# Green Sources Limited

## Lighting Management System
## LMS
## Dimmable

# Company Profile

CityU Enterprises Limited

• **Innovation & Technology**
(創新及科技基金)


• **Studies**
-the Apparatus and Method for Providing Dimming Control of Lamps and Electrical Lighting Systems

-Reactive Power Controller for Green Energy Saving and Dimming AC Lighting Systems

• **Intellectual Properties (Patents)**:
-GB2405540, HK1076977 (Granted), PCT/CN2004/000990 (also filed in USA, Europe, Japan, Korea & China)

- GB2418786, HK1089614 (Filed, PCT application through China)

• **Production**
- China

• **Awards**
2001 - Technological Achievement Award
2004 - The Consumer Product Design Award 2004
2005 - Best New Product Award
2006 - The Notable Mention Award
2009 – Hong Kong Awards for Industry, Machinery and Machine Tool Design Award
2011 – HKICT Awards for Best Green ICT (Adoption – SMEs) Silver Award
2011- Hong Kong Awards for Industries- Innovation and Creativity

• **Sales & Marketing Activities**
-Officially launched LMS in Hong Kong.
- Offer Trial Scheme in different sectors: Government, Cooperate, School and etc.
-Appointed Overseas Distributors
-Attended Lighting Fair 2009
-Participated Inno Design Tech Expo & Eco Expo Asia in 2010
-Jointly Promotion with CLP- Green Plus Gallery in 2011.


2000 | 2001 – 2006 | 2007 - Now

# Power Management System

Designed and Engineered in Hong Kong by City University

Manufactured in China

CE Certified-

- ✓ EC compatibility
- ✓ Safety

**PMS-32**
**180 (W) X 304 (H) X 219 (D) mm**

**PMS10 & PMS20**
**123(W) X304(H) X219 (D) mm**

**It is an intelligent central dimming system designed to save power on lighting loads and turn most of the existing "non-dimmable" lighting systems into "dimmable" ones without major change in wiring and infrastructure.**

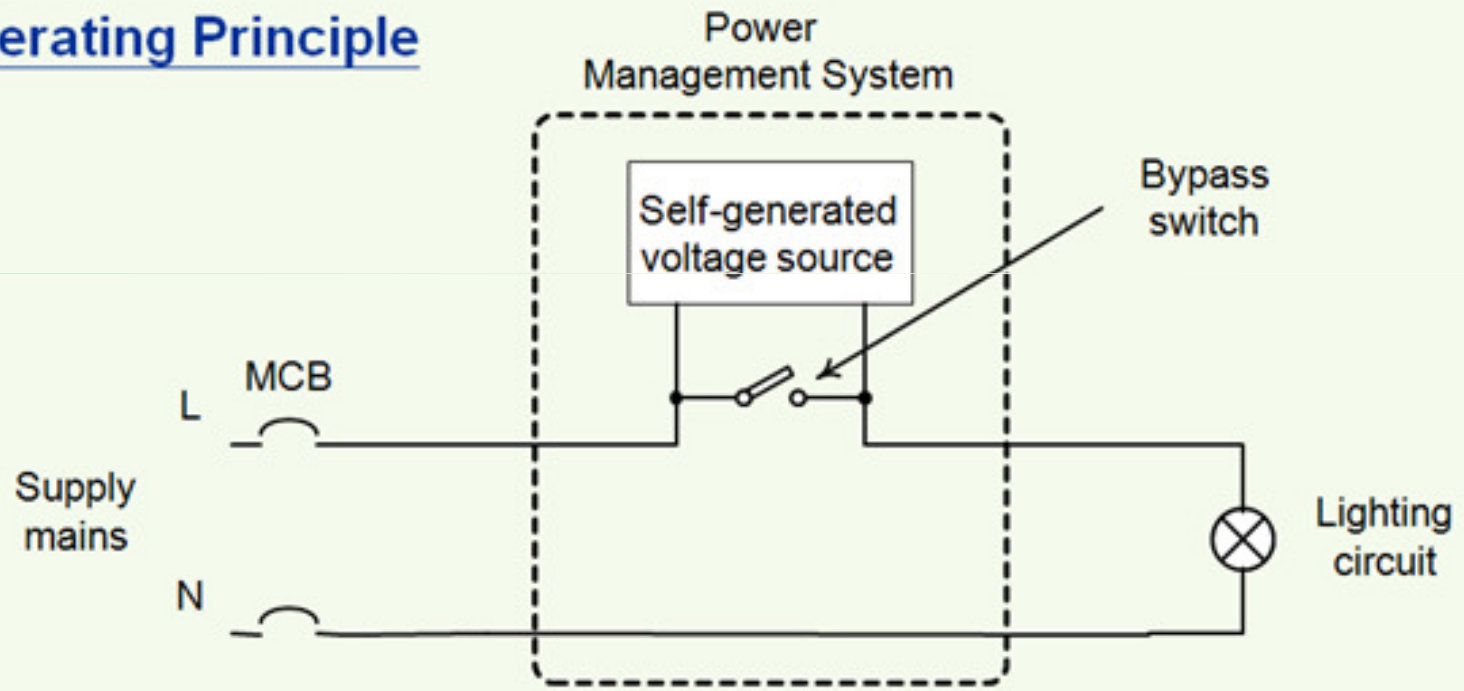
**It reduces power used by all types of discharge and fluorescent lamps normally by 20% to 40% with minimal effect on Lux. It offers an attractive payback of 2 years in general.**

