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January 20, 2016

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

Dear Senators and Representatives,

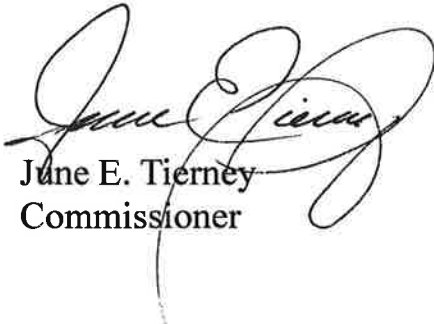
I am pleased to submit the 2016 Annual Report of the Clean Energy Development Fund (CEDF), which includes information on the funds activities and finances from July 1, 2015 through June 30, 2016.

Members of the Clean Energy Development Board, CEDF and other Public Service Department staff, have all worked diligently throughout the year to fulfill the promise and purpose of the CEDF as created by the legislature.

If you have any questions or concerns upon reading the report please do not hesitate to contact me or the Fund Manager, Andrew Perchlik.

I look forward to working with you this year in continuing the work of the Clean Energy Development Fund.

Sincerely,



June E. Tierney
Commissioner





Clean Energy Development Fund

Annual Report

To the Vermont Legislature

Fiscal Year 2016
July 2015 – June 2016

Submitted to the House and Senate Committees on Natural Resources and Energy, the Senate Committee on Finance, and the House Committee on Commerce and Economic Development of the Vermont General Assembly

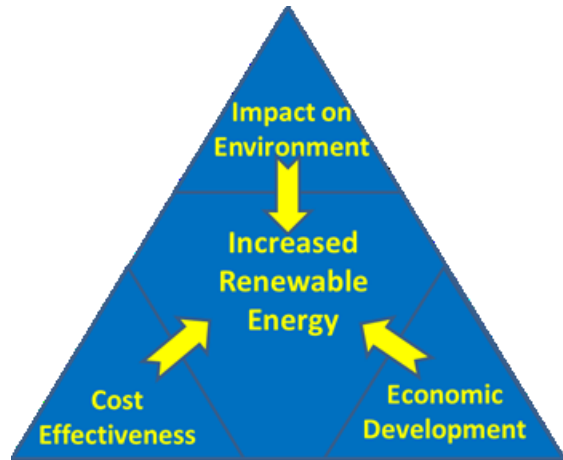
Published: January 2017

CEDF: Strategic Investment for the Clean Energy Economy

Adopted in the five-year Strategic Plan:

The Vision for the CEDF

is to serve the citizens of Vermont by increasing local small-scale renewable energy generation while maximizing associated economic development. The Fund coordinates with other state programs and private entities to integrate and advance renewable energy across all sectors of the State's energy economy.



The CEDF's primary goal is increased renewable energy generation in Vermont. Supporting the primary goal are three objectives:

- Advance development of the clean energy sector of the Vermont economy
- Increase cost effectiveness of clean energy
- Decrease environmental impacts of Vermont's energy use

In pursuit of the primary goal and three objectives the CEDF focuses on the following strategies:

1. Identify barriers to local renewable energy development and coordinate with industry, state agencies, and private organizations to develop solutions that overcome those barriers
2. Strengthen and build the markets for targeted distributed renewable energy technologies
3. Build connections between the deployment of renewable energy and energy efficiency
4. Increase jobs and revenue in the Vermont Clean Energy (CE) industry sector
5. Educate and support CE developers and businesses in obtaining non-CEDF incentives and financing
6. Support and strengthen CE finance and investment-related activities
7. Increase the leverage of CEDF monies while helping to drive the costs of CE projects down
8. Focus support on those CE technologies and CEDF programs that maximize the reduction of Vermont's energy related carbon emissions
9. Continually evaluate programs, activities, and outcomes in order to adjust programs as necessary to meet goals

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■ Purpose and Scope of this Report

The purpose of this annual report is to detail the activities undertaken, the revenues collected, and the expenditures made for Fiscal Year 2016 (July 1, 2015 to June 30, 2016) by the Vermont Clean Energy Development Fund (CEDF). The report also provides information on progress the CEDF made toward its goals and fulfilling its purpose as directed by the Legislature. The report is intended to provide information to the Vermont Legislature, Governor, clean energy stakeholders, and the citizens of Vermont.

■ Fiscal Year 2016 Summary

Fiscal year 2016 (FY16) was the third full fiscal year in the implementation of the CEDF's 5-year strategic plan, adopted in January 2013. When the strategic plan was adopted the CEDF was deploying what was assumed to be the last payment from Entergy Vermont Yankee (EVY) which had funded the CEDF since the CEDF was created. With no planned EVY payments the Legislature made an allocation to the CEDF of \$1.3 million in 2013 to be paid in 2014. Soon after receiving that allocation in 2014 a settlement was reached with EVY and one last payment was made from EVY to the CEDF of \$5.2 million. Half of that EVY payment was allocated by the Legislature for projects in, and for the benefit of, Windham County. These funds received in FY14 together with loan re-payments and a small amount of interest are the funds used by the CEDF for grants and all other expenses in FY16.

Incentive payments were low during the year compared to past years. The Fund spent under \$1 million on grants and incentives, the lowest amount since the 2007. Many grants awarded in FY15 and early FY16 that should have been completed were delayed and will be paid in 2017. In addition, many of the types of projects the Fund is supporting have long development time-lines, such as affordable housing developments. In prior years the Fund was deploying incentives in support of small, and quickly installed, renewables like residential solar PV systems.

Overall the CEDF announced new awards totaling \$1.87 million. If all the projects awarded funds are completed it will yield an estimated \$11.79 million in private capital for clean energy infrastructure investment in Vermont. Competitive grants equaled \$1.48 million for projects estimated to have a total cost of \$5.89 million. The Small Scale Renewable Energy Incentive Program (SSREIP) paid out \$337,691 in incentives for projects with total costs of \$5.8 million. The Fund contracted for \$145,860 of services during the year, including \$89,494 for the administration and program delivery of the SSREIP.

Like the past two years, FY16 showed continued growth in the Vermont clean energy economy. The number of workers involved with clean energy activities reached 17,715, an increase of more than 2,900 since 2013. Since that time, the state's clean energy work force has expanded by 19.8%.¹ As in prior years, the characterization state's clean energy economy is possible due to the CEDF sponsoring the third edition of the Vermont Clean Energy Industry Report which came out in the spring of 2016.

The CEDF continued its transition from broad-based support of all renewable energy technologies, to a focus on a strategically chosen renewable energy. The Fund concentrated on advanced wood heating as the target technology and on credit enhancements as a key financing programmatic tool.

¹ *Vermont Clean Energy Industry Report 2016, May 2016*

Highlights From FY16 Include:

1. Low-income High Performance PV Home Incentives

The CEDF re-established the special category within its Small Scale Renewable Energy Incentive Program (SSREIP) to support the installation of solar PV systems on highly efficient homes (high performance modular houses) reserved for low-income Vermonters. The SSREIP had funded these projects in the past but had ended the program when the CEDF ended support for Solar PV systems. Midway through FY16 the CEDF re-established the category and allocated \$125,000 towards the category.

2. Advanced Wood Heating

The CEDF issued two special grant solicitations in support of advanced wood heating. One was to support the demand for local pellets or chips with grants to install advanced wood heating system in public schools and non-profit affordable housing. The other solicitation was to help build the supply side of the advanced wood heating market in Vermont by providing grants to companies increasing production of pellets or improving the bulk pellet supply infrastructure. Overall five supply grants (\$474,000) and eleven demand grants (\$429,000) were awarded during the year for a total of over \$900,000.



