BURLINGTON ELECTRIC DEPARTMENT

2020 Energy Efficiency Utility Annual Report

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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 Utility Commission (PUC), and the Vermont Department of Public Service (DPS), summarizing the implementation of energy efficiency programs in the City of Burlington for the year 2020. 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.

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 very supportive of BED's pursuit of additional cost-effective energy efficiency.

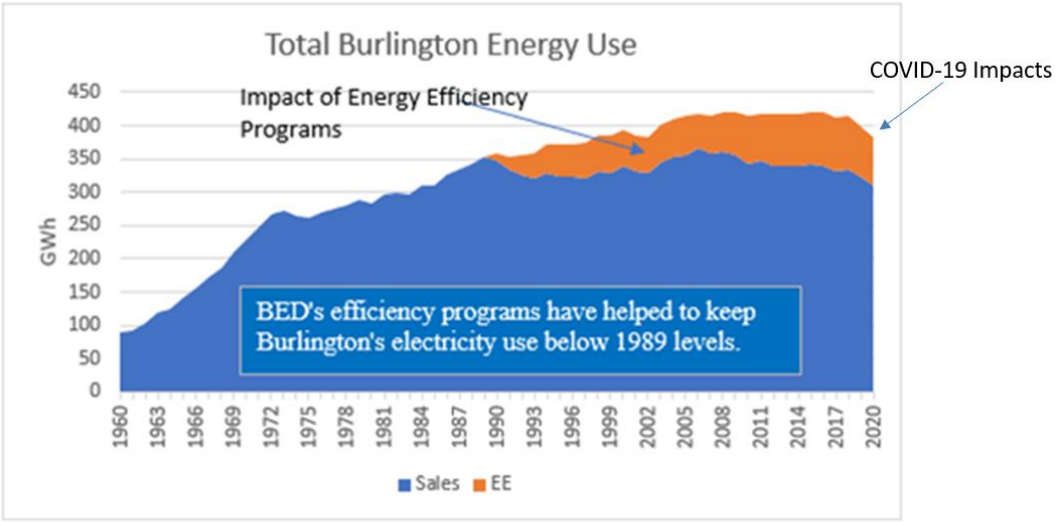
Burlington voters in 1990 approved an 11.3-million-dollar bond to fund energy efficiency programs that supported successful program activities through 2002. Since 2003, BED customers (like all other Vermont electric customers) pay a small monthly charge that supports these "Energy Efficiency Utility" programs. When these funding sources are considered along with customers' direct investment, about $76.8 million has been invested in energy efficiency efforts sponsored by BED over the last 31 years. This is comprised of about $39 million spent by BED on all of its energy efficiency efforts during that period, combined with another $37.9 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. Energy efficiency investments in Burlington are saving our customers approximately $10.4 million annually on electric bills, including avoided energy and transmission and capacity costs.

As Figure 1 indicates, the overall effect has been dramatic. Energy Efficiency has essentially flattened BED's energy load requirement since the 1990's. As of year-end 2020, electricity consumption in Burlington is approximately 8.6% lower today than in

1989 when adjusted to remove COVID-19 impacts. Actual electric consumption in 2020 was 12.3% lower than in 1989, when including COVID-19 impacts. From 1989-2018, statewide electric consumption increased more than 10%. Over same period, U.S. electric consumption increased more than 30%. In other words, we are meeting the needs of a growing local economy with less electricity than we used over 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 31 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.

Figure 1: Impact of DSM on Total City Electricity Sales



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 customers. 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. Given the relatively small size of BED's system, the loss of only a few commercial new construction projects, for example, 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 31 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 helping to reduce non-strategic load growth for the foreseeable future.

This report includes coverage of BED's program activities related to the twenty-first year of operation of the State's — and the nation's — first Energy Efficiency Utility (EEU). With the exception of Burlington, Vermont's electric energy efficiency programs are 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 VGS, Champlain Valley Weatherization Service (CVWS) and the Burlington 2030 District. A cooperative relationship with VGS helps

both organizations promote efficiency services. About 95% of Burlington's buildings use natural gas for space heating and about 85% use it for domestic hot water. 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. BED and VGS have also created a process to share weatherization program and incentives costs for customers who are partially natural gas heated and partially electric heat pump heated.

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.

As reported in BED's 2020 EEU Annual Plan, there are a number of factors that continue to inform BED's planning projections that "traditional" electric energy efficiency savings will become more expensive to obtain. The largest factor is due to increasing efficiency baselines. Baselines 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 continues to estimate that higher incentives may be necessary to encourage higher levels of overall participation and deeper savings per project.

2021 Outlook & COVID-19 Impacts -

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. BED's commercial class uses 75% of total annual electric sales. Working with private sector partners, staring in 2016, BED has helped to establish Burlington as a 2030 District member. 2030 Districts are unique private/public partnerships in designated

urban areas across North America committed to reducing commercial energy use, water, and transport emissions. More information is available at: http://www.2030districts.org/burlington.

BED's energy efficiency programs will also continue to play a major role in BED's strategic vision to make Burlington a Net Zero Energy City. BED continues to encourage building owners to reduce energy loads through weatherization, deep energy retrofits, and Net Zero Energy building practices.

As BED described in many of the 2020 monthly EEU reports, the COVID-19 crisis brought program activity to a near stand-still in the early spring of 2020. These were unchartered waters for us, but BED strived to serve all of our customers during these very difficult times. We began to offer virtual energy audits where customers can now walk us through their buildings via cell phones or tablets. We also began to use the AMI meter "instant read" functionality to remotely assist customers with high bill complaints. Working with customers, we can identify the building circuit breaker(s) with highest loads and then help to identify the appliance(s) driving the high loads. We also revised our website to give energy saving tips for customers at home all day and for commercial customers with unoccupied, or partially occupied, buildings. We also partnered with Burlington's Resource and Recovery Center (https://www.burlingtonvt.gov/resources) where customers can learn about a host of resources. BED, in partnership with VGS and Burlington's 2030 District steering committee, played an instrumental role in providing guidance on COVID related building ventilation issues. This team also helped the City secure a $90,000 State of Vermont grant focused on improving ventilation for small businesses and non-profits organizations.

In March of 2020, as a reaction to the COVID-19 pandemic, and stalled program activity, BED requested PUC approval to apply unspent 2019 EEU funds on economic recovery and "Green Stimulus" energy efficiency programs. The general intent of these programs was to reinvigorate the market for energy efficiency, when public health policy allows for broad economic activity to resume, and to generally support the City and State's efforts to recover from the economic effects of the pandemic.

BED's Green Stimulus program was a major contributing factor to overall program activity over the last six months of 2020 and BED greatly appreciates the program support given by the PUC and the DPS. Starting in June of 2020, BED saw very strong participation with residential cold climate heat pumps and some modest activity with energy efficient home appliances. This residential activity was critical as the commercial sector remained very quiet, over the same period, considering the large number of employees working from home and the greatly reduced retail and restaurant activity.

For 2021, the impacts from the pandemic remain but we are hopeful that program activity will start to return to more normal levels during the summer of 2021. The Green Stimulus program continues to play an important role in early 2021 program activity. Key customers have informed us that several planned new construction projects are being delayed until further notice due to economic uncertainty.

