FINAL ENERGY AUDIT REPORT

JANUARY 8, 2024

Winter Valley
600 Canton Avenue
Milton, MA

Town of Milton (Milton)

Josh Eckart-Lee, Assistant Town Planner
Jack Turner, Environmental Coordinator
Sarah McLaren, Executive Director, Milton Residences for the Elderly (MRE)

Report Prepared By:

Clean Energy Solutions, Inc. (CESI)
Dave Dayton, Chairman and Treasurer
Abigail Despres, Environmental Analyst
John Clune, Senior Project Manager

Purpose – from April 2023 RFP:

> "The Town of Milton has been actively engaged in work to address climate change and its effects on municipal services, energy use, and utilities. This project, "Energy Resilience in Milton: Winter Valley Microgrid" envisions a district-level microgrid composed of the Winter Valley senior housing community, Milton Town Hall, and the Milton Police Department to protect our most vulnerable residents alongside our critical municipal services when we are faced by climate-driven disasters. The Town intends to connect these three locations through a microgrid system that will allow for continued power in times of need through a system that is sustainable and locally controlled. This feasibility study will explore the current demand load of the proposed project area, as well as the timelines for installing the necessary energy generation, storage, and grid operations infrastructure, grid maintenance and ownership structure, and potential for expansion or replication throughout other areas of the town."

CESI performed a site inspection at Winter Valley on May 23, 2023. During the visit, CESI interviewed site staff and noted existing conditions at all Winter Valley buildings. Over the last six weeks, Milton has provided CESI with the necessary information required to issue this Report (equipment specifications, energy billing data, site drawings, and responses to a CESI questionnaire).

Summary of Recommendations and Draft Proforma

To date, our efforts have not revealed the need for any significant energy efficiency (EE) improvements at any of the buildings. Winter Valley is to be commended for installing more energy efficient equipment over time, especially when financial assistance in the form of grants is available.

An exception may be to replace several of the electric-resistance baseboard heating and through-wall air conditioners with air-source heat pumps (ASHPs) in each electrically heated apartment. Given the very generous subsidies and tax credits available in the federal IRA legislation, the capital expenditure would be substantially discounted. This would reduce the total electric load in both heating and cooling seasons. It would be disruptive, however, and the possible tight federal timelines may make it difficult to phase change-overs with occupancy changes. Detailed engineering and financial analysis are recommended early in the Design Phase.

As this feasibility analysis evolves, we may recommend additional EE improvements such as more efficient common area air conditioners, additional wall insulation, and perhaps replacement toilets and aerators in all common area rest rooms, including those at the Office/Community building.

Our major recommendations are to install rooftop solar PV arrays that would be owned by the Town of Milton (or perhaps Winter Valley) on all buildings except building #5 and to install a lithium “battery energy storage system” (BESS) at the exterior of all six buildings, sized to meet the current average monthly demand of each building (as historically recorded on each building’s master electric meter). The roof surfaces on Bldgs. 1-4 are now 14 years old and that age needs to be considered regarding the placement of PV panels. It is also presently assumed that the existing trussed roof structures will not require modification to support the weight of the PV arrays.

This report treats only non-residential loads at WV to start. When we refer to "the current average monthly demand of each building (as historically recorded on each building’s master electric meter" we are not including the residential electricity loads that are recorded on each resident’s electric meter. The rationale is that residents probably will not see bill savings because of their utility allowances will be adjusted as the consumption is reduced and their monthly rent will increase by a commensurate amount. To overcome that obstacle might require complex design modifications that we address in the next phase of work (called "Energy Load Assessment").

<u>Rationale for sizing Solar and BESS installations:</u>

We generally start by maximizing the amount of solar PV that will fit at each facility. In the Winter Valley buildings, we will consider sharing solar and BESS resources with

behind-the-meter wiring (which seems to be the intent of the new generator specification). If that is impractical, we will consider a Community Solar arrangement with Eversource cooperation. (When the total solar output exceeds the connected electric load, the combination of a BESS and net metering – and possible inter-building sharing -- will usually make any surplus economical.) Our current analysis indicates that the rooftop PV potential of Bldgs. 1-4 and the office/community building will only provide on average about 40% of each building's annual kWh requirements, so sharing among buildings may not be practical at Winter Valley.

To size the BESS power rating (kW), we generally try to serve the full average electrical load of the facility, or at least it's important circuits. Where apartments are individually metered, we consider sharing as above.

To size the BESS energy capacity (kWh), we start by recommending four hours of resilience at the predicted coincident average demand for each building. In the rare case where grid power is lost for more than four hours and the solar energy is unable to keep the BESS charged, a backup generator could automatically assume the load. The kWh capacity of the BESS is the principal cost driver. Backup generators are not currently included in this analysis. Final recommendations will be made in the detailed Design phase.

The table below displays the estimated 10-year Cash Flow per the **average** Winter Valley building's savings and cost resulting from the installation of the recommended solar PV rooftop arrays, a BESS at each building, and new controls. The aggregate total for all 6 buildings is displayed in the yellow highlighted box at the top of the table. The total installation cost for all six buildings would cost approximately $1,109,000, of which a total loan of $598,000 (net of the 30% investment tax credit) would be amortized with savings/revenues over a 10-year period. First year savings/revenues for all six buildings would be approximately $165,000 against expenses of $103,000. A total funding shortfall (or Resiliency Gap) of $255,000 would have to be filled with grant or other financial sources. It should be noted that cost estimated are also based on the assumption that the existing trussed roof structures will not require modification to support the weight of the PV arrays.

