2023 Tier III
Beneficial Electrification Plan of the
Burlington Electric Department

Introduction

Pursuant to Vermont Public Utility Commission ("Commission") Order in Docket 8550, the City of Burlington Electric Department ("BED") submits the following informational filing about its 2023 Tier III plan for review. This plan includes a summary of BED's :

- Tier III programs and estimated costs, including administrative expenses;
- Act 151 programs and budgets used in support of furthering Tier III participation; and,
- Estimated GHG emissions reductions.

Existing programs include:

- New and pre-owned all-electric vehicles ("AEV's") and plug-in electric vehicles ("PHEVs");
- Workplace electric vehicle chargers – Level 2 ("EVSEs");
- Multi-family EVSE's;
- BED owned public EVSEs – Level 2 & Level 3;
- Electric bikes;
- Electric motorcycles;
- Cold Climate Heat Pumps ("ccHPs");
- Heat pump water heaters ("HPWHs");
- High performance Central ducted heat pumps ("CDHPs");
- Standard CDHP's;
- Heat Pump Integrated controls;
- Air to water heat pumps ("AWHPs");
- Electric forklifts: and,
- Home and lawn appliances.

For 2023, BED proposes to introduce the following new programs and incentives:

- Workplace Level 3 EVSE;
- BED Owned, Utility pole mounted Neighborhood EVSEs;
- Multiple heat pumps per household and,
- Residential energy and heat recovery ventilation ("ERVs" or "HRVs") systems.

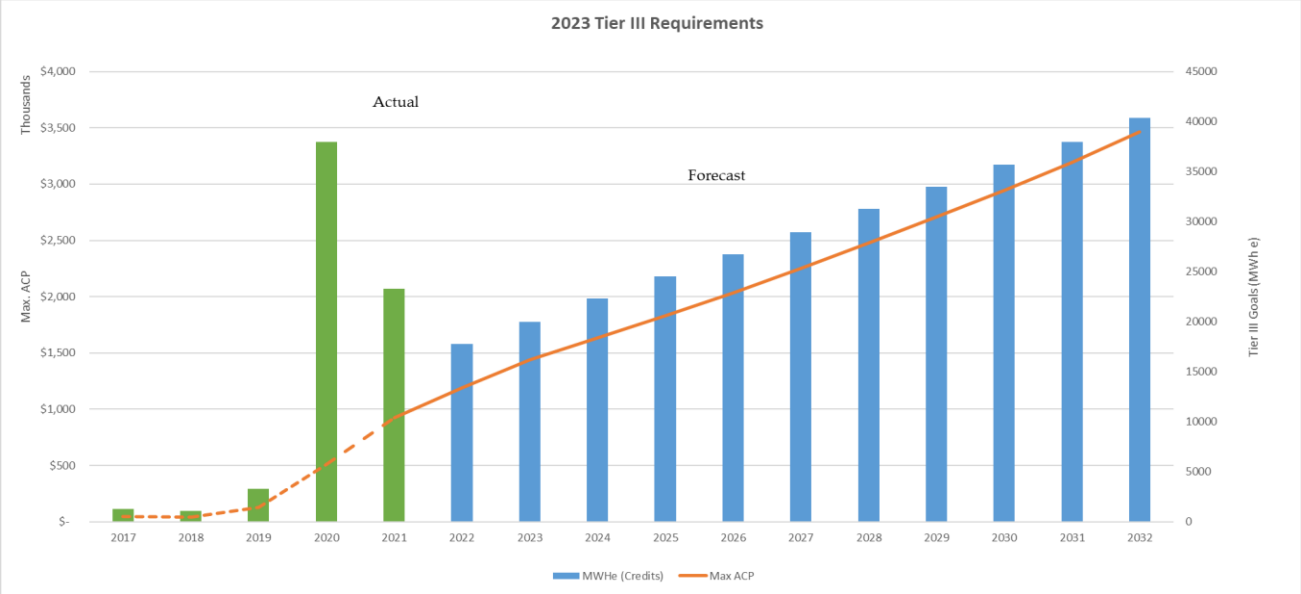
This plan also describes a series of significant program design changes to the existing centrally ducted heat pump program. The changes, which are further described below, bifurcate CDHPs into two performance categories: high performing CDHPs and standard CDHPs.

As noted in previous Tier III plans, BED's energy efficiency utility ("EEU") will continue to provide comprehensive technical assistance to Tier III participants. Although the specific nature of the assistance provided will depend on the customer's needs, the EEU will primarily emphasize strategies for lowering energy costs to the greatest extent possible, reducing greenhouse gas emissions and minimizing the impact of beneficial electrification on BED's electric distribution grid.

Lastly, as noted in the concluding paragraphs of this report, BED reconsidered providing incentives for technologies that do not increase electric consumption (i.e. pellet boilers/woodstoves and passive house designs). However, BED has again chosen not to implement these programs at this time due to the high incremental costs of these measures. In BED's opinion, these measures do not appear to be societally cost effective given the low cost of natural gas and increasingly stringent building codes for new construction. For a more in-depth discussion relative to estimated societal cost benefits of BED Tier III measures, please refer to BED's 2020 integrated resource plan approved by the Commission in April 2021 in Case 20-2492.[1]

Tier III obligation

The graph below compares BED's Tier III recent accomplishments relative to future Tier III obligations.



In both 2020 and 2021, BED exceeded its Tier III requirements. In 2021, BED acquired 23,271 Tier III credits compared to the 14,864 credits required under statute.[2] So far in 2022, BED

[1] These analyses will be updated in a new IRP to be filed in September, 2023.

[2] See; Case 22-0604.

is on track to acquire as much as 19,000 Tier III credits, compared to 16,948 credits we had originally forecasted to acquire in our 2022 Tier plan filed on November 1, 2021.

Tier III goals (i.e. credits) are based on current forecasts of MWh sales multiplied by the appropriate percentage factor established by statute. The table below provides BED's current estimate of its Tier III obligations through 2032.

	Currently Projected MWh Sales	% allocator	Tier III Credit Goals
2023	333,129	6.00%	19,988
2024	334,474	6.67%	22,299
2025	334,041	7.33%	24,497
2026	333,728	8.00%	26,699
2027	333,777	8.67%	28,928
2028	334,949	9.33%	31,263
2029	334,917	10.00%	33,493
2030	334,717	10.67%	35,704
2031	335,004	11.33%	37,968
2032	336,449	12.00%	40,375

As in previous years, BED will re-adjust its Tier III goals based on actual sales during the program year. Such a readjustment occurs in the Spring following the implementation year and is filed with the Commission in August.

Proposed 2023 Tier III Plan update

Under this proposed plan, BED will stive to generate up to 39,745 MWh e (or credits) based on a mix of Tier III measures to be installed during the year.

