Section 3 – Energy Issues in Brattleboro and Southern Vermont

In general, Brattleboro's shares the same energy issues as the state, but also faces significant local electric transmission and distribution issues. According to a recent CVPS study, Brattleboro's electric supply is almost entirely dependent on a single 345/115kV transformer at Vermont Yankee and a single 115kV transmission line from it to the Vernon Road Substation in Brattleboro. Failure of either would likely result in a complete loss of electric power to Brattleboro. While a transmission line failure would be relatively straightforward to repair, a catastrophic loss of the 345/115kV transformer could result in an outage that "could last for as much as a year" as well as forcing a shutdown of the Vermont Yankee plant until it was repaired..

The CVPS study also identified reliability and capacity issues on the 46kV Southern Loop distribution line between Brattleboro and Bennington, as well as concerns about future demand growth in Southern Vermont and potential future problems with the regional transmission network. The CVPS report identified ten potential solutions involving various combinations of distributed generation, demand side management, transmission lines, transformers, and a synchronous condenser. Several options include new generation capacity in Brattleboro that would be able to serve that community's 16 MW load in an "islanding" mode (completely separated from the transmission network), which could be a key component in developing a new local sustainable energy infrastructure.

Another issue related to existing energy use is on-site storage of flammable heating oil and propane, along with carbon monoxide that could potentially leak from malfunctioning heating combustion apparatus in individual buildings. Removing these risks from Brattleboro's buildings would please the fire department and likely result in reduced properly insurance rates.

Energy use in Brattleboro

The following table showing electric consumption in Brattleboro was included in Chapter 7 "Energy" of the 2003 Town Plan:

Table 7 - 1
Brattleboro Use of Electricity, 2000

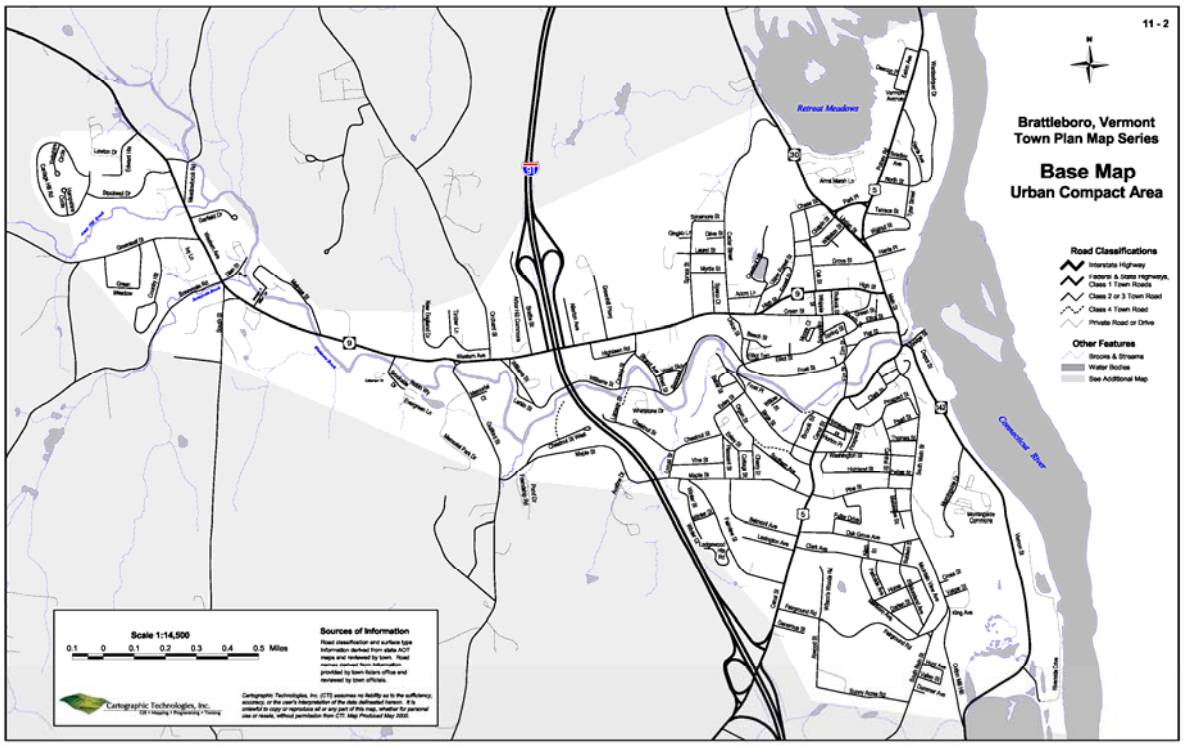
Customer Type	No. of Accounts	KWH Usage	Average per Customer
Residential	6,556	32,058,763	4,890
Small Commercial	1,229	18,200,452	14,809
Large Commercial	157	46,167,095	294,058
Small Industrial	19	7,278,641	383,086
Industrial	14	21,438,813	1,531,344
Large Industrial	5	71,618,160	14,323,632
TOTAL			**196,761,924**
Source: US Census Bureau			