**One unit can control a large number of lighting devices and is compatible with both magnetic and electronic ballasts. Besides, it will have the intelligence to optimize the energy consumption of the existing lighting system.**

**Customers are provided with a *new freedom of control* to use lighting energy *when* and *where* necessary and at an *appropriate* level.**

**LMS comes in two powers, 2kVA and 4kVA. It performs the functions of voltage regulation and division, plus the measurement of energy and other variables.**

## Operating Principle




- patented energy-saving technology
- self-generated voltage source between the supply mains and lighting circuit
- when the output voltage of self-generated voltage source increases, the entire power consumption is reduced
- output voltage harmonic distortion less than 2%
- not process active power, but consume reactive power only
- high energy conversion efficiency (98.5%)

## Merits

| Payback & Energy Saving | High Compatibility & Adjustability | |
|---|---|---|
| Payback period < 2 years | Compatible to most types of lamps, no replacement of existing luminaire | Stable Output |
| Energy saving 20% to 40% | Minimum rewiring | No wave distortion/ No harmonic increment |
| Preserve the life of the existing luminaire | Achieving the optimal LUX level by adjusting the voltage, volt by volt | Increase lamps life span |
| | Turn "non-dimmable" lighting system to "dimmable" with multiple automatic schedule profiles | Operation capability at high Temperature and Humidity. |

## Main differences between PMS and Transformer

| PMS | Transformer |
|---|---|
| Stabilize the input voltage<br>• LMS always starts up in 220-240V<br>• Perfectly for those areas with voltage fluctuations | Cannot stabilize the input voltage |
| Pre-set the pace of dimming<br>• e.g. Decrease 10V in every 5 minutes until it reaches 190V from 220V.<br>• Gradual decrease in input voltage can help to protect lamps, and avoid a sudden decrease in lumen output which will make some people feeling uncomfortable in working or reading. | Cannot pre-set the pace of dimming<br>• It performs the dimming with a sharp jump in input voltage, let's say, from 220V to 190V.<br>• This may damage the lamp, and makes the sudden decrease in lumen output possible – people may feel uncomfortable in working or reading. |