	Tier III Projects	2023 No. of Units	MWHe Credits	Total Budget (incl Admin)	Gross Mwhe
	AEVs & PHEVs (new&preOwned)	235	7,577	$ 506,569	$ 66.86
	BED owned EV Chargers (existing)	10	115	$ -	$ -
	BED owned Neighborhood EV	5	224	$ 11,500	$ 51.30
	Workplace EV Chargers (level 2)	10	716	$ 23,000	$ 32.14
	Workplace EV Chargers (level 3)	5	938	$ 57,500	$ 61.28
	SemiPublic MF Chargers (level 2)	25	177	$ 2,875	$ 16.26
	E Bikes	200	1,120	$ 69,000	$ 61.61
	E Motorcycle	20	180	$ 11,500	$ 63.89
Bldgs	ccHP (first unit per HH)	200	13,011	$ 416,070	$ 31.98
	ccHP (second unit)	25	727	$ 7,188	$ 9.89
	HPWH	20	377	$ 16,376	$ 43.44
	CDHP (Hi Perf)	100	6,745	$ 282,353	$ 41.86
	CDHP (Standard)	50	2,706	$ 135,294	$ 49.99
	HP Integrated Controls	10	58	$ 3,450	$ 59.23
	ERV/HRV	20	296	$ 15,939	$ 53.91
	AWHP	4	646	$ 36,800	$ 57.01
Other	Forklifts	1	125	$ 6,900	$ 55.18
	Comm. Push Lawnmowers	5	55	$ 2,875	$ 52.23
	Comm Ride Lawnmower	5	370	$ 20,125	$ 54.33
	Comm. Leafblowers	5	16	$ 863	$ 54.76
	Comm Trimmers	5	16	$ 863	$ 54.76
	Comm Chainsaw	5	16	$ 863	$ 54.76
	Resi. Push lawnmowers	150	248	$ 17,250	$ 69.70
	Resi Ride lawnmowers	10	49	$ 3,450	$ 70.41
	Resi Trimmers	25	32	$ 1,438	$ 45.63
	Resi Chainsaw	25	32	$ 1,438	$ 45.63
	Resi. Induction Cookstoves	10	36	$ 2,300	$ 63.54
	Resi Snow Blower	10	3	$ 173	$ 62.91
Semi Custom	Commercial VRFs	1	527	$ 34,500	$ 65.43
	Commercial gSHP	1	2,578	$ 172,500	$ 66.91
Eval				$ 15,000	
Totals	Totals		39,745	$ 1,877,386	$ 47.24
	Max. MWHe & Budget allowed		19,988	$ 1,435,738	$ 71.83
	Over(under) goal		19,757	$ 441,648	$ (24.59)

If successful, BED will far exceed its State mandated goal. But achieving this aggressive goal depends on multiple factors, some of which BED can control and others not. It is BED's view that in order to positively influence customers' buying decisions, and materially reduce GHG emissions in Vermont, we will need to maintain extremely strong incentives until the building heat and transportation sectors are transformed. Hence, BED's emphasis on providing customers the opportunity to combine multiple incentives together (i.e. Tier III, EEU and Act 151 incentives, as highlighted below) as a means to increase the cost competitiveness of beneficial electrification technologies vis-à-vis traditional technologies. Achieving our goal also depends on a strong economy, adequate inventories of appropriate technologies, and contractor availability. These factors are beyond BEDs control and may negatively affect our ability to reach our NZE goals.

With respect to expenditures, BED currently estimates spending as much as $1.877 million in 2023 (including administrative expenses) and $15,000 for BED's portion of the Department's evaluation of Tier III programs. [3]

Tier III Budget Summary	2023
Total Incentives	$ 1,611,295
Total Other/Admin	$ 251,091
DPS Evaluation Costs (est)	$ 15,000
Total Gross Project Costs	**$ 1,877,386**
Total Tier III Credits (Lifetime)	39,745
Gross Costs per MWh e	$ 47.24
Max ACP	$ 71.83
Admin Expense as % of Total	13.4%

The gross cost per MWhe - approximately $47 - across the Tier III portfolio is expected to be materially less than the maximum ACP of $71.83.[4]

[3] Summary Spending table does not include anticipated Act 151 program expenditures.

[4] Please note that ACP and maximum gross MWHe costs are used interchangeably throughout this plan and in the plans of other distribution utilities but mean the same thing. ACP and maximum gross MWHe equal $71.83 per credit for 2023. Actual gross MWHe costs is a function of the amount of incentives and administration costs (i.e. total costs) incurred divided by the amount of lifetime Tier III credits per measure. Net MWHe costs equal total costs incurred less incremental revenues divided by the number of lifetime credits per measure. For some measures, net MWhe costs are positive, meaning costs exceed incremental revenues. For other measures, net MWhe costs are negative, meaning the NPV of incremental revenues exceed total first year costs and, thus, result in a net positive benefit to BED over the life of the Tier III measure.

Our experience tells us that while we have had recent success in achieving our statutory goals, much more progress is necessary to achieve our net zero energy goals. In order to maintain the current pace of Tier III adoption (or accelerate it), BED and our various stakeholders must stay engaged in this process to further enhance the ecosystems that drive changes in customer behaviors and purchasing decisions. For BED this means keeping in place significant customer incentive offerings and providing technical assistance to our customers, as well as to other market actors who provide services to Burlington's residents and businesses. While significant barriers remain in place to achieve our future goals, BED is as committed as ever to achieving Vermont's clean energy goals.

New initiatives in 2023

BED is introducing three new programs this year and making modifications to others. New initiatives include:

- Offering up to $10,000 per Level 3 EVSE to workplaces, provided the owner makes EVSE charging available to the public during non-working hours, weekends, and holidays;
- Providing a $250 Tier III incentive for a second ccHP per household, which can be supplemented with an additional $250 incentive funded through approved Act 151 programs and,
- Offering up to $700 (or $1,000 enhanced incentive for income eligible) for energy & heat recovery ventilation systems in residential homes and apartments.

Modifications include:

- Increasing incentives for workplace level 2 EVSEs from $1,500 per port to $2,000 per port
- Creating a two-tiered incentive structure for CDHPs based on performance (i.e. 11.0+ HSPF) and system size (as measured in tonnage).
- Increasing incentives for residential electric ride-on mowers from $200 to $300.
- Increasing incentives for new AEV for income eligible customers from $600 to $700.

Equitable opportunities

Consistent PUC Rule 4.413, BED will continue to offer enhanced incentives to income eligible households in 2023. The table below provides a summary of our incentive offers and funding sources. For applicable measures, eligible customers can combine Tier III incentives with EEU and Act 151 incentives.

	Tier III Projects	Market Rate Incentive	Income eligible enhancement	EEU	ACT 151 incentives	Total Max Customer Incentive
Transportation	New AEV	$ 1,800	$ 700	$ -	$ 500	$ 3,000
	New PHEV	$ 1,500	$ 300	$ -	$ 500	$ 2,300
	PreOwn AEV	$ 800	$ 200	$ -	$ 500	$ 1,500
	PreOwn PHEV	$ 800	$ 200	$ -	$ 500	$ 1,500
	EVSE (home)NEW or preOwned AEV only	$ 400	$ -	$ -	$ 500	$ 900
	EVSE (home)NEW or preOwned PhEV onl	$ 200	$ -	$ -	$ 500	$ 700
	BED owned EV Chargers	$ -	$ -	$ -	$ -	$ -
	Level 2 - Workplace EV Charger, per port	$ 2,000	$ -	$ -	$ -	$ 2,000
	Level 3 - Workplace EV Charger, per system	$ 10,000	$ -	$ -	$ -	$ 10,000
	SemiPublic MF Chargers (level 2)	$ 100	$ -	$ -	$ 500	$ 600
	E Bikes (customer)(3)	$ 200	$ -	$ -	$ -	$ 200
	E Motorcycle	$ 500	$ -	$ -	$ -	$ 500
Bldgs	ccHP,less than 2tons (1)	$ 1,100	$ 400	$ 350	$ 1,000	$ 2,850
	ccHP,2tons+	$ 2,000	$ 400	$ 450	$ 500	$ 3,350
	ccHP (2nd unit)	$ 250	$ -	$ 350	$ 250	$ 850
	HPWH Tier 1&2	$ 500	$ 200	$ -	$ 300	$ 1,000
	HPWH Tier 3&4	$ 800	$ 200	$ -	$ 600	$ 1,600
	Hi Perf CDHP < 2 Tons (Res)	$ 2,000	$ 400	$ -	$ 250	$ 2,650
	Hi Perf. CDHP 2-4ton (Res)	$ 4,000	$ 400	$ -	$ 250	$ 4,650
	Hi Perf. CDHP 4+ Ton (Res)	$ 6,000	$ 400	$ -	$ 250	$ 6,650
	Std. CDHP < 2 Tons (Res)	$ 1,000	$ 400	$ -	$ 250	$ 1,650
	Std. CDHP 2-4ton (Res)	$ 2,000	$ 400	$ -	$ 250	$ 2,650
	Std. CDHP 4+ Ton (Res)	$ 3,000	$ 400	$ -	$ 250	$ 3,650
	ERV/HRV Tier 1	$ 500	$ 300	$ -	$ 250	$ 1,050
	ERV/HRV Tier 2	$ 700	$ 300	$ -	$ 250	$ 1,250
	AWHP per ton (Res)	$ 2,000	$ 400	$ -	$ 600	$ 3,000
	AWHP per ton (Com)	$ 2,000	$ -	$ -	$ 800	$ 2,800
	Integrated Controls (pilot)	$ 300	$ -	$ -	$ -	$ 300

The columns labeled "Market Rate incentive" and "Income eligible enhancement" signify that the incentives are funded through BEDs distribution utility operations (Tier III). The columns labelled "EEU" and "Act 151" indicate that incentives are funded through BED's energy efficiency utility operations (i.e. the energy efficiency charge). Although the source of these incentives is the same, Act 151 incentives and EEU incentives are recorded separately for accounting purposes.

