VERMONT

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March 1, 2017

Members of the Vermont General Assembly
115 State Street
Montpelier, VT 05633-5301

Re: 2017 Vermont Renewable Energy Standard and Standard Offer Report

Dear Senators and Representatives,

I am pleased to submit the 2017 Vermont Renewable Energy Standard and Standard Offer Report which includes information on retail sales, requirements of the Renewable Energy Standard (RES), progress toward meeting RES targets, implementation of the Standard Offer program, market conditions for renewable energy, and retail electric rates.

If you have any questions or concerns upon reading the report please do not hesitate to contact me or the Director of Planning and Energy Resources, Ed McNamara. I look forward to working with you this year in continuing our work on the Renewable Energy Standard and Standard Offer programs.

Very truly yours,

June E. Tierney
Commissioner

Vermont Renewable Energy Standard and Standard Offer Program Report

A Biennial Report to the Vermont General Assembly Prepared by the Department of Public Service

March 1, 2017

The General Assembly requires the Public Service Department (Department) to submit a biennial report addressing renewable energy programs in the state (30 V.S.A. § 8005b(c)). This report addresses retail sales, requirements of the Renewable Energy Standard (RES), progress toward meeting RES targets, implementation of the Standard Offer program, market conditions for renewable energy, and retail electric rates.

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Introduction

The Renewable Energy Standard (RES) and Standard Offer programs are designed to increase the share of Vermont's energy derived from renewable sources. The RES provisions require that the Department of Public Service (Department) provide the General Assembly with a biennial report on various issues related to the RES and Standard Offer programs, renewable energy markets, and Vermont's power supply.

The General Assembly identified eight topics for the Department to address in the biennial report (30 V.S.A. § 8005b(c)).

> (1) The retail sales, in kWh, of electricity in Vermont during the two preceding calendar years. The report shall include the statewide total and the total sold by each retail electricity provider.
>
> (2) Commencing with the report to be filed in 2019, each retail electricity provider's required amount of renewable energy during the two preceding calendar years for each category of the RES as set forth in section 8005 of this title.
>
> (3) For the two preceding calendar years, the amounts of renewable energy and tradable renewable energy credits eligible to satisfy the requirements of sections 8004 and 8005 of this title actually owned by the Vermont retail electricity providers, expressed as a percentage of retail kWh sales. The report shall include the statewide total and the total owned by each retail electricity provider for each of these amounts and shall discuss the progress of each provider toward achieving each of the categories set forth in section 8005 of this title. The report shall summarize the energy transformation projects undertaken pursuant to section 8005 of this title, their costs and benefits, their claimed avoided fossil fuel consumption and greenhouse gas emissions, and, if applicable, claimed energy savings.
>
> (4) A summary of the activities of the Standard Offer Program under section 8005a of this title, including the number of plants participating in the Program, the prices paid by the Program, and the plant capacity and average annual energy generation of the participating plants. The report shall present this information as totals for all participating plants and by category of renewable energy technology. The report also shall identify the number of applications received, the number of participating plants under contract, and the number of participating plants actually in service.
>
> (5) An assessment of the energy efficiency and renewable energy markets and recommendations to the General Assembly regarding strategies that may be

necessary to encourage the use of these resources to help meet upcoming supply requirements.

(6) An assessment of whether Vermont retail electric rates are rising faster than inflation as measured by the CPI, and a comparison of Vermont's electric rates with electric rates in other New England states and in New York. If statewide average rates have risen faster than inflation over the preceding two or more years, the report shall include an assessment of the contributions to rate increases from various sources, such as the costs of energy and capacity, costs due to construction of transmission and distribution infrastructure, and costs due to compliance with the requirements of sections 8004 and 8005 (RES) and section 8005a (standard offer) of this title. Specific consideration shall be given to the price of renewable energy and the diversity, reliability, availability, dispatch flexibility, and full life cycle cost, including environmental benefits and greenhouse gas reductions, on a net present value basis of renewable energy resources available from suppliers. The report shall include any recommendations for statutory change that arise from this assessment. If electric rates have increased primarily due to cost increases attributable to nonrenewable sources of electricity or to the electric transmission or distribution systems, the report shall include a recommendation regarding whether to increase the size of the annual increase described in subdivision 8005a(c)(1) (standard offer; cumulative capacity; pace) of this title.

(7)(A) Commencing with the report to be filed in 2019, an assessment of whether strict compliance with the requirements of sections 8004 and 8005 (RES) and section 8005a (standard offer) of this title:

(i) has caused one or more providers to raise its retail rates faster over the preceding two or more years than statewide average retail rates have risen over the same time period;

(ii) will cause retail rate increases particular to one or more providers; or

(iii) will impair the ability of one or more providers to meet the public's need for energy services in the manner set forth under subdivision 218c(a)(1) of this title (least-cost integrated planning).

(B) Based on this assessment, consideration of whether statutory changes should be made to grant providers additional flexibility in meeting requirements of sections 8004 and 8005 or section 8005a of this title.

(8) Any recommendations for statutory change related to sections 8004, 8005, and 8005a of this title.

Public Engagement

The General Assembly directed the Department was required to "provide an opportunity for the public to submit relevant information and recommendations."[1] The Department issued a press release and an announcement on our public website calling for public comment. One comment was provided. It is included in Appendix 4.

Background

Renewable Energy Standard (RES)

Act 56 of 2015 established a RES for Vermont electric utilities that requires electric utilities to increase the portion of renewable energy they sell to Vermont customers to 55% in 2017, rising over time to 75% in 2032. This is the RES's Tier 1 requirement. Tier 2 requires that an increasing portion (1% in 2017, climbing to 10% in 2032) of electric energy comes from small (less than 5 MW) electric generators that are connected to and support Vermont's distribution grid, or that help to avoid costly transmission upgrades. The Tier 2 requirements are a carve-out of the Tier 1 requirement; in other words the total Tier 1 and Tier 2 requirement in 2032 is 75% of retail sales.

Tiers 1 and 2 of the Renewable Energy Standard requires utilities to hold Renewable Energy Certificates (RECs) to satisfy their requirements, as do all five other New England states. RECs, which are each equivalent to 1MWh generated from a renewable resource, are created when a renewable unit generates electricity. RECs can be sold separately from the electricity generated by the unit. For example, a solar facility could sell electricity to a utility and RECs to another utility or to a private party.[2] RECs, are registered by regional generators in the NEPOOL Generator Information System (NEPOOL GIS). The NEPOOL GIS tracks the characteristics of each generator in order to determine which "classes" of which states' renewable standards would be met by production associated with the REC. Utilities and generators buy and sell RECs on an open market in the region.

Act 56 also created a separate, Tier 3 energy transformation obligation that rises from 2% in 2017 to 12% in 2032 (except that small municipal utilities will not have an obligation until 2019). A utility may meet this requirement through additional distributed renewable generation, or through energy transformation projects that result in net reduction of fossil fuel consumption by the utility's customers. Examples of these projects could include building weatherization; air source or

[1] 30 V.S.A. § 8005b(d).

[2] Utilities cannot claim electricity is renewable if the REC from that electricity has been sold. Conversely, a utility can claim 100% renewability if it holds sufficient RECs to offset retail sales, even if it owns fossil-fuel-fired generation.

geothermal heat pumps and high-efficiency heating systems; industrial process fuel efficiency improvements; increased use of biofuels; biomass heating systems; electric vehicles or related infrastructure; and infrastructure for storage of renewable energy on the electric grid. The Tier 3 requirements are additional to the Tier 1 requirements.

The Public Service Board (Board) convened a workshop process to implement the RES which resulted in an interim order in March of 2016 which was amended by a final order in June of 2016.[3] The orders provide a greater level of detail and address many issues including REC banking, the process for qualifying facilities, measurement and verification etc. The Board is responsible for enforcing compliance (e.g levying the alternative compliance payment in the event that a utility fails to meet it RES obligation).[4] Utilities will report the Board annually. The Department holds the primary responsibility for verifying utility savings claims associated with Tier 3. The Department will continue to be an active participant in evaluating utility compliance filings, and the Department also evaluates utility plans through the Integrated Resource Planning process, which utilities undertake every three years.[5]

The first compliance year for the RES is 2017, and utilities will submit compliance reports in 2018. Meeting the RES requirements will reduce Vermont's greenhouse gas emissions by approximately 15 million tons by 2032, putting the state on a path to meet one quarter of the state's emission reduction goal by 2050.[6] Careful implementation of the RES has been a major focus of the Department, the Board, and the utilities for nearly two years. As utilities continue to build their portfolios of renewable energy and energy transformation projects, the Department looks forward to working closely with them to monitor program implementation.

There are two existing renewable energy programs which relate directly to the RES. Utilities may use RECs from the Standard Offer Program as well as net-metering programs (if the RECs are assigned to the utility) if those projects were constructed after July 1, 2015 to meet Tier 2 obligations. The exact rates of deployment of resources for the Standard Offer program and net-metering programs are unknown until the end of each compliance year, but many utilities expect

[3] The Docket number in that case was 8550. Both the March *Interim Order* and the June *Final Order* give critical details regarding program implementation. Both orders are available on the Public Service Board's website at http://psb.vermont.gov/electric/renewable-energy-standard.

