TOWN OF CARRBORO

NORTH CAROLINA

TRANSMITTAL

PLANNING DEPARTMENT

DELIVERED VIA: ☐ *HAND* ☐ *MAIL* ☐ *FAX* ☒ *EMAIL*

To: **Board of Aldermen**
David Andrews, Town Manager
Department Directors

From: **Chris Lazinski, Consultant**
Randy Dodd, Environmental Planner

Date: **May 28, 2015**

Subject: **Town of Carrboro 2014 Greenhouse Gas Inventory**

Background and Summary

Pursuant to the Town of Carrboro's membership in ICLEI – Local Governments for Sustainability, the Cities for Climate Protection (CCP) initiative, the passage of a resolution in 2009 committing the Town to reduce its greenhouse gas (GHG) emissions, and the completion of previous GHG emissions inventories, an updated inventory has been completed to track the Town's progress in reducing GHG emissions in municipal operations. In accordance with the Town's membership in the CCP initiative, this fourth annual inventory is provided to fulfill CCP Milestone 5 for monitoring and verifying results of actions pursued (see Table 1).

Information

Data Collection

In putting together previous GHG emissions reports, an emphasis was placed on clarity of scope, accessibility and transparency of both energy consumption and GHG emissions data, and repeatability of the methodology. That emphasis has allowed this update to be completed with the exact same methodology as the three previous updates, which allows for the most accurate comparison of data and tracking of emissions over time.

Table 1. Cities for Climate Protection Five Milestone Process

Milestone	Description	Notes
1	Conduct a baseline emissions inventory and forecast.	A summary of the previous municipal operations inventory can be found at http://nc-carrboro.civicplus.com/DocumentCenter/Home/View/1218 The information contained in this memo serves as an update to that report. The most recent community inventory can be found at http://nc-carrboro.civicplus.com/DocumentCenter/Home/View/2788
2	Adopt an emissions reduction target.	Carrboro adopted a climate protection resolution in 2009; this and previous annual reports suggest an approach for further articulation as a measurable emissions reduction target for Carrboro municipal emissions.
3	Develop a Local Action Plan	A countywide inventory that included elements of a plan was previously developed. Carrboro drafted an Energy and Climate Protection Plan for municipal operations in 2014. The Climate and Energy Task Force will be providing community scale climate action recommendations in 2015.
4	Implement policies and measures	Carrboro has adopted the climate protection resolution, and has pursued various measures described in the 2014 plan.
5	Monitor and verify results	This memo is the Town's fourth annual effort to monitor and verify the results of policies and procedures implemented to reduce GHG emissions from municipal operations.

Scope

For consistency with previous inventories and per standard GHG inventory reporting protocols, this inventory focuses only on the Scope 1 and Scope 2 GHG emissions attributable to Town operations. Scope 1 emissions are direct emissions resulting from the combustion of fuel on-site. Examples of Scope 1 emissions include vehicular tailpipe emissions from Town vehicles and emissions from burning natural gas to heat Town facilities. Scope 2 emissions are indirect emissions associated with the consumption of purchased or acquired energy. Scope 2 emissions primarily result from the Town's electricity consumption. As a general rule, emissions are attributable to the Town if they are emitted by an entity that the Town has full operational control over. By this definition, the scope of this inventory includes all electricity use billed to the Town for its facilities, street lighting, and other outdoor lighting, as well as the fuel usage of the Town's vehicle fleet and natural gas use in its facilities. This scope excludes any emissions from operations of the Orange Water and Sewer Authority (OWASA), Orange County Solid Waste (OCSW), Chapel Hill-Carrboro City Schools (CHCCS) and Chapel Hill Transit (CHT), electricity usage attributable to traffic signals within Town limits, and other non-municipal activities. While the actions related to water treatment and delivery, waste processing, public transit, schools, and traffic management are in the public sector and occur within Town limits, the emissions attributable to these services cannot be directly controlled by only the Town government and are therefore outside the scope of this inventory.

