



Whole Airport Energy Saving Lighting Control System

*IES Aviation Lighting Seminar
New Jersey – 2010*

Gil DAVER - AUGIER® - FRANCE

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SUMMARY



1. Introduction (Lamp flux control)

2. High Intensity Discharge (HID) lamps :

- **Technologies,**
- **Operation**
- **Solutions**

3. Control of lighting systems

- **Local**
- **Remote**

4. Airport applications

5. Conclusions



1. Introduction



Control of the luminous flux of lamps :

1) Airfield Ground Lighting by current

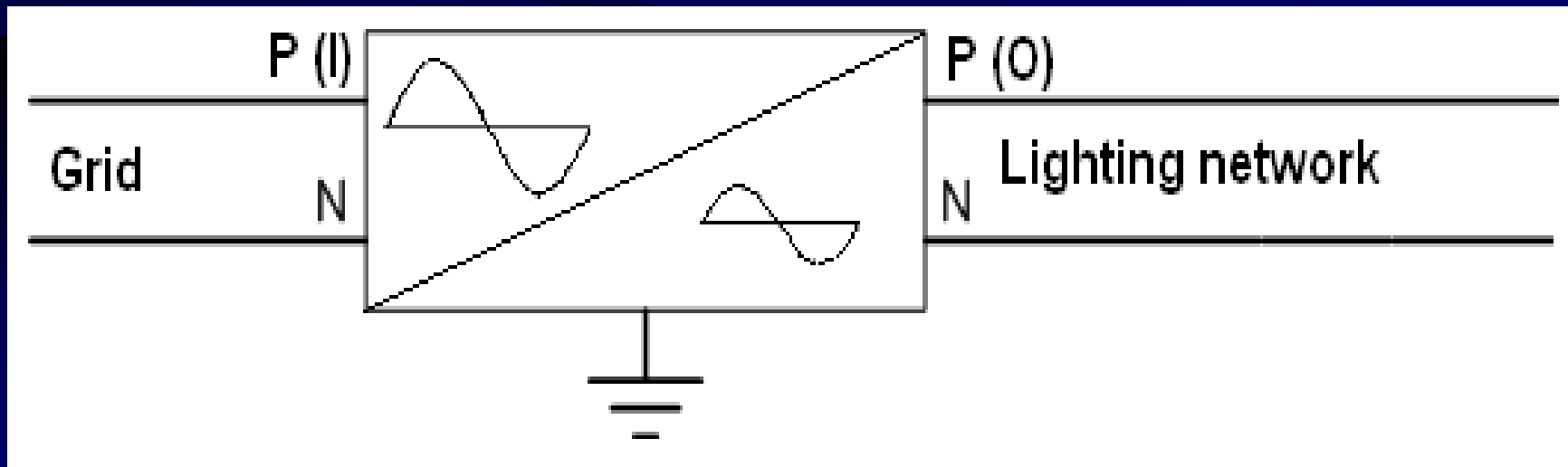
2) Street Lighting by voltage

1) AGL – Halogen lamps:

- AGL – Constant Current Regulators from 2.8 to 6.6 A
- Use of 1.8 A as a warm up brightness



2) Street lighting – High Intensity Discharge (HID) lamps:



2. HID lamps Technologies



MEASURES on HPS lamps :					
INPUT Voltage	-10% / Vr / 10%	-10% / Vr / 10%	-10% / Vr / 10%	-10% / Vr / 10%	-10% / Vr / 10%
OUTPUT Voltage	-30%	-20%	-10%	Vr	+10%
INDUCTIVE ENGINE					
Accuracy of the V control	+/- 3V	+/- 3V	+/- 3V	+/- 3V	+/- 3V
Efficiency of dimmer (%)	> 90%	> 92%	> 95%	> 95%	> 95%
I/O Power factor variation	> 30 %	> 20%	> 10%	> 3-5%	< 1%
Harmonics (%)	< 1%	< 1%	< 1%	< 1%	< 1%
THYRISTOR					
Accuracy of the V control	+/- 3V	+/- 2.5V	+/- 2V	+/- 2V	+/- 2V
Efficiency of dimmer (%)	> 95%	> 95%	> 96%	> 98%	> 98%
I/O Power factor variation	> 50 %	> 30%	> 10%	> 3-5%	< 1%
Harmonics (%)	< 30%	< 15%	< 5%	< 1%	< 5%
IGBT - PWM					
Accuracy of the V control	+/- 1V	+/- 1V	+/- 1V	+/- 1V	+/- 1V
Efficiency of dimmer (%)	> 99%	> 98.5%	> 98.5%	> 99%	> 98.5%
I/O Power factor variation	< 1%	< 1%	< 1%	< 1%	< 1%
Harmonics (%)	< 0.05%	< 0.05%	< 0.05%	< 0.05%	< 0.05%
<i>Temp. at full load & at all V</i>					
Operation temperature (°F)	-10/+130°F	-10/+130°F	-10/+130°F	-10/+130°F	-10/+130°F
Operation temperature (°C)	-25/+55°C	-25/+55°C	-25/+55°C	-25/+55°C	-25/+55°C

2. HID lamps Operation



Type of lamp	Min. of voltage %	Costs saving %
High Pressure Sodium	78	45-50
Low Pressure Sodium	83	35
Mercury Vapor	87	26-30
Metal Halide	78	40
Fluorescent with boot	83	35-45
Fluorescent eco version	83	30-35
Mixed Lamps	83	30

**Guidelines on the Application of
Dimming to High Intensity Discharge Lamps**

A NEMA Lighting Systems Division Document (LSD 14-2002)

« ... generally **not lower than 50 percent** of rated lamp wattage.”

2. HID lamps Operation



American recommendations for roadway lighting

Illuminance for Intersections						
Functional Classification	Average Maintained Illumination at Pavement by Pedestrian Area Classification lux/fc			E_{avg}/E_{min}		
	High	Medium	Low			
Major/Major	34.0/3.4	26.0/2.6	18.0/1.8	3.0		
Major/Collector	29.0/2.9	22.0/2.2	15.0/1.5	3.0		
Major/Local	26.0/2.6	20.0/2.0	13.0/1.3	3.0		
Collector/Collector	24.0/2.4	18.0/1.8	12.0/1.2	4.0		
Collector/Local	21.0/2.1	16.0/1.6	10.0/1.0	4.0		
Local/Local	18.0/1.8	14.0/1.4	8.0/0.8	6.0		