[4] The Alternative Compliance Payment (ACP) is a fee that utilities would be required to pay if they did not meet their RES obligation. It is a variable fee based on the number of kWhs that the utility falls short of its requirement. The ACP for Tier 1 is $.01/kWh. The ACP for Tiers 2 and 3 is $.06/kWh. Another way of thinking about the ACP is as a ceiling on program costs.

[5] 30 V.S.A. 218c.

[6] Modeling performed by the Department for the General Assembly when it was considering the passage of Act 56 establishing the RES projected these GHG emissions reductions based on the renewable electric mix and increasing electrification in heating and transportation due to Tier 3. The 2050 GHG goal appears in 10 V.S.A. § 578.

that Standard Offer and net-metering RECs will meet a significant percentage of their Tier 2 obligation.

Energy efficiency programs also play an important role in compliance with the RES. Since the RES requires a certain percentage of a utility's retail sales be renewable, energy efficiency programs reduce retail sales and consequently the number of RECs must be retired to comply with the RES.

Standard Offer Program

The Standard Offer Program, established in 2009, provides the opportunity for renewable projects of 2.2 MW or less to enter into long-term contracts with the state, through the Standard Offer Program Administrator, VEPP Inc. The Standard offer program has a statutory cap of 127.5 MW, with 50 MW offered in the first few years of the program, and then a set amount offered each year from 2013 onward.[7] The costs associated with the program, as well as the RECs and energy from the projects are allotted to the Vermont utilities based on their pro-rata share of load. Vermont utilities may use the RECs from Standard Offer projects built after July 1, 2015 to satisfy Tier 2 of the RES. RECs from Standard Offer projects built before this date may be used to satisfy Tier 1.

Contracts to generators are awarded annually through a bid (RFP) process which includes a price cap for each technology type including solar, wind, biomass, landfill gas, and food-waste methane digesters, and hydroelectric facilities of up to 2.2 MW.[8]

Net-Metering Program

Net-metering provides a mechanism for Vermonters to generate their own electricity to offset electric bills. In 1997 the Vermont legislature allowed net metering in Vermont. The law was most recently updated in 2014 with Act 99.

Net metering requires electric utilities to permit an individual customer or group of individual customers (referred to as group net metering) to generate their own power using small-scale renewable energy systems and qualified combined heat and power systems using non-renewable fuels. The excess power they generate can be fed back to their utilities. The production from net-metered systems is netted against a customer's usage on a monthly basis.

The Public Service Board conducted an extensive rule-making process to develop and release an update to Rule 5.100: Rule Pertaining to the Construction and Operation of Net-Metering Systems.[9] The rule is under review by the Legislative Committee on Administrative Rules (LCAR). The rule sets rates to be paid to net-metered systems and establishes REC and siting rate adjustors. Net-metered

[7] Pursuant to 30 V.S.A. § 9005a(c)(1)(A), "The amount of the annual increase shall be five MW for the three years commencing April 1, 2013, 7.5 MW for the three years commencing April 1, 2016, and 10 MW commencing April 1, 2019."

[8] Standard Offer rates are also available for farm methane digesters which do not need to apply through the RFP process.

[9] Available at http://psb.vermont.gov/sites/psbnew/files/doc_library/rulemaking-5100-attachment-a-on-reconsideration-08292016.pdf

customers decide whether to allocate their RECs to the utility or to retain them. In the draft rule, there are strong financial incentives for customers to allocate the RECs from their system to the utility for RES compliance. The Department will closely monitor the effect of this financial signal on the REC disposition of new net-metered systems.

Retail sales

30 V.S.A. § 8005b(c)(1)

Retail sales for Vermont utilities have been flat, and in many cases declining. State-wide electric sales declined .9% in 2015 and have declined in 4 of the past 5 years. Projections prepared for the VELCO Long Range Plan show sales are expected to remain relatively flat to declining in the near-term and slight increases in annual sales beginning in roughly 2022.[10] Projections prepared by VELCO are based on demographics, economic growth, weather and other factors including investments in energy efficiency, behind-the-meter distributed generation, as well as electrification of heating and transportation. Retail sales for calendar years 2014 and 2015 are below. These are the most recent years for which data are available. When 2016 data become available, the Department plans to provide them in our annual *Utility kWh Report*.[11]

[10] VELCO Long Range Plan available at http://www.velco.com/assets/documents/2015Plan_Final_toPSB.pdf
[11] Annual *Utility kWh Reports* are available on the Department of Public Service website at http://publicservice.vermont.gov/publications-resources/publications.

Retail Sales of Electricity in Vermont (2014-2015)

Utility	2014 kWh	2015 kWh	Change
Barton	14,092,456	13,874,258	-1.5%
Burlington	338,431,169	344,174,489	1.7%
Enosburg Falls	26,112,944	26,931,925	3.1%
GMP	4,281,681,000	4,229,975,000	-1.2%
Hardwick	32,762,683	32,934,696	0.5%
Hyde Park	11,445,756	11,078,292	-3.2%
Jacksonville	4,935,897	4,888,381	-1.0%
Johnson	13,438,512	13,206,307	-1.7%
Ludlow	47,519,469	46,483,843	-2.2%
Lyndonville	64,936,802	61,330,575	-5.6%
Morrisville	44,826,774	45,130,156	0.7%
Northfield	29,570,021	29,114,161	-1.5%
Orleans	13,096,686	13,050,035	-0.4%
Stowe	74,414,335	73,703,521	-1.0%
Swanton	53,709,982	54,970,014	2.3%
VEC	447,109,866	446,283,112	-0.2%
WEC	69,992,526	69,698,998	-0.4%
Vermont State Totals	**5,568,076,878**	**5,516,827,763**	**-0.9%**

Figure 1: Retail Sales of Electricity in Vermont (2014-2015), as reported by the Vermont electric distribution utilities to the Department of Public Service.

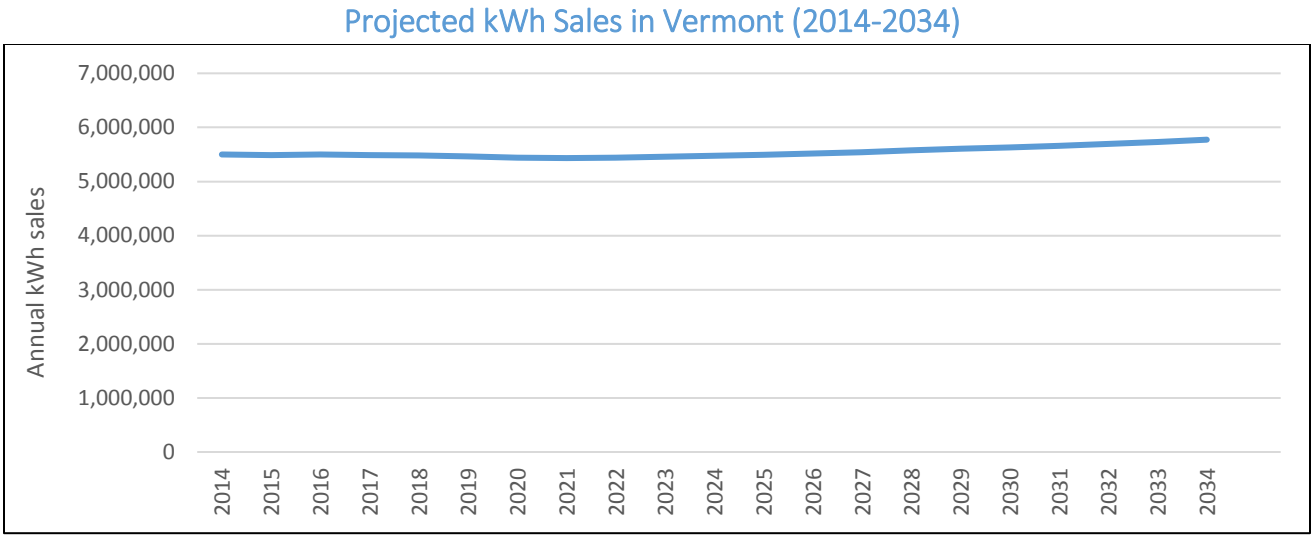

Figure 2: Projected Sales (2014-2034). Source: VELCO 2015 Long Range Transmission Plan.[12]

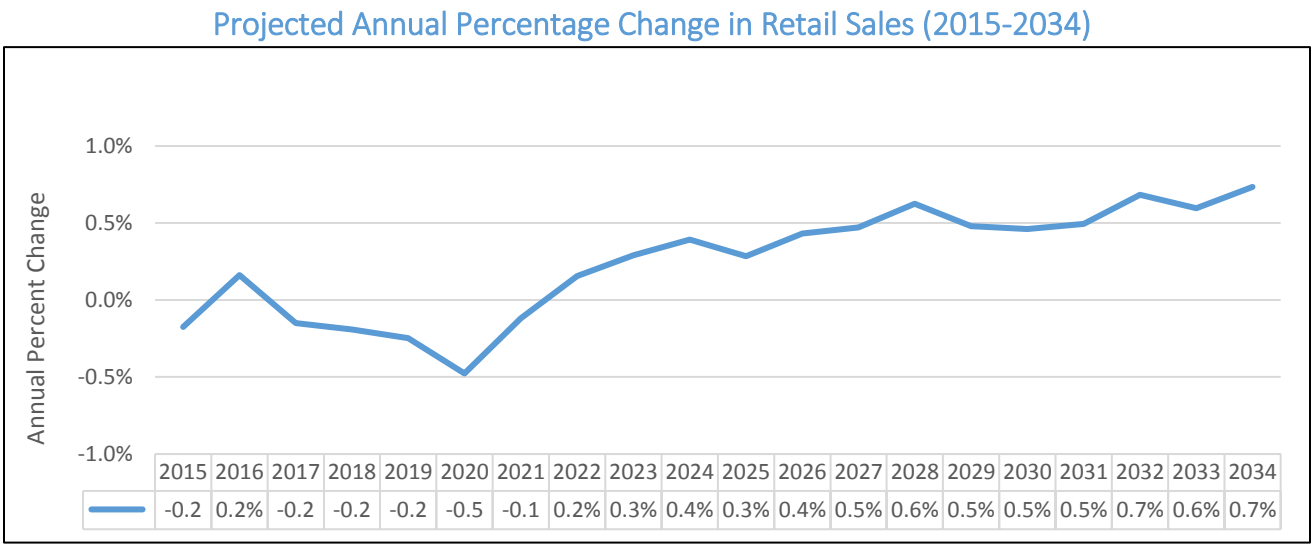

Figure 3: Projected Percentage Change in Sales (2015-2034). Source: VELCO 2015 Long Range Transmission Plan.

