

Renewable Energy in the Mad River Valley

"Vermont Studies/Community Development and Applied Economics

295: Local Community Initiatives"

Instructor: Chip Sawyer (University of Vermont)



Joseph Adams
Marta Ascherio
Tom Batista
Sean McDonald
Jay Taylor

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Project Description

The goal of this project was to examine the culture and presence of renewable energy and provide a comprehensive count of renewable energy installations in the four Mad River Valley towns of Fayston, Moretown, Waitsfield and Warren. This includes all systems harnessing solar, wind, water, biomass, and geothermal energy. This is the first attempt in an ongoing project that the Valley Futures Network Energy Group (AKA "Localvolts") is interested in continuing. Our results here will contribute to a larger project called the [Mad River Valley Energy Study](#).

Project Goals

1. Produce a report with methodology, lessons learned, and recommendations to present to the VFN Energy Group
2. Create a spreadsheet ("Master List") with all energy systems we can locate within the MRV, using the methodology outlined in Goal #1.
3. Observe/reflect within the progress of the project to determine how we could have improved ("Lessons Learned.")
4. Conduct a survey of MRV residents with renewable energy systems. Report the findings of this survey.
5. Conduct visits to renewable energy system sites and produce video/photographic documentation of our visits.
6. Examine parallel or relevant initiatives elsewhere (Case Studies) to give an the VFN Energy Group some ideas about next steps or its progress.
7. Provide recommendations to the VFN Energy Group about the next steps for the group in facilitating renewable energy progress in the MRV and beyond.

Methodology for Data Collection (Goal #1)

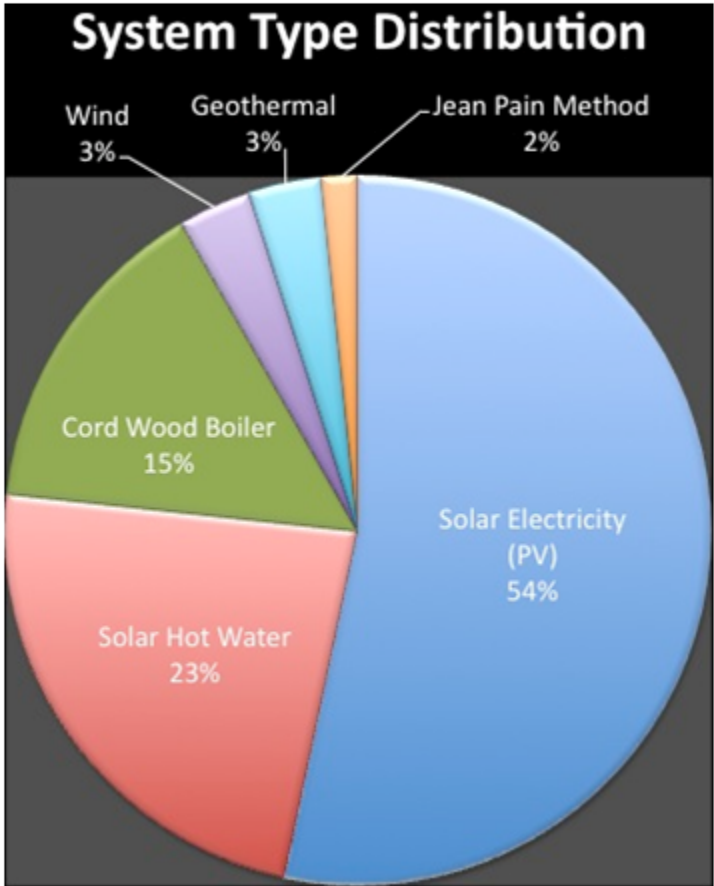
1. A list of Certificates of Public Good is available at your local town clerks office. This document provides information for energy installations in a municipality that use net metering (those “plugged” into the grid).
2. The Clean Energy Development Fund of Vermont keeps an updated map of renewable energy projects in Vermont. The map can be found at are this web address by clicking [HERE](http://publicservice.vermont.gov/energy/ee_files/cedf/CEDF%20Map%20of%20Projects.pdf) (http://publicservice.vermont.gov/energy/ee_files/cedf/CEDF%20Map%20of%20Projects.pdf)
3. E-mail listservs are a quick and easy way to spread the word. The Valley Futures Network, in particular, has a listserv that can reach a large number of people, many of whom are informed about renewable energy in the Valley.
4. Local Installers of renewable energy systems were contacted, but they were able to provide very little information because of privacy standards.
5. Data was collected into a “master list” spreadsheet.

