



Town of Shrewsbury

Energy Reduction Plan

Adopted September 2018

This Energy Reduction Plan (ERP), in accordance with Criterion 3 of the Massachusetts Green Communities Program, outlines proposed energy efficiency measures to reduce costs and environmental impacts of municipal energy use in the Town of Shrewsbury, Massachusetts. The intent of this plan is to assist Shrewsbury in its energy reduction goals and help the Town achieve Green Communities designation through the Massachusetts Department of Energy Resources (DOER) Green Communities Program.

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I. PURPOSE AND ACKNOWLEDGEMENTS

This Energy Reduction Plan (ERP) outlines proposed energy efficiency measures to reduce costs and environmental impact of municipal energy use in the Town of Shrewsbury. The intent of the Plan is to assist the Town of Shrewsbury in its ongoing Green Energy efforts, particularly the Town's current goal to become a designated Green Community through the Massachusetts Department of Energy Resources (DOER) Green Communities Program. In accordance with Criterion 3 of the Massachusetts Green Communities Program, the ERP allows municipal officials to identify energy-efficiency opportunities and establish a timeline with specific targets to reduce energy use in municipal facilities and vehicles by twenty (20) percent over a five-year period.

Shrewsbury's energy baseline is computed from Fiscal Year 2017 (FY2017) energy usage and will be discussed in Section III of this plan. The energy conservation recommendations draw upon information from energy audits performed by Horizon Solutions LLC and the Central Massachusetts Regional Planning Commission (CMRPC). These strategies provide a realistic path for implementation that will evolve with the Town's priorities and changes in technology. The decreased energy use realized as a result of this plan will reduce greenhouse gas emissions and Town operating costs.

A. LETTERS VERIFYING THE ADOPTION OF THE ENERGY REDUCTION PLAN

- **General Government-** A letter of approval of this Energy Reduction Plan by the Board of Selectmen is attached in Appendix A, Adoption Verification Letters.
- **Schools-** A letter of approval of this Energy Reduction Plan by the School Superintendent is attached in Appendix A, Adoption Verification Letters.

B. CONTRIBUTORS TO THE ENERGY REDUCTION PLAN

- Board of Selectmen
- Town Manager's Office
- Shrewsbury Public Schools
- Shrewsbury Electric and Cable Operations
- Public Buildings Department
- Accounting Office
- Assessors Office
- Water and Sewer Departments
- Highway Department
- Fire Department
- Police Department
- Horizon Solutions LLC (Horizon)
- Central Massachusetts Regional Planning Commission (CMRPC)

II. EXECUTIVE SUMMARY

A. NARRATIVE SUMMARY OF THE TOWN

The Town of Shrewsbury is located in Central Massachusetts, approximately 34 miles west of Boston. With a population of 35,608, it is the second largest municipality in Worcester County, following its neighbor the City of Worcester. Shrewsbury is a suburban, residential community about 22 square miles in size with Lake Quinsigamond making up most of the town's western border.

Approximately fourteen percent (14.6%) of Shrewsbury residents are sixty-five (65) years or older and thirty eight percent (37.9%) are between the ages of 15 to 44 years old (American Community Survey, 2016). The Town's median age is approximately forty (40.6) (American Community Survey, 2016). Recent

estimates show that median income in Shrewsbury is equal to \$98,790 (American Community Survey, 2016).

Shrewsbury has a board of selectmen comprised of five (5) members. While Shrewsbury remains an attractive place for recreation, working, and living, the Town must strive to balance environmental sustainability with its social and economic priorities. The Green Communities designation will be a significant step in achieving the status of a sustainable, environmentally friendly community.

B. SUMMARY OF MUNICIPAL ENERGY USES

The number of municipal buildings, vehicles, traffic lights and street lights are shown in Table 1 on page 4.

Municipal Buildings

The Town of Shrewsbury operates twenty-four (24) municipal buildings (excluding water and sewer treatment and pumping facilities) that will be assessed in this Energy Reduction Plan. These buildings include:

- Sherwood Middle School
- Shrewsbury Public Library
- Floral Street Elementary School
- Centech Fire Station
- Walter J. Paton Elementary School
- Calvin Coolidge Elementary School
- Beal School
- Senior Center
- Shrewsbury Town Hall
- Police Station
- Oak Middle School
- Lake Fire Station
- Donahue Rowing Center
- Parker Road PreK School
- Parker Road East
- Fire Headquarters
- Shrewsbury Senior High School
- Highway Garage
- Spring Street Elementary School
- American Legion
- Police Boat House
- Drinking Water Treatment Plant
- Water and Sewer Garage
- Cemetery Garage

Most of these facilities are heated with natural gas. Exceptions include the Donahue Rowing Center, which is heated with oil, and unheated buildings such as the Police Boat House and Parker Road East. At Town Hall, gas heat is utilized for three make up air units. The building's primary heating source is electricity. Although the Drinking Water Treatment Plant is heated, Shrewsbury has never received invoices for natural gas usage at the facility. Consequently, heating data for the Drinking Water Treatment Plant is excluded from this plan.

Building Additions and New Construction

In November 2018 a new water treatment plant will be brought online. This facility will replace the existing plant at 45 West Main Street, which will be demolished. The new facility will include energy efficient equipment as well as systems to treat for manganese.

The Town is also in the process of replacing the Beal School. A new school facility is in the design phase. The Town intends to divest of the Beal School following construction and occupancy of the new facility. The Beal school is 32,100 sf. The replacement facility will be approximately 145,000 sf and meet LEED 4 standards. The lighting at the new school will consist of LEDs with digital lighting controls. The HVAC will

have DDC controls. The building insulation will meet or exceed the building code. The new facility is expected to come online in May 2021.

The Shrewsbury Public Library received an addition along with a complete renovation in August of 2016.

Vehicles

Shrewsbury has a total of 108 municipal vehicles. Of these vehicles, seventy-four (74) are exempt from fuel-efficient vehicle policy adopted by the Board of Selectmen and School Superintendent in September 2018. The Town owns no electric vehicle charging stations.

Street Lights and Traffic Lights

The Town of Shrewsbury has 3,084 streetlights. These lights are owned and maintained by Shrewsbury Electric and Cable Operations (SELCO), a municipal light plant that provides the Town with electricity. The majority of the lights (2,563) are LED while the remaining lights are sodium vapor or mercury (521). Converting the lights to LED occurred in four phases, the most recent (and most significant) of which took place in FY2018. Shrewsbury also has two (2) town-owned traffic control lights, which are located on Old Mill/Main Street and South Quinsigamond Avenue. The Town also owns four (4) flashing school zone lights. The flashing school zone lights are LEDs.

Water and Sewer

The Town of Shrewsbury operates one (1) drinking water treatment plant, thirty-eight (38) sewer pump stations, eight (8) water pump stations, three (3) water regulator pits, four (4) water tanks, and an operations yard. Shrewsbury contributes to the regional wastewater treatment plant with Westborough. Because this plant is located in Westborough, it is excluded from this plan. Shrewsbury also contributes a small portion of its wastewater to the Upper Blackstone Water Pollution Abatement District in Millbury.

Renewable Energy

SELCO receives forty-five (45) to fifty (50) percent of its energy from non-carbon producing assets. There are small solar arrays on the roof at the Oak Middle School and at Floral Street Elementary School. SELCO commissioned a 3MW solar array in July 2018. The array was built by SELCO and will provide energy for 400-500 homes. The array is constructed on a 12 acre portion of a capped ash landfill. SELCO is in the process of creating a community solar program. They are also reserving 1,000,000 kWh hours of energy produced by the solar array for the projected new elementary school. In addition, SELCO has a Power Purchase Agreement (PPA) with Con Edison for a 2.5MW solar array located in Shrewsbury on Cherry Street. There are plans for a 60kW solar facility to be built in conjunction with the new water treatment plant located at 45 West Main Street.