Consistent with PUC rule 4.413 and Commission Orders, BED will strive to spend as much as $450,000 to $500,000 including administrative costs, on income eligible households (See appendix A, DPS Spreadsheet). Such spending is anticipated to amount to roughly 31 percent of total residential spending during CY2023.

In recognition of the many challenges that income-stressed households face, BED is taking additional steps in 2023 to provide meaningful technical and financial assistance to our

customers. As of this writing, BED is in the process of hiring two full-time employees who will be responsible for engaging with historically disadvantaged community members in the City. The essential function of the Project & Equity Analyst position is to:

> *advance the City's transition away from fossil fuels by collaborating with community members, external partners and stakeholders, and other BED staff to ensure that our Net Zero Energy (NZE) initiatives are equitable and accessible to all BED customers.*

This position will also provide project management, research, and perform community engagement activities in support of BED's NZE vision and programs and supports internal organizational development and capacity-building around equity, inclusion, and sustainability.

The essential function of the Energy Services Engineer is to:

> *Help[ ] customers identify opportunities to further energy efficiency and fossil fuel reductions in buildings. This position is responsible for working with Burlington's residential and small commercial customers, and with the Burlington energy professional community, in delivering BED's Net Zero Energy (NZE) programs including energy efficiency, beneficial electrification of space heating and domestic hot water systems, energy codes and City ordinances that help to advance NZE goals.*

To access BED's enhanced incentives, customers simply need to self-report to their household income on online. Burlington's threshold income levels are highlighted in the table below and follow the guidelines established by Burlington's Community Economic Development Office.

Persons in Household	1	2	3	4	5	6	7	8+
Max. HH Income	$ 61,040	$ 69,760	$ 78,480	$ 87,200	$ 94,176	$ 101,152	$ 108,128	$ 115,104

These income level thresholds are consistent with the income levels needed to qualify for our energy efficiency enhanced incentives.

As we have highlighted in previous Tier III plans, BED would like to point out once more that spending on income eligible households is based on our past experience that aggregate Tier III spending will likely be overwhelmingly residential in nature (i.e. AEV, heat pumps, etc.). Approximately 88 percent of total tier III spending in prior years has been on residential incentives for approved Tier III measures. Spending more on residential customers than commercial customers is not consistent with PUC Rule 4.413(c)(3), which directs utilities to allocate Tier III funds to residential and commercial customers in "rough proportion" to their

residential and commercial electric sales. As the Commission knows, the proportional split of MWh sales in BED's service area - and, thus, revenues - is roughly 25% residential and 75% commercial. BED maintains that spending considerably more in the residential sector yields greater benefits to Burlington's residents and allows for greater opportunities to reduce greenhouse gas emissions since commercial institutions in Burlington are not likely to pursue as many electric vehicles and heat pumps as the rest of the community – although it remains valid to assume that custom commercial projects can result in very large reductions in GHG emissions (e.g. gSHP project at Burlington's Hula conference center). ***BED also believes the skewed Tier III spending on residential households (relative to commercial electric sales) artificially elevates the Commission's spending benchmark (in aggregate dollars) for BED on income eligible households.***

Act 151 Programs

In 2023, BED proposes to continue providing additional incentives for several Tier III measures funded through our Energy Efficiency Utility's ("EEU") Act 151 budget. Customer direct incentives range between $250 and $1000, depending on the measure. In addition to customer-direct incentives, BED expects to invest a portion of the Act 151 budget on other programs designed to further support our Tier III efforts. Put another way, the programs listed below, as well as the aforementioned customer-direct incentives, are "additive and complementary" to BED's Tier III programs. Consistent with the Commission's Order in Case 22-1473[5], BED anticipates spending up to $705,000 (plus another $15,000 for the Department's evaluation study) on Act 151 customer direct incentives and other support programs, as shown in the table below.

Act 151 Program	Original budget 2021- 2023	Reallocated Budget 2021 -2023
All -Electric & PHEV	$ 90,000	$ 90,000
Preferred Dealer Network	$ 180,000	$ 45,000
MF EVSE Support	$ 75,000	$ 120,000
Advanced Heat Pumps	$ 195,000	$ 240,000
Geo-Testing Wells	$ 75,000	$ 120,000
DeltaClime	$ 90,000	$ 90,000
Act 151 Program Totals	$ 705,000	$ 705,000
DPS Evaluation	$ 15,000	$ 15,000
Total	**$ 720,000**	**$ 720,000**

[5] See Order of 10/10/2022.

It is important to note, however, that due to the delay in the approval of our demand resource plan,[6] BED was unable to fully commence its Act 151 program operations until January 2022. Thus, spending and goal achievement is being condensed into a two-year period, rather than within the three year EEU performance period. Nevertheless, BED is working hard on achieving all of its original Act 151 goals. And, while our Act 151 plans remain a *work-in-progress*, BED is currently estimating that for 2023 the Act 151 program will result in the following metrics:

Act 151 programs	Tier III participation w/o Act 151 funds	Add'l program participation w/ Act 151 funds	Total Tier III Participation
All Electric & PHEVs	190	42	235
Preferred Dealer Network	-	4	4
MF EVSE Support	3	22	25
Advanced Heat Pumps	322	77	399
Geo-Testing Wells	-	3	3
DeltaClime Projects	-	4	4

As 2023 unfolds, BED will periodically revisit the assumptions relative to Act 151 program spending and goal setting. Accordingly, BED may need to re-notify the Commission in the future about the need to transfer additional funds from one approved Act 151 program to another or to develop an entirely new Act 151 program. BED, of course, will provide appropriate notice of such transfer requests, if necessary.

Alternative Compliance pathways & Net MWhe program costs

30 V.S.A. §8005 (3)(F)(iii) stipulates that the cost effectiveness of Tier III measures shall be consistent with the provisions of subdivision (3) of the renewable energy standard ("RES"), and, as applicable, the screening tests developed under subsections 209 (d)(energy efficiency) and 218c(a)(least cost integrated planning). BED interprets this provision of the RES to mean that distribution utilities should, to the best of their abilities, pursue least cost pathways to compliance.

For BED, this provision presents a challenge. BED could simply elect to purchase additional renewable energy credits, which, given current market conditions, can be acquired for $40 to $60 per REC over the next several months, and retire them as a means to satisfy its RES obligation. However, BED is also pursuing, with other City departments, a net zero energy strategy. Moreover, BED believes that pursuing a *REC retirement only* pathway would be

[6] See Order of 8/26/2021, Case 19-3272.

inconsistent with the State's over-arching Clean Energy policies. Because of the tension created by section §8005 (3)(F)(iii) and the desire of City officials to dramatically reduce GHG emissions in Burlington, BED will continue, on a case-by-case basis, to implement Tier III programs, even though the **gross** cost per MWhe may be more than the short term option of purchasing and retiring Tier II credits and/or additional renewable energy credits ("RECs"). BED notes however that gross costs; meaning aggregate total program costs divided by tier III credits or MWhe – is not entirely indicative of actual costs incurred over the lifetime of the measures included in BED's Tier III programs. Rather than rely entirely on gross MWhe costs as the only cost effectiveness test, BED also includes below in its summary tables, a **net** MWhe cost test, if applicable and relevant. This latter test includes the net present value of forecasted lifetime revenues that are expected to be generated from an installed measure. Net revenues are discounted at 3.0 percent annually and are assumed to amount to roughly 8 to 10 cents per kWh (on average) – the retail rate, less the average wholesale costs for energy, capacity, and transmission during most hours of the year.

