

# THE TOWN OF ROYALSTON ENERGY REDUCTION PLAN

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Prepared by the Montachusett Regional Planning Commission  
with support from the Town of Royalston, Guardian Energy  
Management Solutions, and National Grid



**In fulfillment of the Massachusetts  
Green Communities Designation Grant Program**

**Criteria 3**

**Approved by the Select Board Oct 25, 2017**

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## I. PURPOSE AND ACKNOWLEDGEMENTS

### A. Letters from General Government Verifying Adoption of the ERP

The Town of Royalston has adopted this Energy Reduction Plan (“ERP”) for submission to the Massachusetts Department of Energy Resources (DOER) in fulfillment of Criteria 3 of the requirements for Green Community designation. The Royalston Select Board voted on October 25, 2017 at a properly noticed public meeting to adopt this Energy Reduction Plan. See Appendix A attachment.

### B. List of Contributors that Participated in the Baseline and ERP Process

This plan was produced primarily by the Montachusett Regional Planning Commission (MRPC) through a DOER Municipal Energy Technical Assistance Grant, with significant involvement and assistance from Town of Royalston municipal staff and consulting energy professionals. They include:

#### **Town of Royalston**

Christine Long, Chair, Select Board

Donna Caisse, Chair, Energy Committee

Melanie Mangum, Town Clerk and Administrative Assistant to the Select Board

Keith Newton, DPW Superintendent and Fire Chief

Marie Mello, DPW Administrator

Kathy Morris, Library Director

Gary Winitzer, Sewer Commissioner

Curtis Deveneau, Police Chief

#### **Montachusett Regional Planning Commission**

Karen Chapman, Principal Planner

#### **Consultant**

Matthew Whittemore, Energy Efficiency Specialist, Guardian Energy Management Solutions

## II. EXECUTIVE SUMMARY

### A. Narrative Summary of the Town of Royalston

Founded in 1765, the Town of Royalston is a rural community of 42.6 square miles, notable for its forests, winding roads and historic stone walls. The Town of Royalston is located in the northwest corner of Worcester county in the North Quabbin region, on the New Hampshire border, 28 miles west of Fitchburg, 43 miles northwest of Worcester and 74 miles northwest of Boston. Royalston sits between Winchendon to the east and Warwick and Orange to the west, and Athol, Phillipston and Templeton to the south. According to the 2010 U.S. Census, the Town of Royalston is home to approximately 1,258 residents and has 574 housing units, 76 of which are vacant, including 51 seasonal units. The median value of a single-family owner-occupied home in the community is \$206,800, which is significantly lower than the statewide median value of \$333,100.

The Town of Royalston has a Select Board and Open Town Meeting form of government. In 2009, the Select Board formed an Energy Committee with the mission to evaluate the energy efficiency of the town government and promote energy efficiency, education, and alternative sources to the town and community. The Energy Committee has worked hard and has long sought Royalston becoming a Green Community, but has been unsuccessful in garnering the votes necessary to pass the Stretch Code at Town Meeting. Royalston applied through the Montachusett Regional Planning Commission for a Municipal Energy Technical Assistance Grant to finally submit an application to become designated as a Green Community.

### B. Summary of Municipal Energy Uses

See Table 1 for municipal energy users in Royalston.

**Total Number of Municipal Buildings:** The Town of Royalston has eight (8) municipal buildings. Six of the buildings are heated by oil, and two buildings are not heated.

**Building Additions and New Construction:** The equipment shed at the Department of Public Works location was built in 2017 and is not online yet so there is no usage listed for this building. The first delivery of propane was delivered in July of this year. This building is excluded from the baseline.

**Total Number of Vehicles:** The Town of Royalston has 25 vehicles, of which all are exempt due to weight or public safety use.

**Total Number of Street Lights and Traffic Lights:** The Town of Royalston has 112 street lights, only 12 of which are turned on, and no traffic lights. We will include streetlights in our baseline.

**Water and Sewer:** The Town of Royalston has one (1) wastewater treatment plant with three (3) pumping stations. The limited public water system is operated by a private non-profit and is separate from the town.