Outside of Town borders, SELCO has a thirteen (13) percent ownership stake in a 15MW wind farm built by municipal electric utilities. It resides in Hancock MA and was the largest wind farm in the State at the time of commissioning in 2011. SELCO also has a PPA with Ashelot to purchase hydro-generated energy from a dam in New Hampshire.

Table 1: Summary of Municipal Energy Users		
Municipal Energy User	Number	Ownership
Buildings Heat Source		
Oil Heat	1	Town of Shrewsbury
Natural Gas Heat	20	Town of Shrewsbury
Propane Heat	0	N/A
Propane for Kitchen Use	0	N/A
Biomass Heat	0	N/A
Other Heat Type	0	N/A
Vehicles		
Non-Exempt	34	Town of Shrewsbury
Exempt	74	Town of Shrewsbury
Street Lights and Traffic Lights		
Street Lights	3,084	SELCO
Traffic Lights	2	Town of Shrewsbury
Water and Sewer		
Drinking Water Treatment Plant	1	Town of Shrewsbury
Pumping Stations	46	Town of Shrewsbury
Open Space		
Parks and Fields	2	Town of Shrewsbury

C. SUMMARY OF ENERGY USE BASELINE AND PLANS FOR REDUCTIONS

During baseline year FY2017, the total energy use in municipal vehicles and facilities in the Town of Shrewsbury was 91,976 MMBtus. Table 2 depicts an overall summary of the Town’s municipal energy usage during the baseline year. This table includes projected savings. Figure 1, on the following page, shows overall energy usage by facility category for FY2017 as determined by MassEnergyInsight.

The majority of energy consumed in Shrewsbury is used by municipal buildings (56%). The remaining usage is divided between vehicles (19%), water and sewer (19%), street and traffic lights (5%) and open space (<1%).

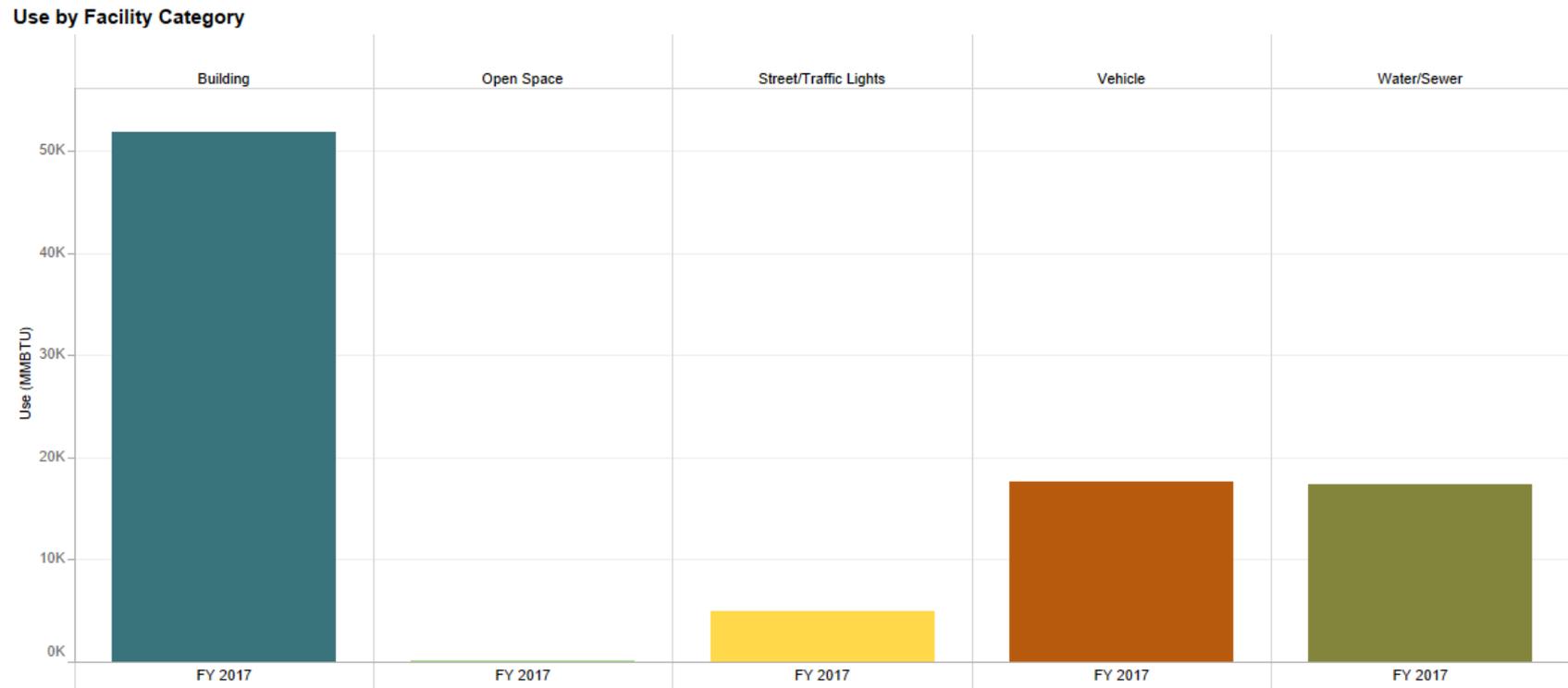
At the request of the Town of Shrewsbury, Horizon Solutions LLC (Horizon) assessed and documented the energy conservation opportunities at Shrewsbury facilities. These opportunities were identified through several site visits, inspections, staff interviews, and data collected through the course of ASHRAE Level 2¹ audits. In conjunction with general (“soft”) measures, the identified projects will reduce Shrewsbury’s municipal energy use by twenty (20) percent from the baseline year. Specific actions are detailed in Section IV of this plan. The complete energy audits from Horizon are included as Appendix C.

¹ An ASHRAE Level 1 assessment determines how much energy a building uses and how that compares to other similar buildings, includes a short walk-through of the facility and identifies potential efficiency measures. The costs and savings of the measures are usually identified with low precision. An ASHRAE Level 1 assessment is often referred to as a scoping audit. An ASHRAE Level 2 assessment expands on a Level 1 by identifying much more accurate costs and savings for the recommended efficiency measures. Note that these costs are still not bid-level construction costs but generally are within 15-20 percent of accuracy. Cost and energy savings from operational and behavioral measures are also quantified in an ASHRAE Level 2 assessment. For more complex facilities, an end-use breakdown of how a facility uses its energy (i.e., 30 percent of electricity use is for lighting, 60 percent for HVAC, and 10 percent for plug load) is typically included.

Table 2: Summary of Municipal Energy Use Baseline (FY2017)				
Categories	MMBtu Used in Baseline Year	% of Total MMBtu Baseline Energy Consumption	Projected Planned Documented MMBtu Savings²	Savings as % of Total MMBtu Baseline Energy Consumption
Buildings	51,892	56.42%	12,486	13.58%
Vehicles	17,655	19.20%	0	0.00%
Street/Traffic Lights	4,941	5.37%	1,457	1.58%
Water/Sewer	17,350	18.86%	0	0.00%
Open Space	139	0.15%	0	0.00%
Total	91,976	100%	13,943	15.16%

² Projected planned energy savings are discussed in more detail later in this plan and are presented in Table 3.

