Street Lighting Intelligent Control
System Solution

INNOEV Highway Centralized Monitoring Center

INNOEV NEW ENERGY TECHNOLOGY CO., LTD
Oct. 2014
Contents

Product Background ........................................................................................................................................ 3
  1.1. Application Background ........................................................................................................ 3
  1.2. Demand Analysis .................................................................................................................. 3
  1.3. INNOEV’s Profile .................................................................................................................. 4
  1.4. Technical Advantage ............................................................................................................ 5
System Architecture .................................................................................................................................. 6
  2.1. System architecture .................................................................................................................. 6
  2.2. System monitoring management .......................................................................................... 6
  2.3. Road central control .............................................................................................................. 7
  2.4. Wireless single lamp controller ............................................................................................ 8
System Functions .................................................................................................................................... 9
  3.1. Equipment management and GIS map shows ........................................................................ 9
  3.2. The remote control circuit .................................................................................................... 9
  3.3. The remote control single lamp ......................................................................................... 9
  3.4. Condition monitoring .......................................................................................................... 9
  3.5. Automatic fault detection and alarm ................................................................................... 9
  3.6. Real-time power monitoring ............................................................................................... 9
  3.7. Energy analysis reports ....................................................................................................... 10
  3.8. Software interface .............................................................................................................. 10
Project Design ..................................................................................................................................... 15
  4.1. System Server ..................................................................................................................... 15
  4.2. Centralized controller ......................................................................................................... 16
Configuration List .................................................................................................................................. 17
Product Background

1.1. Application Background

With the rapid development of urban economic development and transportation, and urban construction of form a complete set with the size and quantity of the road lighting is more and more big, the city road lighting power consumption is also rising rapidly. According to statistics, China's lighting consumes more than about 12% of the total electricity, including road lighting for the whole lighting power consumption by 25% ~ 30%. How to adopt advanced technology for scientific and reasonable energy saving and improve the level of automation control and management of city road lighting has become an important task at present.

Appeared in recent years, in view of the traditional sodium lamp, the whole/in the middle of the night lights, dual light source of lamps and lanterns, step-down voltage adjustment device, intelligent variable power ballast energy-saving measures. With the promotion and popularization of the LED street lamp intelligent road lighting control technology also begins to get the popularization and application. Intelligent road lighting control, through the computer network technology, the use of wired and wireless transmission mode, the lights of the opening and closing, running state and fault condition of remote control, remote sensing, remote communication, so as to realize remote monitoring and management of street lamp; Through the control, electric, SPC and other intelligent control mode, the implementation of road lighting intelligent dynamic scene control, so as to achieve long-term security, energy saving and scientific operation management purposes.

The company research and development of road lighting intelligent control system, using GPRS/CDMA and Internet technology realizes the street lamp management center and the communication between road lighting power distribution cabinet; Distribution is realized by using Zigbee wireless communication technology and the communication between the street lamps. Through the remote control and intelligent dimmer, can achieve on-demand lighting, fine management, greatly reduce the energy waste, prolong the service life of lamps and lanterns of equipment at the same time; Through remote monitoring, can realize automatic inspection, anti-theft and street lamp was carried out on the street lamp fault fast response, save a lot of manpower and resources cost, improve social benefits.

1.2. Demand Analysis

INNOEV's unique lighting intelligent control system development was based on in-depth customer survey and market analysis, which fully considered the following customers requirements:

1.2.1. The reliability

The system has good reliability and stability, and is not affected by power grid pollution, bad weather, the local street lamp fault, trees or other interference sources.

1.2.2. Advanced
INNOEV street lighting intelligent control system solution

The system integration GIS function, support control, electric, SPC etc. Various intelligent energy-saving control modes, the support power distribution cabinet three-phase power and real-time monitoring of each lamp state support street lamp automatic fault alarm, support the automatic generation of energy and analysis.

