

## 1. What is the target market(s) for this product? What types of buildings and/or businesses are best suited for your product?

The LumaWatt Pro system is compatible with nearly any type of lighting fixture. Hence, it is targeted to all buildings and businesses that have a need to reduce fixture lighting load due to over illumination, occupancy patterns, and/or daylighting. We are currently installed in Office Building, Data Centers, Educational Buildings, and Warehouses.

## 2. What is the installation size targeted for the product? Provide a range from smallest to largest in terms of square footage and fixture number.

The LumaWatt Pro system is easily scaled as the installation is at the fixture level and the remainder of the system is wireless. Therefore, the installation target for LumaWatt Pro has no real ceiling in terms of its largest capacity. The smallest installation target on the small end is typically 25,000 sq.ft. / 250 fixtures for pilot projects, and 100,000+ sq.ft. / 1000+ fixtures for full projects.

## 3. Is the system Wired, Wireless, or a Hybrid?

- a. Wired** – All load controllers, sensors, and devices are connected to the system via line and/or low-voltage wires.
- b. Wireless** – All load controllers, sensors, and devices are connected to the system via radio or other wireless signals.
- c. Hybrid** – All load controllers are connected to the system via line and/or low voltage wires, but wireless sensors and devices are available.

The LumaWatt Pro system is a **(C) Hybrid** of wired and wireless. The Control Unit/Driver is wired within the housing of the fixture and the Sensor Unit is tethered to the Control Unit/Driver using a short cable. The fixture provides power to both of these components. The Sensor Unit communicates wirelessly to the LumaWatt Pro Gateway, which collects and transmits data to and from the surrounding Sensors. The Gateway is networked via a Cat5E cable to a Power over Ethernet (PoE) router and then to the LumaWatt Pro Energy Manager, which is a server containing the User Interface for reporting and user preferences. This is what allows us to get enormous coverage and have a very granular level control / visibility with hardly any wiring needed to be installed in the plenum.

## 4. What of the following control strategies does the product provide?

- 1. Scheduling – Yes. The system is capable of 4 different scheduling time periods for weekdays and weekends separately. A different series of system set points can be programmed for each time period
- 2. Daylight Harvesting - Yes. The Sensor Units are calibrated at the time the system is started up. Each Sensor perceives its unique daylight penetration and adjust the individual fixture accordingly. There is a set point in the lighting profiles to customize how aggressive or conservative the fixture responds to daylight.
- 3. Task Tuning - Yes. The system contains lighting profiles (collection of set points) that contain a new Max Light Level, otherwise known as Task Tuning. Separate lighting profiles can be assigned to separate fixtures to allow appropriate Task Tuning for different environments.
- 4. Occupancy Control - Yes. Occupancy set points are configured within the lighting profiles. These set points include:
  - I. Active Motion Window; the time it takes to dim a fixture after a person leaves the area.
  - II. Minimum Light Level; the level to which the fixture shall operate when a person leaves the area. This can be set to '0' to turn the fixture off.

- III. Ramp-up Time; the time (in seconds) it takes the fixture to reach the Task Tuned level when a person enters the area. A gradual Ramp Time eliminates the typical “flash bulb” effect.
- IV. Motion Sensitivity; the time (in seconds) it takes the fixture to accept a person’s presence in the area as “occupied”. Customizing this set point allows persons passing by or peeking into a room to not activate the fixture inadvertently.
- 5. Personal Control/Dimming - Yes. A separate and personal lighting profile can be configured for specific individuals based on personal preferences. This profile can be assigned to the lighting directly above that individual. Should that individual move their work station, the profile can be reassigned to follow them.
- 6. Demand Response / Variable load-shedding - Yes. The system is Automatic Demand Response certified and capable of load shedding. The solution is designed to suite the customer’s specific needs in each applicable project.
- 7. Plug-load control - Yes. The LumaWatt Pro system is capable of Plug Load control in a variety of different ways. This solution is designed to suite the customer’s specific needs in each applicable project.

## **5. What is the topology of the system? (Node-to-node, gateway-to-node)?**

The topology of the LumaWatt Pro system is a Gateway to Node (Sensor) network. However, Sensors can be utilize to relay (aka – Hop) communication from Node-to-Node in the event of signal interference from the Gateway. This flexibility allows LumaWatt Pro to conform to nearly all environments.