BED will also continue pursuing additional implementation strategies to reduce the potential cost impacts of beneficial electrification.[7] In the building thermal sector, BED's energy services staff work with customers (and VGS) to improve their building shell along with the installation of heat pumps. With such thermal improvements (i.e. increased weatherization and air sealing), the amount of electric energy consumed by heat pumps to maintain adequate indoor temperatures is reduced. As mentioned in our EEU reports, BED and VGS have developed a process to share weatherization costs for those customers who are partially natural gas heated and partially heat pump heated. In the transportation sector, BED's residential electric vehicle rate credit program has been expanded to include new and preowned all-electric vehicles and plug in electric vehicles. Under this program initiative, participating customers can receive an incentive to reduce the installation costs of an eligible in-home level 2 charger (between $200 and $400), as well as a 6 cent per kWh bill credit; provided they charge their vehicle between 10PM and 6 AM daily. Moreover, BED is extending its residential EV credit program to small business customers taking electric service under our current SG tariff.

[7] For more detail on the potential impacts of beneficial electrification on the distribution grid and associated costs, see BED's 2020 Integrated Resource Plan; Case 20 – 2492.

Projects & measures

As with previous annual plans, Tier III measures have been categorized into four general service offerings. When combined with our energy efficiency programs, including Act 151 programs, we will be able to provide customers with a suite of comprehensive energy services and financial assistance aimed at reducing the customers' total energy bills while also reducing their GHG emissions footprint.

Tier III service offerings include the following:

Transportation

- All Electric Vehicles and Plug-in Hybrid Electric Vehicles (new & preowned);
- BED owned, publicly available electric vehicle supply equipment ("EVSE");
- Workplace EVSEs – Level 2 ;
- Workplace EVSEs – Level 3 (new);
- BED-owned, Utility mounted EVSE's – Level 2;
- Semi-Public Multi-Family EVSEs – Level 2;
- Electric Bikes; and,
- Electric Motorcycles

Buildings

- Ductless cold climate Heat pumps ("CCHP," or ductless mini splits);
- Residential Heat Pump Water Heaters (HPHW");
- Energy & Heat Recovery Ventilation (new);
- Integrated Controls("IC");
- Centrally Ducted Heat pumps ("CDHP"); and,
- Air-to-Water Heat pumps ("AWHP").

Other

- Electric Forklifts;
- Commercial & Residential Electric lawncare tools; and,
- Residential Induction cook stoves.

Semi-custom Projects

- Commercial Variable Refrigerant Flow (VRF") heat pumps; and,
- Commercial ground source heat pumps.

Except for the semi-custom projects noted above, the amount of Tier III credits per measure have been prescribed and approved by the Tier III Technical Advisory Group ("TAG"). The number of credits is based on the best available information and data concerning

fossil fuel savings that could result from substituting internal combustion engines or other fossil fueled equipment with beneficial electrification technologies. With respect to semi-custom projects, the methodology for calculating fossil fuel savings and, thus Tier III credits, has been approved by the TAG but not the actual number of credits since the amount of fossil fuel savings will vary due to the size of the individual projects and application of the custom measures installed.

BED will continue to promote prescriptive measures and semi-custom projects through a variety of channels including but not limited to:

- Direct customer engagement;
- Online resources such as social media, BED's website, Front Porch Forum, and email;
- Print (i.e. North Ave. News) and on-bill messaging;
- Installation contractors and trade professionals, engineering firms and architects;
- Area Conferences (i.e. Better Buildings by Design and Renewable Energy Vermont)
- Stakeholder groups (i.e. Burlington 2030 District, Drive Electric Vermont)
- Partnerships with Vermont Gas, other City Departments (i.e. Public Works), Efficiency Vermont, affordable housing organizations and CarShare VT.

Transportation

The section below provides a high-level summary of our Transportation related efforts. In 2023, BED will continue to:

- Provide financial incentives via a mail-in rebate form (or at the point of sale if buying from a BED preferred auto dealer) for new and preowned all-electric ("AEV") and plug in hybrid electric vehicles ("PHEV"). Incentives amount to $1800 per new AEV and $1500 per new PHEV. Income-qualified customers receive an additional $700 incentive for a new AEV; $300 for a new PHEV.
- Provide an $800 per vehicle incentive for preowned AEVs and PHEV's. New this year, BED is also offering a $200 enhanced incentive for preowned vehicles to income qualifying households.
- Offer a $400 incentive for a Wi-Fi-enabled, eligible level 2 home charger to residential customers purchasing a new or preowned AEVs.
- Offer a $200 incentive for a Wi-Fi enabled eligible level 2 home charger to residential customers purchasing a new or preowned PHEV's.
- As in previous years, BED will also promote its residential EVSE rate credit program to all AEV and PHEV owners. The EVSE rate credit program provides for a $0.06/kWh credit to participating customers provided they charge between the hours of 10PM and 6AM.
- Provide commercial customers a $2,000 incentive per port for each eligible, level 2 charger at their workplace, capped at 75 percent of installed costs.
- Rebate commercial customers up to $10,000 for level 3 EVSEs, capped at 75% of installed costs; provided that the charger is publicly available during non-working hours, weekends, and holidays.
- Offer a $100 per port for eligible level 2 EVSEs to Multifamily property owners (capped at 75% of installed costs), provided the EVSE is made available to non-residents.
- Offer a $500 incentive per eligible electric motorcycle.
- Maintain BED owned level two (7.2 kW) and level three EV chargers for use by the public 24x7.[8] Chargers are conveniently located at curbside locations along downtown streets and in parking lots. Additionally, each EVSE charger can be found on web-based street maps, allowing EV owners to easily locate them. EV owners are charged in accordance with BED's existing EVSE tariff (approximately

[8] 10 public chargers have been installed since 2015, as of this writing, and are thus eligible to count toward BED's Tier III goals based on actually MWh dispensed. As more publicly available EVSE are added, BED will include additional Tier III credits based on MWhs dispensed.

$0.18/kWh, plus $1.00 per hour after 4 consecutive hours). Publicly available EVSE may be added over time as more EVs are registered in the City.

- Install and maintain five BED owned, utility pole mounted EVSEs (level 2) serving predominantly income eligible households living in multifamily buildings[9];
- Provide a $200 in-store discount to customers per eligible electric bike. Participating stores include Local Motion, Old Spokes, NorthStar Sports, Ski Rack, Outdoor Gear Exchange, Betty's Bikes, and RAD Innovations. A $50 administration fee is also provided to Local Motion for managing and implementing this program for BED in the City.

2023 Program costs and goals

As noted in the table below, BED anticipates spending approximately $682,000 (inclusive of administration costs) in the transportation sector and generating roughly 11,000 Tier III credits at a weighted average gross cost of $61 per MWhe. After considering the present value of incremental revenues (approximately $75,000 annually) from AEV and PHEVs, net costs should amount to no more than $55 per MWHe. And, while BED expects to generate some incremental revenues from the other measures listed below, they are unlikely to significantly reduce Tier III program costs in the initial years. Accordingly, such incremental revenues have been omitted from this analysis.

