Report for:
The Nature Conservancy and Coastal Enterprises, Inc.

Advancing Clean Energy Investment in Northern New England

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VEIC

Table of Contents

Executive Summary 3

Section 1. The Clean Energy Challenge in Northern New England 4

Section 2. Clean Energy Progress in Northern New England 6

Section 3. The Investment Needed for a Clean Energy Economy 11

Section 4. Clean Energy Funding and Finance Approaches to Date 14

Section 5. VEIC's Assessment of Clean Energy Funding and Finance in Northern New England 22

Section 6. Seizing Challenges as Opportunities 28

Section 7. Policy and Regulatory Strategies for Scaling Clean Energy Investment 29

- Recommendation 1: Implement Regional Carbon Pricing for all Energy Produced from Fossil Fuels 30
- Recommendation 2: Support Activities that Advance Performance-Based Regulation 34
- Recommendation 3: Address Policy and Regulatory Barriers to Community Solar 39
- Recommendation 4: Engage in Electric Vehicle Policy and Regulatory Development 43
- Recommendation 5: Enable Plug-in Electric Vehicle Market Transformation 48
- Recommendation 6: Support Electric Transit and School Bus Market Transformation 52

Section 8. Modify and Develop New Clean Energy Finance Tools 55

- Recommendation 7: Implement a Regional Clean Energy Underwriting Initiative 56
- Recommendation 8: Implement Commercial Property Assessed Clean Energy (C-PACE) 63
- Recommendation 9: Expand Municipal Lease-Purchasing 68
- Recommendation 10: Expand Tariffed On-Bill Financing 72
- Recommendation 11: Continue Assessing the Need for a Green Bank 78

Appendix A: Glossary of Acronyms 83

Appendix B: References for Further Information 85

Table of Tables

Table 1. Clean energy finance action plan proposed for TNC and CEI in Northern New England 4

Table 2. Energy efficiency investment in Northern New England in 2017. 8

Table 3. Cumulative solar and wind energy investment in Northern New England. 8

Table 4. Transportation efficiency funding context in Northern New England. 9

Table 5. Annual end-use energy expenditures. 12

Table 6. Funding approaches for EE, DER, and grid-scale renewables in Northern New England. 19

Table 7. Financing approaches for EE, DER, and grid-scale renewables. 19

Table 8. Key challenges affecting clean energy funding and finance in Northern New England. 22

Table 9. VEIC Assessment of Residential Clean Energy Funding and Financing. 25

Table 10. VEIC Assessment of Commercial and Industrial Clean Energy Funding and Financing. 26

Table 11. VEIC Assessment of Transportation Clean Energy Funding and Financing. 27

Table 12. Traditional cost-of-service regulation compared to performance-based regulation. 35

Table 13. Comparison of loan-based and tariff-based on-bill financing. 73

Table of Figures

Figure 1. Annual carbon dioxide emissions from fossil fuels in million metric tons of CO2, 2016. 5
Figure 2. Key components needed for a successful clean energy market. 6
Figure 3. Carbon-reduction goals below 1990 baseline levels. 7
Figure 4: Energy efficiency and renewable electricity goals. 7
Figure 5. Clean energy jobs in Northern New England in 2017. 10
Figure 6. The clean energy investment needed to meet 80% of energy needs in Northern New England.....11
Figure 7. Annual end-use energy expenditures by fuel type. 12
Figure 8. Opportunities for engagement.....28
Figure 9. Activities related to performance-based regulation across the US. 36
Figure 10. EV market share (July 2017 - June 2018). 48

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Executive Summary

Climate change is having a significant impact on Northern New England. A key contributor to climate change is greenhouse gas emissions resulting from the use of fossil fuels to heat buildings, generate electricity, and fuel vehicles. Creating a future in which both people and nature thrive will require significant transformation of all energy sectors away from fossil fuels. Increasing the use of clean energy - defined in this report as the efficient use of renewable energy for both buildings and transportation - creates jobs, stimulates the local economy, decreases air pollution, alleviates fossil fuel health impacts, and helps mitigate climate change.

The Pathway to a Clean Energy Economy in Northern New England

Historically a region heavily dependent on imported oil, Northern New England has been working since the oil embargoes of the 1970's to decrease fossil fuel dependency and improve the environment through the increased use of energy efficiency and renewable energy. As a result, Maine, New Hampshire, and Vermont have established clean energy polices, goals, and programs and have made progress toward developing clean energy markets. However, the markets are still in the early stages of development and substantial scaling up in investment will be needed to fully achieve a clean energy economy. There is much more work to be done to make efficient, clean, renewable energy the first choice for heating, electricity generation, and transportation. The transition to clean, efficient energy use will be achieved through a combination of existing and new capital sources, using both existing and new investment approaches.

The Importance of Using Public Monies to Leverage Investment

Investment in clean energy in Northern New England started largely with energy efficiency programs offered by regulated electric and gas utilities (or third-party administrators delivering the programs for them, such as Efficiency Maine and Efficiency Vermont), complemented by various tax credits and grant programs. For decades, ratepayer and taxpayer dollars have been used to fund incentives, rebates, and grants for a variety of energy efficiency and renewable energy projects. Typically, these public monies are used to cover a portion of the cost of a clean energy project, with the balance borne by the customer (i.e. households, businesses, industries, or government). The customer either uses cash reserves or financing via loans, leases, or other mechanisms to pay their portion of the cost.

The use of public funds to stimulate private investment is referred to as "leveraging." Leveraging public monies to stimulate private investment is key to scaling existing markets to the level of activity needed to achieve a full transition to a clean energy economy. The total investment needed to achieve a clean energy economy in the region was estimated for this report to be about $100 billion across Maine, New Hampshire, and Vermont. While this estimate may seem daunting, it represents a huge opportunity for the region. For example, an estimated $8.2 billion are spent annually on fossil fuels in the region – all of which are imported from outside of Northern New England. This annual expenditure represents dollars that could otherwise be kept in the region if increased investments were made instead in energy efficiency and solar and wood for heating, and electrification of transportation. Building new clean energy infrastructure will require significant new investment from the private sector, both locally and from sources beyond northern New England. This new investment will create jobs, improve equity, and reduce carbon pollution. And while investment of public resources will continue to be necessary, a key to success will be using those resources effectively to leverage substantial increases in private investment.

Progress Using Public Monies to Leverage Private Clean Energy Investment

The concept of using public monies to leverage private investment in clean energy is not new. All three Northern New England states can claim success in achieving this. For example, in 2017 Efficiency Maine,

NHSaves, and Efficiency Vermont leveraged $109 million in public investment to stimulate significant private investment in clean energy. In addition, nearly $11 million of VW Settlement Funds have been set aside for electric vehicle (EV) charging infrastructure. The total investment to date in renewable energy in the region is estimated to be nearly $3.3 billion (based on national solar and wind investment data). While these investments indicate there is progress being made, it is clear there is still a long way to go to achieve a full transition to a clean energy economy. It will take continued leadership and collaboration over many years by a wide variety of public and private sector market actors across many different activities.

The Purpose of this Report and the Methodology Used to Achieve it

The purpose of this report is to help transform the clean energy economy in Northern New England by identifying strategies for substantially ramping up investment in energy efficiency, renewable energy, and transportation electrification in Maine, New Hampshire, and Vermont. The report provides an action plan for clean energy investment activities for The Nature Conservancy (TNC) and Coastal Enterprises, Inc. (CEI), two mission-driven non-profits with a keen interest in helping to advance clean energy. The report provides background information and data on current clean energy investment activities in Northern New England and assesses where additional activity is needed. Mindful that many other market actors will also continue to be involved in clean energy investment, a portfolio of activities is recommended that leverage the capabilities and strengths of TNC and CEI. The recommended activities were selected after:

- Researching current clean energy funding and financing activities in Maine, New Hampshire, and Vermont;
- Completing a literature review of clean energy funding and financing best practices in other jurisdictions;
- Interviewing more than 25 clean energy funding and financing professionals and other policy and regulatory leaders in Northern New England (and beyond); and
- Reflecting on VEIC's more than 30 years of experience designing and implementing energy efficiency, renewable energy, and transportation electrification funding and financing initiatives.

Findings from these activities were used to complete a high-level assessment of the extent to which current offerings are able to serve existing demand for clean energy funding and finance for each market segment of the economy. This qualitative assessment provided the basis for further reflection on key challenges affecting clean energy funding and finance moving forward in Northern New England, and the types of changes and advancement needed to significantly scale up investment over time. A focus was placed on leveraging private investment. This is important given the political reality that substantial increases in public investment are not likely to occur in the near-term. Given this, there is a strong desire to not create even more competition for the public monies that are currently available and being deployed by a wide range of market actors.

Key Challenges for Scaling Private Clean Energy Investment

Key challenges affecting the ability to scale private clean energy investment in Northern New England are summarized below and discussed in more detail in the full report:

- Energy efficiency and renewable energy policies, goals, and regulatory frameworks vary across the three states and unpredictable shifts in policies and regulations occur as elected officials come and go. This makes it difficult for the market to find the political and regulatory consistency and predictability needed for ramp up in investment.
- The clean energy market is complex, with many different market segments to serve and multiple market actors developing and providing funding and financing products.

- There is minimal coordination of funding and financing strategies and approaches across funding and financing entities.
- There is generally low market demand for clean energy compared to the full market potential, except for the Weatherization Assistance Program and some energy efficiency programs. Energy efficiency and renewable energy practitioners report customer confusion about what clean energy improvements to make in a building or for transportation, and which of the many individual technology-specific service providers to seek for assistance.
- There are a variety of underutilized loan offerings throughout the region and even the highest levels of loan uptake (for example, the Heat Saver Loan in Vermont) are achieving only a fraction of the total potential market for such investments.
- There are unrealized opportunities to add credit enhancements as a feature for numerous existing energy efficiency and clean energy loan programs.
- Although commercial Property Assessed Clean Energy (C-PACE) has been very successful in other states, C-PACE is only authorized in New Hampshire thus far, and the Jordan Institute who led the charge for C-PACE is no longer involved in advancing C-PACE in the state.
- There are a lack of financing mechanisms well-suited for households with low credit scores and for renters.
- Transportation efficiency investments tend to rely more on funding than financing in the current market, with the notable exception of a robust market for vehicle loans and leases.
- There is a lack of affordable electric vehicles available in styles preferred by Northern New England consumers, including SUV/Crossover models with all-wheel-drive.
- Some locations in the region report a shortage of trained workers needed to complete energy efficiency and renewable energy projects.

- The region is largely rural, with relatively low populations density compared to nearby states. This can make the region harder to reach and more expensive to serve with funding and financing offerings, compared to more populated areas.

The Recommended Action Plan for TNC and CEI

Addressing the key challenges will be critical to further advancing clean energy investment in Northern New England. Informed by the challenges and the strengths and capabilities of TNC and CEI, VEIC recommends in this report a portfolio of initiatives that address the challenges. Attention was paid to selecting initiatives that complement (and do not duplicate) the actions of other market actors also involved in clean energy investment. For each initiative, an action plan is provided that includes key activities that will further advance clean energy investment and the market segments to be served are specified. In addition, a high-level qualitative assessment was done for each initiative of the impact on mitigating greenhouse gas emissions, stimulating jobs, and improving energy equity for low to moderate income households. A summary of each recommendation and its impacts are provided in Table 1 and are described in more detail in the full report. The recommendations include six that are deemed essential to creating policy and regulatory frameworks and approaches that enable significant scaling of clean energy investment. They are followed by five recommendations that will result in new or expanded finance tools that could help increase clean energy investment over time.

Table 1. Clean energy finance action plan proposed for TNC and CEI in Northern New England

Recommendation	Markets Served	GHG Impact	Jobs Impact	Equity Impact
Key Policy and Regulatory Strategies for Scaling Clean Energy Investment				
1. Implement regional carbon pricing for all energy produced from fossil fuels	All	High	High	High
2. Support activities that advance performance-based regulation	All	High	High	High
3. Address policy and regulatory barriers to community solar	Residential Income eligible Commercial Government	Medium	Medium	High
4. Engage in electric vehicle policy and regulatory development	All	High	Low	Medium
5. Enable plug-in electric vehicle market adoption	All	High	Low	High
6. Support electric transit and school bus market adoption	Government	High	Low	High
Modify and Develop New Clean Energy Financing Tools				
7. Implement a regional clean energy underwriting initiative	Residential Commercial	High	High	Medium
8. Implement commercial clean energy property assessment (C-PACE)	Commercial Industrial Government	Medium	Medium	Low
9. Expand municipal lease-purchasing	Government	Medium	Medium	Low
10. Expand tariffed on-bill financing	Residential Income-eligible Commercial	Medium	Medium	High
11. Continue assessing the need for a green bank	All	High	High	High

Section 1. The Clean Energy Challenge in Northern New England

Increasing the efficient use of clean energy in Northern New England creates jobs, stimulates the local economy, decreases air pollution, improves public health, and helps mitigate climate change. As a region heavily dependent on fossil fuels, there is much unrealized opportunity to ramp up investment in clean energy. A challenge lies in determining where to focus the investment – there is still so much to do! A starting point is to assess which sectors of the economy are producing the largest amounts of greenhouse gases, and to seek to stimulate clean energy investment in those sectors.

Fossil fuel consumption is responsible for the vast majority of greenhouse gas emissions in Northern New England. Presented in Figure 1 are the carbon dioxide emissions produced from fossil fuels in each state.[1] The figure is based on information from the U.S. Energy Information Administration and does not include greenhouse gas emissions from agriculture, wastewater, and landfills. Information in the figure help identify

[1]Source: US Energy Information Administration. These data exclude industrial process, agriculture, and waste-related emissions which together account for up to 15% of total emissions in each state.

which sectors of the economy have the greatest impact on climate change, and therefore are the most important to transform to clean energy the soonest.

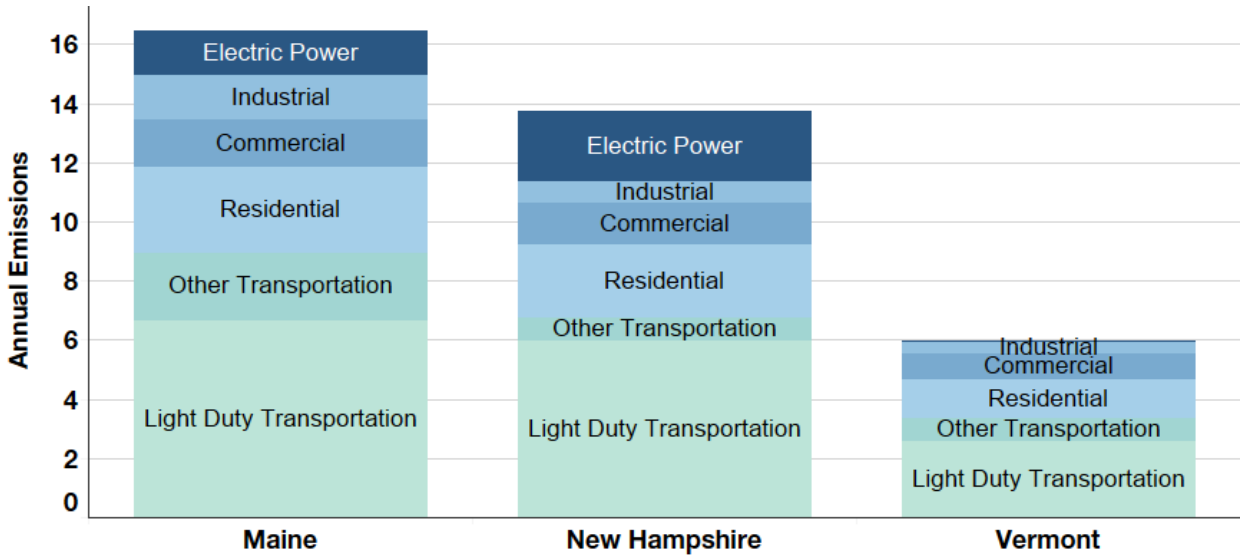

Figure 1. Annual carbon dioxide emissions from fossil fuels in million metric tons of CO2, 2016. [2]

As shown in the figure, the sources of carbon emissions are fairly similar across the three states, led by transportation, followed by buildings, and then by in-state electric power generation.

- In all states, transportation - including "light duty" personal vehicles and trucks and "heavy duty" transit buses, school buses, and freight - is the leading source of fossil fuel emissions (due to gasoline and diesel use), followed by buildings (due to fuel oil, propane, natural gas, and kerosene used for heating).
- In Maine, transportation is the leading source of fossil fuel-related emissions (54%) and industry (9%) accounts for a greater proportion of emissions than industrial sectors in the other two states.
- New Hampshire has the highest share of emissions from fossil fuel power generation (17%) but the lowest share from industrial activity (5%).
- Vermont's carbon emissions are sourced from transportation (57%, the highest in the region) and homes (22%). However, Vermont has almost no emissions from fossil fuel power generation—less than one-tenth of one percent.

The Nature Conservancy and Coastal Enterprises, Inc. seek to help the transition to a clean energy economy by identifying opportunities for advancing clean energy investment in Maine, New Hampshire, and Vermont. The organizations commissioned VEIC to assess the challenges and opportunities confronting the clean energy market and to identify new or expanded finance mechanisms that could help achieve sustained, orderly development - and substantial scaling up - of clean energy in each state and across the region. For this project, clean energy is defined as energy efficiency, renewable energy, and transportation powered by renewable energy rather fueled by gasoline and diesel. Activities are recommended in this report that leverage the capabilities and strengths of TNC and CEI, mindful there are (and will continue to be) many other market actors engaged in clean energy finance in the region. The information and recommendations in this report will be used by each organization to inform their future activities. It is anticipated that both organizations will continue to collaborate, as they do already, with many

[2] Ibid.

other market actors and stakeholders involved in clean energy finance and investment throughout the region.

Section 2. Clean Energy Progress in Northern New England

Presented in Figure 2 are the key components required for a successful clean energy market. They include:

- A consistent, predictable, and favorable policy and regulatory framework;
- Adequate capital available for funding and financing offerings and a sales and marketing strategy for each offering;
- Proven technology, commercially available on a widespread basis, “off the shelf” and “in the show room;”
- A delivery and service infrastructure capable of reaching and serving the market;
- A trained workforce able to serve the market in a professional and cost-effective manner; and
- Adequate customer demand.

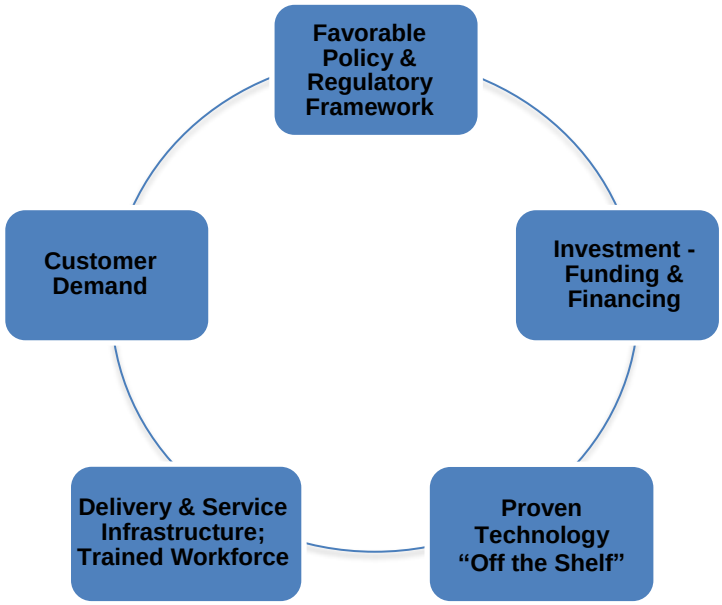

Figure 2. Key components needed for a successful clean energy market.

As discussed below, significant progress has been made in many of these areas in Northern New England - and there is much more to be done!

2.1 Policy and Regulatory Framework

As shown in Figures 3 and Figure 4, each of the Northern New England states has greenhouse gas reduction, energy efficiency, and renewable energy policies or goals in place. In most cases, they were established by executive or legislative action and are statements of intent, rather than mandatory or tied to regulation. Although there are limited or no mechanisms in place for enforcement if the goals are not met, they are indicators of progress towards a clean energy economy and send signals to the market that can help stimulate investment.

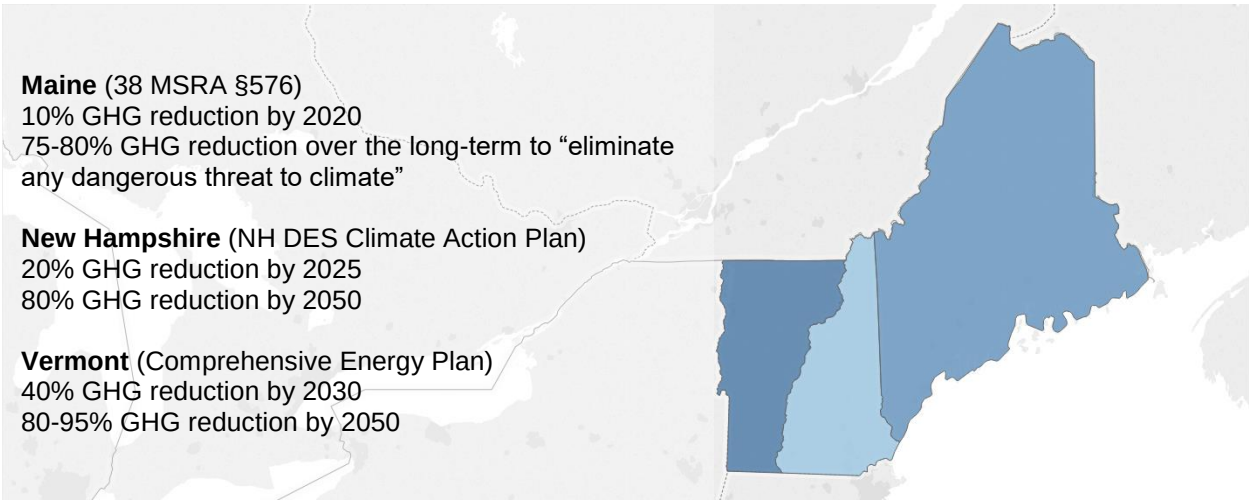

Figure 3. Carbon-reduction goals below 1990 baseline levels. [3]

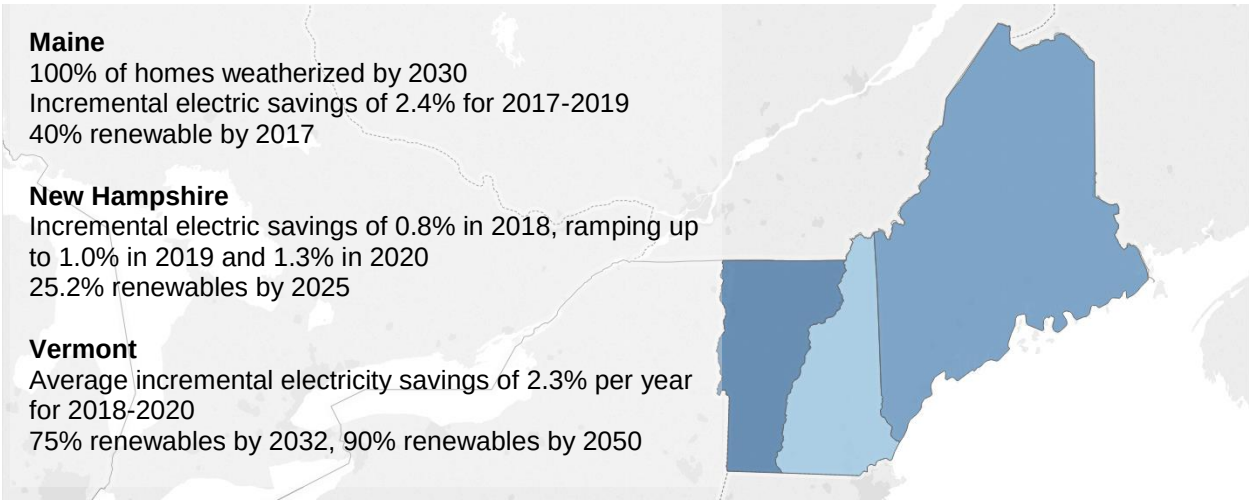

Figure 4. Energy efficiency and renewable electricity goals. [4]

2.2 Clean Energy Investment

Presented in Tables 2 and 3 is information on the investment in clean energy in each of the three states in 2017. As shown in Table 2, the three administrators of statewide energy efficiency programs (Efficiency Maine, NHSaves, and Efficiency Vermont) invested $109 million in the administration and delivery of energy efficiency programs across Northern New England. This estimate includes only the budgets for each of the program administrators. Since many of their offerings also require investment by customers served by their programs, this represents a subset of the total (unknown) energy efficiency investment in the region.

[3] In Vermont, statute (10 VSA §578) also specifies 50% GHG reduction by 2028 and 75% reduction by 2050

[4] State renewable portfolio standard levels, NEEP Energy Efficiency Snapshot (Summer 2018), and Maine's weatherization goal stated in 35-A MSRA §10104.

Table 2. Energy efficiency investment in Northern New England in 2017. [5]

State	Investment ($ million)	Investment ($ per capita)	Savings (% of retail electric sales)	National Rank (based on EE savings)
Efficiency Maine	$32 million	$24	1.38%	8
NHSaves	$23 million	$17	0.58%	27
Efficiency Vermont	$54 million	$86	2.52%	3
Total	**$109 million**			

Efficiency Maine, NHSaves, and Efficiency Vermont each result in additional investment in clean energy beyond what is paid for through each organization. Efficiency Maine reports that every $1.00 of their program investment yields $1.28 of incremental private investment and $4.38 in avoided energy costs.[6] Efficiency Vermont reports that $2.00 are saved for every $1.00 invested in energy efficiency. This positive economic impact is in addition to the fact that by design, all three entities are delivering energy savings at a cost far below what the energy would have cost to procure (referred to as the avoided cost of energy). For example, based on independent, third-party verification of both program and participant costs, Efficiency Vermont is delivering energy efficiency at a cost of 3.6¢ per kWh. This represents a 57% savings compared to the avoided cost of 8.4¢ per kWh for supplying electricity.[7]

For renewable energy investment in the region, as shown in Table 3, it is estimated that $818 million has been invested in grid-scale and customer-sited solar PV and $2.7 billion in grid-scale wind, resulting in a combined investment of nearly $3.3 billion in renewable electricity. Almost all of this investment is in the private sector, coming from residents investing in their homes, businesses and industries investing in their properties, and renewable energy developers building new clean energy projects. These investments create jobs, reduce carbon pollution, and often generate new tax revenue for municipalities. (Note: This is in addition to biomass power investment largely made in the 1980's and 1990's not included in the estimate).

Table 3. Cumulative solar and wind energy investment in Northern New England. [8]

State	Solar Investment	Wind Investment
Maine	$125 million	$1,800 million
New Hampshire	$198 million	$374 million
Vermont	$495 million	$300 million
Total	**$818 million**	**$2,474 million**

[5] American Council for an Energy-Efficient Economy (ACEEE) Scorecard, 2017.
[6] Efficiency Maine. 2017 Annual Report. https://www.efficiencymaine.com/docs/FY2017-Annual-Report.pdf.
[7] Efficiency Vermont. 2017 Annual Report. https://www.efficiencyvermont.com/Media/Default/docs/plans-reports-highlights/2017/efficiency-vermont-annual-report-2017.pdf.
[8] Solar Energy Industries Association, www.seia.org/state-solar-policy; American Wind Energy Association, www.awea.org/Awea/media/Resources/StateFactSheets.

