



Elumia –  
Smart lighting  
monitoring system

Redefining luminary  
monitoring with  
innovative patented  
technology



## Discover the market dynamics

The energy consumed by street lighting has far-reaching implications, as it can consume up to 65% of a city's electricity budget and constitute 10% of its total expenditure, as revealed by the World Bank. Rapid urbanization increases the demand for illumination, consequently increasing energy consumption and financial expenditure unless more intelligent solutions are swiftly adopted.

This scenario underscores the urgent necessity for intelligent solutions, including rigorous monitoring of luminaires. Monitoring is crucial not only for optimizing energy consumption but also for ensuring public safety, minimizing environmental impact, and enhancing urban aesthetics.



# Our smart response

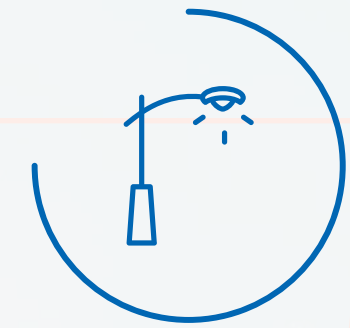
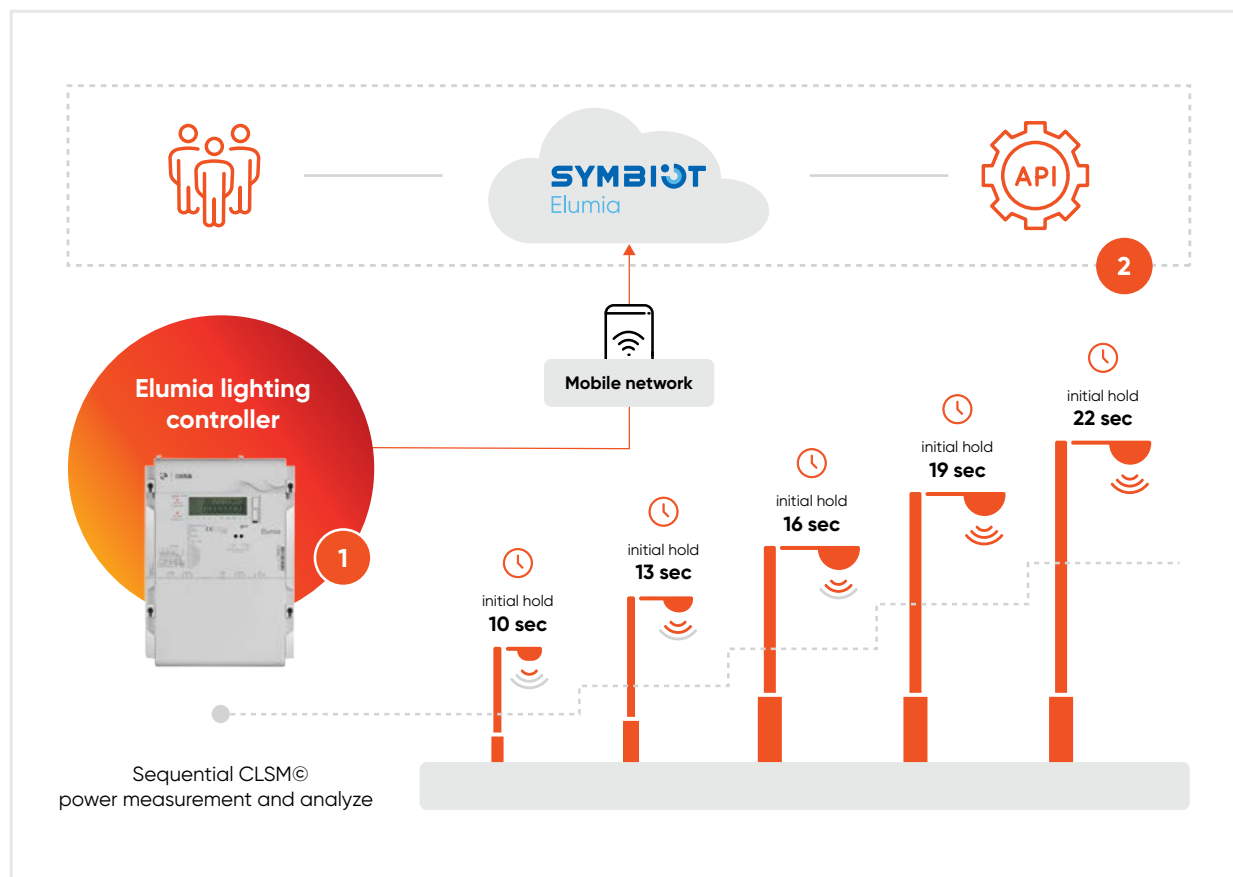
Elumia complements existing IoT solutions, which typically connect only a small portion of a city's luminaires—currently, only about 5% of lights are smart. While IoT solutions offer advanced features like real-time individual lamp control, they come with high costs and complex technical components, making it difficult to justify the ROI.