Table 1 – Winter Valley Average Building Parametric Model ProForma Cash Flow

Total Investment Estimate:	Output value	Units	Questions?			
	AVG/BLDG			TOTAL PROJECT (ALL 6 BUILDINGS)		
Total investment estimate in EE	$0	Dollars ($)	i	$ -	$ 597,805	Total Debt
Total investment estimate in BESS and microgrid controller	$126,933	Dollars ($)	i	$ 761,600		
Total investment estimate in Solar	$57,917	Dollars ($)	i	$ 347,500		
Total investment	$184,850	Dollars ($)	i	$ 1,109,100		
Investment Tax Credit available in IRA	30%	Percent (%)				
Upfront or Imputed Present Value of Annual Resilience Gap or Cash Flow Shortfall	$42,516	Dollars ($)		$ 255,093	23%	

Annual Emissions Reduction Calculation	Output value	Units
EE savings, electric	0	kWh per year
Emission reduction from electric EE	0	metric tons per year
Solar savings, electric	27,800	kWh
Emission reduction from solar displ.	15	metric tons per year

THIS IS THE AVERAGE CASH FLOW FOR EACH OF THE 6 BUILDINGS AT WINTER VALUE - ENTIRE PROJECT WOULD BE 6 TIMES GREATER THAN SHOWN

	Annual Energy Savings from EE Improvements	Annual energy savings from solar energy production [3] i	T&D Demand Savings	Connected Solutions "Active Demand" Response Savings	ICAP Savings	Clean Peak Standard Certificate (CPS) Revenue [1] i	SMART Revenue PV + BESS	Less: Annual System Maintenance (2% est.)	Less: Curtailment Service Provider (CSP) charge	Less: Debt Service	Annual Cash Flow [2] i	Cumulative Cash Flow	Carbon reduction (metric tons/year)
									Total investment:		$ (99,634)	$ (99,634)	
Year 1	$ -	$ 3,614	$ 9,580	$ 8,925	$ 1,607	$ 544	$ 3,336	$ (1,993)	$ (2,841)	$ (12,284)	$ 10,488	$ (89,146)	15
Year 2	$ -	$ 3,686	$ 9,772	$ 8,657	$ 1,607	$ 527	$ 3,236	$ (2,033)	$ (2,755)	$ (12,284)	$ 10,413	$ (78,733)	15
Year 3	$ -	$ 3,760	$ 9,967	$ 8,398	$ 1,607	$ 512	$ 3,139	$ (2,073)	$ (2,673)	$ (12,284)	$ 10,352	$ (68,382)	15
Year 4	$ -	$ 3,835	$ 10,166	$ 8,146	$ 1,607	$ 496	$ 3,045	$ (2,115)	$ (2,593)	$ (12,284)	$ 10,303	$ (58,078)	15
Year 5	$ -	$ 3,912	$ 10,370	$ 7,901	$ 1,607	$ 481	$ 2,953	$ (2,157)	$ (2,515)	$ (12,284)	$ 10,268	$ (47,810)	15
Year 6	$ -	$ 3,990	$ 10,577	$ 7,664	$ 1,607	$ 467	$ 2,865	$ (2,200)	$ (2,439)	$ (12,284)	$ 10,246	$ (37,564)	15
Year 7	$ -	$ 4,070	$ 10,789	$ 7,434	$ 1,607	$ 453	$ 2,779	$ (2,244)	$ (2,366)	$ (12,284)	$ 10,237	$ (27,327)	15
Year 8	$ -	$ 4,151	$ 11,004	$ 7,211	$ 1,607	$ 439	$ 2,695	$ (2,289)	$ (2,295)	$ (12,284)	$ 10,240	$ (17,087)	15
Year 9	$ -	$ 4,234	$ 11,224	$ 6,995	$ 1,607	$ 426	$ 2,615	$ (2,335)	$ (2,226)	$ (12,284)	$ 10,256	$ (6,831)	15
Year 10	$ -	$ 4,319	$ 11,449	$ 6,785	$ 1,607	$ 413	$ 2,536	$ (2,381)	$ (2,160)	$ (12,284)	$ 10,284	$ 3,453	15
Total	$ -	$ 39,572	$ 104,898	$ 78,116	$ 16,065	$ 4,758	$ 29,198	$ (21,819)	$ (24,862)	$ (122,840)	$ 103,087		147

Results	Output value	Units				
			Total Yr 1 Savings	$ 165,630.76	Total Yr. 1 Exper	$ 102,703.63
Total Savings Year 11 (no debt payment)	$ 23,019	Dollars ($)				
Approximate total years to $0 cumulative cash flow	9.9	Years				
Cumulative cash flow over 15 years	$ 218,184	Dollars ($)				

The roof space on Building 5 is not likely to accommodate much if any solar PV and it is not recommended in this analysis. Building 5 is getting a new 100kW diesel fueled generator, the cost of which is not included in our recommendations. Since it is to be connected to apartment loads as well as common area loads, we have sized the BESS at all buildings to also meet the combined average loads of the apartments as well, but only when the grid is down and not as a means of reducing resident electricity payments as calculated for the utility allowances.

The actual ITC value would not be available to Milton until year 2 of any financing so the initial debt would be based on the full installation cost and then paid down with a balloon payment. On the other hand, revenue streams such as SMART, Connected Solutions and Clean Peak are reduced annually over time and may perhaps disappear altogether before the debt is fully repaid. These particulars will be more fully evaluated in our Final Report. For now, we encourage feedback from Milton on the overall project approach.

The analysis does not yet include the possibility of a Production Tax Credit available under the IRA for PV system installations.

Existing Conditions

Winter Valley is located at 600 Canton Avenue in Milton. It contains 160 senior citizen units, typically housing about 164 residents. There are five apartment buildings and a separate office/community building.

