



City of Durham  
General Services Department  
Energy Management  
2017 Annual Report

July 19, 2017

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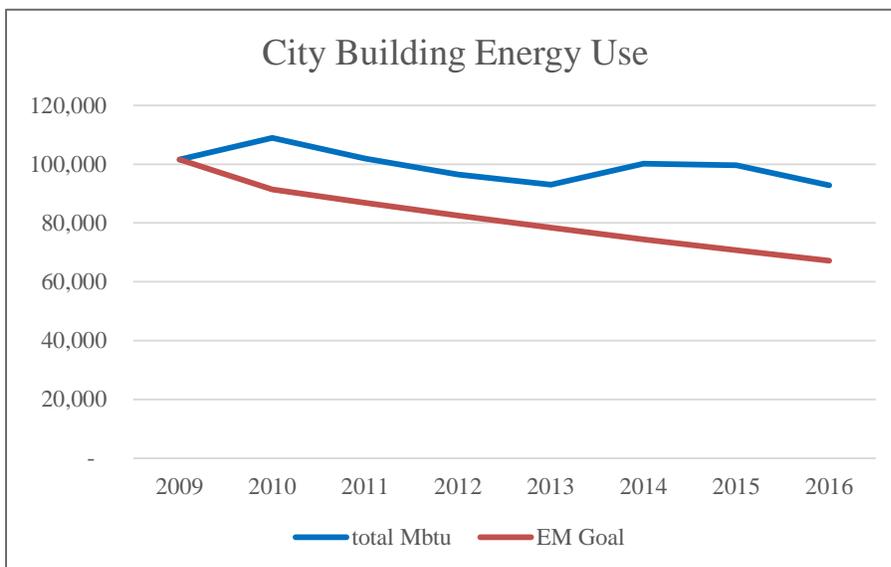
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## EXECUTIVE SUMMARY

The City of Durham established an Energy Management (EM) Program in 2009 in order to promote energy conservation in City-owned facilities and to support the Durham Local Action Plan for Greenhouse Gas Reduction. The EM program strives toward the efficient, cost effective, and environmentally responsible use of energy throughout our City-wide operations.

Since 2009, electricity and natural gas energy use at City-owned and operated buildings has decreased by 9%, with significant savings seen at the Fleet Management facility, Solid Waste Management Administration building, and other buildings that have received Energy Conservation Upgrades.



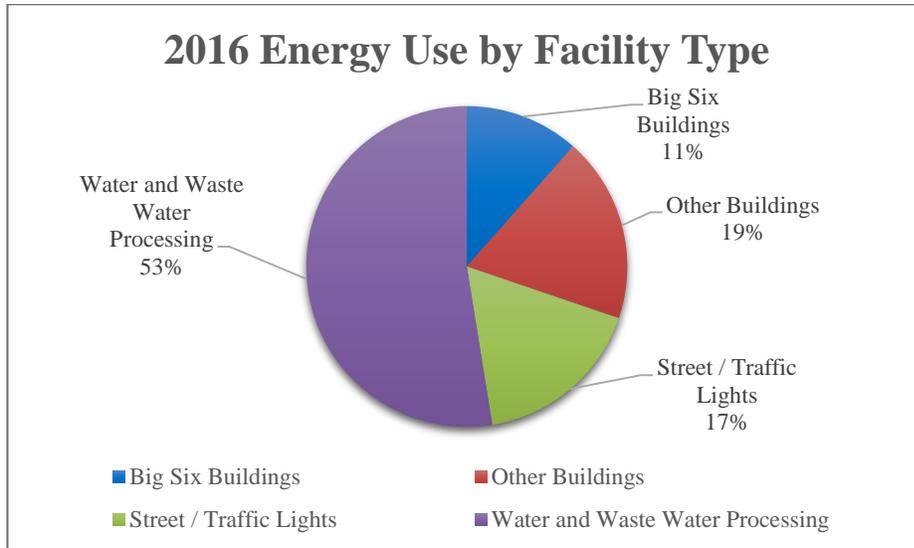
**Energy Use at City-owned and operated buildings has decreased by 9% since establishing the Energy Management Program in 2009.**

*An unusually cold January 2014 led to increased energy use for many City buildings and a winter high peak electric demand for Duke Energy. This was followed by the hottest summer on record in 2014. This increased cooling and heating demand is reflected in the chart in the FY 2014 and FY 2015 energy use.*

The City's Energy Management Policy, adopted in 2009, outlines an Energy Management Reduction Goal of 10% the first year and 5% each year thereafter as reflected in the above chart.

