

# The Definitive Guide to Smart Streetlight Operations



**NEW  
BONUS SECTION:**  
The  
Chicago  
Way

*Read how the City of  
Chicago transformed  
streetlight operations to  
do things never before  
possible*

# 12

*Best Practices for Transforming  
Smart Streetlight Operations*



# Let's get it started

Smart street lighting is revolutionizing and transforming urban infrastructure around the world. Yet many programs encounter avoidable delays and preventable cost overruns from start to finish.

Current lighting inventories are out of date and out of line with the plan. GIS data shows streetlight poles on top of office buildings and other poles missing entirely. Billing record errors mean lost revenue in one area and over-charging in another.

Deployments encounter supply chain delays. Crews install the wrong controller in the right location, or the right controller in the wrong location. Trucks are re-rolled to do it all again. 311 service techs can't tell which light is broken, let alone know how to diagnose and fix it.

It doesn't have to be this way.

*These best practices will help you keep projects on time and systems online.*

*This guide shows you how to:*

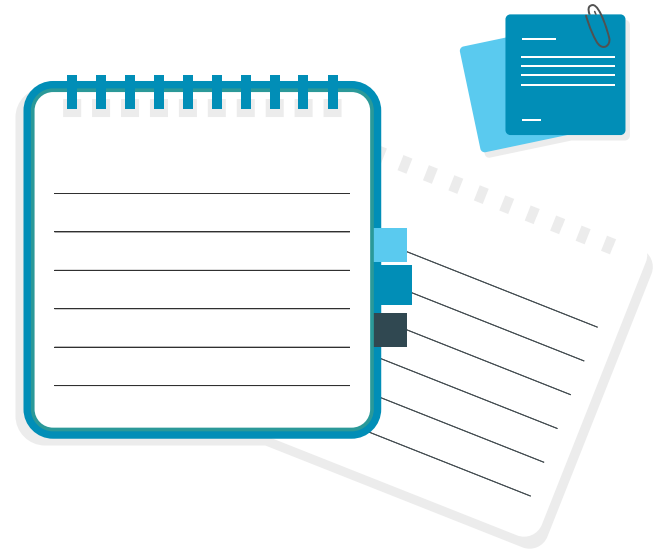
- ▶ Build a Plan for Success
- ▶ Plug the Hole in the Billing Boat
- ▶ Manage the Full Chain of Custody
- ▶ Put Your Back Into It
- ▶ Do Work, Your Way
- ▶ Deploy at Lightning Speed
- ▶ Put Control in the Hands that Need it Most
- ▶ Fix Issues Faster
- ▶ Reduce Truck Rolls
- ▶ See the Metrics that Drive Performance
- ▶ Tap Into the Smart Cities Network
- ▶ Break Down Data Silos
- ▶ Bonus Section: The Chicago Way

# 1 *Build a Plan for Success*

Sounds trite but it's true. Success starts with a plan. The challenge with streetlight surveys is the vicious cycle of expensive, traditional, "boots on the ground" audits. Imagine if you could instantly do a digital survey of your streetlight infrastructure without leaving the office.

*Your next streetlight survey will not only be automated, but it will also be the last streetlight survey you ever have to do.*

Using AI, TerraGo is revolutionizing the way streetlights are identified and maintained, with its innovative use of aerial imagery and machine learning algorithms. Our cutting-edge software platform uses advanced algorithms to scan aerial imagery and automatically detect streetlight poles. This technology automates planning and verification, accelerates the deployment of public smart city lighting, and provides the foundation for self-healing infrastructure data.



## *Planning and Auditing*

- ▶ Conduct investment-grade surveys using AI
- ▶ Crews can update GPS locations, add photos & more during maintenance
- ▶ Automatically synchronize GIS, asset management & back-office systems



## 2 *Plug the Hole in the Billing Boat*

Sure, some street lights and poles are missing from the GIS database, but it's not a big deal, right? No it's not. It's a huge deal. It's the giant sucking sound of leaking revenue and it only gets worse over time. You can't ignore it any longer.