**Table 1: Summary of Municipal Energy Users**

	Number	Ownership
<b>Buildings</b>		
Oil Heat	6	Muni
Natural Gas Heat	0	
Propane Heat	0	
Biomass Heat	0	
Electric Heat	0	
Not Heated	2	Muni
<b>Vehicles</b>		
Non-Exempt	0	
Exempt	25	Muni
<b>Street Lights</b>	112	Muni
<b>Traffic Lights</b>	0	
<b>Water and Sewer</b>		
Drinking Water Treatment Plant	0	
Wastewater Treatment Plant	1	Muni
Pumping Station	3	Muni

C. Summary of Energy Use Baseline and Plans for Reductions

**TABLE 2: Summary of Municipal Energy Use: Baseline Year FY2017**

Baseline Year FY2017	MMBtu Used in Baseline Year	% Total MMBtu Baseline Energy Consumption	Projected Planned MMBtu Savings		Savings as % of Total MMBtu Baseline Energy Consumption
<b>Buildings</b>	1,334	38.06%	296	22.2%	8.4%
<b>Vehicles</b>	1,905	54.35%	205	10.8%	5.8%
<b>Street/Traffic Lights</b>	36	1.03%	17	46.2%	0.48%
<b>Water/Sewer/Pumping</b>	230	6.56%	48	20.9%	1.37%
<b>Total</b>	3,506	100%	566	16.14%	16.14%

### III. ENERGY USE BASELINE INVENTORY

#### A. Identification of the Inventory Tool Used

The Town of Royalston uses the Department of Energy Resources (DOER) Mass Energy Insight (MEI) web-based energy inventory and analysis tool.

#### B. Identification of the Baseline Year and ERP Timeframe

Fiscal Year (FY)2017, which was July 1, 2016 to June 30, 2017, will serve as the baseline year. The five-year timeframe for the 20% energy reduction goal is FY2018-FY2022.

#### C. Municipal Energy Consumption for the Baseline Year (FY2017)

During the FY2017 baseline year, the municipality used 3,506 MMBtu of energy. Table 2 and Figure 1 summarize the facility categories of energy usage. Tables 3a and 3b present energy use for each municipal facility in native units and MMBtu. In order to reach the Green Communities goal of reducing energy consumption by 20%, Royalston will need to reduce its energy consumption by 701 MMBtu.

**Buildings:** Royalston's eight (8) buildings used 1,334 MMBtu, around 38.06% of Royalston's total municipal energy use. The buildings with the largest energy use are the Garage/Office building at the Public Works Department (310.4 MMBtu) and the Public Safety Building on Athol Road (261.9 MMBtu). Royalston has constructed a new 2,400 square foot equipment shed on the DPW property in 2017 and it is yet to be brought online and is therefore excluded from the baseline. We will not include its energy use in our Green Communities reporting, but will monitor the use to be sure it is efficient.

