City of Winston Salem

2016

Sustainability Summary Report

City of Winston-Salem Office of Sustainability

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City-Wide Highlights FY15-16

- STAR Community participant
- CDP Reporting
- Personal Electric Vehicle (PEV) Charging Stations

Executive Summary

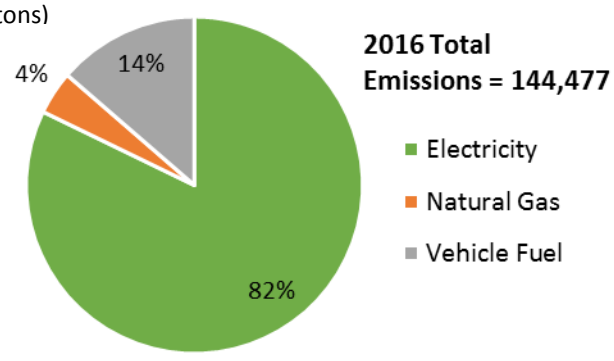
Since the creation of the Office of Sustainability in 2010, the City of Winston-Salem has begun to move towards becoming a more sustainable community. Some of the more recent efforts in sustainability include becoming a member of the STAR Community Rating System as well as CDP, formerly the Carbon Disclosure Project. Both programs are reporting tools aimed at helping our community measure and manage the environmental impact of our community.

The city has also increased the number of electric vehicle charging stations available to the public throughout the community. Most recently, a new Personal Electric Vehicle charging station was installed in February 2017 in a downtown parking garage. This is now the third charging station installed by the city and is available for use by the public.

The City of Winston-Salem's sustainability efforts have also lead to the annual inventory of municipal greenhouse gas emissions. This inventory was conducted using Local Government Operations Protocol with a baseline year of 2008. Greenhouse gas emissions were calculated for the following sources:

- Electricity (kWh) used by select sectors of the municipal government; select government buildings; and street lights;
- Fuel (gallons) used by city-owned vehicles;
- Natural gas (therms) used by select government buildings and sectors; and
- Carbon Dioxide per square foot (CO_2/ft^2) in city buildings.[1]

Figure 1: 2016 CO_2 Emissions from Internal Operations (tons)



In the most recent year, total emissions from internal operations equal 144,477 tons of CO_2. This is up 0.74% from the previous year's emissions, but still down just over 6% since the baseline year of 2008. The largest contributor to the emissions total is the electricity use by municipal operations, making up 82% of the total. The figure to the left demonstrates the percentages of the total that electricity (green), natural gas (orange), and vehicle fuel (gray) contribute.

We hope that the contents of this inventory helps to demonstrate areas in which there are further opportunities to increase our energy and resource efficiency in the future.

[1] This calculation is new to this annual report due to reporting tools such as CDP using CO_2 per ft^2 as the standard measurement for greenhouse gas emissions.

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STAR Communities and CDP Reporting

In recent years, the Office of Sustainability has put an emphasis on the use of reporting tools for annual data tracking. Two of these tools that have proven to be useful are STAR Communities and CDP Reporting. These reporting tools, while different in terms of scale, are both helpful in keeping track of data relevant to the sustainability of the City of Winston-Salem.

STAR COMMUNITIES

In 2016, the City of Winston-Salem became a member of the STAR Communities Rating System (STAR) through the Leadership STAR Community program. Winston-Salem was one of four communities in the Spring 2016 Leadership program participating in STAR version 1.2. The other communities that participated were Ann Arbor, Michigan, Pinecrest, Florida and Dallas, Texas. Through the help of this program, our city will now be able to regularly measure progress across social, economic, and environmental performance areas. STAR is the nation's leading framework and certification program for local sustainability, providing a standard of assessing the sustainability efforts of communities nationwide. This version's framework is made up of 7 goal areas, 44 objectives, and over 500 individual evaluation measures. The goal areas cover all facets of our community and include the following categories:

Built Environment	Climate & Energy	Economy & Jobs	Education, Arts & Community	Equity & Empowerment	Health & Safety	Natural Systems
Ambient Noise & Light	Climate Adaptation	Business Retention & Development	Arts & Culture	Civic Engagement	Active Living	Green Infrastructure
Community Water Systems	Greenhouse Gas Mitigation	Green Market Development	Community Cohesion	Civil & Human Rights	Community Health & Health System	Invasive Species
Compact & Complete Communities	Greening the Energy Supply	Local Economy	Educational Opportunity & Attainment	Environmental Justice	Emergency Prevention & Response	Natural Resource Protection
Housing Affordability	Industrial Sector Resource Efficiency	Quality Jobs & Living Wages	Historic Preservation	Equitable Services & Access	Food Access & Nutrition	Outdoor Air Quality
Infill & Redevelopment	Resource Efficient Buildings	Targeted Industry Development	Social & Cultural Diversity	Human Services	Indoor Air Quality	Water in the Environment
Public Spaces	Resource Efficient Public Infrastructure	Workforce Readiness		Poverty Prevention & Alleviation	Natural & Human Hazards	Working Lands
Transportation Choices	Waste Minimization				Safe Communities	

Image 1: STAR Framework

An eighth category, Innovation & Process, allows communities to get extra credit in areas where they excel and propose new credits to support the evolution of sustainability practice.

In four years, our city will revisit the assessment with the most recently published version 2.0. This updated version still has the same 7 goal areas, but has 45 objectives and over 550 individual evaluation measures.

As of February 2017, the city has reached a STAR certification of 3 STARS with a total of 258.4 total points achieved. Based on the results from this program, the categories that the city succeeded in the most were

Health & Safety (48.4 out of 100), Education, Arts & Community (49.2 out of 70), and Economy & Jobs (51.7 out of 100). On the contrary, those areas in which there is the most opportunity for growth include Climate & Energy (17.9 out of 100), Natural Systems (26.1 out of 100), and Equity & Empowerment (21.7 out of 100). Both Climate & Energy and Natural Systems had 2 objectives in which our community scored no points at all. Those specific objectives are Climate Adaptation, Resource Efficient Public Infrastructure, Green Infrastructure, and Invasive Species.

LEADING STAR COMMUNITY INDICATORS

STAR also recently developed an annual reporting tool called the Leading STAR Community Indicators in 2016. The Leading Indicators are made up of 21 metrics based on the STAR Community certification program. Any community can participate in the Indicator program without having participated in the certification program. The Leading Indicators are a way for participating communities to be able to compare sustainability achievements to other communities as well as monitor changes in data on an annual basis, rather than waiting for the next certification period. The City of Winston-Salem plans to participate in this reporting tool again in the future.

CDP REPORTING

The other reporting tool the City has been participating in is CDP reporting. We have been reporting as a community to the CDP since 2015, however 2017 will be the first year the community's data is public. This reporting system is a global disclosure system that enables companies, cities, states, and regions to measure and manage their environmental impacts. Cities can report on different aspects of environmental data on an annual basis in order to better manage emissions, improve resilience, and protect from the growing impacts of climate change. Over 500 cities are now participating in the reporting process.

Personal Electric Vehicle (PEV) Infrastructure

Beginning in 2012 with the first Personal Electric Vehicle (PEV) charging station at the Old Salem roundabout, the city has been focused on moving forward in vehicle electrification options. The City of Winston-Salem has been working with national, state, regional and local entities, including utility and PEV equipment providers, to develop this type of infrastructure for the community. Since 2012, the city has added two PEVs to its fleet, along with electric vehicles for parking enforcement purposes.

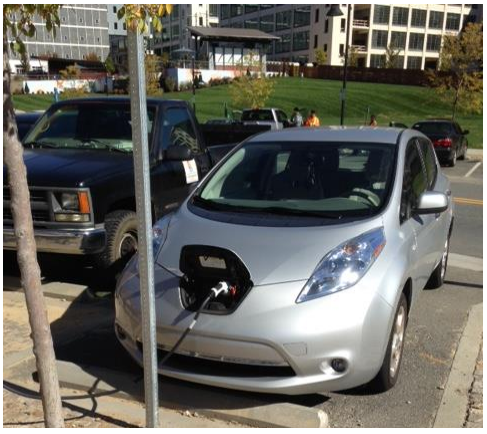


Image 2: New charging station at Patterson Avenue and 5th Street location.

Additionally, the city has been working with Piedmont Authority for Regional Transportation (PART) and Duke Energy in providing new PEV charging stations throughout Winston-Salem. In early 2016, one new PEV Charging Station was installed at Patterson Ave and 5th Street across from Bailey Park with a grant provided under the direction of PART. In February 2017 a new PEV Charging Station was brought online at the city's 4th Street and Church Street parking garage for the use from the city fleet, downtown businesses, and visitors to our city.

