

BuildSmartNY

Five Cities Energy Plans

Albany ■ Buffalo ■ Rochester ■ Syracuse ■ Yonkers

CITY OF BUFFALO



**NY Power
Authority**

Issued January 2015

Table of Contents

Introduction	2
Letter from Mayor	15
Overview	16
Energy Planning & Coordination	20
Energy Efficiency in Buildings	28
Transportation Efficiency	36
Energy Distribution & Supply	52
Moving Forward	58
Conclusion	60
Acknowledgements	62
Glossary	64
Acronyms	66

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.

A handwritten signature in black ink that reads "Gil C. Quiniones". The signature is fluid and cursive.

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

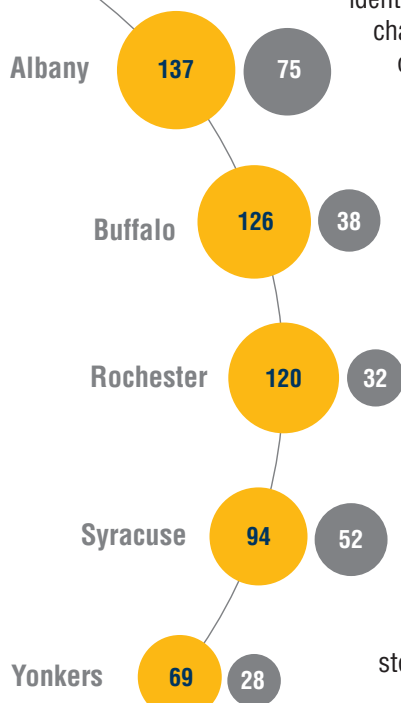


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Introduction

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 master planning process, adopting a grassroots approach that allowed each city to identify its energy priorities, address specific challenges and create a strategy that reflects its ongoing progress in energy planning.

The Five Cities thrived as centers of industry and commercial manufacturing in the early to mid 1900s. Early city planners established dense downtown centers and built the infrastructure and buildings necessary to support residents, workers and visitors. In the decades since, the highway system, suburbanization and the changing economy have changed the form and populations of these cities. While these cities seek to reinvent themselves, reactivate their urban cores, enhance open space and meet the needs of their residents, they face increasing challenges to maintain and modernize aging infrastructure and building stock, compete economically with surrounding

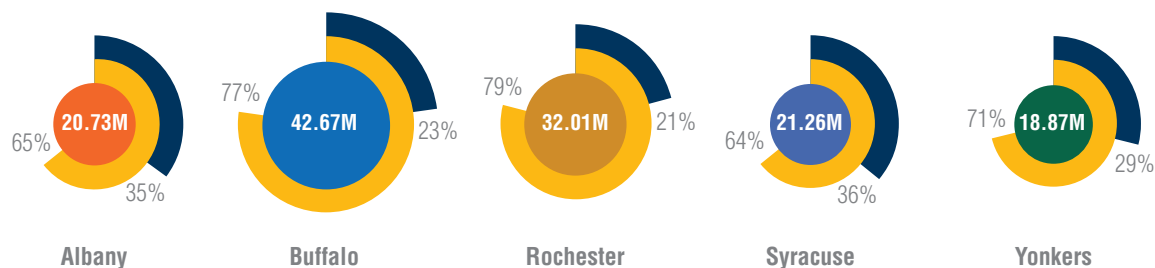
BuildSmartNY

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.

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

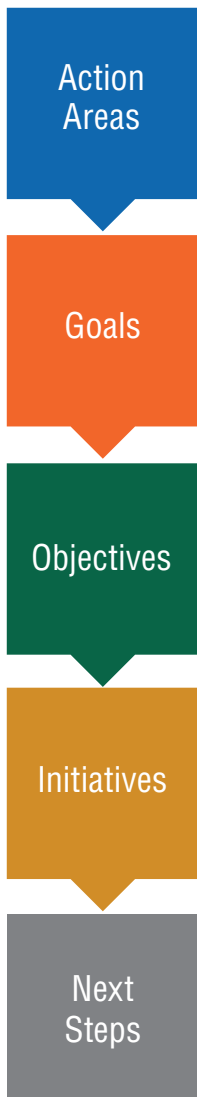
and economic development, reduce the cities' energy consumption and related expenses, contribute to a cleaner environment, and enhance quality of life within the cities. Building on each city's sustainability and economic development successes of the past decade, the plans will also guide municipal energy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



