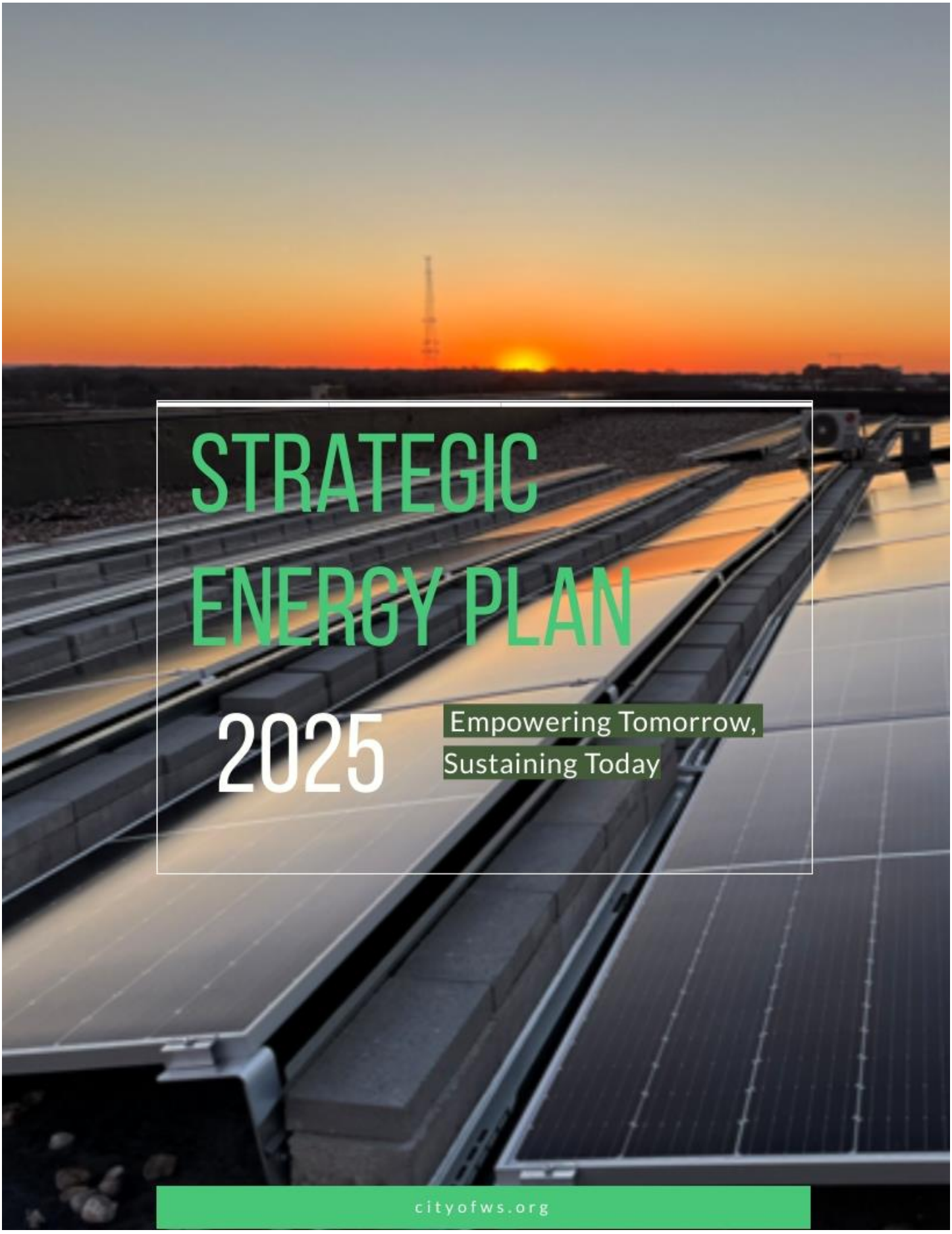


STRATEGIC ENERGY PLAN

2025

Empowering Tomorrow,
Sustaining Today

cityofws.org

Introduction

Dear Residents of Winston-Salem,

I am pleased to present to you Winston-Salem's Strategic Energy Plan, a roadmap that outlines our commitment to sustainability, energy efficiency, and reducing our carbon footprint. This plan is a testament to our dedication to creating a cleaner, healthier, and more resilient community for current and future generations.

Since 2007, our city has taken significant strides towards cleaner energy and sustainability. From the establishment of greenhouse gas inventories to the adoption of strategic plans and sustainability roadmaps, our journey has been marked by continuous progress and innovation. Building on this momentum, we are now taking a step forward with the Strategic Energy Plan.

Our plan is rooted in the principles of energy equity and environmental justice, ensuring that the benefits of our initiatives are accessible to all residents. We recognize the importance of addressing the unique needs of vulnerable communities and are committed to creating programs that promote energy savings and green job opportunities.
This Strategic Energy Plan is not just a document; it is a call to action. It represents our collective vision for a sustainable future and our unwavering commitment to making that vision a reality. I am confident that, with the support of our residents, businesses, and partners, we will achieve our goals and set a standard for other communities to follow.

Thank you for your continued support and dedication to making Winston-Salem a leader in sustainability and clean energy. Together, we can create a brighter, more sustainable future for all.

Dr. Shaleen Miller

Director of Sustainability & Intergovernmental Realtions

Acknowledgements:

A report such as this takes a substantial amount of effort and vision. Key members of this team include Lindsey Smith, energy manager, and Angus Thomas, fleet services director. In addition, Utilities and Marketing contributed to the information and graphics of this report.

Contents

Background

City officials and staff are taking decisive steps to propel Winston-Salem towards a more sustainable future. A significant milestone in this journey occurred in 2007 when Mayor Allen Joines signed the Climate Mayors Agreement, committing to adopt, honor, and uphold the goals of the Paris Agreement. As one of the first 60 mayors to sign this agreement—now endorsed by over 400 mayors nationwide—Mayor Joines positioned Winston-Salem as a leader in climate action.

Utilizing online reporting tools Winston-Salem has effectively measured its sustainability baselines. These tools have provided a thorough gap analysis, highlighting sustainability opportunities across various city departments and functions. The analysis has identified climate, energy, and natural systems as areas requiring the most immediate attention. The City has also conducted various hazard and vulnerability assessments, which reveal that Winston-Salem's major threats include extreme temperatures, drought, localized flooding and climate change. These events pose significant risks to many local systems and resources, particularly those highlighted in the gap analysis. Guided by the Forward 2045 comprehensive plan, the city has identified four key areas to target for emission reductions.

In 2020, with assistance from the Community Sustainability Program Committee (CSPC), the City Council approved Resolution #20-0499. This resolution sets ambitious goals, including achieving 100% clean renewable energy by 2050 and creating green jobs. This Strategic Energy Plan is created to guide the City to meeting this goal in an effort to create benefits of cleaner air, reduced energy consumption, increased resilience, and an overall healthier environment for all residents and future generations.

Resolution 20-0499

In 2020, with assistance from the Community Sustainability Program Committee (CSPC), the City Council approved Resolution #20-0499. This resolution sets ambitious goals, including achieving 100% clean renewable energy by 2050 and creating green jobs. This Strategic Energy Plan is created to guide the City to meeting this goal in an effort to create benefits of cleaner air, reduced energy consumption, increased resilience, and an overall healthier environment for all residents and future generations.

Carbon-Neutrality

What it means to be carbon neutral

Graphic Source: Climate Active.org

The goal of 100% clean and renewable energy is a goal that matches many other cities and regions and is referred to as carbon neutral goals.

Carbon neutral means taking steps to remove the equaivalent amount of carbon dioxide (CO2) to what an organization is emitting through activities. It includes emissions avoidance activities.

Net zero refers to the amount of greenhouse gases (GHG)--such as carbon dioxide or methane--removed from the atmosphere being equal to those emitted by human activity. It is carbon neutrality expanded in scale.

Key Strategies

Achieving the City's decarbonization goals will necessitate financial investments to implement the strategies and action items. Many of these investments are anticipated to yield long-term cost savings. To manage these costs, the City will pursue innovative solutions and explore all potential funding sources, including federal, state, and local funds, government financing, and public-private partnerships. This plan outlines four major strategies.

