"TIER 3" – STATEWIDE TOTAL ENERGY PROGRAM ("STEP") BEYOND FOSSIL FUELS

AN OVERVIEW, ANALYSIS AND PROJECTED IMPACTS FOR ONE OF VERMONT'S ESSENTIAL CLIMATE PROTECTION STRATEGIES

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Prepared by **Energy Futures Group**

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Executive Summary

This report provides and overview, analysis and projected impacts for one of Vermont's essential climate protection strategies, Tier 3 of Act 56.

Vermont's Energy Transformation

Many of Vermont's past energy programs have focused on saving electricity--and the fossil fuel that was burned in producing that electricity--as a means of reducing greenhouse gas emissions (GHG). Today, renewable generating sources like hydro, wind, and solar are providing cleaner kilowatts. As a result, policy is shifting in ways that will encourage using this clean electricity to replace our current dependence on fossil fuels for heating and transportation.

75% of Vermont's total greenhouse gases are generated from driving our cars and trucks, as well as heating our water and homes. Without addressing these sectors, the state's goal of "90% renewable energy by 2050" cannot be achieved.

With this in mind, the Vermont Legislature passed Vermont's Renewable Energy Standard (Act 56) in 2015. Act 56 included an "Energy Transformation" section, also known as "Tier 3". In this paper we will refer to this section as "Tier 3/STEP", or the "Statewide Total Energy Program ("STEP") Beyond Fossil Fuels" because we think that using more understandable language will help people to better understand the potential of this policy. The goal of Tier 3/STEP is to replace fossil fuels with cleaner, renewably-sourced electricity, local wood fuels, biofuels, and efficiency to reduce net carbon emissions.

Tier 3/STEP = Big Savings

The potential impact of Tier 3/STEP is significant. The recent analysis by the Energy Futures Group (EFG) shows that over the next fifteen years Tier 3/STEP can:

- Cut carbon and greenhouse gas emissions;
- Offset the increased costs of adding renewables to the grid;
- Reduce the volatility of energy prices;
- Improve public health;
- Promote local economic development; and
- Potentially save Vermont ratepayers hundreds of millions of dollars in electric costs.

For comparative purposes, it can be useful to relate the impacts of Tier 3/STEP to the long-standing energy efficiency programs of Efficiency Vermont and the other Vermont Energy Efficiency Utilities[1]. While Tier 3/STEP starts out in 2018 at only seven percent (7%) of the Vermont Energy Efficiency Utilities' goals, it grows to more than one-third (34%) of those goals by 2032, providing a meaningful contribution to Vermont's climate savings initiatives.

[1] Vermont's Energy Efficiency Utilities include Efficiency Vermont, Vermont Gas Systems and Burlington Electric Department.

How It Works

The total savings from Tier 3/STEP over its 15 years will be equivalent to approximately 148 million gallons of oil, or about twice the total amount of fuel oil Vermonters used to heat their homes in 2016.

Tier 3/STEP requires Vermont's electric utilities to help their customers reduce fossil fuel consumption by adopting new, affordable and clean energy electrification technologies (such as cold climate heat pumps, heat pump water heaters and electric vehicles). Customers can also use new incentives to lower energy bills by switching to advanced wood heat[2], making efficiency investments, and /or weatherizing their homes. Businesses that currently use fossil fuels are also incentivized to switch to measures that use cleaner electricity. Through these electrification efforts, customers can cut costs, reduce emissions by using cleaner electricity rather than burning fossil fuels, and help to potentially reduce electric rates. By selling more electricity through the Tier 3/STEP efforts, utilities will be able to spread their fixed costs (for poles, wires, trucks, etc.) over additional electricity sales, with the potential impact being reduced electricity costs.

EFG conducted an analysis that estimates up to $7 million in potential savings over the lifetime of the Tier 3/STEP measures being installed in 2018 and over $300 million from those measures put in place over the next fifteen years. These savings could be used to reduce rates, re-invest in electric grid infrastructure, or increase renewable electric supplies.

Vermont's largest electric utilities have targets to save the fossil fuel equivalent of two percent of each utility's annual electric sales starting in 2017, increasing to 12% by 2032. Small municipal utilities have a two-year delay. If they are unable to meet the obligations of the program, utilities can, as a last resort, request flexibility from the Public Utility Commission in a given year or pay an "Alternative Compliance Payment" (or "ACP") to support additional energy transformation measures. Vermont utilities are offering a variety of programs, as evidenced by some of the case studies highlighted below.

Tier 3 is Right for Vermont

Tier 3/STEP comes at an important time for Vermont's renewable energy objectives. The emergence of new, affordable and clean energy electrification technologies (such as cold climate heat pumps, heat pump water heaters and electric vehicles), coupled with the continued greening of Vermont's electric supply, makes Tier 3/STEP an informed and timely element of energy policy for the State. It has the potential to benefit Vermont ratepayers, the economy, the environment, and electric utilities.

This paper provides more background and detail on Tier 3/STEP along with a rate impact analysis and some case studies of some of the early Tier 3/STEP projects. We hope this overview helps readers understand how Tier 3/STEP works and why it is an essential climate protection strategy for Vermont.

[2] Advanced wood heating systems are those that utilize highly efficient technology, produce low emissions, support healthy forest ecosystems, and consume local wood (from within a 50-mile radius). https://publicservice.vermont.gov/sites/dps/files/documents/Renewable_Energy/CEDF/Reports/FY%202015%20Annual%20Program%20Plan%20and%20Budget%20Allocations%20for%20the%20CEDF.pdf

Case Studies

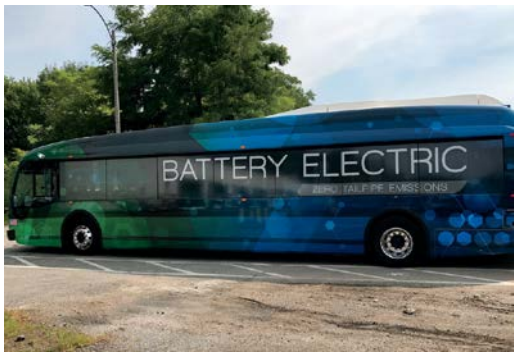
Sometimes stories are helpful to provide examples to help make a policy real. What follows are five case studies of Tier 3/STEP initiatives that show some of the efforts that the Vermont utilities have undertaken to transition their customers away from fossil fuels.

A. Johnson Co. – Lumber Mill Electrification

The A. Johnson Co., LLC is a family-owned and operated forest products business producing high quality hardwood lumber for both the wholesale and retail markets. Based in Bristol, Vermont the company is committed to being responsible to its community.

Green Mountain Power used Tier 3/STEP to lower the cost of bringing 3-phase electrical service to a portion of the mill that had previously operated on a diesel generator.
The change made the workplace quieter and healthier, and reduced GHG's by offsetting 32,000 gallons of fossil fuel each year with power that's 60% fromrenewables.

Electric Busses for Burlington



Transportation represents the largest slice of Vermont's energy and GHG emissions pie. The Burlington Electric Department (BED) is using Tier 3/STEP to offer incentives for electric vehicle off-peak charging, new electric charging stations, and 16 electric bikes in the city's bikeshare program. BED is also helping Green Mountain Transit acquire up to four electric busses.

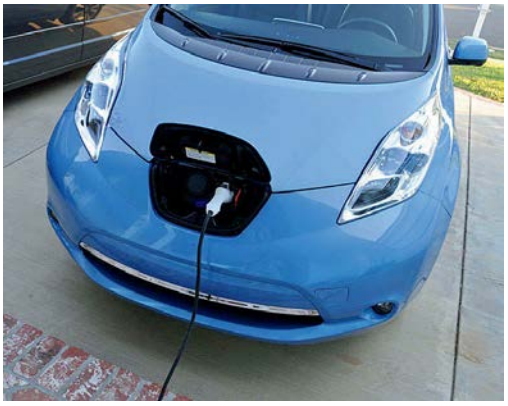
100% of BEDs power comes from renewables, so these shifts greatly reduce GHG emissions.

Homeowner Improvements

Most Vermont homeowners use fossil fuels to heat their homes and water, and to power their cars. Bekah Mandell and Patrick Wood received incentives from Washington Electric Coop (WEC) to finance heating improvements in their 184-year-old home.

Several utilities are using Tier 3/STEP to help residential customers lower their use of fossil fuels by providing rebates for measures such as heat pumps, pellet stoves, energy storage and controls, and weatherization. If the utility's power comes from renewables (WEC is 100% renewable), these measures lower GHG pollution.

Electric Vehicles



Electric vehicles (EV) can cost half as much to operate per mile traveled compared to standard gasoline cars. When charged with renewably-sourced electricity, they can be significantly cleaner as well.

In 2017, Green Mountain Power (GMP) and Freedom Nissan South Burlington offered a $10,000 discount on the purchase of a new 2017 Nissan LEAF. Over 150 LEAFs sold in four months. GMP customers have also received free Level 2 smart EV home chargers, helping GMP reduce costs for all customers by optimizing when the EV charges.

Maple Sugaring with Clean Electricity

Everybody loves maple syrup, right? Well, syrup produced with clean energy is even sweeter!

At Little Charlie's Sugarbush in Jay, Vermont, Vermont Electric Coop (VEC) used Tier 3/STEP to provide incentives to extend electric service about a half mile to the sugar- house. This transition to electric energy will displace almost 8,000 gallons of propane each year and reduces GHGs since 80% of VEC's power comes from renewables.

Overview

This section provides an explanation of Vermont's Renewable Energy Standard, including Tier 3/STEP, along with some context for how Vermont currently uses energy, how Tier 3/STEP is designed to reduce fossil fuel use, and what some Tier 3/STEP projects look like.

What is Tier 3/STEP?

Act 56 of 2015 (30 V.S.A. § 8002-8005), Vermont's "Renewable Energy Standard," created three categories--or tiers--of energy resource types with which Vermont electric distribution utilities must comply:

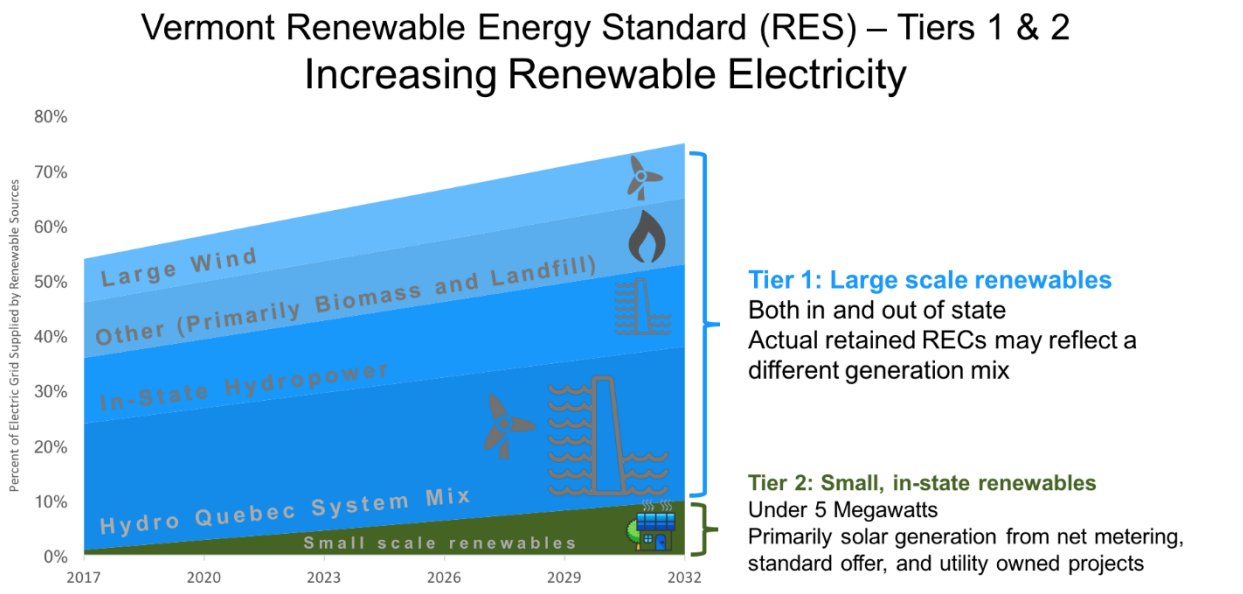
1. *Total Renewable Electricity*
2. *Distributed Renewable Generation*
3. *Energy Transformation*

Tier 1, "Total Renewable Electricity," establishes minimum amounts of renewable electricity within the supply portfolio of each electric utility, starting at 55% of annual retail electric sales in 2017, and growing to 75% renewables by 2032.

Tier 2, "Distributed Renewable Generation," requires the use of small-scale,[3] Vermont-based renewable electricity sources within the overall Tier 1 Total Renewable Electricity targets. Tier 2 requirements start at one percent (1%) of the total generation in 2017 and increase to 10% small-scale local renewables in 2032.

Tiers 1 and 2 are presented visually in Figure 1.