Figure 1. Baseline Dashboard from MEI



III. ENERGY USE BASELINE INVENTORY

A. IDENTIFICATION OF THE INVENTORY TOOL USED

The Town of Shrewsbury will use the MassEnergyInsight (MEI) database as the inventory tool for this Energy Reduction Plan.

B. IDENTIFICATION OF THE BASELINE YEAR

The Town of Shrewsbury intends to complete its twenty (20) percent reduction as outlined in this Energy Reduction Plan in a 5-year period starting in FY2018 and ending in FY2022. FY2017 will serve as the baseline year, starting on July 1, 2016 and ending on June 30, 2017. The total consumption of energy in FY2017 was 91,976 MMBtus as shown Tables 3a and Table 3b on the following pages.

C. MUNICIPAL ENERGY CONSUMPTION FOR THE BASELINE YEAR

During baseline year FY2017, the energy used by municipal vehicles and facilities in the Town of Shrewsbury totaled 91,976 MMBtus. Tables 3a and 3b present energy use for each municipal facility in Native Units and MMBtus, respectively. The information shown in Figure 2 below is provided by DOER to explain how MMBtus are calculated.

Figure 2. MMBtu Conversion Chart

1 kilowatt hour of electricity	= 0.003412 MMBtu
1 therm	= 0.1 MMBtu
1 ccf (100 cubic foot) of natural gas	= 0.1028 MMBtu ³
1 gallon of heating oil	= 0.139 MMBtu
1 gallon of propane	= 0.091 MMBtu
1 cord of wood	= 20 MMBtu
1 gallon of gasoline	= 0.124 MMBtu ³
1 gallon of E100 ethanol	= 0.084 MMBtu
1 gallon of E85 ethanol	= 0.095 MMBtu
1 gallon of diesel fuel	= 0.139 MMBtu
1 gallon of B100 biodiesel	= 0.129 MMBtu
1 gallon of B20 biodiesel	= 0.136 MMBtu ²⁴
1 gallon of B10 biodiesel	= 0.137 MMBtu ⁹
1 gallon of B5 biodiesel	= 0.138 MMBtu ⁹⁴
1 barrel of residual fuel oil	= 6.287 MMBtu

Fuel Energy Content of Common Fossil Fuels per DOE/EIA⁵
BTU Content of Common Energy Units – (1 million Btu equals 1 MMBtu)

³ Based on U.S. consumption, 2007

⁴ Calculated Values from those of diesel and B100 biodiesel

⁵ US Department of Energy/Energy Information Administration

Table 3a. Energy Reduction Plan Guidance (Native Fuel Units)

		Electric (kWh)	Gas (therms)	2017 Oil (gallons)	Gasoline (gallons)	Diesel (gallons)
Building	Sherwood MS	699,000	17,442			
	Shrewsbury Public Library	377,560	6,912			
	Floral Street ES	573,600	17,274			
	Centech Fire Station	39,183	1,570			
	Walter J Paton ES	186,577	10,861			
	Calvin Coolidge ES	397,640	8,823			
	Beal School	205,803	20,086			
	Senior Center	82,400	3,286			
	Shrewsbury Town Hall	532,630	527			
	Police Station	189,041	10,978			
	Oak MS	1,075,500	56,406			
	Lake Fire Station	38,180	2,141			
	Parker Road PreK	102,463	3,112			
	Donahue Rowing Center	33,824		2,398		
	Fire Headquarters	126,160	5,892			
	Shrewsbury Sr HS	2,064,000	65,222			
	Highway Garage	109,900	13,700			
	Spring Street ES	286,160	13,426			
	Legion	1,558	2,012			
	Police Boat House	331				
	Parker Road East	15,692				
	Water and Sewer Garage	41,077	8,868			
	Cemetery Garage	1,811	2,063			
	Allen Farm	71				
	Total	7,180,161	270,601	2,398		
Open Space	Dean Park	36,794				
	Maple Ave Soccer Fields	3,901				
	Total	40,695				
Street/Traffic Lights	Streetlights	1,444,282				
	Traffic Lights	3,685				
	Blinking School Lights	38				
	Total	1,448,005				
Vehicle	Police				39,672	0
	All except police				61,989	36,323
	Total				101,661	36,323
Water/Sewer	108 Reservoir Street Sewer P..	67,694	17			
	17 Hillandro Drive	9,527	0			
	Camelot Drive Sewer Pump S..	14,641	17			
	Quail Hollow Sewer Pump Sta..	39,072	112			
	Stoney Hill Sewer Pump Stati..	47,712	84			

Table 3a. Energy Reduction Plan Guidance (Native Fuel Units) (cont.)

Stone Meadow Farm Sewer P..	13,565	32			
371 Main Street Line	273,600	5,002			
231 West Main Street		10			
Arrowwood Drive Sewer Pum..	17,952	491			
79 Main Street		553			
171 Oak Street	5,867	272			
1 Appaloosa Drive Sewer Pu..	5,563	212			
Bowditch Drive/ James Barre ..	7,578				
7 Cedar Rd. Sewer Pump Stat..	7,199				
Colonial Drive Sewer Pump St..	13,393				
Eaglehead Terrace Sewer Pu..	7,255				
Gold Street/ Farmington Sewe..	31,600				
629 Grafton St. Sewer Pump ..	10,718				
478 Grafton St. Sewer Pump ..	24,727				
Gulf Street Sewer Pump Stati..	25,034				
51 Hartford Turnpike Sewer P..	20,544				
Harvey Place Sewer Pump St..	100,363				
Hill Street Sewer Pump Station	69,221				
Holden Street Sewer Pump St..	10,000				
128 Howe Ave Sewer Pump S..	1,709				
Jordan Pond Sewer Pump Sta..	59,202				
490 Lake St. Sewer Pump Sta..	5,600				
65 Lakeside Drive Sewer Pum..	2,284				
Maple Ave Sewer Pump Stati..	224,700				
Oak Street Sewer Pump Stati..	9,124				
Old Laxfield Road Sewer Pum..	37,583				
ORCHARD MEADOW DR SE..	3,167				
1 PINELAND AVE SEWER P..	2,485				
ROLFE AVE SEWER	290,840				
232 SO QUINSIG. AVE SEW..	2,305				
6 SO. BROOK ST SEWER P..	3,610				
TANAGER HILL DR SEWER ..	5,121				
TOBLIN HILL DR SEWER PU..	27,386				
344 WALNUT STREET SEW..	45,555				
35 BROWNING RD TANK	1,914				
171 GULF ST WATER BOOS..	342,250				
38 HILLSIDE DR WATER TA..	1,170				
LAMBERTS PIT Well	181,843				
Drinking Water Treatment Pla..	2,427,600				
125 PROSPECT STREET	6,923				
SEWALL ST PUMP 4	361,760				
206 SOUTH ST PUMP	3,409				
8 THORNING DRIVE	304				
Colton Lane Pump	14,975				
Total	4,885,644	6,802			
Grand Total	13,554,505	277,403	2,398	101,661	36,323

Table 3b. Energy Reduction Plan Guidance (MMBtu)