Apartment types per building are as follows:

Bldg. #	1	2	3	4	5
One Bed	31	30	31	30	24
Two Bed	1	2	1	2	0
Studio					8
Totals:	32	32	32	32	32

Current common spaces and use patterns:

- Residential buildings
  - Hallways (generally 8am-9pm used by residents)
  - Laundry room (generally 8am-9pm used by residents)
  - The community room in each building is used by residents with no set schedule.

- Office building
  - Office spaces occupied daily.
  - Dining room/activity room
    - Some activity almost every day
  - Beauty shop
  - Commercial kitchen has an electric stove/oven, one commercial refrigerator, three commercial freezers, and two residential type refrigerators.

- Community Room
  - Generally, Monday to Friday, at least one activity is held in the building with about 10 -25 participants. Monthly at least 4 larger events are held with 25 – 40 participants.

- During the day, twelve to fifteen staff are deployed throughout the five residential buildings and management office.

Building Shell / Exterior

Buildings # 1-4 are 2-stories in height. Building #5 is partially 3-stories. Buildings 1-4 are steel frame construction with vinyl siding. Building #5 is wood framed. All have slab on grade foundations. Buildings 1-4 were built in the late 1970s, Building 5 in 1990. A sixth apartment building is currently in the design stage.

The office/community building is also steel framed, vinyl sided, one story with a slab on grade foundation.

Absent building plans, the square footage per building was estimated by CESI using Google Earth measurements. Total square feet are approximately 162,000 (roughly 31,000+ each for Bldgs. 1-5 and 6,000 for the office/community building.

Prior to 2004, the property received a HUD grant to do some drainage work around the buildings. As they trenched around the buildings, they had to remove some of the siding along the slab foundation and it was found that the insulation in places was not installed properly. Insulation was replaced or added at areas where insulation was found lacking. The buildings were thermal scanned by MassSave around 2009 and blown in insulation was placed in areas where insufficient insulation was detected.

Roof

All roofs are wood frame truss construction, with various pitched (shingled) and flat (membrane) areas. The roof framing and surfaces of Bldgs. 1-4 were replaced in 2009 due to structural defects in the original roof framing. Bldg. 5 received new shingles and a new membrane over the third floor of the central building section in 2018.

Windows

In 2010 and 2011 the windows were replaced in buildings 1-4 and the office building with Energy Star rated energy efficient (U-value of .30) double hung vinyl clad windows. Following is an excerpt from the window specifications for that project:

Scope :

1. Submit & obtain Building Permit (cost of permit is $1980.00 based on 12/1000 and is included in lump sum)
2. Supply Diamond Windows Model 4100 Veka Bevel-, White Vinyl, Double Hung (as required, factory mulled),Low-E energy Star rated w/.30u factor glass, 6 over 1 flat grid, full screen
3. Supply and install :
    a. (193) ea Type A windows (approx. 69-1/2 x 45-1/2, 2ea DH windows per opening)
    b. (18) ea Type B windows (approx. 33-1/2 x 45-1/2)
    c. (51) ea Type C windows (approx. 33-1/2 x 33-1/2)
    d. (6)ea Type D windows (approx. 71-1/2 x 47)
    e. (5)ea Type E windows (approx. 35-1/2 x 47)
    f. (3)ea Type F windows (approx. 35-1/2 x 35)

The windows at Bldg. 5 may be original from the time of construction.

HVAC

Heating

Buildings 1-4 common areas, all apartments and the entire office building are heated with electric resistance baseboard and a few wall mount terminal heaters in the office building and common areas.

Building 5 (common and apartment spaces) are heated by two oil-fired Budurus hydronic boilers, Model G215/7 which are 86% efficient, standard atmospheric combustion oil-fired (the boilers are about 2 years old). The boiler replacement bid set (see excerpts in Appendix A) provided by Milton appears to show one hydronic loop throughout the building, two redundant heating circulators with efficient variable frequency drives (VFDs). The boiler water supply temperatures are reset as a function of outdoor temperature. The drawings do not show how the hydronic heating loop is piped (reverse return, etc.). The drawings note that all work must conform to Appendix 115M, 780CMR of the Stretch Building code as adopted by the Town of Milton.

The boilers also provide priority domestic hot water heating through a heat exchanger loop in two large domestic hot water storage tanks with 3-speed circulator pumps. The system also utilizes a domestic hot water recirculation loop and associated pump.

A 4,000-gallon underground oil tank is located south of (behind) Bldg. 5.

Thermostats

All electric resistance heaters in apartments and common areas are controlled by wall-mounted line voltage thermostats (Photo 1995 in Appendix B). A few wall-mounted unit heaters are controlled by integral thermostats. The wall-mounted thermostat in the community room has a locked cover to prevent unauthorized temperature adjustments (Photo 2043). The thermostats in the Bldg. 5 apartments are Cadet low-voltage heat only digital models, probably wired to an electric zone valve. (Photo 2089).

Air Conditioning

Each apartment has one through the wall AC unit of various vintages and efficiencies. Building 5 has nine units on the top floor, six of which are serviced by a central AC unit replaced in the spring of 2022. From the specifications provided by Milton the installation included two LMU36CHV outdoor units on stands and six LSN120HSV5 indoor wall hung units.

A central AC/Heat unit was added to Bldg.3 when the central area underwent an assisted living conversion. There is an underground propane tank next to the building.

The only common area/corridor air conditioning is a through the wall unit in each apartment building's activity room on the first floor and in the office building community room.

Ventilation

All bathrooms and laundry rooms have active ventilation of some kind.
(Photo 2107) Bldg.5 basement shows what may be a make-up air system in background.

