Town of Dighton, Massachusetts
Energy Reduction Plan

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

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

October 2018

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I. Purpose and Acknowledgements

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

Town of Dighton
Board of Selectmen
979 Somerset Avenue
Dighton, MA 02715
Tel: (508) 669-6431
Fax: (508) 669-5667

October 24, 2018

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

To Whom It May Concern

At a public Board of Selectmen's meeting held on October 24, 2018, the Board of Selectmen voted to adopt the attached Energy Reduction Plan.

Sincerely,

Brett R. Zografos, Chairman
Board of Selectmen
Town of Dighton

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

Dr. Anthony C. Azar
Superintendent of Schools

DIGHTON-REHOBOTH
Regional School District
2700 Regional Road
N Dighton, MA 02764
(508) 252-5000 (508) 252-5024 (fax)
www.drregional.org

Kerri Anne Quinlan-Zhou
Assistant Superintendent

Robert Murray
Interim Director of Special Education

Catherine Antonellis
Business Adminstrator

October 16, 2018

To Whom It May Concern;

Please be advised that the Dighton Rehoboth Regional School District adopts the Energy Reduction Plan as part of the Town of Dighton's Green Communities Application for Designation.

Sincerely,

Dr Anthony C Azar

Superintendent

The mission of the Dighton-Rehoboth Regional School District, in partnership with parents and the community, is to provide students with the tools, including technology, to acquire knowledge, apply skills, critically analyze information and issues, and develop social responsibility.

Dighton-Rehoboth does not discriminate based on race, color, religion, gender, national origin, age, marital status, veteran status, disability, sexual orientation, gender identity, or any other legally protected group.

C. List of Contributors

The collaborative efforts of the offices of Dighton Town Administrator Mallory Aronstein, Dighton Board of Selectmen Chairman Brett R. Zografos, Dighton Green Communities Grant Committee Chairman Jonathan Gray, Administrative Assistant Karin Brady, and MA Department of Energy Resources Green Community Regional Coordinator Seth Pickering were all vital in the production this Plan.

Much of the information in this Plan was derived from energy audits performed by Energy Source, led by Dalton Ling. Additional technical assistance was provided by the Southeastern Regional Planning and Economic Development District (SRPEDD), the author of this Plan.

II. Executive Summary

A. Narrative Summary of the Town

The Town of Dighton is located in southeastern Massachusetts in the center of Bristol County. It is located 40 miles south of Boston and 13 miles east of Providence, Rhode Island. The town has an approximate area of 22.1 square miles and is bordered by Taunton on the north; the Taunton River and Berkley on the east; Somerset and Swansea on the south and southwest; and Rehoboth on the west and northwest. According to the 2010 U.S. Census, Dighton had a population of 7,086, having experienced a 14.8% increase in population since 2000.

Dighton was originally part of Taunton's South Purchase along with other surrounding towns. It separated in 1672 and incorporated as its own community in 1712. Originally a farming community, its economy expanded into shipbuilding due to its proximity to the Taunton River. It later became a port of entry attracting manufacturing industries, cotton mills and paper mills.

Today, Dighton can be described as a desirable bedroom community for both Boston, Massachusetts and Providence, Rhode Island. Dighton's population has grown steadily since the 1960s as some of the many farms in town have been developed into housing subdivisions. Dighton is accessible to the larger southeastern Massachusetts region via the east-west Route 44 which passes through the northern part of town and via the north-south Route 138 which passes through the western part of town.

B. Summary of Municipal Energy Uses

- Total Number of Municipal Buildings: 10
- Total Number of Municipal Vehicles: 58
- Total Number of Street Lights: 646
- Total Number of Traffic Lights: 18
- Water & Sewer: 6 Sewer Pump Stations

