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Smart Solutions Across the State: Advanced Technology in Local Governments



New York State Comptroller
THOMAS P. DiNAPOLI

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Introduction

New technologies continue to reshape how local government services are delivered across the State. Local officials are working to meet the evolving expectations of citizens who want their interactions with local government to match the ease and convenience with which they manage their personal business. At the same time, officials are motivated to leverage advanced technologies (often called “smart technology”) to gain operational efficiencies. When successful, these efficiencies have the potential to free up resources for other critical needs, help leaders hold the line on taxes and encourage new growth and development.

A 2016 White House report emphasized that technological innovations “provide an opportunity to revamp how cities operate at all levels and for all stakeholders.”¹ Cities provide residents a variety of critical services, control important infrastructure and have a vested interest in providing modern and efficient public services. Some cities, for instance, have started integrating automatic sensor controls and remote metering into water treatment and delivery, putting in place infrastructure that could enable safer vehicle-pedestrian interactions in busy downtowns, and using mobile phone applications (apps) to make it easier for citizens to do everything from paying for parking to reporting dangerous potholes.

Villages, towns and counties, which often provide at least some of the same services, are also using comparable technologies. School districts and libraries have been investing in an array of new technologies in an effort to facilitate learning and communication.²

Advanced Technologies in Local Government

- Local government “smart technology” often includes devices and applications that collect and use large amounts of data in real time.
- Many municipalities are enhancing their parking services, street lighting and vehicle fleets with new technologies.
- Over half of New York’s cities allow homeowners to pay their property taxes and other municipal bills over the internet.
- School districts and libraries are increasing their use of technology to enhance operations and benefit their communities.
- Customary elements of good governance, including stakeholder communications, well-designed procurements and robust internal controls, may be especially critical when adopting new technologies.
- As they implement smart technology, local governments must consider cybersecurity to protect their assets and their residents’ private information.

Incorporating smart technology, however, has also opened the door to significant new risks. Many of the systems generate and collect massive amounts of data about both residents and government operations. As stewards of the public's security and privacy, local officials face heightened challenges and responsibilities to ensure privacy while simultaneously storing, analyzing, sharing and applying this data, and building staff and infrastructure capabilities.³ In addition, the very novelty, complexity and scope of new and emerging technologies can augment the challenges local governments typically face in striving to use public resources wisely and deliver services effectively while ensuring transparency and accountability.⁴

This report provides a broad overview of the ways that local governments in New York are adopting smart technologies. In order to share information about projects that potentially appeal to the widest array of local governments statewide, it focuses on areas of general government operations, such as local roads and public safety, and on K-12 education. Generally, programs specific to New York City and specialized functions of certain types of local government, such as correctional facilities or community colleges, are not featured. Finally, this report does not make any recommendations for or against these technologies generally, although OSC does often comment on specific applications in its audits and provides training and guidance on related topics, including cybersecurity policy and industrial control systems.⁵



Smart Connectivity

Local governments in New York State have been increasing their own online presences and capabilities. At their simplest, municipal websites post legally required information such as annual budgets, meeting dates, financial reports and independent audits.⁶ However, some offer a variety of additional services online.

Online Systems

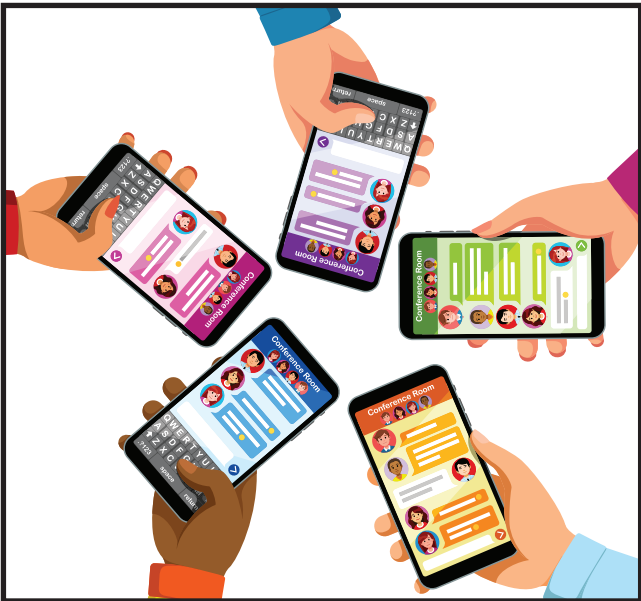
OSC reviewed the official public websites for all of New York’s 62 cities, and the 25 towns and the 25 villages with the largest populations, to determine the types of online payment and communication services provided and (for a more limited number) the types of social media outlets used.⁷

Bill Paying

Many of New York’s cities allow homeowners to pay their property taxes and other municipal bills, such as water, sewer and parking tickets, over the internet. They do this either through a government-owned payment system or a third-party vendor.⁸ Similar payment options are often available in large towns and villages. Compared to traditional forms of remittance – cash, checks and money orders – making payments online can be faster and more convenient for taxpayers. Methods of payment include electronic bank-to-bank transfers and debit and credit cards.

