

The Three-Legged Race: Vermont's Pursuit of 90% Renewables by 2050

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In December 2011 the State of Vermont's Department of Public Service adopted an ambitious energy plan: to obtain 90% of all energy used in-state from renewable power sources by 2050.

The [Comprehensive Energy Plan](#) (CEP)¹ is broken into three key parts or action areas: *home heating and weatherization, transportation, and electric power.*

When the CEP was unveiled, Vermont's total energy use was about 21% renewable.² This issue brief looks at each of the three action areas and what needs to be done to meet the goal of 90% by 2050.

HOME HEATING AND WEATHERIZATION

The first action area of the CEP calls for buildings to be energy-efficient and heated renewably, mostly by geothermal wells and biomass (mostly wood) furnaces/boilers. **At present, building heat consumes 30% of the state's total energy and produces 22% of its carbon emissions.**³ Our housing stock is the oldest in the nation, rated 44th in energy affordability,⁴ and very energy inefficient. **The CEP aims to improve home energy efficiency in 25% of Vermont's homes by 2020**, for an estimated savings of \$1,000 per year per home in fuel cost – an important “interim” milestone.

Weatherizing Vermont

In order to meet the CEP's home energy efficiency milestone, **80,000 Vermont homes will need to be weatherized over the next seven years. At the current pace, however, Vermont will only meet about half of that goal by 2020⁵ because of insufficient funding.** The federal government has made substantial cuts to subsidies for energy efficiency measures such as weatherization. At the same time, a cash-strapped, tax-shy Vermont Legislature failed to answer Governor Peter Shumlin's call to create a new “thermal efficiency” office that would have unified the different weatherization agencies and managed the CEP's 80,000 home weatherization goal.

Renewables for Home Heating

Vermonters are also being encouraged to increase their use of renewables for home heating in order to meet the state's home energy efficiency goals, with biomass burners and geothermal heat pumps serving as the bellwethers of renewable heat generation. Installers say potential customers like the “green” benefits and the lower monthly operating costs: Wood pellets/chips for the furnaces and electricity to power the geothermal pumps cost less than half the cost of heating oil on a monthly basis. But customers

¹Vermont Public Service Department, 2011 Comprehensive Energy Plan:
http://publicservice.vermont.gov/publications/energy_plan/2011_plan

²Pg. 22, “Siting Electric Generation in Vermont,” Energy Generation Siting Commission, April 2013
http://sitingcommission.vermont.gov/sites/cep/files/Siting_Commission/Publications/FinalReport/Finalpercent20Reportpercent20-percent20Energypercent20Generationpercent20Sitingpercent20Policypercent20Commissionpercent2004-30-13.pdf

³ For total energy see pg. 99 of “Siting Electric” (footnote 2). For carbon emissions see “State Level Energy Related Carbon Dioxide Emissions,” USEIA, <http://www.eia.gov/environment/emissions/state/analysis>

⁴ Vermont Thermal Efficiency Task Force (TETF), Analysis and Recommendations, 2013, pg. 34
<http://www.leg.state.vt.us/reports/2013ExternalReports/285749.pdf>

⁵ TETF (footnote 4), pg. 7

are weary of the equipment purchase and installation costs, which range from two to eight times the cost of a traditional oil-burning furnace. **At present, Vermont offers a \$1,000 rebate on pellet furnaces and the U.S. government offers a 30% Energy Star tax credit for geothermal pumps.**

Renewable heating has grown in the public sector, most notably in schools. **Today, 13% of schools, representing 30% of Vermont's K-12 public school students, are heated with local wood and other biomass.**⁶

The fate of the H. 520 legislation during the 2013 legislative session further illustrates the difficulty of CEP implementation. The approved House version featured a “thermal efficiency” measure and other sweeping, pro-renewables actions.

- A declaration that sufficient weatherization would save property owners \$14 billion and reduce CO₂ emissions by 6.8 million tons.
- Enforcement of more stringent building standards.
- Establishment of a Thermal Energy Workforce Development Working Group to further study new renewable heating and cooling technologies.

However, the Senate removed all of these directives before passing its version, unchallenged, into law.

TRANSPORTATION

The second action area of the Comprehensive Energy Plan calls for more plug-in electric vehicles and public transportation. **Transportation currently consumes 36% of Vermont's total energy, and produces 59% of carbon emissions.**⁷

The State hopes that gasoline and diesel-powered cars will be phased out by 2050. Vermont's cold, rural geography is challenging territory to today's plug-in electric cars, with their short ranges and generally low-intensity heaters. For many drivers, the commutes are too long and the mornings too cold to trust an electric car.