		2017						
		Diesel	Electric	Gas	Gasoline	Oil	Total	
Building	Sherwood MS		2,385	1,744			4,129	
	Shrewsbury Public Library		1,288	691			1,979	
	Floral Street ES		1,957	1,727			3,685	
	Centech Fire Station		134	157			291	
	Walter J Paton ES		637	1,086			1,723	
	Calvin Coolidge ES		1,357	882			2,239	
	Beal School		702	2,009			2,711	
	Senior Center		281	329			610	
	Shrewsbury Town Hall		1,817	53			1,870	
	Police Station		645	1,098			1,743	
	Oak MS		3,670	5,641			9,310	
	Lake Fire Station		130	214			344	
	Parker Road PreK		350	311			661	
	Donahue Rowing Center		115			333	449	
	Fire Headquarters		430	589			1,020	
	Shrewsbury Sr HS		7,042	6,522			13,565	
	Highway Garage		375	1,370			1,745	
	Spring Street ES		976	1,343			2,319	
	Legion		5	201			207	
	Police Boat House		1				1	
	Parker Road East		54				54	
	Water and Sewer Garage		140	887			1,027	
	Cemetery Garage		6	206			212	
	Allen Farm		0				0	
		Total		24,499	27,060		333	51,892
	Open Space	Dean Park		126				126
Maple Ave Soccer Fields			13				13	
Total			139				139	
Street/Traffic Lights	Streetlights		4,928				4,928	
	Traffic Lights		13				13	
	Blinking School Lights		0				0	
	Total		4,941				4,941	
Vehicle	Police	0			4,919		4,919	
	All except police	5,049			7,687		12,736	
	Total	5,049			12,606		17,655	
Water/Sewer	108 Reservoir Street Sewer P..		231	2			233	
	17 Hillandro Drive		33	0			33	
	Camelot Drive Sewer Pump S..		50	2			52	
	Quail Hollow Sewer Pump Sta..		133	11			145	
	Stoney Hill Sewer Pump Stati..		163	8			171	

Table 3b. Energy Reduction Plan Guidance (MMBtu) (cont.)

Stone Meadow Farm Sewer P..		46	3			49
371 Main Street Line		934	500			1,434
231 West Main Street			1			1
Arrowwood Drive Sewer Pum..		61	49			110
79 Main Street			55			55
171 Oak Street		20	27			47
1 Appaloosa Drive Sewer Pu..		19	21			40
Bowditch Drive/ James Barre ..		26				26
7 Cedar Rd. Sewer Pump Stat..		25				25
Colonial Drive Sewer Pump St..		46				46
Eaglehead Terrace Sewer Pu..		25				25
Gold Street/ Farmington Sewe..		108				108
629 Grafton St. Sewer Pump ..		37				37
478 Grafton St. Sewer Pump ..		84				84
Gulf Street Sewer Pump Stati..		85				85
51 Hartford Turnpike Sewer P..		70				70
Harvey Place Sewer Pump St..		342				342
Hill Street Sewer Pump Station		236				236
Holden Street Sewer Pump St..		34				34
128 Howe Ave Sewer Pump S..		6				6
Jordan Pond Sewer Pump Sta..		202				202
490 Lake St. Sewer Pump Sta..		19				19
65 Lakeside Drive Sewer Pum..		8				8
Maple Ave Sewer Pump Stati..		767				767
Oak Street Sewer Pump Stati..		31				31
Old Laxfield Road Sewer Pum..		128				128
ORCHARD MEADOW DR SE..		11				11
1 PINELAND AVE SEWER P..		8				8
ROLFE AVE SEWER		992				992
232 SO QUINSIG. AVE SEW..		8				8
6 SO. BROOK ST SEWER P..		12				12
TANAGER HILL DR SEWER ..		17				17
TOBLIN HILL DR SEWER PU..		93				93
344 WALNUT STREET SEW..		155				155
35 BROWNING RD TANK		7				7
171 GULF ST WATER BOOS..		1,168				1,168
38 HILLSIDE DR WATER TA..		4				4
LAMBERTS PIT Well		620				620
Drinking Water Treatment Pla..		8,283				8,283
125 PROSPECT STREET		24				24
SEWALL ST PUMP 4		1,234				1,234
206 SOUTH ST PUMP		12				12
8 THORNING DRIVE		1				1
Colton Lane Pump		51				51
Total		16,670	680			17,350
Grand Total	5,049	46,248	27,740	12,606	333	91,976

IV. ENERGY REDUCTION PLAN

A. NARRATIVE SUMMARY

The Town of Shrewsbury is committed to reducing baseline (FY2017) energy consumption by twenty (20) percent over the 5-year period from FY2018 to the end of FY2022. A list of specific and documented strategies is presented in Table 4 (see Appendix B), which accounts for 13,943 MMBtus or 15.16 percent of total municipal energy consumption. The energy audit conducted by Horizon identifies the majority of these projects and is included as Appendix C. The Town will implement general (“soft”) measures to achieve an additional 4.84 percent reduction in energy use.

Overview of Goals for Years 1 – 3

This time period runs from FY2018 to the end of FY2020. Several energy efficiency measures were completed in the first year of this period. These projects include:

- Streetlights: 1,933 streetlights converted to LED
- Town Hall: 2nd floor lighting upgraded to LED, HVAC upgraded
- High School: Exterior lighting upgraded to LED.
- Paton School: HVAC and air conditioning upgraded
- Spring Street School: HVAC and air conditioning upgraded

In years FY2019 and FY2020, Shrewsbury’s strategy will be to implement the following projects:

FY2019:

- Water Treatment Plant: Replace existing plant with new energy efficient facility
- General conservation measures: Implement general efficiency measures such as instructing staff to turn off computers and other equipment when not in use
- Building Operator Certification
- Senior Center: Boiler replacement
- Town Hall: Roof insulation
- Oak Middle School: VFDs on AHU (auditorium), weather-stripping doors
- Paton Elementary School: Weather-stripping doors
- High School: VFDs on AHUs (gym, commons, and auditorium)
- Parker Road Pre-K: Weather-stripping doors
- Coolidge Elementary: Weather-stripping doors

FY2020:

- Oak Middle School: VFDs on AHUs (classrooms, cafeteria, gym, upstairs corridors)
- High School: VFDs on AHUs (gym class, kitchen, mechanical room, presentation room, department offices), exhaust and makeup air control for kitchen hood

Overview of Goals for Years 4 – 5

The goals for FY2021 and FY2022 are to complete any unfinished projects planned for years 1-3 and the following projects:

FY2021

- Beal School: Bring new school online and divest of existing facility
- Sherwood Middle School: VFDs on AHUs
- Floral Street Elementary School: Lighting upgrade

FY2022

- Oak Middle School: VFDs on AHUs (Band Room, Shop, Boys' Locker Room, Girls' Locker Room)
- High School: VFDs on AHUs (Boys' Locker Room, Girls' Locker Room, Band Room, Choral Room, Wood Shop)
- Parker Middle School: Lighting upgrade
- Paton Road Elementary School: Lighting upgrade (contingent upon availability of funding)
- Spring Street Elementary School: (contingent upon availability of funding)

Identify Areas of Least Efficiency/Greatest Waste

Shrewsbury will work to identify areas of least efficiency/greatest waste using MEI's Buildings to Target assessment. This assessment, which is presented in Table 3a, compares municipal buildings to one another using a standardized energy use per area metric. This metric is measured as kBTU/square foot. Buildings that have the highest energy use and the worst efficiency are located in the top right quadrant of the figure labeled Efficiency and Use in Figure 3b.