Interactive Communication

Cities and larger towns and villages may also offer interactive online communication. Unlike simple email correspondence, this feature allows residents to, among other things, directly make service requests, report code violations or send questions to specific municipal departments. These communication services vary in terms of what residents can ask, request and report. Some require users to create an account, in which they provide some personal information, such as first and last name, phone number, email address and, in some cases, a home or business address. Local governments often contract with third-party vendors to provide the software for tracking requests and complaints and their resolutions.



Social Media

A growing number of local governments have established a social media presence to improve their communications. Some local governments in New York State have Facebook and Twitter accounts where they post road closures, weather warnings, emergency alerts, local news and community events.

The City of Ithaca is an example of a local government with a large and expanding online footprint. The City's website offers homeowners the ability to pay their property taxes and other fees, request services, report problems, and submit online forms and applications.⁹ Also, residents can create user accounts to keep track of their interactions, including any requests or submissions. Ithaca also has an active social media presence with separate departmental accounts where residents can comment directly to the Mayor or the Police Department.

Public Wireless Internet and Municipal Broadband

In addition to what they provide online, local governments are doing more to ensure that their residents, visitors and businesses have better access to the internet. Some of the State's municipalities are implementing public Wi-Fi (wireless internet access) and getting more directly involved with broadband infrastructure.

Some cities, including Albany and Buffalo, are meeting the demand for free public Wi-Fi on a large scale.¹⁰ Through partnerships with local private telecommunication companies, these cities currently provide free high-speed Wi-Fi access to residents and visitors in select areas (known as "hotspots"), usually located in downtown areas and busy corridors. In addition, some public libraries offer visitors the ability to connect to the internet at no cost with their laptops, smart phones and other devices. The ways citizens connect to these networks and the length of their access can vary.



Internet access has become a key component in providing education and health care, managing energy resources and ensuring public safety. It is also important for economic development.¹¹ Rural communities sometimes lack access to broadband internet, having neither cable nor fiber optic networks.¹² New York State has committed to bringing broadband to previously unserved rural areas and achieving universal broadband access.¹³ However, even in cities and suburbs, not all areas are equally well-served, with some neighborhoods suffering from a lack of investment in broadband that performs with even the minimum standard of reliability and speed. In those underserved urban pockets, some local governments have begun investigating options for municipal broadband, where the municipality establishes and owns the network and sells the subscriptions to homeowners and businesses.¹⁴ The City of Albany and Erie County have both conducted feasibility studies of investments in municipal broadband.¹⁵

Street Smart

Transportation is a major factor influencing a community's overall quality of life, environment and economy. Particularly in cities, the ways people navigate the streets – not just how well the roads are maintained for drivers, but how easy it is to find parking, use public transit and walk safely – affect how “livable” a place is. Among other initiatives, municipalities are installing more energy-efficient street lighting and adopting smart technologies to help them ensure proper enforcement of parking restrictions, regulate traffic flow, and use municipal vehicles to collect road maintenance data.

Parking Enforcement

Many municipalities have replaced the traditional coin-operated parking meter with some form of electronic parking meter. These come in a range of alternatives, including multi-space parking and single space meters. The meters can have options such as allowing payment by credit or debit card, being multilingual, providing the ability to call 911, or even having cameras that record use of the parking spot and support remote e-ticketing.¹⁶