2023	No. of Market Rate Participation	No. of Income Qualified Participation	Aggregrate Incentives	Admin Cost	Total Cost	Total Credits	Gross $/MWh e	Net $/MWh e
AEV	86	39	$ 292,125	$ 43,819	$ 335,944	4,958	$ 67.76	$ 58.41
PHEV	34	16	$ 84,650	$ 12,698	$ 97,348	1,479	$ 65.81	$ 58.58
PreOwned AEV	34	16	$ 53,100	$ 7,965	$ 61,065	992	$ 61.58	$ 51.68
PreOwned PHEV	7	3	$ 10,620	$ 1,593	$ 12,213	148	$ 82.56	$ 74.90
Publicly Available EVSE	0		$ -	$ -	$ -	115	$ -	$ -
Workplace EVSE (lv2)	10	0	$ 20,000	$ 3,000	$ 23,000	716	$ 32.14	$ -
Workplace EVSE (lv3)	5	0	$ 50,000	$ 7,500	$ 57,500	938	$ 61.28	$ 20.83
BED Neighborhood EVSE (lv2)	5	0	$ 10,000	$ 1,500	$ 11,500	224	$ 51.30	$ -
MF SemiPublic	25	0	$ 2,500	$ 375	$ 2,875	177	$ 16.26	$ -
E motorcycles	20	0	$ 10,000	$ 1,500	$ 11,500	180	$ 63.89	$ -
E bikes	200	0	$ 60,000	$ 9,000	$ 69,000	1,120	$ 61.61	$ -
Total	**426**	**74**	**$ 592,995**	**$ 88,949**	**$ 681,944**	**11,047**	**$ 61.73**	**$ 54.96**
Max ACP							**$ 71.83**	

[9] In 2022, BED was provided a State of Vermont grant amounting to approximately $95,000 to install 5 pole-mounted level 2 EVSEs in the Old North End neighborhood of Burlington. BED is required to provide up to $10,000 in matching funds. These EVSEs will fall under BED's current publicly available tariff structure and will be maintained by BED.

Buildings

Decarbonizing Burlington's building sector hinges on whether BED can maintain robust customer incentives to offset the upfront capital costs of converting from natural gas systems to heat pumps. But simply converting heating systems in buildings will not be enough. Other initiatives are necessary too. These initiatives include but are not limited to promoting climate-oriented City ordinances for newly constructed buildings, increasing awareness about the benefits of thermal energy efficiency, and capacity building within the trades industry as a means to elevate expertise and professionalism in the building trade sector. While this section of the plan focuses primarily on providing rebates directly to customers and market actors for heat pumps and other measures, BEDs energy efficiency utility staff will continue to work with customers to improve building envelops at the time of their heat pump installation. BED will also continue to partner with VGS as part of the ongoing hybrid home pilot project, which seeks to also reduce home heating loads as heat pumps are installed. Such homes shall also have integrated controls installed to optimize the cost effective use of a customer's heat pump.

New initiatives and significant changes this year

In addition to providing the above-referenced basic services to its customers, BED will - for the first time – provide a $250 rebate to customers for a second ductless mini split heat pump condenser installed at their premise. Up to now, BED has limited Tier III incentives to 1 heat pump system (i.e. outside condenser unit) per household.

Consistent with Tier III TAG policy and Commission Order in Case 22-1473, BED will claim the same level of Tier III credits for each ccHP system installed regardless of the number of outdoor condenser units installed at the premise. Additionally, customers participating in BED's second heat pump program will be able to combine Act 151 incentives ($250/unit) and mid-stream EEU incentives ($250/$350) together. It is worth noting that BED does not anticipate that very many customers will seek to install a second heat pump at their premise; perhaps 25 additional units. As a consequence, the impacts (i.e. costs, electric loads and GHG emissions reductions) of this proposed revision are likely to be immaterial. The table below provides a summary of the anticipated costs and benefits from the second heat pump program.

2nd Ductless HP		2023
No. of Units		25
Total Lifetime MWHe Credits		727
2nd Incentive per condensor		250
Aggregrate budget	$	6,250
Other Expenses	$	938
Total Budget	$	7,188
Cost per MWHe	$	9.89
ACP per MWHe	$	71.83
NPV Net Lifetime Revenue (avg.)		$53,671
Net Cost per MWHe	$	(63.97)
Est Ann. MWh sales (avg)		56.2

As shown above, the gross cost of this second heat pump program is anticipated to amount to only $10 per MWhe, well below the ACP. Even if the Act 151 incentive (another $250 per unit) were to be included as part of this calculation, gross costs per MWhe would amount to only $20, compared to an ACP of $71.83 per MWh e.

Along with this new second ductless heat pump program offering, BED will initiate a series of modifications on January 1 to its existing CDHP program. These modifications include a streamlined incentive structure and minimum performance standards. For higher performing CDHP systems, BED will provide Tier III rebates of:

	Proposed	Existing
<2 tons	$2,000	$1,100 per ton
2-4 Tons	$4,000	
>4 Ton	$6,000	

High performance incentive levels are contingent upon the customer (and/or installer) certifying that the units installed have a HSPF of 11.0 or greater and that the unit's cross-over temperature is set at 15°F[10]. Moreover, CDHPs will need to provide "whole-of-building"

[10] Crossover temperature set point is the outdoor temperature at which the CDHP is programmed to shut down.

heating. So-called "short-ducted" systems serving a smaller subset of rooms in a household shall be disqualified.

If a customer installs a CDHP unit with a lower HSPF, sets a crossover temperature at a level higher than 15°F or installs a short-ducted system, then incentives will be reduced to $1,000, $2,000, and $3,000, respectively, for each bin noted in the above table.

Lastly, BED is introducing this year an energy/heat recovery ventilation program. ERV/HRV systems are commonly used in high-performance construction and retrofit projects. These systems reduce energy loads in homes by transferring filtered waste heat from a home's exhaust air stream to the intake air ducts of a heating system during the colder months, saving energy.

As shown in the table below, BED anticipates spending up to $15,900 supporting this program and claiming up to 296 Tier III credits.

ERV/HRV Tier 2		2023
No. of Units		20
Total Lifetime MWHe Credits		296
Aggregate Incentive budget	$	13,860
Other Expenses	$	2,079
Total Budget	**$**	**15,939**
Cost per MWHe	$	53.91
ACP per MWHe	$	71.83
NPV Lifetime Revenue		$4,788
Net Cost (benefit)per MWHe	$	37.71

In summary, Tier III incentives for 2023 by technology are as follows:

- Cold Climate heat pumps (ductless) – BED is setting incentives for systems that are less than 2 tons in size of $1,100 per unit/condenser; and $2,000 per unit for systems that are 2 tons or greater in size. Income qualifying customer receive an additional $400 per unit. Incentives are capped at 75% of installed costs, except for income qualifying customers. As noted above, customers can benefit from additional financial incentives in the form of sales discounts received by their contractor at the distributor level. Such discounts will be paid by the EEU (between $350 - $450) through its traditional DRP budget and from Act 151 program funds.

Finally, customers installing more than one ductless heat pump system at a single premise can also receive a $250 Tier III incentive (plus, $250 Act 151 incentive).

- Heat pump water heaters – $500 per Tier ½ systems; $800 for Tier ¾ systems. Income qualifying customers can receive an additional $200 per unit.
- High performance CDHP – as noted, incentives will be streamlined into 3 bins: $2,000, $4,000, and $6,000 for less than 2 ton systems, 2-4 ton systems and greater than 4 tons, respectively. Income qualifying households may also receive an additional $400 per condenser. Except for income qualifying households, incentives will be capped at 75% of the installed cost.
- Standard CDHP – incentives shall be set to $1,000, $2,000, and $3,000 for 2 ton systems, 2-4 ton systems and greater than 4 tons, respectively. Income qualifying households may also receive an additional $400 per condenser. Except for income qualifying households, incentives will be capped at 75% of the installed cost.
- ERV/HRVs – Incentives shall be based on performance tiers. Incentives for Tier 1 & 2 systems will be set at $500 per unit, while Tier 3 & 4 systems will be set at $700 per unit. Income qualifying households may also receive an additional $300 per condenser. Except for income qualifying households, incentives will be capped at 75% of the installed cost.
- AWHP - $2,000/ton for residential and commercial customers. Except for income qualifying households, incentives will be capped at 75% of the installed cost. Of this amount, BED's energy efficiency utility will pay 25% of the incentive and claim all of the electric savings while the Tier III program claims the fossil fuel savings allowed under the TAG approved prescriptive formula.
- Customers installing eligible, WIFI enabled integrated controls will receive $300 per household.