Municipal Greenhouse Gas Emissions

TOTAL CO_2 EMISSIONS

Total CO2 Emissions From Internal Operations (Tons)				
	Electricity	**Natural Gas**	**Vehicle Fuel**	**Total**
2008	131,897	3,625	19,015	**154,537**
2009	126,850	8,050	18,294	**153,194**
2010	122,560	7,300	20,532	**150,392**
2011	121,291	6,800	20,507	**148,598**
2012	122,000	6,980	20,853	**149,833**
2013	114,786	6,065	19,075	**139,926**
2014	116,032	6,113	19,409	**141,554**
2015	118,902	5,500	19,010	**143,412**
2016	118,727	6,033	19,717	**144,477**

Table 1.

9-Year Total GHG Emissions Reduction for Municipal Operations **6.3%**

In July, 2008, City of Winston-Salem issued the Greenhouse Gas (GHG) inventory which peaked at 154,537 tons in 2008. GHG emissions were reduced to 139,926 tons in 2013, but have steadily increased over the past three years to 144,477 tons in 2016, which is still 6.5% lower than in 2008. Total GHG emissions are expected to increase in 2017 as a result of the increased building square footage associated with the current capital projects under construction or recently completed plus the completion of the Muddy Creek Wastewater Treatment Plant upgrades.

It should be noted that the original 2008 report GHG Inventory report utilized a multiplier of 2.1 pounds per kWh of electricity to reflect the marginal CO_2 output of coal fire generation rather than the average for all generation, which was approximately 1.05 lbs. /kWh for Duke Energy since approximately 50% of their electric energy was generated with nuclear fuel. Duke's use of coal fired generation has decreased significantly since 2008 so Duke's CO_2 output has been significantly reduced. Nevertheless, the 2.1 lbs/kWh multiplier continues to be used in the attachment to maintain consistency with previous reports.

The Utilities and DOT Departments create over 84% of all GHG emissions due to water/sewage pumping and street lighting where there is no relation to building square footage. The Entertainment areas such as the Fairgrounds and Bowman Gray Stadium and dominated by event energy that takes place outside of the buildings. General fund buildings contribute less than 10% of GHG emissions due to electricity and natural gas use.

CO_2 PER SQUARE FOOT

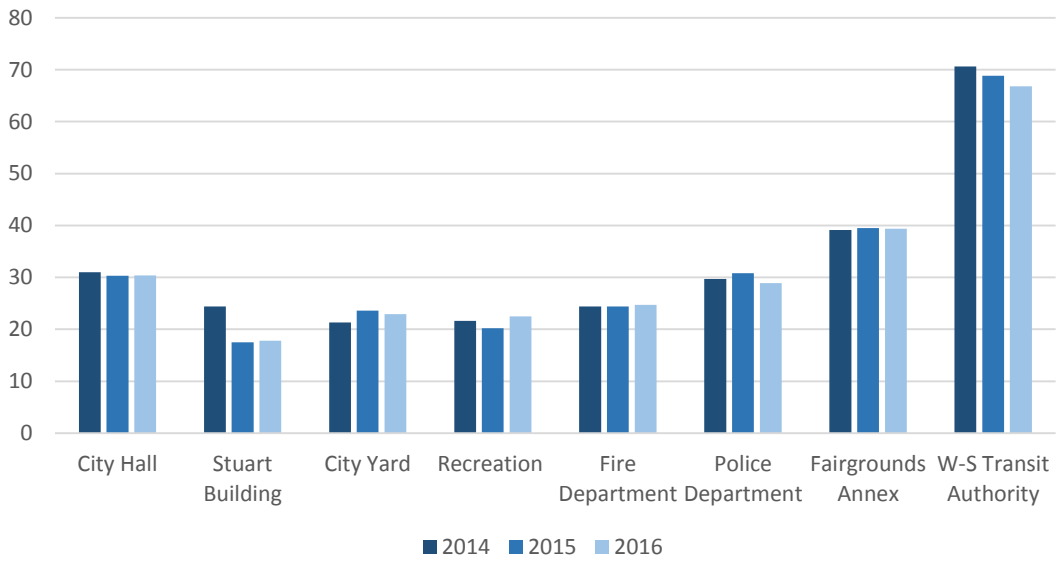
Carbon dioxide per square foot is a new measure included in this sustainability report. This measure is quickly becoming the standard for sustainability reporting nationwide and is used in reporting tools such as the CDP and STAR Indicators report. The total CO_2 per square foot within municipal operations can best be broken down among several department categories with several specific buildings that are summarized below for 2016 in Table 2 and Figure 2. The average CO_2 per square foot for the City's buildings is

approximately 26.8 pounds per square foot. (This average would be less than 13 pounds/sqft using current Duke Energy multipliers.)