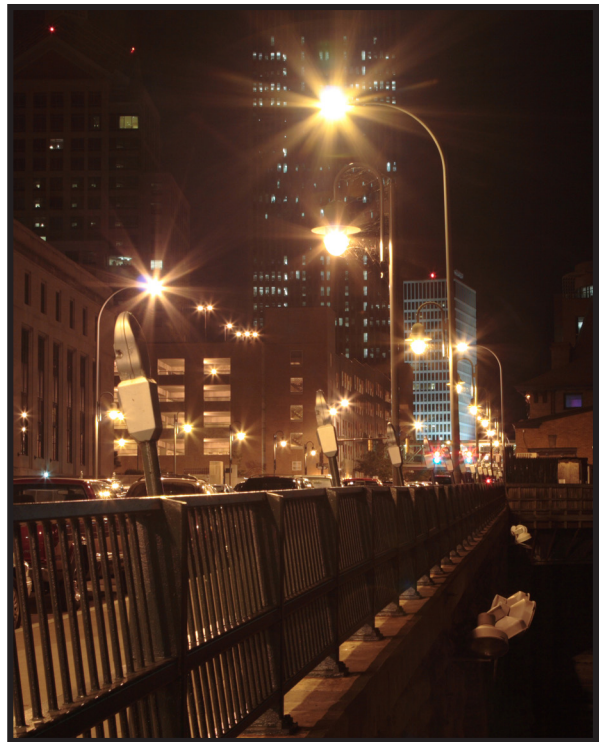
In addition to allowing direct payment through the meter or kiosk, these systems often allow drivers to create user accounts on a smart phone app, and then enter vehicle, personal and payment information. Some mobile app services allow drivers to receive alerts on their phones to renew their parking session before it expires and to pay remotely. Also, when fully integrated into the municipal parking network, apps can provide a “find parking” feature that directs vehicles to empty spaces (such as in a garage) when appropriate. The cities of Kingston, Niagara Falls and Albany are among those extending smart meters and mobile parking apps to improve service to customers as well as streamline parking administration.¹⁷



Multiple methods of accessing this service (kiosk, app, printed ticket, etc.) make the integration of meters, hand-held meter checking devices, and municipal office software imperative. For example, complications arise on the enforcement side when parking inspectors need to check multiple sources (i.e., scan vehicle registration to check if parking was paid at the street kiosk and check the parking app to see if the driver paid on a smart phone) before issuing a citation.

Street Lights

Street lighting upgrades offer potential cost savings for many local governments.¹⁸ Municipalities generally operate and maintain street lights, including replacing light bulbs and paying for the electricity to power them. However, according to a New York State Energy and Research Development Agency (NYSERDA) study, approximately 74 percent of the street lights in the State (excluding New York City) are owned by local utility companies, which then charge the municipalities for the use of the fixtures.¹⁹ Thus, although many municipalities could reap financial benefits from upgrading street lights to LED technology or installing smart dimmers and timers, they might not have the ability to make those changes, and the utility company – which would have to make a substantial investment up front and then sell less electricity – lacks the economic incentive to do so.



The NYSERDA study examines approaches for changing utility incentives, and some local governments are considering gaining ownership of street light poles.²⁰ Proponents of smart technology anticipate additional advantages from ownership through the installation of devices such as cameras, sensors, controls and meters on street lights.

The City of Yonkers was an early adopter of LED street light replacement (in 2013) in part because the City was one of the few that already owned its street lights. At the time, the City reported that switching the nearly 12,000 lights would cut its energy bill by 60 percent – a net savings of almost \$1 million per year – and reduce the City’s carbon footprint by more than 2,700 metric tons annually.²¹ The savings was guaranteed by the contractor to more than cover the cost of installation.²²

The Mid-Hudson Street Light Consortium is currently working with nearly 30 local governments in that region to convert their lighting. One member of the consortium, the City of Kingston, already reported saving \$275,000 in 2017 after it purchased the fixtures from the utility and only partially implemented LED replacement.²³ Municipalities in the consortium expect an annual street lighting cost reduction of up to 90 percent. They also expect the upfront purchase of poles and lighting to be paid back over a few years. These municipalities will then own an asset with the capability to house smart devices, which could provide additional functionality.²⁴

Some local governments considering this option have taken advantage of the Smart Street Lighting NY program, offered by the New York Power Authority (NYPA), which provides turnkey service including project management, low interest rate financing and purchase options to municipalities starting the conversion process.²⁵ The State’s Financial Restructuring Board for Local Governments has also provided assistance to several municipalities for LED street light replacement.²⁶

Rather than making a large capital investment upfront, the City of Schenectady is working with its local utility company (National Grid) on a demonstration project to replace 4,200 company-owned street lights with LED lights, lighting controls and infrastructure for future smart city sensors or devices.²⁷ In this case, the City continues to lease the poles from the utility, but the cost of the electricity supplied should be lowered through the installation of efficient lights. The utility retains its municipal customer, and the City potentially realizes future benefits as the number of innovative technologies located on utility poles grows.