Figure 1. Vermont Renewable Energy Standard (RES) Tiers 1 & 2



[3] Less than 5 megawatts

Tier 3/STEP, "Energy Transformation," requires Distribution Utilities to reduce fossil fuel consumed by their customers through electrification (of heating, hot water, and transportation), switching to advanced wood heating or biofuels, or weatherization. Utilities can also meet Tier 3 requirements through additional Tier 2 renewable generation projects or combine renewable generation and fossil fuel projects to achieve their Tier 3 goals. Utilities are required to save the equivalent of two percent (2%) of each utility's previous annual retail electric sales starting in 2017, increasing 0.67% each year until it reaches 12% in 2032. Smaller municipal utilities[4] have a delayed start date of 2019 and a lower final obligation of 10.67% by 2032. Importantly, and unlike the first two tiers, the savings from individual projects are counted upfront in the year the measures are installed, and the annual goals are reset each year (rather than being cumulative). This concept is explained in more detail below.

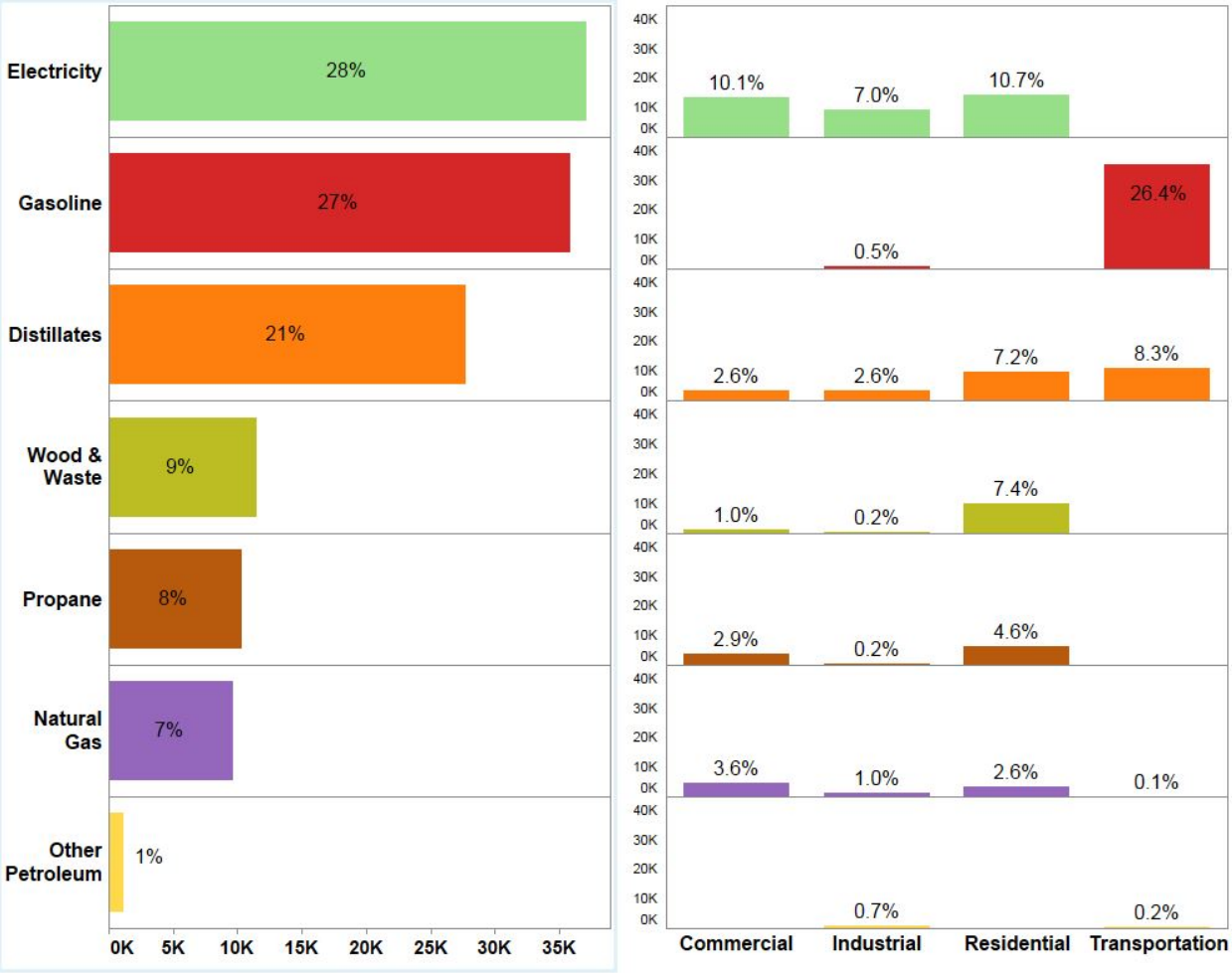
If a Distribution Utility does not achieve these obligations, or chooses to not pursue them, it will be required to pay an "Alternative Compliance Payment"[5] or "ACP".

How Does Vermont Use Energy Now?

Understanding how and where Vermont uses energy provides a glimpse into the potential fossil fuel reduction opportunities for Tier 3/STEP. As is shown below in Figure 2, more than three-quarters of Vermont's total energy use is comprised of electricity, gasoline and distillates.[6] Electricity use is split roughly equally across the residential, commercial and industrial sectors (10.1%, 7.0% and 10.7% respectively). Gasoline is used almost exclusively in transportation, and distillates are used predominantly in transportation and residential heating. Propane, natural gas, and kerosene make up another 16% of Vermont's energy use. Wood, provides 9% of our energy, primarily for residential thermal heating.

[4] Serving not more than 6,000 customers, which is all Vermont Distribution Utilities except for Green Mountain Power, Burlington Electric Department, Vermont Electric Cooperative and Washington Electric Cooperative.
[5] The Alternative Compliance Payments are $.01/kWh for Tier 1 and $.06/kWh ($60/MWh) for Tiers 2 and 3, with gradual increases permitted under the law.
[6] Commonly called "#2 fuel oil" , "heating oil" or "diesel".

Figure 2. Composition of Vermont Consumption of Primary Energy, 2013 (Billions of Btu)[7]



What is not discernable in the Vermont energy use data is a small but growing transition in the way energy is being used. Technological advances are occurring rapidly in cold climate heat pumps (for space heating), heat pump water heaters, electric vehicles, automation, innovative controls, and other products. These technologies provide opportunities to use renewably-sourced electricity (from hydropower, wind, and solar) instead of fossil fuels to heat Vermont's buildings and water and provide transportation solutions. Furthermore, with advances in efficient wood heating, Vermont has an opportunity to displace even more fossil fuel use while re-investing in the local economy in ways that help preserve our forests. Providing Vermont's utilities with statutory and regulatory support to

[7] Vermont Comprehensive Energy Plan 2016, p. 28.
https://outside.vermont.gov/sov/webservices/Shared%20Documents/2016CEP_Final.pdf
Sources: U.S. Energy Information Administration, State Energy Data System, Vermont Department of Public Service.
Notes: ***Primary energy consumption*** *is a measure of energy consumption that included the source energy required to product the electricity consumed by end-users. This is a more inclusive measure of energy consumption than* ***site energy consumption****, which does not count the energy lost in conversion of source energy into electrical power. Gasoline totals shown here include ethanol.*

promote these new approaches to displace fossil fuel use will help speed the transition from fossil fuels, thereby contributing to Vermont's climate, energy, and economic development goals.

Vermont is in a unique position nationally that emphasizes the importance and benefits of taking these steps towards getting off of fossil fuels in our building and transportation sectors. On the supply side, Vermont's electric grid is already more than 55% renewably powered.[8] On the demand side, heating dominates our building loads due to Vermont's cold climate. Since much of the state has no access to natural gas, more than two-thirds of our homes burn delivered fuels (fuel oil, propane, and kerosene) to stay warm compared to the rest of the country where only about 10% burn fuels other than natural gas for heating. As well, Vermont's low population density and limited public transit makes the average commute high relative to other places, as demonstrated by the high percentage of greenhouse gas emissions from transportation relative to other sectors. In Vermont, 55% of emissions come from the transportation sector, compared to 35% from transportation nationally. So, it is essential that Vermont pay attention to space heating, water heating, and transportation in its clean energy future.

Why Was Tier 3/STEP Passed into Law?

Vermont has been working to address energy efficiency and renewable energy goals since the 1980s. Historically, most policies and programs have focused on energy efficiency in buildings, targeted at saving both fossil fuels and electricity. In 2017, for example, customer sited solar generated 18,474 MWh and saved 15,155 tons of CO_2[9], while energy efficiency programs through Efficiency Vermont saved 141,815 MWh, or 842,393 tons of CO_2, seven times as much as through solar.[10] In 2000 Vermont became the first state in the U.S. to institute an "energy efficiency utility" (branded as "Efficiency Vermont") to specifically address electric energy savings opportunities. The State also earmarked Regional Greenhouse Gas Initiative (RGGI) and Forward Capacity Market (FCM) funds for fossil fuel "thermal energy" reductions, which have had positive impacts on energy savings and economic development in Vermont and the rest of the Northeast.[11]

While Vermont has made good progress with electric energy efficiency, there is a lot more that needs to be done if the State is going to meet its goal of "90% renewable energy by 2050."[12] [13] While energy efficiency will continue to be a key strategy in meeting this goal, the need to transition off fossil fuels to renewably-sourced electricity and locally-produced wood for our buildings and transportation is critically important. Without making this transition, it is very unlikely that the State will achieve this aggressive clean energy goal.

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[8] Energy Action Network Annual Report 2017, p.18 (http://eanvt.org/2017annualreport/). In 2017 around 55% of Vermont electric retail sales were from renewable sources on a "site energy" basis. If measured on a "source energy" basis which accounts for power plant efficiency and transmission losses, it is about 43% renewable.

[9] Customer sited solar savings calculated using the VT Energy Atlas, with CO_2 savings calculated through the EPA GHG Equivalencies Calculator.

[10] Efficiency Vermont 2017 Savings Claim Summary, p. 2 (https://www.efficiencyvermont.com/Media/Default/docs/plans-reports-highlights/2017/efficiency-vermont-savings-claim-summary-2017.pdf).

[11] http://www.analysisgroup.com/news-and-events/news/latest-study-from-analysis-group-confirms-that-rggi-program-continues-to-boost-the-economy-and-create-jobs/

[12] http://publicservice.vermont.gov/publications-resources/publications/energy_plan/2011_plan

[13] http://publicservice.vermont.gov/publications-resources/publications/energy_plan/2015_plan

Fortunately, technology is on our side with recent advances in non-fossil fuel technologies that allow us to heat our homes and water and power our vehicles efficiently with electricity and wood. The Vermont Legislature realized this alignment of technology, the potential for a more renewable electric grid, and the fact that while the State has made great gains in energy efficiency, current efforts will not be enough to meet the 90% renewable by 2050 goal. So, in 2015, it passed Act 56, Vermont's Renewable Energy Standard (30 V.S.A. § 8005). The primary purpose of this landmark legislation was to reduce carbon by increasing the grid's renewability and reducing fossil fuel use.

Support for Complementary Policies

Tier 3/STEP's objective of moving Vermont off fossil fuels and onto cleaner, renewable-based electricity and other renewable fuels, like wood, complements other state and local policies and programs. Vermont has a goal of weatherizing 25% of residences (approximately 80,000 homes) by 2020.[14] There are state and federal goals, regulations, and programs to increase vehicle mileage, improve heating system efficiencies, strategically electrify buildings with cold-climate heat pumps, reduce air pollution, create green and sustainable local jobs, support our forest economy, and transition to more electric vehicles. Tier 3/STEP helps support and stimulate these initiatives by requiring utilities to put resources into these efforts while delivering fossil fuel savings. When utilities apply their resources to reducing fossil fuel use it can transform our energy system more quickly and deliver great benefits to customers.

A New Business Model for Distribution Utilities

According to the Edison Electric Institute, which represents investor-owned utilities, decentralized technologies like renewables, efficiency, distributed generation, and new storage innovations (e.g., solar battery storage), will lead to declining power sales and, based upon most current regulatory structures, declining revenues.[15] With Tier 3/STEP, Distribution Utilities are incentivized to pursue a new business model that is more beneficial for utility customers over the long-run and more consistent with Vermont energy policy goals. Converting customers' energy uses from fossil fuels to electricity means increasing sales and the potential for lowering rates by spreading more megawatt-hour sales across the utilities' fixed costs and established delivery infrastructure. If the electric grid becomes increasingly renewable, and if the conversion to electricity is accomplished efficiently and without high embedded charges, Vermonters could shift to heating and transportation energy that is more affordable, cleaner, and renewable.

Public Policy Goals

If deployed effectively, Tier 3/STEP can be a good deal for Vermont ratepayers, utilities, the economy, and the environment. Transforming Vermont's energy sources from fossil fuels to those based on renewables and energy efficiency also helps Vermont achieve several public policy goals, including:

- Reducing carbon and greenhouse gas emissions;
- Offsetting the increased costs of adding renewables to the grid;
- Reducing the volatility of energy costs;
- Improving public health; and
- Promoting local economic benefits.

