Energy Action Plan for the Town of Lyndeborough, NH

NRPC

Prepared by the
Nashua Regional Planning Commission, Jan. 2010

Community Profile

Lyndeborough, New Hampshire is located in the western portion of the Nashua Region and is bordered by the NH communities of Wilton, Milford, Mont Vernon, New Boston, Francestown, Greenfield, and Temple. According to 2007 Census estimates, Lyndeborough is home to 1,769 residents, which places it 149th among NH's incorporated cities and towns. At the time of the 2000 Census, per capita income was $27,169 and median household income was $59,688. Lyndeborough's 2007 Municipal Budget Appropriations were $1,707,504.

Zoning ordinances were first established in 1959 and most recently updated in 2008. The Lyndeborough Master Plan was most recently updated in 2002. Lyndeborough voters elect representatives to the Board of Selectmen and the Zoning Board, while Planning Board and Conservation Commission members are appointed. Lyndeborough Town Administrator, Jim Bingham, and the Meetinghouse Committee have been most heavily involved in this energy project.

Local Energy Committee Background

At Town Meeting 2007 communities across New Hampshire placed resolutions on their ballots calling for a strong federal response to climate change. Many of these towns also took advantage of the opportunity to act locally on this global issue and began forming Local Energy Committees (LECs). These committees are often comprised of local citizens and municipal staff members and are charged with assessing and improving community action on global warming and energy use. The Town of Lyndeborough was one of the 156 communities across New Hampshire to pass the resolution. Currently, Lyndeborough's Meetinghouse Committee also serves as its Energy Committee.

Lyndeborough Energy Inventory Background

In the fall of 2008 the Nashua Regional Planning Commission (NRPC) received grant funding from the NH Charitable Foundation and the US Environmental Protection Agency (EPA) to assist communities in the formation of Local Energy Committees, coordinate networking opportunities and workshops to help them learn from one another's experience, and conduct baseline energy and greenhouse gas emissions inventories. The goal of NRPC's Energy Program is to help communities establish a thorough understanding of their energy use and develop an accompanying action plan.

The first step taken in Lyndeborough was to conduct an inventory of the Town's municipal energy usage. Energy inventories help communities to assess their current energy use and track their energy reduction progress. The results are also beneficial in helping communities to prioritize potential energy reduction projects.

NRPC conducted two inventories in Lyndeborough. Each inventory tool provides a unique look at municipal energy usage. The first inventory was completed using the Small Town Carbon Calculator (STOCC), which assesses energy use, cost, and greenhouse gas emissions from the town's municipal buildings, vehicles, and streetlights. The second inventory was completed using the EPA's Portfolio Manager, which provides a more detailed analysis of the town's municipal buildings. Portfolio Manager is an online, interactive energy management tool that allows users to track and assess energy consumption across a portfolio of buildings. By examining each building and comparing energy use across buildings, towns can see how well each building is performing and where improvements can be made.

The Nashua Regional Planning Commission was responsible for conducting the inventory. Lyndeborough Town Administrator, Jim Bingham provided energy use data for all municipal buildings, vehicles, and streetlights. Electricity use data spanned the 3-year period beginning January 1, 2006 through December 31, 2008. Fuel oil data was provided from January 1, 2007 through December 31, 2008 and propane data ran from January 1, 2007 through May 31, 2009. NRPC staff entered the data into Portfolio Manager. A University of New Hampshire graduate student was responsible for inputting the data into STOCC; this analysis is performed on an annual basis and 2008 data was used here.

The STOCC results precede the Portfolio Manager results in this report as the data provides an overall glimpse at Lyndeborough's energy usage and greenhouse gas emissions. Portfolio Manager results are more specific and detail-oriented for the buildings only and will be presented following the STOCC inventory information.

Small Town Carbon Calculator Inventory

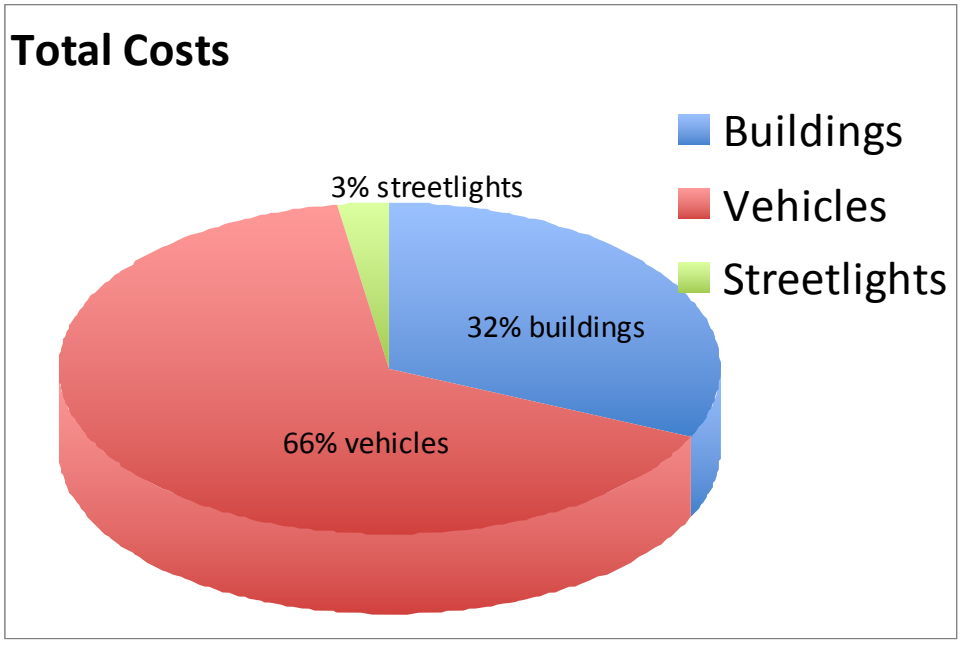
The Small Town Carbon Calculator (STOCC) provides broad-based information on energy use resulting from buildings, vehicles, and streetlights. The purpose of using STOCC is to establish a total municipal baseline for energy costs, carbon dioxide emissions (a major greenhouse gas), and energy usage. In addition to municipal vehicles and streetlights, the following buildings were included in the 2008 STOCC inventory: Center Hall, Citizens' Hall, Fire Department, Highway Department, and J.A. Tarbell Library.