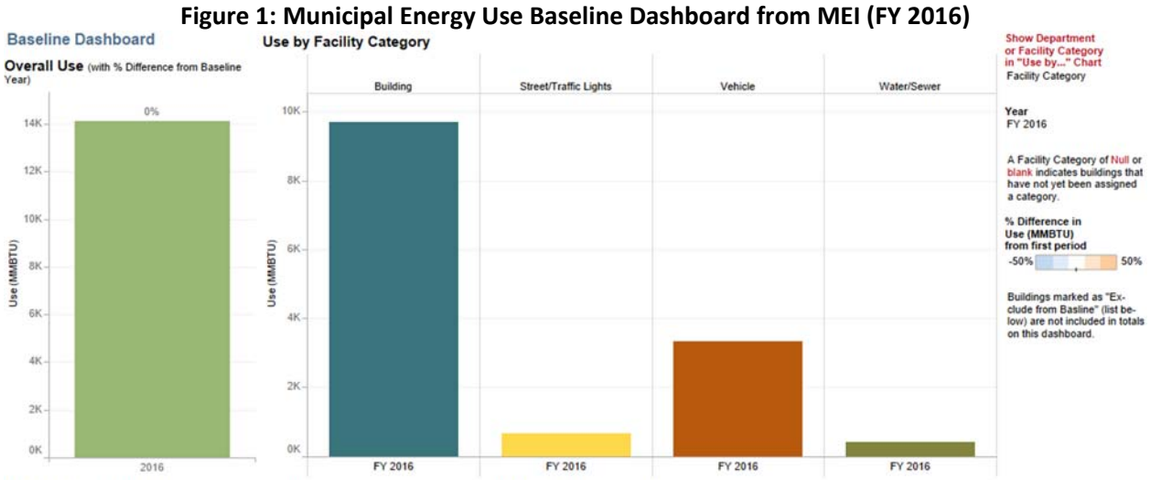
Table 1: Municipal Energy Use Summary

	Number	Ownership
Buildings	**10**	
Oil Heat	2	Municipality
Natural Gas Heat	8	Municipality
Vehicles	**58**	
Non-Exempt	2	Municipality
Exempt	56	Municipality
Street Lights	**646**	Municipality
Traffic Lights	**18**	Municipality
Water & Sewer	**6**	Municipality
Sewer Pump Stations	6	

C. Summary of Energy Use Baseline and Plans for Reductions

This Energy Reduction Plan commits Dighton to reduce energy use in municipal facilities by at least 20% compared to Fiscal Year 2016 over five years. In the baseline year, the town used 14,107 MMBTUs of energy, which means the town must reduce usage by at least 2,821 MMBTUs over the following five-year period.

Figure 1: Municipal Energy Use Baseline Dashboard from MEI (FY 2016)



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 2016
Building	9,681
Street/Traffic Ligh..	665
Vehicle	3,329
Water/Sewer	432

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 2016
Fire Department	434
Highway Department	334
Library	117
Police Department	183
Prime Time	185
School	7,920
Sewer Department	432
Streetlights & Traffic Lights	665
Town Hall	509
Vehicles	3,329

Dighton has identified energy savings measures in each facility category to reduce energy use 19.1% 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	9,681	68.6%	2,689	19.1%
Vehicles	3,329	23.6%	0	0.0%
Street/Traffic Lights	665	4.7%	0	0.0%
Water/Sewer/Pumping	432	3.1%	0	0.0%
Total	**14,107**	**100%**	**2,689**	**19.1%**

III. Energy Use Baseline Inventory

A. Identification of the Inventory Tool Used: The Town of Dighton 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) 2016 will serve as the baseline year. FY 2016 ran from July 1, 2015 to June 30, 2016. This will give the Town until June 30, 2021 (FY 2017 – FY 2021) to reach its 20% energy reduction goal.

C. Municipal Energy Consumption for the Baseline Year (FY 2016): In baseline year, the town used 14,107 MMBTUs of energy. The Appendix presents energy use for each municipal facility in MMBTUs and native units.

- Buildings: Dighton's 10 buildings use 9,681 MMBTUs, approximately 68.6% of Dighton's total municipal energy use. The buildings with the largest energy use are the Dighton Elementary School (3,986 MMBTUs) and the Dighton Middle School (3,933 MMBTUs) as shown in Figure 2.

- Street/Traffic Lights: There are 646 streetlights and 18 traffic lights in Dighton. These lights consume 665 MMBTUs, or 4.7% of the Town's energy use.

- Vehicles: Dighton's 58 municipal vehicles use 23.6% of the baseline total, or 3,329 MMBTUs.

- Water/Sewer Facilities: The Town of Dighton is serviced for wastewater by Town's Sewer Department. Sewer facilities consume 432 MMBTUs, or 3.1% of the town's energy use.

Table 3A: Municipal Energy Consumption for FY2016, Native Fuel Units

ERP Guidance Table 3a - Municipal Energy Consumption for 2016 (Native Fuel Units)

		2016				
		Electric (kWh)	Gas (therms)	Oil (gallons)	Gasoline (gallons)	Diesel (gallons)
Building	Library	10,077		592		
	Town Hall	78,276	2,424			
	Highway Department	17,279		1,976		
	Fire Department	32,088	1,108			
	Prime Time	23,966	1,031			
	North Dighton Fire Station	19,023	1,486			
	Police Department	45,377	283			
	Dighton Elementary School	249,406	31,354			
	Dighton Middle School	421,680	24,945			
	Total	**897,172**	**62,631**	**2,568**		
Street/Traffic Lights	Streetlights & Traffic Lights	194,819				
	Total	**194,819**				
Vehicle	Vehicles				19,298	6,736
	Total				**19,298**	**6,736**
Water/Sewer	Sewer Department	107,305	660			
	Total	**107,305**	**660**			
Grand Total		**1,199,296**	**63,291**	**2,568**	**19,298**	**6,736**