Several industrial energy consumers have left Brattleboro since 2000, but the residential and commercial electric data shown above should still be reasonably accurate. CVPS has noted that

the peak electric demand in the Brattleboro is about 25 MW and that serving the Brattleboro's electric needs in an islanding mode would require a 16 MW generating plant.

Energy to heat Brattleboro's residential structures can be estimated from census data for household heating fuels and EIA residential energy consumption data for average space and water heating fuel use for New England. According to this data, the average Brattleboro household uses 100.7 million btus (mmbtu)/year for space heating and 37.2 mmbtu/year for water heating, for a total of 137.9 mmbtu/year. The Town's 5,364 occupied housing units would therefore use about 740,000 mmbtu/year of primary energy for space and water heating.

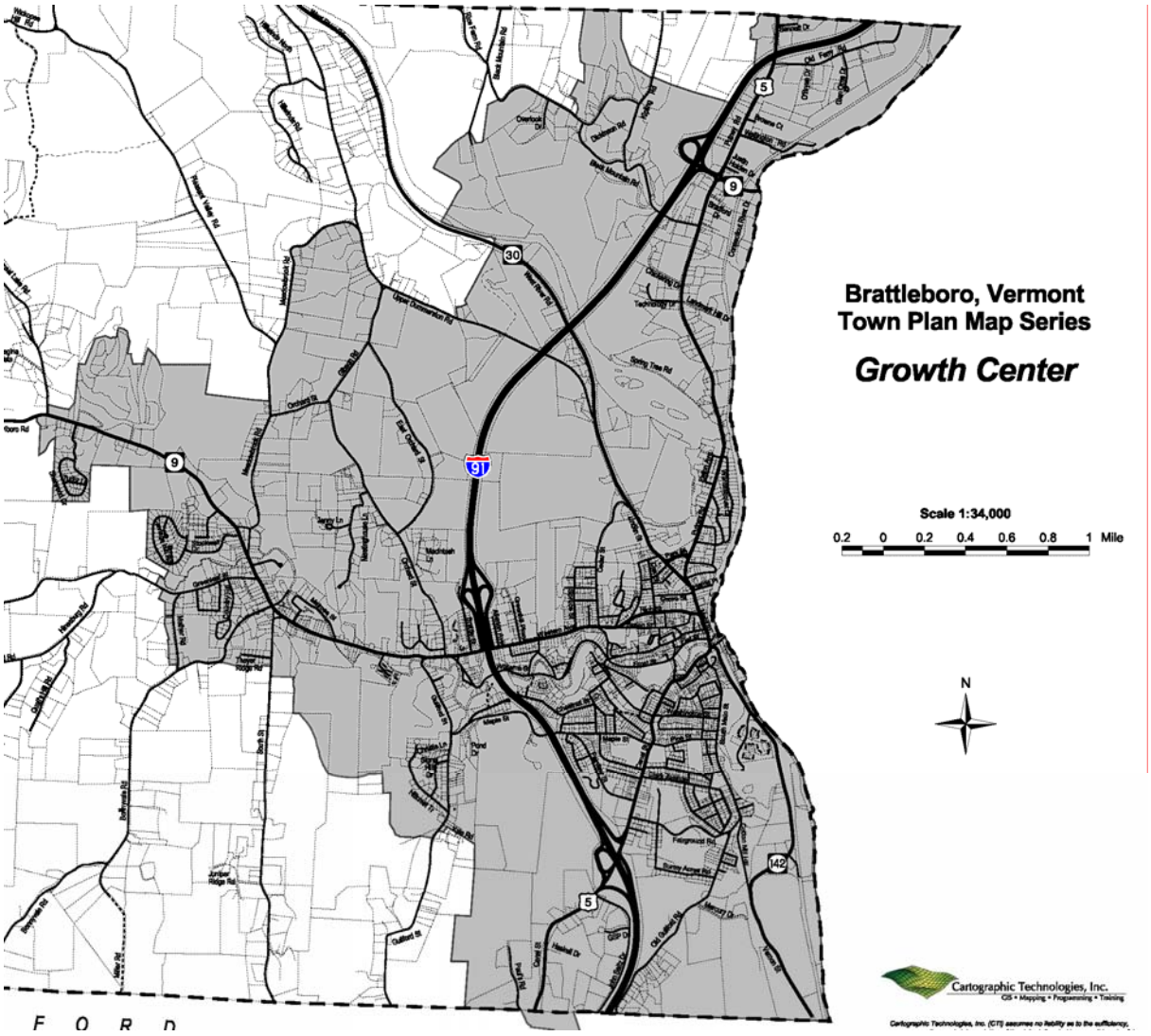
As a practical matter, it would be very difficult (or more accurately very expensive) to build a new sustainable energy infrastructure to serve every household in the Town of Brattleboro. However, it would be technically and economically feasible to serve every building in the built-up areas of the community, including single-family residences. Federal census data breaks down this information for two "Census Designated Places" (CDP) – Brattleboro CDP and West Brattleboro CDP. In addition it is possible to identify the number of housing units down to the census block level. These areas roughly correspond to the "Urban Compact Area" identified in Brattleboro's 2003 Town Plan (shown below) and include about 92% of the Town's housing units (4,954) with an annual space and water heating fuel usage just under 100 mmbtu due to a slightly different mix of heating fuels. Aggregating the heating requirements for these housing units results in an annual primary energy consumption of roughly 480,000 mmbtu.