Table 1.

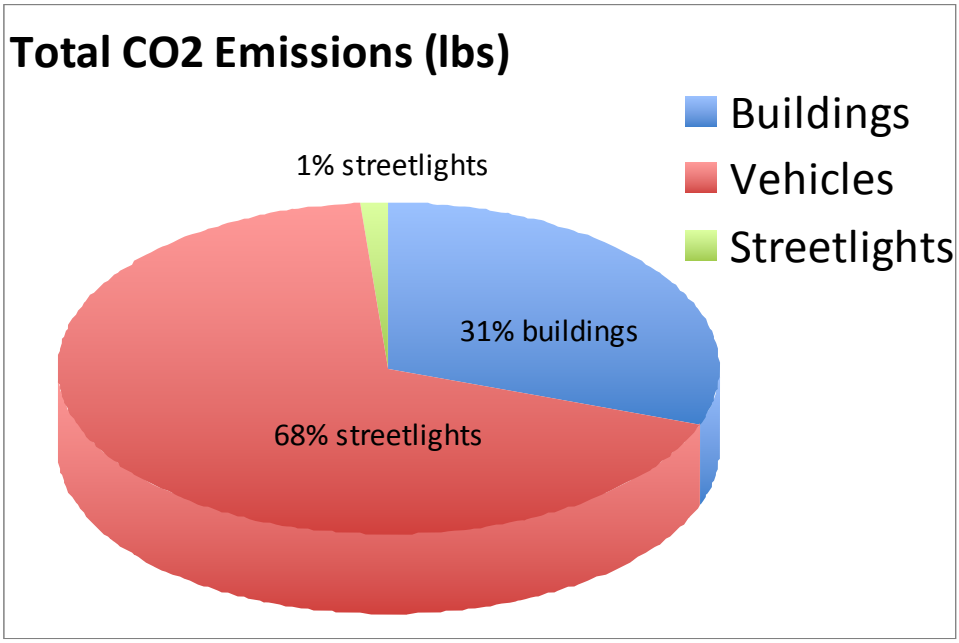
	Municipal Buildings		Vehicles		Streetlights		
	#	% of total	#	% of total	#	% of total	Grand Total
Cost	$30,833	32%	$64,402	66%	$2,506	3%	$97,741
CO_2 (lbs)	165,938	31%	369,542	68%	7,317	1%	542,797
Energy (million BTUs)	991	30%	2,306	69%	28	1%	3,325

In Total, Lyndeborough spent $97,741 on energy in 2008, was responsible for 542,797 lbs of carbon dioxide emissions, and consumed 3,325 MMBTUs of energy.

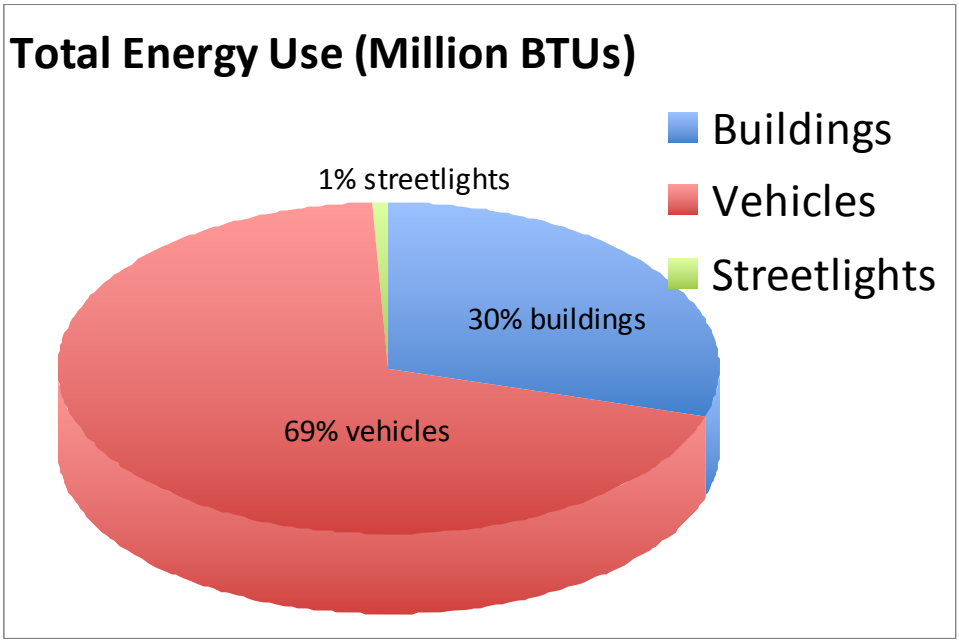
Graph 1



Graph 2



Graph 3



From these graphs, it is clear that the vehicle fleet represents a significant source of energy expenditures and costs for the Town. Moving forward, it will be equally as important for Lyndeborough to address energy use resulting from its vehicle fleet as it will be from its municipal buildings. Recommendations for reducing energy use from these sectors appears later in this report.

Portfolio Manager Inventory

The following buildings were included in Lyndeborough's Energy Inventory using Portfolio Manager:

Table 2.

Building Name	Size (ft^2)	Year Built	Portfolio Manager Category	Fuel Types
Center Hall	2,962	1800	Other-Social/Meeting	Electricity, Fuel Oil (No. 2), Propane
Citizens' Hall	5,322	1884	Office	Electricity, Propane
Fire Department	2,232	1959	Other-Fire Station/Police Station	Electricity, Propane
Highway Department	5,400	1964	Other—Service (Vehicle Repair/Service, Postal Service)	Electricity, Propane
J.A. Tarbell Library	946	1909	Other-Library	Electricity, Fuel Oil (No. 2)

Utility Providers in Lyndeborough

- Electricity—Public Service of New Hampshire (PSNH)
- Propane—Energy North
- Fuel Oil—Ciardelli Fuel Company

The table below provides an overall summary of Lyndeborough's Energy Inventory results using Portfolio Manager. A more detailed analysis by measurement type follows.