Maximize Energy Efficiency in Fleet, Buildings, and Utilities operations

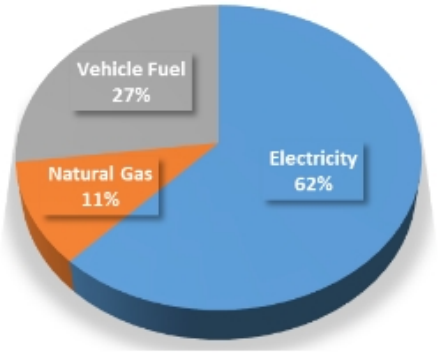
Expand Renewable Energy Generation

Increase Vehicle Conversion to Electrification , Hybrid, and Alternative, Clean Fuels

Seek Funding Opportunities and Partnerships to Support Strategic Energy Goals

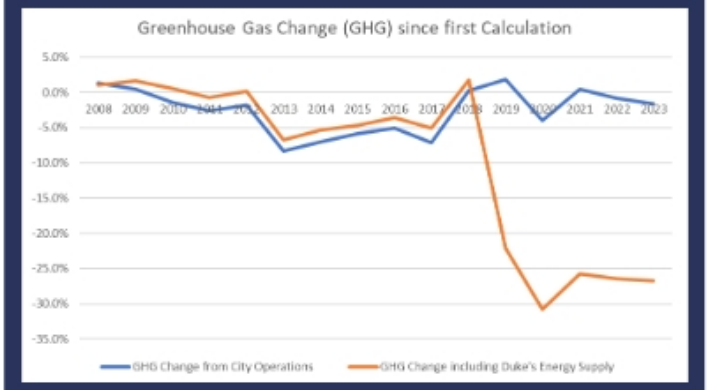
The Starting Point: City's Carbon Footprint

CO2 Emissions by Fuel Type



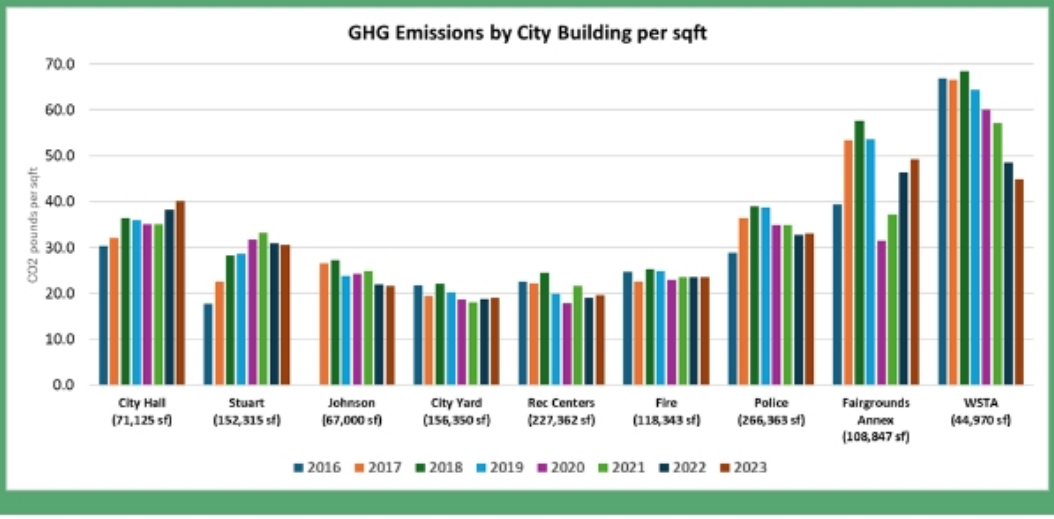
Carbon Emissions by Fuel Type

To reach zero emissions, we need to start with the City's current Carbon Footprint. The pie chart below separates these emissions into three main sources: Electricity, Natural Gas, and Vehicle Fuel. Electricity is the largest producer of greenhouse gas emissions (GHG), followed by vehicle fuel.

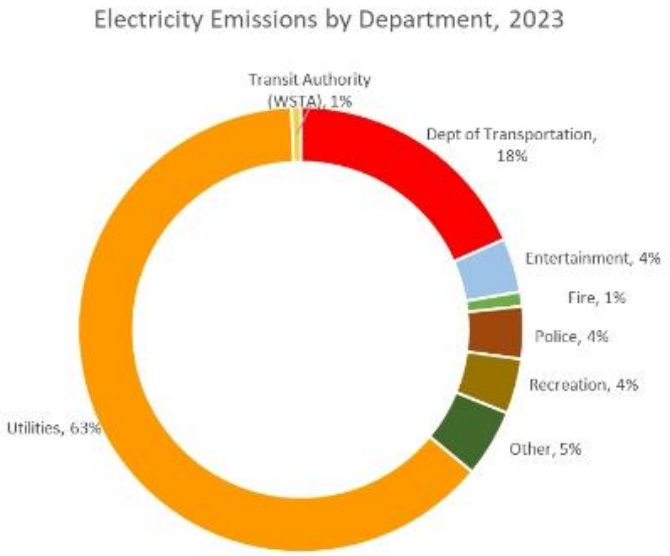


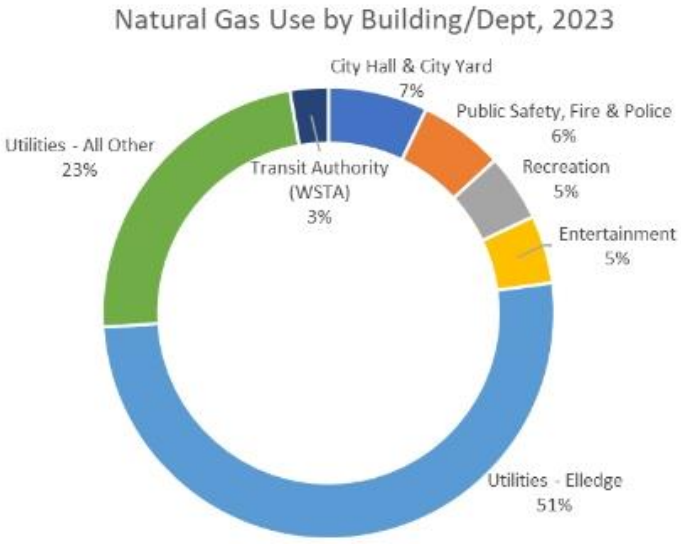
Greenhouse Gas Change (GHG) over Time

The chart shows the Carbon Footprint. From 2008, City Operations have contributed to a 1.6 % reduction. Duke has removed several coal-fired power plants from service and added more renewables. With these changes in Duke operations, there has been a GHG reduction of 26.8%[SW2]



Overview Energy Use by Department/Building





CO2 Emissions Saved

106,350 lb

Equivalent Trees Planted

804

City Installed Solar

The City installed a 70 KW solar panel (PV) system on the rooftop of the Byrce A Stuart Building in December 2023. It went live in May 2024, and supplies approximately 6% of the building's annual energy. Statistics above show the benefits over 9 months of operation (up to Jan. 2025).

Digester Gas Generator

The Muddy Creek Wastewater Treatment Plant (WWTP) operated by Utilities has lowered its power costs and increased efficiency by generating electricity from sewage gas.

VEHICLE FUEL USAGE BY FISCAL YEAR (Gallons)		
Dept	**FY09-10**	**FY23-24**
Police	484,081	389,580
Fire	86,399	112,449
Vegetation Mgt	56,367	54,878
Recycling[1]		55,429
Sanitation	272,595	322,207
Streets & Dept of Transportation	83,143	66,177
Inspections	19,319	22,748
Utilities	277,143	180,673
Utilities Outside Fuel[2]		119,640
Recreation	29,206	29,174
Transit Authority (WSTA)	663,700	639,500
All Other	81,264	74,510
TOTAL	**2,053,217**	**2,066,965**
CO2 Emissions	**20,532**	**20,670**

1. Recycling was contracted by a 3rd party until 2023. City did not buy the fuel.
2. Utilities Outside fuel use (separate vendor provided fuel) does not have data from previous years available. This is primarily diesel fuel used for equipment at the Hanes Mill Road landfill.
3. 2009 is the first year of data on fuel that we have available to track by department.

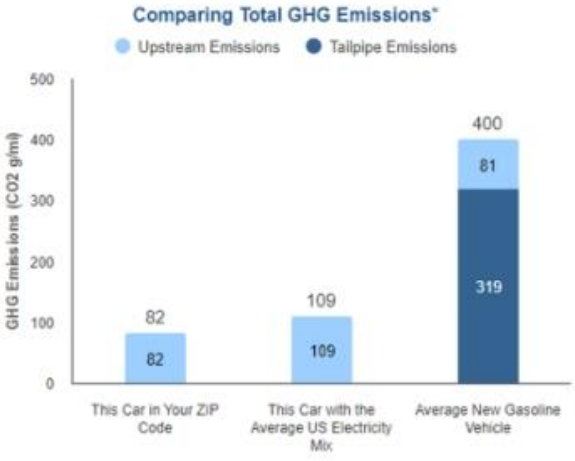
Current Fleet

Total Fleet Counts & Status

Vehicle & Equipment Class	Count	Average Age	Replacement Age	# Past Replacement Age
Police Pursuit Vehicles	378	6	9	69
Admin Vehicles	150	9	10	50
Light Duty Equipment	522	8	10	140
Medium Duty Equipment	129	12	10	52
Heavy Equipment	156	6	10	24
Trailered Equipment	153	17	15	78
Construction Equipment	216	17	12	131
Totals	1704	10.7		544

As of December 2024, the City owns eight, newer electric (EV) vehicles. This includes 1 van (Ford E-transit), 4 sedans (Tesla Model 3), and 3 pickup trucks (Ford Lightning F150). The van and two of the sedans are in the Utilities department. The remaining vehicles are in Property and Facilities Maintenance, Streets, Stormwater, and part of the Fleet rental pool. In addition, the City has two older EV vehicles that are nearing end of life that serve Property and Facilities Maintenance and Vegetation Management.

