BURLINGTON ELECTRIC DEPARTMENT

2016 Energy Efficiency Annual Report

Burlington Electric Department
585 Pine Street • Burlington, VT 05401
Phone 802.658.0300 • Fax 802.865.7400

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1 Introduction & Summary

The Burlington Electric Department (BED) is pleased to submit the following report to the Burlington Electric Commission, the Vermont Public Service Board and the Vermont Department of Public Service, summarizing the implementation of energy efficiency programs in the City of Burlington for the year 2016. BED remains committed to offering its customers high quality and affordable energy services and a secure, environmentally sound supply of electricity into the future. Energy efficiency continues to play a major role in achieving this goal, and is the cornerstone of the BED resource acquisition strategy.

Energy efficiency has been clearly shown to be Vermont's least expensive future energy supply resource over time, and is every day a greater environmental imperative. The Burlington Electric Department is owned by all the citizens of Burlington, who have been unequivocally clear that the option for future supply that they prefer above all others is the pursuit of additional cost-effective energy efficiency.

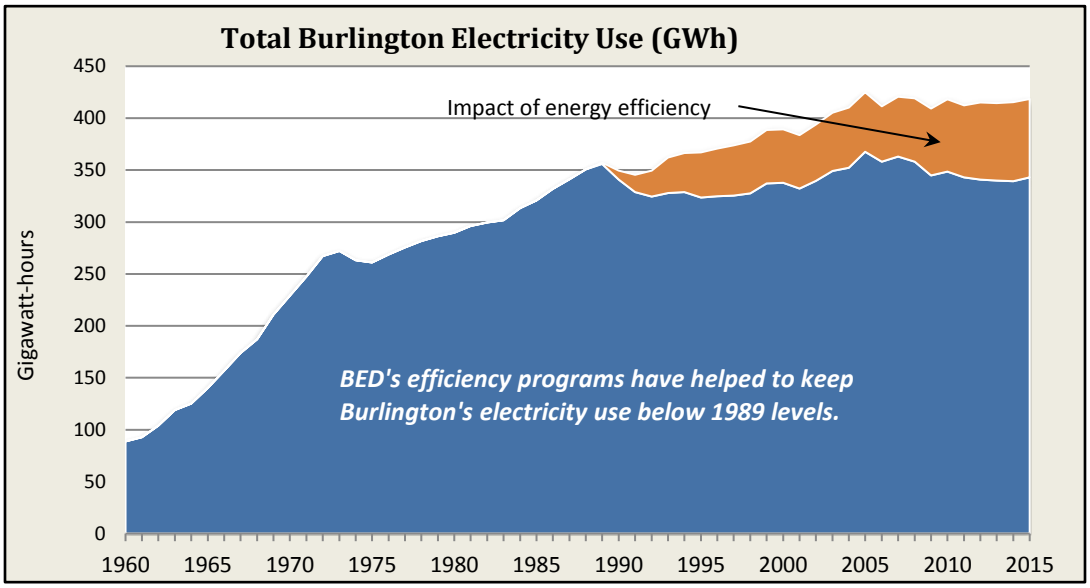
Burlington voters in 1990 approved an 11.3 million dollar bond to fund energy efficiency programs that supported successful program activities through 2002. Since 2003, BED customers (like all other Vermont electric customers) pay a small monthly charge that supports these "Energy Efficiency Utility" programs. When these funding sources are considered along with customers' direct investment, almost $61 million has been invested in energy efficiency efforts sponsored by BED over the last 27 years. This is comprised of about $29 million spent by BED on all of its energy efficiency efforts during that period, combined with another $32 million in matching expenditures by its customers. The willingness to invest their private funds in these investments is a testament to the value that BED customers place on these services.

As Figure 1 indicates, the overall effect has been dramatic. Energy Efficiency has essentially flattened BED's energy load requirement since the 1990's. Overall electricity use in 2016 was 4.0% lower than in 1989. In other words, we are meeting the needs of a

growing local economy with less electricity than we used a quarter century ago. The consistent delivery of affordable energy efficiency services has helped to meet the needs of a growing local economy over the last 27 years with less electricity than was used then!

Energy efficiency expenditures are made almost entirely locally, typically in the form of professional services, skilled trades employment, and equipment purchases. Not only is the value of the City's building and energy-using equipment improved, but locally-retained dollars are "multiplied" many times over by subsequent consumer spending. Absent these energy efficiency expenditures, these funds would have gone toward the purchase of electricity and enhanced infrastructure to satisfy increased demands on the City's electrical system. Most of these dollars would have been exported out of state, and many out of the country. Energy efficiency is a win-win situation for the city of Burlington through increased local economic activity, and through the avoidance of increasingly costly electricity purchases, their associated infrastructure growth and capital expenses, and their environmental impacts.

Figure 1: Impact of DSM on Total City Electricity Sales



During 2016 alone, BED saved 6,102 Megawatt hours (MWh) of energy from efficiency measures installed, which will result in 72,043 MWh of savings over the useful life of the installed measures (2016 measures have a weighted average lifetime of about 12 years). This is equivalent to providing energy to about 1,253 average Burlington residential customers for 12 years.

BED met 82% of MWh savings projections in 2016. BED projected 7,456 MWh savings and achieved 6,102 MWh. BED met 50% of the summer coincident-peak savings goal. 1,069 coincident-peak KW was projected for 2016 and BED achieved 529 KW. BED met 67% of the winter coincident-peak savings goal. 1,104 coincident-peak KW was projected for 2016 and BED achieved 745 KW.

BED's projected budget for 2016 was $2,659,721 and $2,263,056 was expended, about 15% less than budgeted. It is important to note that BED carried over $287,000 of committed EEU funds from 2016 to 2017. There are several new construction projects that will be completed in 2017 where BED has committed incentives based on the agreed upon project design.

Burlington is seeing a relatively large increase in new construction activities. There is close to 1.2 million square feet of new construction that will be completed between 2017 and 2020 which includes about 900 new apartments.

BED's cost for saved energy was higher than projections. BED estimated it would spend about $356 per annualized MWh saved, and instead spent $370 per annualized MWh. This increase was mostly driven by new construction projects which require larger incentives to achieve meaningful savings and also higher than projected activity in the Retail Products Program.

BED's general administrative costs as a percentage of total program costs remained consistent with historical performance; about 17% of the budget was used to defray program operation costs in 2016. 83% of the 2015 budget was spent on direct technical

assistance and cash incentives to customers; 23% of this on direct technical assistance and 60% on customer incentives.

Annual fluctuations in any energy efficiency program's performance depend on a variety of human and business cycle dimensions that are hard to quantify and even harder to predict with precision. The decision to move forward with an energy efficiency project is ultimately the individual customer's. Customers consider a wide variety of factors in their decision-making process, including their perceptions of local and national economic conditions and trends, their availability of funds and competing interests for the use of those funds, fluctuations in their business functions and volumes, and the opinion of off-site consultants and decision makers. The decision to move forward with an energy efficiency project is ultimately the individual customer's. Given the small size of BED's system, the loss of only a few new construction projects can have a dramatic impact on its annual budgets and savings estimates.

Year-to-year fluctuations in program results reflect the relative unpredictability of energy efficiency program timing, and support the notion that *annual* projections are no more than carefully-crafted estimates. In the long run, the performance of BED's energy efficiency programs continues to meet the expectations laid out in BED's Integrated Resource Plans and prior planning documents dating back more than 26 years. Energy efficiency has essentially flattened BED's energy load requirement since the 1990's and BED's consistent investment in energy efficiency will continue to have lasting benefits in the City by reducing load growth for the foreseeable future.

This report includes coverage of BED's program activities related to the seventeenth year of operation of the State's — and the nation's — first Energy Efficiency Utility (EEU). Statewide energy efficiency programs are today operated by the non-profit service provider "Efficiency Vermont" (EVt). Thanks to a long history of successful program implementation, BED serves as the City's own EEU and delivers these programs within the City of Burlington, continuing to build on its past success in helping Burlington's consumer-owners achieve energy efficient electric use.

BED recognizes that much of its success comes from effective working relationships not only with EVt, but also with its partners Vermont Gas Systems (VGS) and the Champlain Valley Weatherization Service (CVWS). A cooperative relationship with the VGS has helped both organizations promote efficiency services. Over 85% of Burlington's building use natural gas for space heating and domestic hot water. VGS reports that about fifty-percent of all their total weatherization program completions have happened in Burlington. VGS's willingness to work with BED to promote electrical energy efficiency programs to its natural gas customers has been a noteworthy strength of its joint energy efficiency program offerings. As described in more detail on page 49, BED looks forward to continuing the ***energyChamp*** program with VGS in 2017 and beyond.

BED also continues to perform substantial analysis of energy efficiency and demand response impacts on its system as part of the BED Integrated Resource planning and reporting process. BED updates all of its energy efficiency and demand response planning assumptions on a 3-year basis. BED is responsible for reacting with appropriate program design modifications to the changing market conditions that impact customers' decisions about undertaking energy efficiency upgrades.

2017 Outlook

There are a number of factors that inform BED's estimate that yield rates ($/MWh saved) will continue to decline in coming years. The largest factor is due to increasing efficiency baselines. Baselines, a term used to describe a state of energy efficient construction required by law, are increasing, due to more stringent state energy codes and federal appliance and lighting standards. This results in declining increments of potential savings to pursue through advanced technology upgrades driven by program activities. BED estimates that higher incentives will be necessary in 2017, and beyond, to encourage higher levels of overall participation and deeper savings per project.

As BED describes in its **2015-2017 Triennial Energy Efficiency Plan** (filed with the VT-PSB December 1, 2015, http://psb.vermont.gov/sites/psb/files/EEU/BED2015-

17Triennialplan.pdf) BED will continue to test all program design assumptions and pursue all strategies to make programs as cost-effective, and as easy to participate in, as possible.

BED's role in helping to establish Burlington as a *2030 District* member is a prime of example of this planning. 2030 Districts are unique private/public partnerships in designated urban areas across North America committed to reducing energy use, water and transport emissions.

Overseen by Architecture 2030, 2030 Districts are in the vanguard of grassroots collaborative efforts to renovate existing buildings and construct high-performance infill development and redevelopment.

The majority of BED's involvement will be to provide technical assistance and incentives to participating building owners as we do today. BED's hope is that the 2030 District effort will be a unique and attractive, peer-driven, vehicle for property-owners who have not participated fully in our programs. More information is available at: http://www.2030districts.org/

BED is also planning to offer new services in 2017 to comply with ACT 56; the Renewable Energy Standard. Tier 3, of ACT 56, presents BED with the opportunity to play in two worlds: the historic EEU world and the new Energy Transformation world. As both a distribution utility, and an energy efficiency utility, BED is in a unique position to offer our customers a full suite of efficiency and strategic electrification solutions. BED is continuing to explore new strategies for electric efficiency as well as a much deeper expansion into the heating and transportation arenas.