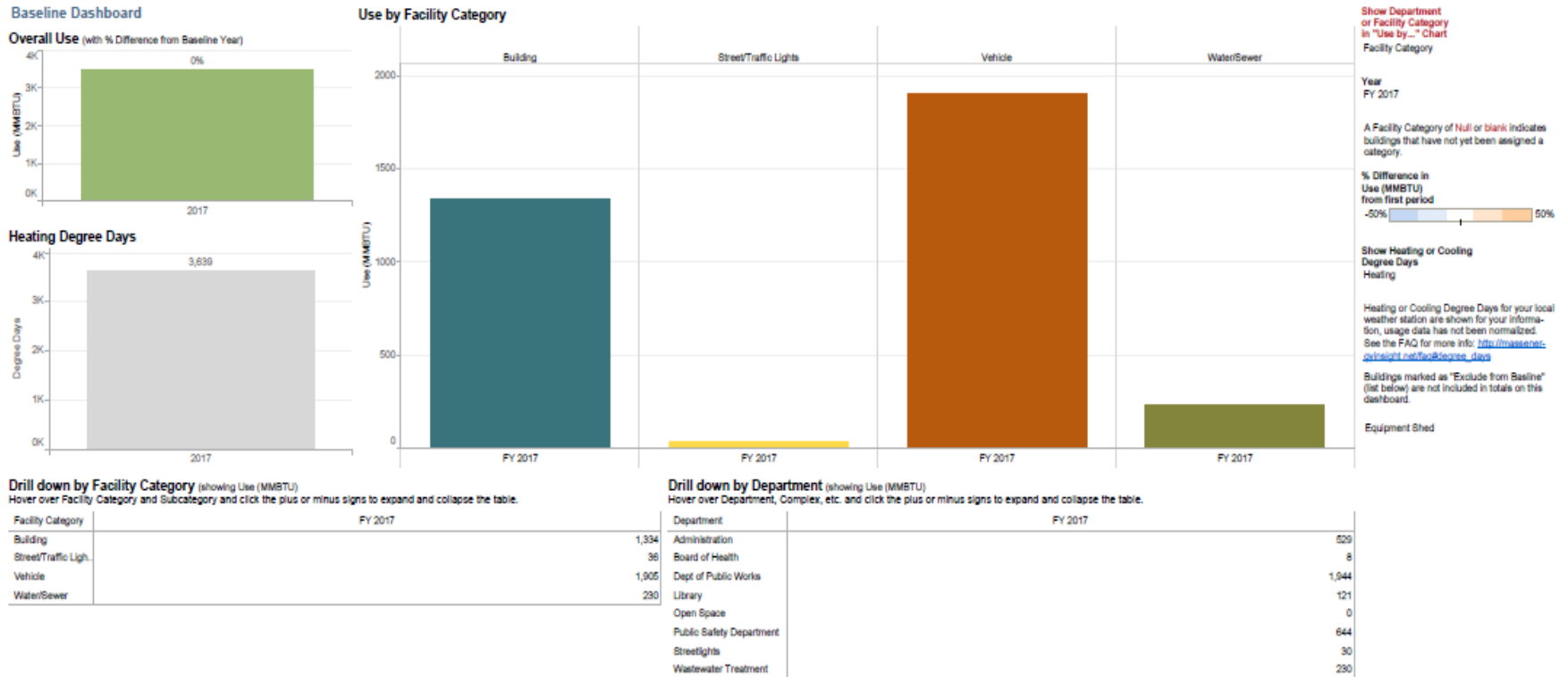
**Vehicles:** The Town of Royalston has a combined total of 25 vehicles, of which all are exempt. Vehicles accounted for 54.35% (1,905 MMBtu) of Royalston's energy use during the baseline year. Vehicles used 2,454 gallons (304 MMBtu) of unleaded gasoline and 11,517 gallons (1,601 MMBtu) of diesel fuel.

**Street and Traffic Lights:** There are 112 streetlights and no traffic lights in the Town of Royalston. All of the streetlights are owned by the Town of Royalston and only 12 of the 112 are turned on and using energy. There are four (4) yard or parking lot lights that illuminate town buildings for the public included in this section. These 12 streetlights and four (4) yard lights consume 36 MMBtu or 1.03% of the Town's energy use.

**Water/Sewer/Pumping Facilities:** There is one wastewater treatment plant and three pumping stations owned by the Town of Royalston. These facilities consume 230 MMBtu or 6.56% of Royalston's total municipal energy use.

**Open Space:** The open space facilities consume a negligible amount of the Town's energy use. The only open space facility is Bullock Park which has a single pole light.

Figure 1: Municipal Energy Use Baseline Dashboard from MEI (FY2017)





**Table 3a. Energy Use in Native Units**

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

		Electric (kWh)	Oil (gallons)	2017		
				Gasoline (gallons)	Diesel (gallons)	Propane (gallons)
Building	Town Hall	11,081	882			132
	Recycling Center	2,225				
	Whitney Hall Town Administra..	10,981	2,299			
	Dog Pound Winchendon Road	7				
	P.S. Newton Library	2,731	802			
	Garage and Office	12,395	1,929			
	Fire Police Station	16,516	1,479			
	Fire Station 2	5,323	619			
	<b>Total</b>	<b>61,259</b>	<b>8,010</b>			<b>132</b>
Street/Traffic Lights	Street Lighting	8,680				
	DPW Lighting	1,963				
	<b>Total</b>	<b>10,643</b>				
Vehicle	DPW Vehicles			681	11,099	
	Fire Dept Vehicles			116	418	
	Police Dept Vehicles			1,657		
	<b>Total</b>			<b>2,454</b>	<b>11,517</b>	
Water/Sewer	Wastewater Treatment Plant	61,164				
	Sewer Pump #1	574				
	Sewer Pump #2	2,912				
	Sewer Pump #3	2,866				
	<b>Total</b>	<b>67,516</b>				
<b>Grand Total</b>	<b>139,418</b>	<b>8,010</b>	<b>2,454</b>	<b>11,517</b>	<b>132</b>	

