BuildSmartNY

# Five Cities Energy Plans

Albany ▪ Buffalo ▪ Rochester ▪ Syracuse ▪ Yonkers

## CITY OF ROCHESTER

NEW YORK STATE OF OPPORTUNITY.

NY Power Authority

Issued January 2015

# Table of Contents



Cover Photo: Rochester skyline

# Letter from Gil Quiniones

The New York Power Authority is pleased to support the Five Cities Energy Plans initiative. When viewed collectively, it represents a wide-ranging effort to rethink how municipalities can reduce their energy use in a systematic, cost-effective fashion. Guided by Gov. Andrew M. Cuomo's landmark BuildSmart NY program that seeks to improve energy efficiency in state government buildings by 20 percent by 2020, the cities of Albany, Buffalo, Rochester, Syracuse and Yonkers have conducted a comprehensive examination over the past year to determine how they can use their resources more efficiently.

With the challenges of climate change and its expected impacts becoming more apparent and severe, state authorities and agencies are pursuing a series of measures that are designed to reduce greenhouse gas emissions while lowering their expenses. A cornerstone of this strategy is making a transition to cleaner generation and a more resilient distribution infrastructure. By engaging in a smart, sustainable use of energy, technology and natural resources, New York will be far better prepared for the environmental and economic challenges of the next decade.

The energy goals and plans set out in the following pages will enable Albany, Buffalo, Rochester, Syracuse and Yonkers to measure their progress, adapt new ideas and pursue best practices. By creating a detailed roadmap for strengthening infrastructure, building more reliable facilities, becoming more accountable for energy use and making critical long-term investments, these urban areas can better address climate change and build a vibrant clean energy economy.

This effort builds on a foundation of success. Prior to developing their plans, the Five Cities had already begun extensive activities that have been reducing energy costs and carbon emissions, making gains in energy sustainability, and supporting green industries and jobs. The Five Cities Energy Plans will enable these cities to further reduce energy costs and alleviate the related environmental impacts while also improving quality of life of their residents. Developing the recommendations in the Five Cities Energy Plans was a demanding task, requiring months of data analysis, meetings with more than 100 stakeholder groups and an extensive sharing of thoughts and proposals across cities.

This document tells a great story about where New York is heading. These Energy Plans should inspire cities throughout the state and across the country to find new ways to manage their own energy use and for their communities. We look forward to working with governments, large and small, to embrace new ideas and approaches for creating a cleaner, more sustainable and more economically prosperous environments for the current and future generations.

Gil C. Quiniones
President and Chief Executive Officer
New York Power Authority

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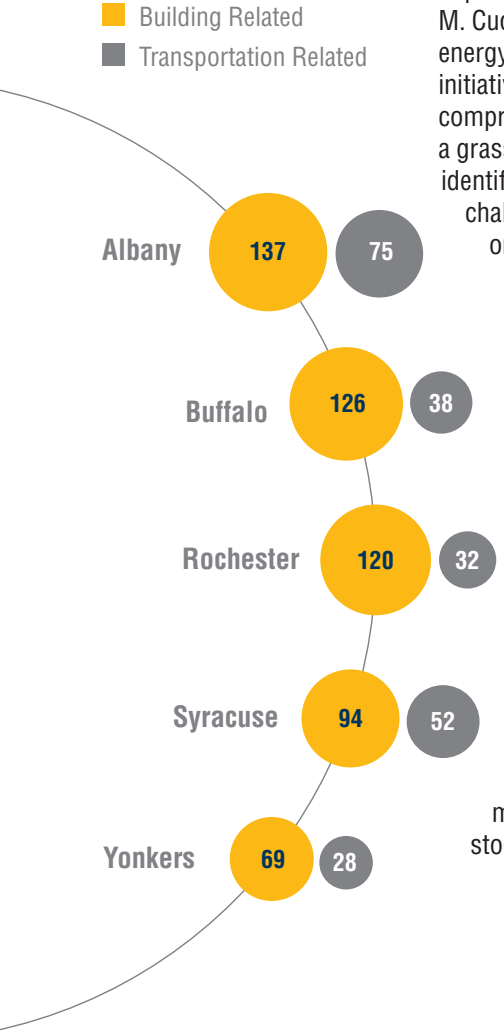
# Introduction

New York State has a long history of energy leadership and innovation, from the development of the first central power plant to the pioneering use of hydropower and air conditioning. The New York Power Authority (NYPA), in partnership with the cities of Albany, Buffalo, Rochester, Syracuse and Yonkers (the "Five Cities"), seeks to build on this legacy with this Five Cities Energy Plans initiative. Expanding upon the successes of Gov. Andrew M. Cuomo's BuildSmart NY initiative to reduce energy usage in state buildings, the Five Cities initiative enabled each of the cities to undertake a comprehensive master planning process, adopting a grassroots approach that allowed each city to identify its energy priorities, address specific challenges and create a strategy that reflects its ongoing progress in energy planning.

The Five Cities thrived as centers of industry and commercial manufacturing in the early to mid 1900s. Early city planners established dense downtown centers and built the infrastructure and buildings necessary to support residents, workers and visitors. In the decades since, the highway system, suburbanization and the changing economy have changed the form and populations of these cities. While these cities seek to reinvent themselves, reactivate their urban cores, enhance open space and meet the needs of their residents, they face increasing challenges to maintain and modernize aging infrastructure and building stock, compete economically with surrounding towns and regions, deal with increasing costs of services and resources, and address the impacts of climate change. A common theme among these challenges is energy, and the Five Cities are committed to being proactive in tackling energy-related issues in order to support improved quality of life for all residents, leverage economic development opportunities associated with an emerging clean energy economy and enhance the resiliency of the built environment and the people it supports.

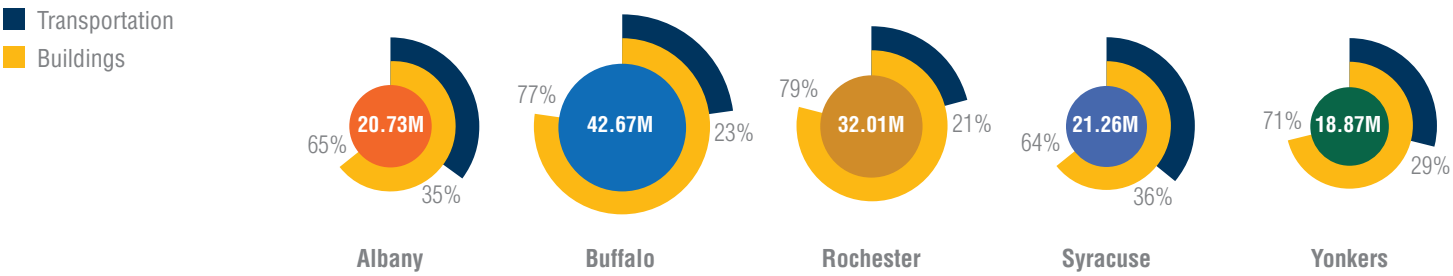
## Energy Consumption per Capita (mmBtu)




## BuildSmartNY

The Five Cities Energy Plans effort is an expansion of Governor Cuomo's BuildSmart NY initiative. Build Smart NY, initially launched by Executive Order 88 in December 2012, is a program that aims to improve the energy efficiency of New York State buildings by 20 percent by 2020 in a strategic, coordinated, cost-effective, and data-driven manner. BuildSmart NY is working to benchmark the energy usage of state buildings, execute energy master plans at the most energy-intensive campuses, target retrofits in the largest, most inefficient buildings, and implement best practices for building operations and maintenance to ensure efficiency improvements are sustained. In addition to reducing energy waste, costs and greenhouse gas emissions, BuildSmart NY seeks to catalyze investment in energy efficiency by demonstrating the economic, social, and environmental benefits of building energy efficiency.

## Overall Energy Consumption (mmBtu)



# Goals of the Five Cities Energy Plans

## Reduce energy consumption

## Strengthen reliability and resiliency of cities' energy infrastructure

## Catalyze clean energy investment and economic development

## Contribute to a cleaner environment

## Enhance quality of life

NYPA established the Five Cities Energy Plans program to develop strategic frameworks for the cities of Albany, Buffalo, Rochester, Syracuse,and Yonkers to comprehensively reduce energy consumption citywide. The plans are intended to be roadmaps to help the cities collaborate with governmental agency partners, institutions, utilities, communities, NGOs and the private sector to achieve the following goals: strengthen the reliability and resiliency of their energy infrastructure, catalyze clean energy investment and economic development, reduce the cities' energy consumption and related expenses, contribute to a cleaner environment, and enhance quality of life within the cities. Building on each city's sustainability and economic development successes of the past decade, the plans will also guide municipal energy management as these cities seek to lead by example in reducing energy use.

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The New York Power Authority is a national leader in promoting energy efficiency, the development of clean energy technologies, and electric vehicles. The energy-efficiency improvements undertaken by NYPA over the last two and a half decades have been responsible for lowering the annual electricity bills at more than 5,300 public facilities by $168 million. Peak electricity demand has been cut by more than 238 megawatts and greenhouse gas emissions by nearly 964,000 tons a year. With the Five Cities Energy Plans initiative, NYPA has significantly expanded the nature and scope of its traditional energy efficiency efforts to support energy planning, municipal energy management and citywide clean energy deployment. It has taken a far more comprehensive and coordinated approach, encompassing the public and private sectors in each city, and going well beyond energy usage at individual facilities.

## Plan Structure


The plans cover four Action Areas that support achievement of the overall goals of the Five Cities Energy Plans: Energy Planning and Coordination, Energy Efficiency in Buildings, Transportation Energy Efficiency, and Energy Distribution and Supply. Additionally, to reflect the unique history, characteristics, challenges and opportunities of each city, each plan has its own high-level set of aspirational, yet achievable goals for each of the action areas, along with a set of objectives and actionable initiatives to achieve those objectives. Significantly, as municipal efforts alone will not achieve the energy usage and greenhouse gas emission reductions required to meet the state's overall energy goals, the Five Cities Energy Plans include City government-led and community-wide strategies to unlock institutional and third-party support for clean energy deployment.

Governor Cuomo has undertaken a number of efforts through multiple state agencies and authorities to support a more resilient and sustainable New York and promote a cleaner and healthier environment. Energy management, infrastructure upgrades, climate action, resiliency and the transition to a clean energy economy are all high priorities for the state and are driven by a myriad of innovative policies, programs and financing mechanisms. The Five Cities Energy Plans will complement and work within these new paradigms and programs, including the regulatory and programmatic redesigns undertaken by the Public Service Commission's Reforming the Energy Vision (REV) proceeding, and the New York State Research and Development Authority's redesigned market development programs. In so doing, the Five Cities Energy Plans will build off of the strong support for market animation and clean energy deployment in New York State, supporting sustainable, private sector-driven clean energy markets, which in turn will help the state achieve its goal to deliver a cleaner, more resilient and affordable energy system for all New Yorkers.

The development of these plans is just the beginning. Energy master planning is a process that involves ongoing assessments of conditions, stakeholder engagement, strategic planning, implementation, measurement of impact and regular reporting of progress. Consequently, NYPA will continue to support the Five Cities in their energy master planning and implementation efforts. More specifically, in collaboration with NYSERDA, the New York State Energy Research and Development Authority's, New York State departments of Environmental Conservation, Transportation, State and Public Service, as well as the Empire State Development Corporation, NYPA will provide technical and financial assistance for the implementation of the plans and ensure progress is reported on annually.

To ensure the Five Cities Energy Plans help the cities achieve their goals and have a real impact on municipal operations and citywide buildings and infrastructure, the development of the plans followed six key principals. The plans had to be:

## Aspirational

*to inspire City staff, businesses, residents and other stakeholders to take action*

## Ambitious

*with clear implementation and performance targets to organize and facilitate this action*

## Achievable

*in terms of their legal, fiscal and technical feasibility, supported by data analysis and precedence in other jurisdictions*

## Accessible

*to the general public, key stakeholders and decision makers with the use of understandable language, clear opportunities for public involvement and partnerships, and regular updates on progress*

## Accountable

*to ensure implementation of initiatives occurs and progress towards the goals is achieved, with clear assignment of responsibilities coupled with ongoing tracking and reporting of progress*

## Adaptable

*incorporating a process for regular updates as policies, trends and resources change over time*

## Planning Process

The Five Cities Energy Plans were developed based on a data- and stakeholder- driven planning approach. Through a competitive process, consultants were selected to form teams with NYPA and the cities to complete the plans. Soon after the effort kicked off in October 2013, the teams embarked on their literature review, data collection and baseline assessment efforts. As part of this effort, consultants for each city benchmarked the energy performance of all municipal buildings over 10,000 square feet and conducted energy audits for the municipal buildings with the highest energy consumption. Additionally, the cities and the consultants reached out to the cities' utilities and infrastructure providers, sister agencies, and major institutions to assess the reliability and responsiveness of the city's infrastructure networks and the preponderance of clean distributed energy systems and alternative transportation services. This baseline assessment helped identify the goals and initiatives for the plans and will serve as a benchmark for measuring progress.

Stakeholder engagement was a priority of the planning process from the inception of the Five Cities Energy Plans initiative. The cities leveraged existing sustainability or energy-related stakeholder groups or created new ones for this effort, with representatives from key institutions, community and environmental groups, local development corporations, the real estate sector, and utilities.

Stakeholder engagement was a priority of the planning process from the inception of the Five Cities initiative

Each city had at least three stakeholder meetings that were scheduled around key planning milestones to provide feedback, brainstorm goals and objectives, prioritize initiatives, and identify potential partnerships.

Based on the findings from the baseline assessment, the stakeholder engagement process and global best practices, the teams developed a long list of potential initiatives that could help meet their identified clean energy goals. To narrow the potential initiatives to those included in the Five Cities Energy Plans, the cities and their consultants evaluated each of them across a set of weighted criteria, with input from their stakeholders and with consideration given to overarching state priorities. Among other criteria, the evaluations all considered the role for City government in the implementation and consistency with city, state and stakeholder priorities. Other criteria included alignment of priorities between and among the plans, expected contributions to energy reduction and climate action goals, technical and legal feasibility, cost effectiveness, and economic viability.

Finally, implementation details were developed for each plan's initiatives. Each initiative lists details on the party responsible for its implementation, key partners and next steps.

| FIVE CITIES ENERGY PLANS CONSULTANTS |
|---|
| **Vanasse Hangen Brustlin, Inc. (VHB**) – City of Albany |
| **Wendel** – City of Buffalo |
| **LaBella Associates, D.P.C.** – Cities of Syracuse and Rochester |
| **Arup** – City of Yonkers |
| **Happold Consulting** – Coordinating Consultant |

Scenes from Five Cities stakeholder meetings.

# Action Areas

The Five Cities Energy Plans take a comprehensive approach to energy management, including a look at energy consumption of municipal government as well as capturing opportunities for citywide impacts. Each of the plans covers four main action areas: Energy Planning and Coordination; Energy Efficiency in Buildings; Transportation Energy Efficiency; and Energy Distribution and Supply.



### Energy Planning & Coordination

The Energy Planning & Coordination action area includes goals, objectives and initiatives designed to improve energy procurement and management processes and foster public-private partnerships and cooperation around clean energy deployment. This action area also contains initiatives around general sustainability and green development that encompass buildings, transportation and infrastructure strategies, and therefore, do not fit neatly into any of the subsequent areas.



### Energy Efficiency in Buildings

The Energy Efficiency in Buildings action area focuses on improvements to building performance in municipal and private buildings. Strategies include building standards and energy code compliance, improved data collection and reporting, public awareness and education, and innovative financing mechanisms to unlock markets for energy efficiency.



### Transportation Energy Efficiency

The Transportation Energy Efficiency action area includes a focus on compact and transit-oriented development, congestion reduction strategies, alternative transportation infrastructure, and clean vehicle deployment. The initiatives cover zoning and development standards, public and private fleets, transit, bike and pedestrian infrastructure, and energy-efficient streetlight improvements.



### Energy Distribution & Supply

The Energy Distribution & Supply action area focuses on clean, distributed energy generation infrastructure, including through the deployment of renewable energy technologies, such as solar PV and microgrid demonstration projects. Similar to the Energy Efficiency in Buildings and Transportation Energy Efficiency action areas, there are initiatives by which the municipalities can lead by example and others to support community action and private-sector investment.

# Cross-Cutting Themes

While the Five Cities Energy Plans are organized into four action areas, energy management and planning does not happen in silos, but rather cuts across institutions, infrastructure typologies and scales. A holistic look at the initiatives developed to achieve the state's and the cities' energy goals reveals four cross-cutting themes. Throughout the plans, icons representing these four themes will be located next to each relevant initiative.

### Municipal leadership: leading by example

The Five Cities' participation in and dedication to this master planning process make clear their commitments to lead by example to reduce energy consumption and greenhouse gas emissions. Most of these cities have been demonstrating this leadership for years with municipal building retrofits, clean vehicle infrastructure and purchases, and renewable energy installations. The Five Cities Energy Plans will build on this strong foundation and provide models for other cities to adopt best energy management practices, animate clean energy markets through new financing strategies and demonstrate emerging technologies.

### Economic development: creating jobs and attracting businesses

The investments the cities make in their assets and the policies they create to guide new and existing development and infrastructure citywide will impact the cities' overall economies. As these cities continue to invest in their urban cores, revitalize underutilized land and activate neighborhoods with new uses and amenities, the implementation of the plans will help to attract clean energy businesses and spur additional job creation as they foster the demand for new energy services and technologies. At the same time, the cities' sustainability leadership and enhancement of infrastructure will make them more attractive for employees and residents alike through the promotion of walkable, transit-oriented neighborhoods.

### Infrastructure: preparing our cities for the future

While the design of the cities' infrastructure systems has changed little over the past few decades, the needs of the systems' users have evolved dramatically. Users today are more dependent on constant, reliable energy services, require the ability to integrate with and use emerging technologies, and value the efficient use of resources. In addition, recent storm events have demonstrated the vulnerability of these cities' infrastructure systems to extreme weather and other disruptive events. Moving towards more distributed and renewable energy generation, and towards more transportation options are just a few of the ways these cities plan to enhance their infrastructure systems to address climate related risks and prepare their cities for the 21st century.

### Climate action: reducing the city's carbon footprint

Many communities across New York State have experienced the dramatic effects of climate change, including severe weather and devastating floods. To mitigate the impacts of climate change, all five cities are committed to reducing their carbon footprint. This commitment is visible throughout the plans, from initiatives to make municipal buildings more energy efficient and generate more renewable energy, to those that encourage more transit-oriented development and promote cycling as a viable commuting option.

