CITY of SCHENECTADY

2017 SMART CITY REPORT

Mayor Gary McCarthy

2017 Schenectady Smart City Report

2016 Review
2017 Goals

A SMART CITY VISION

Gary R. McCarthy – Mayor, City of Schenectady

As Mayor of Schenectady, a small city in Upstate New York, I know firsthand the challenges cities face in deploying new and necessary technology within budget constraints. In the world of fast paced, connected systems, small to medium size cities struggle to incorporate new technology and infrastructure for their citizens at a rate that can be sustained with informed, long term investment strategies.

Streamlining city processes and fostering city-wide collaboration can be an extremely complex process. Cities must also deal with increasing complexities: the need for efficiency standards across departments that utilize different data for decision making; resource demands of citizens, businesses, and city operations; the needs of businesses in order to attract new jobs in innovative fields; budgetary constraints that make purchasing of new technologies that could aid in solving city wide issues difficult. These are just a few variables that the City of Schenectady is working to address as we reach towards a replicable smart city model - a model in which cities our size can begin to tackle the challenges of incorporating intelligent city processes at a rate that offers return on investment necessary to make these initiatives a reality.

The City of Schenectady's roughly 66,000 residents rely on our interconnected ecosystem everyday to live, work, and thrive. We face many of the same challenges large cities do such as traffic management, resource constraints, safety and security concerns, and the need for continuing economic growth. Following the private sector's increasing focus on the IoT (Internet of Things) and the IoE (Internet of Everything), cities all around the globe are beginning to turn to new systems and applications that promise millions in savings or revenue, and improved livability of communities. Soon, the implementations these cities are making today will become a new standard for well performing cities tomorrow. Small to medium size cities need to find innovative ways to create real savings and benefits for their citizens while facing the daily budget and resource crunch. An environment rich in innovation and creativity is necessary to ensure a strong future for our urban centers: adapt or be left behind.

This is where Schenectady sees opportunity. Through the Schenectady Smart City Advisory Commission, local leaders from various fields in the private and public sectors have created a roadmap to help guide our decisions centered on 10 key pillars of smart city progress tailored to our local community. With these pillars in mind, we continue to incorporate smart city concepts into existing city functions in order to develop a continuously evolving project pipeline that we use to help determine where to invest our time and resources next.

Key themes to each of Schenectady's Smart City projects have been creating broad partnerships to ensure community engagement and success, data driven governance tied to proven return on investment, efficient use of resources, and willingness to try new ideas and share information to create synergy and develop new best practices. Embracing a culture of innovation in government has been difficult at times; however, we work diligently to expand upon our success by investing in multiple strategies that will establish a framework for future smart city models.

Very truly yours,

Gary R. McCarthy

Mark Little – Chair, Schenectady Smart City Advisory Commission

It is an exciting time in Schenectady, New York. Emerging smart city technologies have the potential to revolutionize the way Schenectady conducts its operations and the way it brings services to its citizens and visitors. We are becoming more aware of ways to gather and utilize complex data streams to make city operations more productive and the city environment more livable, workable, and sustainable.

Early applications of this technology have replaced traditional city street lights in multiple pilot areas in the downtown area with high-efficiency LED systems yielding significant, immediate energy savings. During this process, light poles have also been retrofitted with a variety of sensors that connect with each other through a mesh network and ultimately to the internet and cloud storage for processing. Wi-Fi and other telecommunication capabilities can also be added to provide citywide Internet access for residents at all income levels. Mayor Gary McCarthy has positioned Schenectady to lead in the application and development of smart technologies through these prototype systems while concurrently pursuing other sites for further development.

In coordination with city efforts, an innovation center is being developed in the heart of downtown to encourage inventors to participate, essentially turning Schenectady into a laboratory for innovators to develop applications for the City, the state, and the world. Our vision is to enhance life in Schenectady in many ways such as increasing internet access, creating more efficient systems for transportation and parking, enhancing public safety measures, creating more effective waste and water management operations, increasing energy efficiencies throughout city processes, fostering an environment for better health and human services and engaging citizens in ways previously not possible.

It will be exciting to watch the progress as Schenectady drives to become a smart city. We hope to learn from the experiences of others who have gone before and we are delighted to share our knowledge as we navigate through various milestones.

Thank you,

Mark Little

SCHENECTADY CITY COUNCIL

Leesa Perazzo, City Council President
Ed Kosiur
John Mootooveren
John Polimeni
Marion Porterfield
Vincent Riggi
Karen Zalewski-Wildzunas

The City Council is the law-making and governing body of the City. The Council appoints the City Clerk and certain Commission and Board members. It also determines policy, approves agreements, sets salaries, and approves contracts for goods and services. It adopts all legislation governing laws and procedures followed in the City.

There are 7 council members elected at-large to serve four-year terms (except in the case of vacancies). They serve on the City Council and Committees. The presiding officer of the City Council is the Council President, who is elected by the council members at the organizational meeting. The Committees of the Council and members are appointed by the Council President.

ADVISORY COMMISSION

Mark Little	Chair	
Kishor Bagul	Founder & CEO, Cloud and Things	
Antonio Civitella	CEO, Transfinder	
John DeAugustine	Publisher, Daily Gazette	
Philip Morris	CEO, Proctors	
Theresa Pardo	Director, Center for Technology in Government - University at Albany	
Laurence Spring	Superintendent, Schenectady City School District	
Thomas Wilson	Principal, TW&A Construction Management	

The goal of the Schenectady Smart City Advisory Commission (SSCAC) is to help build an environment of sustainability, efficiency, and improved quality of life by leveraging technology and innovation for the betterment of residents and businesses in Schenectady. To accomplish this task, the SSCAC has constructed a roadmap that will help guide their recommendations to the City. This comprehensive roadmap pillars around a few main points; delivering efficient and accessible government services, leveraging predictive analytics to inform decision and policy creation to create a safer Schenectady that provides easy access to all essentials needed to live, and committing to green and sustainable design principles.

DEPARTMENTAL COLLABORATION

Mayor Gary McCarthy

David Fronk	Director of Operations
Wayne Bennett	Commissioner of Public Safety
Michael Cerrone	Streets Department Manager
Arthur Clay	Streets Department Supervisor
Eric Clifford	Police Chief
John Coluccio	Signal Superintendent
Carl Falotico	Corporation Counsel
Anthony Ferrari	Commissioner of Finance & Administration
Jeremy Howard	Director of Parks and Property Management
Paul LaFond	Commissioner of General Services
Molly MacElroy	City Assessor
Richard McIlravy-Ackert	Purchasing Supervisor
Ray Senecal	Fire Chief
Eric Shannon	Innovation and Performance Specialist
Floyd Slater	Director of Solid Waste
Chuck Thorne	City Clerk
Joe Troiano	Fleet Manager
Chris Wallin	City Engineer
Ed Waterfield	Receipts Supervisor
Tiffany White	Personnel & Benefits Administrator

SMART CITY COMMUNITY

By engaging in many different smart city projects, we have built upon more than fifty partnerships with private companies, educational institutions, non-profits, and other governments and governmental agencies. In response to our efforts, we have been invited to speak at numerous regional and national events, designated for two awards, and invited to publish three articles on our Smart City efforts. This growing community of stakeholders encourages and fosters an environment rich in innovation and creativity and is a key part in reaching the full potential of our initiatives.

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INTRODUCTION

The broad concept of Smart Cities is centered on sustainability, efficiency, and improved quality of life by utilizing new technology and innovative methods of problem solving. It focuses on finding solutions to typical problems through a new lens by understanding that the future of local government's role in its community heavily relies on the increased use of proactive methods of community engagement. From our Assessment Department to our Water and Sewer Department and everything in between, advancements in technology are continually re-shaping our ability to increase efficiencies. In order to keep these advancements at the fore-front of our planning efforts, we have created this document as a framework to help start our journey of putting systems in place to effectively introduce technological advancements. Our ultimate goal: to aid in long term, sustainable planning that produces quantifiable and meaningful results for our City staff and the citizens they serve.

The road to utilizing Smart City concepts has been in the making for longer than we typically think. From the first time cities started using what are now legacy systems, we introduced a new way of thinking that spread throughout the daily operations of local government. The way we have utilized data and the meaning it's held has changed throughout the years shaping our world into the complexity of systems we see today. However, when local governments increase transparency and work with their community members and private sector partners, we begin to discover how new technological advancements reduce this complexity into something more manageable. From more effective excel worksheets to big data analytics, there are many ways that efficiencies present themselves.

Throughout recent years, the City of Schenectady has seen dramatic positive change in operations, community engagement and its ability to continue to grow in stagnant economic times. It is not always easy to see, but embracing a culture of innovation has paid off many times and has moved us forward by great leaps. Schenectady's Smart City projects have created broad partnerships ensuring community success, data driven governance methods to prove return on investments, and most importantly, the willingness to try new ideas and share information to create synergy through developing new best practices. The revitalization of the downtown area, the development of the brown-fields at Mohawk Harbor, the adoption of clean energy policies that affect the health of our entire city and the collaboration and momentum we've gained from being faced with tighter budgets are only a few examples of the foundation that we have set up for ourselves to move toward a brighter future for our City.

In 2016, we undertook several new smart city projects that built off of this foundation. One example is the launch of our new website with a host of capabilities for residents and city staff to find and use various resources and information. In coordination with this new website, we also launched our new Citizen Request Tracker web application which allows residents from their phones, computers or tablets to report issues or request City services. This application opens up another avenue of communicating to our citizens and allows City staff to use data directly from the public to improve response time. In 2017, we are looking to add more services to our website such as reminders for important dates and online submission of forms and reservations.

Another example is our recent strides in promoting sustainable energy sources and the increasing use of those sources for City operations. Through the adoption of Property Assessed Clean Energy Financing (PACE), we have joined a state-wide network of community members in an effort to prove there are affordable ways to bring renewable energy systems to business owners in our community. Through the installation of our 711 kW solar array at Bevis Hill, we saw an immediate reduction in City energy costs by roughly $50,000. This is in addition to the reduction in energy costs totaling nearly $350,000 a year (approximate reduction of 1,883,000 pounds of CO_2 per year) at our waste water treatment plant from the installation of a combined heat and power cogeneration system.

In conclusion, developing an all encompassing Smart City plan is a difficult process and we are faced with many undefined challenges that are part of a complex system of continuously moving parts. Not only is it difficult to identify variables to track our progress, but it is also difficult to have the time and resources to identify and explain what those variables mean and how they fit into the bigger picture. However, we strive to effectively communicate our challenges and proposed solutions in an effort to build upon that foundation we have. This structure is inevitably becoming stronger, and with the help of our department heads, city staff, consultants, volunteers and citizens, we continue to pour the concrete of our Smart City foundation until the full potential of our combined knowledge is realized. It is only then, that Smart City initiatives will reach their greatest potential; there is no greater power in our local government than effective communication and the fluid transfer of information throughout departments.

This document is a tool to help guide our understanding of what "Smart Cities" means on a departmental level as well as a document for the public to understand what projects we are working on. In an ultimate effort of transparency and public sector progress, we open up our daily processes to the greatest of our abilities to each other and to the public. This effort, although sometimes difficult, is vital for Schenectady to transition into a resilient, strong and truly connected social space for all.

COMPREHENSIVE APPROACH

Many parts are at play when considering how to measure progress in terms of Smart City initiatives. Variables such as public engagement, citizen safety, and fiscal responsibility are only a few of the things we need to take into consideration. Finding ways to quantify these variables and realize their full potential is our ultimate goal. We understand it may not be feasible to strive for a City where everything goes exactly as planned, but the closer we get to this ideal situation, the greater quality of living we all see as a direct result.

Figure 1 demonstrates some of the variables we have currently identified that play a role in developing our Smart City initiatives and help construct a comprehensive, city-wide plan moving forward. These variables play fundamental roles that help to address the core responsibilities and goals of local government to better understand the direction and vision of projects we undertake.

Smart City projects are ways in which we bring data and knowledge together to create more efficient processes, be it in areas of sustainability, asset management, preventative maintenance measures or integrating new systems on top of legacy platforms. They are projects that help gather the seemingly infinite amount of variables that a City has to work to control on a daily basis and turn them into something that can be proactively managed. Understanding how all the parts fit together and developing standards of how we measure our progress are two crucial aspects of these projects.

Figure 1 – The funnel of variables that identify crucial aspects for smart city progress is a collection of the various purposes local government serves in its communities. Identifying ways to make these aspects of daily life proactively manageable is a main goal in our smart city projects.
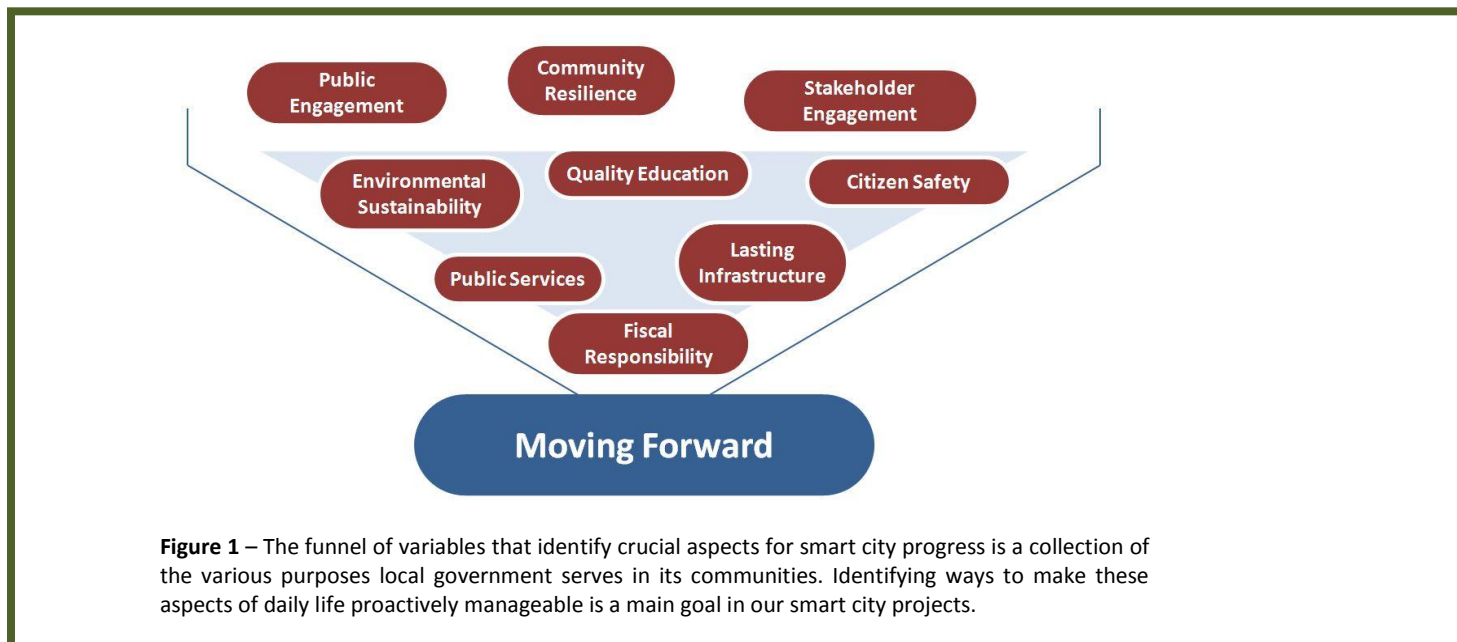
Measuring Progress

Schenectady Smart City Advisory Commission Roadmap

There are many ways the City of Schenectady plans to measure its success of Smart City initiatives. One way is through the use of what the Advisory Commission has termed our living roadmap that will correlate to the current needs of the community. In early 2016, the following 10 goals were recommended by the Advisory Commission to provide a framework for decision making throughout the evolution of various Smart City projects. As we begin our transition into increasingly interdepartmental collaborations, we keep these goals in mind.

1. *Deliver Efficient and Accessible Government Services*
   A Smarter Schenectady identifies what its citizens need and then creates effective and efficient ways to deliver those services, breaking down silos and giving citizens opportunity for involvement and engagement.

2. *Leverage Predictive Analytics to Inform Decision and Policy Making*
   A Smarter Schenectady has mechanisms, talent, and resources in place to collect, manage, use, and share data to inform city operations, strategic initiatives and public policy.

