Protecting Electrical Sites with Intelligent Security Lighting

Intelligent security lighting technology can provide effective perimeter intrusion detection and deterrence while complementing other security products.

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There are over 70,000 electrical substations in the United States. A simultaneous attack on several of them could destabilize the grid and cause widespread blackouts. But even a non-targeted event like vandalism or copper theft can also cause substantial damages, easily reaching into the tens of thousands of dollars (if not much greater when potential liability and service outages are considered).
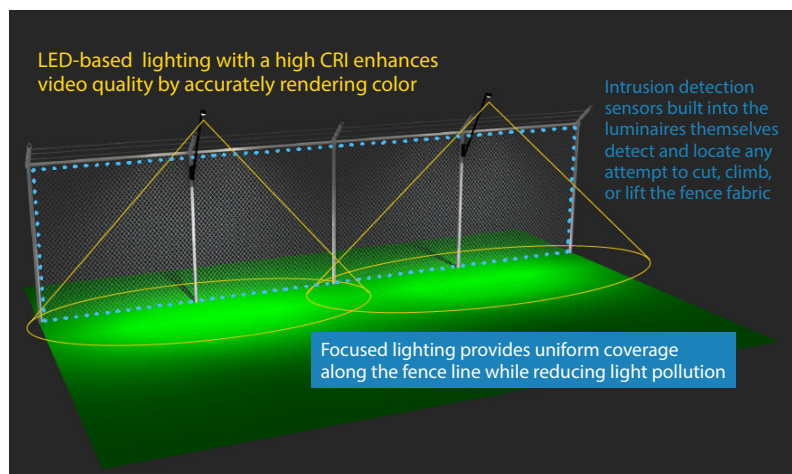
To prevent costly incidents and meet the National Electrical Reliability Commission's Critical Infrastructure Protection regulations (NERC CIP-014), electrical utilities need reliable, cost-effective security solutions. For these solutions to be a success, they must:

- Reliably detect and deter would-be intruders
- Enhance intrusion assessment and response capabilities
- Avoid operator complacency by minimizing nuisance alarms
- Address geographic realities including remote sites, as well as those located adjacent to residential areas, wildlife reserves, and airports

Intelligent security lighting technology can provide effective perimeter intrusion detection and deterrence while complementing other security products like surveillance cameras and video analytics.

WHAT IS INTELLIGENT SECURITY LIGHTING?

One of the first steps to protecting a site is to add security lighting. Traditional lighting technologies such as high pressure sodium (HPS) and metal halide (MH) are expensive to install, require periodic maintenance, and cannot be switched on and off rapidly. As a result, they usually work independently from a site's security system, following a simple time-based schedule. In addition, traditional security lights, as well as their newer LED-based replacement fixtures, generate light pollution due to their wide coverage area.

LED-based lighting with a high CRI enhances video quality by accurately rendering color

Intrusion detection sensors built into the luminaires themselves detect and locate any attempt to cut, climb, or lift the fence fabric

Focused lighting provides uniform coverage along the fence line while reducing light pollution

The Senstar LM100 intelligent lighting system provides targeted, uniform illumination along the perimeter while embedded accelerometers detect intrusions

Intelligent security lighting addresses these limitations and includes embedded processing technology that enables new security applications. By combining targeted LED-based lighting along the perimeter with embedded intrusion detection technology, intelligent security lighting can offer both detection and deterrence functionality in a single product. The resulting hybrid provides unique benefits that are well-suited for electrical markets.

The Senstar LM100 intelligent lighting system illuminates the fenceline and detects intrusions via embedded sensors

NEW DETECTION AND DETERRENCE CAPABILITIES

Deterring would-be intruders in the first place is always the ideal outcome. But when deterrence fails, early detection becomes critical so that operators can respond quickly and effectively. Intelligent security lighting helps to achieve these goals via the following benefits:

1. **Basic site or perimeter illumination** – Discourages would-be intruders while enhancing the effectiveness of camera surveillance systems. LED-based security lighting products dramatically reduce electrical costs when compared to traditional lighting technologies. In addition, the wide light spectrum of newer LED-based products provides a better Color Rendering Index (CRI) value that helps remote operators describe and identify intruders for immediate response or post-incident investigation.