Table 3.

Building Name	Total Energy Use (kBtu)	Current Site Energy Intensity ($kBtu/ft^2$)	Current Source Energy Intensity ($kBtu/ft^2$)	Annual Energy Cost	Energy Cost/ft^2	Total Greenhouse Gas Emissions ($MtCO_2e$)
Center Hall	89,361.13	30.20	37.20	$1,980.70	$0.67	6.97
Citizens' Hall	227,903.05	42.80	73.20	$7,528.65	$1.41	18.63
Fire Department	248,088.44	111.20	155.00	$7,960.50	$3.57	18.24
Highway Department	321,971.69	59.60	88.80	$9,808.16	$1.82	24.47
J.A. Tarbell Library	84,807.56	89.70	111.90	$1,994.77	$2.11	6.68

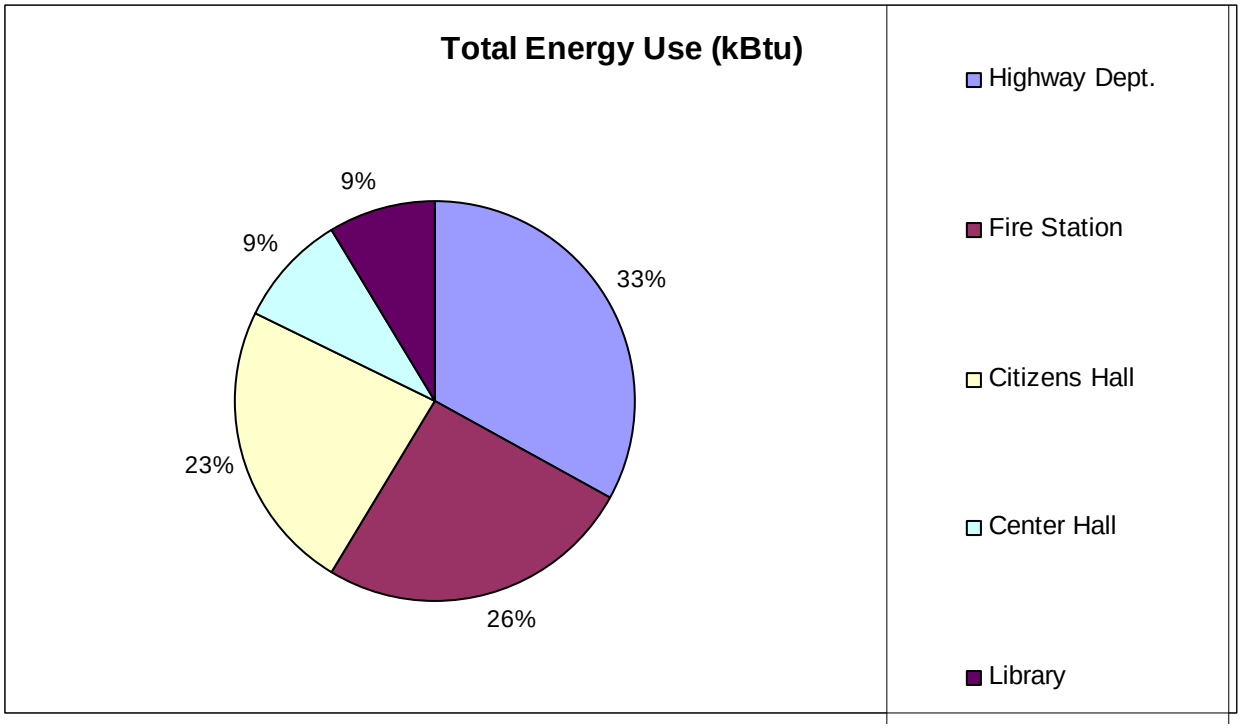
Energy Inventory Measurement Definitions:

- Site Energy Intensity—amount of energy expended per ft^2 on site to heat, cool, and electrify the area. This measurement fluctuates directly with actions such as how much lighting is being use and how the thermostats are set.
- Source Energy Intensity—amount of energy expended per ft^2 based on the type of fuel and the efficiency of that fuel type.
- $MtCO_2e$—metric ton carbon dioxide equivalent, allows emissions of greenhouse gases of different strengths to be added together.

Energy Use by Building

The Portfolio Manager Energy Inventory clearly demonstrates that energy use is not evenly distributed across Lyndeborough's municipal buildings. For example, three buildings—the Highway Department, Fire Station, and Citizens' Hall—are consuming 82% of the total energy used across the entire portfolio of buildings. These results are illustrated in Graph 4 below.