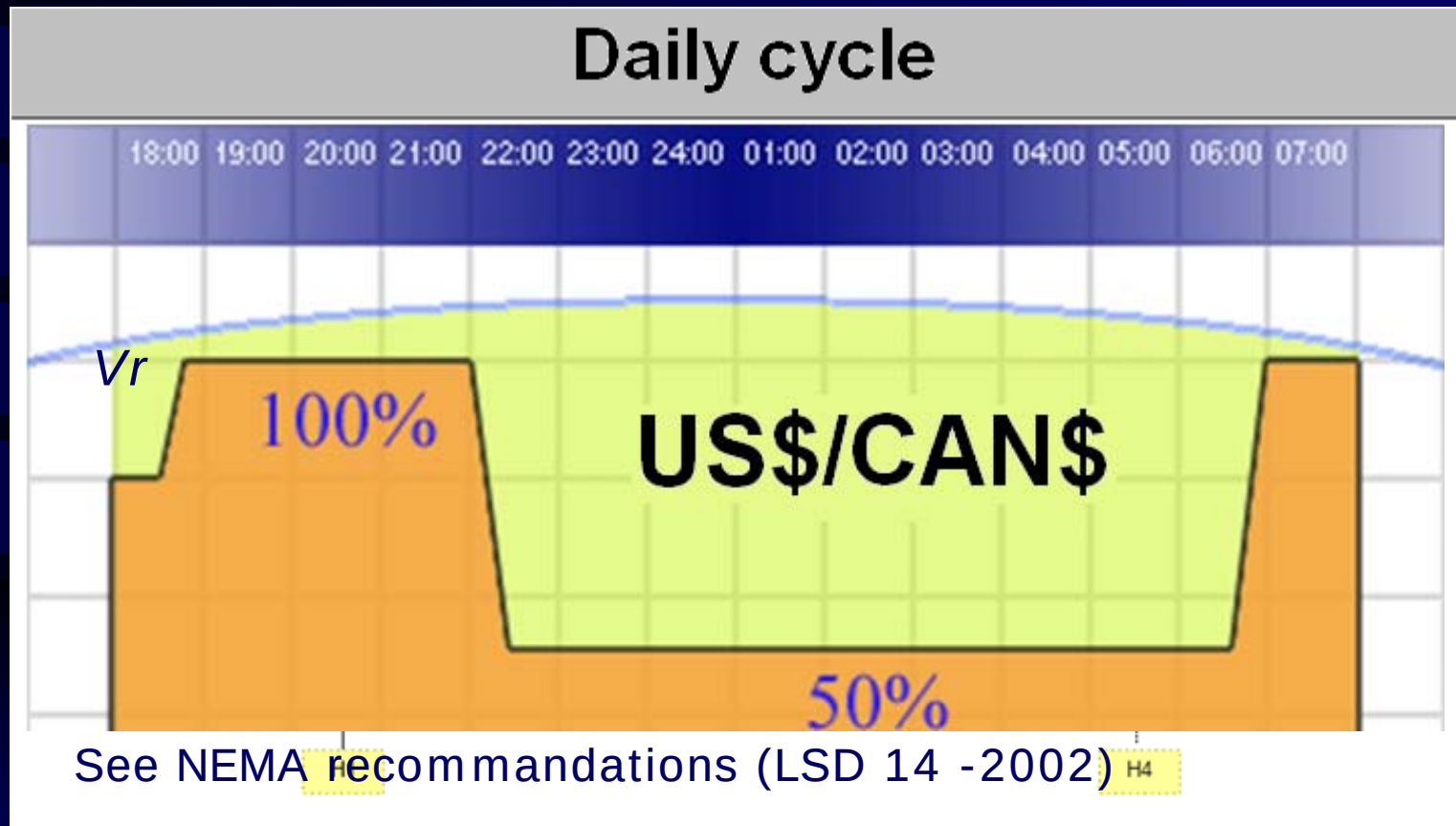
Local	Medium	6.0/0.6	9.0/0.9	8.0/0.8	4.0	0.4
	Low	4.0/0.4	6.0/0.6	5.0/0.5	4.0	0.4
	High	6.0/0.6	9.0/0.9	8.0/0.8	6.0	0.4
	Medium	5.0/0.5	7.0/0.7	6.0/0.6	6.0	0.4
	Low	3.0/0.3	4.0/0.4	4.0/0.4	6.0	0.4

From 'American National Standard Practice for Roadway Lighting, ANSI/IESNA RP-8 – table 9"
 From 'American National Standard Practice for Roadway Lighting, ANSI/IESNA RP-8 – table 3"

2. HID lamps Operation



Standard operation for cost saving in street lighting



Lamp manufacturers do not agree this explanation ... **Why ?**

2. HID lamps Solution



INSERTION of a **DIMMER**

Easy installation on existing cabinet

Connected directly on the control contactor output

Advantage of V control:

1) Regulation of the rated V

→ cuts up to 10% **overvoltage**

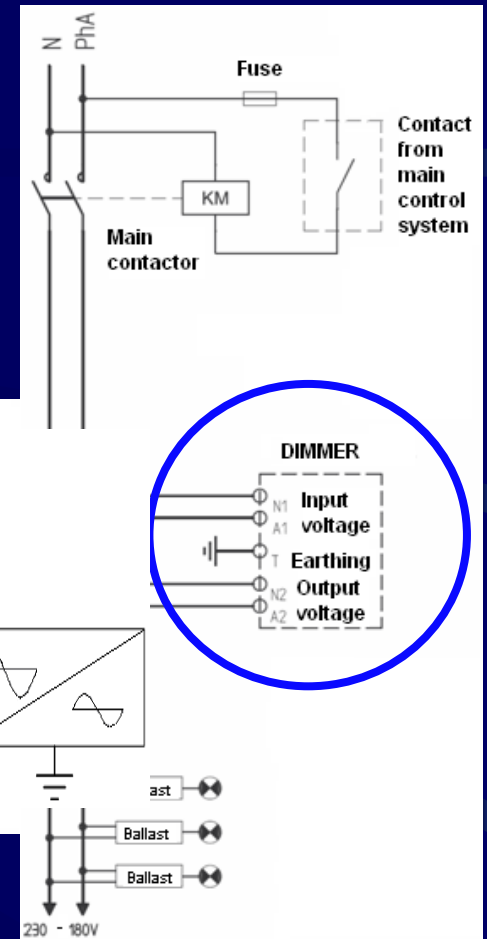
→ some lighting cost **savings**

2) Regulation of reduced V

→ main lighting cost **savings**

IMPORTANT :

- Global network dimmers operate **ONLY** with ferromagnetic ballasts
- **BECAUSE** Electronic ballasts balance the voltage drop !



