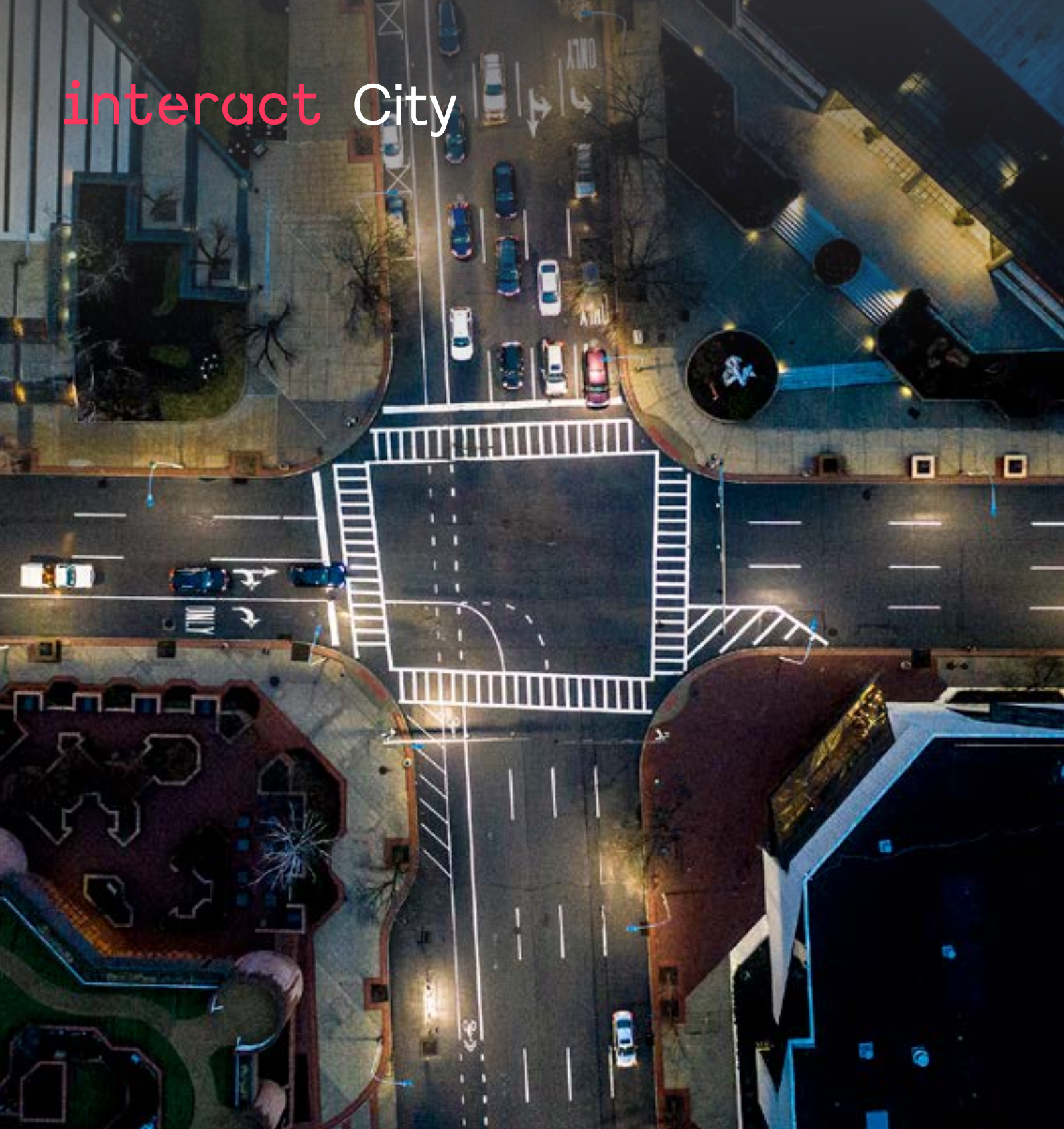


interact City



Case study

Street lighting for the people, of the people, and by the people

How the New York Power Authority is using connected systems for climate action and social equity

Connected systems for a city's specific needs

Urbanization, a leading trend in the past hundred years, shows no signs of slowing down. As a result, mayors and other municipal leaders in cities of all sizes must confront a host of increasingly urgent economic, environmental, and social issues.