Graph 4

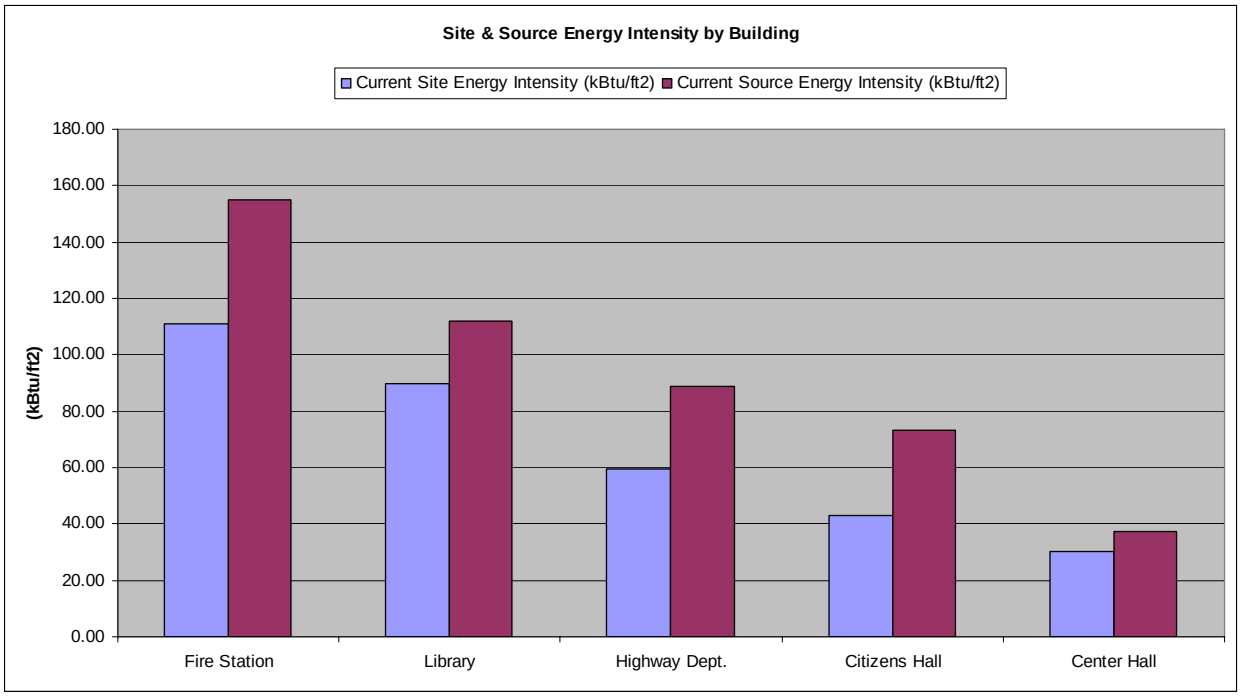


In addition to Total Energy Use, it is important to examine Energy Intensity, which provides a measure of the relative energy efficiency of a particular building. As mentioned above, site energy intensity is the amount of energy expended per square foot on site to heat, cool, and electrify the area. This measurement fluctuates directly with actions such as how much lighting is being use and how the thermostats are set. Thus, reductions in site energy intensity can be addressed through changes in behavior (ex. shutting computers off at night, turning down the thermostat) and through energy conserving technologies (ex. motion sensor lighting). Source Energy Intensity refers to the amount of energy expended per square foot based on the type of fuel used and the efficiency of that fuel type. Measures to reduce source energy intensity involve changing the type of fuel being used to heat or cool the space.

In Lyndeborough, the Fire Station (2,232 ft^2) has the highest site energy intensity at 111.20 $kBtu/ft^2$ and

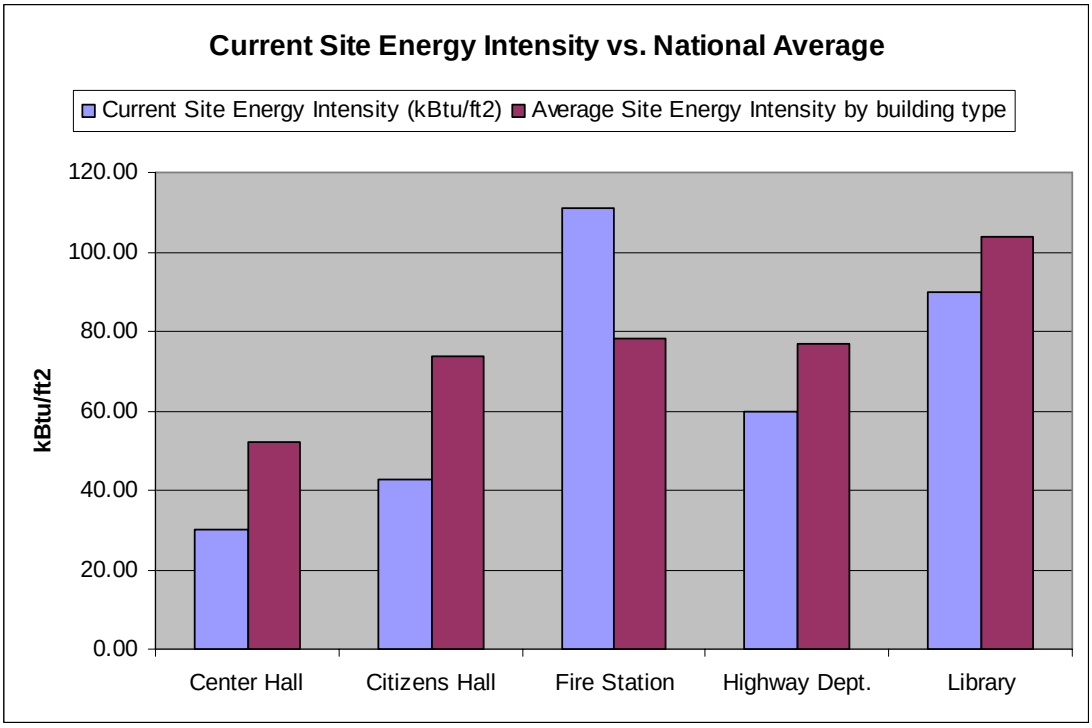
the second highest source energy intensity at 155 kBtu/ft^2. The Library (946 ft^2) has the second highest site and source energy intensity at 89.7 and 111.9 kBtu/ft^2 respectively. The Highway Department (5,400 ft^2) has the third highest site and source energy intensity at 59.6 and 88.8 kBtu/ft^2 respectively. Although site energy intensity is consistently lower than source energy intensity across Lyndeborough's portfolio of buildings, it is recommended that the Energy Committee focus on behavioral changes and simple energy conserving technologies first, as these are often the least costly and most easily implemented actions. These measures can be enacted across all buildings, with a particular focus on the Fire Station, Library, and Highway Department. A comparison of site and source energy intensities across buildings appears in Graph 5.