1.2.3. Safety
System supports communication data encryption, user access control and security authentication function.

1.2.4. GUI
The system software user interface is friendly, intuitive and easy to be used.

1.2.5. Scalability
Support system external its standard three-phase electric meter, loop control extension module, support anti-theft function module, support the light sensors, snow and rain sensor, flow sensor, the sensor module.

1.2.6. Economy
The system has attractive advantage on cost, belongs the industry's most cost-effective products at present.

1.3. INNOEV’s Profile

Headquartered in Nanjing, China, is a world class leading technology enterprise specialized in the design, manufacture, marketing and sales of reliable, high efficiency LED drivers as well as the smart lighting system products. Innoev is becoming a global leading LED driver supplier, providing world-class products, based on leading-edge technology, which deliver unmatched performance and long term value. These products are used extensively by OEMs and system integrators for diverse applications in the LED lighting field.

Attracting numerous outstanding R&D and management talents, Innoev has a world-class R&D and management team with excellent innovation capability. Cooperating with top research organizations such as Nanjing University of Aeronautics and Astronautics, Zhejiang University and Chinese Academy of Sciences, Innoev have established an innovative atmosphere with extraordinary performance result.

Innoev understands the needs and nuances of developing smart LED lighting eco-systems using wireless technologies. We know it is your responsibility to create the most efficient, cost-effective, quality system, and deliver it in a timely fashion. From eco-system to driver level, INNOEV supplies professional solutions for energy-saving and intelligent controlling fields. Our eco-system based digital LED driver is the best choice for today's smart lighting system and smart cities.

The founder and president of Innoev, CF Zhang, is a renowned expert in the power electronics field. He received his second Master degree from CEIBS, with over 60 Chinese patents and 1 US Patent awarded. CF Zhang is the co-founder and former director Engineering of Emerson Nanjing R&D center, a world's top 500 companies. He is also the co-founder & CEO of LED ONE, a sister company of Inventronics.
As a renowned industry leader with over 15 years R&D experience and entrepreneurial background, CF Zhang and his team creates a new area of LED driver and smart lighting system.

Leveraging our brilliant innovation awareness and leading technology capability, our company entitles more than 30 patents. Our LED drivers have successfully deployed into many well-known projects. With its widely recognized brand, Innoev has attracted global cooperation and established strategic partnerships with numerous LED lighting companies from all over the world.

1.4. Technical Advantage

As a leading city intelligent lighting system solutions provider, INNOEV new energy science and technology can offer all system elements, including smart drive, single lamp controller (control module), centralized controller, and system software.

INNOEV’s city intelligent lighting system solution has the following characteristics:

- Remote street lamp control is realized by using Zigbee wireless communication technology. Through wireless communication/control units and intelligent LED drive the integration of design, implement the installation of minimum system cost.

- The systems support LED street lamp, the traditional sodium lamp and also supports solar street light.

- The systems support based on the real time control, electric open to turn off the lights and dimmer function; Also supports the use of flow sensor, the information such as weather forecast, snow and rain sensors for SPC open to turn off the lights and dimmer function.

- The system response speed is very quickly. Only a few seconds of the command execution from open to turn off the lights from mobile terminal or from the system software instructions.

- The system has fault street lamp quick perception and street lamp automatic checking double fault detection function. Alarm information received from the failure to the system software, less than 1 minute.

- The system supports automatic report generation and analysis of energy consumption, intuitive user interface is friendly.

- The system software architecture is compatible with the browser/server (B/S) model and client/server (C/S) mode, the professional version of the client software, web browsers and smart phone APP and so on a variety of ways to realize monitoring of city road lighting, can satisfy the software according to different applications use convenience, the system response speed and flexibility of demand.

- The system software integration of geographical information system (GIS) technology, support major public network map, also support bespoke vector map.

- The system support safety certification and communication data encryption, to ensure public safety.
System Architecture

2.1. System architecture

INNOEV city road lighting intelligent control system by monitoring center management software system, road centralized controller and the wireless single lamp control terminal, etc. The road centralized controller installed on power distribution cabinet, wireless single lamp controller installed on each lamp post.

