Town of Marion, Massachusetts

Energy Reduction Plan

Prepared by the Southeastern Regional Planning and Economic Development District (SRPEDD) with support from the Town of Marion

In Fulfillment of the
Massachusetts Green Communities Grant Program
Criterion #3

October 25, 2018

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I. Purpose and Acknowledgements

A. Letter from the General Government Verifying Adoption of the Energy Reduction Plan

Town of Marion
Two Spring Street
Marion, Massachusetts 02738

MA Department of Energy Resources
Green Communities Division
100 Cambridge Street – Suite 1040
Boston, MA 02114

October 25, 2018

To Whom It May Concern,

The Board of Selectmen held a public meeting on October 25, 2018, and reviewed and considered the Energy Reduction Plan being proposed by the Town of Marion and its Energy Management Committee as part of our Green Community Application.

Marion will be establishing FY2017 as its baseline year to measure a reduction in energy use. The Board of Selectmen are happy to endorse and adopt the measures outlined in the Marion Energy Reduction Plan.

We thank you for your assistance throughout the Green Community designation process.

Sincerely,

Norman A. Hills
Chairman, Marion Board of Selectmen

Randy L. Parker
Vice-Chairman

John P. Waterman
Clerk

B. Letter from the School District Verifying Adoption of the Energy Reduction Plan

OLD ROCHESTER REGIONAL SCHOOL DISTRICT
MASSACHUSETTS SCHOOL SUPERINTENDENCY UNION #55

Marion - Mattapoisett - Rochester
135 Marion Road, Mattapoisett, MA 02739
Tel. (508) 758-2772 FAX (508) 758-2802
www.oldrochester.org

Superintendent of Schools
Douglas R. White Jr., Ed.D.

Assistant Superintendent of Curriculum, Instruction & Assessment
Elise M. Frangos, Ed.D.

Director of Student Services
Michael Nelson, M.Ed.

November 26, 2018

Massachusetts Department of Energy Resources
Green Communities Division
100 Cambridge Street, Suite 1040
Boston, MA 02114

To Whom It May Concern:

The Marion School Committee sent a letter to Mr. Marcus Springer on October 26th, 2018 and it has come to our attention that the letter needs to be addressed to the Green Communities Division instead.

The Marion School Committee is adopting and is fully committed to the town of Marion's Energy Reduction Plan as proposed by the Marion Energy Committee.

This letter is confirmation that the Sippican School does not own any vehicles and if it were to purchase one in the future, it would comply with the Fuel Efficient Vehicles Policy.

Sincerely,

Douglas R. White, Jr. Ed.D.
Superintendent of Schools

C. List of Contributors

The Town of Marion Energy Reduction Plan would not have been possible without the collaborative efforts of the residents of the Town of Marion and from:

Marion Board of Selectmen:
Norman A. Hills, Chairman
Randy L. Parker, Vice-Chairman
John P. Waterman, Clerk
Paul F. Dawson, Town Administrator

Marion Energy Management Committee:
David K. Pierce, Chairman
Eileen J. Marum, Secretary
Jennifer Francis
William G. Saltonstall
Christian Ingerslev
Robert D. Fisher
James Bride III

Marion Planning Board:
William W. Saltonstall, Chairperson
Stephen L. Kokkins, Vice Chairperson
Norman A. Hills, Clerk
Eileen J. Marum
Christopher Collings
Andrew Daniel
Kristen Saint Don-Campbell
Gil Hilario, Town Planner

Marion Facilities Department
Shaun Cormier, Facilities Manager

Marion Building Department:
Scott Shippey, Building Commissioner/Zoning Officer

Massachusetts Department of Energy Resources (DOER):
Seth Pickering, Green Communities Southeast Regional Coordinator

Energy Source
Dalton Ling, Director of Operations & Development

Southeastern Regional Planning and Economic Development District (SRPEDD):
Eric Arbeene, AICP, Principal Comprehensive Planner

II. Executive Summary

A. Narrative Summary of the Town

The Town of Marion is located in southeastern Massachusetts by the Buzzards Bay and is in Plymouth County. It is located 50 miles south of Boston and 40 miles east of Providence, Rhode Island. The town has an approximate area of 26.1 square miles and is bordered by Wareham on the north and northeast; Mattapoisett on the southwest; and Rochester on the northwest. According to the 2010 U.S. Census, Marion had a population of 4,907, having experienced a 4.2% decrease in population since 2000.

Marion was settled in 1679, as a village known as Sippican, which was part of Rochester. Rochester, Mattapoisett and Sippican were widely separate villages under the domain of Rochester, but gradually developed different interests and economies. These factors led to the independence of Sippican, which was renamed Marion in honor of the Revolutionary War hero, Francis Marion, in 1852. Throughout the 19th century, Marion was a thriving seacoast town that focused on whaling and was home to many sea captains and sailors. As the 20th century approached and the whaling industry faded, Marion became a summer tourism destination for the rich and famous and was the summer home of President Grover Cleveland in the late nineteenth century.

Today, Marion can be described as a small, desirable seaside community along Buzzards Bay, where recreational boating is a major summer activity for residents and tourists alike. Marion's population grew steadily from the 1950s through 2000, but decreased slightly during the last decennial census in 2010. Marion is accessible to the larger southeastern Massachusetts region via the north-south Interstate 195 and Route 6 and via the east-west Route 105.

B. Summary of Municipal Energy Uses

- Total Number of Municipal Buildings: 10
- Total Number of Municipal Vehicles: 76
- Total Number of Street Lights: 298
- Total Number of Traffic Lights: 2
- Water & Sewer: 5 drinking water pumping stations, 8 wastewater pumping stations, and 1 wastewater treatment plant

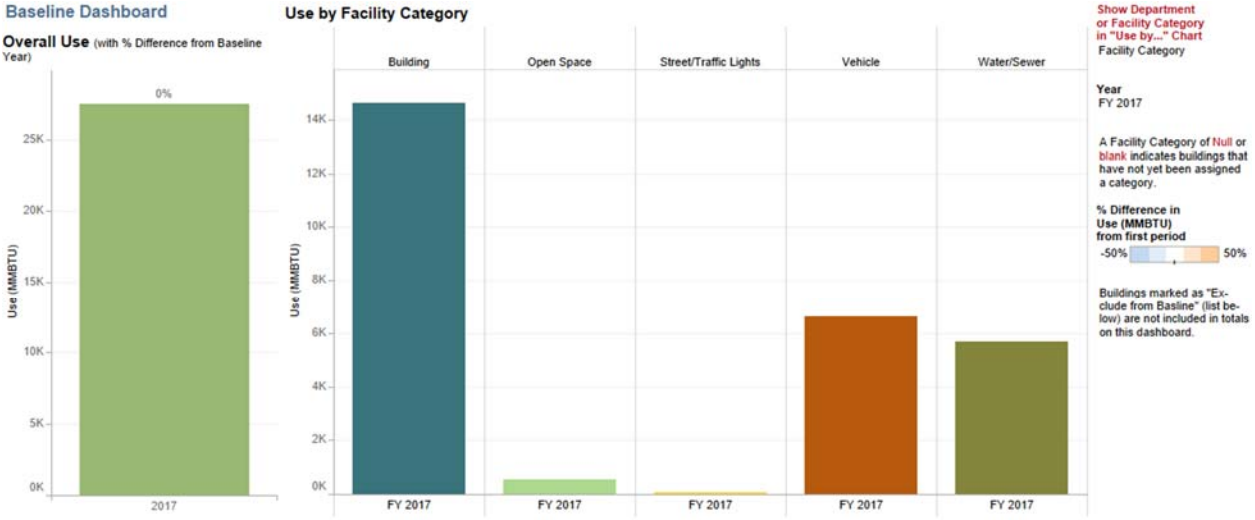
Table 1: Municipal Energy Use Summary

	Number	Ownership
Buildings	**10**	
Oil Heat	3	Municipality
Natural Gas Heat	6	Municipality
Electricity	1	Municipality
Vehicles	**70**	
Non-Exempt	4	Municipality
Exempt	66	Municipality
Street Lights	298	Municipality
Traffic Lights	2	Municipality
Water & Sewer	**9**	
Drinking Water Pumping Station	5	Municipality
Wastewater Treatment Plant	1	Municipality
Wastewater Pumping Station	8	Municipality

C. Summary of Energy Use Baseline and Plans for Reductions

This Energy Reduction Plan commits Marion to reduce energy use in municipal facilities by at least 20% compared to Fiscal Year 2017 over five years. In the baseline year, the town used 27,552 MMBTUs of energy, which means the town must reduce usage by at least 5,510 MMBTUs over the following five-year period.

Figure 1: Municipal Energy Use Baseline Dashboard from MEI (FY 2017)



Drill down by Facility Category (showing Use (MMBTU))
Hover over Facility Category and Subcategory and click the plus or minus signs to expand and collapse the table.

Facility Category	FY 2017
Building	14,644
Open Space	561
Street/Traffic Ligh..	70
Vehicle	6,606
Water/Sewer	5,671

Drill down by Department (showing Use (MMBTU))
Hover over Department, Complex, etc. and click the plus or minus signs to expand and collapse the table.

Department	FY 2017
Null	27,551

Marion has identified energy savings measures in each facility category to reduce energy use 20% based on the total baseline usage, as illustrated in Table 2.

Table 2: Summary of Municipal Energy Use and Reductions

Facility Category	MMBTU Used in Baseline Year	% of Total MMBtu Baseline Energy Consumption	Projected Planned MMBtu Savings	Savings as % of Total MMBtu Baseline Energy Consumption
Buildings	14,644	53.2%	4,459	95.9%
Vehicles	6,606	24.0%	0	0.0%
Street/Traffic Lights	70	0.3%	0	0.0%
Water/Sewer/Pumping	5,671	20.6%	191	4.1%
Open Space	561	2.0%	0	0.0%
Total	**27,552**	**100%**	**4,650**	**16.9%**

III. Energy Use Baseline Inventory

A. Identification of the Inventory Tool Used: The Town of Marion used the Department of Energy Resources (DOER) MassEnergyInsight (MEI) web-based energy inventory and analysis tool.

B. Identification of the Baseline Year: Fiscal Year (FY) 2017 will serve as the baseline year. FY 2017 ran from July 1, 2016 to June 30, 2017. This will give the Town until June 30, 2022 (FY 2018 – FY 2022) to reach its 20% energy reduction goal.