Figure 1: Net Zero home (with PV system supported by the SSREIP)

public schools and non-profit affordable housing. The other solicitation was to help build the supply side of the advanced wood heating market in Vermont by providing grants to companies increasing production of pellets or improving the bulk pellet supply infrastructure. Overall five supply grants (\$474,000) and eleven demand grants (\$429,000) were awarded during the year for a total of over \$900,000.

3. Third Vermont Clean Energy Industry Report

The CEDF commissioned the state's third report, which again confirmed strong growth of Vermont's clean energy sectors. The report showed that clean energy businesses employ 17,715 workers at business establishments throughout the state. At the time of the report, this figure represented approximately 6% of the statewide employment, which was the highest per capita employment of any U.S. state.

4. Credit Enhancement Programs

The CEDF continued to build capacity in Vermont's clean energy finance sector by co-funding the Heat Saver Loan under the PSD Thermal Energy Finance Pilot program, and supporting the Heat Squad program operated by NeighborWorks of Western Vermont and two solar finance programs run by VSECU.

Authority, Funding, & Resources

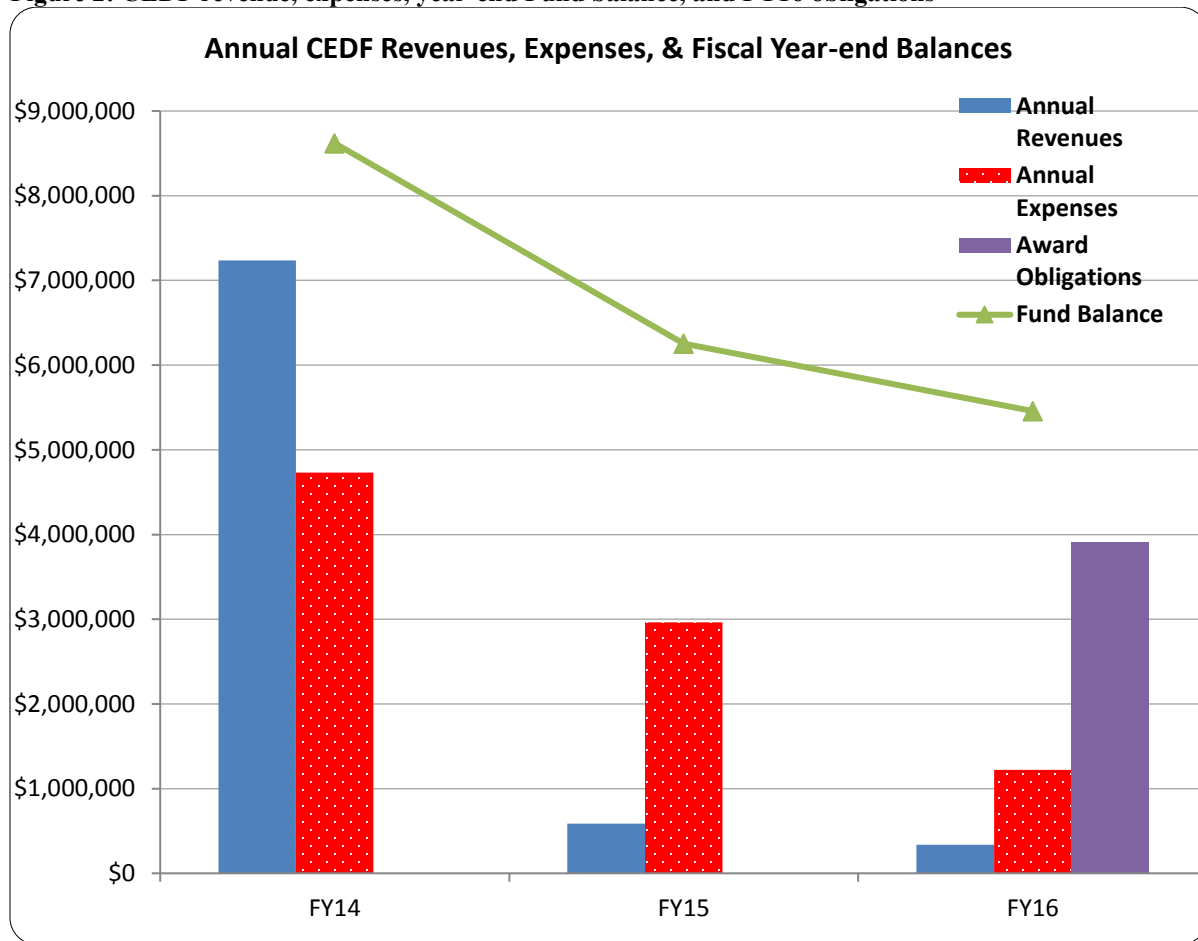
The Vermont General Assembly established the CEDF through Act 74 of 2005 (30 V.S.A. §8015). The purpose of the CEDF is *"to promote the development and deployment of cost-effective and environmentally sustainable electric power and thermal energy or geothermal resources for the long-term benefit of Vermont consumers, primarily with respect to renewable energy resources, and the use of combined heat and power technologies."*

The CEDF is administered by the Public Service Department (PSD), which employs a CEDF Manager and dedicates additional PSD staff time to CEDF tasks as needed. Over the last two fiscal years (FY15 & 16)

the CEDF has not received any funding from the Legislature or Entergy Vermont Yankee. However, the CEDF received a total of over \$7.5 million in FY 2014. Figure 2 shows the revenue, expenses, end-of-year balance of the Fund for last three fiscal years and shows the amount of award and contract obligations at the end of the FY16.

In FY16 the Fund spent the lowest amount of any year since 2007. There were a combination of factors that lead to this low level of expenditures. The primary reason was the slow uptake of new advanced wood heating incentives and the closing out of solar PV incentives. For several years the CEDF expenditures in support of Solar PV represented the bulk of CEDF grants and incentives as the PV market started to grow rapidly in 2010. In comparison, the advanced wood heating market in Vermont is about where the Solar PV market was over ten years ago looking at the number of installations and installation companies.

Figure 2: CEDF revenue, expenses, year-end Fund balance, and FY16 obligations



At the end of FY16 the Fund had almost \$4 million in grant obligations (i.e. signed grant agreements or contracts) and expects that by the end of FY18 the ~\$5 million remaining at the end of FY16 will be fully expended. The CEDF will continue to receive loan re-payments from the ~\$2 million in outstanding loans from past borrowers. The repayments of ~\$250,000 annually should continue a few years after the FY16 fund balance is spent (unless there are one or more unexpected defaults). See Appendix II for a financial report of FY16 revenue and expenses for the CEDF.

The CEDF also controls federal DOE funds in a revolving loan fund established with Vermont's American Recovery and Reinvestment Act (ARRA) State Energy Program grant that was administered by the CEDF. New loans were not made after the ARRA grant was closed-out and thus the revolving loan fund has grown to ~\$1.5 million from loan repayments being deposited into the fund. These funds still retain their federal character and ARRA restrictions. See Appendix II for the FY16 financial report for the ARRA funds still held by the CEDF.

In FY16 the CEDF started working with the Vermont Economic Development Authority, administrator of the CEDF and ARRA loan funds, to create a credit enhancement program with the ARRA funds in FY17.

During FY16 the Fund spent \$119,509 on CEDF staff and administration expenses. This is ~\$26,000 less than in FY15 but it represents a much greater percentage of the total monies expended (\$1.09 million in FY16) than in FY15, 10.8% vs. 5.3%. This high percentage was due to the reduction of almost \$2 million in total expenditures between the two fiscal years. The CEDF expects the administration costs to drop back to 5% of total expenditures in FY17.

Administration expenses as a percentage of the CEDF funds appropriated to the PSD for FY16 is much lower at just under 2%. While this is the statutory structure for calculating the percentage of funds spent on administration², the CEDF believes the administrative costs as a % of expenditures is the better way to calculate and compare this information over multiple years. This is especially true since FY13 when the annual CEDF payments made by Entergy Vermont Yankee ceased.