# The Five Cities

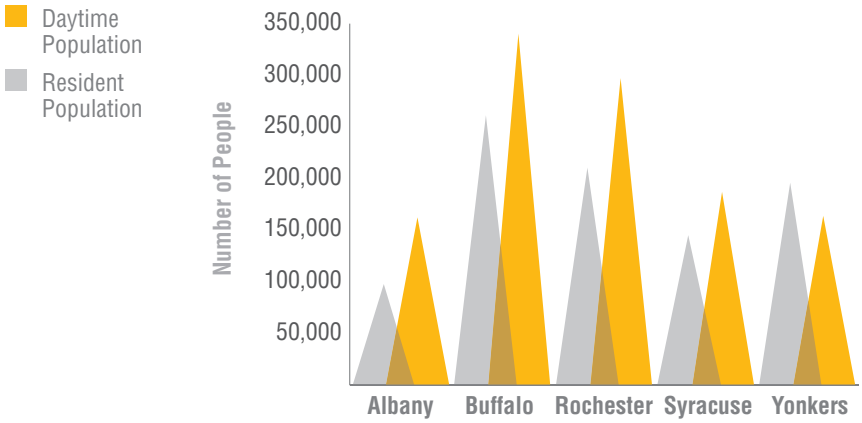
Albany, Buffalo, Rochester, Syracuse, and Yonkers are the five largest cities in the state after New York City. Their combined populations would make them the 11th largest city in the country, providing a significant opportunity to meaningfully reduce energy consumption and greenhouse gas emissions. Due to transit infrastructure and relatively dense, urban cores, these cities on average consume less per capita than the state average. Still, cold winters along with aging infrastructure and building stock mean these cities spend over $2.2 billion in energy-related costs a year. Reducing energy consumption, and therefore costs, while spurring economic development and improving the quality of life for residents are key goals these cities have in common.

On average, buildings consume more than 64 percent of total energy within the cities. Municipal buildings tend to contribute only 1 to 3 percent of this consumption; making it clear that efforts to engage citywide partners to improve building energy performance is critical. Transportation related energy contributes 26 to 39 percent of energy consumption, with the dependence on single-occupancy vehicles for transportation the main source of this consumption. Related costs and emissions are further exasperated by congestion on the roadways within the cities.

The Five Cities have historically been some of the most innovative cities in the United States, consistently placing themselves at the forefront of energy, transportation and building technology. As these cities seek to implement 21st century infrastructure improvements and revitalize downtown cores, they have been putting those innovation legacies to work. Each city is working to promote compact, transit-oriented and mixed-use development in their downtowns through zoning changes. To further reduce automobile dependence, they have taken steps to make walking, cycling, carpooling and public transit more attractive transportation options. And to lead by example, each has pursued energy audits and upgrades to their municipal buildings. Finally, some have already completed greenhouse gas inventories and detailed climate action plans.

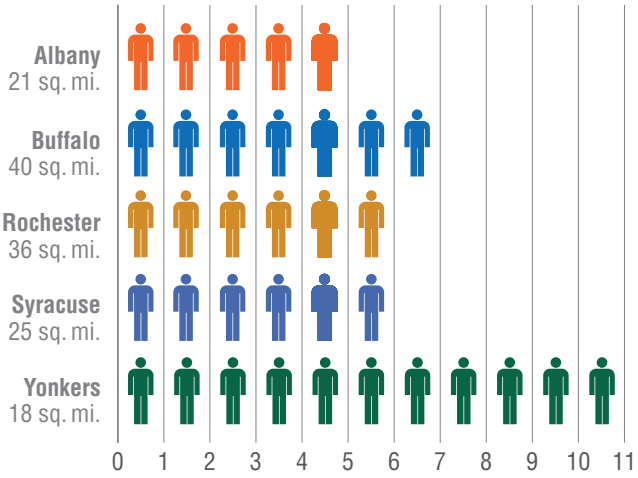
Several key initiatives emerged from the data collection, baseline assessments and planning process, as well as from the unique character of each of the Five Cities. These key initiatives cut across action areas and sectors.

## Population



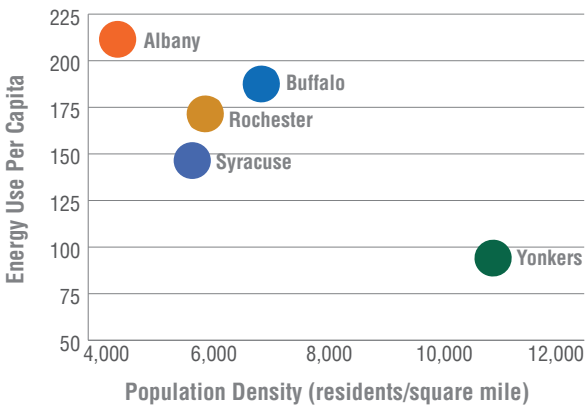

## Density of City Residents

One Person = 1,000 Residents per Square Mile




## Energy Use Per Capita/Population

In general for the Five Cities, it is shown that the higher the population density, the lower the energy use per capita, and vice versa.



**The Five Cities have a history of pursuing innovative initiatives to reduce energy consumption and greenhouse gas emissions.**

## Albany

**Bike Share**
In 2013, Albany commissioned a bike-share feasibility study to explore the implementation of a program similar to those in Boston, New York City and Washington, D.C. The study found that demand, demographics and existing infrastructure in Albany would be generally favorable to a program. In 2014, Albany hosted a pilot program where registered riders could use one of 25 bicycles at kiosks. The University at Albany runs a successful free bike share program for students.

## Rochester

**Office of Energy & Sustainability**
Rochester has established the Office of Energy and Sustainability (OES) in the Division of Environmental Quality. OES's goals are to make Rochester a model for innovative, ecologically sustainable operations, policies and practices, and to connect the City with regional and national sustainability resources. OES takes advantage of the multiple benefits generated by adopting more sustainable practices. These include reduced operating costs, a healthier, safer and more livable community, natural resource conservation and restoration, and mitigating and adapting to climate change.

## Buffalo

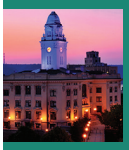
**Green Code**
Buffalo is updating its development framework to promote investment, facilitate job creation, restore the environment and improve the quality of life. The Green Code updated the city's 60-year-old zoning code. It includes a Land Use Plan that provides a framework for decision making about the city's physical development and a comprehensive zoning revision which emphasizes walkable, transit-supportive neighborhoods. The Land Use Plan includes specific plans for the waterfront and brownfield areas.


## Syracuse



**Electric Charging Stations at City Hall**
Syracuse is a leader in electric vehicle infrastructure. During the last few years, electric vehicle infrastructure has significantly increased in the area. There are 16 electric charging stations in Syracuse and three in nearby Liverpool. The city is well positioned for further expansion, especially as electric and plug-in electric vehicles become more common. Syracuse continues to partner with Clean Communities of Central New York to increase alternative fuel vehicle deployment and enhance charging infrastructure.

## Yonkers



**LED Street Light Replacement Project**
The City of Yonkers launched the LED Streetlight Replacement Project in July 2013 with the aim to replace the city's 12,000 streetlights with more energy efficient LED lights. The program improved the reliability of lighting and street safety. It is estimated that the project will cut Yonkers's energy bill by 60 percent, save taxpayers $18 million in energy costs over 10 years, and reduce Yonkers's carbon footprint by more than 2,700 metric tons annually.

## Key Initiatives

While the cities may differ in key ways, all five plans touch upon similar topics.

To improve the energy efficiency in buildings, all five cities included initiatives to support community building retrofits and the pursuit of energy efficiency improvements in municipal buildings. Community-wide initiatives include stricter enforcement of building codes, establishment of a building energy performance benchmarking and disclosure programs, and support of existing energy awareness campaigns. The cities also committed to lead by example through pursuing energy-efficiency improvements for their own buildings and better processes for energy procurement.

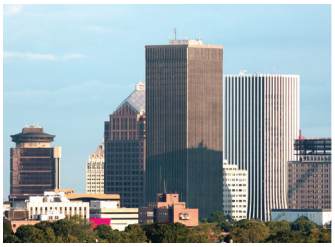
To reduce energy consumption from the transportation sector, all five cities have prioritized initiatives that promote alternative modes of transportation through expansion of pedestrian and bicycle infrastructure, improved transit service, and modifications of zoning to promote walkable and transit-oriented neighborhoods. Similar to buildings, the cities plan to lead by example in the transportation sector by greening their own fleets. This includes reducing the size of their fleets, replacing retiring vehicles with smaller, more efficient, and cleaner models, and promoting alternative vehicles. The cities also have included initiatives to reduce vehicle miles travelled by municipal staff while working and commuting.

Additionally, all five cities have prioritized the retrofitting of streetlights to be more energy efficient.

There was also consensus around the desire to expand clean distributed generation infrastructure (e.g., cogeneration, microgrids) and increase electricity generation from renewable energy sources to enhance resiliency and reduce greenhouse gas emissions. To do so, the cities are pursuing a wide range of initiatives, including feasibility studies to understand the best opportunities for clean distributed generation and renewable energy generation, expansion of existing district energy infrastructure, third-party financing and ownership structures through power purchase agreements, and partnerships with local organizations to launch community solar programs and other aggregation initiatives that will spur market activity in the sector.

Altogether, full implementation of these plans will result in significant annual energy savings. For the five municipal governments alone, achievement of their energy goals will result in a reduction of over 400,000 mmBtu of energy and 55,000 metric tons of greenhouse gas emissions. And many of these initiatives are initial steps to deeper and broader energy management efforts. A 20 percent reduction of energy costs citywide for the Five Cities could mean over $400 million in savings a year.

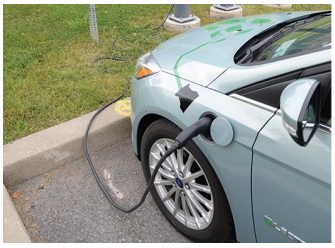
# All Five Cities Include Initiatives Around these 10 Topics



Promote/support community building retrofits

Pursue energy-efficiency improvements for municipal buildings

Improve infrastructure/modify zoning to promote alternative modes of transportation

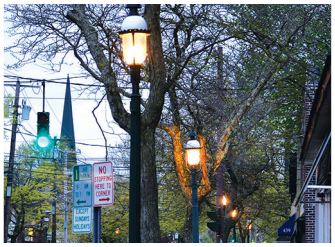


Reduce emissions/fossil-fuel dependence of fleets

Increase electricity generation from renewable energy sources

Implement transportation management tools to reduce idling and vehicle emissions

Expand clean, distributed generation infrastructure



Improve energy efficiency of outdoor lighting

Reduce municipal utility costs

Coordinate with utilities/state to enhance energy infrastructure

# ROCHESTER


# Letter From Mayor Lovely A. Warren

Dear Rochester Residents, Employees, Business Leaders and Stakeholders:

Reliable and sustainable energy is critical to the City of Rochester. From the first water-powered mills along the Genesee River to battery manufacturing at Eastman Business Park, clean energy and innovative technologies have driven Rochester's historic development. To ensure future prosperity, our city's residents, businesses and institutions need a reliable and cost-effective energy supply, resilient infrastructure and a healthy environment.

With support from the New York Power Authority, Rochester developed this Energy Plan in collaboration with City staff, community organizations, business leaders and other stakeholders. This plan advances key components of Rochester's previous planning efforts, including the Municipal Operations Climate Action Plan and Bicycle Master Plan. In addition, it aligns with our participation in the U.S. Department of Energy's Better Buildings Challenge and with the recommendations outlined in the Finger Lakes Regional Sustainability Plan and the Finger Lakes Regional Economic Development Strategy. Together with the energy efficiency upgrades, petroleum reduction initiatives and other actions to reduce greenhouse gases the City has already undertaken, as well as all of the private investment in energy technologies taking place here, we are uniquely positioned to transform Rochester into a green, vibrant, thriving community.

The Rochester Energy Plan sets a course for a reliable energy supply, increased energy efficiency and reduced reliance on fossil fuels. By implementing the initiatives in this plan, Rochester will reduce energy costs in municipal operations and throughout the city, create jobs in the growing industry of "green innovation," revitalize neighborhoods and stimulate economic development. I want to thank all who participated in the planning process and encourage your continued involvement as we implement the plan.

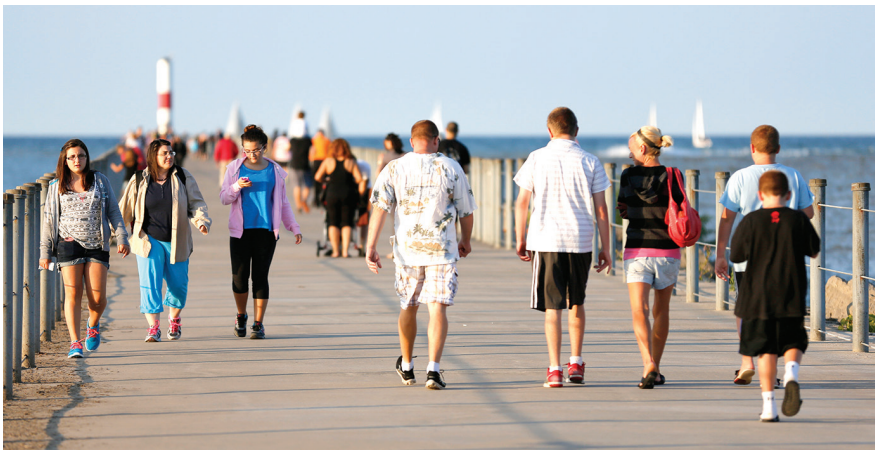
Sincerely,

Lovely A. Warren

Lovely A. Warren
Mayor of Rochester

Top and middle, Rochester skyline; Bottom left, the Rundel Memorial Library; Bottom right, Rochester City Hall

# City of Rochester Energy Plan



The pier at Ontario Beach Park

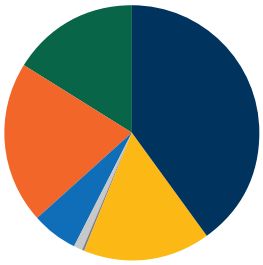
The City of Rochester is committed to the beauty and sustainability of its natural environment. By building on previous energy planning and initiatives, existing community assets and local and regional strengths, Rochester is well positioned to advance its clean energy and energy efficiency goals. Located along the south shore of Lake Ontario with the Genesee River flowing north through the city, Rochester's waterways have contributed to its leadership in clean energy generation, development and sustainability efforts. Water-powered mills along the Genesee River established Rochester as a manufacturing center in the early 1800s, leading to its first nickname—the "Flour City." The growth of shipping along the Erie Canal, including seeds, plants and flowers, earned Rochester its current nickname—the "Flower City."

This legacy of robust hydropower resources and water-based transportation supports the manufacturing and innovation economies that form the basis of Rochester's status as a regional economic hub for Monroe County. Rochester's residential population is 210,565, but that number increases by more than 60,000 people a day as commuters make their way to work in the city (based on 2012 data). Rochester is home to the region's largest employers, including the University of Rochester, Strong Memorial Hospital and a host of other manufacturing, health and research facilities that provide the foundation for the region's growth and economic activity.

The Rochester Energy Plan builds on the city's sustainability efforts, clean energy assets and regional economic strengths to further develop the city's status as a regional and metropolitan leader in energy generation and reliability, economic development, and environmental sustainability. Rochester's environmental mission, presented in the City's Municipal Operations Climate Action Plan, expresses a commitment to outstanding environmental stewardship through practice and policy, guided by the values of sustainability, conservation, restoration, compliance, leadership and continuous improvement. As a participant in the U.S. Department of Energy's Better Buildings Challenge and in line with Build Smart NY goals, Rochester is committed to a 20 percent reduction in energy consumption in municipal buildings by 2020. Further, to support the City's goal of reducing greenhouse gas (GHG) emissions 20 percent by 2020, Rochester's fleet of municipal vehicles will continue to be made more fuel efficient and will include more alternative fuel vehicles. Rochester will continue to lead the community in energy planning as it prepares the City of Rochester Climate Action Plan during the next two years, engaging community stakeholders

## Action Areas

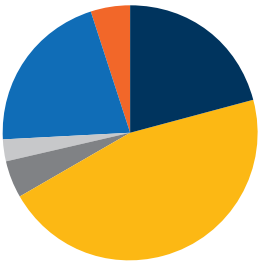
### Municipal Energy Consumption by Fuel Type (mmBtu)



- Electricity (40.2%)
- Natural Gas (16.0%)
- Propane (0.4%)
- Fuel Oil No.2 (0.9%)
- Steam (6.1%)
- Unleaded Gasoline (20.3%)
- Diesel (16.1%)

Figure 1

### Community Energy Consumption by Fuel Source



- Electricity (21.1%)
- Natural Gas (45.8%)
- Coal (4.6%)
- Other Fuels (2.9%)
- Gasoline (20.8%)
- Diesel (4.8%)

Figure 2

to reduce energy consumption and GHG emissions citywide in the buildings and transportation sectors.

The Rochester Energy Plan supports and builds on progress to date and provides a roadmap to improved energy efficiency and reduced greenhouse gas emissions. This will in turn lay the foundation for improved economic activity and regional development and demonstrate the City's commitment to lead by example on energy efficiency and renewable energy initiatives across the region.

## Summary of findings

An accurate understanding of energy usage in municipal facilities and citywide is necessary to inform the Rochester Energy Plan goals, objectives and initiatives. Total energy consumption in Rochester is approximately 33.9 million mmBtu, with buildings citywide using approximately 25.2 million mmBtu, accounting for 79 percent of total energy consumption citywide (based on 2010 data). This presents a significant impetus for increasing the energy efficiency of the city's building stock. The City will lead by example in furthering energy use reductions in its own facilities; however, municipal energy use accounts for only a small fraction of the overall total, leaving much to be addressed citywide.

The transportation sector consumed roughly 6.8 million mmBtu of energy citywide in 2010. While this represents just one quarter of Rochester's total energy use, the sector is responsible for the consumption of 56.5 million gallons of gasoline and 11.8 million gallons of diesel fuel by vehicles travelling 1.15 billion miles through the city each year. Transportation also accounts for roughly one third of municipal energy use. The City has a significant opportunity to lead by example in reducing energy use in the transportation sector through fleet initiatives and the conversion of streetlights to more efficient LED fixtures.