Emergency Systems

There is a small diesel generator at the back of Building 5 which is to be replaced shortly with a new 100kW generator to meet HUD's project refinance requirement of being able to use the elevator during a grid outage. The specification provided by Milton indicates that the new generator will also supply power to the apartments (although individually metered) during a grid outage. That will require new wiring and an ATS behind each meter. If this is done, we can potentially share the BESS among apartments.

In addition, Bldgs. 1-4 have emergency backup batteries for common area lighting for 45 minutes and to also power the alarm systems. The generator in Bldg. 5 is currently wired to two Kohler Power Systems transfer switches (Photos 2115 and 2116).

Lighting

MassSave upgrade all common area (controls and sensors) to LED 4 years ago. The retrofit also included LEDs in all apartments.

Interior Emergency/Security

All emergency lighting is now LED. Interior common areas have battery backup of the required 45 min although the conversion to LED should extend that time by a considerable amount (see certificate of substantial completion in Appendix)

Exterior Security

Winter Valley has no specific exterior security lighting requirements but the areas are well lit. As lighting fixtures get replaced some are move reconfigured to a lower poll set up. Exterior lighting is controlled by manually adjusted timers that come on at dusk

Interior Fixture Types

There is a mixture of surface mounted ceiling troffers, typically 8-foot LED bulbs in laundry, community rooms and hallways. Bldg. 5 common areas have surface mounted troffers and circular fixtures recessed in drop ceiling panels (kitchen and community room.

Domestic Hot Water and Potable Water

Hot Water

Water for the apartments is heated by electric resistance coils in Rheem 30-gallon tanks, each containing two 4500-Watt coils. The tanks are located in apartment closets. About 40 or so tanks were updated last year with similar models.

The community/office building has a Rudd Achiever 80-gallon electric resistance coil tank (Photo 1952). The laundries in Bldgs. 1-4 have a Rheem 65-gallon electric tank (Photos 2021 and 2053).

Bldg. 5's domestic hot water is heated on a priority basis by the two Budurus oil-fired hydronic heating boilers and stored in two large storage tanks with heat exchangers (Photos 2116 and 2117). Dual Grundfos circulators circulate the boiler water through the tank heat exchangers.

Cold Water

All of the toilets (common area and apartment) appear to be 1.6-gallon gravity flush types, typically American Standard with Fluidmaster 400A flush valves (Photos 1967 and 2024). The office/community building has 2 toilets.

There is no active irrigation system in use at any of the buildings.

CESI has not yet received any water billing histories for Winter Valley. It is assumed that each building has its own water meter and account. Given the elderly-occupied nature of the site it is not likely that toilet, showerhead, or aerator replacements will yield much water savings through normal usage alone (with the possible exception of the fixtures in the community building which likely see the most use [flushes, minutes of faucet run time) per day. However, even the newer 1.6 or 1.2 gallon per flush gravity toilets can gradually begin to use more water, especially if the flappers no longer seal properly or the water levels gradually rise above the water fill tube. These issues can

be controlled by good maintenance practices which Winter Valley is likely adhering to. Nonetheless, a quick review of actual water use in each building may be warranted.

Smoke/CO Detectors

In units, smoke/carbon monoxide detectors are installed per HUD requirements. All were replaced about a year ago. Each unit has at least one detector, most have multiple detectors. In addition, each apartment has fire suppression sprinklers, activated by heat.

Central Laundries

Each building has 4 or 5 new electric dryers and washing machines replaced in 2022, coin operated, and owned by the site. The community building also has a laundry with 2 washers and 2 dryers.

Apartments

Each apartment has a full kitchen, full living room/dining area, bedroom (except for the eight efficiency units) and a full bathroom. Individual kitchen equipment is replaced as necessary. There have been no large-scale upgrades. Appliances include a refrigerator (with freezer, about 17 cubic feet in size) and an electric stove. There is no dishwasher or in-unit laundry equipment. Residents typically provide a microwave, toaster oven, coffee maker, etc.

Energy and Water Baselines

Electricity:

Building 1:

Utiltiy	Eversource								Costs as of April 2023:				
Tariff	Rate B2/G1 Small General Service DMD								Supply	$	0.09560	/kWh	
Acct.#	2673-746-1009								Dist. Dmd.	$	18.25	/kW over 10	
Meter #1	5056689								Trans. Dmd.	$	17.63	/kW over 10	
Meter #2	5056690								Other	$	0.0429	/kWh	
	Winter Valley Building #1												
	From	To	Days	kWh 1	kWh 2	actual kW 1	actual kW 2	billed kW	kWh		kW		Total
	2/28/22	3/28/22	28	3,382	6,397	42.0	-	20.8	$	1,354	$	746	$ 2,100
	3/28/22	4/28/22	31	3,263	5,959	40.0		20.0	$	1,277	$	718	$ 1,995
	4/28/22	5/28/22	30	1,875	4,716	27.0		7.0	$	913	$	251	$ 1,164
	5/28/22	6/28/22	31	1,581	1,881	14.0		-	$	479			$ 479
	6/28/22	7/28/22	30	1,586	174	10.0	-	-	$	244	$	-	$ 244
	7/28/22	8/28/22	31	1,618	145	10.0		-	$	244	$	-	$ 244
	8/28/22	9/28/22	31	1,717	1,024	10.0		-	$	380	$	-	$ 380
	9/28/22	10/28/22	30	2,597	3,025	20.0		-	$	779	$	-	$ 779
	10/28/22	11/28/22	31	3,629	5,675	34.0		14.0	$	1,288	$	502	$ 1,791
	11/28/22	12/28/22	30	3,560	8,951	50.0		30.0	$	1,733	$	1,076	$ 2,809
	12/28/22	1/28/23	31	3,337	9,395	42.0		22.0	$	1,763	$	789	$ 2,552
	1/28/23	2/28/23	31	3,926	10,301	48.0	-	28.0	$	1,970	$	1,005	$ 2,975
	2/28/23	3/28/23	28	3,191	8,211	15.5	21.9	17.4	$	1,579	$	624	$ 2,203
	3/28/23		365	31,880	59,457	321		138	$	12,648	$	4,966	$ 17,614

