



Memorandum

To: Town of Weston

From: Brooks Winner, Clean Energy Specialist II

On: 5 January, 2021

Re: Town of Weston Energy Analysis Summary

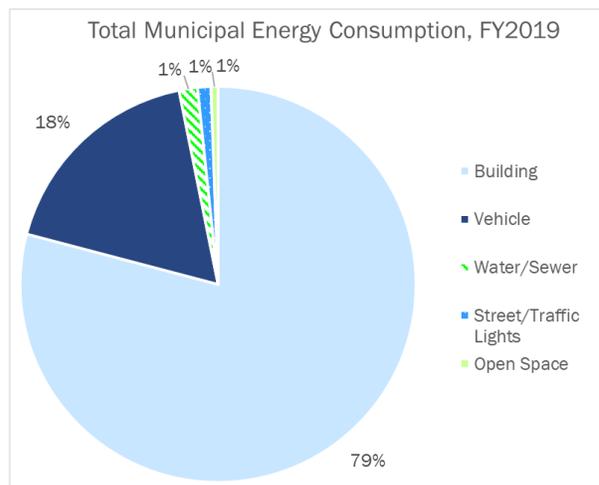
The Town of Weston was designated a Green Community by the Massachusetts Department of Energy Resources (DOER) in December 2011. At that time, the Town set a goal of reducing municipal energy use by 20%. Since then, the Town has made progress toward meeting this goal by implementing numerous energy conservation measures, but as of the end of Fiscal Year 2019 (FY2019), energy use was only 18.8% below the Fiscal Year 2011 (FY2011) baseline. The Town and the Metropolitan Area Planning Council (MAPC) received a Regional Energy Planning Assistance (REPA) grant from DOER in early 2020 to conduct an analysis of the Town’s energy use and identify opportunities to sustain the reductions in energy use in recent years and reduce energy use even further in future years. This memo summarizes the results of this analysis and recommendations of MAPC’s Clean Energy Department.

Energy Analysis Findings

Building energy consumption was 79% of total municipal energy in FY2019

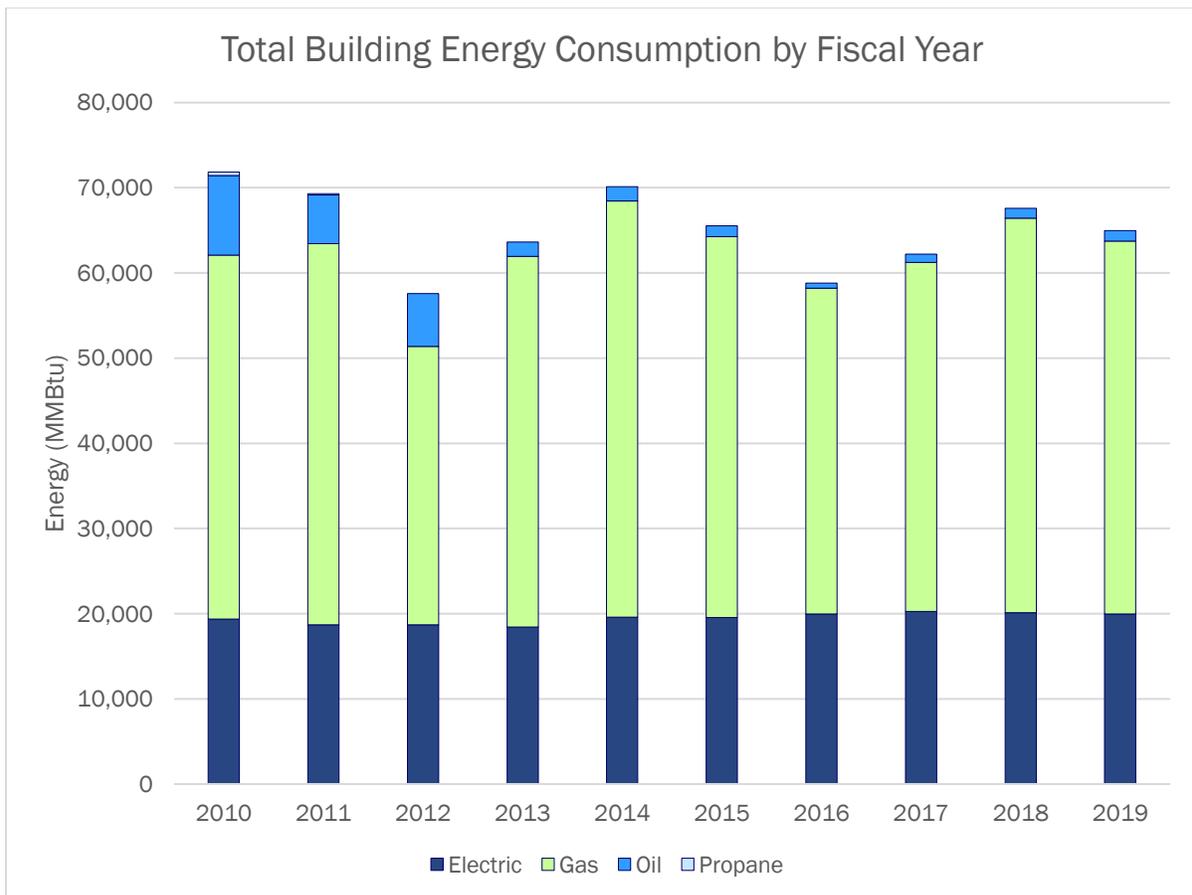
Energy use in town buildings was 79% of total municipal energy consumption in FY2019. Vehicle fuel use was the next largest source of energy consumption, making up 18% of the total in FY2019.

