

City of Durham 2018 Annual Energy Report



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Executive Summary

Energy use at City of Durham owned buildings has decreased by 18% since we established an Energy Management (EM) Program in early 2010. As part of this program, we promote energy conservation and support the Durham Local Action Plan for Greenhouse Gas Reduction.

One of the major accomplishments from 2017 is that Durham was certified as a 4-STAR Community through the STAR Communities sustainability assessment framework. The STAR certification provides a clear, data driven approach for tracking our sustainability efforts, including those related to energy efficiency and greenhouse gas emissions reduction. Additionally, in late 2016 we broke ground on the City's first LEED (Leadership in Energy and Environmental Design) building and today we have two recently completed LEED buildings and one in design.

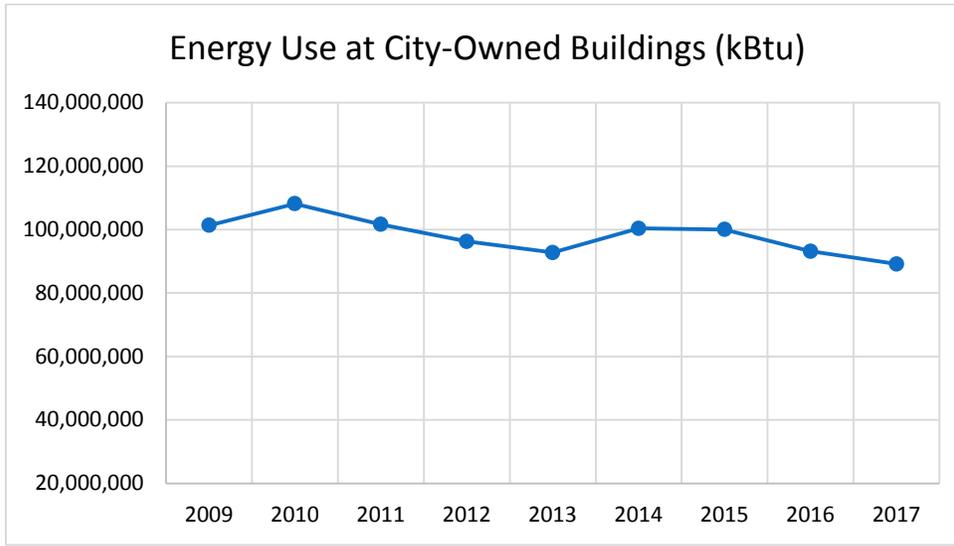


New Durham Fire and EMS Station #17 is planned for LEED Gold

As improvements have been made to our six highest energy use buildings, we have begun tracking energy use and identifying and implementing improvements at additional buildings.



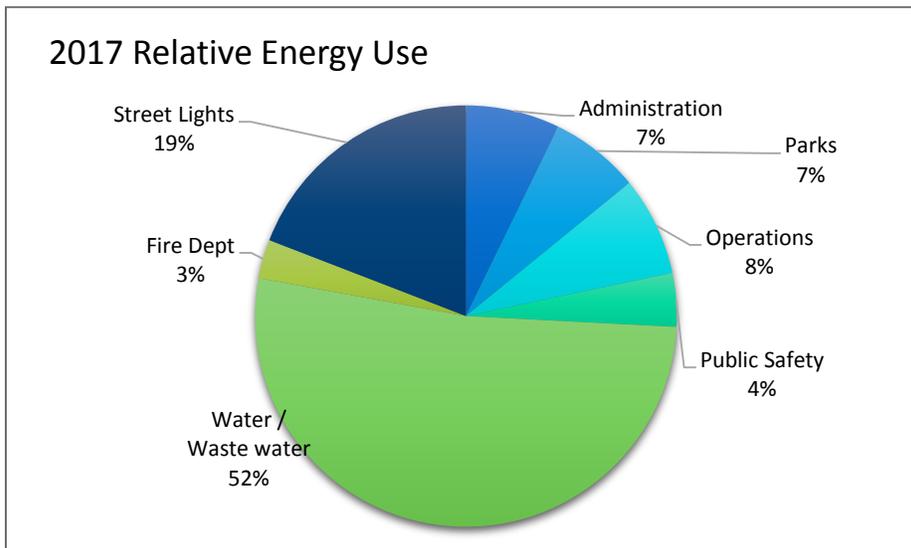
Energy Usage Trends – 2017



Energy use at City owned buildings has decreased by 18% since 2010.