C. Municipal Energy Consumption for the Baseline Year (FY 2017): In baseline year, the town used 27,552 MMBTUs of energy. The Appendix presents energy use for each municipal facility in MMBTUs and native units.

- Buildings: Marion's 10 buildings use 14,644 MMBTUs, approximately 53.2% of Marion's total municipal energy use. The buildings with the largest energy use is the Sippican Elementary School (8,205 MMBTUs) as shown in Figure 2.

- Street/Traffic Lights: There are 298 streetlights and 2 traffic lights in Marion. These lights consume 70 MMBTUs, 0.3% of the Town's energy use.

- Vehicles: Marion's 70 municipal vehicles use 24% of the baseline total, or 6,606 MMBTUs.

- Water/Sewer Facilities: The Town of Marion is serviced for water and wastewater by the Town's Water & Sewer Division. Water & Sewer Division facilities consume 5,671 MMBTUs, or 20.6% of the town's energy use.

Table 3A: Municipal Energy Consumption for FY2017, Native Fuel Units

ERP Guidance Table 3a - Municipal Energy Consumption for 2017 (Native Fuel Units)

		2017					
		Electric (kWh)	Gas (therms)	Oil (gallons)	Gasoline (gallons)	Diesel (gallons)	Propane (gallons)
Building	Sippican ES	719,412	57,501				
	Harbormaster	15,076					
	Music Hall	29,078	7,590				
	Taber Library	38,392	3,604				
	Atlantis Drive	34,800	6,212				
	Fire Station #1 (Spring St.)	56,825		3,468			
	Fire Station #2 (Point Rd)	6,344		719			
	Town House	74,912	13,842				
	Police Department	194,000	3,336				
	Community Center	7,415					
	Town Barn	58,027	5,274	823			
	Total	**1,234,281**	**97,359**	**5,010**			
Open Space	Parks	164,365					
	Total	**164,365**					
Street/Traffic Lights	Street Lights	20,526					
	Total	**20,526**					
Vehicle	Vehicles				33,901	17,281	
	Total				**33,901**	**17,281**	
Water/Sewer	Waste Water Treatment Plant	740,720		7,126			
	Drinking Water Pump Stations	363,437					7,157
	Waste Water Pump Stations	45,720		760			
	Total	**1,149,877**		**7,886**			**7,157**
Grand Total		**2,569,049**	**97,359**	**12,896**	**33,901**	**17,281**	**7,157**

Table 3B: Municipal Energy Consumption for FY2017, Native Fuel Units

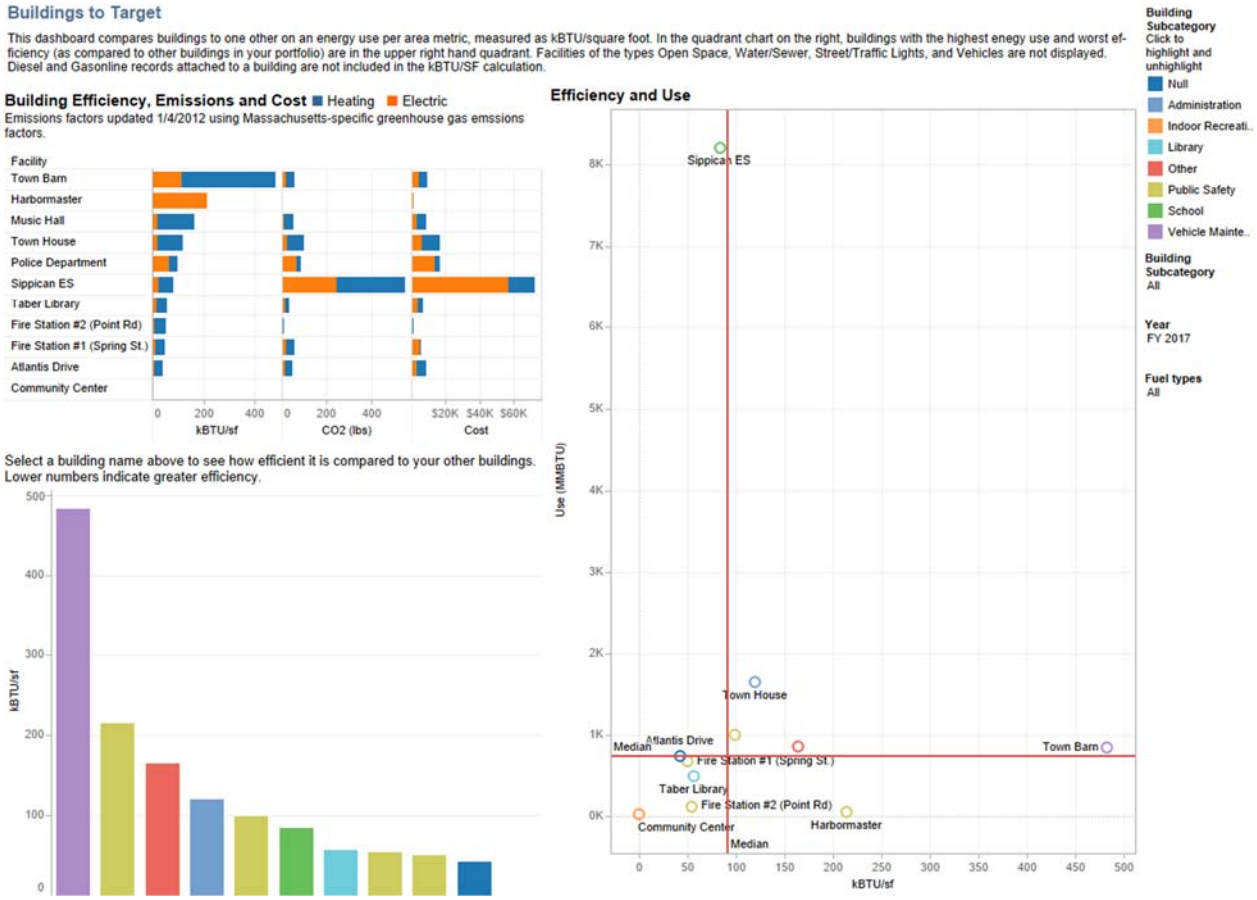
ERP Guidance Table 3b - Municipal Energy Consumption for 2017 (MMBTU)

Please make sure that any data submitted to DOER contains complete Data!

		2017						
		Diesel	Electric	Gas	Gasoline	Oil	Propane	Total
Building	Sippican ES		2,455	5,750				**8,205**
	Harbormaster		51					**51**
	Music Hall		99	759				**858**
	Taber Library		131	360				**491**
	Atlantis Drive		119	621				**740**
	Fire Station #1 (Spring St.)		194			482		**676**
	Fire Station #2 (Point Rd)		22			100		**122**
	Town House		256	1,384				**1,640**
	Police Department		662	334				**996**
	Community Center		25					**25**
	Town Barn		198	527		114		**840**
	Total		**4,211**	**9,736**		**696**		**14,644**
Open Space	Parks		561					**561**
	Total		**561**					**561**
Street/Traffic Lights	Street Lights		70					**70**
	Total		**70**					**70**
Vehicle	Vehicles	2,402			4,204			**6,606**
	Total	**2,402**			**4,204**			**6,606**
Water/Sewer	Waste Water Treatment Plant		2,527			991		**3,518**
	Drinking Water Pump Stations		1,240				651	**1,891**
	Waste Water Pump Stations		156			106		**262**
	Total		**3,923**			**1,096**	**651**	**5,671**
Grand Total		**2,402**	**8,766**	**9,736**	**4,204**	**1,793**	**651**	**27,551**

Figure 2: MEIs Buildings to Target Dashboard

In Figure 2 below, the points further to the right have a higher energy use per square foot (i.e. less energy efficient), while the points higher up use more total energy. The Sippican Elementary School, for example, uses the most energy of any building in Marion.



IV. Energy Reduction Plan

A. Narrative Summary

As shown below, the town has identified energy savings measures to reduce usage from FY2017 by 4,650 MMBTUs or 16.9%.

- **Install LED Lighting and Controls**
  It is recommended that high efficiency LED fixtures/kits are installed to replace the fluorescent lighting. This measure will reduce the energy consumption based on the decrease in lighting power output and the use of adaptive control technology. The scope of this work includes the following:
    - Supply and install new LED fixtures and/or kits
    - Supply and install lighting controls where applicable
    - Remove and recycle old fluorescent lamps and ballasts
    - Remove and recycle old fluorescent fixtures where applicable
    - Warranty on new LED lighting of five years

  By implementing this measure at the Sippican Elementary School, the Atlantis Drive Facility, Community Center, Fire Station #1, Fire Station #2, Music Hall, Police Department, Library, Town House, and Town Barn, the town will save 246,547 kWh (841 MMBTUs) of electricity and $44,378 annually.

- **Install Condensing Boilers**
  It is recommended that new condensing boilers are installed at a few town buildings. Condensing boilers (average efficiency 92%) can obtain a much higher efficiency than the standard non-condensing boiler (average efficiency 75-80%). The scope of this work includes the following:
    - Supply and install Lochinvar condensing boilers
    - Removal and disposal of existing boilers and all necessary piping and components of the old system no longer required
    - Installation of direct venting system for combustion air and exhaust air
    - Install outside air controls for maximum efficiency
    - Commissioning and startup of new boiler systems

  By implementing this measure at the Atlantis Drive Facility and the Sippican Elementary School, the town will save 10,710 therms (1,071 MMBTUs) and $12,852 annually.

- **Implement Building Weatherization Measures**
  By implementing this measure, a reduction in heat loss/heat gain will occur which will lead to energy savings. The scope of work includes the following:
    - A/C Unit Weatherization
    - Attic Bypass Air Sealing
    - Attic Flat Insulation
    - Attic Insulation Baffles

- Door Weather Stripping
- Hopper Window Weatherization
- Overhead Door Weather Stripping
- Wall Air Sealing/Insulation

By implementing a variety of these measures at the Atlantis Drive Facility, Community Center, Fire Station #1, Fire Station #2, Music Hall, Police Station, and Town House, the town will save 6,810 kWh (23 MMBTUs) of electricity, 2,496 therms (250 MMBTUs) of natural gas, 719 gallons of oil (108 MMBTUs) and $5,851 annually.