Shrewsbury's municipal buildings average 51.6 kBTU/sf. The High School is the largest energy user but slightly below the median efficiency at 43.4 kBTU/sf. Oak Middle School is the second largest energy user and has an efficiency comparable to the median and High School (48.3 kBTU/sf). In comparison, the Police Station and Legion are closer to the Town's median usage (981 MMBtu) but are less efficient at 150.4 and 145 kBTU/sf, respectively. Stronger conservation measures at high-usage but relatively efficient buildings combined with the first-wave of conservation measures at small-usage but inefficient buildings will provide the greatest savings. Thus, Figures 3a and 3b provides a clear path forward in regard to what energy conservation measures can be expected to result in the greatest savings at each municipal building in the Town of Shrewsbury.

Figure 3a. Buildings to Target from MEI

Building Efficiency, Emissions and Cost ■ Heating ■ Electric

Emissions factors updated 1/4/2012 using Massachusetts-specific greenhouse gas emissions factors.

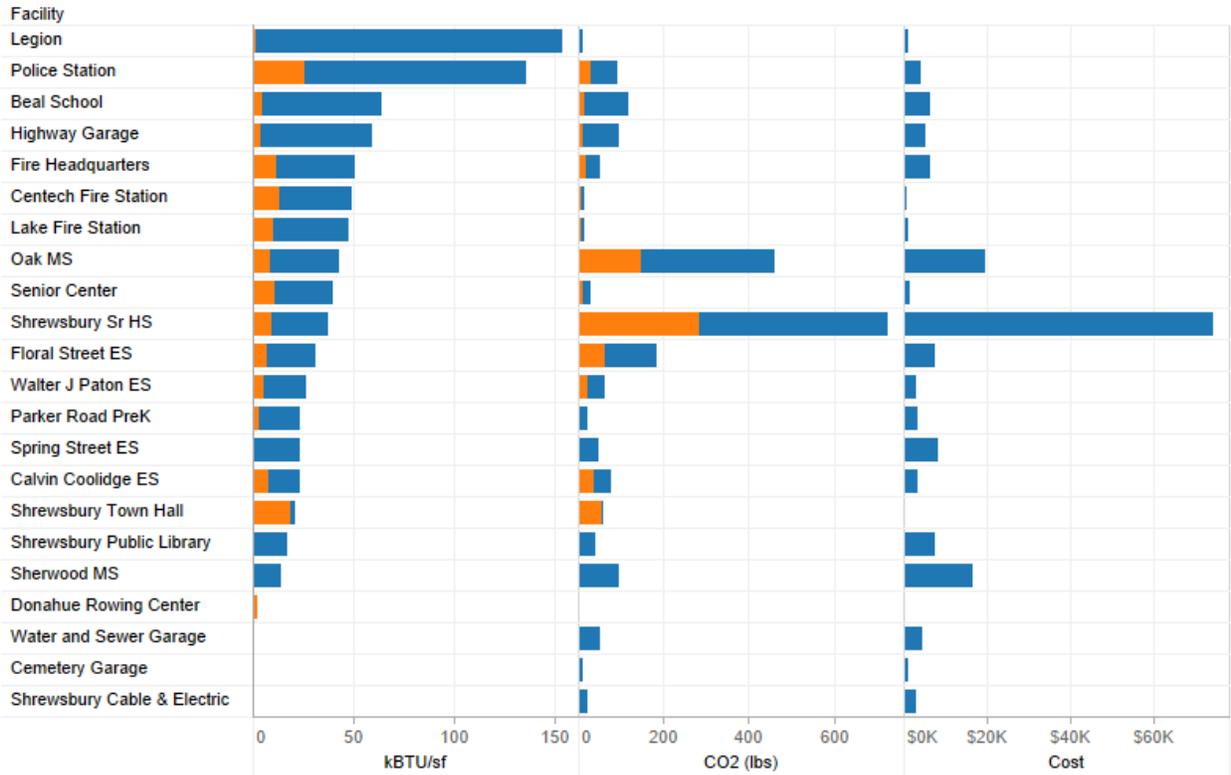
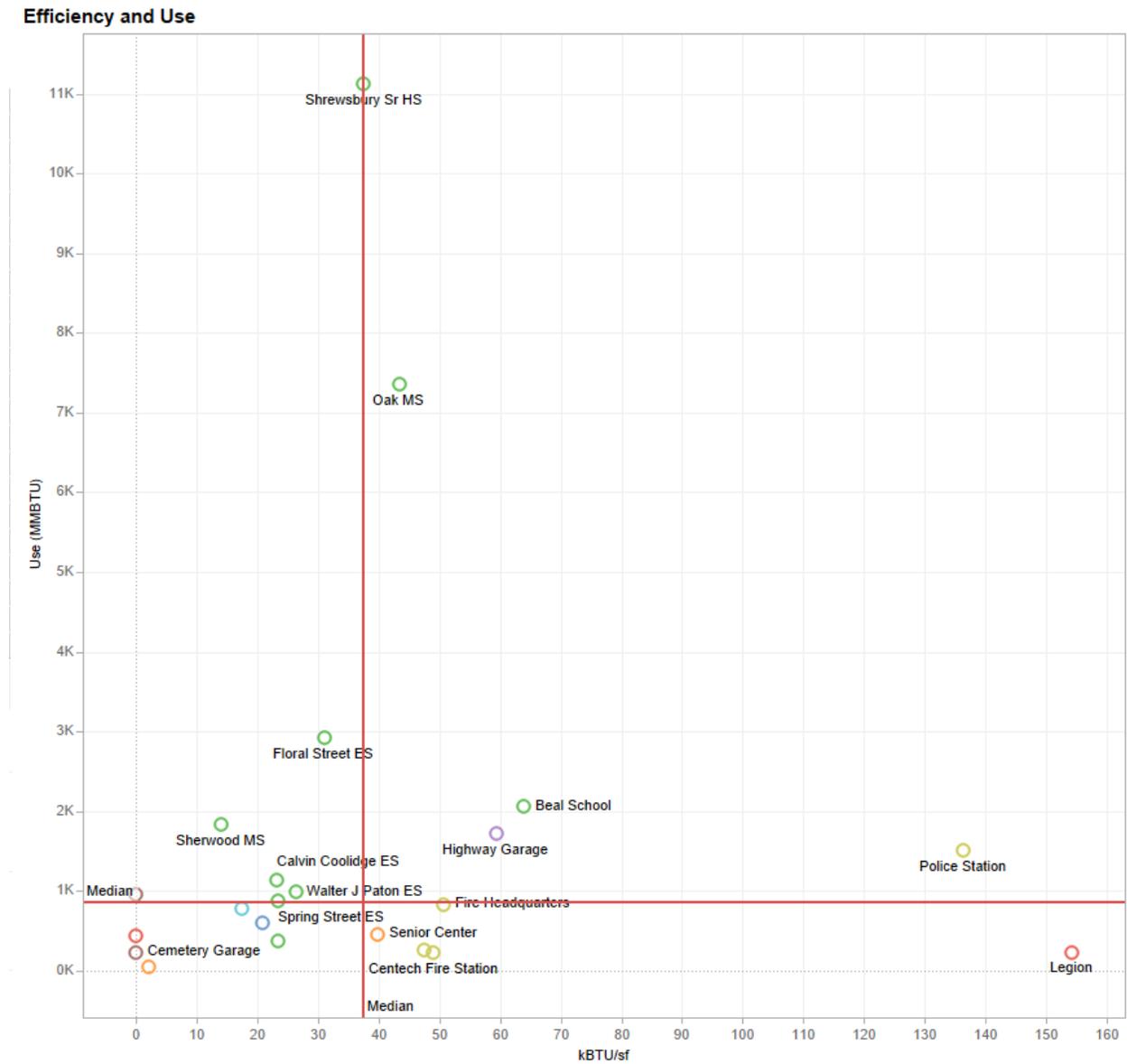


Figure 3b. Building Energy Efficiency per Square Foot from MEI⁶



⁶ Several facilities depicted in Figure 3b are not labeled. These include SELCO and Donahue Rowing Center (bottom left quadrant), water and sewer garage (top left quadrant), and Lake Fire Station (bottom right quadrant).