The investment in transitioning from fossil-fuel based transportation to efficient mobility and accessibility powered by clean energy is difficult to quantify. States have varying approaches to supporting walking and bicycling, public transportation, freight efficiency, rail, land use planning, and other activities essential to reducing vehicle travel. Consistent and reliable data is only just beginning to become available on electric vehicle activities. Presented in Table 4 is a snapshot of funding for public transit services, current plug-in electric vehicle market conditions (which are reflective of state level investments in EV-supportive programs), and state VW diesel settlements. The VW funds are focused on heavy duty vehicle replacements, but each state intends to put the 15% maximum allowed under the terms of the settlement toward light-duty plug-in electric vehicle (EV) charging.

Vermont is the only state in the region (thus far) that has legislated a requirement that all VW funding toward heavy-duty vehicle replacements be spent on bus electrification. This was included in the FY 2019 budget appropriations bill. It is possible other options will be eligible in future years depending on future direction from legislators. Spending plans for Maine and New Hampshire include significant set-asides for state and municipal fleet upgrades which will likely include newer diesel vehicles.

Table 4. Transportation funding in Northern New England.

State	Annual Public Transit Spending[9]	Light-Duty Electric Vehicle Market Share[10]	VW Settlement Funding[11]	
			Heavy Duty Vehicle Replacements	Electric Vehicle Charging
Maine	$39.2 million	1.0%	$17.8 million	$3.2 million
New Hampshire	$10.5 million	0.9%	$21.7 million	$4.6 million
Vermont	$43.8 million	2.2%	$15.9 million	$2.8 million
Total	**$93.5 million**	**1.2%**	**$55.4 million**	**$10.6 million**

2.3 Proven Technology, Available "Off the Shelf"

A diversity of energy efficiency and renewable energy technologies and products are fully commercialized and available "off the shelf" in retail stores or through fuel suppliers, building contractors, HVAC contractors, and auto dealers throughout Northern New England. This is a substantial change from just 20 years ago, when energy efficient lighting, efficient low-emission modern wood heating, solar photovoltaic (PV) panels large- and small-scale wind, and electric vehicles were not fully commercialized and available in the region. Plus, new clean energy technologies keep being developed and brought to market – such as cold climate heat pumps in just the last five years.

[9] Bureau of Transportation Statistics 2015 Data on federal and state funding for public transportation https://www.bts.gov/content/federal-and-state-funding-public-transit-2015.
[10] Auto Alliance Data for July 2017 - June 2018 EV Sales https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/.
[11] VW funding estimates based on state VW diesel settlement mitigation plans:
ME - https://www.maine.gov/mdot/vw/bmp/
NH – https://www.nh.gov/osi/energy/programs/vw-settlement.htm
VT - https://dec.vermont.gov/air-quality/vw

2.4 Delivery and Service Infrastructure and Trained Workforce

Presented in Figure 5 are the number of clean energy jobs in each of the three states as of 2017. According to the National Association of State Energy Offices (and others), clean energy jobs are one of the fastest areas of employment growth.[12]

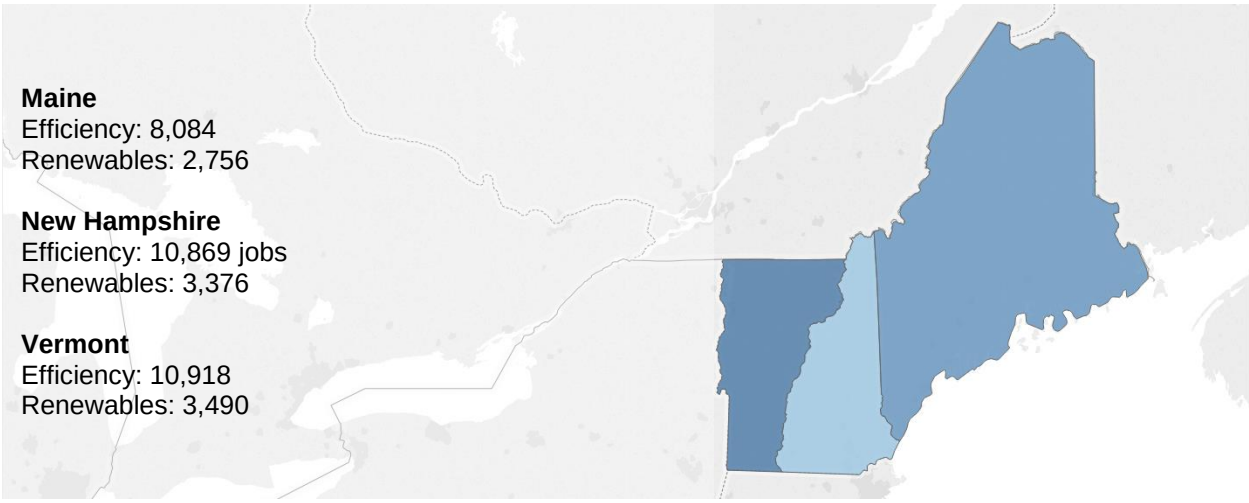

Figure 5. Clean energy jobs in Northern New England in 2017. [13]

2.5 Customer Demand

Customer demand for energy efficiency, renewable energy, and electric vehicles is greater now than ever before. Both the largely federally-funded Low Income Home Energy Assistance Program (LIHEAP) and Weatherization Assistance Program delivered by multiple Community Action Agencies in each state are sometimes not able to meet demand. In addition, a few programs offered by Efficiency Maine, NHSaves, and Efficiency Vermont are sometimes not able to meet demand, such as Home Performance with ENERGY STAR (a residential retrofit program) and certain commercial and industrial offerings.

[12] EDF (2018), https://www.edf.org/energy/clean-energy-jobs, and US Energy and Employment Report issued by NASEO and Energy Futures Initiative (2018), https://www.usenergyjobs.org/.
[13] New Energy America, Fifty State Clean Energy Jobs Report, 2017, https://www.newenergyamerica.org/.

Section 3. The Investment Needed for a Clean Energy Economy

This project included an analysis of the amount of investment needed to meet 80% of Northern New England's energy needs through increased use of energy efficiency and renewable energy. VEIC adapted an existing methodology originally developed by The Catalyst Financial Group and used by the Energy Action Network to estimate the clean energy investment needed to meet climate and energy goals in Vermont.[14] VEIC replicated the methodology for this report using updated cost figures and state-specific data (e.g., number of houses, registered vehicles, etc.), and 2016 fuel consumption data obtained from federal data sources. Freight transportation, industrial process fuels, and aviation are excluded given uncertain decarbonization costs for these sectors; liquid biofuels are similarly excluded from the analysis.

Results are presented in Figure 6. They provide high-level, order-of-magnitude estimates of the investment needed to transition to a clean energy economy, and demonstrate the scaling up needed compared to current investment. As shown in the figure, more than $100 billion of private and public investment are estimated to be needed to meet 80% of the region's energy needs with clean energy (energy efficiency, renewable heating and electricity, and electric transportation). An estimated 50% of the total would be needed for transitioning from fossil fuel transportation to electric transportation powered by clean energy. About 34% would be needed to improve the efficiency of buildings and to transition to renewable heating. The balance would be needed to replace fossil fuel electricity generation with renewable energy.

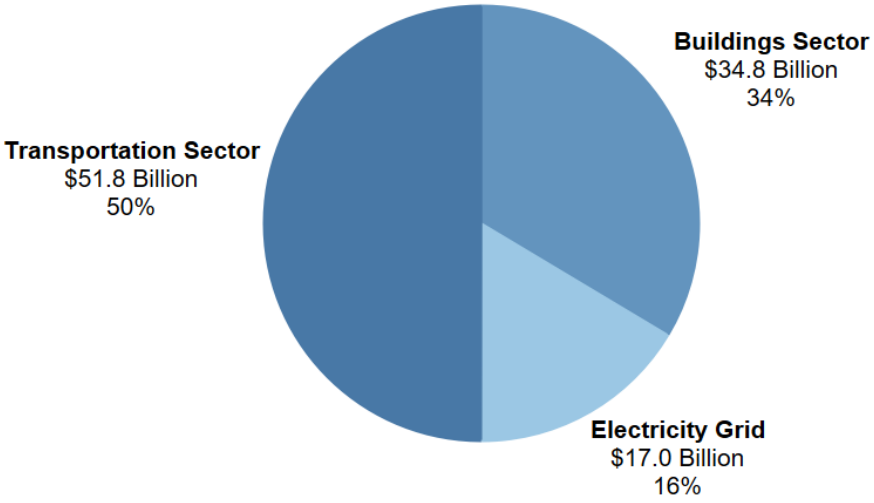

Figure 6. The clean energy investment needed to meet 80% of energy needs in Northern New England.

While a total investment of $100 billion may seem daunting, as shown in Figure 7 each year more than $12.4 billion is spent on energy in Northern New England. And (as shown in Table 5) because the region is heavily dependent on fossil fuels, $8.2 billion of this (or 66%) is spent on fossil fuels. Since fossil fuels are not produced in the region and must be imported from other locations, a large portion of energy expenditures leave the region immediately and represent a significant drain on the local economy.

[14] Wasserman, Nancy, and Bob Barton. 2012. "Mobilizing Capital to Transform Vermont's Energy/Economy." http://eanvt.org/mobilizingcapitaltotransformvermontsenergyeconomyoctober2012/.

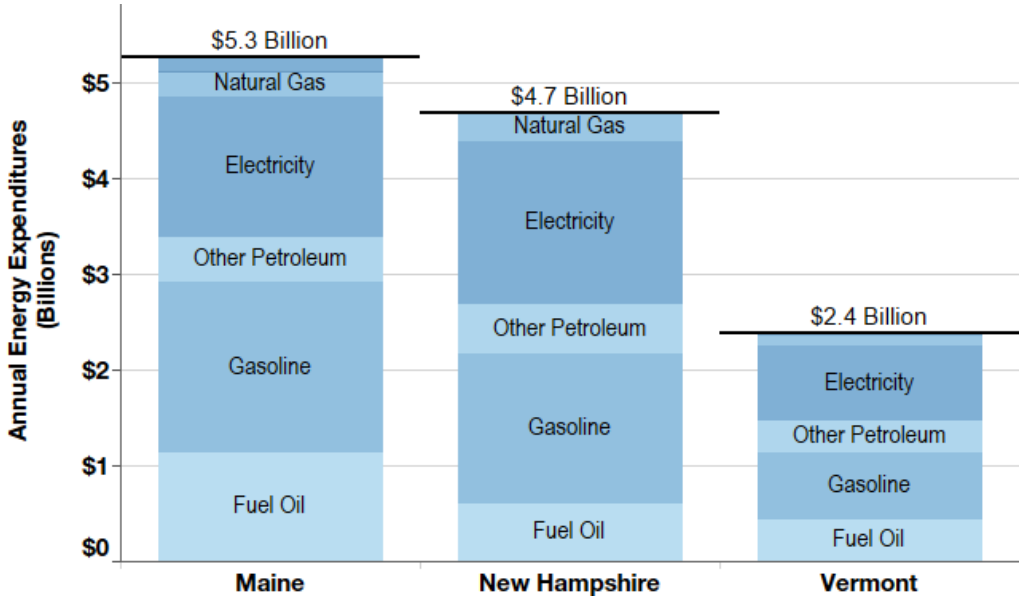

Figure 7. Annual end-use energy expenditures by fuel type. [15]

An important advantage of increasing investment in clean energy is that energy efficiency and renewable energy projects can reduce energy costs, create local jobs, and help stimulate the local economy as workers' earning cycle through the economy (referred to as the multiplier effect). Overtime, investments in clean energy could potentially reduce the energy bill for the region and stimulate economic activity, helping to offset the cost of the upfront investment needed to achieve a clean energy economy.

Table 5. Annual end-use energy expenditures. [16]

State	Annual Energy Expenditures	Annual Fossil Fuel Expenditures	Fossil Fuels as a Percentage of Energy Expenditures
Maine	$5.3 Billion	$3.7 Billion	69%
New Hampshire	$4.7 Billion	$3.0 Billion	63%
Vermont	$2.4 Billion	$1.6 Billion	65%
Total (All States)	$12.4 Billion	$8.2 Billion	66%

That said, when comparing the $100 billion or more of clean energy investment needed to the $109 million per year budgeted for Efficiency Maine, NHSaves, and Efficiency Vermont; the $66 million budgeted for electric vehicle incentives and charging infrastructure and the $3.3 billion invested thus far in solar and wind, it is clear that continued work is needed to:

- Access new sources of capital and continue to leverage the public investment in clean energy to stimulate and scale private investment even more than what is currently occurring; and
- Deploy the capital in new ways that reach beyond the primary focus on electric efficiency in buildings and instead also address renewable heating for buildings and electrification of transportation using clean energy.

[15] US Energy Information Administration. 2017. Total End-Use Energy Expenditure Estimates for 2016. https://www.eia.gov/state/seds/data.php?incfile=/state/seds/sep_sum/html/sum_ex_tx.html&sid=US. Biomass, coal, and natural gas (for Vermont) are displayed but not labeled due to space.
[16] Ibid.

Ratepayer and taxpayer funds alone will likely never be sufficient to meet the total investment needed to reach clean energy goals. Instead, the transition to cleaner and more efficient energy use will rely largely on private investment. The private investment will be funded by a combination of existing and new capital sources, with the public investment playing a key role in bridging the gap between capital market perceptions of risk and the actual risk as measured by payment and default data.

Section 4. Clean Energy Funding and Finance Approaches to Date

There are many different clean energy funding and financing offerings in Northern New England, and many different market actors involved in capital formation and delivery of the offerings. The offerings vary among energy efficiency, distributed energy resources (DER), and grid-scale renewables. Presented below is a brief description of each type of offering and its uses across EE, DER, grid-scale renewables, and transportation electrification. This is provided as background information on the overall clean energy funding and finance "ecosystem" in the region.

4.1 Clean Energy Funding

Clean energy funding is defined as rebates and incentives provided for the purchase of energy efficiency or clean energy technologies, as well as grants provided for energy efficiency or clean energy programs and initiatives. Presented below is a brief description of the clean energy funding approaches used to date.

- **Weatherization improvements** provided at no charge by the **Weatherization Assistance Program (WAP)**, a largely federally-funded residential weatherization program for income-eligible households.

- **Rebates, incentives, and technical assistance** provided by energy efficiency and (a few) clean energy programs funded mostly by ratepayer funds collected by electric and gas utilities. In Northern New England, these include:

    - **NHSaves** - A statewide brand shared by the four utilities, who each deliver their own programs to their customers; and
    - **Efficiency Maine** and **Efficiency Vermont** – Statewide brands delivered to utility customers by third-party administrators (Efficiency Maine Trust and VEIC, respectively) using ratepayer funds collected by the utilities.

- Various federal grant programs available to all states typically included in the federal budget each year (although program budgets can vary year by year) such as the:

    - **Competitive State Energy Program (SEP) –** offered by the US Department of Energy;
    - **Community Facilities Technical Assistance and Training (CF TAT) Program** – offered by the US Department of Agriculture (USDA) Rural Development;
    - **Rural Energy for America Program (REAP)** - offered by USDA Rural Development;
    - **Business Development Grant Program (RBDG) Program** – offered by USDA Rural **Development**; and
    - **Rural Utilities Service (RUS)** – offered to municipal utilities and electric cooperatives by USDA.

- Various state grant programs that vary by state and come and go over time, depending on state legislation and / or the availability of funding.

- Rebates, incentives, and grants have helped develop the clean energy market in Northern New England. However, because they are funded by ratepayers or taxpayers, these offerings are not expected to be sufficient to support the $100 billion of investment needed to achieve clean energy goals in the region. With that in mind, additional funding mechanisms have been developed through a variety of federal or state policies and regulations. These include:

- **Net metering** – a financial arrangement where distributed electricity generation offsets a customer's electricity purchases; this could include on-site generation or participation in group net-metering;
- **Feed-in tariff** – a policy mechanism awarding incremental compensation above market rates for renewable electricity generation; the compensation may vary depending on technology or location;
- **Renewable portfolio standards** – state requirement for utilities to procure a set percentage of electricity sales from of renewable sources over the course of a year; because electrons are indistinguishable on the grid, renewable energy credits (RECs) act to verify that renewable generation occurs but is not subject to double-counting;
- **Federal tax credits** – renewable electricity generation is supported by the Business Investment Tax Credit (30% and declining after 2019 unless new legislation is passed, as has been the case with previous deadlines) often used for solar systems, the Renewable Electricity Production Tax Credit (fixed credit per-unit of generation) often used for commercial wind projects, the Residential Renewable Energy Tax Credit (30% and declining after 2019 unless new legislation is passed), and the Qualified Plug-In Electric Drive Motor Vehicle Credit ($7,500 per vehicle and declining as more plug-in vehicles are sold); and
- **State tax exemptions** – sales tax and property tax exemptions; some states offer blanket property tax exemptions for small projects or allow municipalities to elect whether to exempt project equipment from property tax.

While these additional funding mechanisms are helpful in helping to pay for clean energy projects, alone or combined they rarely come even close to paying for the full cost of clean energy projects. Additional private investment is typically used to pay the balance of the project costs not covered by these offerings.

4.2 Clean Energy Financing

To leverage the ratepayer and taxpayer clean energy funding described above, a variety of financing mechanisms have been used to cover the upfront costs of energy efficiency, renewable energy, and transportation electrification not covered by rebates, incentives, or grants. These are described below.

- **Traditional debt financing** – Energy efficiency investments projects save money by reducing energy usage and the cost savings can be redirected to repay debt used to undertake the project. Additionally solar PV, wind, and biomass power projects produce electricity, the value of which can help offset project costs. Over time, numerous collateralized loan offerings have been developed and offered by banks, credit unions, and various state or federal agencies. The loans have been made available at market rate, reduced rate, or zero interest rate (depending on the loan offering and whether or not the customer was "income eligible" for reduced or zero interest rate offerings).

  What has been demonstrated time and time again, however, is that debt-financing is not attractive to most customers. For residential customers, adding household debt competes with other priorities that represent needs for many households, and wants for other households. These include car purchases, credit card debt, home equity loans, and student loan payments. An April 2018 Money magazine article stated that, "Overall, Americans' debt hit a new high of $13 trillion last year, surpassing the previous record set in 2008 by $280 billion, according to the New York Fed."[17] For business and industry, debt obligations on the balance sheet can be problematic. Business and

[17] Forbes. Tax Equity Financing for Utilities. 2018. https://www.forbes.com/sites/brianpotts/2018/07/18/tax-equity-financing-for-utilities-another-helping-of-renewable-energy-but-hold-the-tax-credits/#62c8c057743b.

industry prefer to reserve debt capacity for business expansion, equipment, inventory, and other costs of doing business. Energy efficiency improvements tend to be a secondary priority and the energy efficiency industry has learned that businesses often doubt that the cost savings will actually materialize.

The energy efficiency industry finds that conventional debt financing poses numerous market barriers that limit its attractiveness for undertaking clean energy projects. These limitations differ by customer market but have in common the complications posed by underwriting individual customers or businesses: collateral, credit scores, traditional underwriting ratios, and income.

As a result, there are many underutilized loan offerings throughout the region and even the highest levels of loan uptake (for example, the Heat Saver Loan in Vermont) are achieving only a fraction of the total potential market for such investments.

- **Credit Enhancements** – Credit enhancements are a tool that that reduce lender or investor risk by providing these capital providers with protection against losses in the event of default or delinquency by the borrower. In energy efficiency financing, credit enhancements are offered by a third party to encourage lenders to offer financing at longer terms, at lower rates than they would otherwise, and/or to customer who would not otherwise be considered credit worthy. Credit enhancements, which can be combined with most repayment mechanisms in clean energy financing programs, typically include:

    - Loan guarantees
    - Loan loss reserves
    - Interest rate buy-downs

  If a loan loss reserve is established along with an interest rate buydown, a lender is able to extend credit to a customer that it might not otherwise since the risk of loss is reduced.

  Credit enhancements are typically provided using government or ratepayer funds. For example, a state agency can serve as the guarantor of loans to residential and commercial? customers to reduce the risk of losses resulting from loan defaults. A loan guarantee does not require government to set aside funds to cover potential losses, but it does obligate government to cover any agreed upon percentage of loan defaults. It is considered best practice for loan guarantees to cover only a share of each loan, thereby ensuring that lenders thoroughly assess the credit-worthiness of borrowers and aggressively pursue collections of delinquent accounts. This was one of the most significant areas of progress for many ARRA-funded clean energy financing programs and led to market transformation as financial institutions modified their lending criteria and accumulated data about clean energy loan performance.

- **Alternatives to Collateralized Debt** - Alternative financing structures exist for residential, commercial, industrial, and government markets that avoid traditional underwriting and collateralization. These include:

    - **Leases** – A lease allows a utility customer to install more energy efficient equipment and to make building envelope upgrades without buying the equipment or paying cash for the upgrades. Like the PPA described below, at the end of the lease period the customer has the option of purchasing the equipment, returning the equipment or extending the contract depending upon the type of lease used. Leases work best for those who are looking for no upfront cash combined with a fast and accessible financing option with a simple contract.

There are four types of leases for energy efficiency investments: capital lease, operating lease, tax-exempt or municipal lease (available only to qualifying entities, typically governments or schools), and the relatively new "green" lease.

Green leases are designed to overcome the financial barriers to making energy efficiency investments in leased office buildings. The Institute for Market Transformation asserts that "green leases serve both building owners and lessees by better aligning financial incentives so that the benefits of investing in energy efficiency are shared mutually between owners and tenants." Green leases attempt to overcome the split incentive that prevents efficiency retrofits from being undertaken in spaces leased by small businesses.

Green leases (also known as aligned leases, high performance leases, or energy efficient leases) align the financial and energy incentives of building owners and tenants so they can work together to save money and ensure the efficient operation of buildings and businesses.[18] They are most effective when the tenant has multiple years remaining on their occupancy lease. The Institute for Market Transformation has created a "Green Lease Leader" designation to recognize companies that include green lease language in new or existing leases. IMT provides model leases for use by building owners and commercial lessees seeking to share the benefits of energy efficiency investments.[19] The Natural Resources Defense Council has also created a guide to assist commercial landlords and tenants with developing a commercial lease that enables energy and water efficiency upgrades.[20]

- **Energy service company (ESCO) contracts** – Through which a provider (typically a for-profit business) provides an agreed upon package of energy efficiency measures and guarantees the cost savings to be realized by the customer. This has largely been used for municipal buildings, universities, schools, and hospitals (the "MUSH" market) which have superior credit characteristics.
- **Energy-as-a-service (EaaS) and energy performance contracting (EPC)** – Designed primarily for business or industry, both approaches allow a company to categorize their financial obligation as an operating cost, which aligns with their balance sheet and financial statements for tax and other purposes.
- **Property assessed clean energy (PACE)** – This approach allows local governments, state governments, or other jurisdictional authorities, when authorized by state law, to fund the upfront costs of energy improvements on residential and commercial properties through voluntary property tax assessments. PACE financing is tied to the property rather than the property owner so that the payment obligations transfers along with the energy savings in the event of a sale of the property.
- **Tariffed on-bill financing (TOBF)** – Designed primarily for residential markets, tariffed on-bill financing allows energy efficiency project costs to be repaid on the utility bill, after lower energy usage costs free up dollars to repay the costs of weatherizing the building over time. The weatherization project costs stay with the meter, so account owners may change but each new account owner inherits the unpaid balance from the previous account owner. Tariffed on-bill financing also addresses the split incentive in rental property because the property owner can authorize the project without facing the collateral, debt-to-equity ratios, or rent increases associated with adding debt.
- **Power purchase agreements (PPAs)** – through which a provider (typically a for-profit renewable energy project developer) pays the upfront construction costs and oversees

[18] https://www.mashvisor.com/blog/green-lease/
[19] IMT, Green Leasing Resources, http://www.greenleaselibrary.com/green-leasing-resources.html
[20] Center for Market Innovation, Energy Efficiency Lease Guidance, November 2011. https://www.nrdc.org/greenbusiness/cmi/files/CMI-FS-Energy.pdf

installation and maintenance for a solar (electric) system. The customer (typically the building owner where the project is sited or the utility company purchasing the power) benefits from a predictable, contracted price for the power. The project developer (or its investors) take advantage of various federal and state tax credits available for the selected technology. This approach alleviates the need for upfront capital by the building owner or utility customer. Instead, it captures the value of tax credits for energy projects that serve public and non-profit entities that lack tax liability and are therefore unable to take advantage of the credit themselves.

- **Equity Financing** – The capital for energy efficiency financing through ESCOs and ESAs is often through private equity. In those cases, the ESCO or ESA provider is an equity stakeholder in a Special Purpose Entity (SPE) set up specifically for the energy efficiency or renewable energy investment. The SPE may raise additional funds through the sale of equity to other investors or through debt financing or lease financing. Equity financing is typically more expensive than other options due to the profit expectations of the equity investors.

- **Tax Equity Financing** – Tax equity is a low-risk means of investing in renewable energy projects using a financing approach referred to as "project finance." Project finance is how most energy generation assets are currently financed in the US. A successful transaction is based on predictable, reliable cash flows that are more than sufficient to service operational expenses and financing costs. For renewable energy developers, tax equity is an important source of capital, yet many developers lack sufficient taxable income to utilize the federal Investment Tax Credits (ITC) themselves. To take advantage of the ITC, developers typically form a holding company with an investor that owns the assets, invests their capital, and derives the tax benefits and cash flow during the first 10 years. When the investor has fully utilized the tax credits and recovered the investment, the developer becomes the majority owner and usually has the right to buy out the investor's remaining nominal ownership in the project.[21]

  Tax equity is generally less expensive than other sources of capital when measured in terms of pre-tax cash. For investors, tax equity provides an attractive after-tax return from a combination of cash yield and cash savings. In addition, the ITC offers a dollar-to-dollar reduction in taxes, allowing tax equity investors to retain cash that would normally be paid in taxes. Investors can also claim accelerated depreciation deductions for most of the renewable energy assets. This is an excellent example of how public policy can drive investments in desired markets.

4.3 Differing Approaches for Energy Efficiency, Distributed Energy Resources, and Grid-Scale Renewable Energy

The "clean energy market" involves investment in three different energy resources:

- **Energy efficiency** (EE) – which consists of energy savings measures and energy savings activities (or behaviors) carried out in homes, businesses, or other facility;
- **Distributed energy resources** (DER) – energy generation such as customer-sited solar electric and wind systems installed "behind the (utility) meter" at a home, business, municipal property or other facility, as well as community solar arrays; and
- **Grid-scale renewable energy** – including solar electric, wind, and biomass power facilities that are tied directly to the grid and are not "behind the meter." They may be developed and owned by

[21] Forbes. Tax Equity Financing for Utilities. 2018. https://www.forbes.com/sites/brianpotts/2018/07/18/tax-equity-financing-for-utilities-another-helping-of-renewable-energy-but-hold-the-tax-credits/#62c8c057743b.

a utility, or by a private company with a power sales contract with the utility or directly with end users (in New Hampshire, which allows “retail choice” among electric utility customers).

Presented in Tables 6 and 7 are overviews of which funding and financing approaches have been used for each of the three components of the clean energy market in Northern New England. This information helps inform the selection of funding and financing approaches to use in the future.

Table 6. Funding approaches for EE, DER, and grid-scale renewables in Northern New England.

		Energy Efficiency	Distributed Energy Resources	Grid-Scale Renewables
US DOE - Income Eligible	Weatherization Assistance Program	✓		
Ratepayer - funded technical assistance, rebates, and incentives	Efficiency Maine	✓		
	NHSaves	✓		
	Efficiency Vermont	✓		
Government Grants	Competitive State Energy Program – US DOE	✓	✓	
	Community Facilities Technical Assistance and Training Program - USDA	✓	✓	
	Renewable Energy for America Program - USDA	✓	✓	
	Rural Business Development Grant - USDA	✓	✓	
	Rural Utilities Service’s Electric Program - USDA	✓	✓	
Policy or Regulation	Net Metering		✓	
	Feed-In Tariff		✓	
	Renewable Portfolio Standard with Renewable Energy Credits			✓
	Federal Investment and Production Tax Credits		✓	✓
	State and Local Tax Credits		✓	✓

Table 7. Financing approaches for EE, DER, and grid-scale renewables.