It is worth noting that the total emissions for Carrboro, from both municipal and community sources, were estimated by a student Capstone team from UNC – Chapel Hill in spring 2015 for

the year 2012 at nearly 112,000 metric tonnes of carbon dioxide equivalent (MTCDE)[1]. The report estimated that total local government emissions from all sectors, including those that are outside the scope of this inventory such as schools and public transit, were 7,400 MTCDE. The emissions that fall under the scope of this inventory are roughly 1,850 MTCDE, meaning that this analysis deals with approximately 25% of all local government emissions and less than 2% of the total emissions coming from Carrboro. Therefore, the Town's effort in cooperating with other private and public entities is paramount to appreciable local reductions.

GHG Accounting Methodology

While electricity, natural gas, and vehicle fuel are all different forms of energy, they all produce GHG emissions at some point in the consumption process. In order to combine different sources of energy into one emissions profile, all usage figures must be converted into one "common denominator" unit, which in this case is metric tons of carbon dioxide equivalent, or MTCDE. Conversion factors used in converting kilowatt-hours (kWh) to GHGs were obtained from the EPA. The EPA released new conversion factors for converting kWh to GHG emissions in February 2014, which lowered the amount of CO_2 emitted per kWh for North Carolina. This new conversion factor was applied to all kWh consumption data from 2003 to present for consistency, which slightly lowered emission levels from previous inventories due to the decrease in lbs. CO_2 emitted per kWh. Many of the conversion factors convert the base unit of energy into pounds of CO_2, so to get the units into MTCDE, a factor of 2204.62 lbs. per metric ton was applied. A table of obtained and derived conversion factors is presented below in Table 2.

Table 2. Conversion Factors for GHG Emissions Calculations

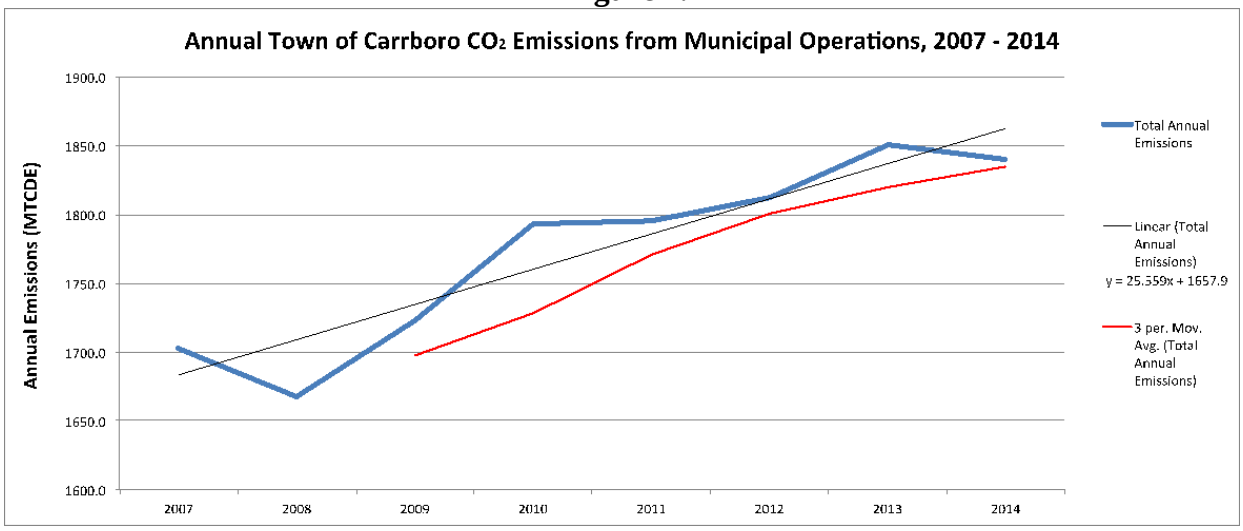
Energy Type	Unit	Lbs. CO_2	MTCDE
Electricity	1 Kilowatt-hour	1.07365	0.000487
Natural Gas	1 Therm	11.0231	0.00500
Gasoline	1 Gallon	19.54	0.00886
B20 Bio-diesel	1 Gallon	17.89	0.00811

Results

The conversion factors in the table above were applied to all Town electricity, natural gas, and vehicle fuel use as defined by the project scope from May 2014 to March 2015 and combined with data from previous inventories. The Town's total emissions for 2014 were 1839.7 MTCDE, which was a decrease of 11.3 MTCDE or 0.6% from 2013 emissions levels. Figure 1 shows the Town's overall annual emissions from 2007 to 2014. A linear trend line applied to the "Total Annual Emissions" data set in Figure 1 reveals that the total emissions attributable to Town operations have been growing at an average rate of 25.6 MTCDE per year between 2007 and 2014, or at a rate of 1.5% of 2007 emissions per year. In an effort to reduce the impact of inter-annual weather variability on emissions, a three-year moving average of emissions was also constructed and is shown in red on Figure 1. Even with the three-year average, it is clear that there is an upward trend to the Town's emissions, but also that the rate of increase is slowing.