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



Economic development: creating jobs and attracting businesses

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



Infrastructure: preparing our cities for the future

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



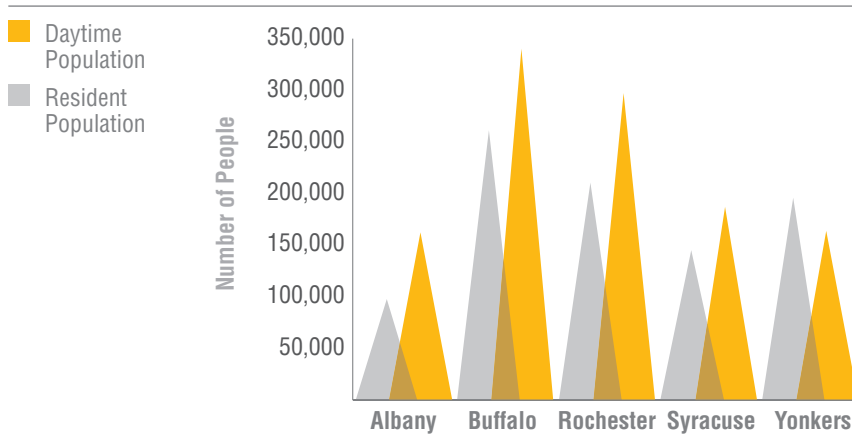
Climate action: reducing the city's carbon footprint

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

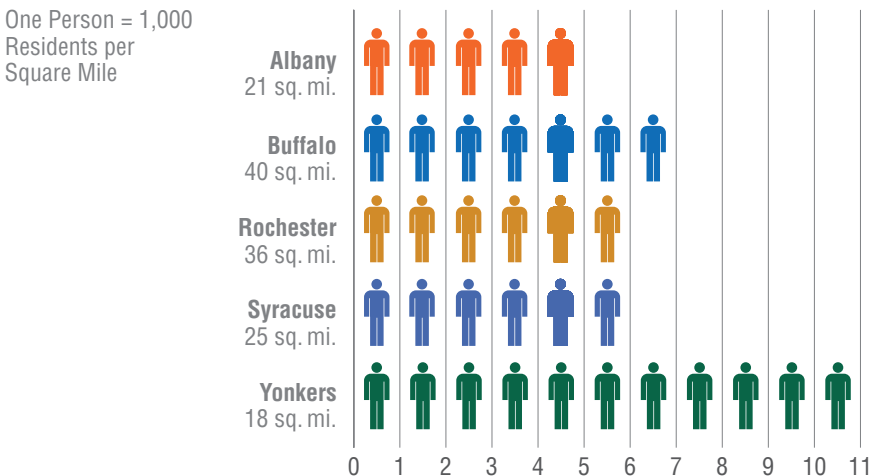
The Five Cities

Albany, Buffalo, Rochester, Syracuse, and Yonkers are the five largest cities in the state after New York City. Their combined populations would make them the 11th largest city in the country,

Population

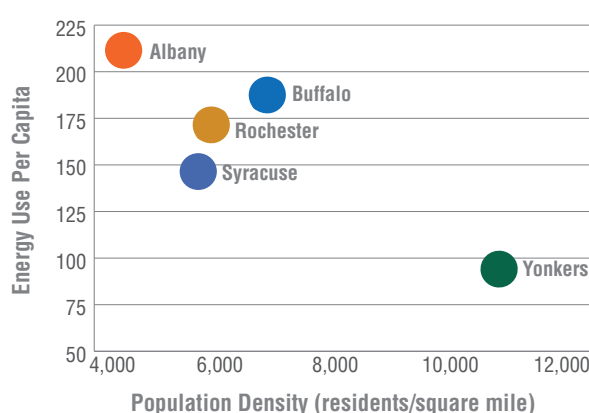


Density of City Residents



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

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.

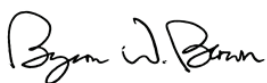
In partnership with the New York Power Authority (NYPA), we look forward to further developing Buffalo's Energy Plan through NYPA's Five Cities Energy Plans initiative, designed to create additional energy savings for public buildings and facilities in our city, while creating jobs and helping to generate 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 letters of the first and last names being capitalized and 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.