3. *Put Safety Above All Else*
   A Smarter Schenectady is one where the safety of all citizens is essential and paramount to ensuring livability and economic growth.

4. *Be a Leader*
   A Smarter Schenectady takes a stand as a leading city by proactively identifying strengths, areas of opportunity and aspiration and sets forth a plan for outreach and continuous improvement.

5. *Provide Easy Access to All Essentials Needed to Live*
   A Smarter Schenectady understands the needs of its citizens and employs design principles to create a city where people want to live and work.

6. *Ensure Connectivity For All*
   A Smarter Schenectady is a place where a gig speed connectivity is a given, and at a low cost for all citizens and businesses.

7. *Pursue a Coherent Social Responsibility Agenda*
   A Smarter Schenectady recognizes that a cohesive, local effort focused on socially responsible actions brings myriad benefits, health and growth to the City.

8. *Increase Revenue*

A Smarter Schenectady understands and focuses on strategic actions to increase revenue to the City in order to support the needed operations and services**.**

9. *Commit to Green and Sustainable Design Principles*

A Smarter Schenectady understands that new advances in technology are creating more environmentally and fiscally sound utilities. In incorporating these design principles, the City will realize tremendous benefits in protecting the environment and cost savings.

10. *Engage with Stakeholders in Substantive and Consistent Ways*

A Smarter Schenectady understands that continual dialogue and feedback with all individuals and organizations within the City is a necessary and critical element.

Roadmap Focus

In order to best understand how each of our Smart City initiatives stand up against these goals, we include a roadmap focus chart, which demonstrates how many goals are being focused on throughout the course of the project. The below examples illustrate how the roadmap focus section can be interpreted. In example "A", all circles with colors correlating to the above 10 roadmap goals have been filled in indicating that project "A" goals focus on all roadmap targets. In example "B", roadmap goals 3, 6, 7, 8 and 10 have been filled in indicating the corresponding targets of project "B". It is important to note that the number of goals a project focuses on does not necessarily correlate with the project's value; it simply identifies which roadmap goals the project is focused on.

Project Status

It is also important to understand the current state a project is in. We have ranked projects in the following way:

Stage 1: The project is currently in a *planning phase* which may include tasks such as forming partnerships, identifying key goals of the project or performing preliminary work as required.

Stage 2: The project is currently in an *execution phase* which may include tasks such as carrying out pre-identified phases of a project, overcoming unforeseen hurdles or required planning.

Stage 3: The project is in a *completion phase* which may include tasks such as monitoring performance, gathering post-project data or submitting documentation to required parties.

Figure 2 – A cycle similar to the above can be used to form a cyclical review process in which initial goals can be compared to current progress.

Figure 3 – *Smart City Readiness Wheel* - A visual representation of city-wide Smart City progress constructed from a recent grant application to the Smart Cities Council.

Systematic Evaluation

During the process of implementing new structures surrounding departmental operations, it is important to track progress in a way that measures success against initial goals and visions. Utilizing a framework much like that drawn out in Figure 2, the City will conduct quarterly reviews to determine what stage smart city initiatives are in compared to their life cycle goals. This framework includes constructive feedback loops in city projects taking into consideration unforeseen obstacles and allows for pivoting if needed.

Establishing Universal Targets

Utilizing various reporting methods from recent grant applications and city projects, we have begun to form new visuals that help us identify where our strengths and weaknesses are in terms of full scale Smart City plans. Figure 3 was one of these visuals formed through universal targets indicated by the Smart Cities Council Grant Challenge. It demonstrates the current readiness of the City by rating Universal Target Areas by "Just Starting", "Partially Completed", "Over 50 Percent Completed" and "Completed" (from the inner most part of the circle outward, respectively). This figure splits Smart City Universal Target Areas into seven subdivisions (Security and Privacy, Instrumentation, Connectivity, Computing Resources, Analytics, Data Management and Interoperability) and takes into consideration variables such as publishing privacy rules, implementation progress of optimal city instrumentation, consideration of cloud computing frameworks, understanding current situational awareness, asset optimization, data policies, and progress for prioritizing the use of legacy systems.
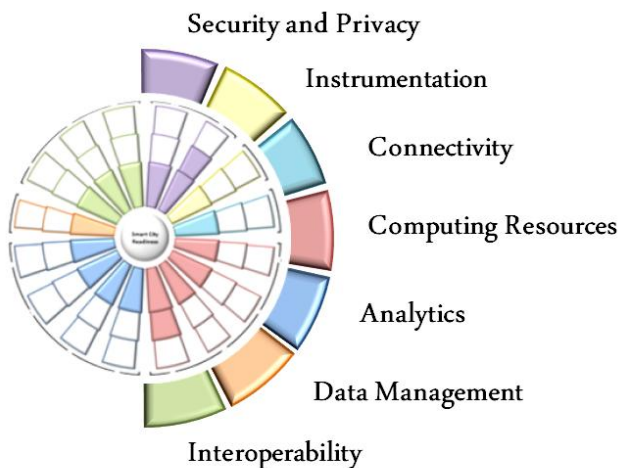
HIGHLIGHT PROJECTS

Schenectady has implemented a variety of solutions to streamline processes and enable city-wide collaboration. One of our major smart city initiatives of 2016 was outfitting downtown light posts with upgraded, HID efficient lighting along with cameras that connect to a single live video feed. With the recent economic development we see surrounding downtown and the new Rivers Casino Resort, it is important for local police officers to be better informed and have access to information in real time to collaborate in a manner made possible by fully utilizing new technology. However, smart lighting is only one area of major recent efforts, as can be seen by the projects in this section.
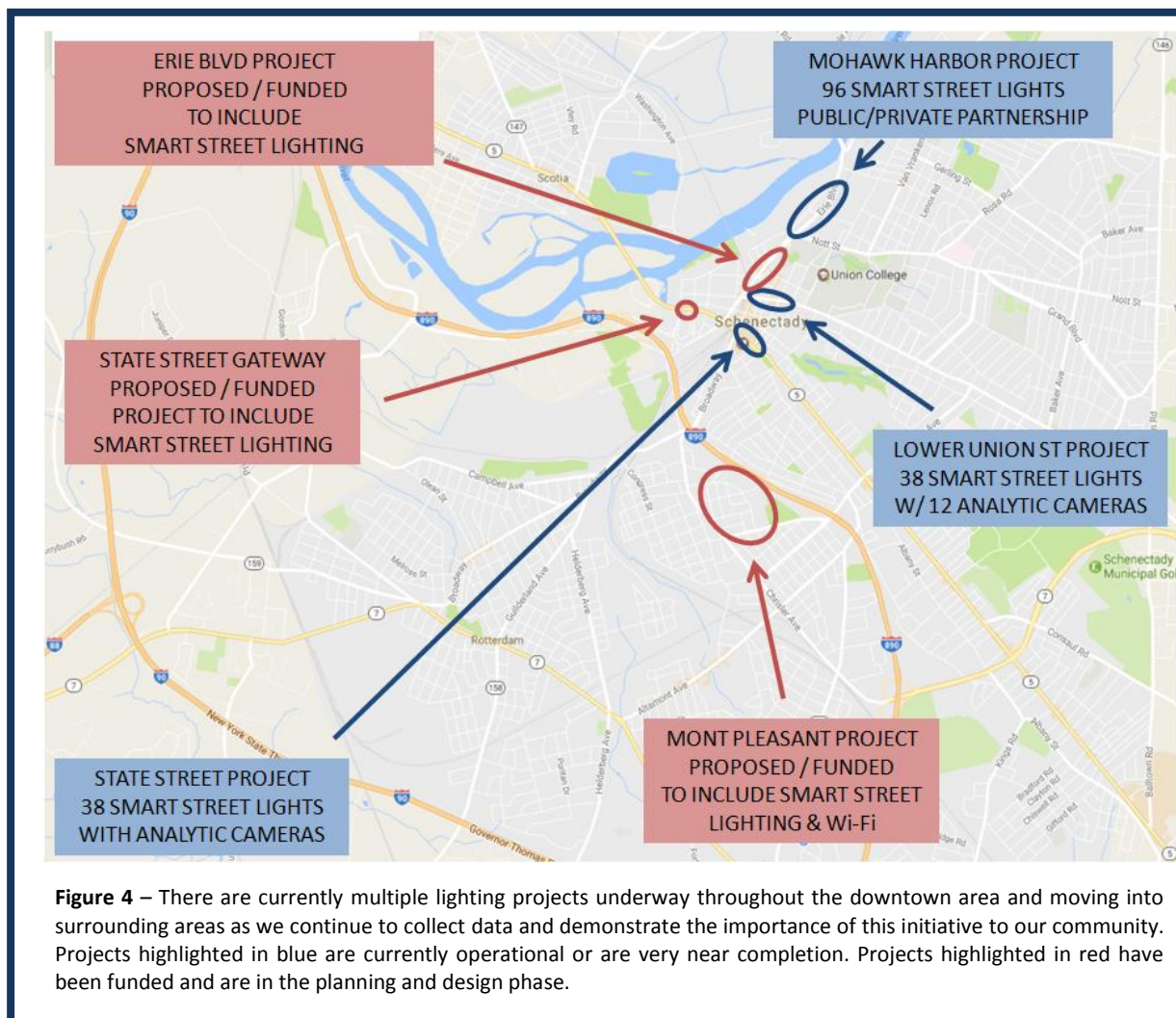
Figure 4 – There are currently multiple lighting projects underway throughout the downtown area and moving into surrounding areas as we continue to collect data and demonstrate the importance of this initiative to our community. Projects highlighted in blue are currently operational or are very near completion. Projects highlighted in red have been funded and are in the planning and design phase.

Union Street Smart Lighting Pilot

Project Lead: City of Schenectady
Partnerships: Private and Public

Roadmap Focus: 8/10 ●●○○○●○●●●
Project Status:

This project includes the replacement of current HID lighting in the Lower Union Street area with Smart LED lighting technology, video technology, sensor placement and Wi-Fi deployment. With a total of 38 lighting fixtures replaced and 12 video cameras equipped with analytic capability, this pilot project allows the City to start collecting and researching data to further prove the benefits of a City-wide street lighting and infrastructure re-haul. Using data collected from this pilot, we have determined the City can save over $370,000 in energy costs per year solely from lighting upgrades.

State Street Smart Lighting Pilot

Project Lead: City of Schenectady
Partnerships: Public

Roadmap Focus: 8/10 ●●○○●○●●●
Project Status:

This project includes the replacement of 36 current HID lighting fixtures in the Downtown State Street area with Smart LED lighting technology, video technology, sensor placement and potential future Wi-Fi deployment. There will be a total of 14 lighting fixtures converted to intelligent node structures with integral camera systems utilizing similar analytic capability present on the Lower Union Street smart lights. The remaining fixtures will be "lightgrid" nodes that incorporate technology which will monitor energy usage and control of lights.

Mont Pleasant Smart Lighting Pilot

PRESIDIO.

Project Lead: City of Schenectady
Partnerships: Private and Public

Roadmap Focus: 10/10 ●●●●●●●●●●
Project Status:

In coordination with a $1 million New York State Capital Project Award, the City of Schenectady will be installing its largest smart lighting layout to date. This project utilizes the same technology implemented on Lower Union Street, along with additional wireless capabilities for the Mont Pleasant area. This will support a neighborhood business corridor on Crane Street, improve public safety, enhance a major park development program in Orchard Park and will support school and youth programming at Pleasant Valley Elementary, Mont Pleasant Middle School and the new Boys and Girls Club.

Mohawk Harbor Smart Lighting Deployment

CISCO
PRESIDIO.

Project Lead: Galesi Group
Partnerships: Private and Public

Roadmap Focus: 8/10 ●●●○○●○●●●
Project Status:

Coordinating with the Galesi Group as part of the Rivers Casino & Resort Development Project, the City of Schenectady is working to expand smart lighting projects into new economic revitalization projects such as the Mohawk Harbor site. These smart lights will include much of the same technology seen on other smart lighting projects including adaptive LED lighting and sensor placement along with future potential of video nodes and Wi-Fi capabilities.

The Electric Vehicle City

Project Lead: City of Schenectady
Partnerships: Private and Public

Roadmap Focus: 6/10
Project Status:

Leveraging existing City vehicle funds and a state grant through the New York State Energy Research and Development Authority (NYSERDA), the City will be purchasing 6 new Partial Hybrid Electric Vehicles (PHEVs) along with corresponding Electric Vehicle Supply Equipment (EVSE). The City will also be installing 4 public facing EVSE in locations throughout the designated "EV Destination" to increase the public's accessibility to charging stations. Finally, the City will take part in various stakeholder and public meetings to educate the local public on the benefits of such technology and how it helps reduce the dependency on traditional sources of energy.

Sustainable Schenectady

Project Lead: City of Schenectady
Partnerships: Private and Public

Roadmap Focus: 5/10
Project Status:

Local governments in New York State can use the Clean Energy Communities program to implement clean energy actions, save energy costs, create jobs, and improve the environment. In addition to providing tools, resources, and technical assistance, the program recognizes and rewards leadership for the completion of clean energy projects. - *NYSERDA CEC Home Page*

The City of Schenectady is currently working towards earning a Clean Energy Community designation and has three out of five steps completed as of October of 2016.

MicroGrid Project

Project Lead: Proctors
Partnerships: Private and Public

Roadmap Focus: 7/10 ○●●●●○●●●○
Project Status:

Through the resilient Schenectady microgrid project, Proctors will install natural gas and solar generation and construct direct electrical connections to Center City and its multiple thermal customers. The microgrid will provide daily electric, heating and cooling for participating facilities, utilizing co-generation technology to create a uniquely efficient system. In the event of a power outage to the existing network, the microgrid ensures these facilities will not lose electric service which will allow them to serve as centers of refuge in emergencies. This effort will increase neighborhood resilience and safety, decrease costs for dozens of businesses and organizations served by the system and will provide economic development strategies centered on reliable and sustainable energy.

Schenectady Innovation Hub

Project Lead: Electric City Innovation Center
Partnerships: Private and Public

Roadmap Focus: 3/10 ○○○●○○○●○●
Project Status:

Wise Labs, in coordination with the Electric City Innovation Center (ECIC), offers a unique environment that links a community of world-class scientists and engineers with a passion for inventing new things and solving tough challenges to entrepreneurs and new businesses in the area. In their effort to help foster the growing ecosystem of innovation, Wise Labs and ECIC have partnered with the City of Schenectady to continue the revitalization of the downtown area and attract new businesses to Schenectady.

Routing and Fleet Management

Project Lead: City of Schenectady
Partnerships: Private and Public

Roadmap Focus: 7/10 ●●●●●○○○●○
Project Status:

Following the adoption of the 2015 Budget, the City Administration began the process of researching various options to utilize GPS tracking and fleet management software. The proposed solution involved software and routing analytics from Transfinder as well as a GPS tracking system and preventative maintenance analytics from Zonar. The resulting project utilizes electronic record keeping for City vehicle maintenance and status updates, real time diagnostic information and intelligent and responsive routing. When used together, these tools have allowed the City to form a baseline to cut future costs of fuel use, vehicle maintenance expenditures and unneccessary miles driven.

Citizen Request Tracker

Project Lead: City of Schenectady
Partnerships: Private and Public

Roadmap Focus: 7/10 ●●●○○●○●●○
Project Status:

Building upon the City's existing citizen reporting platform through CivicPlus, the City has partnered with volunteers from General Electric and Union College to create our own version of a 311 program. Our current platform allows individuals to communicate with City officials to report issues within their community through our website, however more sophisticated software will be developed in the next generation to expand viability and usability. This will work towards closing the communication gap between citizens and getting the necessary services they need.

CITY-WIDE SMART CITY PROJECTS

Creating systems to categorize and identify niche areas of Smart City projects is a unique process for all cities, regardless of geographical size, population or other defining factors. It involves the identification of tailored goals, targets and variables that need to be tracked and maintained throughout the course of a project's continuously evolving lifespan. Figure 6 demonstrates the niche areas the City has focused on in terms of how to relay information interdepartmentally. We refer to these areas as "divisions" which encompass all of the City's departments and functions within 12 categories. This not only helps identify which areas of Smart City Initiatives are at the core of our Smart City vision, it also takes focus away from compartmentalizing projects into "departments" helping to break down any potential silos that may exist in our existing organizational structure.

