

City of Charlottesville Fiscal Year 2023 Annual Energy and Water Performance Report



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Introduction

The City of Charlottesville's Energy and Water Management Program (EWMP) monitors and manages energy and water usage of the City's municipal sites, including both local government and public schools. By taking intentional actions that improve efficiency, reduce the reliance on fossil fuels, and decrease greenhouse gas emissions from municipal sites, the EWMP is focused on supporting **Charlottesville's community-wide climate action goals to achieve a 45% reduction in greenhouse gas emissions by 2030 and carbon neutrality by 2050**. The EWMP tracks the energy and water usage at these facilities to gauge performance, coordinates with the City's Facilities Maintenance and Facilities Development teams on building operations and improvement projects, works with staff to develop strategies that expand the renewable energy footprint of buildings, and engages with staff, faculty, and students to help lessen their impact on energy and water usage.

Building on the comprehensive performance baseline presented in the FY2020 Annual Energy and Water Performance Report and subsequent reports (links provided in Appendix 1), Energy and Water Management Policy passed in 2019 (Appendix 2), and Resolution for Charlottesville City Schools Energy and Water Performance passed in 2019 (Appendix 3), this report outlines actions and the energy and water performance of over 70 municipal sites in the 2023 fiscal year (July 2022 – June 2023). The City's performance was reviewed on an account, building, and building group level, where building groups are categories of similar use types of the City's municipal facilities such as schools, fire stations, and offices. A list of all the City's facilities and building groups included in this report is provided in Appendix 4.

Climate Action Plan (CAP)

In order to provide a framework for meeting the City's community-wide greenhouse gas reduction goals, the City developed a Climate Action Plan (CAP), which details strategies and actions that can be taken across the community, including municipal operations. This plan was presented to City Council on October 3, 2022, and on January 17, 2023, the CAP was formally adopted as an amendment to the City's Comprehensive Plan. The latest version of the CAP can be found on the [Climate Planning page](#) of the City's website.

The EWMP plays a critical role in facilitating the strategies noted in *Chapter 6 – Strategies and Actions: Municipal Emissions* of the CAP that focus on reducing municipal greenhouse gas emissions.

These strategies include:

- Reduce energy demand in existing buildings,
- Reduce energy demand in new construction,
- Achieve carbon neutrality for all electricity that is used by City facilities by 2030,
- Incorporate internal process adjustments to improve coordination effectiveness and collaboration on capital projects and planning.

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Reduce Energy Demand in Existing Buildings and in New Construction

To reduce the energy demand in our existing buildings, the City is implementing operational strategies and technology upgrades that seek to eliminate unnecessary energy usage and improve equipment efficiency in the municipal building stock. The resultant energy reductions from these changes in building equipment and operations will curb annual greenhouse gas emissions.

In 2008, the City adopted a resolution around green building practices that designated the use of the USGBC (U.S. Green Building Council) LEED (Leadership in Energy and Environmental Design) program to guide the design and construction of City facilities. Since then, seven facilities, including the Fontaine Fire Station and Smith Aquatics Center have achieved LEED certification.

However, to create a more cohesive standard throughout City facilities around existing building operations, maintenance, and new construction, the City is developing a comprehensive Green Building Standard that will further define and standardize industry best practices in green building and high performance buildings.

Achieve Carbon Neutrality for All Electricity That is Used by City Facilities by 2030

To reach the 2050 goal of carbon neutrality in City municipal operations, eliminating greenhouse gases associated with our electricity usage is a major step. As stated above, the City is working to reduce the amount of energy being used in building operations. However, electricity will still be necessary to run City buildings and therefore a solution to “clean” what is being used is required.

The strategies for becoming “carbon neutral” for all electricity used by City facilities (after reducing energy demand to the lowest required levels) include increasing the portion of electricity derived from renewable sources and purchasing renewable energy credits (RECs) or offsets through virtual power purchase agreements, for example. The base level of electricity used for certain facilities will likely increase as the City considers whole-building electrification (converting from natural gas-using equipment) and installs electric vehicle (EV) charging infrastructure.

As stated in previous Annual Energy and Water Performance reports, the City has installed solar photovoltaic (PV) systems at seven sites including two schools. To effectively install more onsite rooftop solar, the City is aligning with planned roof replacements to ensure that solar installations match with roof replacement schedules and lifespans. System size and cost will dictate whether funding can be secured internally (system owned outright) or whether a power purchase agreement (PPA) will be the better option. It is anticipated that both approaches will be utilized to pursue carbon neutrality. RECs and offsets may be necessary to reach carbon neutrality as the onsite solar will likely not produce all electricity needed to operate City facilities.

Incorporating Internal Process Adjustments to Improve Coordination Effectiveness and Collaboration on Capital Projects and Planning

Although projects that can improve efficiency, such as replacing HVAC equipment, have traditionally been a part of the capital improvement project (CIP) process, efficiency has not driven decision-making when choosing projects. If equipment is reaching end of useful life, replacement is prioritized and likely some efficiency gains can be achieved through advancements in equipment design, but it is a secondary benefit to just getting the heating, ventilation, and air conditioning (HVAC) systems or lighting function restored. However, as climate reduction goals become a driving need for the City, energy efficiency becomes a necessary criteria that needs to be met when making project decisions. The EWMP is working with internal decision-makers to make energy efficiency a priority when choosing new equipment. For

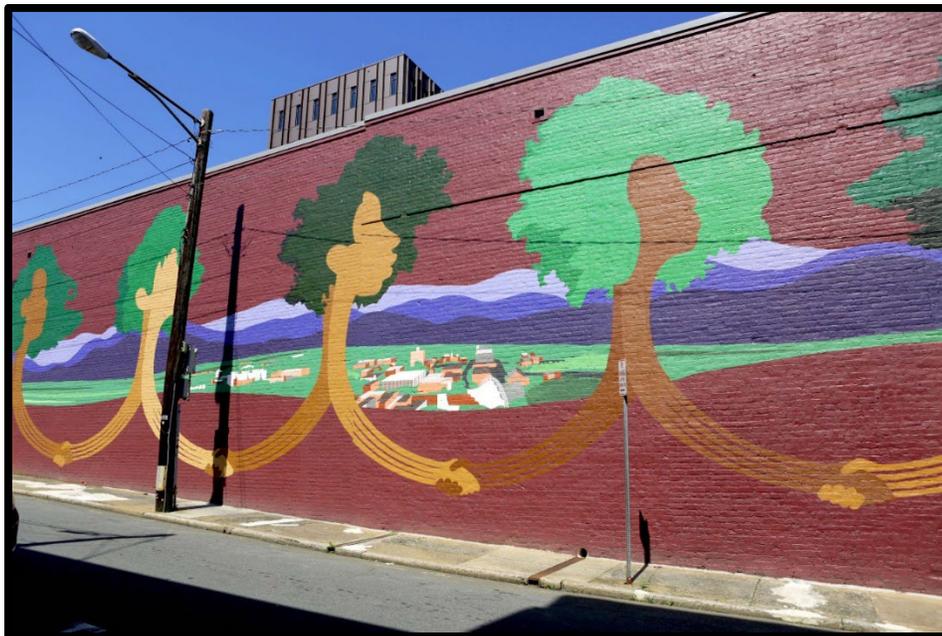
example, lighting upgrades have typically been performed as lighting burns out, but the City is transitioning to planning and budgeting for larger scale lighting upgrades to LED (light-emitting diodes), taking on a proactive stance rather than reactive.

Actions and Performance

Building off previously published data and information (Appendix 1 & Appendix 5), this report explores results and trends in FY2023 utility usage and cost data. The report incorporates the three focus areas identified to improve energy and water performance: operations, technology, and people. New to this report is the inclusion of performance targets and reduction goals aligned with the City's CAP.

The EWMP has established the following performance targets for the City's portfolio:

- Greenhouse Gas Goal
 - 45% reduction in Greenhouse Gas by FY2030
- Energy Goals
 - 30% reduction in Energy Use Intensity by FY2030
 - 3.75% decline in annual energy usage
- Water Goals
 - 30% reduction in Water Use Intensity by FY2030
 - 2% decline in annual water usage



Operations

The efficient operations of facilities represent the lowest cost but potentially the highest impact opportunities for achieving energy and water reductions, an area the City continues to emphasize. Efficient operations can be realized by reviewing the control and maintenance of heating, ventilation, and air conditioning (HVAC) systems, lighting, and plumbing in facilities and aligning these with the current needs of building occupants with the goal of running equipment optimally and efficiently.

Although, across the facility portfolio, occupancy was still lower than before the Coronavirus (COVID-19) due to hybrid working practices in some departments, most facilities returned to normal occupancy levels in FY2022 and remained steady through FY2023. As mentioned in the previous annual EWMP report, this mixture of occupied and unoccupied statuses throughout facilities presents the challenge of turning off portions of buildings that are unoccupied while supplying necessary cooling and heating to occupied areas because of limitations in HVAC system design and control capabilities. Where, in the past, whole buildings were occupied for more or less the same amount of time each day and required less control of specific spaces independent of the rest of the building, varied occupancy presents a scenario that called for more nuanced control that was beyond many system capabilities. This required testing of system settings to see if setbacks could be employed that affected operations in unoccupied areas while still allowing the main systems to continue operating normally. The Facilities Maintenance Division has continued to review building automation system (BAS) data in City and school facilities to find areas where this could be implemented.

In addition to this effort, monthly coordination meetings with Facilities Maintenance and Office of Sustainability staff discuss findings from monitoring energy and water data, providing another set of eyes on how facilities were “behaving” as operating schedules continued to fluctuate throughout the year. Office of Sustainability staff also continued monthly meetings with CCS administrative staff and quarterly communications with school principals to update on school performance, projects, and outreach strategies and to understand ongoing school activities and operational needs.

Strategies Implemented

Reviewing HVAC Schedules and BAS Settings to Eliminate Unnecessary Operation

Effective scheduling of HVAC systems means meeting occupant comfort needs while operating only the equipment necessary to serve the occupied areas. As mentioned above, it is not easy to do this in every facility. It depends on the location of occupants in the facility, HVAC zoning throughout the facility (HVAC design and BAS settings), and proper communication about what areas are occupied. Facilities Maintenance reviewed the BAS to adjust settings, such as temperature setbacks, to scale back operations where possible. Buildings behave differently to changing temperature conditions due to age and design, which causes varied abilities to maintain space temperatures and comfort throughout a facility. The team aims to manage these variances effectively to try to keep uniform space temperatures so that comfort can be maintained without wasting energy.

In FY2023, schools were mostly occupied and operating normally which made this easier to control but City buildings continue to vary in occupancy. School staff, City staff, and Facilities Maintenance continue to maintain good lines of communication regarding the needs of each municipal and school facility at any given time.

Demand-side Management – Load Shedding

Building automation systems (BAS) are a management tool that are installed in many City and School buildings. The City has implemented the programming of these systems to decrease the energy demand (“load”) at the facility once the BAS starts reaching a designated kilowatt (kW) threshold. This limits the amount of energy used at a facility automatically during times when the energy demand is high, such as at peak times throughout the day or throughout the year. Typically, energy “load shedding” occurs by changing the operations of equipment that use energy to lower the overall energy load at the facility. Equipment that is considered non-critical to facility operations is identified and is either shut off directly or temperature settings that control the equipment are adjusted to reduce its operation. Currently, this is in place at most schools and the EWMP continues to work with Facilities Maintenance to fine-tune the appropriate settings that trigger load-shedding events. The EWMP is evaluating the integration of this strategy at more facilities.

Adjusting HVAC Control Strategies

In an effort to improve operations and efficiency, the Facilities Maintenance team implemented an alternative strategy for operating the two chillers at Charlottesville High School. Typically, chillers have been run in a staged manner, where a single chiller operates at a time supplying cooling for the facility and then switches to the other chiller so that only one chiller is running at a time. This usually means chillers are operating at near full capacity to handle cooling demands. However, running both chillers in parallel at lower capacity (lower loads) so that the cooling demand for the building is shared by both chillers allows the chillers to run closer to their optimal levels and improve efficiency.

Strategies Planned/FY2024 Outlook

The EWMP will continue to monitor utilities and building operations to ensure that systems are only running when necessary. School operations during FY2023 had mostly returned to a typical pre-COVID schedule and although municipal buildings are still not to full occupancy levels due to hybrid work practices, this will likely continue going into FY2024. For the foreseeable future, city and school facilities will continue to have additional ventilation time outside occupied hours for COVID-19 mitigation, so electricity and natural gas usage will likely have an elevated base level compared to pre-COVID. This is to be expected and puts emphasis on balancing health strategies and managing energy usage through appropriate monitoring and scheduling operations.



Technology

Building equipment like HVAC, BAS/control systems, lighting, and plumbing fixtures continue to increase in efficiency and offer greater abilities to reduce energy and water usage. In previous years, the City has annually implemented projects that cycle in newer and typically more efficient systems that do help to improve the efficiency of facilities. The existing funding mechanisms have allowed for gradual upgrades of equipment over time that address equipment efficiency, but this is mainly focused on restoring functionality rather than improving efficiency. However, as mentioned earlier, energy and water efficiency are becoming more of a driver in project decision-making to meet the City's greenhouse gas reduction goals.

The EWMP continued to utilize the EnergyCAP Utility Tracking System among other software tools, including the Tableau Data Visualization tool and Systems, Applications & Products in Data Processing (SAP) to monitor and aid in managing energy and water usage. Several viewable EnergyCAP dashboards are available to various groups in the City. The data provided in this report can also be viewable and interacted with in an EnergyCAP dashboard outlined and accessible in Appendix 5.

Strategies Implemented

Installation of LED Lighting

With the improvements seen in LED technology, the City has made an effort to prioritize the specification of LEDs in place of conventional lighting technologies such as incandescent, halogen, fluorescent, and metal halide. The City has upgraded lighting systems by installing LEDs and lighting controls (e.g., dimmers and occupancy sensors) in municipal and school facilities by incorporating them into renovation projects where feasible, and as small, stand-alone projects.

- Renovations at City Hall in the City Manager's office included LED flat panels, LED recessed lighting, and occupancy sensors, photo-sensors, and dimmer controls. Additionally, the basement conference room had to be renovated because of water damage from a flood in 2023, which included replacing the lighting with LED panels.
- In the Public Utilities/Public Works Administration Building, the Public Utilities area, and the Public Service office were renovated to include LED panels with occupancy sensors and dimming controls.
- As part of a renovation in Greenbrier Elementary library, lighting was upgraded to LED and occupancy sensors, vacancy sensors, and photosensors were installed to control the on/off functionality and light levels.
- The Americans with Disabilities Act (ADA) classroom at Walker Upper Elementary was renovated to include LED panels with adjustable color temperature and lumen output to allow greater alignment of the lighting performance with the specific needs of the space.
- Electrical panels were updated at Charlottesville High School and a larger project to update lighting contactors and wiring that will ensure proper functionality of lighting started in FY2023 and will continue into FY2024.