*You can't bill what you can't see.*

Some customers have found thousands of poles missing entirely from their GIS and billing systems. Others have the wrong wattage on thousands of fixtures. Omissions mean lost revenue. Garbage data means you over-charge here and under-charge there. Until you integrate your GIS and billing systems with your crew's everyday field application, your data gets worse and money gets burned. When you integrate your billing systems and field applications from start to finish, you put an end to the ever-growing problem of lost data and lost revenue.



### *Integrated Billing Systems*

- ▶ Rapidly identify missing and non-billable assets
- ▶ Update billing, GIS and back-office systems
- ▶ Keep systems in-sync as part of operations



# 3 *Manage the Full Chain of Custody*



Managing inventory of thousands of dispersed assets can be overwhelming. But it doesn't have to be. Modern inventory applications make it easy to track assets from manufacturers to distribution, from warehouses to truck loads and from installs to maintenance.

*You can't manage without visibility. Supply chain transparency keeps your deployment on track.*

## *Inventory Management*

- ▶ Gain real-time inventory and infrastructure visibility
- ▶ Implement chain-of-custody solution for tracking cyber assets
- ▶ Get ahead of supplier issues that delay your projects

View operations with a dashboard that displays the current location and status of installed components as well as your available inventory, ensuring the day's supply meets the day's demand. Track your cyber assets from cradle to grave, with updated warranty status to keep replacement costs to the bare minimum. Inventory management sounds boring, but streetlight success never gets old.

## 4 *Put Your Back Into It*

Your back-office systems are, well, back at the office.  
Your crews are in the field doing the work. It's time they came together.

*Today's IoT-enabled smart lighting projects can tap into your platforms to work faster and smarter than ever.*

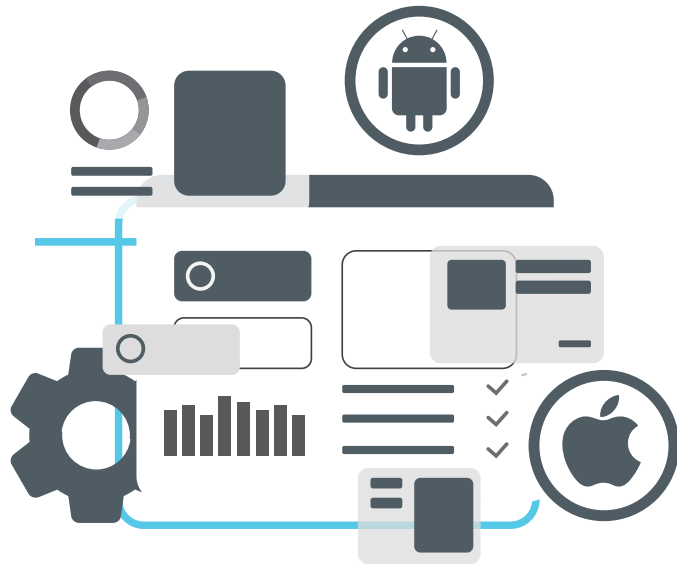
Labor costs account for more than 50% of smart lighting deployment costs. Stop throwing bodies at problems and suffering through cumbersome workflows and paper forms. Start connecting crews and systems. Give crews access to information that eliminates errors and accelerates energy savings. If you give your crews the right tools, they can keep your data up-to-date while they're getting the job done. Now that's working smart.



### *Field App Integration*

- ▶ Connect field applications to back-office systems
- ▶ Deliver real-time diagnostics to fix things fast
- ▶ Eliminate paper with one tap updates

# 5 Do Work, Your Way



## Workflow Customization

- ▶ Configure efficient workflows with smart forms
- ▶ Enable one-tap updates to multiple back office systems
- ▶ Embed data-driven diagnostics to work faster

No two smart street lighting projects are exactly the same, so why should your field app be?

*You need applications tailored to your operations, not rigid platform-specific software.*

The work of your field crews is the lifeline between your lighting infrastructure and your customers, between the services you offer and the revenue you generate. Yet sometimes it feels like the crews are stubbornly resistant to your efforts to go digital. I wonder why. Maybe it's because they're still forced to fill out a bunch of forms, some paper, some online. They have to open one app for one type of work order, use another app for a different service call and for heaven's sake, don't forget to enter job codes at this URL. Stop the madness. Give them one application with smart workflows that minimize time spent tapping on a screen and maximizes their ability to do real work, real fast.