Identifying ways to overlap data from these divisions and utilize them in coordination with each other into meaningful and useful ways will prove to be a very important task for the success of all Smart City Initiatives. Using 2016 and 2017 as baseline years, our goal is to construct a dashboard platform taking into consideration all currently accessible data from these divisions. We will then develop systems in which we can compare key indicators from each division. The result will be a connected set of variables that portray up to date indicators of our City's inputs and outputs and how they are all interconnected. Throughout this section, we discuss some of those variables that have been identified by describing the projects they are a part of.
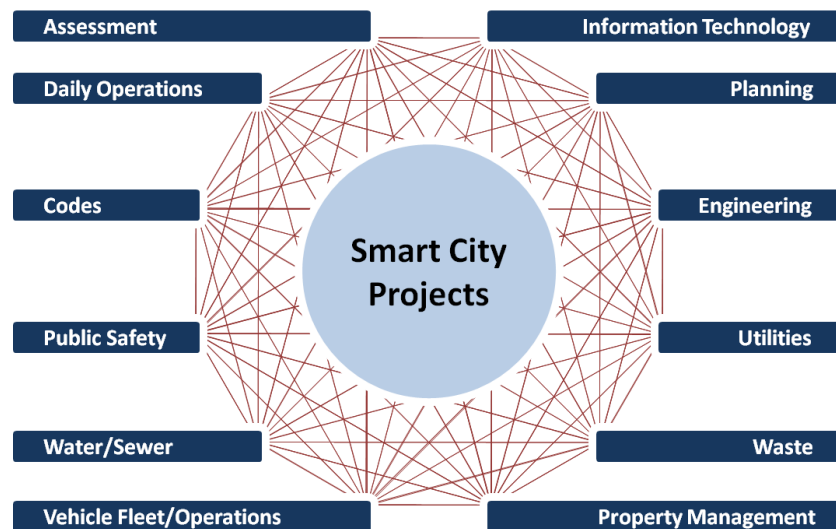

Figure 5 – Smart City Initiatives are unique to each city pursuing them. In our case, we have selected key aspects of our city's operations to divide our initiatives into 12 divisions. Each division is comprised of one or more City Departments. The greater we understand how these divisions communicate with each other, the more coherent our overall Smart City visions will become.

Assessment

The Bureau of Assessment is responsible for assessing real property in the City of Schenectady, maintaining assessments, property inventory records, ownership interest and administering real property tax exemptions to any eligible individuals or organizations. The annual assessment rolls published on May 1 (tentative) and July 1 (final) contain the roughly 20,400 parcels that are located within the City of Schenectady. Smart City Initiatives in this division focus on processes that increase communication efficiencies allowing multiple departments to better utilize data that Assessment gathers on a regular basis.
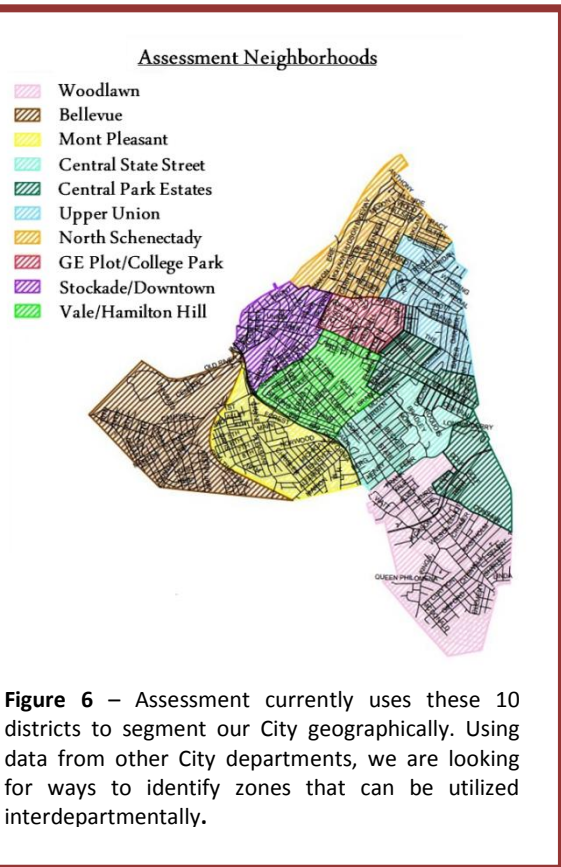
Developing Indicators & Districts

Although some processes that Assessment works with are hard to fully digitize because of state requirements, it is possible to use what data we have to track trends in our property stock. Utilizing current geographical districts shown in Figure 6, Assessment is collaborating with other departments to identify possible overlaps in City district designations. Understanding what data is available to us and how it correlates to other operations and events is extremely useful in making city-wide decisions; however, working towards districts that are universal throughout departments can help identify underlying issues that were previously not visible. Looking at variables such as quarterly private property sales for example, we would be able to identify large shifts in sales from one district to another or even identify drops or increases in the prices of properties sold to see if those changes correlated with other city-wide indicators.

Figure 6 – Assessment currently uses these 10 districts to segment our City geographically. Using data from other City departments, we are looking for ways to identify zones that can be utilized interdepartmentally**.**

2017	Q1	Q2	Q3	Q4
Targets	Determine necessary indicators to measure in collaboration with other departments	Confirm data is available, accessible and quantifiable in the Real Property Systems (RPS)	Create a file in RPS which allows us to pull a report displaying data that represents indicators selected	Organize data into excel file and analyze for yearly report

City of Schenectady Private Sales (Q1 – Q4, 2016)

Total Property Sales

Properties Sold per Quarter by District
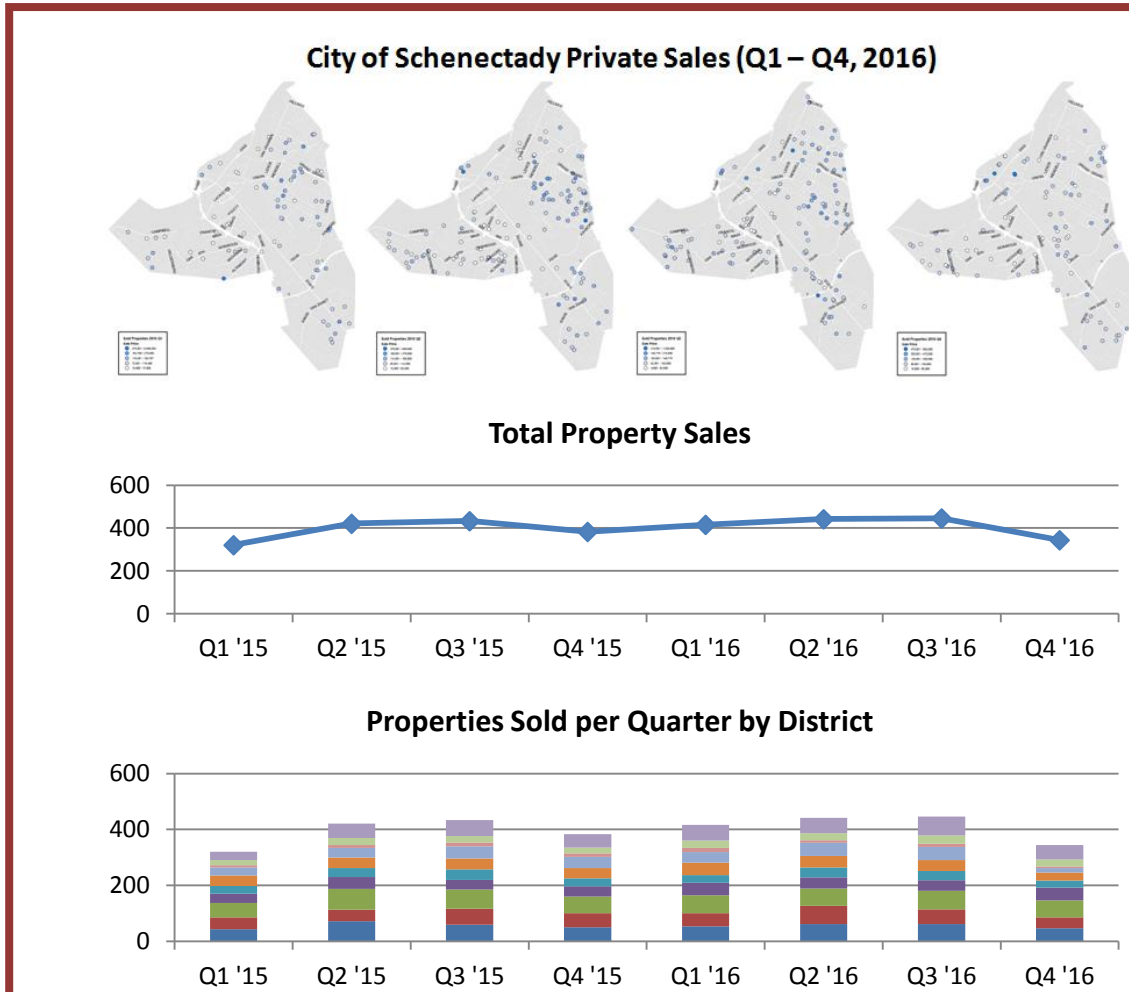
Figure 7 – Utilizing zoning maps and RPS data, the two graphs below demonstrate how we can use this information to graph out properties sold by quarter, per district. D1 through D10 (District 1 through District 10, respectively) are shown throughout the 2015 and 2016 years with corresponding district data. The top-most figure demonstrates how we could visually track shifts in property sales by quarter.

Reviewing Sales Data

Throughout 2017, we will focus on interdepartmental communication between the Assessment, Codes, Development and Engineering departments to build upon existing data and find ways to contribute this information to the dashboard platform.

2017	Q1	Q2	Q3	Q4
Targets	Review deeds and transfer forms from County Clerk	Determine if sales are arms length or non-arms length and report information	Create file in RPS to gather all sales data into one report for review	Analyze report of market data to determine health of real estate market in the City

Codes

Code Enforcement's main focus is on monitoring and inspecting general construction practices and overall building conditions as prescribed by New York State (NYS) and the Code of the City of Schenectady through the promotion of safe business and living conditions for all structures and property, as it relates to the quality of life and well being of our citizens. To aid in the effective management and resolution of complaints and concerns from the public, smart city initiatives in this division focus on ways to more efficiently carry out day to day tasks utilizing proactive methods of data collection and analysis.

Figure 8 – In coordination with recent legislation (a vehicle fleet efficiency policy, property assessed clean energy financing, unified solar permitting and electric vehicle charging station permitting), the City has realized the value of sustainable, alternative sources of energy and we work to implement these advancements into efficiency policies in the future to meet goals set by City Council and our community.

Code Enforcement Training

"The Energy Code is a minimum building standard for energy efficiency, applicable to new construction and renovation of commercial and residential buildings in New York State. The Energy Code is a complex document and one of nine building codes in New York State, making implementation and enforcement complex and time consuming. Since buildings represent roughly 60% of New York's total energy consumption, there is significant opportunity for energy savings through improved Energy Code compliance. This training focuses on what code enforcement officials need to know about the Energy Code in the context of its practical application on active construction projects."

New York State Energy Research and Development Authority Clean Energy Communities Guidance Document

In an effort to lead the region in new code enforcement standards and become a designated Clean Energy Community (CEC), the City of Schenectady is adopting new codes standards building off of recent sustainability initiatives completed in 2016.

2017	Q1	Q2	Q3	Q4
Targets	Conduct initial meeting and site survey for commercial inspection	Conduct initial meeting and site survey for residential inspections	Continue commercial and residential inspections as needed	Prepare documentation for Clean Energy Community credit completion

Combating Urban Blight   ●●●●●○●○○○○   ▭▭▭▭▭▭▭

In an effort to fight urban blight, the City of Schenectady has partnered with the Center for Technology in Government at The University at Albany/SUNY and the cities of Amsterdam, Gloversville, and Troy to build citywide and regional capabilities to collect, manage, and share data related to code enforcement, properties, and property owners so that city leaders can work collectively to take action against problem property owners. Funded by the New York State Department of State's Local Government Efficiency Grant Program, the cities will implement new technologies and develop a resource to share information across the region (and in time, the state) so that city and state leaders have the ability to access data that will improve day to day operations and long term strategies.

Blighted and vacant properties represent a persistent and costly problem for the capital region and most all New York State governments. Code enforcement is the cornerstone of identifying the beginning signs of property decline but it's a program that relies heavily on the collection, sharing, and use of information throughout many departments in all cities. The absence of appropriate technologies, policies, and practices to support such information management is a significant barrier to the ability to combat vacant and blighted properties. As a result, some property owners have capitalized on this inability to share data and continue to avoid scrutiny or penalty for multiple derelict properties. Enabling cities to build capabilities to share information would shine a new light on chronic violators and allow them to proactively prevent the spread of blight.   Through the innovative and collaborative leveraging of information and technology, this project will empower the cities to effectively combat the crushing tide of distressed properties.

Both city and local departments rely on code enforcement information to effectively provide mission critical services. Recognizing the interdependencies among regional municipalities and public service organizations in pursuit of public safety goals, this shared system will address the need for a coordinated and collaborative tool that can assist municipalities in addressing common challenges such as problem landlords, facilitate the identification of opportunities to address shared problems, inform city and private-sector decision-making, and improve service delivery, health, safety, and economic development.

Figure 9 – Partnering with regional stakeholders is important to ensure all communities participating can contribute to the conversation. This type of collaborative effort brings together the best ideas producing creative and realistic solutions.

To build upon the current success of this initiative, some established goals moving forward include:

- Creating technical and organizational code enforcement capabilities within each of the 4 cities (Gloversville, Amsterdam, Schenectady, and Troy) so each can increase the efficiency and effectiveness of their own property management and code enforcement environment
- Developing the technical, data, and policy foundation of a shared information resource, enabling municipalities to potentially participate in a future statewide network
- Encouraging increased uniformity in process and definition within the 4 cities to enable regional information sharing
- Establishing a culture (and community) of knowledge sharing among the 4 cities (and others in the future) so that New York State can work together to fight blight in all communities

Table 1 – Listing of all programs of work carried out by participating cities to prevent and mitigate blight.

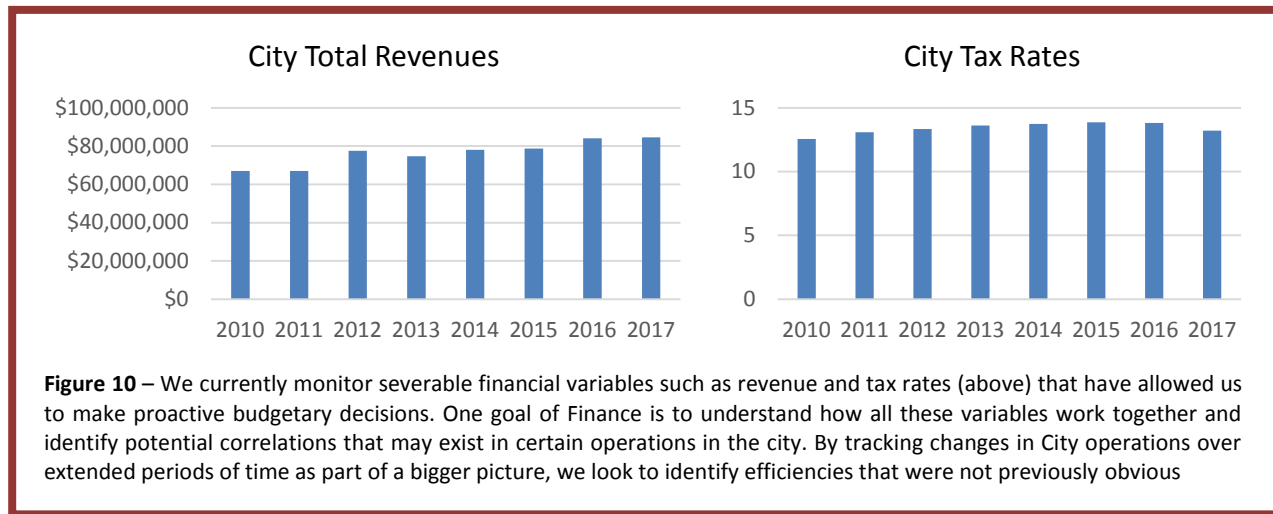| Programs of Work	Description
Building Permit Program	Identify, approve, track, and monitor changes/enhancements to all structures in the City
Code Violation and Enforcement Program	Identify violations, issue tickets, and prescribe reparations (fees & timeframe for compliance)
Public Assembly Inspection and Enforcement Program	Identify areas of public assembly, and certify compliance with all city & state codes
Demolition Management Program	Identify and manage the properties in need of and ready for demolition
Vacant Property Management Program	Identify, track, & monitor vacant properties in the City
Landlord Registration Program	Identify, register, and monitor landlords in the City
Rental Unit Certificate Program	Identify rental units in the City and certify compliance with all city & state codes
Foreclosure Management Program	Identify and manage all properties that are ready for the foreclosure process

2017	Q1	Q2	Q3/Q4
Targets	Develop and present a draft contract for participating cities	Enter contract	Implementation and training of code staff

Daily Operations

--- **Finance** ---

The Finance Department is responsible for all transactions and general accounting for the City of Schenectady including preparing the City's annual financial report, managing city assets, overseeing City tax collections, performing financial analysis, monitoring and forecasting city revenues and expenses, preparing fiscal reports and processing payroll. This division's Smart City Initiatives focus on methods increasing transparency in local government finances and visually illustrating various financial decisions throughout the City's annual budgets.