		Energy Efficiency	Distributed Energy Resources	Grid-Scale Renewables
Traditional Debt Financing	Loans	✓	✓	
Alternative Debt Financing	Credit enhancements	✓	✓	✓
	Leases		✓	

Alternatives to Collateralized Debt	Energy service company (ESCo) contract	✓		
	Energy as a service (EaaS)	✓		
	Energy performance contract (EPC)	✓	✓	
	Tariffed on-bill financing (TOBF)	✓		
	Property assessed clean energy (PACE)	✓	✓	
	Power purchase agreement (PPA)		✓	✓
Traditional Equity Financing	Investors, financial institutions, utility holding companies			✓
Tax Equity Financing	Financial institutions, utilities			✓
	Structures to capture tax credits – Asset sale leaseback, inverted lease, partnership flip			✓

4.4 Clean Transportation Funding and Financing

Investments in clean transportation activities can apply many of the same instruments as other investments in the clean energy sector covered in sections 4.1 and 4.2 above. The discussion below builds on the context provided in section 2.2 above on current support for clean transportation in Northern New England. It provides additional context on funding and financing issues most relevant to advancing clean transportation in the region.

Major capital investments in new transportation infrastructure to support walking, bicycling, public transportation (including passenger rail), freight efficiency and smart growth land use polices are generally advanced through a combination of local, state and federal transportation funding sources. User fees collected through gasoline taxes, vehicle registrations, and purchase and use taxes are the primary sources of public funding. They are often supplemented with general funds from state and local governing bodies. States have also used bonding to finance accelerated investments in transportation infrastructure to catch up on deferred maintenance and fund new improvements.

Maine, New Hampshire, and Vermont transportation agencies have developed “complete street” infrastructure policies to improve accessibility for all users, including pedestrians, cyclists, and people with disabilities[22]. These typically leverage ongoing public infrastructure investments to require consideration of all-users when streets are built or undergo major maintenance and may include sidewalks, bicycle lanes, and other safety measures to increase accessibility and use of non-motorized travel options.

Broader public policies that advance smart growth principles by integrating community land use and transportation planning frequently require major investments in transportation, wastewater, storm water, and mixed-use developments which leverage a combination of public and private funding and financing methods. These efforts are critical to reducing future personal vehicle travel, but due to the complexity of

[22] Smart Growth America Complete Streets Toolkit - https://smartgrowthamerica.org/resources/taking-action-on-complete-streets-implementing-processes-for-safe-multimodal-streets/

the issues and the extended implementation timeframe (often decades to achieve full benefits) these are not explored in depth in this report.

Carbon pricing mechanisms related to fossil fuel consumption can also provide public funding to support clean transportation investments in multi-modal transportation systems and vehicle electrification, both of which have significant potential for reducing greenhouse gas emissions. Carbon pricing is discussed further in Section 6 below.

Shifting transportation to EVs powered by an increasingly renewable grid is a focus of several recommendations included in this report. The electrification of transportation using clean energy represents one of the only near-term options available in the transportation sector to greatly increase efficiency, reduce reliance on costly fossil fuels, and improve the environment. Financing and funding options most relevant to EVs include:

- Loans – Banks, credit unions, and automaker captive finance entities have many options available to finance new and used EV purchases. They are well-positioned to finance a significant portion of the clean transportation investments needed to electrify the personal vehicle fleet in Northern New England.
- Leases – Automaker captive finance entities and other leasing agencies have popularized EV leasing options that roll-in the available federal tax credit and provide consumers assurance they will be able to upgrade to more advanced EV models after their lease is completed – typically in 2 to 3 years.
- Credit enhancements – These are not widely used in clean transportation financing but may be particularly helpful in assisting low-income households in new and used EV purchases.
- State clean vehicle incentives – 45 states offer some type of purchase incentives for light-duty plug-in electric vehicles.[23] State reimbursement for electric bus and other heavy duty EV options may be available through VW diesel settlement funding.
- Federal clean vehicle incentives – Federal tax credits are currently available for up to $7,500 of the purchase price for light-duty EVs. Under current law these begin to sunset at 200,000 vehicle sales per automaker. Competing Congressional proposals to eliminate or expand the program are under consideration. Federal grants are also available for low emission transit buses.
- State EV charging funding – State programs to advance light-duty EV charging infrastructure development funded by the VW diesel settlement are underway across the country, with Maine and Vermont already completing a first round of applications to their respective programs.
- Utility EV grants or incentives - Utilities may offer grants for public, workplace, and multi-unit residential charging installations. Many utilities are also offering vehicle purchase incentives.

Transportation is responsible for the highest share of greenhouse gas and other toxic emissions of any energy sector. In addition, expenditures on fossil fuels used for transportation are rarely supportive of local and state economies. Investments and policy actions that add to and enhance the funding and finance options described above will be necessary to advance clean transportation in the region.

[23] National Conference on State Legislatures EV Incentive Summary - http://www.ncsl.org/research/transportation/electric-vehicle-incentives-and-fees.aspx

Section 5. Assessment of Clean Energy Funding and Finance in Northern New England

Interviews were conducted for this report with representatives of more than 25 businesses, organizations, and agencies who provide clean energy funding or financing. The purpose was to understand the clean energy funding and financing currently being offered in each state, and to learn of the opportunities and challenges associated with the market segments served by them. VEIC used results of the interviews as well as market intelligence gleaned over 30 years of work in clean energy to complete a qualitative assessment of the clean energy market in each state. Results of the assessment are presented in two ways below. First, key challenges affecting clean energy investment in the region are discussed. This is followed by a qualitative assessment of clean energy funding and finance in each state.

5.1 Key Challenges Affecting Clean Energy Investment in Northern New England

Despite the good progress made in clean energy funding and finance in Maine, New Hampshire, and Vermont, there are a variety of challenges affecting the ability to scale up the level of investment needed to meet state goals. A summary of the key challenges and why they matter is provided in Table 8.

Table 8. Key challenges affecting clean energy investment in Northern New England.

Challenge	Why does this matter?
• The limited focus of RGGI (the current market-based pricing system designed to stimulate investment away from fossil fuels to clean energy) on only large fossil fuel power plants rather than also on fossil fuels used for heating buildings and transportation.	✓ Expanding market-based pricing is probably the single most effective mechanism for stimulating clean energy investment. ✓ It will take leadership and engagement by all organizations supportive of expanded carbon pricing to achieve this significant policy and regulatory change.
• The outdated "cost of service" regulatory approach for electric and gas utilities which does not adequately incent or reward utilities for investments in energy efficiency, distributed energy resources, and electrification of transportation.	✓ Moving from utility regulation based on the cost-of-service approach to a performance-based approach could inspire and better enable utilities to innovate and increase capital investments in energy efficiency, renewable energy, electric vehicle charging infrastructure. ✓ This will require action by utility regulators and potentially state legislators and will require the leadership and engagement of all organizations that support a transition to the "utility of the future."
• Market confusion among residential, commercial, industrial, and government decision makers on which energy efficiency, renewable energy, and clean transportation technologies and products to use. Efficiency Maine, NHSaves, and Efficiency Vermont are trusted advisors able to provide technology- and vendor-neutral technical assistance and support. However the largely ratepayer and taxpayer supported programs are not expected (or able) to provide all of the technical assistance and support needed for the complete transition to a clean energy economy. As a result, multiple organizations and agencies also provide clean energy funding and finance, often in ways that are not coordinated with other offerings. An unintended consequence of the multitude of market	✓ Having many market actors engaged in offering services, products, funding, and finance is a sign of success in moving beyond the early adoption phase of transforming a market. ✓ However, it is clear that market confusion exists in the clean energy market in Northern New England. Unrealized opportunities exist for increasing coordination among multiple offerings and further promoting existing technology- and vendor-neutral trusted advisers. ✓ The development of a "green bank" that focuses exclusively on financing clean energy and environmentally friendly products and services is one approach being used in other states to address market confusion and consolidate clean energy financing offerings. That said, there is a growing

actors involved in clean energy funding and finance is market confusion, which can lead to inaction.	clean energy finance activity in Northern New England through existing banks or credit unions. It is not yet clear whether or not a new green bank is needed.
• There are a variety of underutilized loan offerings throughout the region. Even loan offerings with the highest uptake (for example, the Heat Saver Loan in Vermont) are serving just a portion of the total number of buildings that could benefit from energy efficiency and weatherization upgrades.	✓ The most effective clean energy loan offerings are those that are promoted proactively and aggressively by either the lender or an energy efficiency program implementer (like Efficiency Vermont), and that train building contractors and other clean energy practitioners to do "kitchen table" sales while meeting with prospective clean energy customers.
• Despite numerous clean energy loan offerings throughout the region, most fail to recognize the positive impact of reduced energy costs on a borrower's debt capacity and the potential for clean energy improvements to improve lender security.	✓ Borrowers currently not considered credit worthy may in fact be bankable, once reduced energy costs are factored in. ✓ There is unrealized opportunity to adjust current lending activities to better capture the monetary values of reduced energy costs.
• There is substantial need to stimulate clean energy investment in the commercial and industrial sectors without requiring upfront cash or "on balance sheet" debt. This is important in order to preserve capital needed for other pressing C&I priorities and needs.	✓ Business and industry create jobs. Energy costs come straight off the bottom line. Overall financial performance can be improved with cost effective clean energy investments. ✓ New approaches are needed for off-balance sheet clean energy financing for business and industry of all sizes.
• Municipalities face competing demands for revenue generated from local taxes. Small towns, especially, often do not have the cash available to pay the upfront costs of cost-effective energy efficiency and renewable energy improvements that would reduce town energy bills.	✓ Any reduction in municipal energy costs frees up tax revenues for other purposes. In addition, municipalities can lead-by-example, helping to stimulate clean energy investments by others.
• There is a lack of affordable, accessible, and easy-to-use clean energy financing options for low to moderate income households and for renters.	✓ Those living on the economic margins are the most in need of reducing energy costs, as difficult decisions are made between energy, housing, food, clothing, medical care, and transportation.
• A variety of state-level policy and regulatory barriers exist to community solar.	✓ Community solar can provide improved economies of scale compared to customer-sited solar and increased local economic benefits compared to utility-scale solar. Community solar also has the potential for being made available to low to moderate income households and renters. ✓ Community solar state policy and regulatory barriers increase risk for solar developers and result in an increased cost of capital as developers focus investment instead on other, more profitable types of solar development.
• More than one half of the greenhouse gas emissions in Northern New England is from transportation, with light duty vehicles (i.e. personal vehicles and trucks) accounting for much of that carbon pollution. Potential exists for increasing the electrification of transportation, powered by clean energy. However electric vehicles are only in the early phases of adoption in the region and represent a small portion of total vehicle sales.	✓ Increasing the use of electric vehicles charged with clean energy can significantly reduce greenhouse gas emissions. ✓ Education, outreach, incentives, and expansion of EV charging infrastructure are needed to stimulate market uptake.
• Heavy duty diesel vehicles generate about 20% of transportation carbon emissions. Diesel-fueled	✓ "High profile" vehicles such as transit and school buses have great promise for electric vehicle

transit buses and school buses serve some of the most vulnerable populations in the region, exposing passengers to toxic diesel emissions.	demonstration projects, ideally charged with clean energy. Such projects can increase understanding of the market readiness of electric vehicles and can help stimulate market uptake.
● The societal costs of fossil-fueled transportation are not accounted for in existing federal or state policy and regulatory approaches.	✓ There is substantial opportunity for the state regulatory oversight of electric utilities to become a pathway for electrifying transportation using clean energy. ✓ This could help achieve greenhouse gas reduction goals while increasing sales for electric utilities.

5.2 VEIC's Assessment of Clean Energy Funding and Finance, By State

Results of the VEIC's qualitative assessment of the clean energy funding and finance in each state are provided in Table 9 for the residential sector, Table 10 for the commercial and industrial sector, and Table 11 for the transportation sector. The following impacts are assessed:

- The **GHG reduction impact** of investing in clean energy is ranked as high, medium, or low for each market segment. The designation was made based on the overall size of the market segment in each state and the potential for offsetting fossil fuel use in the market segment.
- The **equity impact** of investing in clean energy is ranked as high, medium, or low. The designation is based on the extent of low income households in or affected by the market segment in each state, and the potential for improving energy equity for them through clean energy investment.
- The **job creation impact** is also ranked high, medium, or low based on the overall size of the market segment and the potential for creating jobs by increasing clean energy use in the market segment.

This was done to help make it clear that GHG reduction, equity, and job creation impacts resulting from clean energy vary depending on which market segment is being served. This information helps inform decisions about which new or expanded funding and financing to pursue in the future, depending on which impacts are of greatest importance to decision-makers.

In addition, in each table the effectiveness of the various existing funding and financing mechanisms are qualitatively assessed for each market segment.

- **Green** indicates that the current demand and supply for the funding or financing are well matched and generally working well for the market segment.
- **Yellow** indicates a less than ideal match of supply and demand, or a funding or financing mechanism not well suited to the actual needs of that market segment.
- **Red** indicates that there is substantial and ongoing greater demand than supply for the funding or financing, and therefore a significant unmet market need.
- **Blue** indicates a new funding or finance mechanism not in place yet for that market segment that could have a substantial impact on scaling clean energy investment in that segment in the future.
- **White** indicates that the funding or finance mechanisms is not directed at that particular market segment.

It is important to note that the qualitative assessment was done based on the best professional judgment of VEIC. Results were used to help identify where the greatest needs are for new or expanded clean energy finance in the future. In providing this assessment, VEIC recognizes that others might assess the market differently and form different conclusions as a result.

Table 9. VEIC Assessment of Residential Clean Energy Funding and Financing.														
	Single Family - Bankable			Single Family - Low credit score			Multi-family - Bankable			Multi-family - Renters	Mobile homes - Low credit score			Notes
	ME	NH	VT	ME	NH	VT	ME	NH	VT	All	ME	NH	VT	
GHG Reduction Impact	H	H	H	H	H	H	M	M	M	H	M	M	M	From reducing heating with fossil fuels
Equity Impact	L	L	L	H	H	H	M	M	M	H	H	H	H	By serving low to moderate income
Job Creation Impact	M	M	M	M	M	M	M	M	M	L	L	L	L	Energy auditors, EE contractors, RE installers
EE and/or RE Funding Mechanisms														
Weatherization Assistance Program														1 of 3 NH WAPs has an 8-year waiting list
Efficiency Maine, NHSaves, Efficiency Vermont rebates, incentives														Rebates and incentives are not helpful for low to moderate income unless they cover total project costs
Government grants														Some government grants are available for income eligible single and multifamily housing
Foundation grants	Not typically available for the residential sector													
Tax credits														Not helpful for low to moderate income
EE and/or RE Financing Mechanisms														
Loans – banks, credit unions, CDFIs, government														Not helpful for those with low credit scores; for those who are bankable, energy savings are typically not being underwritten with the exception of a few lenders
Credit enhancements														Credit enhancements are helpful for lenders but not for those with low credit scores
Green bank														There is not currently a green bank serving ME, NH, or VT
Leases														Primarily bankable for solar PV
Property assessed clean energy														"Junior lien" R- PACE in ME, R-PACE in VT but no uptake
Tariffed on-bill financing														No residential TOBF at this time
Traditional equity financing	Not typically used for residential sector unless aggregated for community or grid-scale solar													
Tax equity financing	Not typically used for residential sector unless aggregated for community or grid-scale solar													
Carbon pricing														RGGI is not in effect for fossil fuels used for heating (or transportation)

Table 10. VEIC Assessment of Commercial and Industrial Clean Energy Funding and Financing.										
	SME[24]			C&I[25]			MUSH [26]			Notes
	ME	NH	VT	ME	NH	VT	ME	NH	VT	
GHG Reduction Impact	L	L	L	L	L	L	M	M	M	From reducing heating with fossil fuels
Equity Impact	L	L	L	L	L	L	M	M	M	By serving low to moderate income
Job Creation Impact	M	M	M	M	M	M	M	M	M	Energy auditors, EE contractors, RE installers
EE and/or RE Funding Mechanisms										
Efficiency Maine, NHSaves, Efficiency Vermont rebates, incentives										Most ratepayer funded EE programs are now able to be managed so that demand for rebates and incentives typically do not exceed the supply
Government grants										SME, commercial buildings, and MUSH are eligible for some government grants but demand is often larger than supply; industrial buildings are typically not eligible for government grants
Foundation grants	Not typically available for the C&I sector.									
Tax credits	Not typically available for the C&I sector.									Limited primarily to the federal Investment Tax Credit which may be used for community solar PV, grid-scale solar PV, or grid-scale wind projects producing power used by these market segments
EE and/or RE Finance Mechanisms										
Loans – banks, credit unions, CDFIs, government										Energy savings are typically not being underwritten except by a few lenders
Credit enhancements										Some utility EE programs and agencies assist SME and C&I with credit enhancements, but the practice is not widespread
Green bank										There is not currently a green bank serving ME, NH, or VT
Leases										Primarily for bankable for solar PV
Property assessed clean energy (PACE)										There is a commercial PACE statute in NH but there is no entity offering it yet
Tariffed on-bill financing										In NH, offered by Eversource, Liberty, and Unitil to municipal customers; offered by NH Electric Cooperation to municipal and C&I customers
Traditional equity financing										Solar PV developers report sufficient capital but at too high a cost due, in part, to policy and regulatory risk.
Tax equity financing										Typically used by RE developers primarily for community solar and grid-scale solar; there are a few large MUSH applications but not typically used for SME and C&I due to high transaction costs.
Carbon pricing										RGGI is in place in all 3 states but its limited to fossil fueled power generation only and not heating and transportation

[24] Small and Medium Enterprises
[25] Commercial and Industrial
[26] Municipal Buildings, Universities, Schools, and Hospitals

Table 11. VEIC Assessment of Transportation Clean Energy Funding and Financing.													
	Personal Vehicles			Transit Buses			School Buses			Freight Transportation			Notes
	ME	NH	VT	ME	NH	VT	ME	NH	VT	ME	NH	VT	
GHG Reduction Impact	H	H	H	M	M	M	L	L	L	M	M	M	From reducing fossil fuels
Equity Impact	H	H	H	H	H	H	H	H	H	M	M	M	By serving low to moderate income
Job Creation Impact	M	M	M	L	L	L	L	L	L	M	M	M	From electric vehicle sales and service
Transportation Funding Mechanisms													
Vehicle rebates or incentives													VT has utility-funded vehicle incentive programs through Tier 3; state electric transit and school bus rebates through VW settlement funding
Tax credits													Federal tax credits for EV purchases begin to sunset at $200,000 sales per automaker
Government grants													Grants for EV charging funded by VW and FTA transit bus grants are oversubscribed
Utility EV charging grants or incentives													Some VT utilities offer small grants for public, workplace, and multi-unit charging
Transportation Financing Mechanisms													
Loans – banks, credit unions, automaker captive finance													Strong availability of loan financing for electric vehicle purchases
Leases													Electric vehicle leases are popular as they include the federal tax credit
Credit enhancements													Not proven in transportation, but has potential
Green bank													If green bank concept(s) advances, it could incorporate transportation electrification opportunities
Property assessed clean energy	Generally not applicable for transportation, although minor potential to include EV charging infrastructure as part of PACE investment packages												
Tariffed on-bill financing	Not typically used for transportation, although some utilities may offer tariffs for charging equipment; exploration is underway for adapting TOBF model for transit buses[27]												
Traditional equity financing	Not typically used for the transportation sector												
Tax equity financing	Not typically used for the transportation sector												
Carbon pricing													

[27] Clean Energy Works has developed a "PAYS" model for transit bus applications - http://www.cleanenergyworks.org/home/clean-transit/

Section 6. Seizing Challenges as Opportunities

Challenges can be viewed as unrealized opportunities waiting to happen. As shown in Figure 8, there are a variety of ways to advance clean energy finance in Northern New England in meaningful and impactful ways. They include: advocacy, policy development, and regulatory change; enhancing new offerings and/or their delivery; developing new offerings; and raising new capital. The portfolio of initiatives recommended in this report include a mix of each of these.

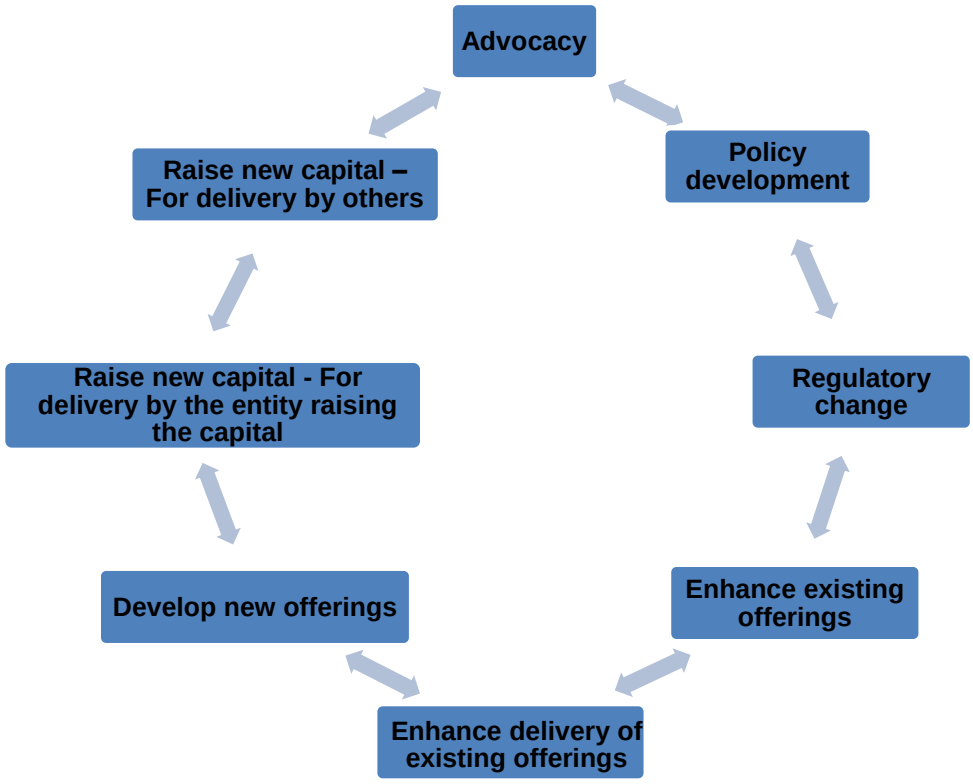

Figure 8. Opportunities for engagement.

6.1 High-level Strategic Guidance

Two foundational issues are essential to consider when engaging with existing and new clean energy finance offerings:

- There will be no single “silver bullet” that transcends the myriad of regional and state-specific challenges to significantly scaling up clean energy investment.
- It is not enough to simply create another financing entity with yet again another source of capital. Rather, existing and new offerings must be fully integrated with a well-developed sales and marketing approach from the beginning.

6.2 Key Principles for Success

Key principles for success include:

- Offerings should deal with actual barriers or gaps. A critical first step is clearly stating the problem and how the proposed solution will address the problem.
- Financing should be offered at market rates, with reduced or zero interest rates for income-eligible applicants.
- Financing should be supported with credit enhancements to allow more applicants to qualify.
- Financing should be structured to result in positive cash flow – enabling longer loan terms if necessary so monthly loan payments are not higher than the energy savings.
- The gap between the perceived risk of lenders and the actual risk should be bridged in some way (through a loan guarantee, loan loss reserve, or other means).

6.3 Common Pitfalls

Common pitfalls include:

- Insufficient market demand - This can be addressed by ensuring there is a sales and marketing component designed into each offering from the beginning and a clear strategy for who and how the sales and marketing will be completed. The experience with many (but not all) existing offerings is that simply developing a clean energy finance offering and listing it on a website will not be sufficient for generating market demand.
- Customer reluctance to clearing the hurdles – other priorities.
- Lack of customer confidence in savings estimates.
- Customer reluctance to taking on debt – Yankee frugality.
- Low fossil fuel prices dampen demand for EE financing.
- Shifting solar incentives lowers demand for PV financing.

Section 7. Policy and Regulatory Strategies for Scaling Clean Energy Investment

Key to scaling clean energy private investment is ensuring that the policy and regulatory framework in each state - and across the region - is enhancing clean energy investment and not creating unnecessary barriers to such investment. Presented below are a portfolio of policy and regulatory initiatives recommended for action in Northern New England. The initiatives address key challenges discussed above and are well suited to the capabilities and strengths of TNC and CEI.

When developing these recommendations, attention was paid to selecting initiatives that complement (and do not duplicate) the actions of the many other market actors also involved in clean energy finance. For each initiative, a high-level qualitative assessment was done of the impact on mitigating greenhouse gas emissions, stimulating jobs, and improving energy equity for low to moderate income households. In addition, the market segments to be served by the initiative were identified and best practices for ensuring the initiative is successful were provided. This information was used to advise TNC and CEI on the state-specific actions they each might pursue in order to continue to advance clean energy finance in Northern New England.

Recommendation 1:
Implement Regional Carbon Pricing for all Energy Produced from Fossil Fuels

What is Carbon Pricing?

Carbon pricing is an instrument that captures the external costs of greenhouse gas emissions - the costs of emissions that the public pays, such as health care costs, costs from heat waves and droughts, and costs from loss of property from flooding and sea level rise—and ties them to their sources through a price, usually in the form of a price on the carbon dioxide emitted. A price on carbon helps shift the burden for the damage from GHG emissions back to those who are responsible for it and who can avoid it.

Instead of dictating who should reduce emissions, a carbon price provides a market-based pricing signal for emitters. Carbon pricing allows GHG emitters to decide to either transform their activities and lower their emissions or continue emitting and paying for their emissions. Placing a price on GHG emissions is a way to internalize the external cost of climate change. It can help to mobilize financial investments required to stimulate clean energy technology and market innovation, fueling new, low-carbon drivers of economic growth.

Instituting carbon pricing may be the single most effective mechanism for catalyzing the transition to a clean energy (decarbonized) economy. For governments, carbon pricing is a key element of the climate policy package needed to reduce emissions. In most cases, it is also a source of revenue, which can be refunded to taxpayers or used to invest in public goods. Businesses can use internal carbon pricing to evaluate the impact of mandatory carbon prices on their operations and as a tool to identify potential climate risks and revenue opportunities. Long-term investors can use carbon pricing to analyze the potential impact of climate change policies on their investment portfolios, allowing them to reassess investment strategies and reallocate capital toward low-carbon or climate-resilient activities.

There are two types of carbon pricing: emissions trading systems (referred to as ‘cap and trade’) and carbon taxes. Further development of a cap and trade approach is recommended as the best-fit approach for Northern New England, given each state’s current participation in an existing regional cap and trade program for the electricity generation sector, the Regional Greenhouse Gas Initiative.

The Regional Greenhouse Gas Initiative

One of the most successful cap and trade programs in the US is the Regional Greenhouse Gas Initiative (RGGI) – a formal collaboration among nine Northeastern and Mid-Atlantic states to reduce carbon dioxide emissions from the fossil-fuel electric power sector. RGGI provides an important model that can help inform creation of a more comprehensive, regionwide carbon pricing approach in Northern New England.

States participating in RGGI agree to a regional limit on the amount of carbon pollution that fossil fuel power plants are allowed to emit in the region. Pollution permits are sold to the power plants up to the limit through quarterly auctions and fossil-fuel power plants are required to buy the permits. The number of permits is reduced each year, so that the region’s power plants contribute progressively fewer emissions to global warming. RGGI has accomplished the following since it started in 2008:

- Reduced carbon pollution in the nine Northeast and Mid-Atlantic States by one-third;
- Saved consumers $1.5 billion on utility bills;
- Created over 22,000 jobs from investments in energy efficiency and renewable energy that replaced fossil fuel-based power;
- Generated $2.9 billion in increased economic activity;

- Reduced fossil-fuel purchases by $1.27 billion from 2011-2014 alone; and
- Doubled renewable energy as a percent of electricity generation.