- **Install an Energy Management System**

  It is recommended that a new Energy Management System is installed and that the HVAC equipment is reprogrammed to allow energy savings to be realized for electricity and natural gas. In conjunction with the local controllers and their energy savings features, it will also allow for remote control, monitoring and alarming of the mechanical equipment. The energy management system will control the following mechanical devices:

  <u>Library</u>
  - (1) Hot Water Boiler
  - (2) Heating and Ventilating Units
  - (2) Air Handler Units
  - (6) Baseboard Radiator Zones

  <u>Music Hall</u>
  - (1) Hot Water Boiler
  - (1) Air Cooled Chiller
  - (1) Air Handler Unit
  - (2) Direct-Fired Reznor Units

  The savings from this measure will be met with the following control strategies:
  - Optimal Start/Stop which allows motors to turn off when the building is no longer being used during holidays, weekends, and unoccupied hours
  - Temperature setback which allows the temperature to decrease during unoccupied hours
  - 7-Day scheduling
  - Demand Control Ventilation (CO^2 monitoring)

  By implementing this measure at the Music Hall and the Library, the town will save 19,992 kWh (68 MMBTUs) of electricity, 1,590 therms (159 MMBTUs) of natural gas and $5,507 annually.

- **Oil-to-Gas Conversion at Fire Station #1**

  It is recommended that the boiler be replaced with a high-efficiency natural gas-fired condensing boiler. Due to the higher prices of oil compared to natural gas, significant cost savings can be achieved by converting to natural gas. In addition to the cost savings, the new burner will be significantly more efficient in its fuel consumption. The existing boiler is

approximately 77% efficient while the new condensing boiler would be approximately 92% efficient.

By implementing this measure, the new boiler will save approximately 725 therms (73 MMBTUs) per year. The combined efficiency savings of the new boiler and the cost savings of the fuel conversion is estimated at $2,650 annually.

- **Install Mechanical Insulation**
  It is recommended that bare pipes, valves, fittings, and tanks are insulated. By implementing this measure, a reduction in heat loss will occur, which will lead to energy savings. The scope of work includes air scoop insulation, end cap insulation, flange insulation, gate valve insulation, pipe fitting insulation, PRV insulation, pump insulation, steam trap insulation, straight pipe insulation, strainer insulation and tank insulation.

  By implementing a variety of these measures at the Town House and Community Center, the town will save 1,601 therms (160 MMBTUs) of natural gas and $1,921 annually.

- **Install Variable Frequency Drives**
  It is recommended that variable frequency drives are added to various pumps and fan motors at the Police Department, Main Water Pumping Station, Perry Hill Pumping Station, and Wastewater Treatment Plant to allow them to modulate based on actual demand/conditions. The VFD's will modulate based on differential temperature and/or differential pressure.

  By implementing this measure at the Police Department, Main Water Pumping Station, Perry Hill Pumping Station, Wastewater Treatment RTU and Wastewater Treatment Circulation Pumps, the town will save 141,037 kWh (481 MMBTUs) of electricity and $25,387 annually.

- **Install Kitchen Hood Controls**
  It is recommended that a kitchen hood control system is installed at the Sippican Elementary School to allow the exhaust fans to modulate as needed based on actual cooking activity. The installation of variable frequency drives on the exhaust fans will allow them to modulate as needed instead of running at full speed. These VFD's will be controlled by temperature and optic sensors. Any increases/ decreases in temperature and/or smoke/particulates will cause the fans to ramp up/down to satisfy conditions without over-ventilating. The scope of work includes the following:
    - Supply and install (2) Variable Frequency Drives (VFDs) in place of the existing motor starters for the kitchen exhaust fans
    - Install temperature and optic sensors in the kitchen exhaust ductwork
    - Install new control keypad
    - Start-up and testing of the new VFDs
    - Warranty for one year

  By implementing this measure at the Sippican Elementary School, the town will save 6,482 kWh (22 MMBTUs) of electricity, 2,089 therms (209 MMBTUs) of natural gas and $3,674 annually.

- **Install Refrigeration Controls**

  It is recommended that refrigeration controls are installed to control the Sippican Elementary School's walk-in coolers and freezer. It is also recommended that the motors are replaced with Electronically Commutated Motors (ECMs). ECMs have a better motor efficiency compared to shaded pole motors (roughly 78%). In conjunction with the local controllers and their energy savings features, it will also allow for remote control, monitoring and alarming of the walk-in coolers/ freezers. The scope of this work includes the following:

  - Supply and install (3) zones of energy savings CoolTrol refrigeration controls to cycle temperature and evaporator fans
  - Replace (6) existing shaded pole motors with (6) high-efficiency EC motors in evaporators
  - Dew-point pulse control for anti-sweat door heaters
  - Start-up and testing of the new controls/motors
  - Installation to be performed by licensed electricians during business hours

  By implementing this measure at the Sippican Elementary School, the town will save 18,804 kWh (64 MMBTUs) of electricity and $3,385 annually.

- **Install Demand Control Ventilation**

  It is recommended that the current Energy Management System at the Sippican Elementary School is expanded to include Demand Control Ventilation. This will also include furnishing and installing duct CO^2 sensors for any Air Handler Units/ Rooftop Units. The scope of work includes the following:

  - Each HVAC equipment will include a non-proprietary field controller (if applicable)
  - Furnish and Install a CO^2 Sensor for each Air Handling Units or Rooftop Units
  - Integrate the sensors into the existing building management system

  By implementing this measure at the Sippican Elementary School, the town will save 18,362 kWh (63 MMBTUs) of electricity, 3,290 therms (329 MMBTUs) of natural gas and $7,253 annually.

- **Install High Efficiency Transformers**

  It is recommended that six standard efficiency transformers are replaced with Rex High Efficiency Transformers. By implementing this measure, the overall energy consumption of the transformers will decrease which will lead to annual energy cost savings. The scope of work includes the following:

  - Furnish and install six Rex High Efficiency Transformers
  - Removal of existing Transformers

  By implementing this measure at the Sippican Elementary School, Wastewater Treatment Plant and Perry Hill Pumping Station, the town will save 17,222 kWh (59 MMBTUs) of electricity and $3,100 annually.

- **Install Wi-Fi Programmable Thermostats**
  It is recommended that new Wi-Fi programmable thermostats are installed to give facility personnel access to space temperature through their cellular phone or computer. The scope of work includes the following:
    - Demo existing thermostats
    - Install new Wi-Fi programmable thermostats
    - Run "C" wire where applicable
    - Town IT department will need to supply appropriate network information for Wi-Fi access.

  By implementing this measure at Fire Station #1 and Fire Station #2, the town will save 203 gallons of oil (30 MMBTUs) and $461 annually.

- **Retrocommissioning**
  Retrocommissioning is the first stage in the building upgrade process. The staged approach accounts for the interactions among all the energy flows in a building and produces a systematic method for planning upgrades that increases energy savings. When the staged approach is adopted and performed sequentially, each stage includes changes that will affect the upgrades performed in subsequent stages, thus setting up the overall process for the greatest possible energy and cost savings. In this staged approach, retrocommissioning comes first because it provides an understanding of how closely the building comes to operating as intended. It also helps to identify improper equipment performance, what equipment or systems need to be replaced, opportunities for saving energy and money, and strategies for improving performance of the various building systems. It is recommended that the Sippican Elementary School be retrocommissioned. According to the Energy Star program https://www.energystar.gov/sites/default/files/buildings/tools/EPA_BUM_CH5_RetroComm.pdf each building that is retrocommissioned can expect to achieve a 7.5% savings in energy use.

B. Path to 20% Energy Use Reduction by the end of Fiscal Year 2022

1. Program Management Plan for Implementation, Monitoring, and Oversight

The Facilities Manager with the Energy Management Committee will be responsible for the oversight of the Energy Reduction Plan and the implementation of its energy conservation measures. Regular updates will be made to the Board of Selectmen and the Town Administrator. The Town Administrator will complete the annual reporting requirements to maintain Green Community designation and eligibility for annual competitive grant funding.

2. Summary of Energy Audit(s) or Other Sources for Projected Energy Savings

- Building audits were provided by Energy Source in 2018 and provide an energy savings of 4,035 MMBTUs or 14.6%. The Energy Source audits are included in the Appendix.
- Retrocommissioning of the Sippican Elementary School would result in the savings of 615 MMBTUs or 2.2%.
- Vehicle policy and maintenance targeting overall vehicle usage would result in the savings 410 MMBTUs or 1.5%. The supporting documentation for these policy and maintenance measures are available in the Appendix.

3. Energy Conservation Measures

Table 3 lists recommended energy conservation measures. References for each measure are included in the table and these references are included as appendices to the Energy Reduction Plan. Projected annual MMBTU savings for each category (buildings, vehicles, and street and traffic lights) are subtotaled to arrive at a municipal grand total.