Note: Ways to improve this methodology will be discussed in the “Lessons Learned” section of this report.

Summary of Findings (Goal #2)

Performing data analysis on the data collected using the methodology described in the previous section, yielded the following for the Mad River Valley:

Renewable Energy System	Count
Solar Electricity (PV)	32
Solar Hot Water	14
Cord Wood Gasification Boiler	9
Wind	2
Geothermal	2
Jean Pain Method	1
Total	60



Net Metered Sites with Certificates of Public Good:

- 2006 CPG's = 15
- 2009 CPG's = 31
- That's a 106% increase!

Lessons Learned (Goal #3)

Our tips for future data collection:

- Place an advertisement or flier in a local newspaper to raise awareness and to solicit more site count referrals
- Hang posters at popular local businesses to raise awareness about the project.
- As social networking media (Facebook, Twitter) become more popular, they will prove very effective for this sort of data collection. For example, Twitter could be used to keep members of the VFN Energy community updated on the progress of MRV renewable energy, and Facebook could reach residents who might otherwise be less engaged (particularly the younger population).
- The next round of counts could include wood stoves, as they are arguably a renewable energy system. However, the popularity of these stoves might make getting an accurate count very difficult.
- Methane digesters are another system that may need to be added to the master list and the survey in the future as technology continues to evolve.
- We recommend that the next round of counting take into consideration the power output of each system and the total output for the Valley. This would be an interesting number to track over time.
- For the survey, a question should be added that asks the participants for the email address of people with other renewable energy systems. Ask for email address and type(s) of systems. These email address would cross referenced with the current list of tracked systems and if a new email address is discovered, then it would be used to reach out to these people.

The Survey (Goal #4)

We created a 36 question survey and contacted a handful of people who we were informed by the VFN Energy Group might be interested in sharing information about their systems. We gave the option of completing the survey by phone, but all of our participants preferred to do it online, which took participants an average of 35-40 minutes to complete. Questions related to basic demographics, system information, personal reflections (motivations, recommendations to other MRV residents), the process of installing and operating systems, and interaction with other community members relating to renewable energy.

Survey Findings

Geothermal	4	19%	
Solar Photovoltaic (Solar PV)	9	43%	
Solar Hot Water (Solar Thermal)	4	19%	
Wind Turbine	0	0%	
Cord wood gasification boiler	1	5%	
Pellet gasification boiler	0	0%	Solar PV most popular
District heating system (heating more than one building with the same heating system)	0	0%	9 responses
Hydroelectric	0	0%	20 systems
Jean Pain Method - Hot Water	1	5%	
Jean Pain Method - Methane Biodigestor Production	1	5%	

- ✓ Range of lengths living in the MRV: 3 - 29 years
- ✓ Range of system ages: Solar Hot Water in 2002 - PV in October 2009
- ✓ When they became motivated to purchase/build their system:

"Knew all along..."	"...when oil prices skyrocketed before/after Hurricane Katrina in 2005"
"During planning for construction of new home"	"In the 70's"
"We wanted to put an addition on our house without increasing fossil fuel consumption"	
"...talking to a friend and neighbor who had just had a PV system installed"	

* These statistics differ from those in the **Summary of Findings** section above in this document because these statistics refer only to the data received from the 9 responses, NOT the data for the whole MRV that we collected.