Clean Energy Development Board

The CEDF is overseen by a seven-person board appointed by legislators and the Commissioner of the Public Service Department. During FY16, the Board consisted of the following members: Sam Swanson (co-Chair), Linda McGinnis (co-Chair), Jared Duval, Johanna Miller, Janice St. Onge, Gaye Symington, and Mark Whitworth. The CEDF Board guides CEDF activities in reference to its legislative purpose and the five year Strategic Plan. The Board works with the Fund Manager and the PSD in the creation of CEDF's plans and programs.

The Board met five times during the fiscal year. The Board provided guidance and input on a variety of topics, including the FY17 budget and Program Plan, grants for solar PV systems on high performance homes for low income Vermonters, and the FY17 annual budget and work plan.³ For more details on the CEDF Board, see Appendix I.

■ New FY16 Awards & Activities

The new awards (grants, incentives, and contracts) made by the CEDF in FY16 are described below. In total, the CEDF awarded \$1.87 million resulting in a reported \$11.79 million in total project costs representing a continued investment in Vermont's clean energy infrastructure. These investments demonstrate that the CEDF was able to leverage about \$5.29 of private investment for each CEDF dollar

² V.S.A 30 §8015 (e) (2)

³ Minutes of the CEDF Board's meetings are posted on the PSD's CEDF web page (http://publicservice.vermont.gov/topics/renewable_energy/cedf/board).

awarded. The grants, contracts, credit enhancements and incentives announced during FY16 are described below in greater detail and summarized at the end of this section in Appendix III.

In addition, the CEDF continued to administer grants and develop programs established in prior fiscal years and these activities are also described below.

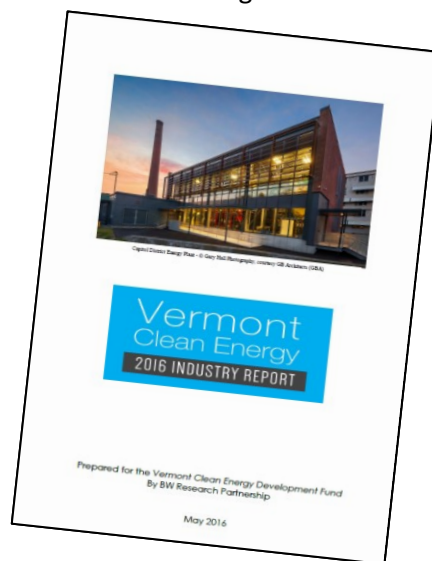
➤ **Vermont Clean Energy Industry Report 2016**

[BW Research, Inc. – \$47,616 for Year 3 under a \$149,957, 3-Year Contract]

Vermont now employs over 17,000 workers at business establishments that engage in clean energy activities. The current year's findings were announced on May 18, 2016 via the release of the third *Vermont Clean Energy Industry Report (VCEIR)*, commissioned by the CEDF to establish a baseline for jobs in the state's CE industry.⁴ The report is based on the third of three studies to be conducted by BW Research Partnership, Inc. under a three-year, competitively bid contract.

This initiative replicated similar reports in other states that used direct employer feedback through a representative survey. Developed in partnership with the Agency of Commerce and Community Development, Department of Labor, and input from an advisory group, the third report reflects a very similar approach taken elsewhere and allows comparisons with other states and regions.

As a result of Vermont and other states' efforts to develop similar reports, BW Research Partnership was contracted by the U.S. Department of Energy to develop a national survey, with data made available to states at no cost. This should substantially reduce the costs for creating on-going reports to track progress in the clean energy industry.



Highlights

Select findings from the third report include:

- The Vermont CE cluster employs 17,715 workers at business establishments throughout the state, which represents approximately 6% of the state's workforce. The growth rate since 2013 was 19.8%.
- Installation accounts for 7,518 jobs or 42% of CE workers, with engineering/research/professional services coming in with 4,170 workers (24%) and trade/distribution/transport counting 3,104 (18%).
- Energy efficiency continues to form the largest segment, employing 49% of the CE workforce, but renewable energy workers expanded in 2016 again with 6,965 jobs (39%).
- Among renewable energy technologies, the solar sub-sector increased to more than 2,100 workers or 30.5% of all renewable energy workers. Woody biomass constituted 1,500 jobs followed by non-woody biomass at 940, then renewable heating and cooling at 933. Wind came in with 369 jobs followed by hydro at 375.
- The state's CE market continues to be dominated by small businesses with about 81% of establishments having 10 or fewer employees.

⁴ Download all the VCEIRs (2014 to 2016) at http://publicservice.vermont.gov/renewable_energy/cedf/reports

The 2016 report also included detailed information on the wood energy segment along with data on clean transportation, value chain activities, firm sizes, hiring difficulty and revenue streams. The CEDF plans to continue building on this set of reports with the fourth edition of the VCEIR to be released in 2017.

➤ **Advanced Wood Heating⁵**

[A total of \$903,054 was awarded to 16 different entities]

The CEDF administered two different granting programs to support the advanced wood heating market, in addition to the pre-existing small scale incentive program and the Windham County program discussed further below. One program was focused on building the supply side and the second the demand side of the market.

Bulk Wood Pellet Delivery Infrastructure Grants:

Part of the task of building a viable wood pellet industry entails building the infrastructure through which heating fuel companies can readily and cost effectively supply large volumes of pellets to their customers. The CEDF wanted to support companies willing to make investments in infrastructure such as bulk pellet deliver trucks, large pellet storage/depots, pellet mills, and bulk filling stations at pellet mills. In the fall of 2015, CEDF issued a request for Letters of Intent to invest in such projects. Based on the letters received five companies were invited to submit grant applications. Based on those applications five preliminary awards were made. These awards are shown in Figure 3 below:

Figure 3: Bulk Pellet Supply Awards

<i>Awardee</i>	<i>Location of Project</i>	<i>Infrastructure Project</i>	<i>Project's Estimated Cost \$</i>	<i>Grant Awarded \$</i>
Bourne's Energy	North Hyde Park	Bulk Pellet Storage Silo	61,693	21,593
Kingdom Pellets LLC	Lunenburg	New Mill - Bulk Pellet Components	1,038,437	250,000
Renewable Fuels of VT LLC	Windsor	Bulk Pellet Handling/loading Equipment at Windsor Pellet Mill	155,081	48,475
Sandri Energy LLC	Brattleboro & Windham County	Bulk Pellet Delivery Truck and Bulk Pellet Storage for Customers	218,625	60,000
Vermont RE Fuels	Montpelier & Surrounding Counties	14 Ton Bulk Pellet Delivery Truck	282,690	94,000
Totals			\$1,756,526	\$474,068

Advanced Wood Heating Installation Grants

⁵ The CEDF defines Advanced Wood Heating as heating systems that: 1) use highly efficient combustion technology, 2) emit low levels of particulates and pollution, 3) support healthy forest ecosystems, and 4) use local wood.

In response to two separate grant solicitations specifically for schools and affordable housing projects, the CEDF offered preliminary grant awards to eleven entities to install advanced wood heating (pellet or chip) systems in their facilities. The awards are listed in Figure 4 below.