Table 3B: Municipal Energy Consumption for FY2016, MMBTU

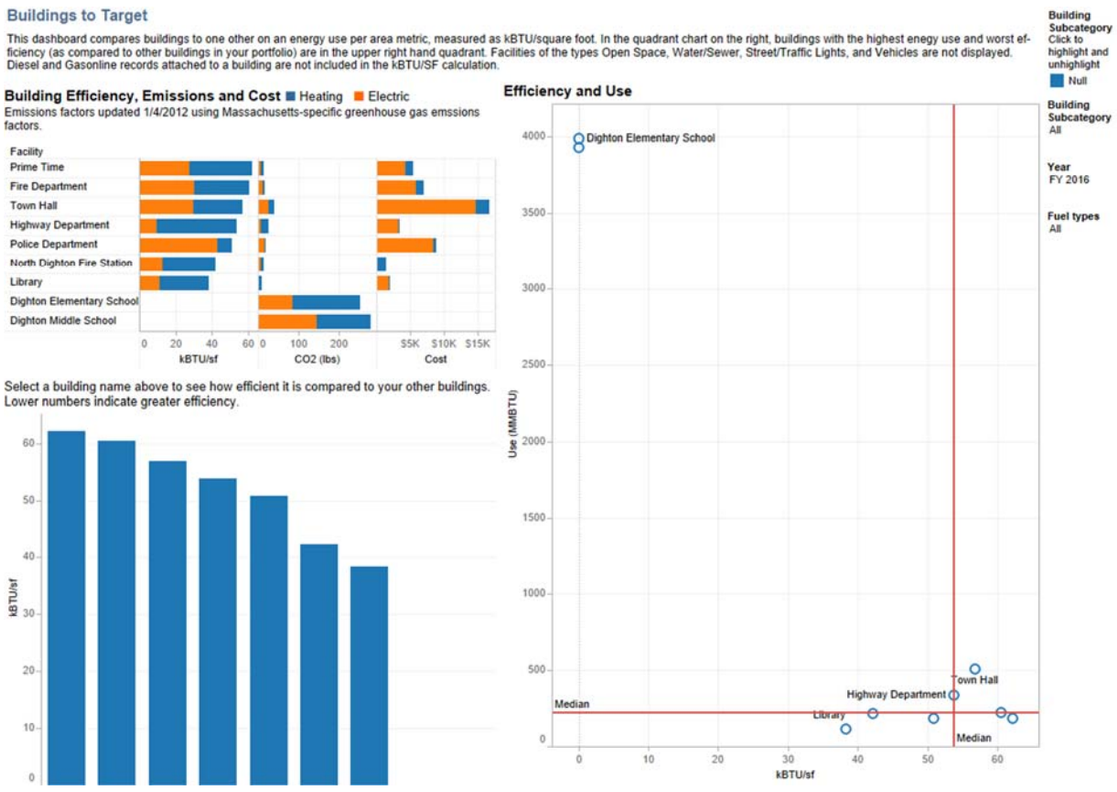
ERP Guidance Table 3b - Municipal Energy Consumption for 2016 (MMBTU)

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

		2016					
		Diesel	Electric	Gas	Gasoline	Oil	Total
Building	Library		34			82	**117**
	Town Hall		267	242			**509**
	Highway Department		59			275	**334**
	Fire Department		109	111			**220**
	Prime Time		82	103			**185**
	North Dighton Fire Station		65	149			**214**
	Police Department		155	28			**183**
	Dighton Elementary School		851	3,135			**3,986**
	Dighton Middle School		1,439	2,495			**3,933**
	Total		**3,061**	**6,263**		**357**	**9,681**
Street/Traffic Lights	Streetlights & Traffic Lights		665				**665**
	Total		**665**				**665**
Vehicle	Vehicles	936			2,393		**3,329**
	Total	**936**			**2,393**		**3,329**
Water/Sewer	Sewer Department		366	66			**432**
	Total		**366**	**66**			**432**
Grand Total		**936**	**4,092**	**6,329**	**2,393**	**357**	**14,107**

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 Dighton Elementary School for example, uses the most energy of any building in Dighton.



IV. Energy Reduction Plan

A. Narrative Summary

As shown below, the town has identified energy savings measures to reduce usage from FY 2016 by 2,689 MMBTUs or 19.1%.

- **Install LED Lighting and Controls**
  It is recommended that high efficiency LED light fixtures are installed to replace the fluorescent fixtures. 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 installing new LED lighting fixtures
  - Remove and recycle existing fluorescent fixtures
  - Warranty on new LED lighting fixtures of seven years

  By implementing this measure at the Middle School, Elementary School, Town Hall, Senior Center, Library, Fire Station, North Fire Station, and Highway Department, the town will save 178,403 kWh of electricity and $29,436 annually.