With buildings comprising such a significant proportion of overall energy consumption, our energy analysis focused primarily on energy consumption from the facilities with the highest energy consumption and those with high energy use intensity (EUI), or energy consumed per square foot of building area measure in thousand British thermal units per square foot (kBtu/sf).



Reduction in heating fuels accounts for most of reduction in energy use

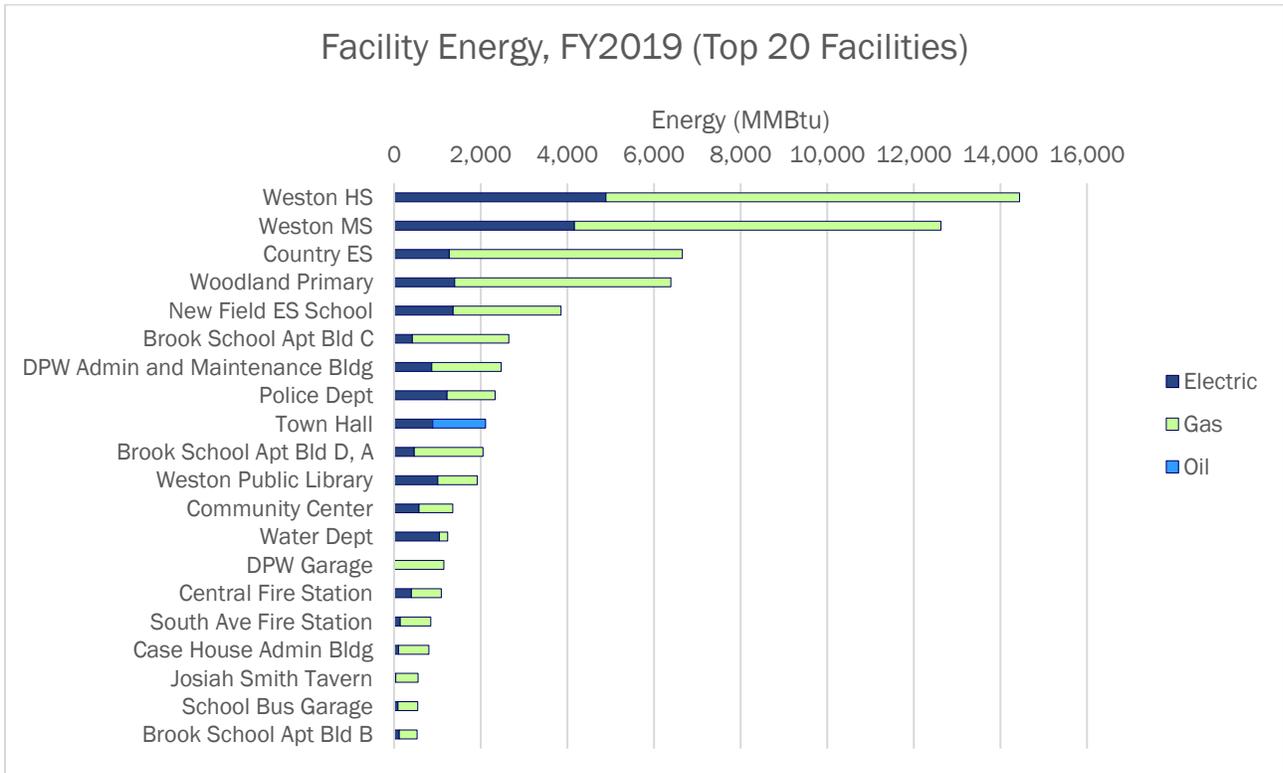
As the graph below shows, electricity consumption has remained relatively stable across the Town’s building portfolio since the baseline year, while oil consumption has decreased significantly and gas consumption has decreased slightly. Lower oil and gas use accounts for most of the decrease in energy consumption since the baseline year.