The revenue generated from the auction of permits (referred to as "cap and trade allowances") is used by states in a variety of ways, including providing support for energy efficiency services provided by Efficiency Maine, NHSaves, and Efficiency Vermont.

The Need to Expand the Regional Carbon Market

Since the thermal and transportation sectors produce a large amount of carbon emissions in Northern New England, there is a significant need for carbon pricing that extends beyond just fossil-fueled power generation. Ensuring the carbon market addresses both thermal and electrical energy production from fossil fuels would be a significant step towards reducing greenhouse gas emissions and stimulating investment in clean energy in the region. For this reason, implementing regional carbon pricing informed by the RGGI model is included as a recommendation.

The Transportation and Climate Initiative (TCI)

The Transportation Climate Initiative (TCI) is a regional collaboration that includes 13 Northeast and Mid-Atlantic states and the District of Columbia working to advance a clean energy economy, strengthen transportation, and reduce greenhouse gas emissions through the transportation sector. Several of the TCI states are exploring the potential for regional and market-based policies that could improve transportation and reduce pollution. In December 2018, nine of the TCI states announced their intention to design a new regional low-carbon transportation policy that would cap and reduce carbon emissions from the combustion of transportation fuels and invest the proceeds into low-carbon and more resilient transportation infrastructure.[28] Vermont was one of the nine states signing on for the announcement. Maine and New Hampshire can join the initiative at any time. Broader state participation will provide more opportunities to craft policies improving transportation efficiency and equity in these states. These issues are particularly relevant to rural economies in northern New England.

The Western Climate Initiative Model for Expanding the Regional Carbon Market

The Western Climate Initiative (WCI) can serve as a model for regional carbon pricing. Formed in 2007 when the Governors of Arizona, California, New Mexico, Oregon, and Washington signed an agreement directing their states to develop a regional target for reducing greenhouse gas emissions, the Western Climate Initiative (WCI) can serve as a model for Northern New England. As part of the agreement, the Governors committed to participating in a multi-state registry to track and manage greenhouse gas emissions in the region, and to develop a market-based program to reach the target. Originally focused on fossil fuel-based power generation, the initiative has since been expanded to include fossil fuels used for heating and transportation.

During 2007 and 2008, the Premiers of British Columbia, Manitoba, Ontario, and Quebec, and the Governors of Montana and Utah joined the original five states in committing to tackle climate change at a regional level. All 11 jurisdictions collaborated in the development of the *Design for the WCI Regional Program* published in 2010.[29]

In 2011 a non-profit corporation, the Western Climate Initiative, Inc was formed that provides administrative and technical services to support the implementation of state and provincial greenhouse gas emissions trading programs.[30] British Columbia, California, Ontario, Quebec, and Manitoba continue to work together

[28] https://www.transportationandclimate.org/statements-support-regional-low-carbon-transportation-policy-development-announcement
[29] http://www.westernclimateinitiative.org/history.
[30] ibid

through the Western Climate Initiative to develop and harmonize their emissions trading program policies. They are also working with Western, Midwestern, and Northeast states on a range of other climate and clean energy strategies through the North America 2050 Initiative.[31]

High-Level Strategic Guidance for Moving Forward

In Northern New England, the thermal and transportation sectors combined account for nearly three-quarters of GHG emissions. In order to reach existing carbon reduction goals, carbon pricing must be expanded beyond the electricity-generating sector. The TCI and WCI each in their own ways provide possible roadmaps for action for Northern New England.

Instituting regional carbon pricing across all energy production from fossil fuels will require substantial policy and regulatory change in each of the three Northern New England states. Nearby states can serve as inspiration and deliberate efforts to harmonize state policies across the region can alleviate some of the challenges in sending consistent policy and regulatory signals to the market place. For example, the Massachusetts Senate unanimously passed a carbon pricing bill in 2018. Carbon pricing legislation has also been introduced in Connecticut, New York, and Rhode Island and is under consideration in New Hampshire and Vermont.[32]

<table>
<tr><th colspan="4">Regional Carbon Pricing Conclusions</th></tr>
<tr><th colspan="4">The Challenge</th></tr>
<tr><td colspan="4">The lack of a market-based pricing system that stimulates investment away from fossils fuels to energy efficiency, distributed energy resources, and grid-scale renewable energy for buildings, electricity, and transportation.</td></tr>
<tr><th colspan="4">How the Challenge is Addressed</th></tr>
<tr><td colspan="4">Carbon-pricing brings a market-based solution that can be adjusted to meet the GHG goals set by each member state. Unlike a carbon tax, the cap and trade approach is a catalyst for market-based solutions to reducing carbon emissions.</td></tr>
<tr><th colspan="2">Recommended for</th><th colspan="2">Market Segments Served</th></tr>
<tr><td colspan="2">Maine, New Hampshire, Vermont (and beyond)</td><td colspan="2">All</td></tr>
<tr><th colspan="2">GHG Reduction</th><th colspan="2">Jobs Creation Impact</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>How</th></tr>
<tr><td>High</td><td>By creating market incentives to reduce emissions</td><td>High</td><td>By stimulating investment in energy efficiency and renewable energy</td></tr>
<tr><th colspan="2">Equity</th><th colspan="2">Level of Effort</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>Why</th></tr>
<tr><td>High</td><td>Revenues generated could be invested in programs designed to reach low to moderate income households</td><td>High</td><td>Carbon pricing has great potential to transform the market</td></tr>
<tr><th colspan="4">Best practices / lessons learned for a successful offering</th></tr>
<tr><td colspan="4">• Limit GHG emissions from all major sources of climate change pollutants – not just from electricity generation at power plants.
• Include all electricity-related emissions in a cap including those associated with electricity imported from outside the region.</td></tr>
</table>

[31] ibid

[32] https://www.ncel.net/carbon-pricing/.

• Ensure that all regulated entities use a consistent reporting methodology to enable accurate accounting of progress being made towards carbon reduction targets. • Mitigate economic impacts on consumers and regulated entities by allowing flexibility in how and when the reductions are made (e.g. enable the banking of allowances and limit the use of offsets). • Engage in state and regional initiatives seeking to implement carbon pricing in Northern New England. • Serve in leadership roles on state-level and local climate action groups. • Initiate engagement with executive level decision-makers and key legislative leaders to help build support for carbon pricing. • Publicly support the work and activities of other carbon pricing advocates and industries and businesses with carbon-reducing sustainability goals and initiatives in Northern New England.
Why is this recommended?
Expanding carbon pricing is perhaps the single most significant way to stimulate investment in clean energy and increase demand for clean energy financing by all market segments.

Recommendation 2:
Support Activities that Advance Performance-Based Regulation

Utilities play a crucial role in the Northern New England economy and infrastructure. As energy efficiency, renewable energy use, and the electrification of transportation increase in the region, recognition is growing that the current utility business model must change as should the way in which costs are recovered and revenues and earnings are calculated. As energy efficiency, demand side management, distributed energy resources, and grid-defection reduce the utility customer base and the need for legacy grid infrastructure, forecasts upon which rates are predicated may increasingly deviate from actual performance. As the utility cost burden is slowly shifting to a declining number of customers, alternative revenue generating activities have not yet fully emerged. Utilities are anticipated to need an alternative path for transitioning to the "utility of the future."

Performance-based regulation (PBR) offers a new tool for states to reward utilities for ramping up cost-effective and prudent energy efficiency and grid investments. Efforts to decouple rate revenue from forecasts that are predicated on traditional usage assumptions are a starting point for moving the industry towards PBR. Decoupling "is a regulatory tool designed to separate a utility's revenue from changes in energy sales…[it] has the benefit of encouraging the substitution of renewable resources, distributed generation and energy efficiency for the utility's fossil fuels production (by reducing a utility's disincentive to promote these types of resources and programs), while simultaneously protecting a utility's financial health from erosion as these types of programs go into effect."[33] Decoupling removes the incentive to sell more power since it breaks the link between a utility company's sales and total electric [or gas] revenue.[34] However, more regulatory reform is needed beyond just decoupling to support a full transition to a modern grid able to take full advantage of efficient, distributed clean energy resources, electrification of transportation, and integration of emerging battery storage technologies.

The Status of Performance-Based Regulation Nationwide

The details of transitioning from a utility rate-of-return business model to a new model that incorporates clean energy will vary nationwide as each state's executive branch, Legislature, and Public Utility Commission develops and refines its policy and regulatory framework. To help enable this, a growing body of literature is available from experts who are calling for new utility business models and new policy and regulatory approaches for achieving them.[35]

The Regulatory Assistance Project began a blog in 2018 to "examine best practices, design consideration, and specific applications for what goes into the 21st century brew that is Performance Based Regulation."[36] The RAP blog explains that the reason for an emerging PBR system is because the traditional model upon which most utility regulation rests is becoming obsolete. Rate revenue is based on the conventional generation and transmission infrastructure, which is a "cost of service" model that allows utilities to recoup and make profit on their capital investments in the traditional grid.

An example of a "Performance Incentive Mechanisms (PIM)" is when regulators adopt a percentage reduction in peak load as a metric for utilities to achieve. The methodology for setting a reduction target is complex, but the concept is that a utility would be rewarded for achieving a reduction target rather than be

[33] Hawaii Public Utilities Commission Docket No. 2013- 0141, p.2-3.
[34] *Ibid, p.4.*
[35] "*The Old Order Changeth: Rewarding Utilities for Performance, Not Capital Investment*." Scudder Parker, VEIC and Jim Lazar, Regulatory Assistance Project. ACEEE Summer Study on Energy Efficiency in Buildings. 2016
[36] "*Brewing Up the Regulation of the Future*." Camille Kadoch et. al., Regulatory Assistance Project, June 14, 2018 https://www.raponline.org/blog/brewing-up-the-regulation-of-the-future.

coerced to achieve through regulatory requirements.[37] Presented below is a comparison between traditional cost-of-service regulation and performance-based regulation.

Table 12. Traditional cost-of-service regulation compared to performance-based regulation. [38]

	Traditional Cost-of-Service Regulation	Performance-based Regulation
Goals	Focus on reliability, affordability, adequacy of highly centralized electricity delivery systems. Consumers are protected from monopolistic power through reasonable rates and careful regulatory oversight.	Focus on traditional regulatory goals, as well as specific outcomes defined by policymakers, utilities, and stakeholders. Consumers receive reliable services. Facilitates opportunities for customer and third-party value creation and innovation.
Incentives for Utilities	Revenues (expenses + depreciation + taxes+ return on rate base) are designed to match costs. Regulators approve costs, which are recovered in rates, often based on per-unit (volumetric) energy usage. The utility is incentivized to increase usage to drive up revenues.	Revenues are earned through a variety of rates and programs. Incentives are designed, communicated, and evaluated. More sophisticated rates are designed to facilitate reliable services and technology deployment. Utility earnings incentives are aligned with policy outcomes rather than increased usage.

Implementation of performance-based regulatory frameworks is active across the country as shown in Figure 9. Hawaii, Rhode Island, and Minnesota are the farthest along in this transition with Ohio and Illinois close behind.[39]

[37] "*Designing a Performance Incentive Mechanism for Peak Load Reduction: A Straw Proposal*." Michael O'Boyle, Energy Innovation Policy & Technology, LLC, April 2016. http://americaspowerplan.com/wp-content/uploads/2014/10/Peak-Reduction-PIM-whitepaper.pdf

[38] "*Performance-Based Regulation. Aligning Utility Incentives with Policy Objectives and Customer Benefits*." An Issue Brief by Advanced Energy Economy, June 5, 2018. Advanced Energy Economy

[39] "America's Utility of The Future Forms Around Performance-Based Regulation." Sonia Aggarwal, Forbes, May 7, 2018.

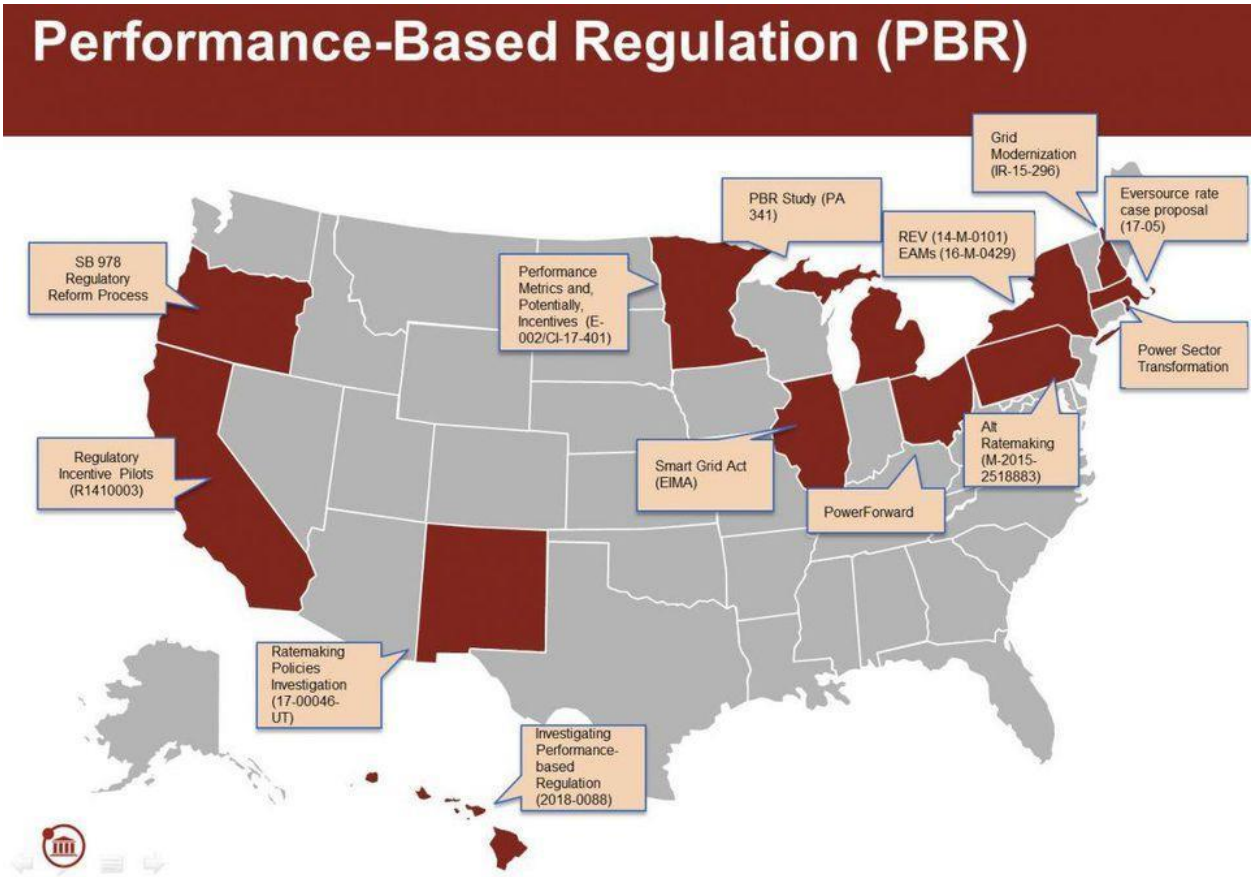

Figure 9. Activities related to performance-based regulation across the US. [40]

The transition to PBR generally occurs collaboratively as "utilities are embracing this change - 81% of utilities said they already have or want a regulatory proceeding in their state to reform utility business and revenue models, and 73% expect to operate either in a hybrid COS-PBR or predominantly PBR-based environment within 10 years."[41] The PBR experience is emerging as a collaborative process among utilities, regulators, advocates, and consumers who engage "transformative scenario planning" that generates recommendations for regulators.

The Opportunity for Performance-Based Regulation in Northern New England

Although PBR is not a capital formation or financing delivery mechanism, it represents a regulatory approach that will be needed to bring clean energy investments and grid transformation to scale. For policy thought leaders, opportunities for advancing PBR in Northern New England are important to watch out for and to ensure that the full range of stakeholders are involved in the discussion. Increasing focus on grid modernization needs in each of the three states can be a pathway for increasing support for and achieving PBR.

Rhode Island serves as a leader in New England for advancing a mechanism that weans utilities from cost-of-service regulation. In March 2017, the Rhode Island Governor directed state regulators to determine how utility regulations could help affordably and reliably reduce emissions to 80% below 2005 levels by 2050.

[40] "American's Utility of the Future Forms Around Performance-Based Regulation." Sonia Aggarwal, VP of Energy Innovation. May 7, 2018. https://www.forbes.com/sites/energyinnovation/2018/05/07/americas-utility-of-the-future-forms-around-performance-based-regulation/#7a5d2e962bb2.
[41] *Ibid*

An inter-agency team implemented a stakeholder process that produced the *Power Sector Transformation Phase One* report.[42] The report recommends changes to the existing utility business model including linking utility profits to performance through metrics and incentives to boost demand-side energy management and integration of DERs like renewables and energy storage. The Rhode Island stakeholder process is an example of an effective way to move state regulatory processes toward a viable utility system that can accommodate clean energy integration.

The Experience thus far in Maine and Vermont

The Public Utilities Commissions in Maine and Vermont have each, in their own way, begun exploring alternative approaches to rate regulation, but not specifically for energy efficiency or clean energy purposes (yet).

In Maine, Central Maine Power was given marketing flexibility to enter into contracts with 18 large-volume customers to provide favorable terms to prevent them from decreasing energy purchases through self-generation. Through a series of Multiyear Rate Plans (MRP), CMP's performance was protected from the revenue loss – and subsequent business failure – that would have been substantial if the large-volume customers had installed self-generation capacity or reduced electricity purchases.[43]

Vermont experimented with an alternative rate plan when its two largest investor-owned utilities merged and needed to reorganize their cost basis. The plan provided a three-year hiatus from annual rate case litigation and contained a set of performance requirements (but not incentives) associated with the evolving smart grid. Before the end of the term of the plan, however, GMP terminated its participation. Shortly thereafter, an independent evaluation of the plan was conducted by the Vermont Attorney General. The evaluation determined that the process did not serve the parties as well as intended. The advocacy group AARP subsequently requested that the Vermont Legislature restructure the alternative regulation statutory framework to improve the process.[44] Vermont's initial foray into an alternative process that allows utilities more flexibility to reorganize their cost basis plants the seeds for creating a more robust policy framework that can achieve the regulatory outcomes that PBR is designed to meet.

These alternative approaches to rate setting are examples of potential pathways for the regulatory reform needed to support a clean energy grid. Once the foundation is laid for increased operating flexibility, multi-year agreements can integrate performance incentives for energy efficiency, demand-side management, renewable energy, and transportation electrification.[45] Moving forward, clean energy, environmental, and other advocates have the potential to engage in and influence efforts to achieve performance-based regulation in each Northern New England state.

Performance-Based Regulation Conclusions
The Challenge Addressed
The current utility cost-recovery mechanism is through rates, a business model that is becoming incompatible with a clean energy grid.
Performance-based regulation supports a process that allows utilities, regulators, and stakeholders to test new pricing structures associated with the utility delivery of alternative services, products, and performance metrics that promote clean energy solutions.

[42] *Rhode Island Power Sector Transformation Phase One*. http://www.ripuc.org/utilityinfo/electric/PST%20Report_Nov_8.pdf
[43] ibid
[44] Report Confirms GMP Customers Not Well-Served by Alternative Regulation. Taylor Dobbs. January 19, 2017. http://digital.vpr.net/post/report-confirms-gmp-customers-not-well-served-alternative-regulation#stream/0
[45] "Performance-Based Regulation for US Electric Utilities." Mark Newton Lowry, PhD, President, Pacifica Economics Group Research, LLC. for Lawrence Berkeley National Laboratory. National Conference of Regulatory Attorneys, Portland, Oregon. May 10, 2017. slides 7-8.

Recommended for		Market Segments Served	
Maine, New Hampshire, and Vermont		All	
GHG Reduction		**Jobs Creation Impact**	
Impact	**How**	**Impact**	**How**
High	PBR could result in utilities being properly incented to achieve significant investment in energy efficiency, renewable energy, and electrification of the vehicle fleet with clean electricity.	High	PBR could significantly scale clean energy investment in the utility sector, resulting in a substantial increase in local energy efficiency jobs and construction jobs for on-site and grid-scale renewable energy projects.
Equity		**Level of Effort**	
Impact	**How**	**Impact**	**Why**
Variable	PBR could and could not have positive impacts on increasing equity for utility customers most in need. It would depend on the extent to which utilities are incented for addressing energy equity issues for their customers.	High	PBR is a major regulatory change that will require the advocacy, support, and hard work of many in each state.

Performance-based regulation is a way to restructure the cost basis and revenue mechanisms for utilities. It can provide a new performance-based approach for increasing utility investment in energy efficiency, transportation electrification, and grid modernization.

Best practices / lessons learned for a successful offering

- Engage with utilities, energy efficiency program administrators, regulators, and advocates to identify the goals to be achieved with PBR.
- Develop a policy framework that achieves the goals and desired outcomes, ideally engaging all key stakeholders affected.
- Seek opportunities to combine tools such as rate decoupling and a renewable portfolio standard with performance-based regulation.
- Include energy efficiency, renewable energy, and carbon reduction goals in the policy framework created for PBR.

Why is this recommended?

PBR is an innovative approach that could become the next best practice for electric and gas utility regulation. Clean energy financing could be a key component of PBR solutions delivered by utilities, either directly or in partnership with administrative entities. As such, PBR is a new regulatory framework that could result in greatly increased clean energy financing available through the utilities.

Recommendation 3: Address Policy and Regulatory Barriers to Community Solar

Community solar projects are renewable energy installations that share financial benefits with multiple small customers. Each state in the region is home to existing community solar projects. However, the rate at which new projects are being developed is decreasing. Industry leaders report this is not primarily due to a lack of capital but rather due to state policies and regulatory requirements that limit profitability compared to customer-sited or grid-scale projects. Policy and regulatory changes are needed in each of the Northern New England states to help make community solar more financial advantageous and to ensure the regulatory and approval process is more predictable.

What is Community Solar?

A *community solar* project is a photovoltaic (PV) system sited either on a building or on the ground whose electricity is shared by more than one household or business. Community solar can refer to both *community*-owned projects as well as third party-owned plants whose electricity is shared by a *community*.

Community solar offers numerous clean energy benefits to customers and local economies. By utilizing group net-metering rules, participants opt-in to receive net-metering credits that offset their own electricity consumption. Credits are distributed proportionally based on each participant's share assigned in advance. This process is referred to as "virtual" net metering, because unlike standard net metering, the community solar project is not located on the same property as some (or all) of the utility customers receiving the credits. However, all participants in a community solar project must be served by the same utility and the project must located in that utility's service territory.

Community solar projects allow participants to receive the benefits of installing solar PV even if they are unable to site it at their own location (due to shade or other impracticalities), unable to afford the upfront cost, or are not eligible for loans or leases. Community solar projects spread financial benefits across multiple customers and improve installation and customer acquisition economies-of-scale over single-customer rooftop or ground-mounted solar. As such, community solar reduces project risk.[46] Industry interviews indicate that banks are experienced in lending to large commercial and bankable residential participants for community solar projects, but rarely offer loans to small businesses or low and moderate income households for the upfront investment.

As with other solar PV projects, community solar projects are structured to monetize the value of federal tax credits. Projects can take different legal forms.[47]

- Utilities can own projects outright and utilize the Business Energy Investment Tax Credit (ITC) and accelerated depreciation (the IRS' Modified Accelerated Cost Recovery System, or MACRS).
- Projects can be self-financed by community participants, although this is typically tax inefficient.
- Community solar projects can be organized as a limited liability company (LLC) or limited partnership (LP) with a tax-motivated (for-profit) investor acting as the majority investor. This enables the investor to monetize the tax benefits during the first six years of the project before a "flip", wherein the majority investor becomes a minority investor who is bought out by the community participants.
- A "sale-leaseback" arrangement involves community partners developing the project and then selling it to a tax-motivated investor capable of monetizing tax benefits. The investor then leases

[46] Feldman, David, and Mark Bolinger. 2016. On the Path to SunShot: Emerging Opportunities and Challenges in Financing Solar. https://www.nrel.gov/docs/fy16osti/65638.pdf.
[47] National Renewable Energy Laboratory. 2010. A Guide to Community Solar: Utility, Private, and Non-profit Development. https://www.nrel.gov/docs/fy11osti/49930.pdf.

the project back to the community partners who are the community net-metering recipients.[48] These projects must work within limits placed on unaccredited investors, namely "private placement" rules that limit the number of individuals holding a stake in the project. While state and federal securities laws can appear daunting, projects have been successful by replicating existing contracts and disclosures, and multiple projects can be located adjacent to each other on the same parcel of land.

- Sun Shares is an approach to community solar developed by VEIC in 2016. The Sun Shares model offers community solar to employees, who receive monthly bill credits and can participate in the solar project regardless of financial history or homeownership. The employer acts as a "backstop" by applying any unused credits to its own electricity bill. This approach can also serve commercial building owners with large roofs or parking lots but independently metered tenants and little electricity use on the landlords' own account.[49] Tax credits accrue to the equity investor, who can be an outside partner or the building owner.

Some states have low-income carve-out requirements for community solar projects. For example, the District of Columbia uses electric utility alternative compliance payments as upfront payments for community solar projects exclusively serving low-income residents.[50] Other options include:

- Encouraging—through rates or other means—projects to incorporate municipal or agencies serving low-income residents, thereby reducing operating costs.
- Requiring state-supported multifamily housing projects to include community solar projects

The Importance of Policy and Regulation to Enabling Community Solar

Community solar policies and regulation are established by state statute and state utility commission regulation. They vary by state and greatly affect the profitability of projects in each state. Key state policies and regulation address: siting guidelines, the maximum number of participants allowed per project, the total capacity of community projects allowed, eligible customer types, interconnection rules, and net metering arrangements. States vary in whether credits for the power generated are monetary or per kilowatt-hour of production, and what types of utility charges (transmission, distribution, or fixed charges) can be offset (or not) with the credits.

- Maine allows a maximum of 9 participants per project and is phasing-in mandatory charges on transmission and distribution costs.
- New Hampshire does not have a customer count cap; credits can be used to offset generation and transmission costs, but up to only 25% of distribution costs.
- Vermont uses a monetary adder system that depends on project size and location. The adder is higher when projects are placed on already disturbed land (among other criteria), or when one group net-metering participant uses a majority of the credits produced.

Uncertainty about future changes in net-metering rules, in particular, creates financial uncertainty; if states move to monetary-based "value of solar" credits, program rules should assure predicable values over the life of a project. Recruiting residential and small commercial customers incurs higher customer acquisition costs than recruiting an individual commercial customer, municipality, or credit-worthy organization. However, the value of net-metering credits is the same whether credits are used by a single commercial

[48] Romano, Andrea, and Jill K. Cliburn. 2015. Community Solar Project Ownership Structures and Financing. http://www.communitysolarvalueproject.com/uploads/2/7/0/3/27034867/20150914_comm_solar_ownership_financing.pdf.
[49] VEIC. Sun Shares Demonstrates New Approach to Community Solar. http://www.veic.org/media-room/news/2017/10/05/sun-shares-demonstrates-new-approach-community-solar.
[50] See DC Department of Energy & Environment's Solar for All program (https://doee.dc.gov/solarforall) funded by DC Code § 34–1436, the Renewable Energy Development Fund.

customer or by many residential customers. Community solar will be less desirable than large-customer net metering as long as this condition persists.

Industry leaders interviewed for this report indicate that certain policy and regulatory changes are urgently needed in in all three states to increase investment in community solar.