# 6 Deploy at Lightning Speed

What if you could deploy a single application that was proven to help you achieve rollout targets, lower project expenses, reduce O&M costs and accelerate energy savings? Would you say “Nah! I’ll just throw more contractors at it. More bodies is the best way to get more done faster.” You’d be amazed but that’s what many cities, utilities and contractors still do.

*Software that helps you install 50 more lights per week can increase energy savings by over \$1 million.*

Intelligent field applications can prevent the mistakes that create installation errors that lead to re-rolling trucks which inevitably create the project delays that make you want to drink heavily and avoid review meetings. Let’s work smarter. Automate all the steps that you can to eliminate human error wherever possible. Validate crews are checking out the right equipment for the day’s work. Use location services to make sure they’re at the right pole. Scan QR codes to make sure they have the right fixture (and capture asset data while you’re at it - goodbye paper forms). Validate successful installation with wireless control before skipping down the road. Then skip, or maybe just drive, down the road to faster deployments and bigger savings.



## Install Automation

- ▶ Eliminate human errors with validation-driven workflows
- ▶ Automate data capture, installation and commissioning
- ▶ Accelerate energy savings and lower labor costs

# 7 *Put Control In the Hands That Need it Most*

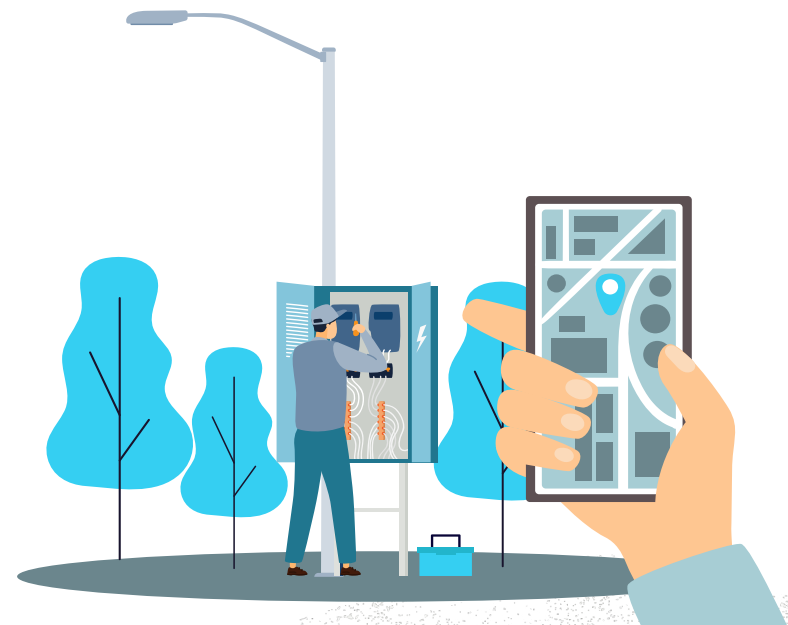
If a crew rolls out to a work order location and can't find a streetlight, how can they get the job done? How often do they go to a 311 call location only to look up and say "I don't know which light they're talking about"? What if instead, they could turn on all the lights on the entire block with a tap on their iPhone?

*Real-time control provides real-time answers in the palm of your crew's hands.*

And real-time answers means you stop re-assigning work orders to a night crew so they can see which light is out. They can see which light is out. They can get real-time meter readings and diagnostics so they know to replace a single component instead of saying "what the heck, I'll just replace everything". Real-time control saves truck rolls, saves maintenance costs and saves a streetlight manager's sanity.

