

BuildSmartNY

Five Cities Energy Plans

Albany ■ Buffalo ■ Rochester ■ Syracuse ■ Yonkers



**NY Power
Authority**

Issued January 2015

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Cover Photos clockwise from top left: Buffalo City Hall; Clinton Square, Syracuse; Yonkers City Hall; Rochester skyline; Albany skyline

Letter from Gil Quiniones



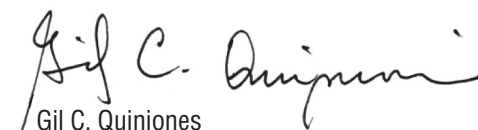
The New York Power Authority is pleased to support the Five Cities Energy Plans initiative. When viewed collectively, it represents a wide-ranging effort to rethink how municipalities can reduce their energy use in a systematic, cost-effective fashion. Guided by Gov. Andrew M. Cuomo's landmark BuildSmart 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.



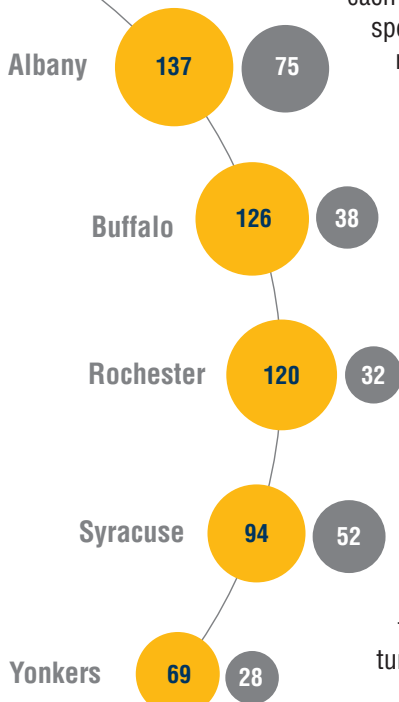
Gil C. Quiniones
President and Chief Executive Officer
New York Power Authority



Introduction

Energy Consumption per Capita (mmBtu)

- Building Related
- Transportation Related



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 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

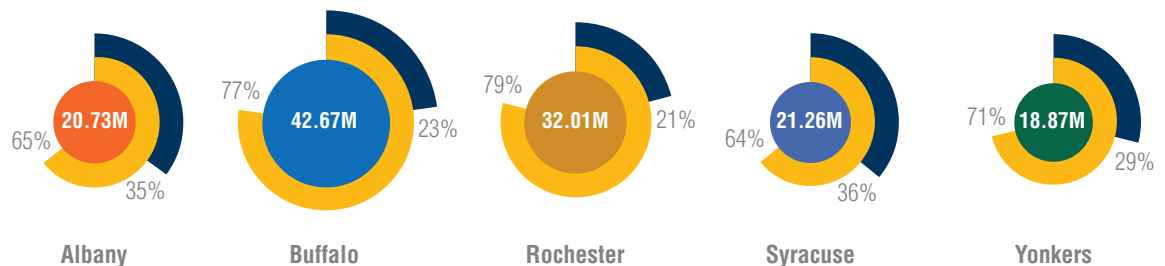
BuildSmartNY

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 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.

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.

Overall Energy Consumption (mmBtu)

- Transportation
- Buildings



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

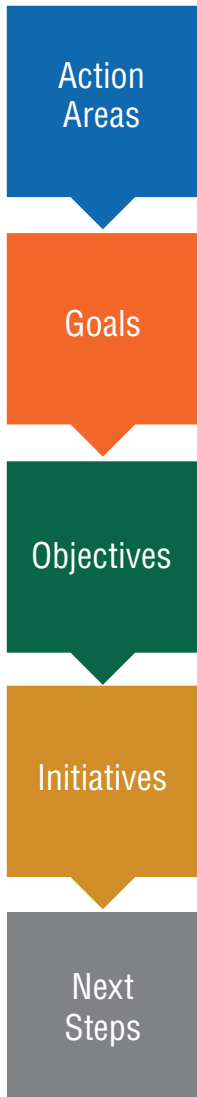
and economic development, reduce the cities' energy consumption and related expenses, contribute to a cleaner environment, and enhance quality of life within the cities. Building on each city's sustainability and economic development successes of the past decade, the plans will also guide municipal energy management as these cities seek to lead by example in reducing energy use.



**NY Power
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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 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 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.

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.

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

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 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.



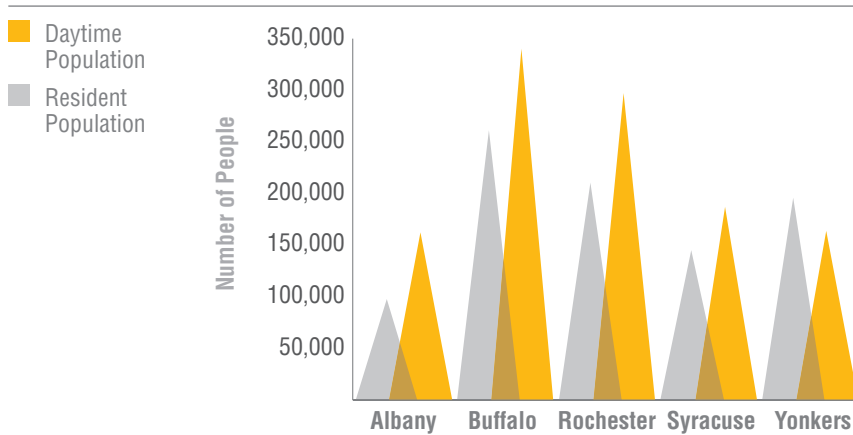
Climate action: reducing the city's carbon footprint

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.

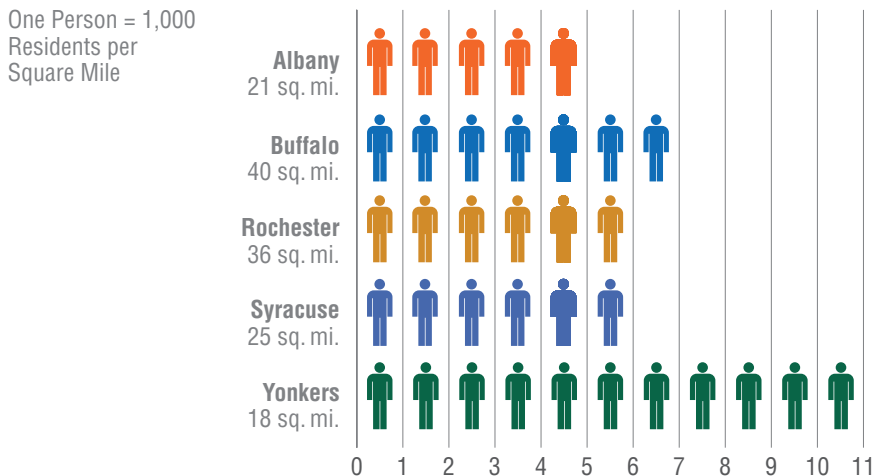
The Five Cities

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,

Population

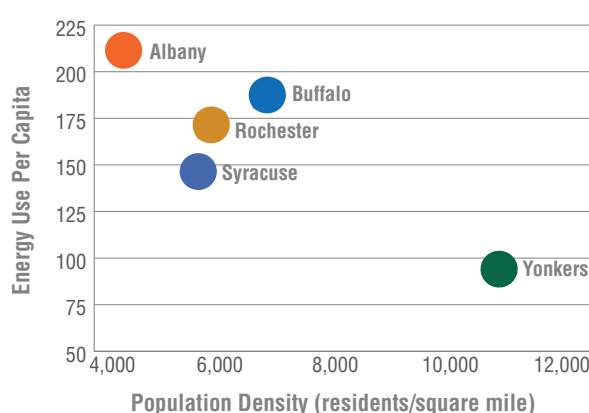


Density of City Residents



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.



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.

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

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.

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.

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.



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



ALBANY



Letter From Mayor Kathy Sheehan



Dear Albany residents, employees, businesses and stakeholders,

Since the early 1600s, Albany has served as an important gateway in the Northeast for transportation, goods and services. As we move into the 21st century, Albany is committed to maintaining this central position, with the understanding that it needs to follow a more sustainable path, and this includes how it consumes and generates energy. I am pleased to say that the Albany Energy Plan establishes that path forward. The plan will serve as an important tool for municipal operations and services as well as the greater Albany community as it continues to rebound from the recent recession. The strategies

identified in the plan will help manage municipal costs, reduce our carbon footprint, modernize our infrastructure to increase our resiliency, provide cleaner transportation options, create a more livable community and continue to promote Albany as a leader in sustainable economic development.

This year-long planning effort allowed the City to take part in a unique opportunity that combined the ideas and dedication of dozens of municipal, regional and statewide stakeholders. With support from the New York Power Authority, Albany collaborated with four other cities—Buffalo, Rochester, Syracuse and Yonkers—to develop the first Energy Plan for our City. While the goals and initiatives of this plan are tailored to the City's needs, we were able to leverage ideas and best practices from the other four cities to create a robust, implementable plan that will guide our energy policy and program decisions for years to come. As a result of this planning effort, we developed and enhanced lasting relationships with stakeholders across the City, region and state that will help us realize our goals.

As with any effective planning effort, an important step in creating the Energy Plan was to review and cull the relevant components of our previous and existing plans. Albany 2030, the Bicycle Master Plan, the Electric Vehicle Feasibility Study and other plans were consulted for pertinent elements that would support the development of the Energy Plan. I am pleased to see that our efforts have aligned so strongly and am confident that this plan outlines a realistic framework for the City to manage municipal energy use and costs, support community scale efforts to improve energy efficiency, reduce greenhouse gas emissions, and transform our infrastructure to be smarter, cleaner and more resilient.

I want to thank everyone who participated in this collaborative planning effort and also extend my gratitude to our residents and stakeholders who are helping Albany be a more sustainable place to live, work, play and do business. We look forward to implementing the important initiatives in this Energy Plan.

Warm Regards,

A handwritten signature in black ink, appearing to read 'Kathy Sheehan', written over a light blue horizontal line.

Mayor Kathy Sheehan
Mayor of Albany, New York



Top left, Broadway, downtown Albany;
Top right, The University at Albany; Middle, New York State Capitol; Bottom, NY Exteriors, landmark locations for Five Cities Energy Plan

City of Albany Energy Plan



Empire State Plaza

As the capital of New York and Albany County seat, a key hub of commerce and transportation in the Northeast, and home to numerous state agencies, Albany seeks to demonstrate leadership in transitioning New York to a clean and sustainable economy. Equally important,

the City has an opportunity to better serve the community by improving the efficiency of its own operations and also by providing clean, reliable, and affordable energy to the residential, commercial, industrial, and public sectors.

The City took a critical first step in demonstrating this leadership by ensuring that sustainability principles were incorporated into Albany 2030, the first comprehensive plan in its 400-year history. Albany 2030, adopted in 2012, was developed to guide local development in a manner that maintains the city's character while improving quality of life, and environmental and fiscal health. In addition to initiatives to support economic development and make housing more affordable, the Albany 2030 planning process included a greenhouse gas assessment that informed the development of a climate action plan with initiatives to improve energy efficiency, modernize infrastructure and enhance transportation networks.

Consistent with Albany 2030, as well as the Capital Region Sustainability Plan, the City seeks to build upon its strong sustainability foundation with the Albany Energy Plan and implement strategies that will further support a vibrant community through affordable, clean, and efficient energy supply, distribution, and consumption. For nearly 10 years, the City of Albany has been leading efforts to become more sustainable by developing plans and programs that will better position the government and community at large to increase energy efficiency, reduce emissions, save money, grow the economy and improve the quality of life for residents. To date, numerous plans have been developed by the City to further advance its energy, climate and sustainability efforts. Many of these efforts have been carried out by the City's Office of Energy and Sustainability, established in 2010.

In parallel with the development of the Albany Energy Plan, the City is focused on the Albany 2030 Sustainable Code Project.

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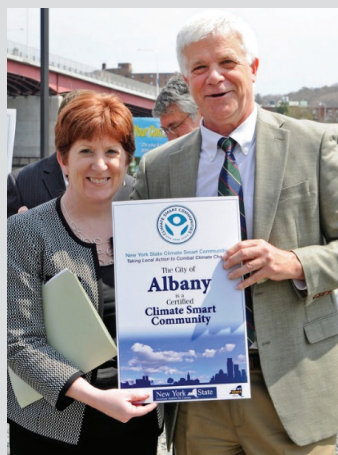
In December 2013, the City was awarded a \$300,000 Cleaner Greener Communities Phase II grant from the New York State Energy Research and Development Authority (NYSERDA) to conduct a comprehensive code update and integrate into it the sustainability principles adopted in the Albany 2030 Comprehensive Plan. The update, known as the Albany 2030 Sustainable Code Project and Unified Sustainable Development Ordinance, will incorporate sustainable design and smart growth principles, including green building codes, stormwater management, bike infrastructure and streamlined permitting, among other components.

The City has also made a commitment to energy efficiency and sustainability through its participation in the STAR Communities Rating System (STAR) and the Climate Smart Communities (CSC) program. Albany is a STAR pilot community, which includes numerous energy and climate related objectives in its comprehensive sustainability framework. In 2014, Albany was rated a 3-STAR Community, as recognition as a community for sustainability leadership. In 2009, the City adopted the Climate Smart Communities pledge, which outlined 10 Pledge Elements that reduce energy use and greenhouse gas (GHG) emissions, adapt to a changing climate, and save taxpayer dollars. Albany is one of six communities to become certified as a Climate Smart Community after participating in a certification pilot program in 2013.

In 2013, Albany completed a Climate Change Vulnerability Assessment and Adaptation Plan to identify energy infrastructure vulnerabilities and priority areas for enhanced resilience. The assessment began before the impacts of Superstorm Sandy were felt by many New Yorkers; and the Adaptation Plan provides a clear strategy to further enhance the resilience of its energy systems and infrastructure and demonstrate forward-thinking leadership as a resilient and sustainable city.

Albany recognizes that increasing energy efficiency, utilizing clean energy technologies, modernizing the grid and enhancing transportation networks are necessary to shift to a greener, more sustainable economy. These efforts create jobs and support research and innovation already occurring within Albany's many institutions.

Albany faces a number of challenges with regard to its buildings and infrastructure – including an aging building stock. Many buildings in the commercial, residential and institutional sectors are in need of updates to equipment, windows and building envelope. Even when renovations are performed or new buildings are constructed, energy code compliance is relatively low.



On April 22 - Earth Day - Governor Andrew M. Cuomo launched the New York State Climate Smart Communities Certification Program and recognized the first six municipalities to achieve certification. The CSC Certification Program is designed to support municipal efforts to meet economic, social and environmental challenges posed by climate change. The new certification effort, which will award certification in the bronze, silver and gold levels, will provide a means to recognize those communities that achieve success under their CSC pledge, a means to track and reward local actions, and a better defined framework for local climate action.

Mayor Kathy Sheehan receives Albany's CSC Certification from NYS DEC Commissioner, Joseph Martens.

Municipal Energy Consumption Forecast by End Use (FY 2011-2020)

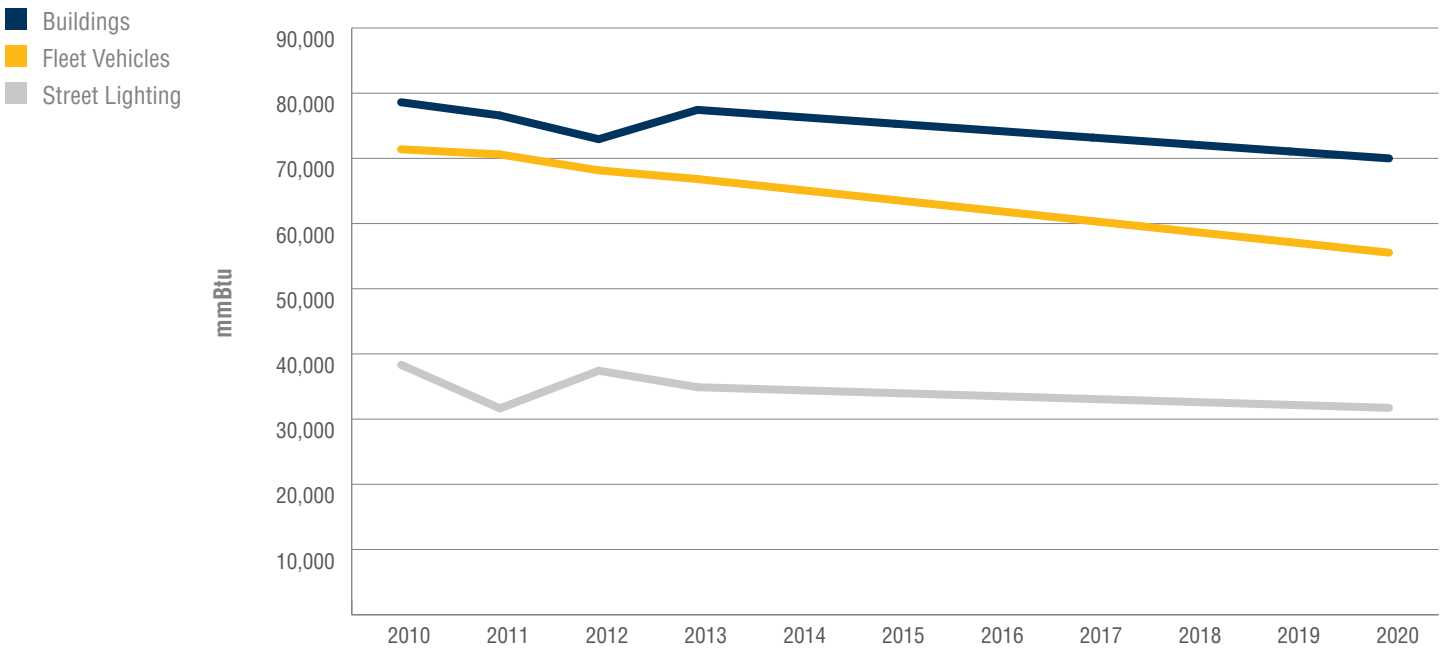


Figure 3

Statewide energy code compliance rates may be as low as 36 percent for recently constructed commercial buildings.

Energy use in buildings and infrastructure is also expensive. Energy costs for municipal buildings and outdoor lighting alone were nearly \$6.3 million in fiscal year (FY) 2011. As buildings are renovated or new ones constructed, they should be designed with energy efficiency in mind. Energy efficient buildings are typically more comfortable, result in less pollution and GHG emissions, and save owners money, which can then be invested elsewhere.

Albany strives to provide a safe, functional and efficient transportation network to its residents and visitors. At the crossroads of two of the

Northeast's busiest interstates, 90 and 87, a gateway between upstate New York, the Hudson Valley, and New England, combined with a modern port and the navigable waterways of the Hudson River, plus an international airport, Albany has significant transportation infrastructure networks to operate and maintain. It is not surprising, given these significant networks running through the city, that the transportation sector accounts for more than one third of citywide energy consumption and is the largest source of GHG emissions in the city (**Figure 3**).

Maintaining transportation infrastructure, including roadways and bridges, is expensive for government entities and taxpayers. Additionally, vehicle fuel prices, which are already a significant expense to drivers and fleet operators, continue to rise. In recognition of these challenges, the City is actively planning for a more sustainable

transportation system throughout Albany and the region. In collaboration with the Capital District Regional Planning Commission (CDRPC), the Capital District Transportation Committee (CDTC), and the Capital District Transportation Authority (CDTA), as well as with the New York State Department of Transportation (NYSDOT), NYSEDA, and other agencies, Albany has improved bicycle and pedestrian infrastructure, enhanced public transit routes, developed the City Bicycle Master Plan, and completed an Electric Vehicle Feasibility Study among other efforts. In further support of these efforts, the Albany Energy Plan provides a comprehensive approach to transportation planning with initiatives to enhance bicycle and pedestrian infrastructure, alternative fuel vehicles and infrastructure, transit-oriented development, and smart growth.

Similar to buildings and transportation infrastructure, the region's electric grid is aging and at risk of experiencing failures. For 2009 through 2013, there were nearly 20 million customer minutes of

service interruption in National Grid's New York service area (of which the City of Albany is a part), and equipment degradation plays a significant role in these service interruptions (**Figure 4**).

Maintaining a functioning electric supply and distribution infrastructure is critical for public safety, access to services and economic stability. As this infrastructure is replaced in the coming years, the City and its utility and state agency partners will need to focus on modernizing the grid and incorporating smart and renewable technologies that enhance efficiency and reliability while reducing pollution and GHG emissions.

Coordinated planning within municipal government and among stakeholders throughout Albany and the region will be essential for implementation. The City has laid a foundation of quality planning and coordination through its numerous sustainability planning efforts as well as through this Energy Plan effort.

Causes of Service Interruptions in Albany

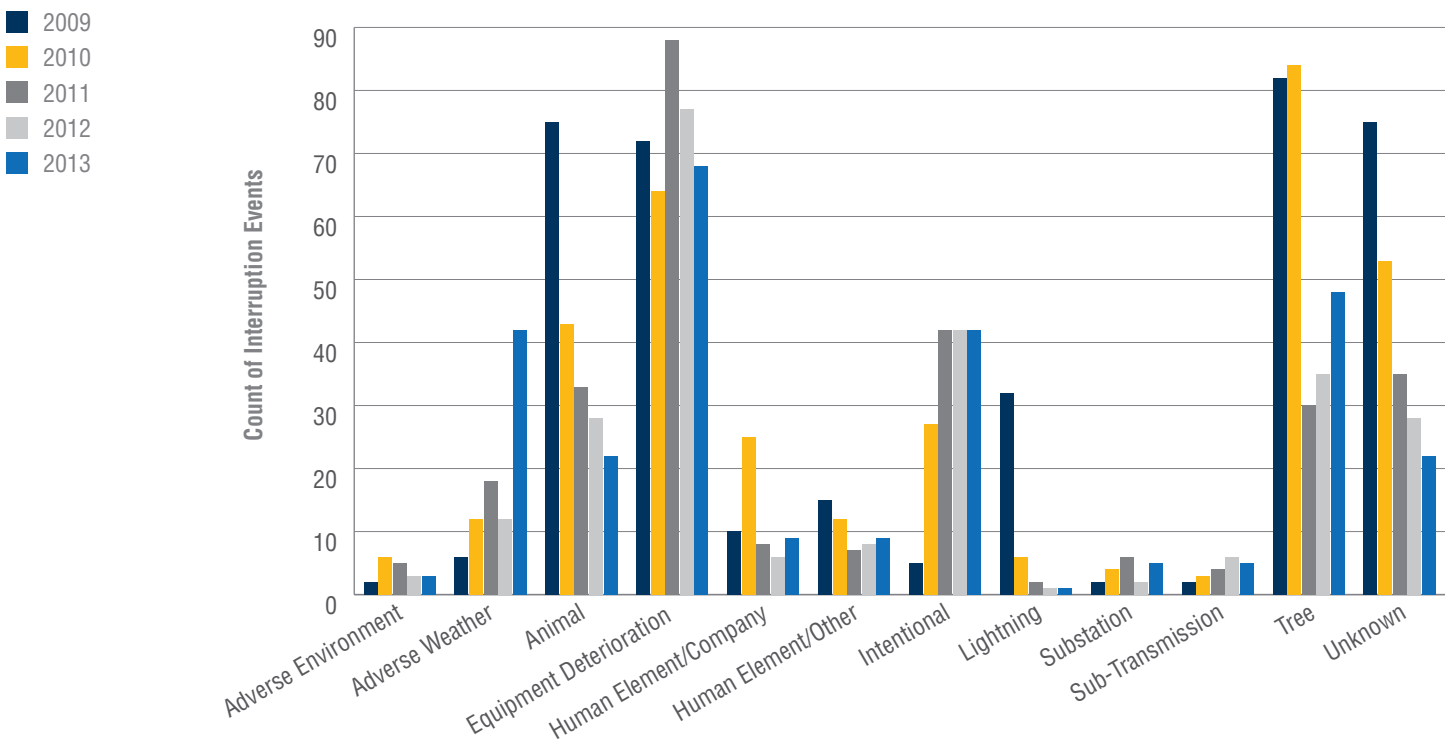


Figure 4

Source: National Grid

The City will need to capitalize on previous and existing efforts and the relationships established during the implementation of the Albany Energy Plan. Going forward, the City will also need to establish internal structures and procedures to better manage its energy data and costs. Finally, a critical component of planning and coordination for the City will be to provide the structure, information, and resources necessary to empower the community to take action.



Albany City Hall

Summary of goals and initiatives

The City has identified the following goals within the four action areas:

- Secure Albany's energy needs through cost-effective policies, integrative planning and strategies that emphasize clean and efficient technologies;
- Promote building efficiency throughout all sectors of the community, including municipal buildings;
- Reduce fossil fuel consumption in the transportation sector; and
- Increase grid efficiency and energy security while decreasing reliance on fossil fuels

Some initiatives are particularly critical to successful implementation of this plan and the ultimate success in achieving the City's goals. The first such strategy is for the City to begin utilizing a web-based energy data management tool. Data collection, tracking and benchmarking are essential to the effective implementation of building energy improvements as well as the implementation of initiatives across all of the action areas. The second critical strategy is hiring an Energy Manager to enhance the capacity of City staff to track performance data and the implementation of projects and build awareness of energy efficiency projects, which is necessary to fully realize the benefits of Albany's energy improvement efforts.

Additionally, the City will expand existing efforts to shift away from single-occupancy vehicles by enhancing transit systems, promoting transit-oriented development, and enhancing bicycle and pedestrian infrastructure. Much of this will build upon the work underway in the Albany 2030 Sustainable Code Project, funded in part by a NYSERDA Cleaner Greener Communities Phase II implementation grant, and also through the coordinated efforts to implement the region's New Visions Regional Transportation Plan.



Delaware Avenue

The initiatives in the Albany Energy Plan are expected to foster energy savings and reduce greenhouse gas reductions in the city. The reductions in energy use and GHG emissions that will be realized by achieving the goals of the Albany Energy Plan will create operational efficiencies in municipal government, increase mobility and connectivity, and improve quality of life in revitalized neighborhoods. These outcomes are expected to spur economic activity across the city and region and make Albany a leader in smart growth and sustainable development.

City of Albany Energy and Sustainability Plans and Studies

- 2007** Albany Sustainable Development Assessment Team: A Sustainable Capital for the 21st Century
- 2009** Greenhouse Gas Emissions Inventory
- 2009** City of Albany Bicycle Master Plan
- 2011** Climate Action Plan
- 2012** Albany 2030 Plan
- 2012** Electric Vehicle Feasibility Study
- 2012** City of Albany TOD Guidebook
- 2013** Local Waterfront Revitalization Plan
- 2013** City of Albany Bike Share Feasibility Study
- 2013** City of Albany Bicycle Signage and Wayfinding Strategy
- 2013** Capital Region Sustainability Plan
- 2013** Albany Climate Change Vulnerability Assessment and Adaptation Plan



Secure Albany's Energy Needs Through Cost-Effective Policies, Integrative Planning and Strategies That Emphasize Clean and Efficient Technologies

Summary of Objectives and Initiatives

Prepare Albany's workforce for meeting the city's energy and sustainability goals

Initiative 1: Implement the Albany Green Business Program

Initiative 2: Support a green jobs training program

Manage City government energy costs through effective energy procurement, demand management and energy use monitoring

Initiative 3: Develop a long-term energy supply strategy

Initiative 4: Create a citywide Energy Manager position

Initiative 5: Utilize a web-based energy data management tool

The City of Albany faces a number of challenges with regard to maximizing efficiency in its buildings and infrastructure. However, these challenges also present tremendous opportunities for improved efficiency, cost savings, pollution reduction, economic development, increased resiliency and enhanced livability. With an economy comprised of energy intensive sectors such as government operations, educational institutions, research facilities, medical centers and laboratories, Albany has significant energy needs that are likely to increase as the economy continues to recover from the most recent recession. These sectors also provide a wealth of knowledge and innovation that, with strategic

coordination, can lead Albany to implement smart, efficient, more sustainable technologies.

Planning and coordination play a critical role in ensuring Albany's energy needs are met and its systems and infrastructure are reliable. As energy demands continue to grow, the City of Albany will have a significant role to play in managing those demands both within its own municipal operations, as well as in establishing effective policies and strategies for managing energy demands at the community scale and catalyzing investment in the clean energy market.

The City manages municipal buildings, vehicles, streetlights, traffic signals, pumping stations and other equipment. In 2011, municipal energy costs totaled \$8.1 million (**Figure 5**).

By 2030, the City's energy use is projected to remain relatively flat or experience a minor reduction, though energy costs are likely to continue to increase. Smart energy demand management, efficient operations, and thoughtful procurement will be critical to minimizing municipal energy costs and impacts to the environment.

As demonstrated in **Figure 6**, the City has a strong record of integrative planning, coordination with stakeholders and effective sustainability policymaking that will support the goal of securing energy needs while creating jobs and transitioning Albany to a cleaner, greener economy.

MUNICIPAL OPERATIONS ENERGY CONSUMPTION (FY 2011)					
Electric use	Gas use	Vehicle fleet fuel	Total energy used	Energy costs	Total MtCO ₂ e
20,944,402 kWh	476,207 therms	70,605 mmBtu (371,527 gallons of gasoline 175,100 gallons of diesel)	196,458 mmBtu	\$8.1 million	11,971

Figure 5

City of Albany Timeline of Sustainability

Albany wins AIA SDAT Grant		City Bicycle Master Plan Completed		City kicks off the Albany 2030 Comprehensive Plan		Climate Action Plan Completed		Electric Vehcile Infrastructure Feasibility Study Completed	
		Albany joins ICLEI	Formation of the Sustainability Working Group		City receives GreenLITES Award from State DOT	Mayor's Office of Energy & Sustainability Founded		Received NYSEERDA CGC Grant for Sustainable Code Project	Certified Climate Smart Community
2006	2007	2008	2009	2010	2011	2012	2013	2014	
	Methane gas electric generation at the Albany Landfill		First on-street bike lane installed		City implements lighting upgrades in municipal facilities	City purchases hybrid vehicles			
2005: Mayor Jennings signs the U.S. Confrence of Mayors Climate Protection Agreement		Mayor Jennings signs the National Local Green Job Pledge		Common Council passes the Climate Smart Communities Pledge		City Energy Conservation Policy	Albany 2030 adopted by Common Conclil	Local Law B creating a Sustainability Advisory Committee	

- Plans & Studies
- Milestones
- Programs & Initiatives
- Policies

Figure 6

Prepare Albany’s workforce for meeting the City’s energy and sustainability goals

The City recognizes the important role it can play in providing resources to support energy efficiency throughout the community. The Albany 2030 Sustainable Code Project, for example, will formalize energy efficiency standards and requirements throughout Albany; however, the

City also has a responsibility to build capacity among all sectors to properly implement these changes. Fortunately, a number of technical and financial resources already exist among utilities, NYSEERDA, the New York Power Authority (NYPA), and others to support these efforts. Local stakeholders have identified the need for a centralized clearinghouse of all of these resources that could further build understanding and capacity among residents, businesses and institutions in Albany and statewide.

Transformer being loaded onto a barge at Port of Albany





Energy Planning & Coordination



Initiative 1: Implement the Albany Green Business program



Albany's commercial sector accounts for 13 percent of citywide energy consumption. To support environmental improvements in this sector, the City in 2012 established the framework for a voluntary Green Business program to work with business leaders, government agencies and nonprofit organizations to reduce energy use, waste, and water consumption. To increase participation rates and rejuvenate implementation efforts, the City will collaborate with Albany County, business improvement districts, the Albany-Colonie Regional Chamber of Commerce and other stakeholders to build off the existing Green Business program structure and pilot a Green Business Certification (GBC) program, following the success of similar programs at the regional level.

The GBC program will be an impartial way to identify, certify and promote businesses in Albany that have taken specific actions to improve

their economic, environmental, and operational performance. The objective, third-party certification will be given to businesses that are leaders and innovators in “greening” their operations and providing guidance to others, and will serve as an incentive for businesses to reduce energy and pollution. The program will also leverage growing interest in green companies, provide a platform for sharing best practices and encourage additional companies to go green, while contributing to Albany's energy and climate goals and supporting overall economic development.

The City will implement the GBC program through an Adopt a Green Business Pledge campaign or challenge. If the City of Albany decides to lead the effort to implement and maintain a GBC program, it will require a significant amount of attention from municipal staff. Other GBC programs have been successful at a county or regional level, allowing the City to focus on increasing participation rates and supporting local economic development by connecting local stakeholders to the resources made available through a more broadly scaled program.

CASE STUDY

Westchester Green Business Challenge

In 2009, Westchester County partnered with The Business Council of Westchester to create the Westchester Green Business Challenge (WGBC) to encourage sustainable business practices that will save money, conserve resources and protect the environment. The WGBC is a public-private partnership that provides support to more than 275 businesses in the county. The challenge included four different scorecards with a checklist of actions businesses can take to be “greener” based on their control over operations: tenants, property managers, owner-occupied and home-based businesses. The scorecard provides resources for each action and automatically generates a business' score across four tiers of achievement. The WGBC scorecard is based on business sector recommendations in the Westchester Action Plan for Climate Change and Sustainable Development, focusing on outreach, energy, transportation, land use, water resources, waste and recycling, and green procurement strategies. Beyond the challenge, businesses can advance to the Westchester Green Business-Certified (WGB-Certified) program to create and implement a formal environmental sustainability program for their business organization.



Initiative 2: Support a green jobs training program



Today's green economy demands more workers with advanced skill sets in the energy efficiency and renewable energy fields. Green jobs apply to a broad spectrum of technical positions that benefit community health, protect the environment, reduce GHG emissions and stimulate the local economy. The clean energy sector is rapidly growing with an increasing need for professionals who are trained to conduct building energy audits, retrofit buildings for energy efficiency improvements, install or repair solar panels or wind turbines, repair hybrid cars or alternative fuel vehicles, or build green rooftops. Albany is looking to support a green jobs training program to enhance the workforce's access to "green" skills development in the fields of renewable energy and energy efficiency. The City will leverage existing green jobs training programs, including those provided by NYSERDA and its local training partners, and connect individuals or local companies to state or regional resources to support green skills development.

The City will support these training efforts by hosting informational sessions on how to enroll in NYSERDA training programs, providing space for training workshops and increasing access to online training courses or online certification and licensing exams.

Manage City government energy costs through effective energy procurement, demand management and energy use monitoring

Initiative 3: Develop a long-term energy supply strategy



The City of Albany spends more than \$6 million per year on natural gas and electricity. Over the last decade, high demand for natural gas in the Northeast has caused significant fluctuations in natural gas and electricity prices. These fluctuations contribute to higher uncertainty in budget allocations for fuel expenses. To address these fluctuations and bring down costs, the City will develop a long-term energy supply strategy to reduce these vulnerabilities.

Green Job Skills Training for Professional Services

Based on 2009 data for the combined Capital District, Mohawk Valley and North Country region

Ninety-two percent (270) of green employers in professional services require that employees have enhanced skills to produce green products or services. In the combined Capital District, Mohawk Valley, North Country region, firms most often utilize professional trade associations and on-the-job training programs.

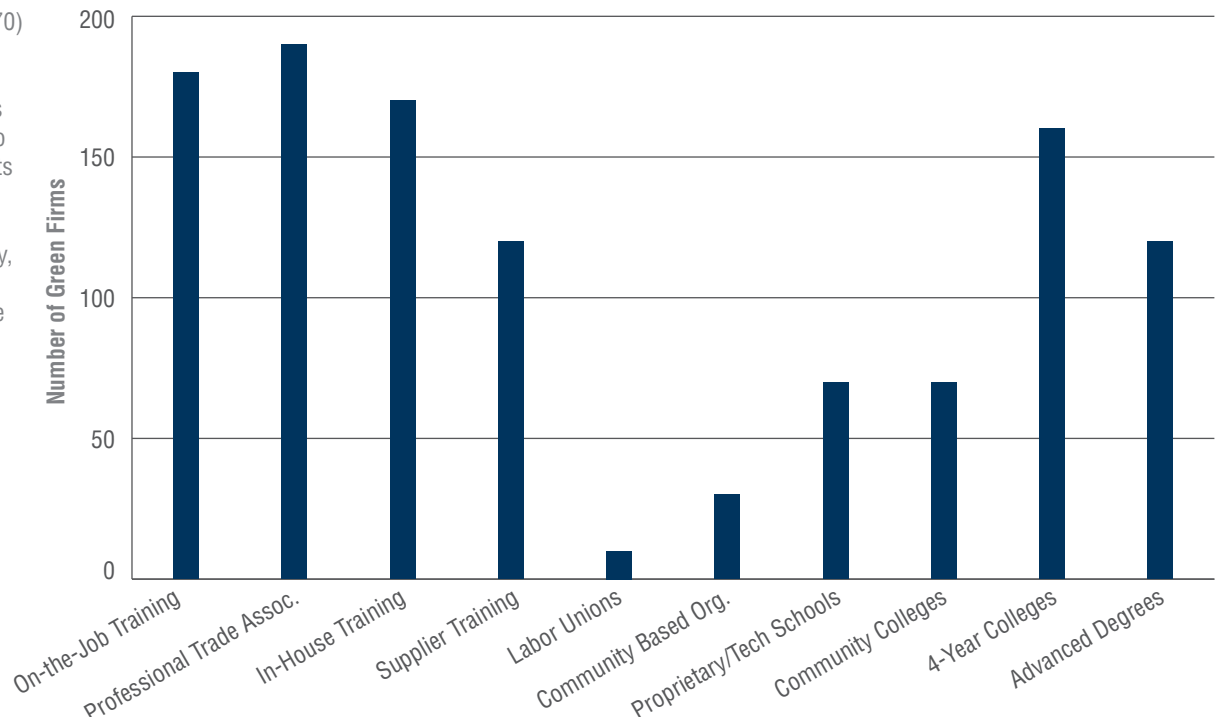


Figure 7

Source: 2009 New York State Green Jobs Survey



Energy Planning & Coordination

CASE STUDY | Massachusetts Municipal Energy Managers

The Massachusetts Department of Energy Resources provides funding on a competitive basis to support municipal Energy Manager positions. The grant supports the position for two years and is open to all Massachusetts municipalities that do not employ an energy manager for more than 15 hours per week. In the first year, awardees are eligible to receive a grant of up to \$50,000 for a full-time energy manager or up to \$25,000 for a part-time position. In the second year, based on achievements in the first year, grantees may be awarded up to \$35,000 for a full-time position and \$17,500 for part time. Kansas and Iowa also provide this type of state support for local government energy management positions.

In developing a long-term energy supply strategy, the City will assess clean energy options, develop a plan to integrate clean energy resources into the consumption mix and establish a process to procure clean, affordable, reliable energy that helps the city meet its renewable energy and greenhouse gas reduction goals. The strategy will also include measures to maintain uninterrupted energy supply to critical facilities during power outages.

To develop a long-term energy supply strategy, the City will consider competitive energy supplier options. As a first step, the City will assign staff and/or hire a consultant to assess energy pricing risks and develop and maintain long-range energy use forecasts.

Initiative 4: Create a Citywide Energy Manager position



The City of Albany will create an Energy Manager position to actively monitor energy consumed by the City's buildings, manage projects aimed at reducing consumption and provide City department heads or other leadership with energy bills and consumption data to facilitate goal setting.

The Energy Manager will also coordinate implementation of preventive maintenance programs for equipment and training for maintenance personnel to facilitate proper equipment operation and maintenance. The Energy Manager will provide technical support and lead energy and sustainability efforts at the municipal and community levels, including the implementation of the Albany Energy Plan.

The position of the Energy Manager within City government is key to their success. The Energy Manager will require regular access to decision makers to report on the City's energy performance and to make recommendations for continued improvement. In addition, the Energy Manager needs to be engaged with capital programs and operations and maintenance (O&M) staff to integrate energy efficiency into capital improvements and to guide O&M personnel on preventive maintenance. The Energy Manager will be responsible for managing energy use through building management systems and monitoring consumption and costs through energy data management tools, overseeing applications for energy efficiency incentives and grants, overseeing contracted services and providing guidance on energy procurement, and directing the City's participation in local, regional, or national energy related programs or challenges.

Solar Insatllation





Initiative 5: Utilize a web-based energy data management tool



The City of Albany is responsible for the management and payment of hundreds of utility accounts and fuel invoices, with annual energy costs exceeding \$8 million (when accounting for electricity, natural gas, heating oil and vehicle fuel). While the City collects and processes utility bills regularly for payment and budgeting purposes, maintenance personnel and other building and equipment users are not regularly informed about costs and consumption.

Albany has an opportunity to not only continue monitoring and tracking municipal energy use data, but also to revise energy tracking, policies and procedures. Albany does not have a central tracking system in place for all of its energy consumption and expenditure data;

this sometimes results in inconsistencies and anomalies in account, meter, consumption and cost data. These inconsistencies pose challenges to understanding municipal energy use and developing appropriate procurement and management strategies, sometimes resulting in incorrect billing.

There are a number of tools available for managing, monitoring, and reporting energy data. The tools provide the ability to centrally manage all energy consumption, cost and facility information, helping to ensure billing consistency and accuracy, track progress on efficiency improvements, measure actual energy savings from those improvements, and review and report data on a monthly or quarterly basis.



Energy Planning & Coordination

Times Union Center



The U.S. Environmental Protection Agency's ENERGY STAR® Portfolio Manager is the most commonly used energy tracking tool. Portfolio Manager utilizes facility descriptions and utility data to calculate an ENERGY STAR® Score (where applicable) and energy use intensity of buildings. In 2014, the City used Portfolio Manager to benchmark its 49 buildings, some of which were eligible for an ENERGY STAR® rating (currently limited to office buildings and wastewater treatment facilities).

Building on the collected information for Portfolio Manager, the City will continue to benchmark its buildings and centrally track energy and water consumption. To enhance this effort, the City will evaluate additional low-cost energy tracking tools which will work with Portfolio Manager to provide more energy management support. These tools can be directly linked to the City's National Grid accounts for automatic and regular consumption data updates. They also generate trend lines for energy use to identify and/or track high energy users or data anomalies, allowing for early identification of potential issues.

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Prepare Albany's workforce for meeting the city's energy and sustainability goals				
Initiative 1: Implement the Albany Green Business Program				
OES or Albany-Colonie Regional Chamber of Commerce	CAC, BID, EDC, CEG, ACES, NYSERDA EDGE, Albany County, Utility Providers, Large Employers	GB participation fees, Community Loan Fund of the Capital Region	Short-Term	Meet with County, Albany-Colonie Regional Chamber of Commerce and key partners to determine roles and structure of GB program. Identify key business partners to participate in GB pilot program.
Initiative 2: Support a green jobs training program				
OES, Department of Youth and Workforce Development	ACES, CEG, CES, DGS, EDC, NYSERDA, NYSERDA EDGE, SUNY ALBANY Local academic institutions, Employers in clean energy sectors	Corporate sponsors, NYSERDA PONs	Medium-Term	Meet with key partners to define green jobs and assess potential green job opportunities and type of training needed. Meet with Regional EDGE Coordinator to identify relevant training opportunities and enrollment information.
Manage City government energy costs through effective energy procurement, demand management and energy use monitoring				
Initiative 3: Develop a long-term energy supply strategy				
OAC, Budget Office, Purchasing	OES, DGS, DWWS, APD, Fire & Emergency Services, Energy service companies, Energy consultants	—	Short-Term	Assess funding and resource options for developing and implementing a long-term energy supply strategy Identify key components of the strategy (e.g. goals and priorities, mix of resources, implementation plan)
Initiative 4: Create a citywide energy manager position				
Mayor's Office	Budget Office, OES, DGS, DWWS, APD, Fire & Emergency Services	NYPA	Short-Term	Determine scope of position and reporting structure
Initiative 5: Utilize a web-based energy data management tool				
OAC, OES, Mayor's Office	Energy data management tool / software providers; National Grid, OES, DGS, DWWS, APD, Fire & Emergency Services	—	Short-Term	Review options and select a tool Collect all needed data and populate tool Medium/Long-term: Monitor energy use, identify opportunities, track progress

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



Promote Building Efficiency Throughout All Sectors of the Community, Including Municipal Buildings

Summary of Objectives and Initiatives

Update and enforce zoning and building codes to promote energy efficient and resilient buildings

- Initiative 1:** Adopt a Residential Energy Conservation Ordinance
- Initiative 2:** Establish energy efficiency standards through green building code and development incentives
- Initiative 3:** Promote building energy codes training for designers, contractors and local code officials
- Initiative 4:** Implement a building energy benchmarking and disclosure program

Implement financing strategies that support the residential and commercial sectors in implementing energy efficiency upgrades

- Initiative 5:** Participate in a Commercial Property Assessed Clean Energy (PACE) program
- Initiative 6:** Launch a new neighborhood energy challenge

Implement energy conservation measures in municipal buildings to reduce energy use by 20 percent by 2020

- Initiative 7:** Update existing service contracts to cover energy saving maintenance procedures and equipment upgrades
- Initiative 8:** Implement preventative maintenance procedures through training and reallocation of existing resources
- Initiative 9:** Set up a revolving energy fund
- Initiative 10:** Utilize existing funding programs to cost share higher level technical assistance
- Initiative 11:** Incorporate energy efficiency into the Water and Wastewater Master Plans

Albany's building stock is aging and many buildings in the commercial, residential and institutional sectors need updates to equipment and the building envelope. Even when renovations are performed or new buildings are constructed, energy code compliance is low.

Energy use in buildings represents approximately 46 percent of GHG emissions in the city. Municipal buildings energy costs were nearly \$1.7 million in 2011. Consequently, municipal and private development and renovations should be carried out with energy efficiency in mind. Energy efficient buildings are typically more comfortable, result in less pollution and GHG emissions, and save owners money. Design guidelines and building codes, accompanied with strong enforcement, can provide guidance and assurance that these benefits are realized.

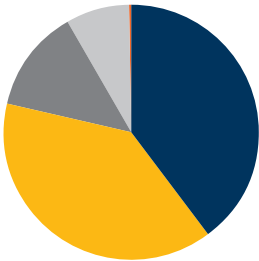
Albany's Department of General Services (DGS) recently completed lighting upgrades in 23 buildings, with savings anticipated to be as much as \$55,000 per year. DGS is also installing window reglazing and storm windows, expected to contribute to improved energy management and reduced consumption.

There are approximately 51,215 buildings citywide, with the vast majority being residential. Residential buildings are responsible for approximately 28 percent of the city's electric and natural gas consumption. More than 55 percent of Albany's residences were built

Albany street scene



Municipal Energy Consumption by Department (mmBtu)



- Albany Police Department (40%)
- Department of General Services (39%)
- Water Department (13%)
- Fire and Emergency Services (8%)
- Albany Housing Authority (0%)

Energy Use (mmBtu),
By Department, FY11

Figure 8

before 1940, and an additional 25 percent were built between 1940 and 1970. There are 2,804 buildings in Albany that are classified as non-residential, representing over 52 million square feet. Of these buildings, 35 percent are larger than 10,000 square feet, and an additional 19 percent are larger than 25,000 square feet, all representing a significant opportunity for improved energy efficiency throughout Albany’s commercial sector.

Update and enforce zoning and building codes to promote energy efficient and resilient buildings

Initiative 1: Adopt a Residential Energy Conservation Ordinance



A Residential Energy Conservation Ordinance (RECO) is a city ordinance that establishes energy efficiency and water conservation standards for all types of residential properties, including single-family homes, mixed-use buildings, condominiums and multifamily properties.

At the time of a sale, transfer of a lease, or a substantial renovation, a RECO requires a building inspection to ensure that the residential building meets the energy and water standards established in the ordinance. Based on the building inspection or energy audit, recommendations are made to bring the building up to code before the project can move forward or change occupancy. The RECO model takes advantage of safety inspections, rental license inspection processes, or the sale of a property to apply energy standards for residential buildings to reduce operating costs, lower energy use, conserve water and decrease GHG emissions.

The City will explore the feasibility of developing a RECO to increase the energy efficiency of residential buildings. A number of considerations will be evaluated (**Figure 9**) regarding the establishment of an appropriate RECO structure for Albany’s residential housing market.

Case studies have shown that, on average, a RECO increases energy efficiency of buildings covered by the ordinance by 10 to 20 percent. A RECO would help stimulate the local economy through

CONSIDERATIONS FOR ESTABLISHING A RECO IN ALBANY
When will the RECO be applicable (e.g. time of sale, transfer of a lease, substantial renovation, safety inspections, etc.)?
What will constitute a substantial renovation (e.g. cost value, square footage, etc.)?
Who will be financially responsible for hiring a certified inspector to conduct the energy audit (e.g. the seller, the buyer, etc.)?
What will be the standard energy requirements or mandatory energy efficiency improvements (e.g. attic insulation, water heater or piping insulation, duct sealing, etc.)?
Will there be limitations to ensure that the costs of energy improvements is not excessive for the homeowner?
What is the specified time period to complete energy improvements?
Who will inspect quality of energy improvements within the specified time period?
How can the RECO process build off existing NYSERDA programs for residential energy audits, such as EmPower NY program, Home Performance with ENERGY STAR® or the Multi-Family Performance Program

Figure 9



Energy Efficiency in Buildings

demand for energy auditors and contractors, and would make housing more affordable by lowering ongoing energy costs for the property owner.

Initiative 2: Establish energy efficiency standards through green building code and development incentives

Albany and other communities in the region have been considering adoption of energy codes that are more stringent than the Energy Conservation Construction Code of New York State. The Capital Region Sustainability Plan included an initiative to adopt an energy efficient building code as a component of its overall energy efficiency goal. The state is considering development of a “stretch” energy code, similar to one developed in Massachusetts, that New York cities and towns could adopt. In addition to adoption of a “stretch code” if developed, the City of Albany will evaluate the most cost-effective and impactful strategies to promote energy efficiency standards in residential and commercial buildings. There are a number of ways to provide incentives for compliance with local energy efficiency or green building standards, including green building overlay districts, density and height bonuses, and

expedited permitting. The City will evaluate the options and incorporate the most appropriate ones into the Albany 2030 Sustainable Code Project.

One such option, a green building overlay, establishes guidelines for sustainable site design and energy efficient development in target areas with existing or planned transit access and neighborhoods in need of densification, diverse housing opportunities, and economic development. The overlay could include energy efficient and green building standards for residential or commercial development.

The City will also consider structural and financial incentives for green buildings that have little or no financial impact on the municipal budget. Incentive to promote energy efficient design and adherence to green building standards can increase revenues or save the developer money. Examples of structural incentives include increased density and height bonuses and expedited permit processing and plan review. Financial incentives include tax credits, property tax abatements, reduced permitting fees or revolving loan funds.

CASE STUDY | Yonkers Green Development

The City of Yonkers created the Green Development Workbook to make it easier for commercial and residential developers to meet sustainability standards and expectations outlined in the Yonkers Green Building Ordinance. The ordinance focuses on increasing energy and water efficiency, improving air quality, and minimizing other environmental impacts of municipal, residential and commercial developments or renovations. The workbook includes a Green Development Checklist that must be completed for all new non-residential developments larger than 15,000 square feet and residential developments with more than 25 units. The workbook was formally adopted in June 2013 and aligns with local, state and federal incentive programs and regulations.



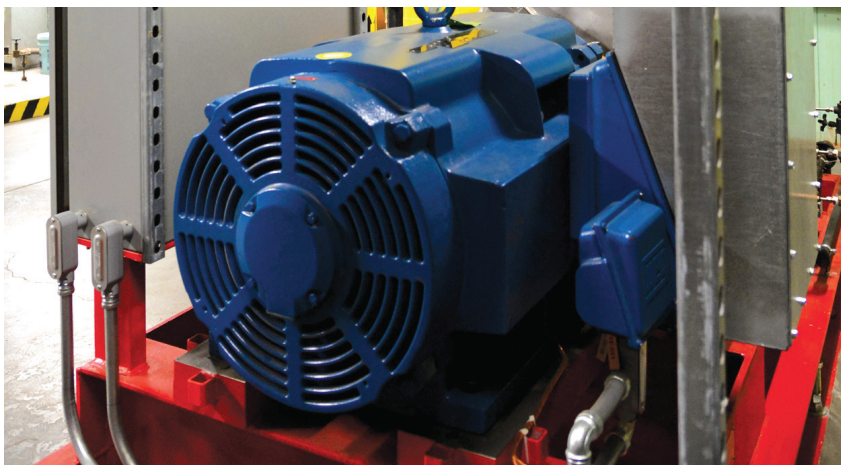
Yonkers Green Development Checklist

This checklist provides an overview of the technical elements of the Yonkers Green Development Standards. To be considered green, the City recommends that the project integrates all yes/no measures applicable to that construction type. In addition, the City recommends New Construction projects achieve 35 optional points and Substantial Rehab projects achieve 30 optional points. The City recommends that Moderate Rehab projects achieve a minimum of 20% of the optional points that are applicable to the project based on the project's scope. Please refer to the Yonkers Green Development manual for details regarding each measure.

To Be Completed By Applicant	
YES <input type="checkbox"/>	NO <input type="checkbox"/>
1: Integrative Design	
1.1a Green Development Plan: Integrative Design Meeting(s) (All Projects) Conduct one or more integrative design meetings and submit a Green Development Plan or equivalent documentation.	
1.1b Green Development Plan: Checklist Documentation (All Projects) Create design and construction documentation to include information on implementation of appropriate Green Development Standards.	
1.2a Universal Design (New Construction, Residential only) Design a minimum of 15% of the dwelling units (no fewer than one) in accordance with ICC/ANSI A117.1, Type A, Fully Accessible guidelines.	
1.2b Universal Design (Substantial and Moderate Rehab, Residential only) Design a minimum of 10% of the dwelling units (no fewer than one) in accordance with ICC/ANSI A117.1, Type A, Fully Accessible guidelines (5 points) and, for an additional point, the remainder of the ground-floor units and elevator-reachable units should have accessible unit entrances.	
2: Location + Neighborhood Fabric	
2.1 Sensitive Site Protection (New Construction) Do not locate new development, including buildings, built structures, roads, or other parking areas, on portions of sites that meet any of the following provisions: • Except for previously developed sites, land within 100 feet of wetlands, including isolated wetlands or streams • Land that is specifically identified as habitat for any species on federal or state threatened or endangered lists • Land with elevation at or below the 100-year floodplain	
2.2 Proximity to Services (New Construction) Locate the project within a 0.25-mile walk distance of at least two OR a 0.5-mile walk distance of at least four of the list of facilities	
2.3 Preservation of and Access to Open Space (All Projects) Establish a legally enforceable open space conservation easement for use by tenants that is binding on all future owners of the property for a percentage of the total project acreage: 10% [4 points]; 20% [6 points]; 30% [8 points]; and 40% [10 points].	
2.4 Access to Public Transportation (New Construction) Locate the project within a 0.5-mile walk distance of combined transit services (bus and/or rail) constituting 76 or more transit rides per weekday and 32 or more transit rides on the weekend	

Project Name:

Checklist 1



A new micro steam turbine at the Sheridan Avenue Steam Plant

The City will also evaluate the feasibility and effectiveness of requiring green building and/or energy efficiency measures to be incorporated into projects funded through the City of Albany's Industrial Development Agency (IDA). Other local governments in the region have also been considering this approach. Partnering with neighboring municipalities and their associated IDAs will further support this analysis, and ultimately, the design of the overlay and/or incentive program. The City will also leverage these partnerships to reach out to and educate businesses and developers of Albany's future green building and energy efficiency programs to ensure their success.

Initiative 3: Promote building energy codes training for designers, contractors and local code officials



NYSERDA has developed comprehensive online energy code training modules on energy code essentials, compliance tools, building science and best practices, and building equipment, which are publicly accessible and available for free or at low cost. The City will utilize these resources to ensure that local code officials and those involved in design and construction projects are informed of stricter requirements and stay up to date on the required local building energy codes.

The City will provide building designers and contractors direct access to these resources and promote the course materials and participation in code trainings. The City will issue a statement on its Buildings and Regulatory Compliance webpage to demonstrate its intention to improve building energy code knowledge among designers and contractors, and will provide links to NYSERDA's energy code training resources and energy code hotline. When pulling permits for building construction and retrofits, the City will ask designers and contractors for proof of energy code training. Additionally, City code officials will take advantage of NYSERDA's third-party resources for plan review and on-site visits to ensure energy code compliance.

Initiative 4: Implement a building energy benchmarking and disclosure program



A building energy benchmarking and disclosure law provides transparency around building energy performance and encourages energy improvements in existing buildings. Such programs typically require owners of non-residential and multifamily buildings to track and publicly report their annual energy usage. The availability and transparency of such data is valuable for building owners and operators to identify inefficiencies that might otherwise go unnoticed. It also provides existing and potential occupants insight into the efficiency and cost effectiveness of the building's operations, helping to inform real estate related decisions. In this context, such programs are intended to create an incentive for energy efficiency improvements by placing buildings in competition with each other as the real estate and investment markets consider energy costs. In addition, these programs create a structure that allows the market to value energy performance and provide the data needed to effectively manage energy consumption.



State Department
of Environmental
Conservation,
625 Broadway

Several U.S. cities, including Austin, Texas; Washington, D.C.; Seattle; and San Francisco, have adopted building energy benchmarking and disclosure laws. Non-residential properties tend to be the focus of these existing programs, with the minimum building square footage ranging from 10,000 to 50,000. All programs require monthly electric and natural gas bills, and some require water usage data. Benchmarking is primarily carried out using the ENERGY STAR® Portfolio Manager program.

An evaluation of existing benchmarking programs found a statistically significant effect on energy consumption from the adoption and implementation of building energy benchmarking and disclosure laws. To help Albany's larger commercial and multi-family building owners realize similar savings, the City will require reporting of annual energy consumption and/or benchmarking and disclosure of energy consumption prior to sale. The City will develop standards appropriate for each sector covered by this requirement and leverage existing benchmarking tools, such as ENERGY STAR® Portfolio Manager. To support the annual reporting process, the City will coordinate with National Grid to create a process for utility data to be easily provided to building owners or directly entered into the benchmarking system, consistent with data transparency efforts encouraged in the new Reforming the Energy Vision (REV) paradigm. Once thresholds, sectors, standards and processes have been established, the City will adopt a policy or ordinance to formalize and implement the energy benchmarking and/or disclosure program.

Implement financing strategies that support the residential and commercial sectors in implementing energy efficiency upgrades

Initiative 5: Participate in a Commercial Property Assessed Clean Energy program



Property Assessed Clean Energy (PACE) programs allow commercial property owners to borrow money from a local government to cover capital costs for energy improvement projects and renewable energy installations. In June 2014, the New York Green Bank provided a letter of credit to the Energy Improvement Corporation (EIC), a non-profit local development corporation, to extend Energize NY PACE financing to large jurisdictions throughout the state. Energize NY PACE financing makes energy efficiency projects more economically feasible for commercial property owners by funding the entire project cost upfront, which is then repaid through a lien on the property tax bill over a term of five to 15 years. Albany will participate in existing commercial PACE programs to help local businesses finance energy efficiency and renewable energy projects.

To participate, the City of Albany or Albany County will pass legislation adopting a PACE financing program, sign a property tax increase agreement and submit a formal letter requesting EIC membership. Once a member, the Energize NY Finance program will be available for Albany's non-residential buildings, including commercial offices, retail, medical institutions, industrial facilities, multifamily buildings, not-for-profit businesses and commercially-owned residential property. Increasing accessibility to PACE financing will stimulate investment in energy efficiency or renewable energy projects at commercial properties and create clean energy jobs in the city.



ENERGIZE NY™
FINANCE

Initiative 6: Launch a new neighborhood energy challenge



Energy reduction challenges creatively engage residents and businesses to take action to lower their energy bills and reduce greenhouse gas emissions through big and small steps, such as replacing light bulbs with more efficient lamps, walking to work or turning down the thermostat. The social component of a neighborhood energy challenge spurs positive behavior change often through the encouragement of the signing of public pledges, sharing information, providing resources for low-cost ways to save energy and reporting progress to compete for either recognition as a green, sustainable neighborhood or earn a green project enhancement for the local community.

The City of Albany will launch a new neighborhood challenge based on best practices from other jurisdictions. A successful neighborhood energy challenge establishes the scope and framework for energy reductions, and could include a focus on water, waste and/or transportation. To support participants and drive competition, the City and/or its partners will look to identify achievable goals and provide supporting materials, such as a public website with instructions for participants, as well as a checklist or online tool for reporting progress. The City will make involvement easy by providing achievable energy reduction goals and specific steps to realize those goals. The City will also create an online space for reporting and tracking

progress to help inspire others to join the challenge and keep participants engaged in behaviors that become sustainable habits.

In 2012, Albany's Affordable Housing Partnership completed a year-long neighborhood energy challenge that included participants who received residential energy efficiency audits supported by NYSERDA. The City will build off existing resources and lessons learned from that challenge to create a more structured program with specific actions and defined reporting requirements. In addition to engaging homeowners, the City will promote energy efficiency resources for tenants, such as the EmPowerNY program. By placing a strong emphasis on GHG emission reductions and sustainability, Albany will be a model for civic engagement and economic prosperity through increased energy efficiency and cost savings.

Implement energy conservation measures in municipal buildings to reduce energy use by 20 percent by 2020

Based on 2011 data Albany's municipal buildings consumed 89,879 mmBtu, resulting in nearly \$1.7 million in energy costs and 5,511 metric tons of GHG emissions. Identifying opportunities to reduce energy use in municipal buildings is critical for the City to save money and reduce its environmental impact. In 2014, ASHRAE Level 1 energy audits were completed in a number of City-owned facilities, including water and wastewater treatment facilities. As a result, a comprehensive list of energy conservation measures (ECMs) have been recommended, including opportunities for lighting upgrades, HVAC duct and pipe insulation, efficiency improvements for plumbing fixtures and pumps, and installation of variable frequency drives. Some of the key findings that the ECMs aim to address include reactive (instead of preventive) maintenance; a number of old and failing steam traps; lack of or poorly functioning building controls and settings; improperly sized HVAC equipment; and insufficient insulation and building envelope penetration.

Albany Fire Station No. 1





Boiler installation

Initiative 7: Update existing service contracts to cover energy saving maintenance procedures and equipment upgrades



Third-party service contractors are responsible for conducting maintenance on several mechanical systems in City buildings. Because of municipal staff capacity limitations and the specialized knowledge necessary for some mechanical systems, the City relies on service contracts to ensure that maintenance activities are carried out regularly and are not impacted by other facility or staffing issues.

The City will utilize service contracts for implementation of ECMs by updating the contracts to include equipment upgrades, equipment specifications and other maintenance procedures that have been identified as having energy saving potential. Benefits of addressing ECMs under service contracts include minimizing additional workload placed on existing City personnel and minimizing the need to make new hires, which reduces overhead costs.

Initiative 8: Implement preventative maintenance procedures through training and reallocation of existing resources



Due to a combination of many factors, including the large number of aging City buildings, a limited number of maintenance staff, along with the existing job responsibilities of facility staff,

the ASHRAE Level 1 energy audits identified lapses in equipment and building maintenance. This, in turn, has led to a large number of energy inefficiencies in Albany's municipal facilities. In many cases, facility staff is only able to perform equipment maintenance when issues arise. This reactive maintenance is much less efficient and more costly than preventative maintenance. Implementation of preventative maintenance, which involves a series of operational, maintenance and management tasks, can prevent system failures and keep equipment functioning optimally. To transition Albany's facility management towards preventative maintenance, the City will enhance training, update job descriptions, the work order system and operating procedures, and allocate required resources for facility staff.

Updates to job descriptions will provide existing employees, who are otherwise adequately trained to address most of the identified ECMs, the time to carry out ECM implementation on a part-time basis. To support their ability to spend time on preventative maintenance, and less time addressing deferred maintenance and system issues, the City may hire additional staff, including apprentices, journeymen and interns to support tasks that do not require highly trained tradesmen to complete and maintain.

Albany uses a work order system to disseminate work tasks along with basic background details, including location, priority, trade and a brief description of the assignment. With a software upgrade, building system inventory and simple programming, the work order system can also support implementation of preventative maintenance procedures. To take advantage of this capability, the City's Energy Manager—working with facility staff—will incorporate preventative maintenance tasks into the work order system, including programming and/or calibrating of thermostats, posting schedules, closing and latching windows and storm windows, replacing worn weather stripping, replacing steam traps, and others, as necessary.

Initiative 9: Set up a revolving energy fund



Relying on the traditional City budget process to provide funding for ECM implementation could result in inconsistent funding that varies significantly each year, making implementation and ongoing efficiency improvements difficult to plan. To better support efficiency efforts and realize tangible improvements to municipal buildings, the City will explore the feasibility of establishing a revolving energy fund for ongoing implementation of ECMs.

An effective program would make funds available within a reasonable time frame and with minimal overhead, allow for multiple ECMS to be implemented at any given time, and be able to be replenished and reallocated for additional investment. This approach supports the overall implementation of the Albany Energy Plan by promoting energy programs and policies that are self-sustaining and that generate savings that can in turn be funneled back into additional efficiency and sustainability efforts.