[12] Available at http://www.velco.com/our-work/planning/long-range-plan.

Required amount of renewable energy

30 V.S.A. § 8005b(c)(2)

This section of the report will be required beginning in 2019.

Progress toward Meeting Targets

30 V.S.A. § 8005b(c)(3)

Renewable Electricity: Tiers 1 and 2

As noted above, RECs are used to demonstrate compliance with RES Tiers 1 and 2. Note that utilities may use their own generation resources to meet these targets; however, the utilities will register their generators in the NEPOOL GIS and will verify compliance using RECs registered in that system.

It is the general assessment of the Department that the utilities are on track to meet their Tier 1 and Tier 2 targets and are making significant progress toward meeting their Tier 3 targets. The Department will receive the first compliance filings in 2018 and will be in a better position at that time to more fully evaluate whether utilities met their targets.

Although utilities were not required to hold RECs in 2015, they did hold a significant amount of renewable power which they supplied to customers. The table below shows the amount of renewable energy acquired by the utilities for which the accompanying RECs were also acquired over the course of 2015 (The Department's most recent full year of data). The tables in Appendix 3 show the same information for each individual utility. These tables show that utilities are generally in good position to satisfy their upcoming Tier 1 obligations.

Because compliance with Tier 2 requires acquisition of renewable energy from "new," in-state plants constructed after June 2015, (as required by Act 56), it is less clear from these tables how ready the utilities stand to meet upcoming Tier 2 obligations. The Department expects that utilities will be able to meet their near-term Tier 2 obligations with "new" purchases from Standard Offer plants and purchases of RECs from net metering customers under the new program (initiated in 2017). Utilities have also been constructing their own resources and contracting with eligible resources for Tier 2 compliance.

RECs and Renewable Energy Held by Vermont Utilities

Progress Toward RES Compliance as of end of CY 2015: **All Utilities**

Generation Source	Renewable MWh[13]	RES Eligibility[14]	% of Sales
Biomass	314,411	Tier 1	5.7%
HQ System Mix	1,759,501	Tier 1	31.9%
"Existing" Hydro	561,862	Tier 1	10.2%
"New" Hydro	3,141	Tiers 1 & 2	0.1%
Landfill Methane	101,671	Tier 1	1.8%
"Existing" Solar	5,654	Tier 1	0.1%
"New" Solar	564	Tiers 1 & 2	0.0%
Wind	503,319	Tier 1	9.1%
"Existing" Std. Offer	98,963	Tier 1	1.8%
"New" Std. Offer	2,413	Tiers 1 & 2	0.0%
Total	3,351,498		60.8%

Energy Transformation Projects: Tier 3

Utilities submitted plans for their 2017 Tier 3 programs to the Public Service Board in November of 2016. Utilities plan to offer a variety of incentives and programs to customers to reduce their fossil fuel consumption including programs for weatherization, high-efficiency cold climate heat pumps, heat pump water heaters, electric vehicles, charging stations, electrification of industrial processes, and other projects. Utilities are also offering some bundled services that include several products. For example, weatherization paired with a heat pump and a smart thermostat. Tier 3 programs are expected to result in fossil fuel savings roughly equivalent to 100,000 MWhs in 2017.

There are several areas of Tier 3 that overlap with programs offered by Efficiency Vermont. In these cases, utilities negotiated with Efficiency Vermont regarding methods for sharing savings associated with measures in their service territory. In general, the incentives and programs offered by the utilities are growing the potential of these programs. For example, if Efficiency Vermont had planned to deploy 40 heat pumps in a utility's service territory, the utility and Efficiency Vermont may partner together to deploy 55 heat pumps and then share the savings associated with the entire program to meet their separate compliance obligations.

[13] Renewable MWh are defined as all MWh supplied to customers for which the associated RECs were also acquired by the Utility. RECs acquired without associated MWh are not accounted for here, nor are MWh acquired without associated RECs. Some utilities went on to sell these RECs in the New England market.

[14] As defined by Act 56, the cutoff date that distinguishes "Existing" from "New" generation is July 1, 2015. Only "New" renewable energy qualifies for Tier 2. Continued installation of Net Metering and Standard Offer projects is likely to be sufficient in itself to satisfy near term Tier 2 requirements.

The chart below shows roughly what utilities plan to do. In most cases, this in in *addition* to what Efficiency Vermont is planning. In some cases, utilities did not differentiate in their plans which measures were additional. Programs may evolve throughout the year based on customer response to incentives. In the first compliance plans, to be filed in 2018, utilities will specify the how savings were shared between the utility and Efficiency Vermont.

Summary of Tier 3 Compliance Plans

Measure	Rough Number of Units
Weatherization	500
Cold Climate Heat Pumps	3,000
Heat Pump Water Heaters	100
Electric and PHEV Vehicles/Buses	65
Charging Stations/Equipment	15
Custom Commercial and Industrial projects	60

Figure 4: Summary of Utility Tier 3 Compliance Plans. Source: Utility plans submitted to the Public Service Board, November, 2016.

The Standard Offer Program

30 V.S.A. § 8005b(c)(4)

This section presents an overview of Standard Offer Program implementation. Several detailed charts in Appendix 1 show each project funded through the program. The program contracted for 70.4 MW of resources and 100,000 MWhs of energy in 2016 at a total annual program cost of just over $22 million.[15] There are 69 plants participating in the program, with 54 of those being on-line. Fifteen projects, totaling 17.7 MW, are under development. The program received 24 bids in 2014 and 25 bids in 2015. The Standard Offer program is projected to grow over the next five years to reach a total capacity target of 127.5 MW shared among the participating utilities.

Initially the program offered rates which were set in statute. After it became clear that resources could be procured more affordably, the General Assembly passed Act 170 which allowed the Board to create a pricing system. The program moved to a RFP bid process which awards contracts to the lowest bidding resources. The RFP bid process has resulted in significantly lower prices for newer projects. Where early solar projects received a rate of $.30/kWh, newer projects are on-line with prices in the range of $.11 to $.14/kWh. The most recent round of Standard Offer contract awards included a solar bid for $.075/kWh. That project is in development, but not on-line yet.

[15] The program costs were not entirely born by utilities in 2016 because many of them sold the RECs produced by Standard Offer projects to offset this cost.

Standard Offer Summary: Projects On-line in 2016

Technology	Capacity (kW)	Range of Rates ($/kWh)	2016 Production (MWh)
Biomass	865	$ 0.12	18,433
Farm Methane	5,394	$ 0.14–0.16	249,281
Hydroelectric	4,939	$ 0.09–0.13	77,640
Landfill Methane/Organic Waste	560	$ 0.12	7,745
Solar PV	46,887	$ 0.11–0.30	660,986
TOTAL	**70,403**		**995,652**

Figure 5: Standard Offer Summary for projects on-line. Source: VEPPI. See Appendix 1 for detail.

There is some concern that low-bid prices will result in projects that bid into the Standard Offer program, but never end up being built. In this case, developers may be bidding into Standard Offer as a way to "hold" capacity in case prices for installing solar come down. The Standard Offer contracts require that solar projects be commissioned within two years and all other project types be commissioned within three years; this requirement ensures that the total 127.5 MW will be constructed.[16] In other words, a project could not hold up development indefinitely, but could create some uncertainty as to when capacity will be commissioned. There are three projects with a total capacity of 6.4 MW online now at rates $.11-$.14/kWh. The Department will continue to monitor the issue and make recommendations to the legislature and the Board if we observe projects in the queue since the start of the bid framework are not ultimately constructed.

In recent years, there has been relatively little diversity in technologies which are supported through Standard Offer because solar PV is able to out-bid other technology types. The Board has attempted to address this concern through instituting technology allocations (set-asides for technologies other than solar), but the Standard Offer portfolio of new acquisitions remains heavily reliant on solar PV.

[16] Additionally, the Standard Offer contract requires that the project developer provide a $200 administrative fee and $15/kW refundable deposit that provide some incentive for submitting only legitimate bids. The Standard Offer contract is available at http://static1.1.sqspcdn.com/static/f/424754/27213609/1472235312580/STANDARD+OFFER+PPA--VERSION+4--March_25_2013.pdf?token=Fcv3Ei9%2B%2FfavOO7aJ7O7KCR7hFY%3D.