Pounds of CO_2 per Square Foot in City Buildings					
	Total Square Feet	**2014**	**2015**	**2016**	**% Change**
City Hall	71,125	31	30.3	30.4	-0.96%
Stuart Building	152,315	24.4	17.5	17.8	-13.28%
City Yard	156,350	21.3	23.6	22.9	3.92%
Recreation	227,362	21.6	20.2	22.5	2.45%
Fire Department	118,343	24.4	24.4	24.7	0.61%
Police Department	266,363	29.7	30.8	28.9	-1.23%
Fairgrounds Annex	108,847	39.1	39.5	39.4	0.38%
W-S Transit Authority	44,970	70.6	68.8	66.8	-2.73%

Table 2: The pounds of carbon dioxide per square foot presented in the table is calculated using the combined numbers from electricity, natural gas, and annual CO_2 emissions per building.

Figure 2: Pounds of CO_2 per Square Foot in City Buildings



Electric Energy Use

The city purchased 166,450 fewer kilowatt-hours (kWh) in 2016 than in 2015. The greatest electric energy reductions occurred in DOT since usage was reduced due to the sale of the Center City Deck (260,000 kWh), LED lighting upgrade in the 4th/Church Deck (350,000 kWh) and the 600,000 kWh reduction on the street light bill due to Duke's upgrade to LED fixtures. Electric energy increases in 2016 resulted from the opening of the Lowery Street Operations Center. Electric energy increases had previously been expected from the Muddy Creek Wastewater Treatment Plant upgrades, but those increases are now expected to be realized after mid-2017. Additional increases in 2017 will result from the opening of the various capital projects under construction with noticeable increases resulting from the opening of the three police district offices and the Beaty Training Center extension. See Figure 3 for a breakdown of electricity use by sector, and Figure 4 for the summary of City Hall energy use.

Figure 3: 2016 Electricity use by Sector

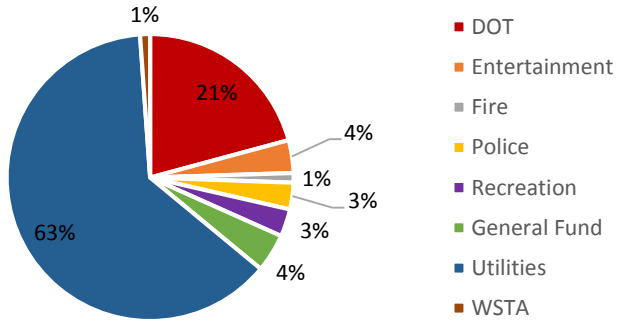
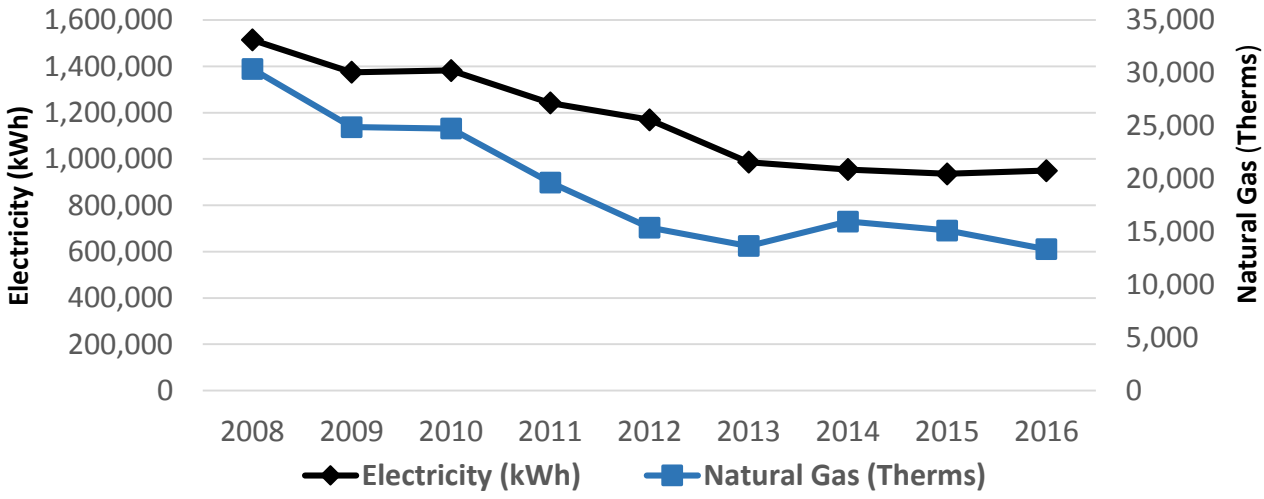