Albany will explore best practice models in developing similar funds, including those developed for Ann Arbor, Michigan, and San José, California. The City will also evaluate potential seed funding sources, including allocation through the municipal budget or through the issuance of bonds. If found to be feasible, the City will draft a standard operating procedure, outlining the parameters, methodology and requirements for use of the funds. This will include the level of replenishment back into the fund and the treatment of rebates and incentives obtained from implemented energy measures.

Initiative 10: Utilize existing funding programs to cost share higher level technical assistance



NYSERDA provides technical assistance and funding to municipalities to assist in analyzing and implementing energy savings measures through its FlexTech program, which can cover up to half the cost of procuring consulting engineering assistance.

The City will pursue FlexTech support to conduct comprehensive energy audits for high cost and consumption municipal buildings based on the

existing site survey audits. These energy audits will help the City identify additional short- and long-term energy conservation measures to save money and lower emissions, allowing for a comprehensive implementation strategy that prioritizes ECM implementation across the City's portfolio. Additionally, the City will look to utilize this funding to implement other municipal energy management activities, including general feasibility studies for equipment replacement and upgrades, retro-commissioning implementation, O&M procedures, procurement support (e.g., RFP drafting and proposal evaluation), and reviewing comprehensive energy audits.

Initiative 11: Incorporate energy efficiency into the Water and Wastewater Master Plans



Water and wastewater treatment are energy-intensive processes that are responsible for a significant portion of the City's energy costs. The City is required to update its Water and Wastewater master plans every five to 10 years. To help reduce costs and emissions, the City will incorporate energy efficiency and demand management into its Water and Wastewater master plans.

Specifically, the City will include strategies to enable facilities to focus on process improvements that would improve energy efficiency, including: benchmarking and continuous monitoring of energy use; review of current operation and maintenance procedures; assessment of facilities' demand and consumption profiles; and feasibility studies for on-site energy generation and renewables. The Water and Wastewater master plans will also include the identification and implementation of ECMs, such as the installation of building management systems and other energy saving capital improvements, as well as retro-commissioning.

By including energy efficiency goals and strategies in the Water and Wastewater master plans, the City's Department of Water and Water Supply (DWWS) and the Albany County Sewer District will take a holistic approach to managing Albany's water and wastewater infrastructure, with the goals of improving efficiency, saving money, protecting the environment and promoting public health.



Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Update and enforce zoning and building codes to promote energy efficient and resilient buildings				
Initiative 1: Adopt a Residential Energy Conservation Ordinance (RECO)				
Dept. of Development & Planning, Dept. of Buildings & Regulatory Compliance	AHA, AHP, OES, ACLT, UTA, ACDA, CDACD	NYSERDA EmPower NY, The Community Loan Fund of the Capital Region	Short-Term	Arrange stakeholder outreach, develop ordinance, propose to applicable legislators
Initiative 2: Establish energy efficiency standards through green building code and development incentives				
Dept. of Development & Planning, Dept. of Buildings & Regulatory Compliance	ACDA Albany IDA	NYSERDA CGC Phase II Grant and City Match	Short-Term	Continue development of Albany 2030 Sustainable Code and Unified Development Ordinance. Begin coordination with Albany IDA
Initiative 3: Promote building energy codes training for designers, contractors, and local code officials				
Dept. of Buildings & Regulatory Compliance	NYSERDA Independent contractor	Comprehensive low and no-cost training is available from NYSERDA	Short-Term	Find a champion within Department of Buildings & Regulatory Compliance
Initiative 4: Implement a building energy benchmarking and disclosure program or energy labeling program				
Dept. of Development & Planning, Dept. of Buildings & Regulatory Compliance	OES Business community	—	Short-Term	Develop Policy
Implement financing strategies that support the residential and commercial sectors in implementing energy efficiency upgrades				
Initiative 5: Participate in a Commercial Property Assessed Clean Energy Program				
Albany County or Dept. of Development & Planning, Property Tax Assessor & Tax Receiver	EIC EnergizeNY NYSERDA	Energy Improvement Corporation	Short-Term	Pass legislation adopting a PACE financing program and sign a property tax increase agreement
Initiative 6: Launch a new neighborhood energy challenge				
OES	AHA, AHP, NYSERDA, CDACD	Funding for home energy audits and improvements are provided through NYSERDA and EmPower NY.	Short-Term	Meet with key partners and determine framework, roles and responsibilities. Create the supporting materials for the challenge including guidance and a website or other mode of communication and solicit participation from target audience/ neighborhoods.

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

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Implement energy conservation measures in municipal buildings in order to achieve a twenty percent reduction in energy use by 2020				
Initiative 7: Update existing service contracts to cover energy saving maintenance procedures and equipment upgrades				
Purchasing, Budget Office	DGS, DWWS, APD, Fire & Emergency Services, Service Contractors	—	Short-Term	Identify ECMs and associated contracts to change
Initiative 8: Implement preventative maintenance procedures through training and reallocation of existing resources				
DGS, Budget Office	DWWS, APD, Fire & Emergency Services	—	Short-Term	Identify ECMs that can be addressed by staff
Initiative 9: Set up a revolving energy fund				
Budget Office	Mayor's Office, OES, OAC	Grants	Medium-Term	Identify options
Initiative 10: Utilize existing funding programs to cost share higher level technical assistance				
OES, Budget Office	DGS, APD, DWWS, Fire & Emergency Services, Engineering Consultants, NYSERDA	NYSERDA Programs	Medium-Term	Meet with NYSERDA representatives to discuss existing funding programs
Initiative 11: Incorporate energy efficiency into Water and Wastewater Master Plans				
AWD	Albany County Sewer District	Existing DWWS planning budget	Medium-Term	Review results of Level 1 Energy Audits and begin incorporating into next master plan

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



Reduce Fossil Fuel Consumption in the Transportation Sector

Summary of Objectives and Initiatives

Upgrade transportation infrastructure to maximize efficiency and reduce automobile dependency

Initiative 1: Expand traffic signal optimization program

Initiative 2: Build on- and off-road bicycling infrastructure within the city

Initiative 3: Implement the City's Complete Streets policy

Expand and improve multi-modal transportation options

Initiative 4: Implement a bike-share system for the city

Initiative 5: Expand bus rapid transit (BRT) routes throughout the city

Remove barriers to installing alternative fuel infrastructure and using alternative fuels

Initiative 6: Provide expedited permitting for electric vehicle charging infrastructure

Maximize efficiency of vehicle fleets

Initiative 7: Adopt a right-size approach to municipal fleet management as part of a green fleet policy

Maximize efficiency and reduce the costs of streetlights

Initiative 8: Convert streetlights to more energy efficient technologies

Within its jurisdiction, the City of Albany has a robust network of vehicular infrastructure that serves an estimated 1 billion vehicle miles traveled (VMT) per year. The transportation sector is responsible for more than one third of citywide energy consumption. Reducing energy consumption and emissions from this sector requires a thoughtful and comprehensive approach that reduces overall fuel consumption and shifts people from traditional single-occupancy vehicles to alternative modes of transportation such as high-occupancy vehicles, bicycling and walking. This approach will also need to include support for high-efficiency and alternative fuel vehicles, infrastructure, transit-oriented development and smart growth principles.

The City is actively employing strategies to reduce overall VMT, with a focus on creating a more sustainable transportation system throughout the city and the region. In collaboration with the Capital District Regional Planning Commission, Capital District Transportation Committee (CDTC), and the Capital District Transportation Authority (CDTA), NYS DOT, and NYSEDA, the City has improved bicycle and pedestrian infrastructure, enhanced public transit routes, and completed a number of planning studies.

Transit-Oriented Development (TOD) and smart growth are key principles embedded in the Albany 2030 Sustainable Code Project. This effort has been augmented through active partnerships with CDTC in the planning and implementation of the New Visions Regional Transportation Plan, which includes service and connectivity of multiple modes of transportation and land use planning.

Upgrade transportation infrastructure to maximize efficiency and reduce automobile dependency

Initiative 1: Expand traffic signal optimization program



Inefficient traffic signal timing and equipment can unnecessarily increase traffic congestion, fuel consumption and air pollution. Traffic signal optimization programs involve retiming and/or synchronization of traffic signals at key intersections to improve the progression of traffic along specified corridors at peak demand. The Federal Highway Administration estimates that signal improvements on arterial road systems can reduce travel delays between 15 and 40 percent, resulting in reduced fuel consumption and air polluting emissions.

Albany has begun implementing a signal optimization program to reduce traffic congestion and associated impacts. The City has already collected and evaluated traffic-related data from select intersections and corridors targeted for improvement. Optimized signal timings are being developed for five main traffic corridors using

CASE STUDY

City of Portland Traffic Signal Optimization

In 2002, the City of Portland Oregon, implemented a traffic signal optimization program that enhanced traffic signal timing at 135 intersections on 16 streets within its jurisdiction. The City received funding from The Climate Trust, a non-profit organization that finances and verifies carbon offset projects, to support this effort. To date, the traffic signal optimization has reduced gasoline consumption by 1,750,000 gallons and greenhouse gas emissions 15,460 tons per year. Portland is looking to expand this program.

Source: <http://t4america.org/2010/10/13/smarter-transportation-case-study-5-traffic-signal-optimization-portland-oregon/>

Signal Improvements can reduce travel delays between

15 and 40%

Syncro optimization software. This data will then be entered into the traffic signal controller at each intersection and the central system software. Albany will continue analyzing traffic data and add new intersections to the central traffic signal system.

Initiative 2: Build on- and off-road bicycling infrastructure within the City



Over the past five years, the City of Albany has engaged in numerous efforts to increase pedestrian and bicycle activity. These include the City of Albany Bicycle Master Plan (December 2009), the City of Albany Bicycle Signage and Wayfinding Strategy (June 2013), and the City of Albany Bike-Share Feasibility Study (June 2013). Additionally, the City has been incorporating on-road bicycle accommodations in roadway improvement projects, including along Delaware Avenue, Broadway, New Scotland Avenue, Clinton Avenue, and Northern Boulevard. These efforts

were facilitated by Albany's demographics, existing infrastructure and demand for enhanced bicycling infrastructure.

Focusing on the routes and destinations identified in the City of Albany Bicycle Master Plan, the City will continue to add bicycle lanes, racks and other infrastructure along key routes to support the development of a citywide cycling network. The City will also investigate the potential for off-road mixed-use paths, especially along former railroad rights-of-way. Former railroad rights-of-way, such as the Albany County Rail Trail, are typically flat, straight, and sheltered from vehicle traffic, providing safe and comfortable cycling conditions.

Initiative 3: Implement the City's Complete Streets policy



To further support Albany's efforts to enhance bicycle and pedestrian infrastructure and the safety and livability of the city's neighborhoods, the City's Common Council adopted a Complete Streets ordinance. Complete Streets are streets that are designed with safe access for all users in mind, including motor vehicles, public transit vehicles and users, bicyclists, and pedestrians of all ages and abilities.

Since the passing of the Complete Streets ordinance, the City has signed a Memorandum of Understanding with the CDTC and received funding from the CDTC's Linkage Program to produce a Complete Streets Policy and Design Manual. The manual will establish criteria for the various types of streets and intersections found throughout the city. It will also detail design guidelines and outline policies and standards for implementation. The City's municipal departments will refer to this manual when instituting or approving any public or private street construction, reconstruction, or resurfacing projects.



Cyclist at Corning Preserve



Expand and improve multi-modal transportation options

Initiative 4: Implement a bike-share system for the city



In 2013, the City of Albany commissioned a Bike-Share Feasibility Study, which concluded that the city's physical, demographic and political environments were conducive to the implementation of a bike sharing system. The study recommends that the City implement a system to be owned by the City or a non-profit organization and operated by a private vendor. The City's readiness for a bike-sharing system is exemplified by its participation in a week-long bike-share pilot program in August 2014.

Following the recommendations made in the feasibility study, the City will implement a bike-sharing system that will be seasonal, offer both annual and short-term memberships, and be well integrated with the CDTA's bus routes and stations. The City will consider future expansion of service times and station locations from the onset of system planning and design.

While direct energy savings and GHG emissions reductions resulting from the operation of a bike-sharing system will be modest, the system will contribute to an overall mode-shift by promoting cycling in the city. This will showcase the City of Albany as a leader in sustainability as well as help support local businesses located near the cycling infrastructure.

Albany bike share pilot program



Initiative 5: Expand bus rapid transit routes throughout the city



Roughly half of Albany's population lives within a quarter mile of a bus stop; however, just 13 percent use mass transit to commute. Improving transit usage can directly decrease the vehicle miles travelled by single-occupancy vehicles and related GHG emissions. Additionally, improving transit access and reliability can encourage economic development along transit corridors, connect residents with jobs and reduce household spending on transportation. Increasing transit usage in the city can be achieved by making existing routes more frequent and reliable, and by adding new routes.

The CDTA recently added bus rapid transit (BRT) lines, known as BusPlus, between Albany and Schenectady. These lines have fewer stops than local buses, dedicated bus lanes, and Intelligent Transportation Systems features such as signal priority. All of these elements help make BusPlus lines significantly faster than traditional buses, allowing them to better compete with single-occupancy vehicles. Implementing proposed BusPlus lines along the River Corridor and Washington/Western avenues routes is expected to improve transit mode share by shifting trips away from single occupancy vehicles. The City will work with CDTA to improve existing routes and implement additional ones, including the proposed River Corridor and Washington/Western avenues BusPlus routes.

Remove barriers to alternative fuel infrastructure and alternative fuels use

Initiative 6: Provide expedited permitting for electric vehicle charging infrastructure



In 2012, the City of Albany completed an Electric Vehicle Feasibility Study that found the city's demographics and infrastructure make it a good candidate for developing alternative fuel infrastructure, including electric vehicle (EV) charging stations. There are 12 EV charging stations in Albany, 10 of which are publicly accessible.



Electric vehicle charging stations at Albany International Airport

Increasing the use of EVs over conventional vehicles requires a more robust EV charging infrastructure. While the City's codes do not restrict development of electric vehicle charging infrastructure, the City — which is an active member of the Capital District Clean Communities Coalition — would like to more actively encourage the use of EVs and the development of EV charging infrastructure.

To encourage developers to incorporate EV charging infrastructure into their projects, the City will provide expedited permitting and inspection processes as applicable. In association with the Albany 2030 Sustainable Code Project and Unified Development Ordinance, the City will also update its zoning regulations to be more favorable to the development of EV charging infrastructure.

Maximize efficiency of vehicle fleets

Initiative 7: Adopt a right-size approach to municipal fleet management as part of a green fleet policy



The City of Albany's municipal fleet consists of 586 vehicles. It costs \$1.8 million per year to operate and generates more than 5,000 metric tons of greenhouse gas emissions. The City has the opportunity to reduce fuel consumption and greenhouse gas emissions by right-sizing vehicles, improving fleet management, and incorporating alternative fuels and fuel-efficient vehicles.

As often is the case, the City has more vehicles and equipment than is required for its operations. Further, many vehicles are larger — and therefore more fuel intensive — than their functions require. To address this situation, the City will adopt a green fleet policy and right-size approach to municipal fleet management. To do so, the City will create and maintain a comprehensive vehicle inventory, develop minimum utilization criteria, and conduct vehicle condition and purpose assessments.

In addition, the City will require its departments to purchase fuel-efficient and low-emission vehicles and equipment whenever practicable. To implement the green fleet policy, the City will perform a complete fleet inventory and identify minimum efficiency requirements by vehicle type (e.g., heavy duty, light duty, etc.).

CASE STUDY

TCI Northeast Electric Vehicle Network

In 2011, the Transportation Climate Initiative established the Northeast Electric Vehicle Network to support the widespread adoption of electric vehicles (EVs) by increasing public access to charging stations across the District of Columbia and 12 states: Connecticut, Delaware, Maine, Massachusetts, Maryland, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island and Vermont. Funded by a \$1 million U.S. Department of Energy grant for EV readiness, these states and the district are improving planning processes for EV infrastructure and developing public-private partnerships to locate charging stations along interstate highways. With approximately 1,000 public charging stations and 70 companies committed to the deployment of electric vehicles, these participants are sharing resources and infrastructure needed to reduce greenhouse gas emissions while benefitting from the local economic growth and job creation related to electric vehicles.

Source: <http://www.transportationandclimate.org/content/northeast-electric-vehicle-network>



Albany Police Department
Center Station

This information will help the City determine the appropriate size and composition of the fleet and plan for eventual vehicle reassignment, replacement and/or elimination through the retirement process. This in turn will inform the setting of fuel consumption and emissions reduction targets. To support the implementation of the green fleet and right sizing policies, the City will track key performance metrics (e.g., mileage, fuel consumption, percent of fleet using alternative fuels, etc.) and perform regular progress reviews to assess the effectiveness of policies and the viability and applicability of current technology.

The outcome of these efforts will balance the fleet's energy and environmental performance with the need to ensure that the City's operational needs are met. Through this approach, the City aims to reduce fuel consumption and maintenance needs, helping to lower the operating costs associated with fuel, maintenance and insurance.

Maximize efficiency and reduce the costs of streetlights

Initiative 8: Convert streetlights to more energy efficient technologies



The City will work with National Grid and the New York State Public Service Commission (PSC) to develop a plan to convert existing street lights to more energy efficient technologies, such as LEDs, high-efficiency metal halide or induction lighting. Energy-efficient street lighting can reduce energy and maintenance costs as well as improve lighting quality and visibility.

The City has already taken some important first steps in this process by convening National Grid, NYSEDA and municipal maintenance and finance staff to discuss challenges and options associated with streetlight conversions. Continued collaboration among parties will be critical to finding a solution that reduces energy consumption and saves the City money. Albany will also evaluate possible opportunities to engage with the New York Green Bank to leverage gap financing or credit enhancements for retrofitting of LED streetlights. The next step for the City will be to determine which path it will pursue in its efforts to convert streetlights.

One option is to support National Grid's streetlight conversions and to participate in efforts with the PSC to establish a new tariff for LED streetlights that is fair to the utility and the customer, and reflects the energy and maintenance savings the streetlight conversions will achieve. Another option is for the City to work with National Grid on a strategy to purchase the assets, enabling the City to convert and maintain the streetlights.

CASE STUDY

City of San Jose Green Fleet Policy

The City of San Jose, California, instituted a green fleet policy in 2007. Associated targets include a nearly 30 percent reduction in greenhouse gas emissions and a nearly 43 percent reduction in fuel consumption by 2022, using 2007 as a baseline year. Also by 2022, the City has targeted 100 percent of its public fleet vehicles to run on alternative fuels.

Source: <http://www.sanjoseca.gov/index.aspx?NID=2953>

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Upgrade transportation infrastructure to maximize efficiency and reduce automobile dependency				
Initiative 1: Expand a traffic signal optimization program				
APD Traffic Engineering	Mayor's Office; Common Council; DGS, CDTA National Grid, NYS DOT	Federal and state transportation grants, CDTC, Internal Capital, Debt Financing, Existing Traffic Engineering Budget, Federal Congestion Mitigation and Air Quality (CMAQ) program	Medium-Term	By the end of 2014, approximately 100 traffic signals will have been incorporated into a central traffic signal system. Continue to bring new intersections online with central traffic signal system
Initiative 2: Build on- and off-road bicycling infrastructure within the city				
APD Traffic Engineering, Dept. of Development & Planning, DGS	NYS DOT, CDTC, Community cycling advocates, neighborhood groups, national groups like League of American Bicyclists	Albany road improvement budget, NYS DOT, CDTC	Short-Term	Plan has been conducted and installation of some infrastructure is underway. Funding should be secured in future budgets to continue expanding infrastructure
Initiative 3: Implement the City's Complete Streets policy				
Dept. of Development & Planning, APD Traffic Engineering, DGS	APD, Fire & Emergency Services, Capital District Transportation Committee, community cycling and walking advocates	CDTC, City match	Medium-Term	Collaborate with CDTC to develop RFP for development of policy and design guidelines
Expand and improve multi-modal transportation options				
Initiative 4: Implement a bike-share system for the city				
Dept. of Development & Planning, APD Traffic Engineering, DGS	APD Traffic Engineering, DGS, CDTC, community cycling advocates, academic institutions, local businesses	Federal and State grants, CDTC, Private Funders, advertising, user fees	Medium-Term	A Bike Share Feasibility Study identifying potential site locations has already been completed. The next step is to develop funding methods and establish partnerships
Initiative 5: Expand bus rapid transit routes throughout the city				
CDTA; APD Traffic Engineering, Dept. of Development & Planning	CDRPC, CDTC	Federal funding, CDTA	Long-Term	Actively promote current BRT routes and engage with partners to plan for additional routes
Remove barriers to installing alternative fuel infrastructure and using alternative fuels				
Initiative 6: Provide expedited permitting for EV charging infrastructure				
Building & Regulatory Compliance, Dept. of Development and Planning	OES, NYSEDA	Little funding necessary (can be funded under the Albany 2030 Sustainable Code Project)	Short-Term	Incorporate code update recommendations from EV Feasibility Study into Albany 2030 Sustainable Code Project
Maximize efficiency of vehicle fleets				
Initiative 7: Adopt a right-size approach to municipal fleet management as part of a green fleet policy				
Budget Office, OES, DGS	Purchasing, DWWS, APD, Fire & Emergency Services	NYSEDA, Empire Cities	Medium-Term	Draft, evaluate, and implement evaluative criteria to determine which vehicles should be "right-sized". Perform a fleet inventory
Maximize efficiency and reduce the costs of streetlights				
Initiative 8: Convert streetlights to more energy efficient technologies				
Budget Office, OAC, DGS	Mayor's Office, Common Council, OES, APD Traffic Engineering, National Grid, NYSEDA, Public Service Commission, NYPA	Internal Capital; Debt Financing; New York State Existing Facilities Program; NYPA Energy Services Programs for Public Entities	Medium-Term	Continue discussions with NYSEDA and National Grid to determine best strategy

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



Increase Grid Efficiency and Energy Security While Decreasing Reliance on Fossil Fuels

Summary of Objectives and Initiatives

Expand use of renewable energy to power municipal buildings and operations

Initiative 1: Enter into a solar power purchase agreement

Expand use of renewable energy to power commercial, industrial, and residential facilities

Initiative 2: Install solar powered generators at critical facilities

Initiative 3: Reduce or eliminate permitting fees for renewable energy installations

Improve the resilience of energy delivery systems

Initiative 4: Plan for development of microgrids

Initiative 5: Establish partnerships for resilient grid development

Maintaining a functioning energy supply and distribution infrastructure is critical for public safety, access to services, reducing economic losses and providing a foundation for powering economic activity. As this infrastructure is replaced in the coming years, Albany, National Grid and state agency partners will focus on modernizing the grid and incorporating smart and renewable technologies that enhance efficiency and reliability while reducing pollution and greenhouse gas emissions.

As the primary electric and natural gas provider in Albany, National Grid operates and maintains the transmission and distribution networks and provides outage management services. The electricity supplied by National Grid is generated from a mix of fuels that primarily consists of nuclear energy, natural gas, hydro-electric

and coal, with smaller amounts coming from biomass, solar and solid waste. Albany's fuel mix includes 14 percent more nuclear than the state average, which, from an emissions standpoint, leads to a relatively cleaner fuel mix.

The combination of New York's high electricity rates, the existence of numerous incentive programs and a changing regulatory framework (particularly with the implementation of the Reforming the Energy Vision proceeding), improve the economics for further cleaning the fuel mix through increased renewable energy generation. Since 2006, the City has approved permits for the installation of 1,780 kilowatts of solar on residential, commercial, non-profit and institutional buildings. Interest in solar has been supported by the City's participation in the NYSolar Smart plan, a strategic effort supporting the U.S. Department of Energy SunShot Initiative and the NY-Sun Initiative, intended to increase solar use through standardizing permitting, reducing installation costs and training local permitting officials.

National Grid's 15-Year Plan

When it comes to reliability of the grid, equipment degradation plays a significant role in service interruptions. National Grid issued an asset condition report and a 15-year plan focused on improving reliability. The plan includes initiatives to address additional capacity and congestion relief, projected load growth, increases in fault levels, the need to replace over-worked breakers, and thermal issues observed on transformer banks.

New York has a reliable electric system, but its transmission lines are aging and will be in need of replacement over the next 10, 20 or 30 years (**Figure 10**).

Source: 2012 New York State Transmission Assessment and Reliability Study (STARS) Phase II Report

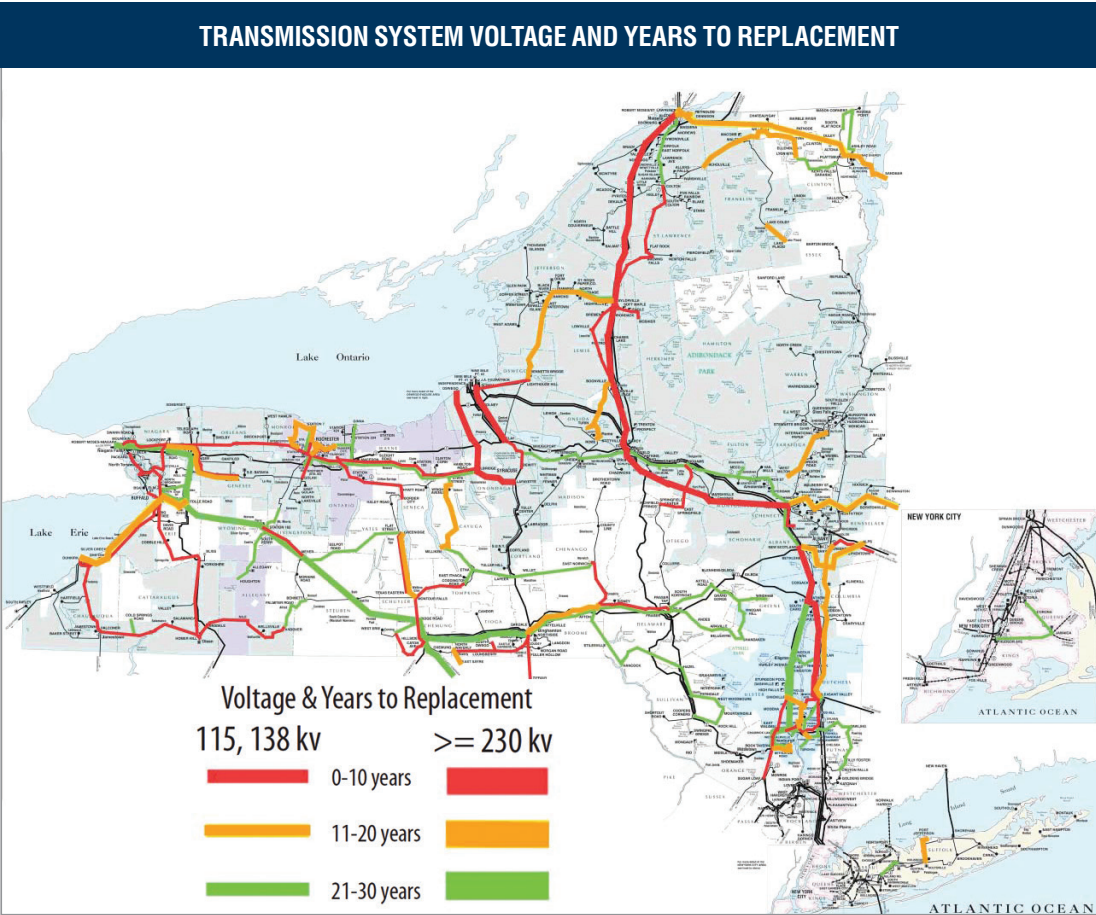


Figure 10

Source: 2012 New York State Transmission Assessment and Reliability Study (STARS) Phase II Report

Expand use of renewable energy to power municipal buildings and operations

Initiative 1: Enter into a solar power purchase agreement



A power purchase agreement (PPA) is a financial arrangement that can involve a third-party developer that designs, finances, purchases, installs and maintains solar photovoltaic (PV) panels and related equipment on the host's property. In exchange, the host purchases the power generated by the PV system from the developer for a predetermined period (usually 20 years). A developer may be able to offer lower rates than the utility because of the availability of tax credits and other renewable energy incentives. Numerous companies are working to standardize language

and structure for municipal PPAs which could reduce soft costs and encourage more municipalities to work together with suppliers of renewable energy. Under a PPA, government agencies and other tax-exempt organizations can indirectly take advantage of the federal investment tax credit and depreciation bonus that are available to for-profit firms for renewable energy installations.

In September 2013, the City released a Request for Proposals (RFP) for renewable energy design and installation services for three City-owned locations: 85 Erie Boulevard, the Loudonville Reservoir, and property in Coeymans, New York. The RFP stated the City's preference to lease the renewable energy equipment. The City's next steps are to select a design firm and to work to develop drawings and complete necessary applications to National Grid. The projects will provide lessons learned to expand the program to include other City-owned sites, potentially including ground-mounted and rooftop solar arrays.



CASE STUDY

Town of Clarkstown Power Purchase Agreement

The Town of Clarkstown, New York, financed a 2.5 MW, 8,000-panel solar farm on a former landfill site in West Nyack, utilizing a PPA with a solar developer, OnForce. OnForce will own and operate the facility and the Town will purchase all of the electricity generated by the system for 20 years.

The agreement includes a stipulation that the Town will receive a \$100,000 payment for project expenses incurred—such as expenses for a feasibility study, New York State Department of Environmental Conservation (DEC) permitting fees, and applications for grid interconnection and remote net metering through its utility, Orange and Rockland (a subsidiary of Consolidated Edison.)

Expand use of renewable energy to power commercial, industrial and residential facilities

Initiative 2: Install solar powered generators at critical facilities



One of the recommendations of the City's Climate Change Vulnerability Assessment and Adaptation Plan is to increase local renewable energy supply. Consistent with this, solar-powered generators will be installed at critical facilities throughout the city to enhance power reliability at these locations. Critical facilities include police and fire stations, health service stations, schools and other facilities that can serve as shelters during emergencies. It is essential that these facilities maintain reliable power sources.

Solar power, when combined with energy storage technologies, improves resiliency by allowing critical facilities to operate during grid outages and times of fuel disruption. Solar power also reduces reliance on fossil fuels, reducing fuel costs and greenhouse gas emissions. In comparison to diesel generators, solar-powered generators also improve local air quality and reduce noise pollution.

Establishing areas where multiple clean distributed generation arrays are connected together may further enhance reliability, decrease demand on the grid and reduce costs associated with necessary grid upgrades.

Solar panels



Initiative 3: Reduce or eliminate permitting fees for renewable energy installations



The installation of renewable energy sources on buildings and other types of properties requires building and electrical permits to ensure that engineering and safety standards are met. The installed renewable energy capacity in Albany is shown in **Figure 11**. The City of Albany will reduce or eliminate permitting fees for renewable energy installations, consistent with NYSERDA's desire to reduce soft costs and barriers to increased deployment of distributed energy resources through its Clean Energy Fund.

INSTALLED RENEWABLE ENERGY CAPACITY BY SECTOR	
Sector	Nameplate capacity
Commercial	1,367 kW
Institutional	153 kW
Non-Profit	32kW
Residential	229 kW
Total	1,780kW

Figure 11

This initiative is supported by NYSERDA through the Cleaner, Greener Communities program, which awards funding to local governments that adopt streamlined permitting processes or other ordinances for installing PV systems less than 12 kW. Albany will customize the New York State Unified Solar Permit and extend this streamlined permitting process to include wind and other renewable energy installations to lower costs and increase the feasibility of projects.

By eliminating or reducing permitting fees for renewable energy installations, the City is joining other municipal leaders in demonstrating its support for community investment in renewable energy. Removing barriers and simplifying the process will help support a green innovation economy and spur local economic development. Distributed generation through renewable energy installations reduces greenhouse gas emissions and reliance on the larger, more vulnerable electric grid system. It also aligns with the emerging state regulatory framework and the New York State Public Service Commission's (PSC) Reforming Energy Vision (REV) initiative.

Improve the resilience of energy delivery systems

Initiative 4: Plan for development of microgrids



A microgrid is a localized energy system within a fixed boundary that is capable of generating and distributing energy and electricity independently or in conjunction with the larger electric grid system. Severe weather events, such as Tropical Storm Irene, Superstorm Sandy, and the Northeastern U.S. blackout of 2003, have demonstrated that regional energy supply networks are vulnerable and that improving local energy delivery systems can better protect residents and businesses.

Microgrids increase community resilience by ensuring that emergency response and health-care providers retain power during extreme weather events, allowing them to continue to provide public health and safety services. Smart grid technology used in microgrid systems also increases the grid's capacity for renewable energy installations and compensates for intermittent solar or wind generation. Microgrids can also be configured to respond to energy pricing, which reduces energy costs for local businesses by automating the system to draw from the most cost-effective source.

With support from the NYS Department of State (DOS) and the NYS Department of Environmental Conservation (DEC), Albany is working with the Affordable Housing Partnership and members



The results of an energy efficiency upgrade at the Sheridan Avenue Steam Plant



of the Community Development Alliance to redevelop 68.6 acres of the Sheridan Hollow neighborhood. The state-owned Sheridan Avenue Steam Plant in Sheridan Hollow provides steam for heating and cooling Empire State Plaza using natural gas boilers and backup gasoline generators. As part of the BuildSmart NY implementation of Executive Order 88, energy efficiency retrofits were completed at the plant in 2013. The Albany 2030 Comprehensive Plan identified the neighborhood as a brownfield opportunity area, which could potentially be suitable for future renewable energy installations or energy storage sites.

Albany will assess the feasibility of expanding operations or improving smart grid capabilities to serve the energy demands of Sheridan Hollow or a larger district. The City will also study the feasibility of microgrid development around the Sheridan Avenue Steam Plant. These assessments will involve mapping existing infrastructure, evaluating the plant's physical capacity and connectivity to the larger distribution network, and determining whether service could be

expanded to additional properties. Funding for such projects may be possible through Governor Cuomo's \$40 million dollar NY Prize competition for development of community microgrids announced earlier this year.

Utility involvement in microgrid development is essential to understanding regulatory barriers, system configuration requirements, charges for standby service, changing patterns of energy demand, and acceptable ownership models and billing structures (innovative frameworks and price signals for which will be created under the new Reforming the Energy Vision proceeding). The City will work closely with utility representatives, NYSERDA, NYPA, NYS Office of General Services (OGS) and other key stakeholders throughout this process.

Initiative 5: Establish partnerships for resilient grid development



Grid resiliency efforts are generally focused on strategies to prevent electricity outages during extreme weather and other natural disasters. Significant “grid hardening” efforts are underway by a number of state agencies and other organizations to protect electricity distribution networks. National Grid is also pursuing a regional approach to deploying smart grid technologies. Enhanced grid automation offers an opportunity to increase system performance and to control and improve system efficiency. Opportunities also exist for grid integrated renewable energy and technologies, such as battery storage, that help optimize renewable energy use. These initiatives provide opportunities and foundation to enhance system reliability and resilience.

To demonstrate the applicability of smart grid, distributed renewable energy and battery storage technologies, the City will form a smart grid working group. The group will include leading organizations in New York working on grid resiliency strategies, including NYSEERDA, NYPA, National Grid, NY Battery and Energy Storage Technology (NY BEST), the New York State Smart Grid Consortium, and the University at Albany. The working group will identify local business partners to develop a proof-of-concept microgrid and smart grid application in Albany.

The City will also seek out partnerships to develop a smart grid demonstration and education center to exhibit how different technological approaches result in a more secure and resilient grid. The center would be a showcase for policymakers and lawmakers in New York State and will further highlight the City of Albany’s leadership efforts in clean energy and enhanced energy security.

CASE STUDY

Duke Energy’s Envision Center

As an example of a smart grid demonstration site, Duke Energy’s Envision Center in Erlanger, Kentucky, was created to allow utility customers to experience the benefits of smart grid technologies and software. The center has exhibits that can simulate outages and recovery responses through smart grid technology. Other exhibits provide a close up view of integrated home energy systems, such as solar panels and plug-in hybrid vehicles. The showcase also includes an apartment complex with advanced metering and a power delivery control center with real time data monitoring.

The Envision Center also serves as a tool to educate government officials, policy makers and other key stakeholders on the benefits of a smarter grid. By conveying the numerous benefits of smart grid technology, the Center promotes a high level of engagement in the decision making process around future energy choices.

Source: <http://www.cincinnatiachamber.com/uploadedFiles/Events/EnvisionCenterDirections.pdf>



Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Expand use of renewable energy to power municipal buildings and operations				
Initiative 1: Enter into a solar power purchase agreement				
OES, DGS	Mayor's Office, Corporation Counsel, NYSEDA, National Grid, Private Sector Partners	Many PPAs require no upfront cost. Third parties take advantage of the NYSEDA PV Incentive Program and federal incentives for renewable energy and the City indirectly benefits from these incentives and tax breaks	Short-Term	Review results of 2013 RFP issued by the City. Work with design firm to create drawings and complete applications to utility and prepare for incentives applications.
Expand use of renewable energy to power commercial, industrial, and residential facilities				
Initiative 2: Invest in solar powered generators at critical facilities				
OES, Fire & Emergency Services, APD	National Grid, Property owners of critical facilities (hospitals, senior centers, etc.), NYSEDA	—	Medium-Term	Identify locations for installation. Collaborate with property owners at critical facilities, NYSEDA, and National Grid to develop plan for implementation.
Initiative 3: Reduce or eliminate permitting fees for renewable energy installations				
Building & Regulatory Compliance, Dept. of Development and Planning	OES, Budget Office	NYSEDA: Cleaner, Greener Communities (PON 2721 - Category 1)	Short-Term	Review current permitting processes and compare to best practices. Develop and adopt permitting standards for all renewable energy projects or customize NYS Unified Solar Permit and apply for CGC funding.
Improve the resilience of energy delivery systems				
Initiative 4: Plan for development of microgrids				
Dept. of Development & Planning OES	DGS, ACES, AHP, BID, NYS DOS, NYS DEC, NYS OGS, NYPA, BuildSmartNY, National Grid, NYSEDA	Build Smart NY, NYSEDA: Flex-Tech program (PON 1746), Existing Facilities (PON 1219), Combined Heat and Power (PON 2568), New Construction (PON 1601), Assisted Home Performance Program through ENERGY STAR.	Long-Term	Contact National Grid to discuss feasibility of microgrid development in Sheridan Hollow neighborhood. Contact New York Power Authority or New York State Office of General Services to determine if Sheridan Steam Plant can facilitate microgrid development.
Initiative 5: Establish partnerships for resilient grid development				
OES	NYSEDA, NYPA, National Grid, Consortium, BuildSmartNY, NY-BEST, SUNY Albany	Most funding from key partners with small investment from the City.	Medium-Term	Find champion in city to create a group with partners for Albany.

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

Summary of Cross-Cutting Themes

The Albany Energy Plan goes beyond advancing clean energy technologies, increasing energy efficiency, and sustainable operations of City buildings and infrastructure. It furthers the City's commitment to creating healthy, livable communities and strengthening the regional economy. Undertaking the energy and sustainability initiatives outlined in the plan will address four themes across all action areas, including:

- Municipal: cities leading by example
- Economic development: creating jobs and attracting businesses
- Infrastructure: preparing our cities for the future
- Climate action: reducing the City's carbon footprint

Municipal leadership: leading by example

As the capital of New York and home to the Albany County seat, Albany is well-positioned to demonstrate leadership in transitioning New York to a clean energy and sustainable economy. The Albany Energy Plan is more than an energy assessment and implementation roadmap; it is a beacon to other communities of holistic energy management with examples of how to implement cost-effective, sustainable strategies to increase operational efficiency and reliability. Local neighborhoods, institutions, businesses and residents can look to the plan and its associated resources to identify applicable projects and be inspired to take action within their own operations. The City will lead by example through efficient management of its own energy costs and consumption in its buildings, fleet and infrastructure.

Economic development: creating jobs and attracting businesses

Increasing energy efficiency, advancing technologies and locally generating renewable energy will keep money circulating in Albany's economy and allow the city to capitalize on the emerging industries of green innovation. Advancing environmentally sound technologies that harness and use energy efficiently will help lower business costs, making the city an attractive location for companies to locate. Energy efficiency measures

also support the City's downtown revitalization priorities. Several initiatives outlined in the Albany Energy Plan highlight statewide training opportunities that will allow people to upgrade their skills, facilitate goals of lifelong learning and prepare the workforce to assume positions in the jobs created locally.

Infrastructure: preparing our cities for the future

Due in part to rapidly aging infrastructure, communities are increasingly vulnerable to brownouts or blackouts which threaten economic productivity, public health and safety. To prepare for the effects of climate change and increased storm intensity and frequency, the Albany Energy Plan focuses on partnering with the state and utilities to modernize the grid and implement smart technologies that increase energy security and reliability. Through the implementation of supply and distribution infrastructure initiatives, Albany will enhance community resilience and ensure grid capacity for economic growth and the continuous integration of renewable energy systems.

Climate action: reducing the city's carbon footprint

The Albany Energy Plan aims to prepare the city for the impacts of climate change and works to limit Albany's contribution to greenhouse gas emissions through implementation of initiatives across all action areas. Since climate change is the result of the combustion of fossil fuels, there is an enormous opportunity to mitigate climate change through strategic energy management and planning and increased reliance on renewable energy. The initiatives outlined in the plan target the technological, operational and behavioral changes that can be made to significantly decrease energy consumption in buildings and vehicles and increase the share of Albany's energy generated from clean, renewable sources, thus decreasing the city's carbon footprint.

Implementation

The Albany Energy Plan will be implemented through a strategic and coordinated effort among City departments and community stakeholders. The City's Office of Energy and Sustainability will oversee the effort in close coordination with the Mayor's Office, the Department of General Services, the Department of Development and Planning, the Office of Audit and Control, the Water and Water Supply Department, and numerous others.

While many initiatives are focused on municipal operations, the expertise, technical and financial resources of the numerous public and private

stakeholders engaged in this planning effort will be critical to its successful implementation. The Albany Energy Plan expands and enhances the other sustainability and energy-related efforts currently underway by the City — led in large part by the Office of Energy and Sustainability. The City has a strong relationship with National Grid and will need to continue to work closely with utility representatives to successfully implement relevant initiatives. The Capital District Regional Planning Commission, Capital District Transportation Committee, Capital District Transportation Authority and other regional stakeholders will be especially important partners in implementing a number of the transportation initiatives.

Municipal Baseline and Savings Projections (mmBtu)

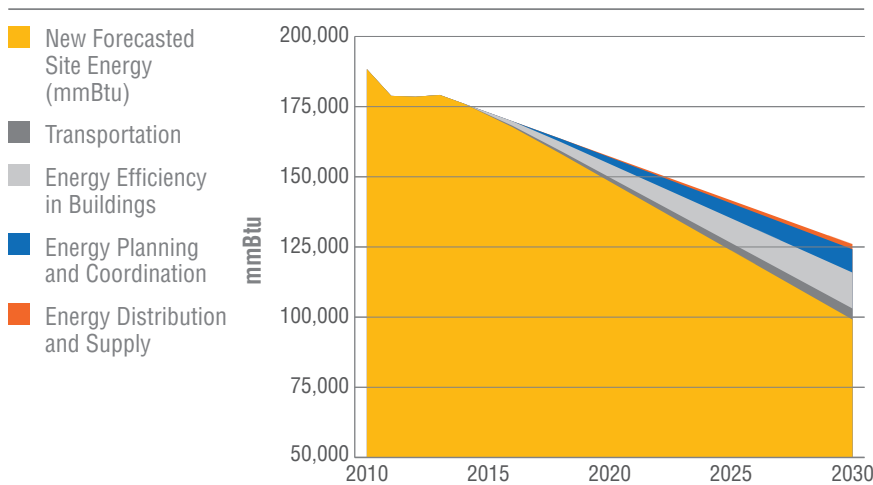


Figure 12

Community Baseline and Savings Projections (mmBtu)

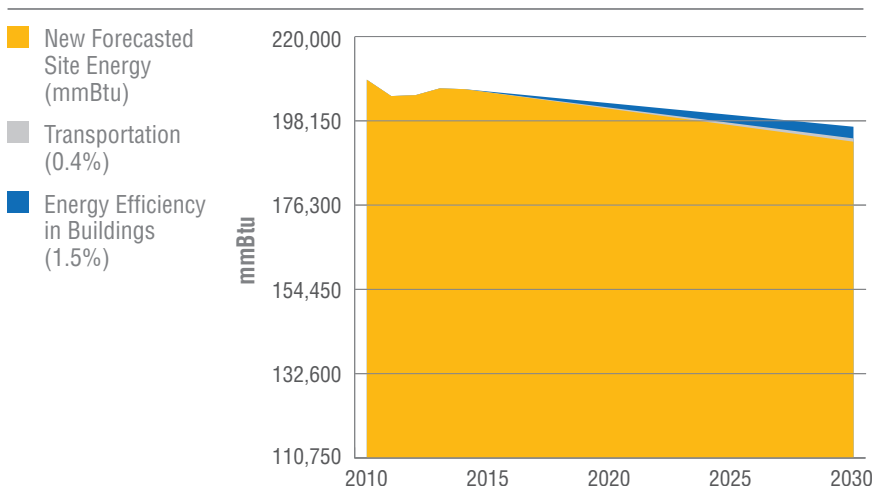


Figure 13

Synergies with Parallel Efforts

The City's Albany 2030 Sustainable Code project aligns well with implementation of the Albany Energy Plan. The codification of Albany's sustainability principles will be significant in supporting many of the initiatives identified in this plan with regard to integration of energy efficiency into building code and development regulations, promotion of alternative fuel vehicles, and enhancements to transportation infrastructure to improve air quality, reduce greenhouse gas emissions, and enhance public health and livability.

Another important component of implementation will be utilization of the City's new Sustainable Advisory Committee (SAC), which includes five Mayoral appointees, five Common Council appointees, and five municipal employees representing key City departments. The SAC has the authority to create subcommittees to focus on specific sustainability topics, including Energy, Equity, Transportation, Water, Waste and Food Systems. The Energy, Transportation, and Water subcommittees will be well-positioned to implement the initiatives identified in this plan. The Sustainability Advisory Committee will be critical to moving the City from planning to action. Inclusion of both municipal representatives and experts from the community will give the SAC the insight, resources and expertise needed to implement priority initiatives.



Alfred E. Smith Building

Financing

Initiatives outlined in the plan have varying levels and sources of funding identified. Some efforts identified in this plan have partial funding in place for implementation, including initiatives that fall under the Albany 2030 Sustainable Code Project, Complete Streets Policy and Design Manual, and some transportation planning initiatives. The City hopes that sharing an understanding of the synergies and benefits of the initiatives with public and private audiences through the Albany Energy Plan will support further investment in related programs.

The engagement of NYPA, National Grid and NYSERDA has been an important step in communicating financial needs and considerations for achieving goals that benefit the City, utilities, and the state. These entities can provide information on technical and financial resources and incentives that will support building upgrades, vehicle efficiency improvements and other projects. In turn, utilities and state agencies have gained a deeper understanding of Albany's needs in regards to implementing initiatives that will accomplish its energy goals.

BUFFALO



Letter From Mayor Byron W. Brown



Dear Residents, Employees, Businesses and Stakeholders:

The City of Buffalo is on the move, with over \$5 billion in new investment and the coming of more than 12,000 new jobs. To further enhance and build on Buffalo's economic development activities, our city continues to make great strides towards a more energy-efficient future by increasing renewable energy production and reducing overall energy consumption. Some examples include new LEED-certified buildings, low-cost hydropower allocations, Green and Healthy Homes Initiative energy improvements and, most recently, the manufacturing of solar panels.

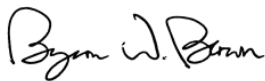
In partnership with the New York Power Authority (NYPA), we look forward to further developing Buffalo's Energy Plan through NYPA's Five Cities Energy Plans initiative, designed to create additional energy savings for public buildings and facilities in our city, while creating jobs and helping to generate a cleaner environment. This new energy-efficiency collaboration with NYPA, which has been expanded to include four other New York cities, started after I requested a series of mutually beneficial meetings between the City of Buffalo and NYPA to further build on our programs (and NYPA's) to achieve the shared goal of creating a more energy-efficient future.

The City of Buffalo has spent nearly \$2.5 million on energy-efficiency measures at over 45 City-owned facilities, with anticipated annual energy cost savings of \$410,205; implemented Complete Streets, traffic signal improvements and smart growth policies designed to encourage energy smart transportation; upgraded its downtown district energy system; and removed barriers to private renewable energy generation through the Green Code. In addition, the Buffalo Sewer Authority has spent over \$20 million on energy upgrades over the last nine years that have cut natural gas usage and reduced electrical usage. These projects have resulted in \$5 million yearly in savings and increased revenues.

This plan is another important step to further build a modern, efficient and resilient, energy system for the City of Buffalo. The plan identifies the City's current energy use as well as provides numerous opportunities to reduce the City's energy consumption. The plan's implementation offers many benefits including saving money, creating jobs, and protecting public health and the environment.

The City of Buffalo is committed to continuing to reduce municipal energy consumption by partnering with utility providers, state agencies, businesses and residents on community-based energy initiatives.

Sincerely,

A handwritten signature in black ink that reads "Byron W. Brown". The signature is fluid and cursive, with the first and last names being more prominent.

Byron W. Brown
Mayor of Buffalo



Top, Solar City Manufacturing Innovation Hub; Middle, Buffalo waterfront; Bottom left, Buffalo Museum of Science; Bottom right, PUSH Green Building Project

City of Buffalo Energy Plan



“Pan-American Exposition - The Electric Tower” by C. D. Arnold

The City of Buffalo has historically been at the forefront of energy innovation. The first commercial alternating current central station in the United States began operations in Buffalo in 1886. In 1881, powered by nearby Niagara Falls, Buffalo installed the first electric streetlights in the nation. Following this breakthrough, at the 1901 Pan-American Exposition World Fair, itself an incredible feat of innovation and electricity, Buffalo earned the title “City of Light.”

Buffalo saw a pattern of growth through the 1950s but a steady decline in population left it with the challenge of balancing aging infrastructure and building stock with the need to foster economic growth and development. However, through the leadership of the Brown administration, Buffalo

is once again seeing resurgence in private and public investments.

Buffalo is well positioned for strong economic growth; as part of that growth, the City remains committed to development that promotes a more sustainable energy future. Recognizing the importance of effective energy management to foster economic growth, improve quality of life, and protect the environment, the Buffalo Energy Plan is intended to help the City achieve those goals as well as support its transformation back to a leader in energy innovation. The development of the plan created a forum through which innovative ideas, technologies and projects can be explored and developed, allowing for continued pursuit of projects and collaboration to enhance Buffalo’s growing clean energy economy.



Buffalo skyline

A key challenge Buffalo faces, similar to many other cities, is the scarcity of capital and operating funds, which are stretched thin maintaining the large number of municipal buildings.

Buffalo has a similar challenge associated with infrastructure improvements, including those to address transportation needs and improved efficiencies throughout the city. Additionally, due to projected growth and development, energy consumption within the city is anticipated to increase. Given these building, infrastructure and growth challenges, Buffalo believes it is critical to integrate energy efficiency into policies that will impact future development and existing infrastructure. The City has exemplified this commitment through a number of actions over the past decade: its signing of the U.S. Mayors Climate Protection Agreement to reduce greenhouse gas emissions; the completion of \$2.4 million in energy efficiency measures at 45 City-owned facilities; the implementation of projects across the city to make streets safer and more accessible for pedestrians and cyclists; the modernization of the City-run downtown district heating system; and the development of Buffalo’s groundbreaking Green Code.

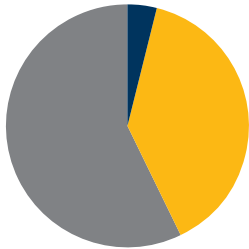
The Buffalo Energy Plan will serve as a framework for reducing energy demands, structured with flexibility to adapt over time as the priorities and needs of the city transform. Strategies

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A bicyclist rides in Buffalo

Municipal Energy Consumption (mmBtu)

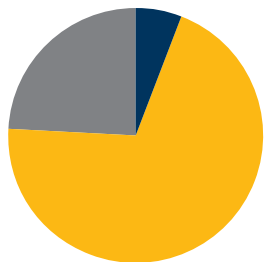


■ Fuel (4%)
■ Electric (39%)
■ Natural Gas (57%)

Total city government energy usage in mmBtus

Figure 1

Municipal Energy Costs (\$)



■ Fuel (6%)
■ Electric (70%)
■ Natural Gas (24%)

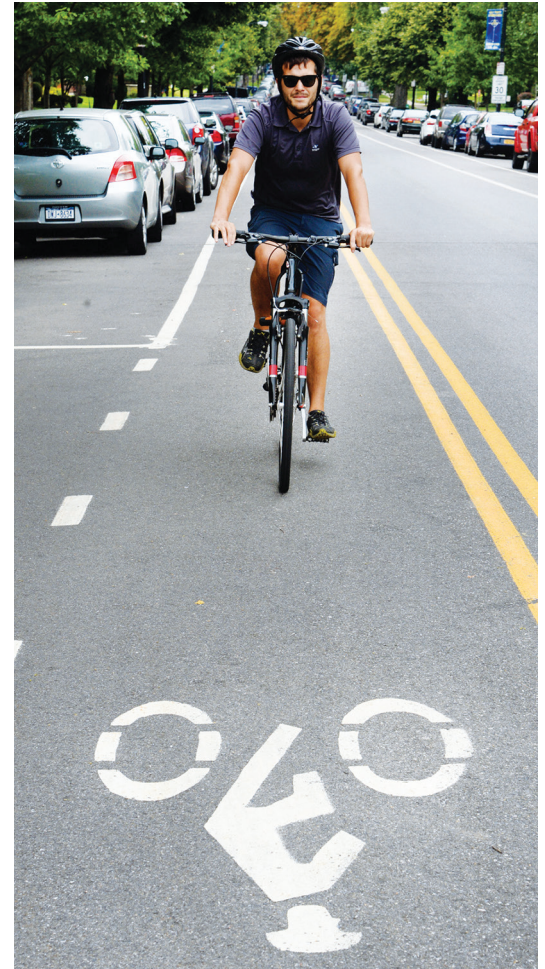
Total city government energy costs

Figure 2

are firmly rooted in the need to be actionable and address energy consumption through the implementation of both clean energy projects and policy transformation. The Plan also provides solutions to capacity and funding barriers through cost-effective strategies, including self-sustaining financing mechanisms and partnerships with the private sector and state agencies. The Buffalo Energy Plan includes initiatives that have the potential to help unlock markets for clean energy investment, with the support of the New York Green Bank and other New York State efforts to expand the availability of capital to finance projects.

Existing conditions

Buffalo is growing once again with new development, new and expanding employers, and new residents. With no intervention, this growth is expected bring increased energy consumption within the city. Energy used to power and heat buildings accounts for the majority of energy consumption. In 2010, Buffalo's residents, workers, and visitors used 2,548,638 megawatt hours (MWh) of electricity and 21,504,001 mmBtu of natural gas; by 2030, this is expected to grow. For municipal building operations, Buffalo used 68,035 megawatt hours (MWh) of electricity and 274,009 mmBtu of natural gas. When the energy consumption of Buffalo's "sibling agencies", including Buffalo Public Schools, Buffalo Sewer Authority, Buffalo Municipal Housing, and Buffalo Water Board is incorporated into the total energy consumption of government operations, the total expands to 6 percent of the total energy consumed across the city. Buffalo has already put into place several strategies to reduce energy usage and costs in municipal buildings



as well as for key community projects, such as lighting improvements to Kleinhans Music Hall, mechanical upgrades to Lafayette Ice Rink and solar installations at various community centers, but there is great opportunity to do more.



SolarCity

Gov. Andrew M. Cuomo recently announced a new, 1 million-square-foot site for the future SolarCity GigaFactory facility, which will manufacture solar panels at the RiverBend site in South Buffalo. It will be the largest solar panel production facility in the Western Hemisphere, creating more than 3,000 jobs in Western New York and nearly 5,000 jobs in the state. The facility, once it has reached full production, will have more than 1 gigawatt of annual solar capacity. The project will position Buffalo as a leader in the solar industry and will help attract other solar energy industry to Western New York.

ENERGY CONSUMPTION BY SECTOR					
Building type	Area (sf)	Electricity (mmBtu)	Natural gas (mmBtu)	Total (mmBtu)	GHG (MT CO ₂)
Residential	148,323,507	2,074,525	11,685,235	13,759,760	792,452
Commercial	66,934,990	2,963,526	4,368,334	7,331,860	477,987
Institutional	57,731,869	2,628,708	5,310,670	7,939,378	360,680
Industrial	34,924,142	1,031,745	2,768,470	3,800,215	232,623
Totals	307,914,508	8,698,503	24,132,709	32,831,212	1,863,741

Figure 3

Buffalo has 261,310 residents and the daily population grows to 306,815 as commuters from the surrounding suburbs enter the city. The primary mode of transportation for commuters and residents is single-occupant vehicles (SOVs). Transportation energy usage accounts for 23 percent of the overall energy consumption of the city, with SOVs accounting for 67 percent of vehicles miles travelled (VMT) in the city. In total, it is estimated that Buffalo consumes 68 million gallons of gasoline and 9 million gallons of diesel fuel annually.

The City has implemented several initiatives already that encourage greater use of alternative

transportation to reduce energy consumption and congestion, and in recent years there has been a gradual shift in transportation choices. Although these projects, which include expanded bicycle lanes, Complete Streets, and traffic signal coordination, have been successful, there are still many opportunities to explore strategies that will further enhance the performance of transportation systems.

The electrical distribution infrastructure remains strong and robust. Downtown Buffalo utilizes an underground network which is less susceptible to power outages associated with extreme weather events. National Grid works annually in conjunction with the New York State Department of Public Service Commission (PSC) to improve the current distribution system and upgrade services as required. In general, major stakeholders are not concerned with power interruptions; however, ensuring energy quality and addressing phase imbalance and harmonics for sensitive equipment have been a primary focus. Similarly, National Fuel, the city's gas utility and distributor, also reports a strong and robust infrastructure, and all sections of the city have access to clean and efficient natural gas. As the utilities plan for future infrastructure upgrades, effective communication and coordination with the City will help ensure utility objectives align

Community Energy Usage

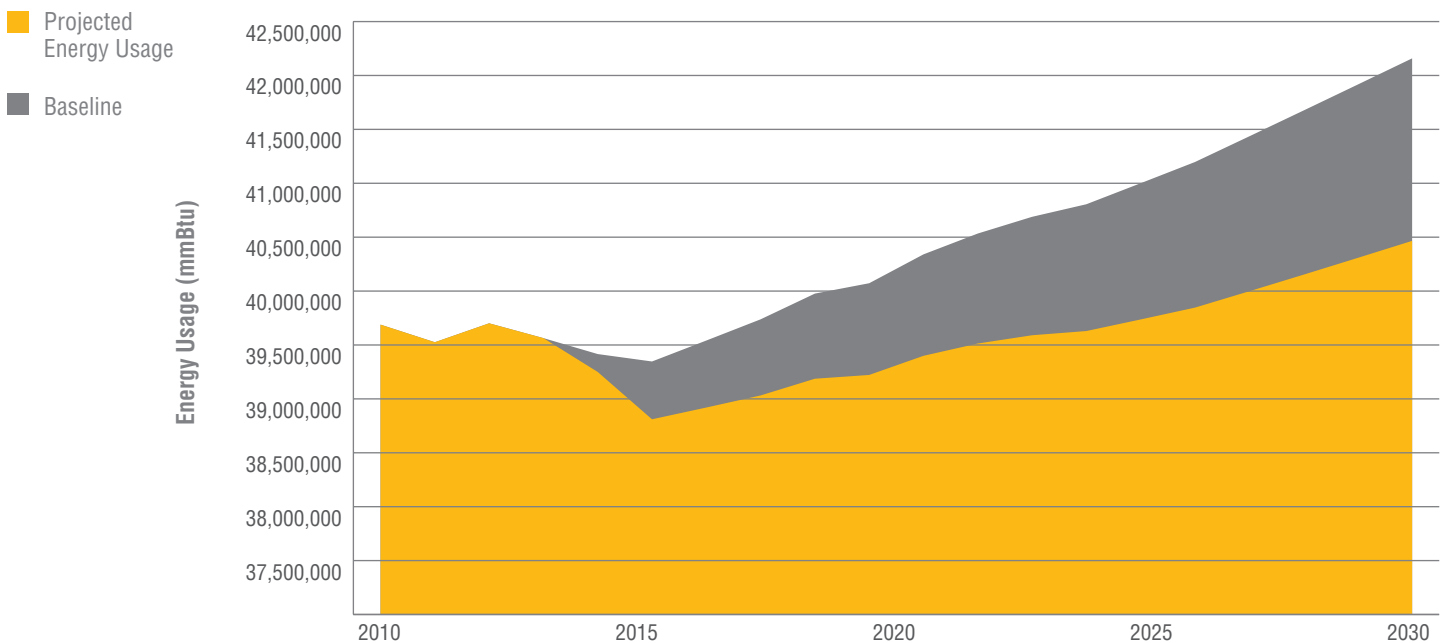


Figure 4

Energy Usage by Sector

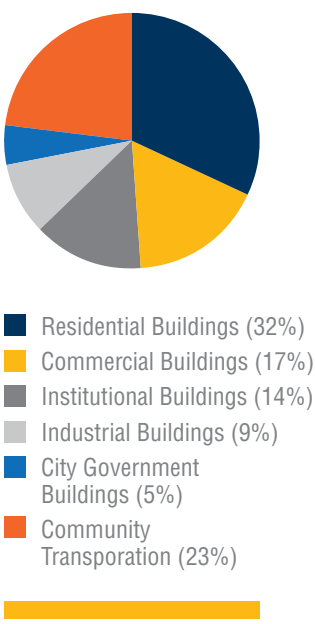


Figure 5

Main Street Transit-Oriented Development

with the economic development goals and the City’s energy initiatives. Re-evaluating the manner in which electric energy is manufactured, distributed and managed will be important not only to Buffalo, but in how future energy needs of the state are met. In response to this, the PSC began the Reforming the Energy Vision (REV) initiative to reform state energy policy and regulations. These regulatory changes will promote more efficient use of energy, an increase in renewable energy production, and remove barriers to distributed generation strategies such as microgrids, on-site power supplies and storage. The new opportunities these changes present will support the achievement of Buffalo’s energy goals.

Summary of goals and initiatives

The Buffalo Energy Plan is organized into four major action areas intended to deliver the greatest impact on the city’s energy consumption. Energy Planning and Coordination lays the foundation for creating an effective energy management approach to address the energy consumption within municipal operations. The initiatives also set the stage for a strong and robust collaborative process between the City and stakeholders to address energy needs of the community, and for sustainable future development and growth.

Energy Efficiency in Buildings focuses on strategies that promote energy efficiency and reduce energy consumption within government buildings. However, as municipal buildings only account for a small percentage of energy use citywide, Buffalo has identified opportunities to support the implementation of energy



conservation measures in buildings across all sectors, helping to unlock private sector leadership and investment.

Transportation significantly impacts the city’s energy consumption and carbon footprint. As such, Buffalo’s transportation strategies are centered on creating a more sustainable transportation system that enhances multi-modal choices and public transportation options. Maximizing transportation efficiencies and municipal operations, such as enhancing traffic signal coordination and right sizing City fleets, respectively, will also greatly reduce fuel consumption and energy costs citywide.

In addition to reducing energy consumption, the Buffalo Energy Plan identifies strategies and technologies that advance environmental goals and performance. The initiatives created under Energy Supply and Distribution Infrastructure provide the City with opportunities to pursue the development of clean energy projects, district energy expansion and demonstration projects for emerging technologies. Again, these opportunities aim to unlock investment opportunities citywide and support a transition toward a cleaner, more reliable and affordable energy future.





Integrate Energy Management Into City Operational, Budgeting, and Planning Processes

Summary of Objectives and Initiatives

Develop a data-driven and intergovernmental energy management process

- Initiative 1:** Assign an Energy Coordinator
- Initiative 2:** Track energy performance indicators annually and resolve data gaps
- Initiative 3:** Host an annual city, state and utility partners coordination meeting
- Initiative 4:** Partner with Greater Buffalo-Niagara Regional Transportation Council to integrate energy considerations into transportation planning efforts

Enhance Buffalo's energy management capabilities

- Initiative 5:** Develop new opportunities for energy management services

Reduce the municipal energy rates

- Initiative 6:** Utilize pooled purchasing strategies to increase the City's energy purchasing power
- Initiative 7:** Reduce risk in market volatility by strategic rate hedging

Robust planning and coordination around energy is a critical ingredient to achieve Buffalo's energy goals and develop strategies that address future energy needs. Effective planning will support energy reliability and security, supply diversification and use of local resources, economic development and jobs, and environmental stewardship. Often, the focus of local government energy planning efforts is the reduction of municipal operating costs. The Buffalo Energy Plan includes a number of initiatives to reduce energy and other operating costs; however, it also includes strategies to integrate energy management into budgeting and procurement processes, citywide planning efforts and stakeholder engagement. Buffalo's Office of Strategic Planning (OSP) and the Department of Public Works (DPW) have set the foundation for this integration by addressing critical data gaps and improving communications between municipal agencies and stakeholders. Building on their achievements to date, Buffalo will continue to improve the energy performance of City government and the community.