Estimating commercial building heating consumption for a community such as Brattleboro is more difficult due to the wide variation in fuels, building sizes and occupancy patterns of these buildings. For our immediate purposes it will be sufficient to simply use the same ratio for heating energy as for commercial and residential electric consumption (approximately 2:1), yielding annual primary energy consumption of 960,000 mmbtu for commercial building heating.

A preliminary survey of larger governmental, commercial, and institutional consumers in Brattleboro (hospital, schools, hotels, offices, retail, etc) shows this to be a reasonable estimate. Quantifying industrial energy usage is even more problematic for all of the same reasons plus the uncertainty of predicting which industries will be here in the future. Brattleboro has had good success in utilizing vacant industrial space to house commercial tenants, which would increase the consumption for the commercial sector. The availability of low cost energy could also become a strong economic incentive for employers to utilize existing facilities and also to locate new operations here to make use of Brattleboro's talented workforce.

Although the new sustainable energy infrastructure would concentrate on serving residential and commercial buildings in the Urban Compact Area, it would be designed to accommodate anticipated growth in the community as identified in the Growth Center map published in the 2003 Town Plan (shown below). Unlike traditional energy services priced on a "postage stamp" basis (i.e. everyone pays the same price, regardless of where they are located), the new energy system proposed for Brattleboro will be limited to built-up areas. This can become a powerful planning tool by giving developers a very real and ongoing financial incentive to locate at a site served by the new energy system, which in turn can help reduce urban sprawl.