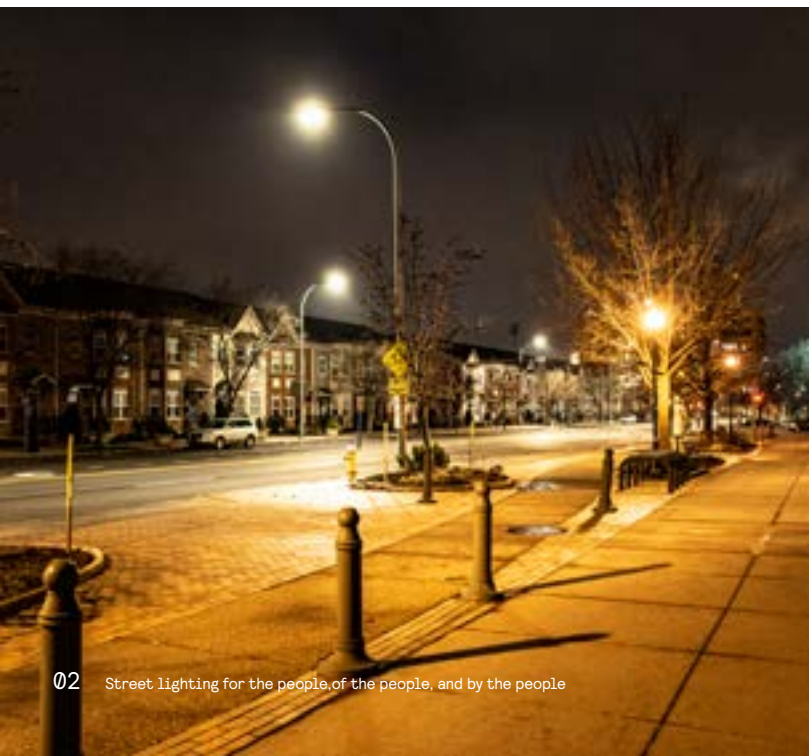
These issues can be especially daunting when approaches to addressing them seem to conflict with one another. How can city leaders constrain or even reduce spending while also investing in critical infrastructure? How can they ensure that new city initiatives benefit all citizens, regardless of income level or other demographic factors? How can a municipality address sustainability without hindering economic development?

Connected systems that participate in the Internet of Things (IoT) have started to make good on their promise to resolve many of the issues that cities face. Smart, connected infrastructure uses data and real-time communications to deliver significant benefits to city managers and residents in ways that were never possible before. By promoting efficiency and managing complexity, connected infrastructure can reconcile the trade-offs that governing often involves.

To deploy smart infrastructure successfully, cities need approaches that integrate innovative financing models, proven technology, and collaboration among vendors and partners to tailor solutions to a particular city's specific needs.

The Smart Street Lighting NY program is a collaboration between the New York Power Authority (NYPA) and a growing number of municipalities in the State of New York. The program demonstrates the important role that connected street lighting can play in building smart city infrastructure—infrastructure that offers superior lighting-related benefits while also serving as a platform for IoT-related benefits both now and in the future.

Because each city participating in Smart Street Lighting NY is unique, the program is designed to be flexible and adaptable to local conditions. As such, the initiative can serve as a model for similar smart infrastructure projects elsewhere in the United States—and also around the world.



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A collaboration that serves the public interest

NYPA is the nation's largest state public power organization and one of the dozens of public-benefit corporations that play a key role in New York State's governance and provision of services. NYPA runs several important innovation programs and strategic initiatives in the state, including Smart Street Lighting NY, a design-bid-build energy project designed to improve energy efficiency and resiliency in participating municipalities.

Smart Street Lighting NY, which was launched in early 2018 by Governor Andrew Cuomo, aims to replace at least half of the more than 1 million streetlights in the State of New York with energy-efficient and sustainable alternatives. Through the program, NYPA provides financial, logistical, technical, and informational support for cities who want to upgrade their street lighting to connected LED. This approach has been a stunning success right out of the gate: with commitments from more than thirty cities to replace 250,000 street lights, the program is almost halfway to its 2025 goal of converting 500,000 street lights across the state. To date, more than 50,000 LED street lights have been installed or are in the process of being installed, saving more than 50 million kWh and \$8.5 million in energy costs per year.