The City will continue to standardize the use of LEDs and advanced lighting controls in future projects.

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Replacing HVAC Equipment and BAS

HVAC equipment replacement is typically a high-cost endeavor that is budgeted as far as 5 years in advance and is primarily focused on older equipment that is reaching the end of its useful life. In FY2023, the Facilities Maintenance team was able to implement projects that included HVAC equipment replacements as well as upgrades to BAS's that provide enhanced control functionality.

- The team completed the replacement of seven make-up air units at Walker Upper Elementary, which was a project that began in FY2021.
- Water source heat pumps were replaced at Walker Upper Elementary, Venable Elementary, and Juvenile and Domestic Relations Court.
- Smith Aquatics Center HVAC renovation was completed in FY2022 but an additional HVAC mini-split system was upgraded in FY2023.
- Johnson Elementary received a new HVAC mini split system.
- The team was able to renovate HVAC systems at the Community Attention Foster Family building, the Pupil Transportation building, and the Wheeling Building transitioning from a natural gas-only heating system to a heat pump system that has electric heating for improved efficiency. Natural gas heating is still available at these facilities but only used when outside temperatures drop below approximately 35°F.
- Venable Elementary received a new air conditioner and new cooling tower and condenser water pumps supporting greater cooling efficiency.
- The team replaced the chilled water pumps at the Public Works/Utilities Administration building.
- The City completed upgrades to the building automation systems at Clark Elementary, City Hall, and Crow Pool.
- Johnson Elementary had CO₂ monitors installed to better control CO₂ levels in coordination with outside air intake. Enhanced CO₂ monitoring allows the BAS to pull in only the amount of outside air that is needed, saving energy on heating and cooling excess outside air. Additionally, this aids in providing improved indoor air quality.

Building Envelope Replacement

The roof at Charlottesville High School is being replaced in three phases over three years: 2023, 2024, and 2025. The first phase was completed in summer 2023 and covers approximately 1/3 of the roof. Ultimately the new roof will prevent leaks and will improve the thermal efficiency of the roof. As the new roof is being installed, the City is planning to install more solar on the roof as phases are completed.

Project Rebate Programs Through the PJM Regional Transmission Organization

The City continued to participate in the Energy Efficiency program offered by the Pennsylvania, Jersey, Maryland (PJM) Regional Transmission Organization, the organization that manages the electric grid across portions of the Mid-Atlantic and Mid-West regions of the United States. Through this program, the City has received quarterly financial incentives for projects that improved energy efficiency of facilities, including a chiller replacement at Charlottesville High School, an air handling unit (AHU) replacement at City Hall, and rooftop heat pump replacements at Walker Upper Elementary.

The City has received over \$4,600 since joining the program and has a designated fund earmarked for energy and water efficiency to allocate these payments. The EWMP will continue to submit new, eligible projects for this program to capture additional funding to be reinvested into efficiency projects.

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Energy Performance Contract (EPC)

In FY2021 the City began the request for proposal (RFP) process to identify an energy services company (ESCO) to be selected for an energy performance contract (EPC). This project delivery model can involve alternative methods for financing and implementing efficiency projects. Projects can be scoped as a budget-neutral approach whereby an ESCO identifies and implements energy and water savings projects with a guaranteed annual utility savings that covers the cost of the projects.

In FY2022, the City selected an ESCO and began the process of performing technical energy audits of over 40 facilities to identify energy and water savings opportunities through upgrading HVAC, lighting, and water-using equipment. Additionally, the ESCO evaluated the solar potential at sites to identify appropriate areas to consider new solar photovoltaic installations. The Technical Energy Audit reports were delivered in FY2023, and the City is working through the process of finalizing the contract and getting the first project underway. These efforts are anticipated to streamline and enable vital upgrades that improve the energy and water efficiency of facilities on a large scale. Being able to complete building improvement projects based on energy efficiency and not just end-of-life equipment replacement is a key strategy for reaching the City's municipal emissions reduction targets.

ENERGY STAR Appliances & WaterSense Fixtures

As a requirement stated in the City's *Energy and Water Management Policy (Appendix 3)*, Environmental Protection Agency (EPA) ENERGY STAR and EPA WaterSense (WaterSense) labeled products need to be prioritized where economically feasible. In FY2023, water efficient fixtures identified to be installed as part of the EPC were installed in key building uses to ensure customer satisfaction and appropriate performance. There were no customer satisfaction issues with the water efficient fixtures identified as part of this effort. These fixtures included:

- WaterSense labeled toilets (1.28 gallons per flush (gpf)) at Charlottesville High School,
- WaterSense labeled urinal (0.125 gpf) at the Facilities Maintenance building,
- WaterSense labeled showerheads (1.75 gallons per minute (gpm)) at Fontaine Fire Station,
- Low-flow faucet aerators (0.5 gpm) were installed in the Facilities Maintenance and Public Works Administration building.

Dominion Energy Streetlight Replacement

The EWMP has been working with Dominion Energy, the electric utility provider for Charlottesville, to develop a plan for expedited upgrades of the streetlights leased by the City from Dominion to LED. The City has approximately 3,700 streetlights overall with the majority being metal halide, high pressure sodium, or mercury vapor lamps. Around 280 streetlights (of the 3,700) have been upgraded to LED due to fixture failure where Dominion automatically replaced with an LED. The City is proactively working with Dominion to expedite installation of LEDs and ensure that specific parameters are taken into account that help to align the LED fixtures selected with the needs of the location. The FY2024 budget includes \$600,000 in capital improvement program (CIP) funding to support this project.

❖ Tonsler Park Lighting Upgrade

In FY2022, the City worked with Dominion on a pilot project at Tonsler Park that upgraded 44 Dominion-owned fixtures to LED including colonial-style post top fixtures around the Tonsler Park facility, cobra head fixtures along the field walkway, and shoebox fixtures in the parking lot. This was completed in Fall 2023. This pilot helped the City understand the process for working with Dominion, the timeline variables that can affect the completion of a project (materials supply, Dominion contractor availability, projects from other jurisdictions in the queue), and the performance of the fixture options Dominion has available for selection. **The project reduced energy usage from lighting in the park by 41% and will reduce the monthly leasing cost by approximately 22%.**



Strategies Planned/FY2024 Outlook

Looking into FY2024, a number of projects started in FY2023 will continue to move forward including:

- replacing the lighting contactors and wiring at Charlottesville High School,
- replacement of unit ventilators and water source heat pumps at Greenbrier and Juvenile and Domestic Relations Court,
- design and engineering for a chiller replacement at Market Street Parking Garage and a cooling tower replacement at Jackson-Via Elementary School.

In FY2024, the City will work with Dominion Energy to initiate the LED streetlight upgrades across the City in a methodical way that will start with higher traffic arteries (as designated by Virginia Department of Transportation) and then move to residential areas. The City will batch the upgrades per Dominion guidelines with the anticipation that this will be a 2-3 year process for completion.

As mentioned above, we are in the process of finalizing the agreement for the energy performance contract and getting the first project underway, which will be replacing HVAC units in the main data center in City Hall Annex. We anticipate this project to begin in Fall 2024/Winter 2025. Simultaneously we are trying to secure funding through CIP and various grant opportunities to support larger projects at school and government facilities identified in the technical energy audits that will be implemented under the energy performance contract. The EPC will be a key method in reducing greenhouse gas emissions from the municipal and school building portfolios and in achieving the City's greenhouse gas reduction goals.

People (Behavior)

Another integral strategy for improving building performance is to educate and communicate with the users of these facilities to ensure they understand how the facility works and how their actions can impact performance. The EWMP engages occupants of all ages to empower them to contribute to the efficient performance of the facility. Numerous outlets and mediums are utilized to educate and communicate with building occupants. One of the primary resources for City staff on information related to the policy and resources to help save energy and water at the workplace, is the City's internal intranet website ([Energy and Water Management Program Intranet City Website](#)- note this website is for internal access only).

Strategies Implemented

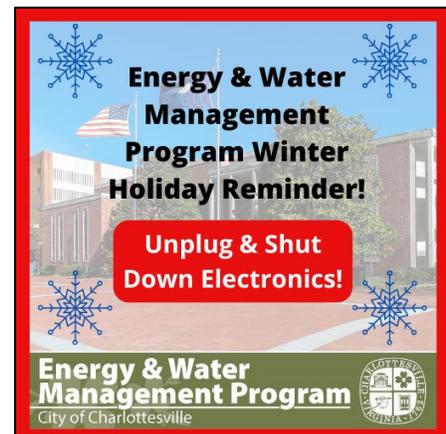
Employee Outreach and Engagement

During the winter of FY2023, several messages were put out around energy conservation:

- Space heater use typically increases when the temperature drops outside and, in order to ensure staff knew the use of these were not allowed in City facilities, an announcement was sent out to City (using the City's Employee News Flash) and School staff (through each school's principal) (Image 1). This messaging was paired with information about hot and cold comfort issues and a reminder of the work order process to notify Facilities Maintenance staff of the issue rather than occupants trying and mask it with a space heater, which ultimately causes more heating and cooling issues for the space.
- During the holidays, the EWMP provided a holiday reminder to turn off and unplug electronics, make sure exterior windows and doors were closed, and no water fixtures were leaking before leaving for holiday break (Images 2 & 3).
- To further support CCS staff and teachers, the EWMP provided staff with school specific checklists going into winter and summer break to ensure classrooms and offices would not waste water or energy while unoccupied (Image 4 & 5).
- The EWMP also connected with CCS custodial staff around turning off lights and reporting water leak issues during their daily rounds at the schools and encouraged them to let the EWMP know of any consistent issues around energy and water.

Image 1: Image used in email/Employee News Flash announcements reminding staff to not use space heaters.

Image 2: Image used in the Employee News Flash to unplug and shut down electronics and other conservation actions before the holiday break.



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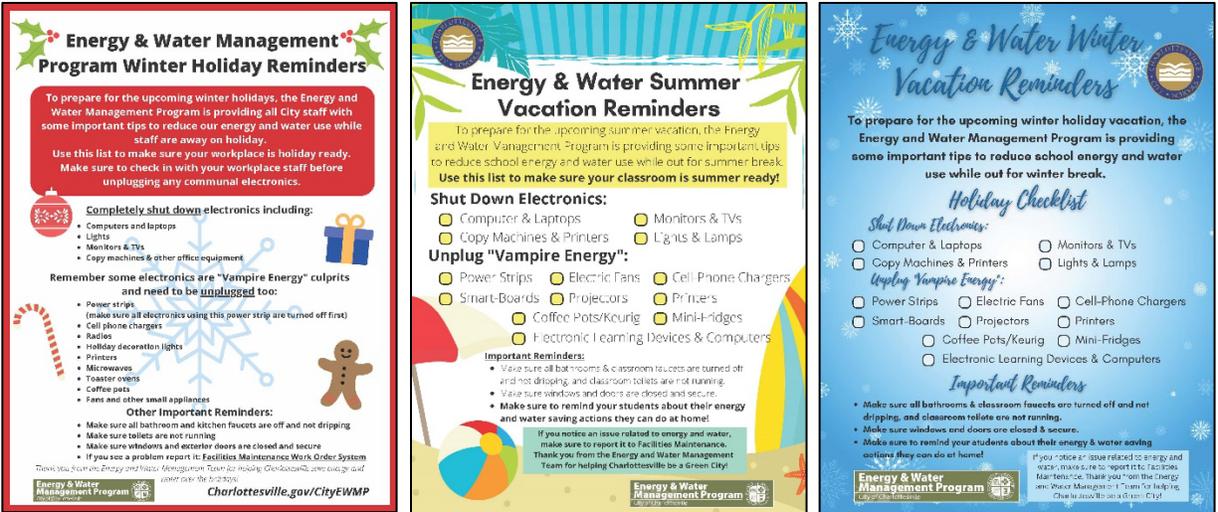


Image 3: Winter reminder and checklist to save energy and water for City staff. Images 4 - 5: CCS Summer and Winter reminders and checklists to save energy and water before going on long breaks.

Energy and Water Management Campaign at CCS



Images 6 - 8: EWMP quarterly themed activity sheets for 2022/2023 Academic Year (Fall, Winter, Spring, respectively). Full versions can be viewed on the EWMP website (LINK).

The EWMP continues to support education around behavior changes around saving energy and water to CCS staff and students through several mediums and outlets. Since spring 2020, quarterly updates with each school’s principals have been offered to discuss school’s performance and upcoming educational initiatives. In addition, the EWMP continued publishing quarterly educational messages and materials to staff and students with some type of educational material, an announcement message, and reinforcing outreach through social media.

The overall message of the 2022/2023 academic year for CCS was to “Be an Energy and Water Saving Leader”. The program continued to build on what students learned in previous academic years and focused around implementing saving actions at school. For FY2023, activity sheets were used to engage

students and have them work together in their classrooms (Images 6 - 8). Activity sheets used two characters, Jade and Taylor, throughout the year to help inspire action as they developed their water and energy saving story, created a tagline or message, and create reminders or poster to remember to do their actions. These activity sheets were developed in coordination with and pushed out by CCS's iSTEM and science teachers to use in their lessons as well as to each school's principal including announcements, activity sheet materials, and social media images to support additional outreach within their respective schools.

To ensure messaging and engagement reached students, education materials and messages were also supported through other outreach means including social media, newsletters, and website ([City's EWMP Education and Outreach Website Link](#)).

❖ Think Global, Act Local Classroom Activity

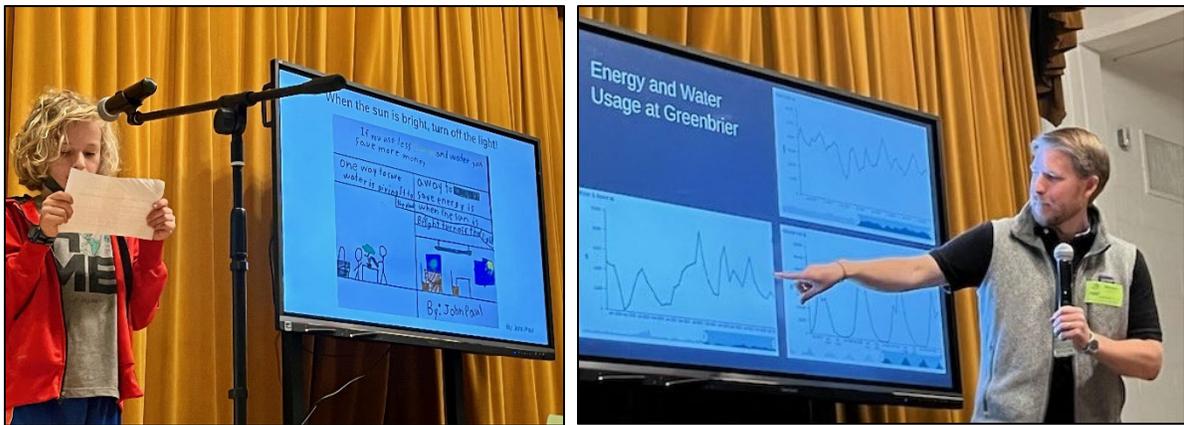


Image 9 - 10: Office of Sustainability staff at Greenbrier Elementary 4th grade class hearing about their final projects at their Global Guardians Conservation Showcase and their advertisements to convince fellow Greenbrier Reading Stars to conserve energy and water.