Table 4: Energy Conservation Measures for Marion Municipal Energy Use

Measure		Status	Energy Data						Financial Data						Reference	
			Projected Annual Energy Savings													
Category/Building	Energy Conservation Measure	Status (Completed Year or Planned Year)	Electricity Savings (kWh)	Natural Gas Savings (Therms)	Oil Savings (Gallons)	Gasoline Savings (Gallons)	Diesel Savings (Gallons	Propane Savings (Gallons)	Projected Annual Cost Savings	Estimated Total Project Cost ($)	Green Communities Grant ($)	Estimated Utility Incentives ($)	Estimated Cost After Utility Incentives ($)	Estimated Payback After Incentives (Years)	Funding Source	Source for Energy Savings
Sippican Elementary School	LED Lighting	2020	133,189	0	0	-	-	-	$23,974	$244,935	-	$25,000	$219,935	9.2	-	Energy Source Audit, 2018
Sippican Elementary School	Demand Control Ventilation	2021	18,362	3,290	0	-	-	-	$7,253	$16,320	-	$1,800	$14,250	2.0	-	Energy Source Audit, 2018
Sippican Elementary School	Refrigeration Controls	2019	18,804	0	0	-	-	-	$3,385	$19,671	-	$3,761	$15,910	4.7	-	Energy Source Audit, 2018
Sippican Elementary School	Kitchen Fan Controls	2019	6,482	2,089	0	-	-	-	$3,674	$28,692	-	$2,400	$26,292	7.2	-	Energy Source Audit, 2018
Sippican Elementary School	Condensing Boiler	2022	0	9,563	0	-	-	-	$11,475	$247,000	-	$14,344	$232,656	20.3	-	Energy Source Audit, 2018
Sippican Elementary School	High Efficiency Transformers	2021	4,489	0	0	-	-	-	$808	$16,105	-	$1,122	$14,983	19.1	-	Energy Source Audit, 2018
Sippican Elementary School	Retrocommissioning	2019	53,956	4,313	0	-	-	-	$	$0	-	$0	$0	-	-	Energy Star (www.energystar.gov)
Atlantis Drive	LED Lighting	2020	22,806	0	0	-	-	-	$4,105	$52,876	-	$4,561	$48,315	11.8	-	Energy Source Audit, 2018
Atlantis Drive	Condensing Boiler	2022	0	1,148	0	-	-	-	$1,377	$56,320	-	$7,500	$48,820	35.5	-	Energy Source Audit, 2018
Atlantis Drive	Building Weatherization	2019	1,003	565	0	-	-	-	$859	$22,289	-	$0	$22,289	26.0	-	Energy Source Audit, 2018
Community Center	LED lighting	2021	2,805	0	0	-	-	-	$505	$3,131	-	$300	$2,831	5.6	-	Energy Source Audit, 2018
Community Center	Mechanical Insulation	2019	0	166	0	-	-	-	$199	$4,948	-	$0	$4,948	24.8	-	Energy Source Audit, 2018
Community Center	Building Weatherization	2019	1,231	544	0	-	-	-	$874	$12,514	-	$0	$12,514	14.3	-	Energy Source Audit, 2018
Fire Station #1	LED Lighting	2021	11,223	0	0	-	-	-	$2,020	$13,526	-	$600	$12,926	6.4	-	Energy Source Audit, 2018
Fire Station #1	Oil-to-Gas Boiler Conversion	2021	0	-3,725	3,140	-	-	-	$2,650	$45,895	-	$4,000	$41,895	15.8	-	Energy Source Audit, 2018
Fire Station #1	Wi-Fi Thermostats	2019	0	0	158	-	-	-	$358	$4,064	-	$0	$4,064	11.3	-	Energy Source Audit, 2018
Fire Station #1	Building Weatherization	2019	950	0	429	-	-	-	$1,144	$17,498	-	$0	$17,498	15.3	-	Energy Source Audit, 2018
Fire Station #2	LED Lighting	2021	10,128	0	0	-	-	-	$1,823	$8,012	-	$1,800	$6,212	3.4	-	Energy Source Audit, 2018
Fire Station #2	Wi-Fi Thermostats	2019	0	0	45	-	-	-	$102	$1,161	-	$0	$1,161	11.3	-	Energy Source Audit, 2018
Fire Station #2	Building Weatherization	2019	681	0	290	-	-	-	$780	$15,585	-	$0	$15,585	20.0	-	Energy Source Audit, 2018
Music Hall	LED Lighting	2021	351	0	0	-	-	-	$63	$4,787	-	$70	$4,717	74.7	-	Energy Source Audit, 2018

Music Hall	Energy Management System	2021	8,730	1,154	0	-	-	-	$2,956	$32,208	-	$6,000	$26,208	8.9	-	Energy Source Audit, 2018
Music Hall	Building Weatherization	2019	323	195	0	-	-	-	$292	$2,844	-	$0	$2,844	9.7	-	Energy Source Audit, 2018
Police Department	LED Lighting	2021	25,009	0	0	-	-	-	$4,502	$22,472	-	$4,500	$17,972	4.0	-	Energy Source Audit, 2018
Police Department	Variable Frequency Drives	2021	6,937	0	0	-	-	-	$1,249	$13,130	-	$2,000	$11,130	8.9	-	Energy Source Audit, 2018
Police Department	Building Weatherization	2019	1,038	453	0	-	-	-	$730	$26,240	-	$0	$26,240	35.9	-	Energy Source Audit, 2018
Library	LED Lighting	2021	13,264	0	0	-	-	-	$2,388	$18,913	-	$2,500	$16,413	6.9	-	Energy Source Audit, 2018
Library	Energy Management System	2021	11,262	436	0	-	-	-	$2,550	$52,650	-	$6,000	$46,650	18.3	-	Energy Source Audit, 2018
Town House	LED Lighting	2021	24,832	0	0	-	-	-	$4,470	$33,367	-	$4,500	$28,867	6.5	-	Energy Source Audit, 2018
Town House	Mechanical Insulation	2019	0	1,435	0	-	-	-	$1,722	$36,638	-	$0	$36,638	21.3	-	Energy Source Audit, 2018
Town House	Building Weatherization	2019	1,584	739	0	-	-	-	$1,172	$14,241	-	$0	$14,241	12.2	-	Energy Source Audit, 2018
Town Barn	LED Lighting	2021	2,940	0	0	-	-	-	$529	$12,199	-	$588	$11,611	21.9	-	Energy Source Audit, 2018
Main Pumping Station	Variable Frequency Drives	2021	31,045	0	0	-	-	-	$5,588	$17,550	-	$3,105	$14,446	2.6	-	Energy Source Audit, 2018
Perry Hill Pumping Station	Variable Frequency Drives	2021	56,305	0	0	-	-	-	$10,135	$40,500	-	$5,631	$34,870	3.4	-	Energy Source Audit, 2018
Perry Hill Pumping Station	High Efficiency Transformers	2021	3,355	0	0	-	-	-	$604	$5,082	-	$839	$4,243	7.0	-	Energy Source Audit, 2018
Wastewater Treatment Plant	Variable Frequency Drives	2021	46,750	0	0	-	-	-	$8,415	$36,450	-	$5,600	$30,850	3.6	-	Energy Source Audit, 2018
Wastewater Treatment Plant	High Efficiency Transformers	2021	9,378	0	0	-	-	-	$1,688	$13,551	-	$2,345	$11,207	6.7	-	Energy Source Audit, 2018
Totals			**529,212**	**22,365**	**4,062**	**0**	**0**	**0**	**$116,418**	**$1,213,362**	**-**	**$110,864**	**$1,102,498**	**-**	**-**	**-**
Total MMBTUs Saved			**1,804**	**2,237**	**609**	**0**	**0**	**0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

C. Summary of Long-Term Energy Reduction Goals – Beyond 5 Years

1. Municipal Buildings (including schools)

To better strategize for the long-term maintenance and management of municipal buildings, Marion will work with internal schools and town staff as well as outside consultants, when necessary, to assess and document the condition of major municipal buildings on an annual basis. In addition to exposing continuing opportunities for energy use reductions, this effort will provide the Town with a clear, long-term asset management strategy for the effective budgeting and maintenance of buildings.

2. Vehicles (including schools)

The Fuel-Efficient Vehicle policy will have become engrained within municipal purchasing practices after five years, and the Town will seek to explore even more efficient policies and tracking systems to enable more efficiency.

3. Perpetuating Energy Efficiency

Ongoing dialogue with Town and School staff can tap into the knowledge of the employees who use and maintain the buildings every day. It can empower building staff to develop a detailed repair and management schedule and collect data on problems and inefficiencies that may be missed by traditional third party audits. The use of a web-based application system like See Click Fix creates additional real-time opportunities for efficiencies in operation and maintenance.

The Town of Marion will grow its capacity to retrofit and build more efficient facilities, purchase more efficient vehicles, and illuminate the Town through more efficient lighting throughout the 5-year period. These practices will become more engrained in the culture of the Town and will provide opportunities to instill the ethos into additional policies and programs for more dedicated long-term funding streams and strategies.

V: Appendices

- Building Energy Audits – Energy Source
- SRPEDD Vehicle Calculations
- MMBTU Conversion Chart

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Energy Efficiency Comprehensive Project

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energysource

October 4th, 2018

Dear Paul Dawson,

Energy Source is pleased to present you with this energy conservation analysis. We trust you will find this to be a cost-effective means to reduce your energy costs, and improve the comfort throughout your facilities by optimizing your lighting and HVAC systems. Other factors to consider as you evaluate this analysis are existing equipment related disruptions and maintenance costs are eliminated or minimized until the new equipment enters its end of life – typically several years.

In the attached analysis, you will find a detailed report recommending the following:

- LED Lighting
- Condensing Boiler
- Building Weatherization
- Variable Frequency Drives
- Energy Management System
- Oil-to-Gas Boiler Conversion
- Mechanical Insulation
- High Efficiency Transformers
- Kitchen Fan Controls
- Refrigeration Controls
- Demand Control Ventilation
- Wi-Fi Thermostats

Energy Source will secure incentives from the utility company which will substantially reduce the net cost of this project. The utility incentives reflected in this proposal are estimated and are subject to change until projects are reviewed by the utility company.

I hope you find this proposal informative. If you have any questions, please do not hesitate to contact me.

Sincerely,

Dalton Ling

Energy Source

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Disclaimer

This report is not for general use and is the property of Energy Source.

All savings estimates and rebates must be considered estimated until reviewed and approved by the utility companies designated within this report.

Pre-existing conditions beyond energy conservation measures are above and beyond these scopes will need to be submitted and approved as additional money may be incurred.

For any questions regarding this report, please contact Dalton Ling, Energy Efficiency Consultant for Energy Source, Inc. at 508-237-3275. Any additional use of this report is prohibited unless permission is given in writing from Energy Source, Inc.

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Executive Summary

Energy Source recently conducted an energy survey at the following Marion buildings:

- Sippican Elementary School
- Atlantis Drive Facility
- Community Center
- Fire Station #1
- Fire Station #2
- Harbormaster
- Music Hall
- Police Department
- Library
- Town House
- Town Barn
- Wastewater Treatment Plant
- Main Water Pumping Station
- Perry Hill Water Pumping Station

Our recommendations are known as Energy Conservation Measures (ECM's) which are outlined in separate write-ups.

The expected energy savings were determined based on current operating hours of equipment surveyed. Poorly performing equipment will reduce the effectiveness of employing these ECMs, and the cost to repair or replace that equipment is not covered in this estimate.