Electricity and natural gas are the predominant fuels used in Rochester. Natural gas is responsible for more than one third of all fuel use and 62 percent of building-based consumption. Rochester's cold winter climate indicates a clear opportunity for initiatives that improve building performance, such as through the implementation of weatherization measures. Greenhouse gas

**Timeline of Rochester Energy Initiatives**

| | |
|---|---|
| **2007** | Signs the U.S. Conference of Mayors Climate Protection Agreement |
| **2009** | Participates in NYSDEC Climate Smart Communities program, pledging to undertake actions to reduce GHG emissions, protect public health and safety, and support a secure economic future |
| **2011** | Completes inventory of greenhouse gas emissions for baseline year 2008. Sets a goal to reduce GHG emissions from municipal operations by 20 percent by 2020 from the 2008 baseline |
| **2012** | Partners with the U.S. Department of Energy Better Buildings Challenge and pledges to reduce energy use intensity (EUI) by 20 percent by 2020 from the 2009 baseline in 4 million square feet of municipal building space |
| **2013** | Completes Municipal Operations Climate Action Plan and reports that GHG emissions from City operations had been reduced by 8.6 percent between 2008 and 2011. The plan recommends that Rochester closely monitor energy usage and building performance in order to measure progress toward its goals |
| **Current** | City departments enter monthly energy usage data into Portfolio Manager for municipal buildings. Overall energy use is monitored, along with progress toward meeting the goals specified in the Better Buildings Challenge and the City's Municipal Operations Climate Action Plan |

# Overview

Traffic on Interstate 490

In 2010, there were an estimated **1.15** billion vehicle miles traveled in Rochester

emissions from fuel usage are estimated at nearly 1.6 million MT CO2e from buildings and 621,000 MT CO2e from transportation.

The Rochester Energy Plan points the way towards a cleaner and more efficient energy future in several ways. First, although new construction continues to occur within Rochester, many of the opportunities for reducing energy usage and GHG emissions will result from energy efficiency improvements and increased use of renewable energy in existing buildings. State and utility renewable energy and energy efficiency incentives enable the City to take advantage of a robust set of resources to support its own priorities and programs. City government can leverage these resources through additional public and private sector engagement and financing, consistent enforcement of codes, and through partnerships with businesses, institutions, and neighborhood organizations that help to uncover the value of energy efficiency and clean energy deployment across Rochester's building stock.

Another major area in which Rochester can progress toward its clean energy goals is by increasing efficiency in the transportation sector. In 2010, the number of vehicle miles traveled (VMT) within Rochester was estimated at nearly 1.15 billion, which includes through travel along Interstate 490, commutes to employment within or outside the city and trips that originate and end within Rochester. The city can take steps to reduce VMT—and corresponding energy usage and emissions levels—by encouraging residents to use alternative modes of transit, such as walking or bicycling. Rochester's zoning laws and infrastructure policies encourage land-use patterns that enable more walking and bicycle trips to be made, while supporting high-quality neighborhoods. Enhancing public transit service also offers a cleaner alternative to driving. Finally, Rochester will encourage the use of electric and other alternative fuel vehicles that will help lower greenhouse gas emissions in the transportation sector. City government will partner with other entities to foster implementation citywide.

Rochester's energy distribution and supply infrastructure can be made more conducive to the deployment of renewable and clean energy. The vast majority of energy used for municipal operations and throughout the city is fueled by natural gas and electricity. Nearly all of the electricity is delivered by Rochester Gas & Electric (RG&E) although increasing amounts are generated by on-site solar power. To encourage this, Rochester is revising its permitting procedures to

facilitate solar energy deployment throughout the city. Improving Rochester's energy distribution and supply infrastructure has other benefits as well; for instance, several district energy systems located in the city offer resiliency to institutions, tenants and members of cooperatives in case of power outages. Continued economic development in Rochester depends on sufficient and reliable supplies of electricity and natural gas. Rochester partners with RG&E and state entities to ensure that key economic development sites have access to necessary energy infrastructure.

## Summary of goals and initiatives

Rochester has established the following goals to address the energy needs of municipal government as well as the community at large:

- Coordinate municipal, utility, community and state energy policies
- Reduce energy usage in buildings
- Reduce petroleum usage and greenhouse gas emissions in the transportation sector
- Ensure an energy supply that is safe, reliable, affordable and clean

To accomplish the goals of the Rochester Energy Plan, the City will pursue several initiatives within each of the plan's four Action Areas.

Coordination of Rochester's energy policies with community, state and regulatory policies and priorities is paramount to ensuring that the city's energy needs and goals are met. The City will communicate regularly with other levels of government and utilities to ensure that energy resources flow to Rochester's community and economic development programs in the most cost-effective manner. Accordingly, staff capacity will be developed to coordinate energy policy at the state and local levels and municipal employees will be made more aware of the City's commitments to reduce greenhouse gas emissions and save energy.

Rochester will reduce energy usage in municipal buildings by implementing various energy efficiency initiatives and measures identified through energy audits. Financing for these improvements will be offset by savings from reduced energy costs and through other funding and financing sources. To increase energy efficiency in buildings citywide, Rochester will continue to enforce the New York State Energy Code and will work with community organizations to support programs that engage community members, increase awareness of energy usage and efficiency potential, and result in long-term energy reductions.

The City will lead by example by reducing energy usage in the transportation sector in areas over which it has direct jurisdiction. The City will reduce energy use and emissions in its fleet vehicles and streetlights. These and other transportation sector initiatives will significantly reduce municipal energy usage and cost.

To ensure that Rochester's energy supply is safe, sufficient, reliable and affordable, and that it contributes to reductions in greenhouse gas emissions and dependence on fossil fuels, Rochester will continue to meet regularly with RG&E to coordinate infrastructure improvements and street repairs, and facilitate the extension of utility infrastructure to key economic development sites. City staff will continue to partner with other governments, private institutions and RG&E to facilitate the expansion of renewable energy, district energy, microgrids and smart grid technology.

Boats on Lake Ontario

# Coordinate Municipal, Utility, Regional and State Energy Policies and Planning

## Summary of Objectives and Initiatives

### Improve energy planning and coordination across City agencies and key stakeholders

**Initiative 1:** Increase staffing for energy management

**Initiative 2:** Communicate regularly with state, regional and community stakeholders

### Reduce municipal energy usage and cost

**Initiative 3:** Expand energy procurement through ESCOs to include natural gas

**Initiative 4:** Monitor and communicate energy usage to City decision-makers and operations staff

Energy suppliers, natural gas and electricity utilities, and regulators all play a role in determining the energy used by and within Rochester. Planning and coordination is essential to ensure the energy supply is safe, clean, reliable and affordable. Rochester is served with electricity and natural gas by RG&E, a subsidiary of Iberdrola USA. Customers may elect to purchase energy from an Energy Service Company (ESCO), with the energy delivered by RG&E. The City purchases electricity from an ESCO for its own operations, with a quarter of this electricity generated from renewable sources, demonstrating Rochester's commitment to more sustainable energy solutions.

Major public and private institutions within Rochester are taking control of some of their energy needs through district energy generation and distribution. District energy installations include Monroe County's Iola Powerhouse, the Rochester District Heating Cooperative and Recycled Energy Development at Eastman Business Park. The city's universities and not-for-profit organizations provide additional opportunities to expand clean energy installations, promote energy efficiency and further the City's other energy goals. In particular, the University of Rochester and the Golisano Center for Sustainability at the Rochester Institute of Technology (RIT) bring opportunities for research, innovative pilot projects, large-scale clean energy deployment and education to further promote energy-related best practices. Smaller non-profit institutions, such as the Center for Environmental Initiatives and Friends of the Garden Aerial, also play a critical a role in supporting Rochester's energy and sustainability planning efforts through public education, demonstration projects and leadership. To advance transportation alternatives, the Rochester-Genesee Regional Transportation Authority operates transit service and community organizations such as the Rochester Cycling Alliance support a growing bicycle culture in Rochester.

## Improve energy planning and coordination across City agencies and key stakeholders

The City of Rochester has a strong tradition of energy planning, efficiency and sustainability in municipal buildings and fleets and in supporting alternative fuels and bicycle and pedestrian transportation options. Rochester's Office of Energy and Sustainability, established in 2011, provides leadership within City government and the region in energy efficiency, greenhouse gas management and other sustainability issues.

City staff influences energy use in the community through participation in coalitions and educational programs, enforcement of building codes, installing bicycle and pedestrian infrastructure, administering zoning regulations, and facilitating utility access to infrastructure under city streets. Continued communication, partnerships and cooperative projects with other governments, institutions and organizations are essential to reducing energy consumption citywide.

Various state agencies provide funding and other support for economic and community development and work in partnership with the City and RG&E to ensure energy needs are addressed. State energy policies and programs affect several of the key economic development initiatives in Rochester, including Midtown, Eastman Business Park and the Port of Rochester. Continued communication and coordination among these entities is essential to advancing Rochester's energy priorities.

### Initiative 1: Increase staffing for energy management

Rochester's Energy and Sustainability Manager, a position within the Department of Environmental Services' Office of Energy and Sustainability, is responsible for monitoring energy performance in buildings, facilitating renewable energy studies and installation, and maintaining information on policies and programs that support the City's sustainability goals. The Energy and Sustainability Manager also participates in local and regional planning initiatives such as Genesee Region Clean Communities and the Finger Lakes Regional Sustainability Plan. Rochester will increase staffing to ensure that the Office of Energy and Sustainability has the capacity to increase energy planning collaboration and manage progress internally.

The Energy and Sustainability Manager and supporting staff will continue to identify funding opportunities for high-priority municipal energy projects and participate in local and regional coalitions that support energy planning policies that benefit Rochester. Because staff members are within the Department of Environmental Services, they are in a good position to provide direct support to City operations. In addition, the Energy and Sustainability Manager will initiate and support partnerships with other municipalities and organizations to advocate for regulations, policies and funding that would reduce City costs and benefit its residents, businesses and institutions.

Downtown Rochester

### Initiative 2: Communicate regularly with state, regional and community stakeholders

Decisions by state, federal and regional regulatory agencies regarding energy supply and distribution reverberate throughout the City's processes regarding planning, development and services. For example, the New York State Public Service Commission (PSC) issues orders relating to energy and utilities that directly affect energy usage in Rochester. The Reforming the Energy Vision (REV) initiative led by the PSC intends to reform New York State's energy industry and regulatory practices for the benefit of citizens, whose lives are so directly affected by how electric energy is manufactured, distributed and managed.

RG&E administers economic development programs in cooperation with the City and other partners to benefit a variety of business sectors, including telecommunications, finance, real estate, manufacturing and mixed-use development. These programs help Rochester retain existing businesses and attract new businesses to the region. The redevelopment of the former Midtown Mall site in downtown Rochester into an 8.5-acre mixed-use urban center with a new street grid is an example of successful collaboration. RG&E worked closely with City staff and state agencies to obtain funding for and to carry out the extensive relocation and upgrades to the natural gas and electricity infrastructure needed to support the redevelopment of this critical economic development site.

Rochester's Energy and Sustainability Manager will continue to monitor PSC decisions that affect City interests relating to rates, infrastructure and utility operations. Rochester will continue to collaborate with RG&E, state agencies, businesses and community representatives to address Rochester's energy needs. Internally, economic development and planning staff will work with the Energy and Sustainability Manager to integrate energy priorities into economic and community development activities.

## Reduce municipal energy usage and cost

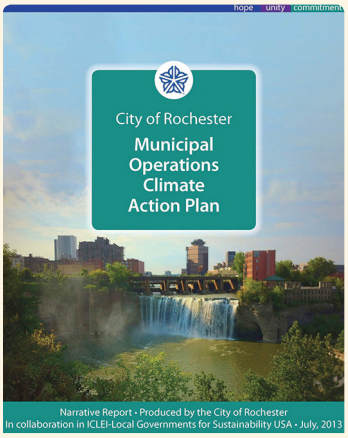
Stronger and better-coordinated energy-planning processes will reduce Rochester's energy consumption and the subsequent costs borne by City agencies and taxpayers. Through competitive bidding to procure energy and the dissemination of energy-use data to City staff, Rochester will improve operational efficiencies related to energy consumption and be able to provide better services to residents and businesses.

### Initiative 3: Expand energy procurement through ESCOs to include natural gas

Rochester relies upon a competitive process to procure electricity for all municipal facilities and street lighting, a quarter of which is purchased as Renewable Energy Certificates (RECs) that meet national standards for renewable products. Rochester's competitive bidding procurement policy for electricity through a state-licensed ESCO—an independent energy services company separate from the utility, from which customers

**CASE STUDY** **Office of Energy and Sustainability**

The City of Rochester established the Office of Energy and Sustainability within the Division of Environmental Quality to lead and coordinate energy efficiency and sustainability efforts throughout City government. As part of the Department of Environmental Services, which manages municipal infrastructure, fleets and buildings, the OES is in a good position to integrate environmental values into how Rochester conducts business. In addition to coordinating sustainability projects within City government, the OES participates in coalitions to support energy and sustainability projects throughout the community and the region.




Significant accomplishments of the Office of Energy and Sustainability include:

- Completion of a Greenhouse Gas Inventory and Municipal Operations Climate Action Plan
- Utilization of the online tool ENERGY STAR Portfolio Manager to monitor energy usage in City facilities
- Evaluation and installation of energy-efficiency improvements and renewable energy projects at City facilities
- Transportation initiatives including acquisition of alternative fuel vehicles, design and construction of a new green fuel facility, Automatic Vehicle Locator program to optimize routes, Complete Streets Policy, and bicycle infrastructure enhancement
- Green infrastructure to reduce stormwater runoff, including a green roof and permeable parking lot at City Hall

The OES was instrumental in securing and managing grant funding and utility incentives from a variety of sources. Since 2009, the OES has secured nearly $7 million in grant funding and incentives to plan and implement climate and sustainability initiatives.

In addition to managing projects within City government, the OES participates in coalitions to advocate for sustainability projects throughout the community. These include the Genesee Region Clean Communities, Inc. and the USDOE Better Buildings Challenge. In addition, OES helps the City of Rochester demonstrate its leadership through a City Council Resolution to Support Climate and Environmental Protection, becoming a NYS DEC "Climate Smart Community" and an ICLEI Cities for Climate Protection Member, and part of the USEPS Green Power Partnership.

Rochester City Hall

have the right to buy power—has succeeded in reducing the City's electricity costs.

Rochester purchases natural gas through RG&E. The purchase of natural gas through an ESCO—similar to the City's experience with electricity procurement—may result in additional cost savings.

Rochester will continue to procure electricity from an ESCO through a competitive bidding process and will still purchase a portion of its electricity from renewable sources. The City will explore the feasibility of "unbundling" the purchase of RECs from electricity to identify potential cost savings. In addition, the City will evaluate expanding competitive bidding from ESCOs that offer natural gas to identify potential municipal cost savings. The City will identify suitable ESCOs and prepare a Request for Proposals as the next steps.

### Initiative 4: Monitor and communicate energy usage to City decision-makers and operations staff

City staff members continually accumulate large amounts of data regarding energy usage and building performance. Sharing this data with building occupants, facility operators, and decision-makers is essential to maintain awareness of energy performance and progress toward Rochester's energy conservation goals. Rochester monitors energy usage and greenhouse gas emissions of buildings used in municipal operations and tracks progress in building performance as part of the Better Buildings Challenge and implementation of its Municipal Operations Climate Action Plan.

The Energy and Sustainability Manager will be responsible for collecting energy usage data for all municipal functions, including buildings and non-building energy usage such as street lighting. The Energy and Sustainability Manager will monitor energy usage trends and communicate findings with individual departments and senior management through periodic reports. This information will help department heads consider energy consumption, greenhouse gas emissions, and progress toward the City's sustainability goals in making decisions regarding capital investments and programs.

## Implementation Matrix

| Responsible party | Key partners | Source of funding | Time frame | Next steps |
|---|---|---|---|---|
| **Improve energy planning and coordination across City agencies and key stakeholders** | | | | |
| **Initiative 1: Increase staffing for energy management** | | | | |
| Mayor; City Council | Finance, Department of Environmental Services (DES) | New York Power Authority or other organization | Short-Term | Determine job title and role |
| **Initiative 2: Communicate regularly with state, regional, and community stakeholders** | | | | |
| Department of Environmental Services | PSC; RG&E; City Departments; community institutions and organizations | City staff budget | Ongoing | Establish communication procedures |
| **Reduce municipal energy usage and cost** | | | | |
| **Initiative 3: Expand energy procurement through ESCOs to include natural gas** | | | | |
| Department of Environmental Services Commissioner | Energy & Sustainability Manager; Finance Department, ESCOs | City staff budget | Short-Term | Solicit proposals from ESCOs |
| **Initiative 4: Monitor and communicate energy usage to City decision-makers and operations staff** | | | | |
| Energy & Sustainability Manager | DES Buildings Division; facilities operators; department heads | City staff budget | Ongoing | Update monitoring and reporting procedures and responsibilities |

**Time frame:** Short-Term = less than five years, Medium-Term = five to 10 years, Long-Term = more than 10 years

# Reduce Energy Usage in Buildings

## Summary of Objectives and Initiatives

### Reduce energy usage in buildings citywide

**Initiative 1:** Enhance energy code enforcement

**Initiative 2:** Partner with business and institutional leaders to implement energy-efficiency programs

**Initiative 3:** Support community engagement programs through collaboration with public and private partners

### Reduce energy usage in municipal buildings 20 percent by 2020

**Initiative 4:** Schedule and implement energy-conservation improvements recommended in recent energy audits

**Initiative 5:** Reinvest energy-efficiency savings through a dedicated fund

**Initiative 6:** Implement incentive programs for employees to reduce energy usage in City facilities

**Initiative 7:** Implement a training program for maintenance staff

**Initiative 8:** Track energy performance through continued use of EPA Portfolio Manager

Rochester is committed to reducing energy use in buildings citywide, and will lead by example through continued energy efficiency gains in City-owned facilities. In addition to reducing energy consumption and greenhouse gas emissions, the accelerated installation of energy-efficiency improvements in buildings citywide will offer job opportunities for residents.