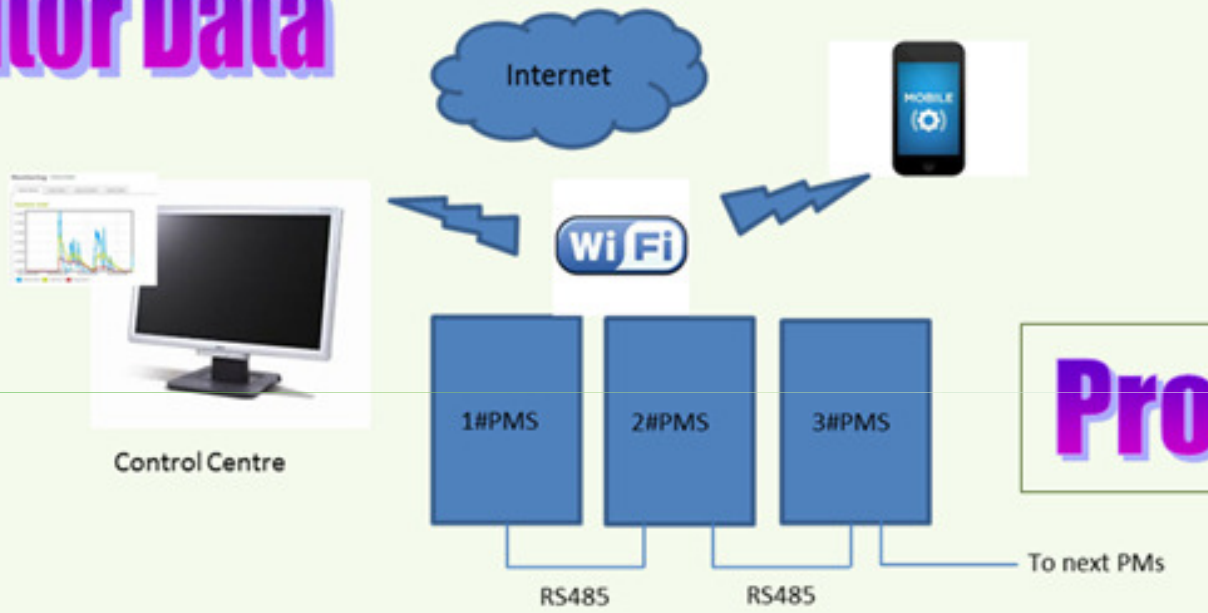
## LMS vs. Transformer

Transformers have been used in the lighting market for energy saving. However, they are inferior to LMS in terms of performance, cost and flexibility as shown in the following table:

| | LMS | Transformer |
|---|---|---|
| Principle | Modern Power Electronics | Electromagnetic |
| Voltage settings | Continuous | Discrete |
| Smooth dimming | Stable | Fluctuated |
| Flexibility in power control | High | Low |
| Noticeable change of light | No | Obvious (Extinction of lamp arc) |
| Maximum loss | 1%-2% of full power (Typically) | 5%-10% of full power (Typically) |
| Adverse effects on lamps | No | Yes |

# Remote Control

## Monitor Data




## Protection

# Remote Control

## - By mobile device

Setting

# Power Management System

2010 - 11 - 3 16: 44 :47

Work Status : Red = Off Green = On

Current Mode : Auto Mode

Alarm : 0

**Alarm Message:**

0 VdcMax電壓最大預警 | 1 OvVdc直流母排電壓過壓 | 2 OvTemp過溫 | 3 PG輔助電源故障 | 4 FanFail風扇故障 | 5 OvCur電流過流 | 6 OvVin輸入電壓過高

7 LowVin輸入電壓過低 | 8 LowIin負載欠流 | 9 LowVlamp負載欠壓 | 10 Short Circuit負載短路 | 11 Alarm Lock Up調光器鎖定 | 12 System Fail調光器故障

## Input:

| | |
|---|---|
| Voltage: | 216 V |
| Power Factor: | 0.76 |
| Power: | 640 W |

PMS

## Output:

| | Old | Now | % |
|---|---|---|---|
| Voltage: | 220 V | 189 V | 14 % |
| Power Factor: | NIL | 0.89 | NIL |
| Power: | 810 W | 651 W | 20 % |
| Current: | 4 A | 3.8 A | 12 % |