**Table 3b. Energy Use in MMBtu.**

**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	Gasoline	Oil	Propane	Total
Building	Town Hall		38		123	12	172
	Recycling Center		8				8
	Whitney Hall Town Administra..		37		320		357
	Dog Pound Winchendon Road		0				0
	P.S. Newton Library		9		111		121
	Garage and Office		42		268		310
	Fire Police Station		56		206		262
	Fire Station 2		18		86		104
	Total		209		1,113	12	1,334
Street/Traffic Lights	Street Lighting		30				30
	DPW Lighting		7				7
	Total		36				36
Vehicle	DPW Vehicles	1,543		84			1,627
	Fire Dept Vehicles	58		14			72
	Police Dept Vehicles			205			205
	Total	1,601		304			1,905
Water/Sewer	Wastewater Treatment Plant		209				209
	Sewer Pump #1		2				2
	Sewer Pump #2		10				10
	Sewer Pump #3		10				10
	Total		230				230
Grand Total		1,601	476	304	1,113	12	3,506

## IV. ENERGY REDUCTION PLAN

### A. Narrative Summary

Having Chosen FY2017 as the baseline year, Royalston is only five months into the five-year implementation period for the Energy Reduction Plan.

#### 1. Overview of Goals for Years 1-3 (FY2018-FY2020)

Royalston's total energy use is 3,506 MMBtus. In order to reduce our energy use by 15%, there needs to be a reduction of 525.9 MMBtus.

**Buildings.** Royalston's buildings use a total of 1,334 MMBtus or 38% of the town's energy. Guardian Energy Management Solutions performed a preliminary Energy Audit for the municipal buildings in the Town of Royalston and we hope to complete the recommended energy conservation measures (ECMs) within the first three years of being a Green

Community. If completed, these ECMs are expected to reduce our energy usage in the buildings by 296 MMBtus or 22.2%.

**Street/Traffic Lights.** Royalston owns all of their streetlights which consume 8,680 kWh or 36 MMBtus or 1% of the town's total energy consumption. Currently only 12 of the 112 streetlights are being used, as well as four (4) yard lights. It can be estimated that each of the 12 streetlights uses 723 kWh. With an LED replacement, each streetlight would use approximately 311 kWh, providing a savings of 412 kWh/streetlight, for a total savings of 17 MMBtus or 46.2%.

**Vehicles.** Royalston's 25 vehicles used 1,905 MMBtus or 54.3% of its energy usage in FY2017. The Royalston Select Board has adopted a Fuel-Efficient Vehicle Policy to replace exempt vehicles with more efficient models when available and adopted the provisions of M.G.L. Chapter 90, Section 16A, which forbids idling when a vehicle is stopped for a foreseeable period of time in excess of five minutes. This anti-idling measure will reduce usage by 1.5% or 28.635 MMBtus. Royalston will install anti-idling devices in the two police cruisers which are expected to save 884 gallons of gasoline or 109.6 MMBtus. Additionally, Royalston's fleet of vehicles will be monitored to make sure maintenance is routinely completed. Using the Vehicle Maintenance Table shown in Appendix C as a guide, we expect to save an additional 66.82 MMBtus for this practice, bringing the total savings for vehicles to 205 MMBtus or 5.8%.

Royalston will evaluate potential energy conservation measures that can be implemented to reduce fuel use overall despite the fact that all of Royalston's vehicles are exempt. In addition, the Energy Committee will evaluate the Vehicle Inventory annually for potential ways to reduce consumption, including reducing vehicle miles traveled, replacing exempt vehicles with fuel-efficient non-exempt vehicles, and replacing exempt vehicles with more efficient exempt vehicles.

**Water/Sewer.** Royalston will have an audit completed of the wastewater treatment facilities including the three sewer pumping stations which were built in 1996. Royalston will ensure that the pumps are properly sized and we expect there to be more energy efficient pumps that could be installed. The addition of variable frequency drives would also allow the pumps to use less energy. The three sewer lift pumps used 22 MMBtus in FY2017 and we hope by either replacing the pumps and/or adding VFDs, we will cut the usage by a third or seven (7) MMBtus. The Wastewater Treatment Plant itself used 209 MMBtus in FY2017, the same amount that all the buildings in the town used. With an audit of this facility, we are hoping there will be some opportunity to decrease the energy usage by at least 10% or 41 MMBtus.