The program has evolved since its inception, even as it retained its original goals. Municipalities are able to do much more than save money and improve the lighting on their streets, as important as those benefits are. As NYPA President and CEO Gil Quiniones explains, IoT integration increases the value of city streetlight systems. "As we implemented Smart Street Lighting NY, we came to understand that these systems are no longer used just to illuminate roads," Quiniones says. "They are in fact vertical assets that can be utilized for smart city deployment."

NYPA devised an innovative financing model to help cities remove obstacles to participation, including offering municipalities low-rate loans for lighting conversions. A municipality could also enlist NYPA's help to buy the city's street lights from the local utility provider. Utility ownership can simplify street lighting for cities, as the cities do not have to manage, maintain, and service

the physical assets. In practice, however, utility ownership of the lighting grid can also lead to stasis and inefficiency. A utility has little to gain from refurbishing a municipal client's lighting system, much less converting it to LED or making it "smart": such conversions can be capital-intensive, and the greater efficiency of a connected system reduces the amount of power the utility sells, suppressing revenue.

But with NYPA's help, this lose-lose proposition for a utility becomes a win-win for a city. With the financing that NYPA offers, the savings in energy and utility-related costs alone can offset the initial conversion cost, and the reduction in lighting-related power needs affords significant savings to the city year after year.

In addition to the offering a favorable financing model, NYPA serves as the single point of contact for a municipality throughout a conversion process, offering complete turnkey service. It audits the municipality's lighting equipment, performs design and engineering duties, handles bidding and procurement, manages construction, and provides environmental services.

In an era in which Americans often associate governance with ineffectiveness and gridlock, Smart Street Lighting NY shows how different levels of government can collaborate in a domain where much is at stake—from preventing crime, to mitigating climate change, to furthering a just society. Bringing together state and municipal governments, state agencies like NYPA, and private sector companies like Signify—whose Interact City connected LED lighting system and management software solution NYPA has adopted—the initiative demonstrates how stakeholders can work together to serve the public interest.



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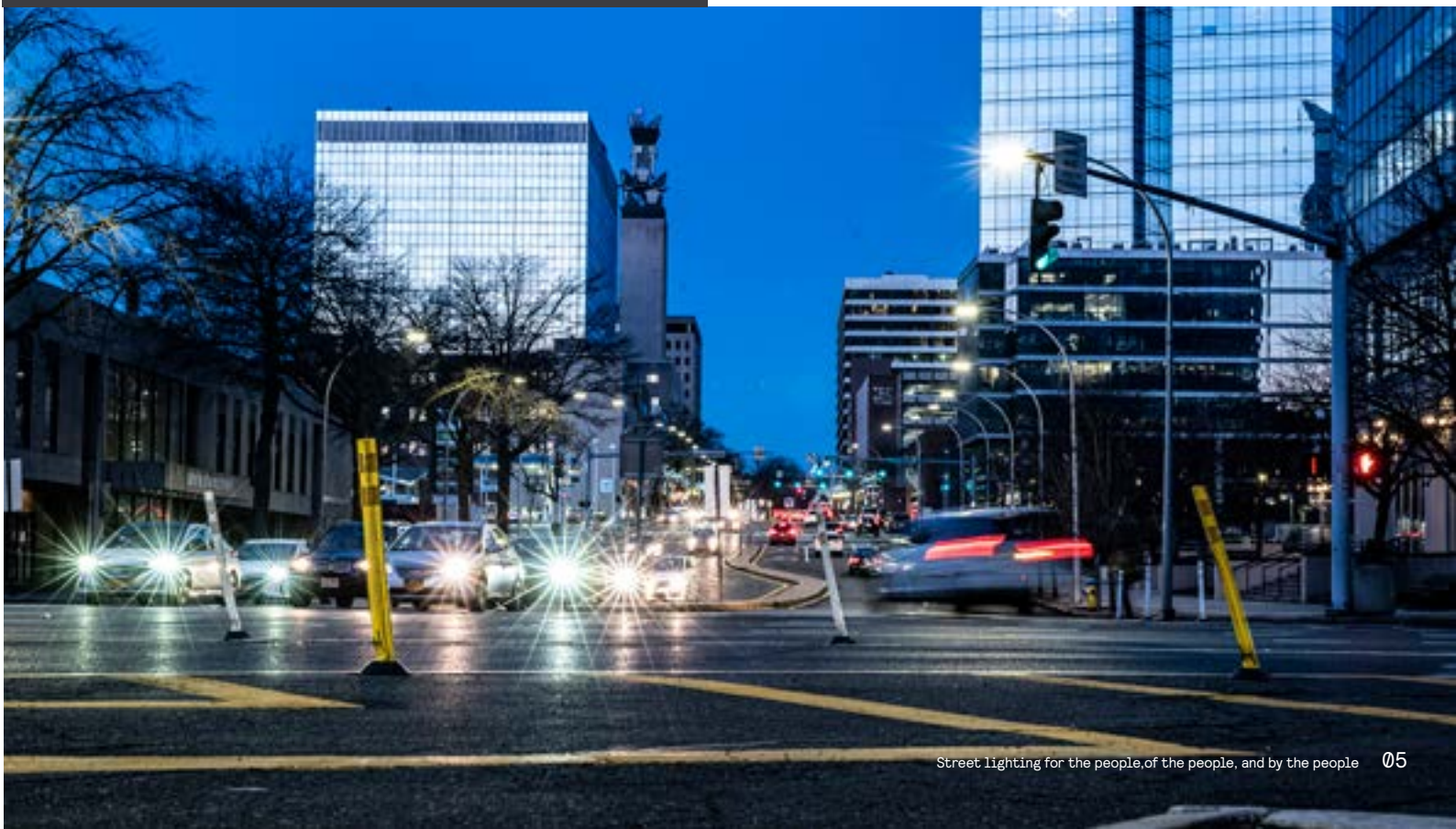
Gil Quinones
NYPA President and CEO