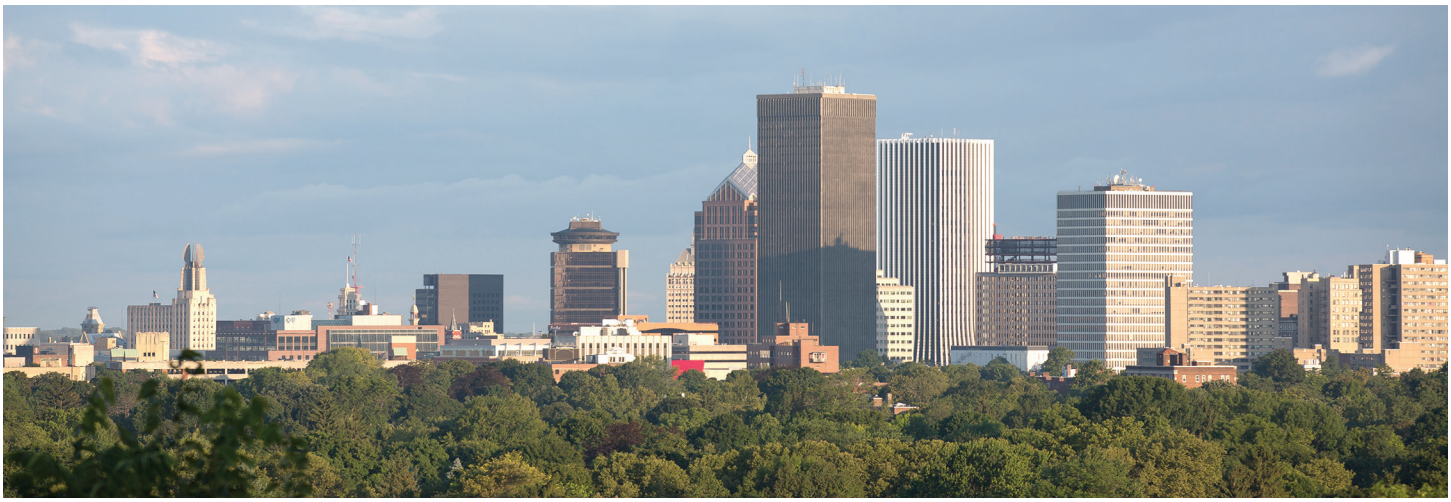
Citywide building energy consumption consists of the electricity, natural gas and other fuels used for heating, cooling, lighting and operating equipment and appliances across building types (including residential, commercial, institutional and industrial). Citywide building greenhouse gas emissions totaled nearly 1.6 million metric tons of carbon, or roughly 70 percent of total emissions in Rochester. Notably, greenhouse gas emission levels are fairly constant across different building types, suggesting that Rochester can benefit from programs that engage commercial as well as residential property owners and tenants. Organizations that represent building owners and institutions, such as the Rochester Downtown Development Corporation and the Building Owners and Managers Association, can be key partners in supporting initiatives to reduce energy usage in buildings citywide. New housing development is occurring in and around downtown in the form of new apartments and condominiums in repurposed commercial and industrial spaces, providing the opportunity to implement energy efficiency improvements in conjunction with redevelopment. The primary tools the city can use to influence efficiency gains in buildings throughout the city are through building code compliance and partnerships.

Rochester's municipal facilities consume only a fraction of energy used by buildings citywide (approximately 227,891 mmBtu in 2010); however, the City has an opportunity to lead by example through energy efficiency programs in municipal buildings. Using the EPA's Portfolio Manager tool, Rochester has benchmarked its municipal buildings to compare and track energy performance at the building level. Additionally, the City has been implementing energy-efficiency measures informed by audits and participation in the U.S. Department of Energy's Better Building Challenge to reduce building energy use

**ENERGY CONSUMPTION IN BUILDINGS BY TYPE**

| Building type | Square feet | Electricity (mmBtu) | Natural gas (mmBtu) | Other fuels (mmBtu) | Total (mmBtu) | Total GHG (MT $CO_2e$) |
|---|---|---|---|---|---|---|
| Residential | 89,778,117 | 1,709,819 | 6,655,286 | 414,252 | 8,776,357 | 507,899 |
| Commercial | 35,771,430 | 1,647,861 | 3,146,878 | 142,277 | 4,937,015 | 298,248 |
| Institutional | 26,857,823 | 1,859,027 | 3,187,226 | 144,101 | 5,190,354 | 315,925 |
| Industrial | 36,650,227 | 1,926,342 | 2,521,601 | 1,846,178 | 6,294,121 | 442,854 |
| **Totals** | **189,057,597** | **7,140,047** | **15,510,991** | **2,546,809** | **25,197,848** | **1,416,798** |

Figure 3



Rochester skyline

20 percent by 2020. In response to this program, Rochester has achieved a 4 percent reduction in energy use intensity (EUI). Recent energy audits have identified many other improvements that, when implemented, are expected to reduce energy usage further.

## Reduce energy usage in buildings citywide

To secure meaningful citywide building energy efficiency gains, Rochester will focus on energy code enforcement, collaboration with partners across sectors and public awareness. These steps will set the pace for greater community energy efficiency activity in the future, leveraging private sector leadership and economic development to demonstrate the opportunities and benefits of high energy performance.

### Initiative 1: Enhance energy code enforcement

All new construction and significant renovations to buildings in Rochester must comply with the NYS Energy Conservation Code. The City will work toward improving consistent application and enforcement of the code, as it is critical to ensuring that new construction and renovation meet current standards and reduce overall energy consumption. City staff will continue to attend regular training to ensure that they are knowledgeable about regulations and enforcement procedures. Training programs provided by the state and other organizations are invaluable in helping staff maintain their certifications and apply codes effectively.

Rochester will also assess potential changes to the code to require compliance with standards that go beyond the current state code for new construction. This assessment would consider staff capacity as well as potential impacts on residents, property owners, businesses and development opportunities.

### Initiative 2: Partner with business and institutional leaders to implement energy efficiency programs

Commercial and institutional buildings together comprise almost half of the total energy use from buildings citywide, thus partnership and leadership from these sectors provides a real opportunity to reduce energy consumption. Leaders from these sectors are already investing in energy-efficiency upgrades and voluntarily adopting energy-efficiency best practices programs and innovative financing mechanisms to spur efficiency gains (and reduce costs). By working with decision-makers in these sectors, Rochester can help expand the adoption of successful energy-efficiency strategies citywide.

Benchmarking in buildings leads to greater awareness of energy performance and drives building owners to improve energy efficiency to reduce costs and be more efficient. Studies have found that when benchmarking results are publicly available, building owners are motivated to improve efficiency in order to compete more effectively in the marketplace. In other cities where mandatory benchmarking has been implemented, utility expenditures were reduced by approximately 2 percent per square foot, which in Rochester would be the equivalent of the energy consumed by 1,600 vehicles in one year.

**Upstate New York Fuel Mix for Electricity Generation**

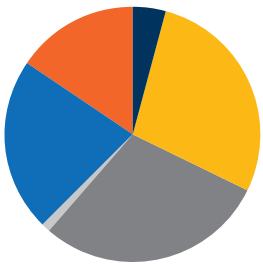



Figure 4

# Energy Efficiency in Buildings

Rochester will set the stage for benchmarking citywide through targeted voluntary benchmarking and public awareness programs. As a first step, the City will leverage the work of existing institutions committed to energy efficiency. For example, the University of Rochester has already demonstrated the benefits of high-performing buildings, as exemplified by the Saunders Research Building and the O'Brien Hall residence, completed in 2011 and 2013, respectively, as well as organizing campus initiatives to reduce energy consumption.

High Falls, downtown Rochester

Another key partner is the not-for-profit organization Friends of the Garden Aerial, established in 2011 to promote sustainability practices and preserve the High Falls Heritage Area and the Genesee River gorge. The City is supporting this organization's application for grant funding to study the feasibility of establishing an "eco-district," a public-private collaboration that supports best practices in sustainability in a designated area. Among other sustainability initiatives, Rochester's eco-district could organize property owners within the district to benchmark their buildings, monitor progress toward energy reduction goals and coordinate energy conservation challenges among building owners. A standard target for eco-districts is to reduce energy usage among participating buildings by 10 percent in five years and 25 percent by 2030.

Other potential partners to advance energy efficiency in buildings include: Action for a Better Community, which administers home weatherization in low-income Rochester households; the Downtown Development Corporation, a private, not-for-profit economic development organization focused on marketing and collaborations affecting downtown; and numerous other education and advocacy organizations. Rochester will support initiatives led by these and other organizations and institutions to accelerate the installation of energy-efficiency measures in buildings citywide by supporting funding applications, providing information about sources of funding and technical assistance, and assessing the potential creation of special districts to fund energy efficiency improvements.

Rochester will continue to work with Monroe Community College and other organizations to support education and training programs that prepare residents for jobs in fields such as heating, ventilating, air conditioning (HVAC), weatherization and renewable energy installation. As demand grows for weatherization and other building improvements citywide, Rochester will work with contractors and building owners to increase job opportunities for residents.

### Initiative 3: Support community engagement programs through collaboration with public and private partners

To engage residents and building owners to reduce energy usage, RG&E and the New York State Energy Research and Development Authority (NYSERDA) administer incentive programs. RG&E offers rebates for customers who install energy-saving natural gas equipment and efficient appliances, as well as free energy assessments and financial incentives for small businesses. NYSERDA's incentive programs support new construction and renovations of commercial and industrial buildings and equipment upgrades.

Rochester will utilize its relationships with building owners in conjunction with its neighborhood development and economic development programs to encourage owners and tenants to utilize and promote RG&E and NYSERDA programs. To support energy efficiency projects led by community organizations, institutions and not-for-profit agencies, the City will provide

meeting space as needed, publicize community efforts on its website, provide information about funding and technical assistance, and participate in meetings and events.

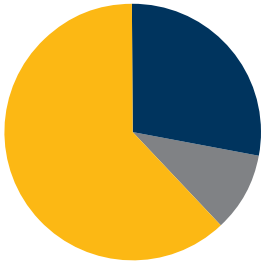
300 State Street

## Reduce energy usage in municipal buildings 20 percent by 2020

The City is responsible for operating and maintaining more than 100 buildings and facilities across many departments and building types, constructed between 1874 and 2008. These include buildings ranging from the Central Vehicle Maintenance Facility and the Blue Cross Arena/ War Memorial to administrative buildings such as City Hall. Other building types include police and fire stations, recreation centers, libraries and parking garages. Each building and department has different energy needs and priorities, as evidenced by their various public service and safety missions.

The buildings collectively consume 227,891 mmBtu of energy annually, resulting in total energy costs of nearly $5.7 million. An additional 20 percent reduction, on top of the City's previous energy reduction successes, would save the City nearly $1.1 million per year in operating expenses.

### Citywide Buildings Energy Consumption by Fuel Type



- Electricity (28%)
- Natural Gas (62%)
- Other Fuels (10%)

Figure 5

**CASE STUDY** **Central New York Energy Challenge Team Pilot Project**

Thirty-four households participated in the Central New York Energy Challenge Team Pilot. Each household filled out a baseline survey at the beginning of the program, providing basic demographic information, family size and house size. The survey also included values-based questions about participants' interest in energy savings, such as surrounding completed projects, knowledge levels, or commitment to changing behaviors to reduce energy consumption. An exit survey asked what changes had occurred in participants' attitudes and behavior. Additionally, participants were asked to sign a waiver to release their household utility usage information to the program so that actual reductions in energy consumption could be measured. The overall reduction goal of the pilot was to save 10 percent on electric usage for participants.


Participants were engaged in teams of five to eight households and met over the course of 12 weeks following a standard curriculum. Materials and training were provided through the Energy Challenge. The results of the pilot demonstrated a 29 percent reduction of electricity consumption in participating households when compared with a control group. Prior to participation, there was only a 4 percent difference between the participants and the control group. [Source: http://cnyenergychallenge.org]

Challenges to scaling this pilot include the extent of staff support needed to facilitate meetings, distribute educational materials, and monitor and report results. Partnerships with organizations already active in neighborhoods can help address these challenges.

# Energy Efficiency in Buildings

Blue Cross Arena at the War Memorial

## Municipal Building Energy Consumption by City Department

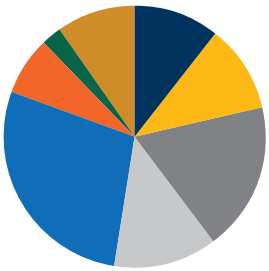



Figure 6

In 2012, Rochester joined the DOE's Better Buildings Challenge, setting a goal of 20 percent reduction in energy use intensity of municipal buildings by 2020. By the end of 2013, Rochester had achieved a 4 percent reduction in energy use intensity. Between 2010 and 2013, energy-conservation measures installed at City facilities contributed to a 7.4 percent reduction in electricity usage, a 5.6 percent reduction in natural gas consumption, and an 11.6 percent reduction in energy cost. Recent energy audits of municipal buildings identified improvement projects such as lighting upgrades, HVAC improvements, and renewable energy installations to further the City's progress toward its goal. The installation of these and other improvements, together with operational and behavioral changes, can further reduce municipal energy costs and systematically improve operation and maintenance of City facilities.

### Initiative 4: Schedule and implement energy conservation improvements recommended in recent energy audits

Rochester conducted ASHRAE Level I energy audits at 40 City-operated buildings between 2010 and 2014. These audits recommended the installation of specific energy-conservation measures (ECMs) and estimated the annual energy savings, the associated capital cost and the simple payback. The ECMs consist of low-cost upgrades to building systems found in many similar buildings: lighting upgrades and lighting controls, heating and cooling plants, HVAC and water systems, motors and drives, building management control systems, and the building envelope.

To implement these recommendations, supplemented by measures that will achieve deeper energy reductions, the City will first take a comprehensive look at the audit findings, conduct additional investigations as needed, and pursue a strategy to implement comprehensive retrofits. For those buildings that showed high potential for significant energy reductions in the Level I audit, the City will conduct either ASHRAE Level II audits or a retro-commissioning strategy to improve the operation and efficiency of aging building systems. Retro-commissioning generates a list of improvements, many of which are low-cost tuning of the building controls, which will result in significant annual energy savings.

The City will select the appropriate mechanism to implement the retrofits, such as using in-house personnel, procuring an ESCO or pursuing a design-bid-build strategy, and then phase in the retrofits annually or biannually through the capital budget. On average, these comprehensive building retrofits are estimated to have a payback between six to eight years, when existing incentive programs are taken into account. Funding for the implementation and execution of the audit recommendations will be secured via incentives and/or grants from RG&E, NYPA, NYSERDA and other state or federal sources, and will also seek to leverage innovative third-party financing mechanisms where possible.

### Initiative 5: Reinvest energy-efficiency savings through a dedicated fund

Dedicating the savings from energy-efficiency improvements to finance additional conservation measures can have a major impact on additional reductions in energy consumption, greenhouse gas emissions and costs. A dedicated fund can facilitate investment in high return-on-investment upgrades and reduce long-term operating costs.

Rochester programs building improvements through a central capital budgeting process, which means a dedicated fund could support energy efficiency initiatives at buildingsin all departments. Funding from energy-efficiency savings will need to be supplemented with additional funding from grants or other sources.

Rochester's Department of Environmental Services will work with the finance and budget departments' staff to evaluate the feasibility of

**Community Energy Consumption by End User**

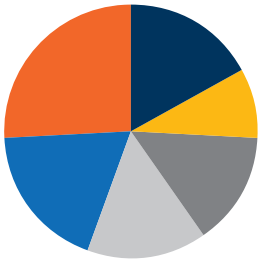



Figure 7

## CASE STUDY Upgrade Parking Garage Lighting

The City of Rochester recently upgraded the lighting system fixtures and controls in six City-owned parking garages. The existing lighting generally consisted of outdated high pressure sodium, inductance and metal halide fixtures. These fixtures were operated manually and had no automatic system controls. They were also not very energy-efficient.

New fluorescent fixtures were installed throughout the garages using T8 lamps with electronic ballasts. Lighting control systems were added using time, motion and photocell sensors to account for time of day, presence of occupants and daylighting factors to reduce the overall consumption of electricity. Factors such as occupant safety, lamp life, lighting levels and maintenance requirements were also taken into account in the analysis. The results of the analysis are shown in the following table:

**PARKING GARAGE ENERGY PLAN**

| Name of Parking Garage | Total Cost | Annual kWh Savings | Annual Energy Cost Savings | Project Payback (Excluding Incentives) |
|---|---|---|---|---|
| Midtown | $1,001,000 | 1,273,442 | $152,813 | 6.6 |
| Sister Cities | $235,800 | 481,915 | $57,830 | 4.1 |
| High Falls | $192,133 | 412,429 | $49,491 | 3.9 |
| Court Street | $266,523 | 470,466 | $56,456 | 4.7 |
| Washington Square | $186,107 | 390,481 | $46,858 | 4.0 |
| Crossroads | $71,178 | 281,399 | $33,768 | 2.1 |
| **Totals** | **$1,952,742** | **3,310132** | **$397,216** | **4.9** |

While the Midtown Garage project is not complete, existing data for the completed projects shows significant savings. Electricity usage will be reduced by 3,310,132 kWh per year for a cost savings of $397,216 per year. The project payback (excluding the incentives that were obtained from RG&E) for all garages combined is 4.9 years.

# Energy Efficiency in Buildings

Blue Cross Arena

establishing a dedicated fund to support energy-efficiency improvements. This fund would collect energy savings from each phase of building retrofits to make the program self-financing, augmenting the City's strategy to create sustainable funding mechanisms for energy initiatives and potentially attracting more private capital to energy efficiency and renewable energy markets.

### Initiative 6: Implement incentive programs for employees to reduce energy usage in City facilities

Programs that engage building occupants to change behavior can supplement physical improvements to reduce energy usage in buildings. A recent study conducted by the Massachusetts Institute of Technology found that programs focused on changing the routines, operations and purchasing practices of building occupants can result in up to 5 percent energy savings. Typical programs include information feedback, financial incentives or awards and engagement programs such as contests between departments. Successful programs utilize games, social engagement and remove barriers that discourage energy-saving behavior.

Rochester's Energy and Sustainability Manager will evaluate the feasibility of instituting incentives and/or recognition programs to help to motivate employees and raise awareness. Offering tangible rewards to staff is a way to signify the City's commitment to energy efficiency and generate participation by staff. By fostering behavioral changes such as turning off lights, computers and other equipment when not in use, significant savings can be achieved.

### Initiative 7: Implement a training program for maintenance staff

Improved building operations and maintenance (O&M) procedures can have a significant impact on building energy consumption. O&M procedures that focus on energy performance offer no- and low-cost opportunities to reduce utility costs while improving the comfort of occupants. Improving O&M in buildings requires partnership with facility staff and ensuring they have the tools they need to operate buildings efficiently and to implement and track maintenance procedures. This includes training, which—when accompanied by the appropriate accountability and motivation—can lead to 10 percent to 20 percent reductions in energy consumption. Training generally covers a variety of operations and maintenance topics, including thermostat setbacks and the operation of building systems and equipment. The City of Rochester will pursue O&M improvements by leveraging existing state resources and partnering with a training organization.

### Initiative 8: Track energy performance through continued use of EPA Portfolio Manager

ENERGY STAR Portfolio Manager is a free online service provided by the U.S. Environmental Protection Agency for building owners and managers to track and improve energy consumption in their facilities. This service can rate or rank eligible buildings, including offices, schools, healthcare facilities and retail stores based on the efficient use of energy. The outputs of Portfolio Manager provide several indicators that can be used to evaluate the performance.