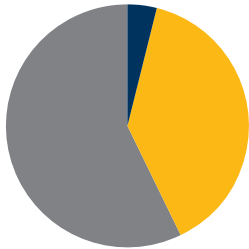
The Buffalo Energy Plan will serve as a framework for reducing energy demands, structured with flexibility to adapt over time as the priorities and needs of the city transform. Strategies

Action Areas

	Energy Planning & Coordination	20
	Energy Efficiency in Buildings	28
	Transportation Efficiency	36
	Energy Distribution & Supply	52

A bicyclist rides in Buffalo

Municipal Energy Consumption (mmBtu)

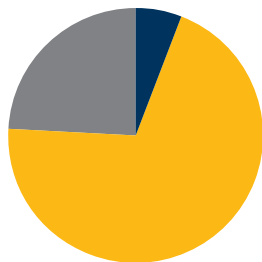


■ Fuel (4%)
■ Electric (39%)
■ Natural Gas (57%)

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

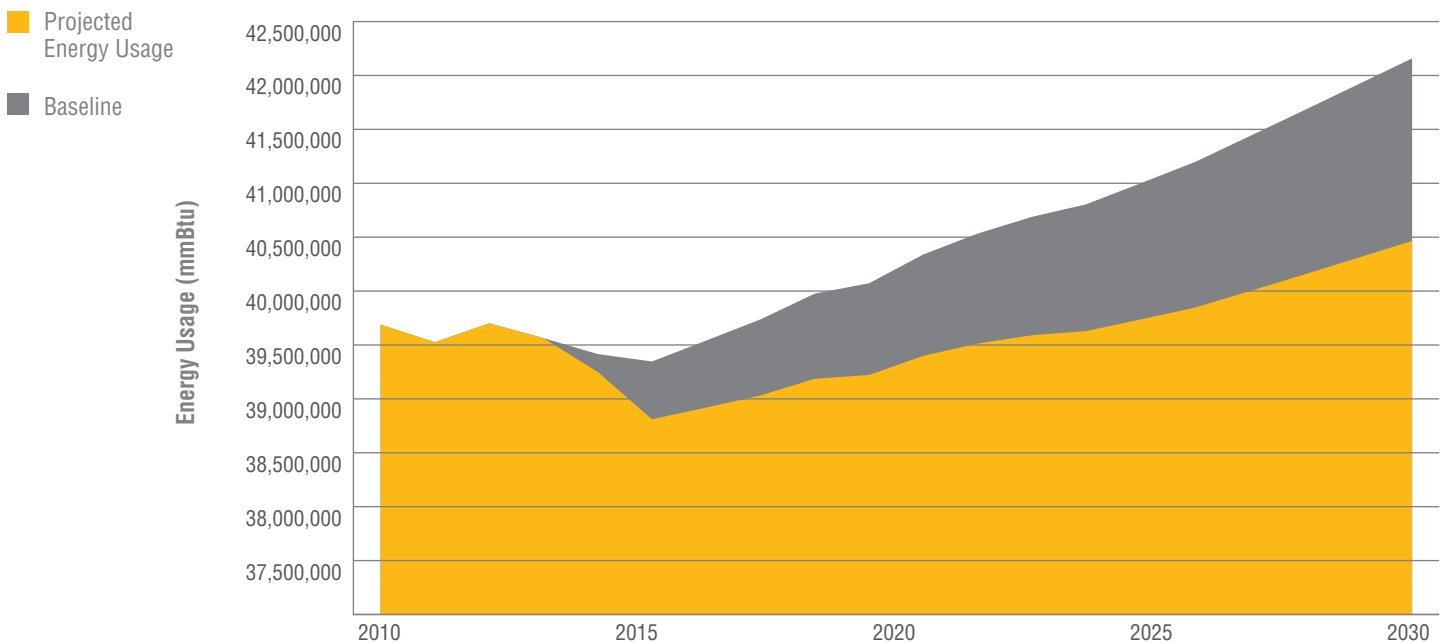


Figure 4

Energy Usage by Sector

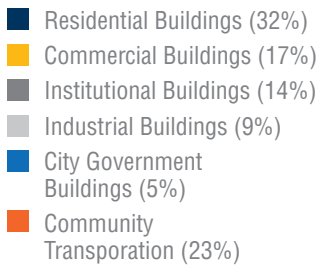


Figure 5

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.

