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Energy Efficient Lighting

David Ellis

OSRAM Ltd.

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OSRAM - Part of the Industry Sector of Siemens

Siemens is a global powerhouse in electronics and electrical engineering, operating in the industry, energy and healthcare sectors

Industry

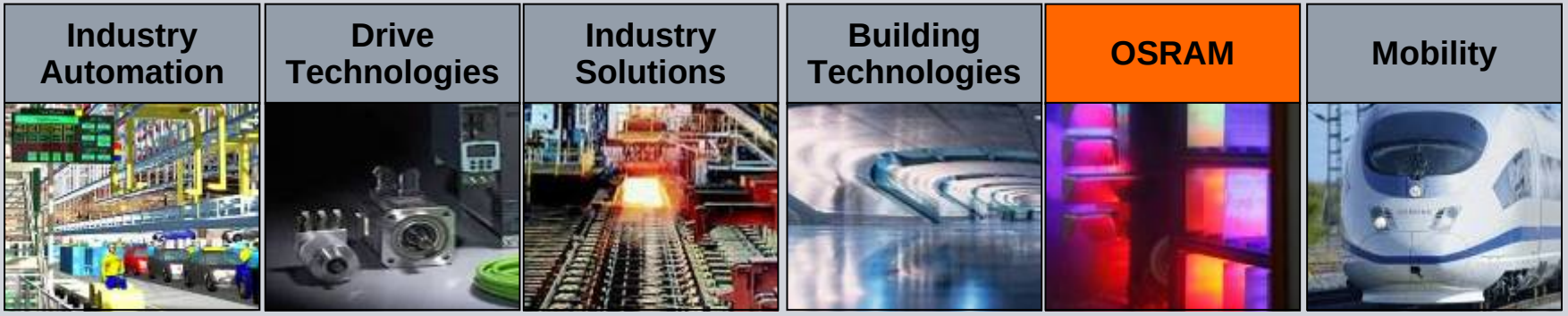
- Drive Technologies
- Industry Automation
- Building Technologies
- Mobility
- **Lighting (OSRAM)**
- Industry Solutions

Energy

- Fossil Power Generation
- Renewable Energy
- Oil & Gas
- Energy Service
- Power Transmission
- Power Distribution

Healthcare

- Imaging & IT
- Workflow & Solutions
- Diagnostics



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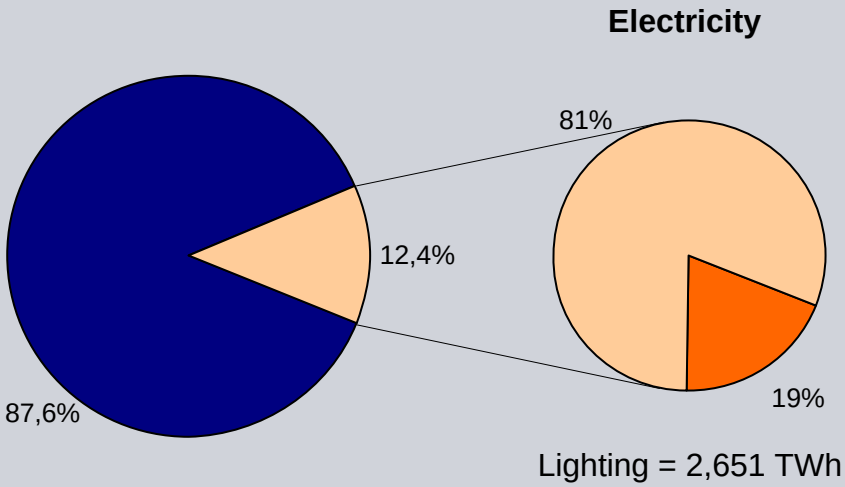
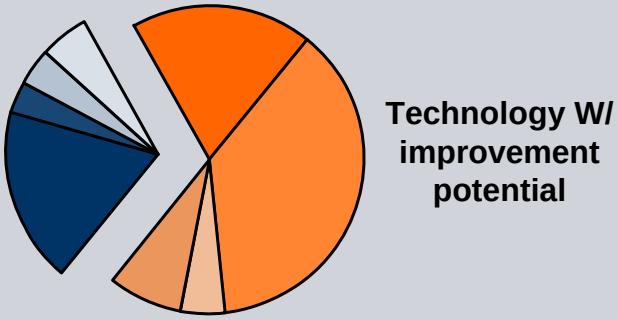
Lighting consumes a significant amount of energy