[14] Vermont Act 92; 10 V.S.A. § 581

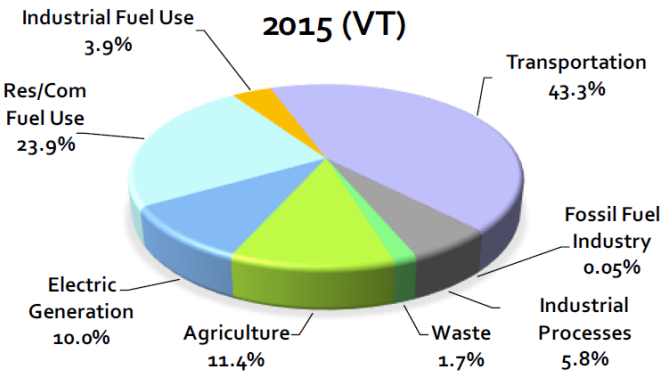
[15] http://americaspowerplan.com/utility-business-models/

It is important to note that while Tier 3/STEP allows for any measures that reduce fossil fuels in the home, business, or for transportation, most of the Distribution Utilities have thus far focused primarily on electrification measures. As EFG has analyzed in this paper, the Distribution Utilities are incentivized to focus on electrification due to the potential for downward rate impacts. However, many proponents of Tier 3/STEP intended it to advance all non-fossil fuel solutions, including weatherization and advanced wood heat, which don't provide the same rate impacts but provide broad economic and environmental benefits.

Carbon and Greenhouse Gas Reductions

More than 75% of Vermont's total greenhouse gases ("GHG") are generated from transportation and fuel use, as shown in Figure 3.[16] Reducing the carbon pollution and replacing the energy consumed by these end-uses with clean renewable electricity or clean burning local wood can make a significant reduction in Vermont's GHG emissions and help meet the state's air pollution and climate change goals.[17]

Figure 3. Vermont Greenhouse Gas Emissions by Source, 2015



Offsetting the Increased Cost of Renewables

Act 56 anticipated that the cost of adding renewables to the electric grid under Tiers 1 and 2 would be offset by additional utility revenues generated under Tier 3/STEP. Bundling these desirable policies to achieve the environmental goal of an increasingly renewable grid with Tier 3/STEP fuel-switching to electricity provided the Legislature, utilities, and ratepayers a policy that can pay for meeting desirable outcomes. As spelled out in the section below on the electric rate impact analysis, Tier 3/STEP has the potential to reduce electric rates, which can offset the presumably higher cost of adding renewables. This occurs because the utilities will switch customers from fossil fuels to electric end-uses under Tier 3/STEP, resulting in the sale of more megawatt hours. This increased sale of electricity spread out over the fixed costs of the electric grid means that it will cost less to deliver each of those megawatt hours in the future. As regulated entities, the benefits from that lower cost electricity should put downward pressure on rates. In this way, Tier 3/STEP was designed to have the potential to pay for Tiers 1 and 2.

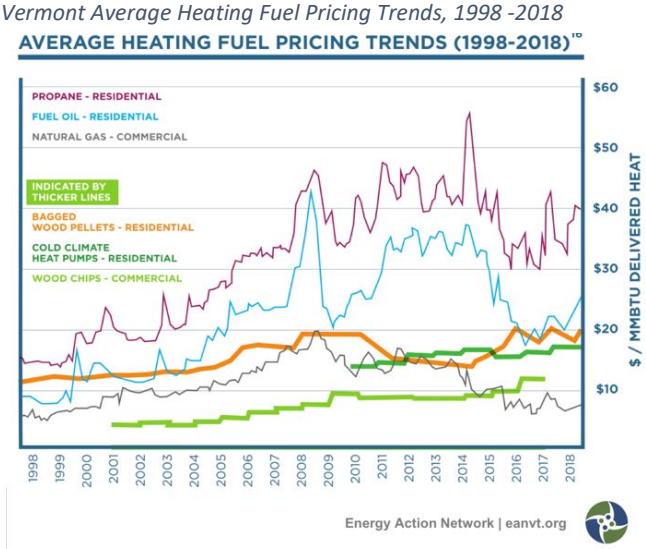
[16] Vermont Greenhouse Gas Emissions Inventory Update: Brief 1990 -2015, June 2018. Vermont Department of Environmental Conservation, Air Quality and Climate Division. http://dec.vermont.gov/sites/dec/files/aqc/climate-change/documents/_Vermont_Greenhouse_Gas_Emissions_Inventory_Update_1990-2015.pdf

[17] http://climatechange.vermont.gov/vermonts-goals

Less Volatile Energy Prices

Reliance on fossil fuel energy brings with it exposure to significant price volatility. For example, as shown in Figure 4,[18] the price of Vermont heating fuel oil (light blue line) has ranged from a low of under $10/million Btu[19] (about $0.50/gallon) in 1998 to a high of more than $42/million Btu (around $3.50/gallon) in 2008. Today, fuel oil is around $3.00/gallon, but future prices are uncertain and likely to continue to ebb and flow based on international markets and other factors beyond Vermont's control. Propane prices (shown in red) are also extremely volatile.

Figure 4. Vermont Average Heating Fuel Pricing Trends, 1998 -2018



In contrast, electricity rates (shown in dark green and labeled as "cold climate heat pumps – residential") tend to be much less volatile, in part due to portfolio planning and regulatory review. Wood pellets (orange line) and chips (light green) tend to be more stable and less volatile given their local or regional origins and disconnection from international markets. While natural gas (shown in grey) tends to be fairly stable, it is still more volatile than either wood or electricity.

Public Health

Fossil fuel related pollutants have a negative impact on the health of Vermonters. Vermont's Clean Air Task Force estimated the costs of the health impacts of fine particulate diesel at $29 million per year.[20] Burning wood or other biomass also emits particulates. It is beyond the scope of this paper to address the different technologies that allow for clean wood heat. However, we note that Vermont's energy policies should favor technologies that burn wood more cleanly and efficiently.

Local Economic Benefits

Moving the energy system to one that keeps more of Vermonters' money in-state by paying for locally-generated electricity and wood and retaining or creating in-state jobs for renewable energy installations, logging and weatherization improvements helps spur economic development. This is primarily the premise of Tiers 2 and 3, encouraging local installations of local renewable energy systems instead of importing it all from out of state.

Instead of sending nearly 80% of every dollar spent on fossil fuels out of state, redirecting energy dollars to local energy projects helps boost Vermont's economy.[21] In addition, efficiency measures reduce energy bills; dollars not spent on purchasing energy can be otherwise expended locally for requirements like food, clothing, and housing costs. Especially in middle or lower income households, this frequently

[18] Energy Action Network Annual Report 2017, p. 17. http://eanvt.org/2017annualreport/
[19] Btu = British Thermal Unit, the approximate energy equivalent of burning a wooden match end-to-end.
[20] Energy Action Network Annual Report 2017, p. 31. http://eanvt.org/2017annualreport/
[21] Vermont Comprehensive Energy Plan 2016, p. 49.
https://outside.vermont.gov/sov/webservices/Shared%20Documents/2016CEP_Final.pdf

translates to local community spending on necessities. Burning wood instead of fossil fuels for heat helps keep dollars local and supports the working forest economy.

This paper focuses on rate impacts of electrification efforts and does not analyze the full lifetime economic benefits of Tier 3/STEP. Beyond rate impacts, these benefits have the potential to be significant, but have not yet been fully calculated.

How Does Tier 3/STEP Work?

Tier 3/STEP establishes "transformation" requirements for each utility based on its recent electric sales.[22] Vermont utilities are required under Tier 3/STEP to support projects to reduce fossil fuel consumed by their customers.[23] If finding this fossil fuel savings becomes challenging or less cost-effective, as an alternative strategy, utilities may also add additional distributed renewable generation (typically solar photovoltaic--or "PV"-- systems) by increasing Tier 2 projects. Green Mountain Power (GMP), Vermont Electric Cooperative (VEC), Burlington Electric Department (BED), and Washington Electric Cooperative (WEC) must each save *the fossil fuel equivalent of* two-percent (2%) of their most recent year's annual retail electricity sales in 2017 and then increase savings by two-thirds of a percent (0.67%) each year until 2032 when they need to reach 12% of annual sales in the equivalent of fossil fuel savings that year.

All municipal electric utilities serving fewer than 6,000 customers (represented by the Vermont Public Power Supply Authority, or VPPSA), plus Stowe Electric Department (which is not a VPPSA member) have an additional 2 years before implementing Tier 3/STEP requirements (and thus a lower total requirement). Starting in 2019, they need to save the fossil fuel equivalent of two-percent (2%) of each utility's annual electric sales, also growing at two-thirds of a percent (0.67%) per year until reaching a total 10.67% of annual sales in the equivalent of fossil fuel savings in 2032.

Savings Goals Reset Annually

Tier 3/STEP goals have been established so that the lifetime savings[24] of any measure or project installed under the program in any given year is counted upfront in the year that measure is installed. In this way, those lifetime savings provide a significant contribution towards that year's goals, but they cannot be booked again in subsequent years even though the benefits are still accruing. This is a different arrangement from Tiers 1 and 2 requirements in which those renewable credits are spread out over the life of the projects.

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[22] The "electric sales" figure is used purely as a reference for the equivalent amount of fossil fuel savings the utilities need to save. The utilities and the Vermont Public Service Department have determined a "megawatt-hour" equivalent amount of fossil fuels that need to be saved relative to each utility's annual target.

[23] When determining fossil fuel savings from fuel switching projects, utilities net out grid-based fossil fuel generated electricity for Tier 3/STEP electrification projects in order to avoid taking credit for electricity that is generated with fossil fuels. Only that portion of electricity generated renewably is credited against the fossil fuel savings project.

[24] Savings are all expressed in "lifetime savings"; that is, the total cumulative savings of each year that the measure lasts. These annual savings are added up and brought forward to the installation year and counted in that year. For instance, a typical cold climate heat pump will save 670 kWh/year (net after accounting for oil displacement and additional electrical consumption to run the unit) and last 15 years, so a utility will claim 10,050 kWh (or 10.05 MWh, = 670 x 15) in savings for the year the unit is installed.

An example of how the Tier 3/STEP savings goals are handled can help show that they are not cumulative but reset annually. For example, in 2018, GMP needs to save 2.67% of their annual sales in equivalent fossil fuel (2% starting in 2017 plus 0.67% in 2018). Expressed in fuel oil savings from Figure 7, GMP would need to work with customers to install measures that would save about 2 million gallons of fuel oil over their lifetime in 2017, and then in 2018 find additional measures that would save another 2.8 million gallons of fuel oil. *And then* in 2019, they need to start from that new base and save 3.33% of their annual sales (2.67% plus 0.67%), or 3.5 million gallons of fuel oil equivalent. As the utilities convert their customers from fossil fuel to electricity, their annual electric sales may increase. That would cause their Tier 3/STEP goals to also increase (because they are a percentage of sales).

Tier 3/STEP's goals increase by 0.67% each year and the base of annual sales is likely to increase annually. This could mean "low-hanging fruit" will be picked in the early years, leaving less cost-effective and more challenging projects for future years. However, as the utilities learn which programs best motivate their customers, fossil fuel prices increase, electric rates stabilize or decrease,[25] and as technology advances and prices decrease, the branches will droop, and these projects could become more cost-effective.

Megawatt-Hour Goals

Units of energy can be represented multiple ways, including gallons, British Thermal Units (Btus), kilowatt-hours, megawatt-hours (1,000 kilowatt-hours), etc. For the purposes of defining a common metric across electricity and fossil fuels, the Vermont Public Utilities Commission (PUC) and utilities agreed to use "megawatt-hour equivalent." A megawatt-hour is equal to about 25 gallons of fuel oil. Fossil fuel savings are all translated into megawatt-hour equivalents to provide a common metric for tracking goals and savings.