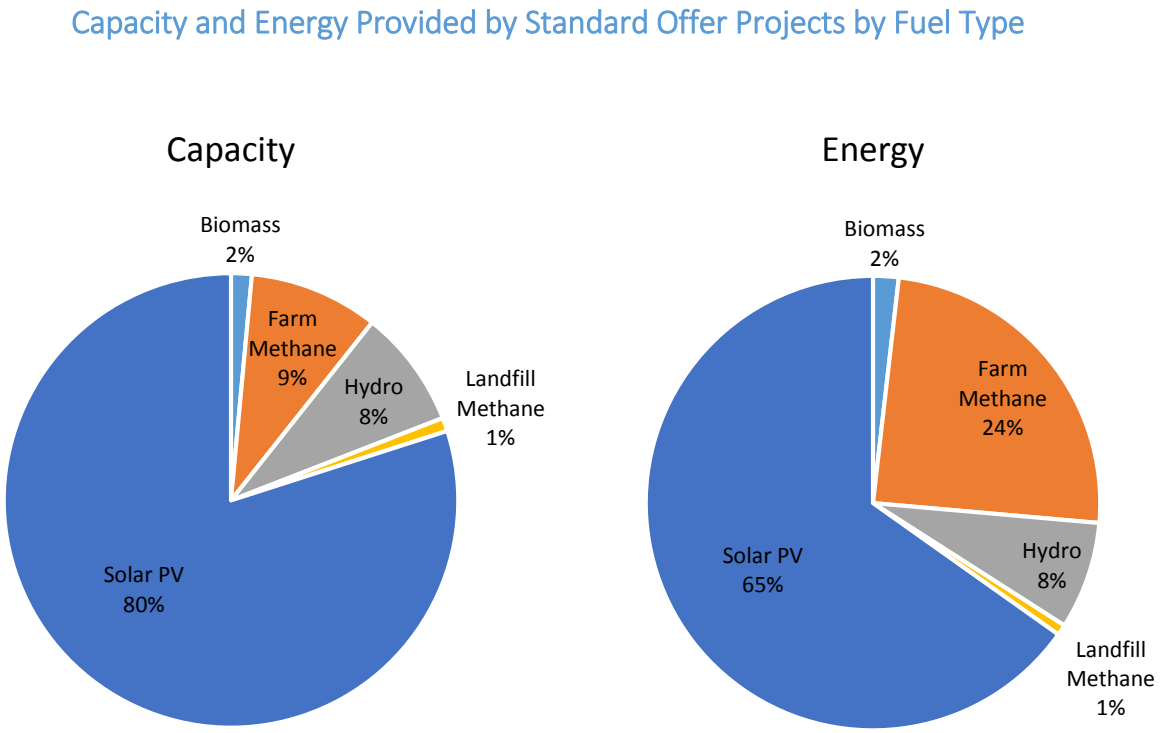

Figure 6: Capacity and Energy Provided by Standard Offer Projects by Fuel Type

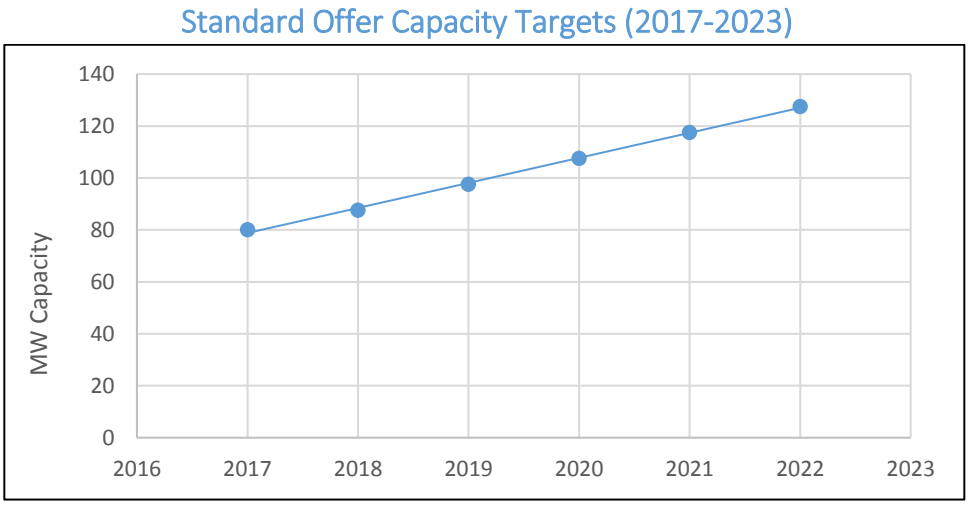

Figure 7: Standard Offer Capacity Targets (2017-2023)

Market Assessment

30 V.S.A. § 8005b(c)(5)

Renewable Markets

The market for RECs in New England is complex. There are many classes of RECs, and not all classes are equivalent. Appendix 2 offers a summary of REC types and describes the standards in other states.

Because of the particular characteristics from the generator from which it was created, a given REC from one generator might count in one state but not in another. The utility which owns the REC (having acquired it from the generator or another market participant, and recorded that ownership in the GIS) uses the GIS tracking system to demonstrate to their regulators that they hold the requisite number of RECs that satisfy that state's requirements.

Generally speaking, the value of RECs in any given class reflects the balance between supply and the policy-driven demand for that Class (or "Tier" in Vermont). When supply is close to or lower than demand, REC prices rise to reflect scarcity; this provides an economic incentive to develop more supply.

Some RECs (such as those for most large and older hydroelectric generation) do not meet any of the other New England states' current RPS class definitions; these RECs tend to be very inexpensive because supply far exceeds demand. In Vermont, these are Tier 1 RECs. Some Tier 1 RECs in Vermont will likely be provided by hydro units in Canada through contracts which Vermont utilities hold with HydroQuebec U.S. (HQUS). The NEPOOL GIS currently does not track RECs from HQUS because Quebec does not have a similar tracking system, and consequently, HQ's electricity is considered "system mix," meaning that it comes from a variety of sources including hydro, wind, and some fossil units. HQUS provides Vermont utilities with formal attestation forms that describe the mix in detail. The Public Service Board will require these forms to verify that Vermont utilities own the renewable attributes of this electricity. These "RECs," which are tracked by the Board rather than the NEPOOL GIS, may be used to satisfy Tier 1 requirements.

Market prices for Class I RECs in New England (similar to Tier 2 in Vermont) have been variable in 2016 and most recently have been dropping. REC prices are very difficult to determine without the assistance of a broker because most RECs are traded through bilateral contracts. The Department of Energy does provide some data on averaged REC prices.[17] These data indicate a downward trend in prices for Class I/Tier 2 RECs in the region, which began roughly in 2014 and continues. Anecdotally, Class I REC prices have continued to fall to the range of $25-$30/MWh in early 2017, from a high of over $60 in 2014. This is well below the Alternative Compliance Payment of $60/MWh established by the legislature for Tier 2 RECs. Low REC prices can affect Vermont utilities

[17] Most recent data provided by DOE EERE is available at http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=5.

in complex ways. Many utilities sell RECs into the New England market, so when prices fall so do revenues. Conversely, dropping REC prices make compliance with the Vermont RES more affordable.

REC prices in New England, 2009-2016

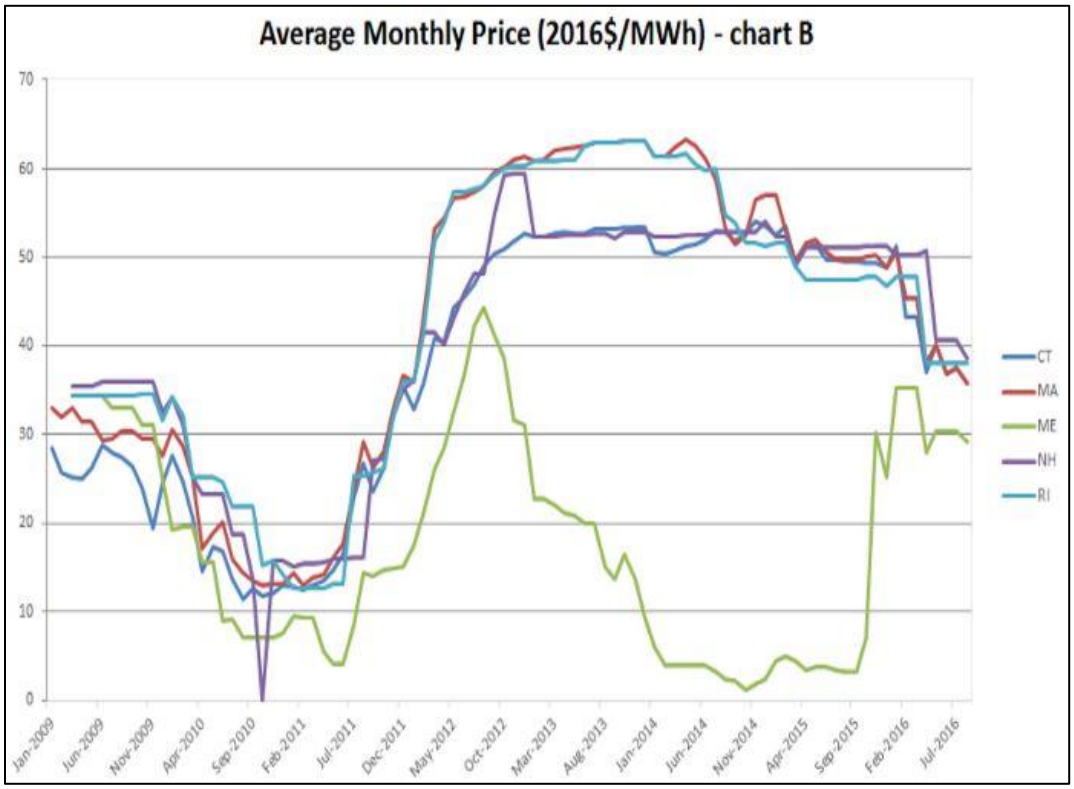

Figure 8: REC Prices in New England (2009-2016). Source, DOE EERE office.