Commuter rail lines
in Downtown Buffalo



Buffalo's energy-management strategy will continue to evolve as initiatives are pursued, evaluated and adjusted, and as the energy needs of the city shift. To ensure energy management practices and clean energy deployment continue to be a priority, Buffalo will integrate energy performance considerations into their processes, including facility management, budgeting and planning. Additionally, coordination and communication within the City's administration, as well as with local stakeholders and state agencies, will be vital to effectively implement initiatives, manage performance and facilitate clean energy projects. For example, Buffalo has integrated energy goals into existing land-use planning

efforts, including the City's Green Code and Local Waterfront Revitalization Plan. Additionally, the City will integrate energy efficiency into transportation initiatives that support a vibrant downtown and align with the Downtown Buffalo Infrastructure and Public Realm Master Plan.

Coordination between municipal departments and sibling agencies is another key component for energy optimization within municipal operations. Developing a structure that improves upon existing coordination efforts will transform the traditional departmentalized approach to a comprehensive and holistic process better able to address the Buffalo's energy needs. By integrating energy goals for buildings, transportation and distributed generation into a coordinated planning process, Buffalo has an opportunity to substantially reduce the energy costs and carbon footprint of government operations and citywide.

Develop a data-driven and intergovernmental energy management process

Data collection, analysis and tracking, including building benchmarking, can identify trends in energy usage and opportunities for improved efficiencies. City agencies currently coordinate on a variety of energy-related activities, including procurement, building retrofits and transportation system improvements. However, development of a structured process for cross-departmental and stakeholder collaboration will ensure greater alignment of parallel efforts and create a level of accountability as Buffalo strives to meet its energy goals. Enhancing City energy management requires developing metrics to measure the implementation of initiatives, creating procedures for reporting and building a process to resolve data gaps.

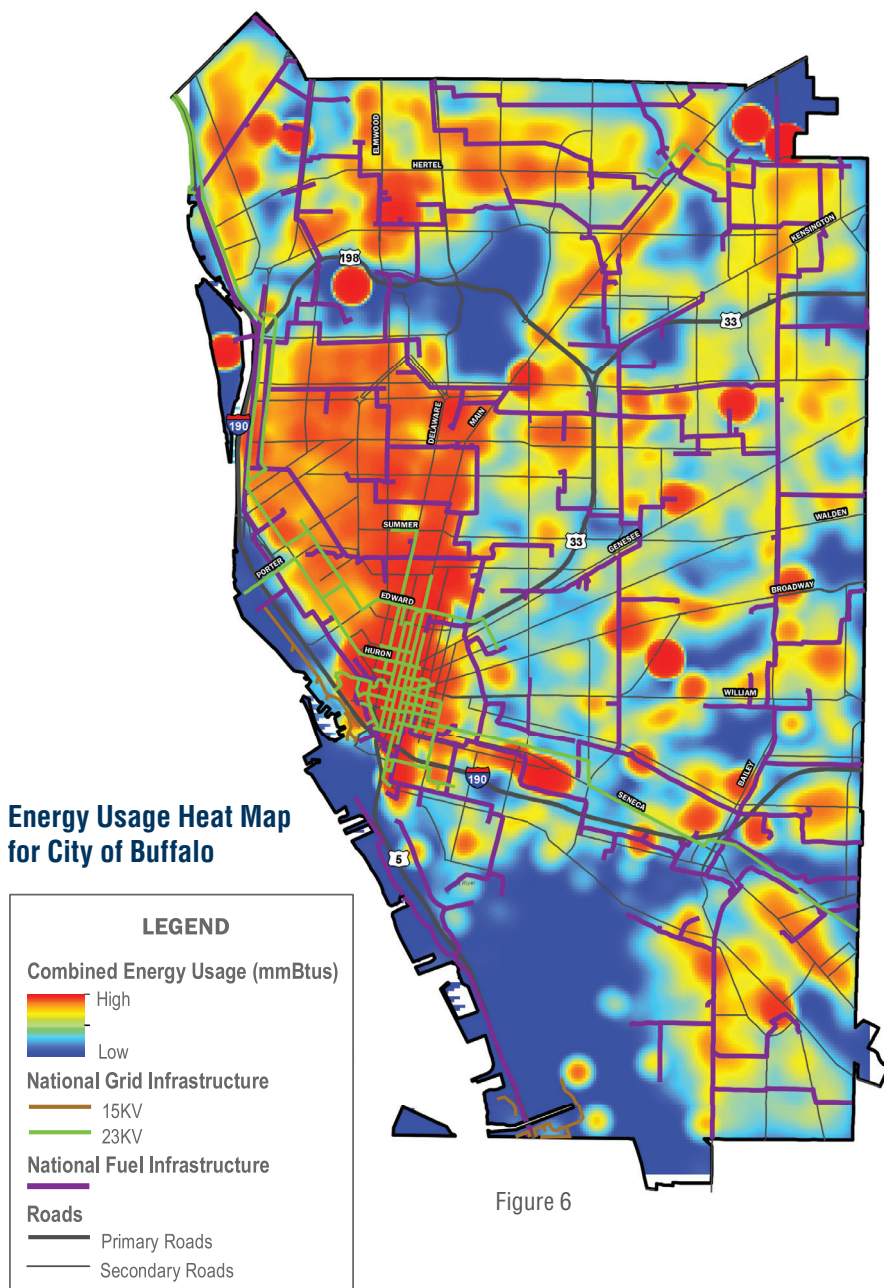


Figure 6



Energy Planning & Coordination

Initiative 1: Assign an Energy Coordinator



To coordinate and track the implementation of Buffalo's energy initiatives, which will be managed daily by the respective departments, the City will assign an Energy Coordinator to track the annual progress of initiatives, report on key performance metrics and be responsible for subsequent plan updates.

The Energy Coordinator will manage municipal energy-efficiency upgrades, renewable energy projects, energy-management procedures, and employee energy-awareness programs. This position will also help facilitate collaboration with stakeholders and development of public-private partnerships. This includes organizing an annual City-hosted energy forum. As transportation planning is a key element in reducing citywide fuel consumption, the Energy Coordinator will also collaborate with the Niagara Frontier Transportation Authority (NFTA) and the Greater Buffalo-Niagara Regional Transportation Council (GBNRTC) to align transportation energy efficiency efforts with existing programs.

Initiative 2: Track energy performance indicators annually and resolve data gaps



Buffalo will put into place an annual process to collect, analyze, and report on energy consumption. Tracking the effectiveness of the initiatives will be based on how measured progress across a set of key performance indicators—including energy, cost savings, and payback—compares to industry standards and recognized best practices. The City will maintain a database for the energy usage data and will determine corrective action or modifications to original initiatives as needed for achieving goals. Tracking and reporting energy performance will provide a number of benefits, including the promotion of behavioral changes through transparency and accountability for energy performance across departments.

As information is compiled and assessed, Buffalo will put into place a process for resolving data gaps. Examples of existing data gaps in municipal operations include vehicle miles traveled of City employees and the structure of municipal leases. This information will provide a more granular level

CASE STUDY

Buffalo Niagara Medical Center tracking infrastructure and energy use



The Buffalo Niagara Medical Center (BNMC) is a consortium of the region's premier health care, life sciences research and medical education institutions, located on 120 acres in downtown Buffalo. More than 12,000 people work at the BNMC at the nine regionally significant institutions and more than 40 public and private companies. To improve operations and maintenance of the campus, BNMC has developed an inventory of

building systems, utilities and infrastructure for its campus. It includes current system capacities, current energy use, a record of all recent improvements and a replacement schedule for existing energy infrastructure. Utilizing information collected in the campus energy inventory, BNMC plans to establish a carbon emissions baseline and set a carbon reduction goal. BNMC will work with companies across the campus to annually evaluate and report on energy performance.

of detail to help guide the decision making process and prioritization of projects. For community and citywide energy management, the ability to understand energy consumption at the parcel level—coupled with land use projections and utility infrastructure capacity—will allow the City to address future build-out scenarios in a manner that better supports economic and regional growth goals.

As an additional next step, Buffalo will coordinate with the New York State Energy and Research Development Agency (NYSERDA), the New York Power Authority (NYPA), and utilities to support data collection and assessment through information sharing and various funding programs. By better understanding how funds for energy projects have been distributed across all sectors, the City will be able to work with state agencies to streamline programs that best fit the needs of the community.

Initiative 3: Host an annual City, state and utility partners coordination meeting



Enhancement of municipal and citywide energy management requires support from state agencies and local utilities. To coordinate these efforts and provide a forum for innovative discussions, the City will host an annual meeting with leaders from National Grid, National Fuel, NYPA and NYSERDA. This coordination will build off of the existing collaborative efforts and the process established during the 2014 Buffalo Energy Plan effort. The annual meeting will focus on the status of current initiatives, areas of collaboration, funding opportunities, and new potential initiatives, particularly as the Department of Public Service's (DPS) Reforming the Energy Vision (REV) takes shape. It will also provide a forum to communicate and coordinate efforts associated with land use planning and economic development within the city. The Energy Coordinator will manage and facilitate the meeting.

Regional Alignment, One Region Forward

One Region Forward is a broad-based, collaborative effort to promote more sustainable forms of development in Erie and Niagara counties—the Buffalo



Niagara Region—in land use, transportation, housing, energy and climate, access to food,

and more. The One Region Forward Final Draft Plan, funded through the United States Department of Housing and Urban Development Sustainable Communities program, analyzes the job, tax, energy, transportation and open space impact of four possible development scenarios. The most compact scenario “Back to the City” which focused on transit-oriented redevelopment of the region’s urban core, would result in the largest economic gains to the region, the largest energy savings per household (3.3 percent compared to existing conditions) and the lowest number of vehicle miles travelled.

Key partners include the Greater Buffalo-Niagara Regional Transportation Council, the Niagara Frontier Transportation Authority, the New York State Department of Transportation, Erie County, the City of Buffalo, and the University at Buffalo Regional Institute and Urban Design Project.

Initiative 4: Partner with the Greater Buffalo-Niagara Regional Transportation Council to integrate energy considerations into transportation planning efforts



GBNRTC is the Metropolitan Planning Organization (MPO) for Erie and Niagara counties. GBNRTC has an established transportation planning process, including identification, evaluation and prioritization of projects to be submitted for federal transportation funding. Long-term regional



Energy Planning & Coordination

transportation strategies are outlined in the 2040 Metropolitan Transportation Plan Update and the Buffalo Niagara 2050 Plan. To encourage infrastructure investments that will reduce citywide fuel consumption and carbon emissions, Buffalo will partner with GBNRTC to coordinate transit-oriented initiatives, including the expansion of Complete Street Projects citywide. The City will also work with GBNRTC to identify and amend regulatory or administrative gaps that impede progress of transportation based initiatives. This process will allow municipal leaders and stakeholders to make informed decisions regarding transportation and influence planning efforts to achieve smart growth strategies for new development and existing corridors.

Buffalo's Department of Public Works (DPW), which is responsible for coordinating infrastructure projects with GBNRTC, will be the City's lead on efforts to incorporate energy savings into transportation initiatives, with assistance from the proposed Energy Coordinator.

Enhance Buffalo's energy-management capabilities

Buffalo purchases energy and manages utility services through a vendor selected through a competitive bid process. Related energy-management services include tracking energy usage, reporting annual usage and building energy use intensities, and billing for the Energy Pool. To enhance the City's energy management

capabilities, Buffalo will expand the type and number of outside consultants and vendors, utilizing its competitive procurement processes.

Initiative 5: Develop new opportunities for energy management services



Buffalo will evaluate leveraging the expertise of consultants proficient in specific aspects of energy management, including energy procurement, municipal building energy services, district energy, renewable energy development, and street lighting and traffic signal efficiencies.

All consultants will work under the direction of the Deputy Commissioner of Buildings and Energy, with assistance provided by the Energy Coordinator, and will be required to share data as necessary with other consultants to allow for a fluid program.

The engagement of professional consultants may be conducted through the release of separate contracts or under a single contract for the all services. This is to ensure Buffalo is getting the highest quality professional services at the best value. The evaluation will consider whether to hire one consultant to provide expertise on all five areas or procure the services of multiple firms. The City will also work to build internal expertise and the knowledge base necessary for successful oversight.

CASE STUDY

Northeast Ohio Public Energy Council

The Northeast Ohio Public Energy Council (NOPEC) was formed in 2000 and is made up of 134 member communities across eight Northeast Ohio counties. As a result of ordinances passed in each of the communities, local governments aggregated all eligible natural gas and electricity customers. Through NOPEC, the communities band together into one large buying group and gain leverage in the deregulated marketplace.

The benefits for NOPEC's individual utility customers include professional expertise and consumer advocacy, volume driven discounts, and long-term stability in prices. NOPEC is the largest public energy aggregation in the United States with an estimated 500,000 customers and the council estimates its customers have saved more than \$175 million since its inception. NOPEC is governed by a General Assembly, made up of one representative from each member community. The representatives from each county elect one person to serve on the Board of Directors.



Reduce the municipal energy rates

Aggregation pools provide an opportunity to trim energy procurement costs. Working with an aggregation agent, an energy pool can secure better pricing on the wholesale market because of its collective size. Buffalo runs an energy pool to procure electricity and natural gas for municipal buildings. Other pool participants include the Buffalo Water Authority, Buffalo Public Schools, the Buffalo Zoo and the Buffalo Municipal Housing Authority. The commitment of pool participants is essential to budget stability and success.

Coordination between the City and the community offers many opportunities to improve the energy-procurement program and create a larger platform on which to leverage buying power in the energy markets. By joining the energy-aggregation pool, municipal, industrial and residential consumers will benefit from lower energy rates, increased budget stability and a decrease in greenhouse gas emissions.



Fountain in downtown
Buffalo

Participate in Statewide Co-Op

The Municipal Electric and Gas Alliance, Inc. (MEGA) is a not-for-profit local development corporation. As of February 2014, MEGA served as procurement manager for more than 250 municipalities' electricity and natural gas supplies.

MEGA's buying power has increased over the years, and it represents a significant share of all supplier-served customer demand in New York State. For this reason, suppliers compete more aggressively to win the bids, leading to reduced energy costs for MEGA's customers. Suppliers' customer service and sales costs are reduced through MEGA's efforts and size, with the savings passed on to consumers.

Initiative 6: Utilize pooled purchasing strategies to increase the City's energy purchasing power



The City, with support from a qualified consultant, will work with local leaders to identify and develop additional participants for the energy pool. The aim of this expansion is to obtain better energy rates from the energy supplier. The consultant will provide oversight of billing and account management and will negotiate rate hedging with participants on the City's behalf.

Buffalo estimates that it will reduce its electricity and natural gas rates by 2 percent and 0.5 percent, respectively, by doubling its purchasing power. This rate reduction will save the City more than \$150,000 for electricity and over \$24,000 on natural gas annually. DPW, with the support of a consultant, will be responsible for evaluating the expansion of the energy pool.

Initiative 7: Reduce risk in market volatility by strategic rate hedging

Energy prices typically peak during periods of high demand; for natural gas, this typically takes place in January, February, June, July and August. Hedging enables the municipality to lock in set rates to smooth out the sharp peaks in prices and provide budget certainty throughout the year. Without a hedge, Buffalo is susceptible to budget fluctuations of as much as \$1.5 million a year, if energy prices fluctuate by a reasonable 20 percent. With hedging, the City can limit its budget deviation to less than \$500,000 under the same market conditions. To reduce market volatility, the City will pursue opportunities to hedge its natural gas rates.

Renewable energy power purchase agreements (PPAs) offer another tool to fix a portion of energy procurement costs. A PPA is a financial arrangement in which a third-party developer owns, operates and maintains the renewable energy generation system, and a host customer agrees to site the system on its property. PPAs are discussed in greater detail under the Energy Distribution and Supply action area in this document.

DPW will work with its consultants to evaluate the current hedging strategy and provide recommendations for modifications that will help the City further stabilize its energy costs.

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Develop data-driven and intergovernmental energy management process				
Initiative 1: Assign an Energy Coordinator				
Department of Public Works & Office of Strategic Planning	NYPA	NYPA	Short-Term	Develop detailed job description
Initiative 2: Track energy performance indicators annually and resolve data gaps				
Department of Public Works - Buildings, Energy, Design & Planning	NYSDERDA and NYPA	—	Short-Term	Set-up tracking on key performance indicators
Initiative 3: Host an annual city, state and utility partners coordination meeting				
Department of Public Works & Office of Strategic Planning	Utilities and NYPA	—	Short-Term	Coordinate Meeting
Initiative 4: Partner with greater Buffalo-Niagara Regional Transportation Council to integrate energy considerations into transportation planning efforts				
Department of Public Works & Office of Strategic Planning	GBNRTC	—	Short-Term	Coordinate Meeting
Enhance Buffalo's energy management capabilities				
Initiative 5: Develop new opportunities for energy management services				
Department of Public Works & Office of Strategic Planning	Five Cities, NYPA	—	Short-Term	Coordinate Meeting
Reduce the municipal energy rates				
Initiative 6: Utilize pooled purchasing strategies to increase the City's energy purchasing power				
DPW - Buildings & Energy - Telecom, Franchise & Utilities & Consultants	Five Cities, NYPA, Energy Pool Participants	—	Short-Term	Adjust Policy
Initiative 7: Reduce risk in market volatility by strategic rate hedging				
DPW - Buildings & Energy - Telecom, Franchise & Utilities & Consultants	Five Cities, NYPA, Energy Pool Participants	—	Short-Term	Adjust Policy

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



Promote Energy Conservation and Efficiency in Buildings

Summary of Objectives and Initiatives

Reduce energy usage in municipal buildings by 20 percent by 2020

- Initiative 1:** Promote energy awareness through outreach and training
- Initiative 2:** Incorporate energy efficiency into capital improvements and new construction
- Initiative 3:** Update the City's lease arrangements to promote energy conservation
- Initiative 4:** Implement energy conservation measures
- Initiative 5:** Improve energy management through preventative maintenance and retro-commissioning
- Initiative 6:** Optimize use of space in municipal buildings
- Initiative 7:** Participate in a demand response program

Support citywide building energy efficiency

- Initiative 8:** Support enforcement of the state energy code
- Initiative 9:** Enhance residential weatherization and energy efficiency improvement programs

Buildings account for 61 percent of citywide energy usage. To achieve significant reductions in energy consumption from buildings, the City will employ cost-effective solutions to reduce energy loads, increase efficiencies and promote a culture of energy conservation. These solutions combine long-term energy reduction strategies with short-term adaptability, providing Buffalo with the flexibility to adjust implementation as new demands, technologies and opportunities arise. In addition to dramatically reducing energy use and emissions, these initiatives contribute to the development of Buffalo's robust and resilient local economy by encouraging clean energy investments by institutions and businesses.

Citywide, buildings consume 2,548,638 MWh of electricity and 21,239,265 mmBtu of natural gas annually. Total emissions resulting from energy usage in buildings is 722,523 and 1,141,218 metric tons of carbon dioxide, respectively. This is equal to the annual greenhouse gas emissions from approximately 332,276 cars.

The way buildings are built and operated impacts the environment, the economy, and the health and wellness of the community. However,

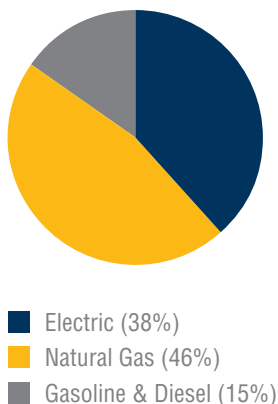
energy conservation and efficiency are usually not primary considerations in daily activities for residents and businesses or in municipal planning and operations. Therefore, Buffalo has identified initiatives and strategies that, if fully implemented, would integrate energy efficiency and conservation measures into the planning of new buildings and the operating of existing residential, commercial, and municipal buildings throughout the city. This integration will ensure that energy use is optimized, cost savings are realized, and greenhouse gas emissions are reduced citywide. Additionally, understanding how buildings consume energy—and continuously monitoring and tracking that usage—can help foster a culture of conservation in building users and support additional actions to improve energy efficiency. As the second-largest city in the state, Buffalo can lead by example for the greater community, and provide a model for economic development for the revitalization of post-industrial cities.

Reduce energy usage in municipal buildings by 20 percent by 2020

Buffalo's municipal building portfolio includes 180 facilities, many of which date back to the 19th century. In the coming years, many of the buildings' major architectural, mechanical and electrical systems will reach the end of their useful lives. However, a shortage of funding and capacity often requires the City to prioritize capital projects and upgrades on an "as needed" approach, prioritizing those in critical condition and leaving older, inefficient systems in place. As a result, Buffalo pays over \$400,000 a year to purchase approximately 39,500 MWh of electricity and 3,403,000 therms of natural gas; without addressing older building systems, this cost is expected to rise.

The City has taken steps toward improving municipal building efficiency, including the completion of several lighting upgrades and building energy audits. Through those audits, Buffalo identified more than \$8 million in Energy Conservation Measures (ECMs) that will reduce energy consumption in existing buildings, and with the help of \$3.6 million in U.S. Department of Energy (DOE) Energy Efficiency and Conservation

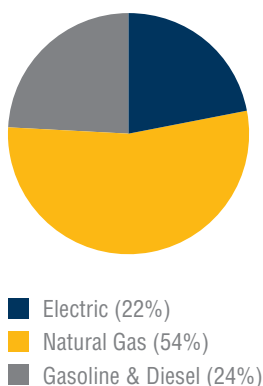
Municipal Energy Usage by Fuel Type



Energy usage by fuel type for City of Buffalo

Figure 7

Community Energy Usage by Fuel Type



Energy usage by Fuel Type

Figure 8

City of Buffalo Energy Improvement Projects

Buffalo has implemented more than \$2,470,752 million in energy efficiency retrofits at 45 City-owned facilities to date. With these improvements, the City anticipates annual saving \$410,205 in energy costs and \$87,000 in operational savings annually, as well as the creation of 11 full time jobs and the reduction of approximately 221 metric tons of greenhouse gas emissions. Retrofits include lighting upgrades in more than 35 buildings and heating, ventilation, and air conditioning (HVAC) upgrades to various community and senior centers. Incentives to support implementation were secured through EECBG, NYSEDA, and National Grid.



Block Grant (EECBG) funding and other incentives, it was began to implement them. For new buildings, the City is developing design standards that will incorporate sustainable building practices and energy efficiency into project development. The greening of municipal facilities is also supported by a portfolio-wide Facility Needs Assessment that is underway. Building on these efforts, the City will target an energy usage reduction of 20 percent by 2020 from a 2009 baseline for municipal buildings and streetlights.

Initiative 1: Promote energy awareness through outreach and training



Employee behavior has a significant influence on how much energy is consumed within buildings. By cultivating an environment of energy use awareness, City staff can learn to take actions that will save energy and lead by example in energy conservation and efficiency.

To achieve savings, the City will design an energy education program that encourages its employees to reduce energy through no-cost actions such as turning off lights, computers and electronics. The program will aim to foster community involvement, encourage teamwork and promote personal commitment toward making a difference. The program may include educational campaigns, training, competitions and other strategies known to reduce energy. Combined, these strategies have the potential to reduce energy consumption 5 to 10 percent annually. The City's Energy Coordinator will develop the energy education program and coordinate the outreach and education components across municipal departments.

Initiative 2: Incorporate energy efficiency into capital improvements and new construction

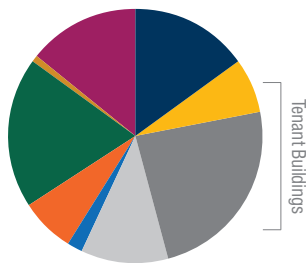


Buffalo is developing design standards for building renovations and new construction of City-owned buildings. The design standards are targeted primarily at reducing expenditures by establishing performance measures for building components including plumbing, HVAC and building envelope. The City will evaluate potential expansion of these standards to include guidelines for energy efficiency.

The City's design standards provide a method for communicating best practices to facility staff and contractors, ensuring a level of consistency in integrating energy efficiency into all capital projects. The design standards will also be incorporated into plumbing, HVAC and electrical specifications to encourage selection of more energy efficient technologies and systems.

In addition to the design standards, Buffalo is looking to incorporate energy efficiency into capital improvements and regular facility assessment and maintenance processes. The City is in the final phase of a facility assessment through which the Buildings Division is identifying building system deficiencies and proposing capital improvements to address them, including those that may result in reduced energy consumption. Once the assessment process is complete, Buffalo will prioritize municipal improvements based on each system's remaining useful life, estimated replacement cost and the urgency of the upgrade.

Energy Consumption by Municipal Department Type



- Major Municipal/City Service Buildings (15%)
- Libraries & Community Center (7%)
- Cultural, Sports & Zoo (24%)
- Police and Fire (11%)
- Parking Ramps (2%)
- Marina & Parks (7%)
- Fleet (19%)
- Signals (1%)
- Street Lights (14%)

Demonstrates the energy usage by key departments and highlights a sector with several tenant buildings.

Figure 9

CASE STUDY

UB – Transparency of Building Energy Use Using Lucid Technology

The University at Buffalo plans to present information on the environmental performance of its buildings to employees and students. By collecting and sharing the data through dashboard technology, the school's community will be able to see how campus buildings compare to each other in real time. These types of programs have been utilized by municipalities and schools around the county to achieve documented energy savings. Typical results have been an 8 to 20 percent reduction in energy consumption from a baseline year, which includes savings associated with facility improvements and behavioral modification programs.



To support the City's energy efficiency goals, the Building Division will apply the design standards to new projects and incorporate energy savings potential into the ranking of the various improvements. Upgrades that were also identified in the separate building energy audits will be given extra weight.

Initiative 3: Update the City's lease arrangements to promote energy conservation



To encourage energy efficiency in tenant spaces, Buffalo will integrate incentives for energy efficiency into lease renewals and future lease agreements. As a first step, the City will review current lease arrangements and identify tenants whose utilities are paid by the City. Buffalo will then evaluate how to restructure the utility terms of the lease at the time of renewal to promote energy conservation. Energy-aligned lease agreements have the potential to reduce energy costs for both the City and its tenants by approximately \$71,000 a year.

Initiative 4: Implement energy conservation measures



In 2014, Buffalo worked with a consultant to conduct energy audits on 64 of its buildings. These structures are responsible for more than 80 percent of the energy consumption by municipal buildings. ASHRAE Level 1 audits aim to identify obvious areas of energy waste or inefficiencies, recommend low-cost ECMs and identify systems for further study. Buffalo's 2014 audits identified a range of capital improvements to reduce energy consumption, including upgrades to HVAC systems, building controls and building envelope, as well as recommendations for retro-commissioning or building tuning.

To ensure the most cost-effective allocation of capital funds, Buffalo will undertake a more detailed energy and economic analysis of potential ECMs. This will enable a comprehensive understanding of the costs, benefits and estimated payback of investments. The City will evaluate the cumulative payback of each building's ECMs to help guide the prioritization of improvements. The analysis will also recommend buildings for ASHRAE Level 2 audits, which involve more detailed energy calculations and financial analysis of proposed ECMs and may include recommendations for more capital intensive improvements that lead to more significant energy reductions.

To implement the prioritized, cost-effective ECMs, City maintenance personnel will coordinate with a contracted consultant, or Energy Services Company (ESCO). The ESCO will further evaluate the facilities' energy efficiency and operational cost reduction opportunities, and develop a project showing how the energy and operational savings can pay for the cost of the improvements.

Energy Management Systems

As a step beyond standard retro-commissioning, Energy Management Systems (EMS) and EMS fault detection for preventative maintenance identify opportunities for energy savings on a frequent basis. This diagnostics technology significantly reduces costs and improves operational efficiency. It incorporates user customizable fault rules to weigh the probability of equipment failure and advise personnel of immediate preventative actions they can take before faults occur, improving safety and optimizing energy savings.

Microsoft uses fault detection on the Redmond, Washington campus, which includes 125 buildings totaling roughly 15 million square feet. The buildings were built at different times, without consistent design standards and with different types of building management systems. By using fault technology Microsoft reports they will save \$1.5 million in energy costs for fiscal 2013 using fault detection that identifies assets that are wasting energy.

An Energy Service Performance Contract (ESPC) can then be structured to finance the upgrades without any capital investment by the City and to guarantee the realization of energy and cost savings.

Initiative 5: Improve energy management through preventative maintenance and retro-commissioning

In addition to energy audits and ECM implementation, significant and cost-effective energy performance improvements could be achieved through improvements to building operations and maintenance (O&M). Retro-commissioning, continuous commissioning, preventative maintenance practices and strategic sub-metering, in combination with the energy awareness campaigns discussed above, can create a robust O&M program. Together, these have the opportunity to save Buffalo approximately \$285,000 annually in energy costs,

paying back the initial investment in less than seven years.

Retro-commissioning studies take a systematic approach to optimize the performance of building systems. Due to the complexity of building systems and controls, it is likely for systems to be operating incorrectly or not as efficiently as they could be. Retro-commissioning studies reveal hidden deficiencies and control problems, and then identify system tuning, adjustments and other necessary corrective actions. Based on findings from Buffalo's energy audits, the City will aim to retro-commission 49 buildings that do not require a full retrofit, but are not operating as efficiently as possible. For an additional six buildings, Buffalo will pilot continuous commissioning, which involves a regular schedule of testing and adjusting building systems for optimal performance.

Two other critical components of a robust O&M program is the integration of preventative maintenance (PM) practices and sub-metering. PM is planned maintenance of building equipment to prevent excess depreciation and promote efficient operations. These practices include adjustments, cleaning, lubrication, repairs, replacements and other activities that extend equipment life. Sub-metering involves strategically installing meters in order to monitor the energy consumption of specific buildings and systems, especially in locations where one meter currently serves multiple buildings. Sub-metering can help provide a clear understanding of how energy is used throughout the facilities, allowing the City to verify loads on individual buildings and identify those which operate less efficiently.

Addressing Citywide Gaps Through Benchmarking for Commercial Buildings

Benchmarking of buildings is recognized as a potentially valuable tool to assist energy planning efforts. Future implementation of a program that supports data collection within the private sector for buildings over a certain size will be explored as additional resources become available to manage and monitor the data.

Studies show that through benchmarking, building owners become more aware of their energy usage and can achieve an average reduction in annual energy consumption around 2 percent. In Buffalo, this equates to a reduction of more than \$1.5 million in annual energy costs. It is anticipated the start-up cost to create, manage and maintain this program would be approximately \$150,000 annually.

CASE STUDY

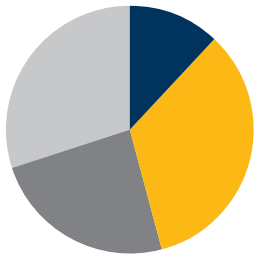
Retro-commissioning



A 2009 study of retro-commissioning by Lawrence Berkeley National Labs looked at retro-commissioning projects on 561 existing buildings. The average cost for the retro-commissioning studies was 30 cents per square foot for the almost 100 million square feet of floor space assessed. The resulting energy savings from the retro-commissioning averaged approximately 16 percent of the total building energy costs with an average payback of just over one year.

The study estimated that if the savings from the retro-commissioning study was applied to all of the existing non-residential buildings in the U.S., more than \$30 billion in energy savings and a reduction of 340 million tons of greenhouse gas emissions could be achieved.

Electrical Energy Usage

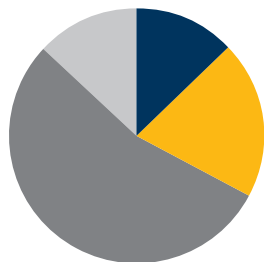


■ Industrial (12%)
 ■ Commercial (34%)
 ■ Residential (24%)
 ■ Institutional (30%)

Compares the electrical energy usage in buildings among these key sectors. Highlighted is the energy usage in the residential sector.

Figure 10

Natural Gas Energy Usage



■ Industrial (13%)
 ■ Commercial (20%)
 ■ Residential (54%)
 ■ Institutional (13%)

Compares the natural gas usage in buildings among these key sectors. Highlighted is the energy usage in the residential sector.

Figure 11

The Green and Healthy Homes Initiative (GHHI)

The Green and Healthy Homes Initiative (GHHI) is a public-private partnership between the federal government, national and local philanthropy, the National Coalition to End Childhood Lead Poisoning and local partners. It aims to help low-income residents in participating cities create healthy, safe, energy-efficient, and sustainable homes. Recognizing that low-income households typically spend 14 percent of their total income on energy, compared to 3.5 percent for other households, the program includes easy steps they can take to lower their energy bills. In November 2010, the U.S. Department of Housing and Urban Development and the Center for Disease Control and Prevention selected Buffalo to join the original 14 pilot sites across the country to participate in GHHI.

Initiative 6: Optimize use of space in municipal buildings



The amount of space that building systems must heat, cool and light is a primary factor in Buffalo's energy consumption. To decrease the area of space the City must condition, it will develop a plan to investigate the utilization of its existing buildings and identify opportunities for more effective use of conditioned spaces. In underutilized municipal buildings, the City will consolidate and relocate work spaces to focus building heating and cooling need where it is necessary, and to reduce it, where it is not, such as in unoccupied spaces. For these latter spaces, the City will implement equipment control strategies to reduce thermostat settings and lighting.

Initiative 7: Participate in a demand response program



During periods of peak demand—which usually occur on hot summer days when air conditioners are running hard, straining the capacity of the electrical grid—inefficient plants are forced to run and energy prices are at their highest. To encourage operators of large buildings to reduce energy demand during peak hours, the New York State Independent System Operator (NYISO) provides incentives for participation in one of its four demand response programs.

Demand response programs provide recurring payments to commercial, institutional, and industrial organizations in return for a commitment to reduce energy demand during times of system-wide high peak demand and other system events. Measures to reduce demand during peak times can range from simple options, such as turning off lights and computers and closing elevator banks, to aggressive techniques,

such as operating backup generators, to avoid consuming energy from the grid. Load shedding, as this peak reduction is sometimes called, can be enhanced with the use of building systems controls designed to shed energy demand for entire facilities.

For Buffalo, participating in a demand response program could result in revenue of \$20,000 to \$60,000 per year for every megawatt (MW) of peak demand reduction during peak times. Therefore, Buffalo will evaluate the feasibility of participating in a demand response program, including NYPA's peak load management program. This evaluation, and any future participation, will be managed by the Building Department with assistance from individual facility managers.

Support citywide building energy efficiency

Achieving real benefits from citywide energy efficiency cannot happen without attending to the energy performance of both new and existing residential, institutional, and commercial buildings. There are a number of energy efficient buildings in Buffalo, including the six buildings certified by the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) standard. Those buildings include HealthNow New York, Buffalo Life Science Center, Burchfield-Penney Art Center, Innovation Center on the Buffalo Niagara Medical Campus, U.S. Federal Courthouse and the U.S. Coast Guard. Major public and private institutions in Buffalo have shown real leadership in energy efficiency.

Ninety-one percent of Buffalo's commercial buildings and 97 percent of its residential buildings were constructed before 1979, when the first energy code requirements were put into place. Addressing how the energy code is

A bicycle lane in Buffalo

91%
of commercial
buildings and
97%
of residential
buildings were
constructed
before an
energy code

interpreted and enforced will help ensure all other new development citywide is more energy efficient. The City enforces the New York State 2010 Energy Conservation Construction Code (NYSECCC) and will look for opportunities for enhancing code education and compliance.

The City is committed to integrating energy efficiency principles into existing programs and exploring the feasibility of implementing new opportunities. For example, the City, through the Buffalo Urban Renewal Agency's (BURA) Emergency Repair Program, provides homeowners and renters with financial assistance to address emergency situations, such as utility service interruption or the repair of an individual component system that is in poor or dangerous condition. While this program is designed to address emergency situations, BURA works to integrate energy-efficiency strategies into the repair program in its continued effort to support a reduction in citywide energy consumption. There are many other opportunities to improve the energy efficiency of buildings citywide, and Buffalo plans to continue to partner with sibling agencies, major institutions, state and federal agencies, civic organizations, real estate developers, and other partners to identify and pursue them.

Initiative 8: Support enforcement of the state energy code



The interpretation of the New York State 2010 Energy Conservation Construction Code (NYSECCC) for renovations and retrofits impacts Buffalo's ability to reduce energy consumption citywide. The success of implementing the energy code is dependent upon a high level of communication between code enforcement officials and the design and construction industries. To ensure consistent interpretation and improved compliance of the NYSECCC, the City will pursue a variety of best practice strategies.

State-Supported Energy Code Training

New York is committed to ensuring at least 90 percent of residential and commercial buildings comply with the 2010 Energy Conservation Code of New York State (ECCNYS) by 2017. NYSERDA's Energy Codes Training and Support Initiative will support the design and construction communities in this transition to a more energy efficient built environment. At a minimum, support will include training seminars and courses, professional certification, and in-person training for municipalities, code officials, and designers.



These may include continuing education, design document checklists, review of building energy code compliance programs, interim and final construction inspection checklists, and energy code compliance certificates as a prerequisite for the certificate of occupancy. Buffalo's Permit and Inspections Department has prime responsibility for code compliance.

Enhanced enforcement of the energy code can result in the design, construction and renovation of more energy efficient buildings that, on average, consume approximately 15 percent less energy than the state average. With Buffalo's expected growth and future development, enhanced code enforcement could save the community an estimated \$600,000 a year.

Initiative 9: Enhance residential weatherization and energy efficiency improvement programs



Weatherization involves low-cost improvements like adding weather-stripping to doors and windows to save energy. It also includes a wide variety of energy-efficiency measures that encompass the building envelope, heating and cooling systems, electrical system, and electricity consuming appliances. A home audit can identify opportunities for weatherization and provide the owner with a clear understanding of the performance of the house as a whole system and not just the energy usage of individual systems.



Energy Efficiency in Buildings



Residential neighborhood
in Buffalo

Utilizing this approach yields higher performance results than what can be achieved with traditional, standalone energy conservation measures.

Buffalo's Green and Healthy Homes Initiative (GHHI) aligns and coordinates public and private funding sources and programs for whole-house solutions to improve the energy efficiency, health and safety of low-income homes. The Buffalo Urban Renewal Agency (BURA) works with the GHHI partners on behalf of the City to promote enrollment in the program and participation in weatherization programs.

Future Opportunity - Property Assessed Clean Energy (PACE)

In 2009, the state passed the Property Assessed Clean Energy (PACE) legislation, which provides long-term, low-interest financing for renewable and energy efficiency projects. Loans are paid back on property tax bills and the energy savings from projects create a revenue stream to support the loan payments.

In July 2014, NYSERDA announced a partnership that will support the expansion of PACE programs statewide. NYSERDA is providing approximately \$1 million to the Energy Improvement Corporation (EIC) to jumpstart its Energize NY Finance program over the next two years. The Energize NY Finance program uses Commercial PACE and property tax laws to provide long-term, market-rate financing for clean energy commercial and multifamily building improvements. Moving forward, the City's Energy Coordinator will be responsible for studying the development of PACE for the City.

CASE STUDY

SmartRegs, Boulder, Colorado

In 2009, the City of Boulder, Colorado, instituted the Residential Energy Conservation Ordinance (RECO), a multidepartment effort to improve the energy and water efficiency of existing housing. RECO is meant to help insulate residents from energy price increases by reducing the amount of



energy used for heat, hot water and lighting. Boulder's Planning and Sustainability and its Public Works departments worked with community and technical-based working groups to develop code updates that would further community sustainability objectives, especially energy efficiency.

To address energy efficiency in existing rental housing and existing commercial buildings, Boulder adopted SmartRegs in 2010. SmartRegs consists of three ordinances that update housing and rental licensing codes and provide baseline energy efficiency requirements for existing rental housing. This program requires all rental housing, about half of Boulder's housing stock, to meet a basic energy efficiency standard by 2019. Addressing energy efficiency in existing rental housing will allow the city to reduce greenhouse gas emissions and meet community climate objectives.

CASE STUDY **PUSH Buffalo**



The Green Jobs/Green NY (GJGNY) program provides New York State with an existing model for community-based energy efficiency and clean energy program implementation. Since 2011, PUSH Buffalo has served as a GJGNY community-based organization for Western New York.

As of 2014, PUSH Buffalo's efforts have resulted in approximately 500 completed Home Performance with ENERGY STAR

audits, 200 Home Performance with ENERGY STAR retrofits, more than 50 bundles of aggregated residential retrofit projects distributed to contractors, and nearly \$1 million of economic impact in target communities.

Additionally, the City will look to foster energy efficiency through the integration with and/or promotion of other programs. For example, Buffalo will evaluate incorporating energy efficiency into the City's rental registration program and marketing existing funding programs available to assist with the assessment and implementation of energy improvements, such as NYSEERDA's Empower program. Most of the programs offer loan programs to assist with obtaining the capital needed to complete weatherization projects.

Studies have shown that this type of program, with a 15 percent participation rate, can reduce annual energy consumption by approximately 2.5 percent. In Buffalo, this could result in a communitywide reduction of approximately \$685,000 in annual energy costs.

Implementation Matrix

Responsible Party	Key Partners	Source of Funding	Time frame	Next Steps
Reduce energy usage in municipal buildings				
Initiative 1: Promote energy awareness through outreach and training				
DPW - Buildings & Energy - Telecom Franchise & Utilitys	NYSERDA, National Grid and National Fuel	—	Short-Term	Adopt Policy
Initiative 2: Incorporate energy efficiency into capital improvements and new construction				
Department of Public Works - Buildings, Energy, Design & Planning	—	NYPA	Short-Term	Adopt Policy
Initiative 3: Update the City's lease arrangements to promote energy conservation				
Department of Public Works - Buildings, Energy, Design & Planning	—	—	Short-Term	Audit Leases
Initiative 4: Implement energy conservation measures				
Department of Public Works - Buildings, Energy, Design & Planning	NYPA, NYSEERDA and National Grid	National Grid, NYSEERDA, NYPA	Short-Term	ASHRAE Level II Studies
Initiative 5: Improve energy management through preventative maintenance and retro-commissioning				
Department of Public Works - Buildings, Energy, Design & Planning	—	National Grid, NYSEERDA, NYPA	Short-Term	Detailed Study
Initiative 6: Optimize use of space in municipal buildings				
Department of Public Works - Buildings, Energy, Design & Planning	—	National Grid, NYSEERDA, NYPA	Short-Term	Detailed Study
Initiative 7: Participate in a demand response program				
Department of Public Works - Buildings, Energy, Design & Planning	NYISO, NYPA	—	Short-Term	Evaluation
Support citywide building energy efficiency				
Initiative 8: Support enforcement of the state energy code				
Permits and Inspections	Department of State	NYSEERDA	Short-Term	Adjust Policy
Initiative 9: Enhance residential weatherization and energy efficiency improvement programs				
Office of Strategic Planning	NYSEERDA	NYSEERDA	Short-Term	Adjust Policy

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



Promote energy-efficient transportation choices and reduce municipal fleet energy consumption

Summary of Objectives and Initiatives

Advance projects supporting multimodal transportation options

- Initiative 1:** Enhance pedestrian and bicycle infrastructure
- Initiative 2:** Increase the number of Complete Streets projects
- Initiative 3:** Partner with the Niagara Frontier Transportation Authority to promote transit use

Reduce VMT through adoption of the Green Code

- Initiative 4:** Promote compact development
- Initiative 5:** Promote transit-oriented development
- Initiative 6:** Market driven parking
- Initiative 7:** Require transportation demand management programs for large development projects

Lead by example in reducing municipal VMT

- Initiative 8:** Evaluate opportunities for telecommuting
- Initiative 9:** Encourage City staff to walk or bike to meetings

Optimize transportation infrastructure and system efficiencies

- Initiative 10:** Improve traffic signal coordination and timing optimization
- Initiative 11:** Reduce street lighting energy usage and maintenance costs
- Initiative 12:** Promote speed awareness education
- Initiative 13:** Provide way-finding signage

Reduce the environmental impact and operating cost associated with fleet vehicles

- Initiative 14:** Develop a fuel management plan
- Initiative 15:** Replace vehicles with high-efficiency and hybrid vehicles
- Initiative 16:** Assess use of route optimization software
- Initiative 17:** Develop a right-sizing program for the City's fleet
- Initiative 18:** Evaluate the opportunities to convert vehicles to alternative fuels

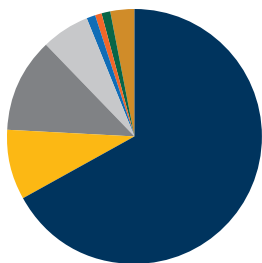
Buffalo's transportation network has a rich history founded upon Joseph Ellicott's radial street design that is traversed by the historic parkways and parks of Frederick Law Olmsted as it extends from the heart of downtown. This relationship creates the setting for a walkable city with tremendous opportunities. However, trends in infrastructure planning over time led to the segmentation of neighborhoods and fragmented connections between core areas of the city. Looking to address the challenges this has presented, the City has embraced transportation strategies that support sustainable development and quality of life by incorporating smart growth principles and place-based development.

Transportation plays a significant role in Buffalo's energy consumption and greenhouse gas emissions, and there is a tremendous opportunity for the City to integrate energy efficiency into infrastructure planning and system improvements. Adopting strategies that create a more livable, accessible and walkable city can meaningfully reduce energy consumption. Improving fleet efficiency and enhancing transit-related infrastructure, such as optimizing traffic signal timing, will also lend to greater energy savings and achievement of transportation efficiency goals. The City recognizes the complexities associated with reducing transportation energy use and will focus on synergistic measures that support both greater efficacy of existing programs and implementation of new opportunities.

Bicycling event in Buffalo



Modal Split



Modes of travel by
commuters for 2010

Figure 12



Reducing vehicle miles traveled (VMT) is an essential component of Buffalo's goals to reduce greenhouse gas emissions and energy consumption citywide. The City's planning efforts have integrated pedestrian, bicycle and Complete Streets design strategies into infrastructure improvement projects, creating better multimodal transportation options for the community and encouraging alternatives to trips made by automobile.

Examples of these strategies include right-of-way (ROW) improvements, extended signal crossing times on busy roads, on-street bike facilities (bike lanes, special intersection markings, and shared lanes) and bicycle parking.

Creating a robust bicycling network that can be integrated with other transportation systems and connects cultural institutions, parks, schools, the waterfront and major business destinations has been a focus of the Brown administration. Additionally, the update to the 2008 Bicycle and Pedestrian Master Plan, along with the development of the Downtown Infrastructure and Public Realm Master Plan, will create a framework for future strategic investments that continue to strengthen and promote mobility options.

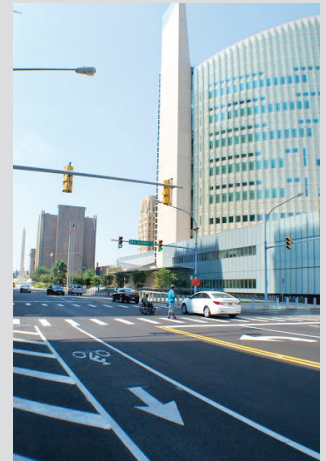


Transportation Efficiency

Bike Paths and WalkScore

Buffalo contains approximately 60 miles of bicycle paths. According to the United States Census Bureau's American Community Survey compiled by The League of American Bicyclists, in 2012 Buffalo ranked 14th out of the 70 largest cities in the country for bike commuting with an estimated 4,180 bicycle commuters (1.6 percent of population).

Buffalo's WalkScore, a ranking of the walkability of a city, is 65, and 30 percent of Buffalo households are car-free, about the same rate as San Francisco and Chicago. While poverty rates play a role in the city's low car ownership, so too does Buffalo's transit system and walkable neighborhoods that make it easier to get by without a car.



CASE STUDY

Buffalo Niagara Medical Campus



The Buffalo Niagara Medical Campus is constructing an integrated mobility hub known as the BNMC GOZONE. The project involves the adaptive reuse and expansion of a vacant historic building adjacent to a major NFTA Metro Rail Station (Allen/Medical Station) following low-impact development principles. These principles include energy conservation, the utilization of renewable energy sources and on-site stormwater management.

The BNMC GOZONE will include:

- A transportation resource center where residents and employees can visit to learn about and sign up for alternative transportation programs and services available to them
- A bicycle workshop and indoor bicycle parking complex, including showers, lockers and changing rooms that will be available to nearby employees and residents. The complex will also act as a "bike-and-ride" for the Metro Rail Station. It will be operated by GObike Buffalo
- An adjacent Buffalo CarShare and Buffalo BikeShare hub

Number of Daily Trips Using Other Modes of Transportation

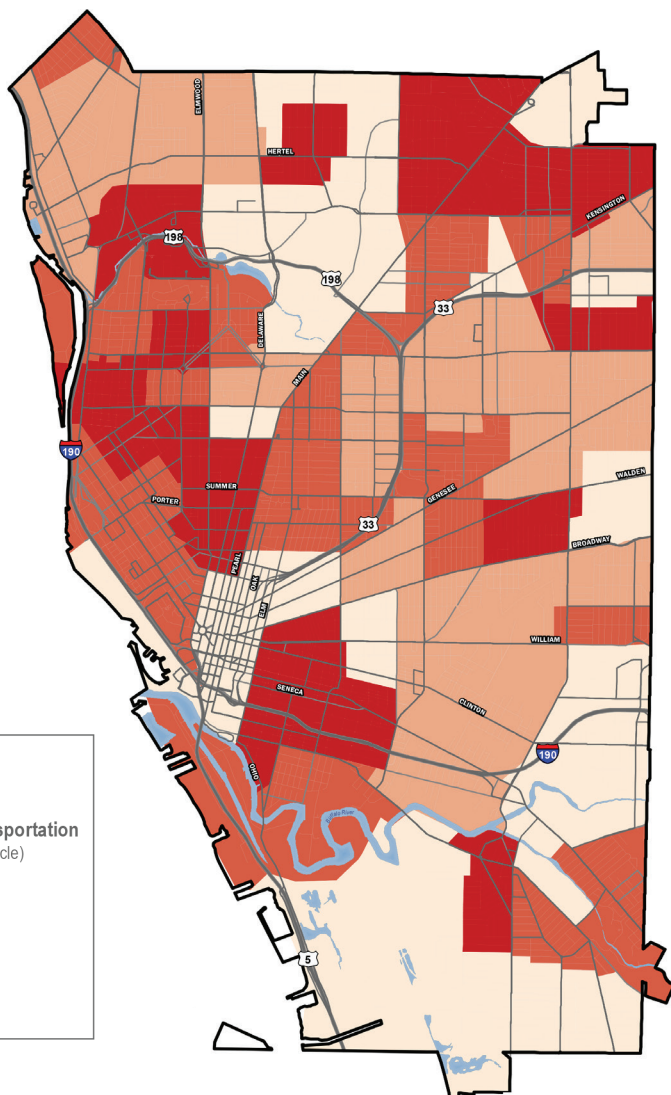
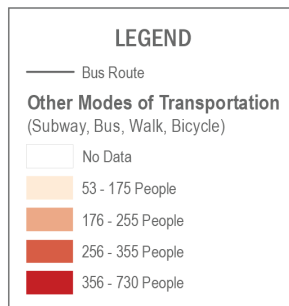


Figure 13

The information on this map was based on 2002 data provided by the Greater Buffalo Niagara Regional Transportation Council and reflects travel that originates and ends within the transportation analysis zone.

Advance projects supporting multimodal transportation options

Buffalo's population increases by 17 percent to over 300,000 as workers who live out of the city commute to work. While there has been a gradual shift in the use of alternative modes of transportation in recent years, 67 percent of residents still commute by single-occupant vehicles. Future population growth, real estate development and economic progress will add to the vibrancy of downtown and increase the city's tax revenues, but also may clog already busy roads and increase fuel consumption within the city. By promoting an integrated, energy efficient transportation network, Buffalo will help lessen the impacts of these challenges on the environment and economy. The City will create pedestrian, cycling and—where possible—transit links that optimize connections between the various modes of transportation, reducing VMT and providing greater multimodal opportunities for all users.

Initiative 1: Enhance pedestrian and bicycle infrastructure



The City has a bicycle path expansion target of 10 miles per year on primary and secondary roads. This goal is dynamic and will change as more paths are put in place and the network grows. Enhancements to pedestrian and bicycle infrastructure will improve the interface of

Ohio Street

The City of Buffalo is reconstructing Ohio Street as a two-way picturesque parkway with streetscape lighting and landscaping along with transit facilities, bike and walking paths, linking downtown and the city's Outer Harbor. Originally designed to serve the waterfront industry, the existing Ohio Street corridor consists of a four-lane commercial arterial with no provisions for



pedestrians, bicyclists or transit users.

The project also complements other recent developments along the downtown waterfront, including Canalside, part of a \$250 million waterfront revitalization project, and the \$172 million HARBORcenter project that stemmed from Mayor Brown's plan to transform a surface parking lot near the downtown waterfront into a major job-generating development project.



Transportation Efficiency

NTFA-Metro bus



alternative modes with transit and create greater connectivity between residences, schools, businesses, recreational sites and major destinations. Building on its efforts to date, Buffalo will continue to add bicycle paths and develop a GIS database of pedestrian facilities to support management of these assets and guide decisions for future investments.

Industry studies have shown enhanced pedestrian and cycling infrastructure will result in a 1 percent reduction in VMT. For Buffalo, this would result in a community energy usage reduction of approximately \$2.7 million in annual energy costs associated with transportation. Additional

non-quantifiable benefits include enhanced quality of life, greenhouse gas emission reduction and improved health and wellness.

Initiative 2: Increase the number of Complete Streets projects



Complete Streets integrate multimodal design elements into projects that allow pedestrians, bicyclists, motorists, transit users and travelers of all ages and abilities to move safely and comfortably. A Complete Streets approach provides transportation choices, supports transit-oriented, mixed-use development and brings a sense of place that encourages activity and enhances the vitality of a community. As the first municipality in New York to pass Complete Streets legislation, Buffalo recognizes the significant benefits associated with designing streets for all modes of transportation and sees new Complete Streets opportunities as an integral component of local and regional economic development and transportation initiatives.

Buffalo, coordinated through its DPW, integrates Complete Streets design elements into the City's Infrastructure Capital Programming and will increase the number of projects annually. For these projects, the City does not take a "one-size-fits-all" approach, but rather considers each site's physical limitations, programmed use of the streets, and available budget. Criteria for prioritizing future projects may include opportunities that support private investment, create links to other Complete Street projects, contribute to place-making or provide support for alternative fuel vehicles.

CASE STUDY

Niagara Street Corridor

In the north half of the City's waterfront, Niagara Street (a designated segment of the Great Lakes Seaway Trail National Scenic Byway) serves as the major waterfront transportation corridor connecting several waterfront parks, neighborhood centers and employment areas. Niagara Street is a wide expanse of pavement, with large billboards, minimal right-of-way landscaping, few traffic calming measures and minimal bike and pedestrian facilities. Travel speeds regularly exceed the posted speed limit by 15 miles per hour or more, creating dangerous conditions. The City is working with numerous stakeholders and partners to reinvent Niagara Street as Buffalo's principal waterfront corridor. A complete, green street project, the effort will include traffic calming measures, clear bicycle and pedestrian facilities, milling/asphalt overlay, street lighting, traffic signal replacements, improved transit stations, street furniture, landscaping, heritage interpretation, public art, and stormwater management. The streetscape project also seeks to encourage redevelopment of the many vacant and underutilized buildings.

Percentage of Daily Trips Using Single-Occupant Vehicles

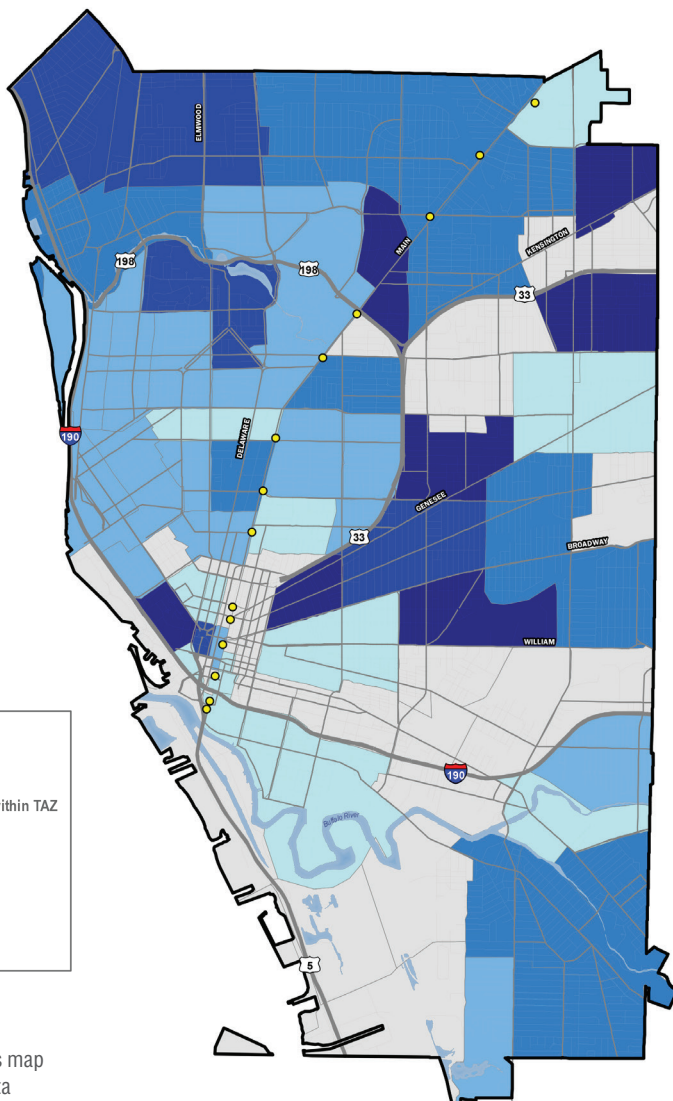
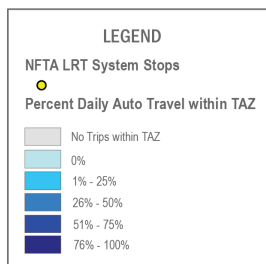


Figure 14

The information on this map was based on 2002 data provided by the Greater Buffalo Niagara Regional Transportation Council and reflects travel that originates and ends within the transportation analysis zone

Initiative 3: Partner with the Niagara Frontier Transportation Authority to promote transit use



The Niagara Frontier Transportation Authority (NFTA) is the primary public transportation provider within Erie and Niagara counties, serving approximately 94,000 people a day and covering 8.9 million miles of road a year. Mobility data for Buffalo from the Texas Transportation Institute indicated that in 2011, NFTA services helped Buffalo avoid 1.5 million hours of traffic delay that would have occurred if transit riders were in cars. This translates to three hours per commuter on Buffalo roadways or approximately 832,150 gallons of fuel saved in a year.

To support increased ridership citywide, the City, led by the Office of Strategic Planning, will partner with NFTA to improve coordination efforts for transit system refinements around compact development and transit-oriented development areas. The City will also support and help identify additional service improvement opportunities, including preferential bus service, traffic signal prioritization and express bus service. Industry studies have shown these types of transit improvements will result in a 1 percent reduction in VMT, which in Buffalo would equate to a reduction of approximately \$2.7 million in annual energy costs.

Reduce VMT through adoption of the Green Code

Zoning policy has a significant impact on revitalization efforts and build-out potential for development, with direct influence on transportation efficiencies. Buffalo has been undergoing a complete revision of its land use and zoning policies to create the Green Code, a Unified Development Ordinance (UDO) that combines zoning, subdivision and public realm standards. The existing zoning is antiquated and difficult to use as it was developed in an era of accommodating the automobile; its provisions do not support walkable urban environments. The new regulations will promote a form-based approach that focuses on the character of development and supports preferred development patterns to make the city a better place to live, work and invest. The Green Code supports transit-oriented development (TOD) and compact development, and is expected to generate higher transit ridership and critical mass through clustering of mixed-use development.

Initiative 4: Promote compact development



Compact development can reduce VMT by as much as 5 percent for passenger vehicles. Through the adoption of the Green Code, Buffalo will promote compact development and facilitate mixed-use project development. This will have a significant impact on reducing the length of commuter trips within the city, and will advance the Western New York Regional Economic Development Council's Strategy for Prosperity



Transportation Efficiency

smart-growth priorities. Consistent with the code, the City will encourage a mix of land uses to support establishment of services within walking distance of residences. The design standards in the code are intended to ensure new development is pedestrian friendly, by discouraging blank walls, requiring main entrances to be located on building fronts, placing parking in the rear and other place-making strategies.

Buffalo's Office of Strategic Planning is responsible for the final development and the administration of the Green Code. Based on the expected build-out of development in accordance with the code, the City's compact development can bring the community almost \$450,000 a year in energy savings.

Initiative 5: Promote transit-oriented development



The City will promote transit-oriented development (TOD), which includes mixed-use development located close to public transportation to facilitate transit use. Studies have shown TOD will reduce projected increases in VMT by 28 percent, and based on expected growth patterns in the city, Buffalo estimates that TOD will save residents, commuters, and visitors almost \$800,000 a year in reduced fuel consumption.

Through implementation of the Green Code, the City will increase density around transit routes and stations. As an incentive for high-quality developments around transit that conform to the Green Code standards, the City will facilitate coordination and approval processes. To further promote use of public transportation through TOD, all new municipal buildings are required to be located near a transit stop. By promoting TOD opportunities, the City helps protect the community from the unpredictability of fuel prices and improves access to transit for all residents, including newcomers and those who are dependent on public transportation options.

Initiative 6: Market driven parking



Excess surface parking is a critical issue in sustaining redevelopment efforts and economic growth within Buffalo. Minimum parking requirements are historically based on peak parking demand, which occurs for relatively short time spans and may vary depending on time of the day or week. This often creates an excess of parking, which encourages more driving and discourages walking. Extensive surface parking also has negative environmental impacts as large expanses of impervious, black asphalt contribute to stormwater runoff and the urban heat island effect. These conditions result in increased water pollution, stress on the City's stormwater system

CASE STUDY

Buffalo Niagara Medical Campus

The Buffalo Niagara Medical Campus (BNMC) has embraced transportation demand management strategies that encourage ridesharing, transit, walking and bicycling. BNMC has led the way through the formation of the BNMC Transportation Management Association (TMA) that includes the City, transportation agencies and GoBike Buffalo. TMA's focus is providing education,



administrative, and trip planning assistance. BNMC also provides safe and efficient pedestrian travel paths, bicycle amenities, carpooling, and The Wave, an on-campus circulator shuttle. BNMC also has a Guaranteed Ride Home program for individuals who must deal with last-minute changes to their schedule.

On average,
4.3%
of Americans
work from home;
In Buffalo, only
2%
reported working
from home

CASE STUDY

San Francisco CityCycle Program

San Francisco offers its City employees a sustainable and healthy transportation option for official business through its CityCycle program, administered by the San Francisco Department of the Environment. Two hundred and fifty bicycles have been deployed in 23 departments to encourage biking when employees would otherwise use a fleet car. According to the biennial municipal employee transportation survey, 11 percent of employees use a bike to get around for work. In 2012, City employees reported biking about 500,000 miles during working hours.

on rainy days, and increased temperatures and resulting energy demand on hot days, respectively.

To support land uses that encourage alternative transportation, foster neighborhood place making and mitigate stormwater runoff and the urban heat island effect, Buffalo will eliminate minimum parking requirements in favor of a market-based approach for new construction and major renovation projects, as set forth in the Green Code.

Initiative 7: Require transportation demand management programs for large development projects



Transportation demand management (TDM) is the application of strategies and policies to reduce travel demand, specifically for single-occupancy private vehicles, at times of peak demand in specific congested areas. TDM strategies promote the use of transit, cycling and walking through access to car and van pooling, park and ride facilities, bike sharing infrastructure, and other convenient amenities. Managing transportation demand can be a cost-effective alternative to increasing capacity, while also improving environmental and public health and fostering more livable cities. The Green Code will require TDM strategies to be employed for large development projects.

Lead by example in reducing municipal VMT

Buffalo maintains a fleet of more than 950 vehicles that travel more than 10 million miles a year. The fleet consumes 484,000 gallons of gasoline and 242,000 gallons of diesel fuel annually. The fleet's energy usage accounts for 19 percent of total municipal energy usage and contributes 6,700 metric tons of greenhouse gas emissions annually.

The City will take steps to reduce fuel consumption and VMT related to official business and operations. By encouraging employees to utilize alternative transportation and providing alternative opportunities for commuting, the City will also help reduce traffic congestion, energy consumption and greenhouse gas emissions.

Telecommuting for Employees of New York State Agencies

The Public Employees Federation (PEF) and Governor's Office of Employee Relations (GOER) support advancement of telecommuting projects as set forth in the New York State Clean Air Compliance Act of 1993 and the State Telecommuting Act of 1993. Through these statutes, state agencies are free to determine if telecommuting is desirable and to implement agency-specific programs. As the state is one of the largest employers in Buffalo, state agencies have an opportunity to significantly impact the reduction in the number of single-occupant vehicles traveling within the city by adopting telecommuting policies.