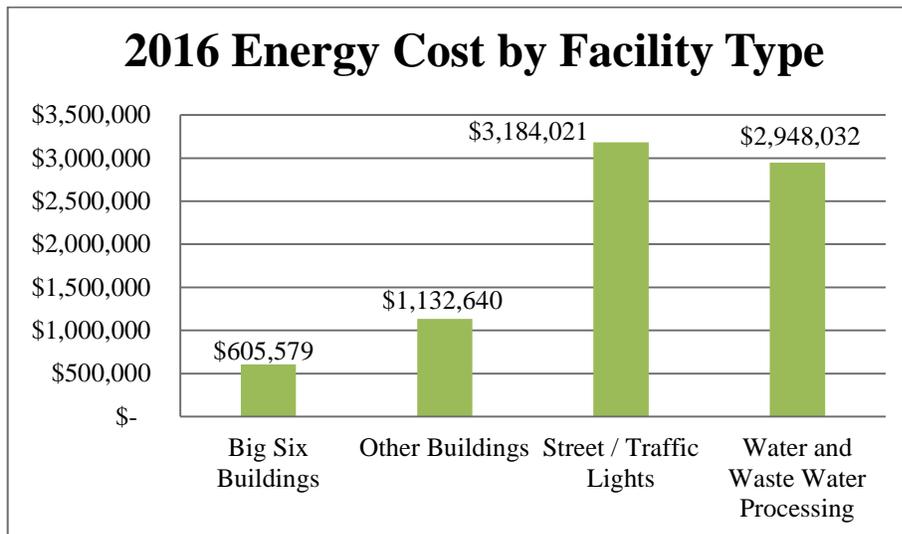
Through Capital Improvement Projects, ongoing preventative maintenance, and occupant education and energy savings actions, we have seen and will continue to realize energy savings at our City-owned and operated buildings.

In addition to buildings, water processing and street lights / traffic lights are major energy users for the City. The chart below shows the electric and natural gas energy use at all the facilities for 2016.



**Water and wastewater processing are critical functions provided by the City and use a significant amount of energy.**

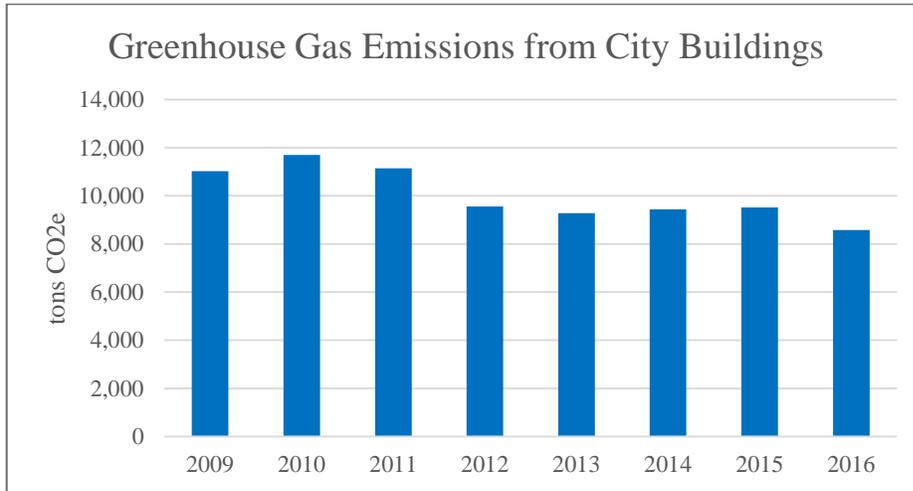
*The “Big Six” Energy Using Buildings (City Hall, Solid Waste Management Administration, Fleet Management, General Services, Fire Administration Complex, and FS #2) were identified for Energy Saving Projects in 2009. 110 other buildings account for 19% of the Total Energy Use.*



**The City of Durham Transportation Department converted Traffic Lights to LED in 2009, saving on electricity costs.**

*Although the electrical use of Street Lights and Traffic Lights are only 17% of the total City Energy Use, because of the electric utility rate structure, the cost is 40% of the total City Energy Bill.*

The City-County Sustainability Office implements Durham's Greenhouse Gas Emissions Reduction Plan. Greenhouse gas emissions contribute to the greenhouse effect by absorbing infrared radiation and include carbon dioxide and chlorofluorocarbons. Adopted in 2007, the plan calls for a 50% reduction of greenhouse gas emissions by government by 2030.