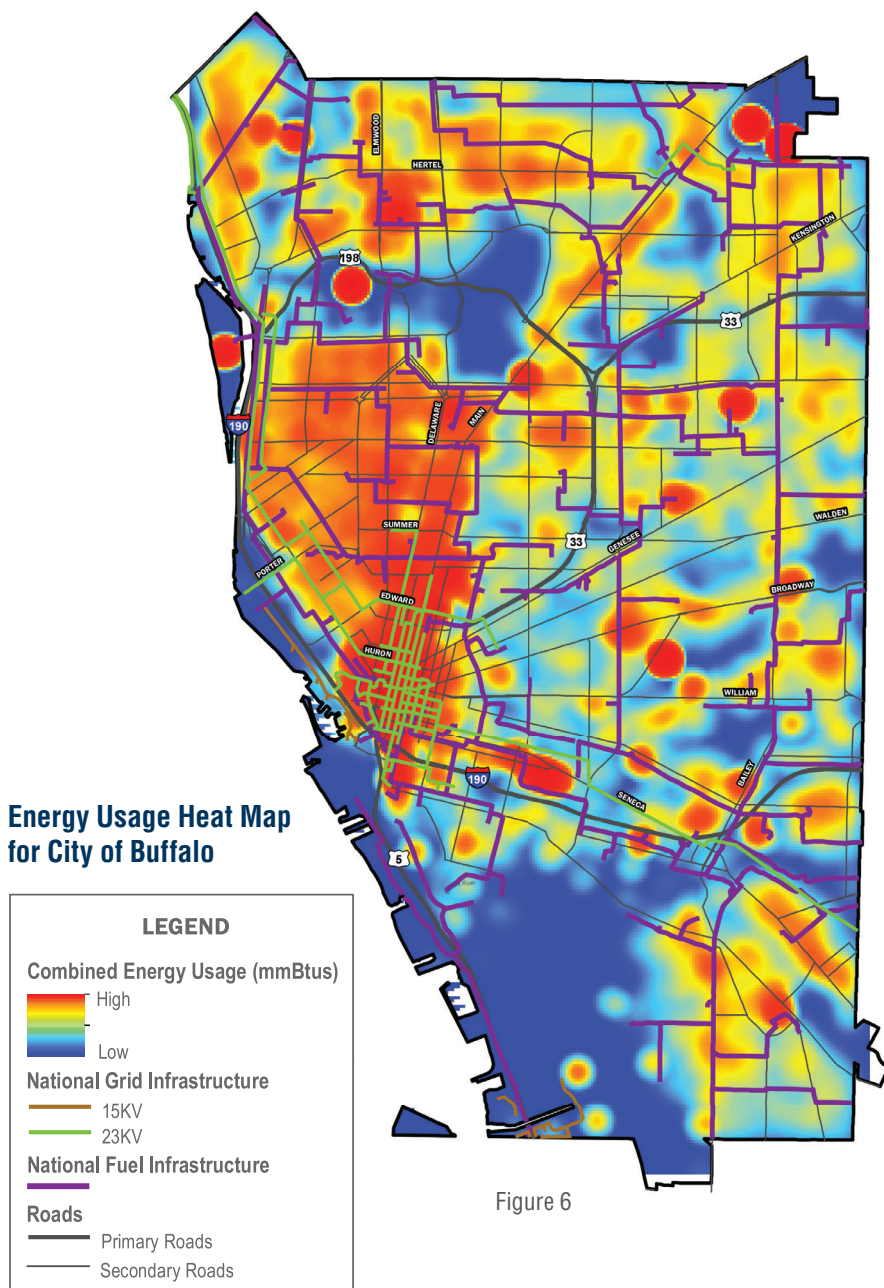


Figure 6



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,

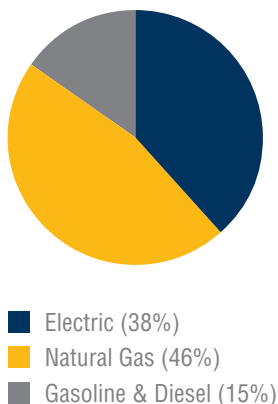
energy conservation and efficiency are usually not primary considerations in daily activities for residents and businesses or in municipal planning and operations. Therefore, Buffalo has identified initiatives and strategies that, if fully implemented, would integrate energy efficiency and conservation 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