Building 2:

	Eversource								Costs as of April 2023:				
Tariff	Rate B2/G1 Small General Service DMD				600 Canton Ave.				Supply	$	0.09560	/kWh	
Acct.#	2673-611-1001								Dist. Dmd.	$	18.25	/kW over 10	
Meter #1	5056687								Trans. Dmd.	$	17.63	/kW over 10	
Meter #2	5056688								Other	$	0.0429	/kWh	
	Winter Valley Building #2												
	From	To	Days	kWh 1	kWh 2	actual kW 1	actual kW 2	billed kW	kWh		kW		Total
	2/28/22	3/28/22	28	8,542	1,726	44.0	-	24.0	$	1,422	$	861	$ 2,283
	3/28/22	4/28/22	31	8,018	1,726	42.0		22.0	$	1,349	$	789	$ 2,139
	4/28/22	5/28/22	30	5,774	1,356	30.0		10.0	$	987	$	359	$ 1,346
	5/28/22	6/28/22	31	1,772	1,338	10.0		-	$	431	$	-	$ 431
	6/28/22	7/28/22	30	188	1,150	4.0	-	-	$	185	$	-	$ 185
	7/28/22	8/28/22	31	178	1,216	4.0		-	$	193	$	-	$ 193
	8/28/22	9/28/22	31	1,023	1,152	8.0		-	$	301	$	-	$ 301
	9/28/22	10/28/22	30	3,209	1,162	16.0		-	$	605	$	-	$ 605
	10/28/22	11/28/22	31	5,877	1,664	36.0		16.0	$	1,044	$	574	$ 1,618
	11/28/22	12/28/22	30	9,549	2,099	42.0		22.0	$	1,613	$	789	$ 2,402
	12/28/22	1/28/23	31	9,436	2,324	46.0		26.0	$	1,629	$	933	$ 2,561
	1/28/23	2/28/23	31	9,999	2,281	46.0	-	26.0	$	1,701	$	933	$ 2,633
	2/28/23	3/28/23	28	8,324	1,708	21.1	13.1	14.2	$	1,389	$	509	$ 1,899
	3/28/23		365	63,347	19,176	305		136	$	11,428	$	4,887	$ 16,315

Building 3

	Eversource								Costs as of April 2023:		
Tariff	Rate B2/G1 Small General Service DMD								Supply	$ 0.09560	/kWh
Acct.#	2673-676-1003								Dist. Dmd.	$ 18.25	/kW over 10
Meter #1	5061880								Trans. Dmd.	$ 17.63	/kW over 10
Meter #2	5045691								Other	$ 0.0429	/kWh
	Winter Valley Building #3										
	From	To	Days	kWh 1	kWh 2	actual kW 1	actual kW 2	billed kW	kWh	kW	Total
	2/28/22	3/28/22	28	4,409	5,495	34.0	-	14.0	$ 1,372	$ 502	$ 1,874
	3/28/22	4/28/22	31	4,399	4,702	32.0		12.0	$ 1,260	$ 431	$ 1,691
	4/28/22	5/28/22	30	2,726	3,123	22.0		2.0	$ 810	$ 72	$ 882
	5/28/22	6/28/22	31	3,354	1,461	18.0		-	$ 667	$ -	$ 667
	6/28/22	7/28/22	30	5,842	235	20.0	-	-	$ 842	$ -	$ 842
	7/28/22	8/28/22	31	5,926	248	20.0		-	$ 855	$ -	$ 855
	8/28/22	9/28/22	31	4,349	942	20.0		-	$ 733	$ -	$ 733
	9/28/22	10/28/22	30	2,965	2,495	20.0		-	$ 756	$ -	$ 756
	10/28/22	11/28/22	31	3,566	3,335	20.0		-	$ 956	$ -	$ 956
	11/28/22	12/28/22	30	4,026	3,980	32.0		12.0	$ 1,109	$ 431	$ 1,539
	12/28/22	1/28/23	31	4,212	4,421	32.0		12.0	$ 1,195	$ 431	$ 1,626
	1/28/23	2/28/23	31	4,738	5,752	38.0	-	18.0	$ 1,453	$ 646	$ 2,098
	2/28/23	3/28/23	28	4,438	4,684	21.1	12.7	13.8	$ 1,263	$ 495	$ 1,758
	3/28/23		365	50,541	35,378	295		70	$ 11,898	$ 2,504	$ 14,402