The system through GPRS/CDMA network technology, to achieve the communication between monitoring center and the centralized controller. Centralized controller is realized by using low-power Zigbee wireless communication technology and the communication between the single lamp controller. The system overall architecture as shown in the figure below:

2.2. System monitoring management

- The monitoring center system software has the following functions:
- integrated geographic information system of street lamp asset management
- road lighting remote configuration and status monitoring of the plan
- statements automatically generated energy consumption and analysis.
- street lights maintenance management.
System software architecture is compatible with the browser/server (B/S) model and client/server (C/S) mode, the professional version of the client software, web browsers and smart phone APP and so on a variety of ways to realize monitoring of city road lighting, can satisfy the software according to different applications use convenience, the system response speed and flexibility of demand.

2.3. Road central control

Road centralized controller has the following features:

- Communication gateway function.
- Centralized controller through the GPRS/CDMA communication and management center; By each single lamp controller with Zigbee communication. Concentrated controller by receiving, execution, forwarding instructions from system management software.
- Zigbee the creation and management of the network.
- Centralized controller is responsible for creating and managing the road of the Zigbee network.
- Lighting plan localization of management.
- Centralized controller built-in real-time clock, according to the system software preconfigured lighting plan, time to turn off the lights and dimmer.
- Loop control.
- Centralized controller built-in 4 road relay, the lighting circuit can be loop control.
- Metering function.
- Centralized controller built-in measuring unit, can measure three-phase electric each phase voltage, current, the instantaneous active power, instantaneous reactive power and instantaneous apparent power, power factor, phase Angle, active power and reactive power, etc., as well as the three-phase instantaneous active power, instantaneous reactive power, instantaneous total apparent power, power factor, total active power and reactive power in electricity, etc.
- Automatic meter reading.

Can through the RS - 485 bus and conform to the national grid, DL/T 645-645 or DL/T 645-2007 multi-function three-phase watt-hour meter is linked together, the communication protocol realization of automatic remote meter reading.
2.4. Wireless single lamp controller

Wireless single lamp controller and intelligent drive integration design, implement the following two major functions:

- Control single lamp switch, adjust the brightness of lamps and lanterns.
- Read drive internal state and street lamp operation parameters and report.
System Functions

3.1. Equipment management and GIS map shows

System database server can record the information about road every street lamp, including manufacturers, product specifications, light pole number and the location information, etc. Each lamp can be visual display on the map; Selected a lamp, can view the details of the lamp; Can be displayed in table a road lights all the details.

3.2. The remote control circuit

Through the system software, can be remote real-time control timing control path in power distribution cabinet open and close the main switch of each circuit.

3.3. The remote control single lamp

Through the system software, can be remote real-time control timing control the street lamp switch (drive), control the brightness of the lamp. Control objectives can be for a single lamp, a set of lights or all lights.

3.4. Condition monitoring

Through the system software, can monitor the street lamp switch state, the current brightness, working voltage/current/power and operation parameters, such as temperature.

3.5. Automatic fault detection and alarm

System has fault street lamp quick perception and automatic road inspection double fault detection function. Alarm information received from the failure to the system software, less than 1 minute.

3.6. Real-time power monitoring

Through the system software can concentrate on roads controller built-in electric meter or external smart meters for remote automatic meter reading. Can measure three-phase electric each phase voltage, current, the instantaneous active power/reactive power, apparent power, power factor, phase Angle, active power and reactive power, etc., as well as the three-phase instantaneous active power always/total reactive power/total apparent power, power factor, total active power and reactive power in electricity power information, etc. System software can monitor the real-time data; also can draw on historical data for analysis.
3.7. Energy analysis reports

Support energy system analysis, the system can automatic generate the energy consume and analyzed report according to the annual, quarter, month, day, or any other time interval.