Ratio : ☑

**Lighting:** Current: 3.8 A

Powered by Powerpeg NSI Limited

Device Diagram | Change Date Range

Show Graph

# Monitor Data

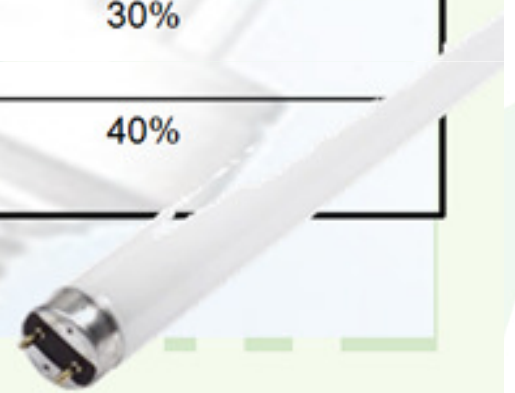
| Timestamp | Input_Current | Input_PowerFactor | Input_Power | Output_Power | Output_PowerFactor | Input_Voltage | Output_Voltage |
|---|---|---|---|---|---|---|---|
| 2010/11/3 下午 04:45:00.000 | 3.800 | -0.780 | 642.000 | 645.000 | -0.860 | 215.000 | 190.000 |
| 2010/11/3 下午 04:30:00.000 | 3.800 | -0.790 | 637.000 | 662.000 | -0.900 | 215.000 | 190.000 |
| 2010/11/3 下午 04:15:00.000 | 3.700 | -0.790 | 644.000 | 660.000 | -0.920 | 215.000 | 190.000 |
| 2010/11/3 下午 04:00:00.000 | 4.300 | -0.850 | 791.000 | 785.000 | -0.850 | 214.000 | 213.000 |
| 2010/11/3 下午 03:45:00.000 | 3.800 | -0.780 | 638.000 | 649.000 | -0.890 | 215.000 | 191.000 |
| 2010/11/3 下午 03:30:00.000 | 3.800 | -0.810 | 643.000 | 652.000 | -0.880 | 214.000 | 191.000 |
| 2010/11/3 下午 03:15:00.000 | 3.800 | -0.810 | 639.000 | 648.000 | -0.930 | 215.000 | 189.000 |
| 2010/11/3 下午 03:00:00.000 | 3.800 | -0.790 | 647.000 | 650.000 | -0.900 | 213.000 | 190.000 |
| 2010/11/3 下午 02:45:00.000 | 3.800 | -0.790 | 632.000 | 640.000 | -0.890 | 216.000 | 191.000 |
| 2010/11/3 下午 02:30:00.000 | 3.800 | -0.770 | 648.000 | 650.000 | -0.900 | 215.000 | 191.000 |
| 2010/11/3 下午 02:15:00.000 | 3.800 | -0.750 | 647.000 | 646.000 | -0.900 | 216.000 | 189.000 |
| 2010/11/3 下午 02:00:00.000 | 3.800 | -0.730 | 596.000 | 602.000 | -0.890 | 216.000 | 182.000 |
| 2010/11/3 下午 01:45:00.000 | 3.800 | -0.800 | 658.000 | 663.000 | -0.880 | 215.000 | 193.000 |
| 2010/11/3 下午 01:30:00.000 | 3.800 | -0.790 | 651.000 | 654.000 | -0.910 | 217.000 | 192.000 |
| 2010/11/3 下午 01:15:00.000 | 3.800 | -0.790 | 655.000 | 666.000 | -0.900 | 216.000 | 192.000 |

## Protection

- Over and under voltage protection
- Fault protection
- Short circuit protection
- Voltage surge/Voltage drops protection

## Lamp Types could be applied & its saving statistics

| Lamp type | Maximum power saving [%] |
|---|---|
| Fluorescent lamps with magnetic ballasts | 18% - 25% |
| Fluorescent lamps with electronic ballasts | 15% |
| Low-power energy saving lamps | 18% - 30% |
| Metal halide lamps<br>**Mercury vapor high pressure lamps** | 30% |
| High-pressure sodium lamps | 40% |