The EWMP once again joined Greenbrier's 4th grade class to hear the Global Guardians Conservation Showcase about their energy and water saving actions. These students reviewed the EWMP educational materials, reviewed the [CCS Performance Dashboard \(LINK\)](#), brainstormed their own important educational messages around saving energy and water at school, and came up with our own message and design. Students presented their energy and water saving tips and messages to the EWMP and discussed how these behavior changes can have a big and important impact on their school's energy and water usage (Images 9 - 10). The EWMP plans to incorporate some of their energy and water saving tips in the next school year's outreach materials.

❖ Light Switch Reminders

Building off the actions outlined in the activity sheets, the EWMP developed light switch reminders on removable stickers to be put up around schools to support the action of turning lights off when



Image 11: Light switch reminders on removable stickers deployed at CCS facilities.

you leave a room (Image 11). Light switch reminders were deployed to each school with Charlottesville High School using their GREEN BACON Club for distributing reminders throughout the school. The program's hope is to have the action of turning lights off to be visible and continually reinforced to students and staff.

❖ Case Study: Climate Action Kits at Walker Upper Elementary School

In May of 2023, 330 5th graders at Walker Upper Elementary School in Charlottesville received Climate Action Activity Kits created by the Community Climate Collaborative (C3) and the Virginia Discovery Museum in partnership with the City of Charlottesville's Energy and Water Management Program (Images 12 - 14). The kits were designed to help students gain a greater understanding of home water and energy use and climate emissions, while connecting families to local energy and water-efficiency solutions.

The kit included an energy scavenger hunt and grown-up guide with information on local rebates and energy efficiency resources; plant your own salad garden kit; windmill building activity; a solar-powered night light; and a water leak detection activity (Image 12 & 14). Kits were offered in both English and Spanish.

The City's Energy and Water Management Program was excited to help bring these Climate Action Kits to Charlottesville City School students for the third year in a row. EWMP continued to work with Charlottesville City Schools on ways students can save energy and having the opportunity to provide a hands-on activity to further support the program's message was instrumental in getting students to implement change at school and at home.



Images 12 - 14: Students from Walker Upper Elementary checking out the contents of the Climate Action Kits.

Strategies Planned/FY2024 Outlook

[WE@Work](#)

The EWMP put their WE@Work, Water and Energy workplace program standing for “Water and Energy at Work”, on hold in 2021 due to COVID-19 and the large number of employees working remotely. Even

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as employees returned to workspaces, the EWMP has continued to hold this program back to ensure staff were able to stay focused around returning to work in their workspaces and getting back to pre-pandemic usage of these spaces. Currently, the EWMP plans to roll out a more updated workplace program in FY2025 focused more broadly on sustainability efforts with actions still including energy and water to promote positive behaviors related to broader climate action goals in the office.

Mirror Clings at CCS

The EWMP plans on distributing mirror clings with water saving messages in the Fall of 2023 to all schools to be displayed in restrooms (Images 15 – 17).



Images 15 - 17: Mirror clings developed to remind students and staff to save water.

Energy and Water Management in CCS Science Pacing Guide

To create a more streamlined inclusion of energy and water education into CCS's curriculums, the EWMP is working with the CCS Science Program to develop grade specific energy and water activities that will be included in the CCS Science Pacing Guide. The end goal is to have at least one energy and one water activity for each grade covering Kindergarten through 8th grade by the start of the 2024 – 2025 school year. These materials will be available to all science teachers with all resources and materials necessary to deliver the activities (Image 18). Additional activities will be added to also cover climate-related topics. All activities align with grade relevant Standards of Learning (SOLs) and state science curriculum.

▼ 4TH GRADE ▶ 5TH GRADE ▶ 6TH GRADE

4.8 Seeing Watersheds

This lesson plan comes from Project WET: Seeing Watersheds and was compiled and adapted by Jill Greiner, Charlottesville's Water Efficiency Program Coordinator. This activity is appropriate for grades: upper elementary & middle school.

[Lesson Plan: 4.8 EWMP Seeing Watersheds \(Word\)](#)
Students use maps to characterize what a watershed is; to identify the key parts and functions of watersheds; to determine watershed boundaries; to discover how watersheds are named; and to describe how water flows in a watershed.

- Handouts: [4.8 EWMP Seeing Watersheds Handouts \(PDF\)](#)
- Correlations Document: [4.8 EWMP Seeing Watersheds Correlations \(PDF\)](#)

Virginia SOL Alignment:

- **Earth Resources 4.8** The student will investigate and understand that Virginia has important natural resources. Key resources include:
 - watersheds and water
 - plants and animals
 - minerals, rocks, and ores
 - forests, soil, and land

Image 18: Current energy and water materials available for CCS Science Educators.

Performance

Prior to the development of the Climate Action Plan, the City had established an FY2015 baseline for the portfolio and a general energy and water reduction target of 2% annually. The FY2015 baseline was chosen to account for new facilities that were opened at that time and to prevent comparison to any years before that would show a smaller portfolio and energy and water footprint. The annual targets were not tied to larger goals set by the City.

With the adoption of the Climate Action Plan and the greenhouse gas reduction goals from the FY2011 baseline, it has become appropriate to adjust the baseline to align with these larger goals.

Performance Targets and Reduction Goals

The City's utility usage performance targets are now represented as Energy Use Intensity (EUI) and Water Use Intensity (WUI). These metrics are seen as a standard for comparing building performance as they normalize against facility square footage, thereby allowing different size facilities to be compared with others of the same building type and would allow the portfolio to be compared to itself overtime, no matter the fluctuation in total square footage. EUI is a well-established metric with abundant data to compare building types within our region and across the nation. WUI is a less well-established metric with fewer building types and smaller data sets to compare to; in addition, WUI does not include any water usage that is associated to irrigation or outside water usage.



Image 19: Energy and Water Management Program municipal reduction targets and goals to help meet the City's greenhouse gas reduction commitments.

With the City's established Climate Action Plan and greenhouse gas reduction commitments, the EWMP has determined the municipal targets to support the City meeting their reduction goals within the

committed timeline (Image 19). Because of cleaning of the grid and emissions reductions already achieved, a 26% energy reduction from FY2011 will enable the City to reach the 45% GHG reduction goal. However, the **EWMP has set an FY2030 goal of reducing electricity and natural gas (combined represented as kBtu) by 30%** from FY2011 baseline, reaching a 48.9% reduction in greenhouse gas emissions. To achieve the remaining reductions required, a **3.75% annual reduction target will be applied across electricity and natural gas**. For water, the **EWMP has set a goal of reducing water usage by 30%** by comparing its WUI from the baseline FY2011 year and meeting this goal by FY2030. To see progress toward this usage reduction goal, the EWMP has set **an annual goal of a 2% reduction in water usage**. Annual targets will be re-evaluated each year based on progress to date to ensure we are on track to meet the 2030 goal.

The City's performance for FY2023 provides a clear view of building performance post COVID-19. City staff have returned to offices or have worked out remote/hybrid setups that will likely continue; therefore, building occupancy has stabilized. The City saw a large impact to its building performance in FY2020 and FY2021 from COVID-19, and any declines in trends caused from these values during that time needs to be noted as heavily impacted by changes in building occupancy and changes in building performance due to COVID-19. These trends are referenced further below in each respective commodity section.

The EWMP actively monitors the performance of the City's facilities looking for trends, abnormalities, and successes when it comes to energy and water performance. Performance data is often matched to actions outlined above- changes in building operations, technology, and occupant behaviors. In addition, weather can significantly impact a building's performance; therefore, degree day data is noted in this report to take into account variations in temperature from year to year. The year 2016 is used as the City's weather normalization standard, meaning all energy data is adjusted according to deviation from 2016 heating and cooling degree days, as it represents a typical and expected weather trend for Charlottesville, Virginia.

The City's portfolio performance was assessed by looking at each utility account, each building, and each building group. Building groups are categories of typical use types of the City's facilities and a way to compare similar types of facilities within a building group and to national standards. The EWMP identified 11 building groups which represent the various 70+ City facilities, and Appendix 4 references which specific facility falls under each building group (Table 1). This performance section reports primarily on information and trends at the building group level with a few individual facilities highlighted.

The figures and data from this report can be viewed through an interactive dashboard on EnergyCAP. See the appendix for further instructions regarding how to access this information (Appendix 5).

City FY2023 Annual Energy and Water Performance Report

Table 1: The City’s 11 building groups and portfolio performance metrics (Weather-normalized Energy Use Intensity (EUI) and Water Use Intensity (WUI)) with regional or national comparison values. Specific buildings under each building group listed in Appendix 4. [Source for Regional Average EUI](#) and [Source for National Average WUI](#).

Building Group	Gross Floor Area (sq. ft.)	Energy Use Intensity (kBtu/sq.ft.)	Regional Average EUI	Water Use Intensity (gal/sq.ft.)	National Median WUI
Courthouses	48,031	65.9	101.2	4.36	14.48
Fire Stations	60,616	58.0	63.5	21.02	28.90
Libraries	55,158	59.0	71.6	6.02	14.48
Offices	245,022	46.2	52.9	6.97	14.48
Parks	--	--	--	--	--
Recreation & Sports	97,764	147.9	50.8	37.41	--
Schools	806,952	55.2	48.5	10.35	10.84
Street Lights & Traffic Signals	--	--	--	--	--
Transit & Parking*	229,510	28.1	56.2	4.03	3.43
Vehicle Charging Stations	--	--	--	--	--
Warehouses & Fleet Mixed Use	84,658		--	4.57	3.43
Offices**	39,090	46.1	52.9		
Vehicle Repair***	45,568	55.7	47.9		

* Includes bus terminals and parking garages. Regional Average EUI is for bus terminals.

**Includes Facilities Maintenance building, Pupil Transportation building, and CAT Transit Operations Center (EUI is weighted average).

***Includes City Yard Warehouse and City Yard Wash Facility (EUI is weighted average).

EUI, WUI and ENERGY STAR Scores

To measure performance, we compare each building to itself overtime to see how energy and water usage has changed over the years. For energy, we also compare buildings to each other using the metrics EUI, which was stated above, and ENERGY STAR score. For water, we use a metric similar to the EUI but for water, Water Use Intensity (WUI). WUI measures how much water (in gallons) a building uses per square foot – the lower the WUI, the better. WUI is not as well established in the building performance space with very limited data on median values for only specific building types. In addition, accounts with significant water usage going toward irrigation needs are omitted as the square footage used only applies to a building or structure.

EUI

The EUI is a measure of how much energy (e.g., electricity and natural gas) a building uses per square foot - the lower the EUI, the better. Most of the City of Charlottesville building groups on average had a lower EUI in FY2023 compared to the regional average for their representative building groups (Table 1). Schools and Recreation & Sports building groups were operating at a higher EUI than the regional

average. The facilities represented in the Recreation and Sports building group include the City’s natatoriums (pool facilities), which require more energy use per square foot than typical recreation facilities so the comparison to the national average has some incongruencies. As of FY2023, the portfolio as a whole has achieved an 8.7% reduction in EUI from the FY2011 baseline but a 0.8% increase from FY2022 reaching 63.1 kBtu/sq.ft. (Figure 1). The target going forward is a 3.75% reduction in EUI compared to the previous year, which for FY2024, would be 60.7 kBtu/sq.ft EUI.

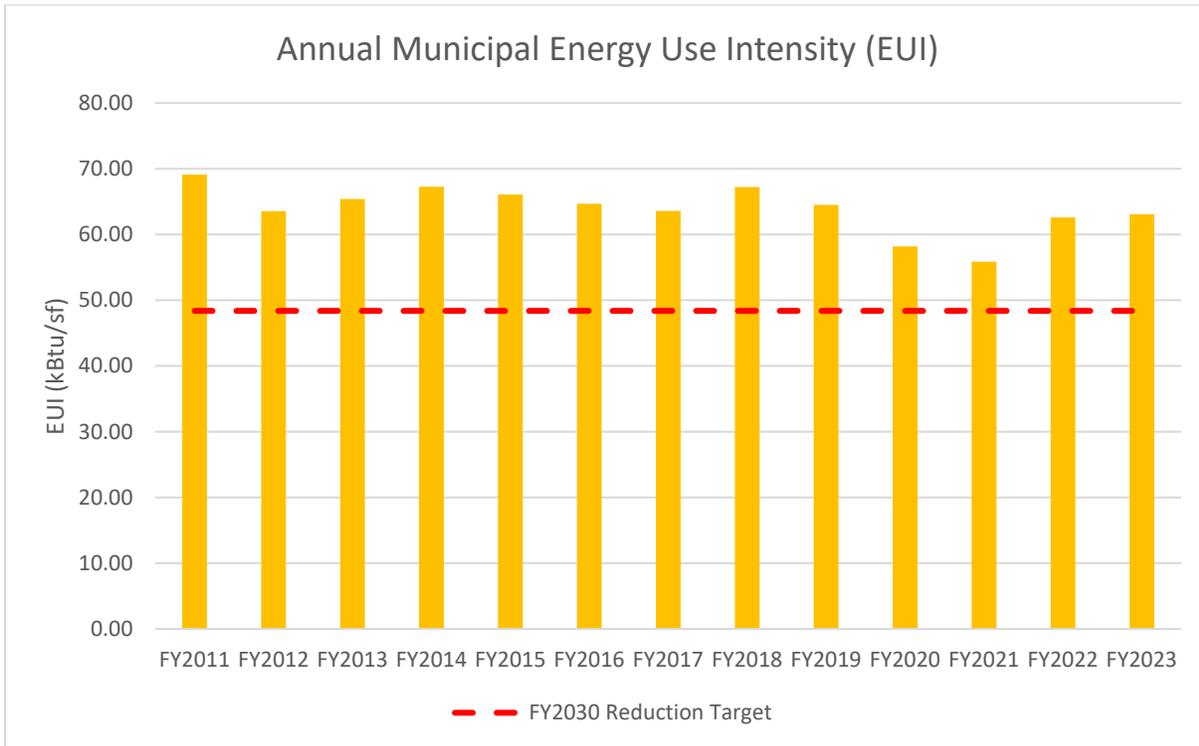


Figure 1: Annual municipal weather-normalized energy use intensity (EUI) for all City facilities (includes streetlights/traffic signals and vehicle charging stations). Red dashed line notes the FY2030 target of 30% reduction from the baseline year, FY2011.