However, change is happening. In 2010, there were only 77 electric vehicles of all types registered in Vermont. By April 2013, the total of electric cars alone had risen to 238.⁸ Still, **just one in 1,756 of the state's 417,928⁹ registered cars are electric plug-ins.** Vermont clearly has a long way to go to meet the CEP transportation goal for 2050.

The rapid increase in plug-in sales follows the national trend, which according to Bloomberg News, more than doubled last year and will likely increase another 89% in 2013.¹⁰ **Energy experts credit consumer belief that high gasoline prices are here to stay, and growing consumer familiarity following the long-awaited market entry of the plug-in vehicles.** And as [Drive Electric Vermont](#) points out, charging an EV is like paying \$1 a gallon for gas at the pump.¹¹

⁶ CEP (footnote 1), Vol. 1, pg. 2

⁷ For total energy see pg. 99 of “Siting Electric” (footnote 2). For carbon emissions see “State Level Energy Related Carbon Dioxide Emissions,” USEIA, <http://www.eia.gov/environment/emissions/state/analysis>

⁸ [Drive Electric Vermont](#) handout, from April 18, 2013 press conference at Vermont Statehouse.

⁹ Vermont Economic and Travel Indicators, March 2013, <http://www.vtlemi.info/eti13mar.pdf>

¹⁰ Bloomberg News, “GM's Chevy Volt outsold Nissan Leaf last year, BNEF says,” March 12, 2013 <http://www.bloomberg.com/news/2013-03-12/gm-s-chevy-volt-outsold-nissan-leaf-last-year-bnef-says.html>

¹¹ Drive Electric Vermont fact sheet, http://driveelectricvt.com/docs/default-source/default-document-library/dev_factsheet_v3.pdf?sfvrsn=2

As with renewable heating systems, the purchase of renewable transportation involves an initial investment and these up-front costs may give buyers pause – for now. For example, the Chevy Volt at Cody Chevrolet in Montpelier [on June 20] lists for \$40,000.¹² In time the per-unit cost will likely decrease, as new technologies, economies of scale, and cheap imports are introduced. On the other hand, America’s recovery as an oil producer and the advent of the three-cylinder car may extend the popularity of internal combustion.

Another hurdle is recharging the battery, necessary from two dozen miles in some models to two hundred in the high-end Tesla Roadster. **As of May 1 2013, Vermont has 20 public electric vehicle charging locations, most located in the Champlain Valley and Washington County,**¹³ and another five stations are planned. Drive Electric Vermont officials believe aggressive state planning and market-based development will help charging stations keep pace with demand. **Vermont and the Province of Québec have also agreed to build a “green highway,” an interstate network of well-spaced, plug-in friendly charging stations from Montreal along Vermont’s interstate corridor.**¹⁴

The state continues to promote commuter bus use by expanding park and ride facilities and giving a discount to state employees. However, employer-based commuter mandates, such as passed by the City of San Francisco, are not yet on the table. Commuter trains, popular in large U.S. urban areas, lack both infrastructure and critical passenger support in Vermont.

ELECTRIC POWER

The growing use of plug-in vehicles and renewable home heaters highlight the fact that Vermont will need more electricity. **Today, electric power represents 35% of Vermont’s energy use, yet makes up an estimated eight percent of total carbon emissions.**¹⁵ Vermont consumes about 6 million megawatt-hours (MWh) of electricity, roughly half of it from renewable sources. (For details on power sources, both renewable and non-renewable, of all Vermont utilities, see VTEP’s “[Vermont Electricity at a Glance](#),” March, 2013).

Getting to 90% will demand a staggering increase in the sheer volume of electricity, even with stringent energy conservation taken into consideration. Vermont renewable energy advocate and developer David Blittersdorf argued in the April, 2013 *Green Energy Times* that by 2050, Vermont will need three times more electricity than today.¹⁶ This claim was independently corroborated by Meredith Angwin of the Ethan Allen Institute’s Nuclear Energy Project.¹⁷ Blittersdorf and Angwin agreed that by 2050, Vermont will need a total of 18 million megawatt hours of electric power.

¹² <http://www.codychevrolet.com/models/chevrolet-volt>

¹³ [Drive Electric Vermont](#) handout, April 18, 2013 press conference at Vermont Statehouse

¹⁴ <http://governor.vermont.gov/newsroom-gov-shumlin-announces-electric-vehicle-corridor>

¹⁵ Vermont utility consumption of fossil-fuel heavy “grid” power, which accounts for virtually all of Vermont’s power-related carbon footprint, about doubled after the Vermont Yankee contract expired in 2012. For pre-2012 levels of four percent, see Vermont Agency of Natural Resources study,

http://www.anr.state.vt.us/anr/climatechange/Pubs/Vermont%20GHG%20Emissions%20Inventory%20Update%201990-2008%20FINAL_09272010.pdf. For 2012 levels, see “Vermont Electricity at a Glance,” <http://www.vtep.org/documents/03-26-13%20Final%20VT%20Electricity%20at%20a%20Glance.pdf>.