Number of Daily Trips Using Single-Occupant Vehicles

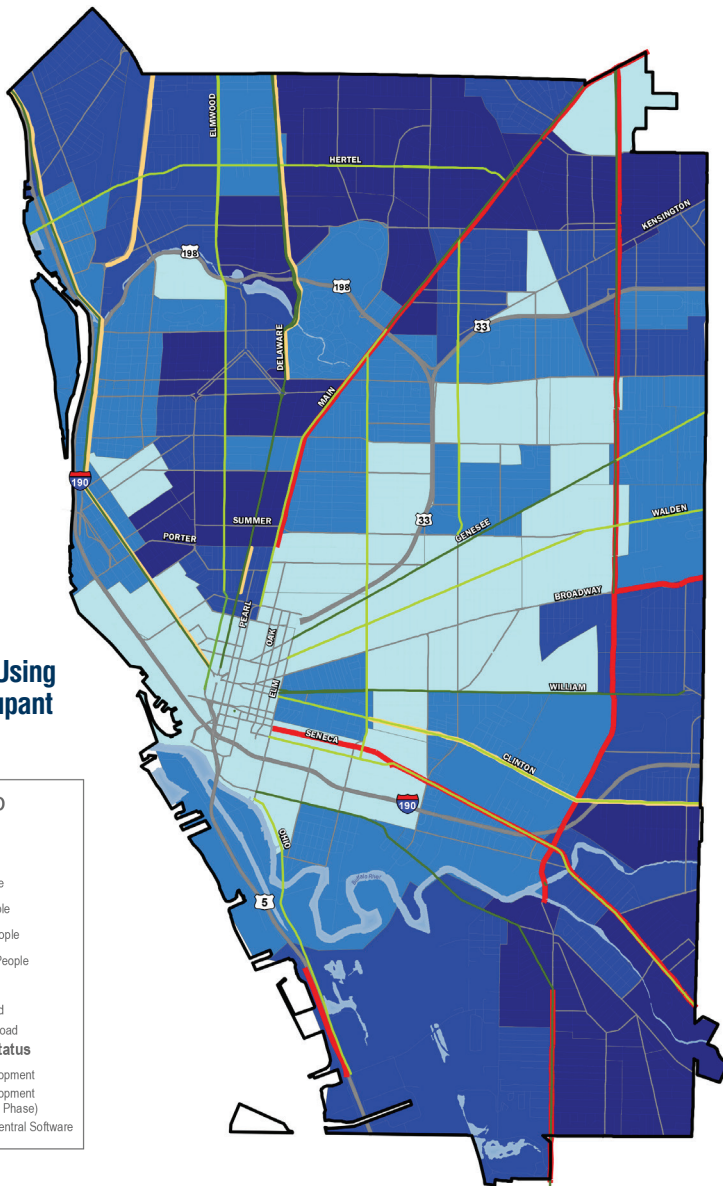
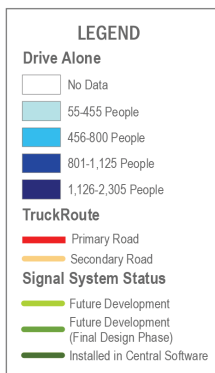


Figure 15

The information on this map was based on 2002 data provided by the Greater Buffalo Niagara Regional Transportation Council and reflects travel that originates and ends within the transportation analysis zone.

Initiative 8: Evaluate opportunities for telecommuting



As technology advances, telecommuting and working from home are becoming viable alternatives to daily office commutes. The standardization of cloud computing and video conferencing, combined with growing concerns regarding gasoline prices and work-life balance, make these alternative commutes attractive options. About 4.3 percent of Americans reported working from home most of the week in 2010,

according to the U.S. Census Bureau. In Buffalo during 2012, approximately 2 percent reported working from home, according to the American Community Survey.

Implementing a telecommuting policy will potentially help reduce Buffalo's energy costs and provide solutions for travel disturbances due to weather. The City will evaluate the feasibility and impact of a telecommuting program to determine whether it makes sense for municipal employees. The Energy Coordinator will lead an interagency group to participate in this evaluation.

The Public Employees Federation and Governor's Office of Employee Relations support advancement of telecommuting projects as set forth in the New York State Clean Air Compliance Act of 1993 and the State Telecommuting Act of 1993. Through these statutes, state agencies are free to determine if telecommuting is desirable and to implement agency-specific programs. Because the state is one of the largest employers in Buffalo, State agencies have an opportunity to significantly impact the reduction in the number of single-occupant vehicles traveling within the city by adopting telecommuting policies.

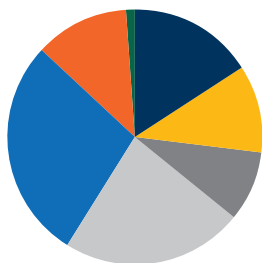
Initiative 9: Encourage City staff to walk or bike to meetings



Biking and walking are energy-efficient and healthy options for City employees to get to meetings or conduct other official business. These options promote a more sustainable and safer transportation system and help City employees better connect with the communities they serve. Some state and local governments, such as San Francisco's, have taken even more concrete steps to encourage cycling by creating bike share programs for City employees to use in place of fleet vehicles.

Buffalo will encourage municipal staff to walk or bike to meetings located within half a mile of City Hall through an energy-awareness campaign, managed by the Energy Coordinator. The City will lead by example by providing a model for these policies in practice to be adapted by other community businesses and organizations.

Baseline City Government Electrical Usage



- Municipal Buildings (16%)
- Buffalo Water Authority (11%)
- Buffalo Municipal Housing (9%)
- Buffalo Public Schools (23%)
- Buffalo Sewer Authority (28%)
- Street Lighting (12%)
- Signals (1%)

This demonstrates the electrical usage by major City agencies and highlights street lighting as a major component.

Figure 16

Street lighting variation when upgraded to LED lights

Optimize transportation infrastructure and system efficiencies

Transportation system management (TSM) is defined by the U.S. Department of Transportation's Federal Highway Administration as strategies used to reduce congestion through improved transportation system efficiency. By reducing congestion, TSM reduces energy use and greenhouse gas emissions. TSM strategies also support better pedestrian safety, reduced congestion and travel time, and improved driver experience. Buffalo is pursuing TSM strategies, including traffic signal optimization, incident management, speed limit reduction, and an assessment of street lighting upgrades and procurement opportunities. Mobility data for Buffalo from the Texas Transportation Institute indicates Freeway Incident Management has reduced annual commuter delay time in 2011 by 271,000 hours, which equates to a reduction of approximately 149,050 gallons of annual excess fuel consumed.

Initiative 10: Improve traffic signal coordination and timing optimization



Traffic signal coordination involves the synchronization of traffic signals by integrating a system timing plan on arterial roadways to reduce delay experienced by motorists traveling through the corridors. For a relatively small investment, traffic signal coordination can reduce vehicle energy usage by scheduling signal timing throughout the day to keep traffic flowing. This time of day signal coordination will in turn reduce energy usage and emissions associated with congestion.

Buffalo has implemented traffic signal coordination for multiple corridors within its roadway network and continues to pursue grant opportunities to improve additional traffic signal

systems. These efforts have focused on high traffic volume corridors used by commuters and by bus transit operations. Implementation of traffic signal coordination and timing optimization have been proven to reduce automobile energy use and related greenhouse gas emissions. Assessment of the performance of a recent traffic signal coordination project in Buffalo, including those on Elmwood Avenue, Clinton Street, Main Street, Seneca Street, Jefferson Avenue and Hertel Avenue, revealed fuel savings of approximately 10.5 percent.

Buffalo will continue to take advantage of the operational capabilities within corridors that already have signal coordination and will evaluate the potential to implement time-of-day patterns in existing corridors. The City will coordinate this effort with the Niagara International Transportation Technology Coalition (NITTEC) signal coordination committee. NITTEC is a coalition of agencies that utilize real-time traffic and roadway information to monitor traffic conditions and make real-time adjustments to improve vehicular flow and handle emergency events. With assistance from NITTEC, the City will also identify potential opportunities to expand signal coordination for high-volume commuter corridors.

The City expects expanding signal coordination and implementing optimized time of day patterns will result in community energy savings of nearly \$1 million annually.

Initiative 11: Reduce street lighting energy usage and maintenance costs



Buffalo has approximately 32,250 streetlights, most of which are owned by National Grid. The City is responsible for the costs associated with both the energy usage and maintenance of the fixtures as well as other assets such as poles and bases. The total annual cost to the City for the existing arrangement is approximately \$11 million.

LED streetlights are significantly more energy efficient than existing street lighting, with the potential to reduce energy demand and consumption by as much as 50 percent, while also improving lighting quality and safety. It is anticipated the City will see approximately \$1.9 million in annual energy savings from the replacement of existing lighting fixtures with light-emitting diode (LED) fixtures.





Transportation Efficiency

The City has recently contracted with a firm to perform an audit of Buffalo's streetlights to compare the utility-owned assets to City-owned assets, including the state and cost of their operations and maintenance. The City will evaluate the potential costs and benefits associated with purchasing the street lighting system from the utility. Early estimates indicate the City will potentially save as much as \$5.6 million annually.

To change over the streetlights, the City would need to purchase the fixtures and other assets from National Grid. The City will also need to identify funding to retrofit the light fixtures to LEDs and cover maintenance costs, either through its existing capital and operating budgets or through a public-private partnership with an ESCO. An ESCO contract typically includes the design, procurement, installation, maintenance and monitoring of the new lighting system, allowing the City to achieve energy savings without the need to allocate capital dollars. The City will work with an ESCO to perform an investment grade energy audit of street lighting. This ESCO may also be responsible for assisting in negotiations with energy suppliers for street lighting, identifying funding sources for project implementation, assisting with project financing, and tracking cost estimates and savings.

Initiative 12: Promote speed awareness education

Decreasing automobile speed can reduce fuel consumption and improve safety. In a recent study by the Texas Transportation Institute, researchers evaluated the effectiveness of a mounted speed display in a school zone on a two-lane roadway in Forney, Texas. The normal speed limit was 55 mph, and the school zone speed limit was 35 mph. The average speed at the beginning of the school speed zone dropped from 44.5 mph to 35.3 mph shortly after the speed display was installed (a 9.2 mph reduction).

To achieve these goals, Buffalo will promote speed management through speed education and strategic use of speed display devices. Traffic speed is also tied to traffic signal coordination as signals are timed based on historic traffic trends, patterns and travel time.

Initiative 13: Provide way-finding signage



Encouraging people to choose alternative modes of transportation requires it to be easy and convenient. Signage can help do that by providing useful information at key decision points, such as metro stations and tourist destinations. The City will integrate way-finding signage into infrastructure improvement projects. Way-finding signage will support Complete Streets efforts and promote bicycle and pedestrian transportation



Regional Alignment with Western New York Regional Economic Development Council

The Western New York Regional Economic Development Council identified tourism as one of the three priority sectors in a Strategy for Prosperity, and included it in the Buffalo Billion's Investment Development Plan. Related to these efforts is the Path Through History Vision Plan, announced by Gov. Andrew Cuomo in 2012, to showcase the state's history and areas of cultural significance. The City's Complete Streets and way-finding strategies will support these initiatives by providing multimodal connections to destinations for visitors and locals.

City of Buffalo Fleet Vehicles Ages

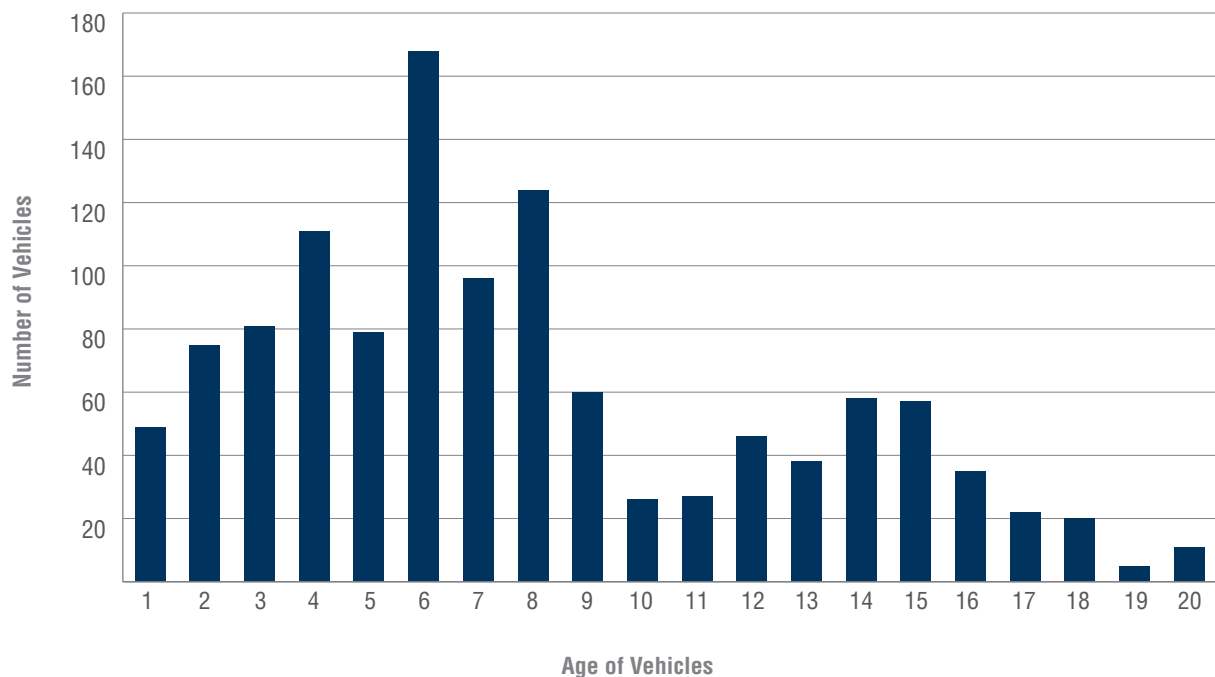


Figure 17

options by transforming streets into easily navigable and accessible public spaces for locals and tourists alike. Way-finding signage includes direction-giving, landmark identification, orientation and safety information. A signage program with easily readable and recognizable signs allows individuals to orient themselves, determine the distance to key destinations and find directions to where they want to go.

Reduce the environmental impact and operating cost associated with fleet vehicles

Buffalo's fleet consists of approximately 970 vehicles across 24 municipal departments, all of which rely on traditional gasoline and diesel fuels to operate. In fiscal year 2010-11, the City consumed 612,106 gallons of gasoline and 225,185 gallons of diesel. Fuel costs exceeded \$2.9 million and resulted in more than 7,673 million tons of carbon dioxide emissions.

The majority of the City's fleet is housed in the Police and Street departments. The Police Department has more than 400 vehicles in service, accounting for 42 percent of the City's fleet. The average age of Buffalo's police cars is 6.8 years and more than 50 police vehicles are over nine years old. The Division of Streets manages 18 percent of the City's fleet with approximately 175 vehicles in service. Of those, 66 vehicles are over the average age of nine years old.

Implementing a comprehensive fleet management program, inclusive of fuel management, alternative fuel vehicle procurement and route optimization programs can reduce fueling costs and emissions.



Transportation Efficiency

Initiative 14: Develop a fuel management plan



Fuel economy can be affected by the manner in which drivers operate and maintain vehicles. Studies have found that training drivers to follow best vehicle operating practices reduces wasted fuel consumption and costs. Therefore, in light of rising fuel costs, the City plans to develop and implement a comprehensive fuel management plan to reduce fuel related expenditures.

With leadership from DPW, the fuel management plan will cover strategies to promote efficient driving habits (ecodriving), ensure proper vehicle maintenance, and reduce vehicle idling, all of which reduce excessive fuel consumption and related costs. The plan will also include preventative maintenance procedures and the monitoring of performance measures.

Kohl's EV Charging Station



Initiative 15: Replace vehicles with high-efficiency and hybrid vehicles



To reduce fuel costs and its environmental footprint, the City will evaluate purchasing vehicles with high efficiency ratings, flexible fuel options, and hybrid technology. Replacement of older vehicles with more fuel-efficient and/or alternative-fuel vehicles could save the City \$475,000 in annual energy costs.

Choosing the appropriate replacement is critical to minimize capital costs—which tend to be significantly higher for fuel efficient, hybrid and alternative fuel vehicles—and to ensure City operational needs are met. For example, more than 40 different models of hybrid vehicles are commercially available including compacts, sedans, SUVs, crossovers and pickup trucks. DPW will evaluate replacement vehicle options and determine whether a particular clean fleet vehicle is more economical than its standard counterpart and, if so, choose the appropriate model. There are several state programs to support the greening of fleets, such as NYSEDA's Alternative Fuel Vehicle Program, through which financial assistance and technical information is provided to encourage fleets to purchase alternative-fuel vehicles and install fueling facilities or charging stations.

Initiative 16: Assess use of route optimization software



Route optimization software, used in conjunction with GPS tracking technology, can help fleet managers reduce VMT, realize greater operational efficiency, lessen the impact on the environment, and create more sustainable business practices. The programs utilize real-time and historical data on vehicle utilization, miles traveled, fuel usage and operating costs to identify opportunities for increased efficiencies. Data-driven solutions can add predictability and consistency to vehicle utilization and routing decisions.

Buffalo will assess utilizing route optimization software to plan out trips for non-emergency services to potentially improve overall transportation operations. DPW, which administers all aspects of fleet management, will lead the assessment. Preliminary estimates anticipate that this software could save Buffalo \$185,000 in annual energy costs, with an upfront cost of \$160,000.

Initiative 17: Develop a right-sizing program for the City's fleet



The City will develop a right-sizing strategy for fleet vehicles. A data-driven and comprehensive right-sizing approach can help reduce fleet size by as much as 5 to 10 percent, by identifying opportunities for agencies to share resources and for early retirement of underutilized—and possibly oversized—vehicles. The resulting consolidation of fleet vehicles can reduce energy costs by nearly \$9,000 annually.

To develop its right-sizing strategy, DPW will conduct a comprehensive fleet inventory, creating a repository of vehicle usage data. It will then use this information to institute a planning process for reassignment or disposal of vehicles, where appropriate. It will consider utilization of fuel consumption as well as miles driven and/or hours used. As part of this effort, DPW will systematically review each piece of equipment to assess its contribution to City operations, including cars, trucks, tractors, backhoes, loaders and other fleet equipment.

Initiative 18: Evaluate the opportunities to convert vehicles to alternative fuels



There are a variety of alternative fuel options, many of which can help reduce cost and emissions. Existing and emerging alternative fuel options appropriate for municipal fleets include compressed natural gas (CNG), electric vehicles (EV) and biodiesel.

For high-usage, major fleet vehicles, the City will perform a detailed analysis to determine the models that are the best candidates for replacement with alternative fuel vehicles, specifically CNG and electric vehicles. Based on the age and annual VMT of the City's fleet, a subset of vehicles—including vehicles used by the Street and Police departments—are likely candidates for CNG vehicles. Route-based and short-distance vehicles, such as meter-reading vehicles, street sweepers and parks vehicles, are the City's best candidates for electric vehicles, given the current stage of technology.

Biodiesel is an alternative fuel produced from a mixture of diesel fuel with vegetable oils, animal fats or waste cooking oil. Biodiesel burns cleaner than traditional fuel with fewer emissions and reduces the petroleum-based fuel consumption.

Grant to Reduce Greenhouse Gas Emissions

NYSERDA recently received a \$1 million U.S. Department of Energy grant on behalf of the Transportation and Climate Initiative to reduce greenhouse gas emissions from the transportation sector. The goal of the initiative is to accelerate the introduction of EV charging stations throughout the Northeast through public and private partnerships. The project will include installation of 80 new electric vehicle charging stations throughout the state. Sixty-seven of the stations will be in National Grid territory and the utility has combined efforts with ChargePoint, a California-based EV company that will contribute an additional \$550,000 to the project.

This initiative supports governor Cuomo's Charge NY plan to develop an EV charging infrastructure across the state and the collaboration between NYSERDA, ChargePoint and National Grid will serve as a model for public-private partnership moving forward.

The fuel can be used in conventional diesel engines without the need for major vehicle modifications. A potential disadvantage of biodiesel is the potentially higher cost. As part of the alternative fuel analysis, the City will explore the feasibility of biodiesel conversion for applicable fleet vehicles.

Based on an initial review of fleet operation, while CNG and EV vehicles cost more than standard vehicles, the City estimates it would achieve \$670,000 in fuel savings from converting major fleet vehicles to CNG, and approximately \$73,000 in fuel savings by converting select specialty vehicles to electric. Additional savings from lower maintenance costs are expected. DPW will further refine these estimates through a detailed analysis, assess opportunities for vehicle conversions, and explore the opportunity to partner with private and regional organizations for fueling options.



Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next Steps
Advance projects supporting multimodal transportation options				
Initiative 1: Enhance pedestrian and bicycle infrastructure				
Department of Public Works - Engineering	—	NYSERDA, NYSDOT, USDOT	Short-Term	Bike Master Plan
Initiative 2: Increase the number of Complete Streets projects				
Department of Public Works - Engineering	—	NYSERDA, NYSDOT, USDOT	Short-Term	Ongoing Effort
Initiative 3: Partner with the Niagara Frontier Transportation Authority to promote transit use				
Department of Public Works - Engineering	NFTA	NYSERDA, NYSDOT, USDOT	Short-Term	Ongoing Effort
Reduce VMT through adoption of the Green Code				
Initiative 4: Promote compact development				
Office of Strategic Planning	—	NYSERDA, BOA, LWRP, NY Main Street	Short-Term	Pass the Green Code
Initiative 5: Promote transit-oriented development				
Office of Strategic Planning	—	NYSERDA, BOA, LWRP, NY Main Street	Short-Term	Pass the Green Code
Initiative 6: Market-driven parking				
Office of Strategic Planning	—	NYSERDA, BOA, LWRP, NY Main Street	Short-Term	Pass the Green Code
Initiative 7: Require transportation demand management programs for large development projects				
Office of Strategic Planning	—	NYSERDA, BOA, LWRP, NY Main Street	Short-Term	Pass the Green Code
Lead by example in reducing municipal VMT				
Initiative 8: Evaluate opportunities for telecommuting				
City of Buffalo - Human Resources	Department of Public Works & Office of Strategic Planning	—	Short-Term	Adjust Policy
Initiative 9: Encourage City staff to walk or bike to meetings				
City of Buffalo - Human Resources	Department of Public Works & Office of Strategic Planning	—	Short-Term	Adjust Policy
Optimize transportation infrastructure and system efficiencies				
Initiative 10: Improve traffic signal coordination and timing optimization				
Department of Public Works - Engineering	Boarder Comm.	—	Short-Term	Detailed Energy Study
Initiative 11: Reduce street lighting energy usage and maintenance costs				
Department of Public Works - Engineering	National Grid	National Grid, NYSERDA, NYPA	Short-Term	Detailed Energy Study
Initiative 12: Promote speed awareness education				
Department of Public Works - Engineering	—	—	Short-Term	Seek funding for education
Initiative 13: Provide way-finding signage				
Department of Public Works - Engineering	—	—	Short-Term	Identify Signage and Locations

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

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next Steps
Reduce the environmental impact and operating cost associated with fleet vehicles				
Initiative 14: Develop a fuel management plan				
Department of Public Works - Streets	—	—	Medium-Term	RFP for Professional Services
Initiative 15: Replace vehicles with high-efficiency and hybrid vehicles				
Department of Public Works - Streets	—	—	Medium-Term	Adopt Policy
Initiative 16: Assess use of route optimization software				
Department of Public Works - Streets	—	—	Medium-Term	RFP for Professional Services
Initiative 17: Develop a right-sizing program for the City's fleet				
Department of Public Works - Streets	—	—	Medium-Term	Adopt Policy
Initiative 18: Evaluate the opportunities to convert vehicles to alternative fuels				
Department of Public Works - Streets	—	—	Long-Term	RFP for Professional Services

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



Promote District Energy and Distributed Generation

Summary of Objectives and Initiatives

Optimize the City's district energy utility

- Initiative 1:** Increase the number of buildings served by the district heating system
- Initiative 2:** Evaluate opportunities to create a new district heating loop
- Initiative 3:** Evaluate combined heat and power systems for existing district heat

Support renewable energy development in the city

- Initiative 4:** Identify opportunities for renewable energy deployment on City properties
- Initiative 5:** Promote community wide renewable energy projects through the Green Code

Onsite power generation, commonly called distributed energy, will play an increasingly important role in meeting citywide energy needs. New York State's anticipated new regulatory framework will reward the integration of decentralized supply systems into a comprehensive energy strategy that helps protect the community from the instability and fluctuation of energy prices. In April 2014, the New York State Public Service Commission issued the Reforming the Energy Vision (REV) initiative to promote more efficient use of energy, deeper penetration of renewable energy resources such as wind and solar and wider deployment of "distributed" energy resources, such as microgrids, on-site power supplies, and storage. This model is a transformation from centralized energy production

and transmission to a decentralized model focused on distributed generation, microgrids and demand response strategies.

Buffalo similarly recognizes the value in shifting toward distributed generation. To do so, the City will focus on deploying cost-effective, clean and affordable energy services, including those from renewable energy sources such as from the sun and wind. Distributed energy generation can also help reduce vulnerability associated with grid degradation and extreme weather events. Increasing the local clean energy deployment supports economic development by attracting new businesses to the region and creating a demand for a green workforce. Skilled labor is needed for not only the design and construction of systems but also for the manufacturing of system

Green Jobs

According to the Buffalo Niagara Where Industry Creates Energy Report, the number of manufacturing and technology jobs in the clean energy sector is expected to rise from an estimated 2,000 in 2006 to almost 16,000 in 2038. As the industry grows, manufacturing needs for systems components will increase the demand for this skilled workforce.

However, WNY REDC has identified skilled labor for green jobs as a local and regional gap. To help address part of this challenge, WNY REDC has partnered with the Manufacturing Institute to bring the Dream It. Do It. (DIDI) program to the region. Through DIDI, WNY REDC will provide the support necessary to connect a skilled workforce in technology and manufacturing to industry leaders. This project promotes advanced manufacturing and the careers offered by the advanced manufacturing sector. The program includes regional marketing, events, internship, and apprenticeship opportunities. Additional programs that support the creation of a skilled green workforce are provided by Erie Community College's Green Energy Professional Development Training Programs.

Green jobs training



components and installation. SolarCity, the largest solar provider in the nation, exemplifies this growth within Buffalo's clean energy industry and is positioned to be a regional and nation leader.

Designing policy to expand district energy and distributed generation systems in Buffalo will help attract investment to its clean energy economy, while enhancing the reliability, resiliency and affordability of the city's energy infrastructure. Strategies to improve the resiliency of the electric power supply in the face of extreme weather events also reduces economic and safety risks. In August 2013, the federal Hurricane Sandy Rebuilding Task Force published the



Downtown Buffalo

Hurricane Sandy Rebuilding Strategy, which describes how combined heat and power systems contributed to keeping a number of college campuses, multifamily housing, critical medical facilities, sewage treatment plants and other facilities running during the storm. The state's anticipated new regulatory framework, through REV proceeding, will reward the integration of decentralized supply systems into a comprehensive energy strategy that helps protect the community from the instability of energy prices and offers customers more control over their energy choices.

Buffalo's energy infrastructure vision connects municipal operations with a vibrant private sector market to create a dynamic, clean energy economy for the region and community. Great strides have already been made, from 14 solar

system installations on municipal buildings to the collaborative planning efforts with the WNY REDC and Buffalo Urban Development Corporation, to bring green industry and technologies to the city. Additional collaboration and investment will help support economic growth and bring clean energy jobs and businesses to Buffalo.

Optimize the City's district energy utility

A district energy system is a central plant that distributes heat (through steam or hot water) or air conditioning (through chilled water) to the buildings served by the system. Related benefits include no up-front capital cost for heating equipment and distribution infrastructure for each building, lower fuel costs and reductions in emissions. In downtown Buffalo, the City operates a district energy plant that provides heat to the Buffalo Fire Department headquarters, the City Courthouse, 42 Delaware Ave., the Erie County Family Court building, the Edward A. Rath County Office Building and City Hall. The system can heat more than 1,000 homes; however, only 30 percent of the system is utilized. This provides a significant opportunity to increase the number of facilities served by the system, thereby increasing the plant's operating efficiency by reducing standby losses.

Initiative 1: Increase the number of buildings served by the district heating system



Buffalo will seek to increase the number of buildings served by the district heating system. The City has recently upgraded the district energy plant with a system to monitor and provide real-time information on the plant's energy usage and operating efficiency. The monitoring of daily building operations can identify spikes in energy usage and allows operators to make recommendations for behavioral or system changes to address these issues. The City will begin to utilize this information to help identify opportunities for system upgrades and expansion. The information will also help ensure that the system will continue to operate at a high efficiency.



Horsefeathers Building geothermal installation



The City will identify major renovations or new construction within 1,500 feet of the existing system and will contact property owners to communicate the benefits of district energy and the potential availability of the additional

district heat capacity coming online. The Office of Strategic Planning will work with the Buffalo Urban Development Corporation, the City's not-for-profit development agency, to coordinate new development opportunities and expansion of the district energy system. The addition of facilities to the district heating loop will provide the City with an estimated \$350,000 in additional revenue, depending on the size and demand of the facility that is added.

Initiative 2: Evaluate opportunities to create a new district heating loop



The City will evaluate the expansion of the boiler plant at Coca Cola Field, home of the minor league Buffalo Bisons, to create a second district heating plant. The heating plant at Coca Cola Field is significantly underutilized, operating at less than 3 percent of its full capacity, which reduces the boilers' efficiency. This reduction in efficiency is estimated to cost the stadium as much as \$4,000 annually in extra natural gas costs. The excess capacity of the boilers could be used to provide heating energy to nearby buildings, which would effectively expand the stadium's heating system into Buffalo's second district heating plant.

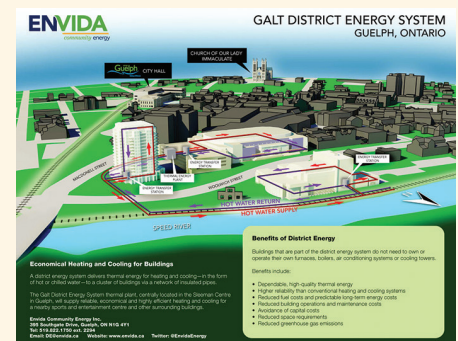
By adding users, and therefore expanding the demand for the system's heat, the heating system would be able to operate at a higher efficiency level, lowering the cost of the stadium's own

CASE STUDY

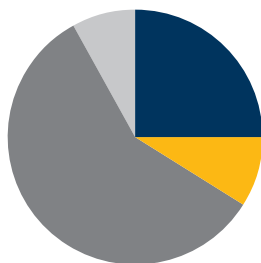
District Energy, Guelph, Ontario

Guelph is a community located 100 miles northwest of Buffalo in Ontario, Canada. Guelph created the District Energy Strategic Plan for an interconnected thermal grid to serve industrial, commercial and residential buildings across the city. It will be the first citywide district energy system in North America. Guelph's goal is to use its district energy network to supply at least half of the community's heating needs in the next 30 years.

The District Energy Strategic Plan takes a phased approach, starting with installation in high-priority areas. The system will then expand to medium priority areas to form an interconnected grid capable of providing large portions of Guelph with economical heating and domestic hot water. Guelph identified the downtown core—a high-density brownfield site—and the 675-acre Hanlon Creek Business Park mixed-use site as its high-priority areas for initial system deployment. The plan is a partnership between the City, Guelph Hydro Inc. and Envida Community Energy Inc.



Existing Photovoltaic Systems



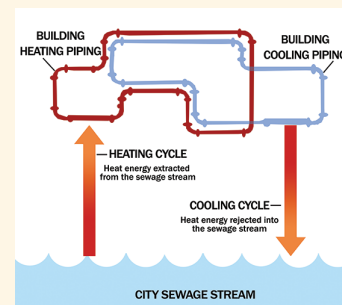
- Commercial (25%)
- Government (9%)
- Not for Profit (58%)
- Residential (8%)

The breakdown of photovoltaic energy within the City by sector.

Figure 18

CASE STUDY Philadelphia Water Department

In 2012, Philadelphia's Water Department installed a sewage geothermal system at the City's Southeast Water Pollution Control Plant. The system was designed by NovaThermal Energy and utilizes the existing plant infrastructure. Thermal energy is extracted from the sewage arriving at the plant, providing approximately 20 percent of the facility's heating energy needs. The resulting benefits include \$15,000 in annual energy savings. The first-of-its-kind project received funding through the Greenworks Pilot Energy Technology Grant (G-PET) program for the design, installation and equipment costs.



Buffalo's municipal sewer infrastructure is well suited for a geothermal well system, due to the predictable water flow and temperature of its sewer lines. Buffalo's system may be capable of generating enough energy to power 500 to 1,000 homes without using natural gas or electricity. Such a system would likely be best suited for new construction, such as new business parks, residential development and new industrial discharge sites.

heating needs while generating a revenue stream for the City. Buildings that choose to connect to this proposed system would see lower fuel costs without the need to invest in the installation, maintenance, and operations of their own heating equipment.

As a next step, the City will hire a consultant to evaluate this and other potential district energy opportunities. The consultant will analyze data and identify capital improvements at the district energy plant(s), marketing and management of the district energy system, and implementing future smart meter technologies.

Initiative 3: Evaluate combined heat and power systems for existing district heat



Combined heat and power (CHP) systems, also referred to as cogeneration systems, produce electricity and heat. CHP systems capture the waste heat from electricity generation to provide heating or hot water, thereby making more efficient use of each unit of fuel. According to the U.S. Environmental Protection Agency, the average efficiency of a conventional power plant in the U.S. is approximately 33 percent, meaning for each unit of energy that goes into the system, only one-third of it is returned as energy for power or heating. CHP systems, however, can achieve

efficiency levels as high as 75 to 80 percent, more than double that of a standard power plant.

Buffalo, with the support of the proposed district energy technical consultant, will evaluate the technical and financial feasibility for the integration of CHP into the existing district heat system for future system expansion. This addition to the district energy system would provide the opportunity to distribute electricity to the plant's current client buildings, in addition to heat. The addition of CHP to the existing district energy plant could save users an estimated \$180,000 annually in energy costs.

The CHP system could also be the anchor for a microgrid demonstration project, an electrical system with generation capacity where loads connected to the systems are energized in parallel with the utility's grid. Governor Cuomo's \$40 million NY Prize competition supports the development of community microgrids in areas with approximately 40,000 residents. Grid vulnerability and the likelihood that future weather events may continue to impact the existing infrastructure are driving this effort. The project requires the state, utilities, the PSC and private entities to work together to remove regulatory and financial barriers to distributed renewable energy resources, which will be made easier under the new REV paradigm.



PUSH solar installation



Support renewable energy development in the city

Renewable energy systems are environmentally attractive options for producing electricity. To date, Buffalo has installed 14 photovoltaic systems on municipal buildings, which produce 335,162 kWh of electricity annually. These installations serve as demonstration projects to support and promote the application of renewable energy technologies citywide. As the City seeks to increase renewable energy deployment, it will continue to lead by example with its installations and promote renewable energy use for the city's institutions, businesses and homes. While these technologies often have significant upfront capital costs, they provide energy independence, enhance the city's resilience and reduce its carbon footprint, while also advancing Buffalo as a global clean energy hub and supporting economic development and job creation.

Initiative 4: Identify opportunities for renewable energy deployment on City properties



As Buffalo explores adding renewable energy and other distributed generation installations, it will assess which portfolio of technologies makes the most sense for its planning and operational needs and which financial mechanisms are best suited for implementation. To do so, the City will complete feasibility analyses for solar, wind, waste to energy and geothermal technologies for installation on its properties. The study will evaluate and compare the cost-effectiveness, environmental impact and constructability of the various renewable technologies. The study will also identify appropriate locations, including building roofs and other municipal property, for siting projects and a process for integrating opportunities into existing capital projects. For example, early studies have identified 26 City-owned buildings as potential candidates to host roof mounted solar photovoltaic (PV) systems, which together could generate over 1 megawatt of electricity. This is the equivalent of powering 230 homes.

There are various implementation and financing mechanisms to support the installation of renewable energy technologies on candidate locations. One of the more promising models for municipal governments, as well as large institutions and businesses, is a Power Purchase Agreement (PPA), a financial arrangement in which a third-party renewable energy developer

CASE STUDY

Buffalo Public Schools Solar Installation Training

Solar energy systems installed on public schools have a number of benefits, including utility savings, reductions in greenhouse gas emissions, job creation and learning opportunities for students. Buffalo Public Schools (BPS) is leveraging this opportunity by cultivating the next generation of renewable-energy industry leaders.

In 2012, students from McKinley High School were provided an opportunity to receive certification in solar installation from the Green Career Institute. This leadership program highlighted the importance of matching the region's growing green economy needs with educational institutions to create a strong and vibrant local community workforce. Highlighting BPS's commitment to lead by example, it is evaluating the use of PPAs for photovoltaic installations across the district. The solar photovoltaic systems would also serve as a learning tool to help educate students, staff and the community on renewable energy.



installs, owns, operates and maintains the system on property owned by the City (or other property owner for non-municipal installations). Instead of investing its own capital and owning the renewable energy systems, the City would purchase only the renewable energy generated on its property, set at predetermined electricity rates for a specified timeframe. This provides the additional benefit of protecting the City's budget from future electricity price increases. If the City's assessment finds this approach to be a cost-effective and feasible strategy, the City will issue a Request for Proposal to select a third-party commercial entity to develop, own and maintain the renewable energy systems on City properties.

Buffalo will also explore utilizing the New York State Remote Net Metering program to obtain renewable energy credits by selling the excess renewable electricity generated on its property to other satellite buildings. This would allow the City to potentially make productive use of capped landfills and unused brownfields within the city as renewable generation sites. On these sites, Buffalo has the potential to host an estimated 24,000 kW of solar electricity, producing 25,320 MWh of electric energy annually—the equivalent of 3,611 homes—22,500 kW and 31,095 MWh of wind energy.

Initiative 5: Promote community wide renewable energy projects through the Green Code



The Green Code includes many standards with provisions that are explicitly designed to encourage reduced energy use, promote alternative energy sources and improve environmental quality of development in the city. This includes supporting alternative energy sources, such as residential-scale solar or wind energy systems. Residential scale systems (less than 500 kW) are currently allowed as accessory uses, and commercial grade systems (more than 500 kW) are allowed in employment areas. Through the adoption of the Green Code, Buffalo will promote community wide renewable energy projects and will explore partnership opportunities with the private sector to do so. Buffalo will also pursue non-development related public private partnership renewable energy opportunities, including the evaluation for renewable energy generation on brownfield sites not under municipal ownership. To the extent that such sites could aggregate multiple customers or generation potential, there may be an opportunity for a private developer to partner with the New York Green Bank to help finance the project.

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Optimize the City's district energy utility				
Initiative 1: Increase the number of buildings served by the current district heating system				
Department of Public Works - Buildings, Energy, Design & Planning	Utilities	National Grid, NYSDERDA, NYPA	Medium-Term	Market District Energy System
Initiative 2: Evaluate opportunities to create a new district heating loop				
Department of Public Works - Buildings, Energy, Design & Planning	Utilities	National Grid, NYSDERDA, NYPA	Long-Term	Detailed Facility Study
Initiative 3: Evaluate combined heat and power systems for existing district heat				
Department of Public Works - Buildings, Energy, Design & Planning	Utilities	National Grid, NYSDERDA, NYPA	Medium-Term	Detailed Facility Study
Support renewable energy development in the City				
Initiative 4: Identify opportunities for renewable energy deployment on City properties				
Department of Public Works - Buildings, Energy, Design & Planning	NYSDERDA & NYPA	NYSDERDA, NYPA	Medium-Term	Release RFP for Professional Services
Initiative 5: Promote community wide renewable energy projects through the Green Code				
Office of Strategic Planning	NYSDERDA & NYPA	NYSDERDA, NYPA	Medium-Term	Release RFP for Professional Services

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

Organizational structure to support implementation

The City's Office of Strategic Planning and the Department of Public Works (DPW) will oversee the implementation of the Buffalo Energy Plan with input and collaboration from the Office of Permit and Inspection Services. Each department will be accountable for applicable initiatives with overall implementation guided by the Energy Coordinator, who will report to the Buildings Division with oversight from the Commissioner of Public Works.

The City will develop performance indicators to track progress towards goals (relating to energy usage and anticipated reductions), and will track and report annually on the progress. Buffalo will continue to work with its stakeholders to flesh out implementation of these initiatives and identify opportunities for partnership. The plan will be updated regularly in coordination with parallel planning efforts to minimize costs and best leverage staff resources.

Financing and Project Implementation Approach

The City will utilize available financial and management resources to implement this plan, including NY state funding opportunities, third-party turnkey contracts and other private partnership opportunities. Third-party contracts may include ESCOs and PPAs. Through an ESCO, implemented energy conservation measures result in energy savings that create a revenue stream used to repay the cost of the project. NYPA's Energy Efficiency Program is a funding mechanism that uses prequalified implementation contractors to provide energy services with guaranteed savings. Greater collaboration with private development will be targeted in an effort to identify public-private partnerships for clean energy deployment and transportation projects that support reduced VMT citywide.

NYPA, NYSEDA, DEC and other state agencies are committed to the success and long-term sustainability of the Buffalo Energy Plan, and will support Buffalo through existing and future funding programs.

Municipal Baseline and Savings Projections (mmBtu)

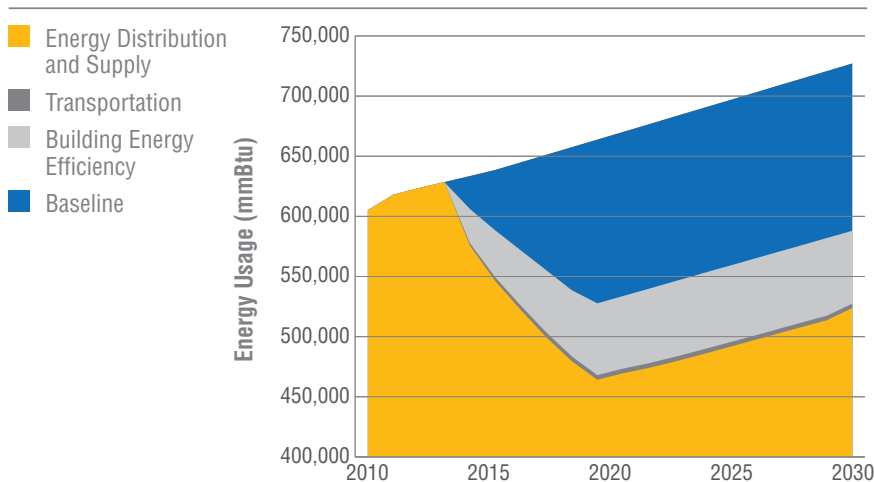


Figure 19

Community Baseline and Savings Projections (mmBtu)

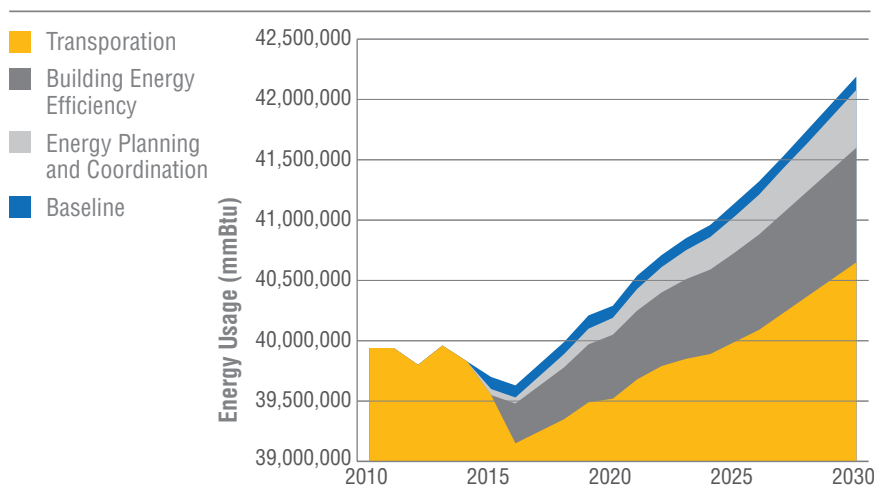


Figure 20

Summary of Cross-Cutting Themes

The Buffalo Energy Plan sets forth a shared energy vision for the city. The goals reflect Buffalo's commitment and leadership in creating a competitive, robust economy and sustainable future. To make a significant impact on the city's energy consumption, both collective and individual efforts are needed moving forward. Emerging from these strategies is a number of cross cutting themes that are woven through the four action areas.

Municipal leadership: leading by example

The City will serve as a role model to encourage the community to take steps to save energy and reduce emissions. Successful energy efficiency strategies can be replicated by businesses, institutions and residents to decrease overall energy use. Implementation of the City's initiatives will increase energy awareness and provide cost savings to taxpayers. Although the City's energy usage accounts for less than 1 percent of the total citywide consumption, increasing the efficiency of municipal buildings and operations will encourage stakeholders to take a leadership role in their respective organizations. Municipal programs that raise energy awareness and reduce fuel consumption by promoting alternative transportation can serve as models and can be emulated across all sectors of the community. Through the Brown administration's leadership, the Buffalo Energy Plan will catalyze private investment in energy-efficiency improvements and improve the local economy without compromising the health of the environment.

Economic development: creating jobs and attracting businesses

As demonstrated by SolarCity, Buffalo is at the cusp of developing a strong clean energy sector that will continue to improve the local economy. The goals of the Buffalo Energy Plan strengthen the city's long-term competitiveness and economic development by creating a framework that decreases energy costs to residents and businesses and improves infrastructure and services. The City's energy goals position Buffalo for long-term success in attracting new business and industry, especially related to energy efficiency and renewable technologies, through initiatives to promote clean energy projects and increase its visibility as an energy hub. Additionally, providing new opportunities for district heat will help draw development to the

downtown, and enhancing Buffalo's transportation infrastructure with a robust network of pedestrian and bicycle friendly Complete Streets corridors will improve access to jobs and support surrounding businesses and property values.

Infrastructure: preparing our cities for the future

The energy demands of the 21st century will require a more resilient energy infrastructure that meets the requirements of modern consumers. As seen during the October 2012 storm in Buffalo and Superstorm Sandy in downstate New York, extreme weather events are becoming more common. Disruptions to the energy supply from these events negatively impact the community in many ways, including causing personal and economic hardships to residents and businesses. Identifying distributed generation opportunities and providing a collaborative energy planning process that includes major stakeholders and the utilities will lead to a stronger, more resilient infrastructure.

Climate action: reducing the city's carbon footprint

The rising levels of greenhouse gas emissions from energy and fuel consumption negatively impact ecosystems, water and resource supplies, and human health. Improving energy efficiency and shifting markets to support greater use of clean energy will reduce Buffalo's carbon footprint. The Buffalo Energy Plan is a decision and policy-making tool that supports smart energy innovation, green growth, and decreased dependence on fossil fuels. The City plays a key role in leading Buffalo into a sustainable future through initiatives that harness energy from renewable sources, optimize building efficiency and promote transportation alternatives. Creating a more sustainable energy future relies on participation from residents and the private and public sectors. Residents have an opportunity to reduce energy consumption in their homes through weatherization programs and to reduce their fuel consumption by using alternative modes of transportation, while the private and public sectors can significantly reduce emissions by integrating energy efficiency measures into buildings, investing in clean energy solutions, and raising energy awareness.

Working together – the City, the state and the community – can make great strides to transform Buffalo into a low-carbon, resilient city.



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,

A handwritten signature in black ink that reads "Lovely A. Warren". The signature is fluid and cursive, with a long, sweeping underline.

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

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Municipal Energy Consumption by Fuel Type (mmBtu)

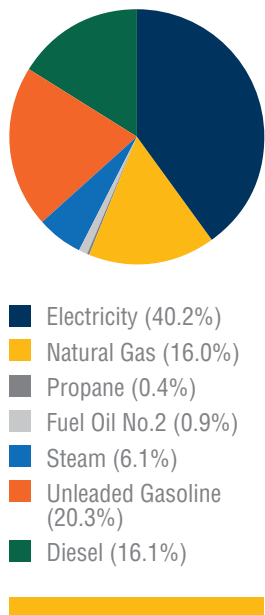


Figure 1

Community Energy Consumption by Fuel Source

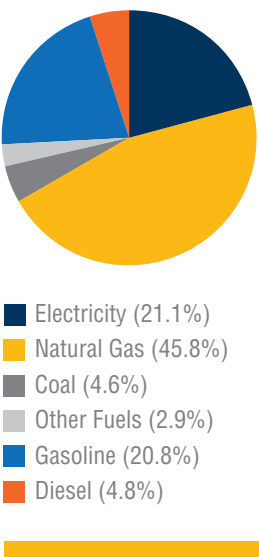


Figure 2

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

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 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.



Energy Planning & Coordination

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

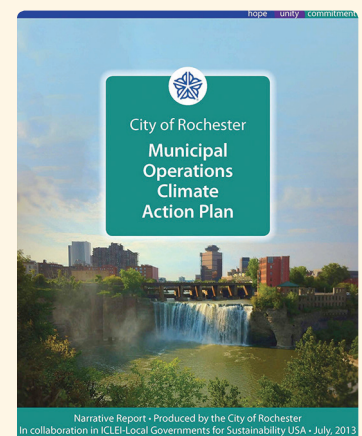
The City of Rochester established the Office of Energy and Sustainability within the Division of Environmental Quality to lead and coordinate energy efficiency and sustainability efforts throughout City government. As part of the Department of Environmental Services, which manages municipal infrastructure, 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.





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 ₂ e)
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

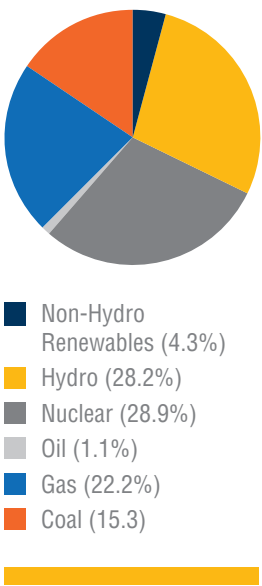


Figure 4



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

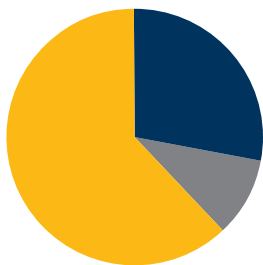


To engage residents and building owners to reduce energy usage, RG&E and the New York State Energy Research and Development Authority (NYSERDA) administer incentive programs. RG&E offers rebates for customers who install energy-saving natural gas equipment and efficient appliances, as well as free energy 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

300 State Street

Citywide Buildings Energy Consumption by Fuel Type



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

Figure 5

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



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.

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.



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.



Blue Cross Arena at the War Memorial

Municipal Building Energy Consumption by City Department

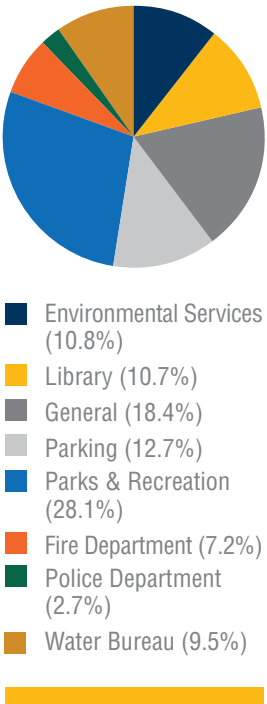


Figure 6



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 buildings in 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

Community Energy Consumption by End User

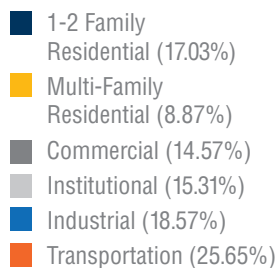
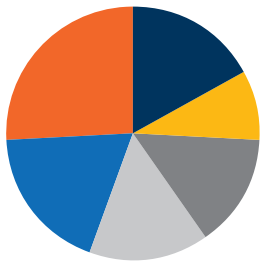


Figure 7

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	3,310,132	\$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

of 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; NYSEERDA; 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	NYSEERDA; 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	NYP&A; NYSEERDA; 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	NYSEERDA, 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 implementa-

tion 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

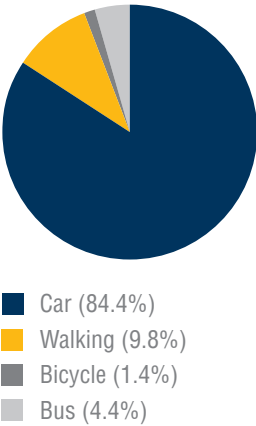


Figure 8

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

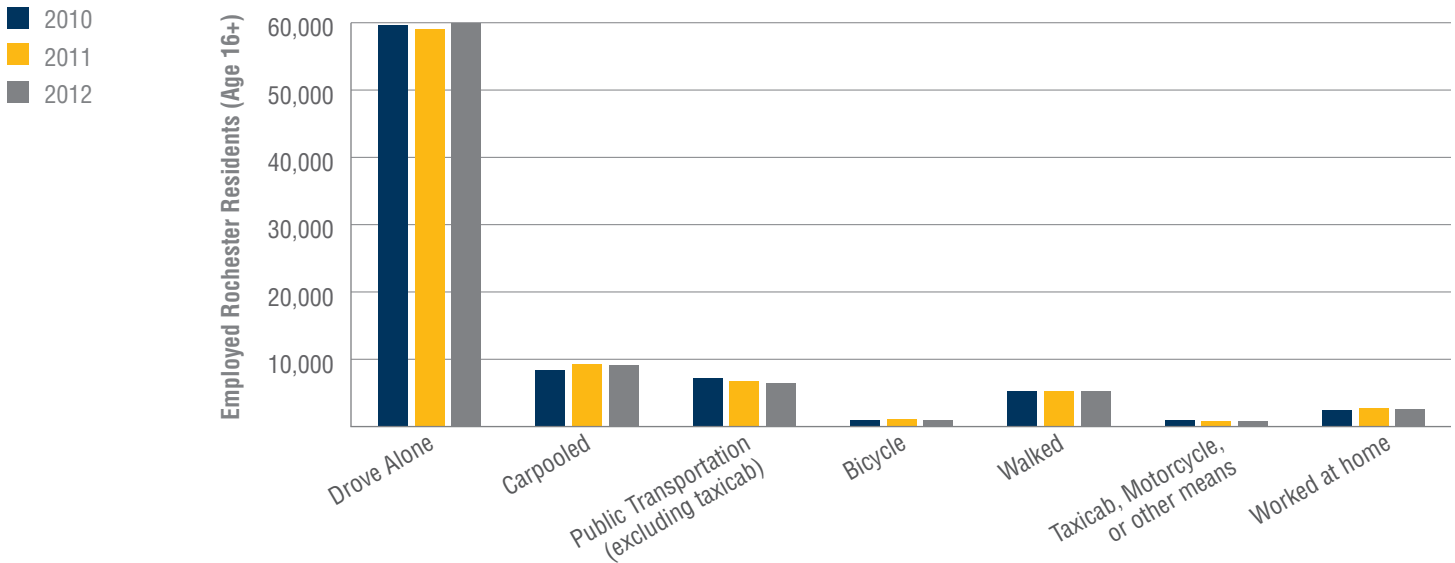


Figure 10

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

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 NYSEERDA-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

Gasoline and diesel fuel contribute
28%
of all greenhouse gas emissions in Rochester



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.

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

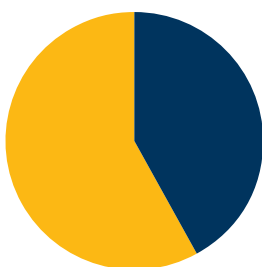
CNG Station





Bicyclist — South Avenue
at Highland Bowl

Municipal Fleets Energy Use by Fuel Type



■ Unleaded
Gasoline (42%)
■ Diesel (58%)

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 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
57.1MW
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



Chiller at the Rundel Memorial Building of the Rochester Public Library

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.

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.

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

Monroe County operates the Lola Powerhouse Combined Heat and Power facility at 444 East Henrietta



Monroe County Lola
Powerhouse

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 1.7 million pounds of steam 65,000 tons of chilled water per hour
University of Rochester	24.3 MW
Monroe County Lola 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.

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 NYSEERDA's goal of transforming clean energy markets in part by reducing barriers to entry. Rochester participated in an incentive program administered by NYSEERDA 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.



Solar panels along the Rochester skyline

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 NYSEERDA 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.

Solar
installations
at City of
Rochester
facilities can
generate
59kW

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.

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.



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.

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.

Projected Reductions in Municipal Energy Consumption by Action Area

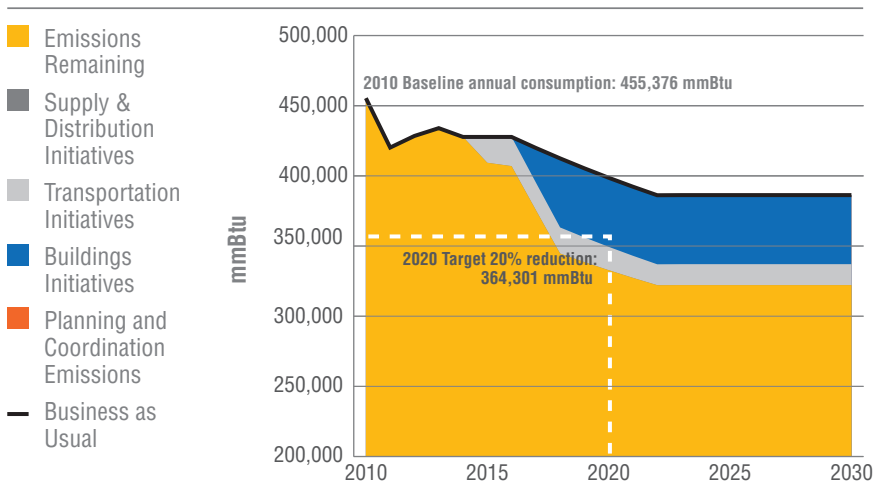


Figure 15

Projected Community Reductions in Energy Consumption by Action Area

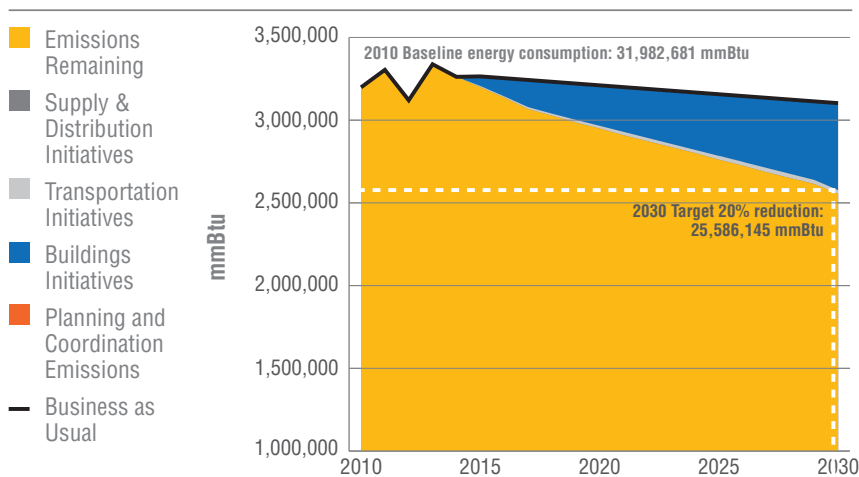


Figure 16

SYRACUSE



Letter From Stephanie A. Miner



On behalf of the City of Syracuse, I am pleased to introduce you to the Syracuse Energy Plan. This document represents a substantial effort undertaken by both the New York Power Authority and the City of Syracuse to find efficiencies in energy usage and opportunities to reduce our environmental footprint. This plan builds on some of the efforts my administration has taken and we look forward to the continued partnership with NYPA to implement the practices developed for this plan.

Keeping the community green and energy efficient is a top priority of my administration. When I assumed office, I established Syracuse's first-ever Bureau of Planning and Sustainability. This new department was laser focused on building an environmentally sound future for the City through smart urban planning and design. One of the chief accomplishments of this bureau was developing a Sustainability Plan for inclusion in our Comprehensive Plan: 2040. This plan will help guide the City of Syracuse as we reduce emissions, support green practices and promote urban sustainability.

The Syracuse Energy Plan will complement the efforts already underway at City Hall. This plan will expand our efforts and integrate them with regional solutions focused on energy-efficient development. Working together, we will implement a holistic approach to energy management. This plan will help us achieve our mutual goals of reducing consumption, increasing energy infrastructure reliability and spurring the investment which will create the jobs that give Syracuse a cleaner, greener future.

I would like to thank the staff from NYPA as well as the City of Syracuse who worked tirelessly on this Plan. I look forward to its implementation and the greener future we can bring to Syracuse.

A handwritten signature in black ink that reads "Stephanie A. Miner".

Stephanie A. Miner
Mayor of Syracuse



Top right, Syracuse
bird's-eye view;
Middle, Syracuse skyline;
Bottom left, Sen. John H. Hughes
State Office Building;
Bottom right, Onondaga
County Courthouse

City of Syracuse Energy Plan

The Syracuse Energy Plan builds on the City's strong tradition in sustainability and energy planning as well as previous and ongoing plans, energy conservation improvements, and renewable energy installations. It is designed to take successful initiatives to the next level, integrate key objectives of regional sustainability and economic development planning efforts, and provide a comprehensive strategy for energy management with respect to energy efficiency measures, usage reduction, and renewable deployment across sectors and interests. Altogether, the initiatives of the Syracuse Energy Plan are intended to reduce energy consumption, strengthen reliability of the energy infrastructure, leverage private sector investment in clean energy projects, create jobs in related industries and contribute to a cleaner environment.

Overview of energy consumption

As the seat of Onondaga County, Syracuse is a major economic hub of Central New York. It is home to numerous universities, colleges and medical facilities. The residential population is 145,170, with a daytime population of 194,000 due to the influx of commuters, including those working for the region's largest employers, SUNY Upstate Medical University and Syracuse University.

In Syracuse, energy consumption exceeded 21 million mmBtu in 2010, resulting in approximately 1.5 million metric tons of greenhouse gas emissions. Buildings account for 64 percent of this energy consumption, including those used for residential, commercial, institutional and industrial uses. The remaining 36 percent of energy consumption comes from gasoline and diesel fuel used by vehicles traveling through and within Syracuse. Municipal operations account for 1.7 percent of energy consumption in the city, with transportation (vehicular fuel and street lighting) accounting for almost half of governmental energy use.

Existing energy, sustainability, and climate action efforts

The Energy Plan advances and complements the goals and recommendations documented in the City of Syracuse Sustainability Plan, Comprehensive Plan 2040, the Land Use & Development Plan 2040 and the Syracuse Bicycle Plan. The City of Syracuse Sustainability Plan presents a roadmap to reduce Syracuse's greenhouse gas emissions by reducing energy usage in City operations and promoting energy use reductions citywide in the building and transportation sectors. The Sustainability Plan set a goal to reduce greenhouse gas emissions from municipal operations by 40 percent above 2002 levels and citywide emissions by 7 percent by 2020. To help the City measure progress toward its sustainability goals, the City of Syracuse Greenhouse Gas Emissions Report documented the greenhouse gas emissions from municipal operations as well as the community at large.

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Community Greenhouse Gas Emissions by Fuel Type

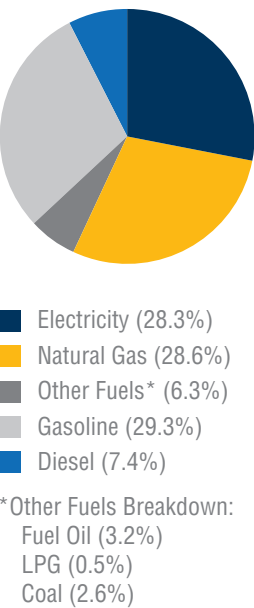


Figure 1



The Syracuse Sustainability Plan is a component of the City’s Comprehensive Plan 2040, which contains a vision for Syracuse’s future and identifies policies, actions, regulations and investments that the City intends to undertake to achieve this vision. Two other components of the City’s Comprehensive Plan 2040 are important in the context of this Energy Plan: the Land Use & Development Plan 2040 and the Syracuse Bicycle Plan. The Land Use & Development Plan includes recommendations for compact development patterns and walkable neighborhoods that aim to reduce the number of trips made using private vehicles. Development and redevelopment in accordance with the land use plan recommendations will reduce the amount of energy used in the transportation sector citywide. The Bicycle Plan recommends infrastructure improvements to support increased bicycle use as a viable mode of transportation within the city. Bicycle infrastructure is essential to encourage more bicycle trips within Syracuse, thereby reducing fuel consumption from vehicles.

The three-county region that includes Syracuse completed the Central New York Regional Sustainability Plan in 2012, which aims to reduce the region’s per capita energy consumption 40 percent below 2010 levels by 2030 and increase the amount of electricity generated by renewable sources by 25 percent. Strategies include the deployment of New York State Energy Research and Development funded commercial energy efficiency projects and the certification of existing public and new residential buildings to ENERGY STAR® or similar energy-efficiency standards. Planning for energy and sustainability is critical to the City’s goals for robust economic development. The Central New York Regional Economic Development Council identifies clean energy and environmental systems as a priority industry concentration, supporting more than 10,000 green jobs. Several projects recommended in the Five-Year Strategic Plan Regional Economic Development Strategy support additional research, design and manufacturing that complement the Syracuse Energy Plan.