The remaining pages on this report provide details on BED's delivery of the following EEU services in 2016:

- Business New Construction

- Business Existing Facilities

- Residential New Construction
- Existing Homes
- Efficient Products
- Thermal Energy and Process Fuels (Residential and Commercial)

Table 1: All Business & Residential DSM History*

	-------- Participants -----	---------- Costs ----------						---------- Savings ----------			
		Admin	Services	Incentive	Evaluation	Participant	Program Total	Mwh	Lifetime Mwh	Winter Kw	Summer Kw
1991	391	$356,563	$0	$273,437	$6,015	$1,091,190	$1,727,205	3,703	52,103	1,224	0
1992	330	$334,066	$0	$264,615	$14,711	$1,104,050	$1,717,442	3,595	72,723	1,385	0
1993	1,343	$344,326	$0	$501,991	$107,646	$2,052,045	$3,006,008	9,198	133,079	2,634	0
1994	734	$367,600	$0	$197,054	$46,172	$927,802	$1,538,628	3,304	32,558	991	0
1995	827	$255,770	$0	$149,865	$16,666	$1,584,811	$2,007,112	6,764	31,402	1,650	0
1996	774	$215,329	$0	$118,006	$44,318	$500,363	$878,016	2,285	38,654	0	358
1997	735	$143,184	$0	$122,189	$6,011	$848,380	$1,119,764	2,665	39,091	0	714
1998	692	$204,588	$0	$107,140	$353	$731,707	$1,043,788	3,202	43,971	0	822
1999	675	$214,782	$0	$101,224	$1,529	$331,985	$649,520	1,300	14,174	0	358
2000	1,364	$334,762	$97,067	$148,162	$0	$761,673	$1,341,664	3,130	37,211	443	387
2001	1,410	$425,123	$129,955	$208,178	$59,637	$609,115	$1,432,008	3,094	41,258	398	341
2002	1,824	$469,263	$192,143	$407,057	$2,352	$1,178,695	$2,249,510	4,438	63,159	444	520
2003	1,897	$305,283	$365,691	$236,762	$19,006	$538,589	$1,465,331	3,346	56,332	346	361
2004	1,484	$253,037	$302,017	$271,856	$19,067	$638,819	$1,484,796	3,500	46,856	625	557
2005	1,977	$242,385	$351,009	$260,806	$5,904	$970,437	$1,830,541	4,948	69,570	630	630
2006	2,188	$221,862	$352,886	$381,706	$42,057	$702,575	$1,701,086	6,254	83,951	813	891
2007	2,045	$255,856	$375,480	$441,352	$52,025	$1,353,651	$2,478,364	9,679	128,022	1,206	1,158
2008	6,392	$447,867	$412,037	$578,245	$65,159	$1,187,671	$2,690,979	7,299	72,402	1,178	889
2009	1,181	$317,257	$371,233	$452,901	$67,667	$1,959,977	$3,169,035	5,679	64,416	765	811
2010	1,638	$378,153	$339,569	$1,102,597	$54,283	$781,528	$2,656,130	6,492	75,954	1,223	1,148
2011	1,027	$310,536	$381,043	$1,372,682	$69,742	$1,020,842	$3,154,845	7,191	68,153	1,333	1,000
2012	1,244	$296,104	$425,616	$1,035,051	$63,671	$1,968,113	$3,788,555	6,428	75,050	1,118	957
2013	1,229	$289,056	$472,270	$1,228,561	$77,562	$1,793,534	$3,860,982	7,007	82,273	1,267	910
2014	988	$380,161	$577,196	$1,246,484	$63,671	$3,277,600	$5,545,111	5,399	64,811	959	785
2015	1,021	$329,612	$570,899	$1,291,414	$67,289	$2,025,393	$4,284,606	6,025	80,842	849	628
2016	1,427	$383,409	$511,696	$1,367,951	$69,644	$2,292,047	$4,624,747	6,102	72,043	745	529
Total	36,837	$8,075,934	$6,227,806	$13,867,285	$1,042,157	$32,232,592	$61,445,774	132,027	1,640,058	22,226	14,755

*** All tables in this report reflect a reduction in MWh savings claims as a result of the final VT-DPS annual savings verification process.**

Table 2: All Business DSM History

	Participants	Costs						Savings			
		Admin	Services	Incentive	Evaluation	Participant	Program Total	Mwh	Lifetime Mwh	Winter Kw	Summer Kw
1991	3	$130,784	$0	$1,849	$0	$2,157	$134,790	31	93	30	0
1992	16	$149,138	$0	$119,535	$4,063	$454,104	$726,840	246	24,388	227	0
1993	164	$162,366	$0	$305,473	$35,559	$1,308,524	$1,811,922	5,587	72,218	1,421	0
1994	104	$238,153	$0	$163,733	$21,690	$630,639	$1,054,215	2,242	14,970	626	0
1995	163	$199,835	$0	$142,342	$9,480	$1,368,954	$1,720,611	6,137	21,386	1,615	0
1996	151	$151,409	$0	$50,423	$28,498	$355,217	$585,547	1,233	16,150	0	334
1997	160	$78,321	$0	$96,959	$5,612	$757,774	$938,666	2,300	33,565	0	669
1998	164	$141,258	$0	$65,048	$50	$615,144	$821,500	2,767	37,930	0	734
1999	162	$150,772	$0	$71,501	$0	$270,056	$492,329	1,051	10,895	0	338
2000	145	$176,552	$56,070	$80,108	$0	$613,597	$926,327	2,438	28,712	309	334
2001	127	$255,082	$99,310	$84,729	$43,248	$384,763	$867,132	2,064	26,581	240	240
2002	113	$284,826	$112,447	$238,866	$252	$912,280	$1,548,671	2,888	43,183	224	392
2003	144	$154,937	$243,386	$148,306	$9,503	$254,905	$811,037	2,193	32,975	122	162
2004	142	$115,796	$192,327	$140,234	$3,928	$507,253	$959,538	2,505	35,419	335	394
2005	133	$133,542	$208,860	$202,143	$0	$814,001	$1,358,546	3,751	57,787	342	397
2006	150	$112,917	$240,425	$261,310	$24,533	$575,467	$1,214,652	5,094	73,084	503	652
2007	151	$125,761	$244,030	$280,213	$33,320	$977,132	$1,660,456	6,530	104,174	482	763
2008	115	$113,641	$250,666	$304,252	$43,576	$904,640	$1,616,775	3,264	48,407	386	386
2009	105	$173,789	$224,900	$305,352	$44,608	$1,743,182	$2,491,831	3,781	51,336	336	555
2010	228	$168,765	$249,094	$849,801	$35,630	$458,549	$1,761,839	3,489	52,358	511	673
2011	220	$162,357	$277,034	$972,032	$47,704	$335,095	$1,794,222	2,787	37,950	421	521
2012	323	$153,822	$307,898	$721,047	$49,516	$1,667,503	$2,899,786	4,215	54,786	494	680
2013	355	$166,097	$384,773	$952,314	$64,371	$1,320,521	$2,888,076	4,440	55,668	533	537
2014	365	$193,375	$434,315	$846,835	$47,753	$3,006,372	$4,528,650	3,559	43,676	526	524
2015	382	$159,179	$430,188	$746,424	$50,467	$1,709,721	$3,095,979	3,691	50,912	332	382
2016	512	$166,511	$406,350	$893,142	$51,990	$1,659,634	$3,177,627	4,074	39,361	361	397
Total	4,797	$4,218,985	$4,362,073	$9,043,970	$655,351	$23,607,184	$41,887,564	82,357	1,067,964	10,376	10,064

Table 3: All Residential DSM History

	-------- Participants -----	---------- Costs ----------						---------- Savings ----------			
		Admin	Services	Incentive	Evaluation	Participant	Program Total	Mwh	Lifetime Mwh	Winter Kw	Summer Kw
1991	388	$225,779	$0	$271,588	$6,015	$1,089,033	$1,592,415	3,672	52,010	1,194	0
1992	314	$184,928	$0	$145,080	$10,648	$649,946	$990,602	3,349	48,335	1,158	0
1993	1,179	$181,960	$0	$196,518	$72,087	$743,521	$1,194,086	3,611	60,861	1,213	0
1994	630	$129,447	$0	$33,321	$24,482	$297,163	$484,413	1,062	17,588	365	0
1995	664	$55,935	$0	$7,523	$7,186	$215,857	$286,501	627	10,016	35	0
1996	623	$63,920	$0	$67,583	$15,820	$145,146	$292,469	1,052	22,504	0	24
1997	575	$64,863	$0	$25,230	$399	$90,606	$181,098	365	5,526	0	45
1998	528	$63,330	$0	$42,092	$303	$116,563	$222,288	435	6,041	0	88
1999	513	$64,010	$0	$29,723	$1,529	$61,929	$157,191	249	3,279	0	20
2000	1,219	$158,210	$40,997	$68,054	$0	$148,076	$415,337	692	8,499	134	53
2001	1,283	$170,041	$30,645	$123,449	$16,389	$224,352	$564,876	1,030	14,677	158	101
2002	1,711	$184,437	$79,696	$168,191	$2,100	$266,415	$700,839	1,550	19,976	220	128
2003	1,753	$150,346	$122,305	$88,456	$9,503	$283,684	$654,294	1,153	23,357	224	199
2004	1,342	$137,241	$109,690	$131,622	$15,139	$131,566	$525,258	995	11,437	290	163
2005	1,844	$108,843	$142,149	$58,663	$5,904	$156,436	$471,995	1,197	11,783	288	233
2006	2,038	$108,945	$112,461	$120,396	$17,524	$127,108	$486,434	1,160	10,867	310	239
2007	1,894	$130,095	$131,450	$161,139	$18,705	$376,519	$817,908	3,149	23,848	724	395
2008	6,277	$334,226	$161,371	$273,993	$21,583	$283,031	$1,074,204	4,035	23,995	792	503
2009	1,076	$143,468	$146,333	$147,549	$23,059	$216,795	$677,204	1,898	13,080	429	256
2010	1,410	$209,388	$90,475	$252,796	$18,653	$322,979	$894,291	3,003	23,596	712	475
2011	807	$148,179	$104,009	$400,650	$22,038	$685,747	$1,360,623	4,404	30,203	912	479
2012	921	$142,282	$117,718	$314,004	$14,155	$300,610	$888,769	2,213	20,264	624	277
2013	874	$122,959	$87,496	$276,247	$13,191	$473,013	$972,906	2,567	26,605	734	373
2014	623	$186,786	$142,880	$399,649	$15,918	$271,228	$1,016,461	1,840	21,135	433	261
2015	639	$170,433	$140,711	$544,989	$16,822	$315,672	$1,188,627	2,334	29,930	517	246
2016	915	$216,898	$105,346	$474,809	$17,654	$632,413	$1,447,121	2,028	32,682	384	132
Total	32,040	$3,856,949	$1,865,733	$4,823,314	$386,806	$8,625,408	$19,558,210	49,670	572,094	11,850	4,691

2 Overview of EEU Services Results

2016 proved to be a challenge for achieving savings goals in some markets but overall BED achieved 82% of the total annual MWh goal, 50% of the summer coincident –peak KW goal and 67% of the winter coincident –peak KW goal. BED projected 7,456 annualized MWh savings and achieved 6,102 annualized MWh. BED projected 1,069 coincident-peak summer KW savings and achieved 529 KW. BED projected 1,104 coincident-peak winter KW savings and achieved 745 KW. Residential New Construction and Retail Products had strong years and exceeded savings projections.

BED spent $2,263,056 in 2016, which is about 15% less than the projected budget of $2,659,721. In total, BED's EEU Services implementation saved 6,102 MWh of energy annually from installed measures that will result in 72,042 MWh savings over the equipment's useful life; 2016 measures have a weighted lifetime of about 12 years.

In the first seventeen years of Vermont's Energy Efficiency Utility structure both BED and EVt have exceeded savings estimates in most years and have done so at a lower cost per MWh than anticipated. Energy efficiency is now being delivered at a total utility cost of about $.037 per kilowatt-hour statewide. When compared with other energy sources, energy efficiency remains the state's best bargain for future supply and the expenditures stay largely in the Vermont economy. Avoiding electric generation also avoids the associated air emissions and other environmental impacts that impact Vermont and the region.