Energy use at City owned buildings has decreased by 18% since 2010 and 4% from 2016 - 2017. Significant savings through Capital Improvement Projects (CIP) and Maintenance Replacement Projects at City Hall, Public Works Operations Center, Solid Waste Management, Fleet Management, and several Recreation Centers have contributed to the results.

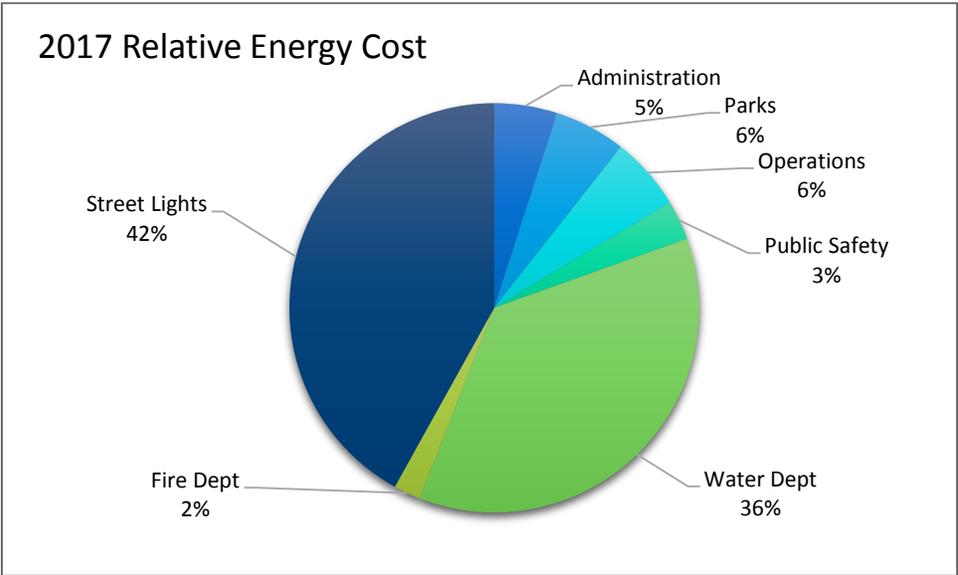
Energy Use, including natural gas and electricity and cost are tracked by Program Area to better understand opportunities for improvements. The City of Durham program areas include: Fire Department, Public Safety (Police and 911), Administration, Parks and Recreation, Operations, Water / Wastewater and street lighting / traffic lights.



Water Reclamation and Water Processing together make up 52% of the City's energy use.

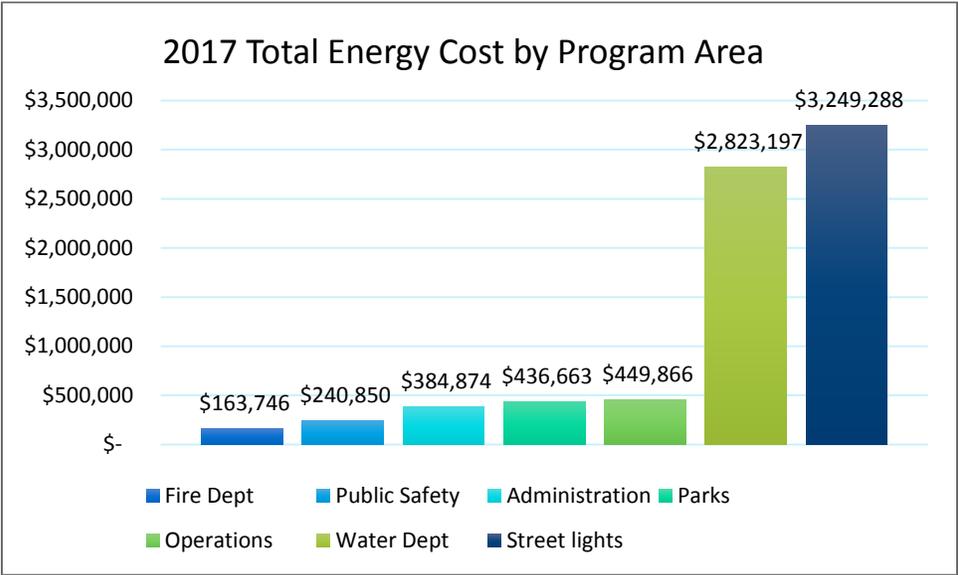
Water reclamation and processing make up the majority of the City's electric and natural gas energy use, at 52%. The Water Management Department continues to make improvements to save energy in the processing of water and wastewater.