Energy Efficiency Markets

Robust energy efficiency efforts in Vermont will drive down the cost of compliance with the RES. Efficiency measures not only reduce the energy that utilities must purchase, they also reduce the RES obligation of the utility.

The most recent Potential Study for efficiency prepared by the Department showed that cost-effective electric energy efficiency resources can play a significant role in the Vermont energy resource mix over the next 20 years with a maximum achievable potential of 23.4% of energy as a percent of forecasted Vermont kWh sales in 2033.[18] The potential for efficiency improvements remains high in the state.

[18] This analysis appears in the most recent Vermont Energy Efficiency Potential study conducted in 2013. The Department is conducting a similar study this year, with results expected in the spring. The 2013 study is available at

Efficiency programs in Vermont and other larger states have helped move the market more generally, helping lower costs of efficient appliances and lighting faster than would have otherwise occurred. Federal appliance and lighting standards reflect this movement toward affordability when they require efficient appliances and lighting.

Retail Electric Rates

30 V.S.A. § 8005b(c)(6)

During the 6-year period 2010–2015, Vermont rates did not rise faster than inflation. In real 2010 dollars, rates remained nearly flat, with slight increases in 2011-2013 being matched by slight decreases in 2014 and 2015. Because average retail electric rates did not rise faster than inflation over the preceding two or more years, this report does not assess components of rate changes.

Retail Electric Rates in Vermont in 2010 Cents/kWh

	2010	2011	2012	2013	2014	2015
Nominal rates	13.24	13.8	14.22	14.61	14.57	14.41
Real rates (inflation adjusted)	13.24	13.38	13.51	13.68	13.42	13.26
Percent change (inflation adjusted)		1.0%	1.0%	1.3%	-1.9%	-1.2%

Figure 9: Retail Electric Rates in Vermont Adjusted for Inflation ($2010)

Most electric utilities in New England and the Mid-Atlantic regions are not vertically integrated, so comparing electric rates between states can be misleading.[19] For example, there may be some costs (such as costs of maintaining the distribution system) that are not represented in rates for states that are not vertically integrated.

The Federal Energy Information Administration reports total retail revenue and total retail energy sales of utilities in the U.S. The Department used this information to compare the average price of electricity among states in the Northeast. Vermont prices are generally lower than those in the rest of New England and New York. In 2015, the most recent year for which data are available,

http://publicservice.vermont.gov/sites/dps/files/documents/Energy_Efficiency/2013%20VT%20Energy%20Efficiency%20Potential%20Study%20Update_FINAL_03-28-2014.pdf.

[19] Vermont is a vertically integrated state, meaning that utilities provide complete service within their territories including generation and purchase of power as well as maintaining and operating the grid to deliver electricity. In states which moved away from vertical integration ("retail choice" or "deregulated" states), utilities generally own and operate the distribution grid while 3rd party providers acquire and sell electricity at varying rates.

Vermont's retail prices were the second lowest among the six New England states and also lower than in New York.

Average Retail Costs in New England and New York (nominal)

	2010	2011	2012	2013	2014	2015	Rank[20]
New England Average	14.89	14.49	14.02	14.47	15.45	16.52	
Connecticut	17.38	16.35	15.54	15.66	17.05	17.77	7
Maine	12.84	12.58	11.81	11.86	12.65	12.78	1
Massachusetts	14.26	14.11	13.79	14.51	15.35	16.9	5
New Hampshire	14.84	14.74	14.19	14.3	15.22	16.02	4
New York	16.41	15.89	15.15	15.44	16.25	15.28	3
Rhode Island	14.07	13.04	12.74	13.72	15.41	17.01	6
Vermont	**13.24**	**13.8**	**14.22**	**14.61**	**14.57**	**14.41**	**2**

Figure 10: Average Retail Costs in New England and New York. Source: Energy Information Agency.

Programmatic Rate Impacts

30 V.S.A. § 8005b(c)(7)

This section of the report is not required until 2019.

Statutory Recommendations

30 V.S.A. § 8005b(c)(8)

The RES was enacted into law in 2015, and 2017 is the first implementation year, meaning that this is the first year in which utilities will be required to procure RECs and conduct energy transformation projects. The Department will receive the first compliance filings from utilities specifying their portfolio mixes in 2018. At that time, we will have much more information regarding the success of the implementation of the RES and how the Standard Offer, net metering, and energy efficiency programs are interacting with the RES. However, anecdotal discussions with utilities and more formal filings, including integrated resource plans filed by utilities, indicate that implementation is going smoothly and that the program simply needs more time to mature.

At this time, the Department recommends no statutory changes related to 30 V.S.A § 8004, 8005, or 8005a. As these programs move forward, the Department will continue to assess issues including the ones raised in this report.

[20] Based on 2015 rates. Lowest rates = 1.

Public Comment

30 V.S.A. § 8005b(d)

The Department issued a press release and an announcement on our website calling for public comment regarding this report, and received one comment. It is attached as Appendix 4.

Appendix 1: Standard Offer Program Details

Data for this appendix were generously provided by VEPPI, the Standard Offer Program Administrator in Vermont.

STANDARD OFFER PROGRAM

SUMMARY REPORT

Technology	ProjectName	Capacity (kW)	Rate ($/kWh)	2016 Production (kWh)	2016 Total Cost
Biomass	Cersosimo Lumber Biomass	865	0.1230	1,843,332	$ 226,795.59
Biomass Average*			0.1230		
Farm Methane	Audets Cow Power (Outside cap 490kWh, Inside 50 MW-190 kWh)	680	0.1393	3,116,614	$ 434,378.64
Farm Methane	Berkshire Cow Power	600	0.1393	2,661,897	$ 368,799.38
Farm Methane	Central Vermont Recovered Biomass Facility	375	0.1366	2,231,477	$ 306,037.99
Farm Methane	Chaput Family Farms	300	0.1600	1,544,873	$ 247,179.71
Farm Methane	Dubois Energy, LLC	450	0.1600	2,223,480	$ 355,756.72
Farm Methane	Four Hills Digester	450	0.1600	2,343,253	$ 374,920.41
Farm Methane	Gervais Digester	200	0.1393	1,090,966	$ 152,273.07
Farm Methane	Gervais Farm Engine 2	200	0.1379	1,310,669	$ 181,305.85
Farm Methane	Green Mountain Dairy	600	0.1382	1,697,221	$ 235,212.00
Farm Methane	Kane's Cow Power	225	0.1600	1,244,415	$ 199,106.32

Farm Methane	Maplehurst Farm Methane	150	0.1379	608,119	$ 83,991.75
Farm Methane	Neighborhood Energy	225	0.1393	897,290	$ 125,286.51
Farm Methane	Rail City Cow Power	300	0.1393	1,671,179	$ 233,306.36
Farm Methane	Riverview Farm Digester	189	0.1366	699,021	$ 95,925.15
Farm Methane	Westminster Energy Group	450	0.1380	1,587,644	$ 219,570.54
Farm Methane *			0.1441		
Hydroelectric	Ball Mountain Hydroelectric	2,200	0.1250	879,604	$ 109,950.51
Hydroelectric	Factory Falls	150	0.0930	542,339	$ 50,437.48
Hydroelectric	North Hartland	138	0.1206	783,020	$ 94,893.15
Hydroelectric	Townshend Dam Hydroelectric	960	0.1250	315,093	$ 39,386.61
Hydroelectric	Troy Hydro Project	816	0.1250	2,887,221	$ 360,902.63
Hydroelectric	West Charleston Hydro	675	0.1250	2,356,707	$ 294,588.38
Hydroelectric*			0.1189		
Landfill Methane/Organic Waste	Brattleboro Landfill Gas and Brattleboro Organic Energy	560	0.1200	774,519	$ 92,942.32
Landfill Methane/Organic Waste *			0.1200		
Solar PV	100 Bobbin Mill Road	50	0.2400	56,831	$ 13,639.44
Solar PV	Advance Transit Building Expansion	32	0.3000	32,089	$ 9,626.84
Solar PV	Barton Solar Farm	1,890	0.2710	2,904,350	$ 787,078.83
Solar PV	Bridport West Solar Farm	2,000	0.2710	2,872,354	$ 778,407.97

