

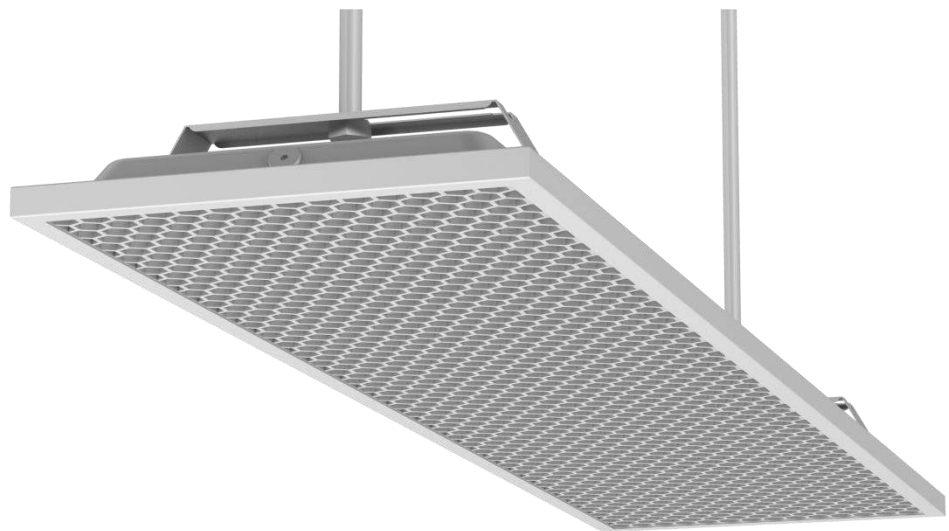


Łukasiewicz
Institute of Microelectronics
and Photonics



Comparative analysis of lighting upgrade

to LARS LED luminaires with motion and twilight sensors and a light mixing function in the corridors of the Institute's buildings.



Case study

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Objective

This analysis presents the benefits of upgrading the present lighting to LARS LED smart luminaires, such as lower costs of energy use and lighting maintenance.



Smart lighting system

Innovative product and technology



LARS Lighting in collaboration with the Łukasiewicz Institute of Microelectronics and Photonics has developed a smart lighting system that **helps achieve vast savings in electricity consumption.**

By combining LED technology, radar motion sensors, twilight sensors and light control systems, we have developed a unique product on the market: an independent lighting system where lamps work autonomously. Cooperation between the two companies also includes design and development of adaptive control systems for LED modules.

An innovative feature of the lamps is the possibility to program their individual parameters. Each lamp is an independently managed unit controlled by algorithms analyzing real time data from sensors. This allows the light to automatically adjust to the conditions in the room. The system responds to changes in natural light during the day, which minimizes the time the lamp is on and has a real impact on extending its useful life.

The product provides excellent savings to end users on electricity used for artificial lighting of rooms, because controlled LED lighting may consume 10 times less electricity than traditional lighting and five times less than standard LED lighting. Electricity bills will be cut by up to 97%, resulting in lower CO₂ emissions and running costs.

Collaboration with the Investor

A. First meeting with the Investor



- 01 **Hold an introductory meeting at the Investor's site**, preferably in the building where the upgrade is to be carried out
- 02 Deliver an initial presentation showing the advantages and benefits of implementing the LARS lighting control system
- 03 Determine what lighting control systems, instruments such as White Certificates, financing methods, etc. the Investor is interested in
- 04 Determine operating schedules in the building (shift work, non-stop work, etc.)
- 05 Carry out an on-site review of the buildings to be upgraded to predetermine the scope of upgrade and technology to be implemented, and to compile a detailed inventory of lighting (powers, quantities and types of light luminaires)
- 06 Obtain available architectural blueprints and detailed designs of the existing electrical installation from the Investor in order to best estimate the benefits of introducing LARS Lighting solutions

B. Prepare a customized offer



- 07 Make lighting calculations using LARS Lighting retrofit luminaires selected for the type of individual rooms (taking into account fitting methods, light beam, controls, etc.)
- 08 Calculate the energy use figures to compare the energy consumed by both the existing lighting installation and the innovative LARS LED Lighting
- 09 Prepare a commercial offer with the energy use figures showing the payback period and generated savings
- 10 Present options to take advantage of financial support instruments such as White Certificates, loans from WFOŚ (the Regional Environmental Protection Fund) or ESCO (the Energy Service Company).