- **Install Wi-Fi Programmable Thermostats**
  It is recommended a new Wi-Fi programmable thermostats are installed to give facility personnel access to space temperature through their cellular phone or computer.
  - Demo four existing thermostats
  - Install new Wi-Fi programmable thermostats
  - Town IT department will need to supply appropriate network information for Wi-Fi access
  - Thermostat training will be provided

  By implementing this measure at the Town Hall, Senior Center, Library, Old Town Hall, and Fire Station, the town will save 8,158 kWh of electricity, 312 therms, and $1,658 annually.

- **Install Mechanical Insulation**
  It is recommended that the bare tank, and valve is insulated with cellular insulation. By implementing this measure, the reduction is heat loss will accrue, which will lead to energy savings. The scope of work includes the insulation of pipes, valves, fittings and tanks to meet the insulation requirements of the fluid temperature in the pipe and to utilize/install pipe covering/jacket to protect the insulation material as required in the work area.

  By implementing this measure at the Elementary School and Middle School the town will save 183 kWh of electricity, 59 therms, and $612 annually.

- **Implement Building Weatherization Measures**
  By implementing a variety of these measures at the Middle School, Elementary School, Town Hall, Library, Fire Station, North Fire Station, and Highway Department, a reduction in heat loss/heat gain will occur which will lead to energy savings. The scope of work includes the following:
  - Attic Bypass Air Sealing
  - Attic Flat Insulation
  - Caulking
  - Door Weather Stripping
  - Overhead Door Weather Stripping
  - Roof Air Barrier Retrofit
  - Roof-Wall Intersection Air Sealing

  By implementing these measures at the Middle School, Elementary School, Town Hall, Library, Fire Station, North Fire Station, and Highway Department, the town will save 19,145 kWh of electricity, 10,307 therms of natural gas, 739 gallons of oil, and $14,649 annually.

- **Oil-to-Gas Conversion at the Library**
  It is recommended to transition away from oil as the price of natural gas (estimated $1/Therm) is cheaper than the price of oil ($1.5/Therm). In addition, oil fired furnaces are unable to obtain the efficiency levels of condensing natural gas furnaces. The scope of this work includes the following:
    - Supply and install one condensing, forced air furnace
    - Removal and disposal of existing furnace and all necessary piping and components of the old system that is no longer required
    - Installation of direct venting system for combustion air and exhaust air
    - Commissioning and startup of new furnace systems

  By implementing this measure, the new furnace will save the town 855 therms and $3,662 annually.

- **Building Operator Certification**
  Achieve Building Operator Certification (BOC) for both Town and School facilities staff. According to the Building Operator Certification program https://www.theboc.info/why-boc/energy-savings-evaluation-reports/ buildings with a BOC staff can expect to achieve a 1% savings in building energy use.

- **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 Dighton Elementary School, Dighton Middle School, and Town Hall are 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 2021

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

The Town Administrator's Office, in collaboration with the School Department, will be responsible both for oversight of the Energy Reduction Plan and for implementation of energy conservation measures within the Town. The Town Administrator's Office will be responsible for the annual reporting requirements to maintain 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 1,983 MMBTUs or 14.1%. The Energy Source audits are included in the Appendix.
- Retrocommissioning of the Dighton Middle School, Dighton Elementary School and Town Hall would result in the savings of 632 MMBTUs or 4.5%.
- Achieving Building Operator Certification (BOC) for both Town and School facilities staff would result in the savings of 73 MMBTUs or 0.5%.
- Vehicle policy and maintenance targeting overall vehicle usage would result in the savings 200 MMBTUs or 1.4%. The supporting documentation for these policy and maintenance measures are available in the Appendix.