Figure 10 – We currently monitor severable financial variables such as revenue and tax rates (above) that have allowed us to make proactive budgetary decisions. One goal of Finance is to understand how all these variables work together and identify potential correlations that may exist in certain operations in the city. By tracking changes in City operations over extended periods of time as part of a bigger picture, we look to identify efficiencies that were not previously obvious

Visualizing Schenectady's Finances

Understanding growth or decline year-on-year is extremely valuable to understand our City's current economic health. It is also very important to see these year-on-year trends in respect to historical data. With this in mind, the Finance Department has been utilizing historical records to develop trend analysis methods that will help the public understand fluctuations and occurrences in City financial operations. This helps us identify underlying variables that may not have been quite as obvious from previous analytical capabilities. City financial indicators will be displayed on our website to transparently identify potential issues and graphically display trends like total City revenue and tax rates similar to what is shown in Figure [].

2017   **Q4**

Targets	1. Visually demonstrate trends and analysis behind resource allocation and decision making moving into FY 2018
	2. Adopt paperless requisition for billing processes

--- Human Resources ---

Human Resources core operations revolve around City employees and their daily operations. Some of these responsibilities include understanding and interpreting employee benefits, workers compensation and disability, retirement planning, civil service reporting, payroll, Affordable Care Act reporting and compliance and assistance in the administration of collective bargaining agreements. Initiatives in this department focus on ways to improve general well being of employees and the effectiveness of internal City services and relationships.

Health Awareness Programs ●○●○●○●○○

The City of Schenectady's Wellness Program annually screens employees, and at times dependents, for health risks through health risk assessment (HRA) surveys and biometric screening. These programs also provide interventions to address health risks and promote healthy lifestyles. The Wellness Program's popularity is mainly driven by employers' expectations that these programs will improve employee health and well-being, lower medical costs, and increase productivity. To help City staff learn more about their health, we've teamed up with MVP Health Care to promote programs throughout the year that provide educational material, experiences and health strategies to improve nutrition, weight management and overall well-being. Our programs have steadily been increasing in attendance and we continue to search for new programs that will help us increase participation at internal events and competitions.

2017	Q1/Q2/Q3	Q4
Targets	Keep track of new and existing event participation (No Gain maintain, blood pressure screenings, wellness audit and minutes in motion) and begin comparing to last year's participations	Analyze year participation and compare event participation to past

Online Application Process ●○○○○○●○○

Alongside the rollout of our new web platform, we are also implementing an online job application module for all new job notices. Jobs will be displayed through our website where individuals can then directly apply to the position on their computer. This module will help us reach a larger audience with new position openings and help to speed up the time required to sort through candidates.

2017	Q1/Q2	Q3	Q4
Targets	Understanding the necessary module information and training for online job application implementation and initial rollout of online application form	Decrease paper job application and increase online submissions	Fully functioning job application use for any new openings

--- Law ---

The Law Department is responsible for managing the City of Schenectady's legal needs including general legal advice for all departments, contract review and management, Freedom of Information requests, parking tickets, prosecuting code violations, managing the sale of City property, overseeing the City's foreclosure process and reviewing and overseeing claims against the City. Initiatives in this division that are Smart City centric involve the legal interpretation of project contracts and procurement procedures and the effective communication of those procedures to all departments.

Digitizing Data and Trend Analysis ●●●●○○○●○○○

Along with current methods of tracking data such as Freedom of Information Law (FOIL) requests, foreclosures, City owned property sales, code violations, code prosecutions, litigation cases, and violation appeals, the City will begin digitizing this data to conduct trend analysis. Using 2015 and 2016 as baseline years, the Law Department will begin reporting quarterly information in coordination with other departments to identify trends across departments. This will be especially useful in the identification of vacant property status as well as whether or not code violations have been carried through to prosecution. The more specific our data is, the better we will be able to enforce violations in our city-wide efforts to decrease vacant property blight.
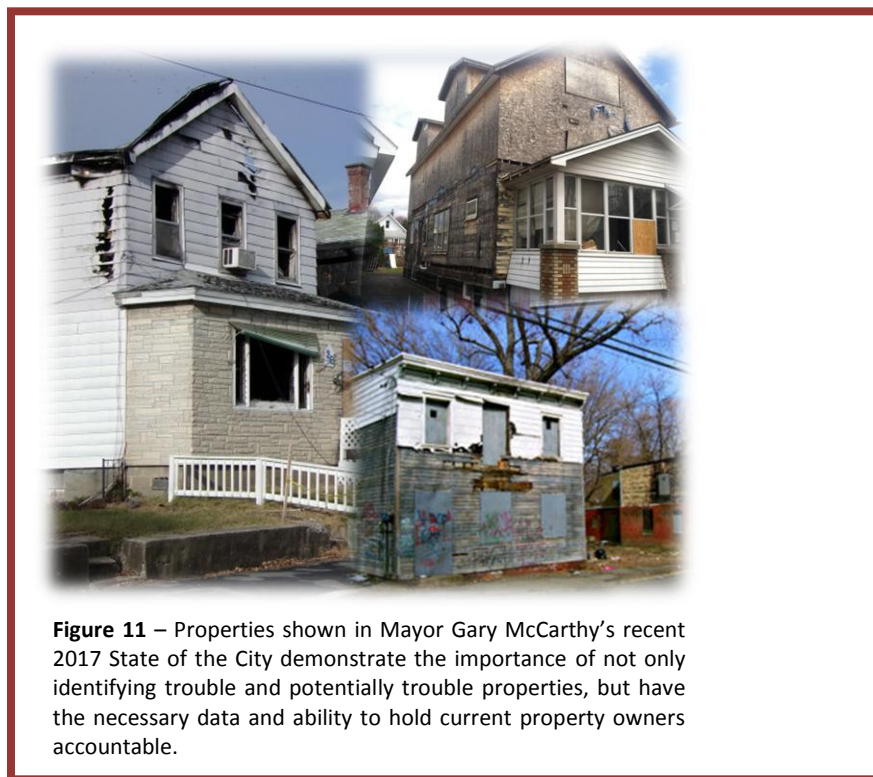
Figure 11 – Properties shown in Mayor Gary McCarthy's recent 2017 State of the City demonstrate the importance of not only identifying trouble and potentially trouble properties, but have the necessary data and ability to hold current property owners accountable.

2017   **Q4**

Targets	Quarterly tracking of vacant properties including locations and duration, code prosecutions and compliance rates, property sales, foreclosures, FOIL requests and litigation cases with year-end report

--- Purchasing ---

The Purchasing Department is responsible for the procurement of goods and services in City Government and oversees purchases of road materials and equipment, office and janitorial supplies, specialized services, and everything in between using a competitive bidding process enabling us to provide the best value for the citizens we serve. Smart City Initiatives in this division pay particular attention to the effective use of City funds and focus on ways in which City departments have maximized their purchasing power.

Online Account Payable System (p-Card)

In 2016, the City had more than 1,400 purchase orders including everything from office equipment, vehicles and property demolitions. The process of completing a purchase order may seem simple, however there are many purposeful barriers put in place to ensure that the City is purchasing goods through best practices. This process is extremely important for large purchases, however becomes burdensome when handling small purchases, as small purchases require the same process as large purchases. The p-Card will help to eliminate some unnecessary steps that will free up valuable resources and time throughout all departments.

2017	Q1	Q2	Q3	Q4
Targets	Identify probable accounts to utilize p-Card	Request information from pertinent vendors	Evaluate vendor programs and select best value	Implement p-Cards with initial departments

Evaluation of Current Bidding Process

The City currently uses a mixture of centralized and de-centralized practices for bidding public work and commodity procurement. While most of the City's bids are handled through the Purchasing Office, several other bids remain in the domain of individual departments. In order to standardize the process, additional resources need to be evaluated to determine if the bids being led by the departments would be better served by consolidating the process in Purchasing. As part of this process, we need to develop a calendar of standing bids, and seek additional methods of distributing the bid information to the widest possible audience to gain competitive pricing for all City expenditures.

2017	Q1	Q2	Q3	Q4
Targets	Renew annual known contracts	Establish calendar of bids for inclusion on website	Continue standardization of bid documents	Develop calendar for Fiscal Year 2018

---   Parking Enforcement   ---

In coordination with the Police Department and the Department of Engineering, Parking Enforcement helps to uphold current regulations for on-street parking and assists in the planning and development of new and improved parking scenarios for City parking.

Parking Meter Upgrades

In June of 2014, the City began the installation of upgraded parking kiosks through efforts led by the parking committee, which brought together multiple stakeholders (Engineering, Receipts, Police, Parking Enforcement and outside collaborators) to identify ways in which metered parking could become easier and more manageable throughout the downtown area. Utilizing data collected from these kiosks from the past few years has helped us identify potential gaps in metering and areas where kiosks would be beneficial over current metering methods. To help create uniform parking throughout the downtown area, we are working towards providing methods that help make collecting meter tolls more efficient for users and enforcement while keeping in mind a financially responsible transition into these methods.
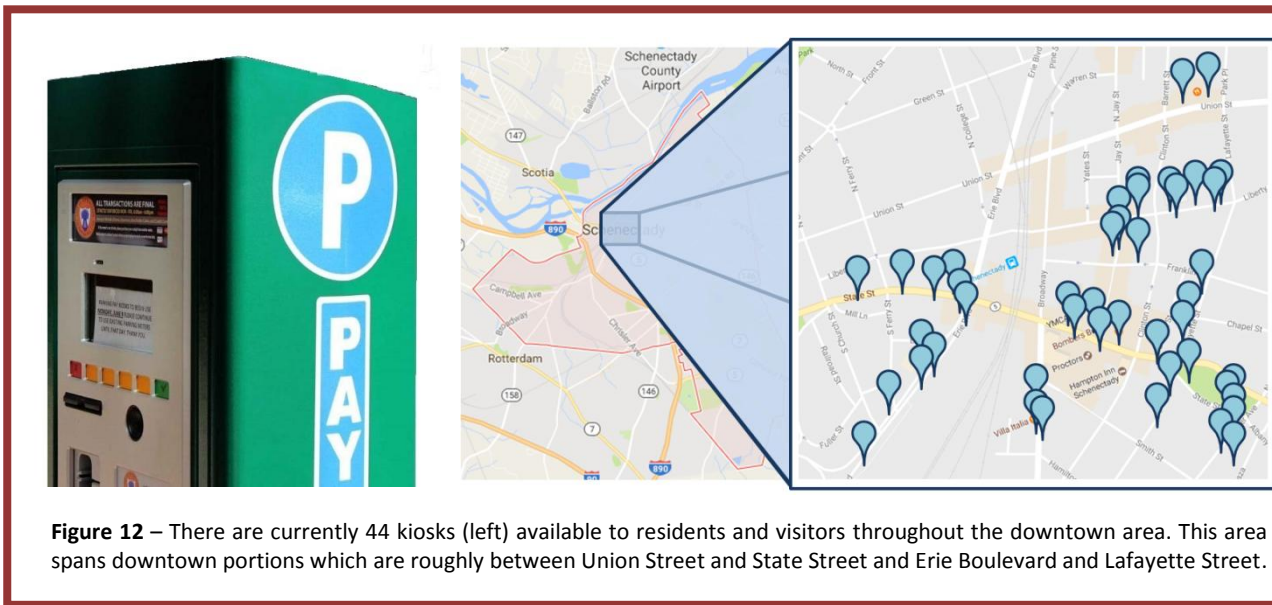
Figure 12 – There are currently 44 kiosks (left) available to residents and visitors throughout the downtown area. This area spans downtown portions which are roughly between Union Street and State Street and Erie Boulevard and Lafayette Street.

2017	Q1	Q2/Q3	Q4
Targets	Determine when kiosks were installed, and how far kiosk data goes back, to form baseline years	Determine locations of all active kiosks and track usage throughout the year	Identify if there are areas in the City that could benefit from kiosk parking or other forms of smart parking
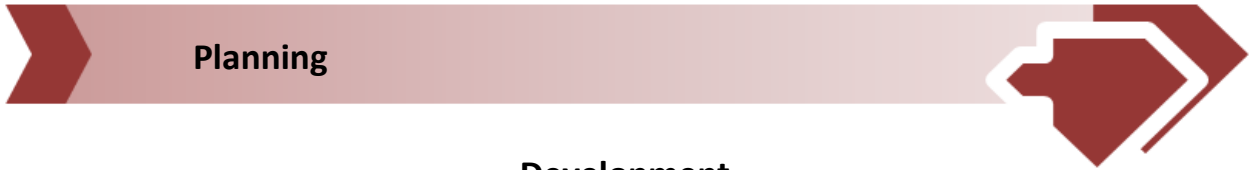
Planning

--- Development ---

The Department of Development is responsible for long-term planning for the City of Schenectady as well as the day to day administration of various City, State and Federally-funded programs geared toward the physical and economic renewal of the City. Major areas of influence include City planning and zoning, community and economic development, historic preservation, transportation planning, neighborhood revitalization and grant procurement and monitoring. In this division, areas of Smart City focus include proactive planning methods utilizing data gathered from multiple departments.
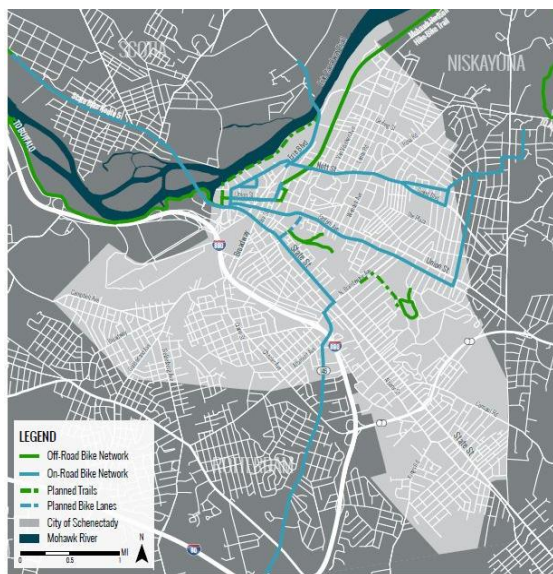
Figure 13 – The above map shows existing bike paths that run throughout the City. Some paths are part of multi-city connector routes and some are in specific areas in our City. The Bike Master Plan will leverage these existing paths to work towards a complete street vision.

Schenectady's Bike Master Plan

With a significant amount of community support for becoming a more bicycle friendly community, the timing is right to look ahead in creating a complete streets vision that will successfully integrate walking, bicycling and public transit, and allow for more sustainable methods of transportation. A large part of reaching our vision as a "complete streets community" is identifying priority infrastructure projects along the way such as the Schenectady Bike Master Plan and coordinating them with the planning of other related projects. As a joint effort between the Engineering and Development Departments, the City is currently working with multiple stakeholders in the community to coordinate a Bike Master Plan that will build upon existing regional connections, city routes, local greenways and trails and the City's ongoing economic development efforts to begin this transition.