C. Second meeting with the Investor



- 11 **Present the final offer** backed up by the energy use figures for the lighting and discuss contractual terms.

Projected benefits of the lighting upgrade

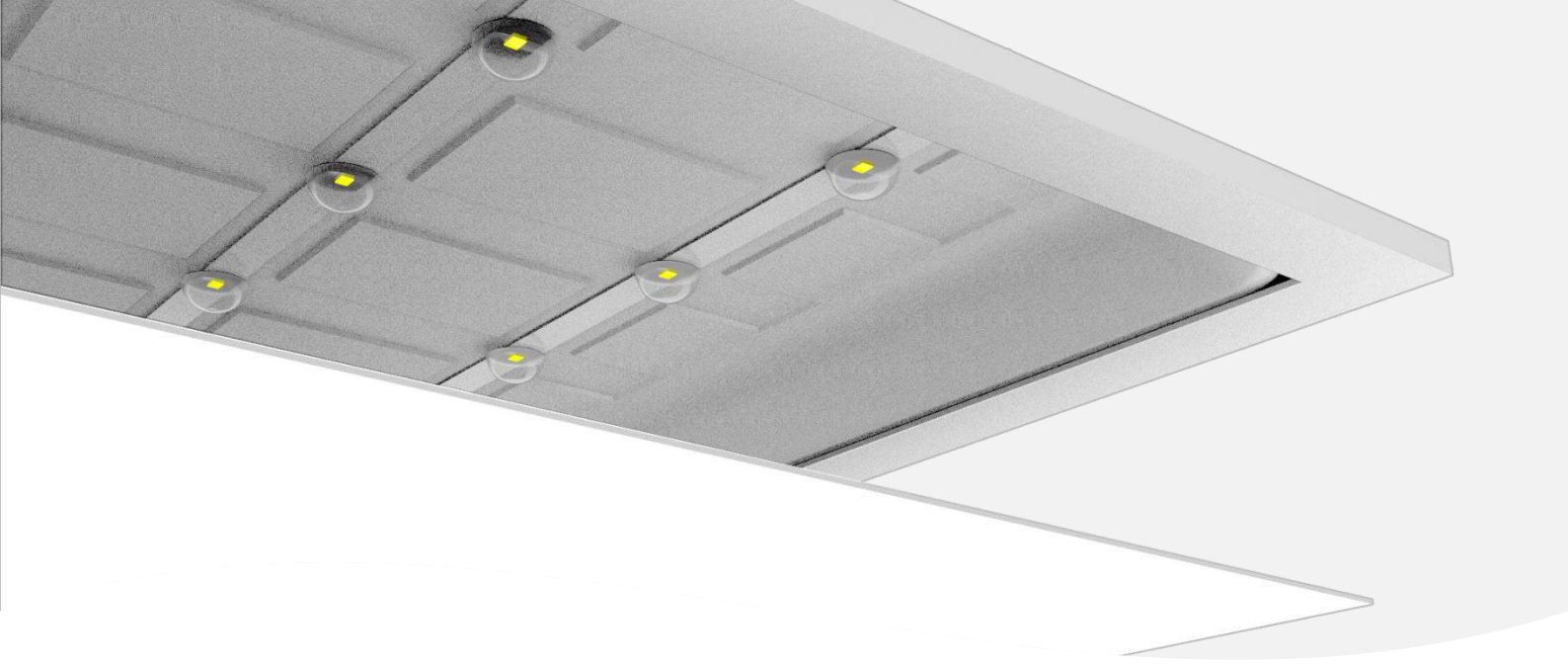
LARS Lighting LED luminaires with built-in motion and twilight sensors and light mixing systems will be much easier to use and ensure compliance with lighting standards.