Graph 5

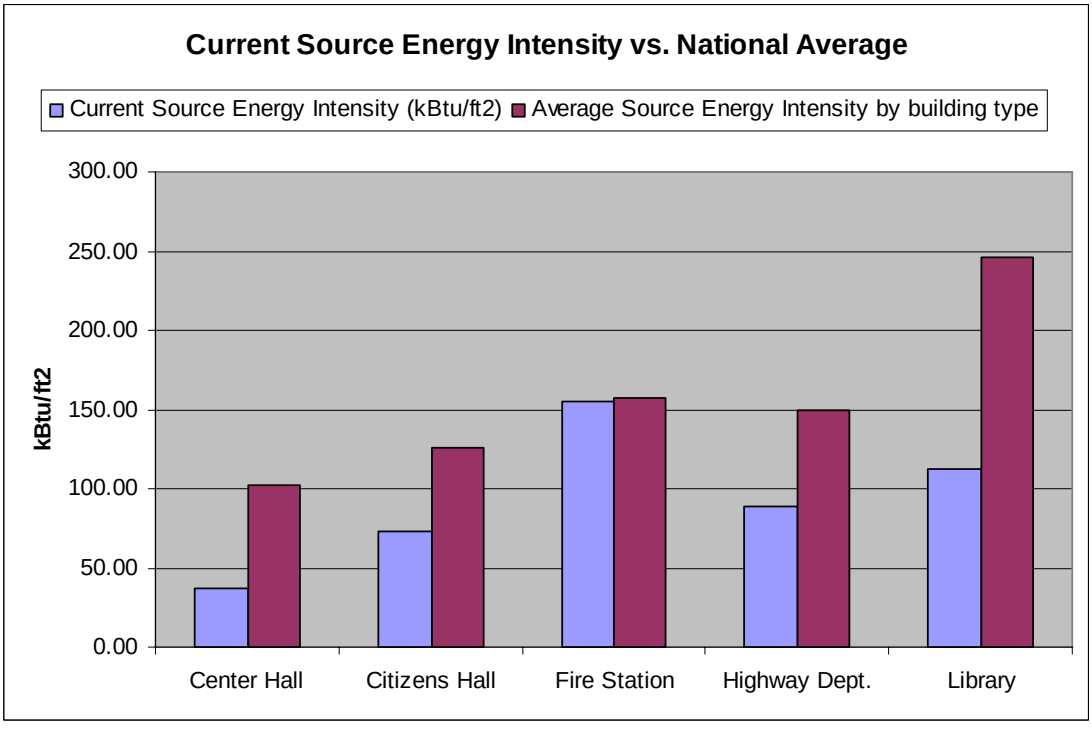


In addition to comparing site and source energy intensities across buildings in the municipality, Portfolio Manager allows users to compare their buildings' site and source energy intensity to national averages for those building types. Graphs 6 and 7 illustrate these comparisons. Every building in Lyndeborough's portfolio had a lower site and source energy intensity than the national average, with the exception of the Fire Station. The Fire Station had a higher site energy intensity compared to the national average and a source energy intensity that was roughly equal to the national average (2 kBtu/ft^2 difference). This provides further justification for the need to examine this building carefully.

Graph 6.