The remaining pages on this report provide details on BED's delivery of the following EEU services in 2020:

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

Table 1: All Business & Residential DSM History*

		Costs						MWh		kW	
	Participants	Admin	Services	Incentive	Evaluation	Participant	Total	Annual	Lifetime	Winter	Summer
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
2017	1,559	$529,382	$561,806	$1,307,062	$69,646	$2,477,247	$4,945,143	7,022	88,436	899	709
2018	1,555	$566,467	$562,927	$1,373,375	$42,397	$1,527,526	$4,072,691	5,381	70,209	942	651
2019	1,489	$545,939	$544,825	$797,194	$54,414	$684,504	$2,626,876	3,854	44,336	549	538
2020	1,228	$611,080	$464,690	$1,738,158	$106,259	$1,062,838	$3,983,025	3,792	57,343	613	492
Total	**42,668**	**$10,328,801**	**$8,362,054**	**$19,083,074**	**$1,314,873**	**$37,984,708**	**$77,073,510**	**152,076**	**1,900,382**	**25,229**	**17,145**

**All history tables in this repot reflect adjustments in MWh savings claims from the DPS savings verification process.*

Table 2: All Business DSM History

		Costs						MWh		kW	
	Participants	Admin	Services	Incentive	Evaluation	Participant	Total	Annual	Lifetime	Winter	Summer
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
2017	508	$232,740	$463,676	$907,098	$50,198	$2,183,380	$3,837,092	4,645	53,336	420	544
2018	436	$263,751	$478,835	$951,062	$31,671	$1,021,748	$2,747,066	2,985	33,472	461	497
2019	468	$292,555	$382,503	$575,846	$40,121	$445,251	$1,736,276	2,504	26,431	235	400
2020	448	$361,598	$317,005	$1,044,544	$74,576	$937,736	$2,735,459	2,642	39,210	383	411
Total	**6,657**	**$5,369,630**	**$6,004,092**	**$12,522,520**	**$851,917**	**$28,195,298**	**$52,943,457**	**95,133**	**1,220,413**	**11,875**	**11,916**

Table 3: All Residential DSM History

		Costs						MWh		kW	
	Participants	Admin	Services	Incentive	Evaluation	Participant	Total	Annual	Lifetime	Winter	Summer
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
2017	1,051	$296,642	$98,130	$399,964	$19,448	$293,867	$1,108,051	2,377	35,100	479	165
2018	1,119	$302,715	$84,092	$422,314	$10,726	$505,778	$1,325,625	2,396	36,737	481	154
2019	1,021	$253,384	$162,322	$221,349	$14,293	$239,253	$890,601	1,350	17,905	314	138
2020	780	$249,481	$147,685	$693,614	$31,683	$125,102	$1,247,566	1,150	18,133	230	81
Total	**36,011**	**$4,959,171**	**$2,357,962**	**$6,560,554**	**$462,956**	**$9,789,409**	**$24,130,053**	**56,943**	**679,969**	**13,354**	**5,229**

2 Overview of EEU Services Results

As described in more detail in each program below, 2020 proved to be a challenge for achieving savings goals in most programs. Overall, BED achieved 60% of the total annual MWh goal, 65% of the summer coincident–peak KW goal and 63% of the winter coincident–peak KW goal.

BED projected 6,383 annualized MWh savings and achieved 3,792 annualized MWh which will result in 57,343 MWh of savings over the useful life of the installed measures (2020 measures have a weighted average lifetime of about 15 years). BED projected 759 coincident-peak summer KW savings and achieved 492 KW. BED projected 970 coincident-peak winter KW savings and achieved 613 KW.

BED's projected budget for 2020 was $3,566,927 and $2,813,927 was expended, about 21% less than budgeted. BED's cost for, first year, saved energy was higher than projections. BED estimated it would spend about $560 per annualized MWh saved, and instead spent $740 per annualized MWh about 33% higher than projected. These higher costs can be directly attributed to BED Green Stimulus program activities which included significant increases to customer incentives. Absent the Green Stimulus effort, BED estimates that overall program savings and expenditures would have been significantly less.

BED's general administrative costs as a percentage of total BED program costs came in at historical performance levels; about 22% of the total budget was used to defray program operating costs in 2020. 78% of the 2020 budget was spent on direct technical assistance (energy audits and engineering services) and cash incentives to customers; 16% of this on direct technical assistance and 62% on customer incentives.

2018-2020 Three-year Performance Period Results –

For the 2018-2020 three-year EEU performance cycle, BED met 67% of MWh savings projections. BED projected 19,363 MWh savings and achieved 13,027 MWh. BED met 74% of the summer coincident-peak savings goal. 2,270 coincident-peak KW was projected, and BED achieved 1,681 KW. BED met 70% of the winter coincident-peak savings goal. 3,000 coincident-peak KW was projected, and BED achieved 2,104 KW. BED's budget for the 2018-2020 cycle was $7,952,000 (including carryover electric RA funds from 2017) and $7,204,655 was expended, about 10% less than budgeted. BED's cost for saved energy was higher than projections. BED estimated it would spend about $411 per annualized MWh saved, and instead spent $553 per annualized MWh; 35% higher than projected.

Table 32 (page 64) show BED's overall results for the 2018-2020 "Minimum Performance Requirements" and the "Quantifiable Performance Indicators" as approved by the PUC.

Table 1: EEU Business & Residential - Total Resource Benefits

Avoided Costs of Electricity	$6,928,075
Fossil Fuel Savings	($79,883)
Water Savings	$58,260
TRB Total	$6,906,458

	Annual	**Lifetime**
Meter MWh	3,816	57,577
Generation MWh	3,791	57,343
Meter Demand	1,463	21,952
Generation Peak Summer kW	492	7,509
Generation Peak Winter kW	613	9,950
Water Savings	$524	$7,245
Fuel	($250)	($3,710)
O+M Savings	$16,400	$184,009

Table 2: EEU Business & Residential - Summary

	Prior Year 2019	Current 2020	Program to Date
Participants	1,489	1,228	34,336
--- Program Costs ---			
BED Administration Costs			
General	$520,250	$607,364	$7,286,615
Implementation	$21,655	$1,004	$2,098,811
Planning	$2,816	$1,773	$116,173
Marketing	$579	$938	$911,162
IT Development	$639	$0	$225,301
	$545,939	**$611,080**	**$10,638,061**
BED Service Costs			
Participants	$544,825	$464,690	$8,926,923
Trade Allies	$0	$0	$11,761
	$544,825	**$464,690**	**$8,938,684**
BED Incentive Costs			
Participants	$797,194	$1,738,158	$20,499,303
Trade Allies	$0	$0	$73,715
	$797,194	**$1,738,158**	**$20,573,018**
BED Total Costs	**$1,887,958**	**$2,813,928**	**$40,149,763**
Evaluation Costs	**$54,414**	**$106,259**	**$1,367,332**
Participant Costs	**$684,504**	**$1,062,838**	**$40,708,727**
Total Program Costs	**$2,626,876**	**$3,983,025**	**$82,225,822**
--- Benefits ---			
Annual MWh	3,854	3,792	155,432
Lifetime MWh	44,336	57,343	1,960,098
Winter Peak kW	549	613	25,917
Summer Peak kW	538	492	18,202
MWh / Participant	3	3	5
Weighted Lifetime	12	15	13

Table 3: EEU Business & Residential - End Use Summary

		MWh			kW			
Description	**Participants**	**Gross**	**Net**	**Lifetime**	**Winter**	**Summer**	**MMBTU**	**CCF**
Air Conditioning Efficiency	70	138.28	144.47	2,110.07	0.39	6.04	103.30	0.00
Cooking and Laundry	26	52.79	42.48	535.32	7.07	4.91	0.63	513.90
Hot Water Efficiency	37	39.98	39.15	503.31	6.12	3.11	0.00	10.20
Light Bulb/Lamp	152	399.29	403.01	4,539.23	71.40	57.11	0.00	0.00
Lighting	8	58.14	61.61	698.26	8.85	6.02	-36.60	0.00
Lighting Hardwired Fixture	517	1,437.95	1,546.53	21,983.30	224.91	243.92	-332.86	0.00
Motors	33	20.64	20.16	238.51	0.75	9.88	0.00	0.00
Office	3	2.33	2.46	12.27	0.22	0.27	0.00	0.00
Other	7	363.99	386.29	7,725.73	175.54	145.96	0.00	0.00
Refrigeration	43	476.42	493.77	7,346.26	30.07	4.38	16.00	0.00
Space Heat Efficiency	62	70.76	73.03	1,450.56	4.26	0.02	0.00	0.00
Space Heat Fuel Switch	5	0.57	0.49	8.84	0.16	0.00	0.00	0.00
Space Heat Replacement	229	353.46	348.10	5,369.93	63.51	6.47	0.00	0.00
Thermal Shell	8	132.38	136.72	3,418.09	15.70	0.00	0.00	0.00
Ventilation	23	268.53	92.89	1,403.54	4.30	4.00	0.00	0.00
Total		3,815.50	3,791.17	57,343.21	613.24	492.09	-249.54	524.10

2.1 Development and Support Service

The following section highlights BED's Development and Support Services (DSS) activities for 2020 (renamed from Non-Resource Acquisition in 2017). DSS 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 DSS categories were developed collaboratively with the DPS as part of the EEU Demand Resource Plan Process and approved by the PUC.