- Lighting accounts for 19% of the global energy consumption
- 2,651 TWh was used globally for lighting in 2005 ~ 8 times the electricity consumption of the UK
- Nearly 70% of electricity is used by lamps for which a better alternative is available





The savings potential of efficient lighting is enormous

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- It would be technically feasible to save nearly 2/3 of the electricity used for lighting
- Realistically 50% of the electricity could be saved > 1300 billion kWh
- Thus 650 million tons of CO_2 would not be emitted into the atmosphere* - an effect similar to planting a new forest nearly 3 times as big as Great Britain

* At average Energy-Mix: 0.5 kg CO_2/kWh

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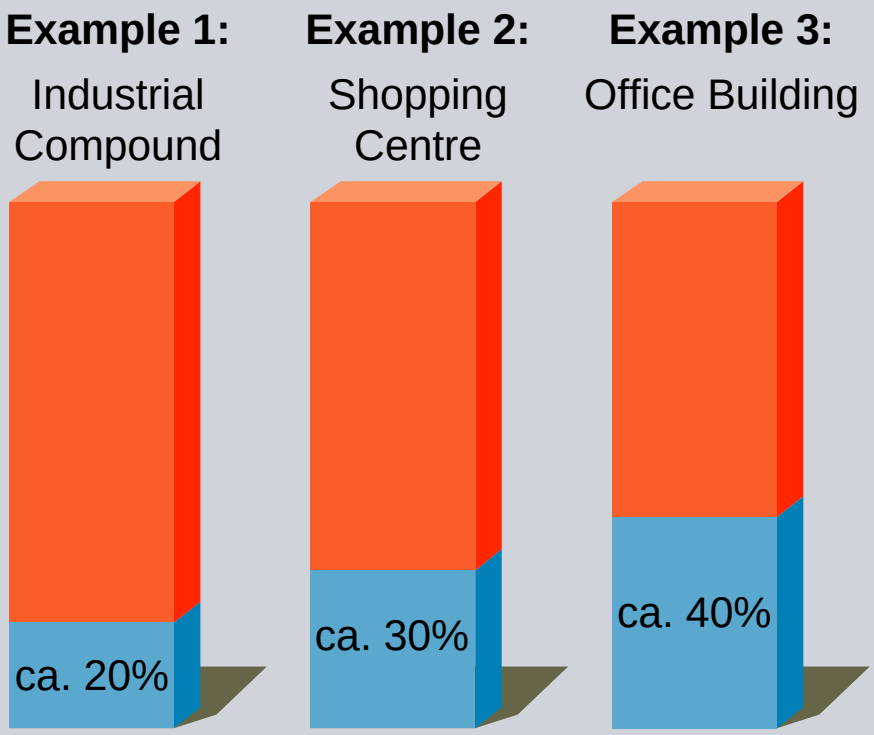
Electricity in buildings

- Lighting in professional buildings uses significant amounts of energy
- 75% of UK buildings still use lighting design that is over 25 years old*
- Adoption of energy efficient lighting could save London 1.4 million tons of CO_2 per year



*McKinsey & Company City research study

Origin of Directive 2009/125/EC* – Ecodesign requirements for Energy-related Products (ErP)

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Based on the Kyoto targets for CO_2-reduction from 1997 EU defined energy saving requirements for the lighting industry.