Following the upgrade of lighting in the office premises in your building, the total power consumption will be reduced by 96% compared to fluorescent luminaires. This analysis applies to the following premises: corridors. It takes account of various operating schedules of lighting during the day and the frequency of its operation.

Preliminary selection of types and quantities of luminaires to be upgraded

Fluorescent lighting			LARS LED lighting				
energy use	quantity	total energy use	savings	luminaire type	energy use	quantity	total energy use
90 W	200	18,000 W					
				IPS 27 W	27 W	167	4,509 W
	200	18,000 W				167	4,509 W

	Pre-upgrade	Post-upgrade
	Fluorescent and incandescent	LARS LED Lighting
LUMINAIRE TYPE	90 W	27 W
Light intensity and operation control system	-	+
Motion sensor	-	+
Twilight sensor	-	+
Quantity of luminaires	200 pcs	167 pcs
Total lamp power [kW]	18 000 W	4 509 W
Energy use by all lamps per year [kWh]	50 400 kWh	2 104 kWh
Energy use reduced by		96%
Net price of a fluorescent tube plus replacement [PLN/piece]	PLN 10	
Lamp lifespan	10 000 h	50 000 h

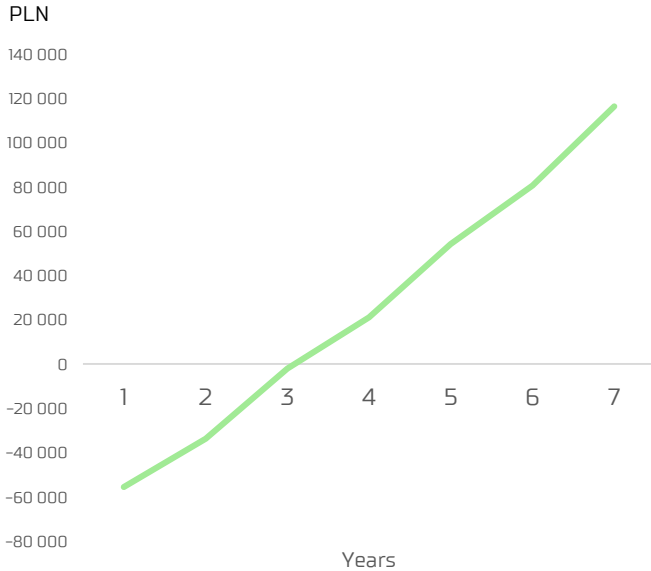


Years		0	1	2	3	4	5	6	TOTAL
LED lighting	Net purchase cost [PLN]	63,460	0	0	0	0	0	0	63,460
	Net maintenance cost – purchase and replacement of fluorescent tubes	8,000	0	8,000	0	8,000	0	8,000	32,000
Capex for LARS lighting compared to alternative lighting									-31,460
Energy price [PLN/kWh]			0.45	0.47	0.50	0.52	0.55	0.57	
Energy use cost – LARS LED lighting			947	994	1,044	1,096	1,151	1,208	6,441
Energy use cost – fluorescent lighting			22,680	23,814	25,005	26,255	27,568	28,946	154,267
Annual savings on electricity bills			21,733	22,820	23,961	25,159	26,417	27,738	147,827
Annual financial outlays (cumulative)		-55,460	-33,727	-2,907	21,054	54,212	80,623	116,364	
Total cost of LARS lighting (purchase of luminaires and cost of energy use)									69,901
Total cost of fluorescent lighting (purchase of luminaires and tubes, cost of energy use)									186,267
Total savings achieved by the project using Smart LARS LED panels									116,367