[1] Agudelo-Frankel, D., Beaman, B., Marshall. G., Myers, J. 2012 Greenhouse Gas Emission Inventory for the Town of Carrboro, NC. http://nc-carrboro.civicplus.com/DocumentCenter/Home/View/2788

Figure 1.



In order to help focus the Town's efforts in emission reduction, Figure 2 was constructed to show the percentage contribution to the Town's emissions from all sources during the 2014 calendar year. The single largest source of emissions is street lighting at 21% of the total, but it is worth noting that the Town does not own its street lighting infrastructure and instead has a lease arrangement with electric utility providers. Emissions from streetlights were followed by Public Works fuel usage at 19% of the total, which increased nearly 5% from 2013 emissions levels. The Century Center is the third-largest contributor to emissions at 16% of total emissions, and it is the largest single facility emitter under the Town's control. The fourth largest contributor to emissions is Police Department fuel usage at 15% of the total, which decreased 7% from 2013 emissions levels. These four largest contributors to Town emissions accounted for 71% of total emissions, and therefore are important areas in which the Town should focus any emissions reduction efforts.

In order to track how these four largest contributors to Town emissions have performed since 2007, Figure 3 was constructed. The figure shows emissions from streetlights have remained relatively constant over the last 8 years, Police fuel emissions are down 52.5 MTCDE from their high point in 2010, Public Works fuel emissions are up 56.2 MTCDE from their low point in 2009, and Century Center emissions have increased fairly steadily, up 49.6 MTCDE this year from their low point in 2008.

Figure 2.