Emissions from Fueleconomy.gov



The chart shows the GHG savings from switching to an electric vehicle, using the example of one of the City's Teslas. All vehicles have some GHG created from the manufacturing process. In addition, there is some GHG from the electrical grid; however, this is much lower than the GHG from using gasoline. In addition, the emissions produced are not localized; therefore, an EV lowers local air pollution levels.

Electric Vehicle (EV) Charging

The City has installed or is in the process of installing Level 2 EV chargers for City Fleet vehicles at City Hall and City Yard.

Hybrid Vehicles

The City also has 66 hybrids in the fleet. Hybrids have gas engines; however, they get significantly better gas mileage, reducing the fuel consumption. This decreases the lifetime cost of the vehicle and reduces GHG emissions.

HYBRID Vehicles	
Department	**Count**
Sustainability	1
Employee Health & Safety	1
Neighborhood Services	3
Police Administration	28
Fire Administration	5
Recycling	1
Vegetation Management	1
Inspections	5
Transportation	3
Utilities	15
Fleet Services	2
Property Maintenance	1

Strategy #1 Maximize Energy Efficiency in Fleet, Buildings, and Utilities Operations

By integrating the following strategies, the City can significantly enhance the energy efficiency of its buildings. This will not only reduce operational costs and environmental impact but also demonstrate our commitment to sustainability and responsible energy management.

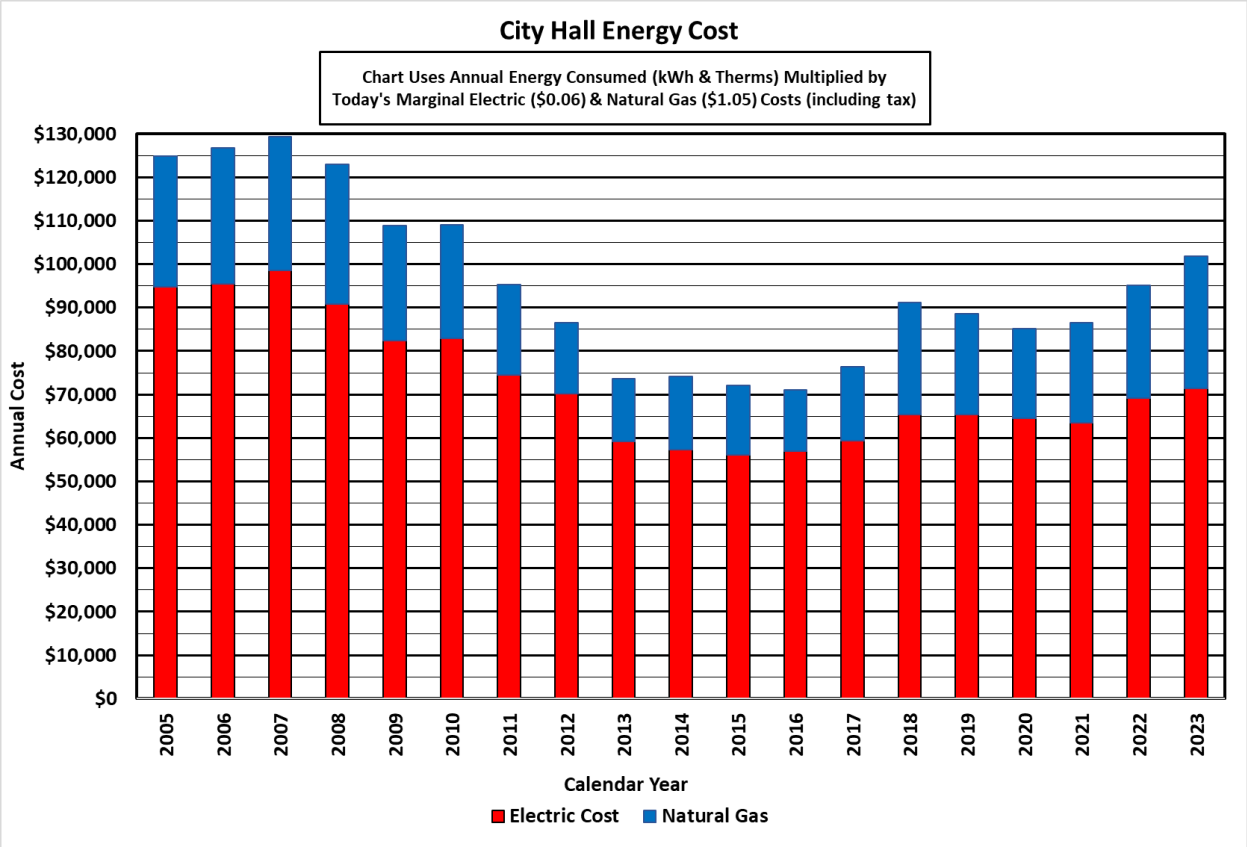
LED Lighting: Upgrading to LED lighting throughout all municipal buildings is a fundamental strategy for enhancing energy efficiency. LED lights consume significantly less energy and have a longer lifespan compared to traditional fluorescent and halide bulbs. This not only reduces energy consumption but also lowers maintenance costs due to less frequent replacements. Implementing LED lighting will provide immediate energy savings and contribute to the City's overall sustainability goals. Some city buildings have been upgraded to LED's; however, most buildings still need to be transitioned.

City buildings make up roughly 18.4% of the city's non-utility energy consumption. By replacing existing lighting with LEDs, city buildings could achieve significant energy savings. For example, if all lighting in the Bryce A. Stuart Municipal Building is converted to LED, the building's overall energy consumption will decrease. This reduction means that the already-installed 70kW solar panels would cover a larger portion of the building's energy needs, increasing their contribution from the current 6% due to the smaller total electricity demand.

Retrocomissioning: Periodically retrocommissioning our buildings ensures that all systems are functioning as intended and operating at peak efficiency. This process involves a thorough review and adjustment of existing mechanical, electrical, and control systems to optimize performance. Retrocommissioning can identify and rectify inefficiencies, leading to substantial energy savings and improved building operations. By regularly undertaking this practice, we can maintain high levels of energy efficiency over the long term.

Building Automation Systems (BAS) and Smart Data Tools: The implementation of Building Automation Systems (BAS) is critical for optimizing the energy use of heating, cooling, lighting, and other systems within our buildings. BAS technology allows for centralized control and monitoring, enabling adjustments based on occupancy, time of day, and other factors to minimize energy wastage. Integrating BAS into our buildings will lead to smarter energy management and significant reductions in energy consumption. City has BAS systems in at least eight large buildings and has programmable thermostats in almost all facilities, but the City does not currently have a Building Controls Manager to focus on optimization. Hiring a building controls manager is a key work item for making sure that continued management of systems already installed work efficiently.

Ensuring correct controls will also help current systems installed work efficiently. For example, the City's police firing range is equipped with an ice bank thermal energy storage system. This system works like an energy battery that runs at off-peak hours to reduce high cost time of use (demand pricing) energy hours. Based on this pricing and seasons, systems like these need to be monitored and maintained for efficiencies.



When building systems are not maintained, energy use may go up despite other technologies present. The graph above of City Hall shows where the building was actively managed for energy efficiency between 2013 and 2017, which correlates to the years that energy costs were the lowest since 2005. The savings realized during that time frame began to increase when the building was no longer managed due to staffing needs. The City should hire staff to manage building controls. Monitoring and maintaining building systems can provide both energy and cost savings.

High Performance Building Standards: Adopting high performance building standards, such as LEED certification, for new constructions and major renovations ensures that our buildings are designed and built with energy efficiency in mind. These standards encompass various aspects of sustainability, including energy use, water efficiency, and indoor environmental quality. By adhering to these rigorous standards, we can achieve substantial energy savings, reduce our environmental impact, and create healthier indoor environments for occupants.

Energy Efficient Appliance and Equipment: Upgrading to energy-efficient appliances and office equipment is a straightforward yet impactful strategy for reducing energy consumption within our buildings. Energy Star-rated appliances, efficient HVAC systems, and other high-performance equipment use less energy while providing the same or better performance as standard models. Investing in these energy-efficient options will lead to lower energy bills and support our broader

energy efficiency objectives. A key work item in this strategy is to encourage sustainable purchasing for all departments.

Strategy #2: Expand Renewable Energy Generation

Expanding renewable energy generation is a pivotal strategy in the City's commitment to sustainability and achieving its carbon neutrality goals. This strategy involves increasing the capacity and utilization of renewable energy sources to power municipal operations, thereby reducing reliance on fossil fuels and lowering greenhouse gas emissions.

In order to obtain its clean and renewable energy goals, the City will need to pursue a variety of possible solutions for energy generation.

Solar Energy: Investing in solar energy infrastructure is a primary focus for the City with plans to install solar panels on rooftops of municipal buildings, parking structures, and other suitable properties. Additionally, exploring opportunities for ground-mounted solar farms on city-owned land will further augment our solar capacity. These installations will provide a significant portion of the City's energy needs, reduce electricity costs, and contribute to a cleaner energy grid. City will continue to review options to purchase off-site solar energy and community solar energy (if approved in North Carolina).