Street lights make up 42% of the cost of the City's energy but only 19% of the actual energy use.

Because of the electric rate structure, street lights make up 42% of the cost of the City's energy but only 19% of the actual energy use. City Departments have been challenged through the City's strategic plan to reduce our total energy use and cost. A link to the strategic plan is found here: <https://durhamnc.gov/183/Strategic-Plan>



The City's electric and natural gas costs for 2017 totaled \$7.7 million.

The City's electric and natural gas costs for 2017 totaled \$7.7 million with street lights and water/wastewater processing comprising 78% of the total. Water processing utility costs have decreased steadily since 2015 as facility improvements have been implemented.

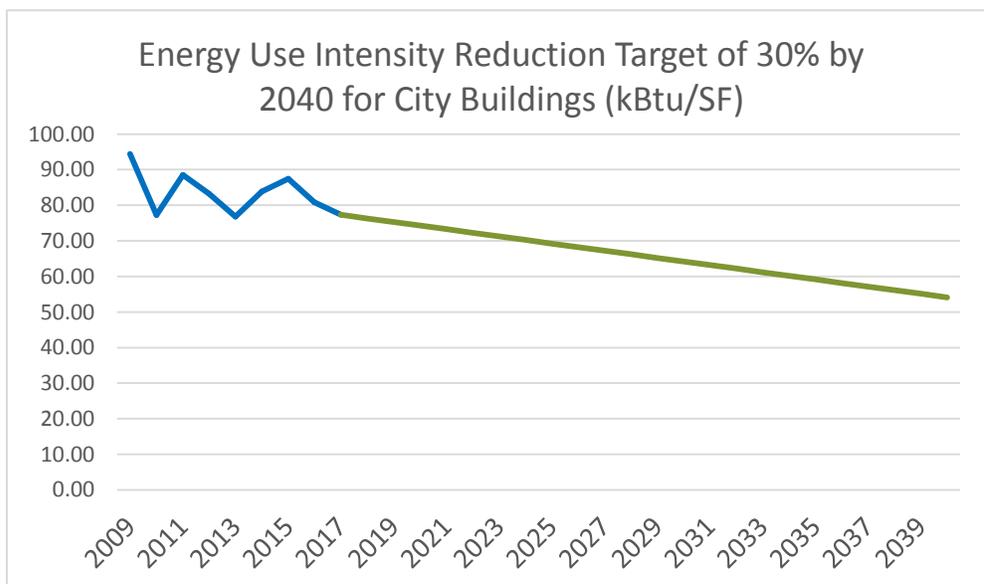


2017's Major Energy Management Accomplishments

Facility Building Upgrades

The General Services Department plans, provides, and maintains the City's facilities infrastructure which supports the quality of life and serves as a foundation of a healthy economy.

Energy use intensity (EUI) has been tracked since 2009. EUI is a measure of how much energy a building is using per square foot per year. It is a useful indicator as it allows energy managers to look at a building's performance through time and benchmark that performance against similar buildings. This measure is not currently weather-normalized, but rather reflects the actual energy use per square foot of City-owned buildings. We have established a goal to reduce the EUI by 30% by 2040 for City-owned buildings. The total EUI for City buildings in 2017 was 18% lower than the EUI in 2009 when the City Energy Management Program was launched.