BED's DSS activities include education, applied research, and development, planning and reporting, evaluation, policy and public affairs, information technology and general administration.

Education & Training- 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.

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.

Planning and Reporting- To help keep the Vermont PUC, the DPS, 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 DSS 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 EEU 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 DSS 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 4: Electric Development and Support Services

DSS Activity	Annual Budget	Year End Costs
Education and Training	$40,500	$35,828
Applied R & D	$12,000	$2,128
Planning and Reporting	$62,500	$71,326
Evaluation	$20,500	$16,800
Policy and Public Affairs	$13,100	$10,495
Information Technology	$15,800	$25,130
General Administration	$54,448	$64,856
Total	**$218,848**	**$226,563**

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, 2020 results in business services fell short of the savings projections. BED projected 4,787 megawatt-hour (MWh) savings while achieving actual annual energy savings of 2,642 MWh, about 55% of the projection. BED's cost to deliver EEU business services in 2020 was $1,723,147 below the budgeted amount of $2,503,382 by 31%.

As mentioned in the Introduction, it is often difficult to forecast savings and expenses in the Business 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 as explained in more detail in Business New Construction program below.

The impacts from the pandemic also significantly affected program activities as the commercial sector essentially closed down, starting in March of 2020, with a large number of employees working from home along with greatly reduced retail and restaurant activity.

Table 5: EEU Business - Total Resource Benefits

Avoided Costs of Electricity	$5,167,587
Fossil Fuel Savings	($139,487)
Water Savings	$0
TRB Total	$5,028,106

	Annual	**Lifetime**
Meter MWh	2,675	39,741
Generation MWh	2,642	39,210
Meter Demand	604	9,318
Generation Peak Summer kW	411	6,464
Generation Peak Winter kW	383	6,371
Water Savings	$0	$0
Fuel	($250)	($3,717)
O+M Savings	$11,490	$127,073

Table 6: EEU Business - Summary

	Prior Year 2019	Current 2020	Program to Date
Participants	468	448	5,001
--- Program Costs ---			
BED Administration Costs			
General	$281,445	$358,421	$3,825,642
Implementation	$7,715	$132	$1,336,354
Planning	$2,816	$1,773	$70,287
Marketing	$579	$1,273	$322,816
IT Development	$0	$0	$120,291
	$292,555	**$361,598**	**$5,675,390**
BED Service Costs			
Participants	$382,503	$317,005	$6,572,934
Trade Allies	$0	$0	$6,780
	$382,503	**$317,005**	**$6,579,714**
BED Incentive Costs			
Participants	$575,846	$1,044,544	$14,143,419
Trade Allies	$0	$0	$38,769
	$575,846	**$1,044,544**	**$14,182,188**
BED Total Costs	**$1,250,904**	**$1,723,147**	**$26,437,292**
Evaluation Costs	**$40,121**	**$74,576**	**$903,093**
Participant Costs	**$445,251**	**$937,736**	**$30,018,116**
Total Program Costs	**$1,736,276**	**$2,735,459**	**$57,358,500**
--- Benefits ---			
Annual MWh	2,504	2,642	98,559
Lifetime MWh	26,431	39,210	1,279,885
Winter Peak kW	235	383	12,577
Summer Peak kW	400	411	12,882
MWh / Participant	5	6	20
Weighted Lifetime	11	15	13

Table 7: EEU Business - End-Use Summary

		MWh			kW			
Description	**Participants**	**Gross**	**Net**	**Lifetime**	**Winter**	**Summer**	**MMBTU**	**CCF**
Air Conditioning Efficiency	6	122.55	130.06	1,949.93	0.00	0.64	103.30	0.00
Cooking and Laundry	1	0.29	0.31	3.71	0.00	0.00	0.00	0.00
Hot Water Efficiency	9	14.45	14.59	189.72	2.30	1.16	0.00	0.00
Light Bulb/Lamp	60	181.64	192.96	1,805.94	17.65	35.51	0.00	0.00
Lighting	8	58.14	61.61	698.26	8.85	6.02	-36.60	0.00
Lighting Hardwired Fixture	222	1,170.22	1,242.08	17,470.29	140.46	215.93	-332.86	0.00
Motors	1	0.09	0.09	1.76	0.02	0.00	0.00	0.00
Other	7	363.99	386.29	7,725.73	175.54	145.96	0.00	0.00
Refrigeration	10	444.13	469.31	7,032.25	27.79	1.51	16.00	0.00
Space Heat Efficiency	29	31.60	31.82	636.38	2.03	0.01	0.00	0.00
Space Heat Replacement	19	22.13	22.22	340.39	4.24	0.43	0.00	0.00
Ventilation	4	265.89	90.36	1,355.44	4.00	3.69	0.00	0.00
Total		2,675.12	2,641.70	39,209.79	382.86	410.88	-250.17	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 Vermont's Commercial Building Energy Code (CBES). By working directly and early in the process with designers and owners, BED assists in the choice of energy efficient systems and construction practices 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 (BNC) addresses all energy consuming equipment, components, or practices, including thermal envelope, motors, lighting, heating, ventilation, air-conditioning (HVAC) and building energy control packages.

Natural gas is almost universally available in Burlington. To insure comprehensiveness in building and system designs, BED coordinates with VGS on projects when appropriate. 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, the ratepayers and Vermont's climate action goals.

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 Permitting & Inspections.

After several years of offering a fairly prescriptive based program, BED, starting in 2014, began to offer an "energy model/tiered incentive" based option for larger projects. The primary motivation was to gain deeper savings per project across more end uses. Historically, BED had been successful with lighting but not as strong with thermal envelope, integrated design approaches and HVAC controls. With baselines increasing due to energy code revisions, and with electric heat pump heating and cooling technology options increasing (coupled with BED's net–zero city strategic direction), BED embarked on a new approach.

BED's tiered incentive approach pays 50% of the incentive at project completion and then the remaining incentive after about one year of comparing actual energy usage data to the building energy model. In order to best estimate the energy efficiency potential of larger buildings, robust energy modeling software is used to compare the energy performance of an energy code 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 allows for deeper BED involvement, more accurate savings claims and ensures that building operators are encouraged to optimize the energy performance of buildings. BED starts to monitor the energy usage data shortly after occupancy and provides feedback to the project team. This approach continues to be well received by customers and the design and building community.

Project Highlights

The annualized megawatt-hour (MWh) savings for 2020 were 1,007, about 48% lower than the projection of 1,938 MWh. Total BED program costs were $666,921, about 46% lower than the budgeted amount of $1,244,610. As descried in several of the 2020 EEU Monthly Reports, two senior housing buildings at Cambrian Rise development completed in 2020.

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. Also, timing plays a role in annual results as some projects do not complete precisely in the planned year. Long-term average results are a better indicator of what can be expected on an annual basis than any given year's data. In addition, the pandemic added another layer of delays to several projects.

Program Outlook

2020 will continue to see further coordination between BED's EEU and Tier 3 programs. Heat pump technology is continuing to emerge as an alternative for building space conditioning, even when natural gas service is available. Accordingly, BED will continue to evaluate the costs and benefits of various HVAC systems such as air source and ground source heat pumps. To further advance the adoption of these technologies, particularly ground source heat pumps, BED is using Tier 3 funding to help offset the initial cost of ground source or variable refrigerant flow (VRF) heat pump systems.

Combining Tier 3 and EEU funds together can help to further the City's transition away from fossil fuels to renewable electricity. Tier 3 funds can be used to influence heat pump adoption and EEU funds can be applied toward the highest efficiency water source heat pumps, thermal shell measures, building controls and lighting. The redevelopment of the former Blodgett Oven factory into the HULA office complex is a prime example of this approach. HULA fully participated in the BED BNC program and they early review of the energy consumption data is indicating strong performance.