The U.S. Department of Energy (DOE) provided free consulting for the City via the C2C: Clean Energy to Communities and the Pacific Northwest National Laboratory, which provided a first level evaluation[1] of the City's buildings in order to evaluate which building types would provide the greatest opportunity for solar capacity and savings. This evaluation used building capacity information and electricity costs to determine which buildings would benefit. Based on this analysis, Fire Stations would have the quickest payback (approximately 15 years) and provide more coverage percentage of electricity than possible at many other building types. Community Centers are the most variable, payback is dependent on amenity and use factors. Payback ranges on them averages 18-25 years. Larger buildings, such as the Police Firing Range and Johnson Municipal Center (Lowery St) can hold much larger solar installations, which reduce the price per KW that the City would pay to install. These larger installations would also reduce the overall GHG footprint more per year; however, the payback, due to use of the buildings, is longer.

Biogas: When organic waste decomposes anaerobically (without oxygen) in landfills, it produces methane, a potent greenhouse gas. This methane can be captured and processed to create landfill gaswhich can then be used as a renewable energy source. By capturing and utilizing this

[1] This evaluation used a sampling of buildings. A full solar feasibility study is recommended for further consideration on costs and buildings to include/exclude.

methane, greenhouse gas emissions are reduced and energy is generated that can be used for electricity generation, heating, or as a vehicle fuel.

Both landfill gas and digester gas are renewable sources of energy derived from the continuous biological process of decomposition. Utilizing biogas from landfills and wastewater treatment plants improves waste management practices by turning waste into a valuable energy resource. City Utilities currently captures landfill gas at Hanes Mill Road Landfill which is utilized by a third-party contractor to generate electricity currently; however, the contractor is developing plans to sell pipeline quality natural gas.

While the Hanes Mill Landfill does have a methane gas generation facility, this facility is owned and operated by a contractor. Therefore, the City does NOT gain GHG credits for this facility.

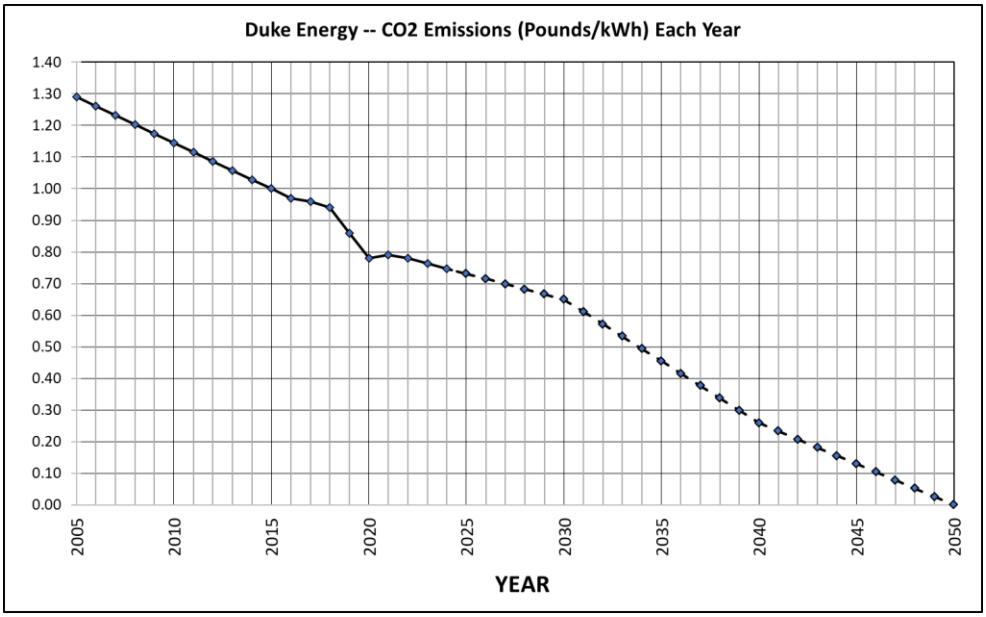
Similarly, digester gas is produced from the anaerobic digestion of organic matter in water treatment plants. This process breaks down biodegradable material and produces biogas, primarily composed of methane and carbon dioxide. The captured biogas can be treated and used as a renewable energy source for electricity, heating, or as a fuel for vehicles, similar to landfill gas.

The City Utilities Department currently has a biogas generator in the form of a Combined Heat and Power (CHP) generator that produces approximately 5 million kWh of energy using digester gas at Muddy Creek Waste Water Treatment Plant (WWTP). Utilities' other WWTP, Elledge, generated electricity into the 1980's, but currently only uses the waste digester gas to heat the BioSolids Dryer and maintain digester tank temperatures. Evaluation of a CHP generator at Elledge should be considered since it could result in reduced net energy. For example, a CHP generator would likely produce 10 to 15 million kWh and the excess heat would still be available for use in the BioSolids Dryer.

Hydropower: Hydroelectric power was generated at Idols Dam for almost 100 years before the powerhouse was removed. Idols Dam should be evaluated for the potential of installing a new technology hydroelectric generation facility. A vendor (Voith Hydro) that specializes in small hydroelectric projects estimated 10 million kWh could potentially be generated annually. This option would require an RFP to determine size, cost and financial and operational feasibility of pursuing this project.

Duke Emission Changes: Duke Energy, the primary electricity provider for the City, is actively transitioning towards renewable energy sources. This shift is expected to significantly influence the City's carbon footprint, aligning with our strategic energy goals and commitment to sustainability. As of the latest data from the North Carolina Public Utilities Commission, Duke Energy's energy mix includes a combination of coal, natural gas, nuclear, and renewable energy sources. In 2023, renewables (including solar and wind) accounted for approximately 2.7% of Duke Energy's total energy production. The remaining energy comes from fossil fuels and nuclear power, contributing significantly to carbon emissions.

Source: Duke Energy



Duke's stated goals are to reduce CO2 emissions from 2005 levels by 50% before 2030, 80% before 2040, and 100% before 2050. NC State Law, HB 951, requires Duke to meet the emissions goals, including stopping coal power production.

Strategy #3: Increase Vehicle Conversion to Electrification, Hybrid and Alternative, Clean Fuels

Electric Vehicles

Increasing the electrification of vehicles is a critical strategy in the City's overall plan to enhance sustainability and reduce carbon emissions. Transitioning from traditional internal combustion engine (ICE) vehicles to electric vehicles (EVs) will significantly lower greenhouse gas emissions, reduce fuel costs, and improve air quality. Key differences in emissions are as follows:

Tailpipe Emissions: EVs produce zero tailpipe emissions, eliminating local pollutants such as nitrogen oxides (NOx), particulate matter (PM), and carbon dioxide (CO2). In contrast, Internal Combustion Engine (ICE) vehicles emit significant amounts of these pollutants, contributing to poor air quality within the City. While CO2 emissions contribute to climate change, the other emissions can contribute to the poor health of residents, especially in the designated Justice 40[2] areas.

[2] Justice40 was social equity and environmental justice initiative by the Biden administration that aimed to prioritize federal investments to benefit disadvantaged communities. Justice40 was an official map of these disadvantaged designations.

Lifecycle Emissions: While EVs have higher emissions during manufacturing, their overall lifecycle emissions are lower due to the absence of tailpipe emissions and higher efficiency. Studies show that EVs can reduce GHG emissions by approximately 50% compared to ICE vehicles when considering the full lifecycle, including production, operation, and disposal.

Energy Source Emissions: The emissions associated with EVs depend on the energy mix of the electricity grid. As the grid incorporates more renewable energy sources, the GHG emissions of EVs will continue to decrease. With Duke Energy's transition to renewables, the emissions benefits of EVs will be further enhanced.

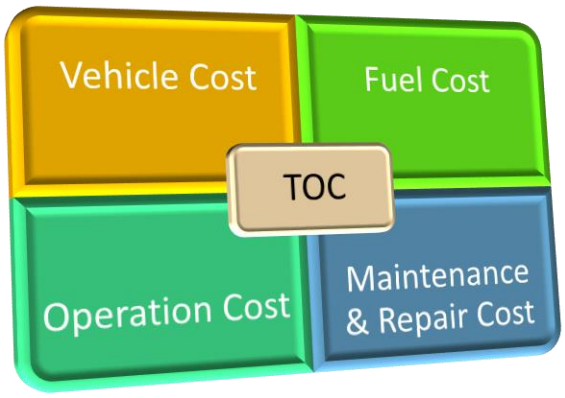
Two main items that the City can implement are: 1. Transitioning the municipal fleet to EVs and 2. Expanding EV Charging Infrastructure. Subsequent options are included for those vehicles that are not yet ready to transition.

1. Transitioning the municipal fleet to EV

EV Suitability for Fleet Operations

To determine the suitability of EVs for various fleet operations, the City will consider the following factors:

Annual Mileage and Duty Cycle: Light-duty vehicles with higher annual mileage are ideal candidates for electrification due to the greater lifecycle cost savings from reduced fuel and maintenance expenses. Driving range is generally not a concern for light-duty vehicles operating within the city limits making them well-suited for EV deployment.