One trend that we found particularly intriguing, and noticed at several points along the way, is that many folks who have renewable energy systems have more than one. This could suggest that they found their first system to be so beneficial/rewarding that they chose to install a second, which could be a selling point for encouraging others to install systems of their own. There are some folks who are branching out and trying lesser known or even experimental systems (such as the "Brown Mound") or a version of a

well known system that is less common (such as Geothermal used for heating AND air conditioning). But there are many others who are going the tried-and-true route, choosing low maintenance and low hassle Solar PV for example.

Site Visits (Goal #5)

Site Visits Completed

Day 1 - 10/14/09

- Gib Geiger residence - Solar electricity (PV)
- John Donaldson residence - Solar electricity (PV), geothermal (Heat/AC)
- Dennis Derryberry residence - Solar electricity (PV), geothermal (Heat), solar hot water

Day 2 - (11/8/09)

- David Frank (SunWood Systems), Mad River Car Wash - Cord wood boiler with gasification
- Gaelan Brown residence - Jean Pain Method (the "Brown Mound")
- Knoll Farm, residence and community center - Solar electricity (PV), cord wood boiler with gasification
- Von Trapp, family farm and residence - District cord wood boiler with gasification
- Kate Stephenson (Yestermorrow) - Solar hot water, mobile solar electricity (PV)

Site Visit Findings

To view the movie produced from the documentation of these site visits, please go to <http://www.youtube.com/MRVEnergy>

Case Studies (Goal #6)

Case Study 1: Can a family farm benefit from section 9006? (Charles City, Iowa)

Challenge - The Tjaden family farm needed to diversify operations to increase revenue to keep the farm operational. They added a hog operation to the farm that inadvertently raised the electric bill by 600 dollars a month. The Tjaden family then looked towards wind energy to help with the electric costs as well as to further the diversification of the farms assets.

Insight - Upon deciding to go with wind energy, the family then needed to locate a wind turbine as well as funding. The family secured a loan from their local bank, as well as a loan with 0% interest for 50% of the project funds from the Iowa Energy Center. At the Iowa Energy Center the Tjaden family learned about the United States Department of Agriculture Renewable Energy Grant program under section 9006 of the 2002 Farm Bill. This would allow the family to apply for grants ranging from \$2,500-\$500,000, or up to 25% of the project costs. With all the state and federal funding available the family decided to go ahead with the renewable energy installation. The family's application was the only wind turbine specific application accepted from Iowa. They received \$45,540 dollars from the USDA.

Approach - The family found a Bonus 450-kw turbine in California. It was in perfect condition and was exactly what the family farm needed. The transportation of the 100 ft tall, 125 thousands pounds was the next issue. The family had to move the turbine from Palm Springs, CA to their home in Iowa. The family considered manually transporting the turbine to minimize costs, but they would not have been able to do so while running the farm simultaneously. The family decided to go with a company that deals with the transportation of wind turbines. It cost the family \$30,000 to move the turbine into their farm. This saved the family a lot of transportation time as well as logistical headaches.

Because the family went with a three phase connection for the turbine, they had to locate it on a hill by their other farm that already had an existing three phase connection. To take advantage of the connection, the family had to give up the ability to net meter. Turbines can only net meter if near a farm, but since they had to plant it on a somewhat distant hill for the three phase connection, the turbine was considered a commercial endeavor. The branding of the turbine being a commercial endeavor led to a major issue with the approach; the insurance. Now that the turbine was labeled a commercial endeavor, the family had to get insurance for the turbine, as the farm insurance did not apply to it. The insurance was needed because they wanted to sell some of the electricity produced, and the organization would not agree to the terms of the contract without the turbine being insured. The turbine received a \$1,000,000 insurance policy.

Success - Even though going through all the paper work of the USDA section 9006 grant was tedious, and even though transporting a huge wind turbine a couple thousand miles was expensive the family knew it would pay off. They assumed that the turbine would require \$2,500 annually for maintenance and 800,000 kwh of energy production. This gave the family an estimated payback timeframe of 6.5 years. That also included all the loans and grants received, as well as the 1.8 cent production tax credit and a 1.5 cent tax credit. The family also made an agreement with Dairy Land Cooperative to sell some of the electricity produced by the turbine. The family hopes that after 3-4 years they might be able to add more turbines as they have various locations on their farm that would be good for wind turbines.