The Energy Use Intensity for City buildings in FY17 was 19% lower than in 2009 when the City's Energy Management Program was launched.

General Services implemented lighting and HVAC energy savings projects throughout 2016 and 2017 in support of client departments and the energy management policy. Significant energy savings were realized at the following locations in 2017 compared to 2016 because of new energy saving measures:

City Facility	Energy Savings (BTU)	2017 Energy Cost	First Year Cost Savings	Percent Cost Savings	Lighting Project Cost
Edison Johnson Recreation Center	-20%	\$ 22,866	\$ 4,592	-17%	\$ 14,744
Fleet Maintenance Building	-7%	\$ 55,382	\$ 8,630	-13%	\$ 42,137
City Hall/ Annex / FS #1	-3%	\$337,162	\$17,937	-5%	\$ 209,528

Edison Johnson Recreation Center and the Fleet Maintenance Building both received new LED lighting through the Duke Energy Small Business Saver program in late 2016, and savings realized in 2017 will continue in the years to come. The City Hall complex, the highest energy use City building, received new LED lighting and occupancy sensors and energy efficient HVAC for the connected Fire Station #1.



Durham Fleet Management and General Services Departments worked together in late 2016 to replace office, warehouse, and maintenance bay lighting with energy efficient LED lighting. This helped reduce the energy use intensity and resulted in a 13% cost savings at this City building.



New LED lights and Fans have contributed to energy savings at the Fleet Maintenance Bay

Fire Station #2 and the Morreene Road Recreation Center each received new energy efficient HVAC systems. Solid Waste Management Administrative offices received new HVAC Controls. Each building realized an energy savings of over 20% compared with 2016.

City Facility	Energy Savings (BTU)	2017 Energy Cost	First Year Cost Savings	Percent Cost Savings	HVAC Project Cost
Fire Station No. 2	-27%	\$ 13,317	\$ 2,890	-18%	\$ 157,800
Morreene Rd Rec Ctr	-21%	\$ 7,147	\$ 415	-5%	\$ 23,900
Solid Waste Management	-21%	\$ 52,373	\$14,138	-21%	\$ 59,970

Ongoing lighting and HVAC projects are planned for City Hall in 2018-2019. The City Hall Complex (City Hall, Annex, and FS #1) had a high energy use intensity of 102.7 kBtu/SF in 2017 and so improvements in this complex are a main focus of the Energy Management Program.



Durham City Hall saves energy by using occupancy sensors for interior lights. Improvements in this facility are a main focus of the Energy Management Program.

Durham was recognized with a 4-STAR rating for National Excellency in Sustainability through the STAR Community Rating System (STAR) in November 2017. STAR is the leading framework and certification program for local sustainability. The framework includes over five hundred measures that evaluate communities across seven goal areas, including climate and energy and the built environment. More information about Durham’s STAR report can be found here:

<http://www.starcommunities.org/certification/certified-star-communities/durham-nc/>



Durham has been recognized with a 4-STAR Rating for National Excellency in Sustainability

Sustainability Report and Roadmap

In 2017, the City of Durham published its first Sustainability Report, highlighting accomplishments that make Durham a sustainable place to live. The Sustainability Report includes a timeline of major environmental milestones, key indicators, and achievements across City departments. This report helped inform the Sustainability Roadmap for the City, which identified overarching goals across the three central areas of sustainability – environmental, economic, and social. Under the environmental goal, climate and energy is a focus area, with a mission to lead the way in addressing climate change by minimizing energy use and increasing community and local government resource efficiency.

Throughout 2017, teams of employees, taking into account survey input from residents, worked to establish a Sustainability Roadmap, which was adopted in early 2018.

The Energy Management strategies that were established in the Climate and Energy section of the Sustainability Roadmap will guide the Energy Management program moving forward by focusing our efforts on key indicators and targets including:

1. Develop a fundable action plan by 2020 to reduce the energy use intensity in City owned buildings by 30% by 2040.
2. Update the Green House Gas Emission Reduction Plan by 2020, creating a fundable action plan towards carbon neutrality in City operations by 2040.
3. Achieve a 5% increase in fuel economy (MPG) compared to FY17 levels by 2020, and 1% per year by 2040.
4. Establish a Water Use Baseline for local government facilities and infrastructure and conduct regular reviews of water use data against the baseline.