Figure 4: FY16 Advanced Wood Heating Awards for Facilities

Awardee	Town of Project	Type of Building	Total Heating System Projected Cost \$	Grant Awarded \$
Barre Supervisory Union	Barre	School	422,000	80,000
Bradley House*	Brattleboro	Affordable Housing	202,880	71,000
Brewster-Pierce Memorial School*	Huntington	School	330,000	47,115
Downstreet Housing & Community Development	Montpelier	Affordable Housing	143,477	40,000
Housing VT – Applegate Apartments	Bennington	Affordable Housing	1,419,405	50,000
Housing VT – Hickory Street	Rutland	Affordable Housing	147,659	50,000
Housing VT – Union Square*	Windsor	Affordable Housing	219,398	25,000
Pittsford School District – Lothrop School	Pittsford	School	520,602	10,000
Shires Housing	Bennington	Affordable Housing	52,871	15,861
Windham & Windsor Housing Trust – Canal Street	Brattleboro	Affordable Housing	\$106,800	20,000
Windham & Windsor Housing Trust – Green Street	Brattleboro	Affordable Housing	142,000	20,000
Totals:			\$3,707,092	\$428,976

**These awards were canceled by the awardees in FY17*

■ Continuing Awards & Activities from FY15

➤ **Windham County Funding**

In April of 2014 an agreement between the State and Entergy Vermont Yankee resulted in the CEDF receiving over \$5.3 million in new funds. The agreement requires that at least 50 percent of those funds (~\$2.6 million) be spent in, or for the benefit of, Windham County.

The CEDF Funding in Windham Co. was allocated as follows:

- Windham Wood Heating Initiative\$1,600,000
- Windham Co. Solar Finance Program\$300,000
- Windham Co. Renewable Energy Grant Program\$400,000
- Anaerobic Digester Program.....\$300,000

➤ **Windham Wood Heat Initiative [\$1,600,000 in FY15]**

The Fund provided a substantial investment to assist with development of a viable advanced wood heating sector in Windham County in FY15. Under the umbrella of the Sustainable Energy Outreach Network (SEON), a consortium of groups with experience in economic development, advanced wood heating systems, and community engagement developed the Windham Wood Heat Initiative (WWHI). The initiative's two year goal was to help schools and municipalities convert 20 buildings from fossil fuels to local, sustainable wood fuel using advanced wood heating systems.

The program involved the Windham Regional Commission, Building Green, the Norther Forest Center and other businesses working together to assist with fuel switching and energy efficiency, increasing the capacity for high efficiency wood-based heating in the region, and contributing to the overall economy. With more than 2.2 million acres of timberland in the vicinity, this program has the potential to model how communities can re-localize their fuel supply.

Given the recent drops in oil prices and budget requirements for schools under Act 46, the pressure to convert heating systems away from fossil fuels appears to have diminished. Just four schools received grants in FY16, despite a burst of interest from schools and towns. The WWHI executive team began to re-think the 20 building goal and at the end of FY16 began discussion with the CEDF on how to restructure the grant and program.

Even without a lot of conversions to advanced wood heat the resources from the Fund and WWHI partners have helped position schools and towns to be ready the next time volatile fuel prices return, and continue to build a local fuel system whose benefits accrue directly to the local economy.

➤ **Windham Co. Solar Finance Program [VSECU's Brattleboro Branch \$300,000]**

In FY15 the CEDF created a new finance program with an allocation of \$300,000 to VSECU for the Windham County Solar Finance Program. This initiative helps residential property owners finance small residential PV and solar hot water systems. During FY 2016, the program supported seven loans for solar PV ranging from 4.42 to 7.56 kW in size valued at a total of \$160,059. Interest rate buy down for the projects totaled \$11,749 for the total generation capacity of 41.8 kW. The cost to the fund came in at

\$3.83/watt with each public dollar leveraging \$13.62 of private financing. There were nine companies listed as installers that could participate in the program. By the end of 2016, the loan program supported one more loan bringing the total capacity to 51.4 kW with an average interest rate buy-down of \$1,760 and a cost of \$3.63/watt. Customers in the program borrowed a total of \$186,490 yielding a total overall leverage of one public dollar generating \$13.25 in private resources. This program is scheduled to close in March 2017.

➤ **Windham Co. Renewable Energy Grant Program [\$400,000]**

In December of 2015, CEDF issued a solicitation to invite businesses, government entities and organizations to submit a Letter of Intent to apply for a CEDF grant to create and administer a \$400,000 renewable energy grant program for Windham County. The Windham Regional Commission was selected as the Grantee and will develop and implement the grant program in FY17.

➤ **Anaerobic Digester Program [\$300,000]**

At the end of FY16 the Fund issued a Windham County grant solicitation for one or more anaerobic digester(s), including projects that may handle a high fraction of food waste, including digesters wholly supplied with food waste. The Fund developed the solicitation with the Agency of Agriculture, Food, and Markets (AAFM). The Fund and AAFM spoke with and received input from food waste and farm anaerobic digester stakeholders, including the Windham Regional Solid Waste District which had plans of installing a food waste digester.

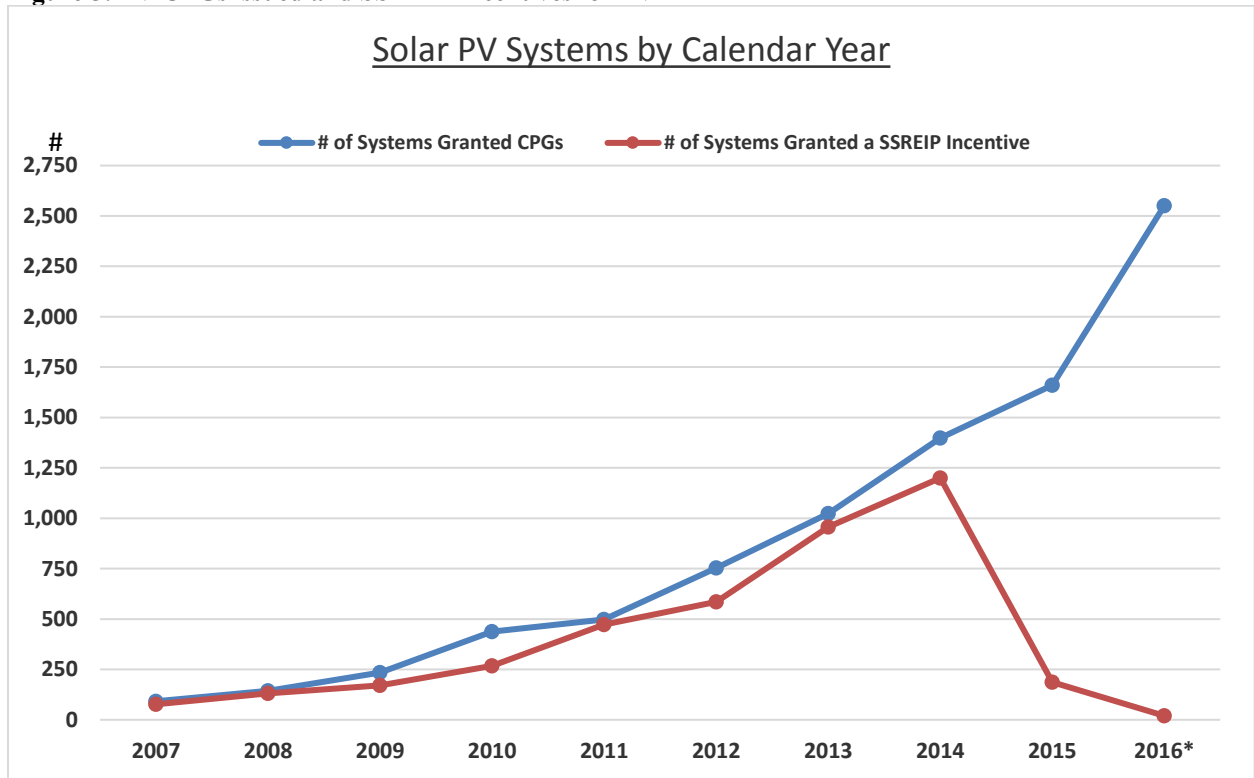
Unfortunately the Fund did not receive any applications for digesters as a result of the solicitation. The solid waste district decided against a food waste digester, the farms in the County that were interested in digesters decided to wait, and the commercial enterprises that had expressed interest in the grant solicitation decided not to pursue a food digester.