¹⁶ *Green Energy Times*, April 15, 2013, “View From The Top”

<http://www.greenenergytimes.net/~webapps/wp/wp-content/uploads/2013/04/GET-APR-2013-WEB.pdf>

¹⁷ Yes VY – the 90% solution, May 15 2013 <http://yesvy.blogspot.com/search?q=18percent2C000>

The Vermont Energy Wind Siting Commission also concedes the need for increased generation in order to successfully replace fossil fuels with electricity for transportation and home heating.¹⁸

If the renewable energy plan takes off, Vermont will be more electrified than ever. **And yet, at present, Vermont has less power-making capacity than any other New England state (1400 MW), and almost half of that amount is Vermont Yankee, which the State of Vermont is implacably trying to close. The loss of Vermont Yankee would reduce our power-making capacity to less than half that of Rhode Island, currently the New England state with the second lowest energy generation capacity, 1800 MW.**¹⁹

The CEP is very specific about the types of electric generation that Vermont should use to meet the 2050 goal, naming wind, biomass, solar, hydro, and methane generation as the sources that would power the geothermal heat pumps, electric cars, and everything else with an AC plug. Nuclear and almost all fossil-fuel powered electricity (oil, propane, coal) are excluded as non-renewable. Small and mid-sized natural gas plants, although fossil-fuel based, will provide spinning reserve, on-demand backup.

Hydro

The CEP calls for more plentiful, renewable Canadian hydro power. While acknowledging the plentiful supply and the willing sellers, it glosses over a serious lack of transmission capacity, both in Vermont and throughout northern New England. Since the CEP's publication, two proposed high transmission line corridors (the Northern Pass in New Hampshire and an eastern Maine corridor) have run into serious opposition.²⁰

The CEP is also vague with regard to additional in-state hydro, which currently supplies 12% of the state's electricity. Supporting in-state, low-carbon generation in general, the CEP notes that even small hydro generators can create big environmental problems. Additionally, **even if Vermont rejuvenated 300 small, existing hydro dams, it would bring us just 5% closer to the 90% renewable goal.**²¹

Biomass

The burning of biomass for both thermal and electric power generation is supported in the CEP. Two existing biomass plants (Ryegate, Burlington) presently produce about 70 MW. Meanwhile, several proposed biomass-burning power plants – in Pownal, Fair Haven, and Springfield – have made little progress in breaking ground due to tepid interest by state legislators and regulators, and the financial draw of cheap natural gas. **Biomass electricity costs between 10 and 13 cents per kWh; while natural gas fueled electricity has been selling on the daily New England market at about five cents per kWh for more than two years.**

¹⁸ "However, the PSD also projects that electrification of our transportation sector as well as heating and cooling through the use of heat pumps will likely increase the need for electricity in the coming years, even while we continue to improve our efficiency and conservation efforts." P. 22, Energy Siting Com. final report, April 2013
http://sitingcommission.vermont.gov/sites/cep/files/Siting_Commission/Publications/FinalReport/Finalpercent20Reportpercent20-percent20Energypercent20Generationpercent20Sitingpercent20Policypercent20Commissionpercent2004-30-13.pdf

¹⁹ "Siting Electric Generation in Vermont," pg. 32

²⁰ Jan. 19 2013 *Kennebec Journal* (Augusta, Maine), "Three decades on, Mainers still seek cheap electricity from Quebec"
http://www.kjonline.com/news/canadian-firm-still-in-picture_2013-01-19.html?pagenum=full

May 17 2013 *Manchester Union-Leader* (Manchester, NH), "Lawyer says Northern Pass in a Corner"
<http://www.unionleader.com/article/20130517/NEWS02/130519269>

²¹ "Siting Electric Generation in Vermont," pg. 99

http://sitingcommission.vermont.gov/sites/cep/files/Siting_Commission/Publications/FinalReport/Finalpercent20Reportpercent20-percent20Energypercent20Generationpercent20Sitingpercent20Policypercent20Commissionpercent2004-30-13.pdf

Although a nominal member of the “renewable power” family, large-scale biomass plants do not enjoy the same tolerance and/or subsidies for double-digit kWh costs extended to solar and wind projects. Reasons given include concerns about emissions, wood supply, and the preferred suitability of biomass for thermal heat.

Wind

Wind power is hailed as the best return on investment of renewable power generators – a claim that seems to be holding true: **Green Mountain Power officials say the effective cost of electric power from the Kingdom Wind project is about 10 cents per kWh, sometimes less.** Wind farms in Sheffield and Georgia have been generating electricity since 2012. The utility plans to purchase an additional quarter-million megawatts-hours – about twice the output of Lowell – from Granite Reliable Wind Farm in Coos County New Hampshire.