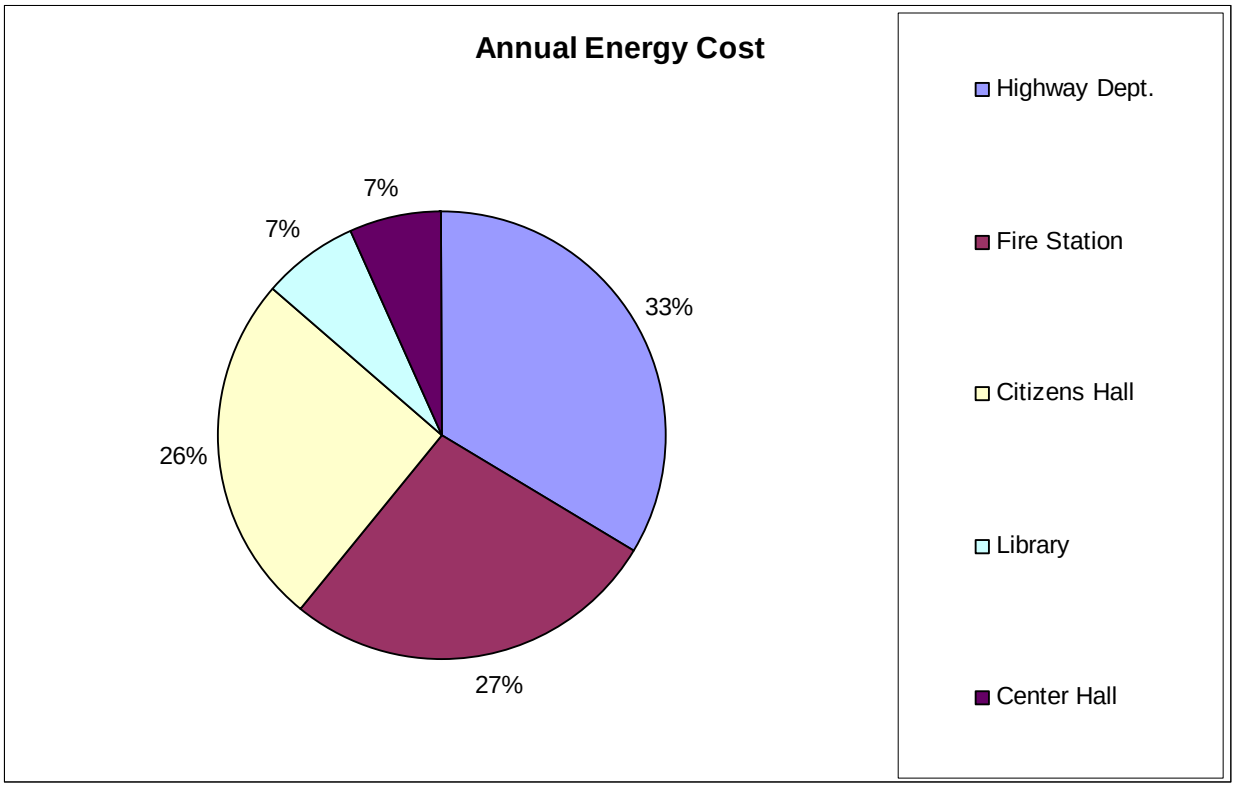
Graph 7



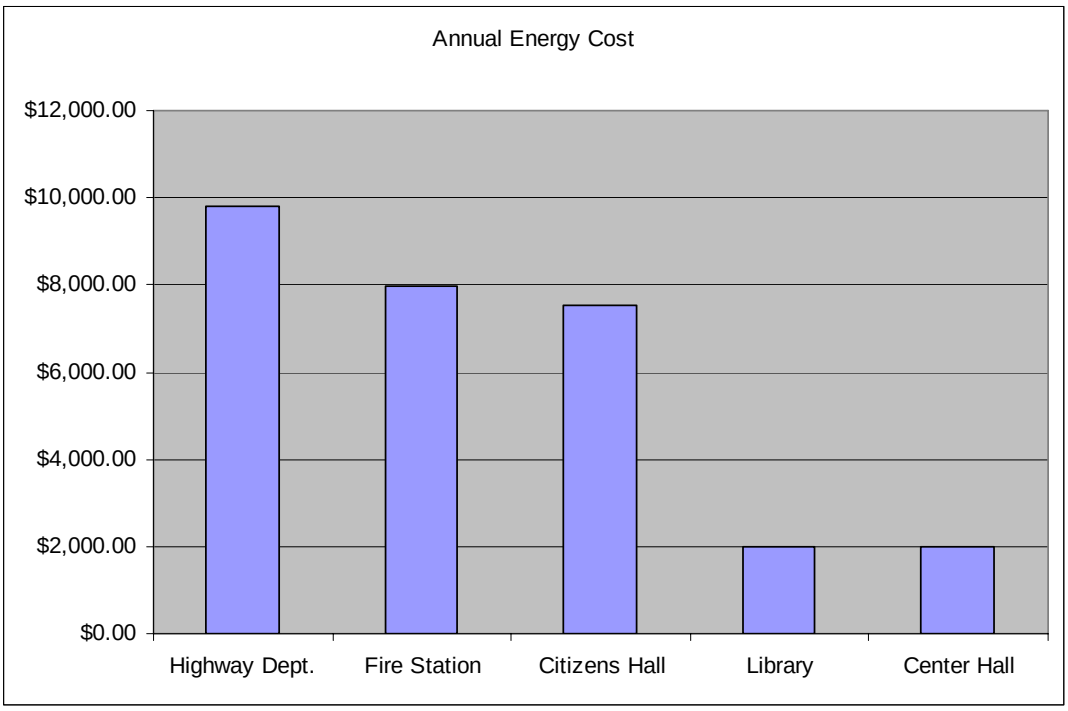
Costs by Building

Another way to evaluate building performance is to examine overall energy costs and energy costs per ft^2. The cost of running municipal buildings is a major concern for most communities and therefore identifying ways to save on energy costs is often a priority when conducting energy inventories. Three of the 5 buildings included in Lyndeborough's portfolio—the Highway Department, Fire Station, and Citizens' Hall—account for 86% of total annual energy costs. The Highway Department has the highest annual energy cost at $9,808.16, followed by the Fire Station at $7,960.50 and Citizens' Hall at $7,528.65. These results are illustrated in Graphs 8 and 9.

Graph 8

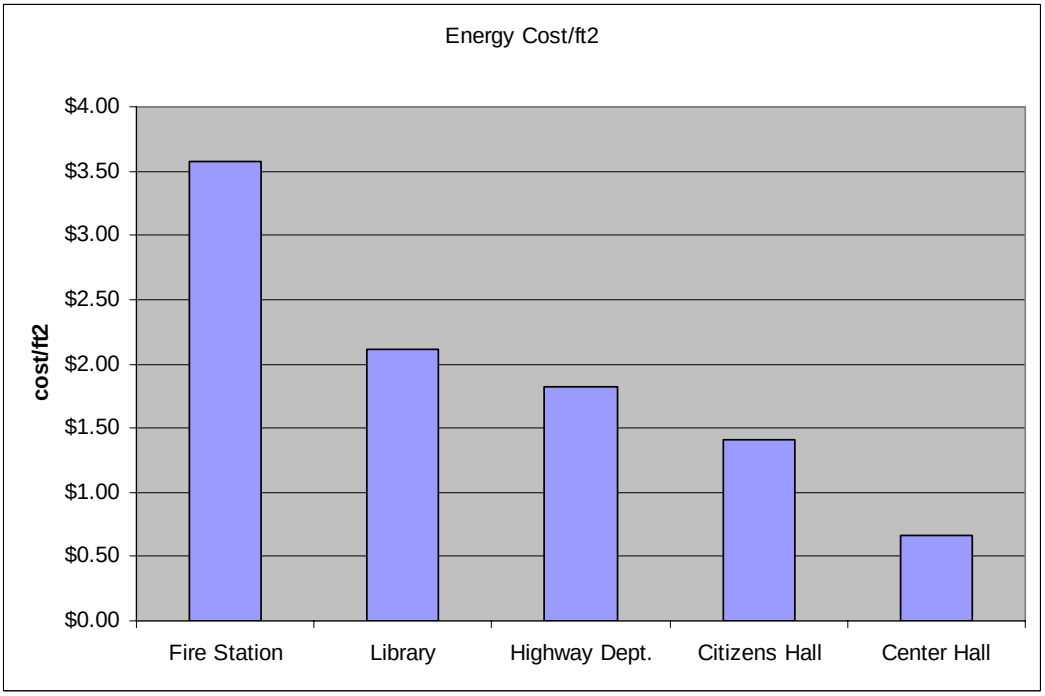


Graph 9



The Fire Station and Library have the highest energy costs per square foot at $3.57/ft² and $2.11/ft² respectively.