Other advanced heat pump technologies, such as ground source heat pumps (gSHP) and commercial-grade variable refrigerant flow heat pumps are discussed below in the semi-custom section of this report.

2023 Program costs and goals

In the aggregate, BED plans to spend up to $0.914 million in the building thermal sector, mostly for ductless mini-split heat pumps and centrally ducted heat pumps in residential buildings. At this level of spending, BED also expects to claim nearly 25,000 credits. Spending in this sector does not include weatherization expenditures, which would be funded partially through Vermont Gas's energy efficiency programs and/or with BED's energy efficiency funds since customers will be relying, in large part, on their newly installed heat pump for a significant portion of their heating needs. The weighted average cost of this program is

expected to amount to nearly $37 per MWh e. Net utility benefits amount to approximately $12 per MWhe, as heat pumps are expected to increase MWh sales significantly.

2023	No. of Market Rate Participation	No. of Income Qualified Participation	Aggregrate Incentives	Admin Cost	Total Cost	Total Credits	Gross $/MWh e	Net $/MWh e
ccHP (1st Unit)	138	62	$ 361,800	$ 54,270	$ 416,070	13,011	$ 31.98	$ (30.63)
ccHP (2nd Unit)	25	0	$ 6,250	$ 938	$ 7,188	727	$ 9.89	$ (63.97)
HPWH	14	6	$ 14,240	$ 2,136	$ 16,376	377	$ 43.44	$ 2.43
CDHP (HiPerf)	69	31	$ 240,000	$ 42,353	$ 282,353	6,745	$ 41.86	$ 15.47
CDHP (Std)	35	15.5	$ 115,000	$ 20,294	$ 135,294	2,706	$ 49.99	$ (4.82)
AWHP	4	0	$ 32,000	$ 4,800	$ 36,800	646	$ 57.01	$ -
Integrated Controls	10	0	$ 3,000	$ 450	$ 3,450	58	$ 59.23	$ -
ERV/HRV	20	0	$ 13,860	$ 2,079	$ 15,939	296	$ 53.91	$ -
Totals	**315**	**115**	**$ 786,150**	**$ 127,320**	**$ 913,470**	**24,565**	**$ 37.19**	**$ (12.07)**
Max ACP							**$ 71.83**	

Other Measures

The table below highlights a number of additional beneficial electrification measures that will be promoted in 2023. These products will be primarily promoted through upstream channels i.e. hardware stores located in the City or nearby towns. Customers may access rebates through BED's online application processes.

2023 Program costs and goals

As shown in the table below, BED anticipates investing up to $60,000 to support these electrically powered devices for residential and commercial use. Weighted average gross MWhe costs are estimated at roughly $58. Due to the small size of the measures involved and program in general, BED does not anticipate that adoption of these technologies will materially impact MWh sales.

2023	No. of Market Rate Participation	No. of Income Qualified Participation	Aggregrate Incentives	Admin Cost	Total Cost	Total Credits	Gross $/MWh e
Forklifts	1	0	$ 6,000	$ 900	$ 6,900	125.0	$ 55.18
Comm. Push Lawnmowers	5	0	$ 2,500	$ 375	$ 2,875	55.1	$ 52.23
Comm Ride Lawnmower	5	0	$ 17,500	$ 2,625	$ 20,125	370.5	$ 54.33
Comm. Leafblowers	5	0	$ 750	$ 113	$ 863	15.8	$ 54.76
Comm Trimmers	5	0	$ 750	$ 113	$ 863	15.8	$ 54.76
Comm Chainsaw	5	0	$ 750	$ 113	$ 863	15.8	$ 54.76
Resi. Push lawnmowers	150	0	$ 15,000	$ 2,250	$ 17,250	247.5	$ 69.70
Resi Ride lawnmowers	10	0	$ 3,000	$ 450	$ 3,450	49.0	$ 70.41
Resi Leafblowers	25	0	$ 1,250	$ 188	$ 1,438	31.5	$ 45.63
Resi Trimmers	25	0	$ 1,250	$ 188	$ 1,438	31.5	$ 45.63
Resi Chainsaw	25	0	$ 1,250	$ 188	$ 1,438	31.5	$ 45.63
Resi. Induction Cookstoves	10	0	$ 2,000	$ 300	$ 2,300	36.2	$ 63.54
Resi Snow Blower	10	0	$ 150	$ 23	$ 173	2.7	$ 62.91
Total			**$ 52,150**	**$ 7,823**	**$ 59,973**	**1,028**	**$ 58.35**

Semi-Custom projects

In 2023, BED will continue to pursue semi-custom projects throughout the City by directly engaging with commercial customers, property developers and building contractors. While BED is open to reviewing all viable projects that can reliably reduce greenhouse gas emissions, preference will be placed on identifying, selecting, and implementing projects that:

- Have long measure and project lives (15+years),
- Reduce a customer's annual fossil fuel consumption by at least 60 - 80 percent; and,
- Include load control capabilities.

Our preference for larger and long-lived projects has meant focusing primarily on promoting variable refrigerant flow ("VRF") systems in commercial buildings. As noted in previous Tier III plans, VRF systems are comprised of large heat pumps with variable speed motors that distribute conditioned air supply (both heating and cooling) through existing and newly installed insulated ducts in buildings. Thus, VRF's are able to maintain consistent temperatures throughout buildings over time. What is more, VRF systems distribute excess heat that accumulates in some internal spaces due to passive heat gains and/or machines (i.e. data servers) and moves it to other spaces in need of additional heat. This feature amounts to essentially free heat (other than fan motors needed to filter air and move heat through the ducted system) and can reduce the cost and emissions of heating buildings.

Other technologies that BED will be promote in 2022 and beyond include ground source heat pumps, advanced multi-ton rooftop units and electric buses. These too are commercially relevant technologies that have been deployed in the past but due to costs and other market barriers have not yet been widely adopted by Vermonters. BED anticipates that neither a gSHP nor an electric bus project will be completed in 2023 due to long project lead times. Nevertheless, BED may either increase its Tier III budget to capture these types of rare opportunities to reduce GHG emissions or transfer reallocate funds from other programs.

Although Semi-custom incentives and estimated Tier III credits will vary between projects, our project review methodology, as further described below, will be applied consistently, irrespective of the technology, customer and building types. Our analytical approach and methodology allow for project-specific incentives to be established based on documented energy modeling of fossil fuel savings that strike a balance between actively promoting new technologies, preventing free ridership, and managing the potential cost impacts of these measures. BED intends to achieve such a balance by capping incentives on a per project basis and allocating a program cost limit of $300,000, inclusive of administrative costs. In summary, program design details are as follows:

- $300,000 total program cost limit;
- $200,000 incentive limit per project;
- Load controls shall be incorporated to the greatest extent possible; and,
- Total incentive package per project shall not exceed 75 percent of the incremental cost of the project.

To participate in a semi-custom project, BED staff will work with customers and their contractors to conduct a series of energy analyses. The following highlights what such analyses may include:

- For new construction and major rehabilitation projects (or "gut rehab"), energy modeling results of forecasted fossil fuel savings relative to code-compliant

buildings and mechanical (i.e., heating/cooling, ventilation, and pumping) equipment[11];
- Estimates of electricity consumption and peak demand; and,
- Estimates of incremental installation and technology costs relative to code-compliant mechanical equipment.