The new urbanization

According to a 2015 estimate by the International Organization for Migration, urban areas are growing by approximately 3 million people every week. Slightly over half of the world population now resides in cities, as compared to 30% in 1950. And the number of the world’s megacities—cities with populations over 10 million—has more than tripled in the last 30 years.

In the developed world, an urban resurgence has infused cities with a new vigor. First-tier cities have become magnets for talent and capital, reversing the late 20th century trend toward suburbanization. Similarly, many smaller cities are now becoming regional centers of commerce and culture.

The dynamics in American cities like San Francisco and Louisville, Kentucky, are very different than they are in Beijing or Nairobi. But in one respect, they share something in common: rapid growth and change can make all cities harder to manage.



Smart Street Lighting NY: The view from 3 cities



Rochester: A commitment to sustainability

As of early 2020, the city of Rochester had replaced 9,600 street lights with Philips RoadFocus cobra heads under the Smart Street Lighting NY project. RoadFocus luminaires integrate directly into the Interact City IoT lighting platform, allowing the city to remotely monitor, control, and manage them.

The city also added an additional 2,200 cobra heads to the Interact City system using connector nodes, which plug into standard sockets and let cities easily connect existing assets without the need for replacement.

Luminaires connect to Interact City via cellular signals, which communicate precise location data along with information on luminaire status and operations. Each luminaire in the system communicates individually, so there's no single point of failure other than the cell tower itself. Installation is essentially plug-and-play, requiring no special IT expertise on the city's part.

Abebe Woldemariam, the city's street lighting program coordinator, estimates that the installation of the new assets took six to seven months. Additional time was devoted to testing different luminaire options and learning about the capabilities of Interact City.

Interact City opens up a variety of options for streamlining street lighting maintenance and governance.

Identifying areas of the system that required repairs, for instance, used to be a time-, labor-, and gasoline-intensive

process of canvassing the city looking for problems. That process is still necessary for luminaires that haven't yet been added to Interact City. But elsewhere, Woldemariam and his colleagues can remotely monitor the system via a central dashboard.

The system takes troubleshooting to a new level of proactivity, prompting the team when there's a glitch, such as a non-functioning light.

