



**Greenleaf Energy Solutions**

**119 Hawley Rd**

**Oxford CT 06478**

May 10, 2021

**New Fairfield Middle School**

**Presented By**

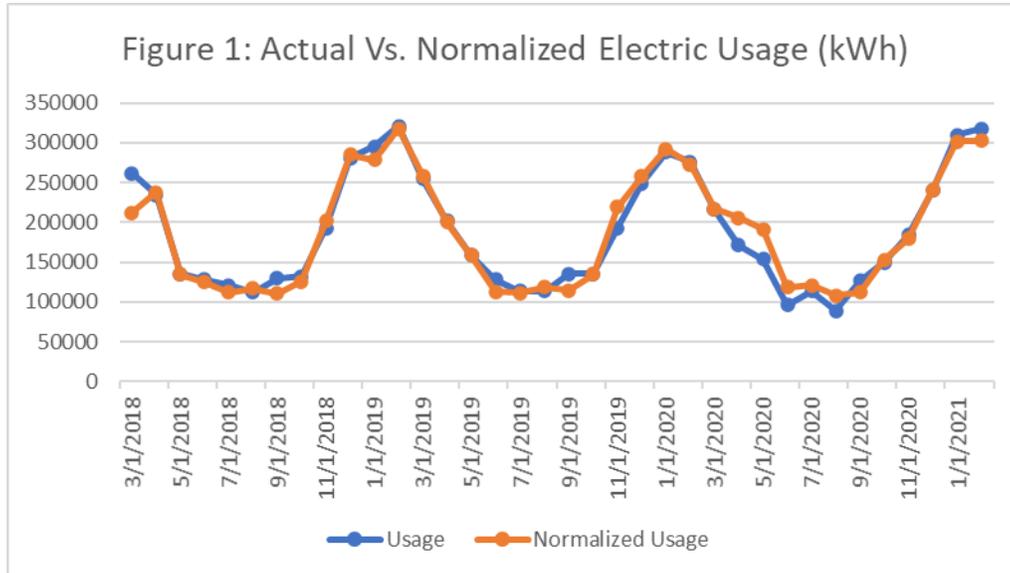
Felipe Siebrecht

(203) 917-8024

[fsiebrecht@greenleafenergysolutions.net](mailto:fsiebrecht@greenleafenergysolutions.net)

## 1. Energy Use

Greenleaf analyzed 36 months of electric history to determine average annual usage and develop a multiple regression formula to estimate usage based on heating and cooling degree days. Figure 1 illustrates the actual electric usage versus the normalized electric usage.



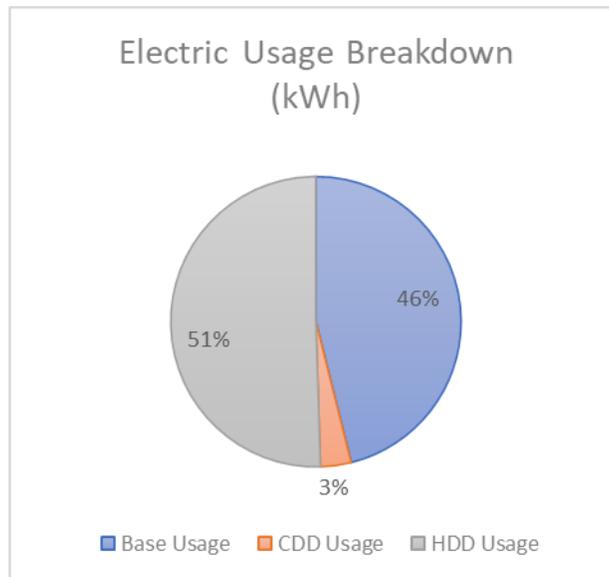
Normalizing the actual usage against days in billing cycle, heating degree days (base 65), and cooling degree days (base 65) resulted in an  $R^2 = 0.99$ , which suggest there is a strong relationship between electric usage in the dependent variables. Baseline electric usage can be defined by the following formula:

$$\text{Monthly kWh} = \text{Days} * 2839 + \text{CDD} * 85.76 + \text{HDD} * 193.3$$

- Where: Days is the number of days in billing cycle
- CDD is the total number of cooling degree days with base 65F
- HDD is the total number of heating degree days base 65F

New Fairfield 54 Gilloti Road Electric Normalize Usage					
Month	2018	2019	2020	2021	Average
Jan		278,772	291,949	302,019	290,913
Feb		318,259	272,764	302,997	298,007
Mar	211,890	258,814	217,267		229,324
Apr	237,710	199,865	205,608		214,394
May	134,349	158,674	191,488		161,504
Jun	125,204	113,274	118,202		118,893
Jul	112,142	111,482	120,873		114,832
Aug	116,577	118,662	108,366		114,535
Sep	110,231	114,659	112,418		112,436
Oct	126,078	134,661	153,346		138,028
Nov	201,758	219,361	179,762		200,293
Dec	285,051	257,919	240,851		261,274
<b>Total</b>					<b>2,254,433</b>

As a result of this analysis Greenleaf identified that approximately 50% of the on-site electric usage is related to heating, likely due to the heat pumps. The Electric Use Breakdown chart illustrates the electric usage by the dependent variables of the normalization analysis.



## 2. Existing Systems

The building is said to be occupied 12 hours per weekday. The systems and spaces focused on for this proposal include the following:

**Central Plant Hot Water Pumps:** Hot water is distributed to end use equipment via two (2) Super-E L1125136 7.5 HP pumps. The pumps are constant volume in a duty/standby configuration.