BED will also continue to offer financial assistance for commercial building envelope commissioning. With a growing number of heat pump heated and cooled buildings (ductless mini splits, variable refrigerant flow (VRF) and ground source heat pump systems) coming online, high performance building shells, and HVAC controls, are an increased focus. With the help of Vermont based thermal envelope specialists, BED

continues working with Architects, owners, and contractors to encourage building envelops that are being designed and constructed utilizing higher performance thermal envelope techniques.

Table 8: EEU Business New Construction - Total Resource Benefits

Avoided Costs of Electricity	$2,709,749
Fossil Fuel Savings	($31,808)
Water Savings	$0
TRB Total	$2,677,941

	Annual	**Lifetime**
Meter MWh	948	15,836
Generation MWh	1,007	16,812
Meter Demand	271	4,917
Generation Peak Summer kW	217	3,969
Generation Peak Winter kW	238	4,408
Water Savings	$0	$0
Fuel	($170)	($2,516)
O+M Savings	$0	$0

Table 9: EEU Business New Construction - Summary

	Prior Year 2019	Current 2020	Program to Date
Participants	16	23	338
--- Program Costs ---			
BED Administration Costs			
General	$61,141	$37,697	$876,782
Implementation	$417	$0	$140,659
Planning	$1,119	$0	$16,966
Marketing	$579	($533)	$186,104
IT Development	$0	$0	$43,673
	$63,256	**$37,164**	**$1,264,184**
BED Service Costs			
Participants	$142,772	$114,472	$2,220,807
Trade Allies	$0	$0	$0
	$142,772	**$114,472**	**$2,220,807**
BED Incentive Costs			
Participants	$257,709	$515,285	$4,919,700
Trade Allies	$0	$0	$3,313
	$257,709	**$515,285**	**$4,923,013**
BED Total Costs	**$463,737**	**$666,921**	**$8,408,004**
Evaluation Costs	**$19,762**	**$37,077**	**$198,079**
Participant Costs	**$290,854**	**$837,390**	**$12,100,495**
Total Program Costs	**$774,353**	**$1,541,388**	**$20,706,578**
--- Benefits ---			
Annual MWh	275	1,007	24,185
Lifetime MWh	4,114	16,812	353,826
Winter Peak kW	25	238	2,673
Summer Peak kW	42	217	3,674
MWh / Participant	17	44	72
Weighted Lifetime	15	17	15

Table 10: EEU Business New Construction - End Use Summary

		MWh			kW			
Description	**Participants**	**Gross**	**Net**	**Lifetime**	**Winter**	**Summer**	**MMBTU**	**CCF**
Air Conditioning Efficiency	1	90.80	96.26	1,443.85	0.00	0.00	103.30	0.00
Hot Water Efficiency	1	3.08	3.25	42.31	0.51	0.26	0.00	0.00
Lighting	5	44.80	47.46	486.05	7.29	4.83	-27.17	0.00
Lighting Hardwired Fixture	6	354.96	377.48	5,662.19	49.77	62.09	-246.20	0.00
Other	7	363.99	386.29	7,725.73	175.54	145.96	0.00	0.00
Refrigeration	1	1.00	1.00	14.93	0.09	0.08	0.00	0.00
Space Heat Efficiency	1	2.34	2.47	49.31	0.17	0.00	0.00	0.00
Space Heat Replacement	1	2.04	2.15	32.31	0.49	0.05	0.00	0.00
Ventilation	1	85.28	90.36	1,355.44	4.00	3.69	0.00	0.00
Total		948.29	1,006.72	16,812.11	237.85	216.98	-170.07	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, financial incentives and on-bill financing 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, controls, motors, and unitary HVAC equipment.

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 VGS to encourage a comprehensive approach to energy savings. BED and VGS staff are committed to bringing appropriate projects to each other's attention.

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.

Program Highlights

The annualized megawatt-hour (MWh) savings for 2020 were 1,635, about 45% lower than the projection of 2,986 MWh. Total BED program costs were $1,056,227, about 16% under the budgeted amount of $1,258,772.

As BED's largest program in most years (this market consumes about 75% of BED's total annual kWh sales), 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 bookstores, 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

As mentioned in other sections of this report, and in prior Annual Reports and Annual Plans, BED began to explore how to move beyond lighting as the dominant measure in this market starting about five years ago. HVAC, and other measures like refrigeration, need to play a more prominent role going forward but with about 70% of BED's commercial customer leasing their spaces, HVAC improvements present strong challenges. Also, HVAC and refrigeration equipment typically have longer lifetimes then lighting so there are less frequent replacement opportunities, and they are much more expensive measures relative to lighting upgrades.

Program Outlook

BED will continue to leverage participation in the Burlington 2030 District effort. 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. More information is available at: information is available at: http://www.2030districts.org/burlington

The 2030 District effort is a unique and attractive, peer-driven, vehicle for property-owners who have not historically participated fully in BED's programs. The program is still relatively young but over 9 -million square feet of Burlington building space (about 24% of City's total gross square footage) is committed. The video featuring two property members describes the process further: https://www.youtube.com/watch?v=8MryRIwTBaw

Table 11: EEU Business Existing Facilities - Total Resource Benefits

Avoided Costs of Electricity	$2,457,838
Fossil Fuel Savings	($107,680)
Water Savings	$0
TRB Total	$2,350,165

	Annual	**Lifetime**
Meter MWh	1,727	23,905
Generation MWh	1,635	22,398
Meter Demand	333	4,401
Generation Peak Summer kW	194	2,495
Generation Peak Winter kW	145	1,963
Water Savings	$0	$0
Fuel	($80)	($1,201)
O+M Savings	$11,490	$127,073

Table 12: EEU Business Existing Facilities - Summary

	Prior Year 2019	Current 2020	Program to Date
Participants	452	425	4,663
--- Program Costs ---			
BED Administration Costs			
General	$220,304	$320,724	$2,948,860
Implementation	$7,298	$132	$1,195,695
Planning	$1,697	$1,773	$53,321
Marketing	$0	$1,806	$136,712
IT Development	$0	$0	$76,619
	$229,299	**$324,435**	**$4,411,206**
BED Service Costs			
Participants	$239,731	$202,533	$4,352,127
Trade Allies	$0	$0	$6,780
	$239,731	**$202,533**	**$4,358,907**
BED Incentive Costs			
Participants	$318,137	$529,259	$9,223,719
Trade Allies	$0	$0	$35,456
	$318,137	**$529,259**	**$9,259,175**
BED Total Costs	**$787,167**	**$1,056,227**	**$18,029,288**
Evaluation Costs	**$20,359**	**$37,499**	**$705,014**
Participant Costs	**$154,397**	**$100,346**	**$17,917,621**
Total Program Costs	**$961,923**	**$1,194,071**	**$36,651,922**
--- Benefits ---			
Annual MWh	2,229	1,635	74,374
Lifetime MWh	22,317	22,398	926,059
Winter Peak kW	210	145	9,904
Summer Peak kW	358	194	9,208
MWh / Participant	5	4	16
Weighted Lifetime	10	14	12