Solar PV	Butternut Mountain Farm Solar	103	0.2400	112,409	$ 26,978.15
Solar PV	Champlain Valley Solar Farm	2,200	0.1441	2,906,780	$ 418,867.05
Solar PV	Charlotte Hinesburg Rd Project	2,000	0.2400	3,158,000	$ 757,920.12
Solar PV	Chester Solar Farm	2,000	0.2400	2,795,096	$ 670,823.13
Solar PV	Claire Solar Farm	2,200	0.2710	3,649,887	$ 989,119.44
Solar PV	Clarendon Solar Project	2,000	0.2400	3,054,922	$ 733,181.34
Solar PV	Clarke Solar Center, LLC	800	0.2710	1,119,844	$ 303,477.76
Solar PV	Coventry Solar Project	2,200	0.2710	3,135,581	$ 849,742.34
Solar PV	Cross Pollination One	2,000	0.3000	3,127,358	$ 938,207.53
Solar PV	Ferrisburgh Solar Farm Project	1,047	0.3000	1,381,499	$ 414,449.83
Solar PV	IRA Rentals Solar	37	0.2710	44,806	$ 12,142.43
Solar PV	Kingsbury Solar	48	0.2400	49,613	$ 11,907.16
Solar PV	Leunig's Building	26	0.3000	29,569	$ 8,870.59
Solar PV	Limerick Road Solar Farm	2,166	0.2710	3,588,374	$ 972,449.30
Solar PV	Northshire	16	0.2400	20,540	$ 4,929.53
Solar PV	Pownal Park Solar	2,200	0.1096	1,102	$ 120.73
Solar PV	Sheldon Springs Solar	2,200	0.2400	2,744,842	$ 658,762.08
Solar PV	South Burlington Solar Farm	2,206	0.3000	3,365,989	$ 1,009,796.57
Solar PV	Southern VT Energy Park Solar	2,000	0.3000	3,044,308	$ 913,292.33
Solar PV	Springfield Solar Alliance I	1,000	0.2710	1,552,225	$ 420,653.04
Solar PV	St Albans Solar Farm	2,000	0.2400	3,064,168	$ 735,400.21

Solar PV	Sudbury Solar	2,000	0.1440	2,355,287	$ 339,161.31
Solar PV	SunGen1Solar	2,100	0.3000	2,872,007	$ 861,602.13
Solar PV	Technology Drive Solar	2,000	0.2710	3,184,051	$ 862,877.76
Solar PV	Whitcomb Farm Solar	2,200	0.2710	3,748,020	$ 1,015,713.33
Solar PV	White River Junction Solar Farm	2,166	0.2400	3,287,736	$ 789,056.61
Solar PV	Williamstown Solar Project	2,000	0.3000	2,838,929	$ 851,678.60
Solar PV*			0.2551		
	TOTAL	58,645		101,408,518	$ 22,042,880.54

* The value of the renewable energy credits reduce these rates to the Vermont utilities

Standard Offer Projects in Development

Technology	Project Name	Capacity (kW)	Rate ($/kWh)
Large Wind	Dairy Air Wind	2,200	0.1160
Small Wind	Bailey Hill Wind	24	0.2530
Small Wind	FELLCO 78A	100	0.2510
Small Wind	FELLCO 78B	50	0.2510
Small Wind	Tomlinson Wind A	100	0.2510
Small Wind	Tomlinson Wind B	50	0.2510
Solar PV	Apple Hill Solar Project	2,000	0.1390
Solar PV	Battle Creek 1 Solar	2,200	0.1087
Solar PV	Checkerberry Solar Park	2,200	0.0750
Solar PV	Chelsea Solar Project	2,000	0.1340
Solar PV	Lyndonville Solar 1	485	0.1540
Solar PV	Lyndonville Solar 2	500	0.1550
Solar PV	Next Generation Solar Farm	2,100	0.1287
Solar PV	Otter Valley Solar Farm	2,200	0.1338
Solar PV	Triland BlueWave-Williamstown	1,500	0.1097
	TOTAL	**17,709**	

Standard Offer Bids Received

Year	Developer Bids	Utility Bids
2013	34	1
2014	18	1
2015	22	2
2016	25	0

Appendix 2: Summary of New England Renewable Portfolio Standards

	Class/ Tier	Target	Target Year	Eligible Technologies	Vintage
Connecticut	1	20%	2020	Solar, wind, fuel cells, geothermal, landfill methane, anaerobic digestion, ocean, certain run of river hydro, certain biomass. End user DG also qualifies.	hydro post 7/1/03; otherwise none
	2	2%	2010	Trash to energy, certain biomass not in Class I, older run of river hydro	
	3	4%	2010	Certain customer sited CHP, EE and load management programs outside of EE charge, waste heat recovery systems.	post 1/06
Massachusetts	1	25%	2030	PV, solar thermal, wind, ocean, fuel cells w/ renewables, landfill gas, certain new hydro, certain incremental improvements to hydro, certain biomass, ag crops or vegetative material, geothermal, biogas, algae, marine.	post 12/97
	1-Solar	Initially 400MW; now 1600 MW (DC)	2020	Two separate carve outs within Class I RPS, on MW basis as directed to the left. Solar PV 6 MW DC or less	post 12/09 for first carve out, post 12/12 for second.
	2	3.6%	2020	Existing systems operating before 1998 in a number of similar technologies as Class I.	pre 1/98
	2-Waste	3.5%	2020	Waste energy (from municipal solid waste)	pre 1/98
Maine	1	10%	2017	Solar, wind, fuel cell, tidal, geothermal, hydro, biomass - (all less than 100MW). PURPA eligible projects. New wind may exceed 100MW	post 9/05
	2	30%	2017	Existing renewables. Municipal Solid waste with recyling. Wind may exceed 100MW	none
New Hampshire	1	15% (including thermal % below)	2025	New Renewable. Wind, hydrogen from biomass or landfill, ocean, methane, geothermal post 12/12, solar thermal post 12/12, certain biomass, solar electric not used for Class II, incremental new production over an historical baseline from certain biomass, methane, and hydro, upgrades to class III or IV sources	post 12/05

	1-Thermal	2.0%	2025	The NH thermal carve out is a portion of the Class I requirement, not additional. Includes "useful thermal energy" that can be metered and for which fuel or electricity would be consumed.	post 12/12
	2	0.3%	2025	New solar	post 12/05
	3	8.0%	2025	Existing biomass, methane up to 25 MW	pre 1/06
	4	1.5%	2025	Existing small hydro up to 5 MW	pre 1/06
Rhode Island	New	14%	2019	Direct solar radiation, wind, ocean, geothermal, hydro up to 30MW, certain biomass, fuel cells using renewables.	post 12/97
	New or Existing	2%	2013	Direct Solar Radiation, Wind, ocean, geothermal, hydro up to 30MW, certain biomass, fuel cells using renewables	pre 1/98
Vermont	1	75%	2032	Existing hydro, solar, wind, biomass, landfill methane and others	none
	2	10%	2032	Under 5MW, built after July, 2015. Solar, low-impact hydro, wind, biomass, landfill methane and others	post 7/15
	3	12%	2032	Utility incentives for measures that reduce customer fossil fuel use. For example, heat pumps and electric vehicles	none

Appendix 3: Utility Progress toward RES Compliance

Progress toward RES Compliance as of the end of CY 2015: **GMP**

Generation Source	Renewable MWh	RES Eligibility	% of Sales
Biomass	98,773	Tier 1	2.34%
HQ System Mix	1,475,462	Tier 1	34.88%
Hydropower	331,406	Tier 1	7.83%
Landfill Methane	18,993	Tier 1	0.45%
"Existing" Solar	4,734	Tier 1	0.11%
"New" Solar	550	Tiers 1 & 2	0.01%
Wind	378,410	Tier 1	8.95%
"Existing" Std. Offer	77,273	Tier 1	1.83%
"New" Std. Offer	1,884	Tiers 1 & 2	0.04%
Total	2,387,486		56.44%

Progress toward RES Compliance as of the end of CY 2015: **VEC**

Generation Source	Renewable MWh	RES Eligibility	% of Sales
Biomass	1,300	Tier 1	0.29%
HQ System Mix	228,204	Tier 1	51.13%
Hydropower	38,215	Tier 1	8.56%
Wind	46,973	Tier 1	10.53%
"Existing" Std. Offer	7,907	Tier 1	1.77%
"New" Std. Offer	193	Tiers 1 & 2	0.04%
Total	322,791		72%

Progress toward RES Compliance as of the end of CY 2015: **BED**

Generation Source	Renewable MWh	RES Eligibility	% of Sales
Biomass	145,180	Tier 1	42.18%
HQ System Mix	4,880	Tier 1	1.42%
Hydropower	87,848	Tier 1	25.52%
"Existing" Solar	920	Tier 1	0.27%
"New" Solar	14	Tiers 1 & 2	0.00%
Wind	68,151	Tier 1	19.80%
"Existing" Std. Offer	6,088	Tier 1	1.77%
"New" Std. Offer	148	Tiers 1 & 2	0.04%
Total	313,229		91.01%

Progress toward RES Compliance as of the end of CY 2015: **VPPSA**

Generation Source	Renewable MWh	RES Eligibility	% of Sales
Biomass	60,243	Tier 1	17.07%
HQ System Mix	16,406	Tier 1	4.65%
"Existing" Hydro	85,969	Tier 1	24.35%
"New" Hydro	3,141	Tiers 1 & 2	0.89%
Landfill Methane	26,352	Tier 1	7.47%
"Existing" Std. Offer	6,378	Tier 1	1.81%
"New" Std. Offer	156	Tiers 1 & 2	0.04%
Total	198,644		56.27%