Building 4

	Eversource								Costs as of April 2023:		
Tariff	Rate B2/G1 Small General Service DMD								Supply	$ 0.09560	/kWh
Acct.#	2673-710-1001								Dist. Dmd.	$ 18.25	/kW over 10
Meter #1	8126003								Trans. Dmd.	$ 17.63	/kW over 10
Meter #2	5056649								Other	$ 0.0429	/kWh
	Winter Valley Building #4										
	From	To	Days	kWh 1	kWh 2	actual kW 1	actual kW 2	billed kW	kWh	kW	Total
	2/28/22	3/28/22	28	8,726	1,135	32.0	-	20.8	$ 1,366	$ 746	$ 2,112
	3/28/22	4/28/22	31	7,545	1,234	29.0		9.0	$ 1,216	$ 323	$ 1,539
	4/28/22	5/28/22	30	3,922	1,182	20.0		-	$ 707	$ -	$ 707
	5/28/22	6/28/22	31	1,220	1,253	10.0		-	$ 342	$ -	$ 342
	6/28/22	7/28/22	30	205	1,219	4.0	-	-	$ 197	$ -	$ 197
	7/28/22	8/28/22	31	153	1,190	4.0		-	$ 186	$ -	$ 186
	8/28/22	9/28/22	31	1,160	1,246	8.0		-	$ 333	$ -	$ 333
	9/28/22	10/28/22	30	1,300	2,452	16.0		-	$ 520	$ -	$ 520
	10/28/22	11/28/22	31	1,267	4,755	20.0		-	$ 834	$ -	$ 834
	11/28/22	12/28/22	30	1,348	8,807	36.0		16.0	$ 1,406	$ 574	$ 1,980
	12/28/22	1/28/23	31	1,117	9,530	36.0		16.0	$ 1,474	$ 574	$ 2,048
	1/28/23	2/28/23	31	1,155	10,265	40.0	-	20.0	$ 1,581	$ 718	$ 2,299
	2/28/23	3/28/23	28	1,211	8,459	21.1	11.1	12.2	$ 1,339	$ 438	$ 1,777
	3/28/23		365	21,603	51,592	244		118	$ 10,136	$ 2,626	$ 12,762

Building 5

	Eversource								Costs as of April 2023:		
Tariff	Rate B2/G1 Small General Service DMD								Supply	$ 0.09560	/kWh
Acct.#	2673-711-1000								Dist. Dmd.	$ 18.25	/kW over 10
Meter #1	5056719								Trans. Dmd.	$ 17.63	/kW over 10
Meter #2	N/A								Other	$ 0.0429	/kWh
	Winter Valley Building #5										
	From	To	Days	kWh 1	kWh 2	actual kW 1	actual kW 2	billed kW	kWh	kW	Total
	2/28/22	3/28/22	28	3,400	-	15.0	-	5.0	$ 471	$ 179	$ 650
	3/28/22	4/28/22	31	3,480	-	15.0		5.0	$ 482	$ 179	$ 661
	4/28/22	5/28/22	30	3,120	-	15.0		5.0	$ 432	$ 179	$ 611
	5/28/22	6/28/22	31	3,040	-	15.0		5.0	$ 421	$ 179	$ 600
	6/28/22	7/28/22	30	3,080	-	15.0	-	5.0	$ 427	$ 179	$ 606
	7/28/22	8/28/22	31	3,400	-	17.0		7.0	$ 471	$ 251	$ 722
	8/28/22	9/28/22	31	3,160	-	16.0		6.0	$ 438	$ 215	$ 653
	9/28/22	10/28/22	30	3,480	-	15.0		5.0	$ 482	$ 179	$ 661
	10/28/22	11/28/22	31	3,680	-	15.0		5.0	$ 510	$ 179	$ 689
	11/28/22	12/28/22	30	3,880	-	15.0		5.0	$ 537	$ 179	$ 717
	12/28/22	1/28/23	31	4,040	-	15.0		5.0	$ 559	$ 179	$ 739
	1/28/23	2/28/23	31	4,000	-	15.0	-	5.0	$ 554	$ 179	$ 733
	2/28/23	3/28/23	28	3,520	-	14.1		4.1	$ 487	$ 147	$ 635
	3/28/23		365	41,880	-	182		62	$ 5,800	$ 2,228	$ 8,028

Office / Community Building

	Eversource								Costs as of April 2023:		
Tariff	Rate B2/G1 Small General Service DMD								Supply	$ 0.09560	/kWh
Acct.#	2673-713-1008								Dist. Dmd.	$ 18.25	/kW over 10
Meter #1	5056652								Trans. Dmd.	$ 17.63	/kW over 10
Meter #2	5056654								Other	$ 0.0429	/kWh
	Winter Valley Office and Community Building										
	From	To	Days	kWh 1	kWh 2	actual kW 1	actual kW 2	billed kW	kWh	kW	Total
	2/28/22	3/28/22	28	5,686	1,897	42.0	-	20.8	$ 1,050	$ 746	$ 1,796
	3/28/22	4/28/22	31	3,778	2,042	32.0		12.0	$ 806	$ 431	$ 1,237
	4/28/22	5/28/22	30	1,796	1,905	20.0		-	$ 513	$ -	$ 513
	5/28/22	6/28/22	31	735	1,966	10.0			$ 374	$ -	$ 374
	6/28/22	7/28/22	30	947	2,172	10.0	-		$ 432	$ -	$ 432
	7/28/22	8/28/22	31	998	2,206	10.0			$ 444	$ -	$ 444
	8/28/22	9/28/22	31	760	2,369	10.0			$ 433	$ -	$ 433
	9/28/22	10/28/22	30	1,939	2,215	20.0		-	$ 575	$ -	$ 575
	10/28/22	11/28/22	31	4,491	2,094	34.0		14.0	$ 912	$ 502	$ 1,414
	11/28/22	12/28/22	30	6,949	2,149	38.0		18.0	$ 1,260	$ 646	$ 1,906
	12/28/22	1/28/23	31	7,332	2,166	44.0		24.0	$ 1,315	$ 861	$ 2,176
	1/28/23	2/28/23	31	7,969	2,128	48.0	-	28.0	$ 1,398	$ 1,005	$ 2,403
	2/28/23	3/28/23	28	5,321	1,953	23.3	18.3	21.6	$ 1,007	$ 775	$ 1,782
	3/28/23		365	43,015						4,219	$ 13,689