"A lot of times we actually find the problems before our residents, and that's always a plus," Woldemariam says. "The system is working great for residents." It's also working well for Woldemariam and his team: the 9,600 connected luminaires have a failure rate of less than 1%.

With the connectivity that Interact City affords in place, Woldemariam is contemplating additions to the street lighting system, such as security cameras and "shot-spotter" devices, if accessible via the wireless network already available at each node. Ultimately, he'd like to bring all of the city's street and area lighting under system control.

To that end, Woldemariam plans to replace the decorative light fixtures that adorn Rochester's residential areas with connected versions. After the cobra heads, these post-top fixtures are the second most common in the city. "We'd like to get those on the smart system as well," Woldemariam says, and adds that the new fixtures will be full cut-off, making them 100% dark-sky compliant.

There are approximately 10,000 of these residential lights to replace; after they're swapped out, the city will have retrofitted about two thirds of its 28,000 lights with connected alternatives.

Rochester's phased deployment of connected LED lighting tech supports its sustainability goals, according to Anne Spaulding, Manager of Environmental Quality in Rochester. She points to a 2017 city climate action plan that aims to slash 2010-level greenhouse gas emissions 20% by 2020, and 40% by 2030.

The city's green achievements to date have been impressive, encompassing electric vehicle initiatives, a program to encourage sustainable home heating and cooling technology, and more. Rochester's commitment to sustainability is clearly integral to its development plans, and a key component of its identity. In turn, its new connected street lighting system is more than just good infrastructure—it's also an expression of the city's values.

NYPA has played an important role in helping Rochester step into a more efficient and better managed future. To begin with, NYPA facilitated the purchase of connected luminaires and IoT lighting software from Signify, affording financial advantages. "Because of the aggregation of the quantity of the lighting, we were able to get a better price by working through NYPA and the Signify contract," Spaulding says. In addition, NYPA offered Rochester help with installation and operation of the streetlights.

Spaulding also cites the importance of the NYPA-organized Five Cities Initiative—comprising the New York cities of Buffalo, Syracuse, Albany, and Yonkers in addition to Rochester—in providing informational support. The Five Cities Initiative "helped each city develop an energy plan," Spaulding says. "Then there was associated funding from NYPA, subsequent to the plan development, to implement some of the actions within those plans."

Spaulding firmly believes that the relationship between NYPA and the city governments in New York State can serve as a model for other cities.

"NYPA has been great reaching out to us, offering us resources and help, and their project management capabilities have been helpful for us," she says. "We utilize those services, and over several projects now it's been a really good relationship."



"A lot of times we actually find the problems before our residents, and that's always a plus. The system is working great for residents."

Abebe Woldemariam
Street Lighting Program Coordinator, Rochester



"Rochester's commitment to sustainability is clearly integral to its development plans, and a key component of its identity."

Anne Spaulding
Manager of Environmental Quality in Rochester



Albany: Building for generations to come

Under the leadership of mayor Kathy Sheehan, New York's capital city of Albany is at the forefront of climate action in the state. Collaborating with NYPA on a smart street lighting conversion project offered "low-hanging fruit" for the city's sustainability initiatives.

"We have nearly 11,000 streetlights, and that presented a real opportunity for us," says Sheehan. "If we could convert those and make them more energy efficient, that would be one of the big ways we could go about implementing the vision that we had for reducing our carbon footprint and keeping ourselves on a path to being an energy-smart city."

At the outset of the conversion project, NYPA helped define the terms of the city's energy use: how much energy it was burning, how much it could reduce its energy use, and so on. NYPA also provided the capital with a manager who would oversee the conversion project. "We didn't have anybody working for the city that had the skill set that we needed to be able to implement the plan," Sheehan says. "And like a lot of municipalities, we're very tight budgeted."

Additionally, NYPA helped Albany purchase the city's lighting stock from the utility that provided power to the city, removing a major barrier. "We didn't own our streetlights, so our ability to do this conversion was really contingent upon our ability to negotiate with the utility to take ownership of those lights," says Sheehan. "That was the path that we determined for the city of Albany was the best path: that we own those lights." With NYPA's help, the city was able to audit the streetlight system and negotiate a sale price for it. NYPA helped finance the city's purchase.