- In Maine, expand the customer cap on individual projects so that more than 9 utility accountholders can participant in each project. This will allow larger projects and reduce administrative costs that are otherwise too high.
- In Maine, allow projects to sign contracts with municipal governments that stabilize property taxes, engage in payments in lieu of taxes (PILOT), or use another predictable property tax mechanism. Project finances can be highly sensitive to property tax increases.
- In Maine and New Hampshire, allow net-metering credits to be applied to generation, transmission, and distribution costs, rather than just generation or some partial mix.
- In New Hampshire, expand the project size cap for small projects above 100 kW. (Larger projects are allowed but receive a lower rate than small projects.)
- In all states, offer more favorable net-metering credits when project participants are majority residential customers, are majority low-income customers, or (to avoid qualifying customers individually) are majority residents of low-income census tracts.
- In all states, extend existing clean energy underwriting support for small business and low income households to include those customers' initial investment in community solar projects.

<table>
<tr><th colspan="4">Community Solar Conclusions</th></tr>
<tr><th colspan="4">The Challenge</th></tr>
<tr><td colspan="4">Community solar is underutilized despite providing greater economies of scale compared to customer-sited solar and greater local financial benefits compared to utility-scale projects.</td></tr>
<tr><th colspan="4">How the Challenge is Addressed</th></tr>
<tr><td colspan="4">Lower the cost of capital by reducing policy risk and engaging local financial institutions.</td></tr>
<tr><th colspan="2">Recommended for</th><th colspan="2">Market Segments Served</th></tr>
<tr><td colspan="2">Maine, New Hampshire, and Vermont</td><td colspan="2">Single and multi-family – bankable
Small- to medium-enterprises (SME)
Commercial and industrial (C&I)
Municipal buildings, schools, hospitals, and universities (MUSH)</td></tr>
<tr><th colspan="2">GHG Reduction</th><th colspan="2">Jobs Creation Impact</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>How</th></tr>
<tr><td>Medium</td><td>Distributed grid-tied solar reduces use of fossil generators</td><td>Medium</td><td>Solar PV creates construction jobs during installation</td></tr>
<tr><th colspan="2">Equity</th><th colspan="2">Level of Effort</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>Why</th></tr>
<tr><td>High</td><td>Community solar brings modest financial benefits to all customers without requiring high credit scores or high income.</td><td>Medium</td><td>There is substantial proven success with community solar that can be leveraged in Northern New England.</td></tr>
<tr><td colspan="4">Expand financing for community solar by advocating for lower interconnection costs and more predicable net-metering credit revenue. The aim would be to reinvigorate community solar in order to attract developer attention and draw new capital, especially from local banks and credit unions.</td></tr>
<tr><th colspan="4">Best practices / lessons learned for a successful offering</th></tr>
</table>

- Many solar developers have experience with community solar but prioritize other project types due to high administrative burdens and marginal project economics for community solar.
- Local lenders are unaware of modest, if stable, returns associated with community solar.
- Community solar has high potential for making solar PV affordable for low to moderate income households and small businesses who otherwise would not have the upfront capital, financing appetite, or appropriate site required for customer-sited solar PV.
- Generally, the smaller scale of community solar PV projects, compared to utility-scale solar PV, make such projects less profitable for developers. As such, any policy or regulatory complexities or barriers can increase costs and decrease the likelihood that developers will pursue community solar. This makes getting the policy and regulatory framework right a top priority for any state seeking to advance community solar.

Why is this recommended?

Community solar serves carbon reduction, job creation, and equity goals. Of all solar PV opportunities in Northern New England, community solar projects are in the most need of policy and regulatory change in order to continue to attract the more than ample supply of capital generally available for solar PV.

Recommendation 4:
Engage in Electric Vehicle Policy and Regulatory Development

The current transportation system in Maine, New Hampshire, and Vermont is almost entirely powered by fossil fuels. Activities that reduce vehicle miles travelled through smart land use policies, walking, bicycling, public transportation, and other more efficient means of transport are helping to clean up this sector. However, rural states continue to rely on automobiles for the great majority of mobility needs and likely will continue to do so for years to come. Vehicle electrification can bring drastic reductions in emissions[51], reduce user costs, improve grid reliability, and be combined with other transportation efficiency activities to further leverage their benefits.

The Transportation Policy, Regulatory, and Market Transformation Opportunity

Energy efficiency programs have long used the term "market transformation" to refer to a strategic process of intervening in a market to create lasting change in market behavior by removing identified barriers or exploiting opportunities to accelerate the adoption of cost-effective energy efficiency as a matter of standard practice.[52] An important and foundational component of successful market transformation is ensuring that policy and regulatory frameworks enable market development. This is especially critical during the development of new markets for recently commercialized and proven clean energy technology, or products.

Electric vehicles (EVs) are ripe for a market transformation approach, as many factors need to be considered in accelerating adoption of EVs among consumers. Research indicates purchase price is the foremost barrier, but knowledge of EV technology, access to suitable vehicles for northeast conditions, charging infrastructure availability, range, the price of gasoline, and other factors are also considerations for car buyers considering a new vehicle purchase. And public policy support and potentially some regulatory change will be key to enabling market transformation.

Experience from cities and states leading in EV adoption, such as California and Oregon, have reinforced the need to take a market transformation approach to vehicle electrification programs.[53] As with the other clean energy measures explored in this report, there is no single element of an EV program that will achieve state carbon reduction goals by itself. The EV regulatory and policy environment continues evolving at a rapid pace. Participating in the development of a suite of EV-supportive policy and regulatory activities will help speed the pace of market transformation and enhance the individual, utility, and societal benefits associated with transportation electrification. Providing purchase incentives are generally recognized as the most effective means of addressing the critical price barrier, but consumers also need to understand how the vehicles will work for their household and be assured charging infrastructure is available before considering a purchase. This makes general EV education and outreach a critical element of an effective incentive program. All of which may require policy and regulatory support to achieve.

EV Supportive State Policy Development

As discussed in the carbon pricing recommendation above, the TCI initiative toward a regional low-carbon transportation policy is an excellent opportunity for states to work cooperatively in crafting policies that will be most effective in advancing clean transportation while growing their economies. A variety of transportation efficiency measures are likely to receive funding through these investments if this initiative

[51] Union of Concerned Scientists (UCS) estimates an EV in New England generates the carbon equivalent of a 102 mpg gasoline vehicle as of March 2018
https://blog.ucsusa.org/dave-reichmuth/new-data-show-electric-vehicles-continue-to-get-cleaner
[52] American Council for an Energy Efficient Economy (ACEEE) – Market Transformation
https://aceee.org/portal/market-transformation
[53] ICCT has researched factors influencing EV adoption in cities and states, as in this July 2018 report
https://www.theicct.org/sites/default/files/publications/Transition_EV_US_Cities_20180724.pdf

moves forward, including walking, bicycling, public transportation and electrification. Vermont is participating in the TCI process. Maine and New Hampshire could join in the development of the policy at any time. The inclusion of more rural states in the development of this policy will ensure the benefits of these investments are not limited to urbanized areas with more mobility options.

Many states are also considering how to fund transportation infrastructure needs as revenue from gasoline tax user fees wanes with advances in vehicle efficiency. Although EVs are rarely the root cause of funding shortfalls at current adoption levels, the issue has risen in importance in the policy arena. As of October 2018, 21 states have enacted legislation requiring special registration fees for EVs.[54] Vermont, Maine, New Hampshire, and Vermont are not among those states yet, but the issue has been discussed. In Vermont, the Vermont Agency of Transportation (VTrans) studied the issue and found that due to their higher purchase prices, EVs contributed more purchase and use taxes to the state transportation fund than an equivalent gasoline vehicle for the first few years of operation.[55] VTrans recommended phasing in EV fees as part of a broader discussion of moving to a vehicle-miles traveled fee and/or as a special registration fee when EVs reach 15% market share, indicating they were moving beyond the early adopter audience. If EV registration fees are advanced, one best practice is to set aside a component of the fee to fund EV charging infrastructure development, as Colorado and Washington state have done.

EV Building and Energy Code Requirements

The purchase price of EVs is expected to continue coming down. In addition, the broader availability in the used market as vehicles come off-lease should begin to address some of the foremost equity issues associated with EVs. However, for low-to-moderate income (LMI) people living in multi-unit dwelling communities and/or renting, it can be a significant challenge installing EV charging equipment at home, (where EV drivers do most of their charging).

California, Vermont, and communities in other states have included building and/or energy code requirements for installing EV charging or making buildings “EV ready” by installing conduit, wiring, or other components to streamline future charging installations.[56] The State of Vermont’s building energy stretch code applies to projects subject to the Act 250 land use permitting process and includes basic requirements for EV charging in larger multi-family housing and commercial developments.[57] Advancing and strengthening these policies at the state or local level will greatly reduce the cost of future charging installations.

Utility EV Regulatory Opportunities

Electric utilities have unique capabilities to support installation of EV charging in areas that are likely to be underserved by traditional private market actors. Many state utility regulatory commissions have already started to consider the role of electric utilities in this realm, either through broad investigations of EVs or in response to specific proposals from utilities. Providing utilities in each state with a clear understanding of what EV-supportive activities may be recoverable through ratepayers will streamline future proposals.

[54] The National Conference of State Legislatures tracks EV fees - http://www.ncsl.org/research/energy/new-fees-on-hybrid-and-electric-vehicles.aspx
[55] VTrans 2016 EV Fee Study - https://legislature.vermont.gov/assets/Legislative-Reports/2016-Legislative-EV-Study-FINAL-formatted.pdf
[56] SWEEP EV Building Code Reference - http://www.swenergy.org/cracking-the-code-on-ev-ready-building-codes
[57] The Vermont residential and commercial building energy standard stretch code is available on the VT DPS website - https://publicservice.vermont.gov/energy_efficiency/rbes

Utility regulators in several states, including Washington, Oregon and California have already initiated these processes.[58] [59] In some cases, regulators have gone through multiple rounds of review before approving use of ratepayer funds for utility investments in charging infrastructure and other activities. Addressing equity issues at the early stages of the EV market will ensure everyone benefits from this transformation and will increase public and political acceptance of future investments.[60]

Demand side management programs, such as EV time-of-use rates and automated demand response associated with charging equipment or in-vehicle telematics, provide opportunities for utilities to manage EV charging loads in concert with renewable energy generation. When done well, this can help reduce peaks and increase the load factor of pre-existing transmission and distribution infrastructure. Selling more kWh through existing infrastructure will help lower costs for all ratepayers and enhance the environmental and societal benefits of transportation electrification.

Utility proposals that include engagement with a broad array of stakeholders to develop proposed regulatory settlement actions have been one of the more effective means of advancing utility EV programs. Settlements have typically included commitments to install charging in underserved areas, incentives to support private ownership of charging (rather than full utility ownership), establishment of programs to manage charging activity, and support for transit charging installations to reduce costs for bus operators. Thus far, regulators have often expressed greater uncertainty on the value of utility ratepayer investments in EV education and outreach.

Key Stakeholders in EV Policy and Regulatory Development

- Many NGOs are actively supporting EV market transformation activities already. Regionally this includes the Sierra Club, Natural Resources Defense Council, Conservation Law Foundation, Acadia Center, Union of Concerned Scientists, Plug-In America, Regulatory Assistance Project, NESCAUM, Ceres, and others. The Sierra Club, Natural Resources Defense Council, Acadia Center, Conservation Law Foundation, and Plug-In America are among the more active NGOs on regulatory issues.
- Additional supporters can be found in the EV industry, including EV charging equipment manufacturers and service providers like ChargePoint, Greenlots, and Electrify America.
- Ratepayers: If utilities or others propose using ratepayer dollars for EV investments, it is expected that proposal will receive significant regulatory scrutiny before approval by public advocates, equipment providers, NGOs, and others concerned about developing a competitive market for EV charging that is available to all.

High-Level Strategic Guidance

- Connect with the state-based Drive Electric coalitions and engage in advocacy for transportation electrification regulatory investigations and rate approvals.
- Consider potential engagement with utilities to encourage filings supportive of investments in charging and/or vehicle incentives.

[58] The Regulatory Assistance Project has an in-depth report on EV regulatory considerations prepared in 2017 - https://www.raponline.org/wp-content/uploads/2017/06/RAP-regulatory-considerations-transportation-electrification-2017-may.pdf.

[59] MJ Bradley & Associates and the Georgetown Climate Center also partnered on a report examining regulatory issues associated with utility investments in EV charging infrastructure - https://www.georgetownclimate.org/files/report/GCC-MJBA_Utility-Investment-in-EV-Charging-Infrastructure.pdf.

[60] Economic analyses have documented significant societal benefits of transportation electrification, e.g. MJ Bradley EV cost benefit studies - https://www.mjbradley.com/reports/mjba-analyzes-state-wide-costs-and-benefits-plug-vehicles-five-northeast-and-mid-atlantic.

- Monitor state public utility commission proceedings for opportunities to support EVs. Consider developing "platform" on potential ratepayer investments in EVs and then engage in regulatory activities as appropriate.[61]
- Monitor Maine and Vermont participation in the CA ZEV program and be prepared to support action at federal level as EPA considers vehicle emission roll-backs.

<table>
<tr><th colspan="4">Electric Vehicle Policy and Regulatory Conclusions</th></tr>
<tr><th colspan="4">The Challenge</th></tr>
<tr><td colspan="4">Market failures do not fully account for the societal costs of fossil-fueled transportation.</td></tr>
<tr><th colspan="4">How the Challenge is Addressed</th></tr>
<tr><td colspan="4">Energy and environmental regulatory actions can address market failures and set the stage for utility and automaker investments in transportation electrification. State utility regulators are in an especially powerful position to advance EV market transformation.</td></tr>
<tr><th colspan="2">Recommended for</th><th colspan="2">Market Segments Served</th></tr>
<tr><td colspan="2">Maine, New Hampshire, Vermont</td><td colspan="2">Utility regulatory actions typically start by focusing on multi-unit residential first and then expanding to other market segments later.</td></tr>
<tr><th colspan="2">GHG Reduction</th><th colspan="2">Jobs Creation Impact</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>How</th></tr>
<tr><td>High</td><td>Electrifying transportation reduces GHG emissions from gasoline and diesel.</td><td>Low</td><td>EV regulatory actions are not expected to create a significant number of new jobs.</td></tr>
<tr><th colspan="2">Equity</th><th colspan="2">Level of Effort</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>Why</th></tr>
<tr><td>High</td><td>Regulators and stakeholders participating in the regulatory process can help ensure EV investments made by utilities are sensitive to equity concerns.</td><td>Medium</td><td>Moderate amount of time and resources necessary to foster and monitor regulatory activities.</td></tr>
<tr><td colspan="4">Engaging with EV industry stakeholders is important for understanding what regulatory issues may be hindering market adoption as well as what actions utilities may consider investing in EV infrastructure, vehicle incentives, consumer outreach, and/or other programs that will further advance transportation electrification.
A Vermont Public Utility Commission EV investigation is currently underway.[62] It is expected to provide clarity on oversight of public charging stations and set the stage for expanded utility offerings to optimize EV charging behaviors for the grid. This investigation may be followed by individual utility filings for EV investments beyond those already underway through the state's renewable energy standard Tier III programs. In Maine and New Hampshire, PUC regulators may benefit from additional education and learning from experience in Vermont and other states on setting appropriate limits on ratepayer EV investments.</td></tr>
<tr><th colspan="4">Best practices / lessons learned for a successful offering</th></tr>
<tr><td colspan="4">• Regulators may benefit from information and education on the benefits of EV to the grid and state-specific opportunities for their advancement.
• It is important that the multitude of stakeholders interested in and supportive of the electrification of transportation participate in any legislative or regulatory proceedings addressing EVs. Getting the policy and regulatory framework right for increased adoption of EV</td></tr>
</table>

[61] Transportation Electrification Accord – https://www.thevaccord.com/.
[62] Vermont PUC Docket 18-2660-INV - https://epuc.vermont.gov/?q=node/64/134378

and expansion of EV charging infrastructure will be key to transforming transportation away from gasoline and diesel. • Equity considerations will be critical to building broad-based coalitions, ensuring this promising new technology becomes available to citizens of all means and to small businesses that may have limited resources available for vehicle swap outs.
Why is this recommended?
Developing state policy and regulatory frameworks that enable EV investments and charging infrastructure will provide the long-term clarity needed to foster investment by utilities and other market actors. Engaging with and supporting the work of state stakeholder coalitions and other NGOs can help ensure robust regulatory investigations are conducted.

Recommendation 5:
Enable Plug-in Electric Vehicle Market Transformation

The Current EV Market

Light duty plug-in electric vehicles are now commercially available in Maine, New Hampshire, and Vermont for personal transportation use. They account for the majority of all EV purchases in the region. Figure 10 includes EV market share data for the Northern New England states. The most recent 12-month data indicates Vermont has the highest EV market share for any state east of the Mississippi River, but at 2.16% it is still far below the level of market penetration needed to achieve state clean energy goals.

Used plug-in electric vehicles make up a small but growing share of overall EV sales. In Vermont, used EVs comprised about 15% of newly registered EVs in the third quarter of 2018. Many low-to-moderate households are not able to afford a new vehicle purchase, so growing the used market is critical to ensuring everyone can benefit in switching to an electric vehicle. The Greenlining Institute's Electric Vehicles for All toolkit includes recommendations to set the stage and enhance the potential of EVs in environmental justice communities, including incentives and financing assistance most relevant to addressing equity considerations[63].

Maine, New Hampshire, and Vermont have each established Drive Electric coalitions to advance plug-in electric vehicle market transformation in ways appropriate to their states. These coalitions provide opportunities for stakeholder coordination across public and private partners, including state agencies, electric utilities and non-governmental organizations. They can provide a forum for policy and regulatory discussion and outreach to consumers and businesses. Broadening these coalitions to include low-and-moderate income advocates is likely an important key in garnering political support for incentive programs and other EV market transformation activities.

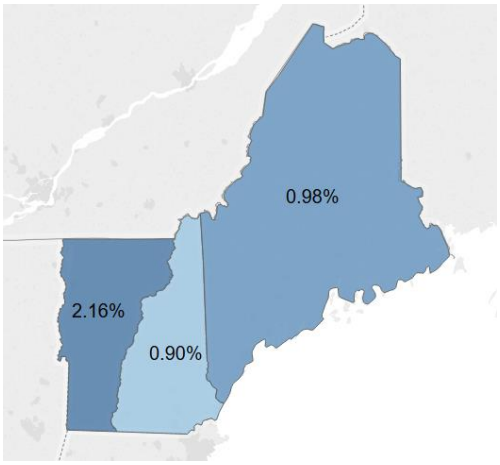

Figure 10. EV market share (July 2017 - June 2018). [64]

The Plug-in Electric Vehicle Experience of Auto Dealers, Automakers, and Fuel Dealers to Date

- Auto dealers: Most auto dealers are not yet effective EV sellers. Sales staff are not as well versed on the specifics of EV ownership. Dealers rely on service and used vehicle sales for much of their profits, so EVs are challenging on both of those fronts due to their high reliability and relatively low

[63] Greenlining Electric Vehicles for All toolkit - http://greenlining.org/publications-resources/electric-vehicles-for-all/
[64] Auto Alliance ZEV Dashboard, October 2018 – https://autoalliance.org/energy-environment/advanced-technology-vehicle-sales-dashboard/

supply in the secondary market. Working with state auto dealer associations on incentive and training programs will be an important element of broader market transformation. Some states, such as Connecticut, have developed mid-stream dealer incentives for EVs to encourage this key market actor. Tesla only sells vehicles direct to consumers - this has created issues in states where Tesla has sought policy changes to enable direct sales models.

- Automakers and auto industry alliances: Auto manufacturers are investing heavily in EV development and production to meet global market demand. However they are simultaneously seeking greater flexibility in how they comply with regulatory mandates like the ZEV program and federal fuel economy requirements. They have advocated for state EV incentives to help meet their regulatory requirements, typically through the Auto Alliance or Global Automakers, the two largest industry alliances.
- Fuel dealers: Owners of fueling stations and suppliers of petroleum-based fuels may see reduced sales of gasoline and diesel fuel. Some are exploring opportunities to provide EV charging, although the ability of EV owners to charge at home means most are not regular users of public charging stations. Convenience stores typically make most of their income on sales of convenience store goods (not fuel), so if an EV driver does stop to charge there is an opportunity to increase store sales.

Others Engaged in Plug-in Electric Vehicle Policy and Regulatory Activities

- Many NGOs are actively supporting EV policy and regulatory actions that will help transform EV markets. Regionally this includes The Sierra Club, Natural Resources Defense Council, Conservation Law Foundation, Acadia Center, Union of Concerned Scientists, Plug-in America, Regulatory Assistance Project, NESCAUM, Ceres, and others.
- Additional participants can be found in the EV industry, including EV charging equipment manufacturers and service providers like ChargePoint, Greenlots, and Electrify America.
- Renewable energy businesses, usually solar PV installers, are also frequently interested in supporting EVs, as there are documented links between consumers interested in EVs and those pursuing solar PV installations[65]. Some of these businesses are also installing EV charging equipment.
- Electric utilities are also important partners in advancing EVs and ensuring their charging occurs in ways that are most beneficial for the electric grid. Several utilities are offering incentives for vehicle and/or charging equipment purchases, off-peak charging discounts and other programs that improve the economics of EV ownership. EV ownership can increase household electric use by 13 to 40% (depending on the miles driven on home electricity)[66], so utilities have an excellent opportunity to further leverage their infrastructure investments with increased energy sales.
- In Maine: The Natural Resources Council of Maine[67], Maine Clean Communities (convener of Drive Electric Maine), Efficiency Maine (administering VW settlement funds for EV charging), the state Department of Environmental Protection, the Governor's Energy Office, and the Maine Department of Transportation.
- In New Hampshire: The New Hampshire Sustainable Energy Association (convener of Drive Electric NH), the state Office of Strategic Initiatives, Granite State Clean Cities, and the New Hampshire Department of Environmental Services.

[65] An example of the EV-PV link is a survey by Clean Technica indicating 30-40% of EV drivers had home solar https://cleantechnica.com/2017/06/25/28-40-ev-drivers-solar-panels-cleantechnica-ev-report/

[66] The National Rural Electric Co-op Association (NRECA) estimated a 13-40% increase in household kWh, depending on the miles driven on electricity https://www.cooperative.com/programs-services/bts/documents/advisories/memberadvisoryevmarketupdatefeb2018.pdf

[67] NRCM completed a brief report reviewing the status of EVs in Maine in September 2018 https://www.nrcm.org/wp-content/uploads/2018/09/EVsurveyandmap.pdf

- In Vermont, VEIC (convener of Drive Electric Vermont), Vermont Clean Cities, Renewable Energy Vermont, the Vermont Department of Environmental Conservation, the Vermont Agency of Transportation, the Vermont Department of Public Service, Vermont Natural Resources Council, Vermont Public Interest Research Group, Vital Communities, Vermont Council on Rural Development, and Energy Action Network.

High-Level Strategic Guidance

- Connect with state-based Drive Electric coalition work and engage in advocacy for incentives and other priorities identified by these groups and support the work already underway across the region.
- Advocate for strong Zero Emission Vehicle (ZEV) programs at the state and federal levels. Maine and Vermont currently participate in the California-led program which requires automakers to sell increasing numbers of ZEVs, including EVs. The US EPA is currently reviewing California's ability to establish a ZEV program which other states can sign on to. Federal advocacy and legal support may be necessary to preserve this program.
- Explore and support EV incentive funding, which could include legal settlements like VW consumer protection settlement funds, carbon pricing proceeds, or other sources.

<table>
<tr><th colspan="4">Plug-In Electric Vehicle Conclusions</th></tr>
<tr><th colspan="4">The Challenge</th></tr>
<tr><td colspan="4">More than half of the greenhouse gas emissions in Northern New England are from transportation. Light duty personal vehicles and trucks account for much of that carbon pollution.</td></tr>
<tr><th colspan="4">How the Challenge is Addressed</th></tr>
<tr><td colspan="4">Increasing the use of plug-in electric vehicles charged with clean energy will significantly reduce greenhouse gas emissions in Northern New England.</td></tr>
<tr><th colspan="2">Recommended for</th><th colspan="2">Market Segments Served</th></tr>
<tr><td colspan="2">Maine, New Hampshire, Vermont</td><td colspan="2">All, if there is attention paid to making plug-in electric vehicles affordable for low to moderate income households.</td></tr>
<tr><th colspan="2">GHG Reduction</th><th colspan="2">Jobs Creation Impact</th></tr>
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<tr><td>High</td><td>Electrifying transportation reduces GHG emissions from gasoline and diesel.</td><td>Low</td><td>Plug-in electric vehicles support local dealership sales but require less service. Some job creation potential exists with the need to expand the EV charging network.</td></tr>
<tr><th colspan="2">Equity</th><th colspan="2">Level of Effort</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>Why</th></tr>
<tr><td>Medium</td><td>Reducing toxic tailpipe emissions benefits all. Smart charging can lower electric rates. Incentives can be designed to help reduce transportation energy burden.</td><td>Medium</td><td>Incentive programs will need funding for at least a 2- to 3-year period to increase their effectiveness – long term funding is currently difficult to identify. Many other policy and outreach tasks are needed to support broader market issues.</td></tr>
<tr><td colspan="4">Plug-in electric vehicle market transformation activities should prioritize the most critical barriers of purchase price, consumer knowledge, charging infrastructure, and availability of vehicles suitable for Northern New England conditions. Incentive programs are commonly used in other states and funded</td></tr>
</table>

by vehicle emission legal settlements, such as more recent VW diesel settlements related to consumer protection issues. If incentive funding is not forthcoming, other program opportunities could explore promotion of used vehicles or other funding/financing opportunities to lower purchase costs. Ideally these programs would have a minimum 2 to 3-year lifespan as many consumers plan vehicle purchases far in advance.
Incentives would likely require state funding but could be administered by a private / NGO entity.
Funding for EV charging infrastructure investments is starting to flow from the state shares of the VW diesel settlement (up to 15% of which can be spent on charging), with Vermont and Maine in the process of allocating funds for the first round of investments.

Best practices / lessons learned for a successful offering

- Electrification of transportation is a key strategy for reducing greenhouse gas emissions from fossil fuel use in Northern New England. It will not be possible to reach climate and / or clean energy goals without substantial investment in the electrification of transportation from clean energy resources.
- Transportation electrification is a key growth opportunity for utilities. Utilities will be integral to success and may be a source of funding for incentives and infrastructure development.
- It is important to consider the entire "ecosystem" for increasing consumer knowledge of EVs, including consumer marketing, workplace charging availability, and public charging availability.
- Plug-in electric vehicle incentive programs should address equity issues in the design through additional incentives or special opportunities for low-to-moderate income community members.

Why is this recommended?

Transportation is the single largest sector in need of cleaning up to meet carbon reduction and clean energy goals. Light duty personal vehicles and trucks generate most of the carbon emissions in this sector and are challenging to reduce in rural Northern New England states. Transportation electrification done well - in part through substantially increased use of plug-in electric vehicles - could lead to significant economic, social, and environmental benefits for the region.

Recommendation 6: Support Electric Transit and School Bus Market Transformation

Heavy duty vehicles, i.e. diesel buses and trucks, are responsible for about 20% of transportation energy use. Biofuels are one way to decrease GHG emissions from this market segment. However, difficulties operating biodiesel in cold climates, the environmental consequences of large-scale biofuel production, and the increased cost of production have limited the utility of biofuels in Maine, New Hampshire, and Vermont. Heavy duty electric vehicles are now in production that can bring the same energy and environmental benefits seen in light duty electrification to this market segment.

Bus Electrification Opportunities

Electric transit buses are the most mature opportunity for heavy duty vehicle electrification, with school bus electrification rapidly advancing, and other heavy-duty vehicle offerings available. Maine, New Hampshire, and Vermont have already received Federal Transit Administration (FTA) low/no emission vehicle grants to support transit buses in Burlington, Montpelier, Nashua, and Portland which will provide valuable experience with these vehicles that can be leveraged with funding for heavy duty vehicle replacements through the VW diesel settlement. Electric buses have been in operation in other states, but little experience exists in rural, cold climates such as those found in Northern New England, so the FTA grant experiences will be an important learning opportunity.