Municipal Energy Consumption by Fuel Type (mmBtu)

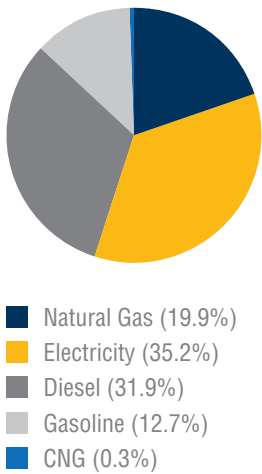


Figure 2

Syracuse has completed numerous projects to advance its goals in energy conservation and sustainability. Renewable energy projects such as the photovoltaic and micro-hydro at the Westcott Reservoir and the solar photovoltaic (PV) system at City Hall Commons reduced the use of traditional electricity generation. The improvement of bicycle and pedestrian infrastructure supports alternatives to trips in cars. Improved traffic signal coordination will reduce fuel wasted idling at intersections. Energy audits, building upgrades, streetlight replacement and the substitution of lighting in garages and traffic lights to more energy-efficient LED lighting have reduced Syracuse's energy consumption. Several more projects are underway. For instance, the City hopes to coordinate more traffic signals along major corridors to alleviate congestion and cut down on vehicle idling, and is working on the construction of more bike lanes. In the building sector, a City ordinance requires LEED-silver standards in newly constructed or renovated City facilities, and also offers a 10-year property tax exemption for LEED-certified buildings citywide.

Summary of goals and initiatives

The Syracuse Energy Plan takes a comprehensive look at energy-related planning, buildings, transportation, and infrastructure trends. It identifies goals and initiatives that build on the success of the Sustainability Plan and other efforts to date to further enhance the City's energy efficiency and resiliency.

To improve energy planning and coordination, Syracuse intends to continue to maintain communications and collaborate with utility, government and private sector partners to support energy policies and programs that benefit residents, businesses and institutions. Key initiatives include participating in the decision-making process of the New York Public Service Commission (PSC), particularly as the Reforming the Energy Vision (REV) proceeding is implemented, and continuing collaborative procurement of natural gas and electricity.

To unlock private sector investment opportunities, Syracuse will begin to improve energy efficiency of citywide building stock, while leading by example with its own buildings. Key municipal energy efficiency initiatives include partnerships with business and community leaders to increase benchmarking of buildings citywide and implementing energy efficiency measures in municipal buildings.

In line with the Comprehensive Plan 2040, Syracuse will promote transit, cycling and walking in the city. For its own fleet, the City will reduce idling and increase the number of alternative fuel vehicles. The conversion of streetlights to LED fixtures will reduce municipal electricity costs.

To help utilities, other institutions and private sector partners strengthen and modernize energy infrastructure for enhanced reliability and lower environmental impact, the Syracuse Energy Plan includes initiatives to coordinate with National Grid to improve infrastructure within City rights-of-ways, support private efforts to establish district energy and microgrids and to increase the amount of renewable energy generated within Syracuse.



New York State Fair

Sen. John H. Hughes
State Office Building





Coordinate Energy Policies and Programs

Summary of Objectives and Initiatives

Collaborate with government, utility and private sector partners to advance energy policies and programs

Initiative 1: Participate in Public Service Commission decision-making processes relating to tariffs and utility regulation.

Initiative 2: Continue and expand collaborative energy procurement through ESCOs

Monitor municipal energy usage and communicate trends to decision-makers

Initiative 3: Maintain and formalize procedures for ongoing monitoring of energy usage and building performance

Initiative 4: Integrate energy-efficiency performance into capital improvement and fleet procurement decision-making

Meeting Syracuse's energy goals requires the coordination of a wide range of public and private actors, from natural gas and electricity utilities and local, state and federal agencies to private citizens, developers and investors. Layers of regulations and institutional policies affect the availability, cost and type of energy used in buildings and vehicles by residents, businesses, institutions and governments.

To facilitate ongoing energy planning and monitoring, as well as the management of sustainability projects and the administration of grants, Syracuse employs a Sustainability Coordinator who works within the City Planning Division of the Syracuse-Onondaga County Planning Agency. The coordinator's duties include project planning and coordination, feasibility assessments and analyzing the impacts of energy efficiency improvements. Syracuse uses an energy consultant to provide monthly reports to individual departments regarding energy usage. Syracuse recognizes the opportunity to build on this capacity by coordinating with the state, utilities and the private sector to reduce costs, increase reliability, promote clean energy generation and catalyze private sector investment in energy initiatives.

Numerous public, private and not-for-profit entities have a role in supporting Syracuse's energy and sustainability goals. The Central New York Regional Planning and Development Board (CNYRPDB) frequently acts as a conduit for grant funding and coordinates community programs relating to energy and sustainability. For example, CNYRPDB coordinated a pilot bill comparison program that engaged neighborhood representatives in reducing energy usage. The Syracuse Center for Excellence carries out research into promising technologies relating to energy efficiency and renewable energy sources. Syracuse University was a key partner in securing funds and implementing transit, bicycle and pedestrian improvements in the "Connective Corridor" that links downtown with Syracuse University. Ensuring continued collaboration between all of these stakeholders is critical to meeting the Energy Planning and Coordination Objectives and Initiatives identified below.

Collaborate with government, utility and private sector partners to advance energy policies and programs

Utilities, government regulators, businesses and institutions affect the cost, reliability and type of energy available to Syracuse. Decisions made by these entities affect Syracuse and other municipalities. Collaboration can help Syracuse gain influence in regulatory decisions and leverage economies of scale in procurement.

Initiative 1: Participate in Public Service Commission decision-making processes relating to tariffs and utility regulation



The New York Public Service Commission (PSC) regulates the rates that natural gas and electricity utilities can charge customers and requires utilities to adhere to maintenance and repair standards. As Syracuse and other utility customers are affected by PSC decisions, such as the Reforming the Energy Vision (REV) proceeding, keeping informed and becoming involved as needed helps ensure that the City's interests are addressed. Other governments, businesses, residents and institutions throughout the region are also affected



State Tower Building

by PSC regulation. Regional organizations such as the Central New York Regional Planning and Development Board maintain information about PSC actions and decisions.

As part of Syracuse's energy-monitoring responsibilities, a City Planning Division staff person or a consultant will continue to monitor PSC decisions that affect City interests relating to energy costs, rates and procedures. When coordinated efforts would enhance its influence with regulators and other decision-makers, Syracuse will collaborate with other municipalities and organizations to advocate for regulations that would benefit Syracuse's municipal operations and its residents, businesses and institutions.

Initiative 2: Continue and expand collaborative energy procurement through ESCOs



Syracuse participates in joint energy purchasing of electricity and natural gas in cooperation with Onondaga County and the Syracuse City School District to heat and power most of the facilities operated by the City, including streetlights. On behalf of this consortium, Onondaga County's Purchasing Department issues Requests for Proposals for the procurement of natural gas and electricity and the partners enter into contracts with Energy Service Companies (ESCOs) at established pricing levels.

When cost effective, Syracuse will continue to utilize professional guidance to secure competitive bids for electricity and natural gas. When collaborative bidding will achieve reduced prices, Syracuse will continue the collaborative procurement process with Onondaga County and the Syracuse School District through an ESCO and consider expanding the consortium to achieve additional economies of scale.

Monitor municipal energy usage and communicate trends to decision-makers

Syracuse's municipal government has five operating departments in addition to executive and finance agencies that manage 182 buildings and 1,029 vehicles. Department heads at each agency work with the Budget Department to prioritize capital investments and develop operating budgets, both of which impact energy consumption and related costs. Energy-related operating costs and performance are factored into those decisions to varying degrees. Monitoring energy use and integrating energy considerations into standard City processes, such as budgeting and procurement, are low-cost ways to foster more informed energy management decisions.



Syracuse's
Sustainability
Plan will reduce
municipal GHG
emissions

40%
by 2020

Initiative 3: Maintain and formalize procedures for ongoing monitoring of energy usage and building performance



Syracuse has contracted with a consultant to monitor and report to the Department of Budget on municipal electricity and natural gas usage and costs by department and to communicate trends to facility managers, occupants and senior management. Fuel usage by vehicles is monitored by the individual departments where vehicles are housed. The City Sustainability Coordinator uses the information collected through regular monitoring to measure progress toward sustainability goals.

Going forward, Syracuse will continue to utilize a consultant or on-staff City energy manager (CEM) to apply a variety of management tools to track energy consumption and greenhouse gas emissions by agency and by fuel type and report progress to individual departments and senior management to inform day-to-day behavior and capital investment decisions. To track overall progress toward sustainability goals, the CEM will monitor energy usage and greenhouse gas emissions from municipal buildings as well as from vehicles. These coordination activities will supplement the initiatives described below for municipal buildings and vehicle fleets.

CASE STUDY

Syracuse Sustainability Plan



Implementation of the Syracuse Sustainability Plan is part of the City of Syracuse Comprehensive Plan 2040 that was adopted by the Common Council in 2014. The Plan is designed to guide City operations in ways that preserve and enhance the local and global environment, reduce the City's energy costs, and

improve quality of life for Syracuse residents. The Bureau of Planning & Sustainability developed the plan with extensive public input from local experts, City staff, stakeholders and community members.

Implementation of the Sustainability Plan will reduce Syracuse's greenhouse gas emissions from City operations by 40 percent by the year 2020. Measures to reduce energy usage citywide, including incorporating smart-growth principles into upcoming zoning revisions and partnering with other entities on community projects such as "Energy Challenges," will achieve a 7 percent reduction in community emissions in the same time period.

Recommended actions address five topic areas: Energy & Green Building; Education; Food Systems; Natural Environment; and Waste & Recycling. In general, the actions support one or more of the following goals:

1. Reduce the volume and impact of energy consumption in the City of Syracuse
2. Reduce negative impacts on the Onondaga Creek watershed
3. Improve the City of Syracuse's local water, food and energy independence
4. Reduce waste and increase recycling
5. Improve quality of life for Syracuse residents

The plan recommends feasible actions that the City can accomplish and suggests personal actions that citizens can take. The Bureau of Planning and Sustainability will lead the implementation process, in collaboration with other City departments and partners. To ensure public accountability, implementation will include additional public engagement as well as measurements and reporting of progress.

Initiative 4: Integrate energy-efficiency performance into capital improvement and fleet procurement decision-making



Each municipal department has a budget for and utilizes its own capital improvement budgeting process. Each department identifies its facilities' improvement needs based on a standard template. The City Budget Department reviews each department's capital requests and determines budget allocations. Pending Common Council approval, each department has discretion over how to expend these funds. Similarly, each department that maintains vehicles utilizes its own procurement process for vehicle purchases. The decentralized process makes it difficult to implement building portfolio and fleet-wide energy performance improvements. Further, it results in lost opportunities for major energy efficiency gains and eventual cost savings through the replacement of building systems and outdated fleet vehicles.

To better leverage replacement opportunities and facilitate strategic capital investment decisions, a team of staff from the Budget, Planning and Operating departments will evaluate the feasibility of reassigning or clarifying responsibilities for central oversight of capital building improvements, including energy efficiency, to a single agency or responsible individual and team with the necessary technical expertise. For example, as recommended in the 2012 Sustainability Plan, Syracuse will create a process for the Engineering and Skilled Trades Division of the Department of Public Works to thoroughly review plans prior to the start of an HVAC, chiller, lighting or other energy-consuming installation to ensure right-sizing. The City will also establish an energy policy that dictates temperature settings, overnight and weekend settings, and demand control to support its facilities maintenance team in achieving further efficiencies from buildings. In addition, Syracuse will establish a more coordinated vehicle replacement policy. These processes will establish energy efficiency as a key factor in the selection and design of capital improvement projects and vehicle replacement decisions.

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Collaborate with government, utility and private sector partners to advance energy policies and programs				
Initiative 1: Participate in Public Service Commission decision-making processes relating to tariffs and utility regulation				
Legislators; Legal Department	NYS PSC; Community Organization	City Staff Budget	Ongoing	Identify staff liaison or community organization to advocate for City
Initiative 2: Continue and expand collaborative energy procurement through ESCOs				
Division of Purchase and Office of Management and Budget	ESCOs	City Staff Budget	Ongoing	Solicit proposals from ESCOs
Monitor municipal energy usage and communicate trends to decision-makers				
Initiative 3: Maintain and formalize procedures for ongoing monitoring of energy usage and building performance				
Sustainability Coordinator	DPW, Facilities Operators, Department Heads	City Staff Budget	Ongoing	Establish monitoring and communication procedures and responsibilities
Initiative 4: Integrate energy-efficiency performance into capital improvement and fleet procurement decision-making				
Sustainability Coordinator	DPW, Facilities Operators, Department Heads	City Staff Budget	Ongoing	Establish monitoring and communication 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 and Greenhouse Gas Emissions from Buildings

Summary of Objectives and Initiatives

Increase energy efficiency in buildings citywide

- Initiative 1:** Ensure Energy Code compliance and evaluate adoption of more stringent code requirements for new construction of large buildings
- Initiative 2:** Require benchmarking and compliance with energy efficiency standards for properties receiving funding from the City
- Initiative 3:** Partner with business and community leaders and state agencies to increase the number of buildings benchmarked through Portfolio Manager
- Initiative 4:** Increase energy efficiency awareness and engagement through energy reduction challenges and public outreach efforts

Reduce energy consumption in municipal buildings by 20 percent by 2020

- Initiative 5:** Benchmark and report on municipal energy performance on an annual basis
- Initiative 6:** Reduce the amount of energy required to heat buildings and provide hot water by implementing weatherization measures
- Initiative 7:** Implement energy conservation measures (ECMs) recommended in energy audits
- Initiative 8:** Continue to require LEED Silver standards for new construction and substantial renovation of municipal buildings
- Initiative 9:** Promote behavioral changes to reduce energy usage among City departments through awareness and incentives
- Initiative 10:** Institute operational changes to reduce energy usage through changes in purchasing, maintenance and operations policies and procedures
- Initiative 11:** Allow energy efficiency cost savings to accrue to a fund dedicated to priority energy projects

The energy used to heat and cool buildings and electricity needed to power lighting and appliances represent 64 percent of all the energy used in Syracuse. If Syracuse is to achieve demonstrable progress toward its energy goals, it will need to support public-private collaborations that will reduce energy consumption in this sector. It has already made significant strides in reducing energy usage in its own buildings and can continue to lead by example by installing additional energy conservation measures. For buildings citywide, Syracuse will work with institutional and business leaders to identify market opportunities to animate private markets.

Increase energy efficiency in buildings citywide

Buildings account for almost two-thirds of energy consumption in Syracuse. The building stock in Syracuse consists of 63,539 residential housing units (accounting for 36.3 million square feet), 36.8 million square feet of commercial, 21.0 million square feet of institutional, and 28.0 million square feet of industrial floor area. Residential buildings are responsible for 42 percent of total building-related energy consumption, followed by commercial buildings (27 percent), and institutional and industrial buildings (approximately 15 percent each). Reducing the energy consumption of these buildings by 20 percent would be the equivalent of the total annual energy usage of 30,500 households or 45,000 cars.

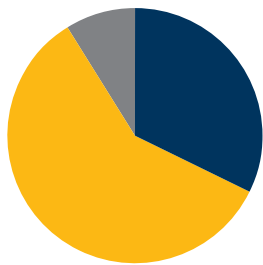
Initiative 1: Ensure Energy Code compliance and evaluate adoption of more stringent code requirements for new construction of large buildings



Current regulations require all new construction and major renovations in Syracuse to comply with the New York State Energy Conservation Construction Code. However, based on the findings of a recent NYSERDA study, construction may not fully comply with Energy Code requirements. In the residential sector,



Community Buildings Energy Consumption by Fuel Type (mmBtu)

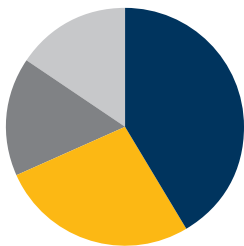


■ Electricity (32.3%)
 ■ Natural Gas (59.1%)
 ■ Other Fuels* (8.6%)

*Other Fuels Breakdown:
 Propane/Butane (1%)
 #2 Fuel Oil (3.9%)
 #4 Fuel Oil (0.9%)
 Coal (2.8%)

Figure 3

Community Energy Consumption by Building Type (mmBtu)



■ Residential (41.6%)
 ■ Commercial/Office (27%)
 ■ Industrial (15.9%)
 ■ Institutional (15.5%)

Figure 4

insufficient compliance with the Energy Code leads to “lost savings” representing 8 percent of residential and 5 percent of commercial total energy costs. Every year, Syracuse issues permits for new buildings, which represents an annual opportunity to ensure new construction and major renovations meet Energy Code requirements, and in turn bring the City more energy-efficient than non-compliant buildings. In the next year alone, Syracuse anticipates issuing approximately 10 permits for new single- or two-family residential and 12 permits for multi-family or commercial construction, in addition to 350 residential and 500 commercial renovation permits.

Syracuse’s Division of Code Enforcement is responsible for enforcing State codes, including the energy conservation provisions contained therein, in conjunction with the municipal departments of Engineering, Fire Prevention, Zoning, Public Works, Planning and Water. City code enforcement officers attend periodic training sessions to maintain their certifications.

To ensure the Energy Code is effectively enforced, Syracuse will continue to maintain the current level of staffing at the Division of Code Enforcement. As recommended in the Sustainability Plan, Syracuse will provide specialized training to appropriate staff, such as Building Performance Institute (BPI) or Leadership in Energy and Environmental Design (LEED) certification. Further, the City will continue to provide required training to enforcement officers and increase staffing levels as resources permit and the rate of new development warrants.

Initiative 2: Require benchmarking and compliance with energy efficiency standards for properties receiving funding from the City



Syracuse has an opportunity to increase the energy efficiency of buildings in the community by requiring benchmarking and energy efficiency improvements as a condition of receiving grant funds administered by the City. The Department of Neighborhood and Business Development administers federal Community Development Block Grant (CDBG) funds that are used to construct and renovate housing for low- and moderate-income residents. This program supports homebuyer assistance, rehabilitation and new construction that involve an average of 200 units per year. Over

the past few years, the Business Development Division has supported approximately \$300,000 annually in new construction.

Syracuse will investigate the feasibility of requiring entities that receive funding through City-administered programs to benchmark buildings using EPA Portfolio Manager or to achieve specified standards of energy efficiency. For the housing improvements, such requirements will need to be consistent with the program goal of supporting low- and moderate-income households. For the business development programs, energy-efficiency standards will need to be part of the agreed-upon incentive package and consistent with the economic development and community revitalization goals of the program.

Initiative 3: Partner with business and community leaders and state agencies to increase the number of buildings benchmarked through Portfolio Manager



Widespread benchmarking of buildings citywide can be an effective aid in reducing energy usage in buildings. Benchmarking allows building managers to monitor energy usage and costs over time and learn how their buildings compare to similar buildings nationwide. A 2010 study by the U.S. Environmental Protection Agency reported that energy consumption in benchmarked buildings decreased by an average of 7 percent.

The 2030 District model, established in Seattle and promoted by various grassroots organizations nationwide, utilizes partnerships among property owners and managers, local government, businesses, and community stakeholders to set collaborative targets for energy reductions, and to share resources and leverage funding to achieve those targets. For existing buildings, the recommended target is 10 percent below the national average, with incremental targets to reach a 50 percent reduction by 2030. In Syracuse, the Central New York Regional Planning and Development Board (CNY RPDB) has introduced the concept to Syracuse’s Downtown Committee, which provides services to a business improvement district, and has discussed the concept with building owners.



Energy Efficiency in Buildings

Citywide Buildings Energy Consumption By Fuel Type and Building Type

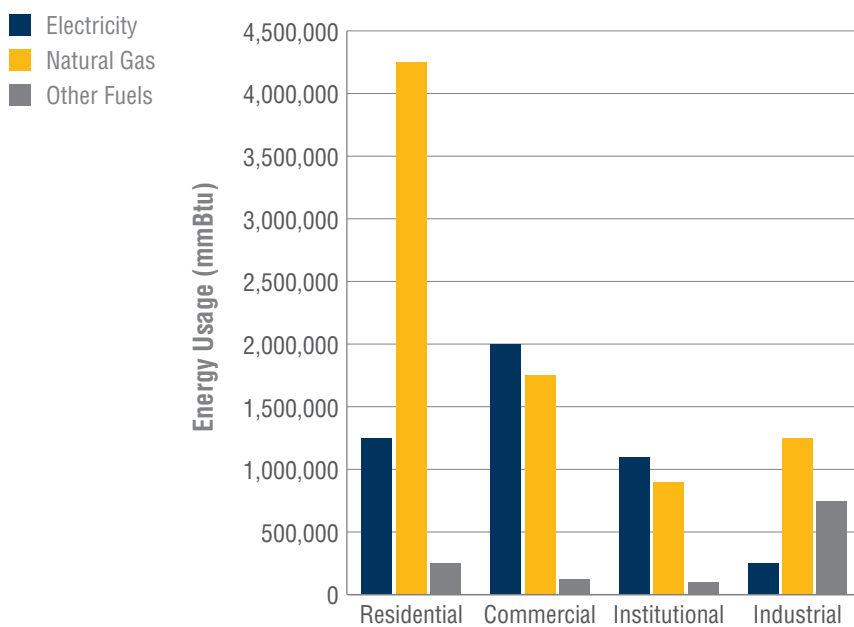


Figure 5

Syracuse will utilize its network of contacts with neighborhood and business organizations to support community programs such as the Syracuse 2030 District or other groups of property owners that will result in additional benchmarking of privately owned buildings. Specifically, the City will make its facilities available for meetings and facilitate communications as staff resources are available.

Kasson Apartments



Initiative 4: Increase energy efficiency awareness and engagement through energy reduction challenges and public outreach efforts



In 2012, Syracuse launched a Mayoral Challenge, coordinated by the Central New York Regional Planning and Development Board, to compare residential energy bills and improve household energy efficiency. The bill comparison program is currently administered by National Grid and raises awareness of energy consumption among homeowners in comparison to similar buildings in their neighborhood. The pilot program—CNY Energy Challenge—provided each participant extensive training in household energy efficiency measures. The 34 participating households reduced their energy consumption by 30 percent. Syracuse will continue to support bill comparison programs initiated by National Grid, the Central New York Regional Planning and Development Board or other entities by participating in outreach efforts, putting information on the City's website and disseminating information through neighborhood organizations.

Additionally, the City will maintain communications with state agencies regarding the availability of resources, including incentives, to support building retrofits. Syracuse will make this information available through its website and through brochures located in relevant City offices. The City will also work with the CNY RPDB and business and institutional leaders to distribute information to neighborhood and business organizations.

Reduce energy consumption in municipal buildings by 20 percent by 2020

The 182 buildings owned and operated by the City vary in size and use, ranging from historic office buildings to an asphalt plant. The buildings collectively consume 110,331 mmBtu of energy annually, resulting in total energy costs of \$3,440,983. An additional 20 percent reduction on top of the City's previous energy reduction successes would save Syracuse \$340,000 a year in operating expenses. Some of these savings will support additional sustainability efforts.

Municipal Buildings Energy Consumption by Fuel Type

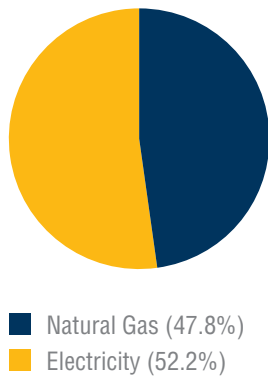


Figure 6

Municipal Building Energy Consumption by City Department

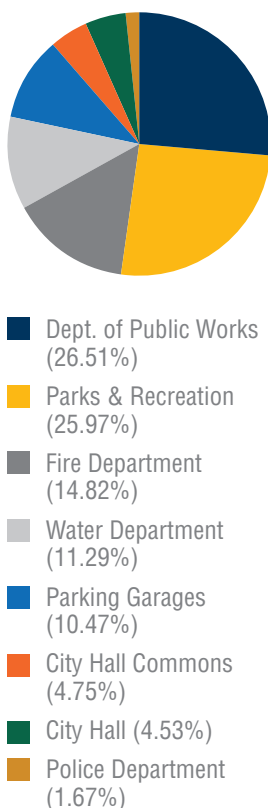


Figure 7

Initiative 5: Benchmark and report on municipal energy performance on an annual basis



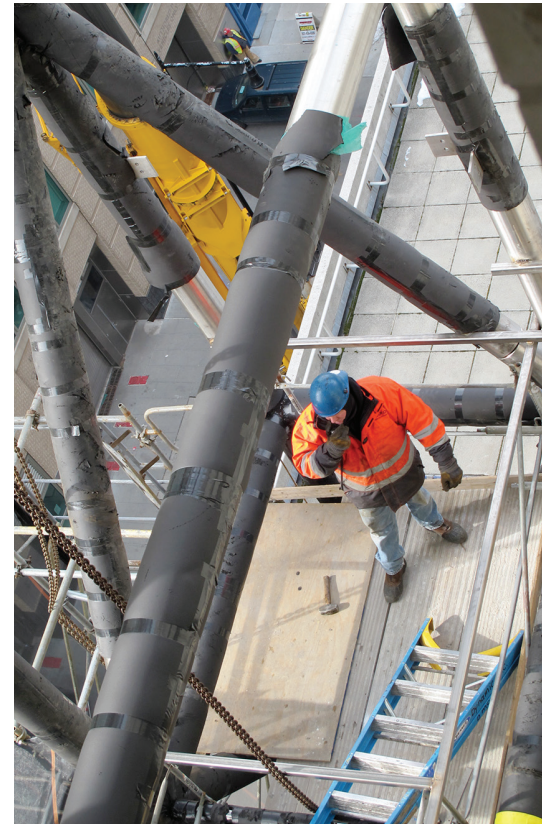
In 2014, all municipal buildings with an area of 10,000 square feet or greater—37 in total—were benchmarked using ENERGY STAR Portfolio Manager, a free online service that allows building owners and managers to track energy consumption in their facilities. This service can rate or rank buildings based on the efficient use of energy compared to similar buildings within a portfolio. Benchmarking can help building managers monitor building performance over time and track the success of measures taken to improve energy efficiency.

As recommended in the Sustainability Plan, the City will institute an ongoing benchmarking program to support decisions about energy efficiency measures and capital improvements. Such a program would include maintaining benchmarking for the City's 37 largest buildings, monitoring performance annually, adding smaller buildings not currently in the system and potentially issuing an annual benchmarking report. This will allow Syracuse to compare like buildings and track performance year over year. Steps toward instituting such a program will include identifying appropriate staff, ensuring sufficient resources, and coordinating information collection and dissemination among building managers and department heads.

Initiative 6: Reduce the amount of energy required to heat buildings and provide hot water by implementing weatherization measures



Syracuse's climate demands a large amount of energy for building heating. Approximately 47 percent of the energy consumed by municipal buildings is natural gas used for heating. During the summer, electricity is used to cool buildings. Weatherization—the sealing and insulating of building envelopes to maximize energy use within the building enclosure—includes low-cost measures such as caulking, door seals and the insulation of ducts and pipes that can



Installation of HVAC system

have a significant and immediate impact on the energy efficiency of buildings and energy costs. Syracuse's buildings include 71 structures (29 percent of the total) that are more than 50 years old. These older buildings (and even some newer ones) often lack proper insulation, which allows outside air into buildings and conditioned air out of buildings, resulting in wasted energy.

To reduce the amount of energy required to heat—and cool—buildings and provide hot water, the City's Skilled Trades personnel will evaluate ways to integrate weatherization measures into their maintenance work schedule to expedite the completion of these low-cost, quick payback solutions. These measures are expected to include periodic inspection and replacement of caulking, pipe insulation and door seals. As recommended in the City of Syracuse Sustainability Plan, Syracuse will provide training to the appropriate staff in green energy and building practices to support maintenance practices that would save energy.



Energy Efficiency in Buildings

20% reduction
of energy use
in municipal
buildings will
save
\$340k
per year

Initiative 7: Implement energy conservation measures recommended in energy audits



Recent energy audits of Syracuse's municipal buildings found opportunities to lower energy consumption and costs through low-cost building system upgrades to lighting and lighting controls, heating and cooling plants, HVAC units and systems, motors and drives, building management control systems, domestic hot water systems, and the building envelope (roof, walls, windows). Several building improvements installed by the City, including LED lighting in parking garages, have reduced energy usage.

An ASHRAE Level 1 audit is based on an on-site survey of the building and recommends low-cost measures for improving energy efficiency; additional research can identify measures that would result in greater savings. When a site survey shows opportunities for significant energy reduction, an ASHRAE Level 2 audit is often conducted, during which the costs and benefits of retrofitting building systems are calculated. Additional investment in building retrofits can result in significant additional energy reduction and cost savings.

A number of strategies can be employed to implement the Energy Conservation Measures: enhancement of existing operations and maintenance (O&M) assignments by facility staff and/or contractors, procurement of an Energy Performance Savings Performance Contract (EPSP) with an Energy Service Company (ESCO), and/or integration into the City's capital planning process. Syracuse will evaluate these implementation options and determine the combination of

strategies that best meet its energy, procurement, administrative and financial needs. As part of the capital improvement budgeting process, the Budget Director and individual department heads will identify and evaluate opportunities to integrate ECMs into other planned building projects. The City Engineer and the Skilled Trades Department will explore whether weatherization, lighting replacement and other tasks can be accomplished by City personnel, and incorporate these functions into maintenance routines where feasible. For those ECMs that require more significant investment in labor and capital, Syracuse will evaluate financing alternatives, including procurement of an Energy Performance Savings Performance Contract (EPSP) with an ESCO.

As resources become available, the City will also conduct additional studies, including ASHRAE Level 2 Audits and retro-commissioning, to develop whole-building comprehensive strategies in those buildings with the greatest opportunities for significant energy performance improvements. This will provide planning and budget information for future capital projects. Syracuse will work with the New York Power Authority, NYSERDA and other sources to secure financing for cost-effective retrofits.

Initiative 8: Continue to require LEED Silver standards for new construction and substantial renovation of municipal buildings



LEED standards, certified by the U.S. Green Building Council (USGBC), include specifications relating to energy efficiency. Buildings designed to LEED standards meet, if not exceed, the current Energy Code.

In 2007, Syracuse passed a law requiring all new construction and major renovations of City-owned buildings, including schools, to meet the LEED Silver standard. To date, one of the three certified buildings is LEED Gold and two are LEED Silver. Two more buildings under design are on track for LEED Silver certification.

Syracuse will continue to require this LEED Silver standard. The City Engineer and other staff are responsible for ensuring this requirement is met. As part of the construction program currently underway for Syracuse City Schools, the design of new and renovated schools will meet the LEED Silver standard.

Sunnycrest Park lacrosse



Initiative 9: Promote behavioral changes to reduce energy usage among municipal departments through awareness and incentives



Many of the daily decisions made by City department heads, facility staff and other employees affect energy use. These decisions relate to the

type of equipment purchased, such as computers, refrigerators, televisions and vending machines, as well as the use of building maintenance contracts. Similar to most cities, Syracuse does not provide direct incentives to City employees or agencies to reduce their energy consumption.

CASE STUDY

Parking Garage LED Projects



In 2011, Syracuse replaced 1,300 high pressure sodium lights with LED fixtures in four parking garages: AXA Towers MONY Garage, Harrison Parking Garage, Madison Irving Parking Garage and Center Armory Parking Garage. As these garages operate nearly 24/7, with lighting used constantly, this was a clear opportunity for energy and cost savings. The new 20- to 71-watt LED fixtures replaced 195-watt high pressure sodium fixtures. In addition, the new LED fixtures incorporate sensors and controls that allow for lower lighting levels when the garages are unoccupied and in spaces that have sufficient day lighting.

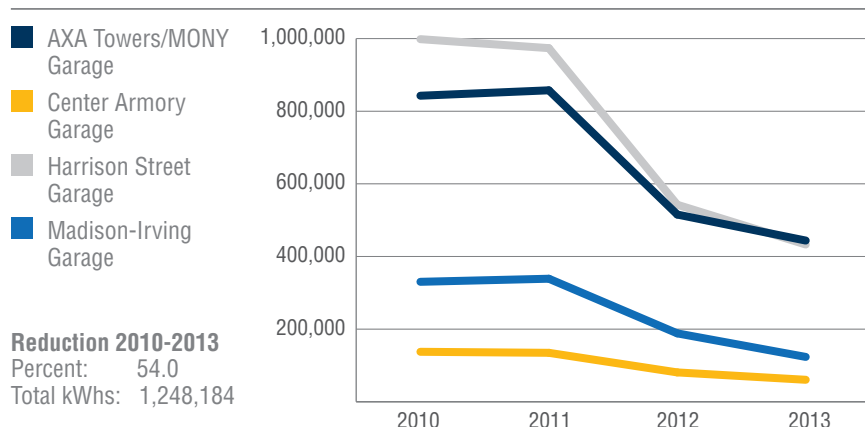
The project reduced electricity use in the four garages by 54 percent—1,248,184 kWhs annually—between 2010 and 2013. In addition, the project reduced the average peak “demand” (measured in kilowatts) for all four garages by 41 percent.

Syracuse obtained funding for the \$713,860 project through the Energy Efficiency and Conservation Block Grant (EECBG) awarded to Syracuse by the U.S. Department of Energy and from National Grid. In addition to the energy supply cost savings of more than \$100,000/year, the reduction in average peak “demand” resulted in additional savings of nearly \$200,000/year.

Maintenance and operational protocols can reduce energy use in buildings by up to

20%

Annual Electricity Consumption at Four Parking Garages Before and After LED Lighting Replacement





Eastwood house

Offering tangible rewards to staff could signify the City's commitment to energy efficiency and generate participation by staff.

In addition, Syracuse will evaluate instituting a program to solicit and recognize the most innovative and effective ideas for behavioral changes to promote energy efficiency from agency staff and offer prizes or public recognition to those employees who make the greatest impact toward energy efficiency. A first step in establishing such a program is to identify appropriate staff and secure sufficient resources to design and implement an employee energy efficiency engagement program.

Initiative 10: Institute operational changes to reduce energy usage through changes in purchasing, maintenance and operations policies and procedures



Maintenance procedures and operational protocols can reduce energy use in buildings by 5 percent to 20 percent. More efficient operation and maintenance practices can reduce energy usage of equipment through solutions such as uniform or standardized temperature settings, overnight and weekend settings and demand control.

As recommended in the Sustainability Plan, Syracuse will create a municipal energy policy that spells out specific energy protocols and performance criteria. Guidelines will be consistent for all

buildings by type, including thermostat settings. The policies will identify the responsibilities of maintenance and other personnel, and may identify an Energy Manager for each building. The City Energy Manager will provide information to department heads and other employees to help them identify ways that purchasing, contracts and other decisions can affect energy efficiency. Purchasing policies for equipment such as HVAC components, office equipment, vending machines, and pumps will favor energy-efficient models.

To be successful, City facility staff will require training designed to support improved operations and maintenance and energy efficiency of buildings. Existing training programs supported by NYSERDA and the New York State Department of State (DOS) are provided at no cost to the City. As a next step, the City Engineer, Skilled Trades and other department heads will investigate additional opportunities for staff training and identify the appropriate staff to receive specialized training.

Initiative 11: Allow energy efficiency cost savings to accrue to a fund dedicated to priority energy projects



Any savings generated through energy improvements to City-owned buildings are attributed to the general fund. Allowing departments to retain the savings generated through energy improvements to buildings that they operate and invest those savings in other building improvements (or, potentially, use as a basis for providing financing for such improvements) would create an incentive for energy efficiency—and cost savings—in City-owned buildings.

As recommended in the Sustainability Plan, and contingent upon Common Council approval, Syracuse will create a fund that is replenished by savings created through energy efficiency projects. The funds will be dedicated to priority energy projects as well as selected departmental projects. This initiative would raise awareness of energy usage and reduce waste as well as provide an incentive for agency staff to pursue energy efficiency gains. Additionally it will require development of clear budget processes and City Council action. As a next step, the City Budget Director, City Engineer, Skilled Trades and department heads will evaluate the potential for modifying the budgeting process to support this initiative.

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Increase energy efficiency in buildings citywide				
Initiative 1: Ensure Energy Code compliance and evaluate adoption of more stringent code requirements for new construction of large buildings				
Code Enforcement	NYS Department of State (Training)	City budget – Enforcement Staff DOS - training	Ongoing	Identify training needs
Initiative 2: Require benchmarking and compliance with energy efficiency standards for properties receiving funding from the City				
Division of Neighborhood & Business Development	CDBG and other funding recipients	City staff budget	Short-Term	Identify suitable contracts
Initiative 3: Partner with business and community leaders and state agencies to increase the number of buildings benchmarked through Portfolio Manager				
Sustainability Coordinator/ Neighborhood & Business Development	CNY RPDB; Local building owners and builders	NYSERDA; National Grid Incentives	Short-Term	Identify appropriate staff and partners to conduct outreach
Initiative 4: Increase energy efficiency awareness and engagement through energy reduction challenges and public outreach efforts				
Sustainability Coordinator/ Neighborhood & Business Development	National Grid; CNY RPDB; Not-for-profit organizations; Neighborhood organizations	NYSERDA; National Grid; Foundations	Short-Term	Identify appropriate roles for staff and/or partners
Reduce energy consumption in municipal buildings by 20 percent by 2020				
Initiative 5: Benchmark and report on municipal energy performance on an annual basis				
All City departments	Sustainability Coordinator	City allocation of staff time	Short-Term	Solicit ideas from employees
Initiative 6: Reduce the amount of energy required to heat buildings and provide hot water by implementing weatherization measures				
Skilled Trades; DPW	Mayor; City Council	Operating Budget	Short-Term	Identify priority projects and schedule work
Initiative 7: Implement energy conservation measures (ECMs) recommended in energy audits				
Skilled Trades; DPW	Consultant, Contractor, Energy Performance Contract	NYSERDA, National Grid, Capital Fund	Medium-Term	Evaluate potential delivery options and divide energy conservation measures into three categories
Initiative 8: Continue to require LEED Silver standards for new construction and substantial renovation of municipal buildings				
Buildings	All Departments	Operating Budget	Ongoing	Allocate staff time
Initiative 9: Promote behavioral changes to reduce energy usage among City departments through awareness and incentives				
Sustainability Coordinator	Mayor; All City Departments	City Staff Budget	Medium-Term	Identify appropriate roles for staff and/or partners
Initiative 10: Institute operational changes to reduce energy usage through changes in purchasing, maintenance and operations policies and procedures				
Department of Public Works	Mayor; Sustainability Coordinator; All City departments	City Staff Budget	Medium-Term	Identify operational procedures, train workers, incorporate into work schedules
Initiative 11: Allow energy efficiency cost savings to accrue to a fund dedicated to priority energy projects				
Office of Management and Budget	Sustainability Coordinator; Skilled Trades, DPW, Mayor's office	City Staff Budget	Medium-Term	Establish a single agency lead and responsible individual and team. Assess pros and cons of 2-3 options for agency lead and draft necessary legislation or regulatory change

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



Reduce Transportation-Related Energy Usage and Greenhouse Gas Emissions

Summary of Objectives and Initiatives

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

- Initiative 1:** Revise zoning to encourage compact development patterns, walkable neighborhoods, bicycle accommodations and transit-oriented design
- Initiative 2:** Partner with CENTRO, businesses and institutions to encourage and support the retention and expansion of transit routes
- Initiative 3:** Construct bicycle lanes and support infrastructure
- Initiative 4:** Design and maintain the existing network of sidewalks and trails to support walking as a safe and comfortable mode of transportation

Reduce emissions from vehicles by minimizing idling and facilitating use of cleaner fuels

- Initiative 5:** Reduce idling on busy corridors through traffic signal coordination
- Initiative 6:** Set a time limit for idling
- Initiative 7:** Partner with Clean Communities of Central New York to expand size and use of alternative vehicle infrastructure

Reduce energy consumption and greenhouse gas emissions from the City's fleet 10 percent by 2020

- Initiative 8:** Decrease City fleet vehicle miles traveled through improved tracking and route optimization
- Initiative 9:** Right-size the City fleet by establishing efficiency and size standards for vehicle purchases
- Initiative 10:** Increase number of alternative fuel vehicles in City fleets
- Initiative 11:** Pilot use of anti-idling technologies in police vehicles
- Initiative 12:** Create a driver-awareness campaign for City vehicle drivers to use less fuel and decrease tailpipe emissions

Reduce energy usage and cost of municipal street lighting

- Initiative 13:** Convert street lights to LEDs

Residents, suburban commuters, employees and visitors contribute to energy consumption and emissions in the transportation sector whenever they drive within or through Syracuse. In 2010, vehicles travelled approximately 893.6 million miles in Syracuse, consuming approximately 53.5 million gallons of gasoline and 11.7 million gallons of diesel fuel. This fuel consumption resulted in greenhouse gas emissions totaling 551,850 metric tons. By 2030, average fuel consumption by municipal vehicles is expected to be 31 percent lower than the current baseline due to improved fuel efficiency standards. Additional reductions can be achieved by reducing the number and length of vehicle trips and increasing the use of alternative fuels.

Syracuse can directly manage its own municipal fleet and reduce its energy consumption. The City can also help to reduce energy use and related greenhouse gas emissions citywide by encouraging more trips to be made by walking, bicycling and transit, by maintaining and constructing infrastructure and promoting more compact land use and development patterns. Through implementation of Syracuse's Bicycle Infrastructure, Land Use and Sustainability plans, Syracuse is making considerable efforts to increase the proportion of trips made by these alternative modes. In addition, City initiatives reduce fuel use and greenhouse gas emissions by reducing idling and delay at intersections and increasing the use of alternative fuel vehicles.



Means of Transportation to Work

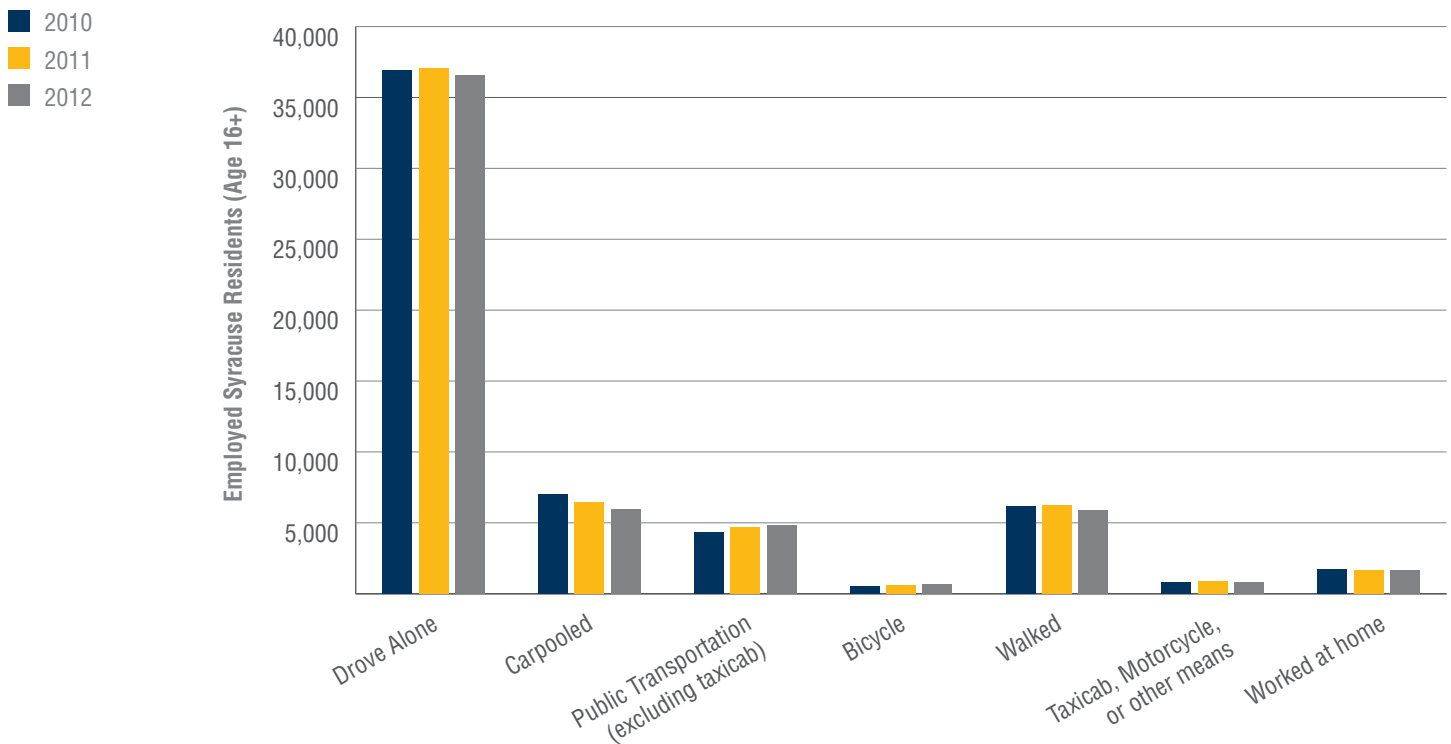


Figure 8

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

Compact and mixed-use development around transit hubs can reduce VMT by up to

40%

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

A great majority of trips within Syracuse are made by private vehicles, as less than 3 percent of trips are made by alternative modes of transportation such as public transit, cycling and walking. Syracuse can affect transportation choices within the community by installing infrastructure to accommodate alternative modes of travel and encouraging land-use patterns and development that make walking, bicycling and transit more attractive options.

Initiative 1: Revise zoning to encourage compact development patterns, walkable neighborhoods, bicycle accommodations and transit-oriented design



Land-use patterns have a significant impact on transportation energy consumption. Population growth in the suburbs has meant more commutes to the region's employment centers in the city, resulting in a 12 percent increase in vehicle miles traveled (VMT) by Onondaga County residents

between 2000 and 2007. Compact development patterns and mixed-use communities planned and built around transit hubs can reduce VMT by up to 40 percent.

The City of Syracuse Land Use Plan established guidelines for rezoning that prioritize bicycle and pedestrian transportation and encourage walking, biking and transit. It establishes a focus on residential and business development in existing neighborhood centers and along historic transportation corridors. The plan establishes design guidelines for the various "character areas" that make up the city and its neighborhoods.

The City Planning Division and City Zoning Administration are undertaking a comprehensive zoning revision in accord with the Land Use Plan with financial assistance from NYSERDA. The divisions will revise zoning regulations to increase accommodations for bicycling and transit, including amended parking and site plan standards and design guidelines for neighborhoods. The City Planning and City Zoning divisions of the Syracuse-Onondaga County Planning Agency will lead the



Transportation Efficiency

By 2030,
federal fuel
efficiency
standard will
result in
31%
lower fuel
consumption
by vehicles

implementation of the Land Use Plan, assisted by a consultant. Syracuse's Common Council will vote on adoption of the revised zoning ordinance following input from the City Planning Commission.

Initiative 2: Partner with CENTRO, businesses and institutions to encourage and support the retention and expansion of transit routes



The public transit service CENTRO, operated by the Central New York Regional Transit Authority (CNYRTA), recently constructed a transit hub at the corner of Adams and South Salina streets in downtown Syracuse. The majority of CENTRO's routes operate on a hub-and-spoke system, centered downtown, which enhances connections between different routes. Ridership during September 2010 was 43,417 people per day on more than 100 routes. Future improvements under consideration include instituting bus rapid transit along key corridors and identifying suitable locations for transit-oriented development.

Several initiatives underway in Syracuse help make transportation by transit, walking and cycling more viable and comfortable. A significant example of this type of initiative is the Connective Corridor, which attracted \$42.5 million in funding for a variety of transportation and streetscape improvements that will result in increased use of transit, bicycling and walking within the corridor, which connects downtown with Syracuse University and surrounding neighborhoods. The City improved the sidewalks, striped the pavement with bicycle lanes and installed bus pull-outs, lighting and landscaping. The City also installed public art at key gateways and new seating, fountain renovations, native plantings, pathways and recycling facilities at a park. CENTRO partnered with Syracuse University to establish a free, dedicated bus line that connects downtown with the campus. Businesses along the corridor have access to grant funding to improve building façades.

Connective Corridor

Syracuse's Connective Corridor is a recent example of a successful collaboration to encourage alternative modes of transportation, and it provides a useful model for future partnerships. The corridor connects University Hill with downtown Syracuse and more than 30 arts and culture venues. The project received funding from numerous sources: Syracuse University and the City secured \$42.5 million in grants from the Empire State Development Corporation and the Dormitory Authority of the State of New York, a \$10 million TIGER II transportation grant, \$2 million from Onondaga County for green infrastructure, and \$1 million from National Grid. In cooperation with CENTRO, Syracuse's transit authority, new buses and digital technology have enhanced bus service between Syracuse University and downtown destinations. Downtown façade improvements and public art enhance the aesthetics of the city center. The City installed streetscape improvements, bike lanes, landscaping, green infrastructure and lighting projects to create a "gateway" to University Avenue that enhances the travel experience along the corridor. CENTRO operates a free, dedicated bus line between University Hill and downtown. Another key partner in the Connective



Corridor is the Syracuse Center of Excellence, which is testing new technologies such as LED lighting, battery and energy storage, energy efficient/smart building systems and smart transportation along the path. Other complementary projects include technology improvements at Syracuse Stage, improvements to City-owned Forman Park and bike lanes and streetscape improvements along East Genesee Street.



Creekwalk Bike Sign

Syracuse will continue to support partnerships with community organizations to secure grant funding and private investment for transportation improvements that support increased use of alternative forms of transportation. In addition to the energy benefits of these improvements, residents and visitors will enjoy improved quality of life and the city will continue to retain businesses and attract new private investment.

Initiative 3: Construct bicycle lanes and support infrastructure



The City has installed numerous street improvements to accommodate bicycles, as recommended in the Syracuse Bicycle Plan 2040. By the end of 2012, more than 13.6 miles of bicycle lanes had been added, primarily through striping along streets. The early focus of this effort was in the University Hill neighborhood, which expressed strong support for improved accommodations for bicyclists. Key off-road bicycle lanes include the Syracuse Creekwalk, which connects Armory Square in downtown Syracuse to Onondaga Lake. A study is underway to develop an off-road route or other enhancements for the New York State Erie Canalway Trail, which utilizes Erie Boulevard.

With the completion of the Bicycle Plan, Syracuse has a clear methodology for identifying optimal bicycle corridors and designing appropriate infrastructure for specific corridors. Each year, Department of Public Works staff convenes a committee, with input from the Syracuse Metropolitan Transportation Council (SMTTC), to discuss opportunities and recommend projects for funding in the City's capital budget. Considerations include coordination with other street reconstruction projects and consistency with other municipal projects.

As recommended in the Sustainability Plan, Syracuse will improve infrastructure for multi-modal transportation that enhances appeal and safety for bicyclists through the construction of additional bike lanes, "sharrows," cycle tracks, bicycle parking and other infrastructure. The City will continue to partner with Syracuse University and other organizations involved in the Connective Corridor project to establish a continuous bicycle system between the University Hill neighborhood, downtown Syracuse and the Near Westside neighborhood.

Initiative 4: Design and maintain the existing network of sidewalks and trails to support walking as a safe and comfortable mode of transportation



"Complete Streets" are planned and designed to address access and mobility for roadway users of all ages and abilities, including pedestrians, bicyclists, wheelchair users, public transportation riders, and motorists. The Syracuse Comprehensive Plan 2040 directs the City to plan for Complete Streets when developing the City's Capital Improvement Program and to view any modification to public and private streets as an opportunity to improve safety, access and mobility for all travelers.

The City will continue to implement Complete Streets principles in the design and construction of roadway improvements. The implementation of form-based codes and design standards in the upcoming zoning ordinance revision will ensure that new development is consistent with each neighborhood's character and will support alternative modes of transportation.



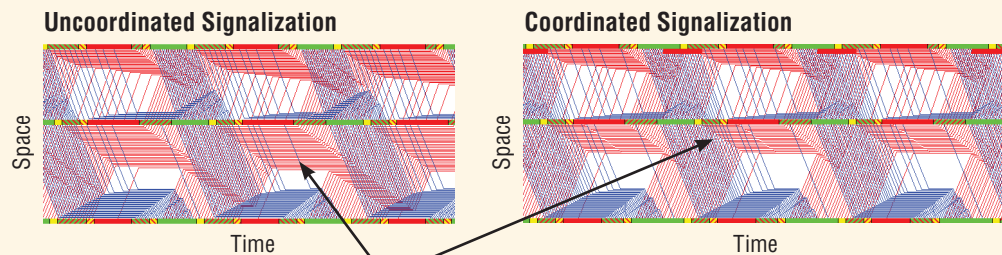
CASE STUDY

Monroe County Traffic Signal Optimization

Monroe County's Regional Traffic Operations Center (RTOC), constructed in collaboration with NYSDOT, monitors and remotely controls traffic signals at more than 450 intersections within Rochester and adjacent communities. Real-time monitoring with cameras at 85 key intersections allows the RTOC to quickly adjust signal timings to control traffic congestion in the case of accidents or upon notification from the public safety coordinator. Monroe County is recognized as a leader in the use of Synchro modeling software to analyze and monitor traffic flow based on input data on traffic signal timings, traffic volumes and roadway network.

The two-dimensional "time-space diagrams" shown below, generated by the Synchro model, compare traffic flows at a single intersection under two scenarios—coordinated signal timing and uncoordinated signal timing—along a major east-west suburban Rochester corridor during the afternoon peak hour. The horizontal axis represents time and the vertical axis represents space. The figures depict the position of vehicles through time (horizontal axis) as they travel from one intersection to another (vertical axis).

The horizontal red, yellow and green bands at the top, middle and bottom of the images represent the red, yellow and green phases of a traffic signal at a particular intersection. The red lines represent westbound vehicles (depicted as traveling from the bottom to the top of the diagram) and the blue lines represent eastbound vehicles (shown traveling from the top to the bottom of the diagram.) Each line shows the path of a single vehicle. Horizontal lines represent vehicles that are stopped at intersections—time passes for these vehicles but they do not move in space. Sloped lines represent vehicles in motion.



Nearly twice as many cars idling at this intersection in the "uncoordinated" model

In the uncoordinated diagram on the left, there are nearly twice as many horizontal red lines shown below the red phase of the traffic signal, representing stopped vehicles in the westbound direction.

Note that there is not a significant difference in the blue lines (eastbound vehicles) between the two diagrams. At this location during the afternoon rush hour, the signal coordination is set to favor the heavier westbound traffic volumes.

A 2010 study using Synchro measured delay at intersections under two scenarios—with and without signal coordination at each intersection during the morning and evening peak hours. Based on calculations for these two weekday hours only, that improved traffic signal coordination reduced gasoline consumption in Monroe County by more than 450,000 gallons per year.

Idling vehicles
consume
1 gallon
of fuel per hour

Reduce vehicle emissions by minimizing idling and facilitating use of cleaner fuels

While Syracuse continues to encourage use of alternative modes of transportation, personal vehicles and commercial vehicles will continue to dominate commutes and trips made to, from and within the city. Therefore, in addition to reducing vehicle miles traveled, it is necessary to reduce emissions from those trips that will continue to occur by passenger and commercial vehicles to reduce citywide energy consumption and improve air quality. This requires vehicles to use fuel more efficiently, reduce wasteful consumption and switch to cleaner energy sources.

Initiative 5: Reduce idling on busy corridors through traffic signal coordination



In vehicles with standard combustion engines, when drivers sit in traffic with their engines running, the vehicle consumes fuel and emits pollutants. On average, idling consumes 1 gallon of fuel per hour per vehicle. Reducing idling can have a significant impact on overall fuel consumption.

One strategy to reduce idling is to reduce delay at intersections with traffic signals. Syracuse is working to do this by upgrading its traffic signal infrastructure to enable coordination of the signal network and its ability to be remotely operated and monitored by City staff. While the majority of Syracuse's signal network is not coordinated, much of the physical infrastructure to do so — including controllable traffic signals, signal controllers and necessary conduit — is in place. The effect of traffic signal coordination will be to reduce wasteful fuel consumption at intersections and to improve air quality.

Syracuse will continue to implement the \$10 million traffic signal coordination project, funded by the Syracuse Metropolitan Transportation Council (STMC). These upgrades will allow for 90 percent of interconnected signals to be controlled remotely and enable the real-time monitoring of conditions at key intersections along the most heavily travelled north, south, east and west corridors. With real-time monitoring, City staff will be able to manage signal timing in response to accidents or periods of unusually heavy traffic. In addition to reducing idling, the City will utilize the infrastructure to improve the efficiency of

NYPA lighting
upgrade project





Syracuse has

16

EV charging
stations

transit at traffic signals (giving priority to buses) and improve in-pavement vehicle detection systems. Syracuse will continue to collaborate with New York State Department of Transportation (NYSDOT) to integrate traffic signals into the signal coordination program. The City is also planning for future expansion of a traffic signal optimization project.

Initiative 6: Set a time limit for idling



Turning off vehicles is a no-cost strategy to reduce energy use and greenhouse emissions within the city. Numerous municipalities have set quantifiable and useful idling limits around the country, and Syracuse will consider doing the same.

To reduce unnecessary fuel consumption from idling vehicles, Syracuse will investigate the feasibility of establishing and enforcing a formal “no idling” policy for municipal vehicles as well as a “no idling” ordinance. The policy would set a time limit for idling—either New York State’s five minutes or three minutes as established in other municipalities. As resources allow, City staff or a qualified consultant will review existing models, standards and guidelines, draft the policy, manage an internal review process and present to the Common Council for approval.

Once approved, City Planning staff will investigate ways to promote public awareness, such as with a press release and information on the City’s website. The informational campaign and enforcement would best be focused on high idle areas, such as school zones, with support from parking enforcement staff and police in extreme circumstances.

Initiative 7: Partner with Clean Communities of Central New York to expand size and use of alternative vehicle infrastructure



In addition to reducing wasteful energy consumption from the transportation sector, efforts to expand the use of cleaner fuel sources, such as compressed natural gas, biodiesel and electric vehicles can foster efficiency gains and greenhouse gas emissions reductions in the transportation sector. During the past few years, electric vehicle infrastructure has grown exponentially in the greater Syracuse area. There are 16 electric charging stations in Syracuse, including the Hills Building, the Carousel Center Mall, the Farmer’s Market lot, the SUNY College of Environmental Science and Forestry, and the Convention Center. Three additional charging stations are located in nearby Liverpool.

During 2012, area car dealerships reported sales of 49 electric and plug-in hybrid vehicles. Given its extensive electric vehicle charging infrastructure and the growing number of commercially available electric and plug-in electric vehicle models, Syracuse is well positioned to make use of the existing infrastructure and encourage further expansion.

To help foster this expansion, Syracuse will continue to partner with Clean Communities of Central New York (CCCNY) and its members to increase alternative fuel vehicle deployment among municipal and other public and private fleets. Participation in a coalition of private and public partners will improve both the City’s and its partners’ ability to attract outside funding. As resources allow, Syracuse will participate in CCCNY events, support efforts to increase the number of clean fuel vehicles deployed at the airport (shuttles, rental vehicles, Airport Authority vehicles), and support Syracuse University’s effort to increase its number of alternative fuel vehicles and enhance charging infrastructure.

Locations of Alternative Fuel Stations in Syracuse, 2013

- Compressed Natural Gas
- ◆ Ethanol
- ▲ Electric

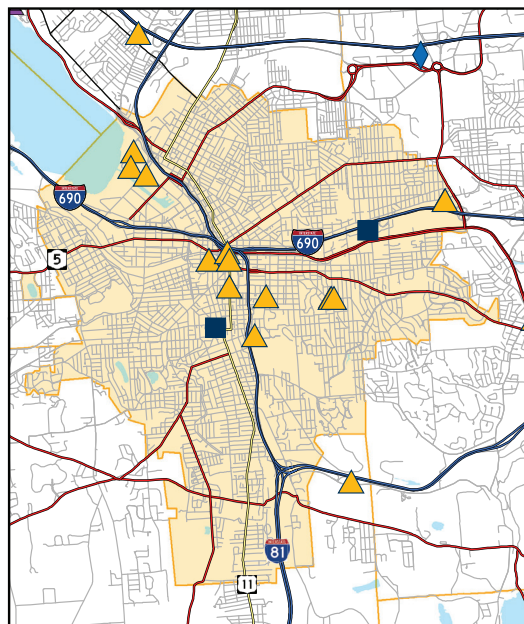


Figure 9

Reduce energy consumption and greenhouse gas emissions from the City's fleet by 10 percent by 2020

The City of Syracuse maintains a fleet of 1,029 on- and off-road vehicles, including waste collection and fire trucks, park maintenance vehicles, police patrol vehicles and standard passenger vehicles. The largest component of the municipal fleet, with 382 vehicles, is police vehicles. Excluding in-house labor, Syracuse spends approximately \$8.5 million annually to operate its fleets, with 38 percent going towards fuel purchases. To cost-effectively reduce those expenses and the environmental impact of municipal vehicle operations, the City has developed a comprehensive strategy to consume less fuel by reducing vehicle miles traveled, minimizing idling and right-sizing vehicles. Syracuse plans to further reduce emissions and lead by example by incorporating more alternative fuel vehicles into its vehicle replacement processes. Given the decentralized nature of the City's fleet management, inter-departmental coordination, standardized and transparent processes and accountability will be critical to reducing the fleet's energy use.

Initiative 8: Decrease City fleet vehicle miles traveled by 3 percent through improved tracking and route optimization



The City of Syracuse has made progress to decrease vehicle miles traveled (VMT) without impacting municipal services, including adjustments to trash and recycling pickup routes. To achieve additional reductions, Syracuse will leverage existing staff resources from each relevant department to form an interdepartmental fleet management team as recommended in the Sustainability Plan. The team will work with the City Energy Manager to coordinate VMT reduction efforts and identify opportunities for route optimization across departments. As resources allow, the team will track and report VMT and fuel consumption trends, communicate VMT goals throughout their departments and share VMT reduction suggestions.

Possible VMT reduction strategies include elimination of unnecessary trips, trip chaining, examination of central equipment locations and equipment delivery methods and route optimization, which seeks to eliminate unnecessary driving

CASE STUDY

CENTRO: Transforming an Urban Transit Fleet

The Central New York Regional Transit Authority (CENTRO) has comprehensively “greened” its transit fleet by applying a variety of best available technologies which save fuel and improve air quality, along with reducing fuel costs. CENTRO has a large-scale compressed natural gas (CNG) bus operation based at its downtown Syracuse headquarters, servicing routes throughout the city. In addition to its CNG units, CENTRO has added hybrid electric buses to its fleet. CENTRO has one of the largest natural gas transit bus fleets in the state. Its large CNG station was constructed in 1996 and was one of the original transit fleets to make use of CNG in the state. Out of 144 large transit buses at the Syracuse location, CENTRO stages 102 large CNG transit buses from the facility, as well as nine diesel electric hybrid buses. Thirty-three buses run on diesel fuel. Its bus garage is outfitted for CNG vehicles, and highly trained staff members operate and maintain the vehicles and fueling station.



CENTRO also operates an important public CNG fueling station in south Syracuse. The City has a collaborative fueling agreement whereby City natural gas vehicles are able to fuel there. The U.S. Department of Energy's most-recent alternative fuel and vehicle deployment report shows CENTRO's buses displaced 878,592 gallons of fuel (based on gasoline equivalents) during 2013.



Transportation Efficiency

and is generally applied to repetitive vehicle routes. Syracuse will evaluate the feasibility of expanding its use of technology such as Automatic Vehicle Locator (AVL) to improve management of vehicle miles traveled within each department and, if recommended by the fleet management team, the use of route optimization software and higher level technology applications with the assistance of a fleet professional.



CENTRO Bus

Initiative 9: Right-size the City fleet by establishing efficiency and size standards for vehicle purchases



Syracuse uses a decentralized process to acquire vehicles with each department responsible for its own vehicles. Generally, the departments choose the smallest vehicle for the job and some downsizing has been realized through attrition. A municipal right-sizing policy involves evaluating the duty cycle of a vehicle versus the model chosen, in order to choose the smallest, most fuel-efficient vehicle to perform the job. Formalizing criteria for right sizing vehicle choices could assist in lowering overall fuel usage.

As recommended in its Sustainability Plan, Syracuse will adopt policies to guide energy efficiency of municipal vehicles to ensure that each department chooses the least expensive and smallest vehicle for a particular task. The fleet management committee will consider efficiency and size standards for each duty application as well as policies for take home vehicles to ensure the “best efficiency vehicle in class.” The fleet management committee will work with the City Energy Manager and each operating department to integrate these policies into vehicle procurement procedures.

Initiative 10: Increase number of alternative fuel vehicles in City fleets



Most vehicles in the City’s fleet run on traditional diesel or unleaded gasoline. Syracuse also maintains a small number of natural gas and hybrid electric vehicles, including four compressed natural gas heavy duty vehicles, two hybrid heavy duty vehicles and a number of flexible fuel vehicles. In 2010, the fleet consumed 711,823 gallons of diesel fuel, 322,743 gallons of unleaded gasoline and 6,681 gallons of gasoline equivalent of CNG. Municipal vehicles emitted nearly 70,000 MT CO₂e in 2010.

To reduce dependence on air-polluting diesel fuel, Syracuse will evaluate replacing four heavy-duty refuse trucks, two street sweepers and four mid-size gas sedans with comparable CNG vehicles, based on the availability of funding and projected fuel costs. Staff will fuel these and the City’s other CNG vehicles at CENTRO’s fueling station, located at CENTRO’s headquarters on the south side of Syracuse. The City will support efforts by CENTRO to modernize the station as a partner in grant applications and through fuel purchase agreements. To obtain the best prices, Syracuse will explore collaborations with Onondaga County, Onondaga County Resource Recovery Authority (OCRRA) and other entities to obtain lower prices through bulk purchases.