**Durham was the first community in North Carolina to adopt a greenhouse gas reduction plan.**

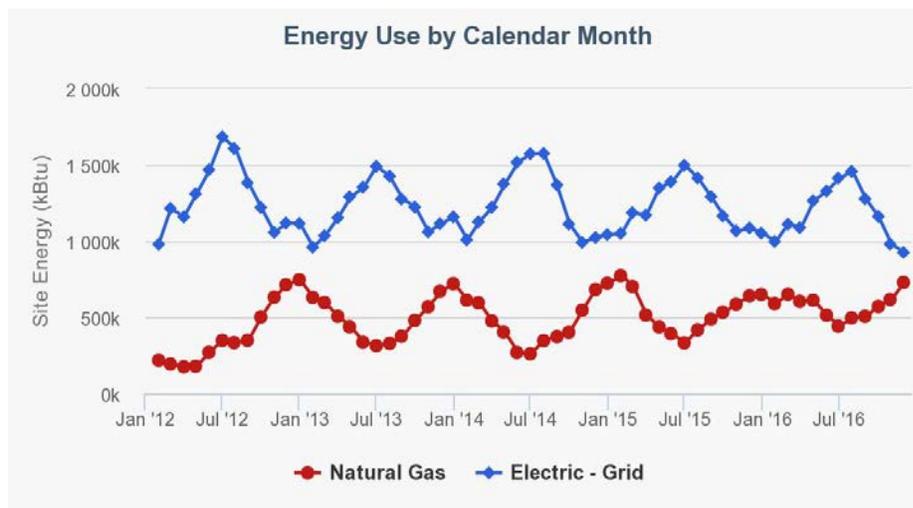
*Since 2009, the greenhouse gas emission from city buildings has decreased by 22% due to facility upgrades that use less energy, cleaner energy production, and greater awareness by employees of the importance of saving energy.”*

## SUSTAINABILITY AND ENERGY MANAGEMENT POLICY

The Sustainability and Energy Management policy, adopted in 2009, has been the City's Energy Management Team guideline for the Energy Management Program. The EM team is responsible for implementation of the policy which includes the following on-going actions:

- **Educate all members of the organization:** In 2016, the City implemented a Duke Energy Program called Smart Energy in Offices, which is an employee engagement and education program. This has resulted in increased awareness and behavioral change for office employees in twenty five departments spanning nine buildings.
- **Identify, publish, and establish action changes needed to achieve energy reduction:** By partnering with Duke Energy with the Smart Energy in Offices program, we have identified action changes that employees can incorporate to save energy every day. The program focuses on behavioral changes and motivates employees through fun competition.

- **Establish internal departmental objectives and processes to achieve energy reduction goals:** The City of Durham Departments of General Services (GSD) and Water Management each have had detailed studies performed to identify potential Energy Conservation Measures (ECM's) at their respective facilities and have implemented many of the ECM's.
- **Coordinate with GSD on future energy saving Capital Improvement Projects (CIP):** GSD works closely with the Fire Department, Fleet Management, Parks and Recreation, Transportation, Police, and other City Departments to identify and implement Energy Savings projects and to ensure planned projects incorporate ECM's to meet the City's goals.
- **Monitor, record, report, and display energy consumption on a monthly basis:** The Energy Management Team is using the Department of Energy's Energy Star Portfolio Manager to record gas and electric consumption on a monthly basis for our higher use buildings. The Portfolio Manager is an on line tool created to measure and track energy consumption and greenhouse gas emissions. In 2015, we began monitoring our eleven highest use facilities, (including City Hall, shown below) and in 2016 expanded to include 45 facilities.



**Energy Star Portfolio Manager shows historical energy use and provides tracking of energy consumption.**

*City Hall Monthly Energy Use Chart from Energy Star Portfolio Manager*



*City Hall envelope improvements added insulation and modernized the 1978 building.*

