

**Technical Specifications
of the Control and Monitoring System
to save energy, reduce maintenance costs
and enhance maintenance efficiency
on our Outdoor Lighting Network**

Document Reference

Date

Confidentiality

1. NAMING CONVENTION

- **Nodes:** the electronic device that is to be installed in the light fixture. It must be able to receive ON/OFF and dimming commands and to execute them with the ballast or LED driver. It must be able to perform the other features listed in the sections below. It must communicate with the Gateway using an ISO standard protocol over the existing powerline cables.
- **Gateway:** the electronic programmable device that is to be installed in the cabinet or feeder pillar. It must provide an astronomical clock to control the main segment contactor (if any) and each light point, individually or by group, by communicating using an ISO standard protocol over the existing powerline protocol. It must send ON/OFF and dimming commands at time that were remotely configured by the end-user in the Central Management Software. It must collect data from each Node and send them to the Central Management Software. It must be able to perform the other features listed in the sections below.
- **Central Management Software or CMS:** the software that enable users to configure Gateways, install and configure Nodes, collect and aggregate data from hundreds of Gateways, identify lamp and other failures/issues, help diagnose failures, centrally trigger and manage alarms and notify users, control and monitor any light point in real-time, analyze energy consumption, enable to program the ON/OFF/DIMMING times and levels and perform the other features listed in the section below.

2. TECHNICAL SPECIFICATION ABOUT THE NODES

Need	Specification	Weight (importance)
Type of installation	Nodes must either be installable at the bottom of the pole or inside the luminaire. Supplier shall detail the possible types of installation and associated technical constraints or need for additional accessories. Nodes shall not require any modification (e.g. hole) to be done to the fixture and shall not modify the fixture manufacture's warranty terms and conditions.	5 points
Low energy consumer	The Nodes must preferably consume less than 3 watts	1 point
Support different type of ballasts	The solution must support any type of electronic ballasts either through a 1-10V or a DALI interface, as well as magnetic ballasts. If the supplier does not provide Nodes to support all these range of ballasts, supplier may list compatible Nodes (manufactured by other companies) that does.	20 points
Support two outputs	It would be considered as a benefit if the Nodes would be able to support at least 2 x drivers/ballasts and dim them individually.	1 points
Communicate using a standardized protocol	The Nodes shall communicate using an ISO standard protocol using the existing powerline cables. This ISO standard protocol has to be supported by at least 5 other competing vendors.	20 points
Repeat the signal if necessary	The Nodes must be able to repeat the signal for other Nodes, in the case when the Gateway can't reach the final Node: repeating or mesh technology	5 points
Detect various failures and alarms	The Nodes must be able to detect ballast failure, lamp failure, low voltage, high voltage, low current, high current, low power factor, flickering lamps, high temperature, low power, high power.	1 point per type of issue detected (in this list)
Measure electrical values	The Nodes must measure mains voltage, mains current, active power, temperature and power factor.	1 point per type of measurement (in this list)

Measure cumulated energy consumption	The Node must measure and store the cumulated energy consumption in kWh.	5 points
Measure number of burning hours	The Nodes must measure and store the number of lamp running hours (also called operating hours) and provide a mechanism to reset them.	5 points
Digital input	The Nodes should have a digital input to connect a photocell or a presence/motion detector	1 points
Second relay	The Nodes should have a second relay that would enable to drive accessory plug for decoration lighting or any other purpose, with independent scheduler. Supplier shall mention the maximum wattage of the load to drive.	1 points