Directive 2000/55/EC (CCG-ban)			Directive 2009/125/EC (ErP)		
21.05.2002	~~EEI = D~~	replaced by	13.04.2010	TIM	Office, Industry (OIL), Street (SLIM)
21.11.2005	~~EEI = C~~		01.09.2009	DIM I	non-directional household lamps
			Published TBC	DIM II	directional household lamps
Ban of conventional control gears with very high (D) and moderate (C) losses			Implementing measurements (IM) for Energy related Products (ErP) in the tertiary (TIM) and domestic (DIM) sector by the definition of minimum efficiencies		

* Successor of Directive 2005/32/EC Energy using Products (EuP)

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EU lamp phase out (common types)

	Sept. 2009	Sept. 2010	Sept. 2011	Sept. 2012	Sept. 2013	Sept. 2014*	Sept. 2015	Sept. 2015
Clear GLS	> 100W	75W	60W	15, 25, 40W	Ban of all clear incandescent lamps			
Pearl GLS	Ban of all pearl/frosted incandescent lamps							
LED CFLi								
	Apr. 2009	Apr. 2010	Apr. 2011	Apr. 2012	Apr. 2013	Apr. 2014*	Apr. 2015	Apr. 2016
FL Tubes		T8 Basic T8 Basic U	T12					
Triphos-phor Tubes								
SON				SON Standard				
SON SUPER 4Y								
MBFU							MBFU	
Metal Halide								

*EU commission review

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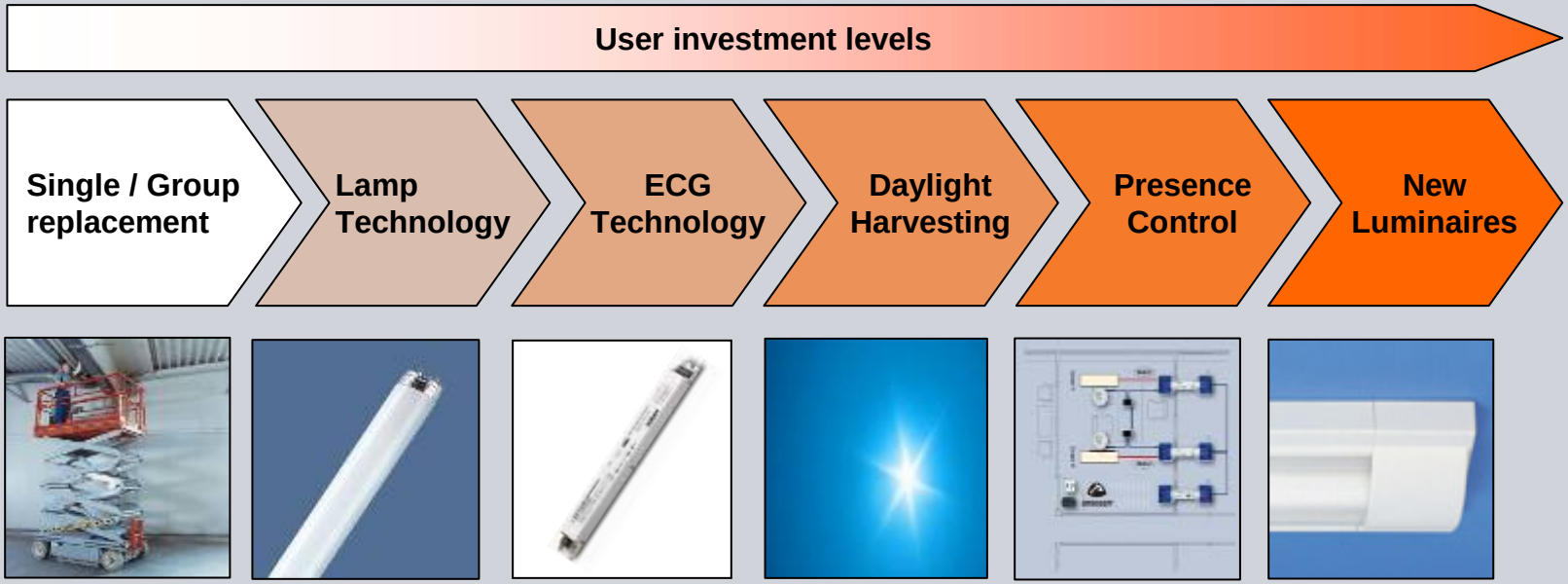
Steps to save energy and reduce maintenance costs