As projects are developed and enrolled in the program, BED will work with customers to evaluate the appropriate energy modeling tools and methodologies. However, BED approval of the energy modeling software, methodology and modeling outputs will be required before incentives are paid out. Project participants shall also agree to install demand controls, as well as actively respond to BED's requests to shift power demand to off-peak periods. Lastly, project participants will be provided, if applicable, with additional electric energy efficiency incentives (paid out of the EEU budget) to improve the electric and thermal efficiency of their buildings relative to existing codes.

It is important to re-iterate here that this program description does not specify an incentive that could be offered to a prospective program participant. Nor does this program description identify the specific number of Tier III credits BED may generate from a specific Semi-custom project. Instead, the description below provides an example of a hypothetical project and how incentives and credits are determined.

Analytical methodology and savings tools

As noted above, participating customers will be required to submit their energy analyses to BED for review and evaluation. At a minimum, the analyses shall include energy modeling scenarios (or model runs) based on TMY3 normalized weather data, proposed building & engineering/mechanical designs, and occupancy schedules. Energy model runs shall compare a base case scenario relative to the annual estimated savings and costs of various heat pump system configurations, along with estimated rate and bill impacts. The base case scenario shall reflect status quo conditions of existing heating/cooling plant and no building envelop improvements. Alternative configuration scenarios may include but shall not be limited to the following:

- Heat pump system offsets 100% of the estimated fossil fuel consumption under existing building conditions (i.e. no building envelop improvements are installed);
- Heat pump system offsets 100% of the estimated fossil fuel consumption under minimally code – complaint conditions (i.e. existing heating/cooling system(s) is

[11] Along with the modeling results, project participants shall be required to also submit other information and data, as requested. Such information and data may include but shall not be limited to setback temperatures, occupancy schedules, heating/cooling load requirements, thermal efficiency levels, and water flow analyses (for gSHPs).

replaced/upgraded with a code – compliant natural gas fired rooftop unit and/or boiler but no building envelop improvements are installed);

- Heat pump system offsets 100% of the estimated fossil fuel consumption under minimally code – compliant equipment replacement, plus the customer also installs building improvement measures (i.e. air sealing, added insulation, new windows etc.); and,
- Heat Pump system offsets 80% (at minimum) of the estimated fossil fuel consumption under minimally code – compliant equipment replacement, plus the customer installs building improvement measures (i.e. air sealing, added insulation, new windows etc.).

For each model run, BED will provide to the customer a preliminary incentive estimate based on the range of realistic fossil fuel savings predicted by the model. The potential range of Tier III incentives will also be combined with energy efficiency related incentives for lighting, weatherization, and any other applicable measures. Once the customer selects the optimal configuration that achieves their goals and capital budget requirements, BED will have the customer re-run the energy model based on the selected design configuration with updated and well-documented, final assumptions and cost inputs. Based on the outputs of this final model run, BED will confirm estimated fossil fuel savings with the customer and finalize the incentive amount. Separately, BED will estimate the potential Tier III credits for reporting.

All incentives and Tier III credits will be established using the tool highlighted below. The example calculation below reflects a commercial project that BED has completed with a customer in the past. The results of this example are being used solely for budgeting purposes and, thus, the exact cost of any future semi-custom project or projects may vary considerably.

Customer:	Busniess name		
Semi-Custom Measures ACP estimator tool			
Step			
1	Displaced Fuel Type		Natural Gas
2	mmBTU content per unit of Fuel		0.10280
3	Net annual estimated displaced ccfs		8,800
4	Annual mmBTU savings		905
5	Heat Rate		8.773
6	First Yr MWh e		103.1
7	Measure Lifetime		25
8	Total Lifetime Credits (MWh e)		2,578
9	Annual Compliance Payment rate	$	71.83
10	Max. ACP Avoided	$	185,171
11	Less Admin costs (15%)	$	27,776
12	Total potential Incentive Payment	$	157,396
13	Total incremental cost	$	250,000
14	Incentive as % of install costs		63.0%
15	Incentive per ccf saved (*lifetime*)	$	0.72
	GHG Emissions reductions		
	lbs of CO2 per mmBTU		117.00
	tonnes of CO2 (lifetime)		**1,323**

Using the example above, the project participant provides BED with the key variables for the type of displaced fossil fuel, net annual estimated ccf's displaced, measure life and total incremental costs. All other cells are automatically calculated within the tool. In this example, the total potential incentive – without BED's per project limitations – could amount to $157,000. The maximum potential incentive is based on the total amount of natural gas savings and the 25 year measure life. If, however, the installed cost of the system was lower – say $100,000 – the maximum incentive would be reduced to $75,000 to account for the 75% cap applied to all projects by design.

2023 Program costs and goals

Assuming two hypothetical custom projects are installed in 2023, BED anticipates spending up to $207,000, inclusive of administrative costs, and claiming between 3,000 and 4,000 Tier III credits. Gross costs per MWh e may range between $55 to $71.

Custom projects	2023
No. of Units	2
Total Lifetime MWHe Credits	3,750
Max. Incentive	$ 180000
Admin	$ 27,000
Total Project costs	$ 207,000
Cost per MWHe	$ 55.20
Max. ACP per MWHe	71.83

As each project is unique it is difficult to precisely determine the additional electrical loads that each system will generate on BEDs distribution grid. Thus, we have not attempted to provide such an estimate for the purposes of calculating a net MWhe costs.

Greenhouse Gas emissions reductions

Assuming customers adopt all of the projects highlighted above, the impact on the electric grid in 2023 will be modest in terms of incremental sales growth – roughly 2000+ MWhs. As shown in the table below, EV's and heat pumps (in aggregate) will most likely have the largest impact on increased electric load growth. In terms of GHG emissions reductions, BED anticipates that the Tier III program will reduce GHG emissions between 18,000 to 20,000 tons over the lifetime of the measures installed in 2023. Naturally, GHG emissions reductions will incrementally increase as more measures are adopted each year.

2023 Potential Electric Loads & GHG Emissions Reductions				
Tier III Measures/Projects	No. of Measures	Per unit Incr. Ann. MWh (est.)	Aggregate Ann. MWhs	Potential GHG Emissions reductions (tonnes)
AEV & PHEV	235	2.40	565	4,427
Public EVSE	10	7.04	70	80
Workplace EVSE/port (level2)	10	4	43	495
Workplace EVSE(level3)	5	11.17	56	649
MF SemiPublic EVSE	25	0.42	11	122
ccHP	200	4.26	853	6,279
CDHP	150	2.70	404	6,294
Total			**2,001**	**18,346**

For more detailed information regarding the forecasted and cumulative potential impacts that the Tier III measures may have on the electric grid, as well as BED's initiatives to ameloriate them, please refer to BED's 2020 Integrated Resource Plan.

Alternatives to Tier III measures that do not increase electric use

BED has not prepared a comprehensive review of other alternative measures to beneficial electrification technologies that do not increase electric loads. The reason is because BED is not convinced that such alternative measures are commercially available, cost effective or capable of reliably serving the energy needs of our customers. Nevertheless, BED offers all of its customers, including those participating in Tier III programs, extensive electric energy efficiency services. BED's energy efficiency assistance is designed to help customers reduce their electric bills and minimize the increased electric demand and costs that may result from adoption of beneficial electrification technologies.

Going forward, BED will consider any potential programs, services or technologies that come to its attention that are not expected to increase electric usage and demand. If BED becomes aware of such programs, it will consider appropriate modifications to this plan, and/or expand its programs to meet its Tier III targets. Due to the aggressive goals set both in BED's NZE roadmap and in the renewable energy standard, BED suspects that all cost-effective options will need to be leveraged. However, BED reiterates its conclusions referenced in the 2020 IRP that the Tier III programs, which will likely increase aggregate electric usage across the City, have the potential to reduce electric rates for all customers, including non-participants, especially if BED can encourage customers to consume electricity during non-peak periods.