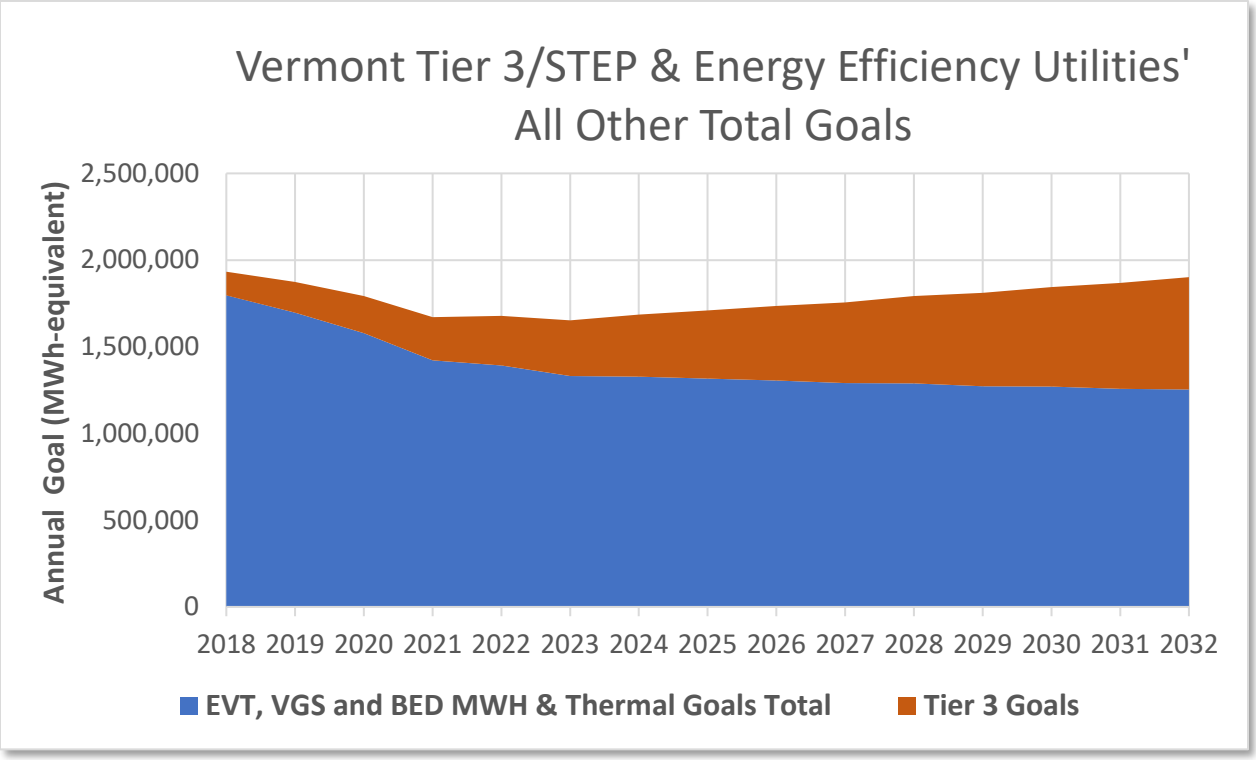
However, for purposes of calculating Tier 3/STEP savings, the utilities don't simply convert fossil fuel savings to electricity for those measures like heat pumps, heat pump water heaters, or electric vehicles that replace fossil fuels with electricity. There is a conversion that discounts the savings by the percent of electricity that is still generated with fossil fuels. About 37% of Vermont's electricity is generated by fossil fuels, so only 63%[26] (=100-37) of a fossil fuel savings measure can be counted towards the Tier 3/STEP megawatt-hour goals.[27]

Comparison to Utility Savings Goals

To provide some reference and comparison to the existing utility savings programs, Figure 5 compares the Tier 3/STEP savings goals for all electric distribution utilities to all of the other goals (electric and thermal) for Vermont's "Energy Efficiency Utilities."[28] As Figure 5 shows, the annual reductions in Tier 3/STEP fossil fuel consumption start out in 2018 at only seven percent (7%) of the Vermont Energy Efficiency Utilities' goals, but then grow to more than one-third (34%) of those goals by 2032.

[25] See Energy Futures Group analysis below that anticipates downward pressure on rates under Tier 3/STEP based on increased electric sales spread out over the utilities relatively fixed assets.
[26] Referred to as the "heat rate".
[27] This "source energy" factor accounts for the efficiency losses incurred in converting fuel sources to electricity then transmitting that electricity to Vermont, typically from outside the state.
[28] Vermont Energy Efficiency Utilities (or "EEUs") include Efficiency Vermont, Vermont Gas and Burlington Electric Department.

Figure 5. Vermont Tier 3/STEP and Energy Efficiency Utilities' All Other Total Goals 2018 - 2032



The following Table 1 provides the details for the savings contributions from Efficiency Vermont, Burlington Electric Department, Vermont Gas Systems, and then all of the other electric Distribution Utilities broken out by their savings goals for electricity, thermal energy and Tier 3/STEP in 2018 and again in 2032. Over this period, the total savings (presented in the common values of MWH equivalent or "MWH-e") stays approximately level at about 1.9 million MWH-e, yet the contribution to the total from Tier 3/STEP increases significantly. In 2018, electric savings provide most (76%) of the savings, but by 2032, this drops to about half (52%), with Tier 3/STEP making up this difference.

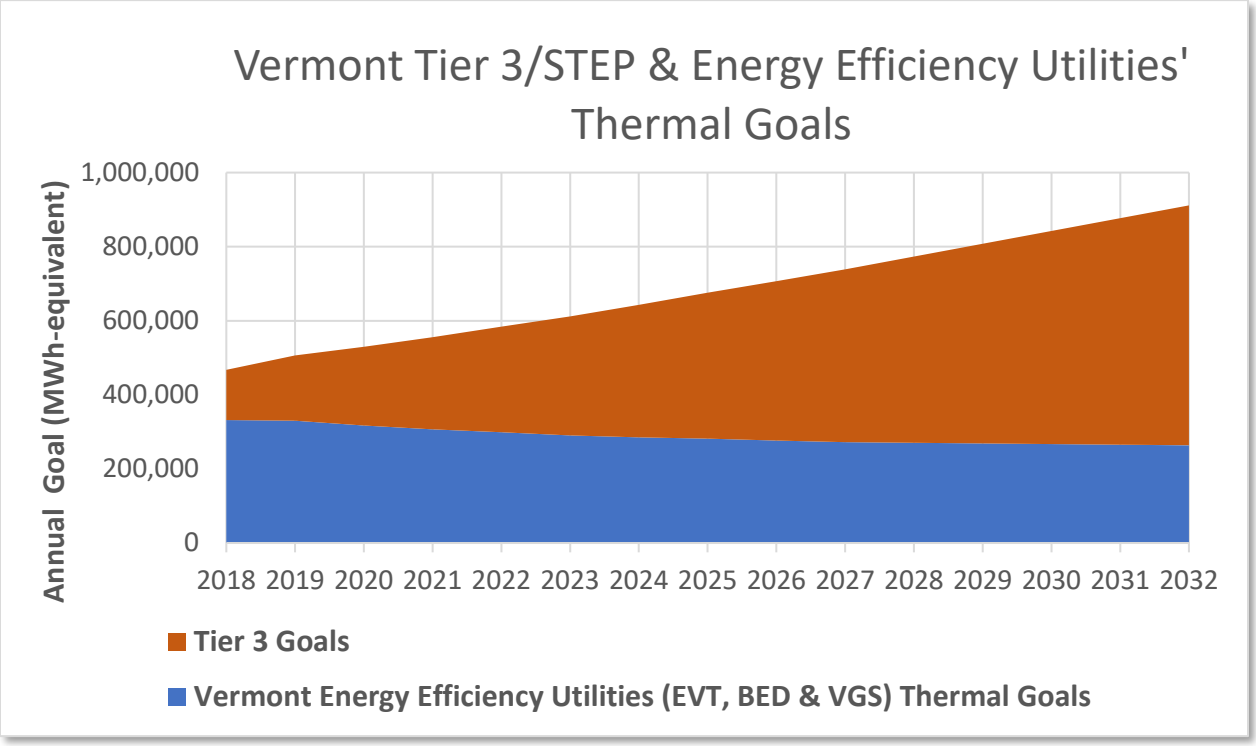
Table 1. Combined Savings Goals Summary (in MWH-e), 2018 and 2032

Savings Goals Summary (in MWH-e), 2018 & 2032										
	2018					**2032**				
Utility	Electric	Thermal	Tier 3	**Total**	% of Total	Electric	Thermal	Tier 3	**Total**	% of Total
EVT	1,388,419	227,574	NA	**1,615,993**	84%	924,301	182,060	NA	**1,106,362**	58%
BED	76,968	416	9,178	**86,562**	4%	65,376	409	41,301	**107,086**	6%
VGS	NA	103,947	NA	**103,947**	5%	NA	81,537	NA	**81,537**	4%
Distribution Utilities (other than BED)	NA	NA	126,551	**126,551**	7%	NA	NA	606,095	**606,095**	32%
Total	**1,465,387**	**331,937**	**135,729**	**1,933,053**	100%	**989,677**	**264,006**	**647,396**	**1,901,079**	100%
% of Total	76%	17%	7%	100%		52%	14%	34%	100%	

Tier 3/STEP can also be compared directly to the Vermont Energy Efficiency Utilities' non-electric "thermal goals." These efforts are funded primarily through the Regional Greenhouse Gas Initiative (RGGI) and Forward Capacity Markets (FCM) to save non-electric energy use to heat our buildings, provide hot water and for industrial processes.

As shown in *Figure 6*, the Tier 3/STEP goal starts out at about 40% of the Vermont Energy Efficiency Utilities' 2018 thermal goals. However, in later years Efficiency Vermont's thermal goals decrease due to level-funding and other factors, along with the impact of inflation over time, while the Distribution Utilities Tier 3/STEP goals climb significantly. By the end of the 15-year period, the collective impact of Tier 3/STEP savings delivered by the Distribution Utilities grows to about two-and-a-half times the thermal goals by 2032.[29]

Figure 6. Vermont Utilities' Tier 3/STEP and Thermal Savings Goals 2018 - 2032



These comparisons demonstrate the magnitude and potential savings impact of Tier 3/STEP on Vermont's energy economy and the environment. Taken together, the Energy Efficiency Utilities thermal goals, their significantly larger electricity efficiency goals and the Tier 3/STEP goals can all have a positive compounding effect if coordinated and implemented effectively in delivering energy savings.

Savings Goals Expressed as Fuel Oil Equivalent

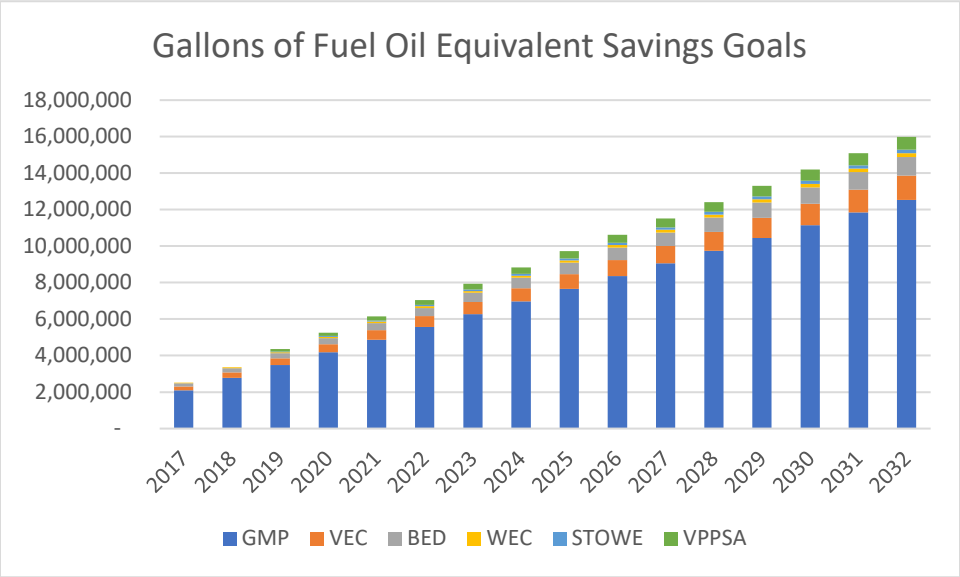
Figure 7 below shows the savings goals for each utility throughout the Tier 3/STEP period, 2017-2032, in equivalent gallons of fuel oil. The utilities have significant fossil fuel savings they need to acquire each year, starting from about 2.5 million gallons in 2017 to almost 16 million gallons saved in 2032. GMP, as Vermont's largest utility, is responsible for almost 80% of the state's total, needing to find about 117 million gallons of oil savings over the period. To put this in perspective, Vermont residential households use approximately 75 million gallons of fuel oil annually.[30] Total accumulated oil savings from Tier

[29] Projections assume values from 2027 continue through 2032 for Efficiency Vermont and Burlington Electric Department since values for 2028-2032 have not been filed with the Vermont Public Utilities Commission in case number EEU-2016-03.

[30] https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=KD0VARSVT1&f=A

3/STEP over the 15-year period is about 148 million gallons of oil, or about the equivalent of what Vermont burns to heat our homes over two years.

Figure 7. Gallons of Fuel Oil Equivalent Savings Goals for Tier 3/STEP



What Do Tier 3/STEP Projects Look Like?

Each of the Distribution Utilities are proposing a different mix of Tier 3/STEP projects based on their goals, mix of residential vs. commercial/industrial customers, vision for the future of their utility, and customer focus. For example, with a more densely populated service territory that has a high penetration of natural gas service, Burlington Electric Department (BED) is focusing on supporting electric vehicles, electric buses and charging stations. They are also soliciting fossil fuel savings ideas from the business community through an "request for proposals" (RFP) process. Green Mountain Power (GMP) has prioritized helping their commercial and industrial customers fuel switch from fossil fuels to electricity. Some of the businesses they plan to reach out to include greenhouse operations, ski area/snowmaking operations, maple sugarmakers, manufacturing, and air-handling operations. GMP is also promoting cold climate heat pumps to displace fossil fuels used for space heating. They also offer controls for customers' homes and businesses to help manage electricity demand and consumption to reduce the portion of the fossil fuels burned to generate electricity for the grid.