ENERGY STAR Scores

Another measure of performance is the ENERGY STAR score. The City has 37 facilities benchmarked using ENERGY STAR Portfolio Manager, an online tool that allows buildings to receive a score (1-100) based on the level of energy efficiency compared to similar facilities across the nation. ENERGY STAR for buildings is a measure of operational performance at that point in time. In 2009, the City achieved ENERGY STAR certification for seven facilities that met the prerequisite score of 75 (Appendix 6).

Eight facilities reached the prerequisite score in FY2023, with seven of those reaching it in FY2022 (but have not gone through the certification process). As many facilities have now had consistent occupancy since FY2022 (post-COVID), the ENERGY STAR scores likely represent an accurate view of energy performance. The City is reviewing space attributes in ENERGY STAR Portfolio Manager based on ENERGY STAR guidance to ensure accuracy with operations and will then evaluate pursuing ENERGY STAR certification for eligible facilities.

WUI

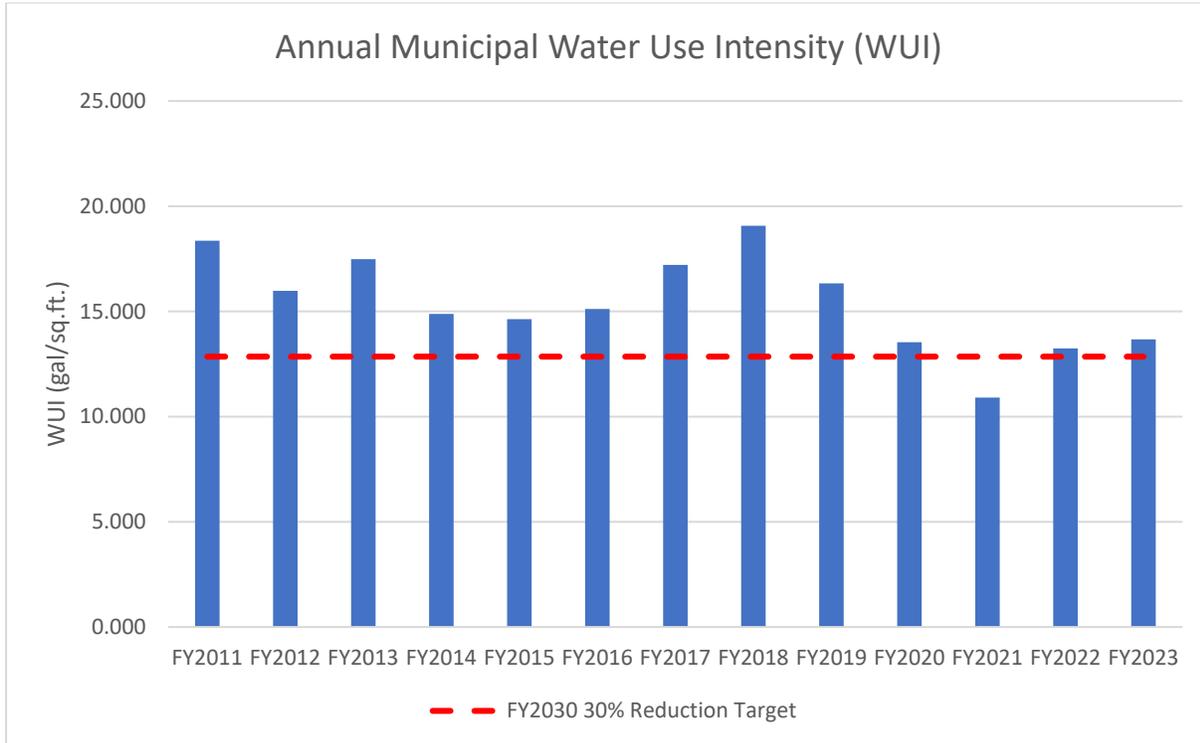


Figure 2: Annual municipal water use intensity (WUI) for all City buildings. Red dashed line notes the FY2030 target of 30% reduction from the baseline year, FY2011. **Note:** irrigation focused accounts were omitted.

Most of the City of Charlottesville’s facilities were able to be assigned a calculated WUI value; however, many of the accounts under the Parks building group were omitted as they primarily served irrigation or other outside water uses. Some building groups also had facilities (square footage) added to their portfolio. There are not many national average values of WUI for specific building types outside of multifamily homes. Nevertheless, the City is using WUI to set target reductions as it normalizes additions of buildings.

Overall, there is a reduction in WUI from the FY2011 baseline year. When comparing FY2023 to FY2011, we see a 25.5% reduction in WUI. This puts the City only 4.5% away from meeting its 30% reduction goal of 12.85 by 2030 (Figure 2). When comparing to national median WUI values provided by the Environmental Protection Agency, City building groups perform at or better than these building types (Table 1). If the City continues to avoid any significant water leaks, to install water efficient fixtures, and have staff behavior supporting water saving efforts, WUI is anticipated to meet its reduction goals before 2030.

Portfolio Performance

Overall, the City (government and schools) spent \$3.45 million on energy and water utilities in FY2023, which shows a rebound and higher usages to FY2019 (pre-pandemic costs) (Figure 3). Costs have increased over time with costs at their highest in FY2023. Electricity makes up the majority (78%) of the City’s utility costs with water and sewer as the next largest at 14% of cost and natural gas contributing 8% of utility costs (Figure 4). Compared to the portfolio baseline FY2011, FY2023 saw a 21% increase in utility costs with a 23% increase in electricity cost, an 18% decrease in natural gas cost, and a 50% increase in water cost. This increase in utility costs is associated with increasing utility rates (*electricity - 39.5% increase, natural gas – 18.3% decrease, water – 94.8% increase*) facilities being run to increase ventilation, and increased utility usage. When comparing costs from FY2023 to the baseline FY2011, several additional buildings were added to the City’s portfolio which will have a significant impact to total utility costs.

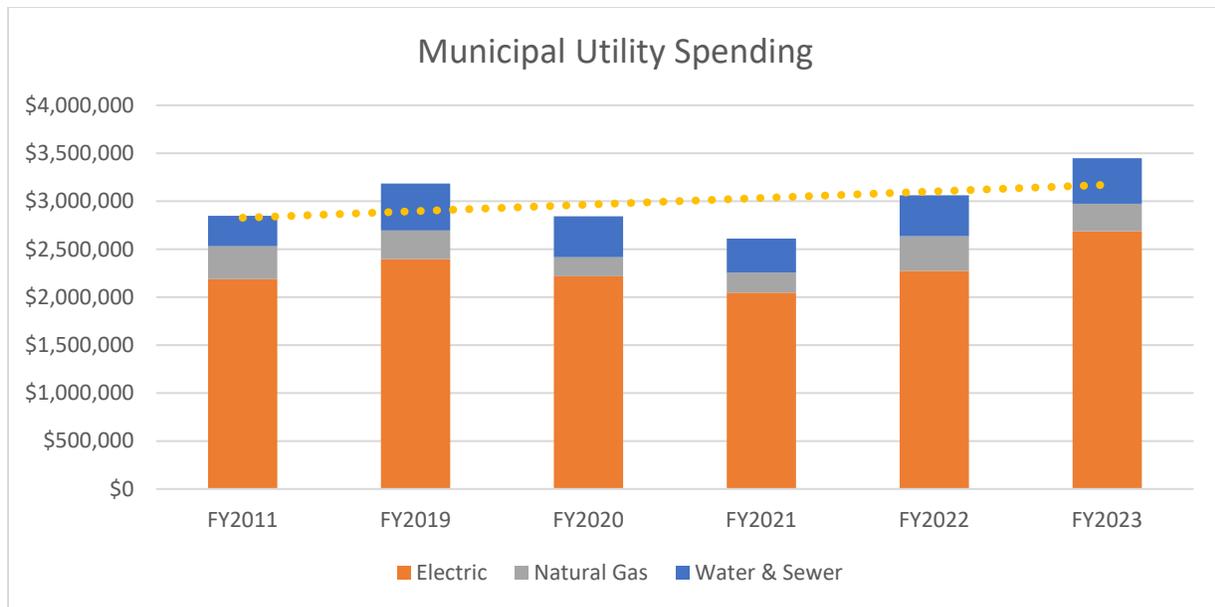


Figure 3: The City’s utility spending for the past 5 fiscal years and FY2011 (baseline year) for each commodity type across all City facilities. The yellow dotted line is the overall trend in spending over time across all years.

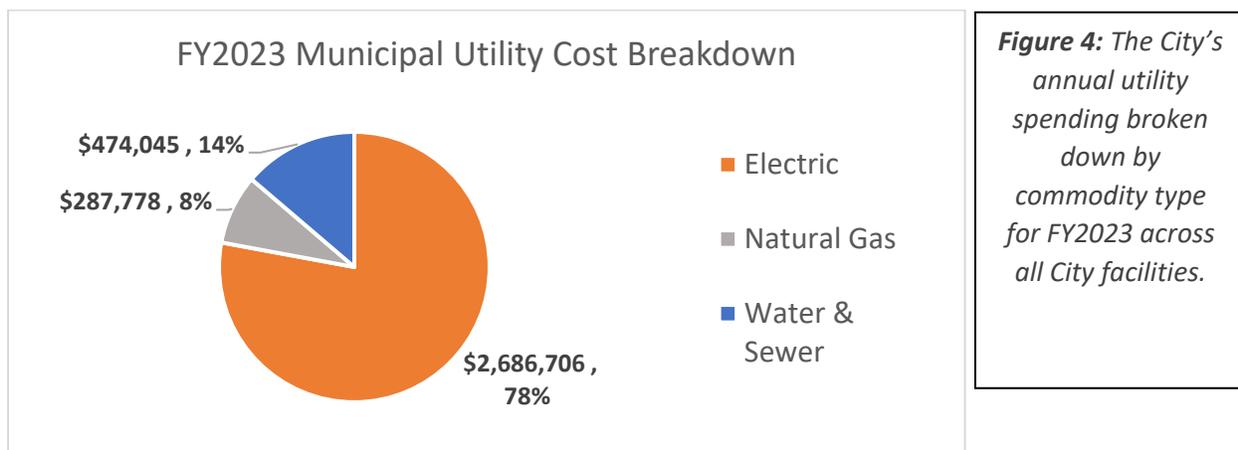


Figure 4: The City’s annual utility spending broken down by commodity type for FY2023 across all City facilities.

Electricity

Electricity makes up the bulk of spending for utilities at 78% of total utility costs. Electricity use across the City’s building portfolio has had some fluctuation since FY2011 (baseline year) but it has for the most part had a steady decline (Figure 5). Adjustments to operations in response to COVID-19 in FY2020 and maintained for most of FY2021 caused major reductions across all utilities making FY2020 and FY2021 anomaly years. However, in FY2022, occupancy increased in many facilities, including schools, and operations began to resemble pre-COVID levels. Occupancy continued to remain steady into FY2023 with electricity showing a 1% drop from FY2022, an 8% drop from FY2019 (pre-COVID), and a 12% drop from FY2011. (Appendix 7.1).

Electricity use at facilities is mainly tied to the cooling and ventilation systems, indoor/outdoor lighting, and equipment plug load. Beyond facilities, the City’s portfolio also includes streetlights, traffic signals, and vehicle charging stations.

When looking at the City’s portfolio by building group, nearly all groups have been trending down since 2011 (Figure 5 & 6). As mentioned in previous reports, since school facilities make up nearly 50% of the electricity usage of the City’s portfolio, they tend to drive the overall performance of the portfolio.

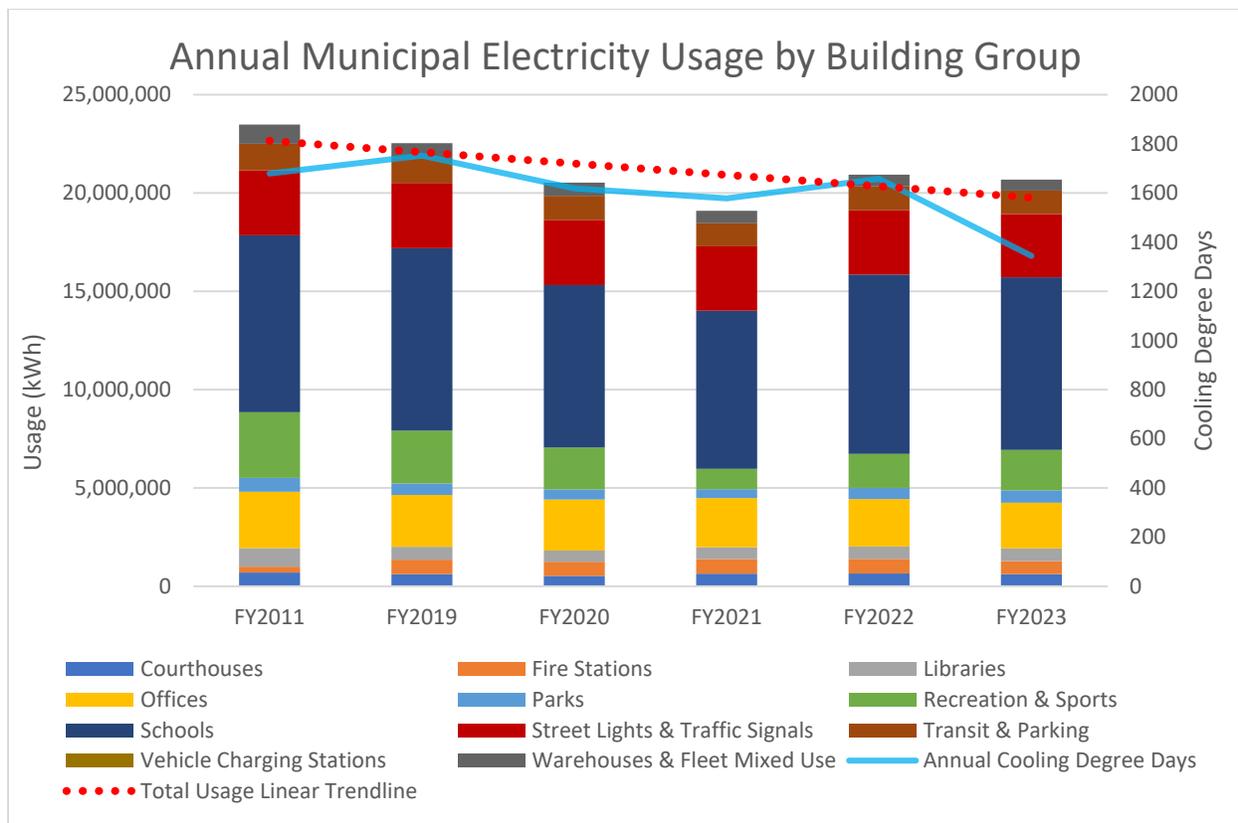


Figure 5: The City’s electricity usage for the past 5 fiscal years and FY2011 baseline year across all City facilities and partitioned out by building group. Annual Cooling Degree Days are included to show variance in weather conditions each year.

