

What is the goal of the Clean Grid Optimization Proposal?

To encourage companies that focus on energy storage, demand control, grid monitoring, distributed generation and generation control to start and grow in Vermont.

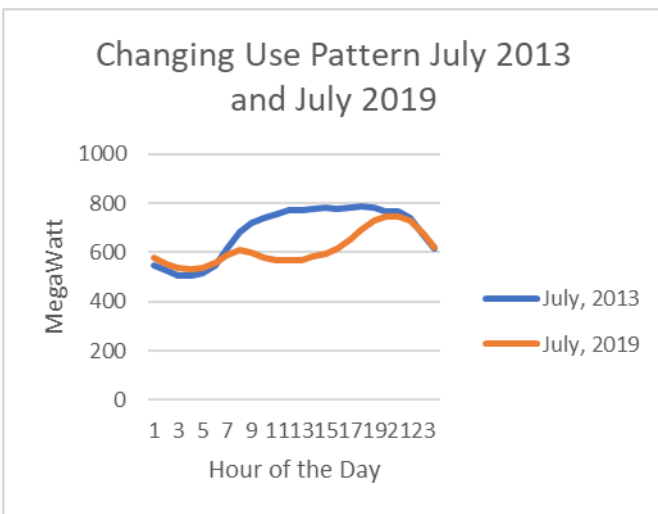
What is the Clean Grid Optimization Sector?

Proposed Legislative Definition (found in H 676):

“A Vermont business entity that sells a product or service to a utility or a customer that allows the utility or customer to change the use of electricity, including the storage and discharge of electricity, based on a signal from the grid representing the occurrence of low cost and high cost conditions.

Why is Clean Grid Optimization a target for economic development?

This approach was recommended by the [Vermont Climate Action Commission](#) in the Summer of 2018. Section II (E), “Jobs and the Economy”, of the report recommended targeting state investments and incentives in climate economy sectors where Vermont could “...focus on matching the familiar challenges of climate economy businesses with the competitive advantages Vermont’s energy sector and business ecosystem either already possesses or could possess with deliberate action.” Vermont’s regulatory environment, progressive electric utilities, near ubiquitous smart grid metering infrastructure, and existing non-profit and for-profit organizational expertise in clean grid optimization led the commission to recommend this sector as one of two to focus on.



In addition, the way in which Vermont generates and uses electricity is changing, creating a market opportunity for businesses to address new challenges that could help address climate change while building Vermont’s next generation of anchor employers.

Just in the past 6 years, our net energy profile has shifted as shown in the figure to the left.

And, the continuing installation of net metered solar generation will continue to change the peaks and valleys in that pattern. Those changes are not only an interesting phenomenon, they have electricity

cost implications, as well. The market cost of electricity is higher during the morning and afternoon peaks. As a result, any steps to shift use to the low demand times of day from the high usage times of day will reduce system costs for Vermont utilities and its customers. From a climate change perspective, the successful implementation of grid optimization strategies will allow for the continued expansion of renewable generation displacing fossil fuel sources of thermal heat, transportation and electricity in New England. The success of this approach in Vermont has broad applicability to other parts of the country struggling to meet their own goals in greenhouse gas reductions.

Vermont is uniquely positioned to provide clean grid optimization services and establish market leadership so that our businesses can expand their activities across the country and the globe. The Agency of Commerce and Community Development has identified at least six clean grid optimization companies from start-ups to large-scale companies with physical locations in Vermont. Many others do business in Vermont.

- Packetized Energy: A small 10-person, Burlington-based firm that evolved out of the University of Vermont is poised to revolutionize virtual battery storage – using software and smart appliances to better manage energy usage.
- Northern Reliability: The Waterbury-based company employs 21 people making energy storage systems for customers across the globe.
- Dynapower: Employing approximately 200 people in South Burlington, the firm specializes in power conversion solutions – including energy storage systems.
- WEG: WEG's newly acquired energy storage business (formerly part of Northern Power Systems) is based in Barre and is co-located with the WEG wind technology group. They employ approximately 10 people. The energy storage business is developing Vermont and Northeast based grid-scale projects and supporting other projects around the world.
- Dynamics Organics – The small two-person firm in Putney specializes in renewable energy and renewable energy system operations. For example, Dynamics Organics designed and operates an ice storage system that has reduced the electricity costs for the Brattleboro Retreat by significantly shifting peak air conditioning loads away from the higher cost times of day.
- Encore Renewable Energy – This Burlington company installs systems that integrate solar generation with storage to affect the net electricity use profile highlighted in the figure.

In addition, there are several other companies in Vermont that are in the field of electronics controls that could enter the market as the clean grid optimization field matures.