3. Energy Conservation Measures

Table 4 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 Dighton 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
Dighton Middle School	LED Lighting	2019	50,624	0	0	-	-	-	$8,353	$77,643	-	$8,190	$69,453	8.3	-	Energy Source Audit, 2018
Dighton Middle School	Mechanical Insulation	2019	183	33	0	-	-	-	$357	$4,299	-	$0	$4,299	12.0	-	Energy Source Audit, 2018
Dighton Middle School	Building Weatherization	2019	2,555	1,555	0	-	-	-	$1,977	$14,365	-	$0	$14,365	7.3	-	Energy Source Audit, 2018
Dighton Middle School	Retrocommissioning	2019	31,626	1,871	0	-	-	-	$	$0	-	$0	$0	-	-	Energy Star (www.energystar.gov)
Dighton Elementary School	LED Lighting	2020	83,095	0	0	-	-	-	$13,711	$94,750	-	$9,300	$85,450	6.2	-	Energy Source Audit, 2018
Dighton Elementary School	Mechanical Insulation	2019	0	26	0	-	-	-	$255	$4,289	-	$0	$4,289	16.8	-	Energy Source Audit, 2018
Dighton Elementary School	Building Weatherization	2019	687	418	0	-	-	-	$531	$4,892	-	$0	$4,892	9.2	-	Energy Source Audit, 2018
Dighton Elementary School	Retrocommissioning	2019	18,705	2,352	0	-	-	-	$	$0	-	$0	$0	-	-	Energy Star (www.energystar.gov)
Dighton Town Hall	LED Lighting	2020	15,468	0	0	-	-	-	$2,552	$36,689	-	$7,830	$28,859	11.3	-	Energy Source Audit, 2018
Dighton Town Hall	Wi-Fi Thermostats	2019	4,829	128	0	-	-	-	$925	$2,740	-	$400	$2,340	2.5	-	Energy Source Audit, 2018
Dighton Town Hall	Building Weatherization	2019	216	131	0	-	-	-	$167	$3,255	-	$0	$3,255	19.5	-	Energy Source Audit, 2018
Dighton Town Hall	Retrocommissioning	2019	5,863	182	0	-	-	-	$	$0	-	$0	$0	-	-	Energy Star (www.energystar.gov)
Dighton Old Town Hall	Wi-Fi Thermostats	2019	1,725	46	0	-	-	-	$331	$1,370	-	$200	$1,170	3.5	-	Energy Source Audit, 2018
Dighton Senior Center	LED Lighting	2019	6,605	0	0	-	-	-	$1,090	$10,790	-	$2,910	$7,880	7.2	-	Energy Source Audit, 2018
Dighton Senior Center	Wi-Fi Thermostats	2019	1,604	42	0	-	-	-	$307	$1,370	-	$200	$1,170	3.8	-	Energy Source Audit, 2018
Dighton Library	LED Lighting	2019	3,306	0	0	-	-	-	$546	$7,823	-	$2,570	$5,253	9.6	-	Energy Source Audit, 2018
Dighton Library	Wi-Fi Thermostats	2020	0	44	0	-	-	-	$44	$685	-	$0	$685	15.6	-	Energy Source Audit, 2018
Dighton Library	Building Weatherization	2022	1,804	0	739	-	-	-	$1,481	$23,238	-	$0	$23,238	15.7	-	Energy Source Audit, 2018
Dighton Library	Convert Oil to Gas	2022	0	-1,298	1,550	-	-	-	$3,662	$18,000	-	$0	$18,000	4.9	-	Energy Source Audit, 2018
Dighton Fire Station	LED Lighting	2022	11,538	0	0	-	-	-	$1,904	$12,197	-	$2,280	$9,917	5.2	-	Energy Source Audit, 2018
Dighton Fire Station	Wi-Fi Thermostats	2022	0	52	0	-	-	-	$52	$685	-	$100	$585	11.3	-	Energy Source Audit, 2018

Dighton Fire Station	Building Weatherization	2022	1,209	735	0	-	-	-	$934	$6,049	-	$0	$6,049	6.5	-	Energy Source Audit, 2018
Dighton North Fire Station	LED Lighting	2022	3,899	0	0	-	-	-	$643	$12,649	-	$0	$12,649	19.7	-	Energy Source Audit, 2018
Dighton North Fire Station	Building Weatherization	2022	11,164	6,783	0	-	-	-	$8,625	$16,113	-	$0	$16,113	1.9	-	Energy Source Audit, 2018
Dighton Highway Department	LED Lighting	2022	3,867	0	0	-	-	-	$638	$11,913	-	$1,605	$10,308	16.2	-	Energy Source Audit, 2018
Dighton Highway Department	Building Weatherization	2022	1,510	685	0	-	-	-	$934	$9,316	-	$0	$9,316	10.0	-	Energy Source Audit, 2018
All Buildings	Building Operator Certification	2022	7,307	443	27	-	-	-	$1,002	$3,790	-	$0	$3,790	3.8	-	Building Operator Certification (www.theboc.info)
Totals			**269,389**	**14,228**	**2,316**	**0**	**0**	**0**	**$51,021**	**$378,910**	**-**	**$35,585**	**$343,325**	**-**	**-**	**-**
Total MMBTUs Saved			**919**	**1,423**	**347**	**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, Dighton 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 Dighton 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

Energy Reduction

Plan Report

Dalton Ling
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dling@energysource.com
www.energysource.com

energysource

October 3, 2018

Dear Mallory Aronstein,

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 Fixtures
- WIFI Thermostats
- Mechanical Insulation
- Building Weatherization
- Convert from Oil Furnace to Gas Furnace

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

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.

