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„Світлотехніка й електроенергетика: історія, проблеми, перспективи”

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SMART STREET LIGHTING SYSTEM IN A MODERN CITY

Annotation. Street and public area lighting is a key service provided by local and municipal governments. Good smart street lighting at night in a modern city is essential for road safety, personal safety, and urban ambience, and it indirectly prevents crime and provides security of properties. Well-lit streets also boost economic opportunities by expanding the hours of commercial activity after dark.

Keywords: smart, street lighting, city lighting, energy saving.

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СИСТЕМИ РОЗУМНОГО ВУЛИЧНОГО ОСВІТЛЕННЯ В СУЧАСНОМУ МІСТІ

Анотація. Освітлення вулиць та громадських приміщень є ключовим завданням місцевих і муніципальних органів влади. Розумне вуличне освітлення вночі в сучасному місті має важливе значення для безпеки дорожнього руху, особистої безпеки та міської атмосфери, а ще це запобігає злочинності та забезпечує безпеку приватної власності. Добре освітлені вулиці також покращують економічні можливості, збільшуючи години комерційної діяльності після темноти.

Ключові слова: розумне, вуличне освітлення, міське освітлення, енергозбереження.

About 50% of the world population lives in cities and it is estimated that this number will continue to grow to reach 70% by 2050 [1]. The resources demanded by citizens – energy, water, land, and so forth – will also grow at least linearly with the population size, however, it is difficult to see how the supply could follow the same growth curve. This fact imposes severe requirements to managing the basic resources efficiently and sustainably. New technologies have a tremendous potential to monitor and analyze resource-consuming processes and to bring added value to the services that a city provides. The infrastructure of the smart city – composed of millions of object instances and heterogeneous devices – must act as the pervasive technology which, managed appropriately, can increase the knowledge that citizens, public organizations, and businesses have of their environment and can help making smart decisions with the involvement of the community [2].

City lighting [3] has always been a major concern, a sit represents 10% to 20% of the electricity use in most countries—sometimes more in developing

countries. One of the measures that are most favored by city councils involves the replacement of the emission devices with new ones based on LED technology. But even without investing into replacing less efficient devices, a significant amount of energy can be saved by a more intelligent control of the lighting system. This is a trend towards highly sustainable systems that are quickly gaining ground.

With the development of economy and urbanization, the smart street lighting system has become one of the crucial concerns of people. However, in street lighting system, the efficient management and energy-saving control of lighting system is very important. A well-designed, street lighting system should permit users to travel at night with good visibility, in safety and comfort, while reducing many malfunctions occurs during night and enhancing the appearance of the neighborhood. Conversely, poorly designed lighting systems can lead to poor visibility which may not be helpful for any pedestrian and who are passing by that street.

Quite often, street lighting is poorly designed and inadequately maintained (e.g., there are large numbers of burned-out lamps), and uses obsolete lighting technology, thus consuming large amounts of energy and financial resources [1].

Providing smart street and public lighting in a modern city is one of the most expensive responsibilities of a municipality and can account for up to 38% of energy consumption and greenhouse gas emissions in some cities. New energy-efficient technologies and design can cut street lighting costs dramatically (up to 60%) and reduce greenhouse gas emissions by the same amount. These savings can reduce the need for new generating plants and redeploy scarce capital to delivering energy access to populations in remote areas. The savings also allow municipalities to expand street lighting coverage to additional areas that include low-income and other underserved areas [4]

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, 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. 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 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.

Literature

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