Source

http://www.windpoweringamerica.gov/pdfs/wpa/37961_family_farm.pdf

Case Study 2: Pioneer City- Scenario for a New Community

Challenge - An American community attempts to transform itself into a new energy community to demonstrate how combining different energy installations into one community will enhance the value of each individual piece. The concept is that the combination of multiple alternative energy installations and practices will produce a whole greater than the sum of the individual parts.

Data - At the time, Pioneer City was facing both intensifying challenges and rapidly increasing opportunities in the energy and economic arena. The community was feeling the economic burden of the recession as well as realizing that the emerging climate change threatened the city economy and environment in many ways, such as: the potential for water shortages, severe storms, increased run off, and flooding. The city was facing rising prices in all of the fossil fuels it heavily relied on, (natural gas and coal) as well as power rates. The city was also suffering from a high unemployment rate.

Insight - Elected city officials, public utility representatives, civic groups, and business leaders came together to set the goals and strategies for the approach to the new community with alternative energy installations. They set 2 goals/hallmarks

- Build everything on the firm foundation of making the most productive use of energy.
- Replace fossil fuels with renewable energy to the greatest extent possible.

With those goals in mind, the civic leaders created the strategy to approach the three key areas of energy transformation; the buildings, vehicles and power grids.

Approach -

Buildings

- Adopted codes for new buildings with the energy efficient goal of eliminating carbon emissions by 2030.

- Make buildings smarter by implementing modern management systems that can track, maintain, and economize the use of energy. The technology also allows for the handling of complex energy flow as well as the communication with power grids
- Installation of local renewable generation such as solar photovoltaic panels, geoheat, wind turbines and biomass-driven combined heat and power.

Vehicles

- Build up local ownership of plug-in vehicles both hybrid and pure battery electric through public ownership (city owned) or individual ownership
- Create a network map of all the charging stations
- Promote mobility services that provide access to alternative energy vehicles without ownership such as green rentals, zip cars, or car shares.

Power Grids

- Make city a smart grid city with installations of smart meters.
- Employ smart grid capabilities to reduce peak loads as well as integrate plug-in vehicles, solar panels, ...etc
- Build local microgrids that would service college campuses, business parks, and neighborhoods driven by alternative energy installations.
- Create district energy systems that supply thermal and cooling energy, associated where possible with electrical microgrids.

Success - On Feb 17th 2009 President Obama signed a stimulus package into federal law that grants cities like Pioneer city funds to achieve green efforts such as these. The funds will also support the creation of green jobs, which will lower the cities unemployment rate.

Sources:

<http://www.newenergynexus.org/2009/02/pioneer-city-scenario-for-new-energy.html>
<http://www.newenergynexus.org/2009/02/pioneer-city-leveraging-stimulus-to.html>

Case Study 3: Cow Power Initiatives in Vermont

What is the idea behind Cow Power?

Cow manure gets broken down by bacteria and releases methane into the air, contributing to global warming. A cow creates 30 gallons of waste a day and each cow pie has enough energy to power two light bulbs for 24 hours. Cow waste has energy and it is in abundant, sustainable supply. Technology exists to transform something that would be contributing to global warming into energy we need.

How does it work?

Farms independently collect cow manure into a anaerobic digester, which simulates a cow stomach. The anaerobic digester heats the cow dung up to 100 degrees F, which stimulates the bacteria to breakdown the cow waste and release methane. The released methane is sent to a generator that burns the methane to create energy.

What kind of resources are needed?

Farmers commonly have to take loans from the bank to purchase generators and equipment that can cost up to 3 million dollars. The greatest resource is the excretion itself. There is an enormous surplus of defecation from cows so why not put some time and effort into using it? As long as cow pies continue to not be collected we will continue to throw away a valuable resource.