Fuel Oil Building 5 Heat and Domestic Hot Water

2019	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Gallons	1,303.00	912.90	775.30						2,030.70		1,215.20	1,062.50	7,299.60
Per Gal	2.95	3.00	3.00						2.90		2.90	2.90	2.93
	3,843.85	2,738.70	2,325.90						5,889.03		3,524.08	3,084.15	21,405.71
2020	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Gallons	792.00	615.00		1,882.30							1,824.20	1,589.91	6,703.41
Per Gal	3.00	2.90		2.00							2.00	2.00	2.20
	2,376.00	1,783.79		3,764.60							3,648.40	3,179.82	14,752.61
2021	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Gallons	1,074.10		1,156.80								1,186.60	2,969.00	6,386.50
Per Gal	2.44		2.74								3.30	3.30	3.05
	2,620.80		3,169.63								3,915.78	9,797.70	19,503.91
2022	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Gallons			700.00	3,100.90					1,540.90			2,221.30	7,563.10
Per Gal			4.95	4.84					4.34			4.54	4.66
			3,465.00	15,008.35					6,687.50			10,084.70	35,245.55

Propane is used for heating at Building 3. According to site management, the average annual consumption over the past three years is 555 gals.

Water and Sewer

Only one 89-day bill was submitted for review. Analysis below shows what may be reasonably low consumption per occupant (assuming it represents an annual usage rate).

Feb 1 to Apr. 30 2023						
Bldg.	1	2	3	4	5	Office
cf	18780	19970	9439	25000	29222	1177
gal/cf	7.48	7.48	7.48	7.48	7.48	7.48
days	89	89	89	89	89	89
occupants/day	32	32	32	32	32	4
Gal/per/Day	49	52	25	66	77	25

Individual Metering

- Apartments are individually metered for electricity.
- All residents receive a Utility Allowance for electricity.

Residents receive a HUD subsidy for electric utilities effective 02.01.2023 as follows: Buildings 1-4: 1 BD $104, 2 BD $150 and Building 5: studio $37 and 1 BD $33 or $41. Building Five the heat is included in the rent, Buildings One through Four, residents pay for heat, it is electric baseboard.

Other Potential Recommended ECMs

- EE – in addition to selective ASHP's, Windows and wall Insulation as Mass Save noted on their inspection..

- BESS **energy storage battery,** utility's electric service and main switchgear? Add to current critical loads?

- Install a Public Display of MG performance in Community Building

- Resilience- Communications – Evaluate microwave, satellite, and LTE etc., during communications outages.

Phase 2 Recommendations:

- Site is on opposite side of Canton Ave. from Town Hall and opposite side of Franklin from the Police Department.
- Investigate opportunities at other sites.

Next Steps

1. Consult Eversource engineers regarding potential changes to electric service.
2. Inspect front-end electric service in each building with PV and BESS in mind.
3. Interview engineer regarding design of new 100kW generator at Building 5.
4. Develop costs, savings, and recommendations regarding "Other Potential Recommended ECMs."
5. Consider sharing DERs among adjacent town facilities.

Appendix A

Excerpt from recent Building #5 central heating system improvements drawings:

MECHANICAL EQUIPMENT SCHEDULE

REQUIRES ELECTRICAL | DOES NOT REQUIRE ELECTRICAL [1]

DWG ID	EQUIPMENT	MANUFACTURER	MODEL NUMBER	PERFORMANCE/REMARKS	ELECTRICAL DATA
B-1	CAST IRON BOILER	BUDERUS	G215/7	294 MBH OUTPUT, 86.7% AFUE, 6"ø VENT, HINGED DOOR [2]	120V
	OIL BURNER	RIELLO	40-F10	2.5 GPH	N/A
B-2	CAST IRON BOILER	BUDERUS	G215/7	294 MBH OUTPUT, 86.7% AFUE, 6"ø VENT, HINGED DOOR	120V
	OIL BURNER	RIELLO	40-F10	2.5 GPH	N/A
AS-1	AIR SEPARATOR	SPIROTHERM	VSR250	21/2" MICROBUBBLE SEPARATOR, 90 GPM MAX	N/A
EX-1	EXPANSION TANK	AMTROL	SX-60V	32 GAL VOLUME, 11 GAL ACCEPTANCE, NON-ASME	N/A
TF-1	INLINE FILTER/FEEDER	FERNOX	TF-1	1" IN/OUT, HYDROCYCLONIC MAGNETIC FILTER	N/A
DHW-1	INDIRECT-FIRED WATER HEATER	VELOCITY BOILER WORKS	MEGA-STOR MS2-119	STAINLESS STEEL, 112 GALLON TANK, 497 GPH 1ST HOUR, 14 GPM @ 5 FT/HD	N/A

[1] COORDINATE ALL ELECTRICAL CHARACTERISTICS W/ EC BEFORE ORDERING EQUIPMENT.
[2] PROVIDE LOGMATIC CONTROLS

PUMP SCHEDULE

REQUIRES ELECTRICAL [1]

DWG ID	EQUIPMENT	MANUFACTURER	MODEL NUMBER	GPM	HEAD (FT)	REMARKS	ELECTRICAL DATA
BP-1	BOILER CIRCULATOR	GRUNDFOS	UPS-26-99-FC	21	6	3-SPEED	1/6 HP, 115V, 1ø
BP-1	BOILER CIRCULATOR	GRUNDFOS	UPS-26-99-FC	21	6	3-SPEED	1/6 HP, 115V, 1ø
P-1	DHW ZONE CIRCULATOR	GRUNDFOS	UPS-3280	28	13	3-SPEED	115V, 1ø
P-2	DHW ZONE CIRCULATOR	GRUNDFOS	UPS-3280	28	13	3-SPEED	115V, 1ø
P-3	MAIN CIRCULATOR	GRUNDFOS	MAGNA3 40-120	60	20	VARI-SPEED, ECM	450W, 115V, 1ø
P-4	MAIN CIRCULATOR	GRUNDFOS	MAGNA3 40-120	60	20	VARI-SPEED, ECM	450W, 115V, 1ø