Click on the link below to learn more about the sustainability roadmap:

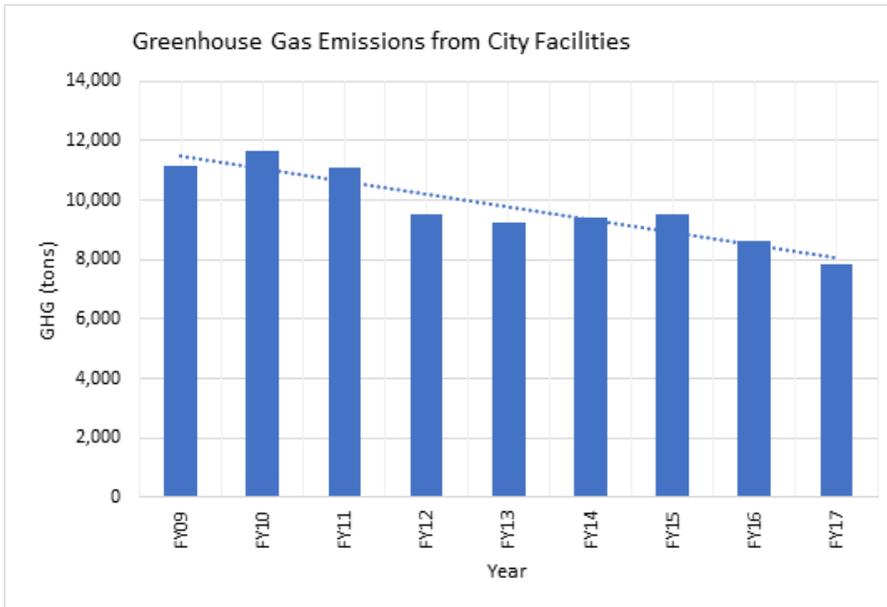
https://issuu.com/cityofdurhamnc/docs/codurham_sustain_bro_web?e=33941847/63100281

Greenhouse Gas Emissions Reduction

The City-County Sustainability Office tracks and reports energy use and greenhouse gas emissions (GHG) for City and County owned facilities, as well as overall community energy use from buildings, industry, vehicles, and other uses. They support the sustainability plan to update the Greenhouse Gas Emission Reduction Plan by 2020, creating a fundable action plan and developing strategies towards carbon neutrality in City operations by 2040.



Greenhouse gas emissions from City operations have decreased 8% between 2009 and 2017, with a 30% reduction for City-owned buildings. This is due in part to energy efficiency upgrades and in part to a shift towards less carbon intensive fuels at the point of electrical generation (Duke Energy power plants).



Greenhouse gas emissions from City-owned buildings have decreased 30% between 2009 and 2017.

Fuel Use Reduction

The City of Durham's Fleet Management is responsible for all services related to the City's more than 1,600 vehicles and equipment. The department is a member of the Triangle Clean Cities Coalition, which assists members in reducing petroleum use by promoting alternative transportation fuels.