Schenectady Gets Smart

In 2016, the City of Schenectady established a Smart City Advisory Commission to help guide decisions on issues such as upgrading technology and infrastructure, while tackling climate challenges and improving the efficiency of services and quality of life for residents.²⁸ The Commission’s award-winning 2017 Smart City Report shows how the City developed a comprehensive approach to building a culture of innovation “centered on sustainability, efficiency and improved quality of life.” Across a range of projects, the City has worked to create “broad partnerships to ensure community engagement,” implement “data-driven governance tied to proven return on investment,” and encourage experimentation and information sharing.²⁹

Some of the major initiatives described in the report include:

- Implementation of smart street lights (see above);
- Completion of a citywide energy and fuel assessment;
- Addition of a solar array to a combined heat and power system to offset the electrical demand of the City’s water treatment;
- Use of software tools to create efficient waste collection routes and track preventative maintenance on municipal equipment and machinery; and
- A pilot project integrating City Wi-Fi and video and sensor technology into street lighting.

Schenectady also offers citizens several smart tools, including a citizen request tracker tool, an online portal with digitized forms, online bill payment options, and an online recreational facilities reservation system. The City then tracks its own responsiveness to citizens using similar tools.³⁰

GPS on Municipal Equipment

Some municipalities have installed Global Positioning System (GPS) tracking on equipment, such as snowplows, heavy trucks and fleet vehicles. GPS tracking provides anti-theft protection and the ability to monitor fuel use, manage the workforce and optimize response routes. Some local governments have used GPS in other innovative ways.

For example, the City of Syracuse's pothole-filling trucks have GPS trackers that collect data every time a hole is filled. Locations that require frequent filling are flagged as possibly having a larger problem. Frequent potholes can mean that the area may be in need of paving, or they can be signs of even deeper issues, such as water main leaks (and thus future water main breaks).³¹ Further, this data can be shared with other local governments, facilitating the design of models that make better predictions and can be used to benchmark performance.

Syracuse also made the data files of 37 GPS-tracked municipally operated snowplows available to the public for a civic hackathon in February 2018 to see how the public could make the data more useful.³² The winning entry was a color-coded visual display that the City's staff can use to identify if and when a road was plowed after a snowfall. The new map will allow staff to make changes to increase route efficiency and to answer requests from residents.

Vehicle-to-Infrastructure Technology

Plans for smart transit systems often envision using smart technology and intelligent street planning to provide faster and more efficient service. The applications are primarily safety-focused: red light warnings; speed compliance markers (such as curve speed, work zone speed, etc.); oversize vehicle warnings; and emergency or evacuation information.

One example already being used in some places is traffic signal priority, which is simply the idea of giving special treatment (like an extended green light) to public buses or emergency vehicles.³³ Rapid transit buses in the Capital District Transit Authority's (CDTA) bus system use GPS and sensors that communicate with traffic lights to make some routes run faster; CDTA also uses this information in smart phone apps that provide real-time arrival and schedule information.³⁴ In the future, traffic lights could also use real-time information about traffic conditions to help alleviate single passenger vehicle traffic delays, helping drivers eliminate unnecessary stops and vehicles reach optimal fuel efficiency.

In the future, as the technology for "connected vehicles" matures, municipalities may reap additional benefits from vehicle-to-infrastructure (V2I) technology, further improving safety, reducing traffic delays, and conserving energy. V2I uses wireless communication to enable "talk" between vehicles and traffic signals, work zones, toll booths, school zones, and other types of infrastructure; these communication tools are also integral to supporting future autonomous vehicles.³⁵ Since 2016, New York City has piloted a version of this technology on 300 roadside units connected to 8,000 vehicles (MTA buses, UPS delivery trucks, taxicabs, and DOT and sanitation vehicles).³⁶

Bike Shares

Bike share programs often use smart technology to provide an alternative mobility option in downtown areas. Users rent the bikes using a mobile app, and can get a subscription or choose other payment options. The app uses GPS to map and pinpoint the availability and location of bikes in real time, and users unlock the bike issued by the app upon login or payment. The apps also offer ways to “lock” the bike while users shop, eat or visit, making them ideal for urban areas.³⁷

The cities of Albany, Buffalo, Ithaca, Rochester, Saratoga Springs, Schenectady, Troy and Utica are among the municipalities statewide where bike shares have been introduced.³⁸ Buffalo’s system has some hubs purposefully placed to take advantage of the public recreation trails along the Buffalo and Niagara rivers, as well as a dedicated bike-friendly ferry that transports cyclists to the waterfront park.³⁹

Many bike share services use special bike racks, or “docks,” but as demand has grown, Rochester and Ithaca (among others) now provide some dockless service. Although this provides convenience to the user and vendor, it may create new problems for the municipality, since haphazard parking of shared bikes may cause safety problems or impede traffic on streets and sidewalks.⁴⁰