## **6. Is the topology based on distributed intelligence or centralized intelligence?**

The topology is based on a distributed intelligence. Each Sensor Unit (node) has its own CPU containing its operating parameters.

## **7. What is the backhaul communications method? (Ethernet, cellular, Wi-Fi)?**

The wired communication part of the LumaWatt Pro system uses an Ethernet backhaul. The wireless communication part of the LumaWatt Pro system uses IEEE 802.15.4 wireless protocol.

Additionally, there are a variety of alternative configurations that we can setup the LumaWatt Pro platform. This includes setting up:

- Energy Managers and Campus Manager on Enterprise or Building Local Area Network (LAN).
- Cloud Services
- Connectivity to Building Management System (BMS)

## **8. What is your products method of data encryption?**

LumaWatt Pro products utilize AES-128 encryption for wireless and SSL for wired connections.

Beyond data encryption, LumaWatt Pro implements a variety of security measures, including:

- Physical security
- On-site network security
- Wireless security
- Multi-site security

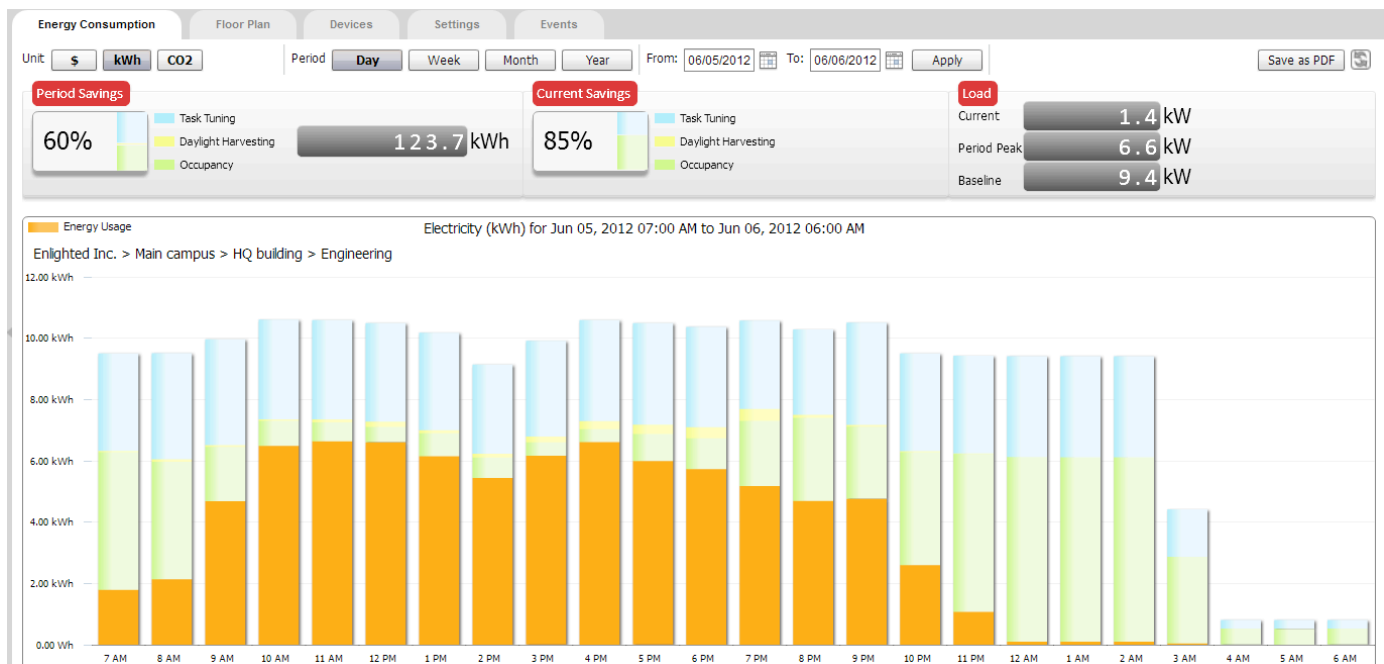
- Data analytics cloud security
- Identification and authentication

## 9. Does the product have energy monitoring and reporting capability? – Yes.

1. If yes,

- Is this a standard feature or optional feature? - Standard feature
- Does the system meter the electricity use of each light fixture or does it use a look-up table methodology? - The system meters the energy consumption of each light fixtures.
- If metered, what is the accuracy of the meter? - The standard Control Unit has a data accuracy below +/- 0.5%
- Succinctly describe the reporting capabilities of the system. Provide links to product brochures or screen shots.