These include an ENERGY STAR score, (a rating from 1 to 100 that indicates the position of a specific building against a database of other similar buildings nationwide), the energy use intensity (EUI) and a similar EUI parameter that compares energy consumption against a national mean for like building types. To evaluate building performance, Rochester maintains utility, cost data, and other criteria for all municipal buildings using Portfolio Manager.

To monitor progress toward its goals, City staff will continue to record and monitor building energy usage and performance. The City Energy and Sustainability Manager will continue to review progress toward the Better Buildings Challenge goal at the end of each year and report these findings to individual building managers and facilities staff.

## Implementation Matrix

| Responsible party | Key partners | Source of funding | Time frame | Next steps |
|---|---|---|---|---|
| **Reduce energy usage in buildings citywide** | | | | |
| **Initiative 1: Enhance energy code enforcement** | | | | |
| Code Enforcement | New York State Department of State | City budget – enforcement staff; Department of State - training | Ongoing | Identify training needs |
| **Initiative 2: Partner with business and institutional leaders to implement energy efficiency programs** | | | | |
| Energy & Sustainability Manager | Business and institutional leaders | City Staff Budget; NYSERDA; RG&E incentives | Medium-Term | Identify partners and initiatives to support |
| **Initiative 3: Support community engagement programs through collaboration with public and private partners** | | | | |
| Energy & Sustainability Manager; Neighborhood & Business Development | RG&E; Neighborhood organizations | NYSERDA; RG&E incentives | Short-Term | Identify appropriate staff and partners to conduct outreach |
| **Reduce energy usage in municipal buildings 20 percent by 2020** | | | | |
| **Initiative 4: Schedule and implement energy conservation improvements recommended in recent energy audits** | | | | |
| Buildings Division; City Engineer | Energy & Sustainability Manager; Architecture & Engineering Division | NYPA; NYSERDA; RG&E; Other State and Federal grants | Medium-Term | Complete additional investigations and retrofit strategy; obtain financing |
| **Initiative 5: Reinvest energy-efficiency savings through a dedicated fund** | | | | |
| Energy & Sustainability Manager; Budget office | Mayor; City Council | Savings from building retrofits | Short-Term | Identify priority projects and schedule work |
| **Initiative 6: Implement incentive programs for employees to reduce energy usage in City facilities** | | | | |
| Energy & Sustainability Manager; Mayor | Consultant/Contractor, Energy Performance Contracts | NYSERDA, RG&E, Capital Fund | Medium-Term | Design incentive program |
| **Initiative 7: Implement a training program for maintenance staff** | | | | |
| Energy & Sustainability Manager; DES Commissioner | Buildings Staff | Utility; State and Federal grants | Medium-Term | Identify training needs and potential vendors |
| **Initiative 8: Track energy performance through continued use of EPA Portfolio Manager** | | | | |
| Energy & Sustainability Manager | DES; Building managers | City Staff Budget | Ongoing | Update reporting procedures |

**Time frame:** Short-Term = less than five years, Medium-Term = five to 10 years, Long-Term = more than 10 years

# Reduce Petroleum Usage and Greenhouse Gas Emissions in the Transportation Sector

## Summary of Objectives and Initiatives

### Increase the proportion of trips made citywide by walking, bicycle and transit

**Initiative 1:** Maintain and improve policies and design standards to support walking, bicycling and transit

**Initiative 2:** Install additional bicycle lanes and other infrastructure

**Initiative 3:** Partner with RGRTA, businesses, institutions and not-for-profit organizations to support transit use

**Initiative 4:** Encourage and support bike- and car-share programs

### Increase the use of alternative fuel vehicles

**Initiative 5:** Support expansion of alternative fuel vehicle fleets and infrastructure citywide

**Initiative 6:** Increase the use of alternative fuel vehicles in the City fleet

### Reduce energy use in conventionally fueled municipal vehicles

**Initiative 7:** Expand anti-idling program with new pilot and technology upgrades

**Initiative 8:** Train employees in "EcoDriving"

**Initiative 9:** Continue program to "right-size" vehicles in the City's fleet

### Reduce energy consumption from the City's street lighting network

**Initiative 10:** Upgrade street lighting to include LED and advanced control technologies

Ensuring reliability and connectivity of Rochester's transportation network remains paramount to municipal operations and citywide economic activity. However, there are numerous opportunities for Rochester to reduce transportation-related energy consumption while maintaining a safe and dependable transportation network.

Citywide transportation efficiency gains will be achieved through a multi-pronged approach that combines the policy and regulatory tools of the City with technological advances and changing consumer habits. Rochester will incorporate active transportation into the planning, design and operation of street projects through implementation of the Rochester Complete Streets Policy. The City will promote initiatives designed to reduce transportation energy use in the community as a whole through increased alternative fuel and electric vehicle use and investments in infrastructure to support a more multi-modal transportation system, including bicycle and pedestrian travel options. Leading by example, the City will also leverage procurement, budgetary policies and staff training processes to reduce fuel usage in the municipal fleet and increase the energy efficiency of streetlights.

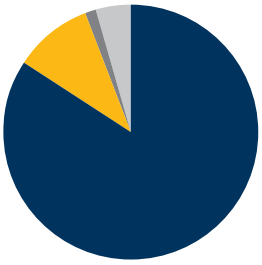
## Increase the proportion of trips made citywide by walking, bicycle and transit

Vehicles traveling through Rochester used 56.5 million gallons of gasoline and 11.8 million gallons of diesel fuel in 2010. Transportation-related fuel consumption contributes 13 percent of total energy use and 12 percent of total greenhouse gas emissions citywide. Reducing gasoline and diesel use is possible through development patterns that reduce car dependence as well as infrastructure that helps shift the mode of travel from cars to walking, bicycling or transit.

According to a recent Genesee Transportation Council travel survey, 84.4 percent of household trips within Rochester are made by car. The remaining 16 percent are made using "active" modes of transportation: 11.2 percent by walking, 4.4 percent by bus and 1.4 percent by bicycle. As 40 percent of daily trips in the Rochester area are 3 miles or less, there are significant opportunities to increase the number of trips made by bicycle or walking. Rochester supports active transportation modes through the maintenance and development of sidewalks, trails, bike lanes and other infrastructure, as well as land-use regulations that promote compact development patterns and pedestrian-friendly development design.


Ford Street Bike Box

## Household Travel 2011 - Trips Within Rochester by Mode



- Car (84.4%)
- Walking (9.8%)
- Bicycle (1.4%)
- Bus (4.4%)

Figure 8

### Initiative 1: Maintain and improve policies and design standards to support walking, bicycling and transit

Rochester's Complete Streets Policy mandates that all street construction, reconstruction, rehabilitation and pavement maintenance projects conducted by or on behalf of the City must include bicycle, pedestrian and transit facilities unless justified by exceptions such as excessive or disproportionate cost. The purpose of the policy is clear: to incorporate active transportation into the planning, design and operation of all future City street projects.

In addition, citywide design standards and guidelines in Rochester's zoning code are intended to maximize visibility for pedestrians, promote active street life and ensure compatibility with the surrounding neighborhood. The pattern of urban development and zoning regulations support compact development patterns and walkable neighborhoods. Rochester's Street Design Standards and Guidelines should be evaluated and improved to ensure that urban development and redevelopment supports walkability and pedestrian access. Zoning regulations require bicycle parking and include minimum standards for the quantity and location of bicycle parking spaces, but should also be evaluated and enhanced.

Several municipal departments are involved in the installation and maintenance of infrastructure to support walking and bicycling. The Department of Neighborhood and Business Development administers zoning regulations and design standards and the Department of Environmental Services (DES) maintains streets, sidewalks and bicycle infrastructure. The Engineering Division is responsible for designing streets in accordance with the City's Complete Streets Policy.

City planning and zoning staff will continue to administer zoning and design standards to maintain pedestrian access and urban design oriented to pedestrians and bicyclists. DES staff will continue to maintain sidewalks and bicycle infrastructure and the City Engineer will continue to apply Complete Streets principles to the design of new and reconstructed streets in continued support of the City's goal of incorporating active transportation options

### Initiative 2: Install additional bicycle lanes and other infrastructure

Rochester has installed numerous physical improvements on city streets since the completion of its Bicycle Master Plan in 2011 and more are underway or proposed. These include "sharrows" (shared road markings) and striped bicycle lanes, some of which were accompanied by a "road diet" (road narrowing) to reduce traffic speeds, as well as physically separated cycle tracks and multi-use trails. By adding to its existing

**EXISTING AND PROPOSED BICYCLE INFRASTRUCTURE**

| Type of bicycle facility | Existing | Expected in 2015 | Proposed (Future) |
|---|---|---|---|
| Bike Lanes (lane miles) | 30 | 14 | 34 |
| Sharrows (lane miles) | 22 | 7 | 4 |
| Cycle Tracks (lane miles) | 0 | 1 | 4 |
| Multi-use Trails (centerline miles) | 30 | 2 | 4 |

Figure 9

Regional Transit Service exceeded

**17.2**

million rides in 2013

bicycle infrastructure, Rochester will advance the City's goal to become the "most bicycle-friendly mid-size city in the country."

Rochester's Department of Environmental Services will continue to construct and maintain bicycle infrastructure as recommended in the Bicycle Master Plan and Bike Boulevards Plan. City staff will continue to partner with other organizations, such as the Genesee Transportation Council (GTC) and Rochester Cycling Alliance, to provide education to bicyclists and motorists, distribute bicycle maps, and identify routes that can serve as bike boulevards.

### Initiative 3: Partner with RGRTA, businesses, institutions and not-for-profit organizations to support transit use

Increased use of public transit can reduce the number of trips made in private vehicles, and thus the related energy use and greenhouse gas emissions. Rochester's radial street network supports a hub-and-spoke system of transit routes that converge downtown. Most of the city is served by bus routes operated by the Regional Transit Service (RTS), a subsidiary of the Rochester Genesee Regional Transportation Authority (RGRTA). RTS ridership was more than 17.2 million people in 2013. Ridership on LiftLine, a paratransit service available to customers with disabilities, was 169,354 people. RGRTA will open a downtown transfer facility in 2014 and is adjusting most of the bus routes and schedules that serve the City and surrounding areas.

Rochester will continue to support RGRTA by administering permitting for its facilities, and DES will facilitate maintenance of bus shelters located in City streets rights-of-way. In partnership with RGRTA, businesses, institutions and not-for-profit organizations, the City will participate in programs to encourage transit use and expand transit service.

### Initiative 4: Encourage and support bike share and car share programs

Bike- and car-share programs can reduce the number of cars driving within Rochester, which in turn is expected to reduce energy use associated with the transportation sector. Existing car-share services within Rochester include Zipcar, primarily focused on the University of Rochester campuses, and Lyft, which is working with City officials to secure needed approvals to begin service. The GTC is studying the feasibility of instituting a bike share program in the city. Rochester will continue to work with GTC to support the bike-share study, to facilitate infrastructure improvements at City facilities and within City rights-of-way, and to study how to grow car-sharing in the city.

## Increase the use of alternative fuel vehicles

Petroleum-based fuels are significant sources of greenhouse gases, contributing 61,183 MT of greenhouse gas emissions, or 28 percent of the greenhouse gas emissions generated within Rochester. Diesel and gasoline fuels also generate particulates and other air pollution that affect the health of residents and visitors. Increasing the use of alternative fuels helps to reduce dependence on petroleum, improves air quality and can reduce costs for fuel and vehicle maintenance.

Leading by example, 40 percent of the vehicles in Rochester's municipal fleet can utilize alternative fuels, including "flex-fuel" vehicles that can use either gasoline or E-85 (85 percent ethanol and 15 percent gasoline) and a growing number that use bio-diesel, CNG (compressed natural gas), LPG (liquid petroleum gas, or propane) and electricity. Rochester's Municipal Operations Climate Action Plan identified the increased use of alternative

## Means of Transportation to Work

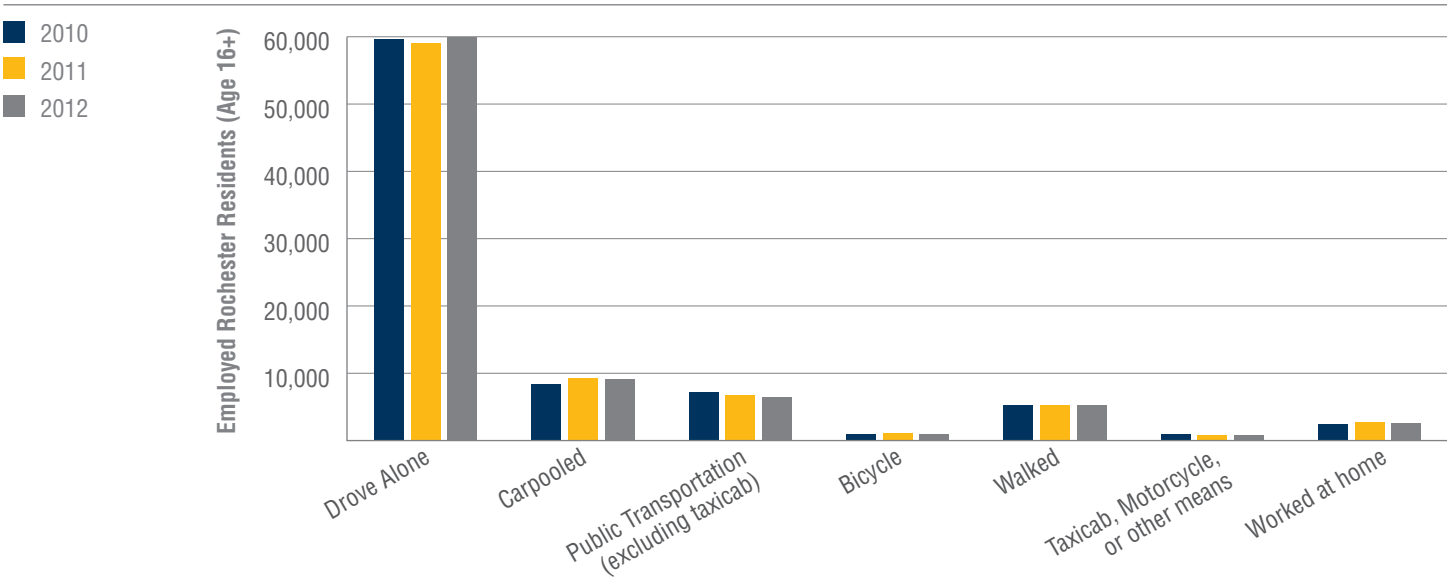



Figure 10 Source: American Community Survey ACS 5 Year, 2006-2010, 2007-2011, 2008-2012

Gasoline and diesel fuel contribute

**28%**

of all greenhouse gas emissions in Rochester

fuels as an effective way to meet the City's greenhouse gas reduction target.

### Initiative 5: Support expansion of alternative fuel vehicle fleets and infrastructure citywide

Rochester has a leadership role in Genesee Region Clean Communities, Inc. (GRCC), which promotes and facilitates funding for increasing the use of alternative fuel vehicles. Through continued involvement with GRCC, Rochester will interact with a wide range of stakeholders in public and private fleets to promote the use of alternative fuels and vehicles and to expand existing alternative fuel infrastructure. In addition to the opportunities for information sharing and education, there is potential for the development of synergistic partnerships that could involve public-private fueling projects and collaboratively seeking grant funding and other outside financing options. Rochester's collaboration with GRCC will demonstrate both parties' leadership in the use of alternative fuels and vehicles to other fleets in the region.

Rochester will support the additional use of electric vehicles citywide by installing and maintaining electric vehicle charging stations. In April 2014, Rochester installed 24 public electric vehicle charging stations as part of a NYSERDA-funded project. These are located in City-owned parking garages, at City Hall and at other municipal facilities. Rochester will maintain these stations for public use and install additional facilities as demand grows.

### Initiative 6: Increase the use of alternative fuel vehicles in the City fleet

Rochester's active fleet contains 1,052 vehicles, including police, fire, parks, water supply and public works vehicles. The fleet includes 437 alternative fuel vehicles, including E-85, CNG, LPG, bio-diesel and electric. The remainder of the fleet runs on gasoline or diesel fuel.

**ALTERNATE FUEL VEHICLES IN CURRENT CITY FLEET**

| Fuel Type | Number of Vehicles |
|---|---|
| LPG (propane) | 15 |
| CNG | 11 |
| Flex-Fuel (E85) | 349 |
| EV and HEV | 45 |
| Biodiesel | 17 |
| Total | 437 |

Figure 11

# Transportation Efficiency

Rochester installed

**24**

public electric vehicle charging stations in 2014

Rochester has had electric and CNG vehicles in its fleet for approximately 14 years. However, the number of CNG, LPG and electric vehicles in the fleet is still relatively small, primarily due to cost. While light-duty alternative fuel vehicles tend to have higher capital costs, these costs are offset in the long term by fuel savings and reduced repair expenses. In addition, these vehicles can potentially remain in the fleet for longer periods, which reduces replacement costs. This is due to their design; with fewer parts, these vehicles have less wear and tear.

In 2013, Rochester upgraded the fleet fueling station at its central vehicle maintenance facility on Mt. Read Boulevard to a green fueling station that dispenses E-85, bio-diesel and CNG. This station will allow the City to expand its fleet of CNG vehicles and increase its utilization of bio-diesel. To secure competitive prices, Rochester purchases fuels from state Office of Governmental Services contracts and through the City's own procurement process.

CNG Station


Rochester has used biodiesel in selected vehicles to date, but not in the diesel fleet at large. The City will evaluate using a B20 blend of biodiesel in warmer months and a B5 blend during the colder months on a small number of vehicles, and will monitor its impact on performance and maintenance. If successful, and if fuel costs are comparable to conventional diesel, Rochester will expand the use of bio-diesel to additional vehicles.

Due to the fuel-intensive nature of the City's large refuse operation and the persistent high cost of diesel fuel, CNG is the most practical alternative fuel for refuse trucks. While the incremental additional cost for CNG refuse vehicles is between $50,000 and $60,000, the fuel savings can be up to 30 percent to 40 percent. To make use of the City's new CNG fueling station, Rochester's Fleet Manager will evaluate the feasibility of incrementally adding CNG vehicles to its fleet. As the CNG fleet grows, the City will evaluate the feasibility of installing a time-fill CNG station at the Solid Waste Division garage complex. Time-fill stations dispense fuel directly from the compressor and are designed to refill fuel tanks overnight so that the refuse vehicles have full tanks in the morning when they are needed for route collections. The existing fast-fill station, which stores compressed gas in vessels for quicker dispensing, is best suited for occasional fueling. As the number of CNG vehicles grows, delays can occur if several vehicles need to refuel at the same time.

