SOLUTION BRIEF

Energy
Market Optimization

Smart Street Lights for Brighter Savings and Opportunities

Smart street lights deliver more than illumination, they provide the foundation for expanded services, reduced costs, and new revenue opportunities

This solution brief describes how to solve business challenges through investment in innovative technologies.

If you are responsible for...

- **Business strategy:** You will better understand how a smart street lighting solution enables you to successfully meet your business outcomes.
- **Technology decisions:** You will learn how a smart street lighting solution works to deliver IT and business value.

Executive Summary

Smart street lights can transform the way municipalities manage cities, while delivering enormous savings. With street lighting accounting for nearly 40 percent of many cities' total energy costs, local governments and utility providers are seeking new ways to decrease energy usage and reduce costs. Switching from halogen to LED luminaires can help achieve that goal by delivering immediate savings of 50 to 80 percent through reduced energy use. Moreover, installing smart LEDs can generate an additional 10 to 20 percent savings by adjusting output to ambient light levels, dimming or brightening as needed.[1] They can also be set to turn on only when they detect motion, and then dim or turn off after a specific amount of time.

In addition to saving money, cities gain enhanced capabilities and functionalities. By using existing brackets and poles, cities and utility providers can cost-effectively add a wide variety of equipment and sensors, as shown in Figure 1. Smart street lights can help monitor traffic flow, parking, pedestrian crossings, seismic activity, or atmospheric changes. They can be equipped with speakers to alert people to dangerous situations or conditions, or with cameras to help police solve crimes or to verify trash collection and other activities. With these capabilities, cities can improve operational efficiency, increase citizen satisfaction, and decrease costs. Furthermore, smart street lights can also open new revenue opportunities, such as leasing poles for digital signs and other services.

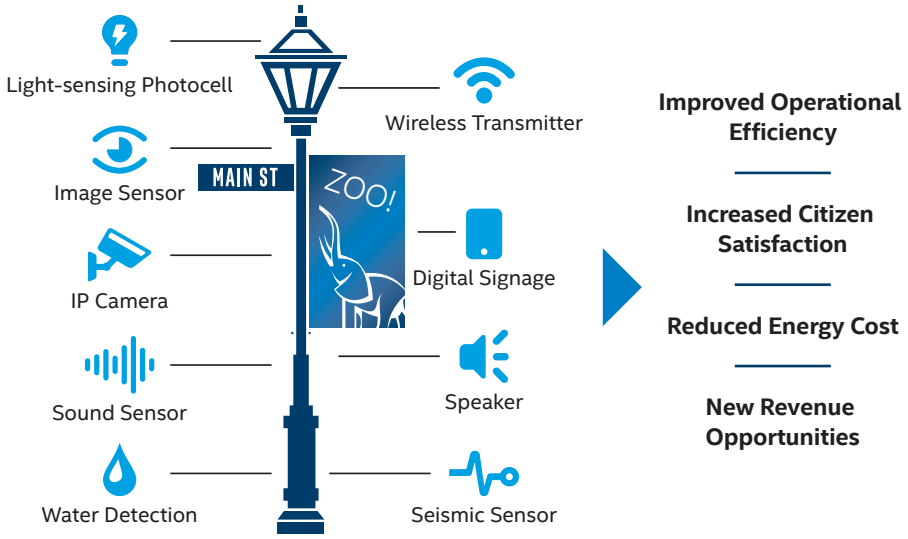

Figure 1. Smart street lights use existing infrastructure to bring new and expanded capabilities to cities, such as seismic sensors, crime detection tools, and traffic monitors.

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Solution Benefits

- **Increased citizen satisfaction.** Smart street lights contribute to more livable cities by helping to improve safety and reduce congestion.
- **Reduced energy cost.** Smart street lights more efficiently manage electricity, leading to greater cost savings compared to simple LED luminaires.
- **Increased revenue opportunities.** Smart street lights can provide new revenue opportunities with digital signage and other capabilities.

Business Challenge: Street Lights Can Do More than Illuminate

Smart street lights offer a wide range of capabilities that benefit cities, utility providers, and citizens. Understanding these benefits helps determine which solutions are best. But deciding what to implement can be difficult because of today's challenges:

- **Technology.** There are multiple applications and technology platforms from which to choose, and it can be difficult to discern which ones meet specific needs. There is also a lack of common standards across networks, and selecting one may have future implications that are presently unknown.
- **Security.** When adding cameras and other capabilities that transmit data, it is important to understand security and privacy issues before implementation. There are many security, control, and management options available, but these, too, often use proprietary systems that could have future implications.
- **Ownership.** Street lights are owned and maintained by different entities in different locations. There may be liability concerns around how street lights are modified, such as dimming and turning off, that have not been fully tested.
- **Cost.** Street lighting is an expensive budget item, in many cases up to 40 percent of a city's total energy cost. And these costs are increasing worldwide as cities expand in size and population. Converting from halogen to basic LED luminaires can instantly save up to 80 percent.
- **Regulations.** Resource availability and climate concerns, such as carbon emissions, are leading to changes in government regulations that must be taken into consideration.

