

*Implementing Energy Efficiency through Renewable Energy Solutions - are
Southeast European Countries on track?*

Adaptive street lighting

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Europeans face many challenges in the coming decades

- Europe will need to import ever increasing amounts of energy as fossil fuel reserves diminish fast and prices grow higher than ever
- Europe to cut its energy use by 20 % in real terms by 2020 without compromising on performance

How to do that?

- Develop of a sustainable energy economy that protects the environment by using renewable sources of energy generated from natural resources
- Choosing energy-efficient appliances and services that reduce energy use

Streetlights are among a city's most important and expensive assets, typically accounting for 40% of its electricity bill.

Today's target is having most energy-efficient street lighting that utilize:

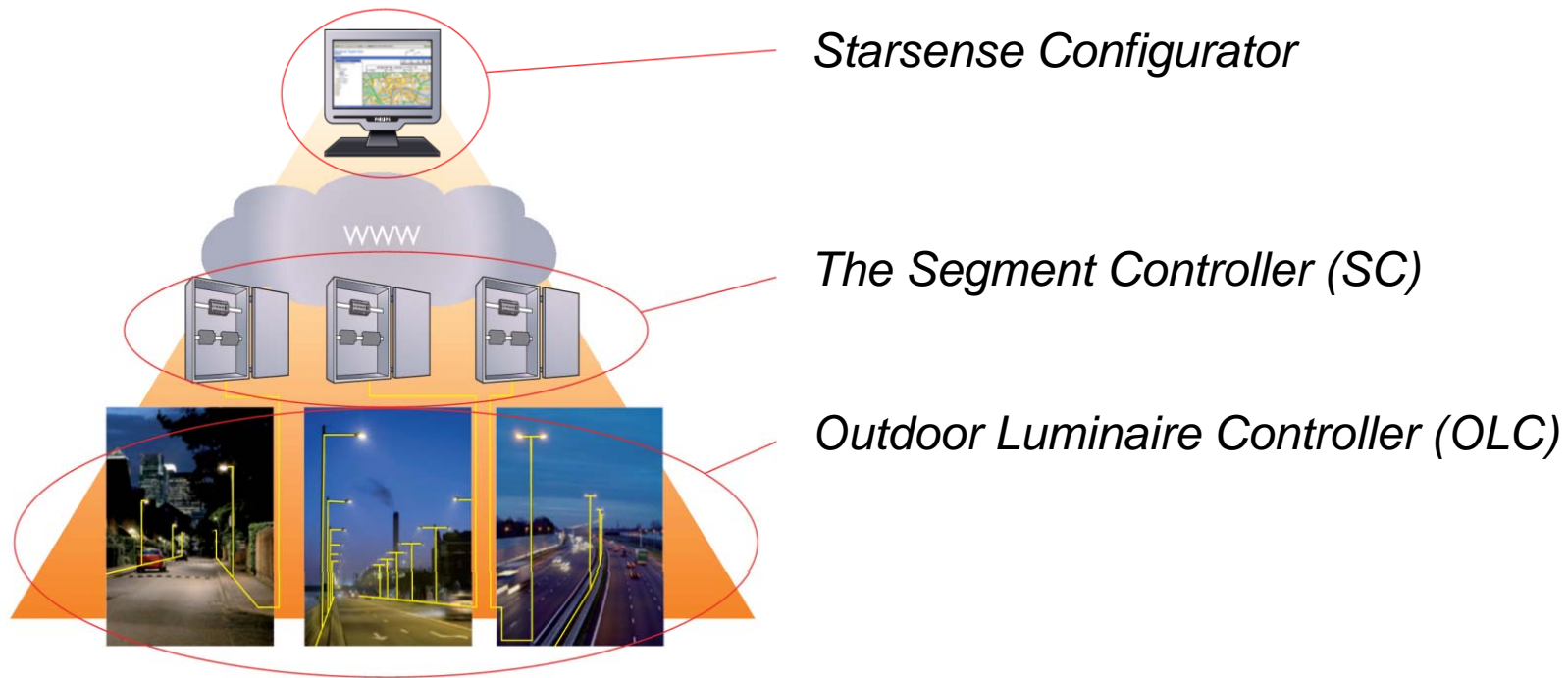
- the latest technologies (telemangement)
- to optimize the light intensity according to the situation by dimming the lamp
- balance between economical goals
- citizens' safety needs

Philips Starsense adaptive street lighting system

- Telemanagement system enables individual light points to be switched **on** or **off** at any given time, or to be set to any dimming level
- Reduced maintenance and management costs
- Environmental benefits