Table 13: EEU Business Existing Facilities - End Use Summary

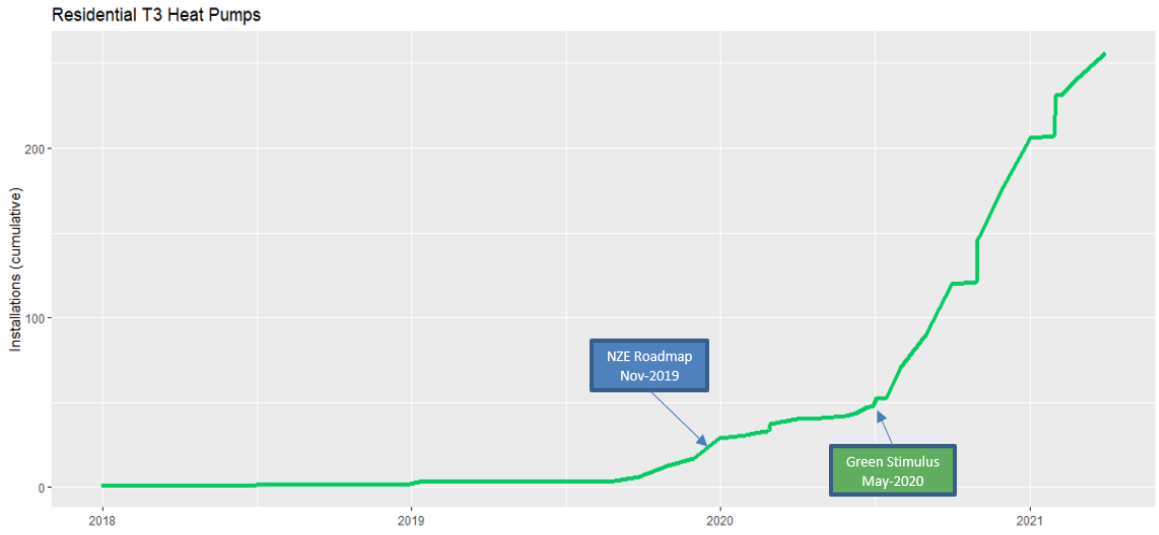
		MWh			kW			
Description	**Participants**	**Gross**	**Net**	**Lifetime**	**Winter**	**Summer**	**MMBTU**	**CCF**
Air Conditioning Efficiency	5	31.75	33.81	506.07	0.00	0.64	0.00	0.00
Cooking and Laundry	1	0.29	0.31	3.71	0.00	0.00	0.00	0.00
Hot Water Efficiency	8	11.38	11.34	147.41	1.79	0.90	0.00	0.00
Light Bulb/Lamp	60	181.64	192.96	1,805.94	17.65	35.51	0.00	0.00
Lighting	3	13.34	14.15	212.21	1.56	1.19	-9.43	0.00
Lighting Hardwired Fixture	216	815.26	864.60	11,808.11	90.69	153.83	-86.67	0.00
Motors	1	0.09	0.09	1.76	0.02	0.00	0.00	0.00
Refrigeration	9	443.13	468.31	7,017.32	27.70	1.43	16.00	0.00
Space Heat Efficiency	28	29.26	29.35	587.07	1.86	0.01	0.00	0.00
Space Heat Replacement	18	20.09	20.06	308.08	3.75	0.38	0.00	0.00
Ventilation	3	180.61	0.00	0.00	0.00	0.00	0.00	0.00
Total		1,726.83	1,634.98	22,397.68	145.00	193.90	-80.10	0.00

2.3 Residential Service Overview

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

In 2020, BED projected 1,459 annualized MWh residential savings while achieving annual energy savings of 1,150 MWh about 79% of the projected goal. BED's cost to deliver residential services in 2020 was $1,090,780, about 3% more than the projected spending of $1,063,545. BED's Green Stimulus program, as a reaction to the COVID-19 pandemic, was a major contributing factor to overall program activity over the last six months of 2020. As the graph below shows, BED saw very strong participation with residential cold climate heat pumps and some modest activity with energy efficient home appliances.

Program Uptake – Residential Tier 3 Heat Pump Incentives



As BED has described in previous Annual Reports, 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's best information indicates that about 95% of residential buildings use natural gas for space heating and about 85% use natural gas for domestic hot water.

BED also turns over 30 to 35% of residential accounts each year due to the high percentage of students. Also, BED's (pre-pandemic) average annual usage per residential customer continues to remain flat with a monthly average of about 390 kWh. BED's (pre-pandemic) residential consumption is about **24**% less than the average Vermont residential customer, about **34**% less than the average New England residential customer and about **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 and to continue to strengthen our close collaboration with VGS as we jointly serve a majority of Burlington's residential customers.

One of BED's key strategic objectives, outlined in BED's 2020-2021 Strategic Direction document, is to ensure all programs are equitable and accessible, with a priority given to low-to-moderate income, rental, black, indigenous, and people of color (BIPOC), immigrant, and refugee populations. BED will also strive to proactively seek customer input, listen to, and hear their needs, and incorporate their input into program design.

Table 14: EEU Residential - Total Resource Benefits

Avoided Costs of Electricity	$1,760,488
Fossil Fuel Savings	$59,604
Water Savings	$58,260
TRB Total	$1,878,352

	Annual	**Lifetime**
Meter MWh	1,140	17,836
Generation MWh	1,149	18,133
Meter Demand	859	12,634
Generation Peak Summer kW	81	1,044
Generation Peak Winter kW	230	3,580
Water Savings	$524	$7,245
Fuel	$1	$7
O+M Savings	$4,910	$56,936

Table 15: EEU Residential - Summary

	Prior Year 2019	Current 2020	Program to Date
Participants	1,021	780	29,335
--- Program Costs ---			
BED Administration Costs			
General	$238,805	$248,943	$3,460,972
Implementation	$13,940	$873	$762,456
Planning	$0	$0	$45,886
Marketing	$0	($335)	$588,346
IT Development	$639	$0	$105,010
	$253,384	**$249,481**	**$4,962,671**
BED Service Costs			
Participants	$162,322	$147,685	$2,353,989
Trade Allies	$0	$0	$4,981
	$162,322	**$147,685**	**$2,358,970**
BED Incentive Costs			
Participants	$221,349	$693,614	$6,355,884
Trade Allies	$0	$0	$34,946
	$221,349	**$693,614**	**$6,390,830**
BED Total Costs	**$637,054**	**$1,090,780**	**$13,712,471**
Evaluation Costs	**$14,293**	**$31,683**	**$464,239**
Participant Costs	**$239,253**	**$125,102**	**$10,690,611**
Total Program Costs	**$890,601**	**$1,247,566**	**$24,867,321**
--- Benefits ---			
Annual MWh	1,350	1,150	56,873
Lifetime MWh	17,905	18,133	680,213
Winter Peak kW	314	230	13,340
Summer Peak kW	138	81	5,320
MWh / Participant	1	1	2
Weighted Lifetime	13	16	12

Table 16: EEU Residential - End Use Summary

		MWh			kW			
Description	**Participants**	**Gross**	**Net**	**Lifetime**	**Winter**	**Summer**	**MMBTU**	**CCF**
Air Conditioning Efficiency	64	15.73	14.40	160.14	0.39	5.39	0.00	0.00
Cooking and Laundry	25	52.50	42.17	531.61	7.07	4.91	0.63	513.90
Hot Water Efficiency	28	25.53	24.56	313.59	3.81	1.95	0.00	10.20
Light Bulb/Lamp	92	217.64	210.05	2,733.30	53.75	21.60	0.00	0.00
Lighting Hardwired Fixture	295	267.74	304.45	4,513.01	84.45	28.00	0.00	0.00
Motors	32	20.55	20.07	236.75	0.73	9.88	0.00	0.00
Office	3	2.33	2.46	12.27	0.22	0.27	0.00	0.00
Refrigeration	33	32.29	24.47	314.01	2.29	2.86	0.00	0.00
Space Heat Efficiency	33	39.16	41.21	814.18	2.24	0.01	0.00	0.00
Space Heat Fuel Switch	5	0.57	0.49	8.84	0.16	0.00	0.00	0.00
Space Heat Replacement	210	331.33	325.88	5,029.53	59.27	6.04	0.00	0.00
Thermal Shell	8	132.38	136.72	3,418.09	15.70	0.00	0.00	0.00
Ventilation	19	2.64	2.53	48.10	0.30	0.30	0.00	0.00
Total		1,140.39	1,149.47	18,133.43	230.38	81.22	0.63	524.10

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 (VESH) standard.

The 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 a better performing thermal shells, HVAC equipment, efficient lighting fixtures, major appliances, and ventilation equipment.

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

- BED staff attends monthly Technical Review Committee meetings where all major new construction projects are introduced to the Burlington Planning and Zoning Department staff as part of the City's local project approval process.
- 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.
- The Burlington Department of Permitting & Inspections (DPI) refers projects to BED.

Program Highlights

In 2020, the majority of the savings came from a new 42-unit, market rate, multi-family building that is heated and cooled using air source, ductless, mini-split heat pumps (CCHPs) in each apartment. This building was completed (at the VESH "High Performance" tier) and did very well on the final blower door air leakage numbers. This is the sixth cold climate heat pump apartment building, completed over the last six years, by the same developer.