Bike sharing programs are not typically municipal services, but instead involve private sector vendors and often third-party sponsors who may be interested in the advertising possibilities. Still, cities may be involved in regulating bike shares (for example, setting rules for where dockless bicycles may be parked), and in promoting themselves to vendors as attractive locations to establish programs.⁴¹



Safety Smart

Public safety uses of advanced technology vary widely. The mapping of real-time crime data to improve allocation of police resources and the use of body cameras by officers on patrol have received considerable public attention. One recent development has been the implementation of Enhanced 911 (E911) services to better locate and communicate with the ever-growing number of people using mobile devices to reach emergency services. The use of drones also presents opportunities and poses new challenges in policing and emergency management.

Enhanced 911

Enhanced 911 is an automated response system that provides emergency dispatch centers, including the many countywide facilities throughout New York State, the ability to pinpoint a caller's exact location by using the GPS on the caller's smart phone. This can be more reliable than standard verbal communication over the phone, helping emergency responders, such as police, firefighters and paramedics, locate people and emergency sites faster. In addition, the technology is available to upgrade systems to handle nonverbal communications, including receiving texts, pictures or streaming video.

To fund these services, counties are authorized to impose surcharges on wireless and landline communication devices.⁴² The device suppliers collect all surcharges and report and pay them to the New York State Department of Taxation and Finance, which then remits the amounts to the counties imposing the surcharge. Departments of Emergency Services, 911 centers or Police Departments then use these revenues to fund E911 services. A recent audit of several counties by OSC noted that, while all of the counties were using these funds appropriately, they were not able to collect enough revenue to pay for the upgrades, due in part to difficulty in identifying all the suppliers in each county. As a result, county officials were unable to determine whether they were receiving all E911 surcharges from their suppliers. OSC recommended that officials track all landline suppliers that should be collecting surcharges to ensure that they are remitting them and to allow for trend analysis and audit reconciliation.⁴³



Drones

Drones, or unmanned aerial vehicles, can be embedded with cameras, sensors and GPS to view, capture and collect data from locations that are difficult to directly access.⁴⁴ Drones are currently being used by some police, sheriff and fire departments as well as non-public safety agencies in myriad ways – to track lost citizens, locate fleeing suspects, find stolen vehicles, or reconstruct vehicle accident scenes. There are reports of drones being used to manage emergencies, such as to assess damage from floods, to measure the volume of landfills, and to inspect bridges, dams and remote power lines.⁴⁵

According to a national study, by early 2018 at least 28 public safety agencies in New York State had drones.⁴⁶ News reports have identified other local governments – including several towns on Long Island – using drones to monitor construction, map and track development, and settle property compliance issues (e.g., lighting or private intrusion onto public lands).⁴⁷



Book Smart

School districts are increasing their use of technology to enrich student development as well as to further parental and community involvement.⁴⁸ Meanwhile, libraries have become a source for free computer usage and public Wi-Fi, as well as smart technology education.

Schools

School districts are using various technologies to provide parents, students and staff with an interactive user experience. School district websites frequently provide such information as weather announcements, schedule changes, contact information, governing board meeting schedules and minutes, and budget and policy documents.⁴⁹ Parents and students may also receive urgent information distributed via text and/or email by participating in a school district notification system.

In addition, some school districts have provided parent portals.⁵⁰ Once a user is registered, a portal uses unique, student-specific login information so that a student's attendance, grades, progress reports and schedules are accessible by parents and students in real time. More schools are also using online systems to facilitate class assignments, including creating, turning in, grading and even collaborating on documents online.⁵¹ High schools also offer students web-based tools for exploring careers, organizing college applications, and developing personal academic plans.

Many school districts are now also providing their students with tablet and laptop computers.⁵² This practice promotes equal access to the online services described above for all students, although in many cases, homes may need broadband internet service to use these tools. In addition, these devices, coupled with school software programs, apps and interactive whiteboards, can help present information and concepts to students in a unique, interactive manner.⁵³

Smart Schools Bond Act

The New York State Smart Schools Bond Act (SSBA) authorizes the State to issue up to \$2 billion in debt to provide school districts with, among other things, grants to acquire learning technology hardware.⁵⁴ Learning technology hardware includes interactive whiteboards, computer servers, and desktop, laptop and tablet computers. Funds can also be used to expand high-speed broadband or wireless internet connectivity in school buildings as well as the surrounding community or to install "high-tech" security features such as video surveillance, emergency notification systems and physical access controls.⁵⁵ In the 611 district investment plans approved through March 2019, most districts planned to upgrade classroom technologies and expand internet connectivity.⁵⁶

Distributing hardware (tablets or laptops) comes with additional concerns. No matter what technology a school district uses, the law requires that the privacy and security of student data be continuously protected.⁵⁷ Districts also need to provide parents with information on appropriate uses, parental controls and any liabilities of the devices. Finally, school districts need to track and account for an increased number of physical assets, update the related technology and software, troubleshoot problems, enforce appropriate usage, and deal with damage and loss.