Technical description of the system

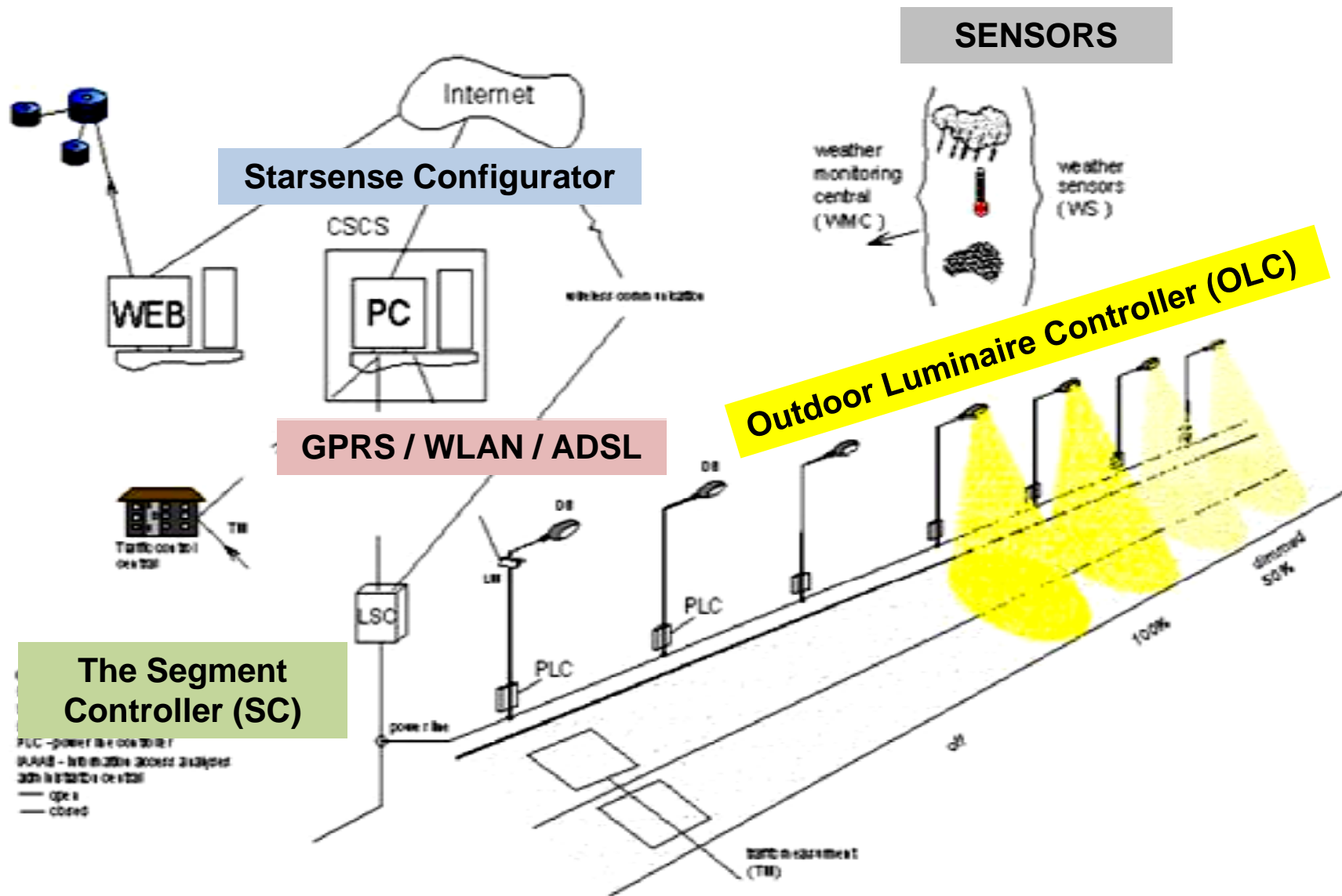
- A central unit regulates each lamp depending on given triggers
- Regulation of illumination level
- Communication between the central unit and the operation central
- Communication system based upon the LonWorks® power-line communication protocol
- Database of fixtures is linked to GIS database



Outdoor Luminaire Controller (OLC): switches and dims the lamp and detects lamp failures. Has a digital input designed to connect to a photocell, enabling local on/off switching.

Segment Controller (SC): controls a number of OLCs connected to the same power grid and gathers information from them to be sent, when required, to the remote PC via Internet, typically through GPRS

Starsense Configurator : The software is used for monitoring and managing the data from the SCs.