School buildings are the top five in overall energy consumption for FY2019

Weston High School and Weston Middle School consume significantly more energy than other Town facilities with the elementary schools rounding out the top five facilities with highest energy consumption. This is consistent with what many other Massachusetts municipalities participating in the Green Communities program have seen with their facilities and is often due to the fact that school buildings are the largest facilities in terms of square footage in a given municipality. Weston Town staff pointed out that there is a pool at the Weston Middle School and that the facility is actively used by outside groups for activities, meaning that the building is frequently occupied even beyond school hours. Notably, the New Field Elementary School, built in 2014, uses much less

energy than the other two elementary schools on a per square foot basis, signaling that this facility is outperforming the other school buildings in terms of energy efficiency.



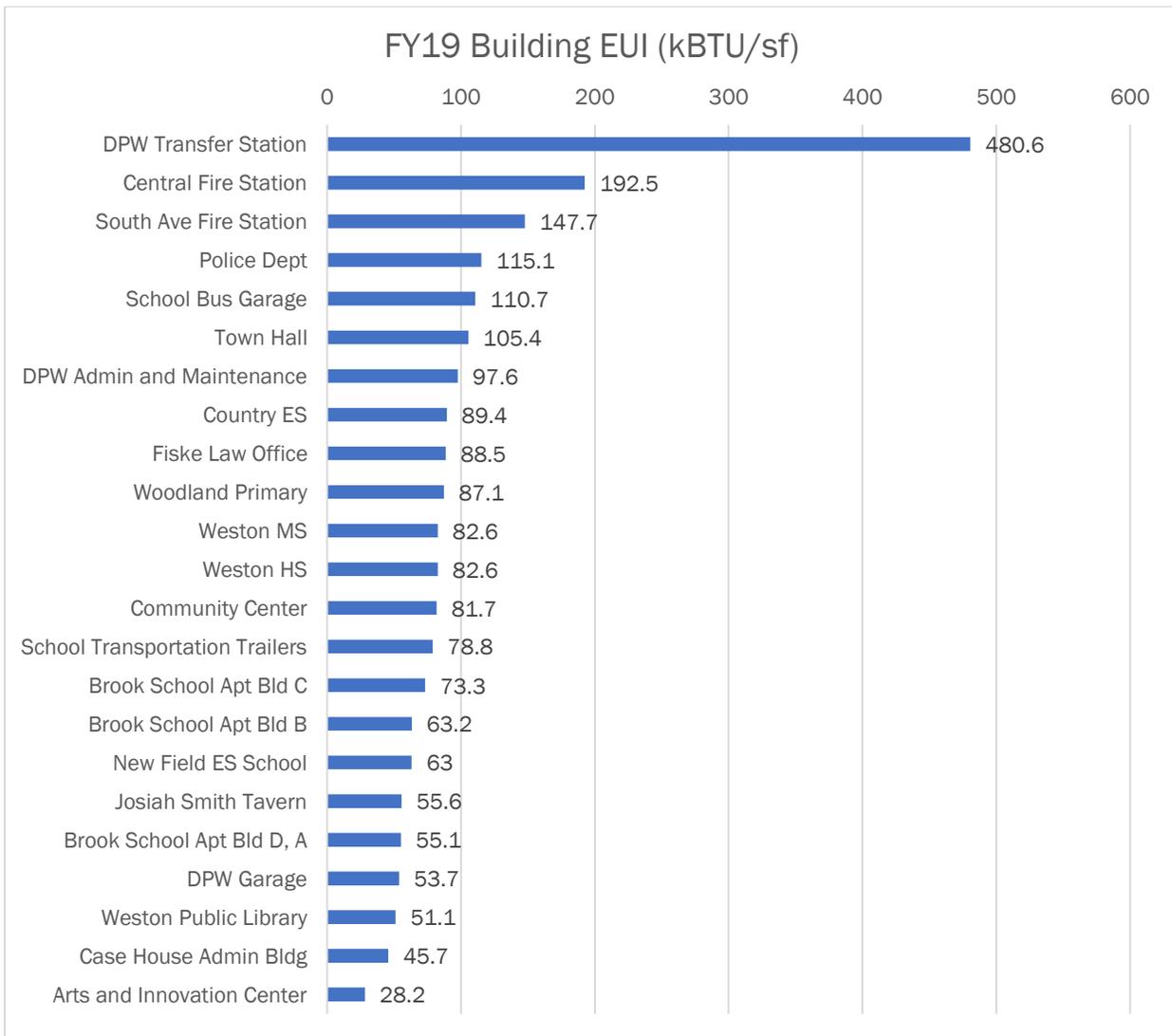
DPW Transfer Station, Police, and Fire buildings have highest EUI

Energy use intensity (EUI) is a common and useful metric for analyzing energy consumption in buildings because it accounts for the size of the building, allowing you to determine which facilities are using energy inefficiently. Using the EUI metric, the DPW Transfer Station (480.6 kBTU/sf), Central Fire Station (192.5 kBTU/sf), South Ave. Fire Station (147.7 kBTU/sf), Police Department (115.1 kBTU/sf), and the School Bus Garage (110.7 kBTU/sf) are the least energy-efficient facilities. For reference, the median EUI for public works buildings in MassEnergyInsight (MEI) is 69 kBTU/sf and the median for public safety buildings is 85 kBTU/sf.

Town staff provided explanations for the high energy use per square footage at some of these facilities such as the Police Department, which is home to a resilience center to provide heating or cooling to residents during power outages and extreme weather events, but the high EUI of these facilities still warrants investigation. The DPW Transfer Station’s overall energy consumption is relatively low, but its EUI is the highest of any facility. This may be explained by the electricity consumption from the heavy equipment at the facility and its relatively small square footage (600 sq. ft.). All of these facilities also have generators that run during outages and may result in higher EUI.