Converting to smart LED lights can save an additional 10 to 20 percent over and above the cost savings achieved with switching to LEDs because smart lights turn on and off more intelligently, adjusting brightness by taking ambient light into account. But there are many more benefits to switching to smart street lights.

Smart Street Lights Deliver a Wide Range of Capabilities

The array of sensor-based capabilities available for smart street lights can solve numerous problems, improve lives, and even offer new revenue sources. As shown in Figure 2, there are significant opportunities:

- **Traffic control.** Video monitoring can help cities better understand traffic and pedestrian patterns, make adjustments, as well as route emergency-response vehicles around congested areas.
- **Parking control.** Street light sensors can provide information about available parking in densely populated areas, as well as monitor vehicles for parking violations without sending personnel out on the street.
- **Crime detection and prevention.** Street lights with video cameras can aid police in solving crimes after they happen,

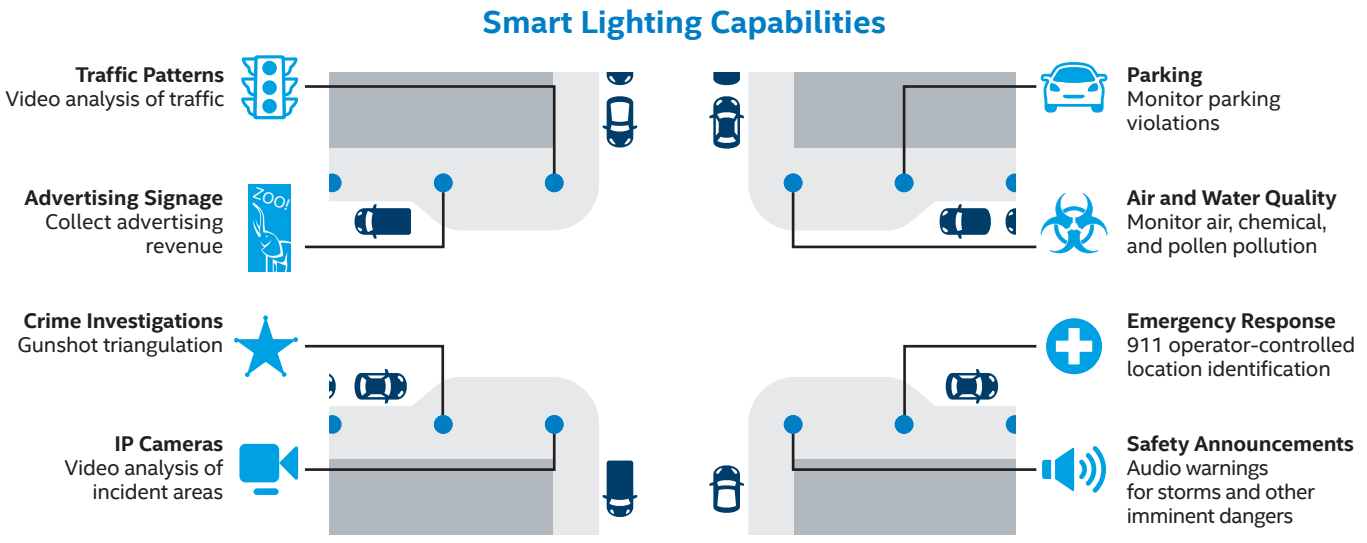

Figure 2. The benefits of smart street lights far exceed basic lighting; they can lead to improved safety, better services, and new revenue opportunities.

as well as deter new crimes from occurring. With sound sensors, police can pinpoint specific information, such as gunshots, and then rapidly secure an area. Atlanta, Georgia, has reduced crime by 28 percent through its use of smart street lights.[2]

- **Emergency response:** Emergency-response operators can activate street lights to help guide emergency workers to specific locations. Lights can also be flashed in sequence, or the color could change, to indicate emergency evacuation routes during natural disasters such as floods and tornados.
- **Environmental monitoring.** Street lights can be equipped with sensors that identify toxic chemicals, pollen counts, or air pollution levels. Air pollution is the single largest environmental health risk according the World Health Organization.[3]
- **Warnings and alerts.** Speaker-equipped lights can be used to warn people in the vicinity of storms or other imminent dangers.
- **Public kiosks.** Street lights can serve as public aids that provide directions to area shopping or public transit schedules.
- **Advertising.** In India, one city leases its poles to a company that equips them with digital signs and smart cells, collecting advertising and subscriber revenue.[4]

With street lights in every neighborhood, in every city across the globe, the opportunities to transform a simple light into a tool to improve the livability of the area translates to more than revenue; it increases citizen satisfaction and safety.

Solution Value: Street Lights Become Revenue-generating Assets

By converting to smart LED street lights, cities can realize immediate savings. LEDs consume much less energy, and smart lights are optimized for greater efficiency by recognizing the conditions within the environment and adjusting energy use accordingly.