## *On-Demand Control*

- ▶ Control one light or a group of lights
- ▶ Access real-time meter readings and diagnostics
- ▶ Support public safety searches or other operations



# 8 *Fix Issues Faster*

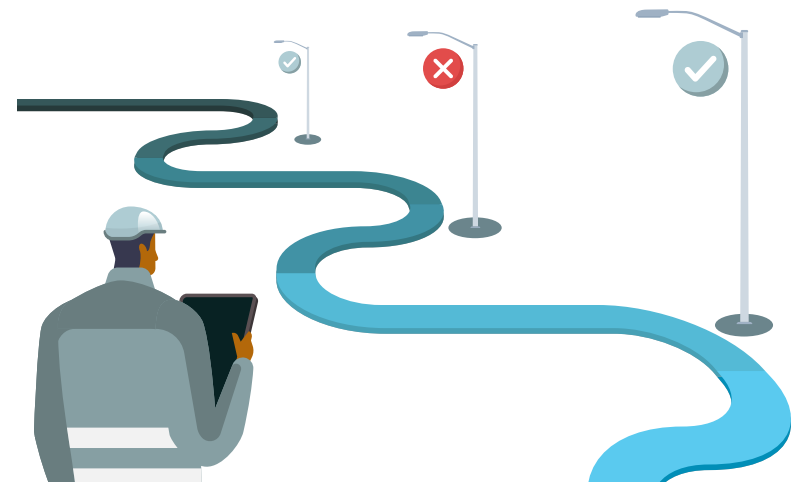
Working blind can be exciting. Citizen calls 311 to report the new smart LED streetlight next to their house is not working. Gotcha. Create a work order. Sometime later..... Carl's on the way. It's 3 o'clock in the afternoon, how the Hell am I supposed to know which one's not working. Karen comes out of her house to tell me, hey, it's this one right here. Thanks. What's wrong? Bulb out? Controller bad? Power issue? No clue. I'll just replace every part, no matter the cost. It will be my last call of the day. Woo hoo.

*Real-time diagnostics mean solving the problem right, fast, the first time.*

How can we expect crews to fix problems with no information? What's so smart about smart lighting that makes maintenance more difficult? How can the new crew be expected to know what Carl learned from 30 years of working on this system and its unknown circuitry? A field application that automatically turns failure reports into prioritized work orders is a game changer. Including historical and real-time data in step-by-step workflows makes it a game winner.

## *Real-Time Diagnostics*

- ▶ Automatically detect failures and dispatch crews
- ▶ Utilize real-time data and step-by-step diagnostics
- ▶ Send prioritized 311 work orders directly to crews



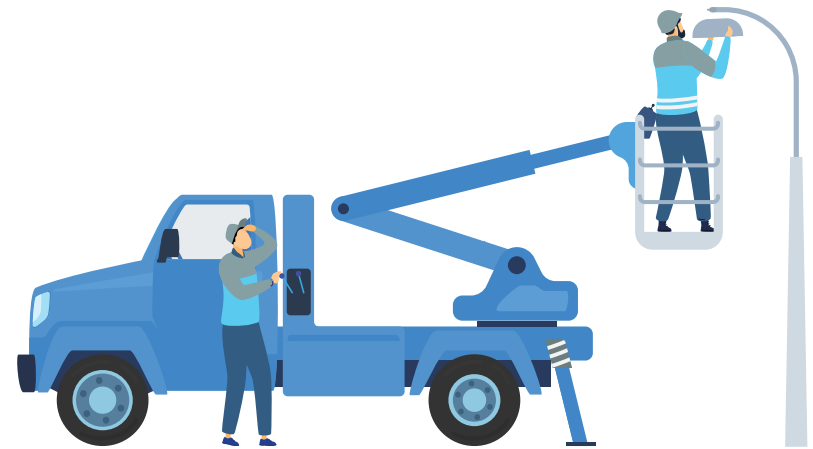


# 9 Reduce Truck Rolls

A crew puts the wrong fixture on the wrong pole. A networked light fails commissioning, so it doesn't work. A day crew answers a 311 call but can't figure out which light is out. There are thousands of reasons for re-rolling trucks. They're costing you dearly. And you don't need to live with it anymore.

*Smart applications can prevent errors and help crews get the job done right the first time.*

Today's smart lighting platforms have the power to help crews work smarter. But they need mobile applications that give that power to them. With smarter apps, crews can be sure they are at the right location with the right equipment, the right parts and the right information – the first time.