The LumaWatt Pro Energy Manager contains the 'Energy Consumption' report tab where the user can view the data as Dollars Saved, kWh Saved, or CO2 Saved. This data can be viewed for the previous Day, Week, Month, Year, or a customized time window. The report viewed can represent the entire project (building), a chosen floor, a specific area, an individual fixture, or a set of fixtures that are operating under a chosen lighting profile.



## 10. How is the system programmed?

- Does it use a remote control? Software? App? A combination?

It is programmed using a User Interface in the Energy Manager software.

- If the technology is programmed via software or an app, describe the graphical user interface and provide screen shots.

Morning: 7:30 AM
Day: 9:00 AM
Evening: 6:00 PM
Night: 9:00 PM
Update

Weekdays
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday

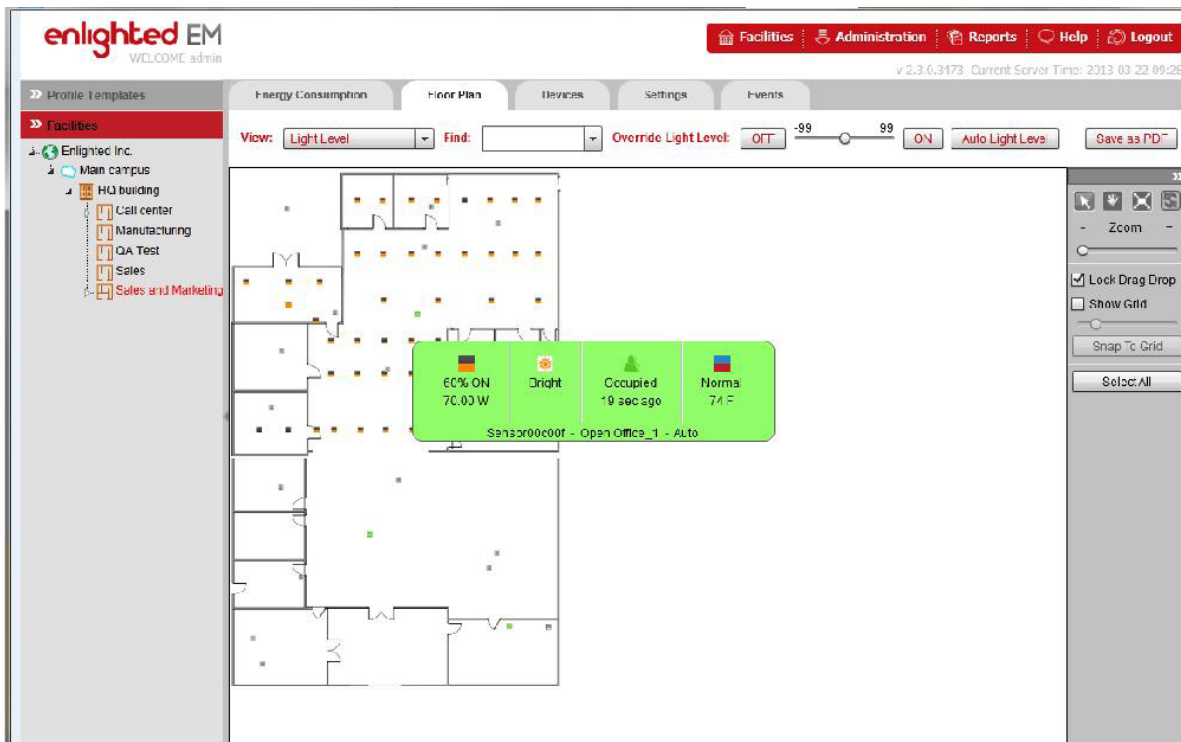
Period	Min light level when on (0-100)(%)	Max light level when on (0-100)(%)	Ramp-up time (0-10)(sec)	Active motion window (1-200)(min)	Motion sensitivity (0-10)	Ambient Sensitivity (0-10)
Week day settings						
Morning	0	60	2	10	1	5
Day	20	60	2	15	1	5
Evening	10	60	2	10	1	5
Night	0	50	0	5	1	5
Weekend settings						
Morning	0	50	2	5	1	5
Day	0	50	2	5	1	5
Evening	0	50	2	5	1	5
Night	0	50	0	5	1	5