Smart street lights can go beyond basic lighting capabilities and become a source for new revenue. Cities can lease capabilities, such as digital advertising or Wi-Fi* hotspots, to a variety of companies and organizations. The savings and revenue opportunities include:

- **Reduced energy cost.** Smart lighting that optimizes dimming, on/off programming, or motion activation can increase cost savings over simple LED luminaires.
- **Optimized maintenance.** Street light maintenance is costly for municipalities and utilities, requiring lift equipment in many locations. And maintenance crews often must interrupt traffic or parking to access the light. With smart street lighting, cities can predict lamp failures using data collected, such as the number of hours the light has operated and the status of a light fixture. Motion sensors and cameras can also provide information on the best time to schedule maintenance.
- **Increased revenue opportunities.** With add-ons such as digital signage, Wi-Fi hotspots, and other capabilities, entities can increase revenue opportunities. In essence, street light and utility poles are becoming more like real estate that can finance themselves.
- **Use of existing infrastructure.** Smart street lights can be installed on existing poles, making saving money as simple as changing the luminaire and enabling a backbone of services in old cities without requiring new investments on infrastructure.
- **Analytics at the edge.** Real-time information, for example, can alert emergency personnel for quicker response. An IP camera can stream images as an event occurs, reducing the need for manual review after the fact. And with some solutions, edge analytics can detect abnormalities and transmit only relevant information to speed the response, as well as reduce costs.
- **Increased citizen satisfaction.** Through improved traffic flow, safer crosswalks, environmental monitoring, and weather alerts, as well as other solutions, the livability of cities is greatly enhanced and citizens are safer and happier.

Both cities and utility providers—whichever entity owns the physical pole—are uniquely positioned to increase value through additional smart street light functionality.

Solution Architecture: Smart Street Lights Use Intel® Technology

Transitioning from halogen, and even simple LEDs, is easy. Smart street lights don't require new infrastructure. Using the same pole and bracket, new luminaires can be installed quickly. Built with Intel® technology, smart street light solutions are designed for performance with a focus on end-to-end security. But one size does not fit all, and organizations should consider three solution categories (shown in Figure 3) when planning investments:

- **Good.** Basic smart lighting with Intel® Quark™ processors includes lamp control and basic sensors. This solution can accommodate add-ons, such as basic weather monitoring, environmental monitoring, and gunshot triangulation.
- **Better.** Enhanced smart lighting with Intel® Atom™ processors includes IP camera functionality (1080p-capable, without edge processing) and can be augmented with environmental monitoring, smart parking, and emergency-response applications.
- **Best.** Smart lighting with Intel® Core™ processors can include high-end Internet-connected cameras for video (full 4K with edge processing), Wi-Fi hotspots, environmental monitoring, smart parking, traffic management, and digital signage applications.

Intelligent Lighting Solutions

Best

High-end IP Camera-based Lighting

- Intel® Core™ processor-based sensors
- Edge processing
- 4K IP camera
- IP camera-based lighting controls
- Wi-Fi* and LTE* protocols
- Sensors for environmental monitoring, crime and safety monitoring, smart parking, traffic management, and digital signage

Better

Enhanced Lighting

- Intel® Atom™ processor-based sensors
- 1080p IP camera
- Enhanced lighting controls
- Wi-Fi and LTE protocols
- Sensors for environmental monitoring, crime and safety monitoring, and smart parking

Good

Basic Lighting

- Intel® Quark™ processor-based sensors
- Basic lighting controls
- LoRaWAN*, Wi-Fi and existing power lines
- Sensors for crime and safety sound triangulation and weather monitoring

Figure 3. With street lights built on Intel® technology, cities and utility providers can select the solution that best fits their needs and upgrade at any time.

Conclusion

Smart lighting is transforming the way cities and utility providers view street lights. Converting to smart street lights can save energy and cost over simple LEDs. With smart street lights, however, cities can realize significant benefits. They can increase citizen satisfaction because they improve safety and reduce congestion. They reduce energy costs by more efficiently managing electricity. And they increase revenue opportunities with capabilities such as digital signage and Wi-Fi hotspots.

Cities and utility providers seeking immediate cost savings or revenue opportunities can now evaluate a wide array of options that address real needs, leading to enormous benefits now and in the future.

Find the solution that is right for your organization. Contact your Intel representative or visit **intel.com/energy.**

Learn More

You may also find the following resources useful:

- Smart LEDs Plug Industries and Cities Into the Internet of Things
- Light Up Smart Cities

[1] navigantresearch.com/research/smart-street-management

[2] crim.cam.ac.uk/people/academic_research/david_farrington/lightsw.pdf

[3] who.int/mediacentre/news/releases/2014/air-pollution/en

[4] deloitte.com/content/dam/Deloitte/in/Documents/technology-media-telecommunications/in-tmt-indian-tower-industry-noexp.pdf

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