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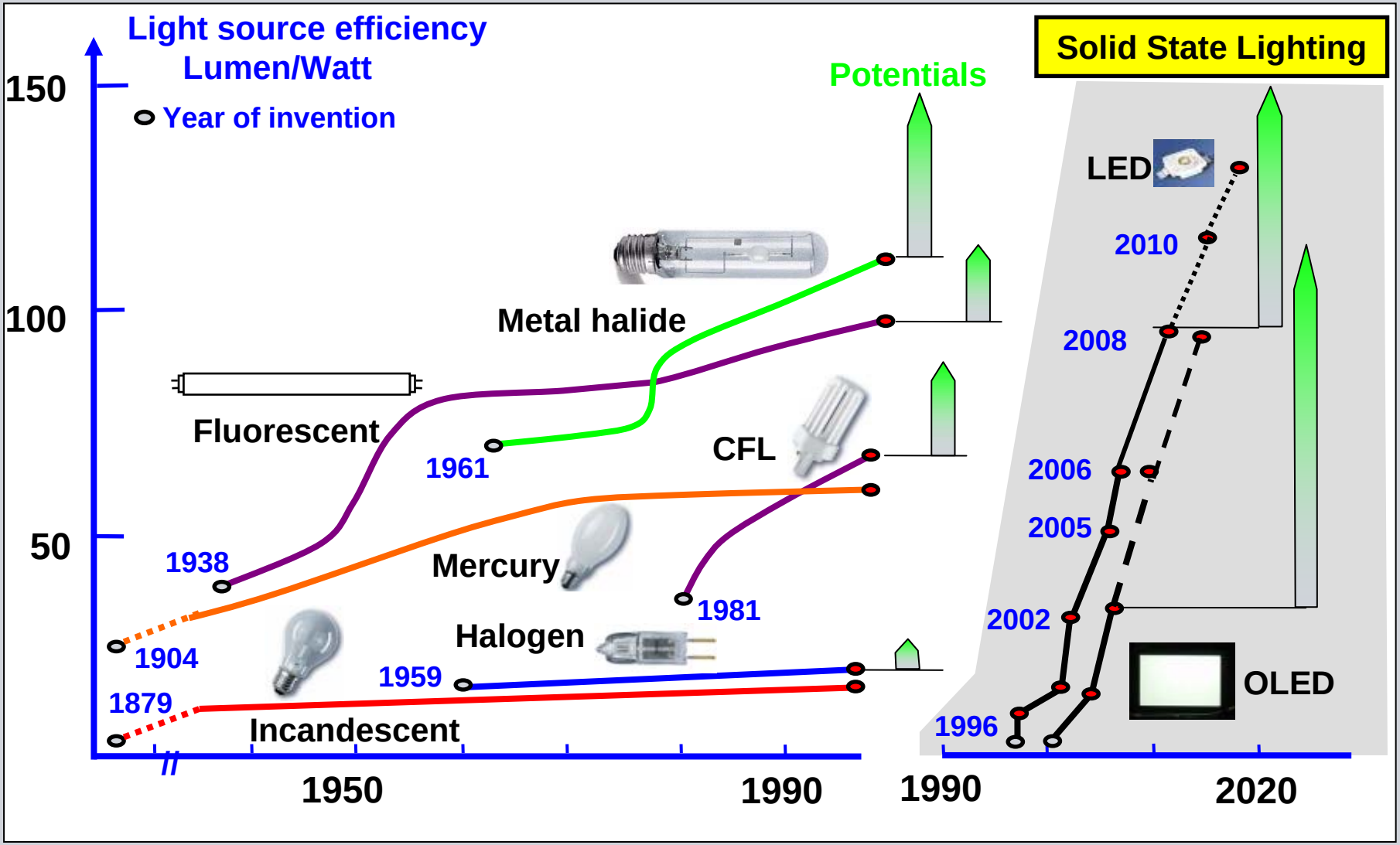
Efficiency of light sources