B. REACHING 20% ENERGY USE REDUCTION WITHIN 5-YEARS FOLLOWING BASELINE

The Town of Shrewsbury is committed to reducing baseline (FY2017) energy consumption by twenty (20) percent over the 5-year period from FY2018 to the end of FY2022. A list of specific and documented strategies is presented in Table 4a (see Appendix B) and accounts for a reduction of 15.16 percent of baseline energy use. The Town will implement general (“soft”) measures to achieve an additional 4.84 percent reduction in energy use. The strategy for implementing this plan is presented below.

Program Management Plan for Implementation, Monitoring, and Oversight

The Town Manager’s Office will be responsible for securing the funds and general oversight of the energy efficiency projects, annual reporting, grant administration, and maintaining energy use data in MEI.

Methodology

The Town of Shrewsbury will follow the recommendations outlined by Horizon and the programmatic measures identified by CMRPC. Together, these strategies will reduce the Town’s energy use by twenty (20) percent.

Summary of Energy Audits and Other Sources for Projected Energy Savings

In 2018, Horizon Solutions audited eleven (11) of Shrewsbury’s buildings as part of the Town’s Green Communities effort. Audited facilities included:

- Oak Middle School
- Sherwood Middle School
- High School
- Senior Center
- Town Hall
- Beal School
- Paton Elementary School
- Parker Road Pre-K
- Coolidge Elementary School
- Floral Street Elementary School
- Spring Street Elementary School

Buildings

In 2018, detailed audits were conducted at eleven (11) municipal buildings. These audits included data during site visit walkthroughs, review of utility bills, and discussions with administration officials, staff, and building occupants. The data presented in these audits includes specific energy conservation measures (ECMs) with detailed information about baseline energy use, projected usage savings and annual cost data. This information is contained in individual reports for each facility as well as in an Energy Audit Summary Report. Annual usage, cost estimates and annual cost savings were taken directly from these reports to estimate energy savings. These reports are contained in Appendix C.

Building Operator Certification

In addition to building upgrades and energy-saving modifications, the Town intends to send the facilities director to Building Operator Certification (BOC®) training. Energy-savings evaluations show that an individual Certified Building Operator (CBO) can reduce energy use by more than 2% of a building’s building electricity demand.⁷ By certifying operators in building systems efficiency, the town will realize savings in energy use and related costs, improvements in comfort and safety, and may continue to experience these benefits for up to five (5) years following certification (based on program estimates).⁸

⁷Energy Savings for the Building Operator Certification (BOC®) Program. <http://www.theboc.info/wp-content/uploads/2017/02/BOC-Energy-Savings-FAQ-2.0-web.pdf>

⁸ Building Operator Certification Program. <https://www.theboc.info/certifications/>

Table 4 Appendix B includes this measure and reflects a conservative savings of 1.5 percent of building energy consumption. BOC training is expected to reduce the Town's energy use by 902 MMBTUs.

C. GENERAL CONSERVATION MEASURES

Specific strategies outlined in Table 4 account for a projected energy savings of 15.16 percent. Beyond these measures, the Town of Shrewsbury will also implement “soft” measures, enabling the Town to meet the twenty (20) percent reduction target.

Municipal Buildings

Town buildings serve as the largest energy users. Consequently, the municipal buildings will continue to be an area of focus in the future. After the priority work identified in Table 4 Appendix B. is underway, smaller but still significant projects can be undertaken in all buildings. Such projects would include energy conserving window treatments for smaller area windows where appropriate and upgrading storm windows.

We also view training and education of building occupants as an ongoing energy reduction strategy. We will utilize a variety of behavioral strategies to conserve energy, including:

Equipment

Municipal employees will be instructed to turn off or set computers and other electronic equipment to hibernation mode when not in use. Additionally, school equipment will be turned off when not in use during summer months. Shrewsbury will ensure that building occupants are maintaining energy efficient practices by placing signage and/or reminder tags in each department office to encourage all occupants to power down and unplug during off hours.

Heating and Cooling

Regarding heating and cooling, building and zone thermostats shall be set to the highest comfortable temperature in summer and the lowest in winter. Employees shall be encouraged to keep warmer clothes on hand so that heating can be set at a lower level. Shrewsbury will also establish specific guidelines for open window air exchange as may be feasible and practicable. Automatic thermostats will be considered where feasible and employees will be encouraged to dial down thermostats when leaving room or building for non-automatic systems. The Town will also evaluate energy efficient strategies for keeping IT equipment cool.

Interior Lighting

Regarding lighting systems, The Town of Shrewsbury will ensure that public buildings are not lighted unnecessarily when in use, that buildings be upgraded to automatic light switches, and that employees be encouraged to turn off lights when exiting rooms and buildings.

Upon designation, the Town will track behavioral changes by conducting occasional, off-hours checks for monitors and lights left on and windows open in winter. We will also create an inventory of light switches that are not automatic and pursue appropriate upgrades.

Street and Traffic Lighting

The Town will continue to identify opportunities to utilize solar energy as substitute for hard wired street lighting systems. The Town Manager's Office will also coordinate with the Public Works and Police

Department to identify additional energy savings by using passive, reflective signage rather than lighting for roadway safety where ever possible.

Operations, Maintenance, and Equipment

The Town will reduce energy consumption by working to make sure that certain operational and maintenance standards are in place. The Town will ensure that all equipment is functioning as designed, thermostats are calibrated correctly, dampers are correctly adjusted, and janitors are implementing best practices. Thermostats can also be relocated to be placed in more effective positions.

D. SUMMARY OF LONG-TERM ENERGY REDUCTION GOALS – BEYOND 5 YEARS

Beyond the 5-year plan outlined above, Shrewsbury will continue to pursue energy reduction goals. The following strategies will allow the Town to reduce its energy consumption beyond twenty (20) percent of the established FY2017 usage baseline.

Vehicles Replacement Plan

The Town will continue to replace older vehicles with more fuel-efficient vehicles. The town will also investigate the possibility of acquiring electric vehicles and installing electric vehicle charging stations at public places throughout the town.

General Vehicle-Fuel Conservation Measures

Shrewsbury will assess opportunities for general fuel economy savings. According to the US Department of Energy (DOE) website at fueleconomy.gov, best practices include the following:

- **Drive sensibly:** Avoid aggressive driving (e.g., rapid acceleration/ braking) to reduce vehicle fuel use by five (5) to thirty-three (33) percent.
- **Remove excess weight:** Avoid storing unnecessary items in your vehicle. An extra 100 pounds could reduce mpg by up to two (2) percent, especially in smaller vehicles
- **Keep engine tuned:** Fixing a vehicle that is out of tune or has failed an emissions test can improve gas mileage by an average of four (4) percent.
- **Keep tires inflated:** Improve gas mileage by up to 3.3 percent by inflating to proper pressure.
- **Use recommended grade of oil.** Improve gas mileage by one (1) to two (2) percent by using manufacturer's recommended grade of motor oil.

Anti-Idling Policy (Non-Police Vehicles)

The Town of Shrewsbury will assess the benefits and feasibility of adopting an Anti-Idling Policy for (some or all) Town-owned vehicles.