2017	Q1	Q2	Q3	Q4
Targets	Finalize Bike Master Plan	Submit Bike Master Plan to City Council for approval	Review Plan in relation to 2018 paving program	Finish review process and identify areas to begin implementation of infrastructure improvements

Engineering

The Engineering Department's responsibilities focus primarily on construction, execution and maintenance of activities taking place within the City's right-of-way. This includes permitting of contractor work, curb cuts, dumpster placement, paving, revocable issuance, sidewalk work, budget estimations for permits and public works projects. Lot line adjustments and approvals, infrastructure and easement documentation, property address assignments as well as participation in general planning and codes department planning is also covered by Engineering. Smart City Initiatives in this division are geared towards improving livability through efficient processes in transportation and construction management and review.

ADA Transition Plan

As the New York State Department of Transportation works to address the rehabilitation and replacement of its infrastructure, roads and facilities are being brought up to current ADA compliance through the implementation of a new Americans with Disabilities Act (ADA) Transition Plan. Using new mapping and selection methods, tracking yearly progress through City capital improvements will become a more visual process allowing citizens to better understand how and when these improvements are made.

2017	Q1	Q2	Q3	Q4
Targets	Verify deficiencies in current sidewalks and roadways in the 2017 paving plan	Utilize paving contract to install identified ADA improvements	Continue Improvements	Identify ADA needs in 2018 paving plan

Researching Potential GIS Solutions

The City currently uses Geographic Information System technology in multiple departments to visually identify trends and accurately depict city planning, development and engineering efforts. GIS technology and the software surrounding it is becoming increasingly user friendly allowing companies and local governments to visually demonstrate geographic data that in turn help various city operations become more apparent. The City has been researching ways in which we can substantially increase the use of systems like this to help in short and long term planning, infrastructure projects and daily operations.

2017	Q1/Q2	Q3/Q4
Targets	Identify products that would meet the needs and requirements of all City departments that would utilize GIS programs	Review plan of action that would incorporate the purchase of GIS products and collaborate between departments to pick a product to move ahead with

Information Technology

Information Technology is responsible to various tasks focused around the City's wired and wireless networks including servers, computers and communication systems. This department is tasked with servicing and maintaining all user and network related devices throughout the City including the Police Department, Fire Stations, City Hall and the Bureau of Services. I.T. initiatives include maintaining excellent user experience through our website and related applications as well as upgrading systems to provide a sturdy foundation for all technology initiatives to build upon.

Citizen Request Tracker

Citizen Request Tracker is a municipal tool that offers an intuitive interface for citizens to report municipal issues online, then allows website administrators to assign requests directly to appropriate departments and provides citizens a means to follow their request through to resolution. This results in improved city operations and accountability through a better understanding of the issues that citizens are faced with on a daily basis. In our baseline year of 2016, we've started to identify areas of need and have developed initial plans to increase departmental accountability and find ways to help our departments respond accordingly to these online submissions.

2016 Distribution of Requests

Legend:
- Assessment
- Bureau Of Services
- Codes
- Development
- Engineering
- Mayor's Office
- Parks/Snap
- Police/Fire
- Utilities
- Waste Department

Values: 3%, 0%, 15%, 11%, 2%, 6%, 5%, 36%, 2%, 9%, 11%
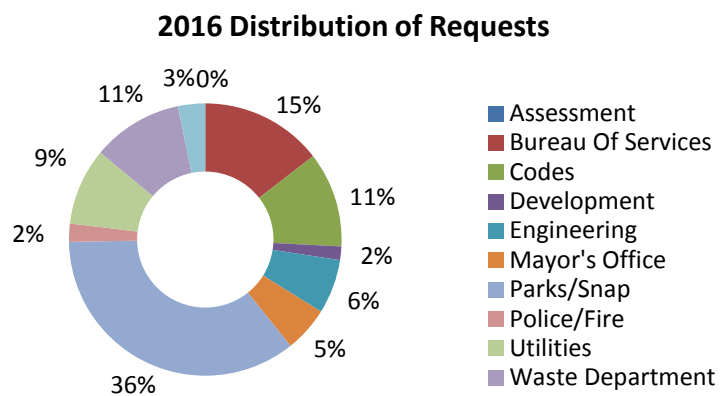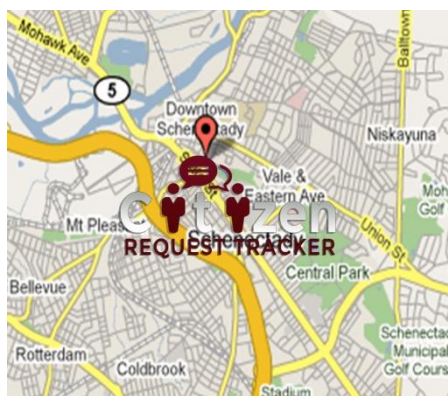
Figure 14 – The citizen request tracker tool is available on our website's homepage. When clicking on this tool, citizens are given an option to report concerns to various department staff throughout the City. Along with other City staff, I.T. is responsible in making sure that reports are sent to the appropriate person to close the report out in a timely manner.

2017	Q1	Q2	Q3	Q4
Targets	Guide administration in direction needed for 100% close out rate	Use Q1 findings to track quarterly close out progress for the 2017 year	Identify Q3 close percentage	Indentify Q4 close percentage

Website Management

Municipal websites offer more than just an explanation of city services and contact information to city staff; they are increasingly becoming the portal in which citizens and city staff can directly communicate concerns, comments and suggestions they have about ways to improve city services. With the introduction of our new website platform in 2016, we have leveraged multiple applications and modules that help create efficiencies across all departments. As we continue to digitize city processes through the use of fillable PDF forms, online payment options and other online developments, we can begin to understand the percentage of citizens using these features by tracking variables such as downloads, unique visits and bounce back rates.

2016 - Unique Downloads

2016 - Unique Visitors
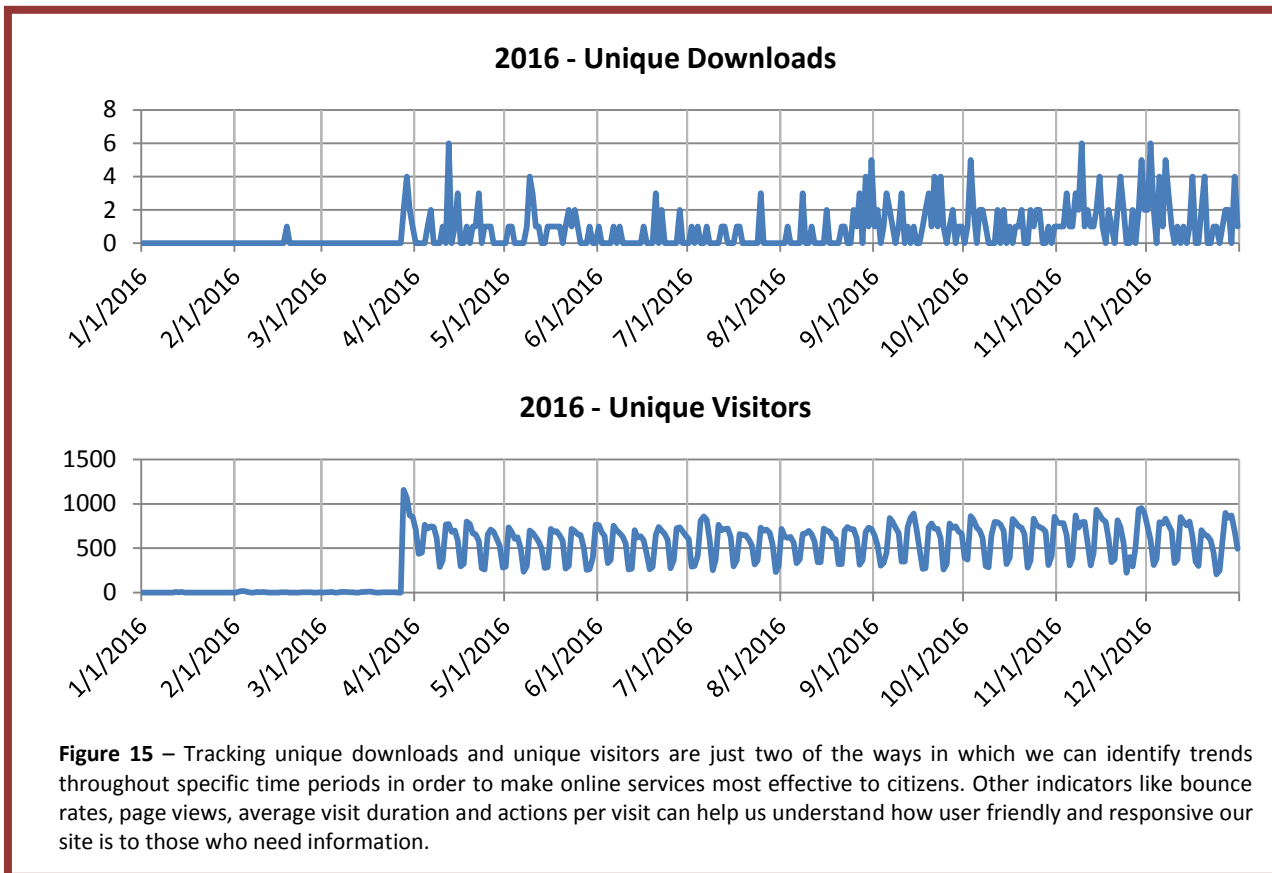
Figure 15 – Tracking unique downloads and unique visitors are just two of the ways in which we can identify trends throughout specific time periods in order to make online services most effective to citizens. Other indicators like bounce rates, page views, average visit duration and actions per visit can help us understand how user friendly and responsive our site is to those who need information.

2017	Q1	Q2	Q3	Q4
Targets	Work on completion of additional website modules and fillable PDF forms	Ensure all departments have fully functioning applications	Increase website use through active participation from departments	Prepare annual report of online statistics and identify areas improvement

COUNTRY	VISITS
United States	166,130
Canada	3,084
India	2,729
United Kingdom	422
Mexico	137
Philippines	136
Russia	136
Germany	117
China	102
Netherlands	89
Ukraine	77
France	73
Italy	66
Australia	61
Japan	57
South Korea	55
Brazil	44
Poland	39
Spain	36
Indonesia	28
Singapore	27
Dominican Republic	26
Ireland	24
Sweden	22

CITY	VISITS
Schenectady, New York, United States	34,266
Albany, New York, United States	8,391
New York, New York, United States	4,695
Mechanicville, New York, United States	3,100
Saratoga Springs, New York, United States	2,422
Smithfield, Rhode Island, United States	2,243
Brooklyn, New York, United States	2,072
Clifton Park, New York, United States	2,016
Seattle, Washington, United States	1,948
Troy, New York, United States	1,714
Watervliet, New York, United States	1,143
Rochester, New York, United States	1,141
Chicago, Illinois, United States	1,069
Federal Way, Washington, United States	981
Bronx, New York, United States	966
Latham, New York, United States	884
Boston, Massachusetts, United States	864
Buffalo, New York, United States	852
Syracuse, New York, United States	827
Delanson, New York, United States	749
Kerhonkson, New York, United States	712
Washington, District of Columbia, United States	687
Ballston Spa, New York, United States	686
Cohoes, New York, United States	643

BROWSER	VISITS
Chrome	96,411
Internet Explorer	21,324
Mobile Safari	21,065
Chrome Mobile	15,023
Firefox	8,080
Microsoft Edge	3,716
Safari	3,530
Samsung Browser	1,996
Chrome Mobile iOS	1,211
Android Browser	781

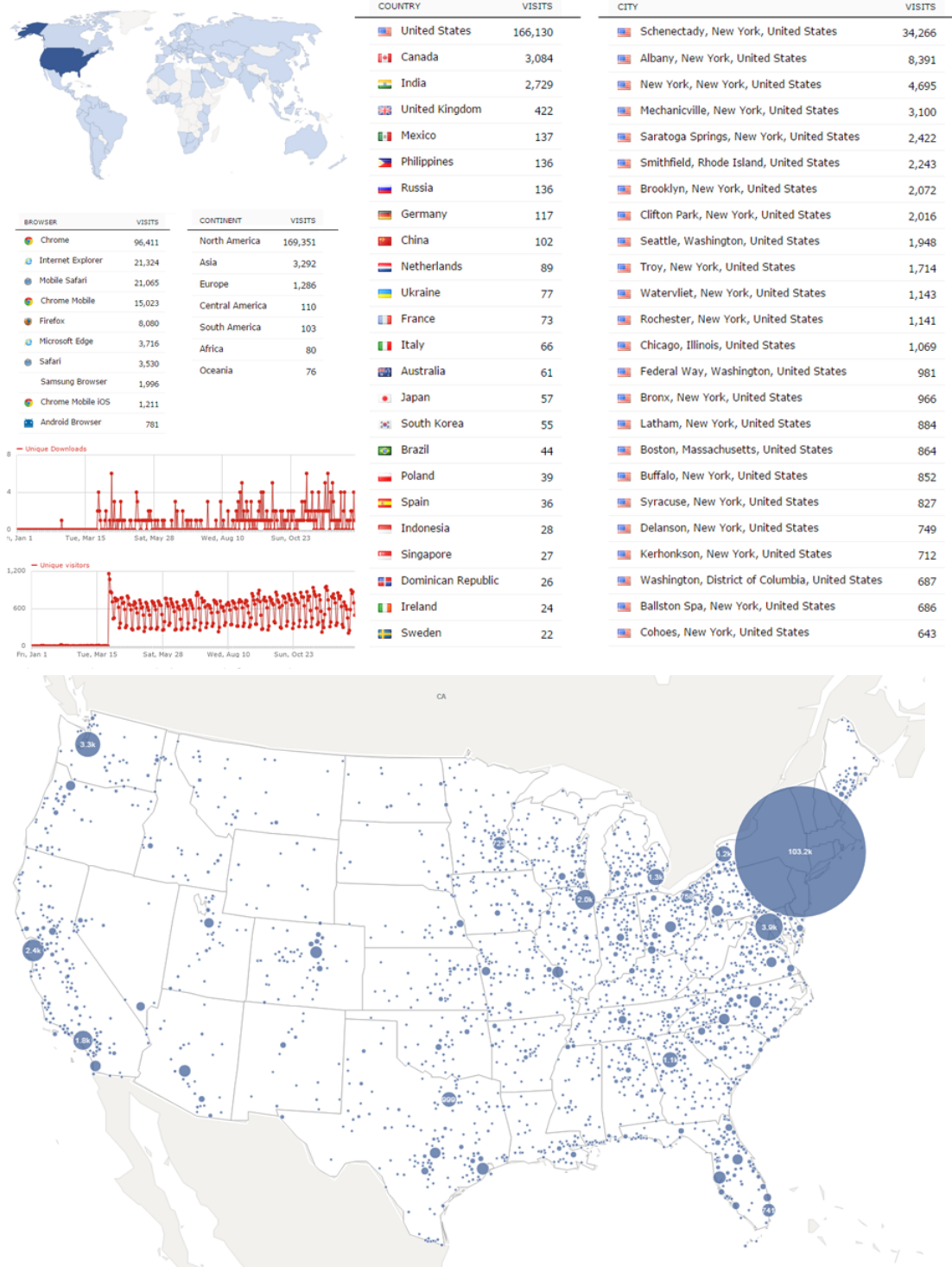| CONTINENT	VISITS
North America	169,351
Asia	3,292
Europe	1,286
Central America	110
South America	103
Africa	80
Oceania	76

Figure 16 – Understanding who is using our website and how they are using it helps us provide better services and information about our community. Whether from current residents, potential visitors or individuals looking to find out more about Schenectady, we can learn from statistics like those listed above offered through our web portal about what can be improved upon. The map of the United States (bottom) identifies City website traffic origination.