Variance Discussion

In 2020, the RNC service achieved 268 MWh in annualized electricity savings for the year which was about 61% of the projected 439 MWh goal. At $142,443 spending was 58% lower than the projected spending of $336,257.

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.

Program Outlook

In 2021, BED, EVT and VGS will continue to assist the residential market with exceeding RBES/CBES and will also promote low-load and net-zero building practices. BED's residential new construction market is dominated by multi-family structures.

As mentioned above, CCHPs 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. From a thermal decarbonization, and net zero energy city perspective, the use of CCHPs can be a positive solution, however, all of these buildings use electric resistance heat to back-up the CCHPs so potential winter peak and customer high bill issues need to be considered if both operate frequently. Fortunately, to date, BED has been able to work with building owners to design and construct high performance thermal envelopes which has mitigated peaking, high bill, and comfort issues. Also, the

electric baseboard heat is on a master control so that it cannot come on until outside temperature is lower than 5 degrees F.

BED has reviewed the 15-minute electric usage data for the CCHP buildings to date, and they are performing very well from both a kWh and CP-kW perspective. BED credits the strong attention to detail on the thermal envelopes with a particular focus on air leakage reduction work.

If thermal envelopes are done poorly, then unwanted peak issues may arise. Also, tenant comfort complaints could lead to the installation of additional electric resistance heat as it is typically the least cost solution for the building owner. As part of our on-going beneficial electrification efforts, BED will continue to focus on high performance thermal envelopes, and controls, to help mitigate possible future regrets from strategic thermal electrification.

Table 17: EEU Residential New Construction - Total Resource Benefits

Avoided Costs of Electricity	$373,464
Fossil Fuel Savings	($1,522)
Water Savings	$1,583
TRB Total	$373,525

	Annual	**Lifetime**
Meter MWh	254	5,172
Generation MWh	268	5,456
Meter Demand	89	1,660
Generation Peak Summer kW	4	58
Generation Peak Winter kW	38	722
Water Savings	$17	$189
Fuel	$1	$6
O+M Savings	$0	$0

Table 18: EEU Residential New Construction - Summary

	Prior Year 2019	Current 2020	Program to Date
Participants	7	10	481
--- Program Costs ---			
BED Administration Costs			
General	$27,474	$28,214	$530,347
Implementation	$0	$0	$96,638
Planning	$0	$0	$11,195
Marketing	$0	($23)	$93,544
IT Development	$0	$0	$34,345
	$27,474	**$28,192**	**$766,068**
BED Service Costs			
Participants	$12,467	$5,368	$679,157
Trade Allies	$0	$0	$2,700
	$12,467	**$5,368**	**$681,857**
BED Incentive Costs			
Participants	$21,455	$108,883	$830,895
Trade Allies	$0	$0	$2
	$21,455	**$108,883**	**$830,897**
BED Total Costs	**$61,396**	**$142,443**	**$2,278,822**
Evaluation Costs	**$5,370**	**$11,440**	**$83,340**
Participant Costs	**$20,287**	**$171,587**	**$594,678**
Total Program Costs	**$87,053**	**$325,470**	**$2,956,839**
--- Benefits ---			
Annual MWh	37	268	2,066
Lifetime MWh	617	5,456	37,173
Winter Peak kW	7	38	410
Summer Peak kW	1	4	314
MWh / Participant	5	27	4
Weighted Lifetime	17	20	18

Table 19: EEU Residential New Construction - End Use Summary

		MWh			kW			
Description	**Participants**	**Gross**	**Net**	**Lifetime**	**Winter**	**Summer**	**MMBTU**	**CCF**
Air Conditioning Efficiency	3	0.30	0.31	7.86	0.00	0.44	0.00	0.00
Cooking and Laundry	1	1.36	1.43	15.75	1.55	0.78	0.56	17.20
Hot Water Efficiency	5	5.68	5.42	70.55	0.86	0.43	0.00	0.00
Motors	1	0.35	0.37	7.40	0.07	0.00	0.00	0.00
Refrigeration	1	2.54	2.42	41.14	0.23	0.28	0.00	0.00
Space Heat Efficiency	6	17.45	18.43	358.87	1.12	0.00	0.00	0.00
Space Heat Replacement	1	97.36	103.00	1,545.05	18.47	1.88	0.00	0.00
Thermal Shell	2	129.24	136.37	3,409.15	15.63	0.00	0.00	0.00
Total		254.28	267.76	5,455.78	37.93	3.82	0.56	17.20

2.3.2 Residential Existing Buildings

Program Description

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

The REB program targets both market driven and discretionary, early replacement/retrofit opportunities. Additionally, the program serves as a point of contact for customers seeking advice about electric vehicles; electric vehicle charging equipment and other transportation related measures, as well as heat pump technology.

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.

BED's best information is that a majority of WAP eligible customers live in privately owned multi-family rental buildings where over 95% use natural gas for space heating and domestic hot water. The average annual electric usage for WAP eligible customers is on par with average BED multi-family residential, historic, consumption patterns of about 320 kWh per month. When combining the high saturation of natural gas usage, with relatively low electric usage, electric energy savings opportunities are somewhat limited and challenging.

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

BED and VGS continue to collaborate on working more effectively 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 LEDs per apartment. This service provides savings directly to tenants but also water savings, and potential maintenance savings via controlled ventilation fans to the property owner. This service allows us the opportunity to develop relationships with property-owners to help identify further savings from refrigeration replacements, common area lighting upgrades, laundry equipment improvements, weatherization, and ventilation.

Program Highlights

For 2020, over 200 CCHP projects dominated the program and captured about 68% of the total savings.

Variance Discussion

REB achieved 333 MWh in annualized electricity savings for the year, about 40% more than the projected goal of 238 MWh. At $604,790 spending was 57% higher than BED's projected spending of $384,032. As BED stated in the Introduction, year to year program savings can be lumpy based on a number of factors. BED's Green Stimulus program, as a reaction to the COVID-19 pandemic, was a major contributing factor to overall program activity over the last six months of 2020. BED saw very strong participation with residential cold climate heat pumps and some modest activity with energy efficient home appliances. This residential activity was critical as the commercial

sector remained very quiet, over the same period, considering the large number of employees working from home and the greatly reduced retail and restaurant activity.

Program Outlook

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 will not produce the savings necessary to make the customer's effort worthwhile. Accordingly, BED and VGS will continue with the ***energyChamp*** collaboration.

energyChamp (EC) was designed to encourage more residential customers to participate in available efficiency programs. The joint effort with VGS was born from the idea that the two utilities are stronger working together than separately. EC offers customers a one-stop option to help them take a more complete look at their total energy picture including the thermal shell, HVAC, lighting, appliances along with solutions for comfort or moisture related issues.

Table 20: EEU Residential Existing Homes - Total Resource Benefits

Avoided Costs of Electricity	$495,604
Fossil Fuel Savings	$53,517
Water Savings	$1,663
TRB Total	$550,784

	Annual	**Lifetime**
Meter MWh	346	5,245
Generation MWh	333	5,090
Meter Demand	203	2,948
Generation Peak Summer kW	22	274
Generation Peak Winter kW	55	859
Water Savings	$17	$201
Fuel	$0	$3
O+M Savings	($101)	($3,169)

Table 21: EEU Residential Existing Homes - Summary

	Prior Year 2019	Current 2020	Program to Date
Participants	133	394	9,837
--- Program Costs ---			
BED Administration Costs			
General	$71,889	$83,853	$1,558,709
Implementation	$7,529	$792	$568,788
Planning	$0	$0	$20,245
Marketing	$0	($296)	$315,808
IT Development	$0	$0	$47,283
	$79,418	**$84,349**	**$2,510,834**
BED Service Costs			
Participants	$147,425	$141,814	$1,342,181
Trade Allies	$0	$0	$0
	$147,425	**$141,814**	**$1,342,181**
BED Incentive Costs			
Participants	$33,564	$378,628	$2,351,819
Trade Allies	$0	$0	$34,277
	$33,564	**$378,628**	**$2,386,095**
BED Total Costs	**$260,407**	**$604,790**	**$6,239,110**
Evaluation Costs	**$3,930**	**$10,226**	**$240,886**
Participant Costs	**$30,740**	**($27,583)**	**$5,192,072**
Total Program Costs	**$295,077**	**$587,433**	**$11,672,067**
--- Benefits ---			
Annual MWh	61	333	22,199
Lifetime MWh	885	5,090	343,252
Winter Peak kW	9	55	6,039
Summer Peak kW	6	22	1,034
MWh / Participant	0	1	2
Weighted Lifetime	15	15	15