For any questions regarding this report, please contact Dalton Ling, Energy Efficiency Consultant for Energy Source, Inc. at 401-490-7555. Any additional use of this report is prohibited unless permission is given in writing from Energy Source, Inc.

energysource

Executive Summary

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

- Dighton Middle School
- Dighton Elementary School
- Dighton Town Hall
- Dighton Old Town Hall
- Dighton Senior Center
- Dighton Library
- Dighton Fire Station
- Dighton North Fire Station
- Dighton Highway Department

Our recommendations are known as Energy Conservation Measures 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 Cost	Electricity Savings		Gas Savings		Oil Savings		Total Cost Savings	Payback Period (years)
				kWh	Cost	Therms	Cost	Gallons	Cost		
LED Lighting	$264,453	$34,685	$229,768	178,403	$29,436	0	$0	0	$0	$29,436	7.8
WIFI Thermostats	$6,850	$900	$5,950	8,158	$1,346	312	$312	0	$0	$1,658	3.6
Mechanical Insulation	$8,588	$0	$8,588	183	$30	59	$582	0	$0	$612	14.0
Building Weatherization	$77,229	$0	$77,229	19,145	$3,159	10,307	$10,307	739	$1,183	$14,649	5.3
Convert Oil to Gas	$18,000	$0	$18,000	0	$0	-1,298	$1,182	1,550	$2,480	$3,662	4.9
Total	**$375,120**	**$35,585**	**$339,535**	**205,889**	**$33,972**	**9,380**	**$12,383**	**2,289**	**$3,663**	**$50,018**	**6.8**

ECM #1- Install LED Lighting and Controls

Existing Conditions

This measure involves the installation of LED fixtures and integrated smart controls where applicable. Currently, Dighton town/school buildings have 28 Watt or 32 Watt T-8 flourescent and compact flourescent fixtures.

Energy Conservation Measure Details

It is recommended that high efficiency LED light fixtures are installed to replace the flourescent fixtures. 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 installing new LED lighting fixtures
- Remove and recycle existing fluorescent fixtures
- Warranty on new LED lighting fixtures of seven years

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

Location	Electricity Savings	
	kWh	Cost
Dighton Middle School	50,624	$8,353
Dighton Elementary School	83,095	$13,711
Dighton Town Hall	15,468	$2,552
Dighton Senior Center	6,605	$1,090
Dighton Library	3,306	$546
Dighton Fire Station	11,538	$1,904
Dighton North Fire Station	3,899	$643
Dighton Highway Department	3,867	$638
Total	**178,403**	**$29,436**

Annual energy savings of 178,403 kWh can be realized from this measure which will lead to an annual total cost savings of $29,436.

Implementation

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

Location	Total Project Cost	Estimated Incentives	Customer Cost	Payback Period (years)
Dighton Middle School	$77,643	$8,190	$69,453	8.3
Dighton Elementary School	$94,750	$9,300	$85,450	6.2
Dighton Town Hall	$36,689	$7,830	$28,859	11.3
Dighton Senior Center	$10,790	$2,910	$7,880	7.2
Dighton Library	$7,823	$2,570	$5,253	9.6
Dighton Fire Station	$12,197	$2,280	$9,917	5.2
Dighton North Fire Station	$12,649	$0	$12,649	19.7
Dighton Highway Department	$11,913	$1,605	$10,308	16.2
Total	**$264,453**	**$34,685**	**$229,768**	**7.8**

It was estimated approximately $34,685 can be obtained from the utility program; therefore, the adjusted customer cost is $229,768. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$229{,}768}{\$29{,}436} = 7.8\ years$$

ECM #2- Install Wi-fi Programmable Thermostats

Existing Conditions

This measure involves the installation of Wi-fi thermostats. Currently, the facilities listed in the chart below have standalone thermostats which do not include a temperature setback function. The benefit of automatic setback function increases system performance, user experience, and energy savings highlighted below.

Location	Qty
Dighton Town Hall	4
Dighton Senior Center	2
Dighton Library	1
Dighton Old Town Hall	2
Dighton Fire Station	1
Total	**10**

Energy Conservation Measure Details

It is recommended a new Wi-fi programmable thermostats are installed to give facility personnel access to space temperature through their cellular phone or computer.

- Demo four existing thermostats
- Install new Wi-fi programmable thermostats
- Town IT department will need to supply appropriate network information for Wi-fi access
- Thermostat training will be provided

Annual energy savings of 312 Therms, and 8,158 kWh; therefore, the energy cost savings of $1,658.