As of early 2020, the city has replaced 70% of its 11,000 streetlights. It has also moved from replacing the lights alongside major arteries to replacing lights in residential neighborhoods.

The results of all this work have been dramatic. According to Sheehan, the drop in citywide greenhouse gas emissions from the conversions is equivalent of removing 600 cars from local roads.

But such striking sustainability benefits were only the beginning. "As we looked at the technology and as we saw what was possible, it really became about a social justice and equity issue, because it allows us to do a number of things that are really helpful to our communities," Sheehan says.

For one thing, the new lights are brighter, which makes streets safer. Managing and monitoring the system in real time with Interact City also helps make Albany a safer place to live.

"Under our old system, our residents, if a streetlight went out, would have to write down the number on the pole and call our utility provider and the utility provider would swap out that light. Now we know when a light is out," Sheehan says. Replacing a busted light used to take six to eight weeks. Now it takes hours.

In many neighborhoods, rapid resolution of street light outages can have important downstream effects—for example, reducing crime. It's no accident that the city is fast-tracking lighting conversions in troubled neighborhoods. "I've had residents tell me, 'I feel safe going to my car now.' So it's really having an impact," Sheehan says.

As NYPA CEO Gil Quiniones has pointed out, connected street lighting can serve as a platform for IoT-enabled services, once the infrastructure is in place. Albany is considering adding sensors to the system, which would automatically brighten or dim street lights depending on how many people or cars are in the vicinity. Security cameras are another possibility, though for privacy and security reasons Sheehan insists on public buy-in before they're deployed.



“I wanted to plan for the city of the future. We needed to ensure that we’re investing now for generations to come.”

Kathy Sheehan
Mayor of Albany

For Sheehan, the conversion was no project to blithely walk into, despite NYPA’s significant financial and logistical help. “I probably asked for more versions and more analytics than my staff wanted to provide, but I think it’s really important that we test and test and test,” Sheehan says. “We wanted to ensure that we were doing what was not only right for the environment, but what was right our residents and right for our budget.”

With 70% of street lights in the city converted, Albany has already realized \$2 million in energy and operational savings, and is projecting annual savings of up to \$3.3 million once the conversion is fully complete. Even factoring in the money that the city borrowed for the project, the city foresees a net benefit of \$1 million per year.

As Mayor Sheehan looks toward the future, she believes that smart lighting will play a key role in the city’s development. “I wanted to plan for the city of the future,” says Sheehan. “We needed to ensure that we’re investing now for generations to come.”





White Plains: The game-changing powers of LED

Replacing conventional streetlights with LEDs can pay dividends in itself, even without taking advantage of the benefits that connecting them offers. Such has been the case in White Plains, a city of nearly 60,000 residents located 25 miles north of midtown Manhattan.

For several years, the city had been swapping in LEDs for its existing vapor streetlights “slowly but surely,” in the words of Rick Hope, Commissioner of Public Works. The city, which has traditionally owned its own street lights, would replace several hundred of its almost 5,000 lights annually, as budget strictures allowed.

Those budget strictures were significant because, Hope says, the new LED fixtures were relatively expensive. So when NYPA approached White Plains with an offer to help with LED conversion, the city was eager to listen.

“NYPA came and actually did a whole matrix for us, explaining how much money we can save by moving ahead with this all at once, basically,” Hope says. “And it wouldn’t cost us a dime, and we wouldn’t have to lay out any money. The savings would outweigh the cost of the program, including installation and the purchase of the fixtures.”

Despite the conventional wisdom, what Hope calls “one of those too-good-to-be-true scenarios” turned out to be true enough. “When we really sat down and looked at it,” recalls Hope, “not only was all the engineering there, [NYPA] did the financing and they did a wonderful job of the analysis of our entire system, which was something we were lacking in—nor did we have the manpower to do a complete analysis as they did.”

NYPA impressed with their attention to system details, and they made the project grunt work easy as well, handling all of it. That freed the administration to concentrate on other governance issues without breaking stride.

White Plains mayor Thomas Roach gives NYPA high marks for replacing all of the city’s vapor lamps with Philips RoadFocus LED cobra heads in a short nine months. Not only that, Roach affirms, “it was done with really no impact on our staffing.”