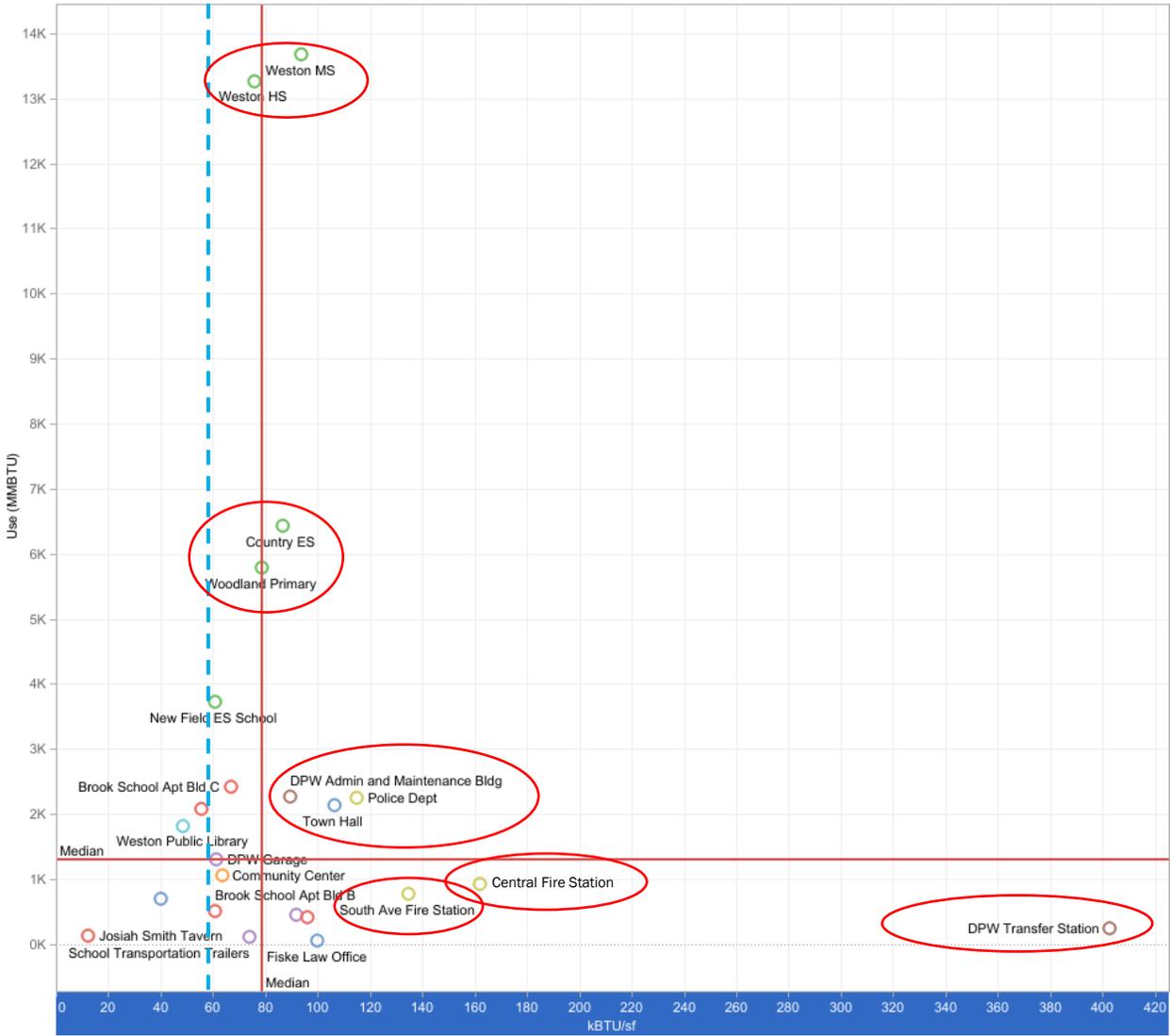


Four of the town’s five school buildings – Weston Middle School, Country Elementary School, Woodland Primary School, and Weston High School – are well above the median for school facilities (56.5 kBTU/sf) according to MEI. The EUI for the Town Hall is also above 100 kBTU/sf and may therefore be worth considering for future efficiency upgrades. For reference, the median for all Administration buildings in MEI is 65.1 kBTU/sf.



The graph below, excerpted from the Town’s data in MEI, shows the overall energy use (MMBTU) on the vertical axis and EUI (kBTU/sf) on the horizontal axis and demonstrates which facilities fall above the median in each category. This shows that the DPW Transfer Station, Police Department, Central Fire Station, and Town Hall are all well above the median EUI and that the Town Hall and Police Department are above the median in both total energy use and EUI.