What are other states doing to promote this sector?

ACCD research suggests no other state has created a suite of incentives targeted at businesses in this sector. Most states have focused on the energy policy of storage – such as California, New York, and Massachusetts setting energy storage targets or requiring utilities to implement electricity storage technology. California has come the closest to incentivizing clean grid modernization businesses to actually do business in their state through laws requiring that utilities only use storage technology that California-based companies manufacture.

Who did ACCD consult with about this proposal?

The Vermont Department of Public Service

Green Mountain Power
Renewable Energy Vermont
Vermont Council on Rural Development
Vermont Sustainable Jobs Fund
Vermont Center for Emerging Technology
Packetized Energy
VELCO
Vermont Electric Cooperative
Vermont Sustainable Jobs Fund AccelVT Energy Accelerator participants

The Proposal Components:

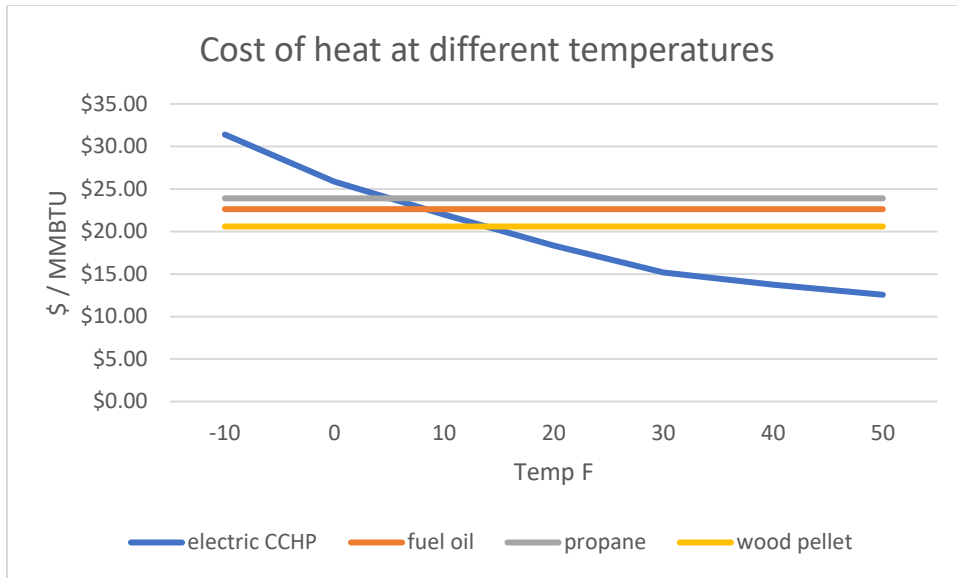
1) Clean Grid Optimization Pilot Program

The Agency of Commerce and Community Development, in cooperation with the Department of Public Service, shall provide grant funding to one or more clean grid optimization companies for the purpose of establishing a pilot program that controls electricity using appliances such as heat pumps and electric vehicle charging stations. These controls shall allow an electric distribution utility, either directly or through a clean grid optimization company as a customer intermediary, to control the use of electricity in a way that provides a customer the valued use of the electricity using appliances and that provides the electric distribution utility to have optimal impact on the electric grid. The goals of the pilot are to establish the economic viability of controls to electricity using appliances that maximize the utility of Vermont's electricity grid and result in a decrease in the use of fossil fuels that might otherwise be used to provide the service of the electricity using appliances.

The Agency believes utilizing this program to better align the use of heat pumps with the Vermont's electricity usage profile and interests would be one possible way to utilize these funds. Below is additional information about how the program could help Vermonters better utilize heat pumps to replace fossil fuel.

Heat Pump Pilot Proposal:

- They are efficient – They use less energy to produce heat than combustion systems.
- They are low carbon – They are powered by electricity that is largely renewable in Vermont
- They can save home-owners money – At most times, the cost per unit of heat from a cold climate heat pump is lower than using fuel oil or propane or wood pellets