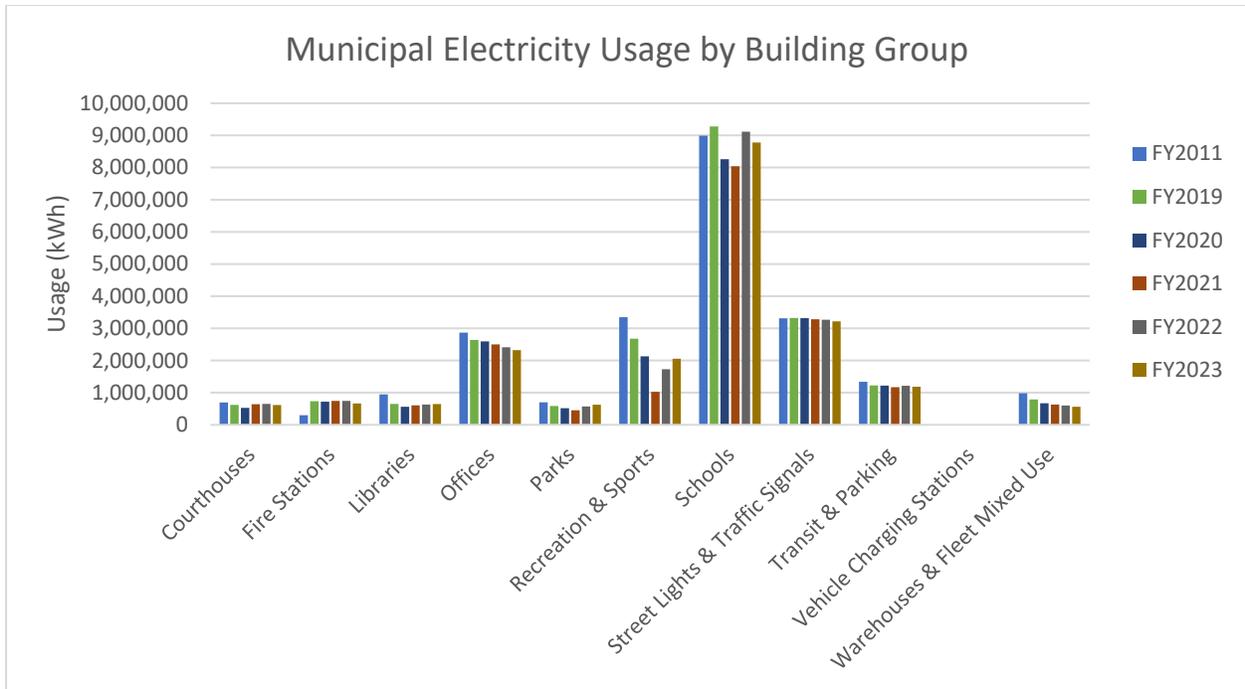


Figure 6: The City’s electricity usage for each building group over the past 5 fiscal years and FY2011 baseline year.

After the significant drop in electricity use in many building groups in FY2020 and FY2021, there was a rebound in FY2022 in those building groups that experienced a return to normal occupancy, mainly in Schools and Recreation & Sports facilities. In FY2023, occupancy remained mostly consistent with the largest change being Smith Aquatics Center opening for the full year after being closed for HVAC renovations. Parks saw an increase as facilities were open a full year in FY2023. Office buildings continued to have lower electricity use in FY2023 as employees have in some cases continued with a hybrid work schedule creating lower occupancy than pre-COVID levels. Additionally, Jessup House was transferred to Albemarle County ownership/operations and Levy Office building was closed for renovations so utilities, including electricity, were not paid by the City for half of FY2023 contributing to the decrease compared to FY2022.

The Street Lights & Traffic Signals building group has remained steady in the electricity usage but will begin to reduce as LEDs are installed to replace the high intensity discharge lighting. As mentioned earlier in the report, the EWMP is currently working with Dominion Energy to plan for upgrading street lights beginning in FY2024.



Natural Gas

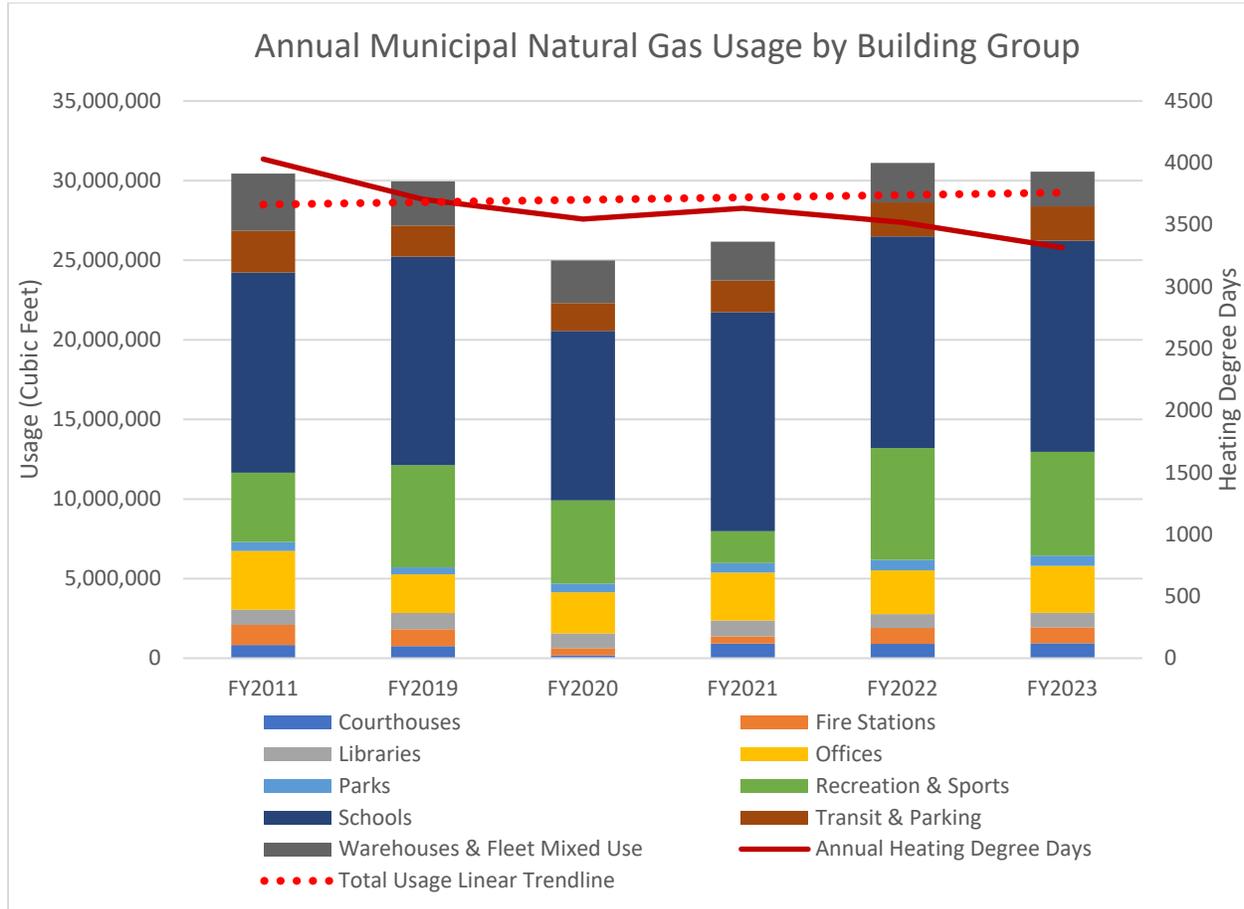


Figure 7: The City’s natural gas usage for the past 5 fiscal years and FY2011 baseline year across all City facilities and partitioned out by building group. Annual Heating Degree Days are included to show variance in weather conditions each year.

In FY2023, natural gas represented approximately 8% of utility spending in the City’s building portfolio. Although the portfolio saw a 2% decrease in natural gas use compared to FY2022, it is at nearly the same usage as seen in the FY2011 baseline. As space heating is a major driver of natural gas usage, a year that is colder on average than other years will typically mean more natural gas use at facilities. Natural gas usage for the City’s portfolio as a whole has tended to follow the trends of heating degree days (HDD), or days throughout the year where temperatures drop below a standard point requiring heating (Figure 7). FY2023 has a lower HDD compared to FY2011 so we would expect usage to be naturally lower than FY2011 but this was not the case. New facilities such as Smith Aquatics and Fontaine Fire Station have contributed to an increase in the expected natural gas usage in the portfolio.

Schools, Recreation & Sports, and Office building groups have the highest usage of the portfolio due to the size of the facilities and type of use. In most cases, natural gas is used for space heating and water heating, and in schools, it is also used by kitchen appliances. Schools use the most natural gas of all of the building groups and tend to sway the portfolio (Figure 8). In FY2022, however, the largest increase in natural gas was in the Recreation & Sports building group where Crow Pool and Smith Aquatics Center

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returned to normal operations. In FY2023, Recreation & Sports trended down in natural gas usage (7%) driven by reductions seen at Key Recreation Center and Crow Pool (Appendix 7.2). The City saw an increase in natural gas usage in the Office building group, mainly due to an increase in space heating seen at City Hall Complex. The Library and Courthouse building groups saw an increase as well due to increased heating at Central Library and Circuit Courthouse. The Warehouses and Fleet Mixed Use building group saw a 12% reduction mostly from reduced natural gas usage at the City Yard Warehouse. The Facilities Maintenance team has made it a standard practice to perform periodic reviews of HVAC systems during the heating season to adjust schedules and equipment settings to reduce unnecessary heating.

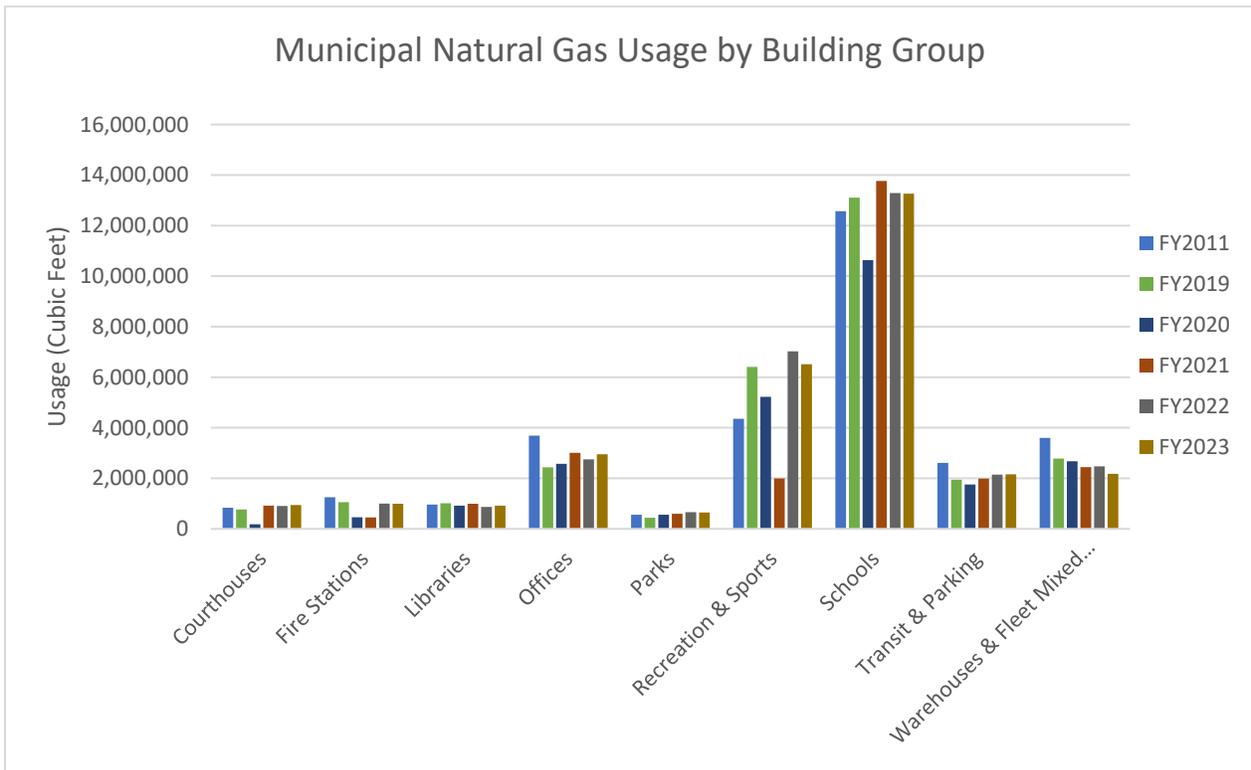


Figure 8: The City’s natural gas usage for each building group over the past 5 fiscal years and FY2011 baseline year.

Water and Sewer

In FY2023, 14% of total utility costs were for water and sewer at City municipal facilities. Water and sewer costs and water consumption have fluctuated over time with a general declining trend in usage (Figure 9). Water expenditures have been increasing overtime since the FY2011 baseline year (50% increase) (Figure 3, Appendix 7.3). This increase in costs is primarily driven by changes in water rates and fees as well as the addition of a few water accounts.

When comparing FY2011* (baseline year) water usage to FY2023 usage, there is a 23% decline. This 23% decline in water usage puts the City in a good position to meet the 30% reduction goal by 2030. However, when comparing last fiscal year (FY2022) to FY2023, there was a 3% increase in water usage across building groups, which fell short of the City’s annual 2% reduction goal to help make a 30%

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reduction by 2030. This increase in usage was driven primarily from three building groups: Fire Stations, Libraries, and Recreation & Sports (Appendix 7.3). In FY2023, there was high water usage due to water leaks from:

- Fontaine Fire Station (Fire Stations building group),
- Lugo-McGinness Academy (Schools building group) with a major waterline break, and
- high-water usage due to water leaks and renovations at Central Library (Library building group) and Smith Aquatic Center (Recreation and Sports building group).

Whereas, in three other building groups (Courthouses, Schools, and Transit & Parking), water usage decreased significantly from FY2022 to FY2023 (Appendix 7.3).