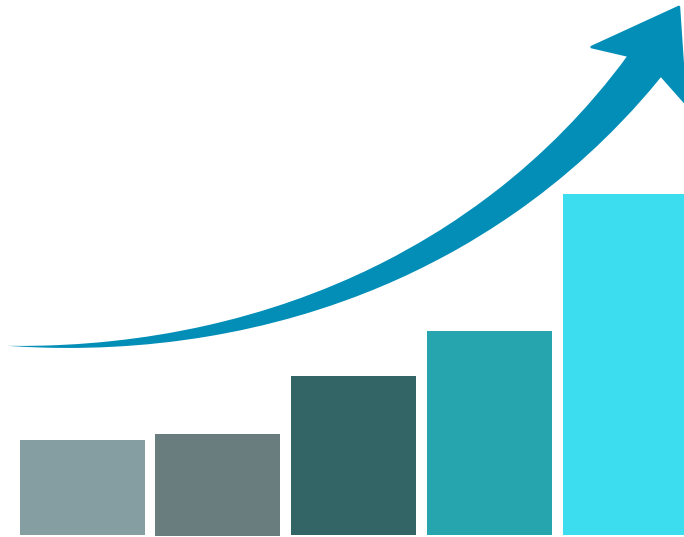


## *Built-in Quality Control*

- ▶ Build workflows with quality control and validation rules to prevent costly mistakes
- ▶ Consolidate related outages into a single work order
- ▶ Use logic to route work orders to the correct crew (construction vs. repairs vs. contractors)

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# See Metrics that Drive Performance



It sounds so easy to manage every single facet of a multi-year, multi-phased, state-wide project that carries with it massive political and budget implications. It should be fairly simple to supervise and communicate across multiple agencies, 24 contractors, hundreds of personnel and numerous suppliers working to replace over 100,000 decades-old sodium lights with wireless LED fixtures. Nobody's gonna want to measure the promised millions of dollars in energy savings that were used to justify financing. No citizen groups are going to be salty if we're not making progress on the network canopy that carries with it the hope of smart city applications that will improve the lives of all citizens.

## Operations Analytics

- ▶ Track progress before backlog gets too large to correct course
- ▶ Actively measure vendor and crew performance indicators
- ▶ Transparently share program milestones with stakeholders

*If any of those assumptions are wrong, you're gonna need analytics, like big time.*

Analytics helps you track and manage progress on a real-time, daily, weekly or monthly basis. Most importantly it helps you correct course when things go wrong by shining a light on problem areas. Contractor falling behind schedule, time for a change. Supplier can't deliver, time for a chat. When things are going good, all your stakeholders can see that clearly and sing your praises. Well, maybe not but they'll know.

# 11 *Tap into Your Smart Cities Network*

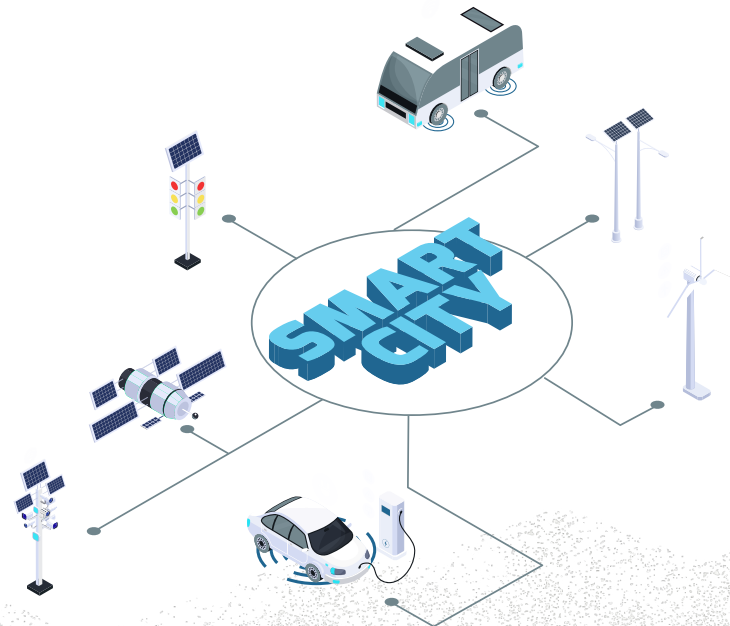
Your smart lighting poles are no longer just lighting poles. They are nodes in a network. They are a readymade smart city infrastructure. Connected street lighting is the network canopy we can use to improve traffic, save energy and keep people safe. So let's start building smarter cities and utilities.