Energy Conservation Measures	Total Project Cost	Estimated Incentives	Estimated Customer	Electricity Savings		Gas Savings		Oil Savings		Total Cost Savings	Payback Period (years)
				kWh	Cost	Therms	Cost	Gallons	Cost		
LED Lighting	$414,218	$44,419	$369,799	246,547	$44,378	0	$0	0	$0	$44,378	8.3
Condensing Boiler	$303,320	$21,844	$281,476	0	$0	10,710	$12,852	0	$0	$12,852	21.9
Building Weatherization	$111,210	$0	$111,210	6,810	$1,226	2,496	$2,995	719	$1,630	$5,851	19.0
Variable Frequency Drives	$107,630	$16,335	$91,295	141,037	$25,387	0	$0	0	$0	$25,387	3.6
Energy Management System	$84,858	$12,000	$72,858	19,992	$3,599	1,590	$1,908	0	$0	$5,507	13.2
Oil-to-Gas Boiler Conversion	$45,895	$4,000	$41,895	0	$0	-3,725	-$4,470	3,140	$7,120	$2,650	15.8
Mechanical Insulation	$41,585	$0	$41,585	0	$0	1,601	$1,921	0	$0	$1,921	21.6
High Efficiency Transformers	$34,738	$4,306	$30,433	17,222	$3,100	0	$0	0	$0	$3,100	9.8
Kitchen Fan Controls	$28,692	$2,400	$26,292	6,482	$1,167	2,089	$2,507	0	$0	$3,674	7.2
Refrigeration Controls	$19,671	$3,761	$15,910	18,804	$3,385	0	$0	0	$0	$3,385	4.7
Demand Control Ventilation	$16,320	$1,800	$14,520	18,362	$3,305	3,290	$3,948	0	$0	$7,253	2.0
Wi-Fi Thermostats	$5,225	$0	$5,225	0	$0	0	$0	203	$461	$461	11.3
Total	**$1,213,362**	**$110,864**	**$1,102,498**	**475,256**	**$85,546**	**18,051**	**$21,661**	**4,063**	**$9,211**	**$116,418**	**9.5**

ECM #1 - Install LED Lighting and Controls

Existing Conditions

This measure involves the installation of LED fixtures/kits and controls where applicable. Currently, the majority of town buildings are using fluorescent lighting technology.

Energy Conservation Measure Details

It is recommended that high efficiency LED fixtures/kits are installed to replace the flourescent lighting. This measure will reduce the energy consumption based on the decrease in lighting power output and the use of adaptive control technology. The scope of this work includes the following:

- Supply and install new LED fixtures and/or kits
- Supply and install lighting controls where applicable
- Remove and recycle old fluorescent lamps & ballasts
- Remove and recycle old fluorescent fixtures where applicable
- Warranty on new LED lighting of five years

By implementing this measure, the following Annual Energy Savings can be obtained:

Building	Electricity Savings	
	kWh	Cost
Sippican Elementary School	133,189	$23,974
Atlantis Drive Facility	22,806	$4,105
Community Center	2,805	$505
Fire Station #1	11,223	$2,020
Fire Station #2	10,128	$1,823
Music Hall	351	$63
Police Department	25,009	$4,502
Library	13,264	$2,388
Town House	24,832	$4,470
Town Barn	2,940	$529
Total	**246,547**	**$44,378**

Annual energy savings of 246,547 kWh can be realized from this measure which will lead to an annual total cost savings of $44,378.

Implementation

The implementation of this measure requires the purchase and installation of LED fixtures/kits to replace the flourescent lighting. The total implementation cost is displayed in the table below:

Building	Total Project Cost	Estimated Utility Incentives	Customer Cost	Payback Period (years)
Sippican Elementary School	$244,935	$25,000	$219,935	9.2
Atlantis Drive Facility	$52,876	$4,561	$48,315	11.8
Community Center	$3,131	$300	$2,831	5.6
Fire Station #1	$13,526	$600	$12,926	6.4
Fire Station #2	$8,012	$1,800	$6,212	3.4
Music Hall	$4,787	$70	$4,717	74.7
Police Department	$22,472	$4,500	$17,972	4.0
Library	$18,913	$2,500	$16,413	6.9
Town House	$33,367	$4,500	$28,867	6.5
Town Barn	$12,199	$588	$11,611	21.9
Total	**$414,218**	**$44,419**	**$369,799**	**8.3**

It is estimated that approximately $44,419 can be obtained from utility incentives; therefore, the adjusted customer cost is $369,799. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$369{,}799}{\$44{,}378} = 8.3\ years$$

ECM #2 - Install Condensing Boilers

Existing Conditions

This measure involves the installation of new condensing boilers. Currently, the hot water at the buildings is being supplied from non-condensing boilers and delivered to baseboards, unit ventilators, and Air Handler Units (AHUs).

Energy Conservation Measure Details

It is recommended that new condensing boilers are installed at a few town buildings. Condensing boilers (average efficiency 92%) can obtain a much higher efficiency than the standard non-condensing boiler (average efficiency 75-80%). The scope of this work includes the following:

- Supply and install Lochinvar condensing boilers
- Removal and disposal of existing boilers and all necessary piping and components of the old system no longer required
- Installation of direct venting system for combustion air and exhaust air
- Install outside air controls for maximum efficiency
- Commissioning and startup of new boiler systems

The annual energy cost savings summary and the proposed boiler quantities are shown below,

Building	Condensing Boiler Qty	Annual Energy Savings (Therms)	Annual Energy Cost Savings
Atlantis Facility	1	1,148	$1,377
Sippican Elementary	1	9,563	$11,475
Total		**10,710**	**$12,852**

Implementation

The implementation of this measure requires the purchase and installation of condensing boilers. It should be noted that the boilers that are being replaced only satisfy the primary boilers. The total material and installation cost breakdown along with incentives are shown on the table below:

Building	Condensing Boiler Qty	Total Project Cost	Estimated Utility Incentives	Customer Cost	Payback Period (years)
Atlantis Facility	1	$56,320	$7,500	$48,820	35.5
Sippican Elementary	1	$247,000	$14,344	$232,656	20.3
Total		**$303,320**	**$21,844**	**$281,476**	**21.9**

Approximately $21,844 can be obtained from utility rebates; therefore, the adjusted Customer Cost is $281,476. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$281{,}476}{\$12{,}852} = 21.9\ years$$

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ECM #3 - Building Weatherization

Existing Conditions

This measure involves a variety of building envelope improvements. Below is a description of each weatherization measure that is being proposed,

- **A/C Unit Weatherization** – The air conditioning units that are left in windows all year long at the Atlantis Drive building have gaps and cracks where they meet the frame of the wall. These penetrations represent weakness points for air to infiltrate and exfiltrate. Leaving these units untreated forces the units to work harder to hold the temperature in their respective spaces, wasting energy and costing the building additional money. In the winter, the perimeter cracks allow heat to escape to the exterior and make it possible for cold, unconditioned air to enter. This results in an increased load on the buildings heating system, which also wastes energy and increases the heating cost.
- **Attic Bypass Sealing** – All seven buildings audited have an attic, which means they also have access points that connect the unconditioned space above from the conditioned space below. Across the board in Marion, these access hatches consist primarily of a wooden board, with no seals present around the edge to compress the hatch. The result is a crack that allows unwanted air to move freely throughout the respective conditioned spaces. Since warm air rises, sealing the attic from the conditioned space is crucial to maintaining an efficient building. The air movement also reduces the effectiveness of the existing insulation that is present in some of the attics.
- **Attic Flat Insulation** – Several of the attics have existing six inch batts of insulation on their flat, but this does not provide an optimal level of thermal resistance for our climate zone. The attic in the vestibule at the Music Hall is completely uninsulated, with only wood framing members acting as the thermal barrier. Wood carries a very low R-value as a thermal insulator and should have additional insulation added on the flat. In the attic space at Atlantis Drive, the space directly above the wrestling gym on the second floor is a direct pathway to the exterior. A combination of a thin ceiling system that is failing in some areas and the deteriorated seals and access points in the attic space above are combining to create a huge weakness over an area of 500 square feet. The result of this is a huge waste in energy consumption, as well as reduced conditions for the occupants below.
- **Attic Insulation Baffles** – When adding insulation to an attic with active soffit venting attic baffles need to be installed. Often times there will be no baffles in place because the inadequate levels of insulation did not pose a risk of covering the ventilation. The attic baffles makes sure the attic has the same ventilation after insulation is added. This installation applies to the attic flats at both Fire Station #1 and Fire Station #2, which have a vented exterior soffit.

- **Door Weather Stripping** – Deteriorated weather stripping materials, ineffective weather stripping installation and daylight showing at the perimeter of door systems create direct pathways for unwanted infiltration/ exfiltration.
- **Hopper Window Weatherization** – Existing weather stripping on the windows in the Atlantis Drive location are creating a gap between the operational lower sash and the frame. The gap that exists is allowing for a lot of air infiltration; the windows show severe signs of cobweb and dust build up that is a direct result of the broken seal the existing weather stripping is creating. A tight compression between sash and frame prevents heating and cooling losses in the conditioned spaces.
- **Overhead Door Weather Stripping** – Remove existing weather stripping and replace with new commercial grade weather stripping to create a full air seal around the door. With low grade, none, or deteriorating materials in place overhead and roll-up doors are a major air leakage source in any building with one these systems.
- **Wall Air Sealing/ Insulation** – A wall assembly that does not have an effective air barrier in place allows unnecessary air leakage losses. This is particularly the case at Fire Station #1, where the dormers on one side of the building connect the attic space with the conditioned meeting rooms on the second floor. The application of batt insulation that exists on the walls in the entrance of the attic does not provide an environmental barrier to prevent heat loss through conduction. While this barrier was started, there is still a great weakness at the interior dormer (attic) walls. The Police Station has a second floor built into the attic that houses air handling equipment as well as the emergency response computer systems for the whole town. There is presently a large air conditioning unit running constantly to prevent the computer systems from overheating and shutting down. There have been issues in the past with the system due to heating and cooling issues in this space. The exterior walls of these rooms were insulated with blow-in cellulose (a loose material), and held together with plastic sheeting staples to the wooden stud cavities. Because cellulose has a low density, the material has fallen to the bottom of these cavities, effectively providing no insulation value at this point. The top of the second floor, which is visible and easily accessible in the attic, has batt insulation placed on top. Batt insulation by itself is not an effective insulator by itself in this space. The result of this is an extreme weakness that is costing the building a lot of additional energy usage from the air conditioning usage, as well as the potential negative implications of the emergency system shutting down from overheating.