Table 4: EEU Business & Residential - Total Resource Benefits

Avoided costs of Electricity	$6,358,492.18
Fossil Fuel Savings	$20,069.28
Water Savings	$117,728.10
TRB Total	$6,496,289.74

	Annualized	**Lifetime**
Meter MWh	5,492	63,443
Generation MWh	6,102	72,042
Meter Demand Kw	1,934	26,459
Generation Peak Summer	528	6,320
Generation Peak Winter Kw	747	10,567
Water Savings	1,072	14,125
Fuel Increase	-784	3,998
O+M Savings	$147,122	$1,414,005

Table 5: EEU Business & Residential - Summary

	Prior Year 2015	Current 2016	Program to date
Participants	1,003	1,427	28,495
--- Program Costs --			
BED Administration Costs			
General	$295,995	$364,423	$4,858,231
Implementation	$2,357	$2,302	$2,017,740
Planning	$0	$0	$106,711
Marketing	$18,555	$16,685	$863,536
IT Development	$12,705	$0	$224,662
	$329,612	**$383,409**	**$8,070,880**
BED Service Costs			
Participants	$570,899	$511,696	$6,213,390
Trade Allies	$0	$0	$11,761
	$570,899	**$511,696**	**$6,225,151**
BED Incentive Costs			
Participants	$1,287,203	$1,367,951	$13,789,821
Trade Allies	$4,210	$0	$72,453
	$1,291,414	**$1,367,951**	**$13,862,274**
BED Total Costs	**$2,191,925**	**$2,263,056**	**$28,158,304**
Evaluation Costs	**$67,289**	**$69,644**	**$1,042,066**
Participant	**$2,023,607**	**$2,292,047**	**$32,954,547**
Total Program Costs	**$4,282,820**	**$4,624,747**	**$62,154,917**
--- Benefits ---			
Annualized mWh	5,937	6,102	132,442
Lifetime mWh	79,387	72,043	1,663,163
Winter peak Kw	831	745	22,429
Summer Peak Kw	617	529	15,108
mWh / Participant	6	4	5
Weighted Lifetime	13	12	13

Table 6: EEU Business & Residential - End Use Summary

Description	Participants	Gross Mwh	Net Mwh	Lifetime Net	Winter Net Kw	Summer Net Kw	MMBTU	CCF
Air Conditioning	46	1,043.40	1,173.19	5,698.81	3.57	11.96	0.00	0.00
Clothes Drying	5	45.17	41.25	577.52	2.78	2.09	-110.30	0.00
Clothes Washing	116	18.18	15.57	202.89	2.09	1.58	68.26	869.30
Consumer Electronics	1578	223.51	252.19	1,470.14	27.84	23.40	0.00	0.00
Custom	65	2.44	3.27	7.62	1.12	0.31	0.00	0.00
Dishwashing	1	0.90	1.02	13.24	0.13	0.07	3.48	33.35
Hot Water	51	61.53	50.19	650.34	7.68	3.92	-159.61	78.87
HVAC	49	130.06	128.39	2,310.99	21.49	0.00	-32.57	0.00
Lighting	6147	3,616.58	4,067.30	54,767.71	661.76	473.60	-1,522.03	0.00
Motors	8	197.24	199.71	3,068.94	3.44	1.75	0.00	0.00
Other Efficiency	2	0.94	0.53	5.28	0.06	0.06	0.00	0.00
Refrigeration	107	45.17	48.44	704.85	4.81	5.99	0.00	0.00
Space Heating	45	95.82	109.53	2,360.03	8.52	1.96	952.00	0.00
Ventilation	30	10.79	11.48	204.15	1.65	1.60	0.00	0.00
Total		5,491.74	6,102.06	72,042.50	746.95	528.29	-800.77	981.52

2.1 Non Resource Acquisition

The following section highlights BED's Non Resource Acquisition (NRA) activities for 2016. NRA activities are those that do not directly achieve immediate energy savings but are essential to the operation and administration of BED's EEU services and to the long-term success of future efficiency savings and innovation. The NRA categories were developed collaboratively with the DPS as part of the EEU Demand Resource Plan Process and approved by the Public Service Board.

BED's NRA activities include: education, smart grid and AMI, applied research and development, planning and reporting, evaluation, policy and public affairs, information technology and general administration.

Education- This category captures BED's work throughout the year on general energy efficiency education that is geared toward building awareness that leads customers to take action to reduce energy use through efficiency or conservation. BED provides education to – builders and contractors, real estate professionals, K-12 students and teachers, college and universities and the general public.

Advanced Metering Infrastructure (AMI) - Smart Grid- Advanced metering infrastructure (AMI), smart grid and a new realm of potential customer energy use empowerment tools are being deployed in most of Vermont. BED continues to explore the possibilities for enhanced interaction with its customers and the potential benefits and capabilities AMI technology will bring them.

Applied Research and Development- This work includes BED's collaboration with EVt and other entities on applied research and development activities designed to optimize the creation of cost-effective solutions to meeting BED's long-term resource acquisition goals.

The main focus of applied R&D is in the following three areas:

- Field-testing new implementation strategies such as social networking
- Technology demonstrations
- Research of emerging technologies and innovative efficiency implementation strategies

Planning and Reporting- To help keep the Vermont Public Service Board, the Department of Public Service, and other stakeholders, informed about BED's EEU activities, BED submits monthly, quarterly, annual reports and an annual plan to the Board and DPS.

Evaluation- Determining the accuracy of BED's savings claims, evaluation is a critical aspect of BED's responsibilities as an EEU to Burlington rate payers. There are several evaluation activities that BED participates in to help BED continually improve savings quantification methods.

Policy and Public Affairs- This NRA activity captures BED's participation in discussions about energy efficiency and EEU related issues that typically occur throughout the year with regulators and other stakeholders.

Information Technology (IT) - BED's on-going IT initiative mainly consists of continuing the support of and improvement to the DSM database system for the collection and processing of project data and program information critical to tracking, reporting and planning functions. There is a fairly regular need to alter measure savings characterization, existing tools or add new tools and functionality to the system which helps us to better understand and respond to changes in the Burlington marketplace.

General Administration- This NRA category captures BED's annual activities and costs for the overall management of EEU programs not specific to the individual programs and includes: general staff meetings, coordination of program implementation across all program functions and managing and monitoring overall performance and spending.

Table 7: Non-Resource Acquisition

Program	Year End Costs	Annual Budget	% of Annual Budget
Education and Training	$25,593	$42,300	61%
Smart Grid and AMI	$7,272	$16,406	44%
Applied R & D	$6,230	$18,900	33%
Planning and Reporting	$47,989	$37,706	127%
Evaluation	$18,148	$18,100	100%
Policy and Public Affairs	$5,152	$14,800	35%
Information Technology	$10,187	$20,506	50%
General Administration	$36,833	$26,000	142%
Total	$157,404	$194,718	81%

2.2 Business Services Overview

This section of the report contains information on BED's Business EEU Services: Business New Construction and Business Existing Facilities (Market Opportunities & Retrofit).

Overall, 2016 results in business services did not meet savings projections. BED projected 5,592 megawatt-hour (MWh) savings while achieving actual annual energy savings of 4,074 MWh, 73% of the projection. BED's cost to deliver EEU business services in 2016 was $1,466,002 below the budgeted amount of $1,985,485 by 26%.

It is often difficult to forecast savings and expenses in the C&I sector in Burlington. This is due to the potential for completion of a few large unexpected projects by one or two customers, dramatically exceeding projections and budgets. On the other hand, savings goals may just as unpredictably be missed due to delays or cancellations of planned significant projects.

BED has begun to explore how to move beyond lighting as the dominant savings measure in the commercial market. Long-lasting LED technology is being widely adopted so HVAC, and other measures, need to play more prominent roles. However, with about 70% of BED's commercial customer leasing their spaces, HVAC improvements present strong challenges that BED will need to overcome.

BED will also continue to offer customers continuous building monitoring tools. The long term goal is to ensure that buildings continue to operate in an energy efficient mode long after the final building functional testing is completed and the installation contractors have departed. Tools that help to ensure the persistence of the energy savings over the life of equipment is well worth exploring.

It is not uncommon to find larger commercial buildings that suffer from energy performance issues that could have been quickly resolved if the building had the correct automated processes in place to monitor energy usage trends, equipment failures or operator errors made to the energy management system. Often building operators, in an

attempt to address occupant comfort issues negatively and needlessly impact the systems' energy efficiency performance. The correct set-up and monitoring of the building energy management system, and provision of the appropriate feedback mechanisms to the building operators, can help to optimize the balance between occupant comfort and energy performance.

Table 8: EEU Business - Total Resource Benefits

Avoided costs of Electricity	$3,672,105.64
Fossil Fuel Savings	($184,836.80)
Water Savings	$0.00
TRB Total	$3,487,269.09

	Annualized	**Lifetime**
Meter MWh	3,669	35,723
Generation MWh	4,075	39,360
Meter Demand Kw	682	7,843
Generation Peak Summer	396	4,416
Generation Peak Winter Kw	362	4,205
Water Savings	0	0
Fuel Increase	-1,383	-15,032
O+M Savings	$99,826	$712,926

Table 9: EEU Business - Summary

	Prior Year 2015	Current 2016	Program to date
Participants	377	512	3,134
--- Program Costs --			
BED Administration Costs			
General	$139,048	$157,265	$2,453,313
Implementation	$0	$0	$1,271,733
Planning	$0	$0	$62,003
Marketing	$10,404	$9,246	$307,669
IT Development	$9,727	$0	$120,291
	$159,179	**$166,511**	**$4,215,009**
BED Service Costs			
Participants	$430,188	$406,350	$4,353,117
Trade Allies	$0	$0	$6,780
	$430,188	**$406,350**	**$4,359,897**
BED Incentive Costs			
Participants	$742,997	$893,142	$9,173,659
Trade Allies	$3,427	$0	$38,148
	$746,424	**$893,142**	**$9,211,807**
BED Total Costs	**$1,335,792**	**$1,466,003**	**$17,786,714**
Evaluation Costs	**$50,467**	**$51,990**	**$653,977**
Participant	**$1,706,542**	**$1,659,634**	**$23,426,161**
Total Program Costs	**$3,092,800**	**$3,177,627**	**$41,866,852**
--- Benefits ---			
Annualized mWh	3,601	4,074	82,844
Lifetime mWh	49,425	39,361	1,090,859
Winter peak Kw	334	361	10,594
Summer Peak Kw	382	397	10,326
mWh / Participant	10	8	26
Weighted Lifetime	14	10	13

Table 10: EEU Business - End-Use Summary

Description	Participants	Gross Mwh	Net Mwh	Lifetime Net	Winter Net Kw	Summer Net Kw	MMBTU	CCF
Air Conditioning	11	1,031.74	1,161.29	5,467.95	3.57	10.87	0.00	0.00
HVAC	12	20.52	20.26	364.68	4.28	0.00	-5.57	0.00
Lighting	1149	2,377.40	2,646.98	29,623.59	345.48	380.67	-1,377.60	0.00
Motors	8	197.24	199.71	3,068.94	3.44	1.75	0.00	0.00
Other Efficiency	2	0.94	0.53	5.28	0.06	0.06	0.00	0.00
Refrigeration	5	3.13	3.32	36.91	0.42	0.45	0.00	0.00
Space Heating	22	34.81	38.99	740.55	3.70	1.96	0.00	0.00
Ventilation	9	3.49	3.50	52.49	0.75	0.70	0.00	0.00
Total		3,669.27	4,074.57	39,360.38	361.70	396.47	-1,383.17	0.00

2.2.1 Business New Construction

Program Description

This service helps commercial and industrial builders and developers incorporate the most energy efficient products and systems possible when building or renovating. It is designed to help customers exceed the City of Burlington's required Guidelines for Energy Efficient Construction (which adopted the statewide CBES energy code as of January 1, 2007). By working directly and early in the process with designers and owners, BED assists in the choice of energy efficient systems and construction techniques that meet business and energy needs.

The program offers financial incentives for the installation of cost effective efficiency measures. Eligible participants gain technical assistance, verification services and financial incentives to help with efficient equipment costs. BED's Business New Construction service addresses all energy (especially electricity) consuming equipment, components or practices, including thermal envelope, motors, lighting, heating, ventilation, air-conditioning (HVAC) and control packages.

Natural gas is almost universally available in Burlington. To insure comprehensiveness in building and system designs, BED coordinates with Vermont Gas Systems (VGS) on all projects. The two utilities notify each other when projects are identified or when major changes are considered by the developers or the design teams. This partnership is mutually beneficial to both organizations and the ratepayers.

BED maximizes the adoption of energy efficient systems and techniques through proactive outreach and recruitment. As both an electric distribution utility and a municipal department with a role in the City's design review process, BED is in a unique position to identify new construction and major renovation before significant design efforts begin. BED coordinates this effort with other city agencies including the city's Planning & Zoning Department and its Department of Public Works.