More generally, the rapid expansion of advanced technologies throughout the public education system continues to raise concerns – about the effectiveness of particular programs and teaching methods, the relationships between public schools and private vendors or donors, and the ultimate goals of public education.⁵⁸ Customary elements of good governance, such as transparency and accountability, strong systems of internal controls and continuous dialogue with stakeholders, can be particularly valuable to school districts seeking to maximize the potential of new technology for their students.

Libraries

Libraries provide members of the community with many online services, as well as onsite access to the internet and other technologies. Many library websites are quite expansive. Patrons can not only gather contact information or find out about ongoing events but can generally search for materials available at their local library, request an interlibrary loan, search certain online subscription-only databases, print documents (for a fee) from any web-connected device, and reserve rooms for meetings and other events.

In addition, libraries are providing more of their traditional services virtually. Through the State's regional library systems, they offer online access to ebooks, audiobooks, magazines and music electronically by streaming materials on a computer or downloading them through an app on a tablet or smartphone.⁵⁹

Libraries, like some branches in the City of Albany, often offer access to free public Wi-Fi, have desktop computers available for use and can loan laptop computers to library cardholders.⁶⁰ Some libraries provide access to newer technologies such as 3D printers and scanners.⁶¹ They also provide hands-on programs and classes designed to improve the public's technology skills.

Smart Utilities

Some of the more advanced uses of smart technology may be the least visible to residents. Upgrading older energy, water and wastewater systems with “smart infrastructure” can allow local governments to gather information that can lead to improved service and efficiency.

Infrastructure technology may include remote systems for uses ranging from metering of electrical and water usage to the operation of critical industrial processes, such as water treatment or sewer maintenance.



Electrical Grid Modernization

An interactive “smart grid” integrates large-scale energy production systems with customer-owned power generation systems, remote home meters, power lines, and related infrastructure. A smart electric grid, with the capacity for two-way interaction, can also help in emergencies by sensing potential shortages and automatically rerouting power to critical community resources such as hospitals and public safety agencies.⁶²

One important element of a smart grid is the incorporation of multiple interconnected “microgrids” (a small network of users with a local source of supply, which is able to disconnect and operate as a single controllable entity).⁶³ Some college campuses, like Cornell University, that have the potential to isolate some operations if necessary can act as microgrids.⁶⁴ In recent years, as locally generated power has become more economical, there has been increasing interest in implementing it on a community level. This approach can decrease the use of traditional fossil fuels and dependence on costly large generation facilities and also reduce disruptions during storms, cyberattacks or other events. Local government entities are involved in various ways in promoting these microgrids. Indeed, NYSERDA awarded funding to 83 local entities to conduct engineering assessments to evaluate the feasibility of installing and operating community microgrids, 11 of which have been awarded funds to operationalize.⁶⁵

Municipalities, such as the City of Troy, the Town of Tonawanda and the Village of Canton, among others, are also encouraging local power generation by hosting “Solarize” campaigns. These are locally organized outreach efforts aimed at getting a critical mass of an area’s homes and businesses to install solar panels, reducing costs through bulk community purchases, and contributing to a more resilient and reliable grid in the process.⁶⁶

Drinking Water Systems

Most households and businesses in the State receive drinking water from publicly operated systems, such as a city water department or a water authority, which is responsible for water delivery infrastructure, water treatment and monitoring, and billing and collection, among other functions.⁶⁷

Older mechanical water meters are not always able to detect low water flows and are generally only read periodically for billing purposes. Newer, advanced meters use electromagnetic or ultrasonic sensors to measure even the lowest flows of water and transmit that data to a central location for continuous monitoring. This allows for more accurate billing and early detection of leaks and broken lines. The City of Yonkers replaced its nearly 30,000 residential water meters with advanced water meter infrastructure and installed remote meters in school and municipal buildings.⁶⁸ In its 2017 annual water report, the City attributed a 6 percent reduction in customer demand and daily consumption to more accurate readings and billing.⁶⁹ The 2018 implementation of an online customer portal will provide residents with real-time water usage information.