Implementation

The implementation of this measure requires the purchase and installation of the four new Wi-fi thermostats. The implementation cost is $6,850 with estimated utility incentives of $900; therefore, the customer cost is $5,950. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$5{,}950}{\$1{,}658} = 3.6\ year$$

ECM #3- Mechanical Insulation

Existing Conditions

- Pipe Insulation – un-insulated pipes in the heating and domestic hot water systems are leading to unnecessary distribution losses and wasted energy.
- Valve & Fitting Insulation – valves and fittings are difficult components of a mechanical system to insulate and as a result are frequently left un-insulated. The Dighton Elementary School boiler room has suction diffusers, triple duty valves, as well as Victaulic fittings, flanges, and an end cap that have all been left bare when the new boilers were installed. The Dighton Middle School boiler room has Victaulic fittings and Victaulic check valves that are poorly insulated with a homemade foam and duct tape insulation. There is also a suction diffuser attached to the centrifugal pump for the chilled water that has been sweating so much that water is collecting on the floor in a puddle. It is also close to the point of corroding due to excess water exposure over an extended period of time. These un-insulated or poorly insulated components have the same temperature fluids passing through them as the pipes that are more likely to be insulated; un-insulated components of the distribution system lead to unnecessary distribution losses and wasted energy.
- Tank Insulation – tanks are difficult components of a mechanical system to insulate and as a result are frequently left un-insulated. Subsequently, the air separator tank was left completely uninsulated at the elementary school, and there are centrifugal pumps at both the elementary and middle school that are uninsulated. These components have a large surface area, which translates for more opportunity for unwanted energy to escape as it travels to its intended destination. Un-insulated tanks or equipment have the same temperature fluids passing through them as the pipes that are more likely to be insulated; un-insulated components of the distribution system lead to unnecessary distribution losses and wasted energy.

Energy Conservation Measure Details

It is recommended that the bare tank, and valve is insulated with cellular insulation. By implementing this measure, the reduction is heat loss will accrue, which will lead to energy savings. The scope of work includes the following:

- Insulation of pipes, valves, fittings and tanks to meet the insulation requirements of the fluid temperature in the pipe
- Utilize/install pipe covering/jacket to protect the insulation material as required in the work area.

By implementing this measure approximately 183 kWh and 59 Therms can be realized and annual total cost savings of $612.

Implementation

The implementation of this measure requires the insulation of a pipes, valves, fittings and tanks. The total material and labor cost of this measure is $92,105. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$8{,}588}{\$612} = 14\ years$$

ECM #4 - Building Weatherization

Existing Condition

This measure involves weatherizing each municipal building. Below is a description of each weatherization measure that is being proposed,

- **Attic Bypass Sealing** – access hatches entering the attic are not properly sealed, allowing conditioned air to escape into the vented attic space. Since warm air rises, sealing the attic from the conditioned space is crucial to maintaining an efficient building. The air movement reduces the effectiveness of the existing insulation. At the Department of Public Works, there are two separate attic hatches, but only one of them is in use. The larger of the two hatches is operable, but no longer used since a lift system was installed directly under it. Because it is also much larger than a traditional attic hatch (almost three times the size at 6' wide and 6' long), it also creates a much greater weakness for unconditioned air entering the conditioned space below. This hatch in particular shows clear gaps into the conditioned space from the attic side.
- **Attic Flat Insulation** – the attic at the Department of Public Works has six inches of fiberglass batt insulation between the joists, but it is not providing the building enough insulation value for our climate. Since this batt insulation is also damaged, it is not insulating at the factory rated R-value, further diminishing its value. Damaged and discolored insulation in an attic will result in excessive energy loss due to the lack of properly insulated thermal barrier. Attic insulation is crucial for controlling conductive heat loss in a building. After air gaps are sealed and convective air loss is reduced the biggest remaining form of heat loss becomes conduction.
- **Caulking** – there are clear gaps present between the window casing and the wall at Fire Station #2. When the windows were replaced, a subsequent two inch gap was left, allowing uncontrollable air leakage around the window frames on the first and second floors. There was an attempt to caulk some of the window casings on the second floor, but the caulking that exists is inconsistent and does not create a proper seal to prevent air infiltration/exfiltration. These gaps allow air to find its way into the wall and window frame cavities or directly from outside to inside resulting in unwanted energy losses.
- **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.
- **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.