Public opinion polls show Vermonters strongly favor ridgeline wind. Yet many Vermonters dislike living near these developments, citing concerns for health, aesthetics, and the environment. Several organizations launched a legislative campaign in 2013 to impose a three-year moratorium. Although the moratorium ultimately failed, the campaign had enough vigor to secure six more pre-2014 session legislative hearings about energy siting. Rep. Tony Klein, a strong wind supporter, noted with concern that the hearings are likely to draw many determined opponents.²²

To move Vermont just 5% closer to 90%, Vermont would need wind power totaling five new Lowell Mountain projects.²³ However, no new ridgeline wind projects are under construction. A proposed 30 MW expansion of the Searsburg wind farm in Southern Vermont, selected by the Obama Administration in October, 2011 for expedited permitting and construction, remains tied up in court. The developers of a proposed Windham wind farm recently announced that there won't be any movement until at least 2014.

Solar

Perhaps the most visible foot soldier in the war for renewables is the solar panel. Supported by many state and federal incentives,²⁴ solar power is sprouting up in backyards, rooftops and meadows all over Vermont. Many of these small projects are “net metered” – that is, the homeowner may sell power back into the grid, getting a corresponding discount on the monthly power bill. **The state's total net metering (of which solar is about 90%) is a big chunk of power – about 27 MW of capacity.**

For policy planning purposes net metering counts as energy conservation because it makes the meter seem to “run backwards.” Therefore it cannot be applied towards the 18 million MWh goal. However, the large-scale, industrial, 2.2 MW solar power developments built with help from the Vermont SPEED program, which requires that utilities buy their power at about 24 cents per kWh, will count. Under the SPEED program, 19,000 MWh (about 14 MW of capacity) were generated in 2012 – about 0.0013% of the 15 million MWh Vermont will need by 2050. **Still, if Vermont were to build 576 MW of solar (equal to 262 2.2 MW plants covering half of Burlington) it would account for just 5% of Vermont's total current energy needs.**²⁵

A 90 PERCENT RENEWABLES FUTURE: REALISTIC OR NOT?

²² Quoted by author, June 13, 2013 Energy Generation Advisory Committee at Vermont Statehouse: "The public that will attend, I don't think they are going to be satisfied with the direction we are going. It's a narrow band of constituency that's going to make the effort."

²³ "Siting Electric Generation in Vermont," pg. 99

²⁴ DsireUSA - <http://www.dsireusa.org/incentives/index.cfm?re=0&ee=0&spv=0&st=0&srp=1&state=VT>

²⁵ "Siting Electric Generation in Vermont," pg. 99

The chasm between Vermont’s renewables present and renewables future – about 3 million renewable megawatt-hours on this side of the 37-year span, 18 million on the other – may simply be a bridge too far, barring unexpected changes. The fuel of wind and sun may be free and everlasting, but harvest and delivery pose long, steep economic, technological, and political challenges. Developments during the eighteen months since the CEP was announced have suggested, to anyone believing in the inevitability of 90% by 2050, something of a reality check. Along with successes have come unexpected challenges in the form of public opposition or failure to achieve important short-term goals.

Despite those challenges, Vermont took a number of key steps this year toward meeting its 90% renewables goal:

- The Vermont Legislature established a requirement that all state government building projects costing more than \$250,000 incorporate renewable energy when feasible.
- The Legislature also creating the Vermont Sustainable Clean Energy Fund to support renewable energy projects already backed by private lenders.
- Low income Vermonters with energy-inefficient homes will be given priority access to weatherization assistance funds.
- In February, 2013 Gov. Peter Shumlin announced [The Home Energy Challenge](#), a year-long, public-private initiative to help 3,500 homeowners save \$2.6 million by using less fuel oil through weatherization and other conservation choices.
- In May, 2013, the State of Vermont rolled out [“Vermontivate!”](#) an internet competition encouraging towns and schools and businesses to better choices in energy, food and transportation.
- In June 2013, another state program, [“Way To Go!”](#) presented awards to businesses and schools that reduced their carbon footprint during a calendar week.

Rep. Klein told the *Burlington Free Press* about 2013’s energy policy setbacks, “I hope this year turns out to have been just taking a breather.”²⁶ The momentum has slowed. Will the pace quicken? Right now it is impossible to know whether the three-legged CEP will stumble out of the race, or get its second wind and eventually reach 90%.

²⁶ “Klein: Total disappointment in session,” May 26, 2013 Burlington Free Press
<http://www.burlingtonfreepress.com/apps/pbcs.dll/article?AID=2013305260004>