In addition to bio-diesel and CNG fueled vehicles, electric vehicles are practical additions to the City's fleet. As most of Rochester is relatively compact geographically, many of the vehicles in the fleet have relatively low mileage totals during their daily and weekly duty cycles. This allows for the frequent use of plug-in-electric vehicles. Other benefits of electric vehicles include reduced air pollution and health benefits for residents. Rochester has 43 electric vehicles in the City fleet, including Battery Electric Vehicles, Hybrid Electric Vehicles and Plug-In-Electric Vehicles. Rochester will install charging stations for these vehicles where they park overnight and will investigate adding electric vehicles to its fleet.

## Reduce energy use in conventionally fueled municipal vehicles

Although Rochester's municipal fleet includes many alternative fuel vehicles, most of the fleet runs on gasoline or diesel fuel. During 2010 and

Bicyclist — South Avenue at Highland Bowl

## Municipal Fleets Energy Use by Fuel Type

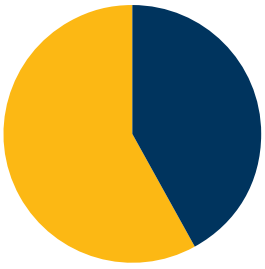



Figure 12

2011, municipal vehicles used 738,625 gallons of unleaded gasoline and 536,095 gallons of diesel fuel. Over the past few years, fuel usage of City fleet vehicles has declined gradually due to procurement of more efficient vehicles and increased use of alternative fuel vehicles. At the same time, fuel costs have increased significantly, providing a financial incentive for Rochester to reduce its vehicle fuel consumption. Vehicle procurement policies, reductions in idling and changes in driver behavior can have a large impact on the amount of diesel and gasoline used in municipal operations.

### Initiative 7: Expand anti-idling program with new pilot and technology upgrades

In March 2012, the City instituted a Vehicle and Equipment Idling Policy for its fleet. This policy aimed to mitigate the negative impacts of idling on engine wear, air quality and energy consumption. It prohibits vehicles and equipment from idling in non-emergency situations and requires vehicle operators to turn off their vehicles after 30 seconds of idling.

To supplement driver actions, technology upgrades can support additional reductions in idling, particularly among the dump trucks used for winter plowing and salting. These trucks spend a significant amount of time idling while waiting to be deployed, waiting in line for fuel or salt loads, or maintaining operator comfort during a break or downtime. In most of these cases, idling is currently necessary to provide a warm cabin for operator comfort.

The City will evaluate the feasibility of introducing anti-idling technology into its dump truck fleet. Available technology uses a small heater that draws relatively little fuel from the diesel tank to keep the truck cabin warm when the engine is not running. Tracking and reporting the fuel use of the vehicles in a test group will determine whether this technology is cost effective. If this initiative is successful in achieving significant fuel savings, the City will consider including these devices on new truck orders. The devices can also be removed from vehicles scheduled for surplus and reinstalled in newer vehicles.

### Initiative 8: Train employees in "EcoDriving"

Rochester will evaluate establishing a program to provide "EcoDriving" training to employees. EcoDriving is a set of driving behavior practices that improves fuel economy, saves money, reduces greenhouse gas emissions and reduces wear-and-tear on vehicles. The initial focus will be on employees within the Department of Environmental Services (462 vehicles and approximately 600 drivers); this department operates 75 percent of the vehicles that are not used for public safety purposes (EcoDriving training is not appropriate for police and fire, as these vehicles are often are responding to emergencies). The City will consider a train-the-trainer approach that offers training to a small group of employees, who in turn train other equipment operators and vehicle drivers in the DES.

Realized fuel savings will depend on a variety of factors, but according to a recent DOE study, it is possible to attain savings of 10 percent annually and as much as 20 percent for aggressive drivers. Based on current fuel usage levels, a 10 percent reduction would save 120,000 gallons of fuel annually and have a positive impact on air quality and reduced wear-and-tear on equipment.

### Initiative 9: Continue program to "right-size" vehicles in the City's fleet

Vehicle right-sizing programs match the need of each vehicle to perform its function with the most fuel efficient model that meets those needs. It is a management practice used to maintain sustainable and fuel-efficient fleets. Without such a program, fleets may accumulate vehicles that are overly specialized—and therefore infrequently used—or oversized for current operational needs. The latter

Rochester's streetlights use

**34%**

of the total electricity used in municipal operations

is often a result of trends in driver preference for larger vehicles, such as sport utility vehicles, when a smaller model would be appropriate. Because larger vehicles tend to consume more fuel, this trend can result in increased fuel consumption and related costs.

Rochester has been applying right-sizing principles in its vehicle acquisition program for the past 14 years. To attain additional reductions in fuel consumption and to mitigate rising fuel costs, the City will continue to employ right-sizing principles in selecting vehicles. Before selecting a vehicle for purchase, the City will evaluate whether reassigning, replacing or eliminating the vehicle would reduce petroleum use and costs without compromising fleet activities. The City will also continue to specify fuel consumption considerations in the City-Wide Fleet Management Policies and Procedures Manual.

## Reduce energy consumption from the City's street lighting network

The City of Rochester owns and maintains 27,999 streetlights, which consume 18.4 million kWh of electricity annually. This represents 34 percent of the total electricity used in municipal operations and 25 percent of the City's annual energy costs. Because 87 percent of the lights are high-pressure sodium, replacement with more efficient LED fixtures represents a significant opportunity to reduce energy consumption and cost.

### Initiative 10: Upgrade street lighting to include LED and advanced control technologies

Rochester has an opportunity to increase energy efficiency in municipal street lighting by installing LED bulbs. Additional energy savings can be realized by installing advanced metering and controls. As the market for LED street lighting has been changing rapidly, many experts believe there are LED street lighting fixtures available that will perform reliably, provide uniform power and deliver energy savings. Because the City owns its streetlights, the conversion to LED is possible at any time that financing is available, and innovative financing mechanisms are available to install LED fixtures at no upfront cost to the City.

By converting a portion of its streetlights to LEDs, Rochester could save more than 4.4 million kWh per year, or $485,000 annually, through the replacement of 70-watt high-pressure sodium lamps with 25-watt LEDs and 100-watt high-pressure sodium lamps with 42-watt LEDs).

Advanced metering and controls for LED lighting offer the possibility of further energy savings by allowing for dimming of the lights. Any dimming program will begin with public discussion and a presentation of the potential savings, both in energy and cost. Different timing schedules may be appropriate for different areas of the city. The example schedule (**Figure 13**) might be appropriate for a residential area, but business districts that are active after midnight might be better served with 10 percent dimming from dusk to 1 a.m. and 50 percent dimming from 1 a.m. to dawn.

**EXAMPLE OF DIMMING PROGRAM**

| Time of Day | Percent Dimming |
|---|---|
| Dusk to 9 p.m. | Full power (no dimming) |
| 9 p.m. to 11 p.m. | 20 percent dimming |
| 11 p.m. to 5 a.m. | 50 percent dimming |
| 5 a.m. to dawn | Full power (No dimming) |

Figure 13

## Implementation Matrix

| Responsible party | Key partners | Source of funding | Time frame | Next steps |
|---|---|---|---|---|
| **Increase the proportion of trips made by walking, bicycle and transit** | | | | |
| **Initiative 1: Maintain and improve policies and design standards to support walking, bicycling and transit** | | | | |
| Department of Neighborhood & Business Development; Environmental Services Transportation Specialist | Energy & Sustainability Manager; City Planning/Zoning staff | City budget | Ongoing | Review and update policies and standards |
| **Initiative 2: Install additional bicycle lanes and other infrastructure** | | | | |
| Department of Environmental Services | GTC | City budget; Transportation Improvement Program; state and federal grants | Short-Term, Long-Term | Complete design for approved projects; Seek funding for additional construction |
| **Initiative 3: Partner with RGRTA, businesses, institutions and not-for-profit organizations to support transit use** | | | | |
| Energy & Sustainability Manager | RGRTA; Community organizations | RGRTA; state and federal grants | Ongoing | Identify priority projects for funding in capital budget |
| **Initiative 4: Encourage and support bike share and car share programs** | | | | |
| Department of Environmental Services Transportation Specialist | Energy & Sustainability Manager; GTC | City budget; state and federal grants | Short-Term; Ongoing | Facilitate permitting for car-share; support funding applications for bike-share |
| **Increase the use of alternative fuel vehicles** | | | | |
| **Initiative 5: Support expansion of alternative fuel vehicle fleets and infrastructure citywide** | | | | |
| Energy & Sustainability Manager; City Engineer | Genesee Region Clean Communities, Inc. | City budget | Ongoing | Continued participation with GRCC activates |
| **Initiative 6: Increase the use of alternative fuel vehicles in the City fleet** | | | | |
| Energy & Sustainability Manager; Budget Office; DES Division of Equipment Services | Energy & Sustainability Manager; Genesee Region Clean Communities, Inc; U.S. DOE | CMAQ; City capital budget; NYSERDA | Short-Term | Identify suitable vehicles for replacement; secure funding |
| **Reduce energy use in conventionally fueled municipal vehicles** | | | | |
| **Initiative 7: Expand anti-idling program with new pilot and technology upgrades** | | | | |
| Fleet Manager | Energy & Sustainability Manager; fleet drivers | Equipment Services Operating budget; grants | Short-Term | Identify potential vendors and schedule demos |
| **Initiative 8: Train employees in "EcoDriving"** | | | | |
| Fleet Manager | Energy & Sustainability Manager; Department of Environmental Services | City Staff Budget; Grants | Short-Term | Identify potential vendors for a Request for Proposals |
| **Initiative 9: Continue Program to "right size" vehicles in the City's fleet** | | | | |
| DES Fleet manager | Energy & Sustainability Manager | City Staff Budget | Ongoing | Review procurement practices |
| **Reduce energy consumption from the City's street lighting network** | | | | |
| **Initiative 10: Convert street lights to LEDs** | | | | |
| DES Street Lighting Coordinator; City Engineer | Energy & Sustainability Manager | City capital budget; NYSERDA or other incentives; energy performance contract | Medium-Term | Determine phasing plan; evaluate financing options; select advanced control package if desired |

**Time frame:** Short-Term = less than five years, Medium-Term = five to 10 years, Long-Term = more than 10 years

# Ensure an Energy Supply That is Safe, Reliable, Affordable and Clean

## Summary of Objectives and Initiatives

### Coordinate with RG&E to facilitate maintenance and improvement of natural gas and electricity infrastructure

**Initiative 1:** Coordinate planning and scheduling of City road construction and utility infrastructure projects with RG&E

**Initiative 2:** Continue to work closely with RG&E to communicate potential energy infrastructure and capacity needs

### Support the continuation, expansion and creation of district energy and microgrids

**Initiative 3:** Encourage Rochester District Heating Cooperative to develop CHP capability and provide electricity to downtown buildings

**Initiative 4:** Partner with other institutions to maintain, expand and modernize district energy facilities

### Increase the amount of energy generated by renewable sources

**Initiative 5:** Adopt the NY-Sun initiative's streamlined solar permitting process

**Initiative 6:** Partner with other organizations to implement a Solarize Rochester program

**Initiative 7:** Install cost-effective renewable capacity at City-operated facilities

Rochester seeks to ensure an energy supply that is safe, reliable and affordable, and that contributes to reductions in greenhouse gas emissions and dependence on fossil fuels. The City will facilitate maintenance of infrastructure by RG&E and support increased capacity from district energy renewable sources.

Most of Rochester's electricity supply comes from bulk power transformers, the Ginna Station nuclear plant in the town of Ontario, New York, conventional power stations operated by public and private entities, and hydropower. The total capability of the electric system that serves Rochester is approximately 2,507 MW. To supplement the utility-supplied electricity, power plants at Eastman Business Park, the University of Rochester and the Monroe County Iola campus have the capacity to generate 153.35 MW. Unique to Rochester are abundant resources that allow hydroelectric power generation. RG&E operates three hydroelectric stations within the city along the Genesee River with a capacity of 57.1 MW—enough energy to supply 40,000 homes.

Increasing energy generation from renewable sources will help to advance Rochester's sustainability goals and align City priorities with the state's vision for a new, more efficient and decentralized energy system through the Reforming Energy Vision initiative. Rochester supports distributed energy enhancements that provide opportunities to realize the goals and advantages of local clean energy generation.

Solar power is a growing source of energy supply in Rochester. There are 35 solar net-metering facilities in Rochester, with a total generating capacity of about 674 kW. Rochester is leading by example with photo-voltaic solar facilities at two of its locations—the Public Market and the Arnett Library.

## Coordinate with RG&E to facilitate maintenance and improvement of natural gas and electricity infrastructure

RG&E maintains transmission and distribution infrastructure for electricity and natural gas within Rochester. Planned improvements include upgrades to the electric transmission and distribution systems, including a new substation to serve the University of Rochester and the replacement of natural gas distribution mains. Because much of the natural gas and electric infrastructure is located below streets, coordination and communication between RG&E and municipal staff is essential to minimize disruptions by scheduling utility upgrades at the same time as the replacement of water lines or street improvements. As RG&E develops its system improvement plans and models based on current and future anticipated growth, timely information about potential development and growth helps the utility plan for future infrastructure expansion and upgrades.

RG&E's hydropower plants in Rochester can generate **57.1 MW** enough to supply about 40,000 homes

### Initiative 1: Coordinate planning and scheduling of City road construction and utility infrastructure projects with RG&E

RG&E meets regularly with representatives of the City's Department of Environmental Services (DES) to share information about upcoming street improvement projects and infrastructure improvement needs. When electric and gas improvement projects are located in a public right-of-way, RG&E submits the proposed construction plans to the City for permit application and approval.

DES staff will continue to work closely with RG&E to facilitate access to city streets as needed to coordinate street and infrastructure repairs, utility maintenance, and pipeline replacement and repair projects in a manner that minimizes disruptions to city residents and businesses. Rochester's Permit Office will facilitate permitting for infrastructure improvements consistent with zoning standards.

### Initiative 2: Continue to work closely with RG&E to communicate potential energy infrastructure and capacity needs

Infrastructure improvements require years of planning and design before construction can begin. Before initiating design, RG&E needs to know the amount of natural gas or electricity that will be needed at a particular site. In a typical development project, a developer will provide a complete set of planning forms to RG&E, including the expected electric and gas loads, and the delivery pressure or service voltage requirements.

RG&E utilizes the developer's information to plan a design that meets demand and system requirements in a cost-effective manner. To plan appropriately for system improvements, RG&E needs information about the project's energy needs well in advance of construction.

As economic development often requires infrastructure improvements, early coordination and communication with RG&E is essential to ensure timely construction of energy infrastructure. In addition, RG&E can be a useful partner in leveraging state and federal grants. Rochester routinely works with RG&E to coordinate projects, particularly in recent years as the City strives to improve capacity and direct grant funding to key economic development sites such as Midtown, Eastman Business Park and the Port Marina.

Municipal economic development, permitting and planning employees may learn of proposed development projects at an early stage. Sharing information about potential new developments with RG&E can help identify any obstacles and facilitate planning for any needed infrastructure extensions or improvements. To ensure that sufficient utility infrastructure and capacity is available to business development projects, City economic development staff will communicate potential infrastructure needs to RG&E as they are identified at a particular site. The City will also collaborate and share information with the Finger Lakes Regional Economic Development Council.

**CASE STUDY** **Eastman Business Park**

Eastman Business Park encloses approximately 2 square miles of property and includes 50 miles of road and railways. Part of the facility is in Rochester, with the remainder in Greece. The facility is occupied by 35 tenant organizations, with 12 main users. Kodak continues to operate the business park but the utilities at the park were recently sold to Recycled Energy Development (RED). The redevelopment of these 1,200 acres as a national center of manufacturing and commerce is a priority project of the Finger Lakes Regional Economic Development Strategy.

This large and diverse industrial park supplies steam, hot water, chilled water, potable water, wastewater treatment and compressed air to tenants. According to the U.S. Energy Information Administration, several different fuels were used to generate 410.4 gigawatt-hours of electricity at Eastman Business Park during the base year of April 2010 through March 2011. There is also a small hydropower generator (not currently operating, but in service as recently as 2010) at the wastewater treatment facility.

## Support the continuation, expansion and creation of district energy and microgrids

Distributed generation, or district energy, generates power for users within a small area, such as a building or campus. A combined heat and power (CHP) facility is a type of district energy that utilizes the heat created during electricity generation for space or water heating, or to drive chillers used for air conditioning. A microgrid is an electricity-generating facility that can be disconnected from the larger electric grid to operate independently, and can be used as a way to improve resiliency when natural disasters or other disruptions disable the regional grid. A microgrid can help preserve vital services by keeping critical buildings functional during such events.

Chiller at the Rundel Memorial Building of the Rochester Public Library

Several district energy systems within Rochester, one of which has been functioning since the late 1800s, contribute to the reliability and resiliency of the city's power supply. These include the Rochester District Heating Cooperative (RDH), Monroe County's Iola Powerhouse, the University of Rochester's cogeneration facility and Recycled Energy Development at Eastman Business Park.

### Initiative 3: Encourage Rochester District Heating Cooperative to develop CHP capability and provide electricity to downtown buildings

As a member and customer of the Rochester District Heating Cooperative (RDH), the City has an opportunity to work more closely with RDH and its members to encourage the development of additional onsite generating capability. Within buildings served by RDH steam, installing micro-turbines in parallel with pressure-reducing valves may be able to generate electricity in a cost-effective manner. Installation of a backpressure generator at the RDH steam plant, which operates year-round, could produce sufficient electricity to operate the plant.

The City will investigate with RDH the potential for electricity generation from steam at those municipal facilities that utilize steam power. Rochester will collaborate with RDH and its members to pursue funding to install generating capacity.

### Initiative 4: Partner with other institutions to maintain, expand and modernize district energy facilities

The City will support RDH if it enters Governor Cuomo's $40 million NY Prize Initiative focused on the establishment of multiple microgrid projects in the state. Given the long history of district energy in downtown Rochester, and the fact that RDH members include municipal, state, federal and private sector entities, an RDH NY Prize application may be very competitive.

Rochester will monitor additional opportunities for district energy and microgrids in cooperation with the NYS Public Service Commission through their Reforming the Energy Vision initiative, RG&E, RED, the University of Rochester and Monroe County. The City will support, through permitting, partnerships and funding applications, the establishment of microgrids for resiliency in case of grid outages.

## CASE STUDY District Energy Facilities in Rochester

RDH provides steam to heat and cool 60 member buildings in downtown Rochester. RDH is a non-profit member-owned cooperative formed in 1985 to purchase and operate a steam distribution system originally established in the late 1800s. City facilities that use RHD steam include Blue Cross Arena and Rundel Library. The system is capable of producing 250,000 pounds per hour of steam at 200 pounds per square inch. The peak winter usage is currently 150,000 pounds per hour; the redundant capacity is intentional to ensure reliability.

