermont has spent roughly $2 billion a year on fossil fuels, with 75 percent of those dollars leaving the state. In order to meet GWSA emission reduction goals, Vermont needs to transition away from its current carbon-intensive building heating practices to lower carbon alternatives. It also needs to do this equitably, recognizing economic effects on energy users, especially energy-burdened ones, the workforce currently providing these services, and on our overall economy.

Strategy 1 - Implement a Clean Heat Standard

A Clean Heat Standard (CHS) is being developed by the EAN Clean Heat Standard Working Group with a detailed final report expected by the end of 2021. The CHS is designed to encourage fossil fuel providers serving Vermonters to decarbonize the fuels they supply. It is a *performance standard* that would be applied to all major suppliers of heating fuels in Vermont with the purpose of driving the market toward greater adoption of low-carbon fuels. As a performance standard, a CHS enables suppliers to choose the most beneficial ways to transition from current practices. It is also designed to allow Vermont's energy users to exercise their choices in how they transition to less carbon-intensive heating practices.

Because Vermont imports 100% of the fossil fuels we use for heating, the CHS would be applied upstream at the wholesale level – that is, on the state's only regulated natural gas supplier (Vermont Gas Systems), and on the large-scale fossil fuel companies that deliver fuels to Vermont's numerous fuel dealers. Fossil heat wholesalers would be required to deliver clean heat solutions to Vermont customers on a percentage basis that rises over time. The wholesalers

could meet the standard through a wide range of actions – through their own activities or by purchasing credits from the activities of others. Energy efficiency and weatherization activities as well as low emissions clean heating options including advanced wood heat, biofuels, biogas, district heating, heat pumps, heat pump water heaters, and solar thermal would be eligible activities for meeting the standard.

To ensure that it does not negatively affect energy-burdened Vermonters, the CHS would need to incorporate policies to minimize adverse effects on low-income customers, and potentially on other customer segments for which there may be equity concerns. This could include disconnection policy, fuel assistance, housing, or other programs to improve energy affordability for low-income households. Because the CHS provides a path for fuel deliverers to comply and transition into the provision of cleaner energy services, the CHS design is fair to traditional fuel suppliers and their employees.

<table>
<tr><th colspan="2">Legislature</th></tr>
<tr><td rowspan="3">Action 1 - Adopt legislation authorizing the Public Utilities Commission to administer a Clean Heat Standard</td><td>Impact – TBD based on program design; potentially high if required emissions reductions are indexed to building/thermal sector share of GWSA reduction targets</td></tr>
<tr><td>Equity – Can be designed to mitigate the disproportionate energy burdens and negative distributional effects of existing heating fuel costs. Works in concert with complementary programs, such as low-income weatherization and fuel assistance programs, to assist in the transition to cleaner heating solutions.</td></tr>
<tr><td>Cost-Effectiveness – TBD based on program design</td></tr>
<tr><td>Timeline to Implement - During upcoming legislative session (No later than May 2022)</td><td>Co-Benefits
- Provides choice in how to meet GWSA targets Reduces energy bills
- Creates a predictable and stable marketplace as fossil fuel businesses transition to clean energy services
- Improves health
- Creates local jobs</td></tr>
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	Technical Feasibility - Yes

Strategy 2 – Transition the water heater market in Vermont to ensure the availability of water heaters whose total cost of ownership is lower than other models, and which can be controlled by electric utilities to help manage their power grids at low cost

The electrification of energy uses currently powered by fossil fuels represents one of Vermont's greatest opportunities to avoid building related GHG emissions. In addition to reducing emissions from combustion and saving consumers money, electrification is a low-cost and underused opportunity for utilities to actively manage and optimize their grid operations. Controllable water heaters will also improve Vermont's ability to adopt greater amounts of variable renewable resources. This strategy seeks to leverage the ability of water heaters, replaced at a rate of approximately 25,000 per year,[16] to store energy in the form of heat and allow electric utilities to manage their operation to realize both emission reductions and consumer savings.

Department of Public Service	
Action 1 - With neighboring states, require electric water heaters for sale to have a modular demand response communications port	**Impact –** Complimentary policy to establishing a Clean Heat Standard. Would enable the transition of fossil-fuel water heaters to state-of-the art, energy efficient water heaters whose heating can be timed to off-peak times of electricity use.
	Equity – Appliance standards do not typically address equity directly. However, the programs developed to implement such a standard can (and should) be. For example, any incentives created to stimulate market demand for controllable water heaters could be income sensitive and could prioritize equipment switch-outs in frontline and impacted communities.
	Cost-Effectiveness – Deemed to be high but awaiting modeling results from Cadmus/EFG.

[16] EAN 2021, p. 25

Timeline to Implement – Initiate discussion with neighboring states no later than July 2022	**Co-Benefits** – An initial step towards creation of a stable and predictable marketplace as fossil fuel businesses and equipment suppliers transition to clean energy services
	Technical Feasibility - Yes

Summary

It is important to note that, while the weatherization at scale suite of actions and the clean heat standard are interdependent, both strategies support the other, making each more effective at meeting the GWSA's just transition goals. Cleaner and more efficient heating appliances will work more effectively in homes that are more capable of maintaining internal temperatures. Likewise, as weatherization proceeds, the CHS will encourage the adoption of lower carbon fuels, producing opportunities for consumers to secure carbon reduction gains immediately. Furthermore, weatherization and energy efficiency improvements would be eligible for CHS credits. So, not only do they promote each other, but the relationship also helps in funding weatherization.