VEIC administered an electric school bus pilot program for the state of Massachusetts using the first purpose-built electric school buses manufactured in North America. Learnings from that program highlighted the need to manage charging to ensure predicted energy cost savings are achieved and service support is available if issues arise with bus equipment. A full report on the pilot experience provides additional details on this initiative.[68]

State Volkswagen Diesel Settlement Funding

Each state is required to develop a spending plan for their VW settlement funds. In Vermont, the legislature acted to restrict VW spending to electric bus options for at least the first year of the program. The Vermont Agency of Natural Resources is currently contracting for an electric school bus program administrator to develop a pilot program to determine the feasibility of accessing VW settlement funds for significant investments in electric school buses. Maine and New Hampshire have taken a different approach to their VW spending plans as they've included significant set-asides for state and municipal fleet vehicle upgrades that may replace older vehicles with newer lower-emission diesel technologies.

Stakeholders Engaged in Electric Transit and School Bus Market Transformation

- Transit bus operators with dedicated fleet managers and planners generally able to investigate electrification opportunities without a lot of outside technical support. School bus operators, however, may require additional support and resources as they may not have capacity for fully exploring these issues in-house.
- Bus manufacturers: Most initial sales of electric bus technologies have come from new market entrants. Manufactures of diesel buses are now starting to embrace electrification, but it may be some time before they are competitive.
- Sierra Club[69] and VEIC[70] have resources available for bus electrification.

[68] The April 2018 Massachusetts electric school bus pilot evaluation is available at https://www.mass.gov/files/documents/2018/04/30/Mass%20DOER%20EV%20school%20bus%20pilot%20final%20report_.pdf
[69] Sierra Club Clean Transportation resources - https://www.sierraclub.org/transportation
[70] VEIC electric school bus resources - https://www.veic.org/electric-school-buses

- Many NGOs are actively supporting EV market transformation activities already. Regionally this includes The Sierra Club (a leader in electric bus advocacy), Natural Resources Defense Council, Conservation Law Foundation, Acadia Center, Union of Concerned Scientists, Plug-in America, Regulatory Assistance Project, NESCAUM, Ceres, and others.
- Additional supporters can be found in the EV industry, including EV charging equipment manufacturers and service providers like ChargePoint, Greenlots, and Electrify America.
- Electric utilities are likely to be important partners as bus operators may need to explore new peak kW demand charge tariff structures associated with electric bus charging to make the economics of bus electrification work.
- In Maine: The Maine Clean Communities (convener of Drive Electric Maine), the Maine Department of Transportation (administrator of VW settlement funds for heavy-duty vehicles), and other Drive Electric ME stakeholders.
- In New Hampshire: The New Hampshire Sustainable Energy Association (convener of Drive Electric New Hampshire), the state Office of Strategic Initiatives, Granite State Clean Cities, and the New Hampshire Department of Environmental Services.
- In Vermont, VEIC (convener of Drive Electric Vermont), Vermont Clean Cities, Renewable Energy Vermont, the Vermont Department of Environmental Conservation, the Vermont Agency of Transportation, the Vermont Department of Public Service, Vermont Natural Resources Council, Vermont Public Interest Research Group, Vital Communities, Vermont Council on Rural Development, and Energy Action Network.

High-Level Strategic Guidance

- Connect with the state-based Drive Electric coalitions and engage in advocacy for electric bus priorities identified by these groups.
- Monitor the TCI initiative that is developing a regional low-carbon transportation policy.
- Explore bus leasing programs for municipalities, transit operators, and/or contracted school bus operators. There are existing private companies providing capital lease options and federal funds can be used toward leasing activities.[71]
- Explore and support bus electrification funding through VW diesel settlement funds, carbon pricing proceeds, or other sources. This may involve supporting legislative initiatives to direct funding to heavy-duty electrification.

<table>
<tr><th colspan="4">Electric Transit and School Bus Conclusions</th></tr>
<tr><th colspan="4">The Challenge</th></tr>
<tr><td colspan="4">Heavy duty diesel vehicles generate about 20% of transportation carbon emissions. Buses are in communities across Maine, New Hampshire, and Vermont serving some of the most vulnerable populations and exposing them to toxic diesel engine emissions.</td></tr>
<tr><th colspan="4">How the Challenge is Addressed</th></tr>
<tr><td colspan="4">Electrification of transit and school buses should be piloted, refined, and implemented across all three states. VW funding can help jump-start this. As electric bus costs decrease, opportunities should develop to work with municipalities and bus manufacturers to develop leasing options or other financing programs to increase uptake.</td></tr>
<tr><th colspan="2">Recommended for</th><th colspan="2">Market Segments Served</th></tr>
<tr><td colspan="2">Maine, New Hampshire, Vermont</td><td colspan="2">Schools, school transportation contractors, public transportation operators</td></tr>
<tr><th colspan="2">GHG Reduction</th><th colspan="2">Jobs Creation Impact</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>How</th></tr>
</table>

[71] Federal Transit Administration leasing resources - https://www.transit.dot.gov/funding/funding-finance-resources/capital-leasing/capital-leasing

High	Electrifying transportation reduces GHG emissions from gasoline and diesel.	Low	Electric bus sales and servicing is not expected to create a significant amount of new jobs.
Equity		**Level of Effort**	
Impact	**How**	**Impact**	**Why**
High	Buses are used by all members of the community. Bus electrification programs ensure low-to-moderate income and minority riders who may not be able to afford and/or operate a personal vehicle are still able to benefit from transportation electrification programs.	Medium	There are market actors already working on bus electrification and there is significant opportunity for others to also engage with policymakers on opportunities to support bus electrification. This could include additional funding and technical resources for transit operators and schools.

Vermont is developing a pilot program for electric buses funded by the VW diesel settlement. Other states are less likely to fund electric buses through their VW dollars without clear policy direction from the administration and/or legislative leaders on the importance of leveraging these one-time funds for market transforming work.

Longer term, it is likely bus owners will be looking for attractive financing and/or leasing terms as costs decrease. There is a need for outreach and support for bus owners to increase recognition of the value of electric buses. One aspect of this could be related to using their batteries for behind-the-meter energy storage systems that increase resilience and reduce peak electric use and/or feeding back into the distribution grid to benefit renewable energy generation.

Best practices / lessons learned for a successful offering

- Electric bus technology is still developing. Supporters will need to be prepared for evolving requirements and ensuring vigilance on energy savings metrics and performance assessment.
- Electric transit buses are more mature vehicle offerings compared to electric school buses at this time. In some cases, the cost savings of driving an electric bus may provide lower lifecycle costs today. This will continue to improve as vehicle costs decrease.
- Funding options such as the Federal Transit Authority's low-or-no emission vehicle program (low/no) or VW settlement dollars are critical at this stage of the market for bus operators who typically operate on very tight margins.

Why is this recommended?

Electric bus technology is rapidly improving as more cost-effective options are introduced and as production volumes grow. Developing appropriate investments to foster this market segment will help enable advancement of heavy-duty transportation electrification. Long term benefits will accrue to communities through reduced emissions and enhanced vehicle reliability. Leasing or other finance options will gain attractiveness as vehicle affordability increases with scale.

Section 8. Modify and Develop New Clean Energy Finance Tools

In addition to ensuring that policy and regulatory frameworks are in place that help scale clean energy investment, there are a variety of ways in which existing clean energy finance tools could be modified and new tools developed. Presented below are a portfolio of clean energy finance tool initiatives recommended for action in Northern New England. The initiatives address key challenges discussed above and are well suited to the capabilities and strengths of TNC and CEI.

When developing these recommendations, attention was paid to selecting initiatives that complement (and do not duplicate) the actions of many other market actors also involved in clean energy finance. Similar to the recommendations discussed in Section 7, for each initiative a high-level qualitative assessment was done of the impact on mitigating greenhouse gas emissions, stimulating jobs, and improving energy equity for low to moderate income households. In addition, the market segments to be served by the initiative were identified and best practices for ensuring the initiative is successful were provided. This information was used to advise TNC and CEI on the state-specific actions they might pursue in order to continue to advance clean energy finance in Northern New England.

Recommendation 7: Implement a Regional Clean Energy Underwriting Initiative

Traditional underwriting for mortgages fails to recognize the impact of energy on a building owner's debt capacity and on the ability for utility costs to increase lender security. With greater underwriting and collateral flexibility, lenders can provide credit to those who are traditionally marginalized by secondary market rules. Integrating unbankable customers and non-performing markets into the mainstream finance economy requires the recognition of alternative forms of credit histories, lower equity levels, and alternative security requirements.

What is Clean Energy Underwriting?

Clean energy underwriting for commercial and residential building construction and retrofits is a market transformation strategy for the lending industry. While there is no one-size-fits all financing solution for all clean energy projects, monetizing the energy savings from efficiency improvements increases debt capacity for the borrower by converting the lower utility costs to a stream of repayments.[72]

For new construction, high efficiency buildings have lower operating costs, which allows the operating budget to tolerate more debt. For existing buildings, energy efficiency improvements reduce operating and maintenance costs, and the cost savings can repay debt borrowed to implement the upgrades. In both cases, the savings projections require an energy efficiency professional to calculate and certify the cost reductions made possible from the energy improvements.

In all property markets, lending relies on as-built or after-improved values. As of 2017, the national Appraisal Institute adopted a standardized green addendum for appraisals of residential and commercial buildings and solar photovoltaic system installations. While still a nascent industry, green appraisals will enable financial markets to lend with more assurance that collateralized assets will retain the value-add attributable to clean energy features.[73]

Commercial Clean Energy Underwriting

When underwriting commercial new construction, traditional lenders evaluate the building owner's ability to repay the loan using conventional assumptions, including operating costs that reflect current market utility pricing. However, energy efficient building design and construction can result in utility costs that remain at significantly lower levels over the life of the building. Higher efficiency buildings have lower ongoing operating and maintenance costs due to optimized temperature regulation and ventilation, longer-lasting lighting, decreased water pressure and water usage, higher comfort and fewer complaints, and the absence of moisture problems that can cause condensation, mildew, mold, and rot.[74]

Some regional examples of underwriting for clean energy in the commercial and industrial sector include:

- In Connecticut, commercial customers of Eversource and United Illuminated can participate in the Small Business Energy Advantage (SBEA) program. SBEA customers have access to free energy audits, comprehensive, custom-designed proposals for efficiency measures and 100% on-bill financing. Underwriting of the project is based on projected utility savings, credit score and utility bill payment history. Qualified customers are offered 0% financing and incentives for up to 50% of

[72] "*Energy Efficiency Retrofit Financing Options for the Commercial Real Estate Market."* Anthony J. Buonicore, Managing Director, Buonicore Partners, LLC. Paper No. 12-001, February 15, 2012. p.3
[73] Appraisal Institute FAQs "*Valuation of Sustainable Buildings"* Professional Development Program (10/16/17). https://www.appraisalinstitute.org/education/education-resources/green-building-resources/more-green-resources/
[74] "*The Economic Benefits of Sustainable Design, Section 2.0*." US Department of Energy. https://www1.eere.energy.gov/femp/pdfs/buscase_section2.pdf

the installed cost of measures. SBEA uses utility-authorized contractors for the audit and all phases of project implementation.

- Efficiency Vermont partners with the Vermont State Employees Credit Union to offer the Business Energy Loan for energy efficiency upgrades in small and medium businesses. Using SBC funds, Efficiency Vermont provides an interest rate buy-down to lower the customer's interest rate with: 3-year loans at 3.75%; 5-year loans at 4.75%; and 10-year loans at 5.75%. There are no closing costs and no upfront costs are paid by the customer. Efficiency Vermont staff perform a cost-savings analysis to ensure that a project will save money through reduced energy usage. VSECU uses the cost-savings analysis to incorporate the reduced utility costs into the loan underwriting process.

- The Vermont Economic Development Authority (VEDA) incorporates both energy savings from an upgrade and reduced energy bills from renewable energy. For efficiency financing, VEDA requires an applicant to submit as part of its application a report from Efficiency Vermont or an independent licensed engineer detailing the proposed project improvements and the projected energy and financial savings. VEDA considers the financing a portion of the cost of the improvements, projected energy savings, payback period, and reasonableness of the engineers' projected revenues and expenses resulting from the energy savings. To ensure sufficient rigor, VEDA only uses estimated savings provided by an independent engineer, not the applicant or the contractor selling the project. In this way, VEDA makes commercial financing decisions using clean energy underwriting standards.

The owners of existing commercial buildings can experience barriers to adding debt, because "loan covenants may restrict the addition of further debt. At a minimum, there typically are strict rules about incurring debt."[75] The maturation of standardized energy efficiency performance and measurement techniques makes energy savings projections more predictable. This reduces the risk of projected savings not being realized and mitigates the perceived risk associated with monetizing savings for debt repayment.

Residential Clean Energy Underwriting

Residential lending underwriting standards require the borrower's secured debt, property taxes, insurance, any property associate fees, and consumer and student debt to not exceed a certain proportion of the borrower's earned and unearned income, depending on the mortgage product parameters. While this approach factors in the property "operating" costs of taxes and insurance, the operating costs of utilities are overlooked. However, two borrowers with identical debt and earnings profiles, with comparable home purchases in the same neighborhood, could have drastically different utility costs that affect their ability to pay their mortgage, and therefore affect lender security.

For example, borrower A may purchase a home with twice the heating and electric costs as borrower B. High utility costs will hamper borrower A's ability to repay debt, thereby jeopardizing mortgage underwriting assumptions that demonstrated ability to pay on paper only. Meanwhile, borrower B's lower heating costs enhance the lender's security, even though the underwriting documents do not account for the borrower's stronger financial capacity.

Changing residential underwriting practices to consider monthly utility costs could promote energy efficiency in multiple ways:

- Strengthen lender security due to the higher total household funds available for mortgage, taxes and insurance.

[75] "*Energy Efficiency Retrofit Financing Options for the Commercial Real Estate Market"* p.3

- Homeowners would have an incentive to implement energy efficiency upgrades before selling.
- The market value of energy efficient homes would be stronger and the real estate industry would recognize the impact of energy as a contributor to or detractor from value.

There are two energy efficiency mortgage products on the market currently that consider the financial savings from energy upgrades. A Fannie Mae and a Federal Housing Administration energy efficiency mortgage product are structured to provide a small amount of unsecured financing over and above appraised value specifically for efficiency upgrades. The underwriting assumptions are that the unsecured portion of the loan will be repaid by improving the home's energy performance. Energy efficiency improvements not only lower heating and electrical costs but reduce maintenance and repair costs. The FHA mortgage product is not well-known by Northern New England lenders because rural lenders tend to specialize in USDA Rural Development mortgage products rather than US HUD federal housing administration products. The FHA mortgage product has a strong track record of success but is not well-known by northern New England lenders. The Fannie Mae product is new and has not really been tested by the lending industry yet. Two credit unions in Vermont are currently exploring the Fannie Mae product.

These two mortgage products differ slightly in that the FHA product offers up to $10,000 of unsecured financing over and above appraised value for energy efficiency. The Fannie Mae product offers up to $3,500 of unsecured financing, and an additional $7,500 if the appraisal supports this amount in an after-improved value. However, the Northern New England appraisal industry is just beginning to see green appraiser certification adoption, so lacks the scale required to deliver after-improved values based on energy efficiency, so this aspect of the real estate is just beginning to see transformation and will take time before the market can fully utilize the Fannie Mae offering. In many cases, the $3,500 of unsecured portion of the Fannie Mae loan can be packaged with Home Performance ENERGYSTAR® incentives to undertake a comprehensive energy project. Freddie Mac is also developing an energy efficiency mortgage product.

Who are Providers of Clean Energy Underwriting?

The primary providers of clean energy underwriting include:

- Traditional banks and credit unions, including but not limited to loan products sponsored by utilities or energy efficiency program administrators in partnership with a bank or credit union
- Green banks
- Entities offering Property Assessed Clean Energy (PACE)
- Utilities offering tariffed on-bill financing
- Energy Service Companies
- Energy as a Service providers, such as Sealed®,

This report contains separate recommendations related to green banks, C-PACE, and tariffed on-bill financing, all of which could engage with clean energy underwriting practices. Sealed® is discussed below followed by traditional banks and credits unions.

An Innovative Approach Underway in New York State

Sealed® is a business in New York State offering an innovative approach for investing in and financing energy efficiency savings across a portfolio of single family home projects.[76] The business conducts a cost-benefit analysis of the savings available from energy efficiency projects in each home and pays the contractor to make the upgrades (including both efficiency and fuel switching) with no financial participation from the homeowner. Upon completion of the work, the repayment agreement with the home owner authorizes Sealed® to withdraw from the customer's bank account the money to pay the utility bill and make

[76] https://sealed.com/

a payment towards the energy efficiency project. The agreement stipulates that in no cases will the total payment exceed the average utility bill the customer paid before the energy efficiency work was completed.

Sealed® received funding from the New York State Energy Research and Development Authority (NYSERDA) and the New York State Treasurer's Office in the form of low-cost financing and credit enhancements. The standard repayment term is 20 years. Repayment agreements may be transferred to the next homebuyer if the owner sells, or the owner must repay Sealed® in one-lump-sum at the time of sale. Sealed® serves single-family home owners with a minimum credit score that is in the high 600's.

While this innovative approach is compelling, the financial modeling requires the economies of scale available in larger urban markets, such as New York and southern Connecticut, to spread the risk that some home performance jobs will underachieve the savings projections balanced by other jobs exceeding projections. For this reason, its applicability in Northern New England may be limited.

Traditional Banks and Credit Unions in Northern New England

In each of the Northern New England states, utilities and efficiency program administrators have partnerships with banks and credit unions to deliver energy loan products. Maine and New Hampshire offer unsecured, low-interest loans for home performance projects as well, although the utility cost savings associated with energy savings are not included in the underwriting criteria.

Efficiency Maine's Home Energy Loan[77] is funded from a revolving loan fund, capitalized with federal American Recovery and Reinvestment Act funds. Loans are unsecured and primarily fund weatherization and high efficiency heating systems, including pellet and wood stoves and biomass and geothermal fired boilers. Underwriting includes maximum debt-to-income ratios and minimum credit scores as low as 520 for smaller loan amounts with positive utility bill history. Maine homeowners can borrow up to $15,000 over 10 years with no fees and interest rates as low as 4.99% annual percentage rate (APR).

New Hampshire Saves[78] offers subsidized interest rate loans through partnerships with private lenders. Credit-worthy customers receiving energy audits, weatherization, or other energy efficiency improvements through NHSaves can apply for a Home Energy Efficiency Improvement Loan offered at a 2% annual percentage rate.

In Vermont, Efficiency Vermont offers the Heat Saver Loan Program which provides discounted interest rates based on household income. The loan can be used for weatherization upgrades, solar hot water, heating system replacements, cold climate heat pumps, and advanced modern wood heating systems.[79] Designed in partnership with the Vermont Department of Public Service, the Vermont State Employees Credit Union (VSECU) packages consumer debt with credit enhancements from Efficiency Vermont to discount the interest rates based on household income. Efficiency Vermont provides a loan guarantee set-aside of up to $250,000, which has not been needed for any defaults during the five-year partnership. While underwriting involves a credit check, the minimum score is only one factor considered. The projected energy savings and utility cost reduction are included in the loan analysis along with the customer's utility bill payment history. The Heat Saver loan volume averages $2.5 million per month for unsecured loans and $75 million annually for secured loans. Efficiency Vermont and VSECU also offer a Business Energy Loan with rates below 5.75% annual percentage rate and a term of up to 10 years.[80]

[77] Efficiency Maine Home Energy Loan. https://www.efficiencymaine.com/at-home/energy-loans.
[78] NHSaves Home Energy Efficiency Improvement Loan. https://nhsaves.com/programs/financing.
[79] Efficiency Vermont Heat Saver Loan. https://www.vsecu.com/environmental/clean-energy-programs/heat-saver-program.
[80] Efficiency Vermont Business Energy Loan. https://www.vsecu.com/financial/business-loans/clean-energy-loan.

Lessons Learned by a Leading Lender in Northern New England

As part of the research conducted for this report, the VSECU provided lessons learned over the course of designing and administering their energy efficiency loan product.

- Partnerships between lenders and efficiency program administrators require flexibility – there is a lot to work through. VSECU had to be willing to try new approaches and gain fluency in lending for clean energy purposes. As a member-owned cooperative, VSECU made green lending a goal, including offering certificates of deposit to increase member capital for green lending.
- Coordination between the lender, the efficiency program administrator, and contractors is very important. Contractor credentialization through the efficiency program administrator (Efficiency Vermont) provided VSECU confidence in accepting a contractor's energy audit results and proposed scope of work.
- As the customer facing entity, it is important that contractors receive training about the loan offering and the application process. This enables contractors to serve successfully as the sales and marketing team for the loan offering. Experience in Vermont indicates that "kitchen table sales" while the contractor is in a home can generate interest in the loan product and is key to stimulating demand for the offering.
- There is a lot of market confusion among customers who aren't sure which energy improvements to implement. Lenders and contractors benefit from receiving training on how to talk to customers about the decision-making process and important considerations.
- Lenders regularly take courses on compliance, mortgage licensing, and other topics. The energy efficiency community would likely find receptivity among lenders for providing training on energy efficiency and renewable energy concepts, phrases, and lending goals through existing networks and events for lenders.
- Promoting accreditation of green lenders, similar to the National Association of Realtors green designation, could be key to increasing green lending.[81]
- NHSaves requested a partnership with VSECU in the Upper Valley of New Hampshire. However, the differences in state banking regulations and differing program details between NHSaves and Efficiency Vermont created unsurmountable barriers.

High-Level Strategic Guidance for Moving Forward

Clean energy underwriting changes are being made in federal government–sponsored residential lending, such as Fannie Mae and the Federal Housing Administration (FHA). Two Fannie Mae and FHA energy efficiency mortgage products offer an additional loan amount at purchase, over and above the appraised value, specifically for energy efficiency upgrades. While these mortgages still require conventional underwriting and collateralization, these changes enable the loan to:

- Be underwritten solely on the basis of energy savings and utility cost reduction; and
- Exceed the loan-to-value ratios established by the property appraisal.

These mortgage products demonstrate that:

- Monetizing the energy savings can mitigate the risk of lending an amount that slightly exceeds appraised value for the specific purpose of lowering the homeowner's total cost of ownership; and

[81] "The National Association of REALTORS® has created a green designation and benefits program tailored for real estate agents. NAR's Green Designation provides advanced training in green building and sustainable business practices so that you can seek out, understand, and market properties with green features" (http://greenresourcecouncil.org/).

- The government entities backing these mortgages are sending a signal to the lending industry that energy efficiency is a positive attribute of collateralized property.

Transforming the lending industry at scale will depend on changes in other components of the "real estate supply chain," such as building energy labeling and property valuation. Climate change is prompting real estate industry players to acknowledge that how the built environment is permitted, designed, financed, valued, and maintained determines a community's resilience to withstand weather events that bring greater magnitudes of moisture, flooding, ice, heat, drought, wind, and fire. There are efforts to quantify the value that energy efficient buildings deliver, but this effort requires deeper engagement from energy efficiency experts and advocates with land use planning and zoning professionals, appraisers, architects, engineers, lenders, contractors, and realtors.

Continued training and support on energy efficiency and renewable energy for the real estate industry could increase interest in and uptake of green lending, green realtor certification, green appraisals, and energy efficiency mortgages. Across New England, there are trade associations for traditional and non-traditional lenders that offer training and education for their members. These trade associations offer a pathway for reaching the Northern New England homebuyer counseling and lender markets. This could include building awareness among realtors and appraisers on green appraising and green realtor certification through regional trade association training programs.

Industry education efforts are an effective way of introducing opportunities and possibilities to existing market actors. Advancing this transformation would likely require a concerted effort to coordinate convene, train, and provide peer-to-peer coaching. A less intensive effort could be the creation of a web-based platform or bulletin board to share information about greening the lending and real estate sectors across New England.

<table>
<tr><th colspan="4">Clean Energy Underwriting Conclusions</th></tr>
<tr><th colspan="4">The Challenge</th></tr>
<tr><td colspan="4">Traditional loan underwriting fails to recognize the positive impact of reduced energy costs on a borrower's debt capacity and the potential for clean energy improvements to increase lender security.</td></tr>
<tr><th colspan="4">How the Challenge is Addressed</th></tr>
<tr><td colspan="4">Clean energy underwriting involves changing underwriting practices to consider utility costs in the debt-to-income ratio, while increasing mortgage loan-to-value ratios for energy efficient properties or for property purchases that include energy efficiency upgrades at the time of purchase.</td></tr>
<tr><th colspan="2">Recommended for</th><th colspan="2">Market Segments Served</th></tr>
<tr><td colspan="2">A regional approach targeted at lenders and the real estate industry in Maine, New Hampshire, and Vermont.</td><td colspan="2">Residential, multifamily, and commercial property.</td></tr>
<tr><th colspan="2">GHG Reduction</th><th colspan="2">Jobs Creation Impact</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>How</th></tr>
<tr><td>High</td><td>Residential retrofits represent the second largest carbon reduction strategy available (with light duty electric vehicles being the first).</td><td>High</td><td>Time of sale or time of purchase energy efficiency projects would substantially increase demand for home performance and energy efficiency contractors.</td></tr>
<tr><th colspan="2">Equity</th><th colspan="2">Level of Effort</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>Why</th></tr>
<tr><td>Medium</td><td>Low to moderate households that are not bankable could benefit from this recommendation.</td><td>Medium</td><td>This recommendation applies to non-traditional lenders that do not rely on the secondary market for</td></tr>
</table>

			liquidity. Appraisals that recognize the value of energy efficiency are also needed in order to transform the secondary market. This is slowly starting to happen through the national organization, the Appraisal Institute.

Traditional property underwriting compares the (relatively) fixed costs of mortgage principal, interest, property taxes, and insurance to the borrower's income. However, the cost of utilities inherent to the property being financed can jeopardize or increase a lender's security interest. Monetizing energy savings that result from clean energy retrofits is an emerging best practice that considers utility usage and costs in debt-to-income calculations. Two existing mortgage products are designed to deliver to the lender an energy efficient property at the time of purchase. The Fannie Mae and Federal Housing Administration energy efficiency mortgages offer the borrower additional financing, over and above the appraised value, to make energy efficiency improvements within a certain time limit after closing on a home. The financed amount that exceeds the appraised value is underwritten by considering the post-retrofit utility costs as part of the debt-to-income ratio. Few lenders in Northern New England currently offer these mortgage products. However, there is nascent interest and a large potential market.

Best practices / lessons learned for a successful offering

- Convene lenders and real estate professionals, including CDFI's and Homeownership Centers, to introduce the concept of the "Total Cost of Ownership[82]" through realtor, appraisal, and lending networks.
- Showcase the Federal Housing Administration Energy Efficiency Mortgage https://www.hud.gov/program_offices/housing/sfh/eem/energy-r
- Share learnings from green realtor and green appraisal certification activities to date with state realtor and appraiser associations
- Meet with state banking and credit union associations to introduce the concept of Total Cost of Ownership and make lenders aware of energy efficiency mortgage products.
- Communicate the success of leading local loan programs, such as the Vermont Heat Saver Loan offered by the Vermont State Employees Credit Union as well as offerings provided by Efficiency Maine, New Hampshire Saves, and various banks and credit unions in Northern New England.

Why is this recommended

Unlocking the value of energy efficiency in the lending market has multiple benefits for lenders and borrowers. Monetizing the value of energy savings can increase mortgage security while lowering greenhouse gas emissions, creating jobs, improving financial picture of borrower, and allowing borrowers to afford more house.

[82]The Total Cost of Ownership (TCO) concept assesses the total cost of buying and owning a building including "typical" mortgage associated expenses – interest, closing costs, and fees and insurance – as well as operating costs – utilities (natural gas, electricity, water, sewer, trash, and communications/cable), maintenance and repairs. http://www.teeceeo.com/.