3.8. Software interface

Street light condition monitoring interface, with roads and street lamp equipment browsing and editing, street lamp attribute to view and edit, geographic location, and other functions.
Virtual distribution cabinets’ interface shows the road the main equipment of distribution ark, and the main switch state of opening and closing.

Light dimming plan configuration interface, friendly user interface and powerful graphics editing/form, make any plans that move light Settings can be completed within 1 minute.
Virtual multi-function table interface can show the road distribution ark of three-phase electric voltage, current, power and other power real-time data and historical data.

Power consumption report interface: can collect the electricity consumption data in a given period and area, and also can automatically generate the analysis reports line chart, histogram, pie chart and so on.
Project Design

4.1. System Server

System server can use third party cloud servers, also can build server by the customer. If the third party to provide the cloud server, it is recommended that the configuration is as follows:

<table>
<thead>
<tr>
<th>Computing capacity (CC)</th>
<th>memory (GB)</th>
<th>hard disk size (GB)</th>
<th>bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>8M</td>
<td>120</td>
<td>5M</td>
</tr>
</tbody>
</table>

Description: 1. The calculating unit (CC) : 1 CC refer to an Intel XEON E5-4610;


If your build server, it is recommended that the server configuration is as follows:

| The server configuration          | Model                                   | Description                                                          |
|-----------------------------------|-----------------------------------------|                                                                     |
| CPU                              | Intel® xeon® E7-4870 x2                 | 1.86 GHz processor, 18 MB cache, 4.80 GT/s QPI, Turbo               |
| Memory                           | 16GB memory (4x4GB), 1333MHz, double row LV RDIMMs, suitable for 2 CPU configuration |
| SAS/PERC integrated card         | PERC H200 modularization RAID controller | modularization RAID controller                                      |
| Hard disk                        | 300GB 10K RPM,6Gbps SAS 2.5 " hot-swappable hard disk | 10K RPM,6Gbps SAS 2.5 " hot-swappable hard disk                     |
| Frame                            | PowerEdge R910 Frame                    | Contains 4 backboard                                                |
| Server management card           | iDRAC6 Express                          |                                                                     |
| Riser card                       | Two double Riser card port embedded BCM5709C GBE | 1G I/O RISER card, two dual port embedded BCM5709C                   |
| COM interface card               | MOXA CP-118U-I                          | 8 serial ports RS-232/422/485                                       |
4.2. Centralized controller

To increase the communication distance and stability, it is suggested that will focus position controller installed in the middle of the road.

<table>
<thead>
<tr>
<th>Controller card</th>
<th>Brocade 815</th>
<th>fibre channel host bus adapters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>High power (2+2 PSU) 1100W, redundant</td>
<td>High power (2+2 PSU) 1100w, redundant</td>
</tr>
</tbody>
</table>

In addition, the static IP address is recommended for the build server, bandwidth more than 4M. The operating system version: Windows Server 2003 or Windows Server 2008 enterprise edition.
## Configuration List

<table>
<thead>
<tr>
<th>Series</th>
<th>Equipments</th>
<th>Brand</th>
<th>Series No.</th>
<th>Quantity</th>
<th>Unit Price</th>
<th>Total</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Single Light</td>
<td>INNOEV</td>
<td>SLC-CT-D01</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Centralized</td>
<td>INNOEV</td>
<td>SLC-GW-01</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Software</td>
<td>INNOEV</td>
<td>SLCMaster</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Professional</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:**

1. the standard warranty is 2 years.
2. normal quotation contains the default standard accessories.
3. offer this price for equipment, excluding construction costs, debugging directed by our engineers.
4. payment term:

**Contact:**

Contact: CFZhang  
Mobile: 18551835871  
EMAIL: cf.zhang@innoev.com  
Address: Qilin science and technology innovation park east Dongqi road 277 FuLi science park 11 building, Nanjing, Jiangsu province, China