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Energy Conservation Measure Details

By implementing this measure, a reduction in heat loss/heat gain will occur which will lead to energy savings. The scope of work includes the following:

- A/C Unit Weatherization
- Attic Bypass Air Sealing
- Attic Flat Insulation
    - Cellulose 6" (Fire Station #1) – install 6 inches of open cellulose across the attic flat over existing batt insulation
    - Cellulose 6" (Fire Station #2) – install 6 inches of open cellulose across the attic flat over existing batt insulation
    - Cellulose 8" (Town House) – remove selected floor boards and dense pack 8" cellulose material beneath on the attic flat
    - Batt Insulation 10" (Music Hall) – install 10 inch batts of insulation in between the joists of the attic
    - Cellulose 10"/Thermax (Atlantis Drive) – use a 1" polyisocyanurate board to cover existing cracks and seal with sheathing tape from attic side and install 10 inches of cellulose across the attic flat over the board
    - Cellulose 6" (Community Center) – install 6 inches of cellulose across the attic flat over existing batt insulation
- Attic Insulation Baffles
    - Baffles (Fire Station #1) – install material to separate the roof slope from the newly installed cellulose insulation to prevent spillage into the soffit area of the attic
    - Baffles (Fire Station #2) – install material to separate the roof slope from the newly installed cellulose insulation to prevent spillage into the soffit area of the attic
- Door Weather Stripping
- Hopper Window Weatherization
- Overhead Door Weather Stripping
    - Weather Strip – install heavy-duty aluminum carrier with oversized vinyl insert gasket at the sides; install heavy-duty aluminum carrier with an oversized U-style gasked at bottom
- Wall Air Sealing/Insulation
    - Batt Insulation/Thermax (Police Station) – remove existing cellulose from wall cavity. Use 6" batts of insulation to fill the wall cavity in between the studs, and seal with 2" Polyisocyanurate board. Also apply to the top of the ceiling on the attic side of the 2nd floor
    - Thermax (Fire Station #1) – use a polyisocyanurate board to cover existing batt insulation on the specified walls of the dormers and seal with sheathing tape

- Thermax (Town House) – use a polyisocyanurate board to cover existing batt insulation on the 3rd floor staircase entry flat and seal with sheathing tape

An overall work summary is shown below:

Weatherization Measure	Atlantis Drive	Community Center	Fire Station #1	Fire Station #2	Music Hall	Police Station	Town House	Total Quantity	
AC Unit Weatherization	7							7	Units
Attic Flat Insulation	500	7,420	837	1,426	182		1,514	11,879	SF
Attic Wall Insulation	500		338					838	SF
Door Weather Stripping - Doubles					2		2	4	Units
Door Weather Stripping - Singles	3	3	2	4	2	2	6	22	Units
Hopper Window Weatherization	32							32	Units
Insulation Soffit Baffles			248	384				632	LF
Overhead Door Weather Stripping	2		4	3		1		10	Units
Retrofit Attic Hatch	1	2	4	2	2	1		12	Units
Wall Insulation						2,481	60	2,541	SF

Implementation

By implementing this measure approximately 6,810 kWh and 2,496 Therms of natural gas plus 719 Gallons of oil can be realized; therefore, a total annual cost savings of $5,851 was estimated.

Building	Electricity Savings		Natural Gas Savings		Oil Savings		Total Cost Savings
	kWh	Cost	Therms	Cost	Gallons	Cost	
Atlantis Drive	1,003	$181	565	$678		$0	$859
Community Center	1,231	$222	544	$653		$0	$874
Fire Station #1	950	$171		$0	429	$973	$1,144
Fire Station #2	681	$123		$0	290	$657	$780
Music Hall	323	$58	195	$234		$0	$292
Police Station	1,038	$187	453	$544		$0	$730
Town House	1,584	$285	739	$887		$0	$1,172
Total	**6,810**	**$1,226**	**2,496**	**$2,995**	**719**	**$1,630**	**$5,851**

The total material and installation cost for weatherizing each town building is shown below,

Building	Total Project Cost	Payback Period (years)
Atlantis Drive	$22,289	26.0
Community Center	$12,514	14.3
Fire Station #1	$17,498	15.3
Fire Station #2	$15,585	20.0
Music Hall	$2,844	9.7
Police Station	$26,240	35.9
Town House	$14,241	12.2
Total	**$111,210**	**19.0**

The estimated customer cost for implementing this measure is $111,210. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$111{,}210}{\$5{,}851} = 19.0\ years$$

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Assumptions & Exclusions

- Electrical Hazards – testing and/ or repair of hazardous electrical components (knob and tube wiring, open junction boxes, etc) that are encountered are excluded from the scope of work and pricing. Others are responsible for testing and/or repair of electrical hazards.
- Hazardous Materials – testing, remediation and/or removal of any potentially hazardous material that is encountered is excluded from the scope of work and pricing. Others are responsible for testing, remediation and/or removal of potentially hazardous material.
- Debris & Storage Removal – this report does not include recommendations or pricing calculations to remove, relocate, or dispose of debris or storage in spaces included in this scope of work. We are able to discuss removal alternatives with the client if self-removal is not a viable option for some or all of the areas to be treated.
- Music Hall – Weather stripping the center of the double doors requires the removal of the existing wooden panel in the center that was added to act as weather stripping. This report assumes that it will be removed by others prior to the weatherization of the doors.
- Town House – The back section of the building has an attic access that was not accessible at the time of the audit. Therefore, recommendations for this section of the building have been excluded from the report. If access is available in the future, the scope of work is subject to change.
- Town House – There is debris placed directly over the insulation batts in the 3rd floor entry way. This report assumes that the debris will be removed from this area by others prior to the commencement of weatherization work in this area.
- Fire Station #1 – There are weatherization recommendations on the attic flat that is also partially used for storage. This report assumes that prior to the commencement of weatherization work in this area, the storage area in the attic will be cleared by others.
- Fire Station #1 – The access doors to the dormers and attic are blocked by items and artifacts related to the town. This report assumes that the access door areas will be cleared by others prior to the start of weatherization work in these areas.
- Fire Station #2 – The attic space in the lower roof line was not assessed at the time of the audit because the acces door had been nailed shut. This area has been excluded from the report, but the scope of work is subject to change if access is available in the future.
- Community Center – An average utility usage rate for a similar type building has been used in the calculations of this report for heating usage in this building.

ECM #4 - Install an Energy Management System

Existing Conditions

This measure includes the installation of an Energy Management System at the Library & Music Hall to refine and tighten the buildings' temperature controls. Currently, the buildings have stand-alone controls that cause the customer to have limited access.

Energy Conservation Measure Details

It is recommended that a new Energy Management System is installed and that the HVAC equipment is reprogrammed to allow energy savings to be realized for electricity and natural gas. In conjunction with the local controllers and their energy savings features, it will also allow for remote control, monitoring and alarming of the mechanical equipment. The energy management system will control the following mechanical devices:

Library:

- (1) Hot Water Boiler
- (2) Heating & Ventilating Units
- (2) Air Handler Units
- (6) Baseboard Radiator Zones

Music Hall:

- (1) Hot Water Boiler
- (1) Air Cooled Chiller
- (1) Air Handler Unit
- (2) Direct-Fired Reznor Units

The savings from this measure will be met with the following control strategies:

- Optimal Start/Stop which allows motors to turn off when the building is no longer being used during holidays, weekends and unoccupied hours.
- Temperature setback which allows the temperature to decrease during unoccupied hours
- 7-Day scheduling
- Demand Control Ventilation (CO2 monitoring)

By implementing this measure, the following Annual Energy Savings can be obtained:

Building	Electricity Savings		Natural Gas Savings		Total Cost Savings
	kWh	Cost	Therms	Cost	
Music Hall	8,730	$1,571	1,154	$1,385	$2,956
Library	11,262	$2,027	436	$523	$2,550
Total	**19,992**	**$3,599**	**1,590**	**$1,908**	**$5,507**

Implementation

The implementation of this measure requires the purchase and the installation of the necessary sensors, actuators, valves, and controllers as outlined below. Programming and training is also included in this scope of work.

Library	Music Hall
Web-enabled supervisory controller	Web-enabled supervisory controller
BACnet field controllers for boiler, AHU's, H&V units, and baseboard radiators	BACnet field controllers for boiler, AHU, and H&V units
Boiler enable, supply & return hot water temperatures	Boiler enable, supply & return hot water temperatures
AHU's, H&V units fan enable & status	AHU's, H&V units fan enable & status
CO2 monitoring	CO2 monitoring
Heating & cooling enable	Heating & cooling enable
Discharge air temperature	Discharge air temperature
Ten wall-mounted digital temperature sensors	Three wall-mounted digital temperature sensors

The total material and installation cost breakdown is shown below:

Building	Total Project Cost	Estimated Utility Incentives	Customer Cost	Payback Period (years)
Music Hall	$32,208	$6,000	$26,208	8.9
Library	$52,650	$6,000	$46,650	18.3
Total	**$84,858**	**$12,000**	**$72,858**	**13.2**

It is estimated that $12,000 can be obtained in incentives; therefore, the customer cost for this measure is $72,858. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$72{,}858}{\$5{,}507} = 13.2\ years$$

ECM #5 - Oil-to-Gas Conversion at Fire Station #1 (New Condensing Boiler)

Existing Conditions

The Town Hall currently has an oil-fired hot water boiler that feeds distribution systems in the building (unit heaters, baseboards, air handlers, etc).

Energy Conservation Measure Details

It is recommended that the boiler be replaced with a high-efficiency natural gas-fired condensing boiler. Due to the higher prices of oil compared to natural gas, significant cost savings can be achieved by converting to natural gas. In addition to the cost savings, the new burner will be significantly more efficient in its fuel consumption. The existing boiler is approximately 77% efficient while the new condensing boiler would be approximately 92% efficient. The new boiler will save approximately 725 therms per year. The combined efficiency savings of the new boiler and the cost savings of the fuel conversion is estimated at $2,650 annually.

Location	Bldg Heat Load (Therms)	Current Boiler Efficiency	Current Energy Use (Oil)			Current Energy Cost	Proposed Boiler Efficiency	Proposed Energy Use (Gas)		Proposed Energy Cost	Annual Energy Savings	
			MMBTU	Therms	Gallons			MMBTU	Therms		Therms	Cost
Marion Fire Station #1	3,427	77%	445	4,450	3,140	$7,120	92%	373	3,725	$4,470	725	$2,650

Implementation

The implementation of this measure requires the purchase and installation of the new boiler, piping the gas lines to the boiler, as well as startup and testing of the new burner. The total material and installation cost of this measure is $45,895. It is estimated that $4,000 can be obtained through utility rebates. The project financials are outlined below:

Location	Project Cost	Estimated Incentives	Customer Cost	Payback (years)
Marion Fire Station #1	$45,895	$4,000	$41,895	15.8

The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$41{,}895}{\$2{,}650} = 15.8\ years$$

*Notes

The removal/disposal of any existing oil tanks is not included in the above pricing.