Table 22: EEU Residential Existing Homes - End Use Summary

		MWh			kW			
Description	**Participants**	**Gross**	**Net**	**Lifetime**	**Winter**	**Summer**	**MMBTU**	**CCF**
Air Conditioning Efficiency	55	6.83	6.53	68.86	0.28	2.29	0.00	0.00
Cooking and Laundry	14	7.11	6.79	82.21	0.92	0.69	0.23	7.10
Hot Water Efficiency	23	19.84	19.13	243.04	2.96	1.52	0.00	10.20
Light Bulb/Lamp	9	22.52	23.55	336.72	6.71	2.11	0.00	0.00
Lighting Hardwired Fixture	4	6.11	6.49	97.40	1.10	1.31	0.00	0.00
Motors	31	20.20	19.70	229.35	0.66	9.88	0.00	0.00
Refrigeration	24	1.05	1.61	27.33	0.15	0.19	0.00	0.00
Space Heat Efficiency	25	21.68	22.75	455.05	1.11	0.01	0.00	0.00
Space Heat Fuel Switch	5	0.57	0.49	8.84	0.16	0.00	0.00	0.00
Space Heat Replacement	209	233.97	222.87	3,484.48	40.80	4.16	0.00	0.00
Thermal Shell	6	3.14	0.36	8.94	0.07	0.00	0.00	0.00
Ventilation	19	2.64	2.53	48.10	0.30	0.30	0.00	0.00
Total		345.67	332.81	5,090.32	55.21	22.45	0.23	17.30

2.3.3 Retail Efficient Products

Program Description

The Retail Efficient Products Program (EPP) service aims to increase sales of ENERGY STAR® qualified lighting products, and appliances such as clothes washers, refrigerators, freezers, 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.

EPP 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. EPP 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 2020 alone, BED customers purchased over 7,000 LED bulbs and fixtures, 126 ENERGY STAR® clothes washers, 58 ENERGY STAR® clothes dryers, 159 ENERGY STAR® refrigerators and freezers, and 42 ENERGY STAR® dehumidifiers.

Variance Discussion

Savings of 549 annualized MWh missed projection of 782 annualized MWh for 2020 by 30%. Annual expenditures of $343,256 was on target of the projected budget of $342,548 LED lighting products accounted for about 85% of total program savings.

Program Outlook

BED will continue to augment EVTs statewide outreach with its own public education and product awareness campaigns using social media channels and newsletters such as the BED's "Bright Ideas" online newsletter. This newsletter includes staff written blogs and pointers about products and "ways to save" ideas. EPP is also promoted through BED's and VGS's energyChamp effort.

2021 will also see a continued focus on promoting the most efficient appliances and technologies including heat pumps but less emphasis will be placed on LED bulbs as they have mostly become the baseline technology. BED will continue to raise customer awareness about how to identify higher-quality LED products.

Table 23: EEU Efficient Products - Total Resource Benefits

Avoided Costs of Electricity	$891,420
Fossil Fuel Savings	$7,609
Water Savings	$55,013
TRB Total	$954,043

	Annual	**Lifetime**
Meter MWh	540	7,419
Generation MWh	549	7,587
Meter Demand	567	8,025
Generation Peak Summer kW	55	712
Generation Peak Winter kW	137	1,999
Water Savings	$490	$6,854
Fuel	$0	($2)
O+M Savings	$5,011	$60,105

Table 24: EEU Efficient Products - Summary

	Prior Year 2019	Current 2020	Program to Date
Participants	881	376	19,017
--- Program Costs ---			
BED Administration Costs			
General	$139,442	$136,876	$1,371,916
Implementation	$6,411	$80	$97,031
Planning	$0	$0	$14,447
Marketing	$0	($16)	$178,994
IT Development	$639	$0	$23,381
	$146,492	**$136,941**	**$1,685,769**
BED Service Costs			
Participants	$2,429	$503	$332,651
Trade Allies	$0	$0	$2,281
	$2,429	**$503**	**$334,932**
BED Incentive Costs			
Participants	$166,330	$206,104	$3,173,171
Trade Allies	$0	$0	$667
	$166,330	**$206,104**	**$3,173,838**
BED Total Costs	**$315,250**	**$343,548**	**$5,194,540**
Evaluation Costs	**$4,993**	**$10,017**	**$140,014**
Participant Costs	**$188,227**	**($18,902)**	**$4,903,861**
Total Program Costs	**$508,471**	**$334,663**	**$10,238,415**
--- Benefits ---			
Annual MWh	1,252	549	32,608
Lifetime MWh	16,403	7,587	299,788
Winter Peak kW	298	137	6,891
Summer Peak kW	131	55	3,972
MWh / Participant	1	1	2
Weighted Lifetime	13	14	9

Table 25: EEU Efficient Products - End Use Summary

		MWh			kW			
Description	**Participants**	**Gross**	**Net**	**Lifetime**	**Winter**	**Summer**	**MMBTU**	**CCF**
Air Conditioning Efficiency	6	8.61	7.56	83.42	0.12	2.67	0.00	0.00
Cooking and Laundry	10	44.02	33.95	433.65	4.60	3.44	-0.16	489.60
Light Bulb/Lamp	83	195.12	186.50	2,396.57	47.04	19.49	0.00	0.00
Lighting Hardwired Fixture	291	261.63	297.96	4,415.61	83.35	26.69	0.00	0.00
Office	3	2.33	2.46	12.27	0.22	0.27	0.00	0.00
Refrigeration	8	28.70	20.44	245.54	1.91	2.39	0.00	0.00
Space Heat Efficiency	2	0.03	0.03	0.26	0.01	0.00	0.00	0.00
Total		540.44	548.89	7,587.33	137.24	54.95	-0.16	489.60

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

Program Description

This BED service provides thermal shell (aka weatherization upgrades) heat pump and wood heating system energy efficiency services specifically to customers who use unregulated fossil fuel (oil, LP gas and wood) for their heating energy needs. There is a relatively small market for these service in Burlington as close to 95% of all buildings are served by VGS who also implements thermal efficiency programs.

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.
- **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 two residential completions in 2020 with total savings of 38 MMBtu's. The projects consisted of two single-family, owner-occupied, homes. BED achieved 13% of the 2020 annual savings goal and 46% of the 3-year (2018-2020) MMBtu goal. BED spent $20,384 in 2020, 20% of the $107,347 annual budget.

Variance Discussion

The pandemic brought weatherization project activity to a stop for most of the year. In addition, 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 400 homes in the TEPF market. The single-family 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 potential for energy efficiency savings in the condominium market is also limited (about 200 units heated mostly by LP-gas) but it too presents challenges as about 35% of the units are rentals. The rental property owner, who does not typically pay the energy bill, and will not benefit from the energy savings, is typically unmotivated to participate. For rentals, BED offers a 50% inventive for eligible weatherization improvements.

BED will continue to promote this service through a variety of channels including direct mailings to property-owners. BED will also continue to promote the service through the regional contractor network.

Program Outlook

BED's TEPF program is comprised of three main components designed to continue existing services and take advantage of new emerging opportunities. The components include:

- Traditional programs as described above
- District Energy System Study (DES); and,
- Advanced Manufactured Homes (a/k/a Zero Energy Modular or ZEM)

Regarding DES, a key focus area of the Net Zero Energy Roadmap is successfully constructing and operating a thermal district energy system from the McNeil Plant to reduce fossil fuel use in the commercial sector. BED and VGS have been actively working with community leaders, businesses, and district energy firms to study the economic viability of a DES in the city. Engineering studies are on-going as well as further discussions with UVMMC and UVM.