University of Rochester co-generation plant

The University of Rochester has had a campus heating facility for many years. In 2012, the facility was upgraded to generate electricity as well as space heat, and it produced 40.8 gigawatt-hours of electricity during the year. The system is fueled by natural gas with fuel oil as a backup, and it has a summer capacity of 24.3 MW.

Monroe County Iola Powerhouse

Monroe County operates the Iola Powerhouse Combined Heat and Power facility at 444 East Henrietta Road. Although the generating capacity is 4.05 MW, the plant usually operates at a base load of 2.5 MW to 3.0 MW. The plant is fueled by natural gas and supplies electricity, steam and domestic hot water to the Monroe Community Hospital and the Monroe County HSS Building at 111 Westfall Road.

Eastman Business Park

The generating plant at Eastman Business Park, owned and operated by Recycled Energy Development (RED), can produce up to 125 MW of electricity, with a 41 MW bi-directional connection to the grid. The current load is 40 MW to 80 MW. Bituminous coal is the main fuel used to generate electricity, with fuel oil as a backup and natural gas co-fired with coal for startup and stabilization. To comply with new federal Maximum Achievable Control Technologies standards for boiler operation that go into effect in January 2017, RED is working with RG&E, the City, and the state to expand natural gas supply to the site so that it can convert the generating plant to natural gas as quickly as possible. The PSC considers the Eastman Business Park to be a "lightly regulated" utility, allowed to provide utility services throughout its campus and to sell a small amount of electricity to the grid.

**DISTRICT ENERGY FACILITIES**

| Facility | Capacity |
|---|---|
| Rochester District Heating Cooperative | 260,000 pounds per hour of high pressure steam |
| Eastman Business Park/Recycled Energy Development (Coal boilers to be replaced by combined-cycle gas turbines) | 125 MW of electricity<br>1.7 million pounds of steam<br>65,000 tons of chilled water per hour |
| University of Rochester | 24.3 MW |
| Monroe County Iola Powerhouse | 4.05 MW |

Figure 14

## Increase the amount of energy generated by renewable sources

Rochester's renewable energy objectives focus on solar energy and the tools at the City's disposal to encourage increased solar energy generation. The City will streamline permitting to facilitate additional renewable energy generation in the community. Rochester also intends to leverage increased demand for solar energy installations to support job training and employment for city residents in clean energy occupations.

Solar panels along the Rochester skyline

### Initiative 5: Adopt the NY-Sun initiative's streamlined solar permitting process

The City of Rochester is in the process of adopting the NY-Sun initiative's streamlined solar PV permitting process. The unified solar permit under the NY-Sun initiative was developed with the goal of reducing the cost of solar PV by streamlining applications for new installations in alignment with NYSERDA's goal of transforming clean energy markets in part by reducing barriers to entry. Rochester participated in an incentive program administered by NYSERDA which provided small grants to municipalities that adopt the new permitting process. Upon completion of the City's adoption of the NY-Sun initiative's unified solar permit, Rochester will conduct outreach and raise awareness of the initiative and encourage solar installations.

**CASE STUDY** **Solarize Madison County**

Solarize Madison in Madison County was the first community solar initiative in the state and the first to utilize the Solarize model program developed by Portland, Oregon. One of the main organizers of the program was a student at Morrisville State College (SUNY Morrisville).

The program issued a Request for Quotation and selected private solar installer partners to publicize the opportunities of solar PV, including open house tours for existing solar installations. The first 15 households that signed up for solar PV installations under the Solarize program received a $2,000 incentive, in addition to existing NYSERDA incentives and state and federal tax credits. The incentive was funded by a bulk purchasing arrangement with the participating installers.

Community outreach programs like Solarize Madison generate enthusiasm for solar PV through grassroots marketing efforts. Many people are not aware of the dramatic decline in the cost of solar panels and consider Central New York too cloudy for solar PV; a Solarize program will help demonstrate that solar generation of electricity is a viable option in Rochester. According to Solarize New York, most communities around the country that have implemented its model report tripling the number of installed solar systems in their communities.

Madison County is predominantly rural and implementation of the Solarize program presented communication challenges. Nonetheless, Madison County's map of "Solar Ambassadors" shows 184.2 kW of solar PV installed in 29 locations during 2012, although Solarize Madison only subsidized 15 installations.

**CASE STUDY** **Brownfields/Brightfields**

Properties that have been contaminated by industrial uses or landfills can become sites for ground-mounted solar arrays, turning a liability into an asset. Solar installations designed to avoid penetrating the ground are used to preserve landfill caps.

Example: A 3 Mw solar array in Scituate, Massachusetts, installed on a 12-acre former landfill, began producing power in late 2013. The panels are ground mounted using a non-penetrating structure. Scituate leases the site to a developer for $1 per year and the town saves $225,000 annually on energy costs by purchasing the solar-produced electricity at an advantageous price. It took three years from the date of approval by the town until the solar array went online. The power produced by the project is used by municipal buildings.

Solar installations at City of Rochester facilities can generate

**59kW**

### Initiative 6: Partner with other organizations to implement a Solarize Rochester program

Rochester will support initiatives led by community organizations to implement a Solarize Rochester program, following the Solarize Portland or Solarize Madison County (New York) models. These programs reduce costs through bulk purchasing and pass the savings along as an incentive. Community groups band together to buy solar panels in bulk. Some programs include small subsidies for the equipment or offer incentives for the first to join the program. Solarize programs are most successful when they are implemented as joint efforts of municipalities and community organizations. The publicity associated with these programs typically stimulates installations in addition to those that are subsidized.

City staff will provide information through its website and contacts with neighborhood organizations, offer meeting space and help to coordinate with potential funding sources and RG&E.

### Initiative 7: Install cost-effective renewable capacity at City-operated facilities

Rochester's renewable energy objectives for City facilities focus on solar and hydroelectric energy sources. The cost of solar photovoltaic (PV) installations has fallen dramatically in recent years. Rochester has opportunities to install solar at a former landfill site and will explore the potential to add rooftop capacity on City buildings.

Rochester has 59 kW of solar capacity at its municipal facilities. The City is looking to significantly increase that capacity with the installation of a solar pilot project on a 10-acre site at the former Emerson Street landfill. This project will be installed and owned by the developer through the NY-Sun initiative and financed through a power purchase agreement. Rochester will utilize the energy generated through remote net metering. The installation of a solar array at this location will help transform a brownfield into an environmental and energy asset for the City of Rochester.

**Solar Array at Emerson Street Landfill: Next Steps**

- Complete regulatory closure of the northern 10 acres of the former landfill
- Identify City facilities to remote net-meter the electricity generated by the solar array. Under present regulations and assuming that the City will remain the owner of the landfill, qualified off-takers are limited to the City's RG&E electric accounts that pay the Systems Benefits Charge and Renewable Portfolio Standard assessments
- Select solar site developer through Request for Qualifications process
- Execute power purchase agreement with selected solar facility developer.

# Energy Distribution & Supply

Frederick Douglass–Susan B. Anthony Memorial Bridge

The City will also evaluate solar capacity at additional municipal facilities. Because of economies of scale, the most practical buildings for solar PV installations tend to have large rooftop areas containing minimal obstructions. City-owned buildings that may have potential for large-scale solar PV installations include the Blue Cross Arena, Central Vehicle Maintenance Facility, Rundel Library and the Public Safety building.

Although the cost of solar PV installations has decreased, the City may still find it more feasible to partner with a third party rather than purchasing the technology through its capital budget. In each case, the City will need to confirm that the roof structure is strong enough to support solar panels, has enough remaining life or warranty remaining, is large enough to be of interest to a private investor, has the appropriate electrical system configuration and is not in the shadow of other buildings or trees. A minimum of 10,000 square feet of available space is generally required along with a roof with at least 10 years to 15 years of expected life remaining.

## Implementation Matrix

| Responsible party | Key partners | Source of funding | Time frame | Next steps |
|---|---|---|---|---|
| **Coordinate with RG&E to facilitate maintenance and improvement of natural gas and electricity infrastructure** | | | | |
| **Initiative 1: Coordinate planning and scheduling of City road construction and utility infrastructure projects with RG&E** | | | | |
| Department of Environmental Services | RG&E | City Budget for staffing | Ongoing | Continue regular meetings and communication with RG&E |
| **Initiative 2: Continue to work closely with RG&E to communicate potential energy infrastructure and capacity needs** | | | | |
| Department of Neighborhood & Business Development | RG&E; state agencies; Regional Economic Development Council | City Budget for staffing | Ongoing | Continue regular meetings and communication with RG&E |
| **Support the continuation, expansion and creation of district energy and microgrids** | | | | |
| **Initiative 3: Encourage Rochester District Heating Cooperative to develop CHP capability and provide electricity to downtown buildings** | | | | |
| Energy & Sustainability Manager; DES | Rochester Heating District Cooperative; PSC | City Staff Budget; Grants | Medium-Term | Continued participation with GRCC activates |
| **Initiative 4: Partner with other institutions to maintain, expand and modernize district energy facilities** | | | | |
| Energy & Sustainability Manager | RED, University of Rochester; Monroe County; RDHC | City Staff Budget | Short-Term | Explore potential for coalition of district energy providers |
| **Increase the amount of energy generated by renewable sources** | | | | |
| **Initiative 5: Complete the adoption of NY-Sun Initiative for streamlined permitting process for solar installations** | | | | |
| Energy & Sustainability Manager; Bureau of Planning and Zoning | Solar installers; Residents | NYSERDA Solar Initiative grant | Short-Term | Implement streamlined permitting |
| **Initiative 6: Partner with other organizations to implement programs to implement a Solarize program** | | | | |
| Energy & Sustainability Manager | Community organizations; Neighborhood associations | NYSERDA, state incentives for PV | Medium-Term | Learn more about Solarize programs, discuss with local groups that have aligned interests |
| **Initiative 7: Install cost-effective renewable capacity at City-operated facilities** | | | | |
| Energy & Sustainability Manager; Bureau of Architecture & Engineering | Facility managers | Power purchase agreement; ESCOs; NYSERDA; grants | Short term (Emerson site); Medium term (other | Identify user(s) for solar-generated electricity from Emerson Landfill site and explore financing options |

**Time frame:** Short-Term = less than five years, Medium-Term = five to 10 years, Long-Term = more than 10 years

## Implementation

Rochester aims to reduce energy usage and greenhouse gas emissions from municipal operations 20 percent by 2020. Its target for citywide initiatives is a 20 percent reduction by 2030. The initiatives in each Action Area of the Rochester Energy Plan will help the City achieve these goals (**Figures 15 and 16**).

This plan identifies the role that Rochester will take to coordinate energy policies and programs of municipal, utility and other governmental entities. Because buildings consume 75 percent of the energy used in Rochester, the plan identifies actions to reduce energy usage in municipal buildings and buildings citywide. To reduce greenhouse gas emissions, the plan recommends initiatives to reduce the use of petroleum fuels in the transportation sector. To improve energy distribution and supply infrastructure, the Rochester Energy Plan initiatives aim to ensure an energy supply that is safe, clean and reliable.

Downtown Rochester

Moving forward, the City will supplement staffing in its Office of Energy and Sustainability, secure funding for recommended initiatives and monitor progress toward achieving its energy and greenhouse gas reduction goals.

The City Energy and Sustainability Manager, a position with Rochester's DES, will continue to coordinate energy planning and policy. The City will add staff within the Office of Energy and Sustainability to support these efforts. In addition to energy monitoring and coordination among City departments, the Office of Energy and Sustainability will develop and maintain partnerships with organizations and institutions throughout the community to support initiatives aimed at reducing energy use in buildings and vehicles citywide.

Rochester will leverage resources from a variety of sources to implement the initiatives in the Rochester Energy Plan. The City will utilize existing procurement and capital planning processes to implement many of the initiatives. In situations where there are upfront capital costs, the City will seek a combination of state and federal funding, innovative financing strategies, and partnerships with other organizations.

To finance capital improvements for energy efficiency in buildings and the expansion of renewable generation at municipal facilities, Rochester will evaluate financing mechanisms such as NYPA financing and energy savings performance contracts from private ESCOs that use savings from reduced energy expenses to finance the upfront costs. The City will also pursue incentives from NYSERDA, RG&E and others to help reduce costs for specific energy efficiency measures such as lighting fixtures, HVAC and motors, renewable energy systems such as solar panels, and vehicle replacements such as alternative fuel vehicles.

The City will continue to support collaborations with other governments, businesses and private institutions to help improve the competitiveness of grant applications. This includes continuing to partner with the University of Rochester, the Rochester District Heating Cooperative, business leaders, and RG&E to support and expand district energy and microgrid infrastructure. City staff will continue to support grant applications led by community organizations that would increase energy efficiency and renewable energy generation citywide.

The Energy and Sustainability Manager and other staff in the City's Office of Energy and Sustainability will track progress toward implementing the initiatives in the Rochester Energy Plan. Over the next five years, the Sustainability Manager will coordinate annual reviews of the progress toward implementing the initiatives and report the impact of these initiatives on energy use and greenhouse gas emissions.

## Summary of Cross-Cutting Themes

### Municipal: leading by example

Leading by example, Rochester will implement energy-efficiency measures in its buildings and vehicle fleets, and install cost-effective renewable energy generation capacity at City facilities. Key projects include a solar installation at the former Emerson Street landfill, energy efficiency improvements at municipal buildings, reducing fuel usage by municipal vehicles and integrating alternative fuel vehicles into the municipal fleet.

### Projected Reductions in Municipal Energy Consumption by Action Area

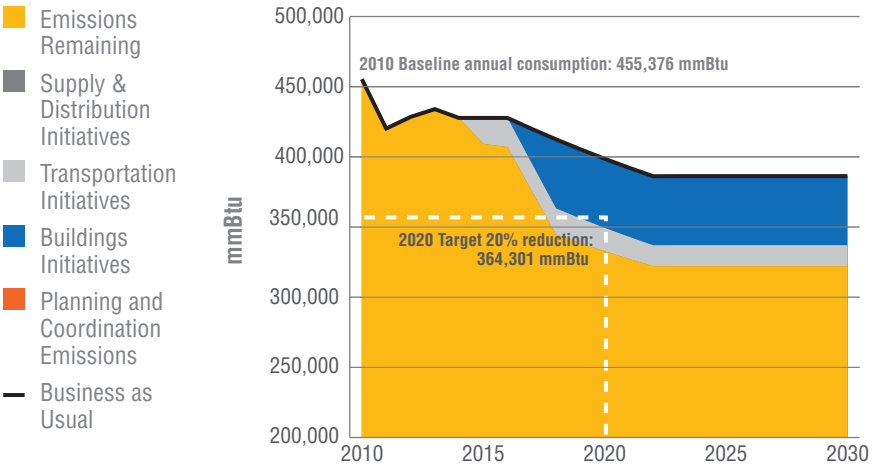



Figure 15

### Projected Community Reductions in Energy Consumption by Action Area

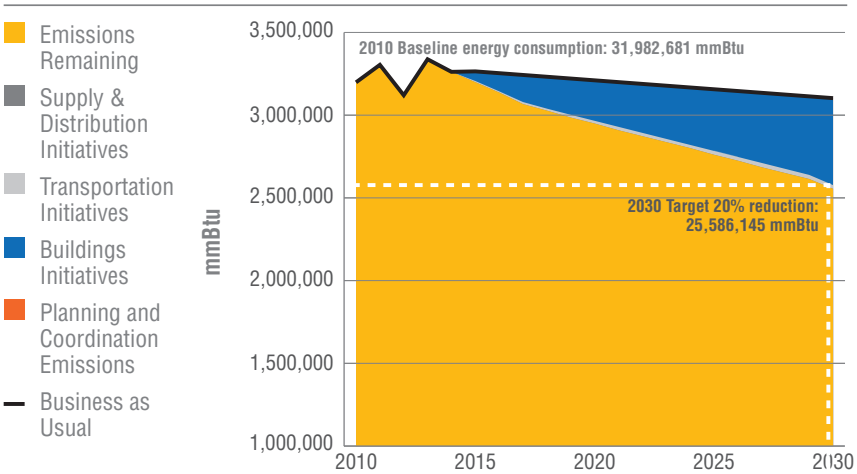



Figure 16

### Economic development: creating jobs and attracting businesses

Improving the energy efficiency of buildings citywide will reduce buildings energy costs and help retain these businesses in Rochester. Expanding district energy at key institutions, such as the University of Rochester and Eastman Business Park, supports resiliency and reduces energy costs for these entities, which are significant economic drivers. Improved infrastructure for bicycles, pedestrians and transit will help residents access jobs in the city and improve the quality of life in neighborhoods.

### Infrastructure: preparing our cities for the future

Rochester will work with RG&E to facilitate repairs and improvement to infrastructure within City rights-of-way and to support expansion and improvement projects that benefit city residents, businesses and institutions. Rochester will continue to investigate the feasibility of installing additional renewable capacity at municipal facilities and pursue installations that are cost effective. Rochester will support the University of Rochester, RDH and other businesses and institutions to expand district energy and create microgrids to increase resiliency.

### Climate action: reducing the city's carbon footprint

Many of the initiatives in this plan will help Rochester reduce its greenhouse gas emissions. These include lowering energy consumption from buildings and vehicles, increasing the amount of electricity generated from renewable sources, and working with RG&E to facilitate the replacement of older natural gas pipelines within municipal rights-of-way.

# Conclusion

## Next Steps

Energy planning does not end with the release of the Five Cities Energy Plans; it is just the beginning. To ensure these plans move forward into implementation, and energy management and planning processes continue, the plans specify who is responsible for implementing each initiative, who the key partners are and what the next steps are to move the initiative forward.

The cities plan to bring Energy Managers onboard to help oversee the implementation of the plans as a whole and manage continued stakeholder engagement to enhance their impact. The Energy Managers will be responsible for tracking and reporting on progress annually and for updating the plans on a regular basis. Some of the cities will embark on the process to formally adopt their respective plans, while others will begin implementation of the initiatives right away. Either way, the cities are committed to making progress on implementing the plans.

## State Support

Unique to this effort, each city, with the guidance from the state and their consultants, had the opportunity to develop these plans in a collaborative effort with the other cities. The state, through NYPA, will continue to bring the cities together to support their collective implementation efforts, so that these cities can continue to learn from each other. Additionally, the state will provide technical and financial assistance to enhance their implementation efforts. Specifically, NYPA will continue to support the municipalities' efforts to improve their own energy performance—including through upgrades to municipal buildings—and their citywide energy priorities. NYSERDA will bring technical and other programmatic assistance to the cities to help them catalyze private investment in clean energy and to develop self-sustaining clean energy financing plans. Other state agencies will also continue to provide relevant assistance to further support implementation and future planning efforts.