Additionally, the City will evaluate the feasibility of integrating electric vehicles into its fleet with the purchase of five plug-in hybrid electric medium duty trucks, four midsize electric cars, and one small electric SUV to replace comparable conventional vehicles. With today's technology, plug-in hybrids are more suitable than pure electric vehicles given Syracuse's harsh winters. To ensure effective maintenance of these vehicles, the Department of Public Works will provide training to its mechanics and assist in receiving certifications for hybrid vehicles. The City will seek grant funding to help cover the incremental additional cost of these vehicles. Based on the experience with the initial purchase of electric vehicles, Syracuse will evaluate whether to acquire additional electric vehicles.

To lead by example, Syracuse will publicize its alternative vehicle program to provide awareness to the public about the benefits of clean air vehicles and provide information on resources. In addition, Syracuse will work with the charging station operator (Car Charging Group) to facilitate the placement of "EV Charging Station" signage in street rights-of-way.

Initiative 11: Pilot use of anti-idling technologies in police vehicles



The police fleet comprises 37 percent of the vehicles used in City operations. Police vehicles operate constantly with little downtime and are estimated to idle approximately four hours per day. Limiting idle time represents an effective method to decrease fuel use by patrol vehicles. Police vehicle anti-idling technology packages account for their unique public safety requirements, enabling the vehicle's lights and computers to continue to operate with the engine off.

The Syracuse Police Department will evaluate the feasibility of installing an anti-idling package into five vehicles as a pilot test of anti-idling technology. This initiative is projected to reduce gasoline usage by 1,679 gallons per vehicle annually. Some municipalities have reported fuel reduction of up to 2.4 gallons per day or 4,380 gallons annually per unit. After the first year, the Syracuse Police Department will evaluate the savings and consider expanding the technology to additional vehicles.



Downtown Syracuse at night

Initiative 12: Create a driver-awareness campaign for City vehicle drivers to use less fuel and decrease tailpipe emissions



A driver-awareness campaign for municipal employees is another low-cost approach to reducing energy usage. Such a campaign articulates energy reduction goals and creates interest among drivers in taking measures and changing behavior to meet the goal.

As resources allow, Syracuse will prepare and distribute information to drivers, such as a short handout and web links. These materials will explain fuel reduction goals for the municipal fleet, offer simple explanations and suggestions on how to use less fuel and encourage interested workers to take an online eco-driving course. A good model for such a handout is a short, half-page document with a photo or graphics. The City will coordinate distribution of information to department heads with other fleet management team efforts and anti-idling campaign material.

Another driver-awareness tool that has been effective in other areas is tags hung in City vehicles. Simple contests among employees at the Water Department or Department of Public Works can acknowledge those employees that have reduced fuel consumption the most. These contests can be effective if the goals and rewards are well understood, participation is voluntary and competitions result in budgetary savings.

Reduce energy usage and cost of municipal street lighting

There are 17,720 streetlights in Syracuse. Nearly all (17,656) are high pressure sodium (HPS) and 64 are metal halide (MH). Syracuse leases most of these from National Grid, paying the utility company for maintenance and energy use.

In 2010, street lighting consumed 14,215,784 kWh of electricity, representing 48 percent of the City's total electricity usage. Due to facility charges paid to National Grid for maintenance of the fixtures and infrastructure, the cost of street lighting represents 61 percent of Syracuse's electricity costs for municipal facilities.



Streetlights
account for
48%
of the total
municipal
operations
electricity use



Initiative 13: Convert streetlights to LEDs



Many U.S. cities have converted or are in the process of converting their streetlights from high intensity discharge (HID) fixtures (e.g., high pressure sodium, metal halide and mercury vapor) to light emitting diodes (LEDs). The market for LED street lighting has been changing rapidly, with costs decreasing and fixture reliability increasing. Additionally, LED luminaires have been found to provide better uniformity of illumination

than is achievable with HID fixtures. This helps reduce light spillage into locations where it would be a nuisance while enhancing it where needed.

If all of the streetlights in Syracuse were converted to LEDs, the cost (excluding design fees and the cost of purchasing the streetlights and associated equipment from National Grid) would be approximately \$6 million and the City would save approximately \$1 million per year. The purchase of streetlights from National Grid is estimated to cost another \$4.6 million. As a first step, Syracuse will acquire selected underpass lighting from National Grid and convert those to LED. The expected cost of this project is \$500,000, with estimated savings of more than \$81,000 annually, based on reduced maintenance requirements and energy usage. Syracuse will explore a range of options for financing and long-term maintenance, including the phased purchase of all streetlights from National Grid and the use of an Energy Services Performance Contract (ESPC) with an Energy Services Company (ESCO).

Syracuse will explore the feasibility of acquiring all of the streetlights in the city from National Grid and converting the lights to LEDs on a phased basis. An alternative option is to support National Grid in its effort to convert streetlights to LED and participate in the New York State Public Service Commission (PSC) efforts to establish a new tariff for LED streetlights that is fair to the utility and the City. Syracuse will also explore multiple potential financing options, including the use of an ESPC with an ESCO, along with possible NY Green Bank partnerships.



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: Revise zoning to encourage compact development patterns, walkable neighborhoods, bicycle accommodations and transit-oriented design				
Planning and Zoning Divisions	Neighborhood Associations, Businesses	NYSERDA Cleaner Greener implementation grant	Medium-Term	Specify scope of work and retain consultant
Initiative 2: Partner with CENTRO, businesses and institutions to encourage and support the retention and expansion of transit routes				
Sustainability Coordinator	CENTRO; Community Organizations, Syracuse University, Other institutions	City budget	Ongoing	Identify funding opportunities, community initiatives
Initiative 3: Construct bicycle lanes and support infrastructure				
DPW (bicycle/pedestrian infrastructure)	Community organizations	Reduced energy use from vehicles (fewer VMTs)	City budget; State Department of Transportation grants	Program bicycle improvements in Capital Improvement Program
Initiative 4: Design and maintain the existing network of sidewalks and trails to support walking as a safe and comfortable mode of transportation				
DPW (infrastructure)	Community organizations	City budget, NYS DOT and other grants	Short-Term; Ongoing	Program improvements in Capital Improvement Program
Reduce emissions from vehicles by minimizing idling and facilitating use of cleaner fuels				
Initiative 5: Reduce idling on busy corridors through traffic signal coordination				
DPW	NYS DOT, Onondaga County	NYS DOT; Federal highway funding	Short-Term	Implement recommendations in recent study
Initiative 6: Set a time limit for idling				
Mayor's Office, Fleet managers	Clean Communities of Central New York (CCCNY); Common Council	City staff budget	Short-Term	Evaluate policies of other cities to determine appropriate idle time
Initiative 7: Partner with Clean Communities of Central New York to expand size and use of alternative vehicle infrastructure				
Sustainability Coordinator and Department of Public Works	Syracuse University and other CCCNY stakeholders	City staff budget	Short-Term; Ongoing	Designate liaison to CCCNY; provide vehicles for display if requested for local events; provide letters of recommendation for grants

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

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Reduce energy consumption and greenhouse gas emissions from the City's fleet 10 percent by 2020				
Initiative 8: Decrease City fleet vehicle miles traveled by 3 percent through improved tracking and route optimization				
Department of Public Works	Fleet managers; Sustainability Coordinator; Onondaga County Purchasing Staff	City staff budget; Grants	Short-Term; Ongoing	Track vehicle use on units with AVL/GPS to determine wasteful use patterns; assess potential for route optimization software
Initiative 9: Right-size the City fleet by establishing efficiency and size standards for vehicle purchases				
Mayor's Office	Fleet Managers; Office of Budget; Sustainability Coordinator	City staff budget	Ongoing	City must determine which office to center effort since each department has its own vehicle purchase procedures.
Initiative 10: Increase number of alternative fuel vehicles in City fleets				
Department of Public Works- Fleet (heavy duty vehicles) and Mayor's Office/Engineering (for any vehicles staged out of City Hall)	CCCNY, NYSERDA; Vehicle vendors	NYSERDA or new CNG state funding programs	Short-Term to Medium-Term	Identify select number of units for replacement with CNG and plan for grant funding for incremental cost; apply for grant when available. For plug-in electric, identify vehicles stored downtown that could use existing charging stations; open account with charging station operator
Initiative 11: Pilot use of anti-idling technologies in police vehicles				
Police Department Fleet Managers	NYSERDA, CCCNY	State or other grants, Technology Innovation funds	Medium-Term	Acquire funds and select technology provider
Initiative 12: Create a driver-awareness campaign for City vehicle drivers to use less fuel and decrease tailpipe emissions				
Mayor's Office, Fleet Managers	Clean Communities of Central New York (CCCNY)	City staff budget	Short-Term	Assign responsibility for creating campaign
Initiative 13: Convert streetlights to LEDs				
DPW - Street Lighting Coordinator	Sustainability Coordinator; National Grid	City capital budget; NYSERDA or other incentives; Energy performance contract	—	Acquire and convert underpass lighting; Investigate alternatives regarding ownership and maintenance for lighting owned by National Grid; Evaluate financing options

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



Modernize Energy Infrastructure to Ensure Safe, Reliable and Affordable Energy for City Consumers

Summary of Objectives and Initiatives

Support the upgrade and modernization of local energy infrastructure in conjunction with utilities and other stakeholders

Initiative 1: Support National Grid's infrastructure modernization program by coordinating the scheduling of work in City rights-of-way

Initiative 2: Improve resiliency by supporting expansion of district energy and micro grids

Support community efforts to generate electricity from renewable sources

Initiative 3: Provide information to homeowners, homebuyers, commercial businesses and builders on opportunities for solar and other renewable energy generation

Initiative 4: Partner with a not-for-profit or governmental agency to administer a "Solarize Syracuse" program

Increase the generation of electricity from renewable sources at City-owned facilities

Initiative 5: Perform site-specific studies for facilities where solar, wind and micro-hydro energy generation are most promising

Initiative 6: Consider issuing an RFP for a Power Purchase Agreement or lease for the installation of renewable energy generating equipment

Residents, businesses and institutions rely on the consistent supply and reliable distribution of electricity and natural gas to maintain a high quality of life and to support continued economic development. Increased decentralized generation, especially from renewable sources such as solar, is needed to support resiliency in case of disruption to the primary supply and distribution infrastructure. As numerous federal, state, local and regional agencies influence energy decisions, including siting, scheduling and rates made by utilities and other entities, Syracuse has an opportunity to facilitate coordination among these entities as they work toward achieving this goal.

National Grid is the public utility authorized by the New York State Public Service Commission to deliver electricity and natural gas to customers throughout Syracuse. It distributes electricity to customers within the city via high-voltage transmission lines that convey the electricity from generating plants elsewhere. It distributes

natural gas through a network of pipelines and pressure-regulating valves from long-distance transmission pipelines.

The electricity generated for use in upstate New York, including Syracuse, mostly originates from independently operated power plants such as the Ginna nuclear plant in Wayne County, NYPA's hydro-electric plant in Niagara County and other plants powered by natural gas, fuel oil or coal. There are two smaller generating facilities within or near Syracuse, including a waste-to-energy facility. Upstate New York's fuel mix for electricity is a combination of hydro, nuclear, gas and—to a lesser extent—coal. This is significantly cleaner than the U.S. average, with pounds of emissions per megawatt hour averaging less than 550, compared to the U.S. average of 1,232.

The regulatory framework that governs electricity generation and distribution is designed to meet energy needs the city might only experience a few days a year, in the peak of summer. The cost of building large-scale infrastructure to meet these large capacity needs is borne by utility rate payers. The high cost of this system has necessitated a transition to more a more distributed generation network, comprised partly by renewable energy sources such as solar and wind. In addition to cost benefits, a modern, distributed energy infrastructure offers clean energy solutions that can lower emissions and enhance resiliency to the effects of climate change and other extreme weather events.



Upstate New York Electricity Generation Fuel Mix

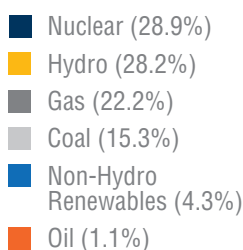
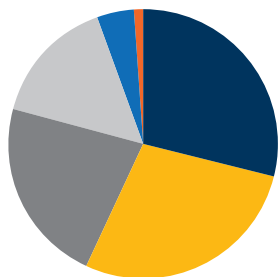


Figure 10

Syracuse possesses some of the foundation of this modern infrastructure, including combined heat and power facilities at school, university and government facilities. In addition, the Public Service Commission's Reforming Energy Vision (REV) presents a unique opportunity for National Grid and smaller electricity generators to take advantage of new regulatory frameworks to increase the amount of electricity generated from distributed energy and renewable sources.

Support the upgrade and modernization of local energy infrastructure in conjunction with utilities and other stakeholders

Initiative 1: Support National Grid's infrastructure modernization program by coordinating the scheduling of work in City rights-of-way



The paramount purpose of the energy distribution and supply system remains to ensure safety and reliability, which enables the continued functioning of Syracuse's economic and social activity. Since a large proportion of the electric and natural gas distribution infrastructure is located within the rights-of-way of City streets, ensuring this reliability and safety hinges on careful coordination between the City and utilities on public works projects and priorities. National Grid's modernization efforts include the phased replacement of older natural gas pipelines to improve reliability and reduce the potential for leakage. In addition, improvements to electric substations and distribution lines are both planned and underway.

To coordinate scheduling of work within City rights-of-way, Syracuse Department of Public Works (DPW) staff meet regularly with representatives from National Grid to coordinate scheduling for upcoming work within City street rights-of-way. National Grid notifies City staff when it needs access to City streets to address reported leaks and to schedule pipeline replacement and electric system upgrades within street

rights-of-way. City staff coordinate with National Grid to schedule utility work in conjunction with street improvements or water or sewer projects underneath streets. This coordination helps to avoid inefficiencies resulting from repeated work within the same section of roadway.

DPW staff will continue to take the lead in coordinating infrastructure improvements within municipal rights-of-way. DPW staff will continue to participate in regular meetings with National Grid and other entities that maintain infrastructure within City rights-of-way to coordinate utility infrastructure improvements with other road repairs, water main replacements and other projects.

Initiative 2: Improve resiliency by supporting expansion of district energy and microgrids



Continued expansion of district energy and microgrid development has potential to improve system reliability, efficiency and resiliency while decreasing participants' cost and emissions. Syracuse will support efforts by the state, utilities, businesses and institutions to expand district energy systems, microgrids and other distributed energy resources that align with the Reforming the Energy Vision (REV) proceeding designed to encourage the overall system efficiency of the grid.

District energy systems provide energy to a building or area without requiring connection to the utility. In Syracuse, Onondaga County's District Heating and Cooling Plant supplies steam to the county's downtown buildings for heating and cooling in addition to generating electricity. Syracuse University's Steam Station provides steam and chilled water to campus buildings, neighboring hospitals and SUNY College of Environmental Science and Forestry.

A microgrid is a group of interconnected electricity loads within clearly defined boundaries that can be either connected to the wider electrical grid or operate independently. District energy and microgrids can support system reliability and resiliency by continuing to provide electricity and other energy during disruptions to the larger electricity grid and energy distribution network.



Project Orange and Other Incarnations of the SU District Steam System

Syracuse's history with district energy systems includes large, high-profile systems that no longer operate, such as Project Orange. It operated a combined heat and power plant from 1992 until 2009, providing steam to Syracuse University and other buildings on University Hill and selling electricity to National Grid through a lucrative state-mandated contract. Ultimately, the price of Project Orange's electricity was too high for National Grid, which bought out the contract. Without National Grid as an electricity customer, Project Orange lost money generating steam and experienced unsuccessful lawsuits against Syracuse University in attempts to achieve better terms with a revised contract. Had it been possible for Project Orange to sell electricity via a microgrid, the outcome might have been different. Project Orange sold its equipment and demolished its remaining facilities as consequences of bankruptcy, and Syracuse University revived its 1929 steam plant to ensure availability of district steam to client buildings.



There are numerous cogeneration (combined heat and power, also known as CHP) projects in Syracuse that use the heat created during the electricity generation to heat buildings. These include Syracuse University's Green Data Center, SUNY College of Environmental Science and Forestry (ESF) and Onondaga County's Metropolitan Syracuse Wastewater Treatment Plant. The Syracuse City School District has several CHP facilities installed at schools. These installations add up to nearly 3.1 MW, enough power and heat to supply more than 1,000 households.

Syracuse will continue to support district energy and microgrid projects through permitting and advocacy. If district energy systems can offer reliable energy and reasonable cost, the City will evaluate becoming a customer of district energy systems.

Syracuse will work with Syracuse University, Onondaga County, SUNY ESF and other organizations to support continued development and expansion of district energy. The City will facilitate project permitting, support grant applications and participate in identifying expansion opportunities.

Support community efforts to generate electricity from renewable sources

A small proportion of the energy used Syracuse is generated from renewable sources. Renewable systems connected to the electric grid include 36 PV systems, three wind energy systems, one hydro-electric system and three combined heat and power systems. These include three renewable energy systems on City facilities—an 11 kW photovoltaic system on the roof of City Hall Commons, 50 kW of photovoltaic on top of the Westcott Reservoir tank and a 50 kW micro-hydro-power generator at Westcott Reservoir. Challenges to installing additional renewable energy include net-metering difficulties in areas such as downtown, where the electricity grid is networked.

Syracuse University has installed solar thermal (solar hot water) systems on 20 buildings that contain 160 apartments. The systems are expected to supply 50 percent to 60 percent of the energy required to heat domestic hot water for the apartments.

CASE STUDY

Solarize Madison County

Madison County was the first county in New York to apply the Solarize model program developed by Portland, Oregon. One of the main organizers of the program was a student at SUNY Morrisville.

The program issued a Request for Proposals and selected private sector 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 the NYSEDA incentives and state and federal tax credits already available. The \$2,000 incentive was funded by a bulk purchasing arrangement with the participating installer(s). A Solarize program in three towns within southeastern Tompkins County has since been modified and expanded to apply countywide. Genesee County has also implemented a Solarize program, allowing Rochester and Monroe County to learn from the experience of other state municipalities.

Community outreach programs like Solarize 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 regard Central New York as too cloudy for solar PV; a Solarize program will help demonstrate that solar generation of electricity is a viable option in the state. According to the Solarize New York web site, most communities around the country that have implemented the Solarize model report tripling the number of installed solar systems within their communities.

Madison County is predominantly rural and implementation of a countywide program there presents 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.





Initiative 3: Provide information to homeowners, homebuyers, commercial businesses and builders on opportunities for solar and other renewable energy generation



While the cost of solar PV installations has fallen dramatically in recent years, public awareness of solar as a cost-effective source of renewable energy has not kept pace. Despite upstate New York's cloudy and rainy weather, state and federal incentives and tax credits now make home solar systems more practical. Additional outreach is needed to ensure that homeowners, businesses and contractors are aware of the opportunities, incentives and tax credits that are available.

Syracuse offers information on current solar incentives at its Central Permit Office. The City will continue to make such information available there for residents, businesses and developers.

Initiative 4: Partner with a not-for-profit or governmental agency to administer a "Solarize Syracuse" program



Solar installations can be encouraged through a Solarize program that informs residents, organizes volume purchases, and passes along the savings as an incentive. The first Solarize program was developed and implemented in Portland, Oregon, and resulted in 600 solar electric installations

over two years. By purchasing solar panels and installation services in larger quantities, residents benefit from lower costs.

Solarize programs are most successful when they are implemented as joint efforts between municipalities and community organizations. The success of the program can be measured in the number of solar installations during the program. Some Solarize programs offer a small direct subsidy to participants in addition to the cost savings from bulk purchases, but the added publicity typically stimulates installations in addition to those that are subsidized.

Syracuse is working with a consortium of non-profit entities to help publicize a new Solarize Syracuse program for local residents. The program has received enough signed contracts to more than double the number of solar installations in Syracuse, from 22 to 50 (as of October 2014). Solarize Syracuse aligns with the strategic vision of NYSERDA's Clean Energy Fund by reducing soft costs, aggregating community participants to lower overall energy costs and stimulating local level interest in clean energy.

Increase the generation of electricity from renewable sources at City-owned facilities

Syracuse has an opportunity to lead by example in generating additional electricity from renewable sources at City facilities. Power generated from renewable sources adds resiliency to the electric grid and reduces the need for electricity generated by less sustainable sources.

Initiative 5: Perform site-specific studies for facilities where solar, wind and micro-hydro energy generation are most promising



The cost-effectiveness of renewable power generation is often dependent on the physical or geographic characteristics of the proposed site. Strategic deployment of renewable generation is therefore critical to producing renewable energy affordably. Syracuse previously commissioned assessments of the solar feasibility of five of its most promising sites in 2011. City-owned buildings

Roof-mounted solar panels



CASE STUDY

Westcott Reservoir



Westcott Reservoir is a City-owned structure comprised of two tanks that store drinking water. Syracuse's water supply comes from Skaneateles Lake, which is 245 feet higher in elevation than the Westcott Reservoir site. This feature enabled the installation of a 30 kW micro turbine which uses 55 to 80 feet of the hydraulic head to generate electricity when the supply of water exceeds the demand. In addition to the micro turbine, a 50 kWh solar PV system on the roof of one tank was sized to generate enough electricity to meet the power requirements of the facility.

The renewables were added during a significant upgrade to the facility that covered the formerly exposed reservoir with a roof. At the time of its installation, the Westcott Reservoir solar project was projected to have a 15-year payback period. Half of the cost was funded by a grant from the federal government. The Chief Engineer who was responsible for the operation of the reservoir during the project noted that the inclusion of renewable energy equipment added significant complications and demands on staff time during the reservoir's design and construction.

City representatives agreed that the process of interconnecting to the electric grid was the greatest challenge. The utility company required field testing of a breaker designed to keep power from the renewables from flowing to the grid during power outages. This "islanding" issue is common to all electrical generation equipment, including solar PV, wind generators, emergency generators and CHP. The lesson learned from this experience is that timely communication between City staff and National Grid is necessary during the design phase.

In April 2013, the New York Public Service Commission issued new standardized interconnection regulations that apply to installations up to 2 MW in capacity. The new regulations are intended to facilitate the interconnection process by setting time limits for utility responses.



with the largest roof exposures are the Public Works Compound and Water Department offices.

The 50 kW hydropower turbine at the Westcott Reservoir takes advantage of the higher elevation of the City's water supply to generate electricity when the water flows downward from the tank. There may be other locations in the Syracuse water system suitable for a similar installation; according to the former water commissioner, it is possible to use micro hydro generators in place of pressure relief valves.



Hydropower generates clean reliable energy

Before Syracuse can design or fund additional renewable generation, additional study is needed to investigate the cost and feasibility of renewable generation at particular sites. As recommended in the Sustainability Plan, Syracuse staff will conduct renewable energy studies at City facilities and will periodically re-evaluate the feasibility of solar installations at City facilities as market conditions change. Any new studies commissioned by the City will address any design requirements established by National Grid for the proper installation

of net-metering equipment. Communication with National Grid early in the design process is essential to ensure that net-metering equipment is properly designed. In addition, National Grid and the New York State PSC will need to address the physical challenges of net metering downtown where the grid is networked. Potential funding opportunities through NYPA, NYSEDA, National Grid or other financial incentive programs may be available to reduce the capital cost.

Initiative 6: Consider issuing an RFP for a Power Purchase Agreement or lease for the installation of renewable energy generating equipment



Alternative financing arrangements can provide up-front capital for renewable energy systems. With a Power Purchase Agreement (PPA), a third-party developer owns, operates and maintains the system and the customer purchases the electricity generated by the system for a predetermined period. This arrangement allows the customer to receive stable, and sometimes lower cost electricity, while avoiding capital costs, risk for system performance, and the design and permitting process. The solar services provider benefits from the tax credits and income generated from the sale of electricity to the customer.

For those facilities where Syracuse determines that solar or other renewable energy generation is feasible, the City will investigate potential financing mechanisms such as a Power Purchase Agreement, lease, or other suitable financing mechanism. Incentives offered by utilities, NYSEDA and other sources may also help to reduce the capital cost. In addition, numerous private companies are working to standardize the language and structure for municipal PPAs which could reduce soft-costs and encourage more municipalities to work together with suppliers of renewable energy.

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Support the upgrade & modernization of local energy infrastructure in conjunction with utilities & other stakeholders				
Initiative 1: Support National Grid's infrastructure modernization program by coordinating the scheduling of work in City rights-of-way				
DPW	National Grid	City budget for staffing	Ongoing	Continue regular meetings and communication with National Grid
Initiative 2: Improve resiliency by supporting expansion of district energy and microgrids				
Sustainability Coordinator	PSC, National Grid, Syracuse University, Onondaga County, Syracuse School District, other institutions	City staff budget; SU, County, Possible grants	Short-Term; Medium-Term	Continue discussions with SU and Onondaga County to determine type of support needed from City
Support community efforts to generate electricity from renewable sources				
Initiative 3: Provide information to homeowners, homebuyers, commercial businesses and builders on opportunities for solar and other renewable energy generation				
Sustainability Coordinator; Central Permit Office	Solar installers; Residents	City staff budget	Short-Term	Compile information to provide to public
Initiative 4: Partner with a not-for-profit or governmental agency to administer a "Solarize Syracuse" program				
Sustainability Coordinator/ City Energy Manager	CNY RPDB; community organizations; not-for-profit organizations; institutions	City staff budget	Short-Term	Identify partners to lead/ continue effort
Increase the generation of electricity from renewable sources at City-owned facilities				
Initiative 5: Perform site-specific studies for facilities where solar, wind and micro-hydro energy generation are most promising				
DPW	Sustainability Coordinator; City Council; Mayor	NYSERDA; other grant funding	Short-Term	Identify facilities for initial studies; Work with National Grid and PSC to address obstacles to net metering at downtown locations
Initiative 6: Consider issuing an RFP for a Power Purchase Agreement or lease for the installation of renewable energy generating equipment				
Syracuse City Department of Engineering	Public Works, Police, Water Dept.	Third-party investor	Medium-Term	Identify potential partners for PPA or lease

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

Organizational structure to support implementation

The City Sustainability Coordinator, who sits within the City Planning Division of the Syracuse-Onondaga County Planning Agency, will continue to coordinate energy planning and policy for the City. Syracuse will engage a City Energy Manager to supplement these efforts and focus on partnerships with the Regional Planning & Development Board, Syracuse Metropolitan Transportation Council and community not-for-profit entities to support initiatives aimed at reducing energy use in buildings and vehicles citywide.

Financing

The City will leverage a number of resources to implement the initiatives in the Syracuse Energy Plan. Many of the initiatives in this plan advance procedures that are already in place and can be implemented at minimal additional cost to the City. Where there are upfront capital costs, the City will seek 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, Syracuse will evaluate funding mechanisms such as NYPA financing and ESCOs from ESCOs that use savings from reduced energy expenses to finance the upfront costs. The City will also pursue incentives from NYSEDA, National Grid and others to help reduce costs for specific energy efficiency measures such as lighting fixtures, HVAC and motors and renewable energy systems such as solar panels and vehicle replacements such as alternative fuel vehicles. To secure funding for additional traffic signal coordination, the City will work with the Syracuse Metropolitan Transportation Council to allocate funds in the New York State Transportation Improvement Program.

As collaboration with other governmental and private institutions help improve the competitiveness of grant applications, Syracuse will continue to support these partnerships. This includes continuing to partner with Syracuse University and other institutions to support transportation initiatives along the Connective Corridor and to expand of district energy and microgrids infrastructure. City staff will continue to support grant applications led by the Central New York Regional Planning & Development Board that would increase energy efficiency and renewable energy generation citywide.

Projected Reductions in Municipal Energy Consumption by Action Area

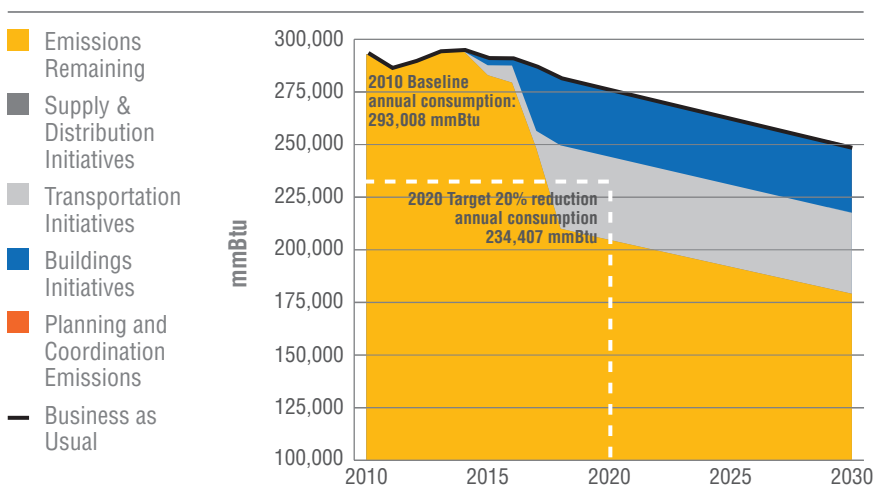


Figure 11

Projected Community Reductions in Energy Consumption by Action Area

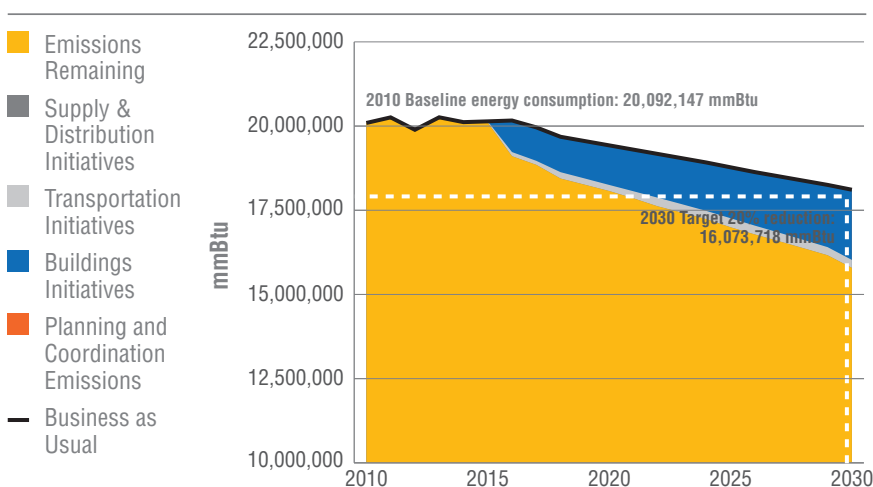


Figure 12

Reporting and updates

The Sustainability Manager, with support from the City Energy Manager, will track progress toward implementing the initiatives in the Syracuse Energy Plan. Over the next five years, the City 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, Syracuse will implement energy-efficiency measures in its own buildings and vehicle fleets and install cost-effective renewable energy generation capacity at City facilities. It will install energy conservation measures and renewable energy capability at its buildings when it is cost effective to do so and reduce fuel use in its vehicle fleet.

Economic development: creating jobs and attracting businesses

Improving the energy efficiency of buildings citywide will reduce costs for businesses and help retain these businesses in Syracuse. Expanding district energy at key institutions, such as Syracuse University and SUNY Environmental Science and Forestry, supports resiliency and reduces energy costs for these institutions that are significant economic drivers in the region. Improved infrastructure for bicycles, pedestrians and transit will help residents access jobs in the city and improve the quality of life.



Infrastructure: preparing our cities for the future

Syracuse will work with National Grid to facilitate repairs and improvement to infrastructure within City rights-of-way and to support expansion and improvement projects that benefit residents, businesses and institutions. Syracuse will continue to investigate the feasibility of installing additional renewable capacity at municipal facilities and install such capacity when it is cost effective to do so. Syracuse will support Syracuse University and other 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 Syracuse reduce its greenhouse gas emissions. These include reducing energy consumption from buildings and vehicles, increasing the amount of electricity generated from renewable sources, and working with National Grid to facilitate the replacement of older natural gas pipelines within municipal rights-of-way.



YONKERS



Letter From Mayor Mike Spano



Dear Friend,

The challenge is clear. The opportunity is extraordinary.

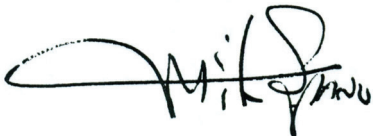
We all know from Superstorm Sandy that extreme weather can wreak havoc on our communities. In the days after the storm, when the power was out, we witnessed firefighters assist frail seniors stuck on the upper floors of a high-rise building after their elevator stopped working. When our fuel supplies were disrupted, we saw residents waiting hours in long lines for a chance to fill their cars with gasoline. In the hour our city was most tested, we felt reassured when an army of city workers and volunteers came together to clean up and rebuild.

There is no arguing climate change is real. We know the devastation it has and will continue to cause if we don't act. By making smart choices, we can address our energy challenges, grow our economy and make Yonkers an even more healthy, vibrant and attractive city. This year, the City will complete a project to replace all city street lights with LEDs. It is anticipated to save \$20 million in energy costs over 10 years. Projects like this are not only good for the environment, they're good for the pocketbooks of taxpayers.

As we continue to make remarkable progress on sustainability in Yonkers, this Energy Plan will serve as an important roadmap for the next phase of the city's sustainable development. I'd like to thank the New York Power Authority and the Office of the Governor for their steadfast support of Yonkers.

Together, we're building a better, greener city.

Sincerely,



Mayor Mike Spano



Top left, Untermyer Gardens;
Top right, Cacace Justice
Center; Middle, 87 Nepperhan
Avenue; Bottom, Yonkers
City Hall

City of Yonkers Energy Plan



Cities across the globe face increasing pressure from climate change, overburdened and antiquated infrastructure, diminishing resources, and economic uncertainty. A common theme among these challenges is energy, and cities like Yonkers, which has grown more than 4 percent in the last 20 years and is expecting additional growth, must be proactive in tackling energy-related issues to prepare for the future and ensure their continued development. To accomplish this, the City developed the Yonkers Energy Plan as part of the Five Cities Energy Plan initiative. The Yonkers Energy Plan aims to reduce energy consumption and greenhouse gas emissions while improving residents' quality of life, strengthening the economic vitality of local businesses, creating new jobs, fostering a healthy community and natural environment, and making Yonkers more resilient.

State of the City

Yonkers and its constituents consumed about 18.9 million mmBtu worth of energy in 2010, producing 1.3 million metric tons (mtCO₂e) in emissions at a cost of nearly \$500 million (**Figure 5**). Buildings are the largest consumer of energy in the city, accounting for 71 percent of energy use in Yonkers. Consequently, there are significant opportunities for energy savings within Yonkers' building stock. Benchmarking energy use can help building owners understand trends and identify potential savings. Enacting more stringent energy codes, on the other hand, can improve building energy performance by design.

The City consumed nearly 600,000 mmBtu and spent around \$16.8 million on energy for municipal government operations in 2010. Of that total, municipal buildings accounted for \$12.1 million and approximately 78 percent of overall energy use. A little more than half of the municipal energy was used by school buildings, making the school district the municipal government's largest end-user of energy by far.

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Community Energy Consumption by Sector (mmBtu)

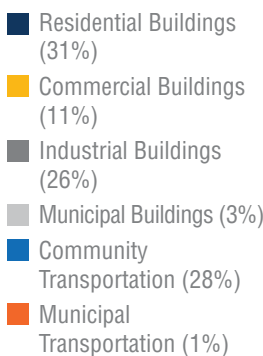
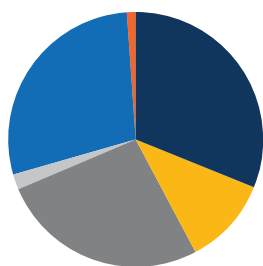


Figure 1

Community Energy Consumption by Fuel Type (mmBtu)

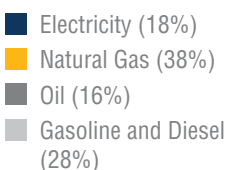
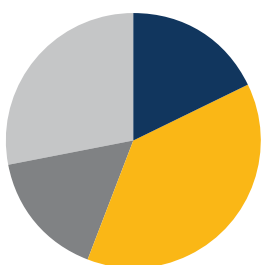


Figure 2

The breakdown of municipal emissions is almost identical to the breakdown of municipal energy use. Not surprisingly, Yonkers' school buildings are by far the leading producer of emissions, representing 54 percent of total emissions. By fuel source, electricity accounts for the largest proportion of municipal emissions at 40 percent with fuel oil not far behind at 37 percent. The school district's heavy reliance on expensive fuel oil to heat buildings also has a major impact on the environment. By converting boilers in the schools to natural gas, the City will save money and lower emissions.

Although buildings account for the majority of energy use in Yonkers, there is also great potential to reduce energy consumption in the transportation sector, which is responsible for 29 percent of total energy use (**Figure 1**).

Existing programs

City Programs

The Yonkers Energy Plan is part of a wide range of ongoing sustainability programs at the city and regional levels. Before the development of the plan, the City put several programs and policies in place to reduce the energy use and greenhouse gas (GHG) emissions of municipal government operations and the community at large. In 2009, Yonkers adopted the New York State Climate Smart Communities (CSC) pledge, which includes a commitment to lower the City's emissions and adapt to climate change. As part of the CSC pledge, the Office of the Mayor produced a draft Yonkers Energy Action Plan in 2012, outlining the City's roadmap to reduce citywide greenhouse gas emissions 20 percent below 2005 levels by 2020. The goals, themes and actions found in the draft Yonkers Energy Action Plan have provided a solid foundation for the development of the Yonkers Energy Plan and played a critical role in the plan's evolution.

Utility Programs

Yonkers' local electricity and gas utility provider, Consolidated Edison (Con Edison), has several programs focused on improving the energy efficiency of its customers' facilities. These

programs are divided into four sectors: residential, small business, multifamily building and commercial/industrial. Examples of Con Edison's energy-efficiency programs include: rebates for HVAC and lighting upgrades, free compact fluorescent light bulbs, water efficient fixtures, smart power strips, and smart controls for A/C systems. These programs are available for Yonkers residents and businesses.

Regional Programs

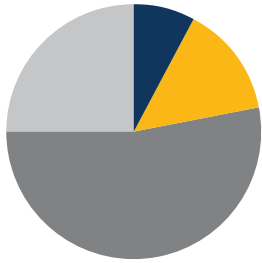
The Mid-Hudson Regional Sustainability Plan (MHRSP), funded by the New York State Energy Research and Development Authority's (NYSERDA) Cleaner, Greener Communities Program, established a sustainability vision for the seven counties north of New York City, including Westchester. The plan looks at sustainability through several focus areas, each with objectives and initiatives, related metrics and targets. For energy, the target is to reduce per capita energy use 50 percent by 2050 compared to 2010. The Strategic Plan for the Mid-Hudson Regional Economic Development Council (MHREDC), which has economic growth as its primary objective, includes measures to reduce energy use and greenhouse gas emissions. These measures include rewarding and supporting projects and programs that involve energy efficiency, renewable energy and energy benchmarking, as well as clean and alternative transportation. Many of the overarching goals and objectives found in the Yonkers Energy Plan were adapted from the mid-Hudson regional plans.

Summary of goals and initiatives

In response to the patterns, trends and challenges associated with bringing current energy use in line with the plan, the City has identified a number of energy-related goals that the initiatives described in this plan will help to achieve. These goals include:

- Encourage efficient, clean and affordable energy through coordination, awareness and education
- Reduce community and municipal building-level energy 20 percent (from 2010 baseline) by 2020
- Increase transportation options citywide to transform Yonkers into a walkable, bike-friendly and transit-focused city
- Expand the use of district and renewable systems to increase resilience and reduce carbon emissions

Municipal Energy Consumption by Sector (mmBtu)



- Street Lights (8%)
- City Fleet (14%)
- School Buildings (53%)
- Other City Buildings (25%)

Figure 3

Municipal Energy Consumption by Fuel Type (mmBtu)



- Electricity (35%)
- Natural Gas (14%)
- Oil (37%)
- Gasoline and Diesel (14%)

Figure 4

Yonkers will achieve these goals through better coordination between City departments and the Board of Education. The work ahead includes expanding the City's Green Development Program, training and educating staff and students, and creating awareness of existing city, state and utility programs and incentives. Building performance will be improved through benchmarking of larger buildings, retrofitting existing buildings, switching heating fuels from oil to natural gas and improving maintenance in municipal buildings.

The city will reduce transport energy by encouraging developers to provide electric charging stations, facilitating better coordination between transit modes, and improving bicycle and pedestrian

routes. Yonkers will develop rideshare programs and replace aging, inefficient vehicle stocks with more efficient vehicles and ecodriving training. The city will also strengthen its energy infrastructure by expanding renewables and ensuring a more resilient energy system through the investigation of opportunities for distributed generation and microgrids, increased solar installations, vulnerability and adaptation plans for the city, and an emergency fuel stock created in concert with Westchester County and the state. Funding for these initiatives will include public and private sources, and will require cooperation from residents and businesses to reduce energy and emissions.



Sarah Lawrence College Center for the Urban River at Beczak

CITY OF YONKERS ENERGY CONSUMPTION AND GHG EMISSIONS (2010)

		Residential Buildings	Commercial Buildings ¹	Industrial Buildings	Municipal Buildings	Non-Municipal Transportation	Municipal Transportation	Total
Electricity ²	mmBtu	1,364,673	416,761	1,416,461	162,423	-	47,271	3,407,589
	\$	80,325,868	24,530,811	83,373,743	6,533,210	-	2,808,616	197,572,248
	MtCO ₂ e	113,389	34,628	117,692	13,496	-	3,928	283,133
Natural Gas	mmBtu	2,621,687	999,649	3,397,544	81,570	-	-	7,100,450
	\$	36,889,325	14,065,899	47,806,275	985,500	-	-	99,746,999
	MtCO ₂ e	139,358	53,137	180,600	4,336	-	-	377,431
Oil ³	mmBtu	1,884,696	740,974	152,994	222,867	-	-	3,001,531
	\$	40,781,340	12,825,600	3,030,175	4,622,978	-	-	61,260,093
	MtCO ₂ e	138,822	55,315	11,333	16,416	-	-	221,886
Gasoline and Diesel	mmBtu	-	-	-	-	5,280,741	81,721	5,362,461
	\$	-	-	-	-	134,378,858	1,837,047	136,215,905
	MtCO ₂ e	-	-	-	-	404,374	5,911	410,285
TOTAL	mmBtu	5,871,056	2,157,384	4,966,999	466,860	5,280,741	128,992	18,872,031
	\$	157,996,533	51,422,310	134,210,193	12,141,687	134,378,858	4,645,663	494,795,244
	MtCO ₂ e	391,569	143,081	309,626	34,247	404,374	9,839	1,292,736

¹Institutional buildings are included within Commercial and Industrial buildings

²Municipal transportation includes electricity used by city-owned street lights and signals; electricity emissions were calculated using the NYSERDA state average emissions factor (625 lb CO₂e/MWh)

³Oil includes distillate and residual fuel oils

kWh: kilowatt-hour

mmBtu: million British thermal units

mtCO₂e: metric tons of carbon dioxide equivalent

Figure 5



Encourage Efficient, Clean and Affordable Energy Through Coordination, Awareness and Education

Summary of Objectives and Initiatives

Improve coordination among City agencies

- Initiative 1:** Initiate a collaborative effort between schools and the City in pursuing group purchasing policies for energy
- Initiative 2:** Use an energy portfolio approach to reduce risk and optimize savings when energy planning

Implement programs and policies to support green development

- Initiative 3:** Adopt a citywide Green Development Program
- Initiative 4:** Initiate a design competition for the redevelopment of an iconic, sustainable building, city block or 'eco-district'
- Initiative 5:** Continue to update zoning codes and planning guidelines to encourage high density, mixed-use development and urban infill

Increase sustainability awareness and provide educational resources for municipal staff, residents, businesses and students

- Initiative 6:** Establish a sustainability training program for City employees and new hires
- Initiative 7:** Establish an experiential sustainability education program in public schools
- Initiative 8:** Create a Yonkers sustainability website and organize a rewards program for City employees and the public
- Initiative 9:** Establish an Energy and Water Efficiency Forum for large building owners (buildings over 25,000 square feet)
- Initiative 10:** Implement an outreach program targeting low-income residents to help reduce energy costs
- Initiative 11:** Work with the state to promote green (environmentally focused) training programs for schools and the general public

Yonkers has implemented several planning and policy initiatives to reduce energy consumption and advance sustainability at the municipal and city levels. There is extensive potential to build upon these efforts. Energy planning and policy development in Yonkers is currently conducted with limited collaboration and integration between City departments. By improving intergovernmental coordination, the City can take advantage of synergies between different department planning efforts and priorities, thereby reducing redundancies and saving taxpayer money. Furthermore, expanding channels of communication between City government and the community will likely increase stakeholder engagement and private

sector buy-in, and make municipal and citywide initiatives more successful. A more integrated approach to energy planning and coordination within the city will help ensure Yonkers and its constituents have the necessary frameworks, training and resources to support sustainability and affordable, efficient, and clean energy.

Improve coordination among City agencies

Yonkers' municipal budget and operations are separate from the education budget and operations. Energy utility accounts and budgeting for school facilities are managed by the Director of School Facilities Management of the Board of Education. Energy utility budgets for non-school facilities are based on past utility bills and usage data, published utility rates or price changes, and assumptions about various factors that may affect future energy demand and prices (e.g., oil to gas conversions, LED streetlight program). When actual energy costs exceed the estimated budget, controls are established to curtail further energy overuse. If necessary, municipal funds are set aside on an "accrual list" to pay the shortfall or compensate for lapses in billing (i.e., a bill comes due in the "13th month" of the year).

The City does not have other hedging strategies to manage unexpected energy expenses. Depending on various factors that may affect energy consumption or energy rates, such as weather or price volatility, unspent funds can be rolled over from previous years to compensate for an expected negative balance in future years. Alternatively, fund transfers may be required as part of an annual fund-balance reconciliation.

Initiative 1: Initiate a collaborative effort between schools and the City to pursue group purchasing policies for energy



There are significant benefits and cost savings associated with purchasing energy and energy-related equipment using economies of scale. By collaborating with the school district, the City can save a significant amount on feasibility studies as well as the procurement of energy and equipment, such as alternative transportation fuels and

vehicle upgrades. A collaborative approach among the schools and other city agencies will also support the Mayor's efforts to work closely with the Yonkers School District.

Programs such as energy savings performance contracts (ESCOs), energy services agreements (ESAs), managed energy services agreements (MESAs) and other capital finance can also take advantage of a larger portfolio of buildings, infrastructure, and vehicles, especially when determining the payback and capital expenditure. The New York Green Bank may be able to assist with financing gaps and providing credit enhancements for certain projects as well.

To leverage economies of scale for energy-related procurement, the City will hold regular meetings between the City Sustainability Director, the Purchasing Director, the departments of Public Works and General Services, and the Director of School Facilities Management to assess energy, fuel and equipment needs across City agencies and optimize purchasing plans.

Initiative 2: Use an energy portfolio approach to reduce risk and optimize savings when energy planning



Energy planning represents an investment-decision problem because of its exposure to unpredictable and external economic conditions. Given the uncertain, complex and dynamic environment of the energy sector, attempting to identify the least-cost long-term energy source is impossible.

The City's historic approach to managing energy has been to focus on energy efficiency projects and energy purchasing as separate activities. This approach exposes the City to the volatility of

energy prices and misses portfolio wide opportunities. An alternate approach is to evaluate the energy projects as a portfolio while simultaneously evaluating different energy procurement sources (i.e. less volatile ones). The outcome will identify the best energy mix for diversifying the City's portfolio of energy projects, reduce long purchasing costs and minimize risk.

The City's Sustainability Director will work with the Purchasing Director, the departments of Public Works and General Services, and the Director of School Facilities Management at the Board of Education to use this approach for future energy projects.

Implement programs and policies to support green development

To ensure Yonkers remains a livable and healthy community, future developments must reduce their environmental impact and optimize their operational performance. Green development can achieve this through thoughtful planning and design that aims to reduce resource consumption and provide enhanced environments for people to live, work, and play. Renewable energy systems, access to public transit and open space, recycled materials, and stormwater management are just a few examples of features that make a development "green." These developments can also attract new businesses that are focused on sustainability and providing their employees with healthy working environments. The City supports green development through the Yonkers Green Development Standards, which require private development in the rezoned downtown area and all new municipal facilities to include design elements that minimize their environmental impact, such as reducing

CASE STUDY

Yonkers Green Building Ordinance

In 2013, the City adopted the Yonkers Green Buildings Ordinance, which requires all City-owned buildings — whether of new construction or undergoing major renovation — to meet the provisions of the Yonkers Green Development Standards. New and renovated buildings within the downtown districts must also meet these standards as part of the Downtown Yonkers zoning amendment.

The 2013 ordinance also encourages private participation by requiring all non-residential buildings larger than 15,000 square feet and residential buildings with more than 25 units to submit a Green Development Checklist addressing a multiple focus areas, including: integrative design, site improvements, location and neighborhood fabric, energy efficiency, and operations and maintenance. Although compliance with the Checklist is not enforced, it familiarizes developers with green building requirements and promotes the benefits of sustainable building practices.



Energy Planning & Coordination

water use, increasing habitat and biodiversity, reducing energy in buildings and exterior lighting, reducing the urban heat island effect and using materials with a low embodied environmental and health impact.

Initiative 3: Adopt a citywide Green Development Program



Building on the Yonkers Green Development Standards for municipal buildings, the City will adopt a Green Development Program starting with buildings in downtown Yonkers and eventually for the entire city, similar to the requirement for buildings located in the rezoned downtown area. The program will retain the mandatory requirements and include the requisite number of optional points established by the initial Green Development Standards. These requirements would reduce citywide energy consumption and increase the stock of energy efficient buildings in the city.

The Yonkers Department of Housing and Buildings will be primarily responsible for the implementation of this program, with support from the Mayor's Office and the Department of Planning and Development.

Initiative 4: Initiate a design competition for the redevelopment of an iconic, sustainable building, city block or "eco-district"



The recent rezoning and redevelopment of the city's downtown and waterfront shows that Yonkers values sustainable planning and design. The City's willingness to guide development through zoning strategies, its commitment

to green construction and the relatively high number of local transit stations present many opportunities to continue this trend through new and innovative projects. The City will launch a design competition to expand sustainability development and provide an opportunity for positive publicity. The competition will include ideas for the sustainable redevelopment of an iconic building—similar to that of the Glenwood Power Station, a sustainable city block or the creation of an "eco-district" within Yonkers.

The Yonkers Department of Planning and Development, with assistance from the Department of Housing and Buildings, will administer the competition. The Yonkers Waterfront Business Improvement District (BID), metro-region developers, and local architects and engineers are also expected to be key stakeholders in the competition. The competition will require a defined project (or number of project sites), development of a public Request for Proposals, an announcement of competition, judging and some form of prize money or potential land development rights.

Initiative 5: Continue to update zoning codes and planning guidelines to encourage high-density, mixed-use development and urban infill



Yonkers' downtown and waterfront rezoning initiatives have encouraged new development and economic growth by allowing higher-density residential and mixed-use programs in these areas. The City will pursue similar rezoning initiatives to promote growth in other locations, such as former industrial zones and areas

Example of a design competition output



surrounding train stations. The use of zoning overlays and amendments, building code updates, and Green Development Standards have set a precedent for the city, and will be used to guide future green development.

The establishment of various local BID's will provide vital support for rezoning plans and encouraging investment from private developers. The City's Department of Housing and Buildings will be primarily responsible for implementing this initiative, with assistance from the Department of Planning and Development.

Increase sustainability awareness and provide educational resources for municipal staff, residents, businesses and students

The Yonkers Green City Advisory Committee is comprised of community volunteers appointed by the Mayor and City Council. The objectives of the committee are to define and provide advice and expertise on environmental and health issues, improve quality-of-life of the community through environmental intervention, apply for environmental grants, and foster educational outreach for Yonkers students and residents.

The committee is working with non-governmental partners, such as MetroPool (a not-for-profit organization that works with employers to implement commuter service programs, including ridesharing), to increase sustainability awareness for City workers and the broader community.

Energy programs and initiatives have been widely publicized and water-use reduction is being strongly encouraged.

Energy and water use can be reduced significantly through focused efforts to educate the public about efficient design, fixtures and usage. Metering also plays a key role in reducing use of energy and other utility resources. Reducing water use is especially important for Yonkers, which buys more than 75 percent of its water from New York City (NYC). More than half of Yonkers homes and businesses are metered for water (a change from less than half as of 2010). This means that most water bills are not based on actual usage, and citywide water use cannot be accurately tracked. If the city's per capita water consumption is greater than that of NYC, an excess charge is applied to the bill that is nearly 60 percent more than the base rate. Reducing energy and water use in Yonkers can be achieved through simple outreach programs and would result in significant savings for the City and its residents.

Initiative 6: Establish a sustainability training program for City employees and new hires



City staff is responsible for implementing sustainability objectives. To accomplish this, staff must receive training to understand the City's goals, the benefits to achieving them, and the activities that support them. Establishing sustainability orientation sessions for new hires and ongoing training programs for current employees is expected to reduce operating costs (greater than

CASE STUDY

Hudson Park and 66 Main

The Hudson Park project and 66 Main St. are mixed-use developments close to the railroad stations under the Alexander Street Urban Renewal Area's influence. 66 Main St. is a commercial and residential building with more than 170 units.



Each unit in 66 Main St. has ground-source (or "geothermal") heating and cooling as well as energy-efficient appliances. Building occupants are within a two-minute walk to Metro-North and Amtrak trains. The cost of the Metro Partners development was \$45 million.

Hudson Park is a 560-apartment development with 15,500 square feet of commercial space. Hudson Park was supported by \$200 million of public investment for the surrounding infrastructure. As part of the project, the City reduced parking requirements by 50 percent compared with the rest of the city to accommodate for the shortage of parking in downtown Yonkers and a more transit-focused development.



Energy Planning & Coordination

5 percent energy savings), align staff with City sustainability goals and serve as a mechanism for staff input. Sustainability awareness training will also encourage employees to practice what they learn in the workplace in their everyday lives.

The City will establish training programs to increase the sustainability awareness of its employees and contractors. The Yonkers Department of Planning and Development will be primarily responsible for the implementation of training programs, with assistance from participating City departments. Representatives from these departments will meet before the implementation to review similar training programs and incorporate department-specific needs into this initiative.

Initiative 7: Establish an experiential sustainability education program in public schools



Creating a sustainable and energy-efficient city includes cultivating an awareness of sustainability principles and practices among its younger residents. Numerous resources are available that engage educators and students with information about sustainability and energy efficiency. For example, schools in Yonkers have already implemented We Future Cycle, a lunchroom recycling program which teaches students to sort waste into separate bins containing recyclables and compost. The City will build upon the existing educational programs in the schools to increase energy awareness. Additional programs, tailored to students across a range of age groups, will include: a chemistry class about the creation of clean fuel (ethanol), an assignment to trace common energy uses to their source (i.e. fuel oil is used for heating, gasoline is used for cars and small equipment), and field trips to the Yonkers Science Barge.

The U.S. Department of Energy and the Energy Information Administration have numerous tools available that offer students information about energy conservation and efficiency and renewable energy. Leveraging these tools, the City will integrate sustainability and energy education into the school district's curriculum. This program will be led by the Mayor's Office and the Director of School Facilities Management



The Science Barge, downtown Yonkers

CASE STUDY

GreeNYC Outreach and Education Program

GreeNYC is New York City's comprehensive sustainability outreach and education program that focuses on disseminating information about easy actions residents can take to reduce their energy consumption, carbon footprint and overall environmental impact. Rather than overwhelm residents with a multitude of different messages, GreeNYC campaigns focus on a single action to maximize impact and sustain behavioral changes. This includes actions like "Turn It Off," which addresses idling vehicles and poor air quality; "Save Money, Turn Up the Thermostat," about addressing air conditioning systems; "Drink Tap Water," which addresses waste reduction by using tap water instead of bottled water; and "Bike to Work."

The program also unifies the City's voice across multiple agencies, improving the effectiveness of communication related to sustainability issues. A unique branding scheme was created for the program, including the "Birdie" mascot, to build interest and establish recognition and consistency. Other engagement tools used include merchandise, using various forms of media (social media and ads on City-owned message boards), partnerships and a GreeNYC website. The site contains an events calendar and has a strong social media component including, Twitter, Instagram and Facebook.

Large buildings represent more than **80%** of the total building energy and electricity consumption

CASE STUDY

Sustainable South Bronx and Sustainable Westchester

Sustainable South Bronx, a not-for-profit organization whose mission is to tackle economic and environmental challenges in the South Bronx and other areas of New York City, prepares low-income residents for green jobs through its Bronx Environmental Stewardship Training (BEST) Academy. Since 2003, over 500 people have graduated from the BEST Academy, which is funded by public (the NYC Department of Small Business Services) and private sources. Graduates complete an intensive 17-week training program in green construction, building retrofits, repair and maintenance, energy efficiency and conservation, and green technologies. The program offers students a chance to earn certifications and provides externships and job placement assistance as well as long-term career support.

Sustainable Westchester is a consortium of Westchester County local governments whose mission is to facilitate effective sustainability initiatives, engage community stakeholders and share tools, resources and incentives to create a more healthy, vibrant and attractive community. More than 80 percent of the county population lives in the 34 municipalities that have already joined Sustainable Westchester.

at the Board of Education with assistance from school administrators and contributions from local non-governmental organizations and public research organizations such as NYSERDA.

Initiative 8: Create a Yonkers sustainability website and organize a rewards program for City employees and the public



Yonkers is engaged in community outreach through the activities of the Yonkers Green City Advisory Committee and the Mayor's weekly e-mail distribution. The City will supplement these measures with an increased focus on sustainability, such as regular awards for "greenest" City employee and local business. The creation of a City-run sustainability website will provide a new avenue for outreach and provide easily accessible resources for the community and employees such as: a list of "easy fixes" for decreasing energy use and water use at home and at work, a database of energy efficiency and renewable energy incentives, and information on water conservation and reclamation strategies such as home rainwater harvesting kits.

The Mayor's Office, with assistance from the Yonkers Green City Advisory Committee, will develop and run a sustainability awards program for municipal employees and the public. The Mayor's Office will procure a third party to create a Yonkers sustainability website. Stakeholders

from the committee and relevant City departments will be consulted prior to implementation to help define the goals of the website and rewards programs and identify target groups.

Initiative 9: Establish an Energy and Water Efficiency Forum for large building owners (buildings over 25,000 square feet)



Yonkers will benefit from comprehensive knowledge and technology sharing resources for energy efficiency, water conservation and renewable energy targeted at large building owners (over 25,000 square feet). Nationally, buildings over 10,000 square feet represent more than 80 percent of total energy and electricity consumed among all buildings. These constituents represent a large portion of the city's overall energy consumption. Buildings account for approximately 10 percent of water use nationally. Not all water customers are metered in Yonkers, creating an overconsumption of water that impacts costs for residents and building owners. As such, their adoption of energy and water use reduction measures would yield significant savings.

The City, led by the Department of Housing and Buildings, will establish and manage the forum with assistance from the Department of Planning and Development and the Yonkers Green City



Energy Planning & Coordination

Advisory Committee. The forum will allow large building owners to share benchmarking knowledge, including peer building performance data, operational features and requirements of peer building owners; share technology knowledge, including advanced prototyping of new and emerging technologies; validate existing and new technologies in practice, and share best practices for implementation of technologies; develop product standards and specifications requirements, including standards and practices for energy system financing; and develop and contribute to new scientific and engineering knowledge, including industry-academic collaboration.

The City will engage local businesses, academic institutions, not-for-profit entities and other relevant local, city and state government to gauge interest and establish priorities for such a program.

Initiative 10: Implement an outreach program targeting low-income residents to help reduce energy costs



Yonkers will implement an outreach program targeting low-income residents. It will help these residents reduce energy costs by providing guidance and identifying funding opportunities to lower energy payments. Existing programs such as EmPower New York provide no-cost energy-efficiency solutions and on-site energy education for income-eligible residents.

The Department of Planning and Development will be primarily responsible for the implementation of this program, with external assistance from Con Edison, NYSERDA and the U.S. Department of Housing and Urban Development. The City's Department of Housing and Buildings will contact community leaders to determine the optimal approach for engaging low-income residents in the outreach program. A section of the newly created Yonkers sustainability website (see Initiative 8) will be dedicated to resources for low-income residents.

Initiative 11: Work with the state to promote green (environmentally focused) training programs for schools and the general public



Green jobs provide workers with long-term career opportunities and play a direct role in improving the environment. Yonkers is committed to training a green workforce. The City and Mayor's Office will promote green jobs by working with Sustainable Westchester, Westchester Community College and other NYSERDA partners and not-for-profit organizations that focus on job training. For example, at the Yonkers YWCA, 20 unemployed low-income minority women received training from the New Way Workforce program to prepare them for careers as qualified solar technicians. The training was made possible by funding from the New York State Department of Labor.

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Improve coordination among City agencies				
Initiative 1: Initiate a collaborative effort between schools and the City to pursue group purchasing policies for energy				
General Services/ School Facilities Management	All City agencies	—	Short-Term	Initiate routine meetings between Sustainability Director, Purchasing Director, Department of Public Works/ Department of General Services Director, and Facilities Management at the Board of Education
Initiative 2: Initiate a collaborative effort between schools and the City in pursuing group purchasing policies for energy				
General Services/ School Facilities Management	Planning and Development	—	Short-Term	Pilot approach on City building portfolio

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

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Implement programs and policies to support green development				
Initiative 3: Adopt a citywide Green Development Program				
Housing and Buildings	Planning and Development	—	Short-Term	Initiate Policy to the entire Downtown Yonkers; Mid-term to expand to the entire City
Initiative 4: Initiate a design competition for the redevelopment of an iconic, sustainable building, city block or “eco-district”				
Planning and Development	Housing and Buildings, Metro-region Developers, Waterfront BID, Local Architects and Engineers	Cleaner, Greener Communities Program (CGC)	Short-Term	Locate area, funding and coordinate for public RFP
Initiative 5: Continue to update zoning codes and planning guidelines to encourage high-density, mixed-use development and urban infill				
Planning and Development	Yonkers Downtown/ Waterfront BID, Yonkers South Broadway BID	Cleaner, Greener Communities Program (CGC)	Short-Term	Locate area, funding and coordinate for public RFP
Increase sustainability awareness and provide pertinent resources for municipal staff, residents, businesses and students				
Initiative 6: Establish a sustainability training program for City employees and new hires				
Planning and Development	All City Departments, NGOs	—	Short-Term	Initiate Policy
Initiative 7: Establish an experiential sustainability education program in public schools				
General Services/ School Facilities Management	State/Third Party Vendors	—	Short-Term	Initiate Policy
Initiative 8: Create a Yonkers sustainability website and organize a rewards program for City employees and the public				
Mayor's Office, Planning and Development	Residents Businesses, City employees	—	Short-Term	Develop webpage, update weekly newsletters
Initiative 9: Establish an Energy and Water Efficiency Forum for large building owners (buildings over 25,000 square feet)				
Planning and Development, Building and Housing	WEAC, Local businesses, Energy Service Providers	—	Short-Term	Reach out to local businesses to gauge interest in starting the program
Initiative 10: Implement an outreach program targeting low-income residents to help reduce energy costs				
Planning and Development, Housing and Buildings	Con Edison, HUD, NYSEDA	NYSEDA: Assisted Home Performance Grants, Home Performance with Energy Star Financing, EmPower New York, Con Edison: [Gas/Electric] Residential Energy-Efficiency Rebate-	Short-Term	Determine optimal approach for reaching stakeholders
Initiative 11: Work with the state to promote green (environmentally focused) training programs for schools and the general public				
Mayor's Office	Yonkers Workforce Investment Board, Board of Education, NYSEDA, Department of Labor	NYSEDA: Clean Energy On-the-Job Training, Clean Energy Training for High School Students, Clean Energy Certifications and Accreditation Incentives, Workforce Development and Training for Renewable Energy and Advanced Technologies, Green Jobs - Green NY Act, NYSEDA: Energy Star Home Builders, Yonkers School District, Department of Labor's Workforce Investment Act	Short-Term	Evaluate existing training programs in other schools and jurisdictions to determine feasibility for programs in Yonkers

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



Reduce Community and Municipal Building-Level Energy 20 Percent (From 2010 Baseline) by 2020

Summary of Objectives and Initiatives

Reduce energy consumption and emissions through energy monitoring systems in buildings citywide

- Initiative 1:** Develop a voluntary online energy and water tracking tool for residents and businesses
- Initiative 2:** Require the benchmarking of energy and water use in large buildings (commercial, industrial, institutional, multi-family)
- Initiative 3:** Require sub-metering for master-metered multi-family, commercial and institutional buildings

Implement programs and policies to reduce citywide energy and GHG emissions

- Initiative 4:** Retrofit an existing building to become a sustainable living demonstration center
- Initiative 5:** Investigate opportunities to weatherize residential buildings
- Initiative 6:** Require new single-or multi-family homes with four units or less to meet ENERGY STAR Labeled Home program requirements
- Initiative 7:** Require energy audits, retro-commissioning and upgrades to large (greater than 25,000 square feet) commercial and multi-family buildings
- Initiative 8:** Require energy and water efficiency audits before pre-existing buildings are sold
- Initiative 9:** Encourage energy efficiency in rental/leased properties by introducing lease agreements that tackle the “split incentives” issue
- Initiative 10:** Work with the state and Westchester County to implement a law phasing out the use of No. 4 and No. 6 heating oils
- Initiative 11:** Engage with NYPA and/or third parties to enroll in demand response programs

Implement programs and policies to reduce municipal building energy use and emissions

- Initiative 12:** Partner with the state to improve maintenance of buildings through staff training
- Initiative 13:** Continue to switch municipal buildings and schools from fuel oil to natural gas for heating
- Initiative 14:** Consolidate municipal energy data into a web-based interface and monitor, benchmark and respond to whole-building energy saving opportunities
- Initiative 15:** Continue to integrate multiple building control systems into a central monitoring station and manage the portfolio of municipal buildings.
- Initiative 16:** Initiate regular maintenance plans for municipal building systems opportunities
- Initiative 17:** Implement energy conservation measures in City facilities

The annual cost of building energy is approximately \$355 million. Buildings account for approximately 71 percent of the City’s total energy use and 80 percent of the City’s total fuel use.