Public Safety

--- Fire Department ---

The Schenectady Fire Department currently employs 124 personnel including fire suppression, Emergency Medical Support (EMS), Hazardous Materials (HazMat), line officers, chief officers, and administrative staff. They are responsible for providing these services throughout the City to ensure the safety of residents and visitors and provide aid to surrounding communities when needed.

e-Learning

Training needs and requirements include general rules and regulations, work place rules and laws, a minimum of 48 hours of annual EMS/ Paramedic training, a minimum of 30 hours of annual HazMat/ Confined Space training, a minimum of 100 hours of annual Firefighting/ Suppression/ Rescue Operations training and Specialty Teams/ Quality Assurance/ Peer Review/ Oversight training. These are minimum requirements set by federal, state, regional, and local governing bodies to ensure all members have standardized and consistent levels of training that is not only necessary for the safety and wellbeing of the members but meets the expectations of the public they serve and protect. From past experience, we have learned that regardless of the department or agency type, it has become increasing difficult to fulfill training requirements. Every agency's call volume and workload has increased and the cost of providing training has become nearly impossible to accommodate every member even at the

minimum required level. As a result, current Fire management must teach a class a minimum of eight times to cover four shifts working out of four stations while still answering our daily calls for service. In an effort to stream line the training needs we are moving forward with an initiative that includes upgrades to classroom facilities in each of our four stations. This will include network capabilities, recording of training and interoperability between our four stations and outside agencies allowing us to share resources such as training programs and instructors. This enhances our ability to not only deliver consistent training, but also reduce redundancy in teaching the same classes multiple times.

Figure 17 –Fire Station 1 classroom (one of four fire stations in the City).

2017	Q1	Q2	Q3	Q4
Targets	Identify the department's needs to fulfill mandatory training requirements as well as consistent communications to four remote locations by administration	Identify the mechanism to best deliver the training consistently to all members in a timely and effective manner	Communicate our needs to the individuals with the knowledge in transmitting, receiving, and recording material	Obtaining the needed equipment – financing the same and installation and training on operation of equipment

--- Police Department ---

The Schenectady Police Department is committed to reducing crime through effective implementation of crime prevention and intelligence driven policing strategies. In partnership with the community and within the framework of the U.S. and N.Y.S. Constitutions, the Police Department serves the public through three bureaus (Field Services, Investigative Services and Administration Service) and utilizes specialty training units such as special operations, forensics, K-9 units and counter-terrorism. Smart City Initiatives in this division are centric to the Police Department's guiding mission to deliver the highest quality of police services possible through proactive, data driven methods of public policing.

Continued Use of DDACTS ●●●●●○○●○○

DDACTS (Data Driven Approaches to Crime and Traffic Safety) is an operational model that uses the integration of location-based crime and traffic data to establish effective and efficient methods for deploying law enforcement and other resources. Through a state wide GIVE (Gun Involved Violence Elimination) initiative, DDACTS's primary focus is on shootings, robberies, assaults and traffic crashes. Shown in Figure 18, predictive analytics from five years of past data collection is used to create target areas for the months of December 2016 through February 2017. This data is then used along with many other factors to proactively allocate resources.
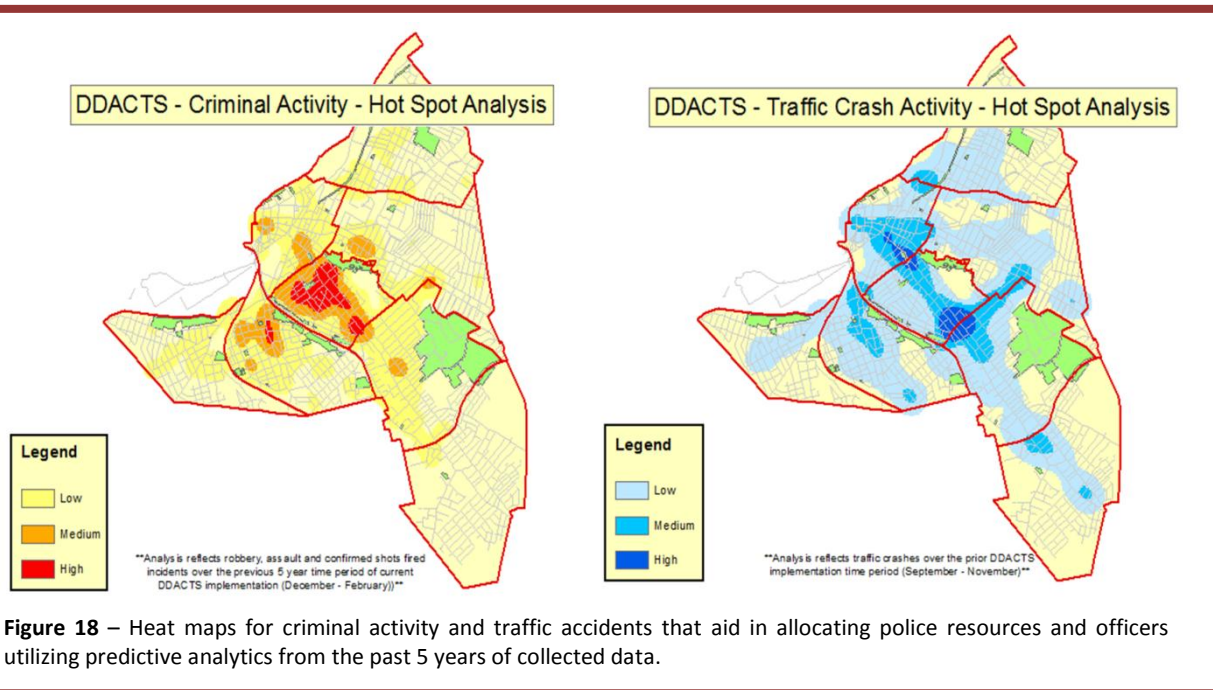

Figure 18 – Heat maps for criminal activity and traffic accidents that aid in allocating police resources and officers utilizing predictive analytics from the past 5 years of collected data.

2017	Q4
Targets	Identify and implement firearm related crimes & traffic strategies within the areas of the City that contribute to the greater proportion of activity and report on 2017 findings

Implementation of STAR Program

Schenectady's Tactical Analytical Report (STAR), alongside a weekly crime report, is being put into use to prepare monthly reports throughout the year indicating areas and events to pay particular attention. Data collected from violent crime, property related crime, shots fired, robbery, aggravated assault, burglary, motor vehicle theft, arson and other crime indicators are compiled into a report that indicates positive or negative changes across all variables. In coordination with DDACTS reports, these methods of policing have contributed to roughly 27% reduction in confirmed shots fired, 29% reduction in shootings involving a victim, 75% increase in arrests associated with crimes committed with a gun and a 40% increase in recovered firearms over last year.

Our best efforts to continue reducing gun violence along with other crime throughout the City is through strengthening our bond with partners and the community and continually enhancing proven unbiased evidenced based approaches. This includes the use of crime prevention techniques through environmental design, the targeting of top offenders, procedural justice and police legitimacy, focused deterrence, and multiple forms of outreach initiatives. STAR is yet another tool that helps us accomplish this decrease in crime that we have seen in the past few years.
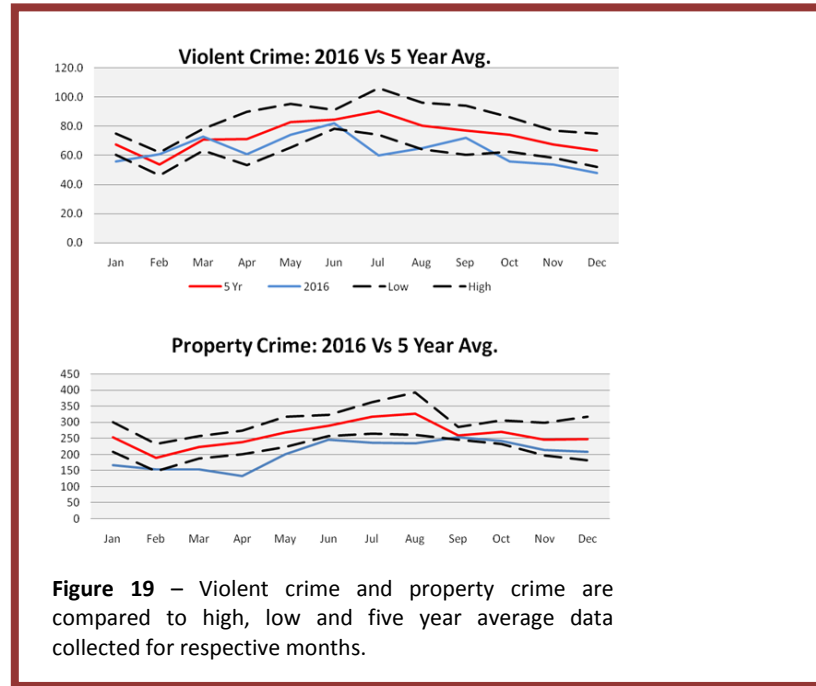

Figure 19 – Violent crime and property crime are compared to high, low and five year average data collected for respective months.

2017	Q1/Q2	Q3	Q4
Targets	Continue to utilize DDACTS data to understand how data drawn from this program can help other City departments operate more effectively	Develop methods to communicate data collection to aid interdepartmental collaboration	Determine what data is useful to other departments and provide summary of 2017 findings

Property Management

--- Facilities ---

Led by the Engineering Department, Facilities is tasked with daily/annual maintenance and Capital Planning for the majority of publicly available City owned facilities. This includes City Hall, the Police Station, the Bureau of Services and other buildings as needed. Initiatives in this department focus on ways to best manage facilities and their use to ensure investments in buildings and other assets are fully realized.

Figure 20 – Facility Dude allows the City to streamline many processes that are normally very time intensive. By creating track-able work orders and maintenance schedules, our staff can focus on tasks at hand. This data can then be exported in the future to other software programs to help ensure efficient building operations including decreased energy use.

Facility Dude Maintenance Solution

Maintaining city facilities is an important aspect in keeping public buildings safe, clean and energy efficient but can be a difficult task taking into consideration building maintenance, tracking of necessary supplies, grounds keeping and much more. In the past, we have utilized several internally developed methods that helped us carry out regular up keep of our facilities; however with Facility Dude we are now able to create regular scheduling for all activities that help us identify potential preventative measures we can build upon. An initial consultation from Facility Dude walks through a full inspection of all City assets that will be tracked through the maintenance software. This survey of building, equipment and asset conditions is then a baseline for future work. Through proactive monitoring, we will begin to take full advantage of investments put into our facilities by seeing the big picture and looking further down the road to extend the life of our buildings and equipment. Once fully implemented, we can then begin to look at ways in which we can utilize software like Facility Dude in coordination with energy use software to decrease Green House Gas emissions from our facilities.

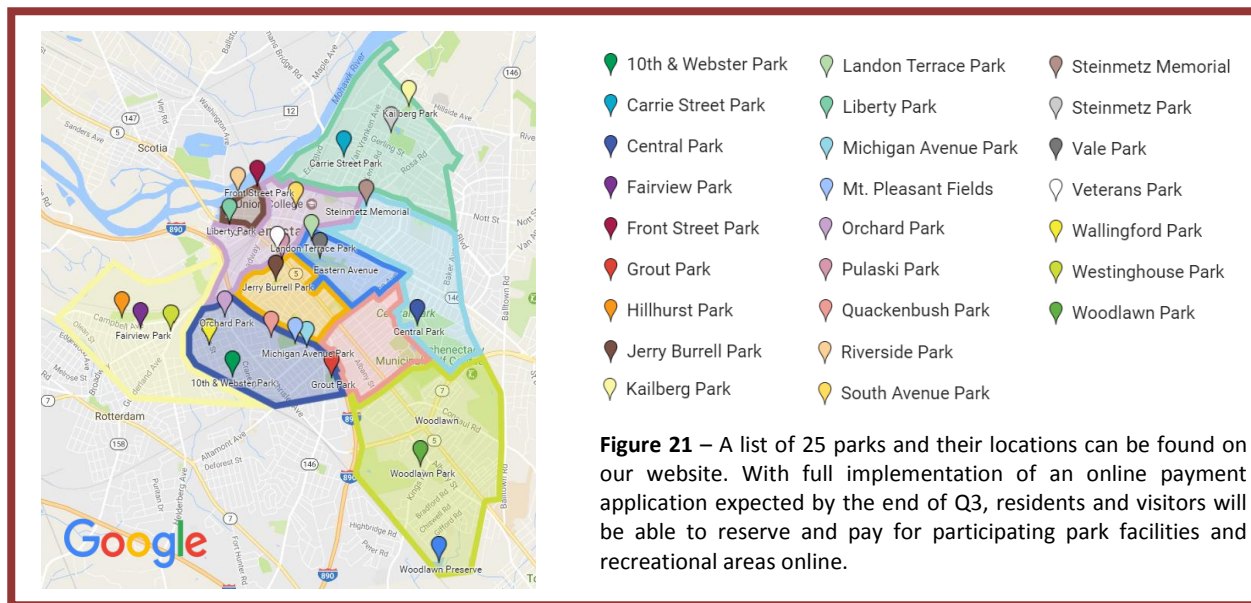| 2017	Q1	Q2/Q3	Q4
Targets	Conduct training on Facility Dude Software and perform baseline inputs on current facilities conditions	Begin implementing software and utilizing work orders	Expand program to include all 7 city owned facilities

--- Parks ---

The City's Parks Department is responsible for maintaining park facilities including 4 publicly accessible pools, an award winning rose garden, the Central Park Music Haven, and multiple handicapped accessible playgrounds and pavilions. Parks also maintains sports facilities throughout the City including 3 collegiate level baseball fields, 2 high school level softball fields, basketball courts, 16 tournament level tennis courts, mountain bike and disc golf courses, pedal boating and fishing areas and various hiking trails. Initiatives in this department focus on ways in which the City can better connect its residents and visitors to the publicly available facilities and activities covering roughly 490 acres.

Online Parks and Facilities Registration ●○○○○●○●○○○   ▭▭▭

Currently, the City is able to rent out participating facilities and recreational areas for public and private events. With the use of our new website through CivicPlus, additional modules and applications will be used to make event calendars and facility rentals available 24/7 on our website. This will allow residents and visitors more access to information for planning events and frees up valuable staff time to fulfill other daily operational needs.

10th & Webster Park	Landon Terrace Park	Steinmetz Memorial
Carrie Street Park	Liberty Park	Steinmetz Park
Central Park	Michigan Avenue Park	Vale Park
Fairview Park	Mt. Pleasant Fields	Veterans Park
Front Street Park	Orchard Park	Wallingford Park
Grout Park	Pulaski Park	Westinghouse Park
Hillhurst Park	Quackenbush Park	Woodlawn Park
Jerry Burrell Park	Riverside Park	
Kailberg Park	South Avenue Park	

Figure 21 – A list of 25 parks and their locations can be found on our website. With full implementation of an online payment application expected by the end of Q3, residents and visitors will be able to reserve and pay for participating park facilities and recreational areas online.

2017	Q1	Q2	Q3	Q4
Targets	Research what needs to be done to incorporate an online payment system into existing legacy systems	Implementation of initial payment system for public	Full implementation of online payment system for parks and select recreational facilities	Analyze results from 2016 and report findings

--- Schenectady Neighborhood Assistance Program (SNAP) ---

SNAP's mission is to help maintain the appearance of City owned properties as well as the City right of way and assist in preparing properties for winter conditions. This includes maintaining properties as they go through the foreclosure process and ensuring structures are safe and marketable. SNAP also maintains bus stops, bridge sidewalks, and park sidewalks. Initiatives in this department center on the proper flow of data throughout departments to SNAP crews, and back to other departments as needed, to have as up to date as possible information on city owned properties and structures.