Recommendation 8: Implement Commercial Property Assessed Clean Energy (C-PACE)

What is C-PACE?

Property assessed clean energy (PACE) is a way to finance energy efficiency and renewable energy improvements on private property. PACE programs exist for residential properties (referred to as residential PACE or R-PACE) and commercial properties (referred to as commercial PACE or C-PACE). PACE programs allow a property owner to finance the up-front cost of energy efficiency, renewable energy, or other eligible improvements on a property and then pay the costs back over time through a voluntary assessment. The unique characteristic of PACE assessments is that the assessment is attached to the property rather than to an individual.

PACE financing for clean energy projects is generally based on an existing structure known as a "land-secured financing district," often referred to as an assessment district, a local improvement district, or other similar phrase. In a conventional assessment district, the local government issues bonds to fund projects with a public purpose such as streetlights, sewer systems, or underground utility lines.

The extension of this financing model to energy efficiency and renewable energy allows a property owner to implement improvements without a large up-front cash payment. Property owners that voluntarily choose to participate in a PACE program repay their improvement costs over a set time period—typically 10 to 20 years—through property assessments, which are secured by the property itself and paid as an addition to the owners' property tax bills. Nonpayment generally results in the same set of repercussions as the failure to pay any other portion of a property tax bill.

A PACE assessment is a debt of property, meaning the debt is tied to the property as opposed to the property owner(s). In turn, the repayment obligation may transfer with property ownership if the buyer agrees to assume the PACE obligation and the new first mortgage holder allows the PACE obligation to remain on the property. This can address a key disincentive to investing in energy improvements because many property owners are hesitant to make property improvements if they think they may not stay in the property long enough for the resulting savings to cover the upfront costs.

There are some key differences between residential PACE and commercial PACE, which have resulted in different rates of adoption and implementation success across the U.S. The main hurdle for R-PACE across the nation has been the prohibition on senior-lien PACE assessments by the Federal Housing Finance Agency, the regulator for Fannie Mae and Freddie Mac. However, C-PACE avoids this issue entirely for a few reasons:

- Statutes creating C-PACE stipulate that a C-PACE customer must obtain prior written approval from all lenders in order for a senior C-PACE lien to be perfected.
- In other words, the C-PACE assessment is treated exactly like property tax payments and enjoy the same legal mechanisms to ensure their payment/collection.
- In addition, mortgages on commercial and industrial properties are not sold to a secondary market that determines the legal constraints under which property owners must operate.

C-PACE Experience Nationwide

According to PACENation, “33 states and the District of Columbia had passed laws enabling C-PACE programs as of 2017.[83] However, only 20 states plus DC have active C-PACE programs in operation.

[83] 2017 C-PACE Economic, Energy and Environmental Impact Report. PACENation. https://pacenation.us/pace-market-data/

Approximately $588 million in C-PACE financing has been provided to over 1,445 commercial buildings, with over half of that total occurring since the beginning of 2015. The majority of completed projects fall in the $75,000 - $750,000 size range, though smaller or larger projects are not uncommon."

C-PACE program administrators range from state green banks, joint power authorities, and local governments to non-profit energy providers and advocates and for-profit vendors. PACENation has found five distinct approaches to PACE program administration[84]:

1. Program administered by local/regional government
2. Program sub-contracted by local/state government to an independent contractor
3. Program sponsored at the state level
4. Independent program administration
5. Multi-jurisdictional program run by an independent administrator

C-PACE provides 100% financing for clean energy improvements through a local, regional, or state entity. The entity offering C-PACE works with private-sector lenders to obtain the financing for eligible energy efficiency and renewable energy improvements. The financing is paid back through an annual assessment on the property tax bill for the building receiving the improvements. A C-PACE program can be administered on a statewide, regional, or local level with the repayment coming from tax payments made at the local level. The payback term may extend up to 20 years, which can save C&I customers money by ensuring that yearly utility bill savings from energy improvements are greater than the annual PACE payment. C-PACE can be applicable for small-to-medium enterprises, commercial and industrial buildings, and municipal buildings, universities, schools, and hospitals (MUSH).

The benefits of C-PACE extend to business owners, property owners, capital providers, contractors and employees, and municipalities. For building and business owners, the key benefits include:

- Saving money and increasing the bottom line by lowering energy costs. Positive cash flow resulting from lower, more predictable energy costs allows owners to focus on their core business.
- Making the building more comfortable. Upgrades that improve buildings make facilities more enjoyable and attractive for owners, employees, tenants, and customers.
- Certainty that the savings will exceed or at least equal the payments for financing. C-PACE programs develop credible energy savings projections that make building owners confident that energy savings will be greater than their investment. These protections are also key to obtaining consent from existing lienholders.

With C-PACE, contractors have a new market for selling clean energy upgrades among small and medium enterprises as well as larger C&I customers. Contractors are able to close more leads by having a financing product that avoids the split incentive for C&I tenants by allowing financing to be transferred when a lease expires or a business relocates. This feature of C-PACE removes one of the most persistent barriers to making clean energy investments in the C&I sector.

Obtaining Lender Consent for C-PACE Financing

There have been over 1,200 C-PACE transactions with lender consent approved by nearly 200 banks and credit unions of all types and sizes.[85] Lender consent, which is required in nearly every C-PACE transaction, is the industry norm for this finance model. Obviously, consent only pertains to a commercial property owner

[84] https://pacenation.us/start-a-pace-program/#programdesign
[85] https://pacenation.us/wp-content/uploads/2018/04/Mortgage_Holder_Primer_Final_for_publication.pdf

with an existing mortgage on their property.[86] Lender consent typically takes 30 days or less. [87] However, some barriers can prevent lenders from consenting to senior-lien C-PACE assessment including, for example:

- Insufficient borrower credit if there are previous defaults or bankruptcy.
- Low debt service coverage ratio (DSCR) with 1.20 as a typical minimum. If the ratio is lower, a lender may be unwilling to consent.
- High loan-to-value ratio with commercial lenders typically seeking a ratio of 70%, with a maximum up to 80%.

In general, the following factors are important to share with lenders to mitigate the risk that could result from a senior-lien C-PACE investment:

- C-PACE assessments do not accelerate. This means that in the unlikely event of foreclosure, only the amount of the C-PACE assessment currently due (and/or in arrears) would be collected and extinguished through such foreclosure action. Lenders are protected since the entire PACE assessment does not come due in the event of foreclosure.
- C-PACE improves the senior lender's collateral. C-PACE finances upgrades that increase after-retrofit value, so the LTV is improved after the project is complete.
- C-PACE improves project cash flow. Energy upgrades improve project cash-flow, resulting in improved DSCR
- C-PACE liens are transferable. In the event of a property sale, C-PACE assessments automatically transfer to the new property owner, unless the buyer or seller decides to prepay the assessment without penalty.

PACE Experience in Northern New England

A variety of activities have been underway in Northern New England for both residential and commercial PACE. The details vary by state.

In Maine, a 2010 statute was passed allowing residential and commercial PACE to be developed.[88] R-PACE has since been implemented in Maine but there is minimal activity since customers can access favorable financing from other sources. C-PACE is permitted in Maine but there are no C-PACE programs in operation in the state (yet). Efficiency Maine currently administers residential PACE in Maine and would be a logical entity to explore first for administering C-PACE. This might require adding capacity within the organization to properly promote and successfully administer such an undertaking.

In New Hampshire, C-PACE was authorized by statute in 2010.[89].Both the Jordan Institute and the Community Development Finance Authority invested considerable time and effort to achieve the legislation. However, C-PACE is not currently being actively promoted or offered in the state. The Community Development Finance Authority would be a logical entity to explore first for administering C-PACE. As with Efficiency Maine, this might require adding capacity within the agency to properly promote and administer such an undertaking.

[86] For a list of consenting ledners, go to https://www.pacenation.us/wp-content/uploads/2016/05/List-of-Consenting-Lenders-05.2016.pdf

[87] PACENation features a 16-minute video from Figtree Investment, a PACE program administrator in California. To view the video, go to https://pacenation.us/start-a-pace-program/#lenderconsent

[88] http://legislature.maine.gov/statutes/35-A/title35-Asec10156.html

[89] https://pacenation.us/pace-in-new-hampshire/

In Vermont, residential PACE is authorized but there is virtually no activity. This is largely due to both the junior lien aspect required by Vermont law as well as the stringent customer underwriting required by the Department of Financial Regulation. Commercial PACE is not authorized in Vermont. In addition, support from the Vermont Department of Public Service and the Vermont Bankers Association would be important while crafting legislation and seeking Legislative approval. The Clean Energy Financing Work Group of the Vermont Public Utilities Commission could also be key to helping develop support for C-PACE. Once approved, Efficiency Vermont is a logical entity to explore first for administering C-PACE. As in Maine and New Hampshire, this might require adding capacity within the organization to properly promote and administer such an undertaking.

<table>
<tr><th colspan="4">C-PACE Conclusions</th></tr>
<tr><th colspan="4">The Challenge</th></tr>
<tr><td colspan="4">The ability to significantly scale up clean energy investment by the commercial and industrial sector requires new approaches that don't rely on upfront cash and "on-balance sheet" debt. In addition, there is minimal incentive for building owner's that lease commercial space to invest in energy improvements in situations where the tenant pays the monthly energy costs (referred to as the "split incentive").</td></tr>
<tr><th colspan="4">How the Challenge is Addressed</th></tr>
<tr><td colspan="4">C-PACE addresses these challenges by providing 100% financing and ensuring the transfer of the repayment obligation from one lessee to the next.</td></tr>
<tr><th colspan="2">Recommended for</th><th colspan="2">Market Segments Served</th></tr>
<tr><td colspan="2">Maine, New Hampshire, and Vermont</td><td colspan="2">Small-to-medium enterprises (SME)
Commercial and industrial (C&I)
Municipal buildings, universities, schools, and hospitals (MUSH)</td></tr>
<tr><th colspan="2">GHG Reduction</th><th colspan="2">Jobs Creation Impact</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>How</th></tr>
<tr><td>Medium</td><td>Financing energy efficiency and renewable energy projects that reduce fossil fuels used for heating reduces GHG emissions.</td><td>Medium</td><td>Energy efficiency and wood harvesting for fuel create local, lasting jobs; solar PV creates construction jobs during installation. Companies that lower utility costs are more resilient and able to offer better pay and benefits.</td></tr>
<tr><th colspan="2">Equity</th><th colspan="2">Lift</th></tr>
<tr><th>Impact</th><th>How</th><th>Impact</th><th>Why</th></tr>
<tr><td>Low</td><td>C-PACE can advance equity if affordable multifamily housing is deemed eligible for the offering.[90]</td><td>Medium</td><td>There is substantial proven success with C-PACE in California and Connecticut that can be leveraged in Northern New England.</td></tr>
<tr><td colspan="4">C-PACE in each state will entail the following:
Capital will be needed from private investors or lenders, bondholders, ratepayers, the public sector, or a combination of these sources. Typically, C-PACE portfolios are aggregated and sold to investors so new dollars become available before the capital pool is depleted.
The capital should not be structured as a loan but rather as a tax assessment that is repaid over 10 to 20 years.
C-PACE usually requires a senior lien position. Failure to repay the assessment results in the same outcome as the failure to pay any other portion of a property tax bill.</td></tr>
</table>

[90] *Commercial PACE for Affordable Multifamily Housing*, 2018. Energy Efficiency for All https://energyefficiencyforall.org/resources/commercial-pace-affordable-multifamily-housing

Best practices / lessons learned for a successful offering
● Finding the appropriate program administrator is key to success. Key capabilities for a successful administrator include: ○ The ability to access capital at competitive rates ○ Expertise in clean energy financing ○ Access to a local team with deep familiarity with local energy efficiency and renewable energy markets ● Gaining the support of an existing mortgage lender for a PACE project (referred to as “lender consent”) is widely considered a best practice for commercial PACE projects. ● Programs with high customer uptake offer turnkey services and financing. This means minimal customer effort or involvement is required. ● Using a Savings to Investment Ratio (SIR) that stipulates the level of savings that must result is also a best practice. Typically, low-return measures are combined with higher return measures to achieve a blended SIR.
Why is this recommended?
C-PACE is an effective way to finance energy efficiency and renewable energy projects for small-to-medium enterprises, commercial and industrial facility owners, and municipalities, universities, schools, and hospitals without adding long-term debt to their balance sheets. There is substantial interest among clean energy thought leaders in Northern New England in advancing C-PACE in each state.

Recommendation 9: Expand Municipal Lease-Purchasing

With an aging building stock and tight municipal budgets that could benefit from reduced energy bills, there is a pressing need for increased energy upgrades in municipal buildings throughout Northern New England. However, many local governments are unable to undertake such projects without technical and financial assistance (especially for small towns). The lack of municipal staff with the appropriate technical expertise, limited capital budgets, and barriers to accessing financing prevent otherwise cost-effective energy upgrades from coming to fruition. Efficiency Maine, NHSaves, and Efficiency Vermont each provide technical support and financial assistance to municipalities. However, the total need is larger than they will likely be able to fund. Many Energy Service Companies seek energy projects in government buildings. However, ESCOs typically favor projects valued at $1 million and above. They often focus on larger communities, rather than the small rural municipalities spread throughout the three-state region.

Municipal Bonds and Municipal Lease-Purchasing

In addition to taking advantage of offerings by Efficiency Maine, NHSaves, Efficiency Vermont, and ESCOs, municipal governments can access financing for energy efficiency and clean energy projects by issuing tax-exempt bonds or by entering into a lease-purchase agreement.

Municipal bonds can be used for municipal infrastructure and capital improvements (including energy efficiency, renewable energy, and transportation electrification projects). However, it is not uncommon for a municipality to have multiple and competing infrastructure and capital improvements needs, making it essential to plan carefully for what to bond for and when. This is particularly true for small municipalities with a limited tax base for generating the revenue needed to pay back bonds. In addition, a municipality must have an investment grade bond rating (or better) to borrow money at the lowest possible interest rate. Achieving such a bond rating depends, in part, on not over-extending borrowing. For this (and many other reasons), there are many municipal buildings with cost-effective energy efficiency and clean energy projects waiting to happen as well as substantial unrealized opportunity to electrify municipal vehicle fleets.

Municipal lease-purchase financing (also referred to as municipal leasing) is an alternative way to pay for energy efficiency and clean energy improvements in municipal buildings and for transportation electrification without having to use bonds.[91] Capital for the lease-purchase comes from a partnership with private investors that is brokered by a municipal leasing consultant. The lease payments are generally levelized and are tied to the useful life of the equipment or to the cashflow of an energy project that provides energy savings or revenue from electricity production. Interest rates are typically lower than those for a taxable commercial lease-purchase agreement because the interest paid is exempt from federal income tax and in recognition of the credit rating of municipal borrowers. At the end of the lease period, the equipment reverts to the lessee at a nominal price, according to terms of the lease. Compared to bonds, municipal lease-purchase financing:

- May not require voter approval;
- Is not subject to any limits that may be imposed by state or local debt ceilings;
- Spreads repayment over the energy efficiency and clean energy asset's useful life;
- Provides greater flexibility when structuring repayment terms and collateral provisions; and
- Lowers transaction costs through faster closing timelines, less complicated legal documents, and eliminating the need for bond ratings or insurance.

[91] https://aglf.memberclicks.net/faq

Lease-purchase interest rates may be slightly higher than bond interest rates. However, other advantages of leasing can help offset that potential downside.

Experience with Municipal Lease-Purchasing

Municipal lease-purchasing is a common, well-established practice throughout the U.S. Recent surveys by the Association for Governmental Leasing & Finance (AGLF) show total municipal lease financial portfolios in the range of $8 to $12 billion, with annual origination volumes around $5 billion.[92] There is some experience in Northern New England using lease-purchasing for municipal energy efficiency and clean energy projects. However, the practice is not yet widespread and unrealized opportunity exists to ramp it up.

In Franklin County, Maine the regional school district used municipal lease-purchase financing on a portion of a $5.8 million project involving energy upgrades to several school district properties. The improvements included replacing boilers, retrofitting lighting systems, repairing roofs, and generally improving the buildings' envelopes to increase energy efficiency.[93]

In New Hampshire, the Building Energy Conservation Initiative of 1997 prompted an assessment of ways to improve the energy efficiency of state-owned buildings. However, the state Treasury Department was concerned about increasing state debt, and potentially adversely affect the state's credit rating. After discussions with ESCOs and other finance professionals, state officials determined that by separating the financing activity from the technical performance obligations under a performance contract, the state could obtain lower cost financing. In other words, a tax-exempt Master Lease Program was established to underwrite performance contracts for the work. After a year of reviewing similar programs, all parties agreed that the non-appropriation language of the Master Lease Program would allow the lease to be repaid from operating funds and thus have minimal impact on the state's credit rating. This low-cost financing permitted New Hampshire officials to install a broader range of energy-efficient equipment than if they had used the financing bundled into an ESCO contract. As a result, more projects met the legislated payback requirements, New Hampshire's credit rating did not change, and the state got better pricing by consolidating all projects under one agreement.[94]

Several Vermont school districts have used lease-purchase financing to undertake major energy efficiency upgrades.[95] For example, a national ESCO partnered with the Rutland City School District in 2014 to make $5.2 million in improvements to six schools using lease-purchase financing. In addition, the nearby Proctor School District implemented $1.6 million worth of energy upgrades in two schools in 2015 using lease-purchase financing.

High-Level Strategic Guidance for Moving Forward

Opportunity exists to complement offerings available from Efficiency Maine, NHSaves, Efficiency Vermont, and ESCO's by launching a municipal lease-purchasing initiative in Northern New England. Such an initiative could be especially helpful for small towns that may not have the staffing expertise to engage in such offerings and may be too small to be of interest to ESCOs. If developed through a mission-driven, non-profit organization with capital formation expertise, the tax-exempt advantage of municipal government transactions could be brought to private investors. If the initiative involved the provision of both technical and financing expertise to municipalities and a well development sales and marketing approach, substantial market uptake could occur.

[92] https://www.store.leasefoundation.org/Products/MunicipalReport.pdf
[93] https://nhsaves.com/blog/developing-financing-strategies-for-energy-efficiency/
[94] https://www.energy.gov/sites/prod/files/2014/06/f16/COO-CFO_Paper_final.pdf
[95] https://www.contractormag.com/management/vermont-high-school-benefits-energy-performance-contracts

Municipal Lease-Purchasing Conclusions

The Challenge

Municipalities face a lack of available cash to pay the upfront costs of cost-effective energy efficiency, renewable energy, and transportation electrification projects that ultimately would payback and reduce municipal energy bills.

How the Challenge is Addressed

Municipal tax-exempt lease-purchase financing is a way to finance municipal clean energy investments that reduce operating costs, lower carbon emissions, and create jobs without using the bonding capacity of the municipality.

Recommended for	Market Segments Served
Maine, New Hampshire, and Vermont	Municipal buildings

GHG Reduction		Jobs Creation Impact	
Impact	**How**	**Impact**	**How**
Medium	Paying for energy efficiency improvements in municipal buildings that heat with fossil fuels reduces GHG emissions.	Medium	Energy efficiency creates local jobs.

Equity		Lift	
Impact	**How**	**Impact**	**Why**
Low	Low-to-moderate income households are not likely to benefit from this recommendation unless municipal lease-purchasing is used to finance improvements to municipally-owned affordable housing.	Medium	There are potentially hundreds of small towns throughout the region that could benefit from municipal lease-purchasing. This recommendation could require a multi-year effort to fully implement.

A municipal or quasi-governmental entity would secure lease-purchase financing to raise capital for financing clean energy investments. An intermediary would be required to originate, underwrite, and service loans for eligible projects. One underwriting approach is for the debt service payments to be covered by the energy and dollar savings resulting from the projects. This function could potentially be provided by an existing entity in each state. CDFIs are intermediaries that can play this role as could the economic development finance agency. Lease-purchase financing is tied to a specific term. Future recapitalization decisions would be tied directly to the experience of the respective programs.

Best practices / lessons learned for a successful offering

- Municipalities without trained staff to identify and undertake clean energy projects will require a targeted program of assistance.
- One-stop shop with standardized documentation or advancing municipal clean energy projects is a best practice for ensuring market adoption.
- Municipal leasing offers key advantages that remove barriers to action.
- Convening and engaging with state associations of municipalities is an effective way to increase interest in and stimulate demand for municipal lease-purchasing.
- Engaging municipal stakeholders in the design and delivery of an offering and raising the capital to launch an offering could jumpstart the market.
- Marketing, technical assistance, and financing are three key aspects of a successful program.

Why is this recommended?

Municipalities can lead-by-example by making sure all cost-effective energy efficiency, renewable energy, and transportation electrification opportunities are completed for municipal operations. While

Efficiency Maine, NHSaves, and Efficiency Vermont have municipal offerings as part of their ratepayer-funded offerings, their resources will likely never be sufficient to support all cost-effective opportunities in every city or town. ESCO's also serve municipal government, but most are not actively pursuing small, rural communities. While municipal bonds are one way to expand clean energy financing support for cities and towns, there are multiple competing demands for bonds. Municipal tax-exempt lease-purchase financing can help alleviate competition for other infrastructure investments requiring bond support. Blended with a targeted program of technical assistance and marketing, this effort could help significantly accelerate municipal energy projects.

Recommendation 10: Expand Tariffed On-Bill Financing

There are a range of cost recovery (or repayment) mechanisms for energy efficiency and weatherization investments made to utility customer households. A common approach is on-bill financing (OBF), which advances the funds used to make energy efficiency or weatherization upgrades through the utility and structures the repayment through the customer's utility bill. On-bill financing programs can use ratepayer, utility, or public funds to capitalize the financing advanced by the utility. Through public-private partnerships, on-bill financing can utilize credit enhancements such as Interest Rate Buy-downs (IRBs), Loan Loss Reserves (LLRs), and guarantees to extend credit to lower-income customers.

Overview of On-Bill Financing

There are three types of on-bill financing:

- **On-bill financing (OBF)** - The utility is the lender in an OBF program. Ratepayer funds collected for energy efficiency programs are the most common funding source, but utility shareholder funds can also be used. In some contexts, *on-bill financing* has become an umbrella term for any financing program that includes charges on a utility bill, including on-bill repayment and tariffed on-bill. However, *on-bill* is used as the umbrella term, while *on-bill financing* (or OBF) is restricted to programs in which the utility is the lender.
- **On-bill repayment (OBR)** - In OBR, the capital provider is a third party, and the utility operates as a repayment conduit for that third-party capital provider. A utility may opt to use its own funds to offer administrative support or credit enhancements.
- **Tariffed on-bill financing (TOBF)** - In a TOBF program, efficiency upgrades are financed not through a loan, but rather through a utility offering that pays for upgrades under the terms of a new, voluntary tariff. This tariff includes a cost recovery charge on the bill that is less than the estimated savings. The on-bill charge is associated with the meter at the address of the property or facility where upgrades are installed, and the cost recovery charge is treated as equal to other utility charges on the bill.

Over time, on-bill programs have become a popular way for utilities to help homeowners invest in energy efficiency improvements. This financing design leverages the billing relationship that utilities already have with their customers and uses customer energy usage data and payment history to optimize energy savings opportunities. To date, nearly $2 billion has been lent through on-bill financing mechanisms for energy efficiency in 25 states, of which 60% went to residential financing.[96]

The Differences Between Loan-Based and Tariff-Based On-Bill Financing

On-bill financing and repayment that uses the utility's or third-party capital and structures the capital as a loan to the customer typically involves some form of underwriting the customer and/or collateralizing the obligation, and this can be problematic for customers that don't conform to underwriting criteria. A tariff, on the other hand, is a regulated fee that is added to the utility rate and other billed items (fees, taxes, etc.). Presented in below is a comparison of loan-based and tariff-based on-bill financing.

[96]Financing Energy Improvements on Utility Bills: Market Updates and Key Program Design Considerations for Policymakers and Administrators. Financing Solutions Working Group. State & Local Energy Efficiency Action Network. May 2014. https://www4.eere.energy.gov/seeaction/system/files/documents/onbill_financing.pdf.

Table 13. Comparison of loan-based and tariff-based on-bill financing. [97]

	On-bill Loan-Based Financing	On-bill Tariff-Based Financing
Transferability	Depends on program design. Full repayment often required at time of sale. Possible to transfer as a lien.	Financing is tied to the meter so recovery obligation remains with the occupant.
Financing term	Shorter term makes retrofits less cost-effective	Longer-term makes retrofits more cost-effective
Regulatory approval?	Yes (for regulated utilities)	Yes (for regulated utilities)
Homeowners eligible?	Yes	Yes
Classified as debt?	Yes	No
Renters eligible?	No	Yes
Credit score check? Debt to income ratio?	Yes	No
Upfront participant cost?	Yes	Yes
Must estimated savings exceed cost recovery by 20%?	No	Yes
Participant signs a loan or promissory note for a debt obligation?	Yes	No
Participant accepts an opt-in utility tariff (not a debt) tied to the premise meter?	No	Yes
Is cost recovery through a fixed charge on the utility bill?	Yes	Yes
Is 100% on-site QA/QC required for payment authorization?	Yes	Yes
Does payment end if upgrade fails and is not repaired by the utility?	No	Yes
Does participant accept risk of disconnection for non-payment?	Yes	Yes
Does tariff stay with the meter (not the participant) until cost recovery is complete?	No	Yes

Tariffed On-Bill Financing as a Pathway to Market Transformation

Under the umbrella term "on-bill," the tariff approach offers the greatest opportunity for market transformation because it can remove market barriers associated with loans. The overarching benefit of the tariff approach is that it avoids underwriting customers and instead underwrites "the building" by assessing the energy usage reduction opportunities using a cost-benefit analysis to arrive at the pay-back amount that does not exceed the home's average utility bill costs. "With a tariff on-bill investment program, the utility owns the improvements until it recovers the cost through a site-specific charge on the bill, then the building owner takes ownership at no additional cost. Because the tariff ties the investment to the meter and not an individual customer, the payments and upgrades apply to both the current and successor occupants of a given property until the utility's costs are recovered."[98]

TOBF is also known as "inclusive financing" because this mechanism can reach all residential markets: homeowners, multifamily property owners, and renters (with the property owner's cooperation). This distinguishes tariff-based financing from "classic" loan-based on-bill financing which has not typically been made available to renters. Because best practices for TOBF do not rely on collateral, income eligibility, loan-to-value, or debt ratios are not essential elements of program design. This approach is more suitable

[97] Adapted from EEtility, Inc., Little Rock, Arkansas.

[98] https://ilsr.org/report-inclusive-energy-financing/

than loans for rental property because it offers the building owner a way to authorize energy improvements that will be repaid by the utility account owners that live in the building. Moreover, as one renter moves out and another renter moves in, the new renter will simply absorb the remaining portion of the job cost allocated to that unit's utility meter.

The additional tariff charged for the energy efficient investment is separate and distinct from the standard electric rate/tariff charged to customers and includes a cost recovery charge on the bill that is less than the estimated savings. The on-bill charge is associated with the meter at the address of the property where upgrades are installed, and the cost recovery charge is treated as equal to other utility charges on the bill. The utility account owner is responsible for paying the tariff charge that is added to the bill for energy efficiency upgrades.

The cost of weatherization and efficiency improvements are structured into the tariff, which is off-set by a reduction in energy costs recovered through utility rates. The program model is designed so that a utility can recover its cost with a charge on the bill that is capped at 80% of the estimated savings from the upgrade over 80% of the life of the upgrade.[99] The goal of this pricing cap is to minimize customer risk. The desired outcome is that the customer's total bill declines, and the allocation to rate revenue decreases as the allocation to tariff charges cover the cost of the energy efficiency measures installed. Existing programs fund a range of improvements, some of which include comprehensive weatherization and others have focused on one or two measures, such as heat pumps.