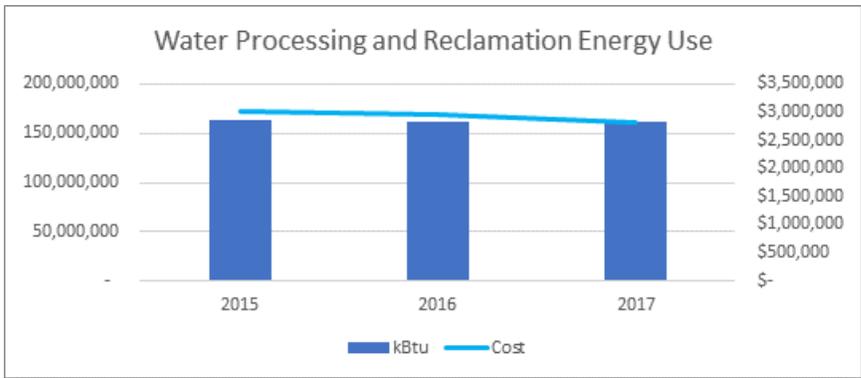


Durham's Fleet Management has developed and implemented strategies to reduce fuel use including educating employees on the idle reduction policy, fuel economy goals, and good driving habits. They continue to invest in modernizing the City fleet including purchasing hybrid, electric, and other low emission vehicles. Fleet has partnered with the Durham Fire Department to outfit 2 replacement units with Auxiliary Power Units that will reduce idle fuel consumption from 4.5 gallons per hour to 0.5 gallons per hour. These strategies have resulted in a 10% increase in fuel economy in the last two years.

Energy Use Reduction in Water Processing

Water Management continues to realize significant energy savings from improvements implemented at the South Durham Water Reclamation Facility with a modification to the aeration basins to install dual air zones in 2016. This resulted in an average cost reduction of 24%. Because of this change and other improvements and water processing and reclamation facilities, we have seen an overall water processing energy savings of 2% and a cost savings of 6% since 2015.





Water Management improvements resulted in an overall water processing energy savings of 2% and a cost savings of 6%.

LEED Projects and Strategies

Fire and EMS Station 17

Durham’s new Fire and EMS Station 17, located in the south-eastern part of the city, will be the City’s first LEED building, and was completed in 2018. The design and construction team are working to ensure compliance with the LEED 2009 areas of Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, Innovation and Design Process, and Regional Priority Credits. Solar Photovoltaic (PV) panels are planned for the roof of this building and will be the City’s first solar PV installation.



Durham Fire and EMS Station 17 will include the City’s first Photovoltaic system and is planned for LEED Gold.

Durham Police Headquarters and Emergency Communications Building

The certification goal for the Durham Police Headquarters project is LEED Silver. The overall emphasis has been focused on reduction of energy use in the building. One of the ways this will be achieved is by using all LED lights. This effort alone can contribute a 40% energy savings in the building energy



usage for lighting. In addition, lights will be equipped with occupancy sensors. Mechanically, a high efficiency air-cooled heat pump system will be used. This system promises to lower operating costs while providing a reliable back bone for a building that contains mission critical operations. This facility completed the construction phase in October, 2018.



The New Police Headquarters will replace the old inefficient building currently in use.

Water Management Facility Complex

Currently in design, the New Water Management Facility Complex (Mist Lake) will emphasize water conservation, resilience, and energy efficiency for the facility. This design strategy resulted in the selection of a geo-exchange heat pump system that uses the ground beneath the parking lot as a closed-loop well field to provide a stable source of heating and cooling for the site throughout the year. Modular high-efficiency heat pumps use stored thermal energy in the well field loop to produce chilled water and heating hot water for building HVAC loads, while also providing heat for the domestic hot water to serve staff locker rooms and equipment wash-down areas. This closed-loop system is anticipated to save close to 1,000,000 gallons of water a year that would otherwise be consumed by the open air condensing chiller.

Non-potable reclaimed water will be used for toilet flushing and vehicle washing, and high-efficiency plumbing fixtures are planned throughout the site to further reduce water usage.

Interior and exterior lighting will utilize low-watt LED light fixtures, while the use of skylights and clerestories provide natural daylight to circulation corridors, public gathering areas, and high-bay warehouse spaces. The project aims to achieve LEED silver certification with these energy efficiency strategies composing part of the facility's overall vision for sustainability. This facility is scheduled to break ground in 2019 and be completed by 2022

What's Next for 2019?

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

- Conduct research and planning for Climate and Energy Sustainability Roadmap Goals
- Continue efforts to reduce energy use intensity at 20 key City-owned buildings
- Monitor and communicate energy saving efforts and achievements
- Revise the City's Energy Management Policy as informed by the Sustainability Roadmap
- Pilot a Smart Building project to see how advanced, sensors, controls, and analytics can further improve Energy Management in City-owned buildings
- Implement best energy conservation practices as identified in the STAR assessment
- Update internal design review processes that focus on energy efficiency for projects



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