Work Order Module Implementation

The most difficult part of creating a work order for SNAP is the amount of departments that the work order has to go through in order to be successfully completed. Our ideal solution is an end to end, track-able work order method that allows full access to violations, complaints and corresponding operational procedures spanning all departments that interact with the work order. This type of system will help us increase the visual appeal of our communities and allow SNAP to allocate its limited resources to areas that will create the greatest impact.
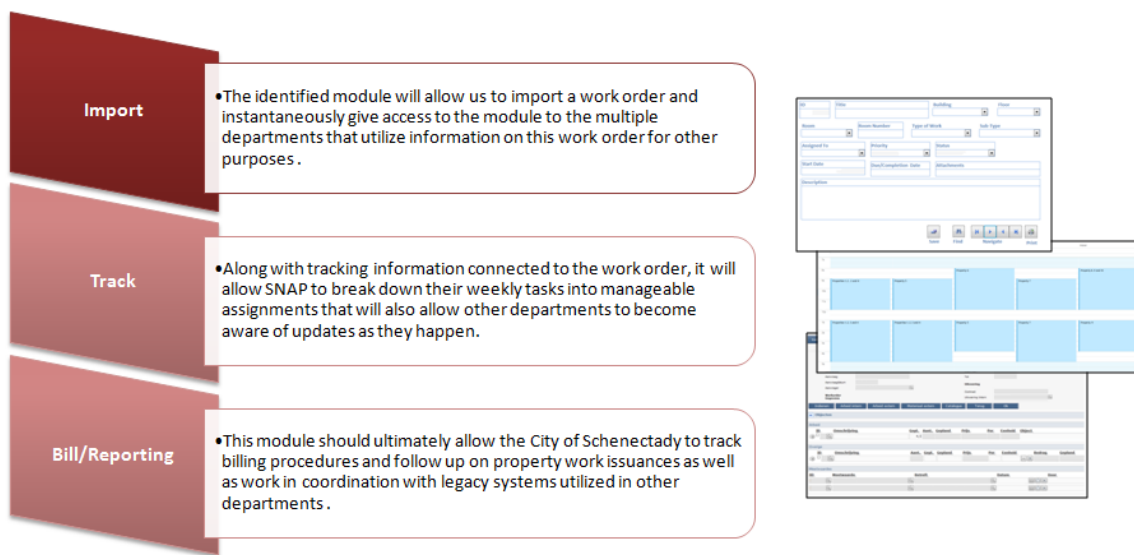

Import
- The identified module will allow us to import a work order and instantaneously give access to the module to the multiple departments that utilize information on this work order for other purposes.

Track
- Along with tracking information connected to the work order, it will allow SNAP to break down their weekly tasks into manageable assignments that will also allow other departments to become aware of updates as they happen.

Bill/Reporting
- This module should ultimately allow the City of Schenectady to track billing procedures and follow up on property work issuances as well as work in coordination with legacy systems utilized in other departments.

Figure 22 – The most effective work order will utilize the concepts above and will help the City produce results that incentivize the community as a whole to build off of our progress and momentum.

2017	Q1/Q2	Q3/Q4
Targets	Identify potential solutions to developing constructive work order module	Implementation of identified work order method along with year-end report to identify any potential issues

Utilities

The Department of Utilities oversees some of the City's core functions including traffic control signing and computerized devices, street lighting, energy accounts, telephone and network communications as well as the Office of Information Technology. IT assists hundreds of users with software training and access to emerging technology and focuses on the installation, maintenance, and tracking of data and the overall health of the City's network infrastructure. They work to increase connectivity and improve analytic data captures to assist users in making informed decisions in their everyday work routines.

Smart Lighting Infrastructure Plan

The City of Schenectady has over 5,100 HID street lights of which roughly 4,600 of these lights are owned and maintained by our local utility company and 500 owned and maintained internally. Our ultimate goal is to purchase the 4,600 lights back from the Utility and replace them with much more efficient lighting technology while adding a number of components that will improve the effectiveness of government services and provide opportunities to improve the quality of life of our residents.

In order to reach this goal, we need to be able to work with our utility company to vet and accept *Wireless Utility Grade Metering* that will be installed in the new luminaires. These meters will be capable of automatically submitting usage and will help reduce incorrect billing by keeping accurate inventories. The data these "Chips" inside these meters collect are not currently accepted under current tariff structures and as a result we are currently limited to flat rate calculations which nullify any savings.

In addition to providing a basis of cost savings, Smart Lighting systems will also automatically alert us to failures or even a knockdown that will aid in proactive maintenance of lights reducing repair times and costs. Video cameras included as part of our scope will also allow us to collect analytic data for traffic and pedestrian volumes, vehicle speeds and delay, parking patterns and notifications of parking violators to public safety. Additionally, sensors will provide data on temperature and road conditions assisting our road crews with advance notice on trends most likely to affect our streets.

The implementation of our deployments as we move along in the process will allow us to test these prognoses and determine the cost / benefits ratios of these use case studies. We can then extrapolate potential savings that can be achieved City wide on a "use case by use case" basis to be used for other municipalities across the State of New York to prioritize their own benefits. This will allow us to work with, train and learn from users in different areas to confirm results, conclusions and determine the future next steps.

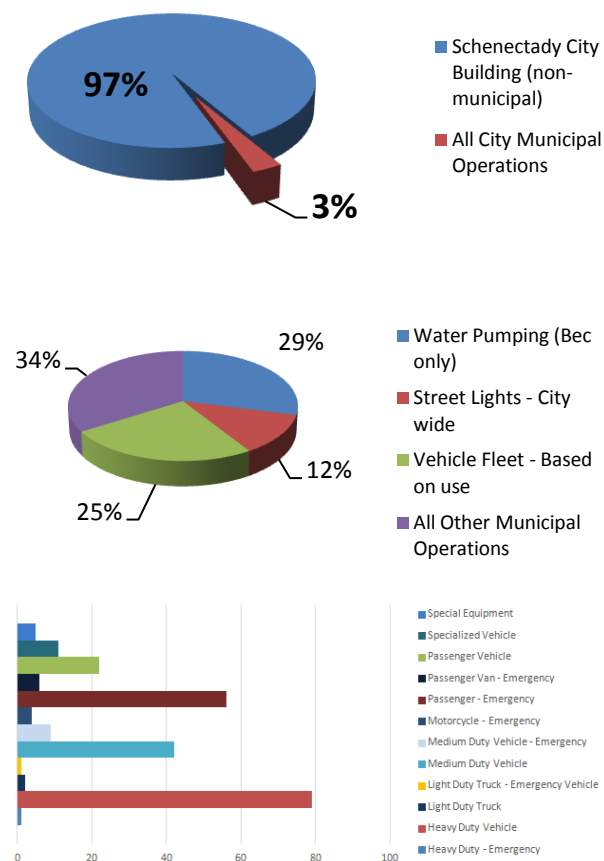| 2017	Q1/Q2	Q3/Q4
Targets	Work with local utility and various stakeholders to identify areas of interest to expand on current smart lighting pilots	Develop a plan of action for identified locations and city-wide implementation plan

Figure 23 – (Top) City municipal operations as a percentage of total carbon footprint due to building operations in the City of Schenectady and (Middle) municipal carbon emissions by sector from 2010 Energy Advisory Board Energy Use and Carbon Footprint Analysis. (Bottom) Energy use and Green House Gas Emissions will also take into account municipal fleet operations. From a recent 2015 vehicle fleet efficiency report, this figure demonstrates the amount of each type of vehicle in use and is one of many tools used to understand how the City could make operations more efficient.

City-wide Energy Use Review

In 2010, a city-wide Energy and Carbon Emissions Review was conducted by the City of Schenectady Energy Advisory Board. This Board consisted of energy and environmental professionals, academics and concerned citizens who provided their time to the community to put together a list of recommendations of what the City could do to begin its path towards decreasing overall pollution, reducing energy costs, and creating a more sustainable mindset going into the future. During this process, the City was designated as a Climate Smart Community and began its path to achieving various goals set by the City Council such as decreasing energy demands for local government operations, encouraging renewable energy for local government operations, supporting a green innovation economy and committing to an evolving process. So far, the City has had success in many of these areas, and in harmony with the last goal of committing to an evolving process, the City has continued to take steps towards leading our community in embracing transformational advancements in green technology. In coordination with many other departments' goals, we have built off of the 2010 Energy Advisory Board's Report and begin tracking city-wide energy and green house gas emission on a yearly basis to identify strengths and weaknesses in our operations.

2017	Q1/Q2	Q3/Q4
Targets	Identify trends and variables used in 2010 report to develop current list of energy use and emission baseline	Using building energy use information, vehicle fleet data and other indicators, develop the outline of an annual energy report

Vehicle Fleet and Operations

--- Mechanical ---

The Mechanical Department is responsible for the oversight and maintenance of all Bureau of Service vehicles including work that is given to outside organizations to perform regular or emergency work on vehicles that is beyond the City's ability. The City's fuel usage is also regulated through this Department. Smart City projects in this Department focus on the optimization of City assets through preventative maintenance measures and record keeping that helps us identify potential savings.

Preventative Maintenance

At the beginning of 2016, the City began to use fleet tracking software offered by Servicefinder and Zonar that incorporated data from our fleet to operate assets more efficiently. From the start of our trial deployment, we have kept track of 72 vehicles throughout the year including snow plows, waste trucks, front loaders, pick-up trucks and 2 electric vehicles. This data is helpful to perform fuel use reports, check to make sure vehicles are performing as they should and develop digital work-orders if a vehicle needs to be worked on. This data not only allows us to make better decisions regarding current fleet assets, but is also useful in the purchasing of new fleet assets. Overall, these systems allow us to transition to a digital reporting system which will help decrease our dependence on paper based systems, and will keep secure records on all fleet assets for future reference.
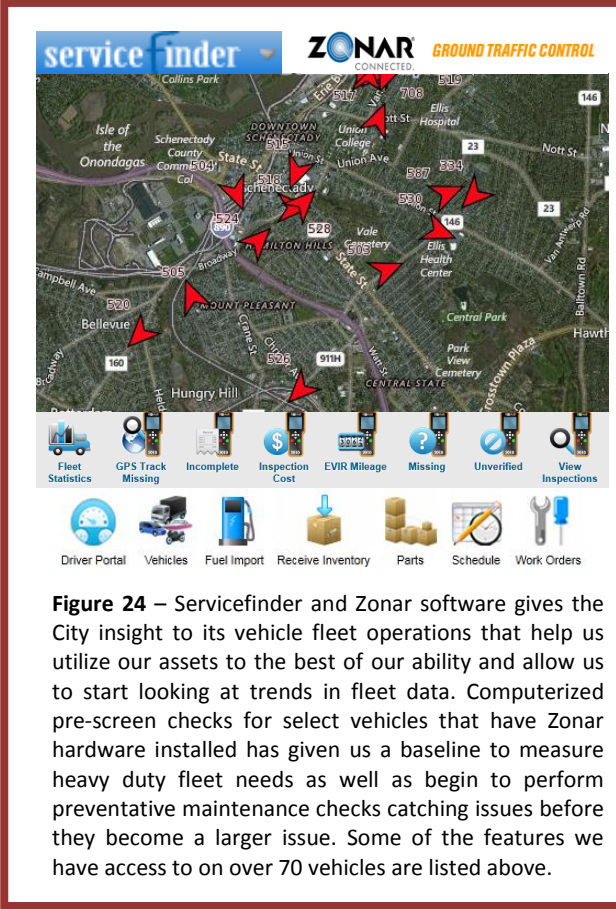

Figure 24 – Servicefinder and Zonar software gives the City insight to its vehicle fleet operations that help us utilize our assets to the best of our ability and allow us to start looking at trends in fleet data. Computerized pre-screen checks for select vehicles that have Zonar hardware installed has given us a baseline to measure heavy duty fleet needs as well as begin to perform preventative maintenance checks catching issues before they become a larger issue. Some of the features we have access to on over 70 vehicles are listed above.

2017	Q1/Q2	Q3/Q4
Targets	Review of 2016 plow routes data and idling data to create a baseline report for asset use	Full implementation of Servicefinder (Parts inventory, regular fuel import schedule and implementation of digital work orders)

--- Streets ---

The Streets Department is responsible for the daily operations of the majority of the vehicle fleet that works on city street maintenance and repair including paving, pothole and plowing vehicles. Smart City projects in this department focus on the efficiency of City-led paving projects as well as the routing and improvement of our plowing vehicles.

Learning Modules ●◐○○●○○●●○○

As part of a joint effort between the Mechanical and Streets Departments, Zonar RFID tags were installed on 72 of our fleet assets. With the help of Transfinder and Zonar representatives, all City staff interacting with these pre-trip check devices were given an initial training session on the technology and use cases they would encounter. As we look to expand the use of these pre-trip check devices, we will need to train more staff on the proper use of the devices as well as create a system that allows us to train new staff and ensure that we continue our transition to a digital pre-trip check. This system will also include a means of communicating any potential issues we are having with analytical and data collection portions of the software.
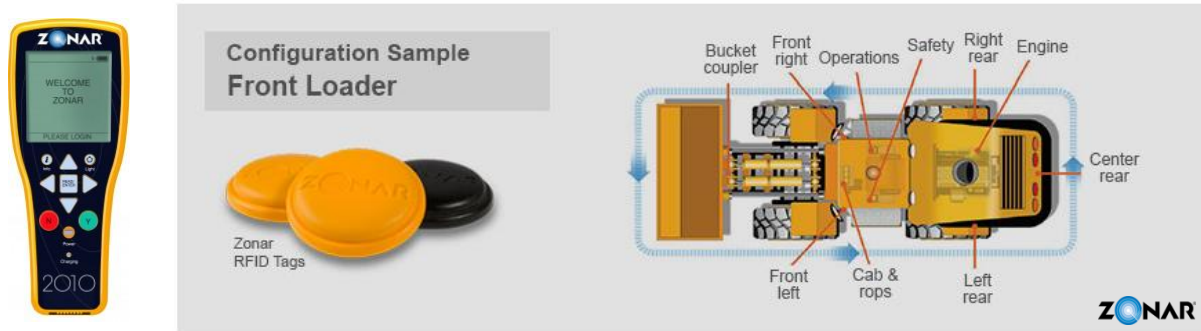

Figure 25 – This diagram (above right) from Zonar's website describes a scenario in which a front loader is retrofitted with RFID devices that detect mechanical changes throughout the vehicle including the vehicle's operations (engine information, GPS tracking, fuel usage, etc). The City's assets are configured similarly with multiple RFID tags placed in specific locations around the vehicle to allow operators to complete a digital pre-trip check. The handheld device (above left) is used to perform this pre-trip check and allows results to be directly submitted to software in the office. This information can then pair up with other software systems to keep track of fleet operations.

2017	**Q1/Q2**	**Q3/Q4**
Targets	Conduct annual training with management staff	Full implementation of existing Zonar equipment and quarterly training sessions with City staff to ensure continuous use

Water and Sewer

The Water and Sewer Department is responsible for the roughly 320 miles of public storm and sanitary infrastructure that runs throughout the City as well as commercial metering and flat rate residential accounts. The City also runs an 18.5 million gallon per day waste water treatment plant providing services to the Village of Scotia, Town of Glenville and portions of Niskayuna, Rotterdam, Rexford and the Hamlet of Alplaus as well as the Glencliff school located in Saratoga County. Smart City projects in this division focus on decreasing energy consumption as well as the implementation of technologies and processes that reduce greenhouse gas (GHG) emissions.