For customers not yet ready for full IoT investments, Elumia is the ideal complementary solution. It focuses on delivering the core functionality of lamp status monitoring with at least 33% lower Total Cost of Ownership (TCO) over 10 years compared to IoT solutions. This makes Elumia the most cost-efficient option on the market, covering the remaining 95% of lights while still providing comprehensive operational status monitoring. It's an affordable solution that offers smart lighting benefits right away.

When customers are ready to fully embrace IoT, the system can be easily upgraded.

Elumia seamlessly integrates with existing systems, ensuring full compatibility and easy adoption in any environment. It utilizes MID-approved lighting controllers, globally patented CLSM technology, Elumia-ready LED drivers from Inventronics, and a cloud-based management system, Symbiot. With fewer components, the system reduces the risk of malfunctions and operational issues, resulting in improved reliability and simplicity. With no IoT complexity and a vendor-agnostic approach, Elumia ensures smooth and flexible integration.

With Elumia, your lighting system will be fully digitized, all while maintaining the lowest TCO on the market.



## SYMBIOT Elumia

You have the potential to fully modernize the methods of controlling city lights by utilizing our innovative cloud-based technology. Symbiot Elumia provides a unified dashboard, offering secure, immediate access to the status of each city streetlight, facilitating remote monitoring with ease. Quick identification of faulty luminaires enables fast, cost-effective repairs, helping to minimize Total Cost of Ownership (TCO).



## Benefits of smart street lighting

Smart lighting equips cities with numerous advantages, enhancing traditional systems with capabilities far beyond simple illumination. Today, smart lighting technologies transform streetlights into intelligent, interconnected devices within the Internet of Things (IoT) ecosystem.

**Elumia stands out by elegantly complementing these existing IoT solutions, which often connect only a portion of a city's luminaires.** With its ability to integrate seamlessly, Elumia ensures that even partially connected lighting networks can achieve comprehensive smart functionality, creating a cohesive, fully connected lighting infrastructure.



### Lower investment costs

- At least 33% TCO savings compared to other IoT solutions.
- Eliminates the need for additional electronics in each street luminaire.
- Simplifies street cabinet installation by removing the need for additional components like astrolocks and contactors—requiring only the Elumia controller.



### Reduced maintenance costs

- Requires no site inspections.
- Automatically detects faulty luminaires, removing the need for night inspections.



### Energy monitoring

- Monitoring of power consumption for each streetlight, per phase, and per street.
- Messages are sent regarding the issues & malfunctions/breakdowns.
- Monitoring of street cabinet consumption
- Detects any irregular energy usage in real-time, allowing immediate fraud detection.
- Theft detection capabilities.



### Dynamic street light operation

- Automatic on-off schedules based on geographical location and time of year or timetable.
- Supports external on-off control.



### Other benefits

- Interoperable with all luminaire manufacturers, ensuring broad applicability and integration flexibility.
- Out-of-the-box compatibility with luminaires that use Inventronics LED drivers.
- Simplifies street cabinet installation by eliminating the need for additional components like astrolocks and contactors.
- Official energy reporting for ESCOs: Provides energy reports based on the MID-approved smart meter, specifically for Energy Service Companies (ESCOs).
- Protects assets with VPN security.