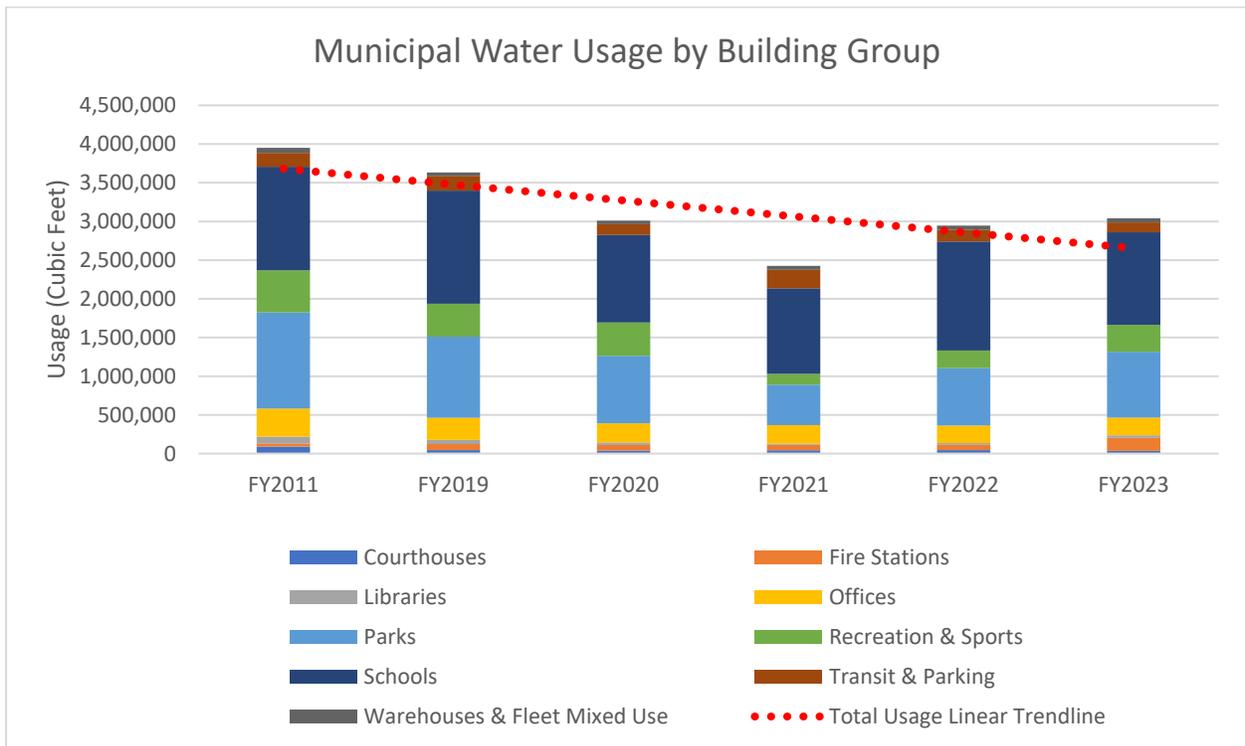


Figure 9: The City’s water usage for the past 5 fiscal years and FY2011 baseline year across all City facilities and partitioned out by building group.

Overall, water usage across City facilities is declining. The City is no longer operating with limited occupancy from COVID-19 (which impacted primarily FY2020 - FY2021). Water usage is stabilizing as shown in the 3% increase from FY2022 to FY2023. In order to achieve the targeted annual 2% decline in water usage, the frequency of large water leaks needs to decline as these large events mask any savings from fixture efficiency improvements and behavior changes.

**Note that there were some facilities missing in the City’s water and sewer portfolio in the FY2011 baseline year. Fontaine Fire Station (Building Group Fire) was not included in the City’s portfolio until FY2014, Promise House (Building Group Office) was added in FY2014, Jessup House (Building Group Office) was added in FY2016, Lugo McGinness Academy (Building Group School) was added in FY2015. These additions to the City’s portfolio will mean increased costs and potentially increased water usage in their respective building groups once added.*

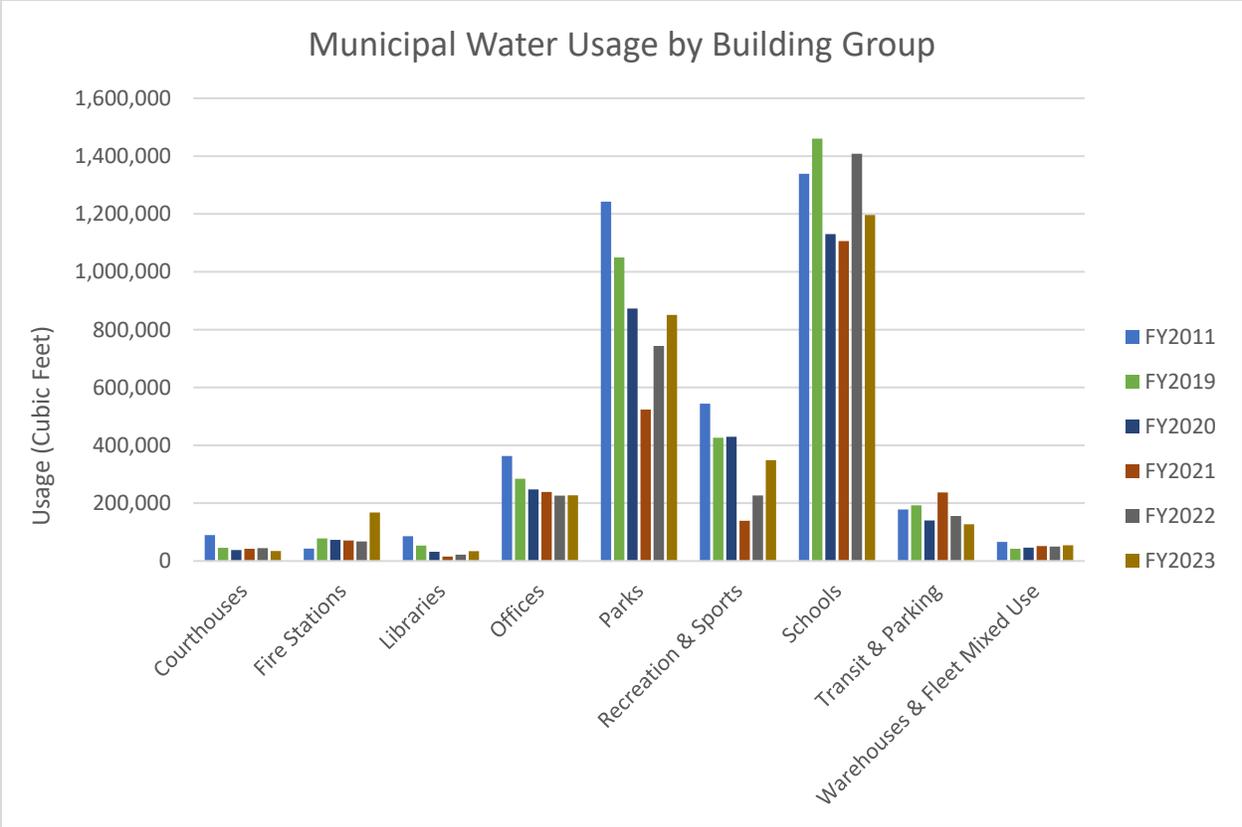


Figure 10: The City’s water usage for each building group over the past 5 fiscal years and FY2011 baseline year.



Greenhouse Gas Emissions

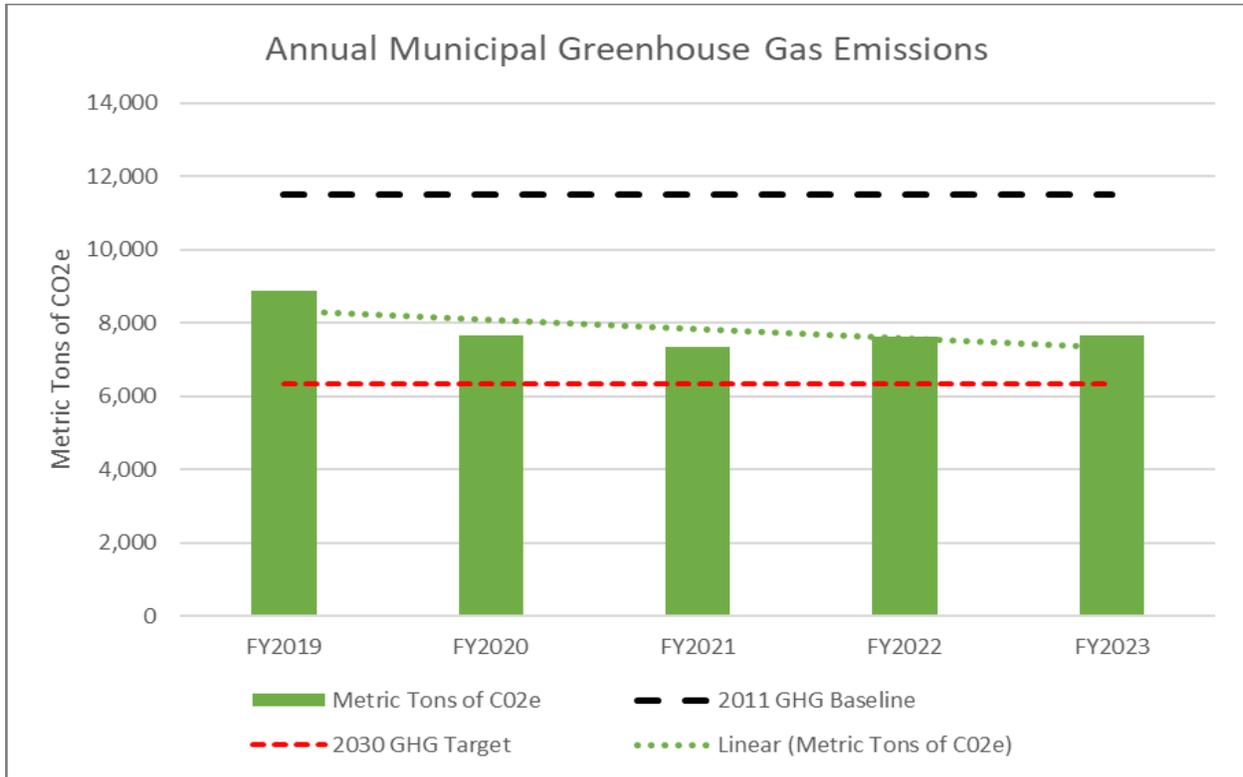


Figure 11: Greenhouse gas emissions for the past 5 fiscal years, FY2011 baseline year, and 2030 GHG Target across all City and school facilities.

On July 1, 2019, the City of Charlottesville committed to a community-wide greenhouse gas (GHG) reduction goal of 45% below the 2011 inventory year by 2030 and carbon-neutrality by 2050.

Since 2011, the municipal portfolio has seen some fluctuation but mostly a downward trend **achieving 33.4% reduction in greenhouse gas emissions by FY2023** (Figure 11). This reduction is in part due to the electric grid generating energy from cleaner sources, so although the portfolio electricity usage is lower than FY2011, the electricity used is producing less emissions providing additional greenhouse gas reductions.

The reduction seen in FY2020 and FY2021 also is attributed to reductions in operations at facilities due to COVID-19, which must be treated as an anomaly. In FY2022, we began to see a rise in greenhouse gas

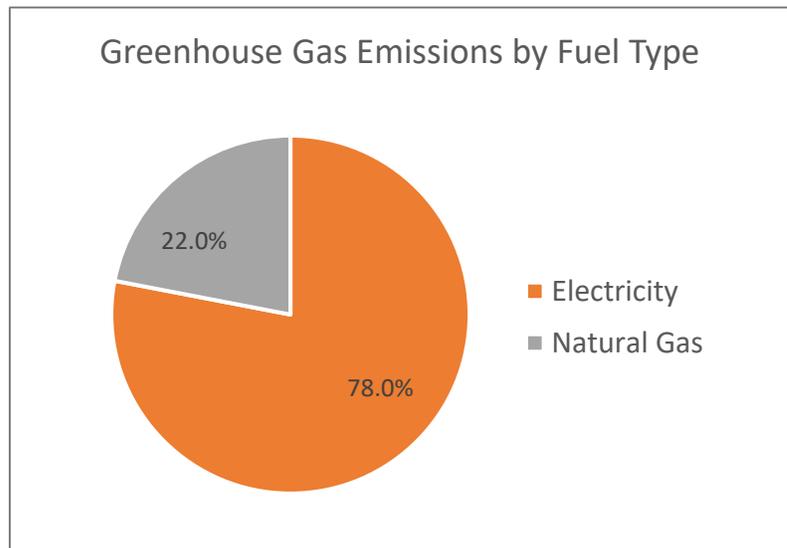


Figure 12: The City’s FY2023 Greenhouse gas emissions by fuel type (percentage).

emissions as buildings became more occupied and returned to normal operations and then leveled out in FY2023. To reach the City’s goal of 45% reduction by 2030, the portfolio needs to achieve approximately 2.5% - 3% reduction in greenhouse gas emissions per year.

Electricity is the source of most greenhouse gas emissions from City buildings so strategies that reduce electricity use (including efficiency) have the greatest potential impact on reduced emissions (Figure 12). Electricity is projected to have reduced emissions over time as renewable sources, such as solar, continue to be installed at the grid-level and onsite. Although advancements are being made in the natural gas industry (e.g., renewable natural gas), its continued use will produce greenhouse gas emissions for the foreseeable future. The [City’s Climate Action Plan \(LINK\)](#) presents strategies and key actions to reduce municipal greenhouse gas emissions by switching to lower emissions fuel sources and by reducing energy use through efficiency and conservation measures.

❖ Solar

As of FY2023, the City’s solar PV systems (Table 2) have produced over 2 gigawatt hours of electricity. Solar systems are incorporated into new construction buildings, such as Fontaine Fire Station and Smith Aquatics Center (Image 20), as well as existing buildings, such as the City Yard Warehouse. The electricity produced by these systems is used directly at the site and most energy production data is tracked and monitored by the EWMP.

Table 2: Solar photovoltaic systems installed to date at City facilities.

Facility	Installed Capacity (kW)	Year Installed	Location
Charlottesville High School	111.8	2012/2013	Roof and ground mount
City Yard Warehouse	44.3	2016	Roof
ecoREMOD Energy House	5.8	2011	Roof
Facilities Maintenance Building	21.1	2012	Roof
Fontaine Fire Station	17.7	2016	Roof
Lugo McGinness Academy	9.4	2015	Roof
Smith Aquatics Center	40.5	2016	Roof



Image 20: Solar PV system on the roof of Smith Aquatics Center.