2. **Immediate and visible alarms** – Intelligent lighting can provide localized instant-on, intensity adjustment, or alarm strobe features, indicating to would-be intruders that they are detected and their location is known (and presumably being recorded by the site's security cameras).

3. **Detect and locate intrusion attempts** – Detection at the perimeter means earlier triggering of alarms and the automatic selection of camera views in the video management software. For immediate deterrence,

Legend:
- 6-year operational costs
- 6-year maintenance costs
- Supply/installation costs

Categories: Mercury Vapor*, Metal Halide*, High pressure Sodium*, LED Area/Steet*, Intelligent Lighting**

Axis: $0, $50K, $100K, $150K, $200K, $250K, $300K

Maintenance & operating costs:
MV = $84,225
MH = $118,228
HPS = $55, 784
LED = $5, 023
Intelligent lighting = $620

Electricity cost assumes 11¢/kWh

* Based on 30-foot lighting standard used for HPS, MH, MV, and LED area lighting.

** Civil cost at $20/hour for installation.

the system could enable or strobe fence lights within the immediate area of an intrusion attempt, as well as trigger audio recordings or two-way intercoms.

COST BENEFITS

The simplified installation and long lifespan of LED-based lighting provides a Return on Investment (ROI) far exceeding that of traditional perimeter security lighting. By virtually eliminating maintenance costs, simplifying installation by using low-voltage devices, and drastically reducing electricity usage, intelligent lighting offers the lowest TCO of any security lighting solution along the perimeter.

The following graph compares the 6-year TCO of current security lighting technologies. These costs take into account the material, installation, operating, and maintenance costs over a six-year period and are based on a 600 m (0.37 mi) fence perimeter.
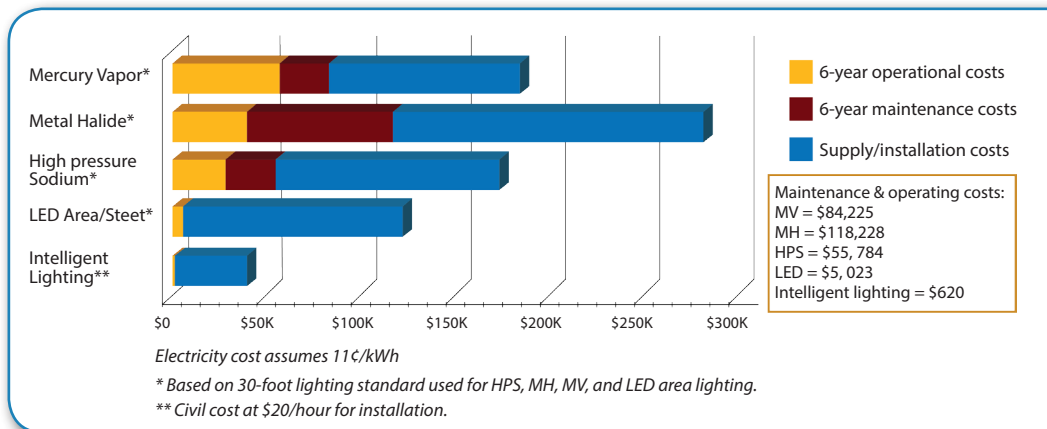
This capture from a surveillance camera demonstrates the light falloff of the Senstar LM100. Targeted illumination along the fenceline ensures the perimeter is well lit and free of hotspots while avoiding light encroachment onto nearby areas.

REDUCING LIGHT POLLUTION

For electrical substations located near residential or high-crime areas, balancing light pollution concerns with the realities of cable theft, vandalism and unauthorized access risks can be problematic. Intelligent security lighting that illuminates only the fenceline, is dimmable, reacts to intrusion attempts, and communicates with the site's security system can manage these concerns while maintaining a secure perimeter.