3. TECHNICAL SPECIFICATIONS ABOUT THE GATEWAY

Need	Specification	Weight (importance)
Easy installation	The Gateway must be installed on a RAIL DIN so that it can fit in the existing cabinets or any other electrical panel. It must be smaller than 90mm (h) x 140 mm (w) x 70mm (d)	15 points
TCP/IP via Ethernet or GPRS to the CMS	The Gateway must be able to communicate using TCP/IP over Ethernet or GPRS. No proprietary protocol shall be accepted. The Gateway must have an RJ45 Ethernet port (for WiFi, Fiber Optic, ADSL, 3G modem connection) and an RS232 port for low cost GPRS modem	Ethernet = 10 points GPRS = 5 points
Remote configuration	The Gateway must be remotely configurable, through the CMS, using a web service (XML, HTTP) type of interface. The Gateway must communicate with the CMS using standardized methods such as XML, HTTPS, SMTP, CSV file exchange or FTP.	20 points
Low energy consumption	The Gateway must consume less than 20 watts	1 point
Operation Temperature	The Gateway must support temperature from -40°C to +60°C not to require any additional ventilation nor heating devices	5 points
Inputs and Outputs	The Gateway must provide at least one digital ON/OFF output to control the mains contactor (if any). It must provide 2 digital inputs for applications such as door-open detection and segment failure detection.	5 points
Additional Inputs	The Gateway must provide a way to add digital and/or analog input modules (e.g. MODBUS I/O modules) to collect other signals, events or failures (door open, fuse blown, luminance) inside the streetlight cabinet.	20 points
Integrated Astronomical Clock	To avoid purchasing additional devices, the Gateway must provide an integrated astronomical clock that can be configured remotely (GPS position of the Gateway). ON/OFF and dimming commands shall be programmed based on the signals provided by this astronomical clock, + or – a time shift.	15 points
Communicate with Nodes and manage the communication network	The Gateway must communicate with the Nodes using an ISO standard protocol over the existing powerline cable. It shall manage the communication network and provide information on the quality of the communication network.	10 points
Number of Nodes per gateway	The Gateway must support up to 200 Nodes per gateway, but it must also guaranty a good and fast communication with each Node, to switch or dim any Node within less than 5 seconds.	5 points
Dynamically manage the communication on the powerline network and particularly the	The Gateway must provide automatic mechanism to manage the repeating of the powerline signal. The network (repeaters) must be set automatically (no manual configuration). The supplier shall describe	5 points

repeating tables	such mechanism that optimizes the communication with the Nodes. The solution must continue to work 100% correctly even when a Node is out-of-order. In this case, the system shall automatically manage when a Node which were repeating the signal for another Node fails.	5 points
Autonomous Controller	The Gateway must control the Nodes (i.e. light points) autonomously, without any connection to any central server or central service. To this extent, it is preferred if the Gateway runs on a real-time embedded operating system.	5 points
Group Control	The Gateway shall provide ways to control groups of light points to switch them ON/OFF and dim them.	5 point
Dimming schedulers	The Gateway shall enable many different dimming schedulers for each group of Nodes. It must enable the end-user to program different dimming schedulers during exception days (e.g. July 4th), exception periods (e.g. from July 1st to August 31st) and must manage the priority between standard schedulers and exception schedulers.	10 points
Push data towards the CMS	The Gateway shall send data to the CMS on its own, without the CMS polling for data, either every day or on alarm/event. This is to ensure scalability and event-oriented communication to provide a high level of reactivity in the CMS.	5 points
Record historical data while no communication to CMS	The Gateway shall keep up to one month of data on its local flash disk if no communication with the CMS	5 points
Monitor MODBUS devices on RS485	The Gateway shall be able to control/monitor MODBUS devices on a RS485 or RS232 serial interface.	1 point
Collect data from Smart Meters	The Gateway shall be able to collect data from any MODBUS energy meter.	10 point
Real-time Clock synchronization	The Gateway shall provide a way to automatically synchronize its internal real-time clock with a NTP server. This action shall not require any manual operation but shall be automatically performed by the Gateway at periodic interval.	5 point
Adjust real-time clock on winter/summer time shift	The Gateway shall automatically (without manual operation) update its real-time clock when summer/winter time shift in any time zone on earth.	5 point
Programmability	The Gateway shall provide means to program specific application that would run in its own local processor.	5 points
Dynamic DNS client	The Gateway shall provide a DYNDNS client to enable remote control even on a TCP/IP network where TCP/IP addresses are changed on a periodic basis.	1 point

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