IdleRight Devices

Shrewsbury will assess the benefits of installing IdleRight systems in its police patrol cruisers. The IdleRight system monitors vehicle battery conditions and automatically turns vehicles on to idle only when necessary. While idling at an emergency or construction scene, a typical police cruiser uses about 0.9 gallon of gasoline per hour. That same vehicle, equipped with the IdleRight system uses only about 1/10th of a gallon of gasoline per hour- and never jeopardizes the charge in the battery needed for startup. The cost of implementing the IdleRight equipment is approximately \$750 per vehicle. This means that the system

will pay for itself in about 3 to 4 months of operation. IdleRight technology is available from Havis, Inc. and is described more completely at www.havis.com/idleright.htm.

Perpetuating Energy Efficiency

The Town Manager's Office will investigate the possibility of an energy savings reinvestment plan, in which some of the energy savings are reinvested into a fund to finance future energy efficiency or renewable efficiency projects.

Alternative Modes of Transportation

The Town of Shrewsbury will continue to encourage walking, bicycling, and carpooling as energy efficient practices to reduce use of fossil fuels.

V. ONSITE RENEWABLE ENERGY PROJECTS AND RENEWABLE ENERGY

SELCO commissioned a 3MW solar array in July 2018. The array was built by SELCO and will provide energy for 400-500 homes. The array is constructed on a 12 acre portion of a capped ash landfill in Shrewsbury. SELCO is in the process of creating a community solar program. They are also reserving 1,000,000 kWh hours of energy produced by the solar array for the projected new elementary school. There are plans for a 60kW solar facility being built in conjunction with the new water treatment plant located at 45 West Main Street.

VI. LIST OF RESOURCES

In addition to the audits and reports referenced above in Section IV and attached to this report, the Town of Shrewsbury used the following people and resources to create this Energy Reduction Plan:

- **Kelly Brown**, Green Communities Regional Coordinator, Western Region, Massachusetts Department of Energy Resources (MA DOER). kelly.brown@state.ma.us
- **Green Communities Grant Program Information and Guidance**, Massachusetts Department of Energy Resources (MA DOER). www.mass.gov/energy/greencommunities
- **Dominique DuTremble**, Associate Planner, Central Massachusetts Regional Planning Commission. ddutremble@cmrpc.org
- **Trea Schumacher**, Planning Assistant, Central Massachusetts Regional Planning Commission. tschumacher@cmrpc.org
- **Chris Bennet**, Planning Technician, Central Massachusetts Regional Planning Commission. cbennett@cmrpc.org
- **2018 Energy Audit**: Prepared by Horizon Solutions LLC. 2018. Appendix C.

APPENDICES – INCLUDED AS SEPARATE ATTACHMENTS

Appendix A: Adoption Verification Letters

Appendix B: Table 4. Energy Conservation Measures

Appendix C: Horizon Solutions Audit Report

Criterion 3 Step 4: Complete Table 4 - ECMs

[Click here to view a sample version of this table](#)