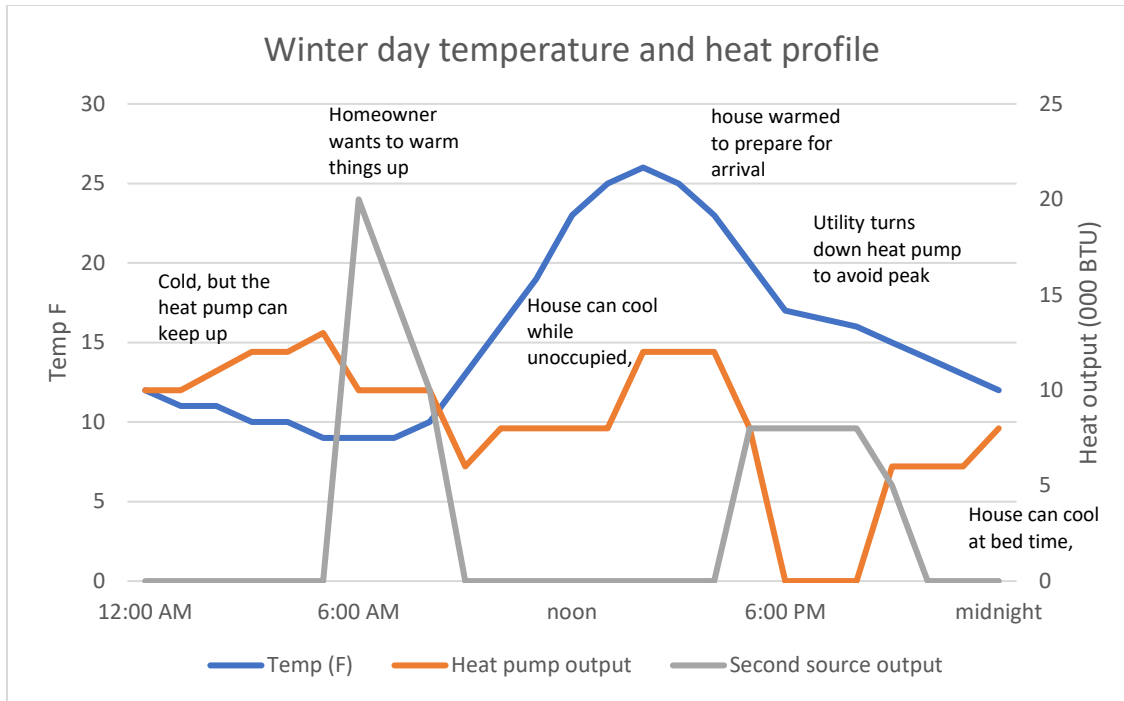


But, they are not perfect

- They are less efficient at very low temperatures
- They can have trouble providing enough heat in some circumstances
- From a clean grid optimization perspective, they demand electricity at some times when the Vermont electric grid is constrained and electricity is more expensive.

A dual control system allows cold climate heat pumps to be used to save Vermont households money and reduce the need for fossil fuels

- A dual control system is used to turn on and off both a heat pump and a second heating source (that most Vermont homes have) to optimize cost effectiveness, comfort and minimize the use of fossil fuels
- It is very hard for each homeowner to control both heating systems and without a dual control system, homeowners can be frustrated with their cold climate heat pump
- The dual control system also allows the electric utility to minimize its overall system costs which provides another means for saving home owners money.
- Optimally controlled heat pumps will encourage more rapid adoption and move Vermont away from fossil fuels more rapidly.



Note that using a heat pump without proper controls; the electricity demand will peak during the morning and early evening – the times that the electric grid is in highest demand.

2) Make the Research and Development Tax Credit Refundable for Clean Grid Optimization Companies