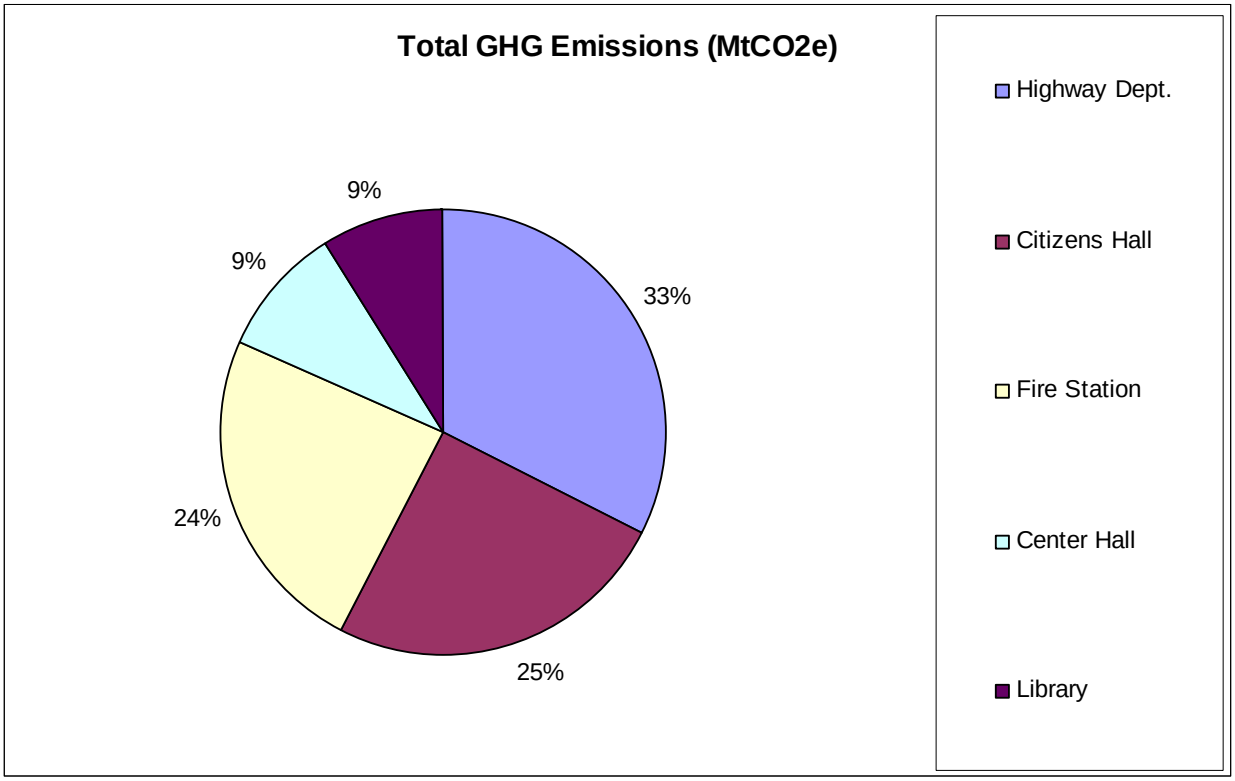
Graph 10



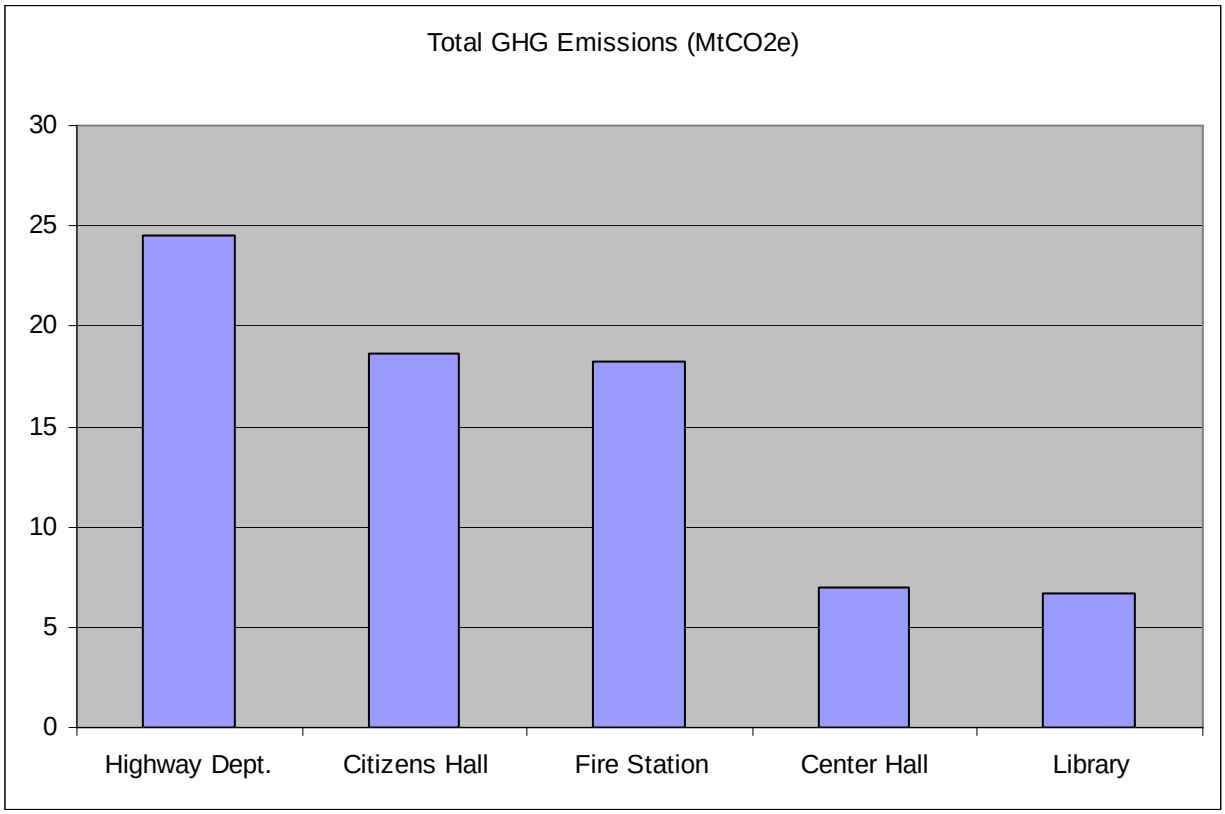
Greenhouse Gas Emissions

The final method for evaluating building performance is through greenhouse gas emissions. As mentioned above, Portfolio Manager measures greenhouse gas emissions in $MtCO_2e$, or metric ton carbon dioxide equivalent. This allows emissions of greenhouse gases of varying strengths to be added together. In Lyndeborough, three buildings—the Highway Department, Citizens' Hall, and Fire Station—account for 82% of the total emissions coming from all 5 buildings in the portfolio. The Highway Department alone produces 33% of the emissions at 24.47 $MtCO_2e$.

