



January 2018

Vermont Electric Generation Data for 2016

EAN's most current analysis of 2016 Vermont electric data is shown on the attached chart. This is the basis of EAN's assessment how "renewable" Vermont's electric supply is. This table has been updated from our November 2017 estimates based on revisions made by the DPS and EAN.

How to draw comparable measures of energy use across multiple sources and different technologies has been and continues to be a source of debate. Since the publication of our 2013 "Energy Pathways" report, EAN has suggested that Vermont's energy metrics should reflect the actual impact or "footprint" of the different energy sources we consume. This methodology of using "source energy" (also called "primary energy") was adopted by the State of Vermont and forms the framework of analysis in the latest 2016 Comprehensive Energy Plan. The excerpt below is from Section 4.1.1:

When discussing Vermont's total energy consumption, it is important to understand how the physical quantities of the various fuels consumed in Vermont are converted into common units that can be meaningfully compared and summed to an overall total. This conversion is done using the heat content of a fuel, measured in British Thermal Units (Btu). For electricity, heat content, or Btu, can be measured on a site basis, which captures only the Btu of the kilowatts delivered to end users; or on a source basis, which captures the additional Btu of the fuels used to generate those kilowatts but which is lost as waste heat in the conversion to electricity.

Further, in calculating source energy totals for electric power, we assume that the heat content (Btu) of the source energy for non-combustion based renewable generators (solar, wind, hydro, and methane) is equivalent to the heat content of the kilowatts delivered to end users by those generators (where one kilowatt-hour is equivalent to 3,412 British thermal units). In other words, non-combustion-based generation is assumed to have zero waste energy. This differs from the practice followed by the U.S. Energy Information Administration (EIA), which assigns the kilowatts delivered by renewable generators a fossil-equivalent heat content (where one kilowatt-hour is equivalent to between 5,000 to 10,000 BTU).

The attached table shows Vermont's electrical generation both from a "site" and a "source" energy perspective. Without accounting for fuel or transmission losses (site energy expressed as MWh), Vermont's generation mix was 60% renewable. When accounting for all energy actually used in the generation process (source energy expressed in MMBTU), Vermont's generation mix was 46% renewable.

This table does not include the impact of renewable energy credits (RECs) sold out of state. As an example, GMP data indicates that 63% of their 2016 energy mix (based on MWh generated or purchased) was from renewable sources. But RECs were sold on about 28% of their renewable sources, reducing the actual RE percentage to around 45%. The DPS now tracks the sale of RECs and adjusts estimates of renewable energy accordingly.



Vermont 2016 Electrical Energy Sources (January 2018 Update)

Generation Source	TOTAL MWh 2016 ¹	% of Total MWh	Conversion Losses ⁵	Total Source Energy MMBTU	% of Total Source Energy
Biomass	465,470	7.7%	77%	6,982,047	18.0%
Distillate	7,288	0.1%	68%	77,987	0.2%
Farm Methane	22,674	0.4%	0%	77,364	0.2%
HQ System Mix ²	1,347,714	22.4%	4%	4,790,000	12.3%
Hydropower	720,389	11.9%	0%	2,457,967	6.3%
Landfill Methane	95,934	1.6%	0%	327,327	0.8%
Natural Gas	17,766	0.3%	57%	140,350	0.4%
Nuclear	773,705	12.8%	67%	8,046,529	20.7%
Solar	256,834	4.3%	0%	876,318	2.3%
ISO-NE Non-RE ³	1,593,721	26.4%	57%	12,590,386	32.4%
ISO-NE RE ⁴	250,863	4.2%	0%	855,945	2.2%
Wind	477,332	7.9%	0%	1,628,658	4.2%
TOTAL ENERGY	6,029,690	100.00%		38,850,878	100.00%
RE Total	3,610,256	60%		17,899,826	46%
Non RE Total	2,419,434	40%		20,951,052	54%

Notes:

1. Based on 2016 data courtesy of VT Department of Public Service
2. HQ System mix is 98% renewable so 2% of energy is not counted as RE
3. This is categorized as "unspecified" in utility reporting data but is largely ISO-NE system power
4. ISO-NE mix was 13.6% renewable in 2016, excluding refuse burning plants
5. Conversion losses are based on PSD standard conversion efficiencies found in Exhibit 4-2 of 2016 CEP