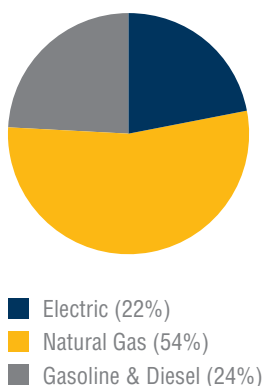
Municipal Energy Usage by Fuel Type



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

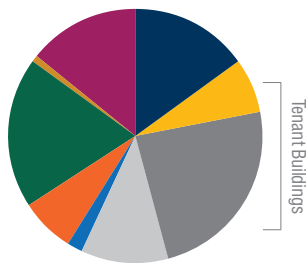


Buffalo is developing design standards for building renovations and new construction of City-owned buildings. The design standards are targeted primarily at reducing expenditures by establishing performance measures for building components including plumbing, HVAC and building envelope. The City will 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

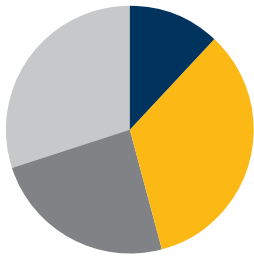
Retro-commissioning



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)

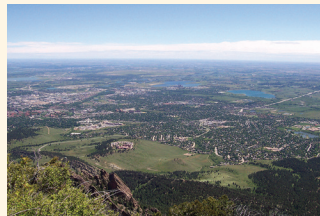
In 2009, the state passed the Property Assessed Clean Energy (PACE) legislation, which provides long-term, low-interest financing for renewable and energy efficiency projects. Loans are paid back on property tax bills and the energy savings from projects create a revenue stream to support the loan payments.

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	NYSEERDA, 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

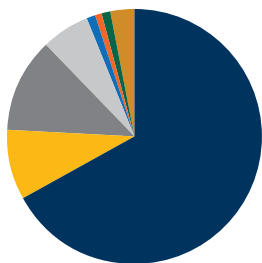
Buffalo's transportation network has a rich history founded upon Joseph Ellicott's radial street design that is traversed by the historic parkways and parks of Frederick Law Olmsted as it extends from the heart of downtown. This relationship creates the setting for a walkable city with tremendous opportunities. 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.

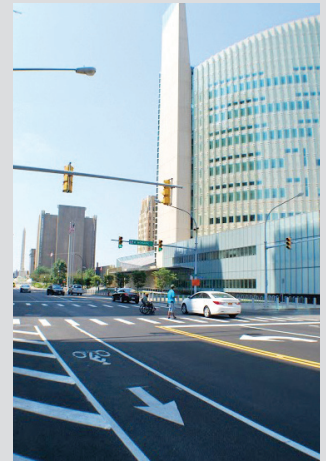


Transportation Efficiency

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

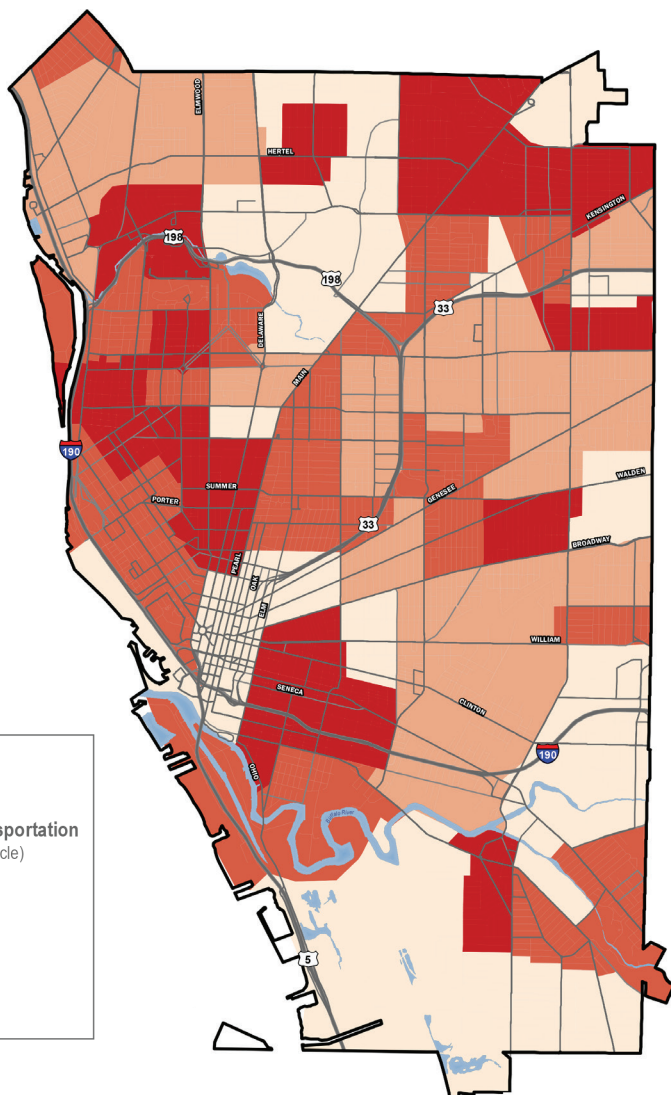
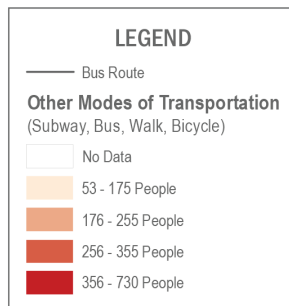