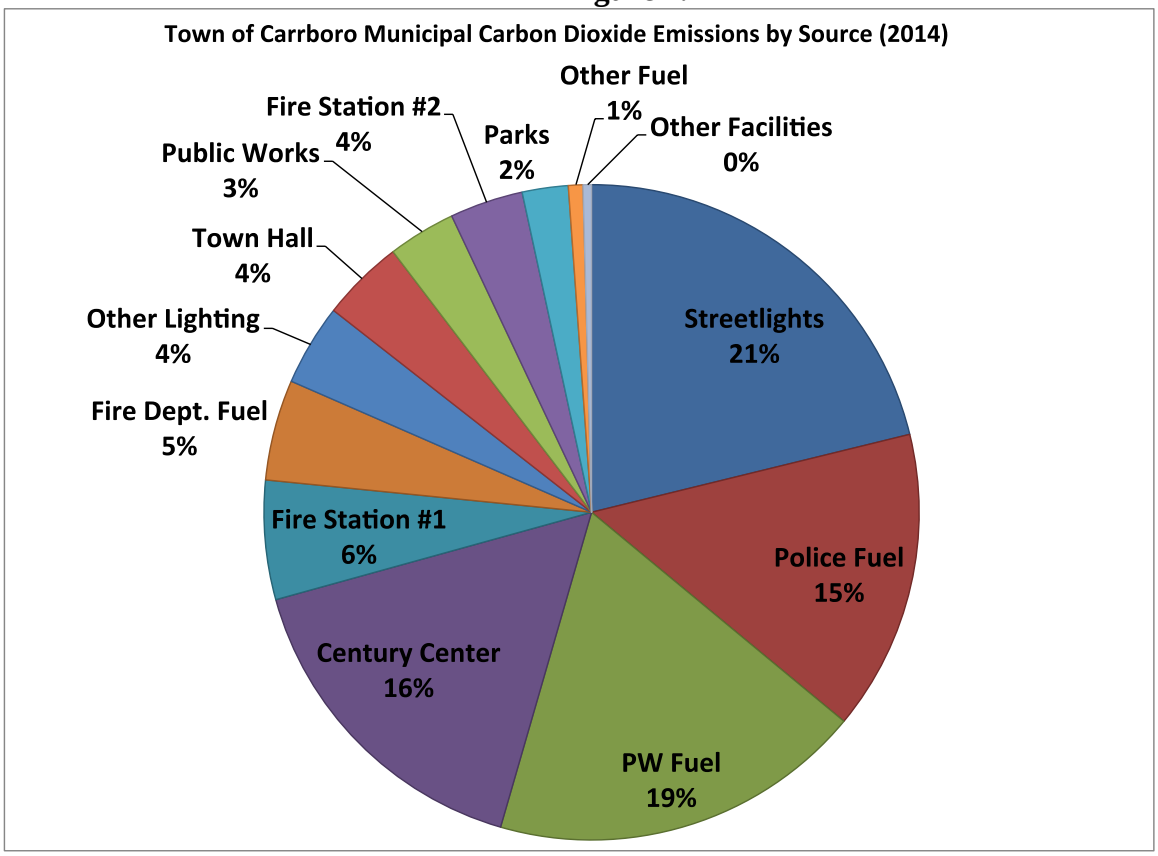


Figure 3.

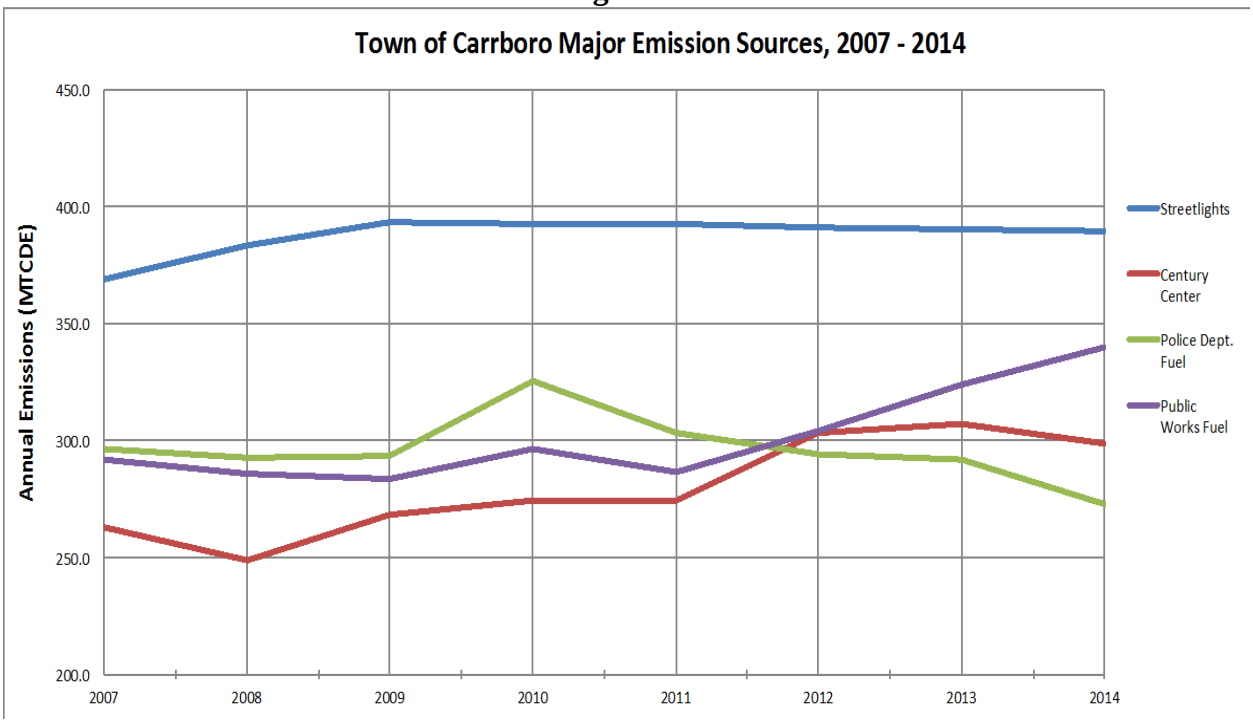


Table 2 spells out the rest of the emissions data from all municipal sources and shows trends that have developed over the last four annual updates dating back to 2011. There were notable reductions in emissions compared to 2011 levels at Fire Station #1 and through reduced Police Department fuel usage. These reductions were negated by significant increases in emissions over that same time period at the Century Center and from increased Public Works and Fire Department fuel usage.