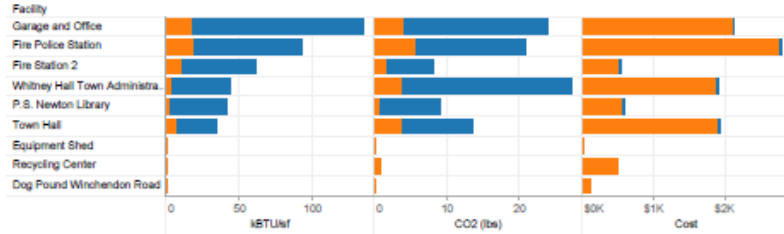
**Figure 2:** MEI's 'Building to Target' dashboard offers the Town insight into which facilities are the worst offenders in terms of energy consumption and emissions.

**Buildings to Target**

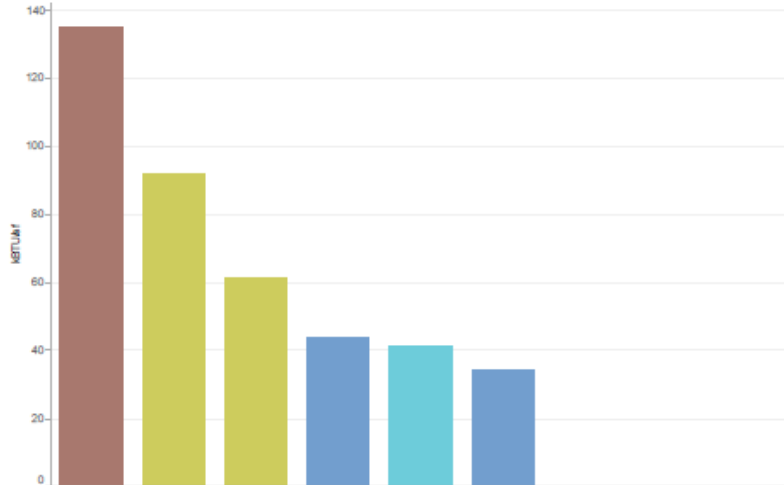
This dashboard compares buildings to one other on an energy use per area metric, measured as KBTU/square foot. In the quadrant chart on the right, buildings with the highest energy use and worst efficiency (as compared to other buildings in your portfolio) are in the upper right hand quadrant. Facilities of the types Open Space, Water/Sewer, Street/Traffic Lights, and Vehicles are not displayed. Diesel and Gasoline records attached to a building are not included in the KBTU/SF calculation.

**Building Efficiency, Emissions and Cost** ■ Heating ■ Electric

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



Select a building name above to see how efficient it is compared to your other buildings. Lower numbers indicate greater efficiency.



**Efficiency and Use**



Building Subcategory  
 Click to highlight and unhighlight

- Administration
- Library
- Other
- Public Safety
- Public Works

Building Subcategory  
 All

Year  
 FY 2017

Fuel types  
 All

## 2. Overview of Goals for Years 4-5 (FY2021-FY2022)

Years 4 and 5 of the Royalston's ERP will continue to be implementation years for energy reduction projects. We will evaluate the installation of anti-idling devices in the two police cruisers and possibly install it in some of the DPW vehicles based on the success of the police vehicles. The wastewater treatment plant will be audited during years 1-3 to identify energy conservation measures such as lighting upgrades, pump upgrades and addition of variable frequency drives. Royalston will evaluate the streetlights and vehicles for ECMs and from these audit activities and the WWT evaluation, and hopes to implement energy conservation measures that would account for another 4% energy usage savings in order for the Town to reach the 20% reduction of energy use goal.

## 3. Identify Areas of Least Efficiency/Greatest Waste

Royalston will utilize MEI's "Buildings to Target" tool to identify underperforming and/or wasteful buildings (see Figure 2). The garage/office building at the Department of Public Works is the biggest energy user, followed by the Public Safety Buildings and Whitney Hall.

## B. Getting to a 20% Energy Use Reduction within the 5 Year Period Following the Baseline Year

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

The Selectmen's office, in collaboration with the Energy Committee and other Town department heads, will be responsible both for oversight of the Energy Reduction Plan and for implementation of energy conservation measures within the Town. The Energy Committee will oversee the submission of Annual Reports.