Figure 13

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

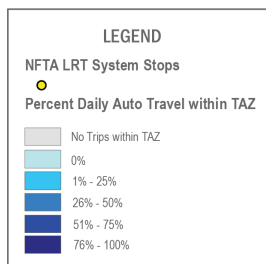


Figure 14

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

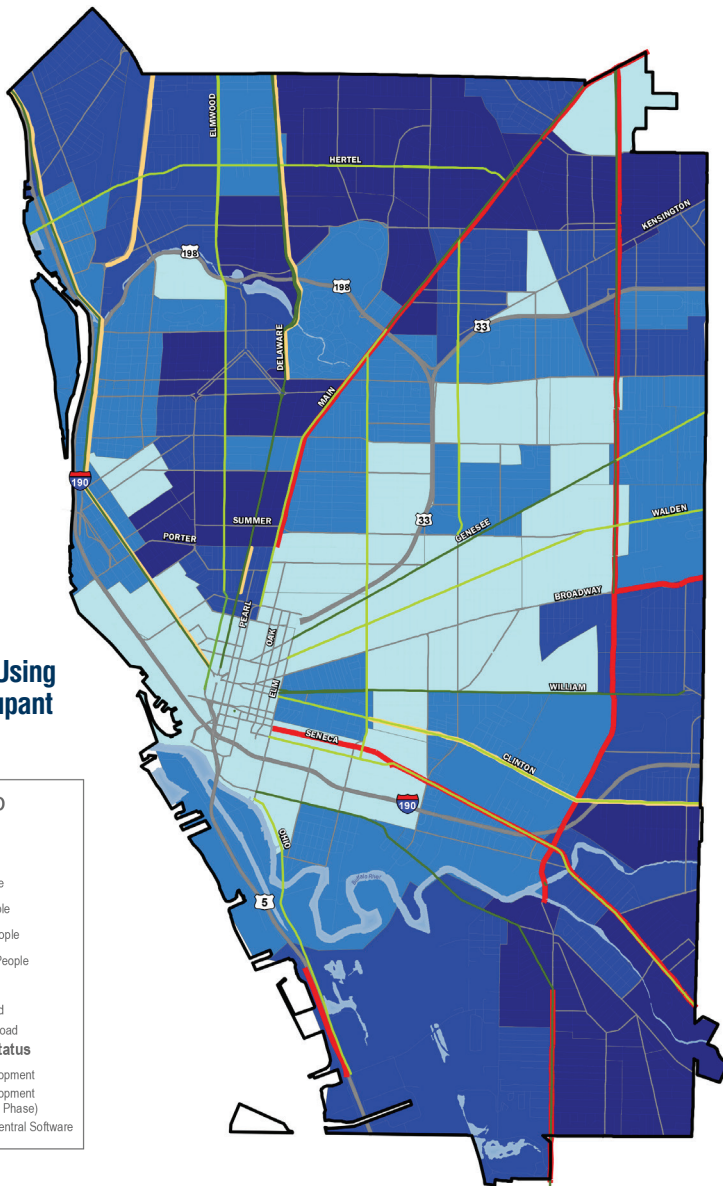
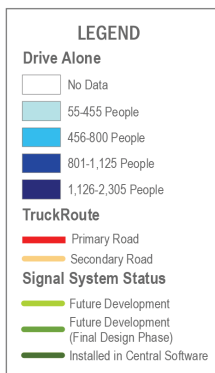


Figure 15

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.