Given the lack of interest in digesters the CEDF will, in consultation with Windham County stakeholders, re-deploy the \$300,000 into a different program in support of renewable energy development in the County.

➤ ***Small Scale Renewable Energy Incentive Program***
[\$1,170,282 budgeted for FY16]

The Vermont Small Scale Renewable Energy Incentive Program (SSREIP), created in 2004 and funded by the CEDF since 2007, completed its shift away from the solar PV market in FY16. As Figure 5 shows, the number of CEDF incentives awarded in calendar year 2016 dropped from over 1,000 in calendar year 2014 to just twenty projects in 2016. At the same time the number of Certificates of Public Good (CPG) issued by the Public Service Board for net metered Solar PV systems continued to rise to an estimated 2,550 in 2016.

Figure 5: PV CPGs issued and SSREIP incentives for PV



* For 2016, the number for CPG's is estimated.

Figure 5 shows that the PV market in Vermont continued to increase rapidly even after the CEDF ended almost all PV awards at the end of 2014. This result confirms the CEDF's belief that it made the right decision shift the SSREIP program away from the maturing PV market to the very nascent advanced wood heating market.

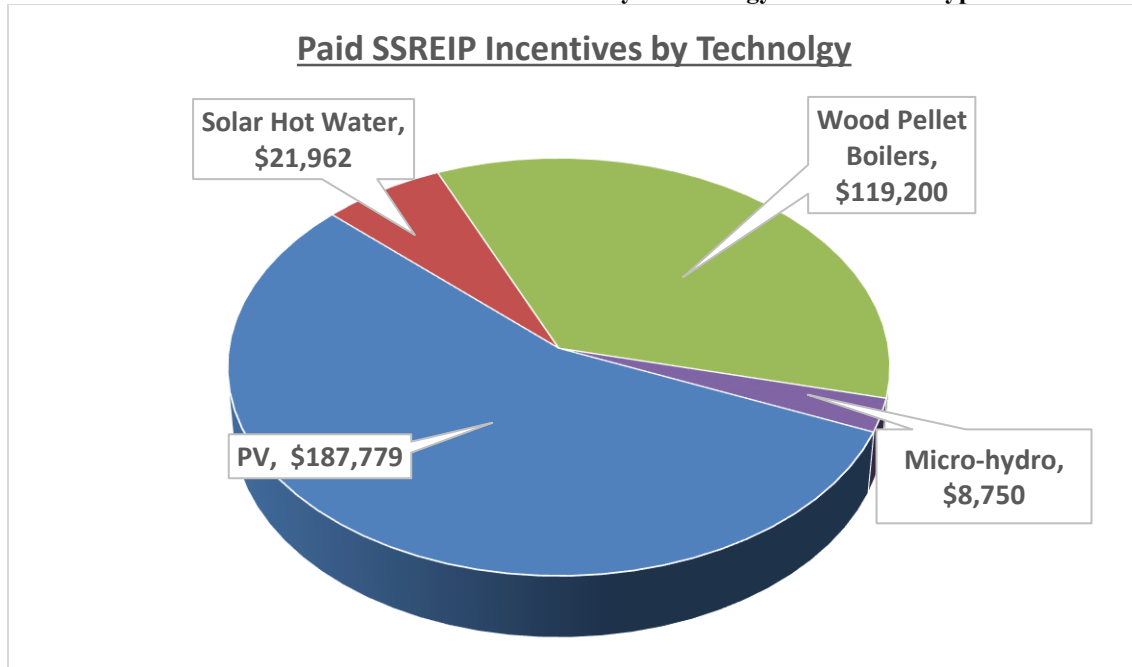


Figure 6: 8.9kW PV system installed on the Wallingford Elementary school

All of the PV incentives paid in FY16 were in support of municipalities, schools, or non-profit affordable housing such as the McKnight Lane mobile home park in Waltham developed by the Addison County Land Trust where all the homes are Vermont net-zero homes with solar PV systems. The SSREIP is a market-based program that continued to provide rebates to individuals, businesses, municipalities, and multi-family low-income housing projects. Figures 7 and 8 below show what types of systems received incentive payments during the fiscal year. Since these graphs show the fiscal year, they include some of the solar PV projects funded in calendar year 2015. The total cost of all the systems installed through the SSREIP was \$5,848,208, resulting in a leverage of over 17 to 1. This investment supported the installation of 92 new PV systems with a total capacity of 642 kilowatts (kW AC), 15 solar hot water systems, 41 wood

pellet systems, and one small-hydro system that expanded renewable energy generating capacity installed across the state.

Figure 7: Fiscal Year 2016 SSREIP Paid Incentives Paid by Technology & Customer Type



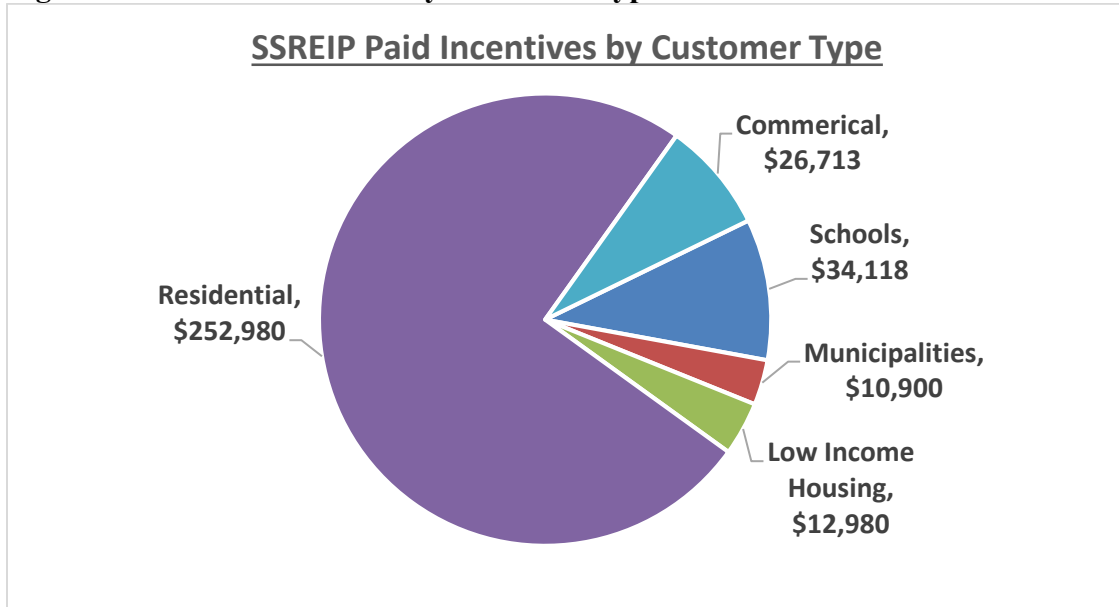
As in prior years, the CEDF continued to contract the administration of the program to the Renewable Energy Resource Center (a unit within the Vermont Energy Investment Corporation, or VEIC). The RERC was last awarded the contract by competitive bid in FY15.

The SSREIP provided a total of \$57,998 for the installation of PV and solar thermal projects on non-profit affordable housing, schools, or municipal buildings. Figure 9 below shows the eight systems installed with SSREIP incentives for municipalities and non-profits.