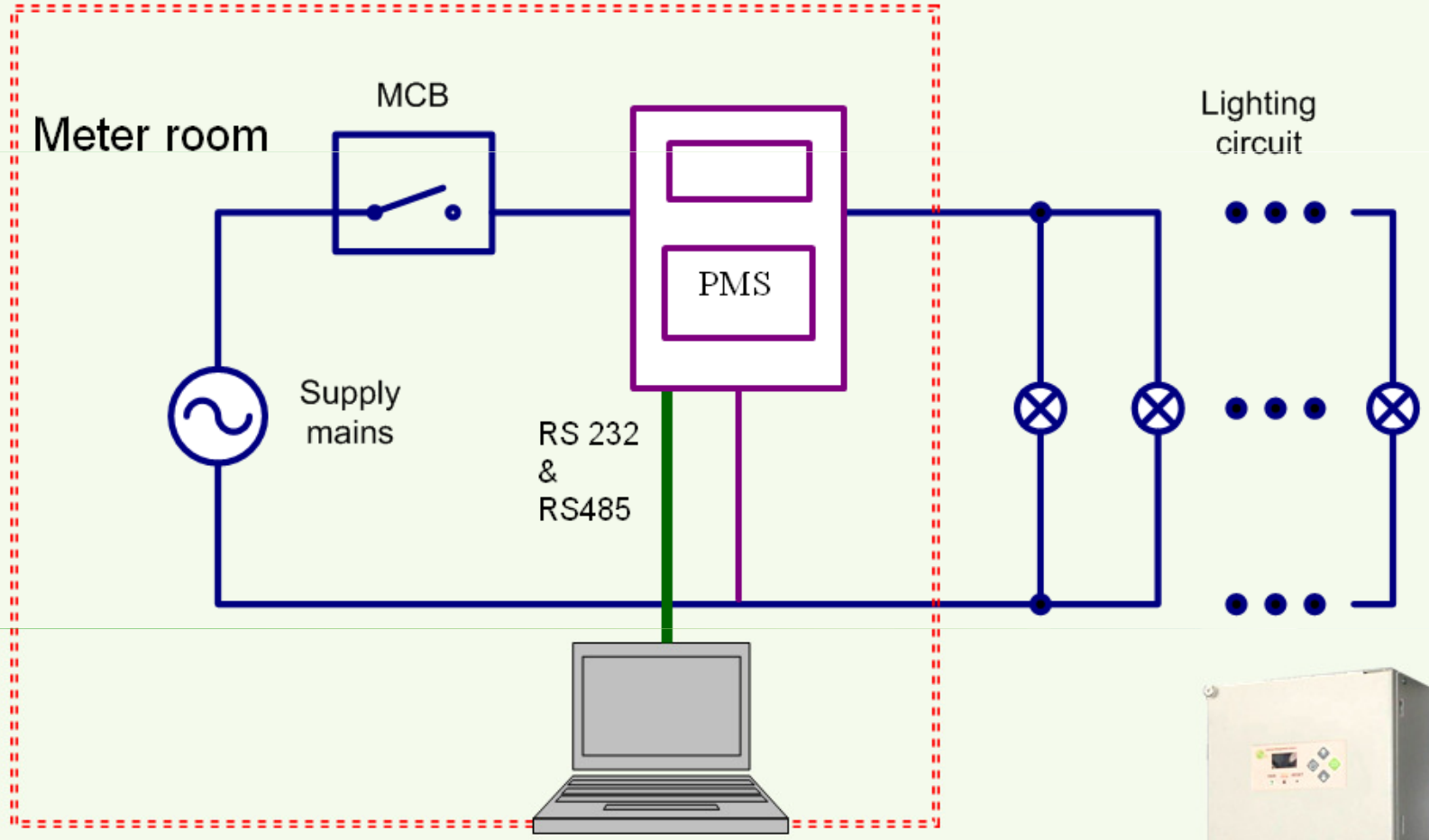
## LMS vs. Electronic Ballast

Another technology is the use of dimmable electronic ballasts. But such technology is inferior to LMS in terms of costs, lifetime and robustness against extreme weather conditions as shown in the following table:

| | LMS | Electronic Ballast |
|---|---|---|
| Installation | Central | Individual |
| Replacement cost | N/A | High |
| Maximum loss | 1%-2% (of full power) | 10%-20% (of full power) |
| Self-recovery | Yes | No |
| Immunity against lightning | High | Low |
| Ballast lifetime | >20 years | 1.7-5 years |
| Maintenance cost | Low | High |
| Maintenance effort | Easy | Difficult |
| Environmental | Recyclable | Non-recyclable (Electronic waste) |

*Remarks: LMS is also compatible with non-dimmable electronic ballasts that have no constant-power control.*

## Installation




# Technical Specifications

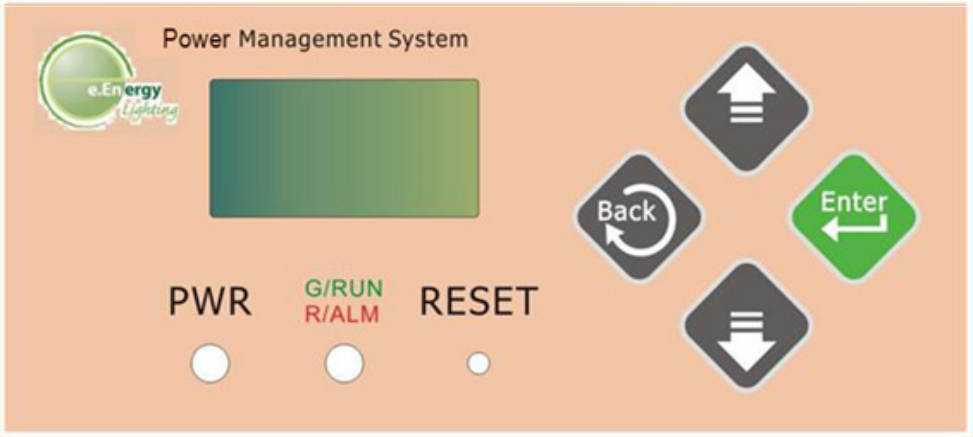
- Supply voltage : 200V ~ 240V, 50Hz
- Maximum load current : 10A (rms), 22A (pk)
- Physical dimensions :