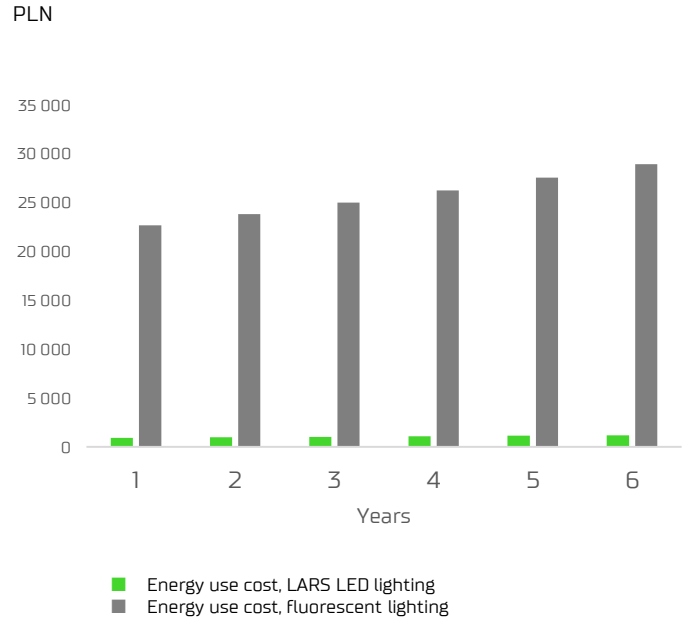
The table above shows projected costs and savings resulting from the lighting upgrade. **The above calculations are general estimates** based on the assumptions presented in this analysis and the actual, accurate measurements of reference installations.

Projected benefits of the lighting upgrade

Payback period



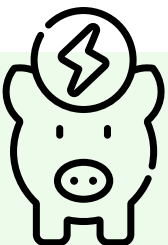
Comparison of annual energy use costs



The presented calculations show that the upgrade to LARS LED luminaires will pay back after 25 months. Any savings achieved after that point are your pure profit.

By upgrading the lighting from the fluorescent lighting to Smart LARS LED luminaires, **the energy use may be reduced by 48,296 kWh annually.**

In the presented calculation, the reduced energy use and considerably lower maintenance costs of luminescent lighting will generate savings of PLN 147,827 over six years.



After the investment is paid back, the estimated savings will reach approx. PLN 116,367. Having said that, even more savings could be potentially generated if more luminaires were upgraded.

Additional benefits

The additional benefits of the upgrade to the energy-saving Smart LARS LED luminaires include the following:

- A considerable reduction in costs of lamp replacement and maintenance on account of the long lifespan of LED luminaires of up to 50,000 hours of continuous operation [the light control system, motion and twilight sensors will extend the lifespan of LARS lamps to a few decades]
- No flickering
- Reduced CO₂ emissions
- No UV radiation
- Minimized heat generated by lighting [less energy consumed for air-conditioning]
- Safe and comfortable use
- Fully-automatic operation of LARS panels
- Panels will start operating when connected to a power source and programmed
- High color-rendering index (Ra > 80) ensuring very good lighting for CCTV monitoring.





Forms of financing

1. Own funds, a loan or lease.
2. ESCO¹ – financing of the investment with energy savings generated by the project. In this case, the initial costs of the upgrade are borne by the financing entity (ESCO), not the Investor. The investment is repaid by the Investor monthly over a specified period of time.
3. Forgivable loans from WFOŚ for lighting upgrades and thermal insulation of buildings.
4. The lease of lighting with a warranty of its operation. The financing party carries out an upgrade (installation of luminaires that guarantee illuminance in compliance with applicable standards) and charges monthly installments to the Investor.

Summary

The upgrade of lighting in the corridors of the Institute in Warsaw to Smart LARS LED lighting will reduce the use of electric energy by as much as 96%.

Smart LARS LED lighting with reduced power consumption, a timer and motion sensors will allow for effective management of energy consumption and achieve a maximum reduction in lighting costs.

¹ Energy Service Company, ESCO-type energy services on the Polish market, Open Data [access: 02.08.2021]



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