Figure 9: SSREIP Incentives to Municipalities and Affordable Housing

Technology	Town	County	Total Cost \$	Incentive Amount \$	Building Type
Solar Electric	Wallingford	Rutland	33,000	11,200	School
Solar Electric	Middlebury	Addison	20,620	4,480	Low Income
Wood Pellet	Putney	Windham	51,335	3,000	Low Income
Solar Hot Water	Montpelier	Washington	22,290	5,062	Low Income
Solar Electric	Middlebury	Addison	20,500	5,500	Low Income
Solar Electric	Sharon	Windsor	39,617	14,856	School
Solar Electric	Plainfield	Washington	37,937	10,900	Municipality
Wood Pellet	East Burke	Caledonia	27,719	3,000	School
Totals			\$253,018	\$57,998	

Figure 8: SSREIP Incentives by Customer Type



The CEDF worked to emphasize the availability of the SSREIP incentives to the schools, municipalities and non-profit affordable housing organizations.



Figure 10: SSREIP supported Pellet Boiler installed at Burke Mountain Academy. Photo by Cutting Edge Energy Systems

➤ ***CEDF Finance Programs***

In FY16, the CEDF continued to operate a set of finance programs initiated in FY15 to spur markets for clean energy around the state. Through credit enhancements intended to reduce risk, the Fund provided resources to financial institutions to offer financing for solar PV, solar hot water, and modern pellet boilers and furnaces. Buying down interest rates and providing loan loss reserves to financial institutions enables customers to access capital for larger upfront expenditures at more affordable terms. Use of credit enhancements also allows the fund to target its resources to audiences that would benefit from reduced energy costs but could not otherwise afford

the investment. This new set of tools has expanded the Fund’s reach by leveraging additional private capital for clean energy investment.

These finance initiatives are part of the Fund’s effort to increase access to solar energy for middle and lower income Vermonters, and foster a transition from incentives toward cost effective financing. Some programs offer tiered interest rate buy down based on the income levels. The intended results include increased rates of investment in solar systems, increased supplies of distributed net-metered renewable

power, and greater confidence in the technology among financial institutions leading to more participation in this market segment.

Thermal Energy Finance Pilot Program

Beginning last fiscal year, the CEDF supported interest rate buy down (IRB) for homeowners seeking financing for qualified clean energy activities under the DPS *Thermal Energy Finance Pilot Program*. In addition to resources provided by the DPS and Vermont Low Income Trust for Electricity (VLITE), CEDF provided an original allocation of \$240,000 of DOE funding to Vermont State Employees Credit Union (VSECU) in 2014, then increased its DOE allocation in FY16 with an additional grant of \$150,000. An additional \$177,000 was supplemented at the end of 2016 to carry the program past the pilot stage.



This pilot included Efficiency Vermont, VSECU and Opportunities Credit Union in a program designed to reach middle and lower income Vermonters with the affordable “Heat Saver Loan” product that helps save energy and money. The two-year pilot was slated to run through the August of 2016, but was later extended to December, then again until March 2017.

By June 30th, the program had supported 211 loans totaling \$2.46 million for a range of thermal upgrades including advanced wood pellet boilers, solar hot water systems, weatherization improvements and other energy saving technologies. By then, 79 vendors or contractors had worked with customers in 108 communities. Borrowers accessed about \$404,000 of interest rate buy down yielding a leverage of about 6 private dollars for each public dollar. These numbers increased by the end of December. The kinds of technologies and services supported by the program are long term in nature. Thus, the investments through the pilot will yield savings and reduced energy consumption for many years to come.

As the pilot drew to a conclusion, participants considered options for the post-pilot period and opportunities for the continued use of finance tools to support clean energy investment. The department issued a program report in December that recommended continuing the program in light of its success. The report can be downloaded from the Heat Saver Loan website (<http://heatsaverloan.vermont.gov/resources>).

Interest Rate Buy-Down Fund [NeighborWorks of Western Vermont]

The CEDF continued to administer a FY15 grant to NeighborWorks of Western Vermont funded with ARRA funds from a canceled PACE finance program. NeighborWorks uses the CEDF/ARRA funds for an interest rate buy-down program for qualified energy efficiency retrofits on qualifying properties to lower the net cost of borrowing to eligible homeowners. As with the Thermal Energy Finance Pilot, this program offers loans for amounts up to \$35,000 with interest rates as low as 0% for income-qualified borrowers. This grant is scheduled to close in March 2017, if it doesn’t expend all its funds prior to that date.

➤ ***Department of Energy Sun-shot Grants***

The CEDF participated in a New England regional Sun-Shot Roof-Top Challenge Grant with the rest of the New England States (minus Maine). This grant started in FY15 but a substantial amount of the work was completed in FY16. There were four main components: PV permitting review by the City of Burlington, firefighting training related to solar PV, a community finance program, and residential solar guide.

PV Permitting Review Project, City of Burlington Electric Department [\$26,000]

CEDF provided US Department of Energy sub-grant to the City of Burlington to be used to review Burlington's existing permitting requirements and ordinances that affect the installation of grid-connected photovoltaic (PV) systems in the city. The intent of this effort was to identify ways that the permitting process could be streamlined and centralized to minimize costs for applicants of PV generation as well as minimize permitting time. The project also reviewed the potential for creating an ombudsman function within the Burlington Electric Department tasked with supporting permit applicants of PV and other distributed generation in navigating the permit process.

The City issued an RFP that led to the selection of Matrix Consulting Group and Graydon Land Use providing technical assistance on the permit reform process. The consultants gathered input via surveys and focus groups with key stakeholders, including solar developers and community members, and developed a set of national Best Practices to compare to the Burlington process. By the end of the project in the fall of 2016, a set of recommendations was prepared to submit to the city council for review (See Figure 11).

Figure 11. Burlington Electric Department Permitting Review Project Recommendations

BURLINGTON PERMITTING PROJECT RECOMMENDATIONS IMPACTING SOLAR PERMITTING	
The following table summarizes the recommendations that were made, as part of the overall permitting improvement project, that have an impact on the permitting process related to solar permitting.	
Area of Focus	Recommendation
Educational	Establish handout specifically outlining permitting process for solar permits including submittal requirements, review timeframes, and zoning requirements / conditions of approval.
Zoning	During next zoning review, establish specific zones where solar permitting is allowed by right.
Zoning	Establish specific criteria for approval of solar permitting in historic districts and/or on historic properties to outline the considerations that will be taken into account when reviewing solar installations on historic properties.
Zoning	During zoning update, consider inclusion of special consideration for approval for plans that integrate solar into redevelopment (to achieve sustainability goals).
Zoning	Create dedicated solar checklist for zoning approvals similar to the other types of checklists that exist for other types of zoning reviews that outline key criteria that must be satisfied for approval.
Process Improvement	Include Solar Permitting in New Streamlined application intake process with established timeframe of over the counter (or 1 day for streamlined reviews) and 3 days for standard review and differential timeframes for streamlined / standard review.
Building Permit Plan Review	Develop sample construction guidelines / plans outlining acceptable installation protocols to streamline plan development, submittal and approval. (While applicants not required to utilize these, they represent typically approach that would be approved if utilized in accordance with established criteria).
Fee Related	As part of a future comprehensive review, fees associated with solar applications should be reviewed to ensure application cost is not more than the actual cost to provide service to applicants.
Technology	As part of future technology upgrades, include solar permitting as one of the initial application types for online submittal, review, and approval of applications.
Inspections	Where feasible, cross-train inspectors to enable single inspection of solar installations to streamline inspection process.

Fire Academy Fire Fighting and PV Trainings, Department of Public Safety MOU [\$7,500]

The Vermont Fire Academy (VFA) identified the need for firefighter training that addresses the hazards, strategies, and tactics required for the mitigation of hazards involving fires or other incidents in close proximity of solar PV installations. The CEDF had contacted the VFA as the regional Sun-shot grant that Vermont and did not have a course of instruction to meet this need. CEDF and the Department of Public Safety Division (PSD) of Fire Safety then collaborated via this MOU to use VFA instructors for delivery of a “Solar Photovoltaic Safety for Firefighters” course and subsequent trainings in Vermont’s counties.