## SUPPORTING DURHAM'S STRATEGIC PLAN

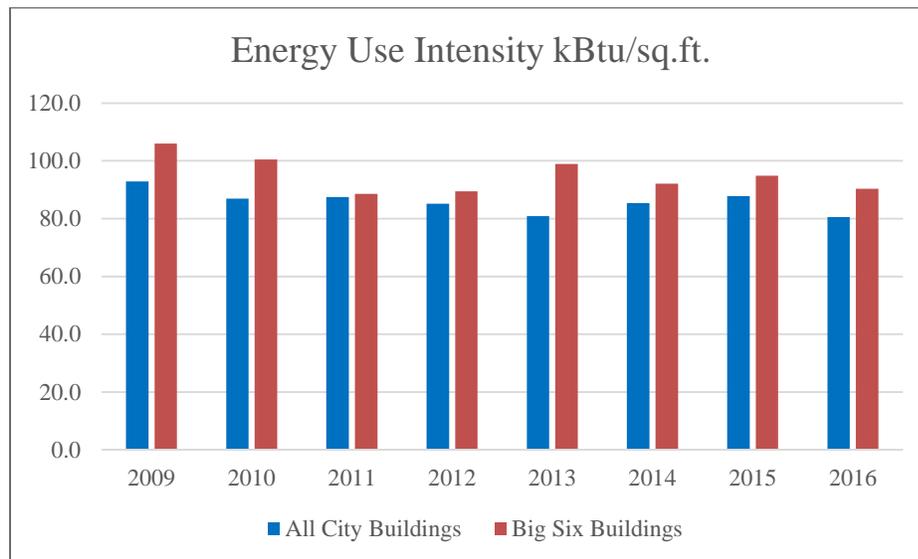
The City of Durham Energy Management Program supports the City-Wide Strategic Plan which can be found on the City website here:

<http://www.durhamnc.gov/StrategicPlan/goals>

There are five Strategic Plan Goals and the EM Program primarily supports Goal Five: **Stewardship of The City's Physical and Environmental Assets** through an objective to: "Protect natural resources by limiting the environmental impact of city operations and fostering community partnerships".

The EM team tracks the environmental impact of city operations through several key indicators including a measure of the energy use per square foot of the top energy use "Big Six" City Buildings. These buildings include: City Hall Complex, Solid Waste Management Administrative Building, Fleet Management, General Services, Fire Administration Complex, and Fire Station #2.

Energy Use Intensity (EUI) is a measure of electricity and natural gas use per square foot of building area. The chart below shows the EUI trend for all City-owned Buildings and for the Big Six:



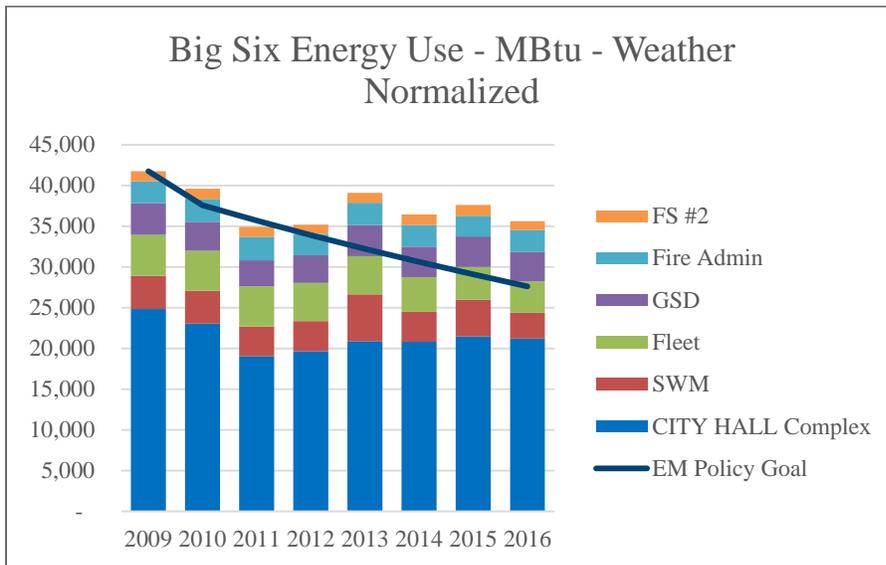
**Goal Five Objective:**  
Protect natural resources by limiting the environmental impact of city operations.

*Since 2009 there has been a 15% EUI reduction in the Big Six Buildings and a 13% EUI reduction in City Buildings overall. These reductions are the direct result of on-going energy saving improvements and employee awareness programs.*

## 2016 HIGHLIGHTS / ACCOMPLISHMENTS

### ENERGY DATA TRACKING AND ANALYTICS

A major Energy Management Team initiative for 2016 was implementation of Energy Star Portfolio Manager. This free EPA sponsored tool allows the City to track electric and natural gas use on a “weather normalized” basis. Weather normalization adjusts energy use data so it can be compared to energy usage in other years over a long period, and can show the impact of energy improvements independent of the weather variation from a “normal” year.