- The user interface provides an intuitive set point screen to allow the user to program the different scheduling periods and the associated Set Points for each of those periods.
- The system is capable of 4 different scheduling time periods for weekdays and weekends separately. These set points include:
  - Min. Light Level; the level to which the fixture shall operate when a person leaves the area. This can be set to '0' to turn the fixture off.
  - Max. Light Level; the level to which the fixture shall operate when a person has occupied the area. This is also known as the Task Tuning level. It is a maximum level for occupancy, not a go to level. This works in conjunction with Daylight Harvesting.
  - Ramp-up Time; the time (in seconds) it takes the fixture to reach the Task Tuned level when a person enters the area. A gradual Ramp Time eliminates the typical "flash bulb" effect.
  - Active Motion Window; the time it takes to dim a fixture after a person leaves the area.
  - Motion Sensitivity; the time (in seconds) it takes the fixture to accept a person's presence in the area as "occupied". Customizing this set point allows persons passing by or peeking into a room to not activate the fixture inadvertently.
  - Ambient Sensitivity; this set point allows the user to customize the fixtures response to Daylight Harvesting for the profile. Daylight Harvesting will supersede the Max. Light Level and dim the fixture accordingly.
- Does the software or app have the ability to display an interactive floor plan? Describe the functionality of this floor plan. Are fixtures and devices selectable on the floor plan to change settings?

Yes, there is an interactive floor plan that displays the fixtures and sensor placement. The sensor icon is dynamic and can be displayed in a variety of ways according to what data the user is interested in at that time.

Available display modes include fixture status, fixture area, fixture light level, ambient level, temperature, and more.

The sensor icon is selectable in two ways. By mousing over the icon a pop-up window will appear displaying a summary of the fixtures real time data including, fixture wattage consumption, percent on (of capacity), temperature, relative ambient daylight, and the time that area was last occupied. By double-clicking on the icon a Fixture Details window will display with these details and more including fixture description, sensor mac address, the last communication time, the energy consumption report for that fixture, the assigned profile, and more. Many of the settings, such as the assigned profile, can be changed in this display.



Additionally, by right-clicking on a floor plan sensor icon, an additional menu is available. From here the assigned profile can also be changed.

## 11. How does LumaWatt Pro differ from its competitors? LumaWatt Pro's product differs from its competitors in its:

1. Architecture that uses a hardwired connection between the sensor and controlled fixture for maximum reliability. The processor in each sensor makes independent lighting decisions over a wired communication channel. Each sensor communicates wirelessly with a central server -- for configuration, Demand Response (DR), and data collection. This provides maximum flexibility of install in all retrofit and new build environments. The best of wired and wireless.
2. Sensor – The LumaWatt Pro System is architected to eliminate unnecessary design complexity. Each sensor can be remotely field upgraded to include improved new algorithms and behaviors. The sensor uses patented advanced digital signal processing (DSP) to detect small motion and virtually eliminate false positives. The approach integrates signatures from the PIR sensor with light level changes in the ambient light sensor to create one of the most advanced motion detection and ambient light responding sensors in the world. The presence of temperature sensors enable detailed understanding of the HVAC needs and behavior of a building. This capability is already being used to extend into HVAC savings. The LumaWatt Pro digital sensor platform is what future-proofs your building. The sensors can collect and process data 65 times a second! This is a true big-data solution. The data is already being used beyond energy saving applications - for improving space utilization, traffic flow, business and employee productivity and in life-safety applications.
3. Big Data Platform and Rich Analytics – LumaWatt Pro's unique and rich data stream enables truly smart buildings and future proofs your investment.

**12. Please list all standards that your proposed product complies with and the extent to which it complies.**

UL, IEEE, AES, IC, FCC, RoHS, C-UL, CSA, DALI

**13. Provide information as to the interoperability and management capabilities of inputs/ outputs from other platforms and systems.**

The LumaWatt Pro system provides BACNet and open API's for integration with other systems. These have been and can be used by existing BMS and other systems.

**14. How have you addressed this system security risk?**

The system was built ground-up by network security experts and has passed security audits by many Fortune 500 customers as well as undergone penetration testing by third parties. The sensor is built with concepts similar to TPM (trusted platform module). All communication is encrypted, passwords one-way hashed, gateway and server's hardened etc. The system is built to resist Replay attacks and Denial of Service Attacks.