At least seven states have requested and received regulatory approval for a tariff specifically for the purpose of funding energy efficiency upgrades, including New Hampshire, Kansas, Kentucky, Hawaii, Arkansas, North Carolina, and California. To varying degrees, the program model used is based on Pay As You Save® (PAYS®), which offers a tool kit for TOBF.[100]

Capital Sources for existing tariffed on-bill financing include utility capital and public and nonprofit funding sources. Midwest Energy's How$mart® program invests utility capital and allows both commercial and residential customers to make efficiency improvements with no upfront cost requirements. The interest rate for residential customers is 5.05% over 15 years. For commercial customers, it is 6.6% over 10 years. The How$mart program is available to all Midwest Energy customers who are current on their utility payments. The program is also available to both home owners and renting or leasing tenants with the owner's permission.[101]

Kentucky's Mountain Association for Community Economic Development (MACED) is a CDFI that finances How$martKY, which is TOBF offered by six electric cooperatives. In North Carolina and Arkansas, the Roanoke and Ouachita Electrical Cooperatives used the USDA Rural Utilities Service Energy Efficiency and Conservation Loan program[102] to capitalize their TOBF offerings. The cost of weatherization and efficiency improvements are structured into the tariff, which is offset by a reduction in the energy usage and costs recovered through utility rates. The desired outcome is that the customer's total bill remains the same, but the allocation to rate revenue decreases as the allocation to tariff charges cover the cost of the energy improvement project.

What is Needed for Successful TOBF?

The "supply-chain" associated with administering a tariffed on-bill program includes a source of capital, project management, and payment collections. Capital must come from some source, which can be investment from profits or a loan to the utility from a traditional or non-traditional lender. CDFI financing is

[99] https://drive.google.com/open?id=0BzYyDNPW3cwwOFBzc3NyTTF2MEE
[100] http://www.cleanenergyworks.org/2015/05/06/pays-financing/
[101] http://www.localcleanenergy.org/State%20On-Bill%20Financing
[102] https://www.rd.usda.gov/files/fact-sheet/RD-FactSheet-RUS-EnergyEfficiency.pdf

one possible source if the funds were to be directed to low-income housing units and/or underserved small businesses, in keeping with CDFI regulatory requirements.

Another source of funds used for TOBF is the USDA Rural Utilities Service (RUS) Energy Efficiency and Conservation Loan (EECLP) program.[103] Electric cooperatives and municipal electric utilities are eligible to apply for this loan program. Cooperatives in both Arkansas and North Carolina have successfully applied for and used EECLP to support TOBF.[104] However, as a federal program with very specific requirements, guidelines, and application requirements, smaller cooperatives and municipal utilities may have limited staffing capacity and capability to successfully apply for and potentially administer the funds. An agency or organization that has previously assisted a cooperative or municipal utility with an EECLP application could be well-positioned to offer services in the future.

The largest TOBF program component is the customer-interface role to help customers choose and implement practical, cost effective energy efficiency measures and support them through the project management process. In places where tariffed on-bill financing is active, this is typically done through a network of vetted, qualified contractors who explain the tariff financing option, enroll the customer, and receive approval from the utility to begin work. There is also a quality control function required to inspect the work and ensure that the contractor's projected savings (and cost) will be achieved within a margin that mitigates risk for the customer. If a utility is administratively unable to fulfill this project management role, it could be outsourced to other entities, such as Efficiency Maine and Efficiency Vermont, or implementation contractors supporting such entities.

Finally, utilities need systems and procedures to recoup the tariff and repay the capital, which is a matter of adjusting billing formats to delineate the tariff charge, expanding collections procedures and implementing finance systems to track and repay the capital provider. There are additional functions associated with aligning project documents, job cost recovery terms, and removing the tariff from the bill after the cost recovery term ends

One consideration with TOBF is that the efficiency upgrades are paid through a tariff charge, and tariff charges may not be an eligible use of funds through the Low-Income Home Energy Assistance Program (LIHEAP). For households that receive LIHEAP, they can pay for their energy usage charges with this assistance but may not be able to cover the tariff charge with it. Therefore, programs must clarify this question or request a waiver from this restriction before assisting LIHEAP recipients with tariff-paid energy upgrades. Ideally, the federal LIHEAP administration will realize that the reduction in low-income utility bills resulting from direct install and weatherization improvements are likely to reduce LIHEAP costs if the TOBF program is designed to reduce usage and cost with a savings margin added to each project that protects the household financially.

Additionally, consumer advocates express concerns about bill disconnects if a household can afford to pay for the usage portion of the utility bill but not the tariff charge. New York has addressed this question with "legislation that provides that the energy-bill is paid first, reducing the risk to utilities."[105]Also, "on-bill programs have historically boasted low default rates…[which] have tended to be less than one percent," with one exception during the pilot phase of a SoCal program.[106]

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[103] https://www.rd.usda.gov/programs-services/energy-efficiency-and-conservation-loan-program.
[104] *Opening Opportunities with Inclusive Financing for Energy Efficiency. Quachita Electric Cooperative. 2017.* Camden, AK. https://www.oecc.com/pdfs/HELP_PAYS_Report_2016-Ouachita_Electric_20170612V1.pdf.
[105] *"On-Bill Financing for Energy Efficiency Improvements: A Review of Current Program Challenges, Opportunities, and Best Practices."* Catherine J. Bell, Steven Nadel, and Sara Hayes. ACEEE Report Number E118. December 2011. p.21
[106] *Ibid*, p. 21

High-Level Strategic Guidance for Moving Forward

Obtaining regulatory approval for this kind of tariff is the first threshold to overcome for implementation, and the desire must come from the utilities to incorporate the financing mechanism into their business models. TOBF could be integrated into a performance-based regulation framework (discussed elsewhere in this report) to create an incentive for utilities to integrate the change into their business activities. If a clear pathway exists for tariffs as a performance incentive, the roadmap for implementation requires an administering entity that can train and manage a contractor network, which is a potential role for energy efficiency program administrators or energy service implementation contractors.

Ensuring consumer advocates are comfortable with TOBF will be key, as some in other jurisdictions have been concerned before implementing TOBF that utility disconnects may increase, if low income customers do not realize the bill savings expected. The TOBF program currently operated in Arkansas by EEtility asserts that two main factors significantly reducing the risk of utility disconnects for non-payment among low-income customers include:

1) Providing a guarantee that ensures the customer keeps at least 20% of the savings; and
2) Ensuring rigorous QA/QC on every energy efficiency and weatherization retrofit performed to ensure the expected savings will be realized.[107]

TOBF advocates note that their system leads to a charge-off rate 10 times lower than other types of energy efficiency loan-based financing. They attribute this to strict adherence to delivering 20% bill savings to the customer and to the rigorous QA/QC to ensure the energy efficiency and weatherization work is delivering those savings.

In Northern New England, New Hampshire leads the way in gaining regulatory approval for the use of a tariff to fund energy improvements. Eversource, Liberty, and Unitil offer TOBF to municipal customers. New Hampshire Electric Cooperative offers TOBF to municipal and C&I customers.

In Maine and Vermont, the advancement of a tariff would begin by engaging utilities to determine interest, then assessing regulatory frameworks to understand the context for application of this strategy. At the very least, it is likely that tariff financing represents an opportunity to find common ground with utilities.

Tariffed On-Bill Financing Conclusions	
The Challenge	
The lack of affordable, accessible, easy-to-use clean energy investment options for renters and income eligible households.	
How the Challenge is Addressed	
Tariffed on-bill financing (TOBF) "links the investment and its repayment to a unit's meter, essentially linking the product to the property and not the individual customer."[108] Traditional underwriting can be by-passed because there are no collateral requirements, and the tariff charge is typically priced to include a 20% risk margin so that the meter account owner pays less than their average utility costs prior to the efficiency improvements. In the multifamily market, the tariff charge is incurred by the renters, so there is no need for the owner to take on debt and deal with property securitization. The tariff charge is passed on to the next occupant and does not have to be addressed during rental unit turn-over or home purchase transactions.	
Recommended for	**Market Segments Served**

[107] Tammy Agard. 2017. (EEtility, Little Rock, AK) Personal Communication. October 2017.
[108] *On-Bill Financing for Energy Efficiency Improvements: A Review of Current Program Challenges, Opportunities and Best Practices."* Catherine J. Bell, Steven Nadel, and Sara Hayes. December 2011. ACEEE Report Number E118.

Maine, New Hampshire, and Vermont		Commercial and residential. Especially well-suited for renters and low to moderate income households not interested in, or eligible for, debt financing.	
GHG Reduction		**Jobs Creation Impact**	
Impact	**How**	**Impact**	**How**
Medium	Paying for energy efficiency improvements in buildings that heat with fossil fuels reduces GHG emissions.	Medium	Building energy efficiency creates home performance contractor and trade industry jobs.
Equity		**Lift**	
Impact	**How**	**Impact**	**Why**
High	TOBF is especially well suited for low to moderate income households with low credit scores who are essentially "unbankable."	Medium	There is proven success with TOBF in multiple states that can be leveraged in Northern New England. The New Hampshire utilities have experience with TOBF for municipal and C&I customers, but not with residential customers.
At least two TOBF programs applied for and received USDA Rural Utilities Services (RUS) loans as their source of capital (in Arkansas and North Carolina). RUS is available to electric cooperatives and municipal electric utilities. The loan provides capital that can be drawn down and repaid over 20 years with an interest rate equal to the US Treasury rate. Investor-owned utilities could potentially use their own capital and some programs have used energy efficiency systems benefit charges, such as Midwest Energy in Kansas. CDFI funds could also be a viable source for tariffed on-bill financing. This is how the Mountain Association for Community and Economic Development offers its $martKY™ tariff financing program to the residential market.[109]			
Best practices / lessons learned for a successful offering			
• Convene stakeholders and regulators to build support for overall approach. • Suggest tariff financed energy efficiency as a performance incentive for utilities to reward them for taking this on and the administrative changes that will be needed to develop and deliver this offering. Build in consumer protection against disconnects by pricing tariffs with risk margin to reduce customer monthly utility costs by at least 20%; and address financing disclosure issues. • Ensure that contractor quality control is built into program design through warranties and contractor payment contingent upon savings being achieved. • Form partnerships with community-based organizations that support low-income renters and homeowners through weatherization, energy efficiency, financial literacy, and advocacy.			
Why is this recommended?			
Current solutions for paying for home energy upgrades are limited to the lending market that underwrites the customer. This poses market barriers to homeowners and multifamily property owners who will not, or cannot, borrow for energy improvements. Tariff financing offers a solution that removes most underwriting barriers and opens up new options for the commercial and residential markets, including renters and low and moderate-income households.			

[109] *Ibid.* p 15

Recommendation 11: Continue Assessing the Need for a Green Bank

Unlike a traditional bank, a "green" bank focuses exclusively on financing clean energy projects and environmentally beneficial technologies. Green banks started to emerge in 2009 as policymakers sought ways to finance the portion of energy efficiency and/or renewable energy projects not covered by rebates, grants, and incentives available from other sources. Generally, such rebates, grants, and incentives are intended to motivate consumers, business, and industry to invest in energy projects for which the initial funding only covers a portion of the total cost. This leaves a gap that must be financed or funded from the customers' own sources. Financing from a green bank is a way to bridge the gap between a rebate, incentive, or grant and the full project cost.

Green banks are currently operating in California, Connecticut, Hawaii, Maryland (in Montgomery County), New York, and Rhode Island and are under development in Colorado, the District of Columbia, and Nevada. TNC and CEI expressed interest in learning more about green banks, both state-specific green banks and the potential for a regional, non-profit green bank. Presented below are results of research conducted for this report.

What is a Green Bank?

By definition a green bank is a public, quasi-public, or nonprofit entity partnering with private lending institutions to overcome barriers to clean energy investment. Green banks are formed to provide loans, leases, credit enhancements, and other financing services to fill gaps in private capital markets for clean energy investments. Green banks in operation to date:

- Are publicly-chartered financing institutions
- Have a mandate to invest in clean energy
- Leverage public funds to stimulate private investment in clean energy
- Offer products across all sectors, focusing on bridging market gaps
- Leverage public funds through various loan and credit enhancement mechanisms

Green banks thus far have been capitalized with public funds and are housed in an existing state or quasi-state agency. The agency has (or developed) the staffing capability to manage the administrative, rule-making, and underwriting authority needed for successful operation of a bank. All green banks currently in operation focus on serving a single state. No regional green banks have been developed yet.

Green Banks in the Northeast

Table 13: Overview of green banks in the Northeast.

Entity	Service area	Launched	Administration	Capital sources	Sponsors/founders	Balance sheet
CT Green Bank	CT	2011	Quasi-state	Ratepayer/private	Re-purposed existing entity	$110M
NY Green Bank	NY	2013	Quasi-state	Ratepayer/private	Gov. Cuomo/NYSERDA	$487M
RI Infrastructure Bank	RI	2016	Quasi-state	Ratepayer/private	Re-purposed existing entity	$653M

Presented in Table 13 is an overview of the three green banks currently in operation in the Northeast.

The Connecticut Green Bank (CT Green Bank) was initially capitalized with $72 million in a legislative appropriation from the Connecticut Clean Energy Fund. The CT Green Bank also receives $27 million per year from the System Benefit Charge assessed on utility bills and $3 million per year of money raised through the Regional Greenhouse Gas Initiative. Since inception in 2011 investment activity beginning in 2012, the Connecticut Green Bank has used public investment (from SBCand RGGI funds) of $219 million

and leveraged $1.1 billion of private investment in clean energy. The bank has achieved a leveraging ratio of 6 private dollars for every 1 dollar of public investment. All operations for the bank, including business development, are handled by in- house staff.[110]

According to information provided by the New York Green Bank (NY Green Bank), "the bank was formally opened for business in 2014. Pursuant to a December 2013 Order of the New York State Public Service Commission, initial funding of $165.6 million was made available … from uncommitted NYSERDA and utility clean energy funds (originally sourced from ratepayer collections). In addition to the Order, NYSERDA transferred $52.9 million of its Regional Greenhouse Gas Initiative revenues to the bank for a total initial capitalization of $218.5 million. In July 2015, the Commission issued an Order providing an additional $150.0 million of capitalization, funded from certain uncommitted ratepayer program funds, subject to specified triggers. This further capital installment was received by the bank in August 2016, at which time its funded capital increased to $368.5 million. In January 2016, the Commission's Clean Energy Fund Order confirmed the bank's authorized capital at $1.0 billion and allocated incremental ratepayer collections in varying amounts from 2016 through 2025 for the remaining $631.5 million of the bank's $1.0 billion capitalization." [111] From inception it was contemplated that the NY Green Bank would be self-sustaining by 2018. In March 2017, the bank reached self-sufficiency (through the generation of annual net income), a year ahead of schedule.

The NY Green Bank makes direct investment in projects with participation by debt and equity investors when the project meets private sector investment grade requirements. The bank recently announced new clean energy investments of $64.9 million for the second quarter of 2018. "With these latest additions to the bank's portfolio, its commitments of $522.3 million are expected to mobilize between $1.46 billion to $1.7 billion in sustainable infrastructure investment in clean energy projects in New York State."[112] Overall, the NY Green Bank has leveraged over $3 of private capital for every $1 of ratepayer funds. With 28 full-time employees in 2018, the bank handles all aspects of lead generation and customer acquisition using their own staff.[113], [114]

The Rhode Island Infrastructure Bank provides the services of a green bank across four categories of projects: clean energy, clean water, drinking water, and municipal roads and bridges. In addition, C-PACE is offered through the bank but the actual program administration and financing for C-PACE is outsourced. This was done to take advantage of existing private sector firms that were already providing C-PACE services before the Infrastructure Bank was formed.[115]

The bank initially capitalized their Efficient Building Fund (serving municipalities and quasi-public agencies) with $2 million of RGGI proceeds and $1.8 million in utility system benefit charge funds were used to establish a loan loss reserve for the fund. In addition, the bank receives about $2.5 million per year for operational costs from the State of Rhode Island. A portion of those funds are used to operate the Efficient Building Fund and C-PACE. To date, the bank has financed $27.9 million of eligible projects through the Efficient Building Fund. The primary business development channel for the fund is through a network of trained contractors who market eligible projects directly to building owners and managers. As a share of

[110] https://www.ctgreenbank.com/about-us-2017/
[111] Sarah Davidson, New York Green Bank, External Affairs. Email dated December 19, 2018.
[112] https://greenbank.ny.gov/News-and-Media/In-The-News/2018-08-15-NY-Green-Bank-Announces-Strong-Second-Quarter
[113] https://greenbank.ny.gov/About/About
[114] Sarah Davidson, New York Green Bank, External Affairs. Email dated November 28, 2018.
[115] https://www.riib.org/

the bank's overall portfolio, clean energy projects range from a low of 15% to 21 %. The leverageing for clean energy financing is $5 of private capital invested for every $1 of public monies used.[116]

Green Bank Opportunities in Northern New England

Several clean energy finance professionals interviewed for this report suggested that a prudent and effective way to bridge the clean energy financing gap in Northern New England is not to create a regional, non-profit green bank but rather to help existing banks and credit unions to become green lenders. Michigan Saves is often sited as a model program that engages banks and credit unions in clean energy finance. Using ratepayer funds, Michigan Saves developed both a loan loss reserve to provide a backstop for lenders and they fund interest rate buydowns that enables lenders to offer below-market rates to borrowers.[117] Northern New England examples of ratepayer-funded credit enhancements used to leverage private capital for clean energy financing include the following:

- Efficiency Maine offers a variety of home energy loans to help pay for energy upgrades. Maine homeowners can borrow up to $15,000 over 10 years with no fees and interest rates as low as 4.99%. The rate charged by a third-party source starts at a higher rate and Efficiency Maine buys down the interest rate.
- NHSaves offers energy efficiency loans for homeowners, using SBC funds to buy-down the interest rate to 2%.
- Efficiency Vermont offers the Heat Saver loan through the Vermont State Employees Credit Union, also using SBC funds to buy down the interest rate.

It is not certain that creating a separate new entity such as a green bank in Northern New England will necessarily increase market adoption or grow the effective demand for clean energy. Homeowners and businesses already have banking relationships built on trust and mutual benefit, and rural New Englanders are known for customer loyalty and a preference to "buy local." In addition, careful consideration needs to be given to what the source of capital would be to start a new green bank. Reallocation of SBC or RGGI funds away from current uses may not be strategic or politically acceptable. At a minimum, a thorough market assessment should be done and a comprehensive business plan be developed, prior to proceeding with a new green bank.

High-level Strategic Guidance for Moving Forward

The following challenges are inherent to Northern New England when considering a green bank and are worthy of further exploring:

- To date, green banks have been chartered by state or county government as quasi-public entities.
- Interviews with green bank industry leaders indicate that high level political support is critical to attracting private capital. Without bi-partisan, sustained support from the highest levels of state government with appropriate statutory mandates, a green bank is unlikely to attract substantial private capital.
- Thus far, green banks have been capitalized with ratepayer funds, federal grants, or utility merger proceeds. Confirming the availability of such funds is key to moving forward, no matter what the structure of the bank is meant to be.
- Except in a handful of metropolitan areas, Northern New England is characterized by a low population density and a large number of businesses with 50 employees or less. This is not ideal for the larger clean energy projects typically favored by green banks to date.

[116] http://www.ripuc.org/eventsactions/docket/4684-Dunsky-PUC-meeting2017-05-18_FINAL.pdf
[117] https://michigansaves.org/home-energy-loan-program-faq/

- The amount of political capital required for creating a regional green bank may be better spent on helping existing lenders become more active in clean energy finance and through the development of credit enhancements to enable that. In Vermont, for example, the HeatSaver Loan is an example of leveraging ratepayer funds to enable a private lender to offer a favorable interest rate and loan term for residential energy upgrades.

Below are some key questions that should be considered when assessing whether to pursue development of a green bank, whether to favor a publicly-charted or a non-profit model, and whether to consider a single-state or a regional, multi-state approach.

- What are the benefits of forming a green bank as a non-profit versus a publicly-chartered institution?
- Would an independent nonprofit be able to provide the same advantages as public finance authorities that typically have significant balance sheets and ultimate backing from state or local government?
- How would a nonprofit leverage public funds to stimulate private investment?
- Is a green bank feasible in small, rural states (such as Maine, New Hampshire, or Vermont), or would a multi-state approach be necessary to develop sufficient demand to warrant formation of a bank and to attract sufficient private capital?
- If so, would there be any unsurmountable political or regulatory hurdles to address across all three states, given that banks are largely regulated at the state level?
- Given that a nonprofit green bank has not been implemented anywhere else yet, what is the risk threshold for those seeking to try that model for the first time? What conditions must be in place for that model to be viable?
- Does it make the most sense to establish a new entity or re-purpose an existing entity to serve the role of a green bank?

The New York Green Bank is currently exploring the possible creation of green banks in other states and may provide financing as well as mid- and back-office services, due diligence, underwriting, and general technical support to a new bank. The bank has retained third-party advisory services to evaluate options for structuring and facilitating such an effort and is securing third-party capital. The Energy Foundation is providing support for this effort. The Foundation aims to facilitate the launch of a collaborative model with the New York Green Bank serving as the capital provider and a state or regional entity doing product and market development, finding customers, and closing qualified leads. The Foundation is providing funding during the start-up phase to help the new collaboration reach sufficient scale, with the goal being for the bank to not rely on philanthropic support over the long-term. The geographic focus for 2019 has been established and is not Northern New England. However, during interviews for this project, Foundation representatives indicated a willingness to consider Northern New England when planning activities for 2020.

Green Bank Conclusions
The Challenge
Market uptake for clean energy loans offered by banks, credits, and various state agencies in Northern New England is not consistently high with the exception of the very successful Heat Saver Loan promoted and offered by the Vermont State Employees Credit Union. In addition, energy efficiency and renewable energy practitioners in the region report market confusion about which energy efficiency and clean energy technologies, projects, and finance offering to pursue, from which vendor.
How the Challenge is Addressed
A green bank specializes in financing energy efficiency, clean energy, and other green infrastructure. Green banks offer financing products (directly or via intermediaries) that underwrite the savings from energy efficiency and value the elimination of fuel costs and fuel price volatility from solar, wind, and biomass projects. When done effectively, a green bank can be a single, “one stop shopping” source for clean energy finance that helps address market confusion, removes barriers to moving forward with clean energy projects, and helps scale private investment.

Recommended for		Market Segments Served	
Continued market assessment and development of a comprehensive business plan, prior to moving forward with developing a new green bank.		All	
GHG Reduction		**Jobs Creation Impact**	
Impact	**How**	**Impact**	**How**
High	Financing energy efficiency and renewable energy projects that reduce fossil fuels used for heating and transportation reduces GHG emissions.	High	Energy efficiency and wood harvesting for fuel create local, lasting jobs; solar PV creates construction jobs during installation.
Equity		**Lift**	
Impact	**How**	**Impact**	**Why**
High	Green banks have the potential to serve low to moderate households by providing financing for affordable multifamily housing.	High	Starting a new bank is a complex undertaking that would involve state regulatory work, capital formation, a well-developed sales and marketing strategy to stimulate demand for financing, and the ability to perform all the functions of a bank.

Best practices / lessons learned for a successful offering

- Ensure there is a market gap that a green bank would address that could not otherwise be achieved by working with existing lenders and government entities.
- Establish financial self-sufficiency as a key goal.
- Strive for a high leverage ratio of private capital deployed compared to the public investment provided.
- Develop financial and carbon reduction metrics, measure and monitor results, and report progress with transparency.
- Involve stakeholders in all aspects of product and program development.

Why is this recommended?

There is interest among some in Northern New England in learning more about green banks and the possibility of a non-profit green bank serving the region. The Energy Foundation is engaged in helping the development of new green banks, but however Northern New England is not a region they are focused on at this time. Interviews conducted for this report of others involved in clean energy finance in the region were not conclusive on the need for such a bank. A key determinant will be the identification of a capital source for establishing a new bank. To date, the initial capital sources for other green banks have been ratepayer or government funds. That approach does not seem likely in Maine, New Hampshire, or Vermont in the foreseeable future. Instead, it was suggested by several finance or economic development thought leaders that an initiative to increase green lending by existing banks and credit unions serving the region might be an alternative approach. Examples include various models discussed in this report that leverage private capital by deploying public monies for credit enhancements that enable lenders to offer financing for clean energy projects that would otherwise not be approved.

Appendix A: Glossary of Acronyms

ACEEE – American Council for an Energy Efficient Economy
AGLF – Association of Governmental Leasing and Financing
APR – Annual percentage rate
C&I – Commercial and industrial
CA – California
CAP – Community Action Program
CDFI – Community Development Financial Institution
CEI – Coastal Enterprises, Inc.
CF TAT – Community Facilities Technical Assistance and Training
CLF – Conservation Law Foundation
CPACE – Commercial property assessed clean energy
DER – Distributed energy resources
DSM – Demand side management
EaaS – Energy-as-a-service
EAN – Energy Action Network
EE – Energy efficiency
EEM – Energy efficient mortgage
EPC – Energy performance contract
ESCO – Energy service company
EV – Plug-in electric vehicle
FAME – Finance Authority of Maine
FHA – Federal Housing Authority
FTA – Federal Transit Authority
GHG – Greenhouse gas
HVAC – Heating, ventilating, and air conditioning
LIHEAP – Low Income Home Energy Assistance Program
LMI – Low to moderate income
ME – Maine
ME DEP – Maine Department of Environmental Protection
ME DOT – Maine Department of Transportation
ME OPA – Maine Office of Public Advocate
ME PUC – Maine Public Utilities Commission
MLP – Master lease program
MSHA – Maine State Housing Authority
MUSH – Municipalities, universities, schools, and hospitals
NESCAUM – Northeast States for Coordinated Air Use Management
NH – New Hampshire
NH CDFA – New Hampshire Community Development Finance Authority
NH CLF – New Hampshire Community Loan Fund
NH DES – New Hampshire Department of Environmental Services
NH HFA – New Hampshire Housing Finance Agency
NH OCA – New Hampshire Office of Public Advocate
NH OSI – New Hampshire Office of Strategic Initiatives
NH PUC – New Hampshire Public Utilities Commission
NH SEA – New Hampshire Sustainable Energy Association
NGO – Non-governmental organization
NRCM – Natural Resources Council of Maine

NRDC – Natural Resources Defense Council
OBF – On-bill financing
OBR – On-bill repayment
PACE – Property assessed clean energy
PIA – Plug-in America
PBR – Performance-based regulation
PPA – Power purchase agreement
PV – photovoltaic (solar)
RAP – Regulatory Assistance Project
RBDG – Rural Business Development Grant
RE – Renewable energy
REC – Renewable energy credits
REAP – Rural Energy America Program
REV – Renewable Energy Vermont
RPACE – Residential property assessed clean energy
RPS – Renewable portfolio standard
RUS – Rural Utilities Service
SBC – System benefit charge
SEP – State Energy Program
SME – Small and medium-sized enterprises
SPE – Special project entity
TNC – The Nature Conservancy
TOBF – Tariffed on-bill financing
USDA – U.S. Department of Agriculture
USDOE – U.S. Department of Energy
USFS – U.S. Forest Service
USHUD – U.S. Department of Housing and Urban Development
VEDA – Vermont Economic Development Authoritys
VNRC – Vermont Natural Resources Council
VPIRG – Vermont Public Interest Research Group
VCRD – Vermont Council on Rural Development
VSECU – Vermont State Employees Credit Union
VSHA – Vermont State Housing Authority
VT- Vermont
VT ANR – Vermont Agency of Natural Resources
VT AOT – Vermont Agency of Transportation
VT CDA – Vermont Community Development Association
VT DEC – Vermont Department of Environmental Conservation
VT DPS – Vermont Department of Public Service
VT PUC – Vermont Public Utility Commission
VTrans – Vermont Department of Transportation
WAP – Weatherization Assistance Program
ZEV – Zero emission vehicle

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