  PMS32-180 (W) X 304 (H) X 219 (D) mm

  PMS10-123(W) X 304(H) X219 (D) mm
- Low power dissipation : 50W max (approx. 2% loss) at the rated load
- Self-diagnostics and event log
- Protection Tracking
  - Input overvoltage and undervoltage
  - Output overvoltage and undervoltage
  - Output over current [> 10A(rms) or 22A(pk)]
  - Output short circuit protection
  - Over temperature

## Technical Specifications (Con't)

- Fail-safe bypass mechanism
- Control modes: Manual, Auto, and Schedule
- Data displayed includes
  - Input and output voltage
  - Input current
  - Power consumption
  - Load power factor




- 100 event logs
- Communication: RS 232 port, RS 485, dry contact for alarm indication

  [opt.] GPRS module
- Safety approvals & Full RoHS compliance
- Single Interface
- One Touch of Button

## Sucess Story

# Hong Kong Police Force

- In March 2011, PMS was installed in The Headquarters of Hong Kong Police Force.
- Energy saving of 20% was achieved.

Hong Kong Housing Authority,
Highway Department (Hong Kong & Heshan), etc.

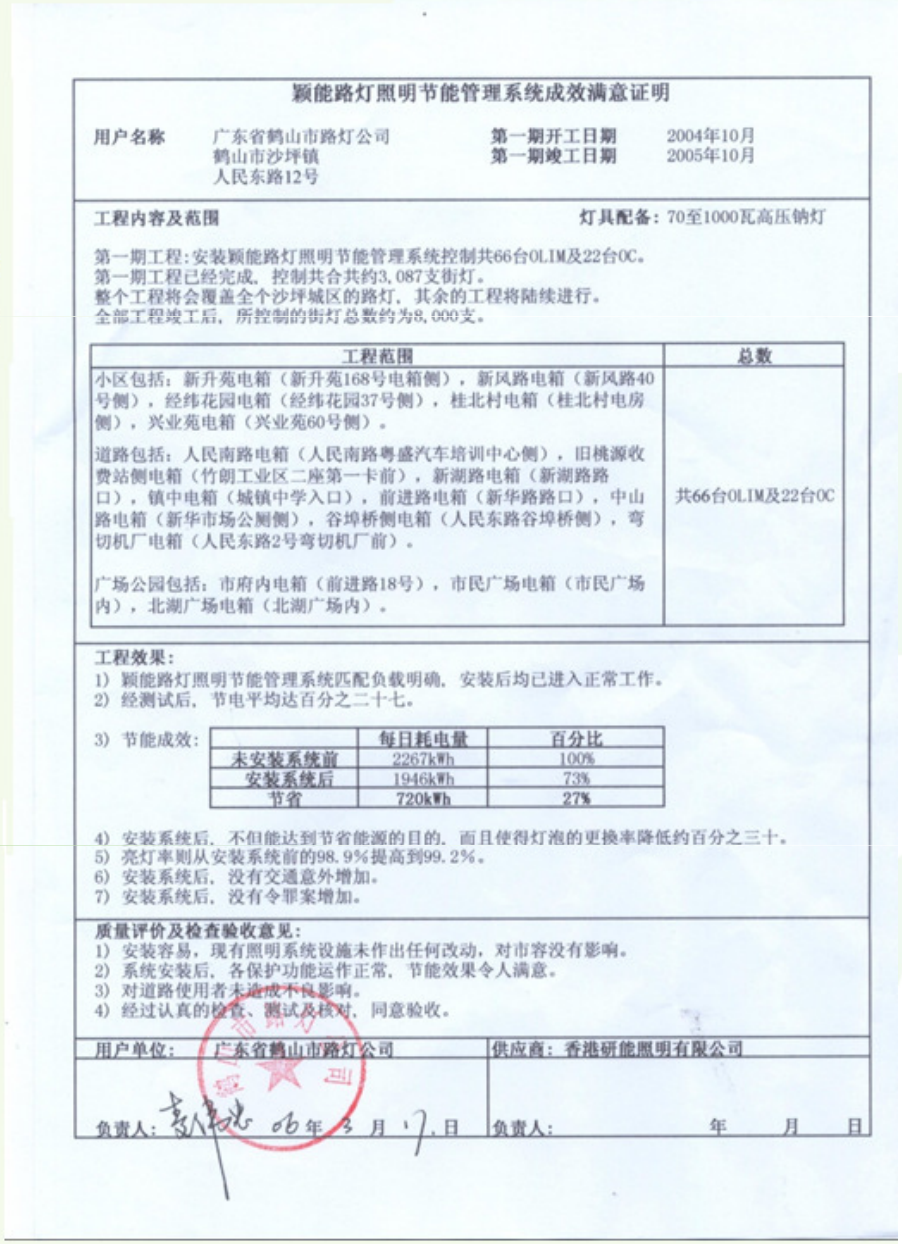
Housing Department
The Government of the Hong Kong Special Administrative F