Progress toward RES Compliance as of the end of CY 2015: **Stowe**

Generation Source	Renewable MWh	RES Eligibility	% of Sales
Biomass	8,711	Tier 1	11.82%
HQ System Mix	20,452	Tier 1	27.75%
Hydropower	5,452	Tier 1	7.40%
Wind	1,033	Tier 1	1.40%
"Existing" Std. Offer	1,318	Tier 1	1.79%
"New" Std. Offer	32	Tiers 1 & 2	0.04%
Total	36,998		50.20%

Progress toward RES Compliance as of the end of CY 2015: **WEC**

Generation Source	Renewable MWh	RES Eligibility	% of Sales
Biomass	204	Tier 1	0.29%
HQ System Mix	14,097	Tier 1	20.23%
Hydropower	12,971	Tier 1	18.61%
Landfill Methane	56,326	Tier 1	80.81%
Wind	8,752	Tier 1	12.56%
Total	92,350		132.50%

Appendix 4: Public Comments and Information

Town of Residence: Groton

Electric Service Provider: Green Mountain Power

Comment:
You asked for comments, please find them attached. Here are ours, taken from our comments to the PSB on the 5.100 rules. In short, the economics were good and permitting reasonable through the end of 2016. Under the new 5.100 rules the economics are very difficult to rationalize new projects and the permitting hurdle is much higher. I'll be curious as to the uptake going forward. Regarding effect on rates by solar, I would encourage a careful analysis to see if GMP's assertion that solar is rate accretive is accurate. They said one thing then another, back and forth so to rationalize what they wanted at different times during the 5.100 rule making and cap process. See GMP's comments in their Nov. 18, 2015 letter. What are the facts? Our attached comments provide our analysis of the effect on rates.

(attachment is included below).

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December 2, 2016

Vermont Public Service Board
C/O PSB Clerk
100 State Street
Montpelier, VT 05602

Delivered via E-Mail with PDF attachment

Re: Revised net-metering rule (5.100) pursuant to Act 99 of 2014

Dear Mr. Volz, Ms. Cheney and Ms. Hofmann: -

We appreciate the efforts of the board and its staff to implement the legislature's directive to set new net metering rules. Our concerns about the content of the most recent draft are noted in this letter.

Our comments are intended to give a basis for a ***Community Solar Carveout*** for your proposed rules to ensure equity for all Vermonters wishing to share in the benefits of having solar panels (and thereby support VT's renewable goals) and minimize the impact of such an allowance on other ratepayers.

My company, Green Mountain Community Solar, under the old NM 1.0 rules, has built and operates four 150 kW (1 acre) solar arrays here in Vermont. These arrays generally have approximately 50% of their net metering participants comprised of small residential and/or business accounts – these arrays and their associated net meter groups are referred to as ***community solar*** (CS).

Here is how CS works for our business model – the 50% of the solar panels in a CS array are owned by folks whose properties are too shaded, live in a condominium or apartment complex or an urban or town center, or are otherwise unsuited for solar panels – at our CS arrays, examples include businesses and nonprofit organizations - four branches of Wells River Savings Bank, Catamount Film and Arts, and Fairbanks Museum – both in down town St. J, and residents in about 30 different VT towns throughout the state. All told, we serve 25 Vermont residents or businesses in each of our farms.

Under the new, lower reimbursement rates and more stringent permitting rules, the economics of solar for the next group of 25 or so similarly-situated Vermonters will be relatively unattainable compared to those who can put panels up on their property.

In short your rules as currently written will be creating arbitrary discrimination against a class of Vermonter that is already underserved.

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By allowing a CS carveout you will be bringing a more equitable economic option to CS-needing Vermonters. While the paybacks for participants under this option are not as good as for residential sites, allowing new inventory to the preferred category sites will prevent further inequity in Vermont.

Background: All VT solar generation represents about 2% of VT's energy consumption; residential solar is about .024%; CS's share of VT's generation is approximately .006%; and all other solar makes up the remainder.[1]

Based on calculations set forth in footnote 1, the source of electric energy used in Vermont is 37 mWhs per year in VT (.024%) from residential solar generation and 8.65 mWhs per year (.006%) from community solar scale generation out of approximately 150 mWhs of total solar generation in the state and 151,000 mWhs of electric energy sales across the whole state, CS has a de minimus effect on rates.

Focusing just on residential scale solar, by analysis of the PSB CPG list, approximately 6,500 residents have an average of 5.7 kW of solar capacity on either their roof or in their yard. Approximately 1,000 residents have an offsite solar solution in the same scale through CS. CS uptake lags similar scale residential, therefore it could be concluded that the CS market has been relatively underserved.

As a matter of equity, all Vermonters need to be able to participate. Our experience suggests that the proposed 5.100 rules as currently written will exacerbate this discrepancy. Given the small portion of VT power purchases sourced from any sub-150 kW scale solar generation in VT and more particularly from CS's 1/3 of the current total of <150 kW sites, providing incentives to CS will have a de minimus effect

[1] *Per the US EIA, in 2015, solar power produced 5.5% of Vermont's net electricity generation (demand) and about 2% of all electricity sold (usage) in the state. By further analysis of the EIA data and that of the PSB and GMP, sub 15 kW scale generation contributes .024% of VT's electricity consumption (there are approximately 6,500 CPGs in likely operation for projects less than 15 kW (5.7 kW average) (source: GMP list of 426Net_Metered_Interconnection_Application_Queue and Mr. Dostis' testimony on November 18, 2016) calculation: 6,500 x 5.7 kW x 1,000 kWh/kW/yr [37.05 mWhs] divided by total in VT [151,000 mWhs – per EIA] gives .024%). Isolating the portion of VT's generation from projects in the 150 kW scale (these are generally the scale of community solar arrays) [this can be done by sorting of GMP's list] shows approximately 107 projects in this scale. By looking at the names of the operating companies associated with these 107 projects, approximately 50 are likely community solar as defined above. Therefore, a calculation of the total generation is; 50 x .150 mW x typical productivity in VT (1.15 mWh/mW/yr) annual generation is approximately 8.625 mWhs or .006%. Note that the remainder of VT's solar generation is from 150 kW + scale projects. Given that the argument of this author is that CS represents a de minimus share of VT total power sales, the remainder of solar production is not relevant to any rule changes favoring this portion of solar generation. This data is presented in hopes that it can be confirmed, perhaps by the Department. Assuming it is correct, a conclusion that could be drawn is that the impact of community solar scale projects on VT utilities' annual total power purchase costs is de minimus.*

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on other ratepayers. Indeed, by GMP's testimony to the PSB on Nov 18, 2015, small amounts of additional distributed solar are not necessarily rate accretive.[2]

Problems for Vermonters with the 2016 and Proposed 2017 Rules: Over the next pages stories of the challenges experienced by CS developers and associated Vermonters who would benefit are related. The reason this granular look is provided is to give color to the reality of trying to follow the interim 2016 rules and the likely challenges if the 2017 rules are put in place as written. Following that, a look forward at what the challenges would be if a CS carve out is not made is given and a specific suggestion for CS carveout language is offered. Lastly other comments related to the rules are noted.

In an effort to continue to offer community solar to Vermonters GMCS tried to permit projects under both the 2016 supplemental rules and the proposed NM 2.0 rules and have found tough sledding. This past summer we submitted sought two separate site approvals – one for a 120 kW rooftop and one for a 150 kW ground mount.

Under the 2016 supplemental order, any project must have met a 50% host customer load criteria. The 120 kW roof project met this criteria and the project was accepted by GMP and a CPG was issued by the PSB. However, when the business risks of the project were unveiled, it was realized that if the building owner goes out of business the project is stranded as there would be no home for the 50% credits that must go to the host customer. And, furthermore it was found that the roof owner was concerned about ice dams, repairs, roof leaks, whether their insurers understand the firefighting issues around panels, and whether their next tenant will balk at not being able to customize HVAC. We've shelved this CPG primarily because of the 50% on-site load criteria business risks.

And, interestingly, also subject to the 2016 supplemental rules, our 150 kW ground mount site CPG application ran into significant and deal-killing headwinds. The site was a former town dump with the 50% host customer load criteria to be met by same town's GMP accounts. ANR first reviewed the site in 2015 and then called for a phase 1 environmental study. Given the likely feasibility from the ANR, the site was submitted in the 7.5 mW supplemental group. However, GMP rejected the project because the meters that would receive the 50% load were not immediately on site. Rule interpretation clarification was requested from the PSB regarding wording and intent it its Order 8652 which governed this supplemental net metering capacity. This request was denied. It was at the town's offices – just three miles down the road from that dump site - that I explained why the permit was rejected.

Throughout the summer our phone continued to ring "do you have any more panels for sale?" Not to be dissuaded, we waited till this September (after your latest NM 2.0 Rules draft was issued) and rolled up our sleeves again in hopes of bringing these callers under VT's solar tent.

[2] *GMP written testimony (Nov. 18, 2015 letter supporting 7.5 mW of above-the-cap supplemental), with GMP's argument starting on page 4.*

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We saw in your NM 2.0 Rules economic incentives for arrays sited in generally non-agricultural sites. Remembering the small NE Kingdom town's former dump site that the town wanted to put to beneficial use, I checked in with the ANR again and found that their requirements now would require both a phase 1 and a phase 2 environmental study at added costs of $20 to $70k. With this new and higher definite cost, and uncertain remediation and responsible party outcomes from the studies - all for a ballasted system – one that floats on and does not disturb the subsurface, this project was simultaneously rejected by us for economic reasons and by the town for liability reasons.