The CEDF helped the VFA/PSD secure DOE Sun-shot funding through CEDF's sub-grant with the Clean Energy State's Alliance. This funding helped support a "train-the-trainers" session in May 2016 where 27 fire instructors learned the materials and were qualified to deliver the course. These instructors then offered 14 geographically disbursed deliveries throughout the state in August with 541 in attendance.

This program was part of the US Department of Energy Rooftop Solar Challenge II grant program that supported the New England Solar Cost Reduction Partnership, coordinated by the Clean Energy States Alliance (CESA).

Community Solar Finance Program [VSECU]

Through FY 2016, CEDF received worked the Clean Energy States Alliance in support of the DOE funded *New England Solar Cost-Reduction Partnership* under the Rooftop Solar Challenge II. A June 2015 CEDF award of \$125,000 to VSECU to construct a statewide community solar finance program with an interest rate buy down was subsequently reduced due to lack of demand, with \$50,000 of the funding re-programmed to assist with other DOE-approved project elements. The loan program helped a set of residents of the state who could be off-takers of net metering credits that lacked access to sufficient solar exposure, who were renters or were not able to install solar on their properties, or wanted to participate in a community project.

The program made a total of 13 loans in the fiscal year valued at \$243,941 using interest rate buy down of \$33,914 to support 68.57 kW of solar PV generating capacity in community systems. The installed cost for this set was \$3.56/watt. By the time the program closed in September 2016, the total number of loans stood at 20 for a total of 92.56 kW of capacity based on loans of \$338,379 using interest rate buy down of \$57,615. The final installed cost was \$3.66/watt assuming the full cost of the project was financed by the loan with each public dollar leveraging \$5.87 of private investment.

Residential Solar Guide [Clean Energy States Alliance]

The CEDF worked with the Clean Energy States Alliance (CESA) to create this simple guide to help Vermonters that are considering solar PV for their home or buying into a community solar PV project. The guide was completed in FY17 and is described below in the FY17 first half preview.

➤ *State Wood Energy Team [SWET]*

The CEDF continued to be active throughout the year in this inter-agency effort that facilitated participation of six key stakeholder groups. The SWET is led by the Department of Forest, Parks and Recreation. The team received a grant from the US Forest Service prior to FY16, but the grant was extended into FY17 to provide technical assistance and conduct outreach and education activities in support of advanced wood heating across the state, but with a focus on schools and non-profit affordable housing.

The SWET, and its connection with the US Forest Service's technical assistance program assisted CEDF's in reviewing grant applications and final plumbing designs submitted to the CEDF as part of its advanced wood heating grant program.

➤ **Food Waste Pilot Projects [Casella Resource Solutions and Grow Compost]**

These two grants were extended during the FY to allow the projects to complete their innovative approaches to developing systems for food waste collection and delivery to farm manure anaerobic digesters.

The passage of Vermont's Universal Recycling Law (Act 148 of 2012) bans disposal of food scraps by 2020 and requires solid waste haulers and facilities to accept these same materials. Organics constitute over a quarter of the municipal solid waste with 60,000 tons of food residuals. CEDF provided two grants in 2015 for innovative solutions designed to demonstrate the anaerobic digestion of food waste, which will help meet the goals for renewable energy and waste reduction. \$35,000 of each project's total award came from a grant to the CEDF from Green Mountain Power.

Fiscal Year 2017 – First Half Preview

CEDF adopted a budget and program plan for FY17 in July of 2016. During the first half of FY17, CEDF continued to administer programs from FY16 and develop new awards/programs. This section provides a brief synopsis of CEDF activities from July to December 2016.

- **Vermont Clean Energy Industry Report 2016** – The CEDF commenced a fourth clean energy industry survey to continue to gain insight into trends in Vermont's clean energy industry. This fourth report is slated for completion in the spring of 2017.
- **SSREIP**
 - Streamlined the Pellet Boiler incentive to make it easier to administer and apply for
 - Started a wood stove change-out with the Agency of Natural Resource's Division of Air Quality and Climate
- **Windham Wood Heat Initiative** – Accepted SEON's cancelation of their existing grant. SEON and the Windham Wood Heat Initiative executive team requested that the administration of the program be transferred to the Windham Regional Commission, which has been a central member of the executive team since the grant started.
- **Wood Heat Grants:** – Three of the advanced wood heat grants awarded during FY16 were canceled by the awardees. Even with the CEDF grants the installation of pellet heating systems for these projects was not economically viable:
 - Brewster-Pierce Memorial School in Huntington (\$47,115 grant canceled)
 - Bradley House in Brattleboro (\$71,000 grant canceled)
 - Housing Vermont's Union Square Project in Windsor (\$25,000 grant canceled)
- **A Vermonters Guide to Residential Solar** – The guide was completed in September of 2016 and has been well received. The guide was drafted by the Clean Energy States Alliance and can be found on the PSD's web page for solar resources:
http://publicservice.vermont.gov/renewable_energy/resources
- **Advanced Wood Heat Baseline Study** – Through a competitive solicitation, the Biomass Energy Resource Center (a program of the Vermont Energy Investment Corporation) was contracted to

complete a report that will provide the PSD and CEDF with the baseline levels of use and economic activity in the advanced wood heating sector in Vermont.

- **Finance Collaborative** – The CEDF is participating in a clean energy finance collaborative convened by the PSD. This public private collaboration seeks to improve the effectiveness and significantly increase the state’s capacity for clean energy finance and investment to support state energy goals. The group held a planning event in October 2016. This is a manifestation of the coordinating role envisioned in 2013 by the CEDF in its 5-Year Strategic Plan.

Conclusion

During FY16, the CEDF closed out the last of its solar PV grants⁶ as it sharpens its focus on building the advanced wood heating market in Vermont. The number of installations and grants in the advanced wood heat sector is low compared to CEDF’s past experience with solar PV, but as the Fund collects information and experience it is developing and adapting programs to best build the industry to maximize the clean energy, cost effectiveness, and economic development goals of the CEDF.

The CEDF finished FY16 well poised to continue to improve the lives of Vermonters, especially those vulnerable to the effects of air pollution and wildly fluctuating heating fuel prices, by increasing the amount of renewable energy and catalyzing economic development in local industries that already have a presence and value chain connections in the State. The Fund sees great promise in the advanced wood heating sector based on the foundational programs created over the last two years.

The CEDF and PSD continue to demonstrate the ability to advance the development of renewable technologies throughout Vermont’s communities while making clean energy more affordable and tied to increased local employment and economic development. The CEDF and PSD have worked to help many citizens, towns, schools, developers, installers, planners, regulators, and legislators who express their desire for a clean, renewable energy future gain essential practical experience with the technology and business sector in Vermont. Such experience will be necessary for the continued growth and advancement of the State’s clean energy economy.

The distance yet to cover to reach the state’s clean energy goals is challenging, but the CEDF continues to demonstrate its capacity to assist in reaching those goals while growing a prosperous and effective economy.

⁶ There will be some affordable-housing solar PV incentives issued through the SSREIP that will close in FY17.

Appendix I – CEDF Statutes and Board

In 2005, the Vermont General Assembly established the Vermont Clean Energy Development Fund (CEDF) through Act 74.

PURPOSE (30 V.S.A. § 8015(c))

The purposes of the Fund shall be to promote the development and deployment of cost-effective and environmentally sustainable electric power and thermal energy or geothermal resources for the long-term benefit of Vermont consumers, primarily with respect to renewable energy resources, and the use of combined heat and power technologies.

ADMINISTRATION

The Public Service Department (PSD) administers the CEDF to facilitate the development and implementation of CE resources. The PSD hires a Fund Manager to oversee the day-to-day operations of the fund.