Highways Department
The Government of the Hong Kong Special Administrative Region


MAIN
hager

# China -Heshan – Street light project

- The 1st generation of PMS have been installed by year 2004/ 2005
- Reported that 30 % of energy saving could be achieved
- Documentary:



颖能路灯照明节能管理系统成效满意证明

用户名称 广东省鹤山市路灯公司 鹤山市沙坪镇 人民东路12号

第一期开工日期 2004年10月
第一期竣工日期 2005年10月

工程内容及范围 灯具配备：70至1000瓦高压钠灯

第一期工程：安装颖能路灯照明节能管理系统控制共66台OLIM及22台OC。
第一期工程已经完成，控制共合共约3,087支街灯。
整个工程将会覆盖全个沙坪城区的路灯，其余的工程将陆续进行。
全部工程竣工后，所控制的街灯总数约为8,000支。

| 工程范围 | 总数 |
|---|---|
| 小区包括：新升苑电箱（新升苑168号电箱侧），新风路电箱（新风路40号侧），经纬花园电箱（经纬花园37号侧），桂北村电箱（桂北村电房侧），兴业苑电箱（兴业苑60号侧）。<br>道路包括：人民南路电箱（人民南路粤盛汽车培训中心侧），旧桃源收费站侧电箱（竹朗工业区二座第一卡前），新湖路电箱（新湖路路口），镇中电箱（城镇中学入口），前进路电箱（新华路路口），中山路电箱（新华市场公厕侧），谷埠桥侧电箱（人民东路谷埠桥侧），弯切机厂电箱（人民东路2号弯切机厂前）。<br>广场公园包括：市府内电箱（前进路18号），市民广场电箱（市民广场内），北湖广场电箱（北湖广场内）。 | 共66台OLIM及22台OC |

工程效果：
1）颖能路灯照明节能管理系统匹配负载明确，安装后均已进入正常工作。
2）经测试后，节电平均达百分之二十七。
3）节能成效：

| | 每日耗电量 | 百分比 |
|---|---|---|
| 未安装系统前 | 2267kWh | 100% |
| 安装系统后 | 1946kWh | 73% |
| 节省 | 720kWh | 27% |

4）安装系统后，不但能达到节省能源的目的，而且使得灯泡的更换率降低约百分之三十。
5）亮灯率则从安装系统前的98.9%提高到99.2%。
6）安装系统后，没有交通意外增加。
7）安装系统后，没有令罪案增加。

质量评价及检查验收意见：
1）安装容易，现有照明系统设施未作出任何改动，对市容没有影响。
2）系统安装后，各保护功能运作正常，节能效果令人满意。
3）对道路使用者未造成不良影响。
4）经过认真的检查、测试及核对，同意验收。

用户单位：广东省鹤山市路灯公司 负责人：06年3月17日

供应商：香港研能照明有限公司 负责人：年 月 日

- **Transport:** MTRC, Hong Kong International Airport, Singapore Airlines, etc.

- **Property Management:** EC Harris, Sino Property Services, Kai Sing Management Services Ltd.

- **Cooperate:** HSBC, Wing Lung Bank, Shanghai Commercial Bank, Central Plaza, Exchange Tower, Amway (China)

- **Schools:** City University of Hong Kong, National University of Singapore, etc.

香港城市大學
City University
of Hong Kong

- **Other:** Suntec City (Singapore)

SUNTEC

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# Thank you