BED continues to support enforcement and provide administration of the Guidelines for Energy Efficient Construction for the City of Burlington, VT (adopted CBES), the energy code for all new construction and renovation in the City. The benefits of the Business New Construction program have evolved into an important facet of the city's economic development efforts. Because BED is involved in the very earliest stages of project development, the benefits of energy efficiency are packaged along with other attractive elements that entice businesses to locate facilities in the city, enhancing employment growth and economic development in Burlington.

Project Highlights

The annualized megawatt-hour (MWh) savings for 2016 were 582, about 31% lower than the projection of 839 MWh. Total BED program costs were $400,269, 5% greater than the budgeted amount of $382,823.

BED continues to utilize a tiered incentive approach for larger projects that pays part of the incentive at project completion and then the remaining incentives after about one year of comparing actual billing history data to the building energy model. In order to best estimate the energy efficiency potential of larger buildings, energy modeling software is used to compare the energy performance of a CBES compliant design to a model of the final "more efficient" building design. The original energy model assumptions are fine-tuned, as needed, with actual operating hours, set-points and plug loads.

It often takes about a year for larger commercial buildings to be fully occupied, equipped and debugged of any performance issues. This approach allow for deeper BED involvement, more accurate savings claims and ensures that building operators are encouraged to optimize the performance of buildings. This approach has been well received by customers.

Variance Discussion

Customers make business decisions independent of BED's program budgeting efforts, and we fully anticipate that year to year efforts will be "lumpy", and show dramatic swings in performance. Long-term average results are a better indicator of what can be expected on an annual basis than any given year's data.

For 2017, BED will continue to explore the potential benefits of commercial building envelope commissioning. BED continues to see a growing number of heat pump heated and cooled buildings coming on line so high performance building shells are an increased focus.

With the help of Vermont based, thermal envelope specialists (examples below), we are working with Architects, owners and contractors to encourage building envelops that are being designed and constructed utilizing higher performance thermal envelope techniques.

The wall to the left of the corner will be spray foam and the wall to the right will be cellulose. Instead of putting cellulose in the first bay (red arrow), put spray foam there instead. It will connect the spray foam air barrier directly to the backside of the taped sheathing air barrier.

The roof sheathing does not appear to have been sealed to the wall sheathing behind the rigid insulation.

Table 11: EEU Business New Construction - Total Resource Benefits

Avoided costs of Electricity	$917,621.68
Fossil Fuel Savings	($46,442.76)
Water Savings	$0.00
TRB Total	$871,178.92

	Annualized	**Lifetime**
Meter MWh	516	6,908
Generation MWh	582	7,795
Meter Demand Kw	135	1,718
Generation Peak Summer	94	1,192
Generation Peak Winter Kw	74	996
Water Savings	0	0
Fuel Increase	-292	-3,834
O+M Savings	$300	$4,500

Table 12: EEU Business New Construction - Summary

	Prior Year 2015	Current 2016	Program to date
Participants	23	20	251
--- Program Costs --			
BED Administration Costs			
General	$33,143	$45,722	$485,294
Implementation	$0	$0	$126,485
Planning	$0	$0	$15,847
Marketing	$3,302	$2,832	$178,599
IT Development	$2,634	$0	$43,673
	$39,079	**$48,554**	**$849,899**
BED Service Costs			
Participants	$96,005	$91,200	$1,117,972
Trade Allies	$0	$0	$0
	$96,005	**$91,200**	**$1,117,972**
BED Incentive Costs			
Participants	$277,078	$260,516	$2,085,123
Trade Allies	$2,977	$0	$3,313
	$280,055	**$260,516**	**$2,088,436**
BED Total Costs	**$415,139**	**$400,269**	**$4,056,307**
Evaluation Costs	**$7,570**	**$10,024**	**$61,087**
Participant	**$1,057,605**	**$325,858**	**$7,375,378**
Total Program Costs	**$1,480,314**	**$736,152**	**$11,492,772**
--- Benefits ---			
Annualized mWh	850	582	17,706
Lifetime mWh	12,818	7,795	273,384
Winter peak Kw	122	74	1,691
Summer Peak Kw	108	94	2,392
mWh / Participant	37	29	71
Weighted Lifetime	15	13	15

Table 13: EEU Business New Construction - End Use Summary

Description	Participants	Gross Mwh	Net Mwh	Lifetime Net	Winter Net Kw	Summer Net Kw	MMBTU	CCF
Lighting	36	513.75	579.74	7,754.73	73.38	93.11	-291.87	0.00
Motors	1	2.35	2.66	39.87	1.01	0.42	0.00	0.00
Total		516.10	582.40	7,794.60	74.39	93.53	-291.87	0.00

2.2.2 Business Existing Facilities
(Market Opportunities & Retrofit Services)

Program Description

Business Existing Facilities, Market Opportunity Service (MOP) targets naturally-occurring equipment changeovers to secure energy savings in the equipment replacement market. Targeted equipment includes lighting, heating, ventilation, cooling, water heating, refrigeration, motors and drives, controls and industrial process applications. This program offers prescriptive and custom tracks, with technical assistance and financial incentives that encourage the adoption of cost effective, high efficiency alternatives to standard efficiency equipment.

BED and EVt offer prescriptive incentives (fixed incentives for specific eligible measures) for building lighting, refrigeration economizers and controls, motors, unitary HVAC equipment and dual enthalpy economizers for unitary HVAC units. BED and EVt also participate jointly in the Northeast Energy Efficiency Partnership to further the market transformation of motors, lighting and HVAC equipment. Incentives for above-average energy efficient equipment are supplied to wholesalers, contractors, and customers at the time of equipment replacement.

Non-prescriptive cost-effective measures or combinations of measures are eligible for custom incentives. Custom incentives are designed to capture as many potential lost opportunity resources as possible, while maximizing program delivery resources. BED staff and trade allies serving Burlington (including: equipment vendors, manufacturers, suppliers, contractors, architects and engineers) market the program to potential participants.

As natural gas is the predominant heating fuel in Burlington, BED works closely with Vermont Gas Systems (VGS) to encourage a comprehensive approach to energy savings. BED and VGS staff are committed to bringing appropriate projects to each other's

attention. This partnership is beneficial to both organizations and our mutual ratepayers. As described in the residential section below, BED and VGS continue to look for ways to better coordinate services by building upon the ***energyChamp*** platform.

Business Existing Facilities, Retrofit Service offers energy efficiency services that have been provided by BED staff for over two decades. Building retrofit entails BED staff and/or trade allies examining customer buildings and systems to identify energy efficiency opportunities for the customer. When promising projects are identified, BED staff prepares analyses for the customer showing the costs and benefits of potential energy efficiency measures. This service is offered to all business customers – from the smallest retail store to the largest commercial and industrial facility. Given BED's long history of delivering this service, the program has reached a high level of maturity and customer acceptance. Facility managers have learned to rely on the program benefits and the technical assistance offered by BED staff.

Program Highlights

The annualized megawatt-hour (MWh) savings for 2016 were 3,492, about 27% lower than the projection of 4,753 MWh. Total BED program costs were $1,065,733, 34% under the budgeted amount of $1,602,662.

As BED's largest program in most years, BEF program managers are responsible for delivering services across a very diverse population of institutions and businesses; from extremely large hospitals and colleges to tiny book stores, restaurants and clothing boutiques. BED's largest customers consume between 1,000 and 57,000 MWh per year and typically exceed peak demand of 100 kWs. Many smaller customers, on the other hand, have the energy profile of large residential homes, consuming about 8,000 to 20,000 kWh annually. Such diversity requires a multi-prong implementation strategy.

Variance Discussion

2016 and 2015, have been relatively low savings year for Business Existing Facilities and BED has been exploring the possible causes. Part of the issue is that the 2016 and 2015

savings goals were ambitious relative to other years as more savings were assigned to BEF from BNC as the new construction market had been very sluggish for several years.

BED also has been exploring how to move beyond lighting as the dominant measure in this market. Long-lasting LED technology is being widely adopted so HVAC, and other measures, need to play more prominent roles. However, with about 70% of BED's commercial customer leasing their spaces, HVAC improvements present strong challenges that BED will need to overcome.

As a response to these growing challenges, BED issued, in mid-2015, an RFP seeking Energy Engineering companies to work with BED staff to help identify cost-effective HVAC related improvements.

BED requested quotes from energy engineering professionals, with proven project histories, to conduct, in partnership and coordination with BED, initial high level energy surveys on commercial buildings. The primary purpose of the high level audit is to quickly identify energy waste and prioritize potential energy efficiency opportunities and provide summary estimates of project costs and savings – both electric and thermal. BED's goal is to provide customers with initial high-level energy efficiency audit reports and recommendations as soon as practical from the date of the customer's request.

BED is using this initial information to present customers with estimated energy savings, potential maintenance and/or building comfort benefits, estimated BED incentives and on-bill financing details. With this information, customers may be persuaded to pursue additional (deeper-level) energy analysis, beyond the initial high-level survey, to finalize savings estimates and overall project cost.

When combined with BED's on-bill-financing service (OBF), the energy engineering approach has leverage close to $800,000 of energy efficiency project in this market over the past few years.

As close to 75% of all kWh sales are to the commercial class, this is an important market to work effectively with. Strategies that encourage these customers to pursue energy efficiency improvements are crucial to helping BED meet savings goals in the years to come.

Table 14: EEU Business Existing Facilities - Total Resource Benefits

Avoided costs of Electricity	$2,754,483.96
Fossil Fuel Savings	($138,394.05)
Water Savings	$0.00
TRB Total	$2,616,090.17

	Annualized	**Lifetime**
Meter MWh	3,153	28,814
Generation MWh	3,492	31,566
Meter Demand Kw	547	6,126
Generation Peak Summer	303	3,224
Generation Peak Winter Kw	287	3,209
Water Savings	0	0
Fuel Increase	-1,091	-11,198
O+M Savings	$99,526	$708,426

Table 15: EEU Business Existing Facilities - Summary

	Prior Year 2015	Current 2016	Program to date
Participants	354	492	2,883
--- Program Costs --			
BED Administration Costs			
General	$105,905	$111,543	$1,968,019
Implementation	$0	$0	$1,145,248
Planning	$0	$0	$46,156
Marketing	$7,103	$6,414	$129,070
IT Development	$7,093	$0	$76,619
	$120,101	**$117,957**	**$3,365,111**
BED Service Costs			
Participants	$334,182	$315,150	$3,235,145
Trade Allies	$0	$0	$6,780
	$334,182	**$315,150**	**$3,241,925**
BED Incentive Costs			
Participants	$465,919	$632,626	$7,088,536
Trade Allies	$450	$0	$34,835
	$466,369	**$632,626**	**$7,123,371**
BED Total Costs	**$920,652**	**$1,065,733**	**$13,730,406**
Evaluation Costs	**$42,897**	**$41,966**	**$592,890**
Participant	**$648,937**	**$1,333,776**	**$16,050,784**
Total Program Costs	**$1,612,486**	**$2,441,475**	**$30,374,080**
--- Benefits ---			
Annualized mWh	2,751	3,492	65,138
Lifetime mWh	36,607	31,566	817,475
Winter peak Kw	212	287	8,903
Summer Peak Kw	274	303	7,934
mWh / Participant	8	7	23
Weighted Lifetime	13	9	13

Table 16: EEU Business Existing Facilities - End Use Summary

Description	Participants	Gross Mwh	Net Mwh	Lifetime Net	Winter Net Kw	Summer Net Kw	MMBTU	CCF
Air Conditioning	11	1,031.74	1,161.29	5,467.95	3.57	10.87	0.00	0.00
HVAC	12	20.52	20.26	364.68	4.28	0.00	-5.57	0.00
Lighting	1113	1,863.65	2,067.24	21,868.86	272.10	287.56	-1,085.73	0.00
Motors	7	194.89	197.05	3,029.07	2.43	1.34	0.00	0.00
Other Efficiency	2	0.94	0.53	5.28	0.06	0.06	0.00	0.00
Refrigeration	5	3.13	3.32	36.91	0.42	0.45	0.00	0.00
Space Heating	22	34.81	38.99	740.55	3.70	1.96	0.00	0.00
Ventilation	9	3.49	3.50	52.49	0.75	0.70	0.00	0.00
Total		3,153.17	3,492.18	31,565.78	287.31	302.94	-1,091.30	0.00