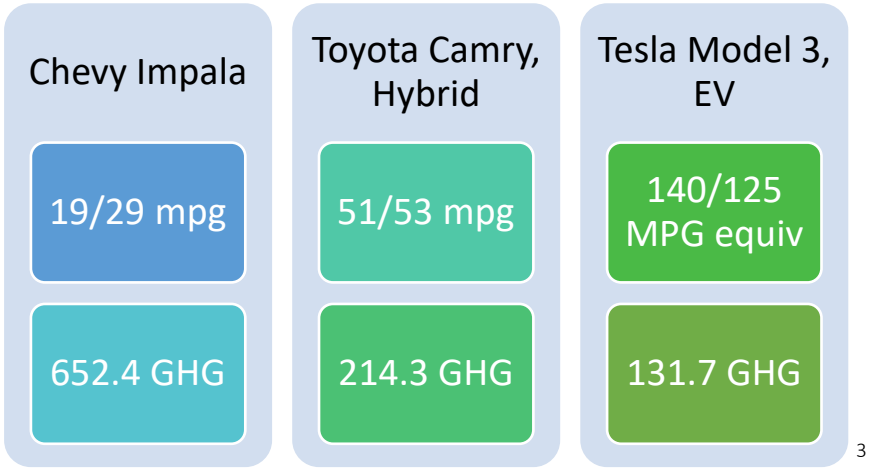
Total Cost of Ownership (TCO): EVs generally have higher upfront costs but lower operating and maintenance costs compared to ICE vehicles. The City will evaluate the TCO, including fuel savings, reduced maintenance expenses, and potential incentives, to identify the most cost-effective vehicles for transition.

Operational Reliability: EVs have fewer moving parts and require less maintenance, leading to higher reliability and reduced downtime.

Priority for Transition: Light-Duty Vehicles

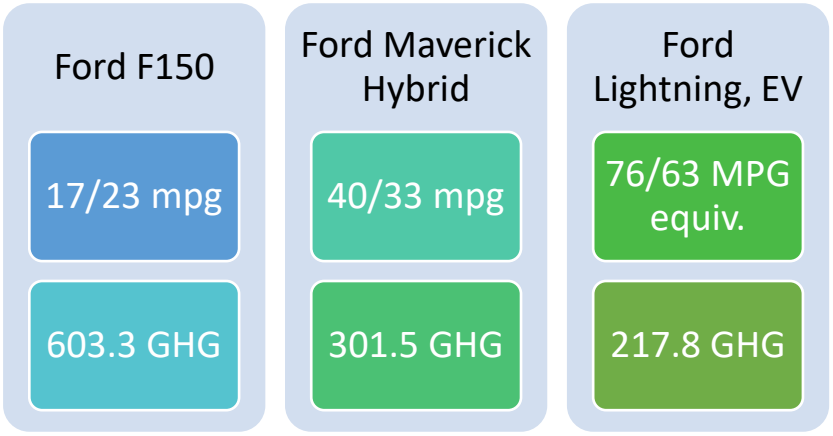
The transition to EVs will prioritize light-duty vehicles, as they are well-suited for electrification and constitute a significant portion of the City's fleet. The following categories of light-duty vehicles will be transitioned first.

Sedans, Examples



[3]

Light Duty Trucks, Examples



[3] These examples were calculated by consultant for City's use case and TOC

Administrative and Pool Vehicles: These vehicles are used for daily administrative tasks and short trips around the city. Their predictable usage patterns and lower mileage make them ideal candidates for early electrification.

Maintenance and Service Trucks: Light-duty trucks used for maintenance, inspections, and other city services will be transitioned to EVs. These vehicles often operate within a limited area and can easily return to a central location for charging. EV trucks generally include electric outlets that can supply worksite electricity for small tools.

Public Safety Vehicles: Non-emergency public safety vehicles, such as those used by code enforcement and parking enforcement, will be prioritized for transition. These vehicles benefit from the high reliability and low operational costs of EVs.

Parks and Recreation Vehicles: Light-duty vehicles used by the Parks and Recreation Department for park maintenance and services will be transitioned to EVs. These vehicles typically have short routes and frequent stops, ideal for electric drivetrains.

Transitioning Higher Priority Vehicles

After transitioning the priority light-duty vehicles, the City will focus on vehicles with more complex usage patterns, such as:

Inspections, Pursuit Vehicles, and Take-Home Vehicles: These vehicles will be pursued after the initial priority vehicles due to issues with home charging and ensuring City responsibility for vehicle charging. Developing appropriate home-charging solutions and policies will be critical for these vehicle categories.

Transition of Heavy-Duty Vehicles

Heavy-duty vehicles will be transitioned to EVs as adequate replacements become available and financial considerations allow. This includes: Availability and Cost: Transitioning heavy-duty vehicles will depend on the availability of suitable EV models and their costs. The City will aim to transition these vehicles when EV prices come down to within 25% of ICE vehicle costs or when sufficient funding is secured.

Fleet Analysis for Transition

During the summer of 2024, a fleet analysis was conducted for the City using assistance from the Department of Energy's Clean Energy to Communities (C2C) program, the Environmental Defense Fund's (EDF's) Climate Fellow Program, and Wake Forest University's engineering department. Assumptions given from the City's Fleet Department include assuming that vehicle replacement prioritization is primarily based on age in service (older vehicles being replaced sooner) and higher annual mileage (priority given to vehicles with more mileage in the same

service period). If a vehicle's odometer reading exceeds 100,000 miles, it will be considered for replacement regardless of the number of years in service.

The vehicles identified as available to transition began at 662. Removing 334 vehicles due to being Patrol vehicles or other vehicles without EV charging infrastructure available, reduce available vehicles to 328.

The next round of analysis considered the models currently available as equivalent models. This analysis should be revised as new models come on the market. There are 69 vehicles in the City fleet that do not currently have EV equivalents without significant upsizing/downsizing costs. Examples of these vehicles include, but are not limited to: 3/4 Ton Pickups, 1 Ton Pickups, Minivans, and most heavy equipment such as dump trucks.

During this phase of the analysis, an additional 12 vehicles will not be replaced due to service schedule and or concern of mileage range.

The final number of vehicles in the current replacement schedule that could be transitioned to EV over the 10 year time frame from 2024 to 2033 is 202. The number of annual replacements varies by year and ranges from 14-31 vehicles per year.

Hybrid Vehicles

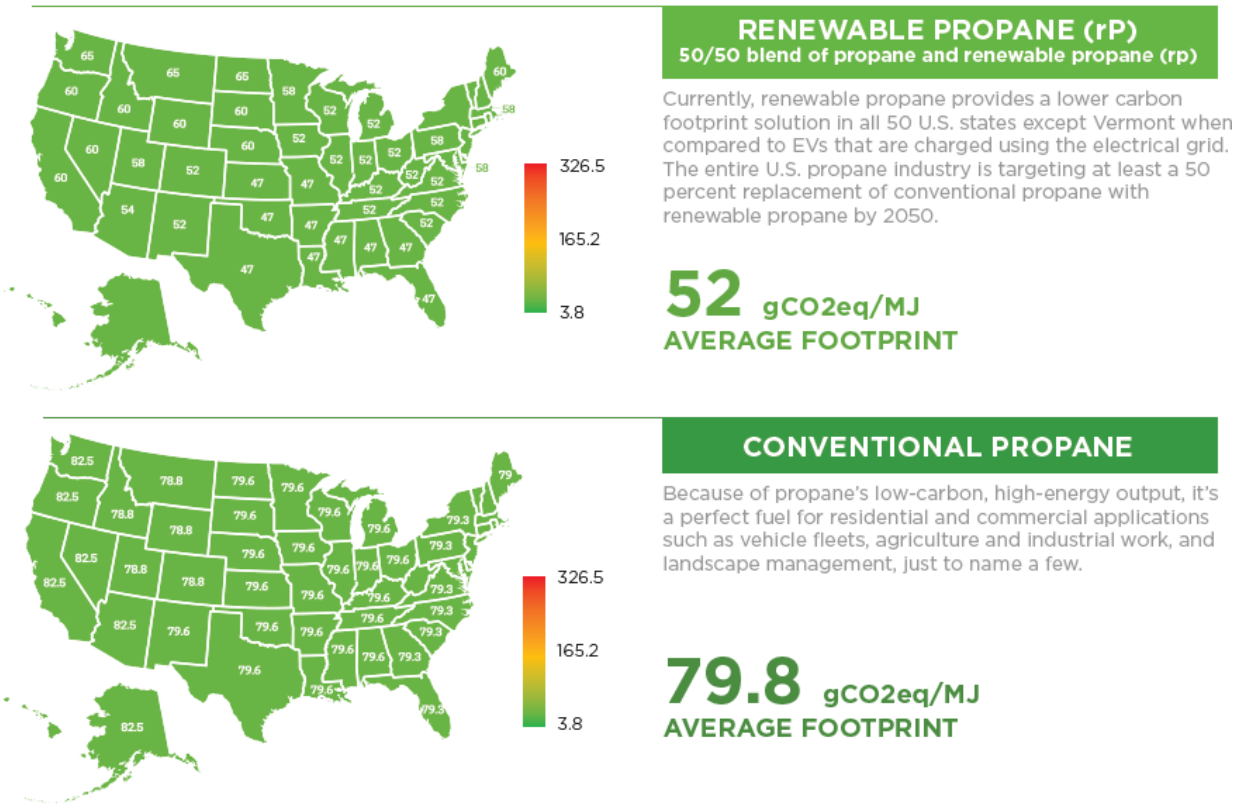
Where EVs are not available or not financially viable, the City will pursue hybrid light-duty vehicles as a secondary option. Hybrid vehicles offer substantial fuel savings and emissions reductions compared to traditional ICE vehicles, providing an effective interim solution until full electrification is feasible.