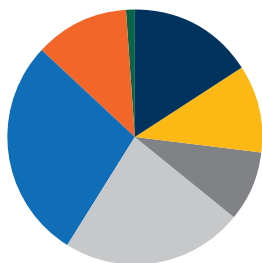
Initiative 9: Encourage City staff to walk or bike to meetings



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

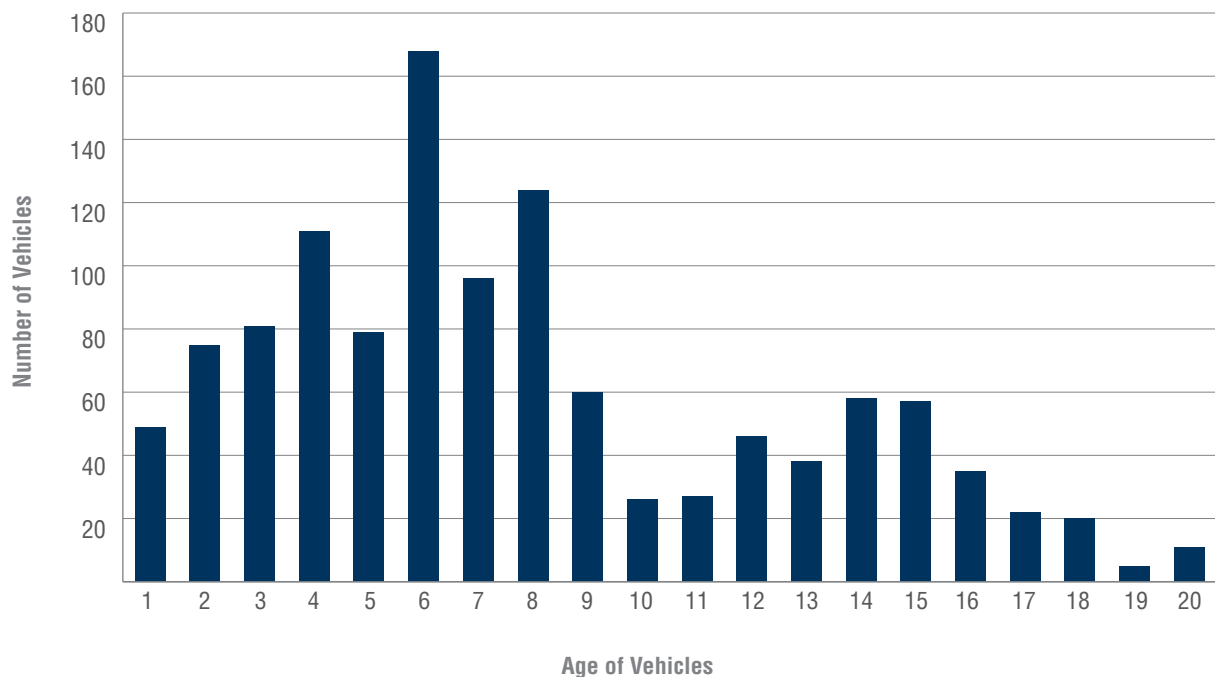


Figure 17

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

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

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

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.

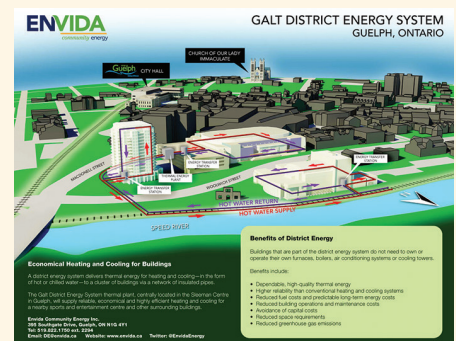
By adding users, and therefore expanding the demand for the system's heat, the heating system would be able to operate at a higher efficiency level, lowering the cost of the stadium's own

CASE STUDY

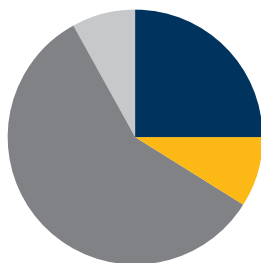
District Energy, Guelph, Ontario

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



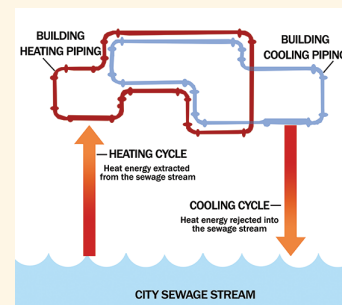
- Commercial (25%)
- Government (9%)
- Not for Profit (58%)
- Residential (8%)