2.3 Residential Service Overview

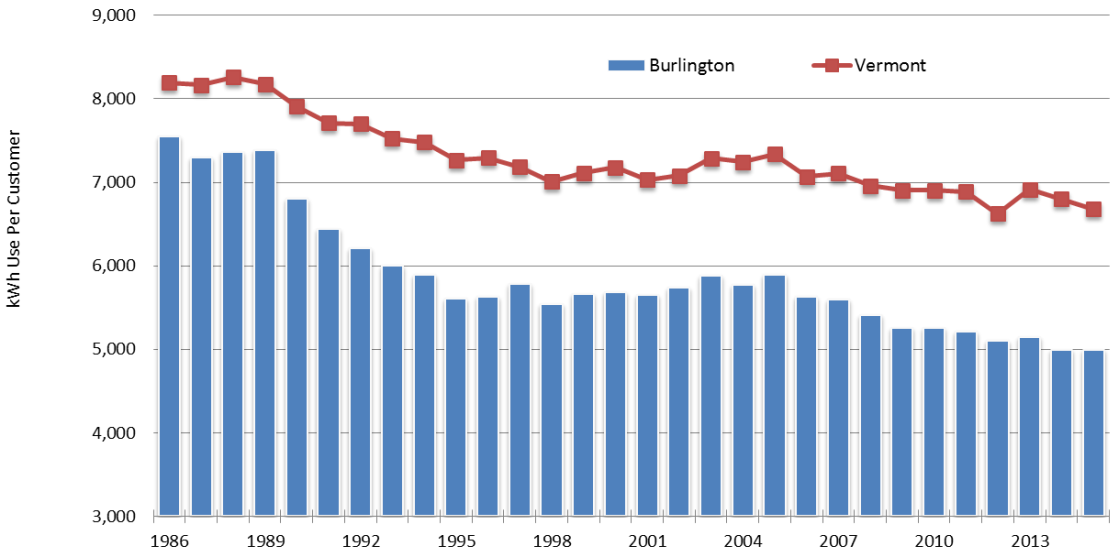
This section of the report contains information on BED's Residential EEU Services: Residential New Construction, Existing Homes, Efficient Retail Products and Thermal Energy and Process Fuels services.

In 2016, BED projected 1,864 annualized MWh residential savings while achieving annual energy savings of 2,028 MWh or 108% of the projected goal. BED's cost to deliver residential services in 2016 was $797,054 which was 18% over projected spending of $674,236. The overspending was driven primarily by multi-family new construction projects and a strong year in the Retail Products Program.

As BED explains in each program below, there are a number of factors that influence year to year budgets and savings projections in Burlington's residential markets.

The residential class presents particular challenges as about 60% of BED's residential customers are renters and about 85% of these customers pay their electric and natural gas heating bills directly. Rental apartments are typically smaller with fewer appliances and lighting opportunities.

BED also turns over about 35% of residential accounts each year due to the high percentage of students. About 85% of residential buildings use natural gas for space heating and domestic hot water. Also, BED's average annual usage per residential customer (2016 monthly average was 399 kWh) continues to decline. BED's residential consumption is about **24**% less than the average Vermont residential customer, **34**% less than the average New England residential customer and **55**% less than the national average.



BED will continue to test all program design assumptions and pursue all strategies to make programs as cost-effective as possible. BED will also continue to focus on energy education efforts. The energy consumption information, and guidance, that is available through BED's smart grid web presentment tool (Energy Engage) is designed to encourage customers to take steps to reduce usage. The tool continues to be invaluable in helping BED staff more effectively assist customers with high bill concerns.

This software includes "dashboards" that presents energy usage details and energy efficiency- related technical advice, and efficiency program opportunities, to customers. EEU funds were not used for Energy Engage but BED believes that it provides a potential platform to launch other energy efficiency offerings from. Pictured below are examples of the types of information that our customers now have access to:

Cut Costs

Weatherproof your windows

Re-glaze leaky, broken window panes.

More Ways to Cut Costs

Be Efficient

Manage your energy usage

Install a programmable thermostat to maintain a comfortable temperature in your home and to manage usage during the winter and summer months.

More Ways to Use Less

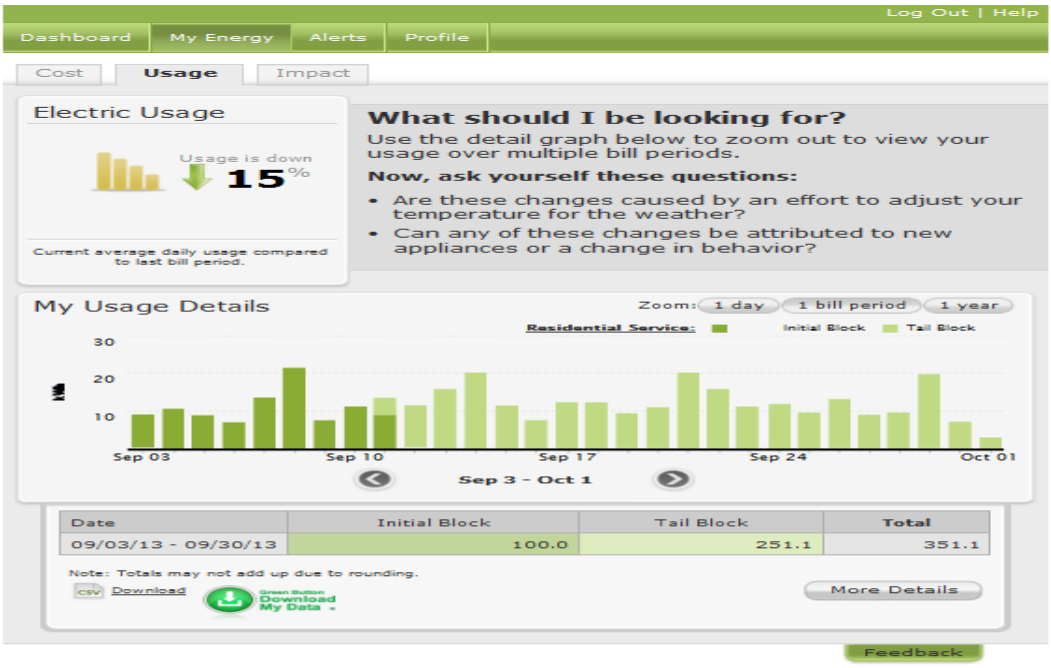
Reduce Your Impact

Plant some deciduous trees

Reduce your heating and cooling costs with an energy-efficient landscape design

.

More Ways to Go Green


Log Out | Help
Dashboard
My Energy
Alerts
Profile
Cost
Usage
Impact
Electric Usage
Usage is down
15%
Current average daily usage compared to last bill period.
What should I be looking for?
Use the detail graph below to zoom out to view your usage over multiple bill periods.
Now, ask yourself these questions:
• Are these changes caused by an effort to adjust your temperature for the weather?
• Can any of these changes be attributed to new appliances or a change in behavior?
My Usage Details
Zoom: 1 day 1 bill period 1 year
Residential Service: Initial Block Tail Block
30
20
10
Sep 03
Sep 10
Sep 17
Sep 24
Oct 01
Sep 3 - Oct 1
Date | Initial Block | Tail Block | Total
09/03/13 - 09/30/13 | 100.0 | 251.1 | 351.1
Note: Totals may not add up due to rounding.
Download
Download My Data
More Details
Feedback
Cut Costs
Tune up your heating and cooling system
Hire a qualified professional to inspect and maintain your heating and cooling system.
More Ways to Cut Costs
Be Efficient
Manage your energy usage
Install a programmable thermostat to maintain a comfortable temperature in your home and to manage usage during the winter and summer months.
More Ways to Use Less
Reduce Your Impact
Plant some deciduous trees
Reduce your heating and cooling costs with an energy-efficient landscape design
.
More Ways to Go Green

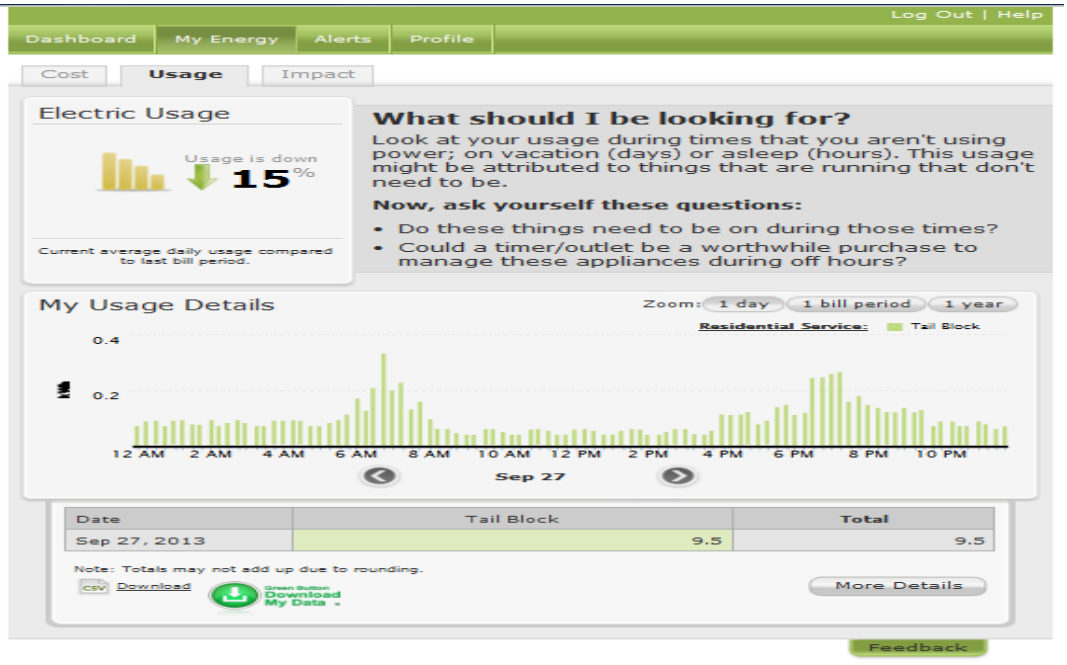

Log Out | Help
Dashboard
My Energy
Alerts
Profile
Cost
Usage
Impact
Electric Usage
Usage is down
15%
Current average daily usage compared to last bill period.
What should I be looking for?
Look at your usage during times that you aren't using power; on vacation (days) or asleep (hours). This usage might be attributed to things that are running that don't need to be.
Now, ask yourself these questions:
• Do these things need to be on during those times?
• Could a timer/outlet be a worthwhile purchase to manage these appliances during off hours?
My Usage Details
Zoom: 1 day 1 bill period 1 year
Residential Service: Tail Block
0.4
0.2
12 AM
2 AM
4 AM
6 AM
8 AM
10 AM
12 PM
2 PM
4 PM
6 PM
8 PM
10 PM
Sep 27
Date | Tail Block | Total
Sep 27, 2013 | 9.5 | 9.5
Note: Totals may not add up due to rounding.
Download
Download My Data
More Details
Feedback
Cut Costs
Hang dry your clothes
Run your dryer less and save energy by installing and using a clothes line for drying clothes.
More Ways to Cut Costs
Be Efficient
Practice daylighting
Use windows and skylights to bring natural light into your home and help reduce the need for artificial light.
More Ways to Use Less
Reduce Your Impact
Plant some deciduous trees
Reduce your heating and cooling costs with an energy-efficient landscape design
.
More Ways to Go Green

Table 17: EEU Residential - Total Resource Benefits

Avoided costs of Electricity	$2,686,386.54
Fossil Fuel Savings	$204,906.08
Water Savings	$117,728.10
TRB Total	$3,009,020.64