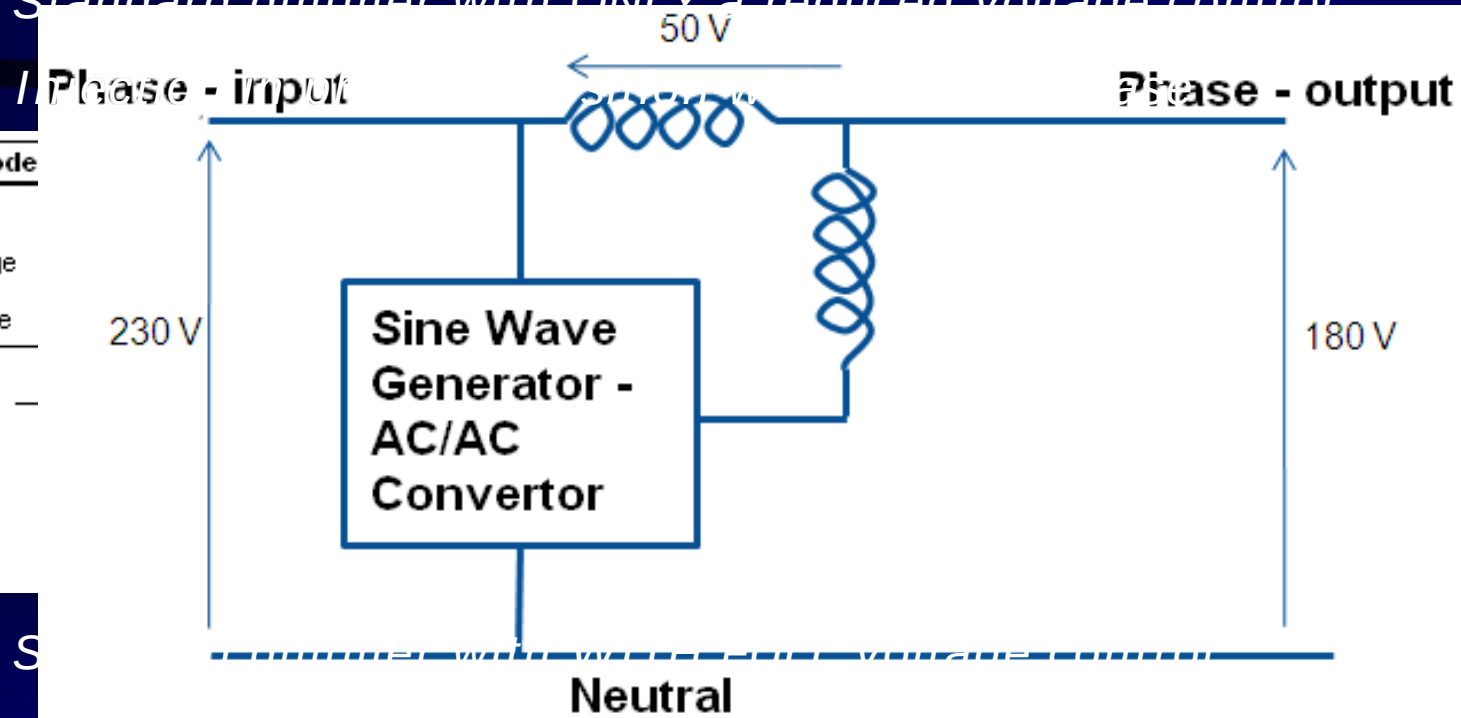
2. HID lamps Solution



Dimmers with **PWM technology**

An AC/AC converter (PWM several kHz) injects a signal inside an auto-transformer with a ratio at 40% of the rated V