Table 2.

Facility Name	2011 Emissions (MTCDE)	2012 Emissions (MTCDE)	2013 Emissions (MTCDE)	2014 Emissions (MTCDE)	Change in MTCDE from 2011 to 2014	% Change from 2011 to 2014
Streetlights	392.3	391.3	390.2	389.6	-2.7	-0.7
Police Fuel	303.0	294.2	292.0	272.8	-30.2	-10.0
PW Fuel	286.8	304.0	323.8	339.9	53.1	18.5
Century Center	274.1	303.1	307.2	298.5	24.4	8.9
Fire Station #1	124.7	119.9	115.1	108.1	-16.6	-13.3
Fire Dept. Fuel	79.0	80.9	86.9	91.4	12.4	15.7
Other Lighting	73.1	74.2	74.2	73.9	0.8	1.1
Town Hall	71.6	68.6	71.4	74.9	3.3	4.6
Public Works	60.2	55.3	58.9	61.5	1.3	2.2
Fire Station #2	58.5	54.0	63.8	66.5	8.0	13.7
Parks	42.3	42.9	42.8	41.7	-0.6	1.2
Other Fuel	16.9	15.6	15.7	13.2	-3.7	-22.0
Other Facilities	12.4	7.9	8.8	7.7	-4.7	-37.9
Annual Totals	**1794.9**	**1811.8**	**1851.0**	**1839.7**	**44.8**	2.5

Overall, municipal emissions increased by 2.5% between 2011 and 2014. The largest increase in emissions during this time frame is the 18.5% increase in fuel use (53.1 MTCDE) from the Public Works vehicle fleet. Further analysis (not presented) indicates that this increase was primarily due to increased solid waste fuel use from hauling to the transfer station beginning in the summer of 2013. Replacing one of the solid waste trucks with a more efficient truck obtained in the spring of 2015 with grant support should mitigate this increase.

The second largest increase between 2011 and 2014 was an 8.9% increase in emissions (24.4 MTCDE) from the Century Center. This can largely be attributed to a change in the natural gas usage in the building, primarily during the summer months, as depicted in Figure 4. Natural gas usage at the Century Center would drop down to under 200 therms per month during the summers of 2010 and 2011, but in 2012, 2013, and 2014 natural gas usage at the facility barely dropped below 1000 therms per month during the summer. This significant change in the usage pattern resulted in much higher emissions attributable to the facility. To address this issue, the Town has programmed funds in the draft 2015-16 operating budget.

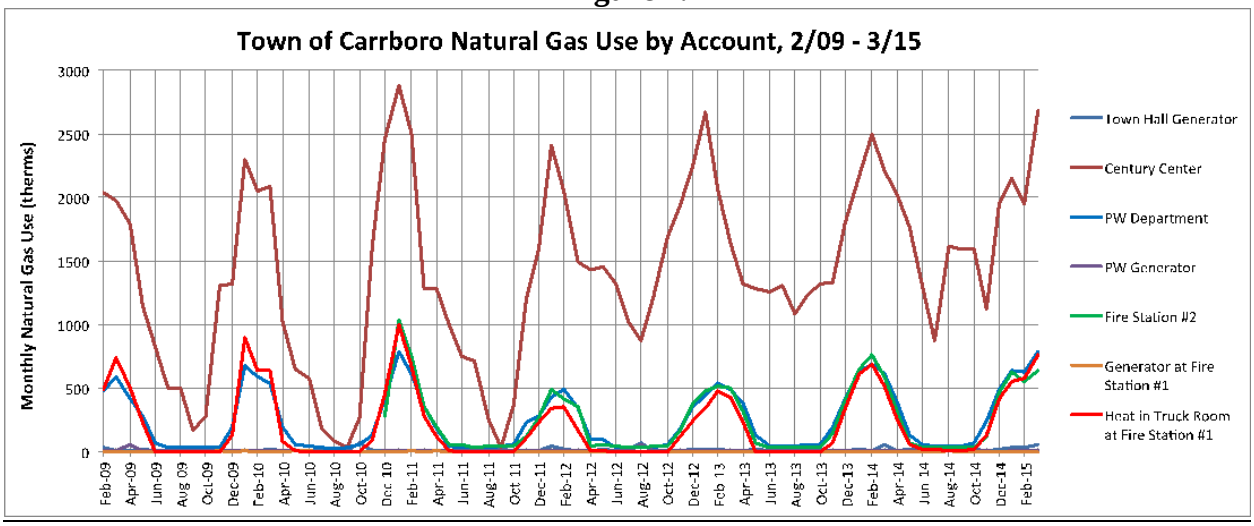
The third largest increase was from greater Fire Department fuel use that resulted in 12.4 MTCDE more emissions, or an increase of 15.7% over 2011 levels.