Propane

Propane vehicles offer a compelling alternative to traditional gasoline and diesel-powered vehicles, providing substantial environmental and economic benefits. As part of our comprehensive strategy to adopt alternative fuel vehicles and future technologies, the City will integrate propane vehicles into its fleet where vehicles are not ready to be electrified and align with operational needs.

Propane, also known as liquefied petroleum gas is a clean-burning alternative fuel that can be used in a variety of vehicle types, including buses, trucks, and service vehicles. Propane vehicles are known for their lower emissions, reduced maintenance costs, and overall cost-effectiveness. Propane vehicles offer significant GHG savings compared to traditional gasoline and diesel vehicles. The combustion of propane produces fewer carbon dioxide (CO2), nitrogen oxides (NOx), and particulate matter (PM), contributing to improved air quality and reduced health risks. Studies indicate that propane vehicles can reduce lifecycle GHG emissions by approximately 12% compared to gasoline vehicles.

Propane Comparison, provided by vendor Alliance AutoGas



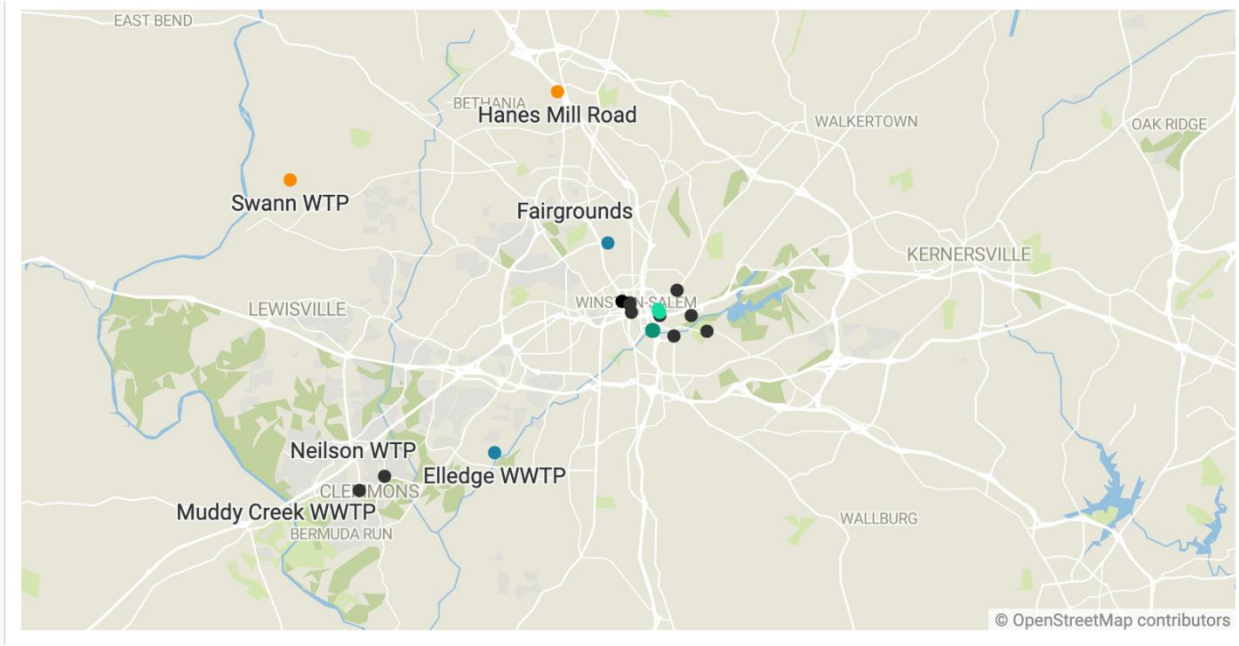
BioPropane, also known as renewable propane, is an emerging alternative that further enhances the sustainability of propane vehicles. Produced from renewable sources such as agricultural waste, cooking oil, and other biomass, BioPropane offers even lower carbon emissions than conventional propane. BioPropane is chemically identical to traditional propane, allowing for seamless integration into existing propane infrastructure and vehicles without modification. By transitioning to BioPropane, the City can achieve even greater GHG savings and support the development of a circular economy.

2. Expanding EV Charging Infrastructure

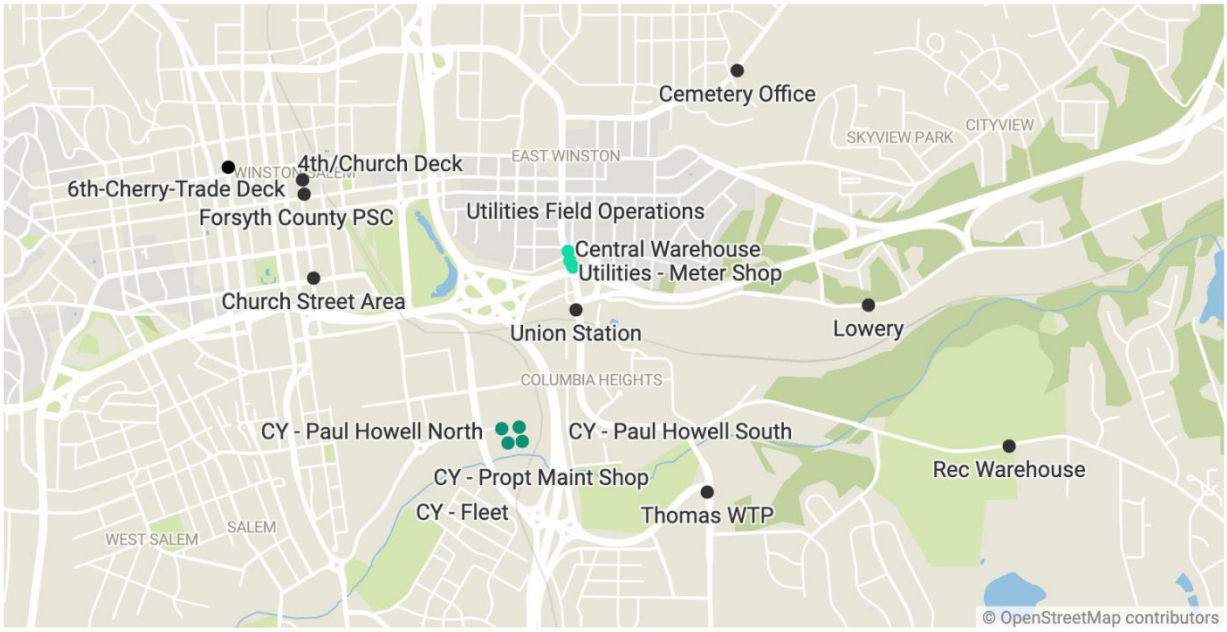
To support the increased use of electric vehicles, the City will invest in expanding EV charging infrastructure. This includes installing charging stations at municipal buildings and strategic locations throughout the city.

Based on the fleet analysis for EV transition, the Department of Sustainability is preparing an EV Charging plan based on the 202 vehicles on the transition list. When the EV transition list is incorporated in to the budget process and the actual number of vehicles and locations is known, staff will also need to evaluate the necessary charging infrastructure and corresponding replacement schedule. Therefore, parking and charging policy, along with upgrades to smarter charging technology can allow a reduction in the number of EV chargers required.

Charging Infrastructure Locations Needed (City and Utilities)



Close-Up View of City Locations near Downtown



Strategy #4: Seek Funding Opportunities and Partnerships to Support Strategic Energy Goals

Securing adequate funding and establishing strategic partnerships are crucial for achieving the City's ambitious energy goals. By exploring diverse funding sources and fostering collaborative relationships, the City can ensure the successful implementation of its energy initiatives. This multifaceted approach ensures that the City can continue to lead in sustainability initiatives, providing long-term benefits to the community and the environment.

Pursuing Federal, State, and Local Grants

The City will actively pursue grants from federal, state, and local governments to fund energy efficiency and renewable energy projects. This includes applying for grants from programs such as the Department of Energy, Environmental Protection Agency, and state energy offices. The City will seek funding to support a grant writer for these identified opportunities when dollar size and complexity warrant.

Engaging with Philanthropic Organizations

Philanthropic organizations and foundations are increasingly supporting sustainability and energy initiatives. The City will engage with these entities to secure funding for specific projects, particularly those that align with their mission and goals. By presenting compelling proposals that demonstrate the environmental and social benefits of our projects, the City can attract philanthropic support to complement public funding.

Intergovernmental Collaborations

Partnering with neighboring municipalities and regional planning organizations can lead to shared resources and joint funding applications. Regional collaborations can enhance the effectiveness and reach of sustainability projects.

Forming Strategic Alliances with Educational Institutions

Collaborating with universities and research institutions can unlock additional funding opportunities and technical expertise. The City will form strategic alliances with these institutions to apply for research grants, develop pilot projects, and conduct studies that advance our energy goals. Joint projects with academic partners can also provide valuable data and insights that inform policy and program development.