Vermont Electric Coop (VEC), serving much more rural areas, has focused on helping finance line extensions to maple sugarmakers who previously ran diesel generators to produce electricity to run their pumps, fans, and lights at their remote sugarhouses. They continue to offer cold climate heat pumps and electric vehicles but have added heat pump water heaters and pellet stoves. Washington Electric Coop (WEC), also rural, is partnering closely with Efficiency Vermont and plans to focus their Tier 3/STEP efforts primarily on electric vehicles, weatherization, and heat pumps. They will also incentivize advanced wood heating. Since WEC has primarily residential customers, they do not have any plans for commercial and industrial fuel-switching projects. Vermont Public Power Supply Authority (VPPSA),

which represents the smaller municipal utilities, will primarily offer electric vehicle programs, with some commercial and industrial custom projects.

These projects all reduce fossil fuels, including fuel oil and propane for space heating and water heating, diesel for transportation, generators and commercial processes, and gasoline for transportation. This is the goal of Tier 3/STEP: to replace fossil fuel use with cleaner, renewably-sourced electricity, local wood fuels, biofuels, and efficiency to reduce net carbon emissions.

The following Table 2 summarizes each of the Distribution Utilities' mix of proposed Tier 3/STEP measures for 2018. Priority efforts by each utility are ranked 1 to 3 vertically in the table by utility, with check marks indicating other efforts that will be undertaken in addition to their top three initiatives. The top three efforts are ranked by each utility based on the planned level of savings in their 2018 plans. Stowe has not yet filed a plan for 2019 (their first year of offering a Tier 3/STEP program) so are not included.

Table 2. Vermont Utility[31] Tier 3/STEP Measure Mix Proposed for 2018

Category	Measure	GMP	VEC	BED	WEC	VPPSA
Home Heating	Pellet / Wood Heat		❸		✓	
	Cold Climate Heat Pumps (CCHP)	❷	❷	✓	❸	
	Heat Pump Water Heaters (HPWH)	✓	✓		✓	
Transportation	Electric Vehicles (EV) & Plug-in Hybrid Electric Vehicles (PHEV)	✓	✓	❶	❶	❶
	Electric Buses			❷		
	Electric Vehicle (EV) Charging Stations	✓		❸		
	Electric Bikes			✓		
Thermal Efficiency	Home Electrification	❸				
	Smart Thermostats	✓				
	Weatherization / Passive House Certification			✓	❷	
Commercial/ Industrial	Fuel Switching Custom Projects	❶	❶			❷
Other	Battery Storage	✓				
	Solar Hot Water				✓	

Note: The top three measures for each utility are ranked 1, 2 and 3 based on the savings projected. The checks (✓) indicate measures that are also being proposed by each utility.

All five Distribution Utilities are focusing on the transportation sector by incentivizing the switch from gasoline-powered to electric vehicles. In fact, despite offering different programs and incentives the utilities have collaborated on promoting electric transportation, such as when they joined with Governor

[31] Note that Stowe isn't included since they do not have to offer a Tier 3/STEP program until 2019, are not filing as part of the Vermont Public Power Supply Authority (VPPSA) group of utilities, and have not yet filed a program plan as of the writing of this paper.

Scott to announce a special discount program on Chevrolet Bolts and Volts, or when Green Mountain Power partnered with Nissan to promote Nissan LEAFs in 2017, with rebates up to $10,000.

It makes sense that electric vehicles are a top measure since they can be charged during off-peak hours when lower cost electricity is more available and less likely to be generated with fossil fuel-fired peaking plants. Charging electric vehicles off-peak can also offer more opportunities for demand management. Cold climate heat pumps to displace space heating from fuel oil and propane are also a top priority for four of the five utilities. Beyond these common approaches, GMP and VEC plan to prioritize commercial and industrial customers and provide customized fuel switching projects. BED's second-level priority is electric buses, WEC's is home weatherization and VPPSA's is commercial and industrial custom projects. There is quite a diversity of priorities and offerings beyond these top priorities for all the utilities; most of the other measures are not being offered or are not prioritized by more than two of the utilities.

Coordination with Existing Utility Programs

As Tier 3/STEP launched, there have arisen some issues and potential conflicts at the intersection of existing Energy Efficiency Utility programs and the new offerings from the electric Distribution Utilities' Tier 3/STEP programs. For example, Efficiency Vermont has been working to establish a cold climate heat pump market and claiming savings for both the fossil fuel displacement savings along with the more efficient electric efficiency savings from a high-efficiency heat pump model compared to a baseline model. However, cold climate heat pumps have become a primary offering by the Distribution Utilities as part of their Tier 3/STEP programs. Efficiency and Distribution Utilities have had to work on how to claim savings without double-counting. While the utilities will attempt to coordinate, there will inevitably be issues along the way that need to be addressed.

While on-going coordination between the Energy Efficiency and Distribution Utilities will continue to be paramount, some guidance from regulators or the Legislature from the perspective of customers and ratepayers may be warranted. Consideration of a framework that encourages coordination and collaboration in the interest of minimizing market confusion could potentially help to ensure the most cost-effective, non-overlapping programs. One idea that may be worth considering could be establishing shared goals for all the Energy Efficiency and Distribution Utilities. At any rate, minimizing conflicts through coordination and collaboration should remain a priority as Tier 3/STEP rolls out.

Tier 3/STEP Rate Impacts

If deployed effectively, Distribution Utilities can realize downward rate pressure through smart Tier 3/STEP programs, especially over the longer term. By working with and encouraging their customers and members to use electricity for heating their homes and businesses, utilities can spread the cost of fixed assets (poles, wires and infrastructure) across a larger volume of sales, potentially reducing rates. Put another way, the objective is for utilities to collect revenue from additional electricity sales that is greater than the sum of the cost of providing the additional electricity plus the cost of promoting the electrification measures. If all other factors that affect rates were held equal, the result ultimately would be a downward adjustment to electric rates or an opportunity to invest to modernize the grid. Indeed, Energy Futures Group conducted an analysis (see below) that estimates up to $7 million in savings over the lifetime of Tier 3/STEP measures installed in just 2018 and up to $300 million from measures installed over the 2018-2032 period.

While energy efficiency through weatherization of buildings (air sealing and insulation) or the promotion of advanced wood heating will not produce any additional revenue from electric rates, the revenue generated from other Tier 3/STEP measures can more than offset the utilities' costs of providing incentives to encourage customers to weatherize their buildings or install wood systems. Additionally, a justification of supporting weatherization or wood heat as a Tier 3/STEP measure may be that it is a less expensive way of meeting the goal than supporting Tier 2 or paying the Alternative Compliance Payment, or it could provide an innovative way to sell products and services that could offset the costs of Tiers 1 and 2. It additionally provides additional non-rate benefits to Vermonters that are not analyzed in this paper.

Reducing fossil fuel used to heat buildings will help Distribution Utilities meet Tier 3/STEP goals, provide benefits to customers (reducing customer heating costs and making them more comfortable), and be paid for through the additional electric sales from other measures. In fact, the net revenue to the utilities from installing a heat pump in a weatherized home will nearly cover the cost of the incentives it takes to encourage the weatherization project in the first place. The five percent difference between the weatherization project cost and the heat pump benefits can easily be offset by encouraging additional heat pumps and the other Tier 3/STEP electric measures. Moreover, weatherization of a home could help make a heat pump a more attractive investment, as they have been known to provide greater customer satisfaction in efficient homes.

Electric Rate Impact Analysis

Overview

Energy Futures Group performed a high-level analysis that examined the likely rate impacts of five scenarios that varied the focus and emphasis of four of the more prominent Tier 3/STEP measures; 1) cold-climate heat pumps ("CCHP"), 2) electric vehicles ("EV"), 3) commercial and industrial projects ("C&I") and 4) building weatherization and/or advanced-wood heating ("Wx/AWH"). This analysis was not intended to reflect any particular utility's approach, but was an attempt to better understand the potential rate impacts and provide some directional results based on some simplified assumptions. While we know that each utility will choose to emphasize different sets of measures and adjust their approach over the Tier 3/STEP timeframe, we wanted to provide results that indicate general trends and directional outcomes. It is important to note that this exercise just analyzes the impact on electric rates and is not a holistic economic analysis.

In each of the first four scenarios we made the simplifying assumption that the Vermont Distribution Utilities would emphasize one particular measure over the entire Tier 3/STEP period, while de-emphasizing the others. For heat pumps, electric vehicles and commercial and industrial projects, the assumption was that they would meet 70% of their total Tier 3/STEP goal through the emphasized measure, while only meeting 10% of the goal with each of the other three measures. For example, in Scenario 1, 70% of the Vermont utilities' budget for incentives and resulting savings would be allocated to cold climate heat pumps, while only 10% would be allocated to each: weatherization/advanced wood heat, electric vehicles, and custom C&I measures. The same allocation of effort (i.e., 70%, 10%, 10%, 10%) was assumed for the electric vehicle-focused and then custom C&I measures-focused scenarios, as well. We realize that this will never be the balance of measures by any utility (especially given the Public

Utility Commission's order in docket 8550 to devote spending in rough proportion to rate class) but wanted to provide some extreme examples to better understand the rate impacts.

Weatherization and/or advanced wood heat help save fossil fuel and meet Tier 3/STEP goals. However, they do not generate any revenue through additional electric sales. They therefore result in a net cost to the utilities, so we assumed that while the utilities would emphasize weatherization and/or advanced wood-heat in this scenario, they would still want to ensure net positive benefits to rate impacts. Instead of meeting 70% of their Tier 3/STEP goals as in the first three scenarios, we assumed they would meet 40% of their goals through weatherization and/or advanced wood heat, with each of the other three measures providing 20%.

We assumed incentives that should motivate customers to participate: $1,200 for a cold-climate heat pump, $2,000 for weatherization, $1,000 for an electric vehicle, and $15/megawatt-hour savings for commercial projects.

In addition to the four scenarios that emphasized each of the four measures, we ran a fifth scenario that balanced emphasis equally across all four measures. In this fifth scenario, each of the measures—heat pumps, weatherization/advanced wood heating, electric vehicles and custom C&I projects—was assumed to provide 25% of the Tier 3/STEP goals.

Results

The summary results of this analysis are shown in Table 3 and Table 4 below. Table 3 summarizes the reduction in electric rates for each of these five scenarios over the lifetime of each measure installed in 2018. We present the contribution towards the statewide Tier 3/STEP goals along with the resulting net present value of electric bill reductions over the life of the measures installed in 2018.[32] As shown in the total column, the lifetime electric rate reductions for just the measures installed in 2018 range from a low of about $0.5 million for the "weatherization/advanced wood heat focused" Scenario 4, to a high of over $7 million for the "cold climate heat focused" Scenario 1.

Table 3. Reduction in Electric Rates for Various Scenarios for Measures Installed in 2018

Scenario & Focus	Allocation of Effort & Savings				Lifetime Reduction in Electric Rates for Measures Installed in 2018 (in $ million)				
	CCHP	Wx	EV	C&I	CCHP	Wx	EV	C&I	Total
Scenario 1 - Cold Climate Heat Pump Focused	70%	10%	10%	10%	$ 7.4	$ (0.7)	$ 0.3	$ 0.3	$ 7.3
Scenario 2 - Electric Vehicle Focused	10%	10%	70%	10%	$ 1.1	$ (0.7)	$ 1.8	$ 0.3	$ 2.5
Scenario 3 - Commercial & Industrial Focused	10%	10%	10%	70%	$ 1.1	$ (0.7)	$ 0.3	$ 2.0	$ 2.7
Scenario 4 - Weatherization/Advanced Wood Heat	20%	40%	20%	20%	$ 2.1	$ (2.7)	$ 0.5	$ 0.6	$ 0.5
Scenario 5 - Balanced	25%	25%	25%	25%	$ 2.6	$ (1.7)	$ 0.6	$ 0.7	$ 2.3

This Scenario assumed 5,301 cold-climate heat pumps, 338 weatherization and/or advanced wood heat jobs, 735 electric vehicles and four custom commercial and industrial projects would be needed to meet the 2018 Tier 3/STEP goals.

Beyond just one year, we also examined the entire period of the Tier 3/STEP initiative from 2018 through 2032, as presented in Table 4. When totaling all the electric rate reductions resulting from the lifetime savings of each measure installed in each year of the program, we found significant ratepayer savings.

[32] This analysis does not consider any electric grid transmission and distribution impacts, similar to the approach taken by some of the Vermont utilities in their Tier 3/STEP planning.