## Keys to Success

Achieving the cities' clean energy goals will be dependent on a number of variables. Primarily, the continued commitment of the cities and their stakeholders is necessary to ensure implementation of the plans moves forward to create momentum around energy action and provide proven results on the benefits of energy performance improvements. To ensure this momentum continues, and grows, the principles demonstrated in the plans must be integrated into existing city processes—i.e., procurement, budgeting, facility management, building codes, zoning—to cost-effectively make energy efficiency and clean energy deployment a part of business as usual. Equally important is engagement with third-party partners, including large institutions, businesses, and investors, to leverage market-based advancements in the local clean energy sector. This combination of sustained municipal action and the activation of local clean energy markets found in these plans could be a model for significant and sustainable reductions in energy consumption for communities across the state, if not the country.

With the Five Cities Energy Plans, Albany, Buffalo, Rochester, Syracuse and Yonkers are following in the footsteps of early city planners, showing energy leadership and pursing innovative strategies to prepare for future needs. Through the plans, the cities share their visions for their cities' future; a future with cleaner air, lower energy costs, more resilient infrastructure and a thriving clean energy economy. They also provide the roadmap to begin to make these visions into realities with action-oriented initiatives, bringing these cities, their regions and the state closer to achieving their clean energy goals.

# State Assistance and Educational Support

| | |
|---|---|
| **NY Power Authority** | • Ombudsman: support cities and liaise between state and city-level efforts<br>• City Energy Managers: support cities in the implementation of the plans and report on progress<br>• NY Energy Manager: collect, analyze and report energy performance<br>• Municipal energy efficiency and clean energy*<br>• Support solar installations on school buildings through K-Solar program |
| **New York State Energy and Research Development Authority** | • Street lighting<br>• Electric vehicles*<br>• Benchmarking<br>• Available financing opportunities (e.g., PACE, Green Bank)<br>• Clean distributed generation (e.g., renewables, cogeneration, microgrids)*<br>• New construction, commercial, industrial and multi-family buildings energy-conservation measures* |
| **New York State Public Service Commission** | • Communications on Reforming the Energy Vision (REV) initiative |
| **New York State Department of Environmental Conservation** | • Climate Smart Communities program: guidance and case studies on municipal energy procurement, renewable energy deployment, energy efficiency, reducing transportation energy use and low-energy policies<br>• Direct municipal support through CSC coordinators |
| **New York State Department of State** | • Modifications to building and energy codes, including those to support the development of solar energy generation at the building and/or community scale<br>• Zoning, land use and watershed planning, smart growth and transit-oriented development<br>• In-person and online training for municipal staff<br>• Shared and consolidated municipal services |
| **New York State Department of Transportation** | • Transportation Demand Management programs<br>• Complete streets and smart growth efforts<br>• Alternative transportation research and development (with NYSERDA)*<br>• Bicycle and pedestrian transportation projects (through Transportation Alternatives Program - TAP)*<br>• Integration of advanced vehicle technologies in the commercial truck and bus sectors (with NYSERDA)* |
| **Empire State Development** | • Facilitation of partnerships with local businesses and other stakeholders |

* Financial support also provided

# Acknowledgements

## Albany

**Stakeholders** Affordable Housing Partnership • Albany Airport Authority • Albany County Executive's Office • Albany Housing Authority • Albany Law School • Albany Medical Center • Capital District Clean Communities Coalition (Clean Cities) • Capital District Community Loan Fund • Capital District Regional Planning Commission • Capital District Transportation Authority • Capital District Transportation Committee • Capital Region Building Owners and Managers Association • Center for Economic Growth • City School District of Albany • College of Saint Rose • Dormitory Authority of the State of New York • EDGE Regional Outreach • Golub Corporation • National Grid • NY League of Conservation Voters • NYS Department of Environmental Conservation • NYS Smart Grid Consortium • One Hundred Black Men of the Capital District • One Hundred Black Men of the Albany, New York Capital Region • Port of Albany • Sage College of Albany • University at Albany • University at Albany—College of Nanoscale Science & Engineering **City Departments** Albany Fire Department • Albany Housing Authority • Albany Parking Authority • Albany Police Department • Albany Water Department • Budget Office • Department of Development and Planning • Department of General Services • Office of Audit and Control • Port of Albany **Main and Subcontractors** Vanasse Hangen Brustlin, Inc. (VHB) • DNV GL • Novus Engineering, P.C. • JK Muir, LLC • Watts Architecture & Engineering **Mayor** Special thanks to the Mayor's Office and Mayor Kathy Sheehan **Other** Special thanks to our city representative for her consistent dedication throughout the process: Kate Lawrence • Special thanks to Mary Millus of the City of Albany for photo recommendations and other logistical assistance • Leif Engstrom, City of Albany for providing data essential to the process • Kim Lynch and Mike D'Atillo of the College of St. Rose for logistical coordination for the city's stakeholder meetings

## Buffalo

**Stakeholders** Buffalo Complete Streets Coalition • Buffalo Development Corporation • Buffalo Municipal Housing Authority • Buffalo Niagara Manufacturing Alliance • Buffalo Niagara Medical Campus • Buffalo Niagara Partnership • Buffalo Public Schools • Buffalo Sewer Authority • Buffalo Urban Development Corporation • CertainTeed • Erie Cancal Harbor Development Corporation • Empire State Development • Erie Community College • Erie County Department Environment & Planning • Erie County Industrial Development Agency • Greater Buffalo Niagara Regional Transportation Council • Kaleida • National Fuel • National Grid • Niagara Frontier Transportation Authority • Niagara International Transportation Technology Coalition • NYS Department of Transportation • One Region Forward • People United for Sustainable Housing • Regional Economic Development Council • ROSWELL • Sonwil • TM Montante • Uniland • University at Buffalo • Urban Design Project • WNY Environmental Alliance **City Departments** Buffalo Fire Department • Buffalo Police Department • Buffalo Urban Renewal Agency • Buffalo Water Authority • Department Public Works • Management Information Systems • Office Strategic Planning • Telecommunications, Utilities & Franchises **Main and Subcontractors** Wendel • Larsen Engineeres • CORE Environmental • Blue Springs Energy • Fisher Associates **Mayor** Special thanks to the Mayor's Office and Mayor Byron W. Brown **Other** Special thanks to our city representatives for all of their consistent dedication throughout the process: Julie Barrett-O'Neill • Brendan Mehaffy • Jason Shell • Steve Stepniak • Special thanks to the Buffalo & Erie County Historical Society for hosting the Buffalo stakeholder meeting

## Rochester

**Stakeholders** Center for Environmental Information • Constellation NewEnergy • Friends of the Garden Aerial • Genesee Transportation Council • Genesee Finger Lakes Regional Planning Council • Greater Rochester Enterprise • Recycled Energy Development—RED Rochester • Rochester Business Alliance • Rochester City School District • Rochester District Heating Cooperative • Rochester Gas & Electric • Rochester Genesee Regional Transportation Authority • Rochester Institute of Technology Institute for Sustainability • University of Rochester **City Departments** Department of Environmental Services, Bureau of Architecture & Engineering • Department of Environmental Services, Bureau of Operations & Parks • Department of Environmental Services, Division of Sustainability • Department of Environmental Services, Office of the Commissioner • Department of Neighborhood & Business Deveiopment, Bureau of Planning & Zoning • Department of Neighborhood & Business Development, Bureau of Inspection & Compliance **Main and Subcontractors** LaBella Associates, D.P.C. • Taitem Engineering, P.C • Clean Fuels Consulting • HR&A Advisors • Larsen Engineers • Haven Rendering **Mayor** Special thanks to the Mayor's Office and Mayor Lovely A. Warren **Other** Special thanks to our city representative for her consistent dedication throughout the process: Anne Spaulding

# Syracuse

**Stakeholders** Building Owners and Management Association—CNY • Central New York Regional Planning & Development Board • Centro/CNY Regional Transportation Authority • CNNY Building Trades Council • Energy Automation, Inc. • National Grid • Onondaga County Environmental Office • Onondaga County Facilities Management • SUNY College of Environmental Science & Forestry • Syracuse Center of Excellence in Environmental & Energy Systems • Syracuse Metropolitan Transportation Council • Syracuse University **City Departments** Syracuse—Onondaga County Planning Agency • Syracuse—Onondaga County Planning Agency, Division of City Planning • Syracuse—Onondaga County Planning Agency, Division of City Zoning • Department of Neighborhood and Business Development • Department of Public Works • Department of Public Works, Division of Building Services, Skilled Trades • Engineering Department • Law Department • Office of Fleet Operations • Budget Office • Water Department **Main and Subcontractors** LaBella Associates, D.P.C. • Taitem Engineering, P.C • Clean Fuels Consulting • HR&A Advisors • Larsen Engineers • Haven Rendering **Mayor** Special thanks to the Mayor's Office and Mayor Stephanie A. Miner **Other** Special thanks to our city representative for her consistent dedication throughout the process: Rebecca Klossner

# Yonkers

**Stakeholders** Con Edison • Downtown BID • Federated Conservationists of Westchester County • Grassroots Environmental Education • Green Guru Network • Greyston Foundation • Groundwork Hudson Valley • Mclean Avenue Merchants Association • MetroPool • Mid Hudson Regional Development Council • Metro-North Railroad • New York League of Conservation Voters • New York Metropolitan Transportation Council • Pace University Land Use Law Center • Sarah Lawrence College Center for the Urban River at Beczak • South Broadway BID • Sustainable CUNY • Sustainable Westchester • Westchester Community Foundation • Yonkers Chamber of Commerce • Yonkers Committee for Smart Development • Yonkers Green City Advisory Committee **City Departments** Yonkers Department of Planning and Development • Yonkers Assessment • Yonkers Department Bureau of Purchasing • Yonkers City Engineer • Yonkers Department of Housing and Buildings • Yonkers Department of Information Technology • Yonkers Department of Parks and Recreation • Yonkers Department of Public Works • Yonkers Fire Department • Yonkers Human Resources • Yonkers Office of General Services • Yonkers Police Department Traffic Engineering • Yonkers Water Bureau • Yonkers Public Schools **Main and Subcontractors** Arup • Setty & Associates, Ltd. • Ellana Inc. **Mayor** Special thanks to the Mayor's Office and Mayor Mike Spano **Other** Special thanks to our city representative for his consistent dedication throughout the process: Brad Tito

# Special Thanks

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# Glossary

***City:*** the municipality, including executive levels, agencies, staff and property (i.e. municipal government).

***city:*** geographical boundary of the municipality (i.e. community or citywide).

***Cogeneration:*** Distributed cogeneration or combined heat and power (CHP) use heat engines to simultaneously generate electricity and useful heat. Steam turbines, natural gas-fired fuel cells, microturbines or reciprocating engines turn generators and the hot exhaust is used for space or water heating or for cooling such as air-conditioning.

***Combined heat and power (CHP):*** See cogeneration.

***Complete streets:*** Complete streets are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities. Complete Streets allow buses to run on time, make it easy to cross the street, walk to shops and bicycle to work.

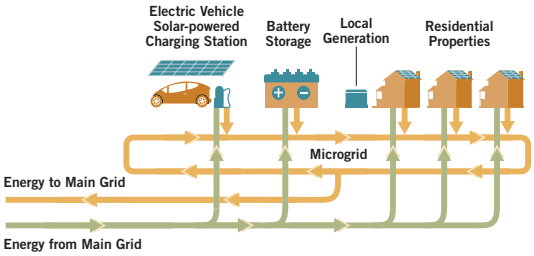
***District energy:*** District energy systems produce steam, hot water or chilled water at a central plant, which is then piped underground to individual buildings for space heating, domestic hot water heating and air conditioning.

***Distributed generation:*** Electricity generated from many small energy sources that provide an alternative to or enhancement of the traditional electric power system.

***Geothermal:*** Geothermal energy is thermal energy generated and stored in the Earth. Geothermal has historically been limited to areas near tectonic plate boundaries. Recent technological advances have however expanded the range and size of viable resources, especially for applications such as home heating.

***Initiatives:*** Policy changes, establishment of offices, hiring of staff, development of new programs, release of campaigns and other actions that support attainment of objectives.

***Microgrid:*** A microgrid is a localized grouping of electricity generation, energy storage and loads that normally operates connected to a traditional centralized power grid. The microgrid can be disconnected from the centralized grid and function autonomously.




***Objectives:*** something that specific efforts/ actions are intended to accomplish (e.g., improve energy efficiency of buildings).

***Plug-in hybrid:*** A plug-in hybrid vehicle is a vehicle which utilizes rechargeable batteries or another energy storage device that can be restored to full charge by connecting a plug to an external electric power source.

***Renewable energy:*** Energy generated from natural resources—such as sunlight, wind, rain, tides and geothermal heat—which are renewable (naturally replenished), ranging from solar power, wind power, hydroelectricity/micro hydro, biomass and biofuels for transportation.

***Stakeholders:*** Non-City individuals who have interest in the plan's success and outcomes, including experts, academic, institutions or other entities representing interests of the cities.

***Waste-to-energy:*** Municipal solid waste and natural waste, such as sewage sludge, food waste and animal manure will decompose and discharge methane-containing gas that can be collected and used as fuel in gas turbines or micro turbines to produce electricity as a distributed energy source.

# Acronyms

**ASHRAE:** Formerly the American Society of Heating, Refrigerating and Air Conditioning Engineers, ASHRAE is a building technology society that focuses on building systems, energy efficiency, indoor air quality, refrigeration and sustainability.

**BMS:** A Building Management System controls and monitors a building's mechanical and electrical equipment to manage energy demand.

**BPI:** The Building Performance Institute is a national standards development and credentialing organization for residential energy efficiency retrofit work.

**CHP:** Combined Heat and Power, also referred to as cogeneration systems, produce electricity and heat. CHP systems capture waste-heat from electricity generation to provide heating or hot water, making each unit of fuel more efficient.

**CNG:** Compressed natural gas is an alternative fuel to gasoline. CNG emits less greenhouse gas emissions than gasoline, diesel and propane/LPG.

**$CO_2$:** Carbon dioxide is a naturally occurring chemical compound and the primary greenhouse gas emitted through human activities.

**$CO_2e$:** Carbon-dioxide equivalent is the term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, $CO_2e$ signifies the amount of carbon-dioxide which would have the equivalent global warming impact.

**ECM:** Energy Conservation Measures are projects or technologies that reduce energy consumption in a building.

**ESA/MESA:** An Energy Services Agreement allows building owners to pay for energy efficiency projects through savings so that there is no upfront cost to the owner. Managed Energy Service Agreements (MESA) offer the same service and is managed by a third party.

**ESCO:** An Energy Service Company is a commercial or non-profit business providing a broad range of energy solutions including designs and implementation of energy savings projects, retrofitting, energy conservation, and power generation and energy supply.

**ESD:** Empire State Development Corporation

**ESPC:** Energy Savings Performance Contracts are agreements between a governmental office/facility and an ESCO under which the ESCO designs, implements and maintains energy efficiency projects and guarantees a certain level of energy savings. In exchange, the governmental office/facility promises to pay the ESCO a share of the savings resulting from the project. They are also sometimes referred to as EPC, or Energy Performance Contract.

**EUI:** Energy Use Intensity is defined as energy consumption per square foot per year for any given property.

**EV/HEV/PEV:** Electric vehicles rely on an electric motor rather than combustion fuel for propulsion. Types of EV include hybrid electric vehicles (HEV) and plug-in electric vehicles (PEV).

**E-85:** 85 percent ethanol and 15 percent gasoline. Fuel for "flex-fuel" vehicles that can use either gasoline or E-85.

**GHG:** A greenhouse gas is any gas in the atmosphere which absorbs heat and thereby keeps the planet's atmosphere warmer than it otherwise would be. Greenhouse gases include $CO_2$.

**HVAC:** Heating, ventilation and air conditioning systems control indoor air quality and temperature.

**kW/MW:** Kilowatt and megawatt are units of electric power. A kilowatt is equivalent to 1,000 watts, and a megawatt is equivalent to 1,000 kilowatts.

**KWh/MWh:** Kilowatt-hour (KWh) is an energy unit equivalent to one kilowatt of power expended for one hour. Megawatt-hour (MWh) is equal to 1,000 KWh.

**LED:** Light-emitting diodes consume less energy, have a longer lifetime and are smaller than incandescent bulbs. They often replace streetlights as an energy-efficiency alternative.

*(continued)*

# Acronyms

**LEED:** Leadership in Energy and Environmental Design is a designation given to buildings and communities that have satisfied the U.S. Green Building Council's ratings on design, construction and maintanance of green buildings.

**LPG:** Liquefied petroleum gas, also known as propane, is an alternative fuel that emits less carbon dioxide than gasoline.

**mmBtu:** One million British thermal units is an energy unit. One Btu is the amount of energy required to cool one pound of water by one degree Fahrenheit.

**MT $CO_2e$:** Million tons of carbon dioxide equivalent is a common metric to measure the amount of $CO_2$ in the atmosphere.

**NYPA:** New York Power Authority

**NYS DEC:** New York State Department of Environmental Conservation

**NYS DOS:** New York State Department of State

**NYS DOT:** New York State Department of Transportation

**NYS DPS:** New York State Department of Public Service/Public Service Commission

**NYSERDA:** New York State Energy Research and Development Authority

**PPA:** A power purchase agreement is a financial arrangement in which a third-party renewable energy developer installs, owns, operates, and maintains the system on municipally owned property.

**PV:** Photovoltaics are solar cells that convert sunlight into electricity.

**REV:** Reforming the Energy Vision Initiative promotes more efficient use of energy, deeper penetration of renewable energy resources such as wind and solar, and wider deployment of distributed energy resources.

**RFQ/RFP:** A request for qualifications is a document that is distributed to gather information from prospective vendors. A request for proposal follows an RFQ and is a solicitation for potential suppliers or businesses to submit proposals.

**TDM:** Transportation demand management is the application of strategies and policies to reduce travel demand, specifically for single-occupancy vehicles, at times of peak demand in specific congested areas.

**TOD:** Transit oriented development is a mixed-use residential and commercial area designed to maximize access to public transport

**TSM:** Transportation system management is a set of strategies used to reduce greenhouse gas emissions by reducing congestion through improved transportation system efficiency.

**USGBC:** The U.S. Green Building Council certifies buildings and communities according to LEED standards and provides opportunities to obtain LEED AP credentials.

**VMT:** Vehicle Miles Traveled is a measurement of miles traveled by vehicles in a specified region for a specified time period.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