Solar power generation has been identified as the primary renewable energy technology to be considered, and multiple avenues for adding more capacity are being reviewed. These include internal funding and power purchase agreements (PPAs) to install solar energy systems onsite at facilities as well

as accessing offsite solar through virtual power purchase agreements (VPPAs). Onsite solar power systems reduce the need for grid-purchased electricity, but system size and generation potential are limited by available facility and roof (based on condition) and ground space. Off-site solar provides the opportunity to access higher capacity systems that will produce larger amounts of solar energy. The City is evaluating how best to achieve the largest greenhouse gas reductions while achieving the direct benefits of onsite solar. Aligning the solar potential of roofs and roof replacement schedules is critical to ensuring that any onsite systems are timed appropriately with roof replacements.

In April 2023, the City, in partnership with Charlottesville City Schools, applied for the federal Department of Energy (DOE) Renew America’s Schools (RAS) grant opportunity through the Bipartisan Infrastructure Law (BIL), which included equipment upgrades and a solar installation at Charlottesville High School. Unfortunately, the City was not awarded the grant but the City is aiming to apply for the second round of grant funding for RAS anticipated to be available in Spring 2024. In the first application for RAS, the City was planning to include a larger solar installation at Charlottesville High School (1.17MW) but due to substantial interconnection fees and other “to be determined” costs imposed by Dominion Energy, the proposed system was reduced in size to 246kW to stay under the 250kW fee threshold that triggers additional studies and fees. Although the fees imposed by Dominion Energy are being reviewed by the State Corporation Commission (SCC), they remain in place for now. The City will be working with Dominion Energy to assist in planning for interconnection fees as projects on CHS and at other schools are being considered.

Green Building Certifications

The Charlottesville City Council adopted a resolution in 2008 to implement green building practices for City construction projects ([2008 Green Building Resolution](#)). This resolution outlined the use of the USGBC (U.S. Green Building Council) LEED (Leadership in Energy and Environmental Design) program to guide the design and construction of City facilities. The City has achieved LEED certification for seven buildings since 2008 (Table 3, [View on the interactive CityGreen Map](#)). The development of a Green Building Standard for the City will go further to institutionalize best practices and standards that adhere to green building principles.

Table 3: Municipal LEED Building Projects.

Project	Year	LEED Level
Downtown Transit Station	2008	Gold
EcoREMOD	2009	Platinum
Smith Aquatic Center	2010	Platinum
Charlottesville Area Transit	2012	Gold
Facilities Maintenance Building	2013	Gold
Fontaine Fire Station	2014	Platinum
Circuit Court - <i>Renovation</i>	2020	Gold

FY2024 Outlook

In FY2024, the EWMP plans to continue to work towards meeting their energy and water reduction goals to help the City make progress to meeting their larger greenhouse gas emissions reduction goals and Climate Action Plan commitments. The EWMP will continue to review utility performance monthly and investigate opportunities to improve efficiency through operations, technology, and behavior strategies. We are looking forward to finalizing the agreement and kicking off the first project in the EPC at City Hall Annex and working to secure initial funding needed to begin the next project. Again, through the investment-grade audits from the EPC, the program has identified a myriad of opportunities to improve efficiency at most of the City facilities and hopes to realize cost savings and emissions reductions from these improvements over the life of the contract. The EWMP will continue to explore funding opportunities (e.g., federal and state incentives, power purchase agreement) to be used in conjunction with internal funding to support energy efficiency, water efficiency, and renewable energy projects. Lastly, the EWMP is supporting efforts with other City Departments to develop a Green Building Standard, which will further solidify the City's commitment to greenhouse gas reductions and increase efficiency opportunities.

The EWMP is looking forward to continuing its education and outreach of City staff and students and potentially expanding to incorporate more in-person connection and engagement.



Glossary

Building Automation System (BAS): A control system in buildings that allows monitoring and control of heating, ventilation, and air conditioning (HVAC) systems, lighting, and other building equipment through a common interface.

Building Groups: Building groups are categories of typical use-types of the City’s municipal facilities developed by the Energy and Water Management Program to compare similar types of facilities with each other and with national standards (e.g., fire stations, schools, and offices). Specific City facilities within a building group are defined in Appendix 4.

Benchmarking: The practice of comparing the measured utility performance of a building over time to itself or relative to other similar buildings.

Climate Action Plan (CAP): A document detailing city-wide greenhouse gas emissions reductions goals with strategies and key actions that target municipal and community-wide sources including the residential, commercial, transportation, and waste sectors. The CAP was adopted by Charlottesville City Council on January 17, 2023.

Calendar Year (CY): Unit of time looking at measurements made from January 1st through December 31st of that year.

Capital Improvement Project (CIP): Project requiring capital expenditure and specified approval annually for City and School budgets.

Charlottesville City Schools (CCS): Charlottesville City Schools are the City of Charlottesville’s public school division. Charlottesville City Schools are a building group in the City facilities portfolio represented as the “Schools” building group.

City Facilities: City facilities represents all facilities and buildings that are managed and/or owned by the City of Charlottesville and are included in this report. In this report City and municipal are used synonymously. The City’s facilities are listed in their respective building group in Appendix 4.

Coronavirus (COVID-19): The coronavirus is an infectious disease that impacted the entire world brought on by a newly discovered coronavirus in 2019, giving it the name COVID-19.

Cubic Feet (cf): Unit of measurement used for natural gas and water utility consumption.

Degree Day: A measure of how hot or cold outside temperatures are on a particular day compared to a standardized temperature (65°F). A cooling degree day is where average temperatures for that day are above the standardized temperature and a heating degree day is where average temperatures are below the standardized temperature. The degree to which these are above or below the temperature are taken into account each day and then accumulated throughout the year to achieve the final cooling and heating degree days for that month or year.

Energy and Water Management Program (EWMP): A program run by the staff from the Office of Sustainability in coordination with Facilities Development and Facilities Maintenance Divisions within the Department of Public Works that manages utility usage for all City facilities.

Energy Performance Contract (EPC): An agreement between an entity and a contractor (typically an ESCO) to perform building upgrade services that provide guaranteed energy savings.

Energy Services Company (ESCO): A contractor that provides the services agreed to in an energy performance contract.

EnergyCAP: Software platform used by the City to monitor and manage utility usage and costs.

ENERGY STAR Score: An energy performance indicator ranging from 1 to 100 established by the Environmental Protection Agency's (EPA) ENERGY STAR program. This performance indicator compares a building's utility performance to other similar building types with normalization of weather and operational differences (e.g., occupancy, plug load, and operating hours). A higher ENERGY STAR score indicates a better building performance where a score of 50 represents a building with a median energy performance compared to similar building types across the nation.

Energy Use Intensity (EUI): The EUI is a measure of how much energy a building uses per square foot. To calculate the EUI, the total energy usage (e.g., electricity and natural gas) is converted to a common unit known as kilo-British thermal units (kBtu) and is then divided by the total square footage of the building. Typical EUIs can range from 40 – 70 kBtu/sf depending on the property type and the lower EUI value, the less energy intensive the facility.

Electric Vehicle (EV): Per the [U.S. Department of Energy](#), Vehicle that can be powered by an electric motor that draws electricity from a battery and is capable of being charged from an external source.

Fiscal Year (FY): Unit of time looking at measurements made from July 1st through June 30th of the following calendar year.

Greenhouse Gas (GHG): Gases that absorb infrared radiation and contribute to the greenhouse effect (warming) of the Earth. The primary greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, and ozone.

Heating, Ventilation, and Air Conditioning (HVAC): Equipment or system that controls thermal comfort within a built environment. Includes equipment such as air handlers, chillers, cooling towers, and boilers.

HVAC Schedules: Setting that determines when components of the HVAC system turn on and turn off daily.

Investment Grade Audit (IGA): Technically the second phase of the ESPC where onsite technical audits are performed at all participating facilities to identify energy/water conservation measures and facility improvement projects to be considered for selection for the overall ESPC project and implementation.

Kilo British Thermal Units (kBtu): Unit of measurement for energy. One Btu (British Thermal Unit) is defined as the amount of heat required to raise the temperature of one pound of water by one-degree Fahrenheit. 1 kBtu is equal to 1,000 Btus.

Kilowatt-hour (kWh): Unit of measurement for power, the rate at which energy is generated or consumed. Used to measure electricity consumption.

Light-Emitting Diode (LED): A semiconductor that emits light when current passes through it. LEDs typically use less energy and last longer than traditional light sources (e.g., incandescent, fluorescent, halogen).

Leadership in Energy and Environmental Design (LEED): An internationally accepted green building rating system developed by the US Green Building Council.

Metric Tons of Carbon Dioxide Equivalent (MTCO_{2e}): Unit used for aggregating greenhouse gases (e.g., carbon dioxide, methane, nitrous oxide) into one common unit. The global warming potential for each greenhouse gas (how much heat each gas traps in the atmosphere, relative to carbon dioxide) is used to convert the emissions of that gas to a carbon dioxide equivalent measured in metric tons.

Photo Voltaic (PV) System: A system that generates electric power by using solar cells to convert sunlight into direct current electricity.

Renewable Energy Credits (RECs): “A renewable energy certificate, or REC, is a market-based instrument that represents the property rights to the environmental, social, and other non-power attributes of renewable electricity generation. RECs are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable energy resource”. (Source: [U.S. Environmental Protection Agency](#))

Solar Power Purchase Agreement (PPA): A financial agreement with a developer where the developer facilitates the design and installation of a solar system and charges the customer a fixed electricity rate for the power generated, typically below the current market electricity rate. The developer maintains the system through the end of the contract term and at the end, the customer may choose to extend the contract, purchase the system, or have the developer remove it.

STEM (Science, Technology, Engineering, and Mathematics): Grade school subject that brings in concepts of science, technology, engineering, and mathematics together in one academic discipline. At Charlottesville City Schools, this subject is called “iSTEM” which stands for Instructional STEM.

Weather Normalization: A method of estimating the impact of weather on energy consumption and adjusting consumption to remove weather variance from year to year. Typically uses degree days (the number of days that exceed or go below a balance point temperature multiplied by the extent to which the daily average deviates from the balance point temperature). If the average temperature is above the balance point, that day would be considered a cooling degree day (CDD). If the average temperature is below the balance point, that day would be considered a heating degree day (HDD).

WE@Work (Water and Energy at Work): WE@Work is a program developed by the Energy and Water Management Program focusing on engagement and education of City staff to improve behaviors that could impact energy and water usage in the workplace.

Water Use Intensity (WUI): The water use intensity (WUI) is a measure of how much water (in gallons) a building uses per square foot. WUI is calculated by dividing the total water consumed by the building in one year by the total gross floor area of the building.

Appendix

Appendix 1: Previous Annual Energy and Water Performance Reports

City of Charlottesville Reports

FY2022 Energy and Water Performance Report

- [City of Charlottesville Fiscal Year 2022 Energy and Water Performance Executive Summary \(PDF\)](#)
- [City of Charlottesville Fiscal Year 2022 Energy and Water Performance Report \(PDF\)](#)
- [EnergyCAP City of Charlottesville Fiscal Year 2022 Energy and Water Performance Dashboard \(LINK\)](#)

FY2021 Energy and Water Performance Report

- [City of Charlottesville Fiscal Year 2021 Energy and Water Performance Executive Summary \(PDF\)](#)
- [City of Charlottesville Fiscal Year 2021 Energy and Water Performance Report \(PDF\)](#)
- [EnergyCAP City of Charlottesville Fiscal Year 2021 Energy and Water Performance Dashboard \(LINK\)](#)

FY2020 Energy and Water Performance Report

- [City of Charlottesville Fiscal Year 2020 Energy and Water Performance Executive Summary \(PDF\)](#)
- [City of Charlottesville Fiscal Year 2020 Energy and Water Performance Report \(PDF\)](#)
- [EnergyCAP City of Charlottesville Fiscal Year 2020 Energy and Water Performance Dashboard \(LINK\)](#)

Charlottesville City School Reports

FY2022

- [FY2022 Charlottesville City Schools Energy and Water Performance Executive Summary \(PDF\)](#)

2020 Charlottesville City Schools Energy and Water Performance Report

- [Charlottesville City Schools Annual Water and Energy 2020 Performance Report and Executive Summary \(PDF\)](#)
- [EnergyCAP Charlottesville City Schools Fiscal Year 2020 Energy and Water Performance Dashboard \(LINK\)](#)

2019 Charlottesville City Schools Energy and Water Performance Report

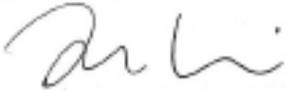
- [Charlottesville City Schools Annual Water and Energy 2019 Performance Report and Executive Summary \(PDF\)](#)
- [EnergyCAP Charlottesville City Schools Fiscal Year 2019 Energy and Water Performance Dashboard \(LINK\)](#)

Appendix 2: City of Charlottesville Energy and Water Management Policy

[City of Charlottesville Energy and Water Management Policy signed July 26, 2019](#) (Login Required: City of Charlottesville Intranet Website)

**CITY OF CHARLOTTESVILLE
STANDARD OPERATING PROCEDURE**



Type of Policy: FISCAL	Policy Number: 200-13
Subject: Energy and Water Management Policy	
Circulated for Comment/Approval of Lead Team? Yes	Date: July 11, 2019
Authorization: Dr. Tarron Richardson, City Manager	
Signature of City Manager: 	Effective Date: 7.26.19

I. PURPOSE OF POLICY

The intent of this policy is to establish guidelines for the optimization of energy and water performance in City of Charlottesville government facilities and to establish a foundation for the Energy and Water Management Programs. To realize commitments regarding reductions in emissions and resource waste, it is of the greatest importance that government facilities are operated in a manner that is economically and environmentally sustainable. It is the joint responsibility of all employees to implement this policy and support Charlottesville as a Green City.

Effective immediately, it is the policy of the City of Charlottesville that City facility operations, including building operations and occupant behavior, be conducted in the manner prescribed below.

Appendix 3: Resolution for Charlottesville City Schools Energy and Water Performance



Resolution for Charlottesville City Schools Energy and Water Performance

Whereas, Charlottesville City Schools are committed to personal and academic excellence and preparing all current and future students to be engaged citizens who make contributions to the well-being of their community, including the natural environment; and

Whereas, building energy use is a major expense and emitter of greenhouse gases contributing to air pollution and climate change; and

Whereas, actions that reduce negative climate and air quality impacts and increase energy efficiencies will also lead to a cleaner environment and a better quality of life for both students and community members; and

Whereas, renewable power installations, energy savings initiatives, and fuel-efficient transportation provide an educational opportunity for students and employees for everyday teaching and learning; and

Whereas, through practices and partnerships, Charlottesville City Schools strives for optimized energy and water efficiency while balancing equity, economic, and environmental impacts; and

Whereas, Charlottesville City Schools has been deliberate and proactive in implementing environmental improvement measures in school operations and taking actions that reduce resource consumption and associated greenhouse gas emissions, including:

- Implementation of a Guaranteed Energy Savings Performance Contract in 2007 to provide energy efficiency and infrastructure upgrades to three schools
- Certification by U.S. Environmental Protection Agency as ENERGY STAR® for seven of nine schools in 2009
- Installation of solar photovoltaic systems on Charlottesville High School and Lugo-McGinness Academy
- Honored by U.S. Department of Education in 2016 with Green Ribbon Schools District Sustainability Award; and

Whereas, pursuing energy improvements and cleaner sources of energy is in line with City goals, values, and commitments on climate protection that acknowledge local and global implications; and
Whereas, Charlottesville City Schools aims to reflect and support the goals of the community it serves.