	Annualized	**Lifetime**
Meter MWh	1,822	27,721
Generation MWh	2,027	32,682
Meter Demand Kw	1,252	18,615
Generation Peak Summer	132	1,904
Generation Peak Winter Kw	385	6,362
Water Savings	1,072	14,125
Fuel Increase	600	19,030
O+M Savings	$47,296	$701,079

Table 18: EEU Residential - Summary

	Prior Year 2015	Current 2016	Program to date
Participants	626	915	25,361
--- Program Costs --			
BED Administration Costs			
General	$156,947	$207,158	$2,404,918
Implementation	$2,357	$2,302	$746,007
Planning	$0	$0	$44,709
Marketing	$8,151	$7,439	$555,867
IT Development	$2,978	$0	$104,371
	$170,433	**$216,898**	**$3,855,870**
BED Service Costs			
Participants	$140,711	$105,346	$1,860,273
Trade Allies	$0	$0	$4,981
	$140,711	**$105,346**	**$1,865,254**
BED Incentive Costs			
Participants	$544,206	$474,809	$4,616,162
Trade Allies	$783	$0	$34,305
	$544,989	**$474,809**	**$4,650,467**
BED Total Costs	**$856,133**	**$797,054**	**$10,371,591**
Evaluation Costs	**$16,822**	**$17,654**	**$388,089**
Participant	**$317,065**	**$632,413**	**$9,528,386**
Total Program Costs	**$1,190,020**	**$1,447,121**	**$20,288,066**
--- Benefits ---			
Annualized mWh	2,336	2,028	49,598
Lifetime mWh	29,962	32,682	572,304
Winter peak Kw	497	384	11,835
Summer Peak Kw	235	132	4,782
mWh / Participant	4	2	2
Weighted Lifetime	13	16	12

Table 19: EEU Residential - End Use Summary

Description	Participants	Gross Mwh	Net Mwh	Lifetime Net	Winter Net Kw	Summer Net Kw	MMBTU	CCF
Air Conditioning	35	11.66	11.90	230.87	0.00	1.08	0.00	0.00
Clothes Drying	5	45.17	41.25	577.52	2.78	2.09	-110.30	0.00
Clothes Washing	116	18.18	15.57	202.89	2.09	1.58	68.26	869.30
Consumer Electronics	1578	223.51	252.19	1,470.14	27.84	23.40	0.00	0.00
Custom	65	2.44	3.27	7.62	1.12	0.31	0.00	0.00
Dishwashing	1	0.90	1.02	13.24	0.13	0.07	3.48	33.35
Hot Water	51	61.53	50.19	650.34	7.68	3.92	-159.61	78.87
HVAC	37	109.53	108.13	1,946.31	17.21	0.00	-27.00	0.00
Lighting	4998	1,239.18	1,420.32	25,144.12	316.28	92.93	-144.43	0.00
Refrigeration	102	42.05	45.12	667.93	4.39	5.54	0.00	0.00
Space Heating	23	61.01	70.54	1,619.48	4.82	0.00	952.00	0.00
Ventilation	21	7.30	7.98	151.66	0.90	0.90	0.00	0.00
Total		1,822.47	2,027.48	32,682.12	385.24	131.82	582.40	981.52

2.3.1 Residential New Construction

Program Description

This service aims to improve the efficiency of all new homes, and buildings undergoing substantial renovation. This includes single-family homes, multi-family homes and low-income multi-family projects. It addresses all major end uses: space heating, water heating, central cooling (if applicable), ventilation, major appliances and lighting for high use areas. Residential New Construction (RNC) encourages builders and consumers to build to the Vermont Energy Star Home standard. This standard specifies that homes meet the Energy Star performance standard (representing over 25% savings in heating, cooling and hot water consumption relative to the Vermont Residential Building Energy Standard (RBES).

The Vermont Energy Star Homes (VESH) standard is promoted to developers, architects, builders, building supply centers, equipment suppliers and consumers through a combination of marketing, technical assistance to builders, provision of energy ratings, and a package of incentives for efficient lighting fixtures, major appliances and ventilation equipment.

EVT and Vermont Gas Systems continue to do great work promoting VESH which has had direct benefits to BED. As most of the trade allies mentioned above build inside and outside of Burlington it has been helpful to have a joint program with identical participation requirements.

BED uses several additional methods to encourage participation in this sometimes difficult to influence market. These include:

BED staff attends monthly Technical Review meetings where all new construction projects are introduced to the Burlington Planning and Zoning Department staff as part of the City's local project approval process. At these meetings BED explains the RNC program to the permit applicant and gives them program literature. BED then forwards the project information to Vermont Wise Energy Services to follow-up with the

customer. For larger multi-family projects BED staff (in partnership with Vermont Gas Systems) work directly with the property owner.

- BED receives monthly "Development Case Load" updates from the Department of Planning and Zoning that track the progress of each of the development projects in Burlington.

- New and revised electric service and line extension applications help us track smaller renovation projects that may have bypassed the City's permit approval process. All "ability to serve" letters from BED include information about energy efficiency services.

- BED receives a weekly electronic report from the Department of Public Works-Building Inspection Division (DPW) listing all trades permits issued.

- The Burlington DPW refers projects to BED to help them ensure compliance with RBES (and CBES) and to assess opportunities for exceeding requirements. DPW requires a compliance memo from BED Energy Services before issuing the building permit.

Program Highlights

In 2016, the majority of the savings came from two new multi-family apartment building; Redstone's 247 Pearl Street and the Champlain Housing Trust's Bright Street Cooperative. The Pearl Street building utilizes electric cold climate heat pumps (ccHP) for space heating and cooling. Natural gas provides the domestic hot water. Both market rate and affordable multi-family projects comprise the vast majority of housing development in Burlington.

Variance Discussion

The RNC service achieved 244 MWh in annualized electricity savings for the year which was 225% greater than the projected 75 MWh goal. At $243,590, spending was 53% higher than the projected spending of $155,873.

As BED has reported in previous Annual Reports, RNC is a difficult market to predict year to year as it only takes a few projects in Burlington to adjust savings projections and budgets dramatically. 2016 was a relatively strong year due to the thermal envelope savings from the 29-unit ccHP building.

Program Changes

In 2017, BED, EVT and VGS will continue to assist the residential market with exceeding RBES and will also promote low-load and net-zero building practices. BED's residential new construction market is dominated by multi-family structures and most of the single-family work is with gut-rehabilitation projects so we will continue to develop strategies to work effectively with both of these markets.

CcHP's are becoming a popular technology for market-rate multi-family new construction projects as they provide heating and cooling at a low first installation cost, especially when the owner desires to have each apartment individually metered. CCHP's have the potential to become a significant new market opportunity if coupled with highly efficient thermal envelopes. But it is a technology that requires careful attention and on-going analysis. BED will continue to study the energy usage of the ccHP buildings over the coming months and years to evaluate the pros and cons of installing ccHP systems in new construction, including whether these systems are cost effective and if peak load requirements begin to rise.

BED is also researching high performance thermal envelope approaches such as Passive House. Passive House is a different approach to cost-efficiently reducing heating and cooling loads through super-tight building envelopes. In 2015, BED has hosted two

separate week-long workshops on the Passive House (PH) design approach; one for local design professionals and the second for local construction contractors.

Table 20: EEU Residential New Construction - Total Resource Benefits

Avoided costs of Electricity	$333,552.39
Fossil Fuel Savings	$253,424.41
Water Savings	$45,548.02
TRB Total	$632,524.81

	Annualized	**Lifetime**
Meter MWh	226	4,527
Generation MWh	244	4,955
Meter Demand Kw	97	1,702
Generation Peak Summer	8	138
Generation Peak Winter Kw	21	425
Water Savings	424	5,445
Fuel Increase	904	23,037
O+M Savings	$1,125	$25,981

Table 21: EEU Residential New Construction - Summary

	Prior Year 2015	Current 2016	Program to date
Participants	4	5	442
--- Program Costs --			
BED Administration Costs			
General	$30,735	$28,173	$332,804
Implemntation	$0	$0	$96,638
Planning	$0	$0	$11,195
Marketing	$2,507	$2,207	$92,165
IT Development	$104	$0	$34,345
	$33,346	**$30,380**	**$567,146**
BED Service Costs			
Participants	$49,044	$39,016	$619,386
Trade Allies	$0	$0	$2,700
	$49,044	**$39,016**	**$622,086**
BED Incentive Costs			
Participants	$42,113	$174,195	$605,453
Trade Allies	$0	$0	$2
	$42,113	**$174,195**	**$605,455**
BED Total Costs	**$124,502**	**$243,590**	**$1,794,688**
Evaluation Costs	**$3,028**	**$4,160**	**$57,171**
Participant	**$24,333**	**$33,295**	**$339,114**
Total Program Costs	**$151,864**	**$281,045**	**$2,190,973**
--- Benefits ---			
Annualized mWh	124	244	1,641
Lifetime mWh	2,404	4,955	28,283
Winter peak Kw	4	21	336
Summer Peak Kw	14	8	285
mWh / Participant	31	49	4
Weighted Lifetime	19	20	17

Table 22: EEU Residential New Construction - End Use Summary

Description	Participants	Gross Mwh	Net Mwh	Lifetime Net	Winter Net Kw	Summer Net Kw	MMBTU	CCF
Air Conditioning	1	5.75	6.78	169.47	0.00	0.00	0.00	0.00
Clothes Drying	2	35.08	29.98	419.75	2.01	1.52	-99.17	0.00
Clothes Washing	1	0.29	0.25	3.43	0.04	0.03	30.40	300.00
Dishwashing	1	0.90	1.02	13.24	0.13	0.07	3.48	33.35
Lighting	5	128.76	141.16	2,823.26	15.14	4.19	0.00	0.00
Refrigeration	2	7.77	8.75	148.68	1.05	1.32	0.00	0.00
Space Heating	2	43.88	51.70	1,292.62	2.59	0.00	952.00	0.00
Ventilation	2	3.80	4.43	84.21	0.50	0.50	0.00	0.00
Total		226.23	244.07	4,954.67	21.46	7.62	886.71	333.35

2.3.2 Existing Homes

Program Description

This service aims to improve the efficiency of all existing residential buildings including low-income single family, market-rate single-family and all multi-family projects (market-rate and low-income). BED offers the same existing homes service as Efficiency Vermont (EVt) and also works closely with Vermont Gas Systems (VGS) and the Champlain Valley Weatherization Service (CVWS) on many of its projects.

Low-income buildings are addressed by a partnership with the state's Low-income Weatherization Assistance Program (WAP). This partnership provides electric efficiency measures to Burlington's low-income electricity consumers. Electrical efficiency measures are delivered to income-eligible electric customers at the time they receive thermal shell, space heating and water heating improvements from CVWS.

This service also works closely with high usage households for energy efficiency improvements that can significantly reduce their energy bills. On-site energy audits, customer energy education, appliance meter loans, technical assistance, project management and cash incentives are all part of this service.

BED and VGS continued collaboration working with the private (market-rate) rental housing market (customers not eligible for low-income energy services) to increase both participation and the depth of savings per participant. Traditionally, renters (60% of Burlington's residential customers are renters) have not been strong participants and the same holds true for property-owners where the tenants pay the energy bills directly which is the case in about 85% of Burlington's dwellings.

The "Rental Properties Owners" service offers free tank wraps (electric tanks only), pipe insulation, water saving devices, enhanced rebates for the early retirement of eligible refrigerators, incentives for improving mechanical ventilation along with up to six free screw-in LED's per apartment.

This service provides savings directly to the tenant but also water savings, and potential maintenance savings via controlled ventilation fans to the property owner. This service allows us the opportunity to develop long-lasting relationships with property-owners to help identify further savings from refrigeration replacements, common area lighting and laundry equipment improvements, weatherization and ventilation.