Eversource will need to be consulted regarding logistics of bringing gas to the building.

ECM #6 - Mechanical Insulation

Existing Conditions

This measure involves the insulation of pipes, tanks, valves & fittings at the Town House and Community Center. Below is a description of each measure that is being proposed:

- **Pipe Insulation** – There is a significant amount of un-insulated condensate and steam pipes found in the basement of the Town House. The boiler was recently replaced, but most of the new pipes were left bare, which is leading to a large amount of distribution losses (wasted energy). The additional office space that was added behind the original section of the Town House means that heat has to travel further to reach the radiators; this distance contributes to greater heat loss because the heat from the steam and condensate have more time to dissipate before reaching the radiators. In turn, the boiler system has to work much harder than it would if the pipes were properly insulated. The pipes in the boiler room of the Community Center are also un-insulated, which is creating distribution losses as the pipes travel into the attic space and to their respective destinations in the building. This building is experiencing greater energy loss from the heating system because the boiler is fitted with copper pipes; it's due to the greater conductivity of copper than iron that it conducts heat faster than iron pipes. As as result, copper pipes lose heat faster than iron.
- **Valve & Fitting Insulation** – Both boiler rooms have valves and fittings that were also left un-insulated with the pipes. Valves and fittings are difficult components of a mechanical system to insulate and as a result are frequently left un-insulated. At the Town House, there is a variety of valves and fittings that have been left bare, including large gate valves and pressure reducing valves, as well as steam traps and strainers. The pipes also have bare 90 degree elbows, 45 degree elbows, and tee fittings at the pipe intersection that should be insulated. These un-insulated components have the same temperature fluids passing through them as the pipes. The boiler room at the Community Center has an air scoop that has been left un-insulated and also has bare pipe fittings at 90 degree elbows, 45 degree elbows, and T-intersections.
- **Tank Insulation** – Tanks are difficult components of a mechanical system to insulate and as a result are frequently left un-insulated. The un-insulated condensate tank at the Town House is creating distribution losses as fluids pass through it from the pipes. It should be insulated on the floor to prevent head from escaping.

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Energy Conservation Measure Details

It is recommended that bare pipes, valves, fittings, and tanks are insulated. By implementing this measure, a reduction in heat loss will occur, which will lead to energy savings. The scope of work includes the following:

Task	Town House	Community Center	Total Quantity
Air Scoop Insulation (Units)		1	1
End Cap Insulation (Units)	4		4
Flange Insulation (Units)	5		5
Gate Valve Insulation (Units)	1		1
Pipe Fitting Insulation (Units)	96	26	122
PRV Insulation (Units)	3		3
Pump Insulation (Units)		1	1
Steam Trap Insulation (Units)	9		9
Straight Pipe Insulation (LF)	619	78	697
Strainer Insulation (Units)	9		9
Tank Insulation (Units)	1	1	2

By implementing this measure approximately 1,601 Therms of natural gas can be realized at an annual total cost savings of $1,921.

Building	Natural Gas Savings		Total Project Cost	Payback
	Therms	Cost		
Community Center	166	$199	$4,948	24.8
Town House	1,435	$1,722	$36,638	21.3
Total	**1,601**	**$1,921**	**$41,585**	**21.6**

Implementation

The implementation of this measure requires the insulation of bare hot water tanks, valves, pipes and fittings. The total material and installation cost of this measure is $41,585. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$41{,}585}{\$1{,}921} = 21.6\ years$$

Implementation

- Asbestos in the Work Area – it is assumed that no comprehensive asbestos remediation project is planned; as a result, it is assumed that all of the areas of asbestos insulation that were found during the on-site inspections will remain in place. Under these assumptions, work areas that are directly adjacent to likely asbestos-containing material cannot be included in the scope of work because installing the retrofit insulation would disrupt potentially hazardous material. Any work areas that are directly adjacent to likely asbestos-containing material or would potentially disrupt asbestos-containing material are excluded from the scope of work.
- Electrical Hazards – testing and/or repair of hazardous electrical components (knob and tube wiring, open junction boxes, etc) that are encountered are excluded from the scope of work and pricing. Others are responsible for testing and/ or repair of electrical hazards.
- Hazardous Materials – testing, remediation and/or removal of any potentially hazardous material that is encountered is excluded from the scope of work and pricing. Others are responsible for testing, remediation and/ or removal of potentially hazardous material.

ECM #7 - Install Variable Frequency Drives

Existing Conditions

This measure involves the installation of variable frequency drives (VFDs) on various pump & fan motors at the Police Department, Main water pumping station, Perry Hill water pumping station, and wastewater treatment plant. An inventory of the pump/fan motors is listed below for each facility. In each case, the pumps/fans have the opportunity of modulating based on differential pressure and/or temperature.

- Police Department – (2) 1.5HP hot water circulator pumps
- Main Water Pumping Station – (1) 25HP pump
- Perry Hill Pumping Station – (1) 25HP pump & (1) 30HP pump
- Wastewater Treatment Plant – (2) 5HP hot water circulator pumps
- Wastewater Treatment Plant – (1) 5HP supply fan, (1) 5HP exhaust fan

Energy Conservation Measure Details

It is recommended that variable frequency drives are added to the above motors to allow them to modulate based on actual demand/conditions. The VFD's will modulate based on differential temperature and/or differential pressure.

Annual energy savings of 141,037 kWh can be realized from this measure; therefore, a total annual cost savings of $25,387 can be obtained as shown below:

Building	Electricity Savings	
	kWh	Cost
Police Department	6,937	$1,249
Main Water Pumping Station	31,045	$5,588
Perry Hill Pumping Station	56,305	$10,135
Wastewater Treatment RTU	25,131	$4,524
Wastewater Treatment Circ Pumps	21,619	$3,891
Total	**141,037**	**$25,387**

Implementation

The implementation of this measure requires the purchase and installation of the above variable frequency drives. The implementation also requires controllers, temperature/pressure sensors, electrical wiring, and programming. The total material and installation cost for this measure is shown below:

Building	Total Project Cost	Estimated Utility Incentives	Customer Cost	Payback Period (years)
Police Department	$13,130	$2,000	$11,130	8.9
Main Water Pumping Station	$17,550	$3,105	$14,446	2.6
Perry Hill Pumping Station	$40,500	$5,631	$34,870	3.4
Wastewater Treatment RTU	$18,225	$2,800	$15,425	3.4
Wastewater Treatment Circ Pumps	$18,225	$2,800	$15,425	4.0
Total	**$107,630**	**$16,335**	**$91,295**	**3.6**

Approximately $16,335 can be obtained from utility company rebates; therefore, the adjusted customer cost is $91,295. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$91{,}295}{\$25{,}387} = 3.6\ years$$

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ECM #8 - Install Kitchen Hood Controls

Existing Conditions

This measure involves the installation of a kitchen hood control system at Sippican Elementary School to automatically control the kitchen ventilation and exhaust fans. Currently, the kitchen exhaust stays on for approximately 2,050 hours annually and runs at full speed regardless of the level of cooking activity that is taking place.

Energy Conservation Measure Details

It is recommended that a kitchen hood control system is installed to allow the exhaust fans to modulate as needed based on actual cooking activity. The installation of variable frequency drives on the exhaust fans will allow them to modulate as needed instead of running at full speed. These VFD's will be controlled by temperature and optic sensors. Any increases/decreases in temperature and/or smoke/particulates will cause the fans to ramp up/down to satisfy conditions without over-ventilating. The scope of work includes the following:

- Supply and install (2) Variable Frequency Drives (VFDs) in place of the existing motor starters for the kitchen exhaust fans
- Install temperature and optic sensors in the kitchen exhaust ductwork
- Install new control keypad
- Start-up and testing of the new VFDs
- Warranty for one year

An estimated annual energy savings of 6,482 kWh and 2,089 Therms can be realized from this measure; therefore, the total projected cost savings is $3,674.

Building	Electricity Savings		Gas Savings		Total Cost Savings
	kWh	Cost	Therms	Cost	
Sippican Elementary School	6,482	$1,167	2,089	$2,507	$3,674
Total	**6,482**	**$1,167**	**2,089**	**$2,507**	**$3,674**

Implementation

The implementation of this measure requires the purchase and installation of two VFDs, a controller, termperature & optic sensors, and electrical wiring. The VFD's will also need to be programmed. The total material and installation cost of the drives and control system for this measure is $28,692. Approximately $2,400 can be obtained from utility incentives; therefore, the adjusted estimated customer cost is $26,292.

Building	Total Project Cost	Estimated Utility Incentives	Customer Cost	Payback Period (years)
Sippican Elementary School	$28,692	$2,400	$26,292	7.2
Total	**$28,692**	**$2,400**	**$26,292**	**7.2**

The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$26{,}292}{\$3{,}674} = 7.2\ years$$

ECM #9 - Install Refrigeration Controls

Existing Conditions

This measure involves the installation of refrigeration controllers to control door heaters, fan cycling and associated Cooler/Freezer compressors. Currently, the facility has evaporator fan motors which circulate/transfer cool energy from the cooling coils to the coolers/freezers. The evaporator fans are equipped with shaded pole motors which have a full load efficiency of around 30% efficient. The existing evaporator fan motors and the anti-sweat door heaters run 24/7. The current inventory of the facilities that require controls are shown below,

Building	# of Motors	# of Zones
Sippican Elementary School	6	3
Total	**6**	**3**

Energy Conservation Measure Details

It is recommended that refrigeration controls are installed to control the facility's walk-in coolers and freezer. It is also recommended that the motors are replaced with Electronically Commutated Motors (ECMs). ECMs have a better motor efficiency compared to shaded pole motors (roughly 78%). In conjunction with the local controllers and their energy savings features, it will also allow for remote control, monitoring and alarming of the walk-in coolers/freezers. The scope of this work includes the following:

- Supply and install (3) zones of energy savings CoolTrol refrigeration controls to cycle temperature and evaporator fans
- Replace (6) existing shaded pole motors with (6) high-efficiency EC motors in evaporators
- Dew-point pulse control for anti-sweat door heaters
- Start-up and testing of the new controls/motors
- Installation to be performed by licensed electricians during business hours

The table below shows the annual energy cost savings for this measure:

Building	Electricity Savings	
	kWh	Cost
Sippican Elementary School	18,804	$3,385
Total	**18,804**	**$3,385**

Annual energy savings of 18,804 kWh can be realized from this measure; therefore, total annual cost savings of $3,385 can be obtained.