City Budget and Matching Funds

The City recognizes the importance of aligning funding opportunities with its budget constraints. Prioritization of matching funds will be as follows:

- Projects with Existing Funding: Projects that have already secured partial funding or are in the process of being implemented will receive higher priority for city match funds. This approach ensures that ongoing projects are completed efficiently and within budget.
- Replacement of Vehicles: Vehicles that are already scheduled for replacement in the City's budget will be prioritized for matching funds when transitioning to EVs. This

strategy minimizes additional financial burdens by aligning new investments with planned expenditures.

Energy Performance Contracting (EPC) EPC allows the City to finance energy efficiency improvements through cost savings generated by reduced energy consumption. This approach can be applied to retrofitting buildings with energy-efficient technologies, such as LED lighting and building automation systems.

Other Strategies:

Renewable Energy Credits (RECs): As part of the City's commitment to achieving genuine sustainability and carbon neutrality, the decision has been made to NOT rely on Renewable Energy Credits (RECs) as a primary strategy. While RECs are a common tool for demonstrating renewable energy usage, our approach emphasizes direct action and tangible improvements in our energy infrastructure. By investing in physical renewable energy infrastructure, the City ensures that its energy consumption is directly linked to the production of clean energy. This approach results in real reductions in greenhouse gas emissions and supports the development of local renewable energy resources.

Direct investments in renewable energy projects offer greater transparency and accountability compared to the purchase of RECs. With tangible projects, stakeholders can clearly see and measure the impact of the City's investments. This transparency builds trust within the community and demonstrates the City's genuine commitment to sustainability. It ensures that the benefits of renewable energy—such as job creation, local economic growth, and environmental improvements—are realized within the community. Developing local renewable energy sources enhances the City's energy security and resilience. By generating energy locally, the City reduces its dependence on external energy providers and improves its ability to withstand energy supply disruptions. This resilience is particularly important in the face of increasing climate-related risks and uncertainties.

The REC market can sometimes lead to issues of double counting, where the environmental benefits of renewable energy are claimed by multiple parties. By focusing on direct renewable energy projects, the City avoids these complexities and ensures that the environmental benefits of its investments are not overstated or misrepresented.

Investing directly in renewable energy infrastructure can lead to significant long-term cost savings. While RECs provide a way to claim renewable energy usage, they do not reduce the City's actual energy costs. In contrast, installing solar panels, battery storage, or wind turbines can lower energy bills over time, providing a return on investment through reduced operational costs. These savings can be reinvested in further sustainability initiatives.

Community Influence & Engagement

While the Strategic Energy Plan primarily focuses on internal city operations, the City of Winston-Salem recognizes the vital role it plays in influencing broader community choices toward sustainability. As a municipal leader, the city has both the responsibility and the opportunity to encourage residents, businesses, and developers to adopt energy-efficient practices and renewable energy solutions. This section outlines strategies that extend beyond municipal operations, aiming to foster a culture of sustainability throughout the community.

1. Empowering Residents through the Solarize Program and Alternatives

The City acknowledges the potential for renewable energy adoption among residents, particularly in low-income communities.

To facilitate this, one proposed strategy is the implementation of assistance to Solarize programs[4]. By increasing the availability of renewable energy in underrepresented areas, the Solarize program contributes significantly to reducing the community's overall carbon footprint and promoting energy equity. The program can also help lower the financial barriers to solar energy installation for low-income households. This initiative could be augmented with city council approval and grant funding, to support the installation of solar on low and moderate income homes, thereby decreasing energy burden[5].

Solarize the Triad has been a successful program in the region built by non-profit organizations in the area. It has been modeled against successful programs in the Triangle and Western North Carolina. In future recurrences, the City should participate either on its own buildings or through programming with residents.

Another possible project to increase solar in the community would be Community Solar. The U.S. Department of Energy describes community solar as a solar project or purchasing program that is based in a specific geographic area that provides benefits to multiple customers via optional buy-in. Community Solar allows for residents to jointly own a solar facility or subscribe to a portion of a facility's output. Currently, the environment for community solar is complex and challenging based on the significant

[4] The City Sustainability Dept served on the Steering committee of the 2023-24 Solarize the Triad program; however, this program was not officially approved by the City, nor supported via City funds.

[5] Energy burden refers to the percentage of a household's income to pay for electricity and gas bills. Over 6% of income on electricity bills is considered an energy burden, with 10% considered severe energy burden.

presence and influence of Duke Energy. However, as options become available, the City will review community solar options that could potentially benefit residents.

2. Incentives for Energy Efficiency and Renewable Energy in Development

Another crucial strategy involves offering incentives for residents and developers to incorporate energy-efficient designs and renewable energy systems in their buildings. The city could provide a range of incentives, such as rebates, or expedited permitting processes, to encourage sustainable building practices. These incentives would target both new constructions and renovations, ensuring that energy efficiency and sustainability are integral to the city's growth and development.

3. Expanding and Encouraging EV charging infrastructure

As part of our commitment to increasing the adoption of electric vehicles (EVs), the City of Winston-Salem recognizes the importance of accessible and widespread EV charging infrastructure. To support this transition, the City strives to expand EV charging stations on city-owned properties, including public parking areas, government buildings, and recreational facilities. This initiative aims to make EV ownership more convenient for residents, visitors, and city employees, reducing range anxiety and encouraging the switch to cleaner transportation options.

Public Charging on City Property

Duke Energy Partner Installed	City Owned/Operated
• Carl Russell Community Center, 3521 Carver School Rd • Jamison Park, 285 Meadowlark Rd • Hanes Hosiery Community Center, 501 Reynolds Blvd	• Central Park Tennis Courts, 803 E. Salem Ave (near the Old Salem Traffic Circle) • Bailey Park, 420 N. Patterson Ave • Inside the 4th/Church Parking Deck, Enter at 171 E. 4th Street

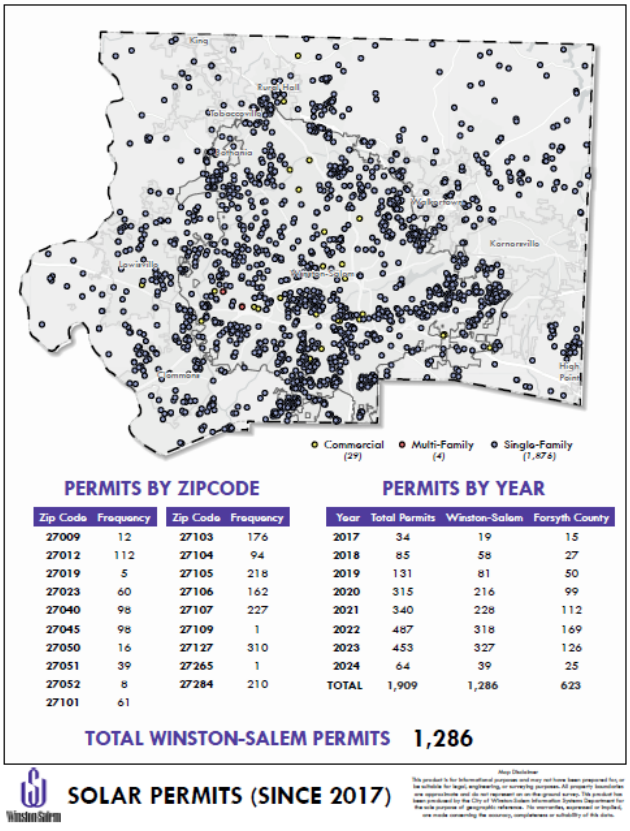
By strategically placing EV chargers in high-traffic areas and underserved communities, the city can ensure equitable access to EV infrastructure. Additionally, the city will explore opportunities to power these charging stations with renewable energy sources, further enhancing the environmental benefits.

In addition to expanding infrastructure on city property, the City of Winston-Salem could develop programs to encourage private investment in EV charging infrastructure. The city could implement incentives and streamlined permitting processes for businesses and developers who install EV charging stations. These incentives could include grants, or zoning benefits, making it easier and more financially attractive for private entities to contribute to the EV charging network.

Public-private partnerships will play a crucial role in this strategy, as collaborating with private companies can expand the reach and accessibility of EV charging stations. By fostering a collaborative environment, the city aims to create a comprehensive and reliable charging network that supports the growing number of EVs in the community.

By expanding EV charging infrastructure on city property and encouraging private investment, Winston-Salem is positioning itself as a leader in sustainable transportation. This strategy not only supports our internal fleet electrification goals but also promotes a broader cultural shift towards cleaner, more efficient transportation within the community.

4. Community Education and Engagement



Zip Code	Frequency	Zip Code	Frequency
27009	12	27103	176
27012	112	27104	94
27019	5	27105	218
27023	60	27106	162
27040	98	27107	227
27045	98	27109	1
27050	16	27127	310
27051	39	27265	1
27052	8	27284	210
27101	61		

Year	Total Permits	Winston-Salem	Forsyth County
2017	34	19	15
2018	85	58	27
2019	131	81	50
2020	315	216	99
2021	340	228	112
2022	487	318	169
2023	453	327	126
2024	64	39	25
TOTAL	1,909	1,286	623

To maximize the impact of these initiatives, the city plans to engage in robust community education and outreach efforts. By providing residents and businesses with information on the benefits of energy efficiency and renewable energy, as well as the available programs and incentives, the city can empower the community to make informed choices. Workshops, public forums, and educational materials will be part of a broader effort to raise awareness and foster a culture of sustainability.