Program Highlights

In 2016, 15 fuel switch projects were completed. 12 electric hot water tanks were switched to natural gas and 3 dwellings replaced electric heat with natural gas space heating equipment. 995 LED lighting products were installed. 33 customers and their contractors took advantage of rebates for high efficiency circulator pumps for boilers. 31 refrigerators were retired early and replaced with ENERGY STAR models and BED also provided 60 water saving devices.

Variance Discussion

The Existing Homes service achieved 226 MWh in annualized electricity savings for the year, 40% less than the projected 373 MWh. At $165,803 spending was 36% less than BED's projected spending of $257,682.

BED will continue with the market-rate rental housing campaign as about 60% of BED's residential customers live in rental housing and about 85% pay their electric and heating costs directly. Over 85% of BED's residential rental customers use natural gas for space heating and domestic hot water. At current electric and natural gas rates, switching to electric heat pump technology would increase customers' annual energy costs so these measures are not viable for most of Burlington. BED will continue to leverage common area energy savings, building water savings, and ice dam and moisture damage solutions for property-owners as part of the service to help develop long-term relationships with building owners.

Because 60% of BED's customers are renters, expanding and refining the existing homes program to actively target multifamily (MF) buildings will continue to be a priority.

However, because MF electric bills are relatively small (321 kWh per month on average) compared to the cost of space and water heating with natural gas, the program will focus on a whole building, all-fuels marketing approach to motivate customers to take action. Identifying electrical opportunities alone simply won't produce the savings necessary to make the customer's effort worthwhile. Accordingly, BED and VGS will continue with the ***energyChamp*** collaboration.

As most efficiency programs around the nation have struggled with participation rates in the market-rate multi-family sector, delivering a combined utility effort will provide valuable insights on how to effectively engage this difficult market. More information about the ECC is available at: https://energychamp.org/

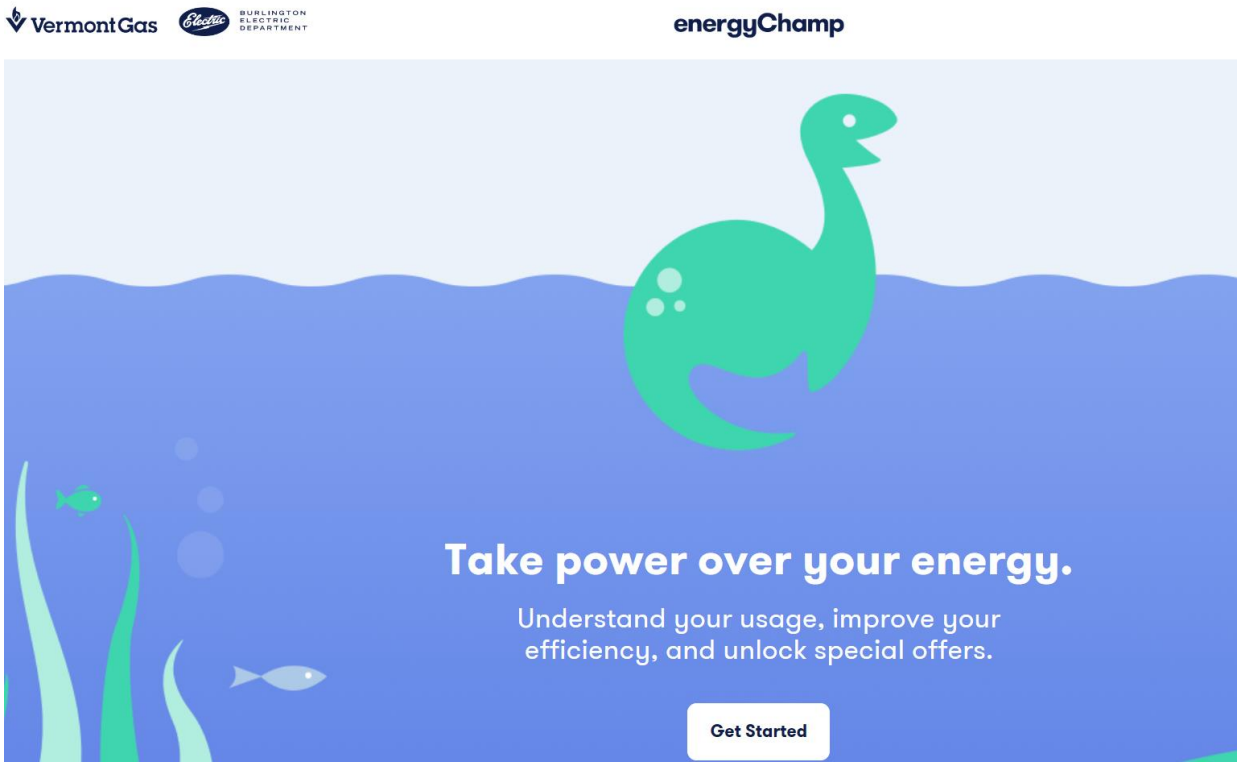


Table 23: EEU Residential Existing Homes - Total Resource Benefits

Avoided costs of Electricity	$312,771.19
Fossil Fuel Savings	($30,565.75)
Water Savings	$8,363.57
TRB Total	$290,569.01

	Annualized	**Lifetime**
Meter MWh	235	3,657
Generation MWh	226	3,507
Meter Demand Kw	102	1,377
Generation Peak Summer	9	106
Generation Peak Winter Kw	38	567
Water Savings	97	960
Fuel Increase	-177	-2,534
O+M Savings	$2,094	$22,505

Table 24: EEU Residential Existing Homes - Summary

	Prior Year 2015	Current 2016	Program to date
Participants	158	141	8,896
--- Program Costs --			
BED Administration Costs			
General	$31,066	$36,716	$1,325,639
Implementation	$2,357	$2,302	$559,113
Planning	$0	$0	$19,067
Marketing	$1,317	$1,156	$314,025
IT Development	$2,234	$0	$47,283
	$36,974	**$40,174**	**$2,265,127**
BED Service Costs			
Participants	$88,958	$66,276	$911,666
Trade Allies	$0	$0	$0
	$88,958	**$66,276**	**$911,666**
BED Incentive Costs			
Participants	$63,551	$59,354	$1,741,748
Trade Allies	$783	$0	$34,277
	$64,334	**$59,354**	**$1,776,024**
BED Total Costs	**$190,265**	**$165,803**	**$4,952,817**
Evaluation Costs	**$6,897**	**$6,747**	**$218,435**
Participant	**$53,062**	**$39,292**	**$5,124,662**
Total Program Costs	**$250,225**	**$211,842**	**$10,295,915**
--- Benefits ---			
Annualized mWh	224	226	21,205
Lifetime mWh	3,477	3,507	326,839
Winter peak Kw	39	38	5,868
Summer Peak Kw	9	9	997
mWh / Participant	1	2	2
Weighted Lifetime	16	16	15

Table 25: EEU Residential Existing Homes - End Use Summary

Description	Participants	Gross Mwh	Net Mwh	Lifetime Net	Winter Net Kw	Summer Net Kw	MMBTU	CCF
Clothes Drying	3	10.09	11.27	157.77	0.77	0.58	-11.13	0.00
Clothes Washing	2	0.55	0.56	7.85	0.08	0.06	20.76	17.90
Consumer Electronics	7	1.58	1.76	7.04	0.06	0.19	0.00	0.00
Custom	65	2.44	3.27	7.62	1.12	0.31	0.00	0.00
Hot Water	38	40.04	23.49	303.27	3.55	1.82	-159.61	78.87
HVAC	37	109.53	108.13	1,946.31	17.21	0.00	-27.00	0.00
Lighting	81	30.35	34.26	434.21	11.04	3.05	0.00	0.00
Refrigeration	19	20.14	20.47	248.97	1.88	2.37	0.00	0.00
Space Heating	21	17.12	18.84	326.86	2.23	0.00	0.00	0.00
Ventilation	19	3.50	3.55	67.44	0.40	0.40	0.00	0.00
Total		235.35	225.60	3,507.33	38.33	8.77	-176.98	96.77

2.3.3 Retail Products

Program Description

The Efficient Products (EP) service aims to increase sales of ENERGY STAR® qualified lighting products, compact fluorescent (CFL) screw-in bulbs, CFL hardwired fixtures, LED lighting products and ENERGY STAR® appliances such as clothes washers, refrigerators, freezers, and ceiling fans with CFL or LED lights, room air conditioners, dehumidifiers and a number of consumer electronics. This is accomplished primarily through sales at retail stores with on-site and mail-in consumer rebates, but also by arranging retailer buy-downs and manufacturer mark-downs.

EP also promotes advanced power strips for home entertainment centers and controls for computers' internal power supplies. These incentives are intended to entice consumers by lowering the cost of efficient products. EP uses a variety of marketing and promotion efforts in addition to its prominently displayed in-store rebate coupons including a catalog, and an on-line purchase web site in order to build consumer awareness and participation in the program.

Program Highlights

In 2016 alone, BED customers purchased 33,983 LED and CFL bulbs, 50 LED lighting fixtures, 83 ENERGY STAR® clothes washers, 90 ENERGY STAR® refrigerators and freezers, 35 ENERGY STAR® dehumidifiers and 1,686 efficient consumer electronic devices such as ultra-efficient LCD computers monitors, efficient televisions and controlled power strips.

Variance Discussion

Savings of 1,558 annualized MWh exceeded the projection of 1,416 annualized MWh for 2016 by 10%. Annual expenditures were $387,660 which is about 50% higher than the projected budget of $257,683. BED and EVT's promotion of higher quality LED's drove the higher program spending.

Program Changes

2017 will see a continued focus on promoting specialty LED bulbs and appliances that are the most efficient within the ENERGY STAR rating. These products include: refrigerators, clothes washers, dehumidifiers, pool pumps and consumer electronics. 2017 will also see the continued promotion of high efficiency circulator pumps and air source heat pump water heaters (a limited market in Burlington due to the high saturation of natural gas).

To continue to drive demand for efficient products, BED and EVT will continue to launch various promotions designed to help raise awareness about new, innovative and emerging technologies that not only reduce energy consumption but also result in numerous non-energy benefits (i.e. improved comfort, lower operating costs and water savings). Promotions may include, for example, point of purchase marketing material, special events, co-branding and cooperative advertising, and sales force training.

Table 26: EEU Efficient Products - Total Resource Benefits

Avoided costs of Electricity	$2,040,062.96
Fossil Fuel Savings	($17,952.58)
Water Savings	$63,816.52
TRB Total	$2,085,926.82

	Annualized	**Lifetime**
Meter MWh	1,361	19,537
Generation MWh	1,558	24,220
Meter Demand Kw	1,053	15,536
Generation Peak Summer	115	1,660
Generation Peak Winter Kw	325	5,369
Water Savings	551	7,720
Fuel Increase	-127	-1,473
O+M Savings	$44,077	$652,593

Table 27: EEU Efficient Products - Summary

	Prior Year 2015	Current 2016	Program to date
Participants	464	769	16,023
--- Program Costs --			
BED Administration Costs			
General	$95,147	$142,269	$746,475
Implementation	$0	$0	$90,256
Planning	$0	$0	$14,447
Marketing	$4,327	$4,076	$149,677
IT Development	$640	$0	$22,742
	$100,113	**$146,344**	**$1,023,597**
BED Service Costs			
Participants	$2,710	$55	$329,220
Trade Allies	$0	$0	$2,281
	$2,710	**$55**	**$331,501**
BED Incentive Costs			
Participants	$438,542	$241,260	$2,268,962
Trade Allies	$0	$0	$26
	$438,542	**$241,260**	**$2,268,988**
BED Total Costs	**$541,366**	**$387,660**	**$3,624,086**
Evaluation Costs	**$6,897**	**$6,747**	**$112,483**
Participant	**$239,669**	**$559,826**	**$4,064,610**
Total Program Costs	**$787,932**	**$954,233**	**$7,801,178**
--- Benefits ---			
Annualized mWh	1,988	1,558	26,752
Lifetime mWh	24,081	24,220	217,182
Winter peak Kw	454	325	5,631
Summer Peak Kw	212	115	3,500
mWh / Participant	4	2	2
Weighted Lifetime	12	16	8

Table 28: EEU Efficient Products - End Use Summary

Description	Participants	Gross Mwh	Net Mwh	Lifetime Net	Winter Net Kw	Summer Net Kw	MMBTU	CCF
Air Conditioning	34	5.92	5.12	61.40	0.00	1.08	0.00	0.00
Clothes Washing	113	17.34	14.77	191.61	1.97	1.49	17.10	551.40
Consumer Electronics	1571	221.93	250.43	1,463.10	27.78	23.22	0.00	0.00
Hot Water	13	21.50	26.70	347.07	4.13	2.10	0.00	0.00
Lighting	4912	1,080.08	1,244.90	21,886.65	290.10	85.69	-144.43	0.00
Refrigeration	81	14.13	15.90	270.28	1.46	1.85	0.00	0.00
Total		1,360.89	1,557.81	24,220.12	325.45	115.43	-127.33	551.40

3 Thermal Energy and Process Fuels Activity (TEPF) (Residential and Commercial)

Program Description

This BED service provides thermal shell and heating system energy efficiency services to customers who use unregulated fossil fuel (oil, LP gas and wood) for their heating energy needs. This service is funded by revenues from the ISO-NE Forward Capacity Market (FCM) and Regional Greenhouse Gas Initiative (RGGI) auction proceeds.