*More and more smart lighting deployments include deploying other sensors as part of the rollout.*

Your crews can leverage the same network and applications for deploying and connecting water and gas meters, intelligent traffic signals, air quality, speed detectors, video and security systems. Every city is different. So are the collection of sensors they need to become smart cities. You can't ask crews to use 30 different applications to manage thousands of sensors from 30 different vendors spanning dozens of networks. You need an integrated field application so smart city crews can work smart too.

## *Multi-sensor Support*

- ▶ Build an integrated plan for multi-sensor deployment
- ▶ Deploy field applications that span IoT platforms
- ▶ Identify a full-lifecycle approach for IoT assets





# 12 Break Down Data Silos



You know what's great about systems integration projects? The \$200 per hour consultant you never see? Wait no, it's the schedule overruns they blame on you? Wait, wait, maybe it's the fact that once they're done, any minor change, all the bugs they left behind, and every tiny 3rd party API change that ever happens in the future means pulling out the checkbook all over again.

*I guess that's why so many platforms that should be working together, simply don't. You gave up. It's time to take a fresh look.*

## Systems Integration

- ▶ Deploy secure 2-way integrations at lightning speed
- ▶ Sync real-time streaming data pipelines between platforms
- ▶ Replace expensive systems integration with a reliable, low-cost, built-in service

They call it an Integration Platform as a Service (IPaaS), not that we need another “-aaS” acronym. Matters not. IPaaS connects the lighting, billing, GIS, asset management and other back-office systems that need to be integrated. IPaaS is a legitimate cure to the uber-expensive, failure-prone, system integrator disease. The right field application should deliver, operate, monitor and maintain these interfaces as part of a comprehensive SaaS offering. You deserve the integration benefits the SI sales guy's been promising since the Reagan years. And you get reliable, worry-free, hands-off operations.



# *The Chicago Way: Challenge*

The City outlined a four year program over 270,000 existing outdated High-Pressure Sodium (HPS) light fixtures with new LED light fixtures on streets, alleys and viaducts. These changes would save city taxpayers \$100 million over ten years.

*One of the largest and most ambitious smart lighting programs in the world, the scale and schedule presented numerous challenges that needed to be met head on.*

## *Challenge*

- ▶ Deploy over a quarter million smart LED streetlights and wireless controls in the world's largest city-led project
- ▶ Maintain the streetlight network and smart devices and the underlying electrical circuits
- ▶ Deploy operations application that integrates CMS, billing, 311 (Salesforce.com) and ArcGIS platforms

Specific Operational Challenges included:

- Speed of Deployment – accelerating creates massive savings, delays are equally costly
- Platform Integration – field updates need to be synced across CMS, billing, GIS and 311 systems
- Asset Integration – need to manage more than lights including electric grid - total assets over 800,000
- Resource Management – the crews, fleets of trucks and schedules need to be continuously optimized
- Operational Efficiency – digital transformation to replace paper forms and manual procedures with intelligent automation



Bonus

# The Chicago Way: Solution



*“By correlating service requests from citizens and system alerts, we can consolidate work orders, improve our response times and lower operations costs by reducing truck rolls.” David Reyes, City of Chicago*

## Solution

- ▶ TerraGo’s StreetlightOps® Platform, including Installation, Maintenance and Work Order modules
- ▶ TerraGo’s iPaaS solution for integrating CMS (SLV), streetlight work orders (StreetlightOps), 311 (Salesforce.com), billing system and GIS (ArcGIS)