Efficiency and Use



[Appendix A](#) (below) provides a table summarizing the Energy Use Intensity (kBTU/sf), Energy Use (MMBTU), and Gross Floor Area (sf) of each Weston's facilities using data from MEI.



Recommendations

Based on the analysis above, MAPC provides the following recommendations about how to reduce energy use at key facilities and lower utility costs with information about incentives available from the Mass Save program to support energy-saving measures.

1. Consider replacing oil heat from Town Hall with Air-Source Heat Pump heating system and building envelope measures

The Town has replaced most of its oil heating systems with natural gas systems in recent years, but the Town Hall is the last remaining building heating with oil. Oil is generally one of the most expensive heating fuels and burning oil produces significant amounts of greenhouse gas pollution. Converting the heating system at the Town Hall to a clean, cost-effective air-source heat pump would likely result in a significant decrease in overall energy consumption at the Town Hall given the energy efficiency of air-source heat pump systems and could help the Town achieve its energy reduction goal. The Town should consider conducting an analysis of the potential cost, energy, and emissions savings from converting from oil to air-source heat pumps and reducing wasted energy through building envelope measures (air sealing and insulation) with the support of an energy consultant.

There are generous rebates from the Mass Save program for such conversions and air-source heat pumps offer the additional benefit of providing cooling. More information on Mass Save incentives for commercial heat pump systems is available at <https://www.masssave.com/en/saving/business-rebates/upstream-electric-hvac-program/>.

2. Complete LED retrofits and add lighting controls at schools and other top electricity consumers

According to Mass Save, LED lamps use up to 90% less energy and can last up to 15 times longer than traditional lighting.¹ Switching to LED lighting can significantly energy costs and staff time required for replacing bulbs and ballasts. Adding lighting controls helps maximize the savings and extend the life of your LED lights. The Town has been conducting phased LED lighting retrofits, most recently with support from a Green Communities Competitive Grant. The Town should continue and accelerate this process to complete lighting upgrades while the rebates from Mass Save continue to be offered.

The Mass Save program currently offers generous rebates for LED lighting in schools and other municipal facilities, but these incentives are likely to go away after 2021 as LEDs become standard across the lighting industry. More information on Mass Save incentives for LED lighting is available at <https://www.masssave.com/learn/partners/upstream-lighting>.

¹ <https://www.masssave.com/learn/partners/upstream-lighting>



3. Conduct energy audits of all facilities that have not been audited within the last five years, focusing on top energy users and those with high EUI

Many town facilities have not had energy audits completed the recent past. Basic energy assessments are available at no cost through Mass Save and can help identify energy saving opportunities and available incentives, but these assessments stop short of providing detailed engineering analysis and recommendations for savings measures. Consider conducting ASHRAE Level II energy audits at all facilities that have not been audited within the last five years starting with the top energy consumers and/or the EUI outliers identified above. Green Communities Competitive Grant funds may be used for ASHRAE Level II audits for oil heated buildings (such as the Town Hall), and possibly all buildings in the future (pending a policy change by the MA DOER). More information about ASHRAE standards for energy audits is available in the US Department of Energy's *A Guide to Energy Audits*: https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20956.pdf

We recommend starting with the following facilities based on the overall energy consumption and EUI: Country Elementary School, Woodland Primary School, and the Town Hall.

More information about Mass Save's no-cost energy assessments is available at <https://www.masssave.com/saving/business-rebates/facility-assessments>.

4. Consider conducting retrocommissioning at school buildings to address temperature control issues and reduce energy use

According to Town staff, there are concerns about temperature control issues as some school facilities, a common problem for school buildings throughout the Northeast. One potential solution to these issues is *retrocommissioning*, the process of tuning up building systems to ensure that they are operating properly and efficiently. According to Mass Save, retrocommissioning tuning equipment can result in energy savings of 10-35 percent² and can extend the life of equipment by reducing wear and tear.