BED and EVT established a working partnership in early 2009 that serves BED's TEPF customers. BED customers have access to the same services and incentives as those customers in the rest of the state including:

- **Home Performance with ENERGY STAR-** The EEU's collaborate to deliver TEPF savings to residential customers through a network of Building Performance Institute (BPI) certified contractors installing comprehensive home energy thermal improvements. The unregulated fossil fuel residential market is relatively small in Burlington due to the high saturation of natural gas (over 85% of residential buildings use natural gas for space heating and domestic hot water) but there are streets and neighborhoods that Vermont Gas Systems does not serve mostly due to rock ledge issues.

- **Replacement of Commercial Heating Systems –** BED customers are eligible for the same incentives as EVt customers for the installation of oil and propane boilers and furnaces in commercial buildings. BED and EVt share the same rebate form which helps to inform all contractors and distributors that this is a statewide offer. BED estimates that this is a very small market within Burlington as over 98% of commercial buildings are served by natural gas.

- **Commercial Building Performance-** Technical assistance and incentives to assist small businesses property owners in improving the insulation and comfort of their buildings. Energy audits and improvements are performed by a participating Building Performance Institute (BPI) certified contractor.

Program Highlights

There were nineteen residential completions in 2016 with total savings of 169 MMBTU's. The projects consisted of eighteen Redrocks condominium units and one single-family home. BED achieved 37% of the residential annual savings goal.

Since the program began in 2009, there have been eighty-four projects completed in Burlington with total savings of 1,332 MMBTU's. The program continues to be widely promoted by BED and EVT through a variety of channels.

Variance Discussion

The limited unregulated fossil fuel market, as well as the housing characteristics of the potential unregulated fuels market, has presented challenges in attracting participants.

BED's current best estimate is that there are about 500 to 700 homes in the TEPF market. The market is made up of homes that are predominately located in the more affluent Burlington neighborhoods where the properties have been relatively well maintained and updated over the years. The City of Burlington's energy efficiency code (established in 1991) for new construction and renovation may also be a contributing factor in relatively higher levels of existing energy efficiency. There is a limited-potential condominium market (about 250 units heated mostly by LP-gas) but it too presents challenges as about 35% of the units are rentals. As noted earlier, the rental property owner, who does not typically pay the energy bill and will not benefit from the energy savings, will need to participate or at least approve participation in any program offering.

Condominium associations present other challenges in terms of bylaws and other restrictions regarding allowed building improvements. There are also common area issues that can require greater levels of communication outreach and project management. For example, one of the complexes (Ledgewood) that we continue to focus on consists of seventy-six (76) units in nineteen (19) separate buildings and only one unit per building has an attic access hatch. The energy audits have shown that attic

bypass air sealing and added insulation will produce the greatest energy savings for these units, so access is critical. A compounding challenge is when the attic access happens to be in a rental unit.

The TEPF market is also being impacted by VGS service expansion. Ledgewood East and Ledgewood South (~ 60 units) have been working with VGS who is now able to provide service to Ledgewood East and is exploring if they can serve Ledgewood South. It is uncertain at this time how many units will convert the LP gas equipment to natural gas. BED has met with VGS and will share all energy audit data with them so that they can pursue weatherization opportunities with these customers.

VGS is also now serving the Village Green and Van Patten Parkway neighborhoods that consists of about 100 single-family homes, in the New North End, that heat predominantly with oil or LP gas.

For 2017, BED continues working with CEDO and the newly formed resident cooperative at the Farrington Trailer Park. Farrington's (now the North Avenue Cooperative) is Burlington's only trailer home park and consists of about 110 homes heated by LP or kerosene. About 30 percent of the homes are rented. Over many years, CVWS had treated many of the homes but CEDO, CVOEO and BED are exploring other energy savings opportunities with the resident owners.

Many of the homes are very old and ready to be replaced. BED, and partners, are exploring the financial viability of introducing high performance modular homes to the residents. These homes can be net-zero energy which would eliminate fossil fuel usage and have a significant financial impact for customers when compared to existing energy costs.

In May of 2017, A VERMOD model home is schedule to be installed so that residents, and potential new buyers, can see a high energy performance home first-hand.

All-electric HVAC systems incorporate efficient heat-pump technology, and all appliances and lighting are ENERGY STAR rated. *VERMOD homes require very little electricity to operate.*

Table 29: Thermal Energy and Process Fuels Activity

Period Costs for TEPF Savings	**Residential**	**Commercial**	**Total**
Year to Date Costs	$26,270	$350	$26,620
Annual Budget	$93,402	$4,916	$98,318
% of Annual Budget	28%	7%	27%
Energy Savings Results			
MMBTU Year to Date	169	0	169
MMBTU Annual Goal	450	36	542
% of MMBTU Annual Goal	37%	0%	37%
Progress Towards MMBTU 3-Year Goals			
MMBTU Cumulative to Date	277	2	279
3-Year MMBTU Goal	1,350	120	1,470
% of 3-Year MMBTU Goal	21%	2%	23%

TEPF NON-RESOURCE ACQUISITION

	Year to Date Costs	**Annual Budget**	**% of Annual Budget**
Education and Training	$1,135	$2,600	44%
Applied Research and Development	$353	$1,000	35%
Planning and Reporting	$776	$1,300	60%
Evaluation	$353	$800	44%
Policy and Public Affairs	$353	$1,000	35%
Information Technology	$495	$800	62%
General Administration	$1,131	$5,286	21%
	$12,786	**$4,596**	**36%**

4 Appendix

4.1 Definition and End Notes

Tables 30 and 31 are templates to help explain the appropriate footnotes for each program and summary table throughout this report.

Table 30: Summary Report Table Template

	Prior Year	Current Year 2015	Projected Year 2015	Projected Year 2015	Program To Date
		(1)	(2)		(3)
Participants					
	(4)				
Program Costs					
BED Administration Costs	(9)				
General	(10)				
Implementation	(11)				
Planning	(12)				
Marketing	(13)				
IT Development	(14)				
BED Service Costs	(15)				
Service to Participants	(16)				
Service to Trade Allies	(17)				
BED Incentive Costs	(18)				
Participants	(19)				
Trade Allies	(20)				
BED Total Costs	(8)				
Evaluation Costs	(23)				
Participant Costs	(21)				
Total Program Costs	(26)				
Benefits					
Annualized MWh	(27)				
Lifetime MWh	(28)				
Winter Peak KW	(29)				
Summer Peak KW	(30)				
MWh/Participant	(31)				
Weighted Lifetime	(32)				

Table 31: End Use Report Table Template

Description	Participants	Gross MWh	Net MWh	Lifetime MWh	Winter Net KW	Summer Net KW	MMBTU	CCF
	(33)	(35)	(36)	(34)	(37)	(38)	(39)	(40)

Footnotes for the report table templates:

(1) Verified activity for the current reporting year. For savings this figure will be the estimated savings for measures actually implemented and verified for the current report period. Savings should be reported in MWH, at generation and net of all approved adjustment factors, except as otherwise noted.

(2) Estimated portion of the three-year savings and costs projected for the current report year. This footnote should identify the source of the projections. Projections for categories footnoted (4) to (7), (21) to (26) and (28) to (32) will be provided if available.

(3) Program to date activity. For participation [(4) to (7)], the program to date column should count each customer (premise) only once, regardless of participation in previous years. The executive summary should count each customer (premise) only once, even if a customer was served by more than one program.

(4) Number of customers with verified installations during the current report period. Customer is defined as a unique premise as defined by the utility, with one exception. For master-metered, multifamily buildings, customer is defined as a dwelling unit.

(8) Total costs incurred by Burlington Electric Department during the current report period. All costs in nominal dollars, (9) + (15) + (18).

(9) Subtotal of all administrative costs detailed in the categories below, (10) + (11) + (12) + (13) + (14).

(10) Costs include general management, budgeting, financial management and legal costs directly associated with program implementation (such as contract review).

(11) Implementation management and administrative costs include costs related to business development and customer service, data management, and other program administrative costs directly related to implementation.

(12) Costs related to program design and planning, program screening and other similar functions.

(13) Costs related to marketing and outreach.

(14) IT development and maintenance costs do not need to be broken out by program, i.e., this category may be filled in only on the executive summary page.

(15) Subtotal reflecting total implementation costs, (16) + (17).

(16) Costs related to conducting audits or analyses, preparing the package of efficiency measures, contract management and post project follow up.

(17) Costs related to educational or other support services provided to entities other than individual program participants, such as trade allies, manufacturers, wholesalers, builders, and architects.

(18) Subtotal reflecting total incentive costs, (19) + (20).

(19) Direct payments made to participants to defray the costs of specific efficiency measures. If a program employs a shared savings mechanism or loan system, this category should include the utility share of the measure and carrying costs projected over the payment period, net of all projected participant payments.

(20) Incentives paid to manufacturers, wholesalers, builders, or other stakeholders.

(21) Total costs incurred by participants related to BED activities during the current report period. This category includes the participant contribution to the capital costs of installed measures and to specific DSM-related services, such as technical assistance or energy ratings.

(23) Evaluation costs, excluding tracking and reporting expenditures.

(24) Total program costs, (8) + (21) + (22) + (23).

(26) Total expenditures associated with the delivery of direct services to participants and trade allies, including all BED, participant and third party costs.

(27) Annualized MWH savings at generation and net of all approved adjustment factors (e.g., free riders, spill over) for measures installed and verified during the current report period.

(28) The lifetime estimated MWH savings for measures installed and verified during the current reporting year, at generation and net of all approved factors. (Estimated annualized savings times the life of the measure).

(29) Estimated impact of measures at time of winter system peak, at generation, net of adjustment factors.

(30) Estimated impact of measures at time of summer system peak, at generation, net of adjustment factors.

(31) Annualized MWH savings per participant, net at generation, i.e., (27) / (4).

(32) Average lifetime, in years, of measures in the program weighted by savings, i.e., (28)/(27).

(33) Number of customers with verified installations of measures within the end use, utility grouping.

(34) The total annualized MWH saved, at generation, net of adjustment factors, should add up to the savings reported in the line item footnoted as (27).

(35) The total lifetime MWH saved, at generation, net of adjustment factors, should add up to the savings reported in the line item footnoted as (28).

(36) The total annualized MWH saved, gross at the customer meter.

(37) The total winter coincident KW, at generation, net of adjustment factors, should add up to the savings reported in the line item footnoted as (29).

(38) The total summer coincident KW, at generation, net of adjustment factors, should add up to the savings reported in the line item footnoted as (30).

(39) Total MMus estimated to be saved (positive) or used (negative) for alternative fuels as a result of measures installed in the end use.

(40) Total water saved (CCF) (positive) or used (negative) due to measures installed in the end use.