Standard dimmer with ONLY a reduced voltage control



Final voltage
=
Network voltage
-
Injected voltage

Final voltage
=
Network voltage
+
Injected by electronics
phase % network

2 ways of injection: phase opposition OR same phase as grid one

3. Control:

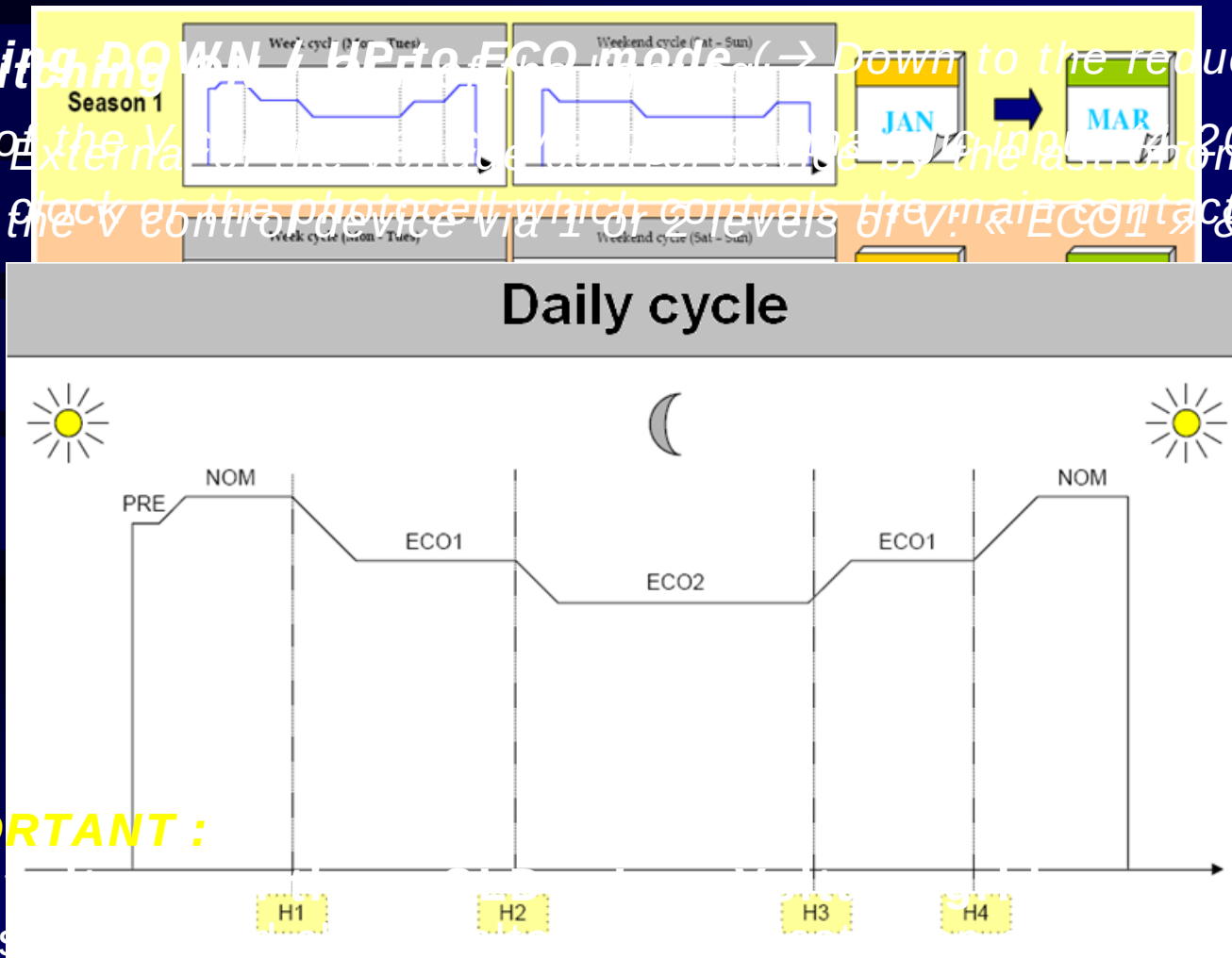
- Local



2 main solutions:

Inside or External of the voltage control device

- 2) **Switching DOWN / HP to ECO mode** (→ Down to the reduced voltage)
- External of the V control device (→ by the last chemical clock of the photo cell which controls the main contactor, 20mA / 0-10V)
 - Inside of the V control device via 1 or 2 levels of V: « ECO1 » & « ECO2 » clock,



IMPORTANT :

Drop
Always

work

3. Control: - Remote



*4 main technologies for remote control:
Copper wiring, Optic fiber, Wifi & **GSM***

1) Copper wiring:

- *Serie communication RS232 with the dimmer → Difficult to install*

2) Optic fiber wiring:

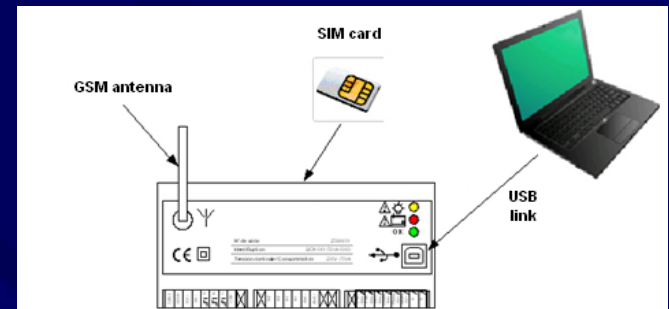
- *Serie communication through modem RS232 → Difficult to install*

3) Wifi / Wimax:

- *Serie communication through modem → robustness of the comm.?*

4) GSM modem:

- *SMS to/from cellular phones*
- *AND / OR PC Supervision software*

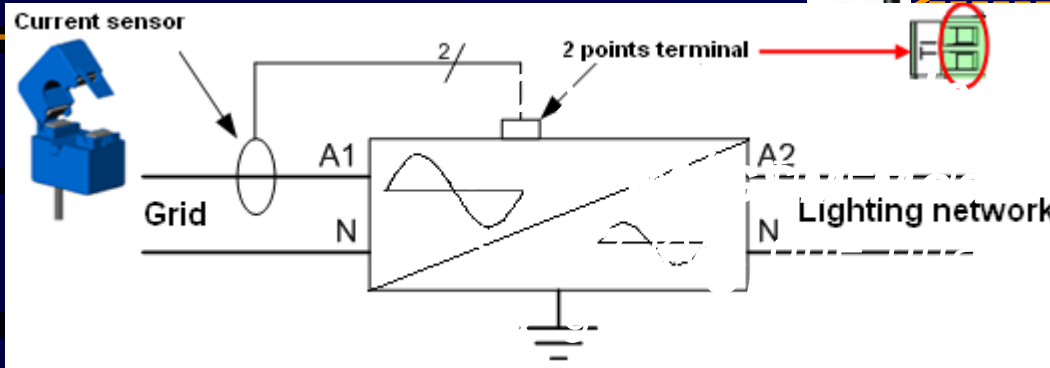


3. Control: - Remote



Solution with GSM network

Meet cellular operators → **special prices**



Cabinet + GSM modem



PC
software



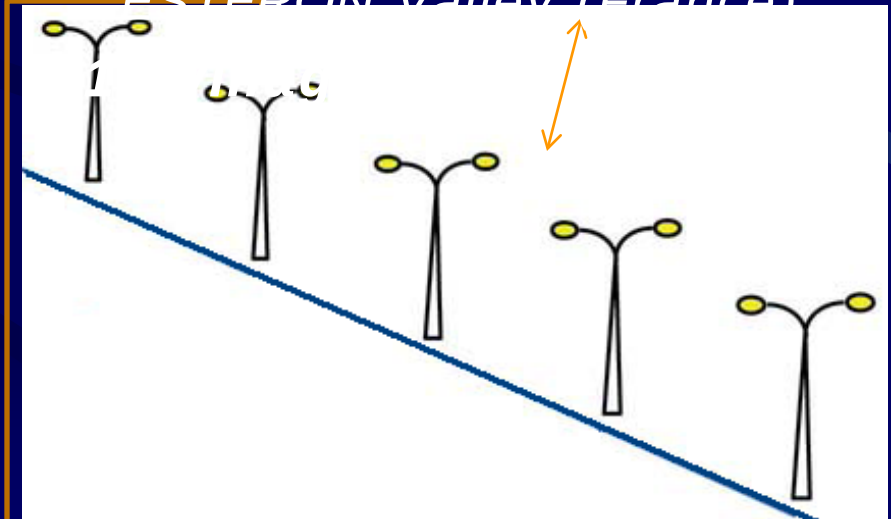
6 kVA one phase
3 kVA one phase

60 cabinets



1 Monitoring PC

ESTERON Valley (France)



3. Control Remote



Individual monitoring of HID lamps

The previous system could include:

- Up stream side:
 - **A Global monitoring system** with GPS position of lamps
- Down stream side:
 - **An Individual monitoring** of the real state of each HID lamp (by Power Line Carrier)

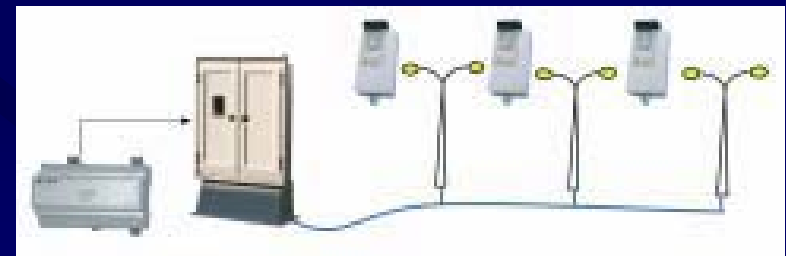


tages:

the maintenance hours
2 600 modules
planning of repairing actions
(HPS-150W)

vantage:

Return On Investment (ROI) quite long



4. Airport applications

Main HID lamps uses

→ **Where cost savings are !**

1) Apron

(Manual part IV §13: 20 -> 10 lux)

2) Parks

3) Roads

4) Terminals

Marseille Provence

5 x 27 kVA (Apron)

1 x 36 kVA (Park)

Lyon St Exupery

1 x 27 kVA (Park)