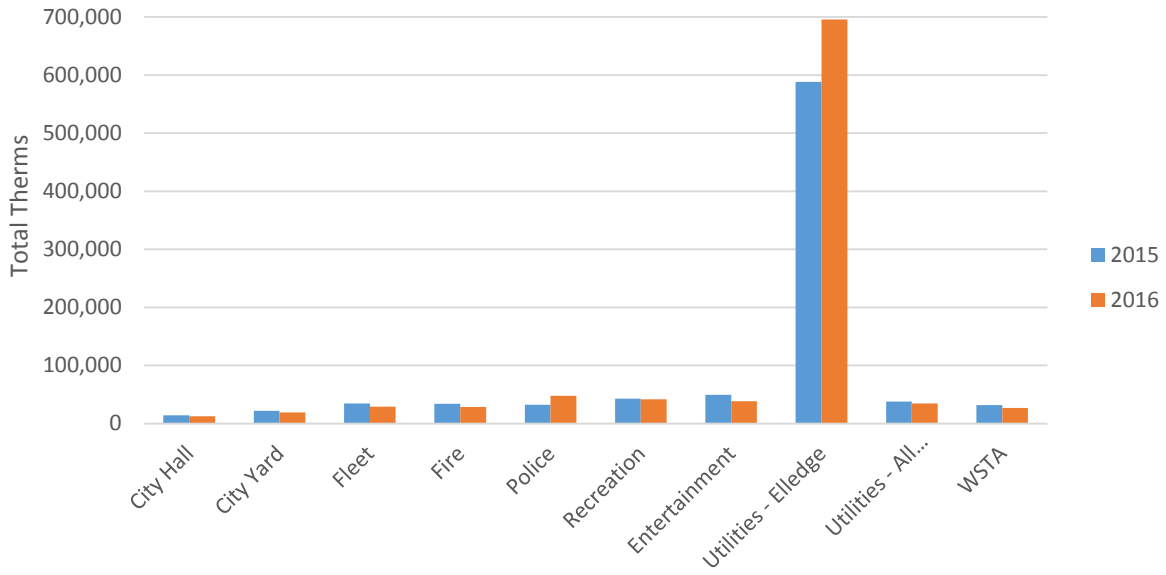
Figure 4: City Hall Energy Usage



Natural Gas Use

In 2016, there was decreased use of natural gas in city buildings, which is reflected in every department category except Police and the Elledge Bio-Solids Dryer. The Public Safety Center utilized 15,000 therms more than in the previous year and the dryer used 18% (107,000 therms) more natural gas than in 2015. The Bio-Solids Dryer consumed 71% of all natural gas required for City operations in 2016. Refer to Figure 5 to see how natural gas use changed between 2015 and 2016. Natural gas use in 2017 is expected to increase due to the full year operations of the Lowery Street building, the Beaty Training Center expansion, the police district office openings and the Muddy Creek Wastewater Treatment Plant upgrade.

Figure 5: Municipal Natural Gas Use



Energy/Greenhouse Gas Tracking

A tracking tool often used to evaluate performance of either new equipment or major upgrades to heating and cooling systems within the City of Winston-Salem is known as degree-days. The two main uses for degree-days in buildings are:

- to estimate energy consumption and carbon dioxide emissions due to space heating and cooling for new build and major refurbishments
- for on-going energy monitoring and analysis of existing buildings based on historical data

While the formula can be a little difficult to understand, simply translated, degree-days are calculated from the difference between a reference base temperature and the average temperature of the day. When we are below that base, energy, along with greenhouse gas, is being generated for heating (a heating degree-day). When we are above a base temperature of 60 degrees we are producing cooling which generates energy and greenhouse gases for cooling (a cooling degree-day).

Cooling degree days were 17% higher than average over the past year resulting in greater air conditioning usage in city buildings than normal. Heating degree days were 6% below average resulting in decreased natural gas use in the city's buildings. See Figure 6 below for the summary of heating and cooling degree days since the baseline year of 2008.

Figure 6: Degree Days