Solar Array Installation

●●●●●●○●●●●● ▭▭▭▭

The City-led installation of a new 711 kW solar array at the Bevis Hill reservoir started producing power in 2016 contributing to a reduction in energy costs and GHG emissions from the City's existing Combined Heat and Power (Co-Gen) at the waste water treatment plant. The 3,029-panel solar array saved the City approximately $50,000 in 2016 and is expected to save an estimated $840,000 over the life of the system by producing roughly 840,000 kilowatt hours of electricity annually. With the success of these 2 high impact projects, the City is now looking to expand our focus on clean energy generation by exploring options for another solar array on site at our waste water treatment plant. This solar array would focus on directly offsetting electricity needs of the treatment plant.
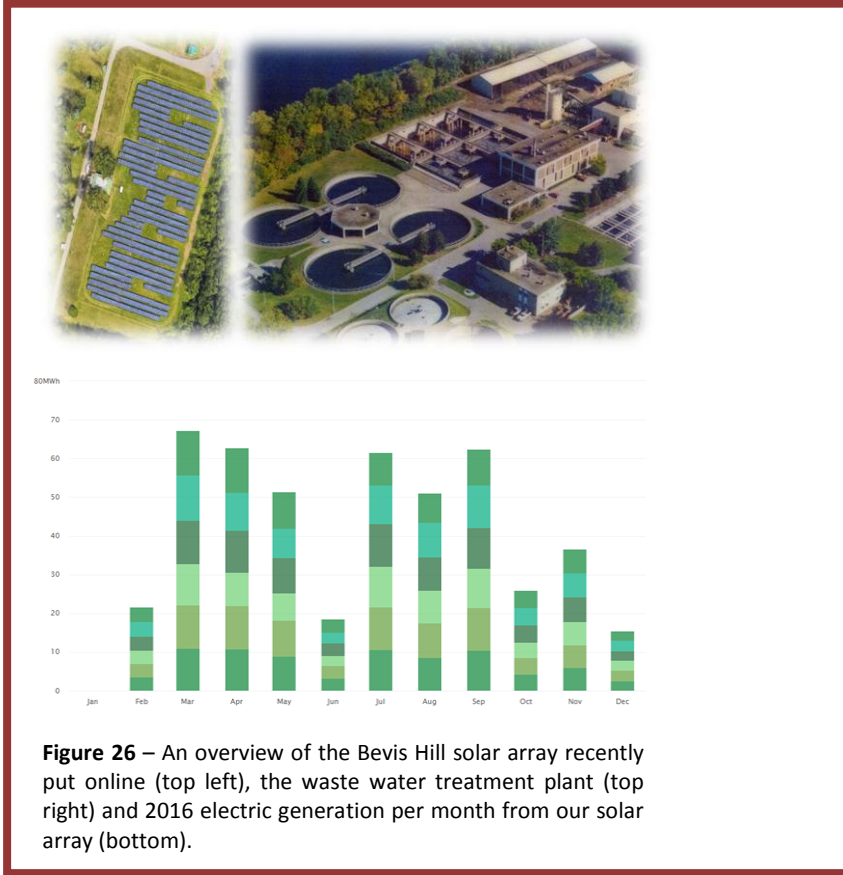

Figure 26 – An overview of the Bevis Hill solar array recently put online (top left), the waste water treatment plant (top right) and 2016 electric generation per month from our solar array (bottom).

2017	Q1	Q2	Q3	Q4
Targets	Research return on investment necessary to determine feasibility	If feasible, construct a cost – benefit analysis on various installer quotes	Determine best locations and positions for array	Planning on solar array installation moving forward

Waste Collection

The Waste Department is responsible for the collection of residential waste for the City of Schenectady and Village of Scotia as well as over 650 commercial stops throughout the City of Schenectady. Utilizing a 5 district system, roughly 2 dozen recycle and waste trucks run routes 5 days a week to collect solid waste and recycling including e-waste, yard waste, plastics, cardboard, glass and tin. Smart City Initiatives in this department focus on engaging citizens to increase their recycling as well as identifying more efficient routes to collect waste.

Commercial Waste Routing

Routefinder Pro, a tool provided through Transfinder's routing software, is helping the City create commercial waste collection routes that will help save costs associated with commercial route waste collection and track collection trends to better anticipate potential changes in a route. Starting this year, a dedicated team of one to two trucks will be assigned to commercial routes depending on the district. This will help us understand the total resources used to collect commercial waste and make necessary adjustment to ensure the most effective use of city resources.

2017	Q1/Q2	Q3	Q4
Targets	Evaluate current commercial routes and utilize Routefinder Pro software to identify potential efficiencies	Re-route identified changes, train staff on new commercial routes and practices and conduct successful trial runs	Full implementation of track-able routes

Single Stream Recycling

With a recent recycling campaign led by the Waste Department, the City teamed up with the Schenectady School District to hand out flyers to thousands of children to help the public get more involved in recycling. Through a recent switch to single stream recycling, our goal is to help citizens understand the benefits of recycling and make it as easy as possible for them to do so. By decreasing the amount of waste and increasing the amount of recycling, we can all make conscious efforts to make more sustainable choices and help decrease overall costs associated waste collection.

2017	Q1	Q2	Q3	Q4
Targets	Promote recycling through the School district with take-home flyers	Identify other avenues to reach the public	Create a public advertising campaign to increase recycling	Report 2016 data and identify potential 2017 operational changes

City of Schenectady

Recycling is Easy

SINGLE STREAM RECYCLING

All of your recyclables can be put into one container for collection.

Is there anything I need to do in order to mix my recyclables in one bin? All you need to do is put the *Single Stream Recycling* sticker on your recycling container.

Can I mix my recyclables in my trash container? Please separate your recyclables **from your trash container.** Place all of your recyclables in one bin. You do not need to separate your recyclable items.

Mixing all your recyclables in one bin is OKAY

Place the *Single Stream Recycling* sticker on the front of the bin

Where do I get a sticker? You can get a sticker at City Hall, Room 9 or call 382-5144.

Can all items go in the bin? The only items that that are not acceptable are:

- Trash
- Diapers
- Clothing
- Styrofoam
- Plastic Bags
- Compost
- Yard Waste
- Audio & VHS Cassettes

NO

YES

These are all acceptable

PAPER   PLASTIC   GLASS   METAL

Do I have to clean and rinse the containers? Please clean and rinse food and drink containers such as juice boxes, milk cartons, glass bottles, plastic containers, aluminum foil dishes, frozen food cartons.

Figure 27 – This latest recycling flyer was distributed throughout the City of Schenectady School District in an effort to get children and their families more involved in recycling, help them understand the types of materials that can be recycled, and find out where they can get more information.

A.1 – Schenectady Smart City Community

A special thank you to everyone we have collaborated with:

[s]Cube

Bloomberg Philanthropies

Capital District Clean Communities

Capital District EV Drivers Group

Capital District Regional Planning Commission

Capital District Transportation Authority

Capital District Transportation Committee

Capital Region Chamber

Center for American Entrepreneurship

Center for Economic Growth

Center for Technology in Government, University at Albany
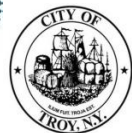
Cisco

City of Albany

City of Amsterdam

City of Gloversville

City of Troy

Civic Plus

Clarkson University

Climate Action Associates

Cloud and Things

CMA Consulting

Community Development Resources

Corning

Daily Gazette

Downtown Schenectady Improvement Corporation

Electric City Innovation Center

Ellis Medicine

Energize NY

Florida International University

Galesi Group

General Electric

Global City Teams Challenge

Mayors' Institute on City Design

MetroLab Network

Mobilitie

Museum of Innovation and Science

National Grid

National Institute of Standards and Technology

New York State Assembly

New York State Department of State

New York State Department of Transportation

New York State Research and Development Authority

Presidio

Proctors

Rensselaer Polytechnic Institute

Schenectady City School District

Schenectady County

Schenectady County Environmental Advisory Council

Schenectady Metroplex Development Authority

Sensity

State University of New York

The Compliance Engine

The Schenectady Foundation

The Wright Foundation

Town of Colonie

Town of Niskayuna

Transfinder

TW&A Construction Management

Underwriters Laboratories

Union College

Upper Union Street Business Improvement District

US Ignite

Verizon

Wink

Wise Labs

Zonar

A.2 – Public Sector Digest

Below – Published pages by Public Sector Digest, Your Future City, December 2016

ASSET MANAGEMENT

CREATING A REPLICABLE SMART CITY MODEL FOR SMALLER CITIES

GARY MCCARTHY, CITY OF SCHENECTADY

A s Mayor of Schenectady, a small city in Upstate New York, I know firsthand the challenges cities face in deploying new and necessary technology within our budget constraint. In the world of fast paced, connected systems, small to medium-sized cities are struggling more than ever to incorporate new technology and infrastructure for their citizens at a rate that can be sustained with informed, long term investment strategies. Streamlining city processes and enabling city-wide collaboration can be an extremely difficult process.

The City can save over \$370,000 in energy costs per year solely from lighting upgrades.

Cities must also deal with increasing complexities: the need for efficiency standards across departments that utilize different data for decision making; resource demands of citizens, businesses, and city operations; increasing status quo of what businesses need to attract new jobs in innovative fields; and, budgetary constraints that minimize purchasing potential of new technologies that could aid in solving city wide issues. These are just a few variables among many that the City of Schenectady is working to address as we work towards a replicable smart city model - a model in which cities our size can begin to tackle the challenges of incorporating intelligent city processes at a rate that offers the return on investment necessary to make these initiatives a reality.

The City of Schenectady's roughly 66,000 residents rely on our interconnected ecosystem every day to live, work, and thrive. Small and medium-sized cities deal with many of the same issues large cities do such as traffic management, resource constraints, safety and security concerns, and the need for continuing economic growth. Although we deal with these issues on a relative scale to our population, it is important to realize that much of the urban growth seen in recent years is in small and medium-sized cities like Schenectady.

From recent estimates, nearly half of the world's urban dwellers reside in urban communities with fewer than 500,000 residents. According to the 2010 US Census, the majority of the US population lives in smaller, non-rural communities.

Following the private sector's increasing focus on the IoT (Internet of Things) and the IoE (Internet of Everything), cities all around the globe are beginning to turn to new systems and applications that promise millions in savings or revenue, and improved livability of communities. Soon, the implementations these cities make today will become a new standard for well performing cities tomorrow. Small to medium-sized cities need to find innovative ways to create real savings and benefits for their citizens while facing the daily budget and resource crunch. An environment rich in innovation and creativity is necessary to ensure a strong future for our urban centers: adapt or be left behind.

This is where Schenectady sees opportunity. We created the *Schenectady Smart City Advisory Commission*, which brought together public and private sector leaders from various fields. They created a roadmap which helps guide our decision making by identifying 10 key pillars of smart city progress for our local community. We have also been working on various projects that incorporate smart city ideals into existing departmental functions such as multiple street lighting and infrastructure pilots, routing software and fleet management processes, sustainability and resiliency initiatives, citizen engagement programs, government efficiency and standardized information practices that help deter urban blight, clean fleet initiatives and collaborations with private and public sector partners across many industries. These initiatives all come together to form a continuously evolving project pipeline that we use to help us determine where to invest our time and resources next.

In the case of our street lighting and infrastructure pilots, we have replaced current HID lighting in our downtown area with Smart LED lighting technology, video technology, sensor placement and Wi-Fi deployment. With a total of 38 lighting fixtures replaced, and 13 video cameras equipped with analytic capability, this pilot project allows the City to start collecting and researching data to further prove the benefits of a city-wide street lighting and infrastructure re-haul. Using data collected from this pilot, we have determined the City can save over $370,000 in energy costs per year solely from lighting upgrades.

Our next step will be to build on this pilot with the same technology in a neighborhood business corridor. Deploying this 21st century infrastructure will help us improve public safety, enhance a major park development program, and support school and youth programming at a local elementary school, a middle school, and a new Boys and Girls Club.

Working alongside local businesses like Transfinder also helps pave the road for private-public partnerships that offer mutual benefits to our citizens by increasing the effectiveness of city services. Following the 2015 budget process, our City Administration began researching various options to utilize GPS tracking and fleet management software. The proposed solution involved software and routing analytics from Transfinder as well as a GPS tracking system and preventative maintenance analytics from Zonar. The resulting pilot program utilizes electronic record keeping for City vehicle maintenance and status updates, real time diagnostic information, and intelligent and responsive routing. When used together, these tools have allowed the City to form a baseline to cut future costs of gasoline use, vehicle maintenance expenditures, idling costs and unnecessary miles driven.

The key themes to each of Schenectady's Smart City projects have been creating broad partnerships to ensure community engagement and success, data driven governance to prove return on investment, efficient use of resources, and willingness to try new ideas and share information to create synergy and develop new best practices. Embracing a culture of innovation has been difficult at times; however, collaborating with innovation hubs, such as the recently opened Electric City Innovation Center, helps us stay connected to an entrepreneurial community that constantly brings new ideas to the table, changing the way we think about providing more efficient government services.

As we have seen with this collaboration, people from all sectors, industries, ages and backgrounds gather together to learn about city operations and find ways to positively affect citizens' lives behind the scenes. Their efforts combine with ours to foster a growing ecosystem of innovation focused on bringing new technology and business to our community.

We realize that many of the projects we are working on are not in and of themselves revolutionary, however we believe it is vital to take steps forward. Instead, like many other cities our size, we are looking for ways to improve the delivery of services that show tangible results for our residents and pave the way for future investments. Through building partnerships, tracking data, and investing in multiple strategies, we have seen diversified success and savings that show a new replicable smart city model for small and medium-sized cities.

GARY MCCARTHY has served as Mayor of the City of Schenectady since 2011. McCarthy also previously served on the Schenectady City Council, the Schenectady Municipal Housing Authority, Schenectady Industrial Development Agency, and Metroplex, where he helped bring a new focus on economic revitalization. As Mayor, Gary has stabilized the City's finances by reducing the tax levy and improving the City's bond ratings. McCarthy co-chairs the Center for Economic Growth's Capital Region Local Government Council (LGC), serves as Second Vice President of New York State Conference of Mayors' Executive Committee, and was one of the first mayors in the nation to complete the Mayors Challenge to End Veteran Homelessness.

A.3 – electro*industry* magazine

Below – Published page by National Electrical Manufacturers Association, April 2016, Vol.21 No. 4

View from a Smart City

› Watching a Smart City Progress

Mark L. Little, Chairman, Schenectady Smart City Commission

It is an exciting time in Schenectady, New York. Emerging smart city technologies have the potential to revolutionize the way Schenectady conducts its operations and brings services to its citizens and visitors.

"Smart" in this context means gathering and using complex data streams to make city operations much more productive and the city environment more livable, workable, and sustainable. Some early applications of this technology replaced city lights with highly efficient LED systems. This yields significant, immediate energy cost savings. At the same time that lights are replaced, light poles can be retrofitted with a variety of sensors that connect with each other through mesh network techniques and ultimately to the Internet and cloud storage for processing.

Wi-Fi or other telecommunication capabilities can be added to provide citywide Internet access for residents at all income levels. All of this can complement advanced information technology systems and applications for productive integration of a multiplicity of city systems.

Mayor Gary McCarthy has positioned Schenectady to lead in the application and development of smart technologies, and he has created a smart city commission to advise him on these technologies. Commission members are leaders in diverse areas, including technology, education, arts, media, project management, and government.

Schenectady has already built out two areas with prototype systems and is pursuing other sites for further development. Multiple big-company vendors are engaged, while smaller-company and academic partners are being solicited to build applications on top of the hardware and software platforms that will be built.

An innovation center is being developed in the heart of the city to encourage inventors to participate. Events expose innovators to city systems so that their work can be properly focused on city needs. The goal is to build a citywide system that will enable all to take exciting new approaches to building. The city is thus a laboratory for innovators to develop applications for the city, the state, and the world.

Our vision is to enhance life in the city in many ways:

- **Internet access for all and in all places**: The divide that currently separates socioeconomic groups' access to information could be bridged, and limitations on Internet connectivity in certain areas of the city could be eliminated.

- **Efficient transportation and parking**: Data on public and private traffic flows could be used to minimize congestion, reduce accidents, make parking easier, and make management of parking fees more effective.

- **Enhanced public safety**: Widespread sensing would allow for faster responses to fires and crime, with significant potential for saving lives and property. Disaster alerts could be spread quickly, and predictive analytics could be used to avoid issues before they occur. Code issues could be quickly identified and addressed.

- **Effective waste and water management**: Monitoring of the volume, types, and location of waste and tracking pickup activity could lead to cost-effective solutions for waste handling. Monitoring water quality and the state of water infrastructure could pay significant dividends in the avoidance of service interruptions and costly emergency repairs.

- **Energy efficiency**: Emerging distributed generation such as private and commercial solar can be best handled with widespread sensing and smart control systems. Municipal and commercial buildings could be outfitted and controlled more effectively with significant reductions in energy usage.

- **Health and human services**: Applications for remote health monitoring and for providing medical reminders to patients show significant promise. Effective responses to emergency issues and avoidance of inappropriate use of emergency systems could significant increase patient safety and yield cost benefits. Providing input and feedback through the Internet has been shown to deliver enriched educational experiences.

- **An engaged citizenry**: Access to new levels of data about the city could be used to more effectively engage the public in improving the city and holding an informed debate about the future of the city.

It will be exciting to watch the progress as Schenectady works to become a smart city. We hope to learn from the experiences of others who have gone before, and we will be delighted to share our learnings as we strive for smart city innovation. ⏹

Mr. Little retired as the chief technology officer of GE.

"Technology is the easy part. The hard part is turning ideas into action."

- **Smart Cities Readiness Guide, Smart Cities Council**

Researched and compiled by:

Eric Shannon