If the Distribution Utilities met their Tier 3/STEP goals through Scenario 4 with a 40% weatherization/advanced wood heat focus over the 14-year period, they would generate more than $22 million in potential electric rate reductions for Vermonters. If the utilities focused instead on meeting 70% of their goals with cold climate heat pumps as in Scenario 1, they would produce $300 million in potential electric rate reductions, assuming 220,000 heat pump installations in about two-thirds of Vermont's 330,000 households.[33] For initiatives that focused on electric vehicles, commercial and industrial projects, or balanced across all the measures, around $100 million in potential electric rate reductions would accrue. Because electric vehicle charging is more controllable than heat pumps and therefore could use more off-peak electricity, electric vehicle adoption with subsidized charging (and utility timing control) could have the biggest rate-dampening effect.[34]

Table 4. Reduction in Electric Rates for Various Scenarios for Measures Installed 2018-2032[35]

Scenario & Focus	Allocation of Effort & Savings				Lifetime Reduction in Electric Rates for All Measures Installed 2018-2031 (in $ million)				
	CCHP	Wx	EV	C&I	CCHP	Wx	EV	C&I	Total
Scenario 1 - Cold Climate Heat Pump Focused	70%	10%	10%	10%	$ 305.3	$ (27.6)	$ 10.6	$ 12.0	$ 300.3
Scenario 2 - Electric Vehicle Focused	10%	10%	70%	10%	$ 43.6	$ (27.6)	$ 74.2	$ 12.0	$ 102.2
Scenario 3 - Commercial & Industrial Focused	10%	10%	10%	70%	$ 43.6	$ (27.6)	$ 10.6	$ 84.2	$ 110.8
Scenario 4 - Weatherization/Advanced Wood Heat Focused	20%	40%	20%	20%	$ 87.2	$ (110.3)	$ 21.2	$ 24.0	$ 22.1
Scenario 5 - Balanced	25%	25%	25%	25%	$ 109.0	$ (69.0)	$ 26.5	$ 30.1	$ 96.6

We also examined the same scenarios under a more plausible approach, emphasizing the primary measure in each scenario at a savings allocation rate of 40% (instead of 70%), and assuming each of the other measures contributes 20% to the savings goals. The results are presented in Table 5 and Table 6 below and show that there is still significant potential for rate reductions across the board. While the cold climate heat pump lifetime reduction drops to about 55% of the savings under the 40% scenario compared to the 70% scenario ($4.0 million vs. $7.3 million for measures installed in 2018 and $164 million vs. $300 million for the period 2018 – 2032), the other scenarios remain within 10% of the initial scenarios presented above. There appears to be significant rate reduction potential under various scenarios regardless of the mix of different measures.

Table 5. Reduction in Electric Rates Under Balanced Emphasis for Measures Installed in 2018

Scenario & Focus	Allocation of Effort & Savings				Lifetime Reduction in Electric Rates for Measures Installed in 2018 (in $ million)				
	CCHP	Wx	EV	C&I	CCHP	Wx	EV	C&I	Total
Scenario 6 - Cold Climate Heat Pump Emphasized	40%	20%	20%	20%	$ 4.2	$ (1.3)	$ 0.5	$ 0.6	$ 4.0
Scenario 7 - Electric Vehicle Emphasized	20%	20%	40%	20%	$ 2.1	$ (1.3)	$ 1.0	$ 0.6	$ 2.4
Scenario 8 - Commercial & Industrial Project Emphasized	20%	20%	20%	40%	$ 2.1	$ (1.3)	$ 0.5	$ 1.2	$ 2.5
Scenario 9 - Weatherization Emphasized	20%	40%	20%	20%	$ 2.1	$ (2.7)	$ 0.5	$ 0.6	$ 0.5

Table 6. Reduction in Electric Rates Under Balanced Emphasis for Measures Installed 2018 - 2032

Scenario & Focus	Allocation of Effort & Savings				Lifetime Reduction in Electric Rates for All Measures Installed 2018-2031 (in $ million)				
	CCHP	Wx	EV	C&I	CCHP	Wx	EV	C&I	Total
Scenario 6 - Cold Climate Heat Pump Emphasized	40%	20%	20%	20%	$ 174.5	$ (55.2)	$ 21.2	$ 24.0	$ 164.5
Scenario 7 - Electric Vehicle Emphasized	20%	20%	40%	20%	$ 87.2	$ (55.2)	$ 42.4	$ 24.0	$ 98.5
Scenario 8 - Commercial & Industrial Project Emphasized	20%	20%	20%	40%	$ 87.2	$ (55.2)	$ 21.2	$ 48.1	$ 101.3
Scenario 9 - Weatherization Emphasized	20%	40%	20%	20%	$ 87.2	$ (110.3)	$ 21.2	$ 24.0	$ 22.1

The potential impact of Tier 3/STEP is significant. It will provide environmental benefits by reducing the burning of fossil fuels; offset the increased costs of greening Vermont's electric grid; reduce the volatility of energy costs; promote local economic development; and potentially save Vermont ratepayers

[33] https://www.census.gov/quickfacts/fact/table/VT/HSG010216#viewtop

[34] "Getting to 90% Renewable by 2050," Energy Action Network 2017 Annual Report, p.13.

[35] Assumes that avoided costs are not changing significantly over the period.

hundreds of millions of dollars in electric costs. Alternatively, these savings could also be reinvested in the electric grid to modernize it for the future. Tier 3/STEP can be a win-win for all involved.

Customer Energy Bill Reductions

These measures don't just offer downward pressure on electric rates. They also can provide economic benefits in the form of energy bill reductions to participants. Cold climate heat pumps can produce heat less expensively[36] than fossil fuels or electric baseboards, depending on the fuel used and its cost; Electric Vehicles (EVs) can provide transportation at less than half the cost per mile traveled compared to a standard combustion engine;[37] utilities can provide electricity for industrial processes less expensively than a diesel generator;[38] an insulated home will save money and provide intangible comfort benefits for homeowners;[39] and heating with wood typically provides less expensive and more predictable fuel costs for Vermonters.[40] Customers can save directly by participating in Tier 3/STEP programs offered by the utilities in addition to all ratepayers benefitting with the utilities electrifying their customer base through Tier 3/STEP and the resulting potential rate reductions.

How Can Tier 3/STEP Help Support Weatherization and Advanced Wood Heat?

While weatherization (i.e., building air-sealing and insulation) will not result in electric rate reductions like other Tier 3/STEP electric measures, it provides an opportunity of generating fossil fuel savings to help meet a utility's Tier 3/STEP goals. At the same time, weatherized homes and businesses can be valued by some customers as a way to reduce customers' heating costs and improve comfort. Some utilities will choose to support Home Performance with ENERGY STAR, the Low-Income Weatherization Assistance Program, Zero Energy Now, Heat Squad and other weatherization programs in Vermont to meet customers' needs, provide customer service and leverage the transaction to potentially provider other products and services. However, utilities may need to negotiate savings claims with other programs and entities currently claiming savings from some of these initiatives in order to log Tier 3/STEP savings credits.

As the analysis above points out, combining weatherization along with other measures that use electricity to displace fossil fuels, such as cold climate heat pumps, utilities can leverage the net benefits to electric ratepayers to carry the costs of weatherization and still end up with excess revenues that could help put downward pressure on rates. The analysis showed that the net revenue to the grid after incentives for a heat pump was almost the same ($1901) as the cost to the utility for providing incentives for a typical weatherization project ($2000). Therefore, pairing weatherization with heat pumps could allow utilities to meet their Tier 3/STEP savings goals while leveraging the electricity sales of the heat pump to carry the cost of weatherization while also mitigating the impacts heat pumps will have on winter peak demands. As is shown in Table 6 above, all of the scenarios include some percentage of weatherization, which can be supported by the electric sales from the other measures.

[36] https://www.efficiencyvermont.com/tips-tools/guides/is-heat-pump-heating-cooling-system-right-for-you
[37] https://avt.inl.gov/sites/default/files/pdf/fsev/costs.pdf
[38] See related case studies on GMP's A. Johnson Lumber project and VEC's sugarhouse line extension projects.
[39] https://www.nrel.gov/docs/fy11osti/51242.pdf
[40] "Getting to 90% Renewable by 2050," Energy Action Network 2017 Annual Report, p.17.

While offering an incentive for weatherization alone is not going to motivate many people to participate, there may be opportunities to partner with other organizations or programs to leverage their outreach efforts and budgets. Since weatherization costs could be covered by the benefits of other Tier 3/STEP electrification measures, it could provide a worthy measure for those utilities interested in offering this service to their customers.

Similarly, although advanced wood heat does not provide rate benefits, it is still a possibility for fulfilling the Tier 3/STEP requirements. Thus far, two utilities have offered advanced wood heat as part of their program, but it has been a relatively minor piece of all Tier 3/STEP plans. This speaks to the question of whether Tier 3/STEP is intended to support only electrification efforts or to be a total energy solution that supports all solutions that transition Vermonters off of fossil fuels.

Equity Issues

Tier 3/STEP programs can benefit both rural and urban Vermonters of all incomes. Distribution Utilities are required to include low income programs in their Tier 3/STEP plans. Since fuel oil and propane are pervasive throughout the state and all Distribution Utilities will be offering programs, rural Vermonters are able to take advantage of Tier 3/STEP programs and benefits. Natural gas, which is generally less expensive than delivered fuel oil and propane, is only available in limited parts of the state. Therefore, rural homeowners and business owners would be more likely to heat with delivered fossil fuels and more likely targets for Tier 3/STEP heating programs and benefits, especially cold climate heat pumps, heat pump water heaters, and advanced wood heating.

Vermont maple sugarmakers have been a successful early target market for Tier 3/STEP programs. These rural businesses will likely continue to participate in programs that help eliminate diesel generators with line extensions and increase the efficiency of boiling operations to reduce oil used in the evaporation process.

Electric vehicles can cost less than half of what a conventional car costs to operate.[41] Since rural Vermonters rely more on their vehicles to drive to and from work over longer distances, they should be well positioned to take advantage of some of the Tier 3/STEP electric vehicle programs.[42] However, rural Vermonters are likely to be skeptical until electric vehicles become more commonplace, increase their range, are better tested on Vermont roads in winter, offer pickup truck and four-wheel drive models, and can be serviced through a larger network of charging stations. The Tier 3/STEP program focus on electric vehicles will help overcome some of these issues over time and could lay the groundwork for more rural electric vehicle uptake in the future.

[41] http://fsec.ucf.edu/en/publications/pdf/fsec-cr-2053-17.pdf
[42] https://avt.inl.gov/sites/default/files/pdf/fsev/costs.pdf

Additional Ideas to Explore

Tier 3/STEP is destined to evolve over its 15-year life. As the earlier and easier transformational measures are addressed, utilities will need to look for new opportunities for fossil fuel savings and ways to coordinate to optimize programs and offerings. Some initial ideas that may be worth exploring include the following:

- What about electrification of off-road vehicles that could include tractors, all-terrain vehicles, snow mobiles, lawnmowers, excavation equipment, airplanes or boats?
- Is Tier 3 applicable to dirty two-cycle engines for electrifying leaf blowers, household-scale chainsaws, trimmers, etc.?
- Are there other industries that use diesel engines besides sugarmakers or any remaining ski areas that haven't yet electrified that could be likely participants?
- Could utilities replace backup generators with storage batteries that could also double for grid management and claim Tier 3/STEP credit?
- Could Tier 3/STEP encourage transportation reduction? For example, Citizen Cider, located in Burlington, often has to transport apples fairly long distances because there are no storage facilities in Burlington. Could BED subsidize establishing storage facilities that would alleviate the need for that transportation? Are there other examples where transportation costs could be avoided by creating shared infrastructure?
- Could utilities use Tier 3/STEP funds to subsidize expanded car share or bike share programs?
- Are there examples in other states where there are innovative efforts to lower heating or transportation costs, and could Tier 3/STEP be a tool for those ideas to move to Vermont?
- Are there other ways to solicit ideas from markets like putting out requests for proposals for new savings ideas?
- Could more utilities offer off-peak charging rates and demand management systems as an incentive for more electric vehicles?
- Might establishing shared savings goals between all Vermont utilities (efficiency and distribution) encourage greater cooperation and more effective delivery of programs to maximize participation and savings and minimize customer confusion among a myriad of programs?
- As discussed above, there is not a clear alignment in Tier 3/ STEP between the focus on electrification and a "total energy" focus on reducing fossil fuels. Given that Distribution Utilities are incentivized (through downward pressure on rates) to primarily use Tier 3/STEP funds to promote strategic electrification as a means of fossil fuel displacement vs. efficiency or the adoption of renewable fuels, is additional policy, particularly to advance weatherization and advanced wood heat, needed to fulfill the state's renewable energy goals?

Conclusion

Tier 3/STEP is a step in the right direction, helping to meet the State's climate and energy goals. At the same time Tier 3/STEP exists within an ecosystem of other policies and programs that also help achieve similar goals. While it is important to recognize the important contributions Tier 3/STEP can make, it is also imperative that Tier 3/STEP be considered and the Distribution Utilities work collaboratively with the Energy Efficiency Utilities, State agencies, non-profit housing providers, regional initiatives, the private sector, and others "to ensure the coordinated delivery of energy transformation projects with the delivery of similar services…"[43]

Tier 3/STEP is the right policy for Vermont. It provides a win-win proposition for Vermont ratepayers, the economy, the environment, and Distribution Utilities. However, to fulfill its promises, the established goals need to be kept intact to ensure that all the benefits are realized.[44] Vermonters stand to benefit with electric system savings of as much as $300 million over the term of the Tier 3/STEP program, assuming all other things held constant compared to what rates otherwise would have been.