Regarding the ZEM Pilot effort, and as described in BED's 2018-2020 EEU Triennial Plan, BED gained PUC approval to use TEPF funds to develop a pilot that would provide financial and technical support to income qualified customers seeking to purchase ZEM homes. The pilot recognizes the financial challenges that many residents will face in obtaining a ZEM mortgage when compared to buying a used home or a conventional new mobile home. The pilot phase is designed to test all program assumptions and to ensure that potential participant are provided ample guidance to inform their home purchase decisions.

The pilot includes a Memorandum of Understanding with the Champlain Housing Trust (CHT) which allows NAC residents to participate in CHT's "Manufactured Housing Down Payment Loan Program (MHDP)" which includes access to CHT's "Home Education & Counseling" training program: http://www.getahome.org/education.

Through a partnership with Green Mountain Habitat for Humanity (GMHFH), the two ZEM's pictured here have been located in the NAC since 2019. In mid-2020, these two new homes were purchased by families who participated in the CHT home loan service; there are now three ZEM home at NAC!

BED continues to work with the NAC Board to encourage more ZEM homes in the park and will continuing working with CHT's Homeownership Program and Green Mountain Habitat for Humanity to find eligible buyers. There are about five empty lots and several homes that need replacement in the coming years.

Table 26: Thermal Energy and Process Fuels Activity

Period Costs for TEPF Savings	**Residential**	**Commercial**	**Total**
Year to Date Costs	$20,113	$252	$20,384
Annual Budget	$101,980	$5,367	$107,347
% of Annual Budget	20%	5%	19%
Energy Savings Results			
MMBTU Year to Date	38	0	38
MMBTU Annual Goal	285	35	320
% of MMBTU Annual Goal	13%	0%	12%
Progress Towards MMBTU 3-Year Goals			
MMBTU Cumulative to Date	411	33	444
3-Year MMBTU Goal	855	100	955
% of 3-Year MMBTU Goal	48%	33%	46%

TEPF Development and Support Services

	Year to Date Costs	**Annual Budget**
Education and Training	$2,101	$3,200
Applied Research and Development	$0	$600
Planning and Reporting	$664	$900
Evaluation	$414	$700
Policy and Public Affairs	$1,024	$900
Information Technology	$579	$2,676
General Administration	$6,142	$2,300
	$10,925	**$9,676**

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 27: 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 28: 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.

4.2 2018-2020 Quantifiable Performance Indicators (QPI) / Minimum Performance Requirements (MPR) Results

Table 32: BED's 2018-2020 Electric & TEPF QPI and MPR Results

QPI#	Title	Performance Indicator	Target	Policy Goal Advanced	BED Reported Results
1	Total Resource Benefits	(a) Present worth of lifetime electric, fossil, and water benefits (b) Lifetime electric Mwh savings	(a) $19,940,354 & (b) 215,120 Mwh	Encourage EEUs to design and implement efficiency initiatives that will maximize the lifetime electric, fossil fuel, and water benefits	(a) BED achieved 99% of the goal at $19,799,775 (b) BED achieved 80% of goal with savings of 171,880
2	Electricity Savings	Annual incremental net MWh expected savings	19,362	Annual incremental MWh savings indicator intended to encourage EEUs to design and implement efficiency initiatives that will maximize annual incremental electrical energy savings	BED achieved 67% of goal with 13,027 in mWh savings
3	Summer Peak Demand Savings (MW)	Cumulative net summer peak demand expected savings	2.3	Cumulative summer peak demand savings indicator intended to encourage EEUs to design and implement efficiency initiatives that will maximize the capacity reduction coincident with peak summer demand	BED achieved 74% of the goal with 1.68 in savings
4	Winter Peak Demand Savings (MW)	Cumulative net winter peak demand expected savings	3.0	Cumulative winter peak demand savings indicator intended to encourage EEUs to design and implement efficiency initiatives that will maximize the capacity reduction coincident with peak winter demand	BED achieved 70% of the goal with 2.1 in savings

5	Business Comprehensiveness of Savings	Increase the average kWh savings for commercial-sector participants over the 2018-2020 period	Improve 2018-2020 commercial sector average depth of savings by 10% or more when compared to 2015-2017 average commercial-sector savings.	Intended to ensure that energy efficiency initiatives are designed and implemented to acquire comprehensive savings	BED did not achieve this target. Average savings were slightly less than the 2015-2017 average. The final measure mix installed by customers can have a significant impact on these results i.e. large new construction
6	Long-term Market Transformation	Provide technical assistance and date analysis services in order to ensure benchmarking of a specific number (and/or square feet) of commercial buildings by end of the performance period	25 buildings or 350,000 square feet	Encourage EEUs to design and implement efficiency initiatives that maximize market transformation	BED achieved 100% of the goal with 36 buildings benchmarked during the 2018-2020 period
Items 7 through 11 below are minimum performance requirements (MPRs)					
7	Minimum Electric Benefits (Equity for all Electric Ratepayers)	Total electric benefits divided by total costs	Equal or greater than 1.2 benefit/cost ratio	Equity for all Vermont electric customers as a group by assuring that the overall electric benefits are greater than the costs incurred to implement and evaluate the *EEU* and the *EEC*	BED has achieved this goal with a cost benefit ratio of 2.7 over the three-year period (avoided cost of electricity / BED program costs + evaluation costs)
8	Equity for Residential Ratepayers	A minimum level of overall efficiency efforts, as reflected in spending, will be dedicated to residential customers	A minimum of 70% of residential-sector share of total RA spending be in the residential sector.	Equity for residential customers by assuring that a minimum level of overall efficiency efforts, as reflected in spending, will be dedicated to residential customers	BED has achieved this goal with $2,536,955 in spending over the three-year period

9	Equity for Low-income Customers	A minimum level of overall efficiency efforts, as reflected in spending, will be dedicated to Low-income customers	A minimum of 70% of the low-income sector share of total RA spending be on low-income services ($190,000 over the 3 year period)	Equity for low-income customers by assuring that a minimum level of overall efficiency efforts, as reflected in spending, will be dedicated to low-income households	BED did not achieved this goal with $151,000 in spending over the three-year period; 80% of the goal
10	Equity for Small Business Customers	Number of total non-residential premises with annual electric use 40,000 kWh/yr. or less participating in energy efficiency programs.	225	Equity for small business customers by assuring that a minimum level of overall efficiency efforts, as reflected in participation, will be dedicated to small business accounts	BED has achieved this goal with 569 participants over the three-year period.
11	Administrative Efficiency	Meet determined milestones on schedule including: a) Defining all administrative costs and providing the costs for the 2015 - 2017 period. B) By July 31, 2018, submit a proposal on how these costs will be tracked and reported, including a metric on the ratio of incentive costs and total administrative costs as a percent of total budget for the current performance period.	TBD	This indicator is intended to define and track administrative costs and ultimately require the program administrator to assess operations to ensure delivery of services in a cost effective manner that maximize ratepayer value.	BED met pre-determined milestones on schedule

TEPF QPIs are items 1 and 2 - Item 3 is a MPR					
1	Thermal & Mechanical Energy Efficiency Savings (Residential and Commercial)	Incremental net MMBTU savings (3Yr total)	955	Intended to encourage EEUs to design and implement efficiency initiatives that will maximize unregulated thermal energy savings	BED did not achieve this goal with savings of 444 MMBTU; 46% of goal
2	Residential single family comprehensiveness	1) Average air leakage reduction per project 2) Percent of projects with both shell and heating systems measures installed.	1) 34% reduction per project 2.) 16% of premises	Intended to ensure that energy efficiency initiatives are designed and implemented to acquire comprehensive savings	1) 22% reduction on average over the 3-year period 2.) Did not met this target due to the high percentage of water based heating systems in B-ton
3	Equity for Residential Customers	Minimum level of overall efficiency, as reflected in "core TEPF"* spending, is dedicated to residential customers or 95% of total budget ($300,080), less 70% performance metric cap	$210,055	Equity for residential customers by assuring that a minimum level of overall efficiency efforts, as reflected in spending, will be dedicated to residential customers	BED achieved this goal as over 95% of total program spending went to the residential class

*** Core TEPF program spending reflects BED'S 2018-2020 proposed budget without the proposed North Avenue Cooperative VerMOD pilot project that is still in development.**