City FY2023 Annual Energy and Water Performance Report

Therefore be it resolved that the Charlottesville City Schools, acknowledging the ongoing partnership with the City of Charlottesville and the reliance on City support in implementing energy and water performance improvement measures, commits to

- 1. Support improved performance of the school building portfolio through efforts to reduce energy and water use through management, conservation, and efficiency upgrades; and
- 2. Work with the City to pursue new school buildings that integrate high performance standards related to energy and water; and
- 3. Partner with City staff to evaluate and pursue opportunities increasing the amount of clean energy used by Charlottesville City Schools, such as through increased onsite renewable energy.



 Chair, Charlottesville City School Board

April 11, 2019

 Date

[Resolution for Charlottesville City Schools Energy and Water Performance \(PDF\)](#)

Appendix 4: City of Charlottesville's building groups and specific buildings used and referenced in the report.

City Building Groups

Courthouses

- Circuit Court
- Juvenile & Domestic Relations Court

Fire Stations

- Bypass Firehouse
- Central Fire House
- Fontaine Fire Station

Libraries

- Central Library
- Gordan Avenue Library

Offices

- CAFF Office (414 4th St.)
- City Hall Annex
- City Hall Complex
- Community Attention Main Office (909 E Market St.)
- DHS Administration (907 E. Jefferson St.)
- Jessup House
- Levy Building
- Preston-Morris Building
- Promise House (708 Page St.)
- Public Works Administration
- Wheeler Building

Vehicle Charging

- Police Vehicles Station
- Public Works Station

Parks

- Azalea Park
- Belmont Park
- City Market
- Court Square Park
- Downtown Mall Fountains
- Fifeville Park
- Forest Hill Park
- Greenleaf Park
- Jordan Park
- Various Landscape Accounts
- Maplewood Cemetery
- Market St. Park
- McGuffey Park
- McIntire Park
- Melbourne Road
- Northeast Park
- Oakwood Cemetery
- Pen Park
- PVCC Field
- Quarry Rd. Baseball Field
- Rives park
- Tonsler Park
- Washington Park Center, Grounds, and Pool

Transit & Parking

- Downtown Transit Station
- Market St. Parking Garage

Recreation & Sports

- Carver Center
- Crow Pool/Center
- Key Recreation Center
- McIntire Golf Course
- Meadowcreek Clubhouse and Golf Course
- Onesty Pool
- Smith Aquatic Center

Schools

- Buford Middle
- Burnley-Moran Elementary
- Charlottesville High School
- Clark Elementary
- Greenbrier Elementary
- Jackson-Via Elementary
- Johnson Elementary
- Lugo-McGinness Academy
- Venable Elementary
- Venable School Annex
- Walker Upper Elementary

Warehouses & Fleet Mixed Use

- City Yard Warehouse
- City Yard Wash Facility
- Facilities Maintenance
- Public Transportation
- Transit Operation Center

Street Lights & Traffic Signals

- Multiple Locations

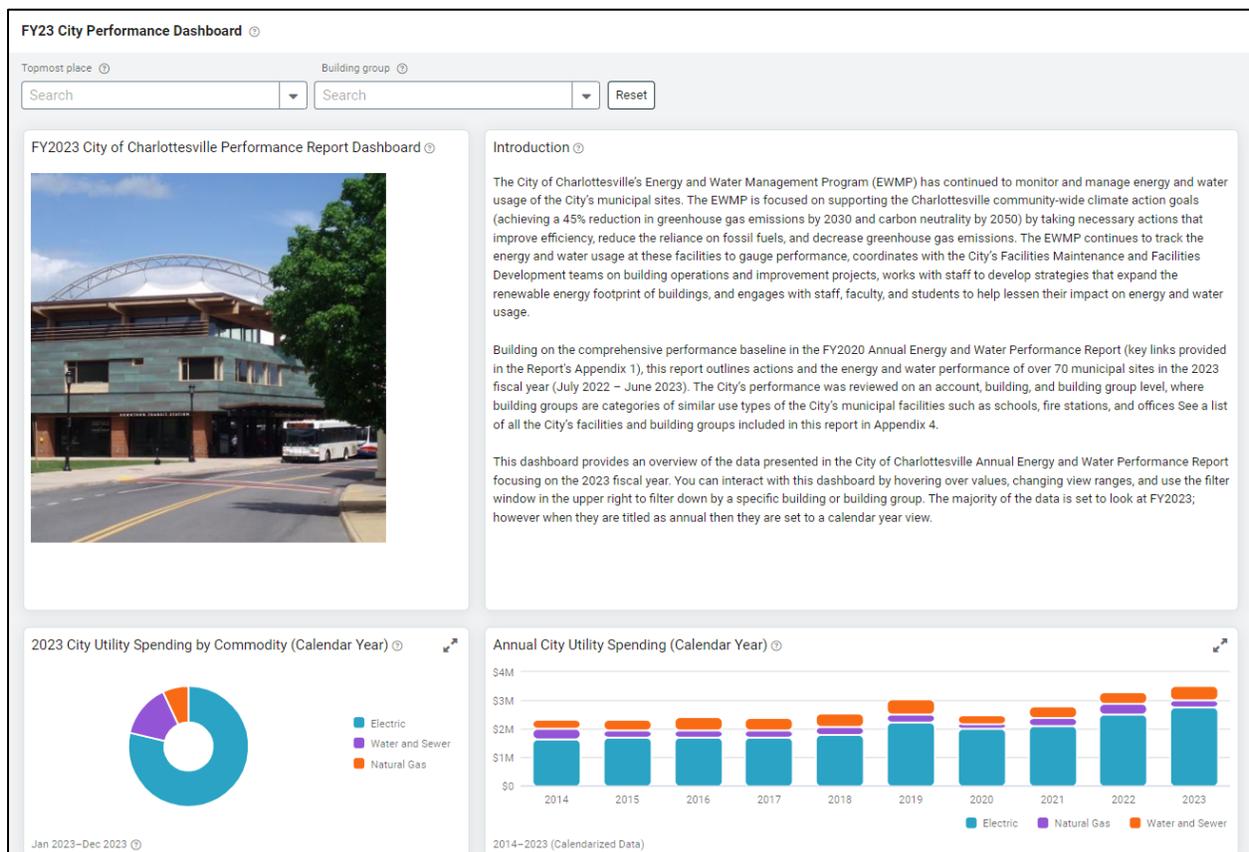
Appendix 5: EnergyCAP Dashboard info & Link

[EnergyCAP FY2023 City Performance Report Dashboard Link](#)

(Try opening dashboard using Chrome web browser for best results)

This dashboard is an interactive option for viewing the data put forth in this report using the EWMP utility tracking software, EnergyCAP. The figures in this dashboard are all slight variations of the data provided in this report. The data in this dashboard are for all City facilities; however, you can further filter the data specifically for one facility using the “Filter by building or building group” feature in the upper right. Start typing the name of the facility or building group (from Appendix 4) and select the correct name from the auto-generated list and the data will update with your new filtered view. Many of the figures and graphs offer the ability to interact including hovering over the figures to get detailed information and changing time views of the data using the slide bar above or below a graph. Most data presented in these figures are static and are focused on FY2023; however, a few are continually updated with data over time but still include FY2023 numbers and some are showing calendar year views, not fiscal year.

Any questions about this data or dashboard can be directed to EnergyWaterTeam@charlottesville.gov.



City FY2023 Annual Energy and Water Performance Report

Appendix 6: City Benchmarked Facilities and ENERGY STAR Scores

Facilities	ENERGY STAR Score*		
	FY2011	FY2022	FY2023
Buford Middle School	36	34	34
Burnley-Moran Elementary School <i>(ES Cert. 2009)</i>	67	72	68
Bypass Firehouse	208.5 kBtu/sf	165.3 kBtu/sf	191.4 kBtu/sf
Central Fire House	190.4 kBtu/sf	137.1 kBtu/sf	138.5 kBtu/sf
Central Library	204.4 kBtu/sf	148.5 kBtu/sf	157.8 kBtu/sf
Charlottesville High School <i>(ES Cert. 2009)</i>	61	57	57
Circuit Court	40	61	61
City Hall Annex	42	50	54
City Hall Complex <i>(ES Cert. 2009)</i>	79	89	87
Clark Elementary School <i>(ES Cert. 2009)</i>	47	38	28
CAFF Office (414 4th St.)	10	52	58
Community Attention Main Office (909 E Market St.)	84	92	94
Crow Pool/Center	374.2 kBtu/sf	461.0 kBtu/sf	383.4 kBtu/sf
Downtown Transit Station	24	39	39
Facilities Maintenance	97	98	100
Fontaine Fire Station	**	130.5 kBtu/sf	121.6 kBtu/sf
Gordon Avenue Library	148.6 kBtu/sf	102.0 kBtu/sf	101.9 kBtu/sf
Greenbrier Elementary School <i>(ES Cert. 2009)</i>	61	60	64
DHS Administration (907 E Jefferson St.)	65	74	77
Jackson-Via Elementary School <i>(ES Cert. 2009)</i>	45	50	48
Jessup House	**	99	**
Johnson Elementary School <i>(ES Cert. 2009)</i>	79	78	75
Juvenile & Domestic Relations Court	58	66	70
Key Recreation Center	152.4 kBtu/sf	131.8 kBtu/sf	132.9 kBtu/sf
Lugo-McGinness Academy	**	84	86
Market St Parking Garage	62.6 kBtu/sf	54.7 kBtu/sf	55.6 kBtu/sf
Onesty Pool	459.6 kBtu/sf	243.7 kBtu/sf	754.3 kBtu/sf
Preston-Morris Building	59	73	64
Public Works Administration	72	87	88
Pupil Transportation	98	100	100
Smith Aquatic Center	1010.8 kBtu/sf	349.3 kBtu/sf	448.1 kBtu/sf
Tonsler Park	149.9 kBtu/sf	321.4 kBtu/sf	346.8 kBtu/sf
Transit Operation Center	193.6 kBtu/sf	134.0 kBtu/sf	125 kBtu/sf
Venable Elementary School	52	55	48
Venable School Annex	1	21	14
Walker Upper Elementary School	33	20	19
Wheeler Building	40	44	53

* Property types that aren't eligible for ENERGY STAR scores use weather normalized source EUI (kBtu/sf) in Portfolio Manager.

** Facility was not constructed or owned/occupied by the City at this time.

Appendix 7: Detailed Utility Usage and Costs for FY2022 and FY2023

Appendix 7.1: City of Charlottesville’s electric usage and costs for each building group in FY2022 and FY2023 with percent comparison.

Building Group	Electricity (kWh)			Electricity Cost		
	FY2022	FY2023	% Change	FY2022	FY2023	% Change
Courthouses	650,420	617,502	-5%	\$62,863	\$72,439	15%
Fire Stations	742,518	667,149	-10%	\$62,177	\$74,634	20%
Libraries	631,672	647,099	2%	\$60,823	\$71,618	18%
Offices	2,410,791	2,321,415	-2%	\$207,091	\$252,864	24%
Parks	569,130	626,882	10%	\$58,624	\$78,064	33%
Recreation & Sports	1,735,705	2,057,328	19%	\$164,172	\$235,184	44%
Schools	9,116,873	8,780,513	-4%	\$912,998	\$1,055,850	16%
Street Lights & Traffic Signals	3,265,358	3,217,863	-1%	\$579,598	\$645,455	11%
Transit & Parking	1,213,491	1,184,448	-2%	\$108,379	\$133,629	23%
Vehicle Charging Stations	3,509	5,073	45%	\$534	\$805	51%
Warehouses & Fleet Mixed Use	601,743	559,336	-7%	\$57,398	\$66,164	15%
Total	20,941,209	20,684,608	-1%	\$2,274,656	\$2,686,706	18%

City FY2023 Annual Energy and Water Performance Report

Appendix 7.2: City of Charlottesville’s natural gas usage and costs for each building group in FY2022 and FY2023 with percent comparison.

Building Group	Natural Gas (cubic feet)			Natural Gas Cost		
	FY2022	FY2023	% Change	FY2022	FY2023	% Change
Courthouses	907,200	942,964	4%	\$11,752	\$10,451	-11%
Fire Stations	997,713	995,580	0%	\$12,141	\$10,058	-17%
Libraries	867,639	915,688	6%	\$10,647	\$9,048	-15%
Offices	2,748,047	2,948,678	7%	\$32,898	\$28,977	-12%
Parks	659,650	646,088	-2%	\$8,693	\$7,079	-19%
Recreation & Sports	7,024,550	6,511,359	-7%	\$79,660	\$59,844	-25%
Schools	13,285,104	13,264,459	0%	\$149,397	\$117,563	-21%
Street Lights & Traffic Signals		-			\$0	
Transit & Parking	2,144,900	2,158,483	1%	\$25,349	\$21,599	-15%
Vehicle Charging Stations		-			\$0	
Warehouses & Fleet Mixed Use	2,472,407	2,177,199	-12%	\$30,086	\$23,160	-23%
Total	31,107,210	30,560,499	-2%	\$360,621	\$287,778	-20%

City FY2023 Annual Energy and Water Performance Report

Appendix 7.3: City of Charlottesville’s water usage and costs (water and sewer) for each building group in FY2022 and FY2023 with percent comparison.

Building Group	Water Use (cubic feet)			Water & Sewer Cost		
	FY2022	FY2023	% Change	FY2022	FY2023	% Change
Courthouses	44,741	34,911	-22%	\$8,278	\$7,196	-13%
Fire Stations	67,937	167,605	147%	\$13,413	\$28,463	112%
Libraries	22,163	34,246	55%	\$4,338	\$6,487	50%
Offices	226,034	227,085	0%	\$38,225	\$40,683	6%
Parks	743,805	851,014	14%	\$103,213	\$120,412	17%
Recreation & Sports	226,830	348,692	54%	\$28,733	\$44,647	55%
Schools	1,408,165	1,196,479	-15%	\$199,102	\$196,062	-2%
Street Lights & Traffic Signals						
Transit & Parking	155,603	126,840	-18%	\$23,949	\$21,095	-12%
Vehicle Charging Stations						
Warehouses & Fleet Mixed Use	49,920	54,351	9%	\$7,799	\$8,999	15%
Total	2,945,200	3,041,223	3%	\$427,051	\$474,045	11%