Conclusions

Successful implementation of the above noted programs is expected to result in approximately 40,000 MWh_e credits in 2023 and require an expenditure of up to $1.8 million, inclusive of administrative costs. At this point, BED views the use of excess VT Tier II RECs and banked Tier III credits to be a less desirable pathway to comply with its Tier III obligation in 2023. Accordingly, BED proposes to implement, to the best of its abilities, the above noted programs even though our Tier III programs may be a more costly pathway (in the short term) than purchasing (& retiring) additional RECs. BED also believes that pursuing its preferred Tier III plan is much more supportive (than the alternative REC-only pathway) of Vermont's broader policy goals to move the state away from fossil fuel use. However, BED may still use such excess Tier III credits carried forward from past years to avoid having to make ACP payments in the future.

Finally, BED continues to work diligently on evaluating new Tier III projects that may encourage customers, especially low to moderate income customers, to adopt beneficial electrification technologies. We are especially looking forward to leveraging Act 151 funds as a

means to increase Tier III program participation and raise awareness of the multiple climate actions customers can take to lower their greenhouse gas emissions. As a result of such evaluations, BED may introduce in the months ahead new projects and/or additional support activities . Proposed activities, if any, will not only focus on increasing program participation but shall also seek out ways to increase access to minority and disadvantaged community members.

Appendix A

Measure [a]	Per measure Incentive [b]	Per measure Admin cost [c]	Avg. Total Cost per measure [d]	# of measures [e]	Total Gross Cost [f]	Present Value Net Revenue [g]	Utility Present Value Life Cycle Cost (Total Net Costs) [h]	Average Savings per unit (MWhe) [i]	Total Savings (MWhe) [j]	Gross $/MWhe [k]	Utility Present Value Life Cycle Cost Net $/MWhe [l]
AEVs & PHEVs (new&preOwned)	$ 1,833	323	$ 2,156	235	$ 506,569	$67,968	$ 438,601	32.24	7,577	$ 66.86	$ 57.89
BED owned EV Chargers (existing)	$ -	0	$ -	10	$ -	$7,043	$ -	11.53	115	$ -	$ -
BED owned Neighborhood EV Chargers (level 2)	$ -	0	$ -	5	$ 11,500	$6,831	$ 4,669	44.84	224	$ 51.30	$ 20.83
Workplace EV Chargers (level 2)	$ 1,955	345	$ 2,300	10	$ 23,000	$21,803	$ 1,197	71.55	716	$ 32.14	$ 1.67
Workplace EV Chargers (level 3)	$ 9,775	1725	$ 11,500	5	$ 57,500	$28,591	$ 28,909	187.65	938	$ 61.28	$ 30.81
SemiPublic MF Chargers (level 2)	$ 98	17	$ 115	25	$ 2,875	$0	$ 2,875	7.07	177	$ 16.26	$ 16.26
E Bikes	$ 293	52	$ 345	200	$ 69,000	$0	$ 69,000	5.60	1,120	$ 61.61	$ 61.61
E Motorcycle	$ 489	86	$ 575	20	$ 11,500	$0	$ 11,500	9.00	180	$ 63.89	$ 63.89
ccHP (first unit per HH)	$ 1,768	312	$ 2,080	200	$ 416,070	$814,528	$ (398,458)	65.05	13,011	$ 31.98	$ (30.63)
ccHP (second unit)	$ 250	38	$ 288	25	$ 7,188	$53,671	$ (46,483)	29.07	727	$ 9.89	$ (63.97)
HPWH	$ 696	123	$ 819	20	$ 16,376	$15,461	$ 915	18.85	377	$ 43.44	$ 2.43
CDHP (Hi Perf)	$ 2,400	424	$ 2,824	100	$ 282,353	$177,990	$ 104,363	67.45	6,745	$ 41.86	$ 15.47
CDHP (Standard)	$ 2,300	406	$ 2,706	50	$ 135,294	$148,325	$ (13,031)	54.13	2,706	$ 49.99	$ (4.82)
HP Integrated Controls	$ 293	52	$ 345	10	$ 3,450	$0	$ 3,450	5.82	58	$ 59.23	$ 59.23
ERV/HRV	$ 677	120	$ 797	20	$ 15,939	$4,788	$ 11,151	14.78	296	$ 53.91	$ 37.71
AWHP	$ 7,820	1380	$ 9,200	4	$ 36,800	$24,963	$ 11,837	161.38	646	$ 57.01	$ 18.34
Forklifts	$ 5,865	1035	$ 6,900	1	$ 6,900	$0	$ 6,900	125.04	125	$ 55.18	
Comm. Push Lawnmowers	$ 489	86	$ 575	5	$ 2,875	$0	$ 2,875	11.01	55	$ 52.23	
Comm Ride Lawnmower	$ 3,421	604	$ 4,025	5	$ 20,125	$0	$ 20,125	74.09	370	$ 54.33	
Comm. Leafblowers	$ 147	26	$ 173	5	$ 863	$0	$ 863	3.15	16	$ 54.76	
Comm Trimmers	$ 147	26	$ 173	5	$ 863	$0	$ 863	3.15	16	$ 54.76	
Comm Chainsaw	$ 147	26	$ 173	5	$ 863	$0	$ 863	3.15	16	$ 54.76	
Resi. Push lawnmowers	$ 98	17	$ 115	150	$ 17,250	$0	$ 17,250	1.65	248	$ 69.70	
Resi Ride lawnmowers	$ 293	52	$ 345	10	$ 3,450	$0	$ 3,450	4.90	49	$ 70.41	
Resi Leafblowers	$ 49	9	$ 58	25	$ 1,438	$0	$ 1,438	1.26	32	$ 45.63	
Resi Trimmers	$ 49	9	$ 58	25	$ 1,438	$0	$ 1,438	1.26	32	$ 45.63	
Resi Chainsaw	$ 49	9	$ 58	25	$ 1,438	$0	$ 1,438	1.26	32	$ 45.63	
Resi. Induction Cookstoves	$ 196	34	$ 230	10	$ 2,300	$0	$ 2,300	3.62	36	$ 63.54	
Resi Snow Blower	$ 14	3	$ 17	10	$ 173	$0	$ 173	0.27	3	$ 62.91	
Commercial VRFs	$ 29,325	5175	$ 34,500	1	$ 34,500	$0	$ 34,500	527.30	527	$ 65.43	
Commercial gSHP	$ 146,625	25875	$ 172,500	1	$ 172,500	$0	$ 172,500	3,222.39	3,222	$ 53.53	
Total					$ 1,862,386	$ 1,371,963	$ 497,466		40,390	$ 46.11	$ 12.32

Rate Class [m]	Total Savings (MWhe) [n]	Total Incentive [o]	Total Gross Cost [p]	Savings % [q]		
Residential	32,312	$1,266,423	$1,489,909	80%	Estimate	
Commercial and Industrial	8,078	$316,606	$372,477	20%	Estimate	
Totals	40,390	$1,583,028	$1,862,386			

Low-income Equity Benchmark [r]	Avg per participant
$461,872	$ 2,450

Low-income Definition [s]	# LI Participants [t]	% LI Participants [u]	MWhe Total [v]	% LI MWhe [w]	LI Incentive total [x]	% Incentive [y]
AEV	39		1547.0		$ 117,000	
PHEV	16		473.4		$ 36,800	
PreO AEV	16		317.3		$ 24,000	
PreO PHEV	3		88.8		$ 4,500	
ccHP	62		4033.3		$ 176,700	
HPWH	6		113.1		$ 6,000	
CDHP (HiPerf)	31		3038.5		$ 82,150	
CDHP (Std)	15.5		741.2		$ 25,575	
	189		10,352	32%	$472,725	31.73%
					$2,508	-$10,853

Previous Cumulative Banked Tier III Credits Total [z]	Current Year Tier III Obligation [a1]	Tier II Credits converted to Tier III [b1]	Current Year Tier III Claimed/Verified Credits [c1]	New Cumulative Banked Tier III Credits [d1]		
26705	17,779	-	17,779	8,926		