Carrying on our look at the feasibility of any sites for permitting under the proposed 2017 rules, we looked at any sites, now specifically including non-preferred ground sites. Here is what we've found, for a non-preferred ground site for a 150 kW (1 acre) the imposition of the same permitting criteria and requirements as those for a 500 kW will add 5% to costs. And, more importantly to the economics, a non-preferred ground site gets a relative penalty of 4 cents for the first 10 years and a perpetual three cent penalty thereafter. The higher permitting hurdle and life of project low reimbursement make a non-preferred site uneconomic.

If the intent were to slow development of solar in VT, our experience has demonstrated success. However our lack of success will only effect those Vermonters who might have wanted to equally share in solar options readily available to those folks who can put in a back yard or rooftop system.

Our last avenue we explored is the rooftop, and as I noted before with issues of business continuity and building owner concerns, the devil is in the details. I have heard anecdotally from others seeking to install arrays on rooftops many issues with fire access, roof loading and roof replacement issues. In short, qualifying rooftops just aren't that easy or prevalent.

Looking forward under the proposed 5.100 rules as currently drafted we find that opportunities for participating the benefits of solar panel ownership are not equal for all Vermonters. Previously, under your NM 1.0 rules, owners in CS arrays found a 12 year payback, and a comparable residential roof enjoyed a 10 year payback – terms generally consistent with the PSB's original 10 year solar adder. Under the proposed NM 2.0 rules, the value proposition to CS participants is significantly lessened. Assuming a permit can be had, on a non-preferred site a participant would receive an 18 year payback. If the CS array were located on a preferred ground or rooftop site, a 14 year payback is achieved (note these paybacks are three years more than what would be received for a <15 kW VT rooftop or backyard installation). Given the paucity of and difficulty permitting preferred ground sites, it appears rooftops will be the most viable avenue. However, I would encourage PSB staff to inquire in detail with roof top installers to understand the inventory and owner challenges. There may not be enough rooftops to allow for CS equity to be achieved and for the goals of VT to be advanced.

We and other community solar providers work to bring all Vermonters under the solar tent (participant equity). Recently, as the above examples indicate, our particular experience has led me to conclude that there are many fewer tent entrances and those entrances are much narrower now for a CS potential Vermonter.

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Here is a suggestion for a Community Solar carveout for your NM 2.0 rules that could breathe life back into this segment and create equity for all Vermonters. Specifically, please allow under point nine of your preferred site definition, the following: **those projects whose net meter group will have, for the life of the project, at least four members, one of whom must be allocated not less than 40% and not more than 60% of a project's output, with the other three or more members allocated the remaining net meter credits.**

Here is the effect: you will increase the inventory of land that could be used for community solar only thus allowing more potential sites to be used for this specific subset of net meter solar generation. Your new permitting participation and aesthetic criteria and the ANR will keep this inventory from being inappropriately developed. Adding a review of this criteria to under section 5.127 would give future boards a chance to review the efficacy of adding a Community Solar carveout.

And by allowing CS into Category 2 (preferred) you will be bringing a more equitable economic option to CS owners. While the paybacks for participants under this option are not as good as for residential sites, allowing new inventory to the preferred category sites will prevent further inequity in Vermont.

This is a reasonable request. It does not ask to change the solar reimbursement rates. It only affects a small portion of the solar market in VT and importantly, it levels the playing field for all small residential and business accounts whose properties won't allow them to have solar panels. Furthermore, it will have a de minimus effect on other ratepayers. **Please consider a Community Solar carve out in your NM 2.0 rules.**

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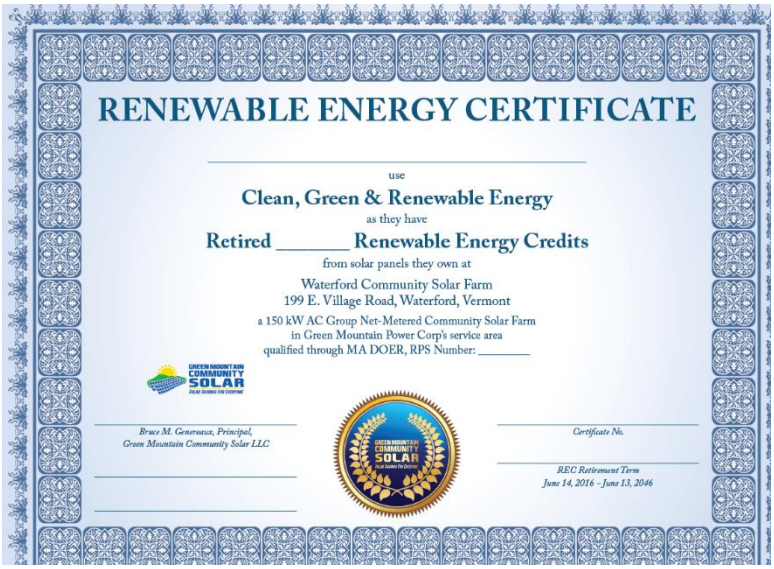
Additional Comments:

Renewable Energy Credits: Please consider removing the perpetual 3 cent per kWh REC penalty as this arbitrary life-of-investment charge makes folks who want make the renewable claims unable to do that. CS participants who've elected to purchase and retire their RECs so they can make the claim that they've gone "solar" and use "clean, green and renewable" energy can do so and they get the following certificate, so concern about double counting or non retirement are addressed with the certificate process.


RENEWABLE ENERGY CERTIFICATE

use

Clean, Green & Renewable Energy

as they have

Retired _____ Renewable Energy Credits

from solar panels they own at

Waterford Community Solar Farm
199 E. Village Road, Waterford, Vermont

a 150 kW AC Group Net-Metered Community Solar Farm
in Green Mountain Power Corp's service area
qualified through MA DOER, RPS Number: _____

Bruce M. Generaux, Principal,
Green Mountain Community Solar LLC

Certificate No.

REC Retirement Term
June 14, 2016 - June 13, 2046

Solar Farm Installation Costs: If it is true that a basis for rationalizing the lowering of reimbursement rates relates is declining capital (installation) costs of solar arrays, please find tabulated below data on that subject from our actual experience. We have installed four 150 kW AC projects over the past 18 months and are under contract for a fifth December. Their installation costs, when balanced against the remuneration (reimbursement) generated from net meter credits, provides the basis for customer economics. The following chart shows our costs for distinct projects at five dates between December 2014 and December 2016, on an all in basis (permitting, land preparation, land acquisition/lease, construction and materials) have been:

	Dec 2014	July 2015	Dec 2015	June 2016	Dec 2016
Cost, $/kW DC	**$3.21**	**$2.39**	**$2.36**	**$2.35**	**$2.44**

Our experience is that installation costs have stopped declining despite declines in solar panel prices. Please note that solar panels (modules) represent only about 25% of total project costs. Balance of system prices, including steel prices, wiring and ground conditions (ease of installation) are the major drivers of cost, not the cost of solar panels. Furthermore, forecasted costs of 2017 installations show ***no further cost reductions*** that may have been a basis for reimbursement rate reductions in your proposed rules. The impact of installation costs and lower reimbursement is the same as mentioned earlier in this letter – the payback threshold is being approached such that motivation for folks to invest in solar panels and their associated benefits is lost. Alternative returns compete for investor dollars, thus lowering the solar contribution portion towards the state renewable energy goal.

GREEN MOUNTAIN COMMUNITY SOLAR
SOLAR SAVINGS FOR EVERYONE

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Grandfathering: It appears that over the past year there have been many different proposals regarding grandfathering of existing solar in the multiple drafts of the 5.100 rules. First, there was perpetual, then 10 years, now 20 years of grandfathered rates, with bypass rates not being covered after 10 years. Solar panels are warranted to operate at 80% of their nameplate in year 25. They will continue to operate for years beyond that. The terms of CS investments are 30 years. Please allow the rules in place when a CPG was issued to remain in perpetuity. We've all experienced so much maligning of government recently and eliminating grandfathering by a government agency is smarting with Vermonters. This minor change in favor of the utilities strands the individual investors who as a whole are independent power producers, adding value and resilience to Vermont's grid. Lowering reimbursement rates after year 10 and having uncertainty after year 20 is not necessary to the financial health of the host utilities. Vermonters don't change the rules on Vermonters in mid-game. Change these rules and you'll dampen investor confidence and further darken government regulator's impressions with the public.

Here is another way to look at rate changes in mid-stream. If these solar farms were IPPs, the investor utility would fight to keep his/her investment from becoming stranded – I believe the term is rate stability. The threat of changing rates during the investment period for the many small investors is akin to stranding the investments of a group of small independent power producers. But, importantly in this case, it is harder for the small investors to advocate for maintaining rates in the manner that a publically traded utility with more financial resources and trained legal representation would.

Permitting: The proposed rules whereby projects occupying less than 1 acre (150 kW) would be subject to the full Section 248 permitting process would mean that project applications between 50 and 150 kW would cost developers $20,000 or more in increased legal fees and increase the time required for application review by the PSB staff. Both of these overheads increase cost to developers, and reduce return to owners without any significant benefit to the State of VT. Moreover, the legislature has required that the Board simplify the application process, and your proposed rule does exactly the opposite. Please revert this part of your rule change to allow the current <150 kW application process to stay as is.

Please feel free to contact me for clarification on any of the above points.

Sincerely,

Bruce M. Genereaux,
Member/manager, Green Mountain Community Solar LLC