Smart industrial control systems (ICS) in drinking water and wastewater treatment systems automatically monitor flows and make adjustments to maximize efficiency. The City of Yonkers, in addition to the customer-facing improvements described above, has adopted smart ICS technology in its water infrastructure.⁷⁰



Well-designed ICSs are configured to be resilient to system failure (including physical failure, as in the case of a flood, and cyberattacks) by having built-in redundancies, an especially crucial feature when the function involves providing public drinking water or keeping sewage out of waterways. However, their very interconnectedness increases the risks associated with unauthorized access or hacking. OSC provides guidance and resources to improve cybersecurity of the ICS environment.⁷¹ OSC has also been conducting reviews of the security of ICSs for water and other utilities; in Wayne County, the Town of Queensbury and the City of Binghamton, OSC identified improvement opportunities in key areas such as employee cybersecurity awareness training and controls over the public disclosure of system information.⁷²

Finally, smart technologies can help local governments detect and/or prevent problems in water mains, ranging from leaks to serious breaks. The technologies may include cameras and other kinds of sensors. When water main breaks happen in populated areas, they can necessitate road closures and even the shutdown of restaurants and offices. An analysis of the City of Syracuse showed that its downtown area was at high risk for such breaks.⁷³ In 2016, the City piloted water main sensors that detect acoustic waves transmitted through the pipes. These waves identify water main leaks early, allowing the Water Department to repair the water main before a severe break occurs and to schedule the repairs during off-peak hours.

Sewer Systems

Another place where advanced technologies can make a real difference is in managing sewer systems. Local governments can mitigate sewer overflows and backups by combining existing mapping and information models with integrated, distributed sensors to facilitate real-time reporting of conditions, precipitation events, and water velocity and levels.

Monitoring tools, such as sewer manhole covers equipped with sensors, can detect an elevated water level in the sewer pipe below the roadway and alert department staff. Transmissions from these sensors can alert staff to perform preventative maintenance where most necessary – often this means clearing the debris, sediment, and accumulated grease in sewer lines – to provide extra sewer capacity and improve the flow of wastewater.⁷⁴ This is particularly important in cities with combined sewer systems, which commingle the water from rain and snowmelt with the wastewater from homes and businesses, where wet weather events can result in the overflow of untreated sewage onto streets and into nearby bodies of water. When pipes are clear, more water stays in them, reducing overflows. New York City, which has several very large combined sewer systems, is piloting the implementation of such sensors.⁷⁵

Cybersecurity and Planning

Advanced technologies are allowing local governments to enhance their operations in many ways, and promise to allow them to do even more. At the same time, their use entails several potential problems and risks. One of the most important concerns is that smart technologies generate a large amount of data about both their users and the systems themselves. Local governments must give heightened attention to the issue of data security, knowing that a breach can happen anywhere. For example, several entities experienced ransomware cyberattacks in 2019, including the City of Albany, the Onondaga County Public Library, and the school districts of Syracuse, Rockville Centre and Mineola. Another complicating factor is that the application of smart technologies also often depends on the expertise of third-party vendors, which may want to use or sell the data and may not have the same concern for confidentiality as the local government.⁷⁶

Another challenge is that smart infrastructure has so many interconnected components – hardware, software and the data – that may be vulnerable to attack.⁷⁷ As industrial control systems have become more complex and interconnected, for example, the cybersecurity risks have increased. In New York State, the Division of Homeland Security and Emergency Services and the Office of Information Technology Services have prioritized funding to protect critical infrastructure from cyberattack.⁷⁸ If malicious actors were to breach this sort of data, they could potentially interfere with the physical operation of the systems.

With these risks in mind, local governments should be sure to make cybersecurity and planning key priorities, as described below.

Seek Guidance

Right from inception, officials should be in conversation with residents, businesses and other community stakeholders to ensure the project responds to public priorities and goals. Early in the process of planning for smart capital investments, officials should seek advice and guidance from their associations and leaders of other municipalities that have already initiated similar projects, as well as ask for legal counsel. While being on the cutting edge of adopting a new technology can be attractive, it can also lead to unexpected difficulties. If possible, consider undertaking a limited pilot project in order to assess risks before embarking on a larger commitment.



Assess Full Fiscal Impact and Funding Opportunities

Officials should carefully weigh the costs and benefits of owning versus leasing equipment and of hiring permanent staff versus contracting with a vendor. Regardless of the solution chosen, local government staffing may need to be adjusted with the introduction of smart technology, especially in the areas of technical support, maintenance and coordination of systems.