## Elevated security standards

We have meticulously crafted Elumia with the latest in cutting-edge security technologies and industry best practices to protect customer data and prevent cyber threats. Elumia provides a comprehensive set of security features to protect data during transfer, storage, and use. It employs a variety of encryption techniques, including AES-256 encryption, to ensure that data remains impervious to unauthorized access. It also includes role-based access control, an audit logging system, and an intrusion detection system, ensuring your data remains untampered with. Our devices undergo rigorous penetration testing to provide you with the ultimate assurance of cyber resilience.

## Why Elumia is unique?

- 01 World-wide patented technology of sequential measurement of street lighting.
- 02 Elumia operates without the need for Radio Frequency (RF) communication. Only mobile communication is required between the Elumia controller and the cloud to provide operational monitoring functionality.
- 03 Fully compatible with all existing LED luminaires.
- 04 At least 33% lower TCO over 10 years compared to current IoT solutions, making it the most cost-efficient option on the market.



# Discover Elumia's powerful features

Elumia is more than just smart street lighting; it's an intelligent solution packed with features that revolutionize the way you manage and control your lighting infrastructure. Explore the impressive array of capabilities Elumia brings to the table.



- **Luminaire health monitoring:** Elumia detects malfunctioning luminaires, eliminating the need for manual site inspections and ensuring timely replacements.
- **Energy supervision:** Keep a watchful eye on energy consumption and quickly identify anomalies to optimize energy usage. Gain insights into the power consumption of each streetlight, broken down by phase, street, and more.
- **Grid and luminaire protection:** Elumia ensures there are no inrush current issues, protecting both the grid and luminaires.
- **Centralized management:** Utilize Elumia's central street light management system based on GIS for efficient oversight.
- **Certified metering:** Elumia is using an MID certified device for power and energy measurement.
- **Supported energy inspection:** Due to the MID approved device, Elumia can provide all data for energy inspection.
- **Theft detection:** Elumia includes theft detection features to safeguard your valuable assets.
- **Intelligent lighting control:** Elumia automatically adjusts luminaires based on their geographical location and the time of year, optimizing energy efficiency. In addition, Elumia supports external on-off control such as a lux meter or similar.
- **Flexible scheduling:** Create custom on-off schedules based on the calendar, allowing for efficient energy management.
- **Multiple control options:** Turn lights on and off internally or through external switches, all effortlessly operated through Elumia; other devices can also be controlled.
- **Retrofitting made easy:** Upgrade your existing luminaire base without the hassle of replacing the entire fixture, saving time and resources.
- **Global connectivity:** Enjoy out-of-the-box global connectivity via the LTE Cat-1 cellular network, keeping you connected wherever you are.
- **Security focus:** Elumia prioritizes security, ensuring your smart street lighting system remains protected from potential threats.
- **Built-in security:** Elumia includes a state-of-the-art VPN for security right out of the box.
- **Effortless street cabinet installation:** With zero-configuration installation, getting started with Elumia is a breeze.
- **Remote firmware updates:** Effortlessly update fixtures in the field remotely, including the option to perform downgrades if necessary.





# We believe in green initiatives: efficiency, savings, and sustainability

Experience the future of smart street lighting with Elumia. Our feature-rich solution empowers you with unprecedented control, energy efficiency, and peace of mind.



## Sustainability

Elumia offers a smarter maintenance approach, eliminating the need for night visits and manual inspections, digitizing your lighting infrastructure while reducing operational costs and energy consumption.

## Easy management

By designing a smart lighting system, it is possible to control, monitor, and respond to the system remotely.



## Respect the planet

Developing eco-sustainable lighting system for public areas also means protecting the environment and lowering CO<sub>2</sub> emissions.



# Mastering the art of efficient execution

Discover how the CLSM algorithm and the Elumia solution revolutionize your street lighting, ensuring efficiency, reliability, and precision in every aspect.

## CLSM algorithm

The CLSM algorithm operates by sequentially activating luminaires and monitoring their power consumption. When a luminaire is in good condition, its power consumption increases upon activation, while a faulty luminaire's power remains unchanged. By observing the power profiles over time, the system can accurately and cost-effectively identify malfunctioning luminaires.