Energy Costs in Brattleboro

The annual energy use and costs for residential consumers in the built-up areas of Brattleboro can be estimated using data from the 2000 federal Census and 2001 EIA Residential Energy Consumption Survey, as shown in the following table:

Annual Residential Heating Use and Costs for Brattleboro Urban Areas 2000 Census and 2001 EIA Residential Energy Data for New England Census Division						
Space Heating Fuel	**Households**	**mmbtu/ household**	**Annual cost**	**Average unit cost ($/mmbtu)**	**Total mmbtu**	**Total cost**
Bottled, tank or LP Gas	788	61.1	$935	$15.30	48,147	$736,780
Electricity	537	16.1	$510	$31.68	8,646	$273,870
Fuel oil, kerosene, etc.	3,624	80.5	$728	$9.04	291,732	$2,638,272
Total	4,949	70.4	$737	$10.47	348,525	$3,648,922
Water Heating Fuel	**Households**	**mmbtu/ Household**	**Annual cost**	**Average unit cost ($/mmbtu)**	**Total mmbtu**	**Total cost**
Bottled, tank or LP Gas	788	19.1	$363	$ 19.01	15,051	$286,044
Electricity	537	7.3	$250	$ 34.25	3,920	$134,250
Fuel oil, kerosene, etc.	3,624	30.5	$273	$8.95	110,532	$989,352
Total	4,949	26.2	$285	$10.89	129,503	$1,409,646
Total Heating	**Households**	**mmbtu/ Household**	**Annual cost**	**Average unit cost ($/mmbtu)**	**Total mmbtu**	**Total cost**
Bottled, tank or LP Gas	788	80.2	$1,298	$16.18	63,198	$1,022,824
Electricity	537	23.4	$ 760	$32.48	12,566	$408,120
Fuel oil, kerosene, etc.	3,624	111.0	$1,001	$9.02	402,264	$3,627,624
Total	**4,949**	**96.6**	**$1,022**	**$10.58**	**478,027**	**$5,058,568**

From this information we can see that in 2001 Brattleboro residents paid about $5 million to space and water heating, and based on the commercial/residential ratio 2:1 ratio commercial building heating costs would be approximately $10 million. Since commercial buildings use higher volumes of fuels, they likely pay less per unit for purchased energy, but this is offset by excluding any industrial buildings (or industrial buildings that have been converted to commercial use).

Energy costs have increased significantly since 2001 and an updated estimate of the Brattleboro's total heating costs can be made by using the most recent Vermont Fuel Price Report prepared by the Vermont Department of Public Service.

Total Heating Cost using February 2007 Vermont Fuel Price Report	**Households**	**Mmbtu fuel/ Household**	**Annual cost**	**Average unit cost ($/mmbtu)**	**Total mmbtu**	**Total cost**
Bottled, tank or LP Gas	788	80.2	$ 2,045	$25.49	63,198	$1,611,211
Electricity	537	23.4	$ 960	$41.03	12,566	$515,583
Fuel oil, kerosene, etc.	3,624	111.0	$ 2,016	$18.16	402,264	$7,305,943
Total	**4,949**	**96.6**	**$ 1,906**	**$19.73**	**478,027**	**$9,432,737**

Brattleboro's heating costs have nearly doubled over the past six years, although the overall increase would probably be somewhat less since higher prices would result in some reduction in consumption. From this it is possible to calculate the total amount spent for heating residential and commercial buildings in Brattleboro's built-up areas at somewhere around $30 million. This does not include approximately $4 million spent for residential and $7 million for commercial building non-heating electricity use, nor any consumption or costs for industrial facilities. It is also recognized that some energy consumers in Brattleboro use coal for heating, while others such as the Brattleboro Union High School and Middle School have switched to wood, which can reduce energy costs but potentially increase emissions, especially if a many consumers convert to this fuel and use small boilers with unregulated emissions.

The following table shows the delivered cost of heat at current market prices and consumed in typical heating apparatus:

Heating Fuel (from Vermont Fuel Price Report – February 2007)	Average unit cost	Cost per mmbtu (February 2007 – $/mmbtu)	Building Conversion Efficiency	Average unit cost of delivered heat ($/mmbtu)
Propane	$2.32/gal	$25.49	70%	$36.42
Electricity	$0.14/kWh	$41.03	100%	$41.03
No. 2 Fuel oil	$2.51/gal	$18.16	70%	$25.95

The actual annual efficiency of individual building heating apparatus can vary widely. New high efficiency gas furnaces, for instances, can have efficiencies above 95%, while older apparatus could have efficiencies of 50 to 60%.