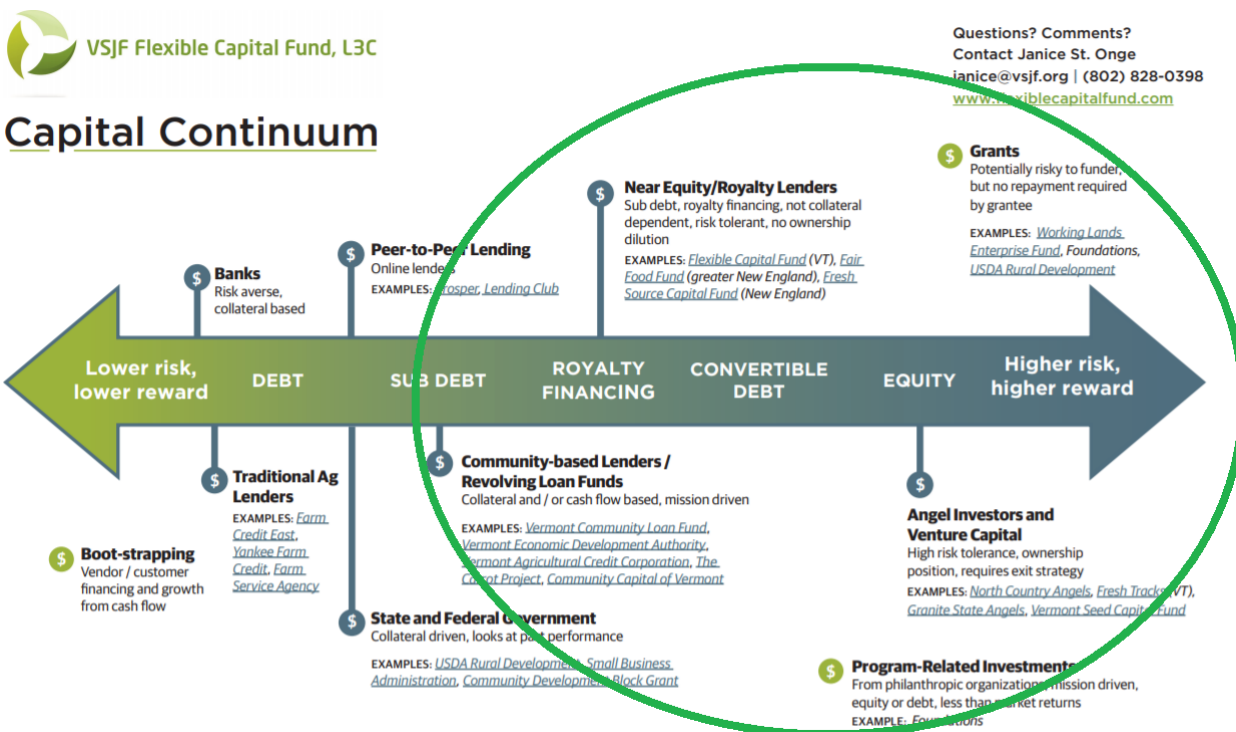
The Governor is proposing to provide an enhanced version of Vermont’s existing Research and Development Tax Credit to companies that qualify for their work in clean grid optimization. The enhancement allows qualifying companies to get a larger credit value (50% v. 27% of the federal amount) and to have the credit be refundable for those companies that do not have a Vermont tax liability. Clean Grid Optimization is a very new field and therefore, the business activities require research and development to move into the market. Most small start up companies do not have taxable profits and a tax credit such as the existing Vermont Research and Development Tax Credit provide no actual economic benefit to the company. Making the credit refundable provides greater opportunities for Vermont companies to accelerate their research. The Governor has budgeted \$500,000 in the FY21 budget to account for forgone revenue.

Clean Grid Optimization Innovative Capital Special Fund

The Governor has proposed appropriating \$2 million of General Fund dollars to the Agency of Commerce and Community Development to create a Clean Grid Optimization Innovation Capital Special Fund. The fund would invest directly in clean grid optimization businesses. Many start-up climate economy businesses are attracted to larger cities where equity capital is more available, and this grant program would provide a unique Vermont advantage at a Vermont scale. The State has provided similar funding with great success to the Vermont Center for Emerging Technology – which has made investments in some clean grid optimization companies. This fund would direct additional funding to these businesses.

The Agency would competitively award the funding to an organization with experience providing technical and financial assistance to growth-stage companies. Vermont has two operating private venture capital organizations doing this type of work (Vermont Works and Fresh Tracks Capital), and two non-profit organizations doing this type of work (Vermont Sustainable Jobs Fund and Vermont Center for Emerging Technology). In addition, the University of Vermont currently utilizes an ACCD grant to make subgrants to technology companies bringing UVM research to market. The relationship between the State and the selected organization would be managed through a grant agreement. The funding would be used to provide grants, equity investments, or seed capital investments to growth-stage clean grid modernization business headquartered in Vermont. This could include grants (less than \$100,000), equity (investments that would give the organization an ownership stake in the company, which would be high risk, high reward investments), or other creative financing.

The organization would work with the business to identify which type of funding is appropriate. Decisions on which companies to invest in would be made by an independent board at the organization – as outlined in the grant agreement with the State. Eligible expenses of the fund would include product development, start-up costs, equipment purchases, marketing, and talent acquisition. The below infographic from the Vermont Sustainable Jobs Fund and the VSJF Flexible Capital Fund outlines the continuum of capital businesses must access. This fund would focus on funding types in the green circle.



Eliminate the Corporate Income Tax on Clean Grid Modernization Companies

H. 676 includes a proposal to eliminate the corporate income tax as another way to increase investment in clean grid optimization business activities. Companies that are in this growing field can use their

capital to accelerate growth rather than losing that opportunity for a lower level of taxation into Vermont's General Fund. The Governor's FY21 budget accounts for \$400,000 in forgone revenue as a result of this proposal.

Clarify Valuation of Energy Storage Equipment Related to Property Tax

Vermont towns and cities have some latitude with respect to the manner in which they establish property values for taxation. In the early days of solar, the variations of valuation town-to-town made it difficult to determine the business profitability of solar installations until the state developed guidelines for valuing solar properties. The same situation exists for large scale, on-site battery storage today. H. 676 clarifies these storage devices should not be valued as real property (similar to solar).