For buildings, heating fuels (natural gas and oil) account for 75 percent of the energy consumption while the remainder is related to electricity use (**Figure 6**). This large proportion of heating fuel use is to be expected given the temperate climate of the region and the fact that, on average, there are nearly four times as many heating degree days as cooling degree days in Yonkers each year. Close to 1 million metric tons of CO₂ equivalents are emitted by buildings in Yonkers each year.

Buildings and irrigation consume approximately 10.2 billion gallons of water annually in Yonkers, 77 percent of which is purchased from New York City. The lack of metering infrastructure and awareness throughout the city contributes to an unpredictable and unnecessary overconsumption of water, which increases customer rates and energy use by City-owned water pumping stations.

Reduce energy consumption and emissions through energy monitoring systems in buildings citywide

Yonkers lacks energy and water monitoring systems for the community, contributing to an unpredictable consumption of energy and water. Energy metering and monitoring systems provide policy makers and building owners with key information on how the city and how different buildings are consuming energy and water. Actual energy and water consumption information can be used to inform policy decisions and create collaboration opportunities amongst building owners and tenants, and ultimately reduce energy, water, emissions and costs for the municipality and building owners citywide.

Community Building Energy Consumption by Fuel Type (mmBtu)

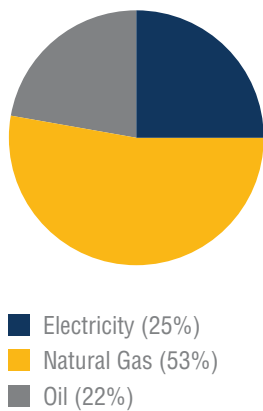


Figure 6

Initiative 1: Develop a voluntary online energy and water tracking tool for residents and businesses



Before any mandatory requirements to report energy use are implemented, it will be critical to understand the potential participation rate and outcomes of energy benchmarking in the city. A voluntary participation program will allow the City to test the program's framework and implementation strategy before establishing a mandatory large-scale program. To establish a voluntary program, the Mayor's Office will reach out to residents and businesses to gauge interest in participating, determine metrics, recruit volunteers and procure a third party to develop the program's website. The third party will also track and compare the volunteer residential and commercial building owners' energy and water use. Additionally, the City will identify local businesses that are willing to donate prizes (in the form of discounts or free services) for high performers (i.e., those who reduce energy and water consumption over a determined period) as an incentive for usage reductions.

Initiative 2: Require the benchmarking of energy and water use in large buildings (commercial, industrial, institutional, multi-family)



After the volunteer benchmarking programs described under Initiative 1 conclude, the City will enact a mandatory benchmarking requirement to provide information to building owners about energy and water use in buildings of a type similar to their own. It also encourages building owners and tenants to increase energy efficiency, reduce costs and utilize incentives available through local, state and federal programs. This information also provides the local, state and federal programs

with information that allows them to better measure the improvements in performance of building owners.

The Yonkers Assessment Department will develop a policy requiring owners of large buildings to track, assess and report energy and water use through ENERGY STAR Portfolio Manager. The policy framework will be based on the experience and lessons learned from Initiative 1 and the input from stakeholders and best practices from other cities, such as New York City's benchmarking policy, Local Law 84.

Initiative 3: Require sub-metering for master-metered multi-family, commercial and institutional buildings



An energy meter measures the amount of electricity, gas or steam that is consumed by a whole building, a section of a building or equipment within the building. A meter that measures usage for a smaller part of a building is called a "sub-meter." Sub-meters can measure more specific types of energy usage, such as indoor or outdoor lighting, equipment or specific spaces within a building. Existing buildings may already have basic energy meters or sub-meters that have been installed by a utility supplier.

Master-metered buildings have only one electric or gas meter that serves the whole building. This creates a disconnect between tenants who consume energy and building owners who typically pay utility bills. By sub-metering master-metered buildings, an owner creates an incentive for tenants to reduce their energy use because the tenant will be responsible for paying for the energy they consume. After installing individual sub-meters in several multifamily buildings, and billing each tenant for their actual energy use, NYSERDA

CASE STUDY

Boston Energy Smackdown Competition

Several Boston-area families participated in the Energy Smackdown pilot competition to see who could best reduce their energy consumption and carbon footprint. The competition was managed by the BrainShift Foundation, which setup a tracking tool and publicized the participants' results online. The participants achieved an average year-on-year savings of 14 percent and 17 percent for electricity and natural gas, respectively. After the pilot, the competition was expanded to 120 households and was developed into a reality television show that was broadcast on a local cable channel. The show highlighted the participants, community events and energy audits that took place at the competitors' homes. At the conclusion of the second phase of the competition, participants had reduced their greenhouse gas emissions by 17 percent.



Energy Efficiency in Buildings

Citywide, energy
consumed in
buildings costs
\$355M
per year

observed an 18 percent to 26 percent decrease in overall energy consumption. Many commercial property owners have realized similar savings when installing tenant sub-meters, according to a 2011 National Science and Technology Council study on Sub-Metering of Building Energy and Water Usage. Installing sub-meters does not reduce energy use on its own; however, sub-metering used in combination with bill allocation, data monitoring and analysis has the potential to save end users energy and money.

The Yonkers Department of Housing and Buildings will work with relevant stakeholders to develop a policy requiring sub-metering for master-metered multifamily, commercial and institutional buildings.

Implement programs and policies to reduce citywide energy and GHG emissions

Residential and non-residential buildings represent 78 percent and 22 percent of the existing community building stock, respectively. Of the non-residential buildings, roughly 15 percent, or 211 buildings, are larger than 25,000 square feet. The residential building stock in Yonkers is relatively old, with an estimated median year of construction of 1947. About half of the residential units in Yonkers are in buildings with one to four units while the remainder are in buildings with five or more units. The residential energy use intensity (EUI) in Yonkers is 69.5 kBtu/sf, which is about 24 percent higher than the average residential EUI in the state (56 kBtu/sf).

Initiative 4: Retrofit an existing building to become a sustainable living demonstration center



The City plans to locate a sustainable living demonstration center at a selected facility. The center will connect the community to energy efficiency practices, passive house design and construction, renewable energy technologies and resilience in action. It will also provide visitors with resources on energy and water incentives, conservation strategies, and a Materials for the Arts facility that collects art supplies for reuse in community programs. The Department of Planning and Development will issue an RFP for the renovation and transformation of a selected facility into a sustainable living demonstration center.

Initiative 5: Investigate opportunities to weatherize residential buildings



Weatherizing homes through the ENERGY STAR® Home Performance Program and on-bill financing will provide residents with support for implementing cost-effective energy-efficiency measures including improvements to the building envelope, heating and cooling systems, electrical and lighting systems and appliances. Residential weatherization can significantly lower home energy bills. Homeowners who participate in the U.S. Department of Energy's Weatherization Assistance Program reduce their energy consumption by an average of 35 percent.

NYSERDA offers an on-bill recovery program to assist in financing these retrofits. On-bill financing is a loan to a household to help pay for an energy-efficient upgrade (or in some cases, a renewable energy project) for the resident's apartment or building. Loans are paid back to the utility by the resident directly through the bill.

The Yonkers Department of Housing and Buildings will publicize available partnerships, programs, and funding mechanisms for residential weatherization. The Buildings Department will also reach out to residential building owners to educate them on the potential energy savings associated with weatherization.

Initiative 6: Require new single- or multi-family homes with four units or less to meet ENERGY STAR® Labeled Home program requirements



Although residential energy usage in Yonkers decreased between 2006 and 2010, there are programs available to reduce it further. The ENERGY STAR® Labeled Home Program (included in the Green Development Standards) integrates three components to improve the energy performance of a home, including: a high performance envelope (weatherization, insulation and windows), a high-efficiency heating and cooling system, and energy-efficient lighting and appliances.



Philipse Manor Hall

Together, the
City and school
district own
and operate
95 facilities

To earn the ENERGY STAR® label, homes must be constructed to meet rigorous energy-efficiency standards within the three components outlined above. Compliance is verified by independent home raters who inspect and test homes under construction. According to the U.S. Environmental Protection Agency, ENERGY STAR®-certified homes can lower annual utility bills by 20 percent compared to conventional homes.

The Yonkers Department of Planning and Development, with support from the Department of Housing and Buildings, will work with relevant stakeholders to develop a policy mandating new single-family homes or multi-family homes with four units or less to be built to meet the ENERGY STAR® Labeled Home program requirements. The Mayor's office will reach out to residential building owners in support of this policy.

Initiative 7: Require energy audits, retro-commissioning and upgrades to large (greater than 25,000 square feet) commercial and multi-family buildings



Energy audit and retro-commissioning processes identify low-cost operational and maintenance building improvements that will save energy and money. Studies suggest that retro-commissioning can reduce energy consumption in existing buildings by 10 to 15 percent. Con Edison, NYSERDA and NYPA offer incentives for energy audits and retro-commissioning projects. Yonkers will work with these partners under the Department of Public Service's new Reforming the Energy Vision (REV)

proceeding to take full advantage of expected data transparency reforms to drive better knowledge of available energy efficiency incentives and resulting savings. Private financing is also available for retro-commissioning projects because of their relatively short pay-back periods, suggesting an opportunity to achieve large-scale energy reductions in this sector. Financially viable projects that require longer pay-back periods may also be eligible for Green Bank partnership financing.

The Yonkers Department of Planning and Development, with support from the Department of Housing and Buildings, will work with relevant stakeholders, including building owners, to develop a City ordinance requiring large buildings to undergo an energy audit every 10 years and perform retro-commissioning of certain building systems. By taking advantage of the market of existing programs and incentives to save energy and reduce greenhouse gas emissions, this policy will help large buildings owners and operations save money.

Initiative 8: Require energy and water efficiency audits before pre-existing buildings are sold



One of the largest barriers to improved energy performance in cities is a lack of understanding of energy use in pre-existing building stock and which buildings meet code requirements.

A mechanism to facilitate energy improvements in existing buildings is the grading of building energy performance based on the results of a required audit at the time buildings are sold. This would allow potential buyers to understand the future operational costs and needed upgrades of a building before making a purchase. It also provides information to the City about the existing building stock.

Many building owners are not aware of the benefits of energy audits or the potential funding sources that are available to support efficiency improvements. By educating building owners in partnership with public and private organizations, the City will increase implementation of energy audits and energy-efficiency improvements by connecting building owners to energy professionals, incentive programs, and unlocking third-party financing opportunities.



Energy Efficiency in Buildings

Residential energy consumption has decreased from 2006 to 2010

The Yonkers Department of Housing and Buildings, with support from the Department of Planning and Development, will work with homeowners and business owners to develop a City ordinance requiring all buildings to undergo an energy and water efficiency audit before they are sold. The audit will need to be completed by a certified professional and the results will be required to be given to prospective buyers. The City will reach also out to governmental and non-governmental organizations that have experience with energy audits and retrofits to establish partnerships that will benefit local building owners starting with larger (greater than 25,000 square feet) and older buildings.

Initiative 9: Encourage energy efficiency in rental/leased properties by introducing lease agreements that tackle the “split incentives” issue



There are multiple options for financing energy efficiency projects, including capital funding, publicly available incentives or grants, utility incentives or grants, or third party-funded projects. However, in cases where a building has a non-owner tenant, a “split incentive” issue occurs in which the savings are disproportionate for either the owner or the tenant. An Energy Aligned Clause in lease agreements allows the owner and tenant to share the costs of an energy-efficiency upgrade by including language where a portion of the energy savings enjoyed by the tenant is applied to the cost of the efficiency upgrade.

The Yonkers Department of Planning and Development, with assistance from the Department of Housing and Buildings, will study other ordinances that aim to enhance the energy efficiency of rental properties and determine best practices that can be applied to Yonkers.

Initiative 10: Work with the state and Westchester County to implement a law phasing out the use of No. 4 and No. 6 heating oils



The City will work with the state to phase out No. 4 and No. 6 fuel oils, also known as heating oil and residual oil, respectively. Both fuel oils generate a significant amount of air pollution, including particulates, sulfur dioxide, nitrogen oxides and carbon dioxide. Approximately 120 non-residential and multi-family buildings in Yonkers use No. 4 and No. 6 fuel oil, but the number of single-family homes with No. 4 is currently unknown. By switching to low sulfur No. 2 oil, or natural gas, the pollutants in the air will be significantly reduced, improving the health of people in Yonkers.

Natural gas emits approximately 30 percent less carbon dioxide emissions and is less expensive than heating oil. Switching from fuel oil to natural gas will save a home or building owner money and reduce emissions by 5 percent citywide and 7 percent across residential, commercial, industrial and institutional/municipal buildings. These savings will be enhanced with boiler system upgrades.

The Yonkers Department of Planning and Development will collaborate with state agencies and legislators to propose a statewide law phasing out the use of No. 4 and No. 6 heating oils in buildings. The department will also team up with state and Westchester County agencies to create an integrated strategy for helping building owners switch from fuel oil to natural gas. Providing additional resources such as an approved plumber or HVAC contractor list, and funding for feasibility studies, will benefit Yonkers by improving the appeal to building owners of converting boilers. The Buildings Department will reach out to Con Edison to ensure the utility is engaged throughout the process.

Example of Sustainable Demonstration Centers



Approximately
120
buildings in
Yonkers use No.4
and No.6 fuel oils

CASE STUDY

ENERGY STAR® Certified Homes Program

Since 2001, Greenburgh, New York, has required newly constructed residential buildings to comply with the requirements of the ENERGY STAR® Certified Homes Program. The law applied to single- and two-family homes as well as multi-family buildings that are three stories high or less. Greenburgh was the first municipality in the state to mandate compliance with the ENERGY STAR® program for new homes. Between 2001 and 2009, approximately 70 ENERGY STAR®-certified homes were constructed in Greenburgh.

Reduce peak demands in large municipal and community buildings

Peak shaving is the process of reducing a building's peak electrical demand and lowering the amount of energy purchased from the utility company during peak hours. Con Edison and NYPA charge customers for electricity consumption based on total kilowatt-hours used by the building and peak electricity demand based on the largest amount of kilowatts required during a given period of time. Customers with time-of-use billing are charged higher consumption rates during peak hours compared to the rest of the day. Peak hours typically start in the early afternoon and end in the early evening, which is often when buildings have the largest electrical demands. By reducing electricity consumption during peak hours, consumption costs and demand costs drop significantly. In addition, these strategies reduce the impact on the transmission grid during peak hours. It also helps improve air quality by reducing the need for dirtier and more inefficient power plants to run to meet peak demand.

Some conventional peak shaving strategies include use of on-site gas or diesel generators as a power source to offset use of electricity from the grid. These can be controlled manually or automatically through building and energy management systems. Another option to reduce peak demand, when feasible, is through thermal energy storage. This method typically uses electricity to create heat or cooling during periods when electricity prices are low, or during periods of excess electricity, and stores heat for later heating and cooling uses. Two common technologies that can be deployed relatively easily are ice storage (using chillers to create ice that can be

used for cooling systems or chilled water systems during peak daytime use) and hot water storage (using hot water tanks heated by electrodes or heat pumps for domestic hot water or district hot water systems). Additional, less intensive peak shaving strategies include dimmable lighting and daylight sensors, variable speed fans and motors, pre-cooling the building on hot days by turning on the system earlier in the morning, turning off escalators, reducing the number of elevators in use and turning off non-essential loads (fountains, equipment, etc.).

Initiative 11: Engage with NYPA and/or third parties to enroll in demand response programs



Studies have shown that demand response programs can reduce an eligible commercial building's peak demand by 10 to 20 percent, earning each building tens of thousands of dollars annually. Reducing peak demands of large electricity consumers in Yonkers will help alleviate congestion on the local grid and decrease emissions from peaking power plants that are turned on to supply electricity during high demand periods. The New York Independent System Operator's (NYISO) demand response program averages three to five demand response events a year, with each event lasting four hours to six hours.

The Yonkers Department of General Services will engage with NYPA and/or third parties to enroll municipal buildings in demand response programs. The Department of Planning and Development will seek out industrial buildings and large buildings to introduce owners to demand response programs.



Energy Efficiency in Buildings

Air Pollutants by Heating Type

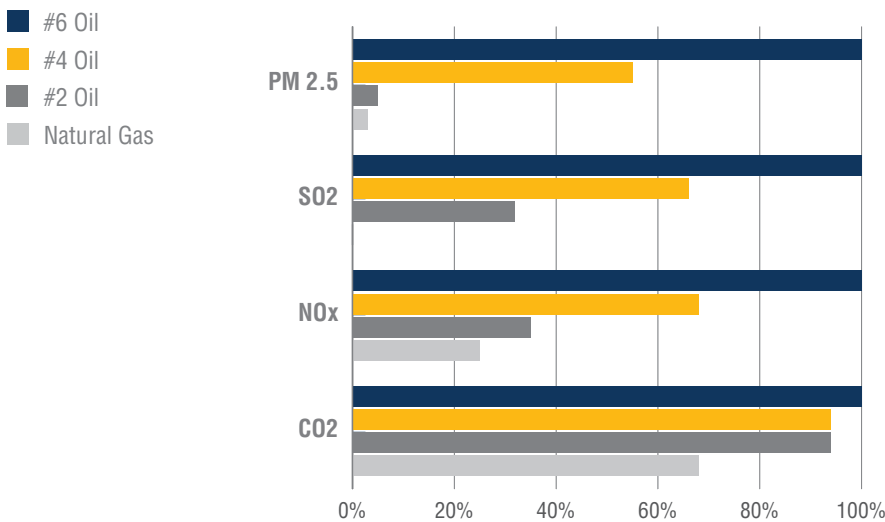


Figure 7

Implement programs and policies to reduce municipal building energy use and emissions

The City owns and operates nearly 50 municipal buildings. The Yonkers School District owns another 45 buildings. These buildings and facilities consume more than 78 percent of the total municipal energy in Yonkers, with school buildings representing almost 54 percent of the total energy use. Fuel oil and electricity make up 37 percent and 35 percent of the energy consumed by municipal buildings, respectively. The total annual cost of energy for municipal buildings is \$4.14 million while the total cost of energy for the schools is \$8.12 million.

In 2010, the City partnered with NYPA to complete energy audits of 10 municipal buildings. Based on the findings, several energy conservation measures (ECMs) were recommended for implementation. The ECMs focused on lighting retrofits as well as retro-commissioning and upgrading heating control systems. NYPA provided more than \$1.5 million for the upgrades, which were completed in 2013 and are estimated to save the City \$266,300 in energy costs and prevent the release of 547 tons of carbon dioxide annually.

Building on the first round of energy audits conducted in 2010, the City and NYPA completed an additional 20 energy audits in spring 2014. Based on the available data from these audits, many of the facilities owned by the City and the school district have numerous opportunities for energy-efficiency upgrades, including replacing inefficient lighting fixtures, installing lighting controls, upgrading outdated boiler systems with advanced controls and natural gas burners, and performing retro-commissioning on existing heating, ventilation and air conditioning systems. The City lacks sufficient capital to make needed retrofits to the municipal building stock and must seek out funding programs and partners to make recommended upgrades. There are also a number of low- to no-cost opportunities to pursue, such as increased maintenance, lighting upgrades and controls, adding insulation to hot water pipes, retro-commissioning and switching to natural gas with existing dual fuel boilers. Funding partners to alleviate the City's capital concerns may include the state, ESCOs or MESAs.

Initiative 12: Partner with the state to improve maintenance of buildings through staff training



Yonkers' building portfolio includes a broad range of facility types and ages. Building systems vary in performance and complexity, making comprehensive maintenance plans difficult to formulate and manage. To improve maintenance and operation, the City will team up with state and local partners and start a training program for facilities staff with a focus on energy efficiency and sustainability awareness. Better trained building staff can lead to utility bills that are reduced by 10 to 20 percent.

The Office of General Services and School Facilities Management will be responsible for the implementation of training programs for municipal buildings under their respective jurisdictions. Partnerships with vendors will be necessary for system-specific training, although the scope and administration of training programs will be determined by individual building and types of systems. Green Professional Building Skills Training is a series of courses launched by the Urban Green Council in New York City that teaches people sustainability principles and trade-specific knowledge. Other organizations and programs such as the Building Operators Certification, Certified Energy Manager and Building Performance Institute also offer relevant training.

CASE STUDY

Austin Energy Conservation Audit and Disclosure Ordinance

In November 2008, Austin, Texas enacted the Energy Conservation Audit and Disclosure Ordinance, which mandates that single-family, multi-family and commercial properties 10 years or older undergo energy audits before being sold. The audit must be performed by a certified energy professional and the results have to be provided to potential buyers and tenants. Property owners are not required to perform any energy efficiency upgrades, but they can receive an exemption to the ordinance if certain energy conservation measures have been recently completed. Failure to comply with the ordinance can result in fines between \$500 and \$2,000.

Initiative 13: Continue to switch municipal buildings and schools from fuel oil to natural gas for heating



Although natural gas prices have declined in recent years, fuel oil prices have risen. Based on the most recent available 12-month average price data (May 2013 to May 2014), natural gas costs \$1.62 per gallon of fuel oil equivalent, compared to \$4.09 per gallon for fuel oil. The significant price difference makes natural gas an environmentally preferable and a more economically beneficial alternative to fuel oil.

Natural gas also emits nearly 30 percent fewer greenhouse emissions than fuel oil. While approximately 10 City buildings have already switched from fuel oil to natural gas since 1997, almost half of City buildings still use fuel oil No. 2 for heating. The majority of these facilities are school buildings, with only six non-school buildings using fuel oil.

To minimize municipal costs and emissions, the City will continue to switch existing fuel oil burners to natural gas and further reduce emissions—and possibly energy consumption—by retrofitting boilers with new burners. The Department of General Services and Facilities Management at the Board of Education will identify which municipal buildings are candidates for fuel switching and will reach out to ESCOs and Con Edison for funding opportunities.

Initiative 14: Consolidate municipal energy data into a web-based interface and monitor, benchmark and respond to whole-building energy saving opportunities



Municipal energy data is recorded via basic spreadsheets with little analysis of trends and changes at the portfolio scale. Assessment of individual building utility data is also minimal. Furthermore, some utility accounts are not associated with specific buildings, resulting in bill payments for unknown energy users. This makes it difficult to determine abnormalities or significant changes in energy usage patterns. By consolidating municipal energy data into an intelligent, secure, web-based interface, such as ENERGY STAR Portfolio Manager, facility managers and department officials will easily identify energy consumption anomalies and investigate their causes. This will improve detection of potentially serious issues with HVAC equipment and highlight energy savings opportunities. Many energy data collection programs contain built-in analytics and warning systems that eliminate the need to actively monitor incoming data.

Grinton I. Will Library





Energy Efficiency in Buildings

CASE STUDY

Energy Efficiency Through Energy Performance Contracts

Wilson County, North Carolina, located near Raleigh, was experiencing high energy costs and occupant discomfort within many of its older buildings. To combat this, the County completed \$900,000 in energy efficiency retrofits, including the installation of integrated building management systems (BMS) in 10 buildings. The county executed an Energy Performance Contract (EPC) with an Energy Service Company (ESCO) to pay the upfront costs of the retrofits. In an EPC, the ESCO provides the initial capital for the retrofit and recoups the retrofit costs through utility bill savings. The newly installed management systems help facility operators to closely manage energy usage and reduced energy consumption by 15 percent while providing \$107,000 in annual savings.

The Department of Planning and Development, along with the Department of General Services, will engage with NYPA and/or release an RFP for a service to feed building energy use and cost data into an intelligent, secure, web-based interface. This will build upon the existing benchmarking of all City buildings over 10,000 square feet that was completed in 2014.

Initiative 15: Continue to integrate multiple building control systems into a central monitoring station and manage the portfolio of municipal buildings



Several City buildings contain advanced building management systems (BMS) to monitor and control complex building systems such as boilers and chillers. Many of these BMSs are also connected to a database at Yonkers Public Library which monitors and manages the connected buildings from a central location. A BMS can also quickly turn off specific equipment during a demand response event, generating extra revenue

for the City. Adding buildings to the City's existing central database will reduce operational costs by streamlining the management of Yonkers' portfolio of buildings and will increase the potential for demand response program participation.

As buildings receive retrofits and upgrades, the Department of General Services and the Board of Education will assess the feasibility of installing BMSs as part of the scheduled retrofit or upgrade. Newly installed systems will be linked to the existing central database at Yonkers Public Library.

Initiative 16: Initiate regular maintenance plans for municipal building systems



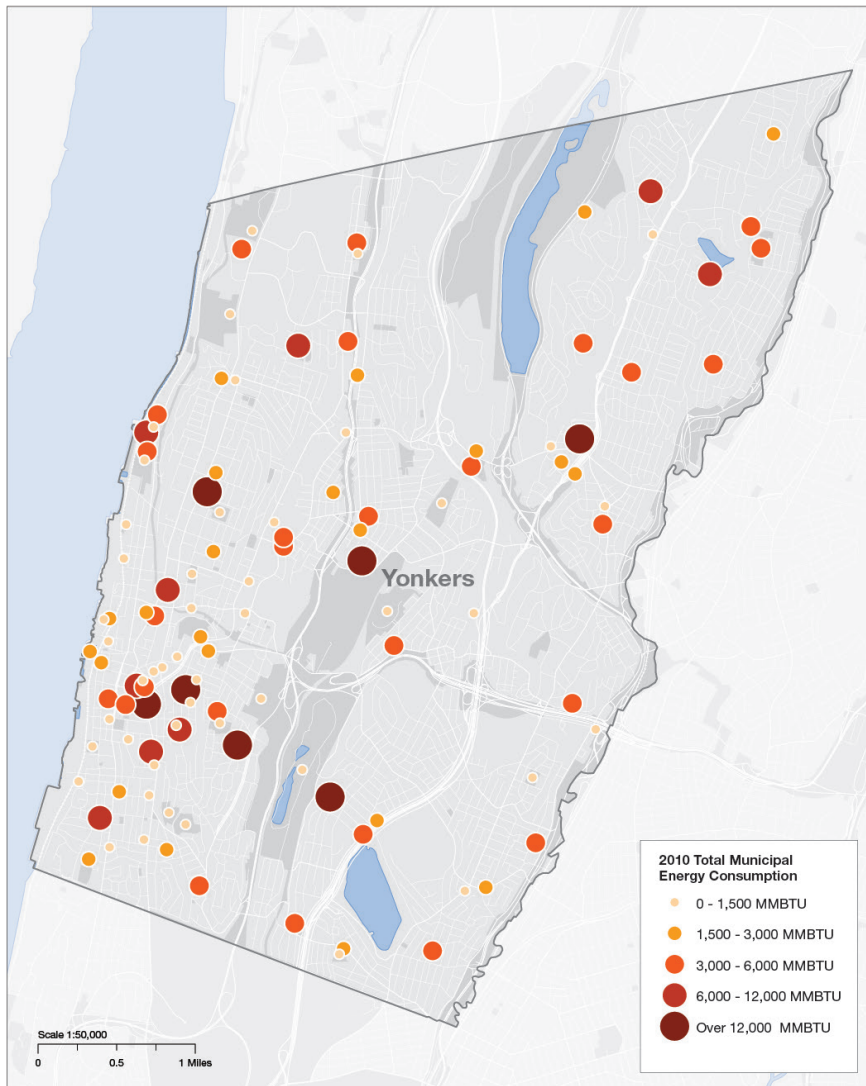
In 2014, 20 municipal buildings underwent ASHRAE Level 1 energy audits to determine their current state of operation and identify opportunities for energy savings. The buildings are a representative sample of the City's diverse building portfolio and include police facilities, primary and secondary schools, parking garages, recreation and cultural facilities, as well as water pump stations. Walk-throughs revealed many of the buildings and their systems were not performing optimally due to deferred maintenance. This was especially true in older facilities such as the 1st Precinct Police Station.

Developing and adhering to regular maintenance plans for HVAC, plumbing, domestic hot water, lighting, controls systems and building envelopes will improve building performance and ensure equipment is functioning properly. This can reduce energy consumption and utility costs while improving occupant comfort. Performing regular maintenance will also help identify minor problems with building systems before they develop into serious situations, thereby avoiding the costs associated with significant repairs and downtime.



Boiler installation

Energy Consumption of Municipal Buildings



The Department of General Services and the Facilities Management at the Board of Education will assess maintenance plans and schedules to determine gaps and areas for improvement. Updated plans will be developed by both agencies to remedy any issues that are discovered after the assessment.

Initiative 17: Implement energy conservation measures in City facilities



Specific energy conservation measures (ECMs) were recommended for the 20 buildings that received an ASHRAE Level 1 energy audit in spring 2014. Many of the observations and recommended ECMs follow similar themes. These themes can be grouped into the following categories: lighting and lighting controls, building envelope, and HVAC systems and controls. By implementing the recommended lighting system upgrades and the HVAC system ECMs, the City could significantly reduce its energy consumption and greenhouse gas emissions while improving light quality and occupant comfort. There are also considerable opportunities to reduce operational and future maintenance costs by retro-commissioning, refurbishing or replacing HVAC systems.

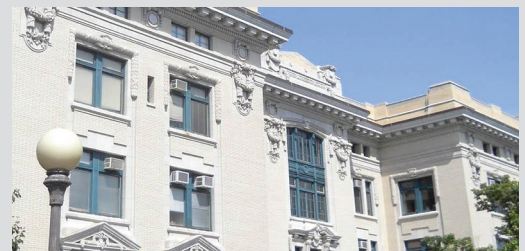
The City's Department of General Services will work with NYPA to select, implement and fund the recommended ECMs. The implementation of the recommended ECMs will be modeled after the process and partnership with NYPA that was used to complete the recent energy efficiency retrofits to Yonkers City Hall.

Figure 8

Yonkers City Hall Energy Efficiency Retrofits

Yonkers City Hall recently had 500 existing single-pane windows replaced with high-efficiency, Low-E double pane windows. The window replacement project is expected to reduce solar heat gain and air leakages while cutting greenhouse gas emissions by more than 50 tons.

The City Hall retrofit was part of a larger collaboration with NYPA to upgrade nine municipal facilities in Yonkers, including: new high-efficiency LED lighting on the Yonkers City Hall roof and in the City Council Courtroom; lighting upgrades and heating upgrades at the Department of Public Works Vehicle Repair Center; lighting upgrades at the E.J. Murray Memorial Skating Rink; lighting upgrades and a new building management system at the Grinton I. Will Branch of the Yonkers Public Library; lighting upgrades and new electrical equipment at the Water Bureau and Treatment Plant; and new boiler timers at the 1st Police Precinct, 2nd Police Precinct/Fire Station No. 7 and 87 Nepperhan Avenue.





Energy Efficiency in Buildings

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Reduce energy consumption and emissions through energy monitoring systems in buildings citywide				
Initiative 1: Develop a voluntary online energy and water tracking tool for residents and businesses				
Mayor's Office	Web-developers, building owners, businesses	NYSERDA Cleaner, Greener Communities	Short-Term	Reach out to residents and businesses to gauge interest in program participation; Determine metrics, search for volunteers, set up web-site and search for businesses to donate prizes (with donating organization advertised on website)
Initiative 2: Require the benchmarking of energy and water use in large buildings (commercial, industrial, institutional, multi-family)				
Assessment	Housing and Buildings, Planning and Development, Con Edison, ENERGY STAR	—	Short-Term	Develop policy that requires owners of large buildings to track, assess, and report energy and water use through an internet-based benchmarking tool developed by the United States Environmental Protection Agency
Initiative 3: Require sub-metering for master-metered multi-family, commercial and institutional buildings				
Housing and Buildings	NYSERDA, Con Edison	NYSERDA: Energy Smart Multifamily Performance Program	Short-Term	Develop policy that requires sub-metering for master-metered multifamily, commercial, and institutional buildings
Initiative 4: Retrofit an existing building to become a sustainable living demonstration center				
Planning and Development	Housing and Buildings	NYSERDA Multifamily Performance Program, FlexTech Program, Existing Facilities Program, Industrial and Process Efficiency Program, Advanced Buildings Program, Energy Smart Multifamily Performance Program; ConEdison: Commercial and Industrial Energy Efficiency Program, [Gas/Electric] Multifamily Energy Efficiency Incentives Program; HUD: Community Development Block Grant	Short-Term	Public RFP
Initiative 5: Investigate opportunities to weatherize residential buildings				
Planning and Development	Housing and Buildings, Multifamily Building Owners, Tenants	NYSERDA: Energy Smart Multi-family Performance Program; Con Edison: [Gas/Electric] Multi-family Energy Efficiency Incentives Program, HUD: Community Development Block Grant, DOE: Better Buildings Challenge	Short-Term	Publicize partnerships for businesses, residents, and building owners
Initiative 6: Require new single- or multi-family homes with four units or less to meet ENERGY STAR Labeled Home program requirements				
Housing and Buildings	Planning and Development, Residents, Businesses, Building Owners	—	Short-Term	Develop webpage, update weekly newsletters
Initiative 7: Require energy audits, retro-commissioning and upgrades to large (greater than 25,000 square feet) commercial and multi-family buildings				
Housing and Buildings	Planning and Development, Multifamily Building Owners, Tenants, Commercial Buildings, BPI	NYSERDA: Energy Smart Multi-family Performance Program, FlexTech Program, Existing Facilities Program, Industrial and Process Efficiency Program, Con Edison: [Gas/Electric] Commercial and Industrial Energy Efficiency Program, DOE: Better Buildings Challenge	Long-Term	Develop policy that requires large buildings to undergo an energy audit every 10 years, along with retro-commissioning, to "tune up" the building's existing systems and ensure efficient operation

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

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Implement programs and policies to reduce citywide energy and GHG emissions (continued)				
Initiative 8: Require energy and water efficiency audits before pre-existing buildings are sold				
Housing and Buildings	NY State, Planning and Development, BPI	NYSERDA: Existing Facilities Program	Mid-Term	Contact third party auditors
Initiative 9: Encourage energy efficiency in rental/leased properties by introducing lease agreements that tackle the “split incentives” issue				
Housing and Buildings	Planning and Development, Building owners and tenants	NYSERDA, Con Edison, Energy Star	Short-Term	Study other local city ordinances that aim to enhance the energy efficiency of rental properties in New York, California, Wisconsin, Vermont, and Texas to find success stories
Initiative 10: Work with the state and Westchester County to implement a law phasing out the use of No. 4 and No. 6 heating oils				
Housing and Buildings	NY State, Westchester County, Housing and Buildings, Residents, Businesses, Building Owners	NYS: Refundable Clean Heating Fuel Tax Credit (Corporate, Personal) (12/32/16), Con Edison	Short-Term	Work with state agencies and legislators to propose a policy that requires buildings to phase out the use of #4 and #6 heating oil
Reduce peak demands in large municipal and community buildings				
Initiative 11: Engage with NYPA and/or third parties to enroll in demand response programs				
Department of General Services, Board of Education, Planning and Development	Planning and Development	For Community - NYSERDA: FlexTech Program, Existing Facilities Program	Mid-Term	Release RFP for Demand Response on Municipal Buildings; Seek out industrial buildings and large buildings to introduce demand response programs
Implement programs and policies to reduce municipal building energy use and emissions				
Initiative 12: Partner with the state to improve maintenance of buildings through staff training				
General Services/School Facilities Management	State/Third Party Vendors	—	Mid-Term	Initiate Policy
Initiative 13: Continue to switch municipal buildings and schools from fuel oil to natural gas for heating				
General Services, Board of Education, Planning and Development	Facility Managers/Staff, NYPA, NYSERDA, ESCOs, Con Edison	NYPA loan	Short-Term	Investigate fuel switch for City buildings that consume fuel oil, reach out to ESCOs and Con Edison for funding opportunities
Initiative 14: Consolidate municipal energy data into a web-based interface and monitor, benchmark and respond to whole-building energy saving opportunities				
Department of General Services, Board of Education, Planning and Development	Facility Managers	Municipal budget	Short-Term	Planning and Development to release RFP for a service to feed energy use and cost data into an intelligent, secure, web-based interface
Initiative 15: Continue to integrate multiple building control systems into a central monitoring station and manage the portfolio of municipal buildings				
Department of General Services, Board of Education, Planning and Development	Facility Managers	NYPA loan	Short-Term	Ongoing as retrofits occur
Initiative 16: Initiate regular maintenance plans for municipal building systems				
Department of General Services, Board of Education, Planning and Development	Facility Managers/Staff	Municipal budget	Mid-Term	Assess current maintenance plans and schedules to determine gaps and areas for improvement
Initiative 17: Implement energy conservation measures in City facilities				
Department of General Services, Board of Education, Planning and Development	Facility Managers/Staff, NYPA, NYSERDA, ESCOs, Con Edison, local commissioning agents	NYPA loan	Mid-Term	Public RFP



Increase Transportation Options Citywide to Transform Yonkers Into a Walkable, Bike-Friendly, Transit-Focused City

Summary of Objectives and Initiatives

Create active, mixed-use neighborhoods that are safe and easily accessible by walking, cycling and transit

- Initiative 1:** Develop locations with opportunities for mixed use, transit-oriented development
- Initiative 2:** Encourage coordination between transit agencies
- Initiative 3:** Develop a citywide bicycle and pedestrian master plan in coordination with existing projects and efforts
- Initiative 4:** Adopt a Complete Streets Policy
- Initiative 5:** Encourage businesses and developers to build electric charging stations and other alternative fuel stations
- Initiative 6:** Develop a traffic signal optimization program

Expand and encourage commute options for City employees

- Initiative 7:** Implement a pre-tax transit benefit program for City employees
- Initiative 8:** Develop a rideshare program
- Initiative 9:** Develop a City employee guaranteed ride home program
- Initiative 10:** Develop an alternative work schedule program

Improve City vehicle fleet efficiency

- Initiative 11:** Replace retiring City vehicles with more fuel-efficient and alternative-fuel models
- Initiative 12:** Upgrade municipal facilities to accommodate alternative vehicles
- Initiative 13:** Implement a pilot employee car-sharing program to help right-size the fleet
- Initiative 14:** Develop a fuel management and vehicle maintenance plan, and provide EcoDriving training to City employees
- Initiative 15:** Evaluate private school bus systems for fuel efficiency

Yonkers is continually working to become a denser, mixed-use and mass transit-oriented city. Transportation accounts for approximately 29 percent of the city's total energy use and 32 percent of the city's greenhouse gas emissions. In 2010, transportation citywide consumed approximately 5,280,000 mmBtu of energy (404,000 MtCO₂e). Street lights and signals consumed 47,000 mmBtu (4,000 MtCO₂e), and the municipal vehicle fleet used an additional 82,000 mmBtu (5,900 MtCO₂e). Currently, 85 percent of trips originating

in Yonkers are taken by automobile, highlighting an opportunity for a switch to alternative vehicles and modes to significantly reduce the city's transportation energy demand.

Create active, mixed-use neighborhoods that are safe and easily accessible by walking, cycling and transit

Yonkers sees approximately 900 million vehicle miles traveled (VMT) within the city annually, or about 12.5 miles per person per day. As depicted in **Figure 10**, for travel within Yonkers, approximately 80 percent of residents drive (**Figure 10** – left) while approximately 87 percent of trips in and out of Yonkers are by private automobile (**Figure 10** – center). Of the trips leaving Yonkers, approximately 20 percent of residents use rail (**Figure 10** – right). Overall, the transportation energy use per person is low compared to other U.S. cities (**Figure 9**).

As most trips in Yonkers are taken by car, priority has historically been given to vehicle infrastructure. The pedestrian network of sidewalks, crosswalks and dedicated paths is currently disjointed and feels unsafe in many locations throughout the city. There are a limited number of on-street bicycle lanes, which limits short bicycle trips to work or other destinations. In terms of a recreational bicycle and pedestrian system, off-road paths and shared roadways include the Old Croton Aqueduct Trailway, the South County Trailway and the Bronx River Pathway. As shown in **Figure 11**, there is limited east-west trail connectivity across Yonkers.

The challenging topography and disjointed network of sidewalks and crosswalks contribute to a lack of convenience and safety that does not support cycling or walking within the City.

Yonkers is served by two Metro-North Railroad (Metro-North) lines that primarily serve residents commuting to Manhattan (**Figure 12**). Commuters to destinations outside of Yonkers use automobiles slightly less than other cities in region with 71 percent commuting by automobile and 25

Yonkers Transport Travel Energy Compared to Other Cities

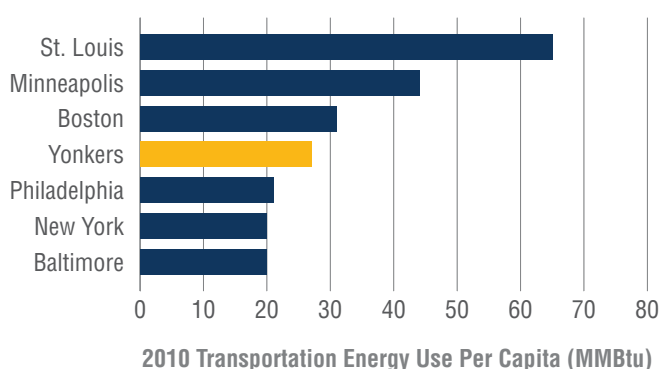


Figure 9

percent by rail. This is supplemented by a number of Bee-Line bus routes connecting Yonkers to the rest of Westchester County as well as a few routes that extend to the Bronx. However, the inconvenience caused by a lack of transit schedule coordination between the Bee-Line bus system and Metro-North discourages public transit use.

Land-use density and mix also play a role in creating places where walking, cycling and mass transit are more convenient than driving. In Yonkers, the high level of single-occupancy vehicle use can be attributed to a land-use pattern that is low-density with activity centers spread across

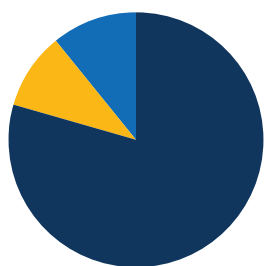
much of central and eastern Yonkers. Over the last decade, the redevelopment of Yonkers Downtown has encouraged mixed-use development and transit-oriented development (TOD). There are additional opportunities for smart growth around each of the 10 Metro-North stations that lie along the city's edges. Yonkers will also consider complementary policies and programs that reduce fuel use and greenhouse gas emissions for those who will continue to drive in the near future.

Initiative 1: Develop locations with opportunities for mixed use, transit-oriented development



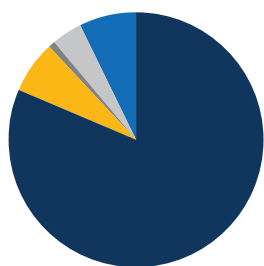
Demographics and economic trends are influencing people's decisions to live in active urban neighborhoods with plentiful transit options. According to several studies, transit-oriented development (TOD) requires at least 12 residential units per acre in residential areas and 50 employees per acre in commercial centers to create active street life and support retail such as grocery stores and coffee shops within walking distance of homes, offices and stations. The locations of Metro-North rail stations in Yonkers create numerous development opportunities for TOD, specifically in areas within 15-minute walking distance (approximately half a mile) around each station (**Figure 13**). Leveraging these opportunities and the expansion of the Yonkers Green Development Program, the City will rezone areas around the rail stations in a manner similar to the recent rezoning of downtown, where there is now greater activity than in areas around other stations in Yonkers.

Community Mode Share: Internal Trips



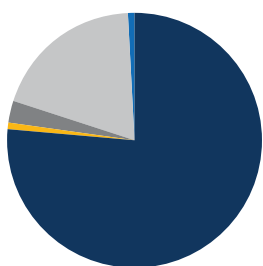
- Automobile (79.8%)
- Bus (9.5%)
- Shared Ride/Taxi (0.2%)
- Rail (0.0%)
- Walk/Non-Motorized (10.6%)

Community Mode Share: All Destinations



- Automobile (87.1%)
- Bus (6.7%)
- Shared Ride/Taxi (0.8%)
- Rail (3.8%)
- Walk/Non-Motorized (7.1%)

Community Mode Share: Work Trips



- Automobile (76.5%)
- Bus (0.9%)
- Shared Ride/Taxi (2.6%)
- Rail (19.2%)
- Walk/Non-Motorized (0.8%)

Figure 10



City of Yonkers Bicycle Network and Bicycle Parking

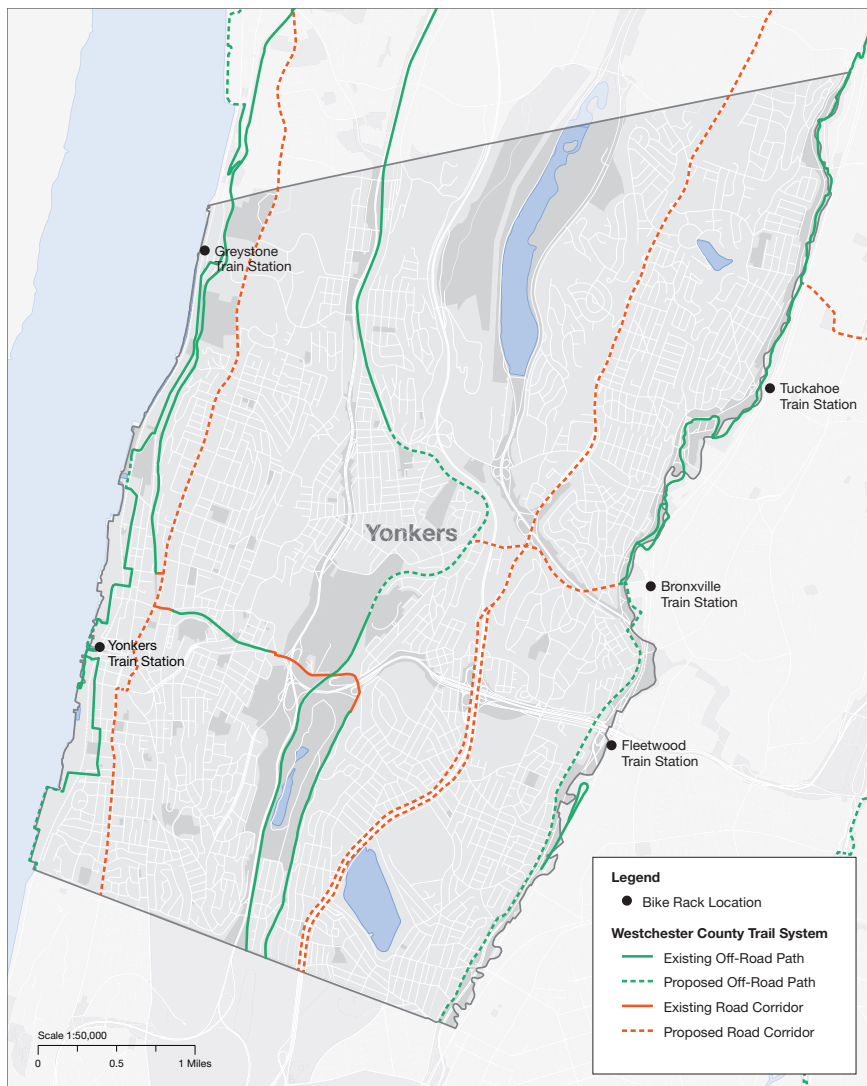


Figure 11



Hudson Street
in Downtown Yonkers

Initiative 2: Encourage coordination between transit agencies



Better coordination between Bee-Line and Metro-North schedules would reduce waiting time for riders who transfer from bus to rail and shorten their commute, especially for those traveling between Yonkers and New York City. This would help make mass transit a more attractive option and likely increase overall use. The City will coordinate efforts with non-government organizations, such as the New York Metropolitan Transportation Council (NYMTC) or MetroPool, and representatives from Metro-North and Bee-Line to provide better multi-modal service and improved transit connections, especially in highly congested areas such as Getty Square. The City will also work with Bee-Line to encourage coordination with the potential new Hudson Valley Transit Link BRT.

Initiative 3: Develop a citywide bicycle and pedestrian master plan in coordination with existing projects and efforts



Yonkers will develop a citywide bicycle and pedestrian master plan to set bicycle and pedestrian related targets aimed at improving walking and cycling within the city. To start, the City will prioritize on-street bicycle infrastructure that connects to regional existing and planned off-road paths, as well as identify new and improved pedestrian and bicycle infrastructure within Getty Square—the central business district and transit hub. Infrastructure will also be developed in the area within the 15-minute walk radius (and two-mile radius for bicycle facilities) from each commuter rail station, especially as development around transit stations increases.

Initiative 4: Adopt a Complete Streets Policy



Complete Streets are streets that are designed and operated to enable safe access for all users, including pedestrians, bicyclists, motorists and transit riders of all ages and abilities.

Yonkers will develop a Complete Streets Policy that can be used to guide all future development and transportation projects. The City will consider every transportation improvement undertaken in the public right-of-way, including street construction, reconstruction, repaving, etc., as an opportunity to create safer and more

City of Yonkers Transit Networks

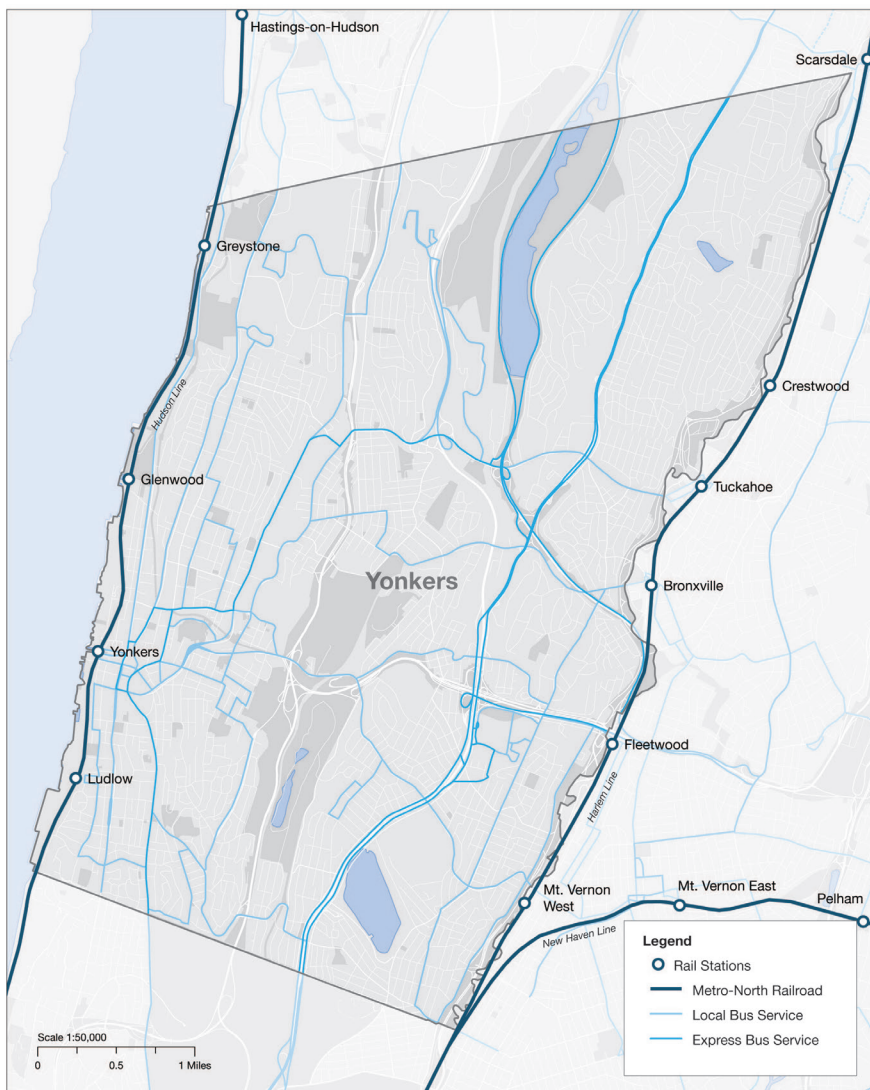


Figure 12

accessible streets. Complete Street principles will be considered early in the planning and design phases of any new project. These principles will guide the planning, funding, design, construction, operation and maintenance of new and modified streets. To develop a Complete Streets Policy, the City will consider a variety of implementation measures, including: updating design guidelines; inclusion in a comprehensive plan; internal policies developed by transportation agencies; executive orders from elected officials; and policies developed by stakeholders from the community and agency staff that are formally adopted by an elected board.

Initiative 5: Encourage businesses and developers to build electric charging stations and other alternative fuel stations



Plug-in electric vehicles (PEVs) are battery-powered vehicles charged through the electric grid. The number of PEVs on the road are projected to increase across New York State. Charge NY is the state's program to increase a statewide network of up to 3,000 PEV charging stations over the next five years. In recent years, battery-swapping and rapid-charging capability have improved, along with other infrastructure technologies.

As the need for electric vehicle infrastructure increases, the City will take the necessary steps to support its growth. The City, through the Department of Planning and Development, will encourage the development of electric vehicle infrastructure by including electric vehicle charging stations and alternative vehicle priority parking in its Green Development Standards and work with the state to encourage and install charging stations through Charge NY.



Yonkers LED Street Light Replacement

In 2013, Yonkers launched a Light Emitting Diode (LED) Street Light Replacement Program to replace all of its street lights with LED lights. The program improved the reliability of lighting and street safety, and is expected to save at least \$18 million in municipal energy costs over the next 10 years. It will reduce the carbon footprint of the city by more than 2,700 metric tons annually.



Transportation Efficiency

City of Yonkers Trips and Transit Locations with 15-Minute Walk Radius

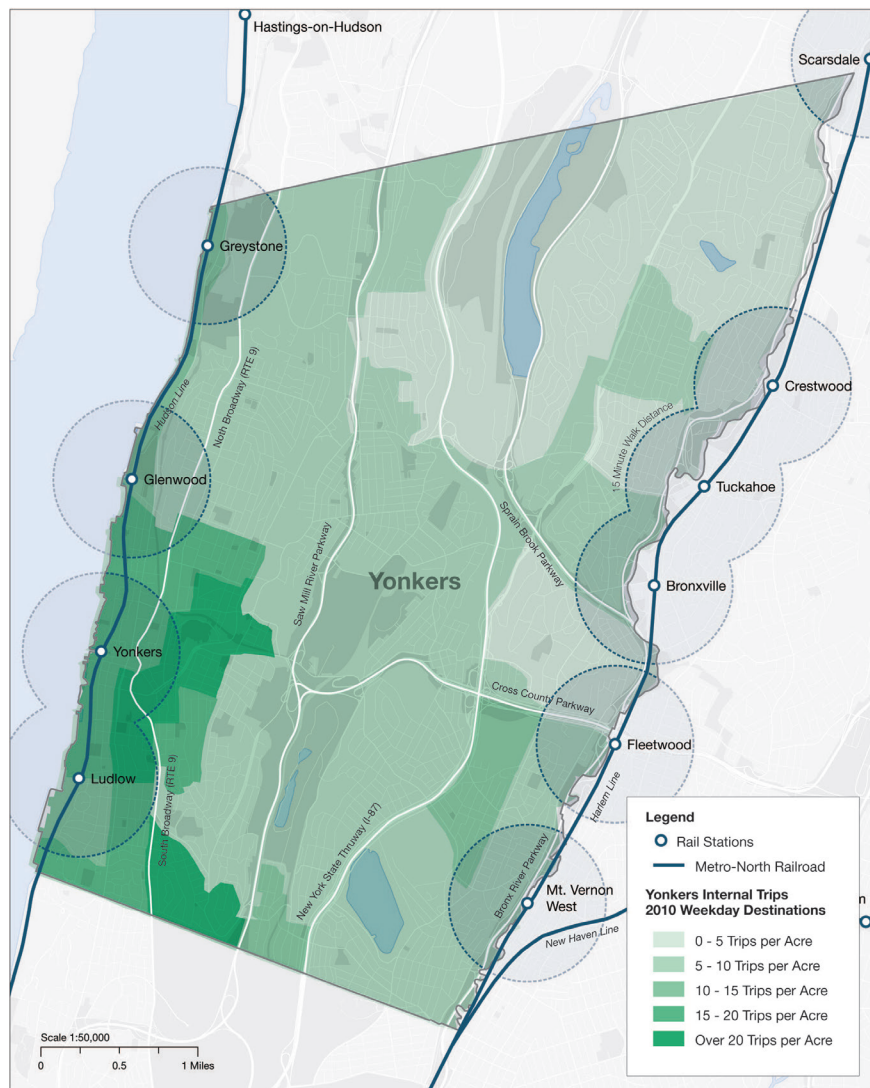


Figure 13

On average,
commuting
by car costs
City employees
\$264
per month

Transit-Oriented Development in Yonkers

The City has implemented strategies to decrease fuel use and emissions from transportation. For example, the Alexander Street Urban Renewal Master Plan and the rezoning of downtown encourage transit-oriented development (TOD) to reduce vehicle use and promote high-density, mixed-use development. To promote the comprehensive planning of large scale, mixed-use commercial developments, the City Zoning Ordinance was amended to include Planned Multi-Use Development Districts, which require the adoption of a Comprehensive Development Plan that meets specific planning requirements that support higher density growth.

Initiative 6: Develop a traffic signal optimization program



Traffic signal timing and signal coordination along heavily travelled corridors have a major impact on traffic flow. Inefficient signal timing causes congestions and travel delays, which in turn requires vehicles to idle at intersections, increasing air emissions and fuel consumption. Power interruptions can also cause traffic signals to go out of sync, resulting in mistimed signals, further exacerbating congestion and delays. This is especially true during rush hour on Central Park Avenue and other major streets in Yonkers.

The City uses software to monitor traffic in real time. As traffic patterns change, signal timing parameters are modified to reflect the traffic patterns during these periods. Yonkers is committed to a traffic signal optimization program to maintain and upgrade signal technology as well as adjust signal timing in real time to improve the overall flow of traffic. The City is also committed to improving the efficiency traffic management and monitoring periods of congestion. Yonkers' Traffic Engineering Department will develop a traffic signal optimization program starting with Central Park Avenue, and other key intersections and will coordinate with the state Department of Transportation and Westchester County to ensure that the traffic signals throughout Yonkers are synchronized and maintained.

Expand and encourage commute options for City employees

Yonkers has approximately 2,000 full-time municipal employees who commute. According to a 2010 survey, on any given week, 86 percent of employees drive alone and 7 percent participate in a carpool (**Figure 14**). The average commute distance is approximately 11 miles.

Municipal Mode Share: Employee Commute

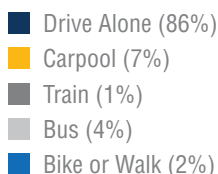
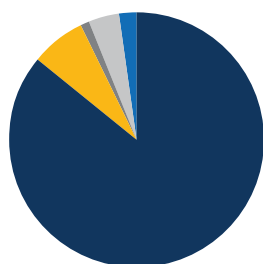


Figure 14

CASE STUDY

Transit Coordination in Los Angeles

The Los Angeles County Metro board in California approved an implementation plan to better coordinate schedules and transfer points between transit agencies to maximize system efficiency. The implementation plan included convening the transit agencies within the county to discuss the goal, inventory all Metrolink stations and bus connections, identify all transit centers, hubs and transfer points for bus-bus and bus-rail transfers, review all transit schedules, and coordinate special projects and schedules. As a result, Service Council meetings are held monthly to discuss and schedule coordination issues. Also the board promoted new bus connectivity improvements at stations in local and regional publications (a combined circulation of up to 1.2 million people). An inventory identified 280 bus and bus-rail transfer locations, and committees were convened to determine any special project that could impact the coordination and passenger safety. A set of criteria was used to determine the success of transfer – less than three minutes or greater than 18 minutes between a bus or train arrival or departure is considered a missed connection; four to five minutes or 16 to 17 minutes between a bus or train arrival or departure is considered a connection that needs a minor schedule adjustment; and a six- to 15-minute window between a bus or train arrival or departure considered a good connection.

The cost of driving to work for some City employees includes \$50 per month for parking, as well as any additional costs for fuel, tolls, and vehicle maintenance and repair. A monthly transit pass that includes unlimited Bee-Line and New York City subway service is \$112 per month. Many drivers are not aware of the full cost of driving, as it may seem to be a cheaper alternative. However, the average monthly driving costs for a City employee may be as much as \$264 based on Internal Revenue Service mileage rates. There are no programs in place to encourage employees to consider alternative travel modes.

Initiative 7: Implement a pre-tax transit benefit program for City employees



The City will develop a comprehensive employee commuting program that will include be a pre-tax transit benefit. Transit is a viable commute option for municipal employees given the extent of the Bee-Line network, as well as the fact that more than half of City employee commutes are no more than five miles in each direction. A transit benefit program would provide an incentive for City employees to switch to transit by allowing those that take mass transit to work to pay for it with pre-tax salary dollars. The 2014 federal tax code allows tax-free transportation fringe benefits of up to \$130 per month per employee for mass transit or vanpool expenses.

Transit-Oriented Development in Downtown Yonkers





Residential Land Uses by Density in Yonkers

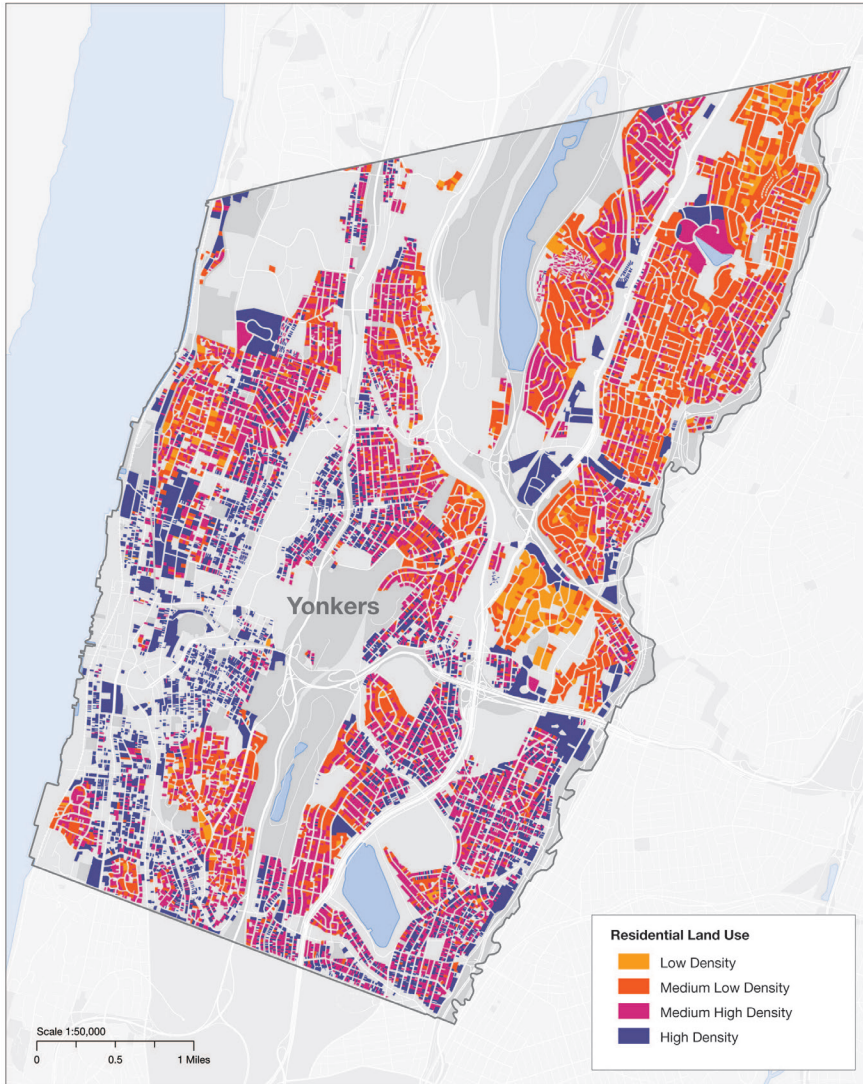


Figure 15

To support transit use, City agencies will begin to offer this pre-tax payroll deduction. Aside from being a no-cost initiative, it offers an added benefit in that the City saves on payroll taxes for participating employees. Employees' awareness of the benefit is critical to the success of the program. Upon implementing the option to participate in the pre-tax transit program, City agencies will encourage enrollment by providing guidance on registration, transit maps and timetables through email and in-office information sessions. Additional incentives, such as competitions between departments, or entry into a monthly lottery for those who commute by alternative modes at least three times a week, will help encourage the shift to non-automobile modes.