Bâle - Mulhouse

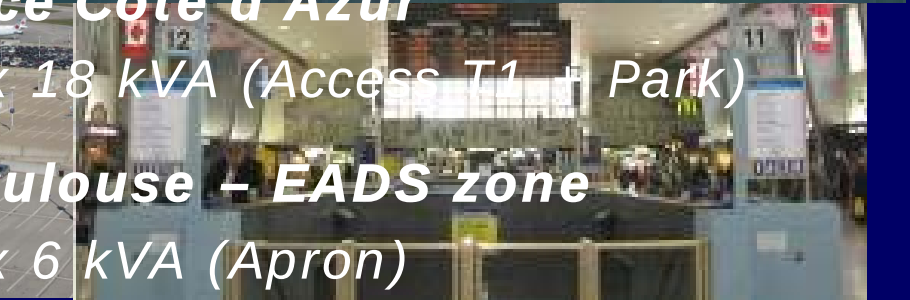
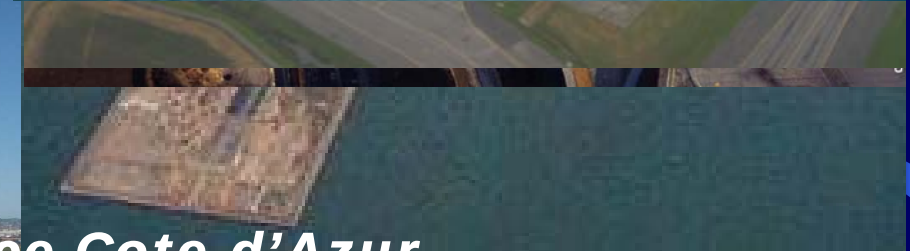
2 x 9 kVA (Park)

Nice Cote d'Azur

1 x 18 kVA (Access T1 - Park)

Toulouse - EADS zone

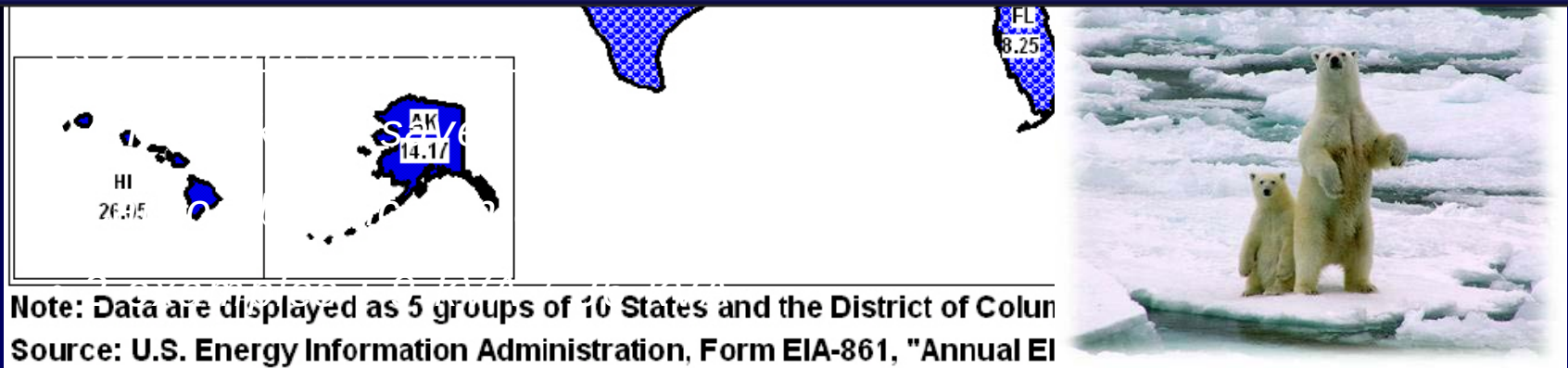
1 x 6 kVA (Apron)



5. Conclusions



State / Province	Cost	Dimmer 9 kVA 1 phase		Dimmer 36 kVA 3 phase		R.O.I.





... Thank you for your attention
& Think about them !
and at your children future !!!



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