Implementation

The implementation of this measure requires the purchase and installation of refrigeration controls to control walk-in coolers/freezers, door heaters, and evaporator fans. This measure also consists of replacing shaded pole motors with Electronically Commutated Magnetic Motors (ECMs). The total material and installation cost for each building is shown below:

Building	Total Project Cost	Estimated Utility Incentives	Customer Cost	Payback Period (years)
Sippican Elementary School	$19,671	$3,761	$15,910	4.7
Total	**$19,671**	**$3,761**	**$15,910**	**4.7**

The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$15{,}910}{\$3{,}385} = 4.7\ years$$

ECM #10 - Install Demand Control Ventilation

Existing Conditions

This measure includes the installation of Demand Control Ventilation to refine and tighten the building temperature controls at Sippican Elementary. The building has several Air Handler Units and Rooftop Units that deliver fresh air into the larger common spaces. Currently, these areas use a standard thermostat to regulate room temperature and the outside air damper is fixed at a certain position. The unit fans will run on full load when the space is occupied. The specifications for the common area heating/cooling capacities is shown below:

Energy Conservation Measure Details

It is recommended that the current Energy Management System at the school is expanded to include Demand Control Ventilation. This will also include furnishing and installing duct CO^2 sensors for any Air Handler Units/ Rooftop Units. The scope of work includes the following:

- Each HVAC equipment will include a non-proprietary field controller (if applicable)
- Furnish and Install a CO^2 Sensor for each Air Handling Units or Rooftop Units.
- Integrate the sensors into the existing building management system

Annual energy savings of 18,362 kWh and 3,290 Therms can be realized from this measure; therefore, total cost savings of $7,253 are estimated, as shown below:

Building	Electricity Savings		Gas Savings		Total Cost Savings
	kWh	Cost	Therms	Cost	
Sippican Elementary	18,362	$3,305	3,290	$3,948	$7,253
Total	**18,362**	**$3,305**	**3,290**	**$3,948**	**$7,253**

Implementation

The implementation of this measure requires the purchase and the installation of the necessary sensors, and controllers. Programming is also included in this scope of work. The total material and installation cost of the control system for this measure is approximately $16,320. Utility incentives of $1,800 are estimated to be obtained as well; therefore, the adjusted customer cost is $14,520 as shown below:

Building	Total Project Cost	Estimated Utility Incentives	Customer Cost	Payback Period (years)
Sippican Elementary	$16,320	$1,800	$14,520	2.0
Total	**$16,320**	**$1,800**	**$14,520**	**2.0**

The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$14{,}520}{\$7{,}253} = 2.0\ years$$

ECM #11 - Install High Efficiency Transformers

Existing Conditions

Sippican Elementary School, the Wastewater Treatment Plant, and the Perry Hill Pumping Station all use low voltage transformers to step voltage up/down. The transformer process is not 100% efficient; therefore, there are two different types of losses associated with the process; core losses and winding losses. Transformer efficiency has improved over time and new transformers have a higher efficiency.

Energy Conservation Measure Details

It is recommended that six standard efficiency transformers are replaced with Rex High Efficiency Transformers. By implementing this measure, the overall energy consumption of the transformers will decrease which will lead to annual energy cost savings. The scope of work includes the following:

- Furnish and install six Rex High Efficiency Transformers
- Removal of existing Transformers

An annual savings breakdown can be seen below:

Building	Existing Transformer Size (kVA)	Quantity	Electricity Savings	
			kWh	Cost
Sippican Elementary	150	1	2,764	$498
	75	1	1,725	$311
Wastewater Treatment	50	1	4,818	$867
	15	2	4,560	$821
Perry Hill Pumping Station	30	1	3,355	$604
Total	**320**	**6**	**17,222**	**$3,100**

Annual energy savings of 17,222 kWh can be realized from this measure; therefore, a total annual cost savings of $3,100 can be realized.

Implementation

The implementation of this measure requires the purchase and the installation of two Rex Transformers. The total material and installation cost of the transformers for this measure is shown below:

Building	Existing Transformer Size (kVA)	Quantity	Total Project Cost	Estimated Utility Incentives	Customer Cost	Payback Period (years)
Sippican Elementary	150	1	$9,043	$691	$8,352	16.8
	75	1	$7,062	$431	$6,631	21.4
Wastewater Treatment	50	1	$5,082	$1,205	$3,878	4.5
	15	2	$8,469	$1,140	$7,329	8.9
Perry Hill Pumping Station	30	1	$5,082	$839	$4,243	7.0
Total	**320**	**6**	**$34,738**	**$4,306**	**$30,433**	**9.8**

Utility incentives of $4,306 are estimated to be obtained as well; therefore, the adjusted customer cost is $30,433. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$30{,}433}{\$3{,}100} = 9.8\ years$$

ECM #12 - Install Wi-Fi Programmable Thermostats

Existing Conditions

This measure involves the installation of Wi-Fi thermostats at Fire Station #1 and Fire Station #2. Currently, these facilities have standalone thermostats which do not include temperature setback.

Energy Conservation Measure Details

It is recommended that new Wi-Fi programmable thermostats are installed to give facility personnel access to space temperature through their cellular phone or computer. The scope of work includes the following:

- Demo existing thermostats
- Install new Wi-Fi programmable thermostats
- Run "C" wire where applicable
- Town IT department will need to supply appropriate network information for Wi-Fi access

Annual energy savings of 203 Gallons can be realized from this measure at an annual cost savings of $461.

Location	Thermostat Quantity	Oil Savings	
		Gallons	Cost
Fire Station #1	7	158	$358
Fire Station #2	2	45	$102
Total	**9**	**203**	**$461**

Implementation

The implementation of this measure requires the purchase and installation of the new Wi-Fi thermostats. The implementation cost is $5,225 and utility rebates are not available for oil heating; therefore, the customer cost is $5,225 as show below:

Location	Total Project Cost	Estimated Incentives	Customer Cost	Payback (years)
Fire Station #1	$4,064	$0	$4,064	11.3
Fire Station #2	$1,161	$0	$1,161	11.3
Total	**$5,225**	**$0**	**$5,225**	**11.3**

The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$5{,}225}{\$461} = 11.3\ years$$

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Installation and Warranty Information

If you decide to proceed with this proposal, Energy Source will be responsible for the following tasks:

- Develop final equipment specifications and equipment layout
- Processing and filing application for utility incentives
- Material ordering and receiving
- Dismantling and removing existing systems from premises
- Construction
- Final walk-through with you

Installation

All installation staff will agree to submit to a CORI check before proceeding with project.

The removal and disposal of asbestos and toxic materials if present are the owner's responsibility and should be determined before proceeding with the project.

Warranty

Included with your project is a one-year warranty on all labor and materials provided by Energy Source. At the end of the first-year materials remain covered by standard warranties provided by their manufacturers. Warranty periods begin when the installation is completed. The owner has a one-month period following the completion of the installation to accept or reject work performed by Energy Source, after which time we will assume that the work has been accepted.

Due to the fluctuation in commodities this proposal is valid for a period of 30 days from the date shown at the top of this proposal, after which time we will be happy to provide an adjusted quote if necessary.

Policies that Affect Fleet Gas and Diesel Usage

The adoption of the policies below for municipal vehicles will result in the savings of additional energy and assist Dighton in meeting the 20% energy reduction threshold.

Adoption of a Town-Wide Anti-Idling Policy for Municipal Vehicles: Idling vehicles contribute significantly to air pollution and waste fuel, increasing fleet management costs. Municipalities across the Commonwealth and the nation have seen significant cost and greenhouse gas emission reductions since implementing Town-wide "no-idling" policies for municipal vehicles. According to the U.S. Department of Energy https://www.fueleconomy.gov/feg/maintain.jsp communities that adopt a town-wide anti-idling policy for municipal vehicles can expect to achieve a 3% savings in vehicle fuel use.

Closely Monitor Tire Pressure, Use 100% Synthetic Oil and Use Fuel Efficient Tires: By maintaining appropriate air pressure in vehicle tires, using 100% synthetic oil and fuel efficient tires, communities can expect to achieve a 3% savings in vehicle fuel use.

Anti-Idling Policy		
All FY 2017 Gasoline Usage (Gallons)	33,901	
All FY 2017 Diesel Usage (Gallons)	17,281	
Percent Savings	3%	Idling vehicles contribute significantly to air pollution and waste fuel, increasing fleet management costs. Municipalities across the Commonwealth and the nation have seen significant cost and greenhouse gas emission reductions since implementing Town-wide "no-idling" policies for municipal vehicles. In many cases this has been as much as a 3% decrease.
Gallons of Gasoline Saved per Year	1,017	
Gallons of Diesel Saved per Year	518	
MMBTUs Saved per Year	**205**	
Closely Monitor Tire Air Pressure, Use 100% Synthetic Oil & Use Fuel Efficient Tires		
All FY 2017 Gasoline Usage (Gallons)	33,901	
All FY 2017 Diesel Usage (Gallons)	17,281	
Percent Savings	3%	Maintaining appropriate air pressure in vehicle tires, using 100% synthetic oil and using fuel efficient tires can decrease a vehicles fuel consumption by as much as 3%.
Gallons of Gasoline Saved per Year	1,017	
Gallons of Diesel Saved per Year	518	
MMBTUs Saved per Year	**205**	
Total MMBTUs Saved	**410**	

MMBtu Conversion Chart

Fuel Energy Content of Common Fossil Fuels per DOE/EIA

BTU Content of Common Energy Units – (1 million Btu equals 1 MMBtu

- 1 kilowatt hour of electricity = 0.003412 MMBtu
- 1 therm = 0.1 MMBtu
- 1 ccf (100 cubic foot) of natural gas = 0.1028 MMBtu (based on U.S. consumption, 2007)
- 1 gallon 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 (based on U.S. Consumption, 2007)
- 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
- 1 gallon of B10 biodiesel = 0.137 MMBtu
- 1 gallon of B5 biodiesel = 0.138 MMBtu
- 1 barrel of residual fuel oil = 6.287 MMBtu