### 2. Energy Conservation Measures

Table 4 attached details Energy Conservation Measures that reduce overall energy consumption by 566 MMBtus or 16% over the next five years. The full Energy Audit performed by Guardian is included as an attachment in Appendix B. Additional ECMs will be investigated through audits of the Wastewater Treatment Plant as well as modifying employee behavior, evaluating processes and operations to hopefully reach the full 20% energy reduction.

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

### 1. Municipal Buildings

Royalston will promote energy efficiency behaviors and educate employees about the importance of energy reduction in their work. Energy usage will continue to be monitored to ensure we are reaching our goals and evaluating new technologies.

### 2. Vehicles

The town will replace older vehicles with more fuel-efficient vehicles and will monitor usage, maintenance, and idling.

### 3. Street and Traffic Lighting

Royalston will evaluate all of their streetlights to see if replacing all of the 112 lights with LEDs is feasible following the replacement of the 12 streetlights that are currently being used.

### 4. Perpetuating Energy Efficiency

The town's department heads will continue to provide recommendations for best practices to improve the energy efficiency of their buildings and operations.

The town 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. LIST OF RESOURCES

Jim Barry: Regional Coordinator, Green Communities Division, Massachusetts Department of Energy Resources (DOER)

[Jim.Barry@MassMail.state.ma.us](mailto:Jim.Barry@MassMail.state.ma.us)

John Snell: Customer Support, Peregrine Energy Group

[jsnell@peregrinegroup.com](mailto:jsnell@peregrinegroup.com)

Green Communities Grant Program Information and Guidance: MA DOER

[http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/gc-grant-program/  
www.havis.com](http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/gc-grant-program/www.havis.com)

<http://www.mapc.org/wp-content/uploads/2017/09/Retrofit-Streetlights-with-LEDs.pdf>

## APPENDIX A: LETTER FROM SELECT BOARD VERIFYING ADOPTION OF THE ENERGY REDUCTION PLAN

See attachment: ROYALSTON\_CR3\_SelectBoardLetter

## APPENDIX B: GUARDIAN SOLUTIONS ENERGY AUDIT

See attachment: ROYALSTON\_CR3\_ERP\_APPENDIXB\_auditreport



## APPENDIX C: VEHICLE MAINTENANCE TABLE

**VEHICLE MAINTENANCE TABLE.**

Dept.	Key	Action	Source	US Gov Estimate Range	ERP Estimate Used	Gallons Saved	Gasoline Component	Diesel Component	MMBtus Saved per Year	
All	Drive sensibly	Avoid aggressive driving (e.g., rapid acceleration and braking).	*	5-33%	1.0%	140	25	115	19.1	
All	Remove excess weight	Avoid storing unnecessary items in your vehicle. An extra 100 pounds could reduce mpg by up to 2% especially in smaller vehicles	*	1-2%	0.5%	70	12	58	9.55	
All	Keep engine tuned	Fixing a vehicle that is out of tune or has failed an emissions test can improve gas mileage by an avg. of 4%.	*	4%	1.0%	140	140	25	19.1	
All	Keep tires inflated	Improve gas mileage by up to 3.3% by inflating to proper pressure.	*	Up to 3%	0.5%	70	70	12	9.55	
All	Use recommended grade of oil	Improve gas mileage by 1%-2% by using manufacturer's recommended grade of motor oil.	*	1-2%	0.5%	70	70	12	9.55	
	<b>Total</b>						<b>490</b>	<b>86</b>	<b>404</b>	<b>66.85</b>

*\*Fueleconomy.gov*

## APPENDIX D: IDLERIGHT CALCULATIONS

### IdleRight Fuel Savings

<b>Per Police Cruiser</b>	
A) Hours per Day Idling	1.5
B) Days per Week on Duty	7
C) = A x B Hours per Year Idling	546
G) Gallons per Hour Saved	0.81
S) CxG Gallons Saved per Vehicle per Year	442
<b>Total for all Cruisers</b>	
N) Number of Police Cruisers	2
SxN = Total Gallons Saved per Year	884
<b>MMBtus Saved per Year</b>	<b>109.61</b>

### Anti-Idling Policy Calculations:

Total Gallons Gasoline in FY2017 X 1.5% = Gallons saved

2,454 X 1.5% = 37 gallons

Total Gallons Diesel in FY2017 X 1.5% = Gallons saved

11,517 X 1.5% = 173 gallons