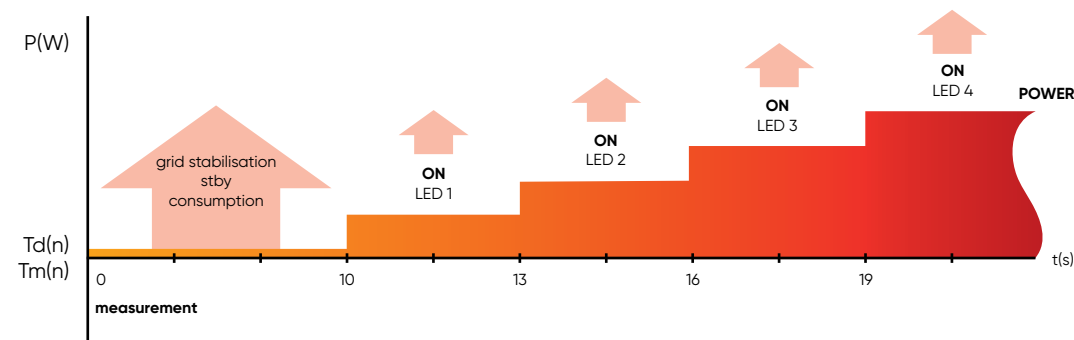


Figure 1 - depicts the power profile when all luminaires are functioning correctly.

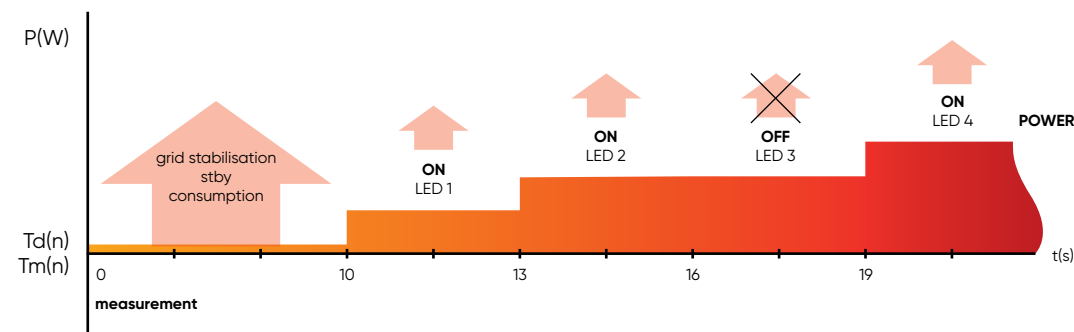


Figure 2 - showcases the power profile when luminaire No. 3 is broken.

Within Figure 1 and Figure 2, we present power profiles illustrating two scenarios: one featuring perfectly functioning luminaires and the other highlighting a scenario with a single malfunctioning luminaire. Notably, in the latter case, there is an absence of a power step at position M3. Our advanced algorithm swiftly detects this anomaly and accurately identifies luminaire 3 as the culprit.

For optimal operation, all luminaires are initially powered at reduced levels (10-50% of maximum power) and are sequentially powered to 100%. This approach ensures immediate illumination of the street while allowing the CLSM algorithm to identify issues through sequential power increases.

## Measurement

Elumia relies on the Iskraemeco smart IE.X energy meters, which is MID certified and serves as a dependable data source for energy inspection without the need for additional external devices.





# Elumia components

The Elumia solution requires three essential components:

1.

## Luminaire with delayed ON capability

We offer flexibility with a choice of standard luminaires from various vendors.

Optimal efficiency is achieved if the luminaire's power supply supports initial delay and power control, enabling seamless integration with the CLSM algorithm.

For luminaires without this capability, external sequencers is used to introduce necessary delays in the power supply, ensuring compliance with the CLSM algorithm. These sequencers can also retrofit existing installations for CLSM functionality.

2.

## Elumia lighting controller

The Elumia lighting controller is the central component of the Elumia solution, offering a range of features:

- Power measurement
- Street lighting control
  - Power switching using internal breakers or external devices over internal relays
- Build on IE.5 meter and enhanced with EDGE compute capability
- Plug-and-play installation with zero configuration connectivity

Elumia's comprehensive functionalities include:

- Metering
  - Utilizes the standard Iskraemeco smart IE.X energy meters
  - Achieves Class 1 measurement accuracy
  - Rated current 85A per phase
  - Equipped with an internal breaker for light control
  - Provides I/O functionality, including 2 high voltage inputs and 2 output relays with 230V/5A capacity for compatibility with various external components
- Street lighting control
  - Autonomous executes ON/OFF switching of luminaires
  - Utilizes precision timing based on an astronomical clock by taking into account the geographical position and precise time of Elumia
  - Responds to external control devices like lux meters
- Detection algorithm
  - Runs the CLSM algorithm for faulty lamp detection
- Communications

- Supports seamless connectivity through a cellular modem employing 4G Cat-1 technology
- Employs an eUICC with eSIM support, facilitating extensive Machine-to-Machine (M2M) deployment with global coverage
- Utilizes dual eSIM functionality for supporting 2 communication contracts and 8 endpoints (4 endpoints per contract)
- Security
  - Subjected to rigorous DNV penetration testing to ensure robust security
  - Utilizes state-of-the-art VPN technology, namely Wireguard, for enhanced data protection
  - Implements a comprehensive key management system for enhanced security measures

3.

## Symbiot Elumia cloud-based software solution

Symbiot Elumia software suite acts as a central access point for all Elumia lighting controllers.

Offers a GIS with graphical representation of luminaire statuses and seamless integration with external software systems.

It provides connectivity and security services, data analytics, street lighting project design, and user-friendly interface.

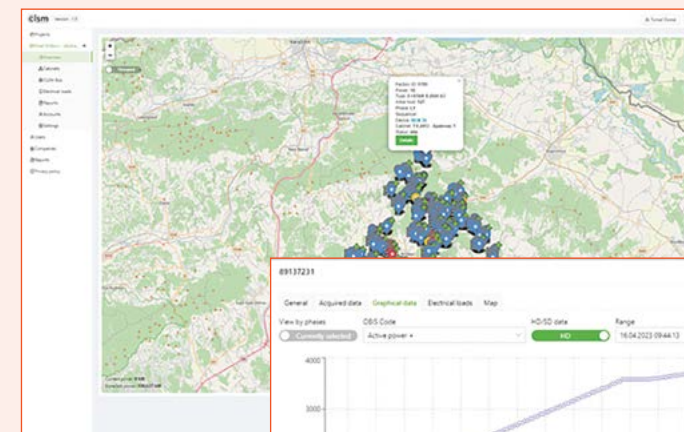


Figure 3 - GIS visualization of luminaire statuses

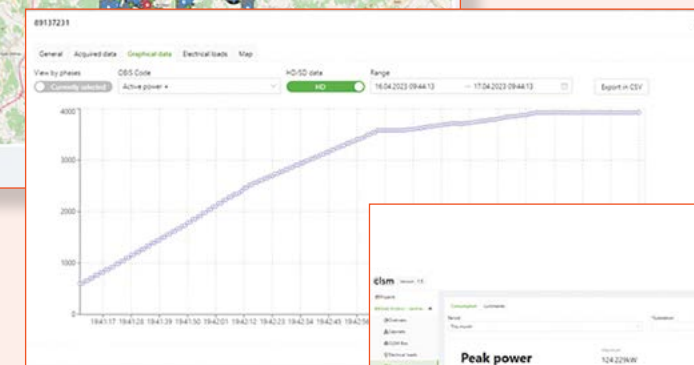


Figure 5 - Graphical representation of recorded measurements

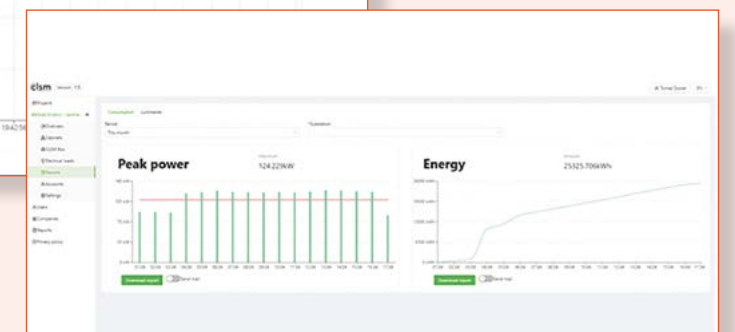


Figure 4 - Power profile report



Ready to transform your lighting with cutting-edge smart solution?

Embrace efficiency, cost savings, and sustainability today. Contact us to embark on a brighter, smarter, and more connected future for your community.



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