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)

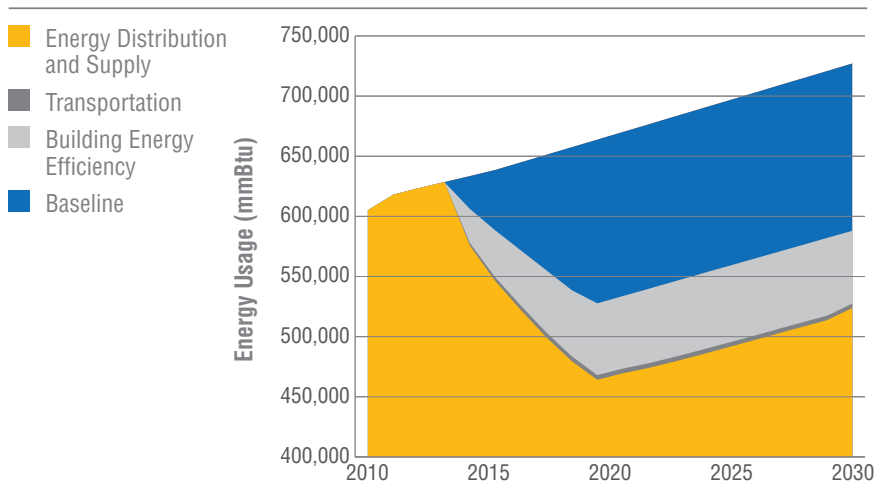


Figure 19

Community Baseline and Savings Projections (mmBtu)

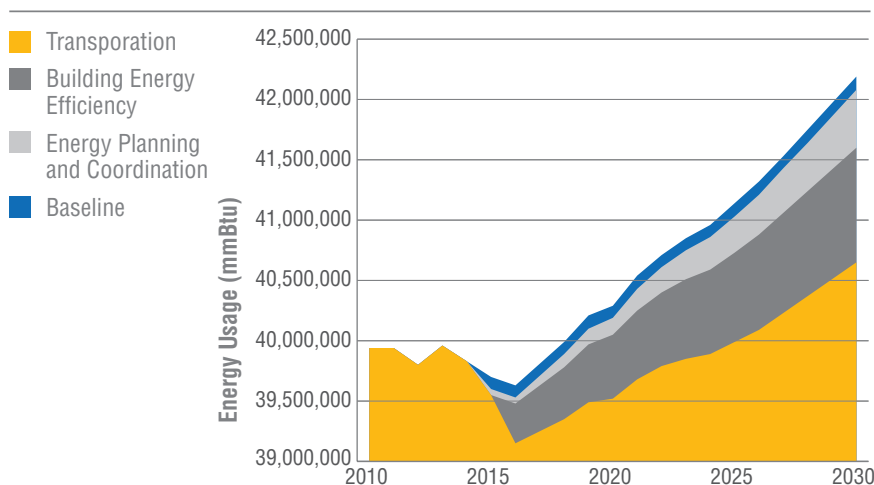


Figure 20

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.

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

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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 Engineers • CORE Environmental • Blue Springs Energy • Fisher Associates **Mayor** Special thanks to the Mayor's Office and Mayor Byron W. Brown **Other** Special thanks to our city representatives for all of their consistent dedication throughout the process: Julie Barrett-O'Neill • Brendan Mehaffy • Jason Shell • Steve Stepniak • Special thanks to the Buffalo & Erie County Historical Society for hosting the Buffalo stakeholder meeting

Rochester

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

Syracuse

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

Yonkers

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

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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.

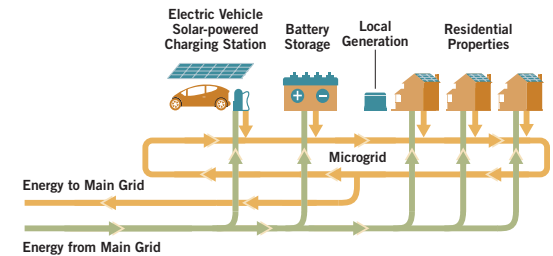
District energy: District energy systems produce steam, hot water or chilled water at a central plant, which is then piped underground to individual buildings for space heating, domestic hot water heating and air conditioning.

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