Overall architecture of the Monitoring System for Adaptive Street Lighting

Case study for municipality of Gazi Baba

Current condition in Municipality Gazi Baba

Type of bulb	Power	Qty.	Total Pwr. (kW)
Mercury-vapor 125W	139	117	16,3
Mercury-vapor 250W	272	58	15,8
Mercury-vapor 400W	429	388	166,5
High Pressure Sodium 70W	84	10	0,8
High Pressure Sodium 150W	169	14	2,4
High Pressure Sodium 250W	278	388	107,9
High Pressure Sodium w/ignitor 110W	124	3	0,4
High Pressure Sodium w/ignitor 220W	242	16	3,9
TOTAL:			313,8 kW

New proposal with energy efficient bulbs, electronic ballast and controllers

Type of bulb	Level of illuminance 100%			Level of illuminance 50%		
	Power	Qty.	Total Pwr (kW)	Power	Qty.	Total Pwr (kW)
Mercury-vapor 125W	/	/	/	/	/	/
Mercury-vapor 250W	/	/	/	/	/	/
Mercury-vapor 400W	/	/	/	/	/	/
High Pressure Sodium 70W	78	130	10,1	39	130	5,1
High Pressure Sodium 150W	161	88	14,2	80,5	88	7,1
High Pressure Sodium 250W	269	776	208,7	134,5	776	104,4
High Pressure Sodium w/ignitor 110W	/	/	/	/	/	/
High Pressure Sodium w/ignitor 220W	/	/	/	/	/	/
TOTAL			233,1			116,5
Savings in total installed power	100%	80,8 kW or 25%		50%	197,3 kW or 63%	

The municipality has **72000** inhabitants and it is spread on **92** square km and it has **994** luminaries.

Energy consumption in Municipality Gazi Baba from street light system

(Price: 0,072 €/ kWh)				Level of illuminance: 6h 100% + 5h 50%		
Current condition in Municipality Gazi Baba				New proposal with energy efficient bulbs, electronic ballast and controllers		
Type of bulb	Power [W]	Qty.	Total Consumption per anum. (kWh)	Power [W]	Qty.	Total Consumption per anum. (kWh)
Mercury-vapor 125W	139	117	65.296	/		
Mercury-vapor 250W	272	58	63.341	/		
Mercury-vapor 400W	429	388	668.305	/		
High Pressure Sodium 70W	84	10	3.373	78	130	22.207
				39		9.253
High Pressure Sodium 150W	169	14	9.499	161	88	31.028
				80,5		12.928
High Pressure Sodium 250W	278	388	433.074	269	776	457.149
				134,5		190.479
High Pressure Sodium w/ignitor 110W	124	3	1.494	/		
High Pressure Sodium w/ignitor 220W	242	16	15.546	/		
TOTA [kWh]			1.259.927	723.044		
TOTAL [€]			108.300,00 €	62.151,00 €		
Savings in total consumption of energy		kWh:	536.883	Euros:	46.150,00 €	

Summary of the expenditures per year for maintenance of street light system

Current condition in Municipality Gazi Baba		New proposal with energy efficient bulbs, electronic ballast and controllers
TOTAL	17.863,00 €	3.925,00 €
Savings in annual maintenance	13.938,00 €	

Costs of the design and implementation of Starsense telemanagement system

Type of expenditure	Qty.	Price [€]	Total [€]
Deassembly and assembly of the old street luminaires with new ones, electronic ballast and new Starsense system			
Selenium SGP340 SON-T 70W K EB + OLC	130	406,5 €	52.845,00 €
Selenium SGP340 SON-T 150W K EB + OLC	88	423,00 €	37.224,00 €
Selenium SGP340 SON-T 250W K EB + OLC	776	439,00 €	340.664,00 €
Assembly of the telemanagement system for monitoring, controlling, metering and diagnosing outdoor lighting			
Segment Controller PHILIPS LFC7065	20	2.764,00 €	55.284,00 €
GSM/GPRS Modem	20	285,00 €	5.700,00 €
Unpredictable costs		4.878,00 €	4.878,00 €
TOTAL		585.970,00 €	

Return On Investment (ROI)

Cost of the design and implementation of the project	585.970,00 €
Total annual savings	60.088,00 €
Uncovered investment after 1 year	525.882,00 €
ROI in years	8,75

Type of savings	Unit	Before	After	Savings	%
Energy	kWh	1.259.927	723.044	536.883	42,61
CO ₂	kg	1.222.129	701.353	520.777	

Conclusion

- Production doesn't have the capacity to meet all electricity market demands
- Solution to the problem is energy-savings
- Street lighting takes 40% of the municipality electricity bill so have to be replaced with new energy efficient technologies like telemanagement systems with energy savings up to 50%

Payback period of the investment must not be an excuse not to implement energy efficient technologies