On the Way Automated fault detection and diagnostics for LED street lighting systems

Many of the benefits of LED streetlights are proven and accepted, and cities and electric utilities are replacing their aged installed base of high-pressure sodium (HPS) and metal halide (MH) with LED. However, in many instances, the benefits of these new lighting systems are compromised by aging electrical distribution systems, extreme weather, and the possibility that some LED streetlights may not be designed to function as intended during non-ideal circunstances. For example, power line disturbances that result in voltages outside the rated LED driver operating range can cause intermittent service disruptions or compromise reliability and lifetime, potentially resulting in dangerous conditions.

Connected lighting systems (CLS) that offer remote monitoring and promise sophisticated lighting control strategies and improved maintenance efficiency have been on the market for many years, but their deployment remains limited. In principle, CLS improve upon traditional maintenance practices by automating what are typically manual, in-person tasks, as summarized in Figure 1. REMOTE-MONITORED DATA CAN ALERT MAINTENANCE STAFF AS SOON AS A SERVICE DISRUPTION OCCURS. (Top) Remote monitoring, and (Bottom) remotely monitored data can alert maintenance staff as soon as a service disruption occurs. (Top) Remote monitoring, and (Bottom) remotely monitored data can alert maintenance staff as soon as a service disruption occurs. The use of CLS to improve maintenance efficiency holds much promise but remains far from standard practice. The data provided by deployed CLS may not always lead directly to fault diagnosis and maintenance actions. For example, a service disruption resulting from a luminaire not providing light or open-circuited circuitry can be detected by monitoring the driver output voltage and current, then comparing these values to_defined thresholds. But different types of lighting service disruptions, and the ways to detect and differentiate between them, are not yet well-defined in recommended practice, leaving maintenance staff struggling to set useful thresholds. And while a voltage or current that is outside a user-defined high or low threshold may be an indication that a service disruption has occurred, observed and characterized, faults associated with unique service disruptions were named and documented faults for various luminaire manufacturers contain-...
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