**Additional projects planned for Fire Admin and City Hall Complex will further reduce Energy Use at the City's “Big Six” buildings.**

*As of December 2016 the “Big Six” facilities have reduced energy use by 15% compared to 2009*



*Envelope and Lighting Improvements at City Hall*

*LED Pole Lighting Installation at Fire Administrative Building*



## **FACILITY ENERGY IMPROVEMENTS**

Since 2012, the EM program has focused primarily on energy use reduction at the “Big Six” Buildings, which are 6 of the City’s high energy use buildings. These 6 facilities were identified because together they make up 37% of the City’s building energy use and have a high Energy Use Intensity (EUI).

As of December 2016, each of the “Big Six” buildings has reduced energy use compared to 2009 as shown in the chart below.

| Facility                                     | % Change in Energy Use since 2009 (weather normalized) |
|--|--|
| Fleet Management                             | -23.5%   |
| Solid Waste Management                       | -22.0%   |
| City Hall / Annex Building / Fire Station #1 | -14.7%   |
| Fire Station # 2                             | -13.3%   |
| General Services                             | -6.0%  |
| Fire Administration Complex                  | -0.6%  |

*Fleet Management has realized a 23.5% reduction in electric and gas use following HVAC and controls projects. LED Lighting was installed throughout the complex in December 2016, so additional significant savings are anticipated for 2017.*



*Solid Waste Management Administrative Building has reduced energy use by 22% since 2009 due to new Variable Frequency Drives and a new chiller. Additionally, a new boiler and HVAC controls were installed in late 2016, and so additional energy savings is expected.*

*Historic Fire Station #2, built in 1950, is the City's highest energy use Fire Station in part because it is the only station with a hot-water boiler heating system. HVAC upgrades in January 2016 have resulted in an energy use reduction of over 13%.*



A summary of capital improvements at the 6 facilities and realized savings is shown below. Over \$518,000 has been saved on utility bills since 2009 at the Big Six Buildings.

| Facility     | 2016 Energy Cost | Completed EM Projects | Planned and Funded EM Projects | Total Savings since 2009 |
|--------------|------------------|-----------------------|--------------------------------|--------------------------|
| City Hall    | \$343,036        | \$399,613             | \$500,000 HVAC Ctrl            | \$419,688                |
| SWM          | \$51,416         | \$107,621             | Lighting                       | \$4,395                  |
| Fleet        | \$63,627         | \$173,304             | None planned                   | \$64,981                 |
| GSD          | \$64,921         | \$241,873             | Lighting                       | \$32,127                 |
| Fire Admin   | \$49,103         | \$111,106             | \$11,833 lighting              | (\$5,209)                |
| FS #2        | \$14,357         | \$181,905             | None planned                   | \$2,181                  |
| Other        |                  | \$14,862              | \$5,373                        |                          |
| <b>Total</b> | <b>\$586,460</b> | <b>\$1,230,284</b>    | <b>\$517,206</b>               | <b>\$518,163</b>         |

In addition to the Energy Management projects noted above, thirteen projects with energy systems such as lights, HVAC, and/or thermal envelope were reviewed for Energy Efficiency and code compliance, including planned LEED Silver certification for 2 facilities – Fire Station 17 and EMS Facility, and the Police Headquarters.



*Rendering of Fire Station #17, planned for LEED Silver Certification*

*Rendering of the new Durham Police Department Headquarters, currently under construction. It is planned to have LEED Silver Certification*



*Rendering of the new Durham Police Department Headquarters, view from Main Street*

### **DUKE ENERGY PROGRAMS**

Three programs with Duke Energy were implemented in 2015 and 2016. The first, Smart Energy in Offices, promotes energy-savings actions by both employees and facilities maintenance technicians. Nine City Office Buildings qualified for the program and representatives from 25 City Departments have been designated as team captains to help educate and motivate staff members. Seven of the buildings received awards for the combined efforts of building maintenance staff and occupants during the Smart Energy in Offices Campaigns. Four of the nine office buildings are also “Big Six” buildings and so have been targeted for energy improvements through Energy Management Project funding.