By expanding its focus beyond internal operations, the City of Winston-Salem is not only leading by example but also actively encouraging its community to participate in the transition toward a sustainable future. These efforts reflect a comprehensive approach to energy and environmental stewardship, reinforcing the city's commitment to creating a resilient and sustainable environment for all residents.

Conclusion: Implementing Winston-Salem's Strategic Energy Plan

To effectively implement Winston-Salem's Strategic Energy Plan (SEP), it is essential to establish clear structures, sufficient resources, and robust monitoring mechanisms. Adequate staffing, knowledge, and financial investments will play pivotal roles in achieving the city's ambitious target of 100% clean renewable energy by 2050. While this will require an initial investment, long-term cost savings, improved air quality, and enhanced community resilience are the anticipated outcomes.

City Leadership

Achieving these goals will necessitate strong leadership that fosters collaboration across public, private, and community sectors. The City will lead efforts to implement immediate and short-term strategies to reduce carbon emissions.

Structural and Cultural Change

To ensure success, the City must establish processes and decision-making structures that support implementation. These include defining clear responsibilities across departments, aligning budgets and project plans, and creating accountability mechanisms. By embedding sustainability into the organizational culture, the city can prioritize initiatives effectively, adapt to changing conditions, and maintain momentum throughout the plan's lifecycle.

The SEP will function as a dynamic framework, evolving alongside advancements in technology, updates in policy, and new funding opportunities.

Community Engagement and Communication

Transparent and consistent communication is integral to building trust and fostering public support. The city will develop a data dashboard that will allow for regular updates to stakeholders, outline project milestones, and celebrate successes.

A Vision of a Resilient Future

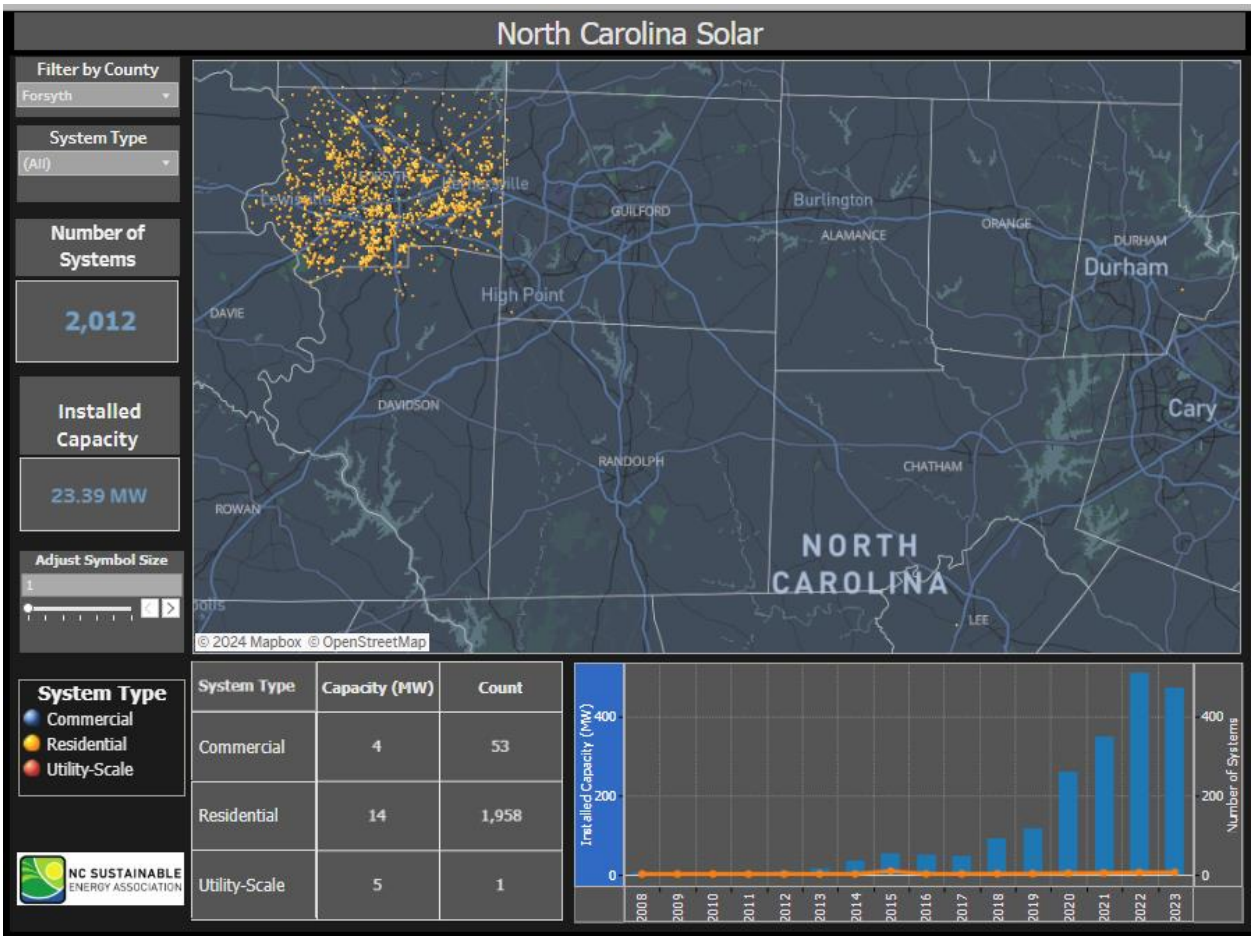
By implementing this plan, Winston-Salem reaffirms its commitment to climate action and sustainability leadership. The SEP sets a course for creating cleaner air, enhancing community resilience, reducing energy consumption, and fostering a healthier environment. Success will require coordinated action across sectors and departments, but the rewards—financial savings, environmental stewardship, and a thriving community—make this effort an important step toward a sustainable future for all residents.

References

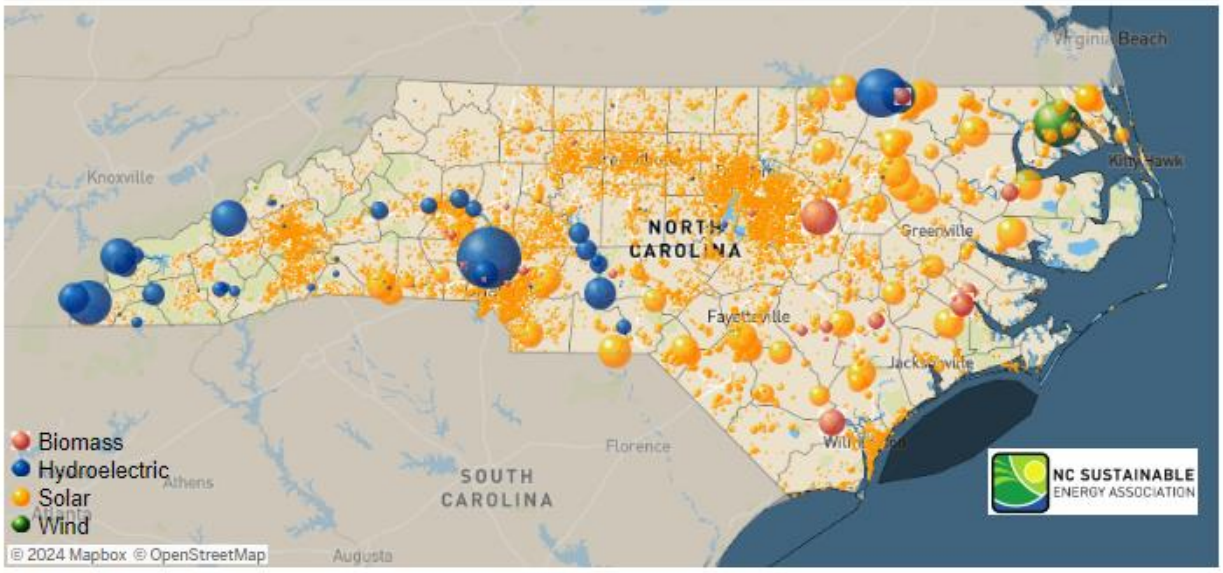
"Duke Energy files proposed Carolinas Carbon Plan to deliver a cleaner energy future for customers". May 16, 2022. Duke Energy. Accessed 6/17/24: Duke Energy files proposed Carolinas Carbon Plan to deliver a cleaner energy future for customers | Duke Energy | News Center (duke-energy.com)

Appendices

NC Sustainable Energy Association Data on Number of Solar Installations in Forsyth County



INSTALLED RENEWABLE ENERGY SYSTEMS



General System Type	Capacity (MW)	Number of Records
Biomass	467.459	58
Hydroelectric	1,809.906	70
Solar	5,947.052	19,607
Wind	208.193	28
Grand Total	8,432.610	19,763

County

(All)

General System Type

- (All)
- Biomass
- Hydroelectric
- Solar
- Wind