The new lighting immediately improved the experience of city life for both residents and visitors. “Traditional vapor lighting creates an orange-ish glow, which I find unpleasant,” Roach says. He adds that he likes the new LEDs’ “crisp light.”

Roach also likes the fact that the new fixtures cut down on light pollution. Not only are more stars visible in the night sky, but White Plains residents say that they’re less bothered by stray light shining from the street into their houses and apartments at night. “You want street lighting like everything else: you want to have what you need, and no more,” Roach says.

The LED luminaires also deliver significant efficiency benefits. An LED cobra head can remain in service for as long as 25 years, as opposed to the two or three years of a conventional luminaire, so work crews spend a lot less time changing them. Such operational efficiency benefits taxpayers, as does the new luminaires’ energy efficiency, consuming 50% to 70% less energy than the conventional lights they replaced. As a result, White Plains is reducing their energy burden by an estimated 6,000,000 kWh per year.

Mayor Roach considers the new lighting system, with an ROI of about six years, a win-win. “Once [the NYPA financing] is paid off, then you’re really raking it in,” Roach says, clearly pleased by the prospect. “This is a great way to provide better constituent service and save money.”

Looking ahead, Rick Hope believes that connecting the lighting system might be in White Plains’ future. The connectivity necessary to bring the new RoadFocus luminaires under Interact City management is already built into them, meaning that “going smart” would require no additional installations or retrofits on the city’s part.

Like the City of Albany, White Plains is considering the value of deploying IoT devices on top of the connected street lighting infrastructure, including security cameras, Wi-Fi, and 5G equipment. “The plan would be to really give connectivity to a lot of the residents or people who come to work here in the day,” says Commissioner Hope. “I think that’s where the future lies for us.”



“[The street light conversion] was done with really no impact on our staffing . . . This is a great way to provide better constituent service and save money.”

Thomas Roach
Mayor of White Plains



“The plan would be to really give connectivity to a lot of the residents or people who come to work here in the day. I think that’s where the future lies for us.”

Rick Hope
Commissioner of Public Works, White Plains



A model that municipalities can replicate

Urban governance poses many challenges: tight budgets, competing visions, structural issues with no immediate resolution, rivalry among local stakeholders. It makes sense, therefore, to encourage decision-making at the municipal level, where it is most in line with local realities, while at the same time making sure that often resource-stressed municipal governments get the help they need.

When entrusted with the mission, state-level organizations and public-benefit corporations like NYPA can provide that help. So can companies like Signify, which has moved beyond its role as a tech provider to become a trusted advisor and strategic partner both to NYPA and the municipalities that NYPA supports. The result is a supple, multi-layered model of cooperative governance that demonstrates how political institutions can overcome red tape and gridlock to put ambitious plans into action.

The Smart Street Lighting NY collaboration model is flexible enough to apply anywhere in the world where municipal leaders have worthy plans that require financial and logistical help, and where state governments and agencies are willing to lend monetary support and expertise. Government structures, legal regimes, political cultures, and much else may differ, but the basic principles pertain.

One takeaway from the success of NYPA and its smart street lighting program is this: cities may want to consider adopting connected technology sooner rather than later, to get ahead of what appears to be an inevitable future. The smart city is coming. In many cities around the world, it's already here.

As White Plains commissioner Rick Hope says to his counterparts in other cities who may be considering the pros and cons of converting their street lights, "My advice would be, don't wait."

Connected street lighting and the urban future

Connected street lighting can revolutionize a resident's experience of a city. Here are a few examples:

- Air quality sensors installed within the street lighting system can offer granular data to support targeted public health interventions
- Noise sensors can alert the city when decibel levels on the streets exceed a threshold, ensuring quiet, healthy neighborhoods for residents
- Gunshot and fire detection sensors can integrate with police, fire, and emergency medical systems, allowing first responders to react quickly when a crisis occurs
- Easier identification of available parking and payment can reduce traffic and emissions
- Traffic signal queue sizing and priority can better manage public transport, improve citizen productivity, and reduce traffic and emissions
- Smart poles can host Wi-Fi transmitters that offer public broadband access throughout the city, closing the digital divide





Learn more about Interact City

www.interact-lighting.com/city

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