Initiative 8: Develop a rideshare program



Carpool and vanpool programs are other viable commuting options for City employees, given the density of residential development in Yonkers. Many of the employees who live less than five miles from their offices likely live fairly close to one another. Rideshare programs can reduce the total number of automobile commute trips for employees living in areas that are not easily accessible by mass transit.

To support carpooling, the City will develop a rideshare program in which employees use their vehicles to carpool to work with other employees who live close by. Employees who are interested in participating will be able to contact neighboring employees and arrange the scheduling and driver details. To support ridesharing, the City will work

CASE STUDY

PlaNYC's Expansion of NYC Bicycle Network



New York City's long-term sustainability master plan, PlaNYC, was released in 2007 and included a phased approach to expanding the city's bicycle network. In PlaNYC, the City committed to building 200 miles of bike lanes by 2009 and another 1,800 miles by 2030. Sidewalk improvements for pedestrians were also a plan focus. With help from extensive public outreach and education to gain political support during the planning process, the City has already added more than 300 miles of bike lanes to the city cycling network.

CASE STUDY City of Campbell River Green City Strategy

The City of Campbell River, British Columbia (population 320,000), is located on the east coast of Vancouver Island. In 2008, its City Council adopted the Green City Strategy, which identified opportunities to reduce community greenhouse gas emissions by supporting plug-in electric vehicle (PEV) charging infrastructure. A stakeholder workshop was held to identify emerging needs and trends around PEVs, during which several businesses and institutions expressed a strong interest in hosting charging stations. As a result of the planning process, 12 new PEV charging stations were installed at locations including City Hall, a City-owned visitor information center, a local college and a major shopping center.

City Fleet by Vehicles Type

Breakdown of
City Fleet
Vehicle Type

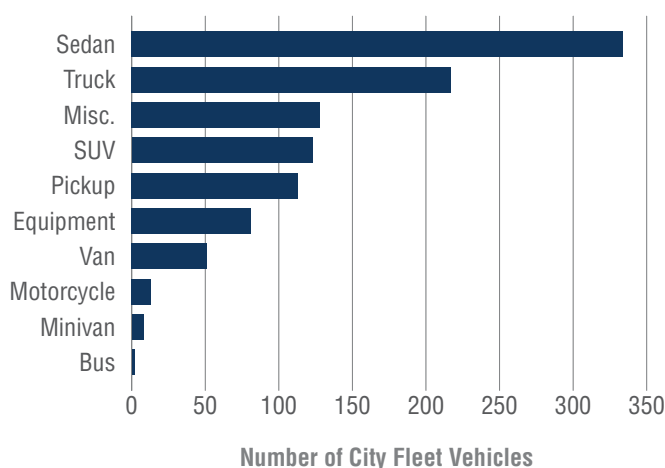


Figure 17

City Fleet Breakdown by Department

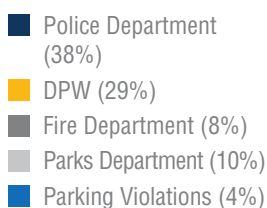
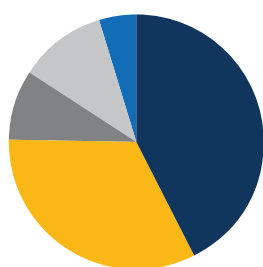


Figure 16

with MetroPool to procure cars or vans for use with participants sharing operating costs. These programs will be structured to be flexible, allowing employees to rideshare anywhere between two and five days a week. Priority parking spaces may be given as an incentive to participate. Ridesharing programs will reduce total vehicle energy usage, alleviate road congestion during peak commute hours and reduce overall greenhouse gas emissions.

Initiative 9: Develop a City employee guaranteed ride home program



A guaranteed ride home program will encourage employees to take advantage of the other employee commute program options by addressing the concern of being stranded during an emergency

or unexpected situation. These services will likely rarely be used and thus represent a very low cost to the City, but will have the benefit of increasing transit or rideshare use by providing participating employees with a sense of security in knowing they will be able to get home quickly should any unexpected issues arise. The City will work with local taxi services to develop a voucher or reimbursement system to provide free or low-cost rides home for commuters who use alternative modes in case of unexpected circumstances, such as when an employee has been asked to stay late, or in the event of a personal or family emergency. The City's Human Resources department will work with MetroPool to develop this program.

Initiative 10: Develop an alternative work schedule program



Alternative work schedules help reduce peak hour congestion and the number of miles commuted per week. It also provides employees with the benefit of flexibility in their work schedules. These can be structured a number of ways, including staggered shifts or compressed schedules (10-hour shifts over four days rather than eight-hour shifts over five days per week).

The City will pilot an alternative work schedule program that will reduce the number of commute trips for municipal employees. The City will first target municipal staff in customer-facing service roles, such as staff processing parking violations. This provides an added benefit of improving the City's customer service experience by allowing the possibility of extended service hours on certain days of the week. If successful, the City will consider expanding the program to staff in a broader range of departments.



Non-Residential Land Uses by Type in Yonkers

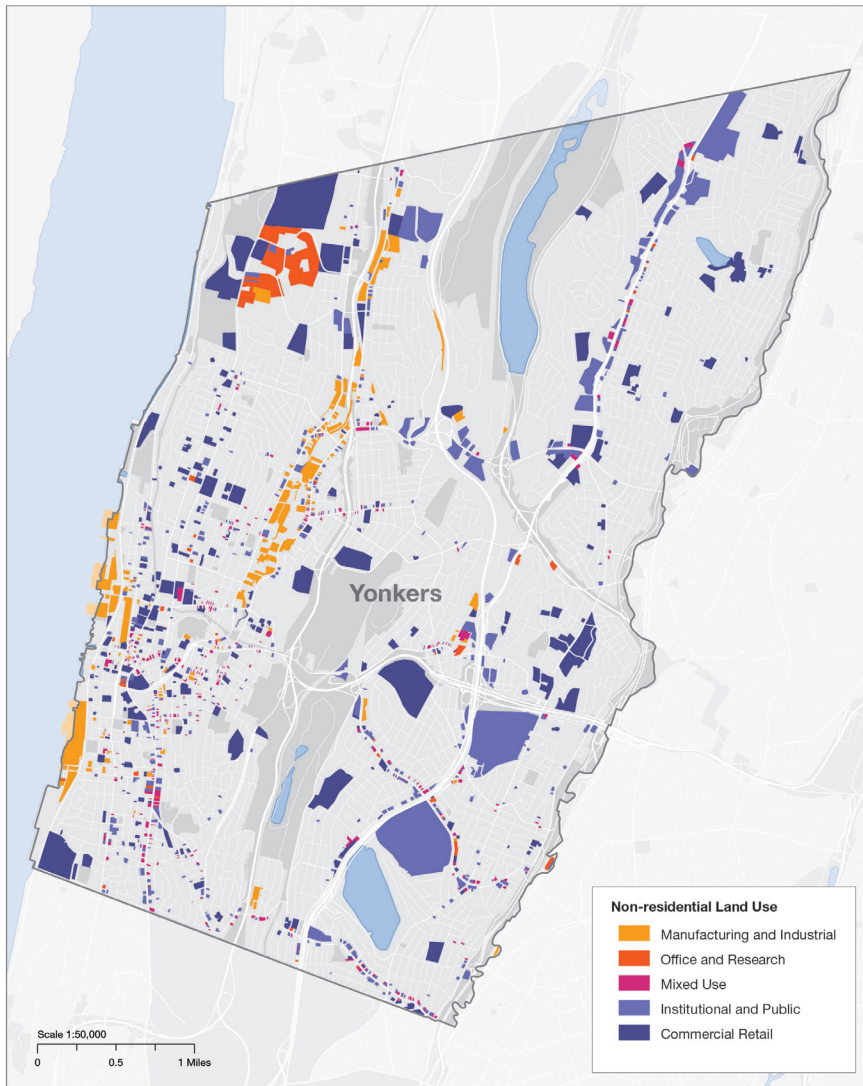


Figure 18

Improve City vehicle fleet efficiency

Yonkers has approximately 1,070 fleet vehicles, mainly consisting of sedans and trucks (**Figure 17**).

The breakdown of City-owned vehicles by department (**Figure 16**) is as follows: Police Department (38 percent), Department of Public Works (DPW) (29 percent), Parks Department (10 percent), Fire Department (8 percent), and Parking Violations (4 percent).

The breakdown of the amount of fuel consumed by each department (**Figure 19**) follows a similar trend. The Police Department accounts for 37 percent of the total, followed by DPW (33 percent), Fire Department (10 percent), Parks Department (8 percent), and Parking Violations (4 percent). This trend correlates closely with fuel costs, where the price of diesel has a higher impact on the DPW.

The municipal fleet accounts for approximately 14 percent of energy use and 13 percent of CO₂ emissions by municipal operations, and approximately 11 percent of municipal energy costs. There are significant opportunities to reduce energy use and costs through proper sizing of the vehicle fleet, investigation of more fuel-efficient and alternative-fuel vehicles, and upgrades to municipal facilities to allow for better tracking of fuel access.

Initiative 11: Replace retiring City vehicles with more fuel-efficient and alternative-fuel models



The City will implement a vehicle purchasing policy to ensure transition to smaller and more fuel-efficient vehicles throughout all municipal



Yonkers EcoDriving Training Pilot

The City of Yonkers recently piloted an EcoDriving training course in which experts spent a day instructing and training City employees using EcoDriving techniques. Each driver started the day driving a route around the City, while recording the fuel usage. The second time the driver rode with the instructor receiving proper instruction. On the final ride, the driver rode without instruction. After the final drive the City employee saved approximately 25 percent of the fuel compared to the initial drive without instruction.

City Fleet Fuel Consumption by Department and Total Fuel Costs

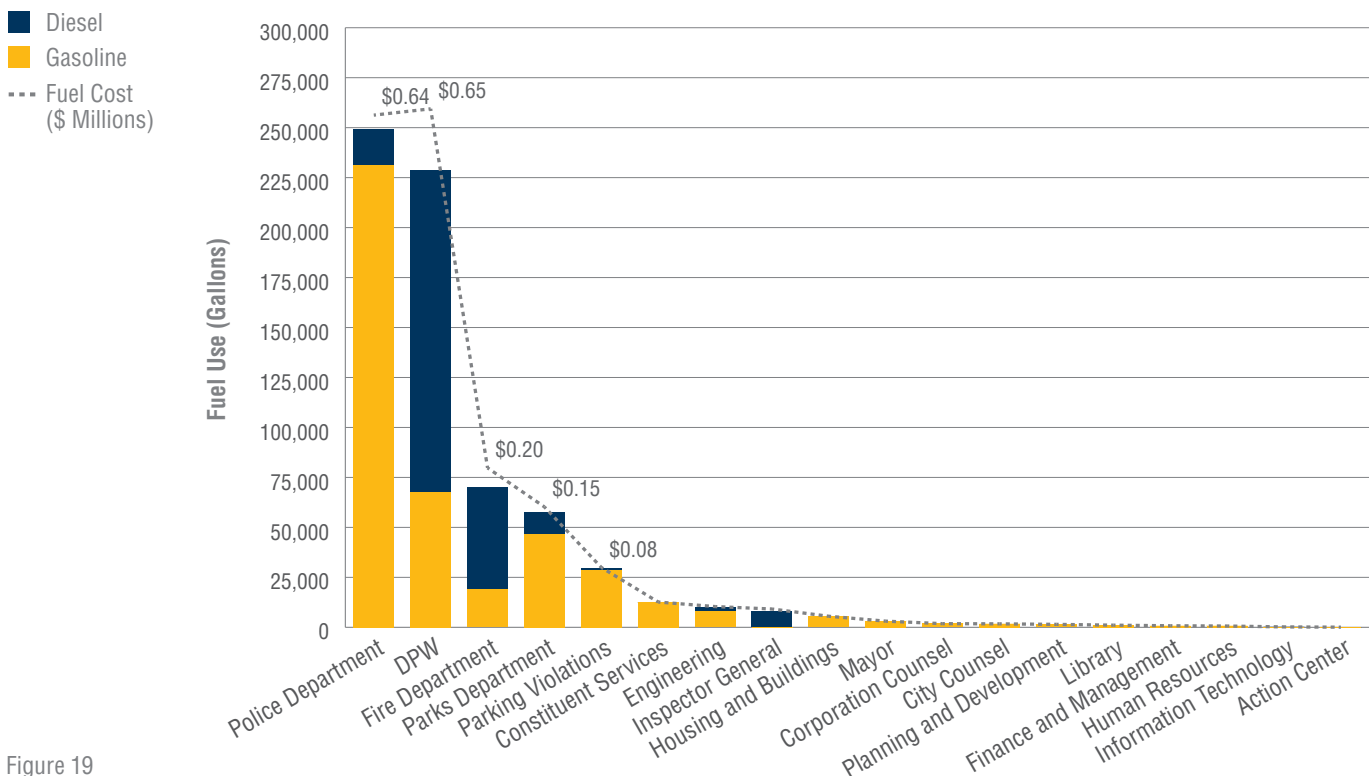


Figure 19

departments. The policy will be based on an assessment of City operational needs and how specific vehicles could help meet them. The creation of detailed guidelines, including a list of approved vehicles, would allow the City Fleet Services and other vehicle purchasing departments to choose vehicles that best meet their needs.

In the short term, for vehicles that will not need to be replaced for several years, the City will install auxiliary batteries or idle reduction systems to reduce gasoline use while the car is idling. These systems recharge the battery using the car's alternator.

In the short to medium term, the City, working through the DPW, Purchasing Department and Planning and Development, will implement a policy to replace 10 percent of the vehicle fleet each year for the next 10 years.

As an example, the City operates 250 vehicles primarily for administrative purposes. Each is driven about 8,200 miles per year (an average of 33 miles per weekday). A representative vehicle that the City operates now, such as a 2004 Chevrolet Cavalier, is estimated to consume 365 gallons of gasoline per year, at a cost of \$1,220. If a single 2004 Chevy Cavalier is replaced by a

Bee-Line Bus

Example of city rideshare program web portal

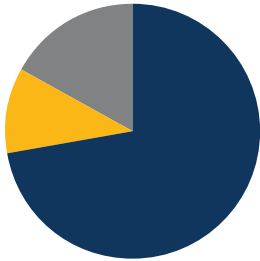


511NY Rideshare





Municipal Energy Cost (\$)



■ Buildings (72%)
■ Transport (11%)
■ Street Lighting (17%)

Figure 20

CASE STUDY

Philadelphia Car Share Program



In 2005, Philadelphia's municipal fleet was about 6,000 vehicles (including more than 400 non-police sedans), costing the City approximately \$6,200 annually per vehicle for gas, operations and maintenance. In response to significant budget cuts, the City implemented a program to share cars with residents in a major fleet-reduction effort. The project helped reduce fleet size by more than 330 vehicles, saving \$1.8 million annually, without sacrifice to employees' ability to accomplish City business. The local not-for-profit PhillyCarShare, selected through an RFP process, set up an automated vehicle sharing system in which City employees would trade in municipally owned vehicles for 24-hour access to hybrid gas-electric cars, which would also be available to local residents. Program costs were about \$30,000 per year. This eliminated hundreds of vehicles from the fleet that had previously been available for commuting, but which had also been used inefficiently. The initiative is led jointly by the Mayor's Office, the Office of Fleet Management, the Finance Department and the Managing Director's Office. Employees are charged the same rate as residents.

current model year vehicle, the potential annual savings range from \$68 to \$237 for a gasoline vehicle, a potential savings of \$622 to \$966 for a hybrid, electric, or alternative fuel vehicle, not including maintenance cost differences or the cost of capital infrastructure.

The vehicle replacement program will include sedans as well as refuse trucks, work trucks/pick-ups and vehicles used for parking enforcement. Large and fuel-inefficient vehicle types, such as SUVs used for parking enforcement, will be replaced by smaller vehicles, electric vehicles or even bicycles.

Initiative 12: Upgrade municipal facilities to accommodate alternative vehicles



As vehicles are retired and alternative-fuel vehicles are introduced, the City will continue to upgrade municipal facilities to meet vehicle needs. This includes accommodating larger liquefied petroleum gas (LPG), compressed natural gas (CNG) and electric fleets. The City is converting 20 municipal vehicles (pickup trucks) to propane (or LPG), and it recently installed a LPG filling station at the DPW Vehicle Maintenance Center.

Building on this progress, the City will explore working with Westchester County to install a CNG fuel station at the Westchester County Material Recovery Facility, which could reduce capital costs to the City and help regionalize a CNG refuse fleet. A new CNG fuel station is estimated to cost approximately \$100,000 for two to four pumps

for slow fill up or \$1.2 million for fast fill-up. It will reduce carbon dioxide emissions (and other ambient air pollutants) as well as reliance on diesel fuel.

Initiative 13: Implement a pilot employee car-sharing program to help right-size the fleet



The City maintains a fleet of more than 1,000 vehicles, including some take-home vehicles. Many take-home vehicles are not used regularly, remaining parked for a large percent of the time, but still requiring regular maintenance and replacement. To reduce fleet size and associated maintenance costs, the Public Works, Purchasing and the Planning and Development departments will explore working with a car-sharing service, such as Zipcar.

A City car share pilot program will involve removing a certain number of fleet vehicles from use, and training City employees on how to use third-party protocols to reserve and check out a vehicle when needed. These vehicles could be shared by residents and City employees, or dedicated for City employee use only during working hours. Car sharing reduces unnecessary trips and has been shown to reduce emissions and VMT. The introduction of a car share program will reduce the overall City fleet size, while still meeting the needs of employees who do not require a vehicle eight hours a day.



CNG refuse vehicle

Yonkers has
a fleet of over
1,000
vehicles

Initiative 14: Develop a fuel management and vehicle maintenance plan, and provide EcoDriving training to City employees



Municipal fuel pumping stations are located throughout Yonkers. A vehicle and fuel management plan would help reduce operation and maintenance costs, and identify potential improvements in the fleet's efficiency and use. The City is introducing new technology that will help collect and analyze driver data to support better vehicle and fuel management.

The most technologically advanced add-ons to a fuel management system can automatically pull odometer information, trouble codes, idling time,

maximum speeds and engine time. Vehicles do not have to be fueling for data to download; they can drive near an antenna or a terminal for information to be transmitted. This technology will help track driver behavior, vehicle frequency and purpose of use, and better match vehicle type to use.

To further reduce fuel consumption, the City will continue to offer EcoDriving training, which teaches techniques that promote safe driving and reduce vehicle maintenance costs, fuel energy consumption and costs, and greenhouse gas emissions.

Initiative 15: Evaluate private school bus systems for fuel efficiency



Transportation is available to elementary and middle school students in Yonkers and live at least 1.5 miles from their school. School bus services are contracted out to several private operators through the Board of Education. As such, the school bus fleet is composed of vehicles of various ages, fuel efficiencies and rates of greenhouse gas emission. The City will encourage school bus contract providers to leverage the NYSERDA Clean Air School Bus Program to phase out pre-2007 school buses. The City will also create new fuel standards governing new vehicle specifications that will reduce associated air pollution by 95 percent compared to pre-2007 vehicles.

CASE STUDY

Auxiliary Battery Systems in Austin, Texas, Patrol Cars

The City of Austin, Texas, has 650 patrol cars with auxiliary battery systems. Each battery system provides an average of three hours of electrical use per day, saving 2.4 gallons of gasoline per day, and eliminating 113 idling "ghost miles" and 21.4 kilograms of CO₂ per day per vehicle. A 2,000 watt-hour system, typical for police cars, was quoted to cost approximately \$4,300 for the system and \$500 for installation per vehicle.

The New York Police Department (NYPD) has been recognized nationally for its adoption of hundreds of hybrid electric vehicles, including marked units. Police Fleet Manager magazine reported in 2012 that the NYPD had 789 hybrid electric fleet vehicles (out of 8,000 total). These included 20 Chevrolet Volt plug-in electric vehicles, 169 Nissan Altimas, 232 Ford Fusions, 59 Ford Escapes, 115 Toyota Priuses and 13 GMC Yukons. The NYPD has other hybrid electric vehicles, including Toyota Camry, Honda Accord and Toyota Highlander models. The Police Fleet Manager article noted that the hybrid vehicles were expected to receive a higher resale value at auction of \$10,000 compared to \$5,000 for the standard Impalas, due to their high demand for use as taxis.



Transportation Efficiency

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Create active, mixed-use neighborhoods that are safe and easily accessible by walking, cycling and transit				
Initiative 1: Develop locations with opportunities for mixed use, transit-oriented development				
Planning and Development	Residents, businesses, developers, MTA, Bee-Line, NYMTC, community groups	NYSERDA Cleaner, Greener Communities, City Planning budget to update zoning and land use plans	Short-Term	Develop a proposal to amend the zoning code in TOD areas
Initiative 2: Encourage coordination between transit agencies				
Planning and Development	Traffic Engineering, MTA, Bee-Line	Tax or fee-based sources (sales tax, property tax, vehicle fees, parking fees, advertising revenue)	Short-Term	Analyze current Metro-North and Bee-Line services to identify schedule coordination issues; study physical connections between services to identify opportunities to improve customer experience (transfer connections, waiting areas, real time transit information, etc.)
Initiative 3: Develop a citywide bicycle and pedestrian master plan in coordination with existing projects and efforts				
Planning and Development	Traffic Engineering, MTA, Bee-Line	NYSERDA CGC, FHWA Transportation Alternatives Program (TAP)	Short-Term	Develop an on-street bicycle network including facilities for bicycle parking (both on-street and within office buildings), showers in office buildings for bicycle commuting; improve pedestrian environment especially in downtown Yonkers and adjacent to MTN stations
Initiative 4: Adopt a Complete Streets Policy				
Planning and Development	Traffic Engineering, MTA, Bee-Line	NYSDOT Transportation Enhancement Program (TEP), NYMTC	Short-Term	Host a policy development workshop. Leverage Smart Growth America's Complete Streets Policy Workbook to develop a vision, goals and policy document
Initiative 5: Encourage businesses and developers to build electric charging stations and other alternative fuel stations				
Planning and Development	Businesses, developers, NYSERDA	NYSERDA CGC	Short-Term	Add to Yonkers Green Development Standards
Initiative 6: Develop a traffic signal optimization program				
Traffic Engineering	NYSDOT, Westchester County	NYSDOT Transportation Enhancement Program and Statewide Transportation Improvement Program, Federal Highway Administration	Short-Term	Perform city-wide traffic study focusing on most congested areas.
Expand and encourage commute options for City employees				
Initiative 7: Implement a pre-tax transit benefit program for City employees				
Human Resources Administration	City agencies, City employees, Westchester Smart Commute Program	—	Short-Term	Reach out to provider and initiate policy
Initiative 8: Develop a rideshare program				
Human Resources Administration	City agencies, City employees, Westchester Smart Commute Program, MetroPool	Municipal budget	Short-Term	Work with existing taxi/vanpool services to create a program; develop pilot program; provide information session to employees; create an online tool for employees to sign up for the program; provide priority parking space for carpools and/or vanpools

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

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Expand and encourage commute options for City employees (continued)				
Initiative 9: Develop a City employee guaranteed ride home program				
Human Resources Administration	Taxi/Van vendors, City agencies, City employees, Westchester Smart Commute Program, MetroPool	Municipal budget, CMAQ	Short-Term	Ensures employees who carpool, bike, walk, take transit, are not stranded if they stay late, bus stops running, or employee has an emergency; Identify potential City departments; establish implementation guidelines; contact potential vendors (taxi services) to develop voucher/payment system
Initiative 10: Develop an alternative work schedule program				
Human Resources Administration	Parking violations and other client facing departments	—	Short-Term	Identify potential department for implementation; develop potential schedule; identify interested employees
Improve City vehicle fleet efficiency				
Initiative 11: Replace retiring City vehicles with more fuel-efficient and alternative-fuel models				
Department of Public Works, Purchasing Department	City agencies, City employees	—	Short-Term	Identify use cases and appropriate replacement vehicle types; develop use guidelines; institute safety training program; purchase vehicles and safety equipment
Initiative 12: Upgrade municipal facilities to accommodate alternative vehicles				
Planning and Development, Department of Public Works	—	—	Mid-Term	Develop and release RFQ
Initiative 13: Implement a pilot employee car-sharing program to help right-size the fleet				
Department of Public Works, Purchasing	Zipcar, City agencies, City employees	Municipal funds	Short-Term	Review best practices of other City agencies that have implemented City fleet car share; study vehicle use patterns to identify the number of vehicles to set aside and the number of carshare vehicles to implement; develop pilot
Initiative 14: Develop a fuel management and vehicle maintenance plan, and provide EcoDriving training to City employees				
Department of Public Works	City agencies, Vehicle Maintenance Department, City employees	—	Short-Term	Assess driving profiles/use cases for departments/job classifications; Track fuel usage/mileage; Review maintenance logs/implement vehicle maintenance reporting program; Review which vehicles are being used for what purposes; better match vehicle type to use
Initiative 15: Evaluate private school bus systems for fuel efficiency				
Board of Education	Private bus companies	NYSERA- PON 1896 New York State Clean Air School Bus Program Round 3, FHWA Safe Routes to School	Mid-Term	Inventory existing school bus fleet and identify potential for retrofitting to more efficient vehicles; study current bus service and student demand; survey community to understand needs for student commutes to school; recommend improvements to fleet, routes, and policies

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



Expand the Use of District and Renewable Systems To Increase Resilience and Reduce Carbon Emissions

Summary of Objectives and Initiatives

Identify and support the expansion of district and renewable energy systems

- Initiative 1:** Investigate opportunities for distributed generation, district heating/cooling and combined heat and power systems
- Initiative 2:** Facilitate and increase renewable energy production on municipal and community buildings through third-party solar developers
- Initiative 3:** Install microgrids at critical facilities
- Initiative 4:** Work with Westchester County to develop a composting program and anaerobic digestion facility

Enhance the city's resilience to outages and disaster events

- Initiative 5:** Develop a vulnerability and adaptation plan
- Initiative 6:** Work with Westchester County to create an emergency fuel stockpile
- Initiative 7:** Work with the state to reduce methane emissions associated with natural gas pipeline leaks

Municipal buildings and facilities in Yonkers buy electricity from NYPA, natural gas from Con Edison and heating oil from private companies. Residential, commercial, industrial and institutional facilities buy natural gas and electricity from Con Edison. Their heating oil is purchased from private companies.

Con Edison's electricity fuel mix includes natural gas, nuclear, coal, oil and renewable sources such as wind, solar and hydroelectric stations. Fossil fuels, which emit greenhouse gas emission when they are burned (e.g., coal, natural gas and oil), make up almost two-thirds of Con Edison's electricity generation mix. By 2030, Con Edison predicts that renewables will make up 26 percent of the generation mix while fossil fuels will be reduced to 59 percent of the generation mix (**Figure 22**). This change will help lower greenhouse gas emissions, but further steps will be needed to reach the state's "80 by 50" goal.

Yonkers Energy Supply Chain

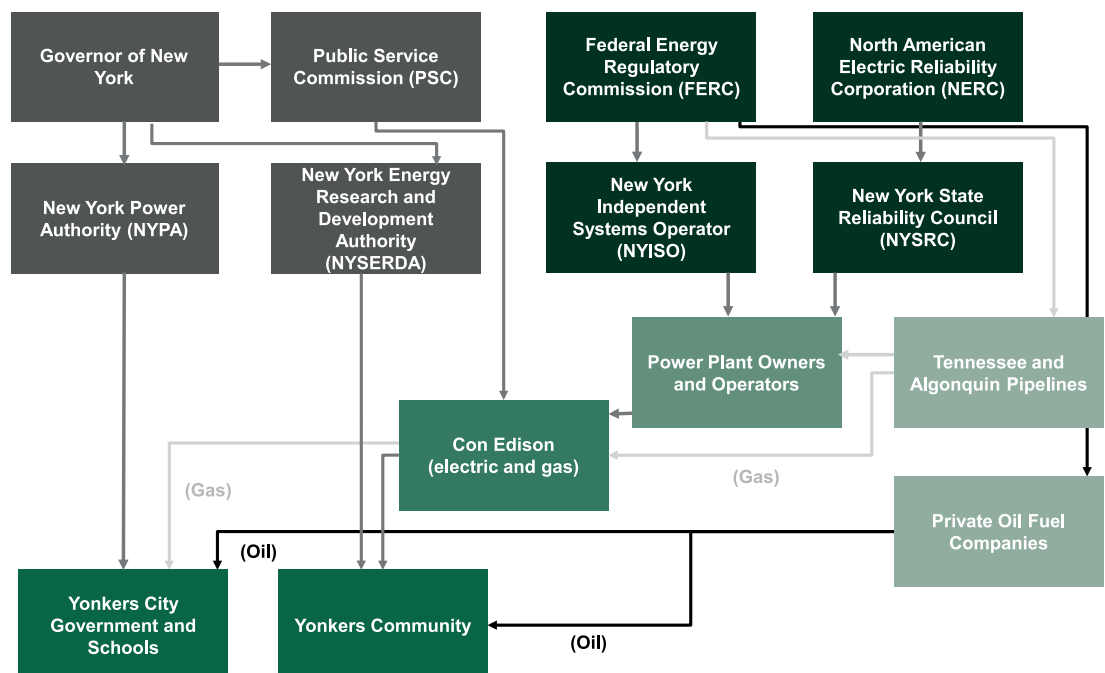


Figure 21

Over half
of the city's PV
has been installed
over the last
2 years

Identify and support the expansion of district and renewable energy systems

There are no major power plants or district energy networks in Yonkers. Energy generation is partially limited because of the city's relative density and space availability. Regulatory barriers also make it difficult for non-utilities to run power lines across rights-of-ways and build local energy networks that serve multiple customers. Existing legislation, interconnection and right-of-way issues also create challenges for energy generation and distribution projects such as combined heat and power (CHP) systems and renewable energy installations. Yonkers recognizes the greater importance of distributed renewable generation sources in light of the state's Reforming Energy Vision, which seeks to build a more reliable and efficient energy grid infrastructure.

Initiative 1: Investigate opportunities for distributed generation, district heating/cooling and combined heat and power systems



Distributed generation (DG) technologies provide power locally to meet a specific demand. Spare power is then distributed across the grid or stored for future use. Because the energy is generated and distributed close to the loads, transmission and transformation losses are minimized,

which can make DG more energy efficient than centralized power. District heating and cooling systems include a local centralized plant with high capacity heat and cooling equipment that collectively services several buildings. Compared to building-specific heating and cooling systems, district systems are more efficient and reduce costs. Additionally, the inclusion of CHP to district systems allows for increased efficiency through the reclamation of waste heat. CHP systems convert a primary fuel (typically natural gas) into electricity and recover the "waste heat" byproduct, which can be used for space heating, domestic hot water production, space cooling (via absorption chillers) and industrial processes (**Figure 23**).

Yonkers has one known 49 MW CHP unit in operation; it serves a private sugar refining factory located along the Hudson River. Two alternative fuel units also operate in the city: a 200 kW biogas fuel cell, operated by NYPA at the Yonkers Wastewater Treatment Plant and a private waste-to-fuel plant that converts waste materials such as used waste plastic into diesel fuel.

The Department of Planning and Development will commission a comprehensive feasibility study to identify sites in Yonkers that are well suited for distributed generation, district heating/cooling and CHP systems. The study will focus on determining areas where synergies between demand and energy production exist, concentrating on industrial facilities.

New York Control Area Electrical Fuel Mix

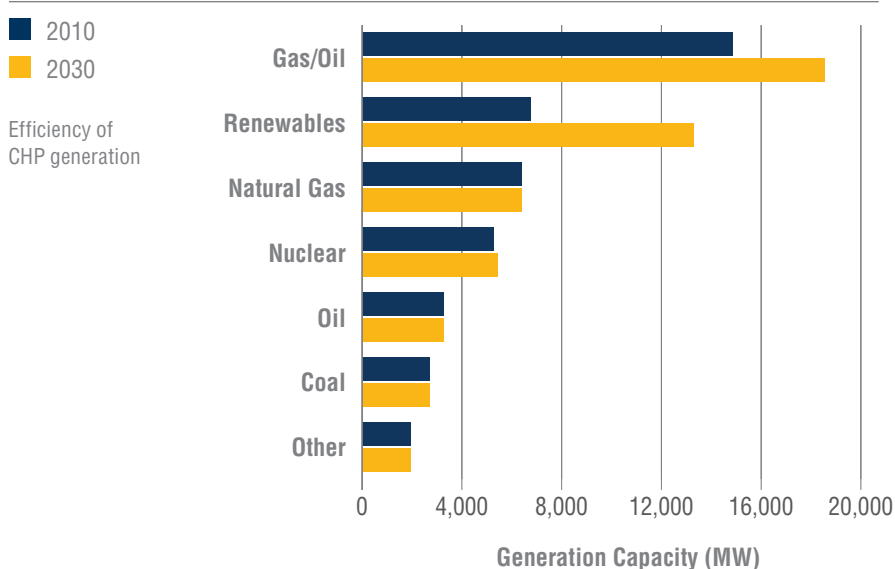


Figure 22

Initiative 2: Facilitate and increase renewable energy production on municipal and community buildings through third-party solar developers



The number of solar photovoltaic (PV) installations in Yonkers and Westchester County has increased over the last six years—mainly due to NYSERDA incentives, solar lease programs and decreases in PV prices (Figure 24). As of October 2013 there was almost 1.8 MW of solar PV in the city. Although the number of installations has risen recently, PV systems still face market barriers and regulatory challenges in Yonkers. For example, the City requires professional verification from a third party that the PV system was installed to specification. Furthermore, public sector



Efficiency of CHP Generation

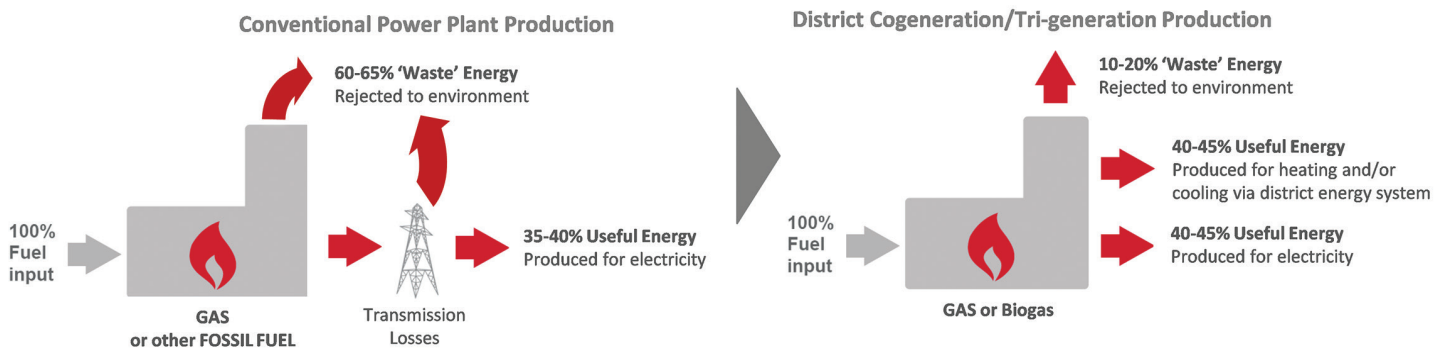


Figure 23

buildings in the state have limited net metering capabilities, which significantly reduce potential utility cost savings. Yonkers will utilize NYSERDA's programs to help reduce these kinds of market barriers, for instance by lowering soft costs related to permitting and system verifications.

There are additional opportunities (**Figure 25** and **Figure 26**) to install PV panels throughout the city. School buildings are particularly good locations for PV systems due to their large, flat roofs. The City will look at collaborating with the K-Solar program, a joint project spearheaded by NYPA and NYSERDA to provide school districts with the tools and expertise to bring solar energy

to their facilities and reduce their energy costs. By increasing the community and municipal government's solar PV capacity, Yonkers' residents, businesses and government can generate additional carbon-free electricity while reducing dependence on dirty fossil fuels.

Yonkers will endorse a program to help homeowners and businesses purchase community renewable energy at a cheaper rate than individual systems through economies of scale. Solarize Westchester will help lead the effort to find third-party providers to install solar panels for homeowners, businesses and municipal properties. Homeowners and businesses would then be able to negotiate a Power Purchase Agreement (PPA) in which the third-party provider sells the generated electricity back to them at a fixed rate that is lower than utility rates. As an alternative, the homeowner or business could finance the panels themselves or apply for NY Green Bank "gap financing" or credit enhancements in the event loan tenors are longer or project risks are greater than conventional banks can agree to.

The Department of Planning and Development, along with the Department of Housing and Buildings will partner with local organizations such as Solarize Westchester to connect Yonkers residents and businesses with third-party renewable energy providers that specialize in Power Purchase Pools and PPAs. The Planning Department will also be responsible for educating the public on the benefits, programs, funding sources related to solar PV, and Power Purchase Pools and PPAs through the City's sustainability website and other forms of communication.

Number of Solar PV Installations Compared to System Cost (without Incentives) in Yonkers

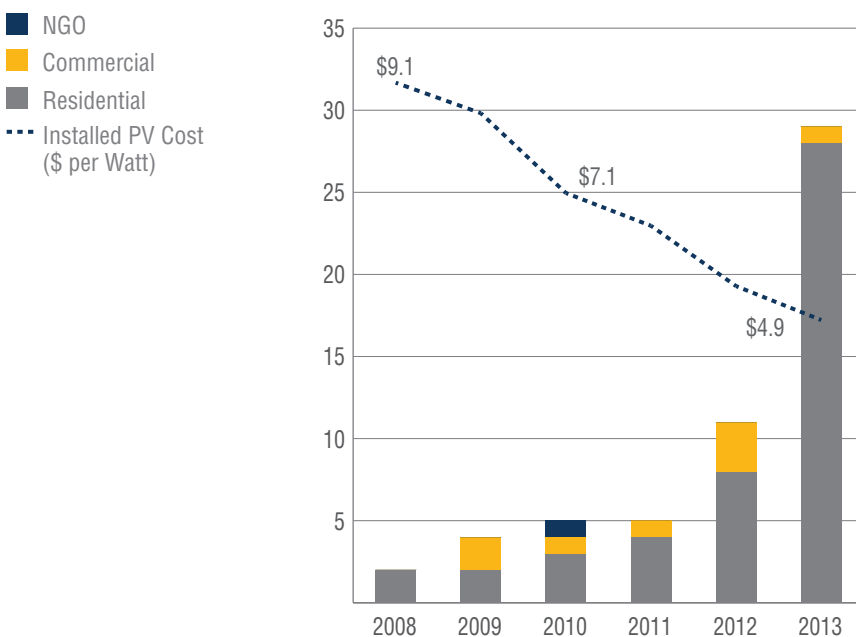


Figure 24

Yonkers Rooftop Solar Power Capacity

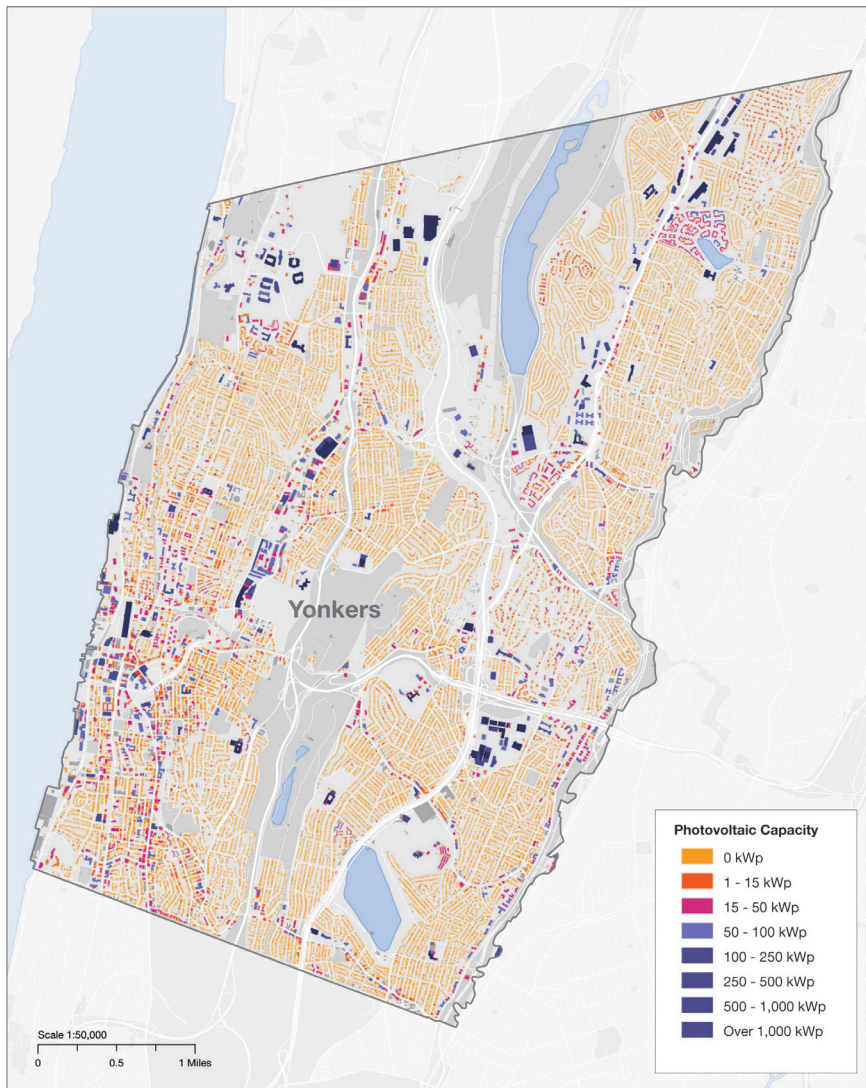


Figure 25

The Department of General Services will reach out to third-party developers to gauge interest in installing solar PV systems on municipal buildings through models such as power purchase agreements. NYPA and NYSEERDA's K-Solar Program may help facilitate solar installation on school buildings in Yonkers.

Initiative 3: Install microgrids at critical facilities



Microgrids are smaller distributed generation systems coupled with energy storage, management and control systems. Microgrids can augment centralized power generation during peak demand periods and can disconnect and operate independently from the grid as an energy island during grid failure. The ability of the microgrid to “self-heal”—that is, detect problems with the power grid and isolate the microgrid from the main, or primary grid in the event of a disturbance—increases the overall resilience of a central power system and facilities connected to the microgrid. Microgrids can also facilitate cleaner energy production through the use of renewables or by coupling them with heat-distribution networks that use waste heat from the power production process.

There are a number of potential microgrid development sites that contain critical facilities in Yonkers, including: the area around the Cacace Justice Center, City Hall and St. Joseph's Medical Center, the area surrounding the Westchester County Wastewater Treatment Plant and the Ludlow neighborhood, and the area near the Empire Casino (a 24-hour facility) and the Hillview Reservoir, which provides potable water to New York City (**Figure 27**).

CASE STUDY

Solarize Brooklyn

Solarize Brooklyn was a volunteer-led initiative that partnered with a not-for-profit renewable energy advisor to bring affordable solar power to the community. The program offered educational sessions and free solar assessments to community members to introduce residents to solar technology and the procurement process. Solarize Brooklyn helped reduce the costs of solar energy systems by partnering with local installers that provided special pricing to residents as well as additional discounts based on the volume of systems that were installed. Twenty-three households decided to install solar energy systems through Solarize Brooklyn, which exceeded the total number of installations during an entire year before the program existed.



Energy Distribution & Supply

The Department of Planning and Development will engage with proposed site owners and third parties for further evaluation of the proposed microgrid sites to determine the optimal location for the project and apply for the state's NYPrize competition.

Initiative 4: Work with Westchester County to develop a composting program and anaerobic digestion facility



Yonkers generates approximately 82,000 tons of organic waste such as food and yard waste per year (this represents approximately 25 percent of organics generated in Westchester County). This waste can be composted or processed in an anaerobic digester (**Figure 28**) to reduce the amount of material being sent to landfill. Approximately 3.3 million cubic meters of biogas could be generated if half of the organics were diverted from the waste stream (four times as much for Westchester County). The biogas could be converted into transport fuel in the form of CNG or processed to generate 6.7 GWh of electricity, or 15 percent of municipal building electricity consumption.

The City has already had some success in diverting organic waste through its "Love 'Em & Leave 'Em" program and the We Future Cycle school lunch recycling program. As residents become more aware of the benefits of diverting waste through programs like We Future Cycle, there will be a growing amount of organic waste that requires processing.

DPW, with support from the Department of Planning and Development, will meet with stakeholders, key partners and other Westchester County communities to determine interest in developing a composting program at the county level. To gauge private company interest in the project, DPW and its Westchester County partners

POTENTIAL POWER CAPACITY OF SOLAR PV

Category	Solar Capacity (kWp)	Solar Generation (MWh/year)
Commercial-Retail	50,858	55,733
Common Land Homeowners Association	299	327
High Density Residential	153,390	168,094
Institutional and Public Assembly	44,456	48,717
Low Density Residential	15,745	18,513
Manufacturing, Industrial, Warehouse	53,972	59,146
Medium High Density Residential	276,556	325,189
Medium Low Density Residential	181,048	212,885
Mixed Use	18,266	21,478
Office and Research	8,187	8,972
	802,777	919,055

Assumptions: 20 percent efficient modules; White Plains, NY weather data; Tilt for pitched roofs — between 25 and 37 degrees (output should be almost the same for that range), no spacing factor used (inclined plane), Tilt for flat roofs — 5-degrees, spacing factor of 1.25 between panels; derate factor of 80 percent; usable roof area of 60 or 80 percent; structural integrity of the roof not taken into account.

CASE STUDY

i.Park Hudson Solar Panel



One of Yonkers's most prominent PV systems can be found on the i.Park Hudson complex, located downtown. The complex has 3,700 solar panels on its roof, covering the same area as two football fields. The panels are capable of generating approximately 1.2 million kilowatt-hours of electricity each year, which is equal to 15 percent of the complex's annual electricity consumption. When it was installed at the end of 2012, it was the largest commercial rooftop system in Westchester County. The \$5 million project was funded by private investment and federal tax incentives that will recoup its costs through energy savings and by charging tenants at the complex a fixed rate for the electricity produced by the panels via power purchase agreement.

Potential Microgrid Opportunities in Yonkers

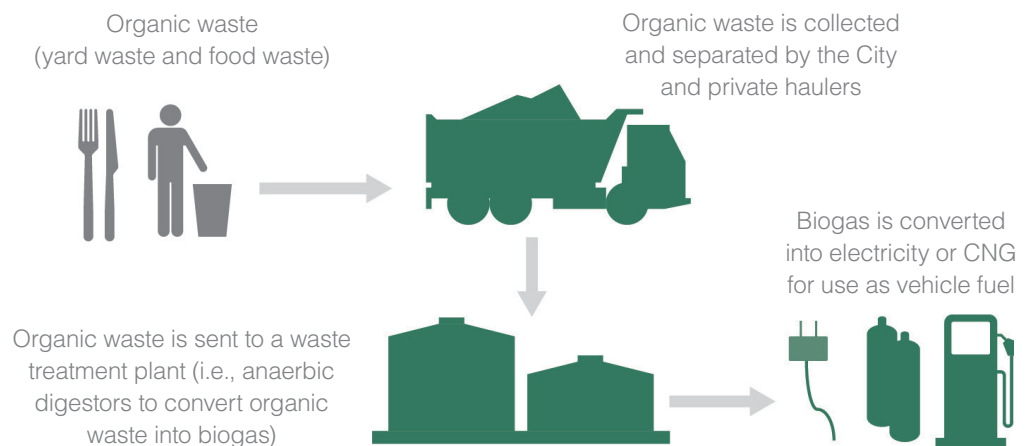
Figure 27

Yonkers
generates
approximately
82,000
tons of organic
waste per year



Organics-to-Energy Program in Yonkers

Figure 28





Snapshot of Outages or Interruptions to the Electricity Grid During Superstorm Sandy

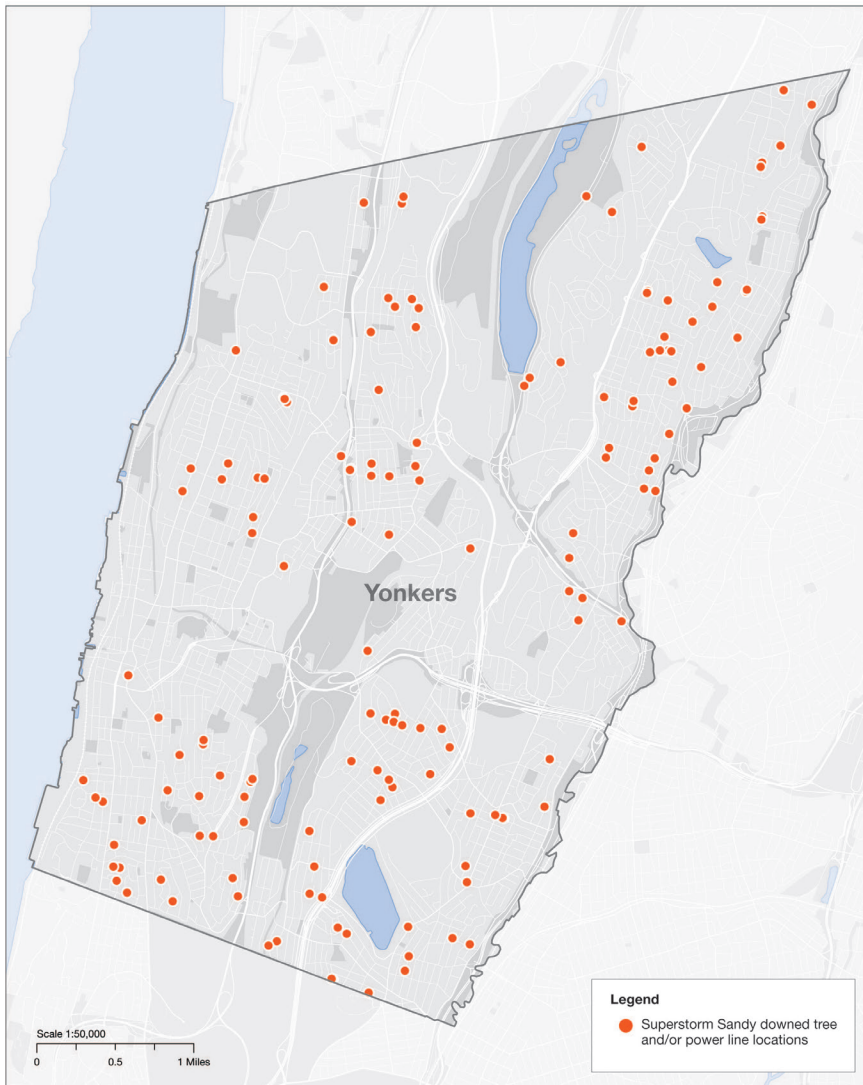


Figure 29

will release a public request for qualifications (RFQ). A countywide anaerobic digestion facility will be investigated after a successful composting program is implemented and organic waste diversion reaches high enough levels. Yonkers will also monitor the Reforming the Energy Vision (REV) proceeding in the event that reforms make anaerobic digestion a more cost-effective alternative energy option for power generation.

Enhance the city's resilience to outages and disaster events

Extreme weather events such as Superstorm Sandy and Hurricane Irene demonstrated that Yonkers's energy infrastructure was vulnerable to extreme weather events. The City is using lessons from each storm to become better prepared for the next one. The Office of Emergency Management initiated a Hazard Mitigation Plan website with information and fact sheets related to hazard events. The state provided funding to develop a Community Reconstruction Plan for the City to mitigate against future risks and build increased resilience.

Initiative 5: Develop a vulnerability and adaptation plan



Vulnerability is a function of the character, magnitude and rate of a hazard to which a system is exposed, its sensitivity to that hazard and ability to adapt.

Yonkers' Office of Emergency Management, with support from the Department of Planning and Development, will meet with appropriate stakeholders and establish a working group to develop a vulnerability and adaptation plan. The plan will include an assessment of the vulnerability of locations, populations and key services to natural and man-made hazards. It will also include mitigation measures designed to build resilience and improve adaptability in response to future hazards. On the energy side, this plan will determine which buildings and infrastructure have the greatest need for back-up utilities (e.g., power and heat, electricity, water, etc.), equipment and services during hazard events.

Initiative 6: Work with Westchester County to create an emergency fuel stockpile



During Superstorm Sandy, numerous terminals in New York Harbor closed, leaving Yonkers and many other nearby municipalities with a shortage of gas and diesel fuels. Working with the Westchester County Department of Emergency Services, the Yonkers Office of Emergency Management will determine the optimal site for an emergency fuel terminal and execute the planning process for the project. A fuel stock will provide short-term relief for the county and first responders after major disasters, and ultimately make Yonkers more resilient to disaster events.

Initiative 7: Work with the state to reduce methane emissions associated with natural gas pipeline leaks



New York State's pipeline infrastructure is aging and composed in significant part of leak-prone cast iron and unprotected steel pipes. Natural gas that passes through these pipes has high carbon dioxide emission factors. To address this issue, the New York State Energy Plan includes an initiative to require an increase in inspections, repair of leaks (also at compressor stations) and accelerated replacement of faulty portions.

Yonkers's DPW and Department of Engineering will coordinate efforts to advocate for an increase in inspections and improved maintenance of gas pipelines statewide in support of the New York State Department of Public Service's (DPS) ongoing efforts to increase the rate of leak-prone pipe replacement statewide. DPW and Department of Engineering will meet with DPS, the Department of Environmental Conservation (DEC) and Con Edison to ensure these important stakeholders understand the City's desire to reduce the environmental and safety impacts of gas distribution infrastructure.

Implementation Matrix

Responsible party	Key partners	Source of funding	Time frame	Next steps
Identify and support the expansion of district and renewable energy systems				
Initiative 1: Investigate opportunities for distributed generation, district heating/cooling and combined heat and power systems				
Planning and Development	Building Owners, Residents, Businesses, Developers, Con Edison, NYISO	—	Short-Term	Commission comprehensive DG, district heating/cooling, and CHP feasibility study
Initiative 2: Facilitate and increase renewable energy production on municipal and community buildings through third-party solar developers				
Planning and Development, Housing and Buildings, Department of General Services	Solarize Westchester, NYSEDA, CUNY, third-party solar developers	NYSEDA Solar PV Program Financial Incentives, Federal tax incentives, NY Green Bank	Short-Term	Contact third-party developers, identify building owners
Initiative 3: Install microgrids at critical facilities				
Planning and Development	NYSEDA, Con Edison	NY Prize, Private Finance	Mid-Term	Release RFQ for third-party consultants
Initiative 4: Work with Westchester County to develop a composting program and anaerobic digestion facility				
Department of Public Works, Planning and Development	Westchester County Department of Environmental Facilities, County Executive Office, NYS Department of Environmental Conservation	CGC, Renewable Portfolio Standard Customer-Sited Tier Anaerobic Digester Gas-to-Electricity, Federal tax incentives	Mid-to-Long Term	CGC, Renewable Portfolio Standard Customer-Sited Tier Anaerobic Digester Gas-to-Electricity, Federal tax incentives
Enhance the city's resilience to outages and disaster events				
Initiative 5: Develop a vulnerability and adaptation plan				
Planning and Development, Office of Emergency Management	—	Community Development Block Grants for Disaster Recovery	Short-Term	Meet with appropriate stakeholders and establish a working group tasked with developing plan
Initiative 6: Work with Westchester County to create an emergency fuel stockpile				
Office of Emergency Management	Con Edison, NYSDEC, NYSDPS, Department of State	—	Mid-Term	Determine optimal site for emergency fuel terminal
Initiative 7: Work with the state to reduce methane emissions associated with natural gas pipeline leaks				
Public Works, Engineering	Residents, Businesses, City employees	—	Mid-Term	Meet with NYS PSC, NYS DEC, and Con Edison to discuss the City's concerns

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

Summary of Cross-Cutting Themes

Several cross-cutting themes are present throughout the initiatives found in the Yonkers Energy Plan. These themes span all of the plan's program areas and highlight the potential for synergies among the initiatives.

- Municipal: leading by example
- Economic development: creating jobs and attracting businesses
- Infrastructure: preparing our cities for the future
- Climate action: reducing the city's carbon footprint

Municipal leadership: leading by example

By creating well-conceived programs and policies, and completing projects and initiatives with tangible energy and cost savings, Yonkers's municipal government will lead by example and serve as a model for local residents and businesses, as well as for other cities. The City is already leading by example through its LED Street Light Program and the Yonkers Green Buildings Ordinance, which demonstrate its commitment to reducing the impacts of the built environment. The City will build upon this progress by establishing sustainability awareness training programs for municipal staff and by developing a citywide EcoDriving training program that aims to reduce

fuel usage and costs of municipal vehicles. Additional initiatives that exhibit the City's commitment to leading by example include creating a rideshare program for municipal employees and implementing an experiential sustainability education program in public schools to teach the next generation of residents how to minimize their impact on the environment.

Economic development: creating jobs and attracting businesses

Creating jobs and attracting businesses to Yonkers will play a key role in the city's future economic success. The City plans to accomplish this by initiating a design competition for the redevelopment of an iconic, sustainable building, city block or "eco-district" in Yonkers. The City will also promote green training programs for schools and the public while encouraging renewable energy projects through Power Purchase Pools and Renewable PPAs. These parallel efforts will function in tandem by creating a demand for local renewable energy professionals and linking residents to programs focused on training the next generation of renewable energy workers.

Infrastructure: preparing our cities for the future

As global temperatures rise, cities must prepare for the future effects of climate change on the natural and built environments. As evidenced by recent disasters such as Superstorm Sandy, cities and their infrastructure are vulnerable to storm events and other impacts that have been linked to climate change. Moreover, Yonkers' high density puts added strain on its aging infrastructure. Yonkers is committed to preparing for the 21st century by modernizing its infrastructure and making it more resilient. To accomplish this, the City will study electrical grid infrastructure to evaluate how increased distributed generation can be safely integrated and where it will be most beneficial to the resilience of the overall grid. The City will also work to develop a microgrid plan around Yonkers' critical facilities to reduce grid congestion and ensure power is available when and where it is needed most.

Waterfront park





Climate action: reducing the city's carbon footprint

Although city dwellers typically have smaller per-capita carbon footprints than people who live in suburban and rural communities, Yonkers must commit to reducing the city's carbon footprint to mitigate the effects of climate change. The City's Planning Department has already adopted the New York State Unified Solar Permit Application to streamline the solar PV application process. This will help Yonkers increase its solar capacity and reduce emissions by generating carbon-free, renewable electricity. By developing a citywide bicycle and pedestrian master plan and adopting

a Complete Streets Policy, Yonkers will transform itself into a bicycle- and pedestrian-friendly city, thereby decreasing transportation fuel consumption and emissions.

Implementation

The City Department of Planning and Development, in coordination with the Mayor's Office, and a newly appointed City Energy Manager, will be responsible for the rollout and tracking of the Energy Plan. Existing City departments and personnel will implement and track the plan to optimize existing administrative structures and take advantage of potential synergies between the plan and current programs. The Department of Planning and Development, with support from the Mayor's Office and the City Energy Manager, will coordinate interdepartmental initiatives to ensure open communication and knowledge sharing takes place between departments.

Within each department, personnel will be selected to lead individual initiative implementation. Those employees will also be responsible for coordinating performance tracking. Depending on the initiative, tracking may be carried out internally or by third parties, such as NYSERDA and Con Edison. The reporting entities will be responsible for collating performance tracking results and submitting progress reports to the Department of Planning and Development by the end of the fiscal year on an annual basis. After reviewing individual progress reports, the Department of Planning and Development and the City Energy Manager will produce an overarching progress update for the Yonkers Energy Plan and make necessary updates to the plan itself.

Funding for the initiatives will be derived from a combination of federal and state programs and the City's municipal budget. Specific initiative funding sources are listed in the implementation matrices throughout this plan.

The Yonkers Energy Plan was developed with the goal of reducing energy use and greenhouse gas emissions of municipal government operations and of the community at large. The plan also aims to enhance the quality of life of residents, generate new jobs and economic opportunities, protect the natural environment, and create a more resilient Yonkers. By implementing this plan, the City of Yonkers will ensure it is prepared for the 21st century.

Baseline with Municipal Initiatives Savings (mmBtu)

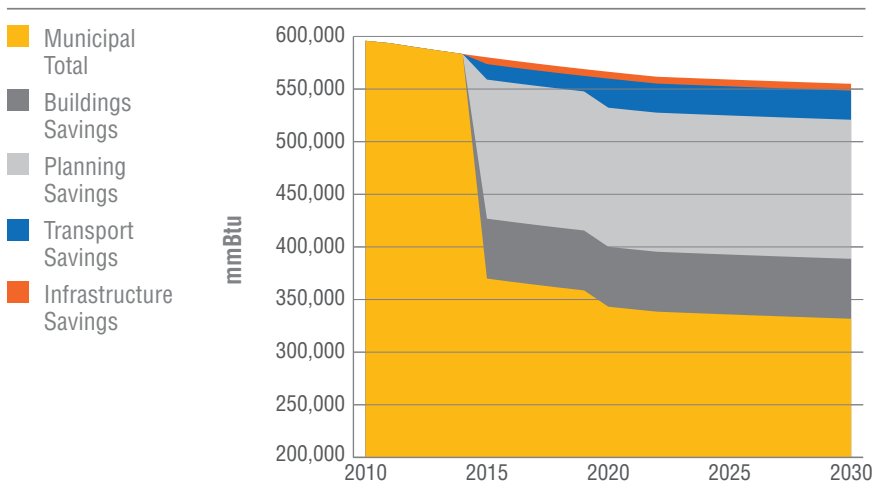


Figure 30

Baseline with Community Initiatives Savings (mmBtu)

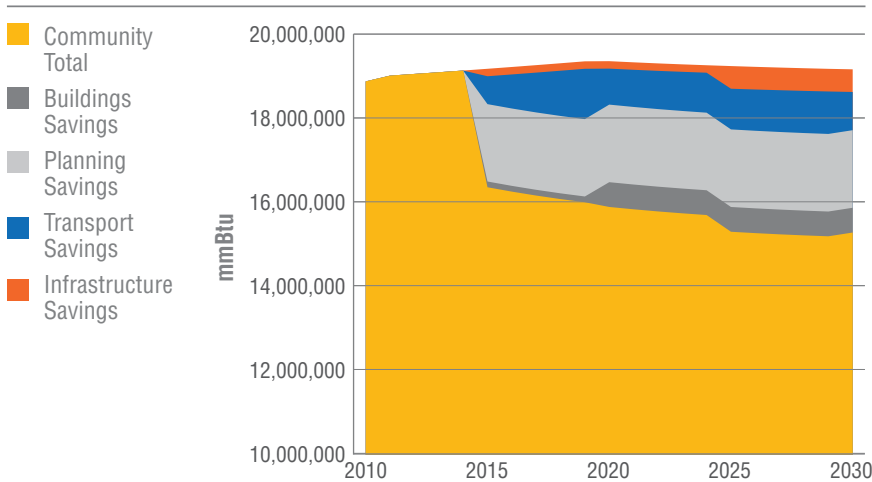


Figure 31

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 pursuing 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
- City Energy Managers: support cities in the implementation of the plans and report on progress
- NY Energy Manager: collect, analyze and report energy performance
- Municipal energy efficiency and clean energy*
- Support solar installations on school buildings through K-Solar program

New York State Energy and Research Development Authority

- Street lighting
- Electric vehicles*
- Benchmarking
- Available financing opportunities (e.g., PACE, Green Bank)
- Clean distributed generation (e.g., renewables, cogeneration, microgrids)*
- 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
- 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
- Zoning, land use and watershed planning, smart growth and transit-oriented development
- In-person and online training for municipal staff
- Shared and consolidated municipal services

New York State Department of Transportation

- Transportation Demand Management programs
- Complete streets and smart growth efforts
- Alternative transportation research and development (with NYSERDA)*
- Bicycle and pedestrian transportation projects (through Transportation Alternatives Program - TAP)*
- 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'Attilio 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 Canal 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

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Syracuse

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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

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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.

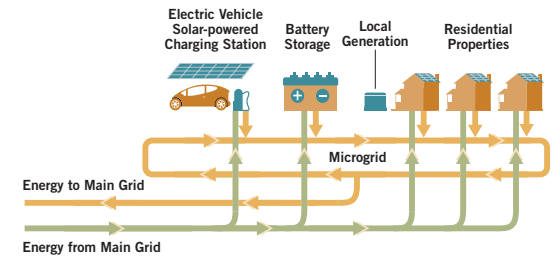
District energy: District energy systems produce steam, hot water or chilled water at a central plant, which is then piped underground to individual buildings for space heating, domestic hot water heating and air conditioning.

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.

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.

CO₂: Carbon dioxide is a naturally occurring chemical compound and the primary greenhouse gas emitted through human activities.

CO₂e: Carbon-dioxide equivalent is the term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO₂e 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 CO₂.

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)

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 maintenance 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 CO₂e: Million tons of carbon dioxide equivalent is a common metric to measure the amount of CO₂ in the atmosphere.

NYP&A: 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

NY&ERDA: 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.



www.nypa.gov/buildsmartny/fivecities.html