While the Tier 3/STEP goals need to be kept in place for all Vermont utilities, customers and markets could benefit from a coordinated state-wide policy framework, ensuring that the utilities have the support and authority to proceed with Tier 3/STEP while minimizing potential conflicts with the Energy Efficiency Utilities through a clear delineation of roles, responsibilities, and boundaries. The current Act 56 statute provides a useful framework, with some flexibility so that tactics can vary to reflect the different needs of different regions (rural, urban, etc.) and the strengths of the different utilities and market partners. As the utilities gain experience from Tier 3/STEP, their programs and offerings should evolve, along with partnerships and collaboration that optimize delivery and maximize customer experience while minimizing market confusion.

Tier 3/STEP is also only one piece of the puzzle. As discussed, the current structure prioritizes electrification measures over other fossil fuel reduction measures like weatherization and advanced wood heating. While the program is a significant step in the right direction, as the proposed name suggests, it alone will not fulfill Vermont's renewable energy goals.

We hope that the reader has gained a better understating of how Tier 3/STEP works and contributes to Vermont's climate protection strategies.

[43] Act 56 of 2015 (3)(E)(vii) page 21

Appendices

EFG Analysis and Assumptions

	Economics per MWh Equivalent								
Measure	NPV benefit to grid per Tier 3 MWh equiv	NPV of gross elec revenue	Net elec benefit to Grid	utility Tier III prog cost	Net ben/cost to grid	NPV ben of fossil fuel save	NPV of fuel impacts	Average Capital Cost	Total Cost
Cold Climate Heat Pump	$ (108.78)	$243.47	$ 134.69	$ 61.71	$ 72.98	$ 277.42	$ 168.64	$ 162.81	$ (5.83)
Weatherization				$ 46.16	$ (46.16)	$ 160.79	$ 160.79	$ 230.80	$ 70.01
Electric Vehicle	$ (43.68)	$111.53	$ 67.86	$ 50.12	$ 17.73	$ 203.05	$ 159.37	$ 534.06	$ 374.69
Custom C&I Electrification	$ (96.52)	$131.64	$ 35.12	$ 15.00	$ 20.12	$ 211.26	$ 114.74	$ 60.00	$ (54.74)

	Conversions										
Measure	added kWh/year	MMBtu fossil saved	measure life	tier 3 RE %	tier 3 heat rate (Btu/kWh)	Net to Gross	tier 3 lifetime MWh equiv	tier 3 lifetime MWh equiv offsets	net tier 3 lifetime MWh equiv	Gross tier 3 lifetime MWh equiv	increased kWh/MWh equiv
Cold Climate Heat Pump	2882	23.4	15	63%	9232	0.88	33.5	14.1	19.4	22.10	148.21
Weatherization	0	20.0	20	63%	9232	1	43.3	-	43.3	43.33	-
Electric Vehicle	2027	29.9	8	63%	9232	1	26.0	6.0	20.0	19.95	101.61
Custom C&I Electrification	218000	2475	20	63%	9232	1	5,361.8	1,613.2	3,748.6	3,748.59	58.16

	Per Measure Unit							
Measure	avg elec rate	tier 3 incentive	elec TRB	fossil TRB	Average Capital Cost per Unit	PV of Electric Revenue	Net Revenue to Grid (absent incentives)	Net revenue to the Grid after incentives
Cold Climate Heat Pump	$0.16	$ 1,200	$ (2,404)	$ 6,130	$ 3,597	$5,379.81	$3,264.62	$1,900.98
Weatherization	$0.16	$ 2,000	$ -	$ 6,967	$ 10,000	$0.00	$0.00	($2,000.00)
Electric Vehicle	$0.16	$ 1,000	$ (871)	$ 4,051	$ 10,655	$2,225.20	$1,353.82	$353.82
Custom C&I Electrification	$ 0.15	$ 56,229	$ (361,827)	$ 791,934	$ 224,915	$493,466.50	$131,639.02	$75,410.24

Scenario 1 - Cold Climate Heat Pump Focused							
MWh Equivalents to Meet Goal				Number of Units Needed to Meet Goal			
CCHP	Wx	EV	Custom C&I	CCHP	Wx	EV	Custom C&I
70%	10%	10%	10%				
76,063	10,866	10,866	10,866	3,912	251	545	3
101,418	14,488	14,488	14,488	5,216	334	726	4
126,772	18,110	18,110	18,110	6,520	418	908	5
152,127	21,732	21,732	21,732	7,824	502	1,089	6
177,481	25,354	25,354	25,354	9,127	585	1,271	7
202,836	28,977	28,977	28,977	10,431	669	1,452	8
228,190	32,599	32,599	32,599	11,735	752	1,634	9
253,545	36,221	36,221	36,221	13,039	836	1,815	10
278,899	39,843	39,843	39,843	14,343	920	1,997	11
304,254	43,465	43,465	43,465	15,647	1,003	2,179	12
329,608	47,087	47,087	47,087	16,951	1,087	2,360	13
354,963	50,709	50,709	50,709	18,255	1,170	2,542	14
380,317	54,331	54,331	54,331	19,559	1,254	2,723	14
405,672	57,953	57,953	57,953	20,863	1,338	2,905	15
431,026	61,575	61,575	61,575	22,167	1,421	3,086	16
456,381	65,197	65,197	65,197	23,471	1,505	3,268	17
$ 7,401,293	(668,779)	256,940	291,460	**$ 7,280,914**	**Scenario Total for 2018**		
$ 305,303,325	$ (27,587,129)	$ 10,598,759	$ 12,022,745	**$ 300,337,700**	**Scenario Total for 2018-2031**		

Scenario 2 - Electric Vehicle Focused							
MWh Equivalents to Meet Goal				Number of Units Needed to Meet Goal			
CCHP	Wx	EV	Custom C&I	CCHP	Wx	EV	Custom C&I
10%	10%	70%	10%				
10,866	10,866	76,063	10,866	559	251	3,813	3
14,488	14,488	101,418	14,488	745	334	5,083	4
18,110	18,110	126,772	18,110	931	418	6,354	5
21,732	21,732	152,127	21,732	1,118	502	7,625	6
25,354	25,354	177,481	25,354	1,304	585	8,896	7
28,977	28,977	202,836	28,977	1,490	669	10,167	8
32,599	32,599	228,190	32,599	1,676	752	11,438	9
36,221	36,221	253,545	36,221	1,863	836	12,708	10
39,843	39,843	278,899	39,843	2,049	920	13,979	11
43,465	43,465	304,254	43,465	2,235	1,003	15,250	12
47,087	47,087	329,608	47,087	2,422	1,087	16,521	13
50,709	50,709	354,963	50,709	2,608	1,170	17,792	14
54,331	54,331	380,317	54,331	2,794	1,254	19,063	14
57,953	57,953	405,672	57,953	2,980	1,338	20,333	15
61,575	61,575	431,026	61,575	3,167	1,421	21,604	16
65,197	65,197	456,381	65,197	3,353	1,505	22,875	17
$ 1,057,328	(668,779)	1,798,577	291,460	**$ 2,478,586**	**Scenario Total for 2018**		
$ 43,614,761	$ (27,587,129)	$74,191,315	$ 12,022,745	**$ 102,241,692**	**Scenario Total for 2018-2031**		

Scenario 3 - Commercial & Industrial Project Focused							
MWh Equivalents to Meet Goal				Number of Units Needed to Meet Goal			
CCHP	Wx	EV	Custom C&I	CCHP	Wx	EV	Custom C&I
10%	10%	10%	70%				
10,866	10,866	10,866	76,063	559	251	545	20
14,488	14,488	14,488	101,418	745	334	726	27
18,110	18,110	18,110	126,772	931	418	908	34
21,732	21,732	21,732	152,127	1,118	502	1,089	41
25,354	25,354	25,354	177,481	1,304	585	1,271	47
28,977	28,977	28,977	202,836	1,490	669	1,452	54
32,599	32,599	32,599	228,190	1,676	752	1,634	61
36,221	36,221	36,221	253,545	1,863	836	1,815	68
39,843	39,843	39,843	278,899	2,049	920	1,997	74
43,465	43,465	43,465	304,254	2,235	1,003	2,179	81
47,087	47,087	47,087	329,608	2,422	1,087	2,360	88
50,709	50,709	50,709	354,963	2,608	1,170	2,542	95
54,331	54,331	54,331	380,317	2,794	1,254	2,723	101
57,953	57,953	57,953	405,672	2,980	1,338	2,905	108
61,575	61,575	61,575	431,026	3,167	1,421	3,086	115
65,197	65,197	65,197	456,381	3,353	1,505	3,268	122
$ 1,057,328	(668,779)	256,940	2,040,223	**$ 2,685,712**	**Scenario Total for 2018**		
$ 43,614,761	$ (27,587,129)	$ 10,598,759	$ 84,159,217	**$ 110,785,608**	**Scenario Total for 2018-2031**		

Scenario 4 - Weatherization/Advanced Wood Heat Focused								
MWh Equivalents to Meet Goal				Number of Units Needed to Meet Goal				
CCHP	Wx	EV	Custom C&I	CCHP	Wx	EV	Custom C&I	
20%	40%	20%	20%					
21,732	43,465	21,732	21,732	1,118	1,003	1,089	6	
28,977	57,953	28,977	28,977	1,490	1,338	1,452	8	
36,221	72,441	36,221	36,221	1,863	1,672	1,815	10	
43,465	86,930	43,465	43,465	2,235	2,006	2,179	12	
50,709	101,418	50,709	50,709	2,608	2,341	2,542	14	
57,953	115,906	57,953	57,953	2,980	2,675	2,905	15	
65,197	130,394	65,197	65,197	3,353	3,010	3,268	17	
72,441	144,883	72,441	72,441	3,726	3,344	3,631	19	
79,686	159,371	79,686	79,686	4,098	3,678	3,994	21	
86,930	173,859	86,930	86,930	4,471	4,013	4,357	23	
94,174	188,348	94,174	94,174	4,843	4,347	4,720	25	
101,418	202,836	101,418	101,418	5,216	4,681	5,083	27	
108,662	217,324	108,662	108,662	5,588	5,016	5,446	29	
115,906	231,812	115,906	115,906	5,961	5,350	5,810	31	
123,150	246,301	123,150	123,150	6,333	5,685	6,173	33	
130,394	260,789	130,394	130,394	6,706	6,019	6,536	35	
$ 2,114,655	(2,675,116)	513,879	582,921	**$ 536,340**	**Scenario Total for 2018**			
$ 87,229,521	$ (110,348,515)	$ 21,197,519	$ 24,045,491	**$ 22,124,015**	**Scenario Total for 2018-2031**			

Scenario 6 - Cold Climate Heat Pump Emphasized							
MWh Equivalents to Meet Goal				Number of Units Needed to Meet Goal			
CCHP	Wx	EV	Custom C&I	CCHP	Wx	EV	Custom C&I
40%	20%	20%	20%				
43,465	21,732	21,732	21,732	2,235	502	1,089	6
57,953	28,977	28,977	28,977	2,980	669	1,452	8
72,441	36,221	36,221	36,221	3,726	836	1,815	10
86,930	43,465	43,465	43,465	4,471	1,003	2,179	12
101,418	50,709	50,709	50,709	5,216	1,170	2,542	14
115,906	57,953	57,953	57,953	5,961	1,338	2,905	15
130,394	65,197	65,197	65,197	6,706	1,505	3,268	17
144,883	72,441	72,441	72,441	7,451	1,672	3,631	19
159,371	79,686	79,686	79,686	8,196	1,839	3,994	21
173,859	86,930	86,930	86,930	8,941	2,006	4,357	23
188,348	94,174	94,174	94,174	9,686	2,174	4,720	25
202,836	101,418	101,418	101,418	10,431	2,341	5,083	27
217,324	108,662	108,662	108,662	11,177	2,508	5,446	29
231,812	115,906	115,906	115,906	11,922	2,675	5,810	31
246,301	123,150	123,150	123,150	12,667	2,842	6,173	33
260,789	130,394	130,394	130,394	13,412	3,010	6,536	35
$ 4,229,310	(1,337,558)	513,879	582,921	**$ 3,988,553**	**Scenario Total for 2018**		
$ 174,459,043	$ (55,174,258)	$ 21,197,519	$ 24,045,491	**$ 164,527,794**	**Scenario Total for 2018-2031**		

Scenario 5 - Balanced							
MWh Equivalents to Meet Goal				Number of Units Needed to Meet Goal			
CCHP	Wx	EV	Custom C&I	CCHP	Wx	EV	Custom C&I
25%	25%	25%	25%				
27,166	27,166	27,166	27,166	1,397	627	1,362	7
36,221	36,221	36,221	36,221	1,863	836	1,815	10
45,276	45,276	45,276	45,276	2,328	1,045	2,269	12
54,331	54,331	54,331	54,331	2,794	1,254	2,723	14
63,386	63,386	63,386	63,386	3,260	1,463	3,177	17
72,441	72,441	72,441	72,441	3,726	1,672	3,631	19
81,497	81,497	81,497	81,497	4,191	1,881	4,085	22
90,552	90,552	90,552	90,552	4,657	2,090	4,539	24
99,607	99,607	99,607	99,607	5,123	2,299	4,993	27
108,662	108,662	108,662	108,662	5,588	2,508	5,446	29
117,717	117,717	117,717	117,717	6,054	2,717	5,900	31
126,772	126,772	126,772	126,772	6,520	2,926	6,354	34
135,828	135,828	135,828	135,828	6,985	3,135	6,808	36
144,883	144,883	144,883	144,883	7,451	3,344	7,262	39
153,938	153,938	153,938	153,938	7,917	3,553	7,716	41
162,993	162,993	162,993	162,993	8,382	3,762	8,170	43
$ 2,643,319	(1,671,947)	642,349	728,651	**$ 2,342,372**	**Scenario Total for 2018**		
$ 109,036,902	$ (68,967,822)	$26,496,898	$ 30,056,863	**$ 96,622,841**	**Scenario Total for 2018-2031**		

Act 56 of 2015 – Tier 3 Sections

No. 56. An act relating to establishing a renewable energy standard.