To fund these improvements, officials need to carefully estimate the fiscal impact of the new technology and create an implementation plan. This includes seeking out grants or other funding available from public or private sources to partially defray upfront costs. Officials should undertake a thorough calculation of the total return on investment and consider the ultimate impact of this investment on the value of the municipality's infrastructure. Officials should also be aware of the potential impact of new technologies on their revenues. For instance, increasing residents' ease of payment may mean that municipalities collect less money in fines.

Protect Your Data

Audits conducted by OSC have shown that some types of weaknesses are prevalent in existing local government and school district information technology (IT) systems, regardless of the complexity or size of the system.⁷⁹ Examples range from a lack of data security policies and plans, to IT access logs that are not reviewed internally, and to unsecured networks that could allow unauthorized access, among others.⁸⁰ Creating a "chief data officer" position or assigning a qualified staff member to such a role can help. This individual would be in charge of the local government's data operations and ensure that all of the local government's smart technology works in harmony. IT administration, asset management and security are all functions that may be provided through sharing services with other local governments, delivering both expertise and cost savings.⁸¹

Develop a Plan

Since it is likely that there will be more use of smart technology in many aspects of local government operations, it is vital that every local government have a plan for its implementation. In particular, local government leaders should be prepared to systematically address the heightened need for cybersecurity, particularly concerning smart infrastructure devices and related data. While this is a challenge both organizationally and financially, there are resources to help. The New York State Office of Information Technology Services has cybersecurity suggestions for local governments, and the Division of Homeland Security and Emergency Services' support includes cybersecurity assessments and incident response. OSC offers training and publications on capital planning and asset management, as well as several cybersecurity technical and non-technical management guides, in addition to conducting cybersecurity audits.⁸²

OSC's Division of Local Government and School Accountability is committed to helping local officials respond effectively to the challenges and opportunities presented by smart technologies. See the Contacts page at the end of this report for regional assistance.

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- ⁵ All examples of municipal practices in this report are for illustrative purposes only. This report does not constitute a legal opinion about the legality or effects of any actions taken by the local governments described in this report. OSC resources for local officials, including audits, training and guidance, are available at www.osc.state.ny.us/localgov/resources/index.htm.
- ⁶ Under New York State General Municipal Law (GML) Section 30(7), "each municipal corporation shall make accessible to the public via its official internet web site documentation pertaining to its most recent annual financial reports, current year budget, most recent independent audit report and most recent fiscal performance plan or multiyear financial plan." In addition, New York State Public Officers Law Section 104 requires a public body to post the time and place of meetings on the entity's website.
- ⁷ OSC reviewed the official public websites for all of New York's 62 cities, the 25 towns with the highest populations and the 25 villages with the highest populations. The 2017 population estimates from the U.S. Census Bureau were used to determine the most highly populated towns and villages in the State. In addition, OSC evaluated the social media presence (i.e., Facebook and Twitter) of all 62 cities.
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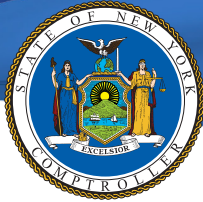
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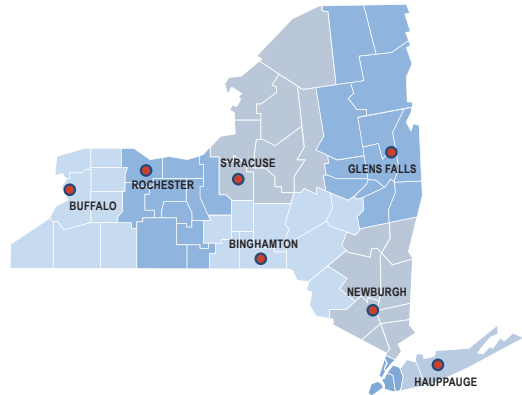


Office of the NEW YORK STATE COMPTROLLER

New York State Comptroller
THOMAS P. DiNAPOLI

Division of Local Government and School Accountability

110 State Street, 12th floor, Albany, NY 12236
Tel: 518.474.4037 • Fax: 518.486.6479
Email: localgov@osc.ny.gov
www.osc.state.ny.us/localgov



Executive • 518.474.4037

Elliott Auerbach, Deputy Comptroller
Tracey Hitchen Boyd, Assistant Comptroller
Randy Partridge, Assistant Comptroller

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STATEWIDE AUDIT

Tel 315.793.2484

Contact

Office of the New York State Comptroller
Division of Local Government and School Accountability

110 State Street, 12th floor
Albany, NY 12236
Tel: (518) 474-4037
Fax: (518) 486-6479
or email us: localgov@osc.ny.gov

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