**Gym Heating and Ventilation Units (HVUs):** The gym is heated and ventilated by two (2) constant volume Carrier HVUs with model number 39LG115BA1931. The units each have a 7.5 HP supply fan with an Insulation Class F, which is suitable for VFD operation. The gym is approximately 8,500 ft<sup>2</sup>.

**Cafeteria Rooftop Unit (RTU):** The cafeteria is conditioned by a constant volume Carrier RTU, model number RSH13M53E15JBABOA. The unit has a 20 HP supply fan with an Insulation Class F, which is suitable for VFD operation. The cafeteria is approximately 6,700 ft<sup>2</sup>. ***This unit is beyond useful life and replacement is recommended.***

## 3. Proposed Scope

### ECM – 1 Demand Control Ventilation:

The Gym HVUs will receive CO2 sensors mounted in the return duct to monitor for real time occupancy levels. The system will prompt the outside air dampers to position correctly allowing only the minimum required outside air as necessary per ASHRAE standards.

Measure Scope:

1. *Install Demand Control Ventilation (DCV) systems including CO2 sensors and Belimo controllers for the two (2) Gym HV Units.*
2. *Current system is at 20% fixed outside air – this strategy will optimize outdoor air.*
3. *Occupancy for the Gym is 30 persons for 3 periods per day. The average persons per hour over a 12-hour day is  $(30 \times 3)/12 = 7.5$  persons per hour*

#### 4. Program and Commission

##### **ECM – 2 Constant Volume to Variable Air Volume Conversion**

The current HVUs in the gym are all single-zone, constant air volume (CAV) systems. The fans run 100% of full power even during partial load conditions. Adding Variable Frequency Drives (VFD) to the fan motors will convert the system to a staged variable-flow system, allowing fans to run at reduced speed under partial-load conditions.

Measure Scope:

1. *Replace the two (2) existing 7.5 HP motors with premium efficiency motors and variable frequency drives (VFDs), one on each Gym HVU.*
2. *Implement a two-stage speed fan control linking fan speed to the active heating stages*
3. *Program and Commission*

##### **ECM – 3 Hot Water Pump Variable Pumping**

The hot water (HW) system is a 2-pipe primary-loop, 2-valve, hydronic system with 2 × constant-speed lead-lag pumps. The pumps run at near 100% even during partial load conditions. Adding Variable Frequency Drives (VFD) to the pump motors allowing the pump to run at optimal speed reducing energy significantly.

Measure Scope:

1. *Install 2 × VFDs one on each lead-lag CW pump.*
2. *Install 1 × Differential Pressure Sensor (DPS) near the remote load to maintain minimal control head during partial load conditions.*
3. *Program and Commission*

##### **ECM – 4 Lighting Upgrades – Middle School Gym**

The Middle School Gym's lighting system currently consists of (48) high bay fixtures with (6) 28w Fluorescent lamps installed. The lights operate at an estimated annual usage of 2880 hours or 55 hours per week. Upgrading the lighting to LED-Integrated high bays with advanced controls will result in greater energy savings and enhanced fixture lifetime.

Measure Scope:

1. *Install 48 x LED Integrated High bays at 11,000 Lumens.*
2. *Install 48 x Enhanced lighting controls that enable the fixtures to use occupancy sensors and trim the light output/energy usage of the fixture.*
3. *Install 2 x Enhanced wireless switches to control the light output of the fixtures and manually turn them on/off.*
4. *Program and Commission*

#### 4. Simple Payback Summary

New Fairfield - Middle School	Project Cost	Est. Rebate*	GES Discount**	Final Cost	Combined Annual Savings	ROI	Payback Years	Est. kWh Savings	Est. Oil (Gal) Savings
ECM – 1 Gym HVU DCV & New Motors	\$25,575.00			\$25,575.00	\$3,676.32	14%	6.96	-	1,776
ECM – 2 Gym CV to VAV Conversion w/ Motors	\$38,750.00	\$16,398.71		\$22,351.29	\$5,609.49	25%	3.98	32,997	
ECM – 3 Heating Hot Water Pump Variable Pumping	\$34,061.25	\$14,414.47		\$19,646.78	\$4,997.66	25%	3.93	29,398	
ECM - 4 Lighting	\$23,635.97	\$10,002.57		\$13,633.40	\$2,104.08	15%	6.48	10,845	
<b>Project Total</b>	<b>\$122,022.22</b>	<b>\$40,815.75</b>	<b>\$5,707.13</b>	<b>\$75,499.34</b>	<b>\$16,387.55</b>	<b>22%</b>	<b>4.61</b>	<b>73,240</b>	<b>1,776</b>

\* Rebate Breakdown: Rebate contains a standard rebate, Savings are Essential Bonus Rebate, and a Comprehensive Bonus Rebate  
 \*\* GES Discount: Splits half of the difference between the original estimated incentive of \$52,230.00 and the actual incentive of \$40,815.75.

#### 5. Payment Options

- **Financing** – This municipal energy conservation project qualifies for Eversource Municipal On-Bill Financing. Eversource only provides the documentation upon completion of the project. New Fairfield Board of Education agrees to execute the on-bill financing agreement within 10 days of receipt or pay the balance of the project due within 15 days. A 1% per month penalty will be charged for balances beyond 30 days.

#### 6. Next Steps

We appreciate the opportunity to work with you and hope this proposal addresses all your needs. The information that is displayed above is based on data collected from the Greenleaf team and has been finalized by the Eversource Energy Opportunities program. If you have any questions related to this offering, please contact me directly to discuss.

Signing the Project’s Eversource LOA and below will allow Greenleaf to move forward with material procurement and scheduling the project’s installation.

X \_\_\_\_\_

Title: \_\_\_\_\_ Date: \_\_\_\_\_