(H.40)

It is hereby enacted by the General Assembly of the State of Vermont:

* * * Renewable Energy Standard * * *

Sec. 1. 30 V.S.A. § 8002 is amended to read:

§ 8002. DEFINITIONS

As used in this chapter:

* * *

(3) "CPI" means the Consumer Price Index for all urban consumers, designated as "CPI-U," in the northeast region, as published by the U.S. Department of Labor, Bureau of Labor Statistics.

* * *

(6) "Environmental attributes" means the characteristics of a plant that enable the energy it produces to qualify as renewable energy and include any and all benefits of the plant to the environment such as avoided emissions or other impacts to air, water, or soil that may occur through the plant's displacement of a nonrenewable energy source.

(7) "Existing renewable energy" means renewable energy produced by a plant that came into service prior to or on ~~December 31, 2004~~ June 30, 2015.

* * *

(ii) purchase of tradeable renewable energy credits for distributed renewable generation at a cost that is less than the applicable alternative compliance rate.

(3) Energy transformation.

(A) Purpose; establishment. This subsection establishes an energy transformation category for the RES. This category encourages Vermont retail electricity providers to support additional distributed renewable generation or to support other projects to reduce fossil fuel consumed by their customers and the emission of greenhouse gases attributable to that consumption. A retail electricity provider may satisfy the energy transformation requirement through distributed renewable generation in addition to the generation used to satisfy subdivision (a)(2) of this section or energy transformation projects or a combination of such generation and projects.

(B) Required amounts. For the energy transformation category, the required amounts shall be two percent of each retail electricity provider's annual retail electric sales during the year beginning January 1, 2017, increasing by an additional two-thirds of a percent each subsequent January 1 until reaching 12 percent on and after January 1, 2032. However, in the case of a provider that is a municipal electric utility serving not more than 6,000 customers, the required amount shall be two percent of the provider's annual retail sales beginning on January 1, 2019, increasing by an additional two-thirds of a percent each subsequent January 1 until reaching 10 and

two-thirds percent on and after January 1, 2032. Prior to January 1, 2019, such a municipal electric utility voluntarily may engage in one or more energy transformation projects in accordance with this subdivision (3).

(C) Eligibility criteria. For an energy transformation project to be eligible under this subdivision (a)(3), each of the following shall apply:

(i) Implementation of the project shall have commenced on or after January 1, 2015.

(ii) Over its life, the project shall result in a net reduction in fossil fuel consumed by the provider's customers and in the emission of greenhouse gases attributable to that consumption, whether or not the fuel is supplied by the provider.

(iii) The project shall meet the need for its goods or services at the lowest present value life cycle cost, including environmental and economic costs. Evaluation of whether this subdivision (iii) is met shall include analysis of alternatives that do not increase electricity consumption.

(iv) The project shall cost the utility less per MWH than the applicable alternative compliance payment rate.

(D) Conversion. For the purpose of determining eligibility and the application of the energy transformation project to a provider's annual requirement, the provider shall convert the net reduction in fossil fuel consumption resulting from the energy transformation project to a MWH equivalent of electric energy, in accordance with rules adopted by the Board.

The conversion shall use the most recent year's approximate heat rate for electricity net generation from the total fossil fuels category as reported by the U.S. Energy Information Administration in its Monthly Energy Review. If an energy transformation project is funded by more than one regulated entity, the Board shall prorate the reduction in fossil fuel consumption among the regulated entities. In this subdivision (D), "regulated entity" includes each provider and each efficiency entity appointed under subsection 209(d) of this title.

(E) Other sources.

(i) A retail electricity provider or a provider's partner may oversee an energy transformation project under this subdivision (3). However, the provider shall deliver the project's goods or services in partnership with persons other than the provider unless exclusive delivery through the provider is more cost-effective than delivery by another person or there is no person other than the provider with the expertise or capability to deliver the goods or services.

(ii) An energy transformation project may provide incremental support to a program authorized under Vermont statute that meets the eligibility criteria of this subdivision (3) but may take credit only for the additional amount of service supported and shall not take credit for that program's regularly budgeted or approved investments.

(iii) To meet the requirements of this subdivision (3), one or more retail electricity providers may jointly propose with an energy efficiency entity appointed under subdivision 209(d)(2) of this title an energy transformation project or group of such projects. The proposal shall include standards of measuring performance and methods to allocate savings and reductions in fossil fuel consumption and greenhouse gas emissions among each participating provider and efficiency entity.

(F) Implementation. To carry out this subdivision (3), the Board shall adopt rules:

(i) For the conversion methodology in accordance with subdivision (3)(D) of this subsection (a).

(ii) To provide a process for prior approval of energy transformation projects by the Board or its designee. This process shall ensure that each of these projects meets the requirements of this subdivision (3) and need not consist of individual review of each energy transformation project prior to implementation as long as the mechanism ensures those requirements are met. An energy transformation project that commenced prior to initial adoption of rules under this subdivision (F) may seek approval after such adoption.

(iii) For cost-effectiveness screening of energy transformation projects. This screening shall be consistent with the provisions of this subdivision (3) and, as applicable, the screening tests developed under

subsections 209(d) (energy efficiency) and 218c(a) (least-cost integrated planning) of this title.

(iv) To allow a provider who has met its required amount under this subdivision (3) in a given year to apply excess net reduction in fossil fuel consumption, expressed as a MWH equivalent, from its energy transformation project or projects during that year toward the provider's required amount in a future year.

(v) To ensure periodic evaluation of an energy transformation project's claimed fossil fuel reductions, avoided greenhouse gas emissions, conversion to MWH equivalent, cost-effectiveness and, if applicable, energy savings, and to ensure annual verification and auditing of a provider's claims regarding project completion and resulting MWH equivalent. Changes to project claims resulting from periodic evaluations shall not reduce retroactively claims made on behalf of a project approved under subdivision (3)(F)(ii) of this subsection (a) or reduce verified claims carried forward under subdivision (3)(F)(iv) of this subsection (a).

(vi) To ensure that all ratepayers have an equitable opportunity to participate in, and benefit from, energy transformation projects regardless of rate class, income level, or provider service territory.

(vii) To ensure the coordinated delivery of energy transformation projects with the delivery of similar services, including low-income weatherization programs, entities that fund and support affordable housing,

energy efficiency programs delivered under section 209 of this title, and other energy efficiency programs delivered locally or regionally within the State.

(viii) To ensure that, if an energy transformation project will increase the use of electric energy, the project incorporates best practices for demand management, uses technologies appropriate for Vermont, and encourages the installation of the technologies in buildings that meet minimum energy performance standards.

(ix) To provide a process under which a provider may withdraw from or terminate, in an orderly manner, an ongoing energy transformation project that no longer meets the eligibility criteria because of one or more factors beyond the control of the project and the provider.

(G) Petitions. On petition of a retail electricity provider in any given year, the Board may:

(i) reduce the provider's required amount under this subdivision (3) for that year, without penalty or alternative compliance payment, if the Board finds that compliance with the required amount for that year will:

(I) cause the provider to increase significantly its retail rates; or

(II) materially impair the provider's ability to meet the public's need for energy services after safety concerns are addressed, in the manner set forth in subdivision 218c(a)(1) (least-cost integrated planning) of this title; or

(ii) allow a provider who failed to achieve the required amount under this subdivision (3) during the preceding year to avoid paying the alternative compliance payment if the Board:

(I) finds that the provider made a good faith effort to achieve the required amount and its failure to achieve that amount resulted from market factors beyond its control; and

(II) directs that the provider add the difference between the required amount and the provider's actually achieved amount for that year to its required amount for one or more future years.

(4) Alternative compliance rates.

(A) The alternative compliance payment rates for the categories established by this subsection (a) shall be:

(i) total renewable energy requirement – $0.01 per kWh; and

(ii) distributed renewable generation and energy transformation requirements – $0.06 per kWh.

(B) The Board shall adjust these rates for inflation annually commencing January 1, 2018, using the CPI.

(b) Reduced amounts; providers; 100 percent renewable.

(1) The provisions of this subsection shall apply to a retail electricity provider that:

(A) as of January 1, 2015, was entitled, through contract, ownership of energy produced by its own generation plants, or both, to an amount of

renewable energy equal to or more than 100 percent of its anticipated total retail electric sales in 2017, regardless of whether the provider owned the environmental attributes of that renewable energy; and

(B) annually each July 1 commencing in 2018, owns and has retired tradeable renewable energy credits monitored and traded on the New England Generation Information System or otherwise approved by the Board equivalent to 100 percent of the provider's total retail sales of electricity for the previous calendar year.

(2) A provider meeting the requirements of subdivision (1) of this subsection may:

(A) satisfy the distributed renewable generation requirement of this section by accepting net metering systems within its service territory pursuant to the provisions of this title that govern net metering; and

(B) if the Board has appointed the provider as an energy efficiency entity under subsection 209(d) of this title, propose to the Board to reduce the energy transformation requirement that would otherwise apply to the provider under this section.

(i) The provider may make and the Board may review such a proposal in connection with a periodic submission made by the provider pursuant to its appointment under subsection 209(d) of this title.

(ii) The Board may approve a proposal under this subdivision (B) if it finds that:

(I) the energy transformation requirement that would otherwise apply under this section exceeds the achievable potential for cost-effective energy transformation projects in the provider's service territory that meet the eligibility criteria for these projects under this section; and

(II) the reduced energy transformation requirement proposed by the provider is not less than the amount sufficient to ensure the provider's deployment or support of energy transformation projects that will acquire that achievable potential.

(iii) The measure of cost-effectiveness under this subdivision (B) shall be the alternative compliance payment rate established in this section for the energy transformation requirement.

(c) Biomass.

(1) Distributed renewable generation that employs biomass to produce electricity shall be eligible to count toward a provider's distributed renewable generation or energy transformation requirement only if the plant produces both electricity and thermal energy from the same biomass fuel and the majority of the energy recovered from the plant is thermal energy.

(2) Distributed renewable generation and energy transformation projects that employ forest biomass to produce energy shall comply with renewability standards adopted by the Commissioner of Forests, Parks and Recreation under 10 V.S.A. § 2751.

(d) Hydropower. A hydroelectric renewable energy plant shall be eligible to satisfy the distributed renewable generation or energy transformation requirement only if, in addition to meeting the definition of distributed renewable generation, the plant:

(1) is and continues to be certified by the Low-impact Hydropower Institute; or

(2) after January 1, 1987, received a water quality certification pursuant to 33 U.S.C. § 1341 from the Agency of Natural Resources.

~~(e) Regulations and procedures. The Board shall provide, by order or rule, the regulations and procedures that are necessary to allow the Board and the Department to implement, and to supervise further the implementation and maintenance of the SPEED program. These rules shall assure that decisions with respect to certificate of public good applications for construction of SPEED resources shall be made in a timely manner.~~

~~(f) Preapproval. In order to encourage joint efforts on the part of regulated companies to purchase power that meets or exceeds the SPEED standards and to secure stable, long-term contracts beneficial to Vermonters, the Board may establish standards for pre-approving the recovery of costs incurred on a SPEED project that is the subject of that joint effort.~~

~~(g) State; nonliability. The State and its instrumentalities shall not be liable to a plant owner or retail electricity provider with respect to any matter related to SPEED, including costs associated with a standard offer contract under this~~

~~section or section 8005a of this title or any damages arising from breach of such a contract, the flow of power between a plant and the electric grid, or the interconnection of a plant to that grid.~~

~~(h) (n) [Repealed.]~~

Sec. 4. 30 V.S.A. § 8005a is amended to read:

§ 8005a. ~~SPEED;~~ STANDARD OFFER PROGRAM

(a) Establishment. A standard offer program is established ~~within the SPEED program~~. To achieve the goals of section 8001 of this title, the Board shall issue standard offers for renewable energy plants that meet the eligibility requirements of this section. The Board shall implement these standard offers ~~through the SPEED facilitator~~ by rule, order, or contract and shall appoint a Standard Offer Facilitator to assist in this implementation. For the purpose of this section, the Board and the Standard Offer Facilitator constitute instrumentalities of the State.

* * *

(k) Executed standard offer contracts; transferability; allocation of benefits and costs. With respect to executed contracts for standard offers under this section:

(1) A contract shall be transferable. The contract transferee shall notify the ~~SPEED~~ Standard Offer Facilitator of the contract transfer within 30 days of transfer.