- **Roof Air Barrier Retrofit** – the Dighton Library is a historic building (1910) with a lot of character; the staff takes a lot of pride in the building and its use, which is not currently being maximized. The 2nd floor is so hot that it prevents occupants from being able to occupy the space for more than a couple minutes at a time, especially during the warmer summer months. There was an attempt to re-finish the second floor of the Library; the cape style roof was insulated at the cap, and below a solid gypsum ceiling was installed. However, behind the side access panels on the second floor, there is exposed batt insulation at the underside of the roof that is directly in a conditioned storage space. This batt insulation does not create an air barrier between the conditioned space and the roof, and it also does not provide the building with an optimal level of thermal resistance. The infiltration/exfiltration of air in turns reduces the effectiveness of the fiberglass insulation.
- **Roof-Wall Intersection Air Sealing** – the roof-wall intersection is regularly an area that allows unwanted air leakage through the building shell. Most of the buildings in Dighton have a weakness in this area, including the Elementary School, Middle School, Fire Station #1, and Fire Station #2. Exterior flashing and finish details at this area are not constructed to stop air leakage (exterior flashings are for water control, not air control); unsealed exterior flashing details combine with interior gaps in the framing between the roof and wall assembly to allow infiltration/ exfiltration.

Energy Conservation Measure Details

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

- **Attic Bypass Air Sealing**
- **Attic Flat Insulation**
- **Caulking**
- **Door Weather Stripping**
- **Overhead Door Weather Stripping**
- **Roof Air Barrier Retrofit**
- **Roof-Wall Intersection Air Sealing**

An overall project summary is shown below,

Location	Electricity Savings		Gas Savings		Oil Savings		Estimated Cost Savings
	kWh	Cost	Therms	Cost	Gallons	Cost	
Dighton Middle School	2,555	$422	1,555	$1,555	0	$0	$1,977
Dighton Elementary School	687	$113	418	$418	0	$0	$531
Dighton Town Hall	216	$36	131	$131	0	$0	$167
Dighton Library	1,804	$298	0	$0	739	$1,183	$1,481
Dighton Fire Station	1,209	$199	735	$735	0	$0	$934
Dighton North Fire Station	11,164	$1,842	6,783	$6,783	0	$0	$8,625
Dighton Highway Dept.	1,510	$249	685	$685	0	$0	$934
Total	**19,145**	**$3,159**	**10,307**	**$10,307**	**739**	**$1,183**	**$14,649**

By implementing this measure approximately 19,145 kWh, 10,307 Therms, and 739 Gallons of fuel oil can be realized; therefore, a total annual cost savings of $14,649 was estimated.

Implementation

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

Location	Total Project Cost	Estimated Cost Savings	Payback Period (years)
Dighton Middle School	$14,365	$1,977	7.3
Dighton Elementary School	$4,892	$531	9.2
Dighton Town Hall	$3,255	$167	19.5
Dighton Library	$23,238	$1,481	15.7
Dighton Fire Station	$6,049	$934	6.5
Dighton North Fire Station	$16,113	$8,625	1.9
Dighton Highway Dept.	$9,316	$934	10.0
Total	**$77,229**	**$14,649**	**5.3**

The estimated customer cost is $77,229. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$77,229}{\$14,649} = 5.3\ years$$

ECM #5- Convert from Oil to Natural Gas

Existing Conditions

This measure will involve the installation of a natural gas furnace at the Library. This system will replace the existing oil fired, forced air furnace.

Energy Conservation Measure Details

It is recommended to transition away from oil as the price of natural gas (estimated $1/ Therm) is cheaper than the price of oil ($1.5/Therm). In addition, oil fired furnaces are unable to obtain the efficiency levels of condensing natural gas furnaces. The scope of this work includes the following:

- Supply and install one condensing, forced air furnace
- Removal and disposal of existing furnace and all necessary piping and components of the old system that is no longer required
- Installation of direct venting system for combustion air and exhaust air
- Commissioning and startup of new furnace systems

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

Location	Total Project Cost	Gas Savings		Oil Savings		Estimated Cost Savings	Payback Period (years)
		Therms	Cost	Gallons	Cost		
Dighton Library	$18,000	-1,298	$1,182	1,550	$2,480	$3,662	4.9

Implementation

The implementation of this measure requires the purchase and installation of one high efficiency, condensing, forced air furnace. It should be noted that the price of the new heating system excludes the proper removal of the oil tank on site. The simple payback is calculated as follows:

$$Payback\ Period = \frac{Customer\ Cost}{Cost\ Savings} = \frac{\$18{,}000}{\$3{,}662} = 4.9\ year$$

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
- Development and delivery of comprehensive project completion manual.

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

Anti-Idling Policy		
All FY 2016 Gasoline Usage (Gallons)	19,298	
All FY 2016 Diesel Usage (Gallons)	6,736	
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	579	
Gallons of Diesel Saved per Year	202	
MMBTUs Saved per Year	**100**	
Closely Monitor Tire Air Pressure, Use 100% Synthetic Oil & Use Fuel Efficient Tires		
All FY 2016 Gasoline Usage (Gallons)	19,298	
All FY 2016 Diesel Usage (Gallons)	6,736	
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	579	
Gallons of Diesel Saved per Year	202	
MMBTUs Saved per Year	**100**	
Total MMBTUs Saved	**200**	

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