[1] COORDINATE ALL ELECTRICAL CHARACTERISTICS W/EC BEFORE ORDERING UNITS

PLUMBING EQUIPMENT SCHEDULE

REQUIRES ELECTRICITY | DOES NOT REQUIRE ELECTRICITY [1]

DWG ID	EQUIPMENT	MANUFACTURER	MODEL NUMBER	PERFORMANCE	ELECTRICAL DATA V/ø/Hz HP
TV-1	HI-LOW TEMPERING VALVE	LEONARD	TM0820B-LF-DT	LARGE & SMALL-TYPE THERMOSTATIC MIXING VALVE, ADJUSTABLE HIGH TEMP LIMIT, INLET CHECKSTOPS, OUTLET BALL VALVES 1.0 GPM MIN FLOW, 40 GPM @ 10 PSI PRESSURE DROP	N/A
PEX-1	POTABLE EXPANSION TANK	TACO	PAX-30	STEEL SHELL, HEAVY DUTY BUTYL BLADDER, 11 GAL VOLUME, 5 GAL ACCEPTANCE	N/A
DHWR-1	DHW RETURN CIRCULATOR	GRUNDFOS	ALPHA2 15-55	6 GPM @ 8FT/HD, ECM, STAINLESS STEEL	115/1/60 0.15HP

[1] COORDINATE ALL ELECTRICAL CHARACTERISTICS W/ EC BEFORE ORDERING EQUIPMENT.

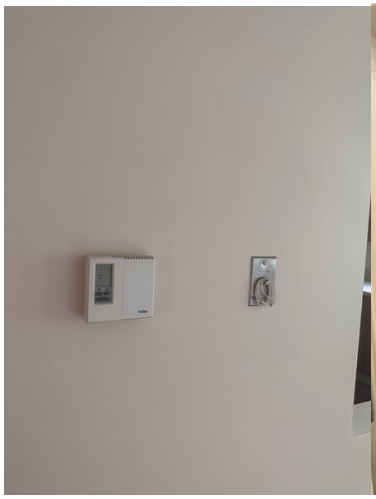
Appendix B

Photos

2107 1995 2043



2089



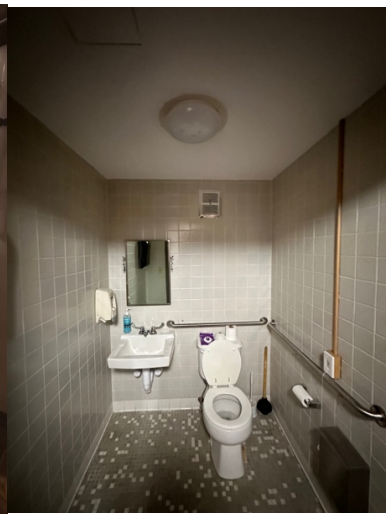
2115

1952

2021

2116

1967



Appendix C

Electricity Allowance kWh Consumption Calculations – 2021-2022
Based on Sample of Apartment Usage

			2022	2022	2022	2022	2022	2022	2022	2022	2022	2021	2021	2021		98,815
Bldg. #			September	August	July	June	May	April	March	February	January	December	November	October		6587.667
1	1	1 BD	147	200	218	140	283	737	897	1233	1302	1046	840	255	7,298	$ 104
1	2	1 BD	286	314	336	275	501	891	1100	1407	1427	1185	957	356	9,035	$ 104
1	3	1 BD	285	367	441	255	287	588	653	959	898	842	773	300	6,648	$ 104
1	4	1 BD	163	329	356	139	175	205	314	455	502	366	239	121	3,364	$ 104
2	5	1 BD	514	448	677	514	648	697	1092	1312	1466	929	742	522	9,561	$ 104
2	6	1 BD	208	357	439	226	276	424	712	1074	1060	712	545	153	6,186	$ 104
2	7	1 BD	377	541	638	393	441	587	647	878	922	827	640	350	7,241	$ 104
2	8	1 BD	197	131	105	183	236	276	448	601	663	569	512	243	4,164	$ 104
3	9	1 BD	355	349	384	329	444	666	964	1419	1304	1124	952	522	8,812	$ 104
3	10	1 BD	365	176	193	364	653	1120	1311	1698	1706	177	1167	621	9,551	$ 104
3	11	1 BD	278	407	503	197	477	812	793	1005	774	579	537	321	6,683	$ 104
3	12	1 BD	175	183	206	166	274	510	743	984	997	875	763	293	6,169	$ 104
4	13	1 BD	218	313	359	223	280	322	452	674	760	635	545	246	5,027	$ 104
4	14	1 BD	198	156	316	215	240	331	502	705	747	674	451	218	4,753	$ 104
4	15	1 BD	305	390	468	300	322	419	312	375	334	377	449	272	4,323	$ 104
4	16	2BD	351	535	599	363	468	741	1035	1481	1511	1249	958	472	9,763	$ 150
5	17	1BD	218	218	206	169	183	217	194	275	255	207	203	185	2,530	$ 41
5	18	1BD	190	288	390	200	205	172	150	163	153	186	169	154	2,420	$ 41
5	19	1BD	314	456	150	152	118	123	144	136	135	129	129	170	2,156	$ 33
5	20	studio	183	285	334	196	165	122	114	167	222	125	124	122	2,159	$ 37