In order to take on such a big project, the City of Chicago and lead contractor Ameresco looked to TerraGo’s zero-code, customizable platform, StreetlightOps. StreetlightOps provided Chicago with the ability to rapidly deploy custom capabilities by configuration, not coding, including integration with back-office systems. This enabled field operations efficiencies by applying rules-driven optimization utilizing data from the different systems. With StreetlightOps, field crews get automated work order notifications on their mobile devices. These work orders are optimized, de-duplicated, consolidated and assigned based with most efficient routes and proximity. All of the data is synchronized with back office systems, including CMS (Itron SLV), billing, 311(Salesforce.com) and GIS (ArcGIS). The mobile workflows are step-by-step data driven diagnostics that leverage multi-platform data and extend powerful features to the field crew mobile devices like real-time control of lights.



Bonus

# The Chicago Way: Results

With the help of TerraGo StreetlightOps, the City of Chicago has been able to install hundreds of thousands of new LED light fixtures ahead of schedule, streamline maintenance, increase safety, reduce energy costs and improve the environment. The ongoing maintenance benefits have greatly improved service levels.

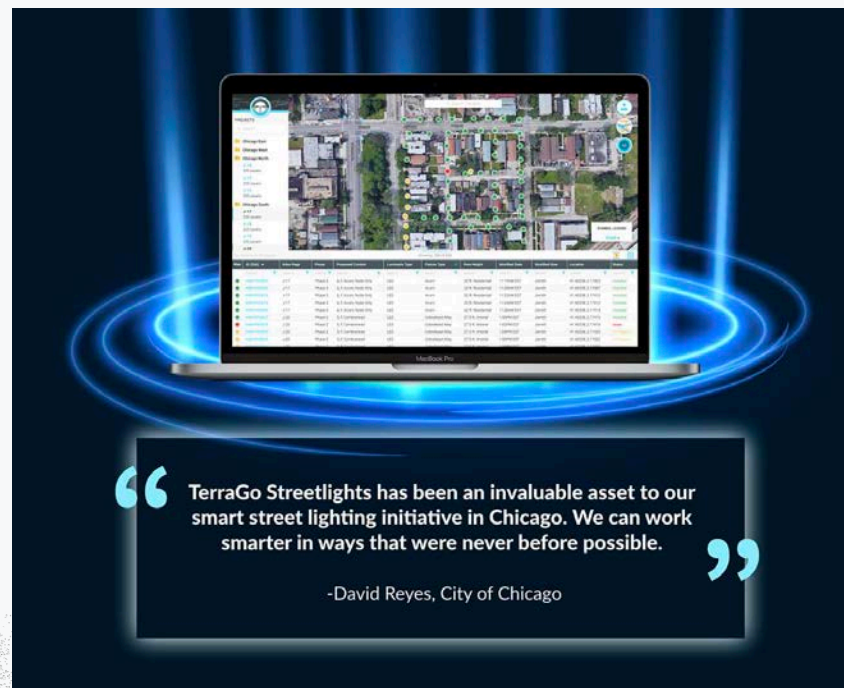
Chicago resolved 200 “All Outs” over a few days, restoring over 2,000 actual lights out and resolving over 500 individual citizen calls, far exceeding any past restoration rates.

Specific operational benefits include:

- Automated consolidation and de-duplication of work orders
- Proactive outage restoration work orders
- Geographic distribution of tickets based on proximity
- More efficient and priority ticket routing
- Automated the creation of Salesforce ticket numbers
- Provides geospatial view of outages and restoration work
- Advanced routing reduces drive time and increases repairs
- Automatic field updates to circuitry, location and condition
- Self-healing data for all back office systems with field updates
- Receive mobile failure alerts with work orders
- Eliminates paper-based operations and reduces delays

## Results

- ▶ Over 280,000 lights have been installed and the project has met or exceeded its ambitious schedule and the delivery of over \$10 million per year in savings
- ▶ Transformed operations with intelligent work order management that reduces truck rolls, optimizes routes, improves service and reduces outage times
- ▶ Automated work order assignment, eliminated paper forms and reduced work order delays



*If you're interested in putting these best practices to work for you, TerraGo experts can show you how. With TerraGo StreetlightOps, you get an award-winning application that is already field-proven to help our customers deliver in every one of these areas.*