ECMs				Table 4 Energy Conservation Measures Data															
				Status		Energy Data						Financial Data					Reference Data		
Category (Select one from drop-down)	Building/Site Name	Energy Conservation Measure Name	ECM Type (select one from drop-down)	Status (select one from drop-down)	Status Date (Completed with month/year or planned month/year)	Projected Annual Electricity Savings (kWh)	Projected Annual Natural Gas Savings (therms)	Projected Annual Oil Savings (gallons)	Projected Annual Propane Savings (gallons)	Projected Annual Gasoline Savings (gallons)	Projected Annual Diesel Savings (gallons)	Projected Annual Cost Savings (\$)	Total Installed Cost (\$)	Green Community Grant (\$)	Utility Incentives (\$)	Net Cost (\$)	Funding Source(s) for Net Costs	Source for Projected Savings	
Lighting	Streetlights	Streetlights	Exterior Lighting	Complete	6/30/2018	427,000	0	0	0	0	0	\$ 49,800	\$ 345,000	\$ -	\$ -	\$ 345,000	Town & DOER	SELCO	
Building	Town-Wide	BOC Energy Evaluation	Other	Planned	6/30/2019	144,116	4,051	36	0	0	0	\$ 28,165	\$ 1,895	\$ 1,895	\$ -	\$ -	NIA	content/uploads/2017/02/BOCenergy-	
Building	Oak Middle School- Auditorium	VFDs on AHU-2	Pump/Motor/Drive	Planned	6/30/2019	46,541	6,266	0	0	0	0	\$ 10,697	\$ 23,389	\$ 13,989	\$ 9,400	\$ -	NIA	Horizon	
Building	High School- Gym	VFDs on AHU-1	Pump/Motor/Drive	Planned	6/30/2019	59,839	6,266	0	0	0	0	\$ 10,963	\$ 24,455	\$ 15,056	\$ 9,400	\$ -	NIA	Horizon	
Building	High School- Gym	VFDs on AHU-2	Pump/Motor/Drive	Planned	6/30/2019	59,839	6,266	0	0	0	0	\$ 10,963	\$ 24,455	\$ 15,056	\$ 9,400	\$ -	NIA	Horizon	
Building	High School- Commons	VFDs on AHU-8	Pump/Motor/Drive	Planned	6/30/2019	26,595	3,805	0	0	0	0	\$ 5,780	\$ 14,885	\$ 9,178	\$ 5,707	\$ -	NIA	Horizon	
Building	High School- Auditorium	VFDs on AHU-13	Pump/Motor/Drive	Planned	6/30/2019	33,244	3,917	0	0	0	0	\$ 6,478	\$ 15,565	\$ 9,691	\$ 5,875	\$ -	NIA	Horizon	
Building	High School- Auditorium	VFDs on AHU-14	Pump/Motor/Drive	Planned	6/30/2019	33,244	3,917	0	0	0	0	\$ 6,478	\$ 15,565	\$ 9,691	\$ 5,875	\$ -	NIA	Horizon	
Building	Senior Center	Condensing Boiler	HVAC	Planned	6/30/2019	0	2,290	0	0	0	0	\$ 2,038	\$ 69,061	\$ 65,626	\$ 3,435	\$ -	NIA	Horizon	
Building	Town Hall	Roof Insulation	Weatherization	Planned	6/30/2019	1,598	568	0	0	0	0	\$ 681	\$ 37,961	\$ 37,109	\$ 852	\$ -	NIA	Horizon	
Building	Paton Elementary School	Weatherstripping Doors	Weatherization	Planned	6/30/2019	10,800	1,905	0	0	0	0	\$ 2,883	\$ 3,789	\$ 932	\$ 2,857	\$ -	NIA	Horizon	
Building	Oak Middle School	Weatherstripping Doors	Weatherization	Planned	6/30/2019	49,313	2,610	0	0	0	0	\$ 7,248	\$ 5,704	\$ 1,788	\$ 3,915	\$ -	NIA	Horizon	
Building	Parker Road Pre-K School	Weatherstripping Doors	Weatherization	Planned	6/30/2019	6,130	483	0	0	0	0	\$ 1,104	\$ 3,345	\$ 2,621	\$ 724	\$ -	NIA	Horizon	
Building	Coolidge Elementary School	Weatherstripping Doors	Weatherization	Planned	6/30/2019	43,910	1,066	0	0	0	0	\$ 5,779	\$ 8,494	\$ 6,884	\$ 1,599	\$ -	NIA	Horizon	
Building	Oak Middle School- 5 Classrooms	VFDs on RTU-6	Pump/Motor/Drive	Planned	6/30/2020	20,155	2,238	0	0	0	0	\$ 4,209	\$ 22,392	\$ 19,035	\$ 3,357	\$ -	NIA	Horizon	
Building	Oak Middle School- Cafeteria	VFDs on RTU-9A	Pump/Motor/Drive	Planned	6/30/2020	6,649	1,141	0	0	0	0	\$ 1,747	\$ 13,571	\$ 11,859	\$ 1,712	\$ -	NIA	Horizon	
Building	Oak Middle School- Cafeteria	VFDs on RTU-9B	Pump/Motor/Drive	Planned	6/30/2020	6,649	1,141	0	0	0	0	\$ 1,747	\$ 13,571	\$ 11,859	\$ 1,712	\$ -	NIA	Horizon	
Building	Oak Middle School- Upstairs Corridors	VFDs on RTU-12	Pump/Motor/Drive	Planned	6/30/2020	29,919	3,581	0	0	0	0	\$ 6,478	\$ 22,169	\$ 16,297	\$ 5,871	\$ -	NIA	Horizon	
Building	Oak Middle School- Gym	VFDs on RTU-10	Pump/Motor/Drive	Planned	6/30/2020	16,622	2,350	0	0	0	0	\$ 3,920	\$ 21,242	\$ 17,717	\$ 3,525	\$ -	NIA	Horizon	
Building	Oak Middle School- Gym	VFDs on RTU-11	Pump/Motor/Drive	Planned	6/30/2020	16,622	2,350	0	0	0	0	\$ 3,920	\$ 21,242	\$ 17,717	\$ 3,525	\$ -	NIA	Horizon	
Building	High School- Gym Class	VFDs on AHU-5	Pump/Motor/Drive	Planned	6/30/2020	26,595	3,581	0	0	0	0	\$ 5,580	\$ 22,075	\$ 16,704	\$ 5,371	\$ -	NIA	Horizon	
Building	High School- Kitchen	VFDs on AHU-6	Pump/Motor/Drive	Planned	6/30/2020	19,946	1,902	0	0	0	0	\$ 3,488	\$ 14,499	\$ 11,645	\$ 2,853	\$ -	NIA	Horizon	
Building	High School- Mechanical Room	VFDs on AHU-7	Pump/Motor/Drive	Planned	6/30/2020	19,946	2,014	0	0	0	0	\$ 3,588	\$ 14,499	\$ 11,478	\$ 3,021	\$ -	NIA	Horizon	
Building	High School- Presentation Room	VFDs on AHU-12	Pump/Motor/Drive	Planned	6/30/2020	13,297	1,343	0	0	0	0	\$ 2,392	\$ 14,331	\$ 12,316	\$ 2,014	\$ -	NIA	Horizon	
Building	High School- Dept. Offices	VFDs on AHU-17	Pump/Motor/Drive	Planned	6/30/2020	19,946	2,378	0	0	0	0	\$ 3,911	\$ 14,499	\$ 10,932	\$ 3,567	\$ -	NIA	Horizon	
Building	High School- Dept. Offices	VFDs on AHU-18	Pump/Motor/Drive	Planned	6/30/2020	19,946	2,894	0	0	0	0	\$ 4,371	\$ 14,499	\$ 10,158	\$ 4,341	\$ -	NIA	Horizon	
Building	High School	Exhaust and Makeup Air Control Kitchen Hood B	Other	Planned	6/30/2020	20,589	3,305	0	0	0	0	\$ 4,795	\$ 30,271	\$ 25,313	\$ 4,958	\$ -	NIA	Horizon	
Building	Sherwood Middle School	VFDs on AHU-4	Pump/Motor/Drive	Planned	6/30/2021	19,946	1,320	0	0	0	0	\$ 3,369	\$ 21,334	\$ 19,353	\$ 1,981	\$ -	NIA	Horizon	
Building	Floral Street Elementary School	Lighting Upgrade	Interior Lighting	Planned	6/30/2021	124,370	0	0	0	0	0	\$ 31,461	\$ 219,382	\$ 187,910	\$ 31,472	\$ -	NIA	Horizon	
Building	Oak Middle School- Band Room	VFDs on RTU-2	Pump/Motor/Drive	Planned	6/20/2022	13,962	1,141	0	0	0	0	\$ 2,552	\$ 21,249	\$ 19,537	\$ 1,712	\$ -	NIA	Horizon	
Building	Oak Middle School- Shop	VFDs on RTU-8	Pump/Motor/Drive	Planned	6/30/2022	6,649	1,007	0	0	0	0	\$ 1,628	\$ 13,574	\$ 12,063	\$ 1,511	\$ -	NIA	Horizon	
Building	Oak Middle School- Boys' Locker Rm	VFDs on AHU-4	Pump/Motor/Drive	Planned	6/20/2022	6,649	895	0	0	0	0	\$ 1,528	\$ 13,572	\$ 12,230	\$ 1,343	\$ -	NIA	Horizon	
Building	Oak Middle School- Girls' Locker Rm	VFDs on AHU-5	Pump/Motor/Drive	Planned	6/20/2022	6,649	895	0	0	0	0	\$ 1,528	\$ 13,572	\$ 12,230	\$ 1,343	\$ -	NIA	Horizon	
Building	High School- Boys' Locker Rm	VFDs on AHU-3	Pump/Motor/Drive	Planned	6/20/2022	17,475	1,790	0	0	0	0	\$ 3,166	\$ 22,609	\$ 19,923	\$ 2,686	\$ -	NIA	Horizon	
Building	High School- Girls' Locker Rm	VFDs on AHU-4	Pump/Motor/Drive	Planned	6/20/2022	17,475	1,790	0	0	0	0	\$ 3,166	\$ 22,609	\$ 19,923	\$ 2,686	\$ -	NIA	Horizon	
Building	High School- Band Room	VFDs on AHU-10	Pump/Motor/Drive	Planned	6/20/2022	9,973	1,141	0	0	0	0	\$ 1,913	\$ 13,665	\$ 11,952	\$ 1,712	\$ -	NIA	Horizon	
Building	High School- Choral Room	VFDs on AHU-11	Pump/Motor/Drive	Planned	6/20/2022	9,973	783	0	0	0	0	\$ 1,595	\$ 14,270	\$ 13,095	\$ 1,175	\$ -	NIA	Horizon	
Building	High School- Wood Shop	VFDs on AHU-20	Pump/Motor/Drive	Planned	6/20/2022	6,649	1,007	0	0	0	0	\$ 1,495	\$ 13,572	\$ 12,062	\$ 1,511	\$ -	NIA	Horizon	
Building	Parker Middle School	Lighting Upgrade	Interior Lighting	Planned	6/20/2022	27,926	0	0	0	0	0	\$ 7,226	\$ 80,846	\$ 65,460	\$ 15,386	\$ -	NIA	Horizon	
Building	Paton Elementary School	Lighting Upgrade	Interior Lighting	Planned	6/20/2022	55,417	0	0	0	0	0	\$ 14,219	\$ 216,576	\$ 184,879	\$ 31,697	\$ -	NIA	Horizon	
Building	Spring Street Elementary School	Lighting Upgrade	Interior Lighting	Planned	6/20/2022	79,875	0	0	0	0	0	\$ 19,742	\$ 248,147	\$ 216,520	\$ 31,627	\$ -	NIA	Horizon	
TOTAL Projected Savings						1,582,037	85,400	36	0	0	0	\$ 294,289	1,767,388	1,190,183	232,205	345,000			
TOTAL MMBtu SAVINGS						13,943	6397.9	8539.984058	4.99993	0	0	0							