Graph 11



Graph 12



Energy Inventory Analysis

Portfolio Manager's performance measures can be divided into two broad categories—those that take into consideration building square footage and those that do not. Performance measures that take square footage into consideration include Site Energy Intensity (kBtu/ft^2), Source Energy Intensity (kBtu/ft^2), and Energy Cost/ft^2. Performance measures that do not take square footage into consideration include Total Energy Use (kBtu), Annual Energy Cost ($), and Greenhouse Gas Emissions ($MtCO_2e$).

The Fire Station was in the top three worst performing buildings in every category. It had the worst performance in Site Energy Intensity, Source Energy Intensity, and Energy Cost/ft^2; the second worst performance in Total Energy Use and Annual Energy Cost; and the third worst performance in Total Greenhouse Gas Emissions. The consistency with which the Fire Station performed poorly in each of these categories indicates that further attention and priority should be given to this building.

The Highway Department was also in the top three worst performing buildings in every category. It had the worst performance in Total Energy Use, Annual Energy Cost, and Total Greenhouse Gas Emissions; and the third worst performance in Site Energy Intensity, Source Energy Intensity, and Energy Cost/ ft^2. The

consistency with which the Highway Department performed poorly in each of these categories indicates that further attention and priority should also be given to this building.

The Library was the second worst performing building in every category that considers square footage. It had the second highest Site Energy Intensity, Source Energy Intensity, and Energy Cost/ft^2.

Citizens' Hall was among the top three worst performing buildings in every category that does not consider square footage. It had the second highest Total Greenhouse Gas Emissions, and the third highest Annual Energy Costs and Total Energy Use. Because its total energy usage and thus overall energy costs are so much greater than the Library, priority should be given to Citizens' Hall over the Library.

Recommendations based on Energy Inventory Results

Overall Goal

A recommended goal is to reduce municipal energy consumption by 15% below 2008 levels by 2015. This is in line with the NH Climate Action Plan's goal to reduce NH's annual greenhouse gas emissions by 80% below 1990 levels by 2050. In 2008, Lyndeborough consumed 3,325 MMBTUs of energy. A 15% reduction by 2015 would bring Lyndeborough's energy consumption level down to 2826.25 MMBTUs.

Building Recommendations

- Use Energy Committee members, students, and volunteers to conduct walk-through building audits to look for easily correctable changes in behavior or easily implemented energy efficiency measures. Continue to track building performance in Portfolio Manager after subsequent actions have been implemented to measure associated energy efficiency improvements. The following buildings should be included in this process and are listed in order of priority:
  1. Fire Station
  2. Highway Department
  3. Citizens' Hall
  4. Library
  5. Center Hall

- Use Lyndeborough facility maintenance staff to recommission buildings that continue to perform poorly after walk-through audit recommendations have been implemented. Recommissioning examines the building's equipment systems operation and maintenance procedures and compares them to intended or design operations procedures. The primary focus of recommissioning is to identify operation and maintenance improvements that will result in energy cost savings and that are relatively fast and inexpensive to implement. Recommissioning does not necessarily involve the purchase or installation of

new equipment or technology and in-house staff can typically implement many of the operation and maintenance improvements. Example recommissioning activities include calibrating building controls such as thermostats and occupancy sensors; adjusting operating schedules to ensure equipment is only on when necessary; checking for leaky or improperly functioning steam traps; and cleaning heat exchanger tubes in condensers, evaporators, and boilers to maintain optimal efficiency. Priority should be given to buildings that do not have an active preventative maintenance program.

- Conduct professional audits of buildings where no performance improvements are seen after implementing volunteer walk-through audit recommendations and recommissioning activities. Energy audits examine existing building systems for equipment replacement (retrofit) opportunities that will result in energy cost savings. Utility providers often offer free or low cost auditing services and should be utilized first.

- Focus initial actions on buildings that are very visible to the public, such as the Citizens' Hall. This will raise awareness of the Energy Committee and help Lyndeborough to set a good example for its citizens.

- Involve students to the greatest extent possible when conducting audits and making energy efficiency improvements. This will help to raise awareness of the Town's efforts to improve energy efficiency and instill an environmental ethic in students and their parents.

- After energy efficiency measures have been successfully implemented, research the feasibility of installing green energy technologies (ex. small wind, solar, geothermal) in one or more municipal buildings. Priority should be given to buildings with high source energy intensity.

- Continue to benchmark using EPA's Portfolio Manager on a regular basis. Complete a STOCC inventory for 2009 once complete data is available (early 2010). Visit the Clean Air-Cool Planet website for the excel files and more information about the inventory process. http://www.cleanair-coolplanet.org/for_communities/stocc.php

Vehicle Fleet Recommendations

- Maintain Town vehicles. A poorly tuned engine, for example, can increase fuel consumption by 10-20% depending on its condition. Keep tires properly inflated and aligned, conduct routine oil changes, and check and replace vehicle air filters. These measures will not only reduce fuel consumption but also will help vehicles to last longer.

- Instruct operators to drive more efficiently. Stay within posted speed limits and use cruise control. Avoid unnecessary idling, braking, and acceleration, which can improve fuel economy by 5-10%. Combine trips when possible; several short trips taken from a cold start can use twice as much fuel as one trip covering the same distance when the engine is warm. Finally, remove excess weight from the vehicle. Carrying an extra 100 pounds reduces fuel economy by 1-2%.
- Develop criteria within the Town's vehicle replacement policy to gradually phase in more fuel efficient or hybrid vehicles.
- Establish an anti-idling policy to encourage municipal fleet users as well as the general public to turn off their engines when the vehicle is not in use. NH state regulations under RSA 125-C:6, XII specify that when temperatures are above 32°F vehicles may not idle for more than 5 minutes. At temperatures between -10°F and 32°F vehicles may not idle for more than 15 minutes. Contact the Nashua Green Team for information about the anti-idling policies they put in place for the City.
- Conduct an analysis of the standard routes vehicles take and determine whether there are more efficient routes for them to travel. Contact Steve Russell with the City of Keene's Public Works Department to learn about route analysis studies conducted there.
- Continue to conduct energy inventories of the vehicle fleet. There are a number of reasons why some years may experience increased vehicle use. Cleanup from events such as ice storms and floods may result in abnormally high fuel usage for the year and may not provide an accurate picture of typical fuel usage.