Assisting the PSD is a Clean Energy Development Board with decision-making and approval authority with respect to the plans, budget, and program designs of the CEDF. The Board also serves in an advisory function to the Commissioner of the PSD. The Board consists of seven members appointed in the following manner:

- Three members appointed by the Commissioner of the Public Service Department
- Two members appointed by the chair of the Senate Natural Resources and Energy Committee
- Two members appointed by the chair of the House Natural Resources and Energy Committee

CED Board during FY16 (affiliations), Appointing Authority, and Year Term Ends:

- Jared Duval (*Vermont Agency of Commerce & Community Development*) PSD Commissioner, 2019
- Linda McGinnis, Co-Chair (*Energy Action Network*), PSD Commissioner, 2017
- Johanna Miller (*Vermont Natural Resources Council*), House Energy Committee Chair, 2017
- Janice St. Onge (*Vermont Sustainable Jobs Fund*), PSD Commissioner, 2019
- Sam Swanson, Co-Chair (*Pace Energy and Climate Center*), Senate Energy Committee Chair, 2019
- Gaye Symington, (*High Meadows Fund*), House Energy Committee Chair, 2019
- Mark Whitworth (*Energize Vermont*), Senate Energy Committee Chair, 2017

Public Service Department & CEDF Personnel Working on CEDF Projects in FY16

Christopher Recchia – PSD Commissioner
Jon Copans – PSD Deputy Commissioner
Asa Hopkins – Director, Energy Policy and Planning
Kelly Launder – Assistant Director, Energy Policy and Planning
Andrew Perchlik – CEDF Fund Manager
Edward Delhagen – Clean Energy Finance and Program Manager
Anne Margolis – 1Renewable Energy Development Director
Sheri Rockcastle – Administrative Services Manager
Stacy Drinkwine – Financial Manager

**VERMONT CLEAN ENERGY DEVELOPMENT FUND
STATEMENT OF REVENUES, EXPENDITURES AND
CHANGES IN FUND BALANCE
Fiscal Year 2016**

CEDF FUND:	\$ FY16
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REVENUES

Fund Interest Income	17,960
Loan Interest Income	44,193
Loan Repayments	243,133
Grants	0
Total Revenues	305,286

EXPENDITURES

Wages & Benefits	119,157
Per Diem	250
Meetings & Conferences	0
Dues	0
Travel	102
VEDA Admin of Loans	20,639
SSREIP Program	469,821
Contract - Other	70,479
Grants	419,435
Total Expenditures	1,099,882

Fund Balances

Net change in fund balance FY15 to FY16	(794,596)
Fund balance, June 30, 2015	6,251,912
Fund balance, June 30, 2016	5,457,317

ARRA REVOLVING LOAN FUND		FY16	\$
REVENUES			
Loan Repayments (P&I)		187,734	
Interest on Cash Balance		<u>5,064</u>	
Total Revenues		<u>192,798</u>	
EXPENDITURES			
Residential Credit Enhancement -Heat Saver		249,820	
ARRA Loan Administration Fees		<u>17,781</u>	
Total Expenses		<u>267,601</u>	
Net change in fund balance		(74,803)	
Fund balance, June 30, 2015		1,205,250	
Plus: Monies at VEDA Un-encumbered		<u>265,655</u>	
End of FY16 Fund Balance		<u>1,396,102</u>	

Appendix III – All New CEDF Awards Announced in FY16

Funding Type	Award Recipient (# of Awards)	Technology, Capacity or Type of Activity	Funds Awarded	Total Project Cost (Estimated Upon Award)	Estimated Annual Energy Production	
Contracts & MOUs	-BW Research, Inc.	• Vt. Clean Energy Industry Report #3 (Year 3 of a 3-yr \$149,957 contract)	\$47,616	\$47,616	NA	
	-Dept. of Public Safety (MOU)	• Fire Academy Fire Fighting and PV Training	\$7,500	\$7,500	NA	
	-University of Vermont	• Clean Energy Intern	\$1,250	\$1,250	NA	
SUBTOTAL: Contracts		3	\$56,366	\$56,366		
Grants	<i>Solar PV</i>	-Burlington Electric Department	• Burlington PV Permitting Reform Project	\$26,000	\$32,000	NA
<i>Biomass Energy (Pellet or Chip Systems)</i>	-Lathrop Elementary School	• Pittsford Town School pellet boiler	\$10,000	\$520,602	1 MMBtu/hr	
	-Shires Housing Inc.	• Bennington Historic Rehabilitation pellet boiler	\$15,861	\$52,871	0.109 MMBtu/hr	
	-Barre Supervisory Union	• Barre City Elementary & Middle School chip boiler	\$80,000	\$422,000	3.51 MMBtu/hr	
	-Downstreet Housing & Community Development	• River Station Housing pellet boiler	\$40,000	\$143,477	0.35 MMBtu/hr	
	-Holton Home	• Bradley House*	\$71,000	\$202,880	0.51 MMBtu/hr	
	-Chittenden East Supervisory Union	• Brewster-Pierce Memorial School*	\$47,115	\$330,000	0.3 MMBtu/hr	
	-Windham & Windsor Housing Trust (Brattleboro)	• 13 Canal Street pellet boiler	\$20,000	\$106,800	0.123 MMBtu/hr	
		• Green Street pellet boiler	\$20,000	\$142,000	0.191 MMBtu/hr	
	-Housing Vermont	• Applegate pellet boiler	\$50,000	\$1,419,405	1.88 MMBtu/hr	
		• Hickory Street pellet boiler	\$50,000	\$147,659	277 MMBtu/hr	
	• Union Square pellet boiler*	\$25,000	\$219,398	700 MMBtu/hr		
<i>Biomass Energy (Infrastructure)</i>	-Bourne's Energy	• Pellet Storage Silo	\$21,593	\$61,693	NA	
	-Kingdom Pellet LLC	• Bulk Pellet Components	\$250,000	\$1,038,437	NA	
	-Renewable Fuels of Vt., LLC	• Windsor Pellet Mill Improvements	\$48,475	\$155,081	NA	
	-Vermont Renewable Fuels	• Bulk Pellet Delivery Truck	\$94,000	\$282,690	NA	
	-Sandri Energy LLC	• Bulk Pellet Delivery Truck	\$60,000	\$218,625	NA	
<i>Finance Programs</i>	-Windham Regional Commission	• Windham Renewable Energy Grant Program	\$400,000	\$0	NA	
	-Thermal Energy Finance Pilot Program, Amendment (VSECU)	• Interest Rate Buy-Down Fund	\$150,000	\$390,000	NA	
SUBTOTAL: Grants		17	\$1,479,044	\$5,885,618		
Incentives	<i>Small Scale Renewable Energy Incentive Program</i>	Solar PV (kW-AC)	\$187,779	\$2,751,420	757.6	
		641.91			MWh/yr	
		Solar Thermal (MWh/yr)	\$21,962	\$171,641	55.1	
		48.016			MWh/yr	
		Wood Pellet (MWh/yr)	\$119,200	\$972,412	2,304.6	
		9,974.2			MWh/yr	
Hydro (kW-AC)	\$8,750	\$1,952,735	1.6			
	360			MWh/yr		
SUBTOTAL: Incentives		149	\$337,691	\$5,848,208	3,118.95	
TOTAL	169	1001.91	\$1,873,101	\$11,790,192	Electric (MWh/yr)	
		Electric (kW-AC)	Funds Awarded	Total Project Cost	759.2	
		9,974.2			Thermal (MWh/yr)	
		Thermal (MMBtu/hr)	Leverage:	\$5.29	85,877.3	
				Combined (MWh/yr)		
				86,636.6		

* These grant awards were cancelled by the grantees after the award was made