The largest emissions decrease between 2011 and 2014 is in the form of a 10% savings (30.2 MTCDE) of Police Department fuel emissions, resulting from procedures being put in place to reduce the time police vehicles are idling. This change has seen significant savings in emissions almost immediately.

The second largest emissions decrease is from Fire Station #1, which shaved 13.3% (16.6 MTCDE) off of its 2011 emissions resulting primarily from a 16.4% reduction in electricity use in the building despite a small increase in usage of natural gas.

Taken together, these five significant changes make up a net increase of 43.1 MTCDE, which is almost all of the 44.8 MTCDE increase in emissions between 2011 and 2014.

Figure 4.



Emissions Reduction

Based on this 2014 update, should the Town's commitment to emissions reductions continue, it is clear that additional action is needed to prevent future emissions growth and begin to reduce overall emissions.

Policy Options

According to a 2009 resolution passed by the Board, the Town's goal is to "cut CO_2 emissions by [the Town's] proportion of the amount which is required to stabilize the climate back to less than 350ppm of CO_2 in the atmosphere in time for a 90% probability for success" in averting the worst impacts of climate change. While this resolution applies to the emissions of the whole community, the most easily quantifiable and manageable emissions are those attributable the Town's municipal operations. The completion of an Energy and Climate Protection Plan in May 2014 along with operating budget and CIP programming are positive recent steps towards

pursuing reductions from municipal operations. Addressing these emissions provides an opportunity for the Town to "lead by example".

Using the most recent estimates for the Town's per capita emissions from the 2015 Capstone report, the community of Carrboro emitted 5.5 MTCDE per capita in 2012. If Carrboro were a country, that would rank 71st out of 213 countries listed in a 2013 study[2] conducted by the United Nations Millennium Development Goals program, well below the United States' total of 17.5 MTCDE per capita and most other developed nations. If those estimates are accurate, it shows that Carrboro has done well in keeping emissions levels relatively low, thanks in large part to the absence of significant industry, but it is clear that there is much work to be done in order to avoid the worst impacts of climate change. It is recommended that the Town pursue further study into a per capita recommended carbon budget for the community, via work of the Energy and Climate Task Force, a portion of which can be allocated to municipal operations.