Mass Save's Equipment & Systems Performance Optimization (ESPO) services are designed to help facilities identify opportunities to save energy through tuning and retrocommissioning equipment. More information about the ESPO program is available at <https://www.masssave.com/en/learn/business/espo>.

Retrocommissioning projects may also be worth considering for future Green Communities Competitive Grant applications, perhaps combined with other measures to reduce gas/oil consumption such as insulation and air sealing of buildings.

5. Explore behavior change initiatives to reduce energy waste at key facilities, schools

Instituting a behavior-based energy use reduction program at schools and other key facilities (e.g., DPW Admin Bldg., Police Dept., Town Hall, Library, Community Center) will allow Weston to better

² <https://www.masssave.com/learn/business/espo>



understand the inefficiencies in building operations and will also help implement programs that will work synergistically with existing investments in energy infrastructure in buildings. Further, this program can support or expand school curriculum by using “buildings as a teaching tool” for students.

While behavior-based energy reduction strategies have been difficult to measure or evaluate in the past, this is no longer the case. The Acton-Boxborough School District has been recognized by both DOER and the Department of Education as a national leader in implementing behavior-based energy programs that result in significant and measured energy savings. Moreover, schools with established behavior-based energy programs have reduced their energy use by 20 to 37% as a direct result of their behavior-based initiatives.

More information can be found in the Powering Down report the US Green Building Council's Center for Green Schools at <http://centerforgreenschools.org/sites/default/files/resource-files/Behavior-based-Efficiency.pdf>.

In 2016, four MAPC communities (Hamilton, Wenham, Salem, and Swampscott), hired a consultant to oversee the implementation of a behavior-based energy reduction program in one school in each school district. The programs used a faculty lead to work with students that developed programs to ensure everyday energy savings – such as lights being turned off – as well as larger weekly savings, such as powering down all applicable electronics by end of day Friday. The programs also connected students to the facilities staff. In this way, students became an extension of the facilities staff to help monitor issues and check up on set points, etc.

Hiring a consultant is not necessary but is highly recommended for the first year of implementation. Based on MAPC's program with the four schools, MAPC would recommend budgeting about \$15,000 to \$20,000 for a consultant. Also, each school would want to set aside about \$500 to \$1000 per year to pay for materials the students may need to implement their behavioral awareness programs. The Town could also consider building the management of behavior change initiatives into the responsibilities of the new Sustainability Coordinator position.



Appendix A: Energy Use Intensity (kBtu/sf), Energy Use (MMBTU), and Gross Floor Area (sf) Summary

Facility	kBTU/sf	Use (MMBTU)	Gross Floor Area (sf)
DPW Transfer Station	481	288	600
Central Fire Station	192	1,094	5,684
South Ave Fire Station	148	848	5,740
Police Dept	119	2,333	19,611
School Bus Garage	111	545	4,928
Town Hall	105	2,112	20,033
DPW Admin and Maintenance Bldg	98	2,472	25,320
Country ES	89	6,655	74,419
Fiske Law Office	89	46	524
Woodland Primary	87	6,391	73,348
Weston MS	87	12,630	145,583
Weston HS	83	14,446	174,980
Community Center	82	1,356	16,602
School Transportation Trailers	79	114	1,440
Brook School Apt Bld C	73	2,651	36,184
Brook School Apt Bld B	63	528	8,352
New Field ES School	63	3,857	61,200
Josiah Smith Tavern	56	553	9,948
Brook School Apt Bld D, A	55	2,055	37,322
DPW Garage	54	1,149	21,400
Weston Public Library	51	1,919	37,525
Case House Admin Bldg	46	800	17,500
Arts and Innovation Center	28	119	4,212
Lights Bradford Road Water Tower		2	
Outdoor Swimming Pool		289	
Security Lighting		179	
Street Lights		691	
Town Hall Christmas Lights		1	
Town-wide Vehicles (All Vehicles)		14,574	
Traffic Signals		202	
Water Dept		1,237	