Cow Power in Vermont.

In April 2009 an Article was written about a Handy Toyota car dealership in St. Albans Vermont that has vowed to only purchase energy that has been extracted from cow feces. The dealership has also promised to give 60 dollars to the Cow Power movement for every Hybrid car that is sold. This type of partnership promises a future for the Cow Power movement and will hopefully encourage other businesses to follow Handy Toyota's lead in trying to cut carbon emissions.

Vermont is leading the way with this new technology and as long as people step up as leaders for the cow power movement we have confidence that this technology will develop and become more known. The cow power movement has tapped into an energy source that is not being used and is in great supply in our backyard. Politicians need to realize the importance of this movement and the help it needs to become a part of American life.

Sources:

- <http://www.cvps.com/cowpower/>
- http://www.nytimes.com/slideshow/2008/09/24/business/businessspecial2/20080924-farmer_index.html

Recommendations (Goal #7)

Serve as a resource. An easy way for the VFN Energy Group to promote renewable energy in the valley is to host public information sessions. These sessions could include instruction on do-it-yourself projects, efficiency projects, taking advantage of government incentives, and finding installers.

Make affordability and accessibility a priority. The most popular systems in use in the Valley are also some of the most expensive. Promoting lower-cost systems (“breadbox” solar hot water, the “Brown Mound”) will make renewable energy a viable option for more Valley residents, many of whom cannot afford a solar array or a gasification boiler. This could also help bridge the gap between the VFN and residents of the Valley that have previously been uninvolved or resistant to involvement with the VFN.

Engage in activism. Lobbying for incentives and convenience could go a long way toward promoting the use of systems that are currently out of reach for many Vermonters. The process of obtaining incentives is cumbersome, and likely very discouraging. Additionally, current regulations create obstacles for businesses looking to install renewable or alternative energy sources, and lobbying to reduce the red-tape associated with this activity will assist the progress of renewable energy in the Valley. Lastly, encouraging your municipalities and institutions to consider renewable energy systems could significantly lower the Valley’s carbon footprint, especially since it is clear the VFN is uniquely connected to those who lead the municipalities and institutions.

**And a special note from Jay of the project group, because he is CONVINCED that the "Brown Mound" is going to change the world... Keep a close eye on Gaelan Brown's "Brown Mound" because it is very low cost and simple, but has tremendous potential because of the abundance of resources and lack of technical expertise/money required to "install." It seems like a very practical solution to heating concerns in Vermont.

See Also

The following products of this projects are also available as resources:

- [Video production of interview of Mad River Valley who have installed renewable energy systems.](#)
- [Presentation slides presented by student team on December 2, 2009](#)
- [Video of final presentations given to Mad River Valley residents on December 2, 2009](#)

References

Sources

1. "Cow Power" *The New York Times*. Web. 14 Dec. 2009. <http://www.nytimes.com/slideshow/2008/09/24/business/businessspecial2/20080924-farmer_index.html>.
2. "CVPS Cow Power." *Central Vermont Public Service*. Web. 14 Dec. 2009. <<http://www.cvps.com/cowpower/>>.
3. "Pioneer City: Leveraging the Stimulus to Make a New Energy Community." *New Energy Nexus*. Web. 14 Dec. 2009. <<http://www.newenergynexus.org/2009/02/pioneer-city-leveraging-stimulus-to.html>>.
4. "Pioneer City: Scenario for a New Energy Community." *New Energy Nexus*. Web. 14 Dec. 2009. <<http://www.newenergynexus.org/2009/02/pioneer-city-scenario-for-new-energy.html>>.
5. *Vermont Department of Public Service*. Web. 14 Dec. 2009. <<http://publicservice.vermont.gov>>.
6. *Wind and Hydropower Technologies Program: Wind Powering America*. Web. 14 Dec. 2009. <<http://www.windpoweringamerica.gov>>.

Community Contacts for project

1. Stan Ward, VFN energy group
2. Dennis Derryberry, VFN energy group