The first step to reducing light pollution is to use engineered lighting that directs light downwards and along the fenceline, thus meeting the International Dark Sky Association's (darksky.org) recommendations of using outdoor lighting only where needed. Targeted, top-shielded luminaires minimize light escaping upwards or horizontally.

A key requirement for intelligent security lighting is that the LED bulbs support dimming, instant-on, and grouping functions. For example, perimeter lighting could run at 30% illumination intensity and switch to 100% when a perimeter intrusion is detected. In addition, embedded intelligence enables luminaires to be grouped into zones or areas, so that individual luminaires or zones light up or strobe, indicating to would-be intruders know they are detected (and hopefully dissuaded from continuing their trespassing).

PART OF THE SECURITY ECOSYSTEM

Bringing intelligence to the perimeter enables new applications and enhanced multi-layer security, especially when video analytics are used. For example, consider a site where a people tracking analytic monitors the immediate surrounding area. Under normal operation, the video surveillance system records a low-bandwidth stream. When the analytic detects the movement of people near the perimeter, the video management software switches to a higher quality stream and increases the intensity of the perimeter lighting. The improved lighting maximizes the performance of the analytic software and ensures potential intruders are recorded (and ideally deterred) well before an intrusion is attempted. If the area has a relatively high amount of nearby legitimate human activity (for example, a public sidewalk near the substation), alarms are only generated when a disturbance occurs on the actual fence. This results in reduced operator overload, as the number of false and nuisance alarms are dramatically reduced.

In addition to lower electrical usage, intelligent lighting can lower surveillance camera costs. By providing uniform, hotspot-free lighting along the perimeter, higher quality video can be obtained with lower performance cameras. For utility companies with hundreds or thousands of sites, the resulting savings in equipment costs can be substantial.
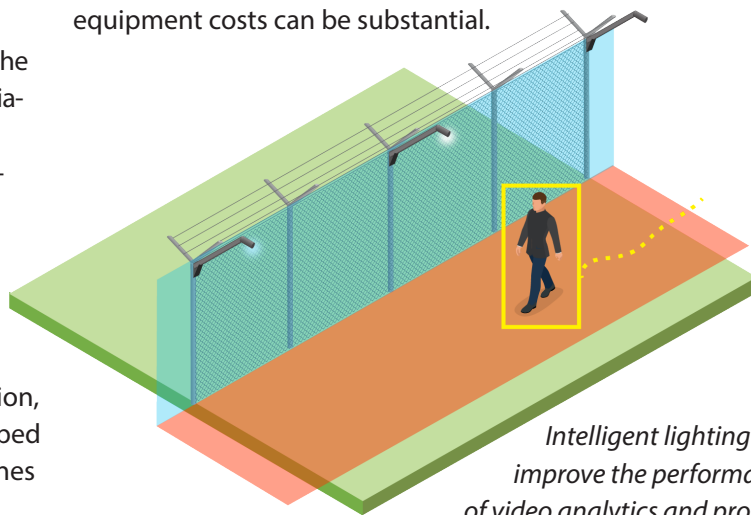
Intelligent lighting can improve the performance of video analytics and provide a multi-layer approach to security

MOVING FORWARD WITH BETTER TECHNOLOGY

For utility operators, intelligent lighting is leading to new capabilities and reduced costs. It may very well lead the next generation of perimeter security systems, offering strong deterrence and detection features while enhancing existing camera surveillance systems and meeting regulatory requirements.

SENSTAR®

Protecting electrical utilities for over 35 years

Senstar products can help simplify security, protect remote sites, and meet NERC CIP requirements.

Perimeter Intrusion Detection
Detect and locate intruders at the fenceline.

Intelligent Perimeter Lighting and Sensing
Provide an immediate psychological deterrent.

Video Management and Analytics
Monitor even the most remote locations.
Give more control over access points and entry points.
Streamline IT operations with centralized IT management.