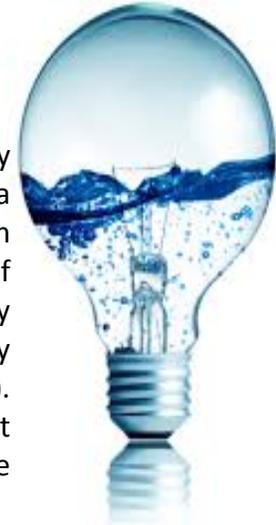
The second program, Small Business Energy Saver Program, is a lighting retrofit program where Duke Energy pays up to 80% of the cost of the labor and materials of the lighting installation. Lighting improvements are complete at four facilities and in process or under evaluation at seven additional facilities.

The third Duke Energy Program is the Smart Saver Incentive Program, which provides rebates for installation of Energy Star and other qualified equipment. The City has received rebate incentives for LED Lighting, lighting controls, efficient pumps, and

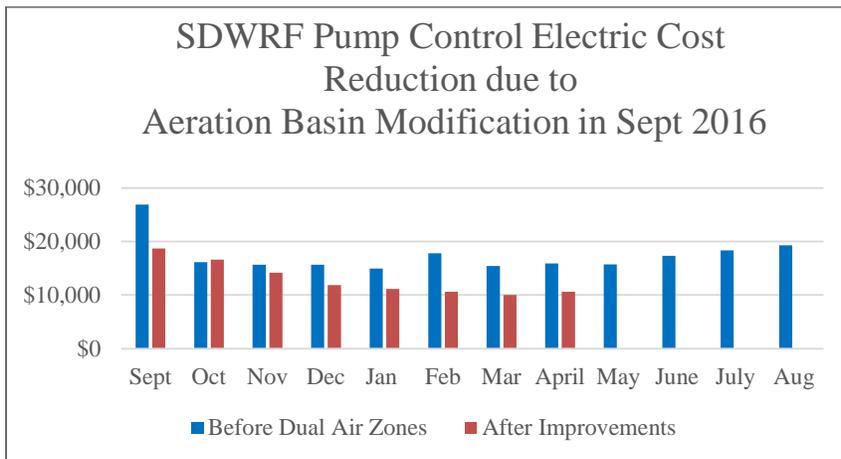
Variable Frequency Drive Controls for pumps. We are currently working with Duke Energy Subcontractors on Smart Saver Incentives at the new Fire Station #17, new Durham Police Department Headquarters and a renovation project for the Sign and Signal Shop.

**WATER MANAGEMENT ENERGY IMPROVEMENTS**

Water and wastewater services are a critical function of a healthy community. The Durham Department of Water Management utilizes a significant amount of energy in running the City’s 2 Water Reclamation Facilities and 2 Water Treatment Facilities. In 2011, the Department of Water Management evaluated energy use and developed an Energy Management Plan for both the North Durham Water Reclamation Facility (NDWRF) and the South Durham Water Reclamation Facility (SDWRF). The energy audit and evaluation showed energy saving opportunities at both locations which are planned or have been implemented over the past few years.



- Aeration basins were modified in 2016 with dual air zones in order to better maintain air set points. This helps with the amount of time staff can operate with one engine driven blower each day. The Pump Control Building Has seen an average electrical cost reduction of 24% each month since implementing this improvement.



**Pump Control Building has realized an average monthly electric savings of 24% since modifications in Sept. 2016.**

- Methane Gas, generated from the four digesters at the SDWRF, is captured and used to run the two engine-driven blowers continuously during the off-peak billing periods. One of the engines runs on the methane gas all day.

The full reports on The Department of Water Management's energy management master planning can be accessed here: [Water Management Energy Master Plan](#).

### **TRANSPORTATION DEPT: STREET & TRAFFIC LIGHTS ENERGY IMPROVEMENTS**

Streetlights and traffic lights make up approximately 22% of the City's Duke Energy electricity use. To reduce the impact of this necessary lighting, the City and the NC Department of Transportation have converted all of the traffic lights to LEDs, which are 80% more efficient than traditional lighting. 95% of the energy in LEDs is converted into light and only 5% is wasted as heat.

## **2017-2018 GOALS AND FOCUS AREAS**

The City of Durham Energy Management Team has established the following goals for the upcoming year:

- Participate in the creation of the Durham Environmental Sustainability Plan
- Participate in becoming a STAR (Sustainability Tools for Assessing and Rating) certified community
- Continue participation in Smart Energy in Offices Campaign
- Develop an effective internal design review process focusing on energy efficiencies for projects
- Expand efforts to install energy system controls in City owned facilities while developing smart analytics to guide maintenance and future project planning
- Identify additional facilities for energy savings upgrades.

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