Current Actions

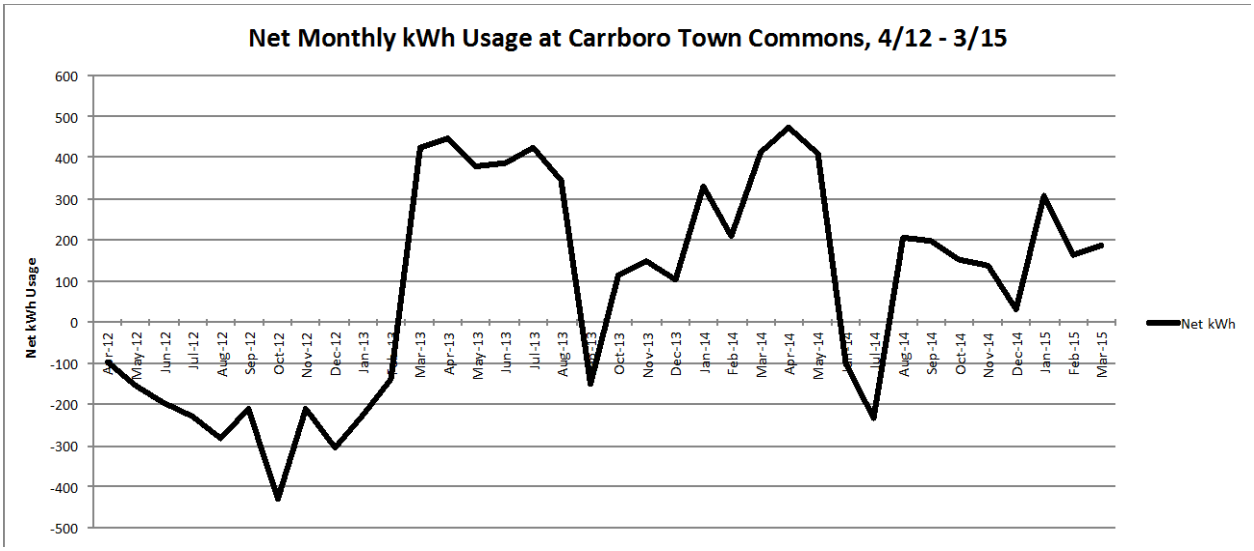
Energy efficiency projects in Town facilities have already been preliminarily investigated as part of a study by Waste Reduction Partners in 2008 and the Town's applications to obtain Energy Efficiency Conservation Block Grant (EECBG) money in 2010. As mentioned above, the Town's 2014 plan is being supported by actions in the annual operating budget and updating of the Capital Improvement Program. In the upcoming year, the most significant planned action that should reduce emissions involves improvements to the heating and air conditioning system at the Century Center. Unfortunately, the Town has not been able to pursue a major emissions reduction opportunity via replacement of streetlights with LED lights due in large part to regulatory actions resulting in an unfavorable rate structure. The Town placed a major emphasis on LED replacement to achieve the goal of 5-10% overall emissions reduction between 2014 and 2016. In the absence of pursuing this replacement, the Town will, at best, be able to achieve a much smaller reduction by 2016.

Carrboro Town Commons Solar PV Update

The 5kW solar photovoltaic (PV) system that was installed on the south-facing roof of the market stalls at the Carrboro Town Commons has now been producing electricity since February 2013. As of the end of March 2015, the system had cumulatively produced 12,131 kWh, which means that 5.9 MTCDE of emissions or 0.3% of the Town's 2014 total has been offset by the project. The system has been successful in making the Town Commons a net producer of electricity for each month since beginning its operation except for September 2013, when the system produced only 213kWh, and for June and July 2014, when reliable data from the system are not available. Figure 7 shows net usage of electricity at the Town Commons site between April 2012 and March 2015.

[2] http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=749

Figure 7.



Solarize Carrboro (not part of Town operations but of interest) resulted in installation of 192kW of residential solar PV capacity in 2014. Assuming that those systems produce electricity at the same average monthly rate that the Town Commons system does, that effort is producing almost 240,000 kWh annually, or offsetting approximately 116 MTCDE, which for comparison is 6.3% of municipal 2014 emissions. A 2015 Solarize Carrboro campaign is currently underway.

Conclusion and Recommendation

In 2014, the Town's emissions under the scope of this inventory dropped 11.3 MTCDE or 0.6% compared to 2013 emissions levels, but have grown by 44.8 MTCDE overall since the first annual GHG inventory was conducted in 2011. Given this trend and the inability to achieve the desired annual emissions reduction of at least 2%, it is clear that more concerted effort is called for. In 2014, the Town developed a plan and committed resources to reduce emissions. The reduction in Police vehicle fuel use in 2014 is one outcome of that effort. Additional reductions are anticipated from the recent solid waste vehicle purchase and, assuming successful completion in 2015-16, improvements at the Century Center. Solarize Carrboro is an example of a community initiative that has received logistical and publicity support from the Town that is addressing the imperative of climate mitigation. In contrast, the inability to pursue streetlight replacement with LED lights has made it nearly impossible to achieve the overall goal of reducing municipal energy use by 5-10% by FY 15/16. It is recommended that the Town use the information provided in this report and supporting data and analysis to continue to identify emissions reductions opportunities, and to update the inventory in the spring of 2016. It is further recommended that, in concert with the deliberations of the Climate and Energy Task Force, the Town investigate setting a community-wide per capita emissions budget expressed in metric tonnes of carbon dioxide equivalents per person. This will allow all emissions, including those from municipal operations, to have a "big picture" benchmark against which progress in reducing emissions can be judged and normalized as population changes. This approach will allow the Town to have a measurable goal to address the 2009 resolution and further the Town's goals of environmental stewardship, economic sustainability, and "leading by example".