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Upgrade incandescent lamps

Incandescent

60W

1,000hrs

Halogen ECO

42W,

2,000hrs

Compact Fluorescent

11W

20,000hrs

LED

12W

25,000hrs

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Upgrade halogen reflector lamps

12V Halogen

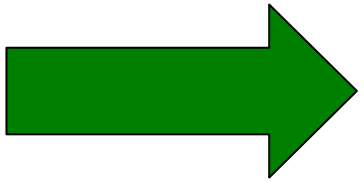
35W

2,000hrs

240V Halogen

35W

1,000hrs



Halogen ECO

20W

5,000hrs

LED

10W

25,000hrs

Halogen ECO

20W

5,000hrs

Parathom® LED

10W

25,000hrs

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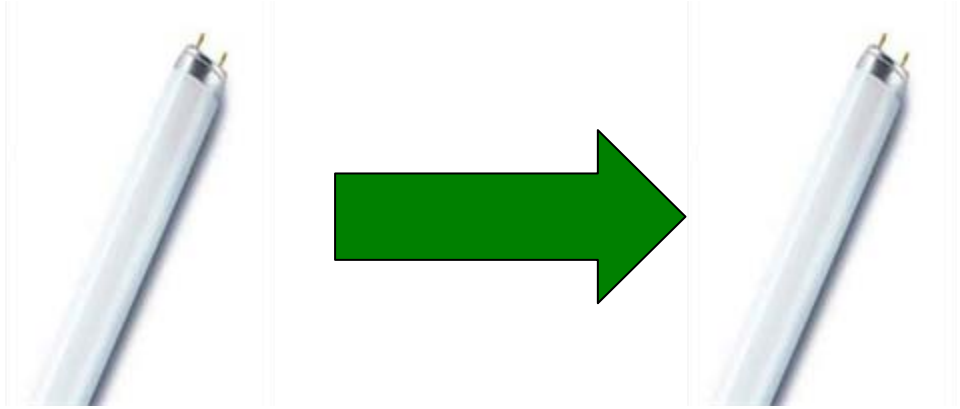
Upgrade T8 fluorescent tubes



T8 Basic

36W

13,000hrs (CCG)

LUMILUX® T8 ES Energy Saver

32W

13,000hrs (CCG)

LUMILUX® T8 XXT

36W

90,000hrs (ECG)

SubstiTUBE™ T8 LED

24W

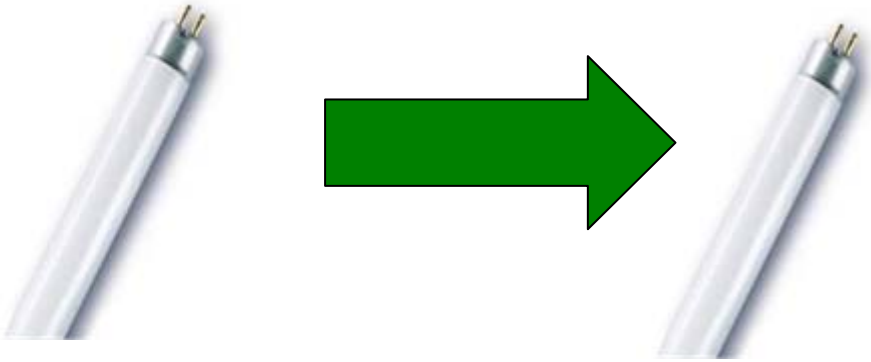
50,000hrs (CCG)

Upgrade T5 fluorescent tubes

LUMILUX® T5 HE Energy Saver

32W

20,000hrs



LUMILUX® T5 HO Energy Saver

73W

24,000hrs

LUMILUX® T5 HE, HO

35, 80W

20,000 - 24,000hrs

LUMILUX® T5 HO XT

80W

50,000hrs

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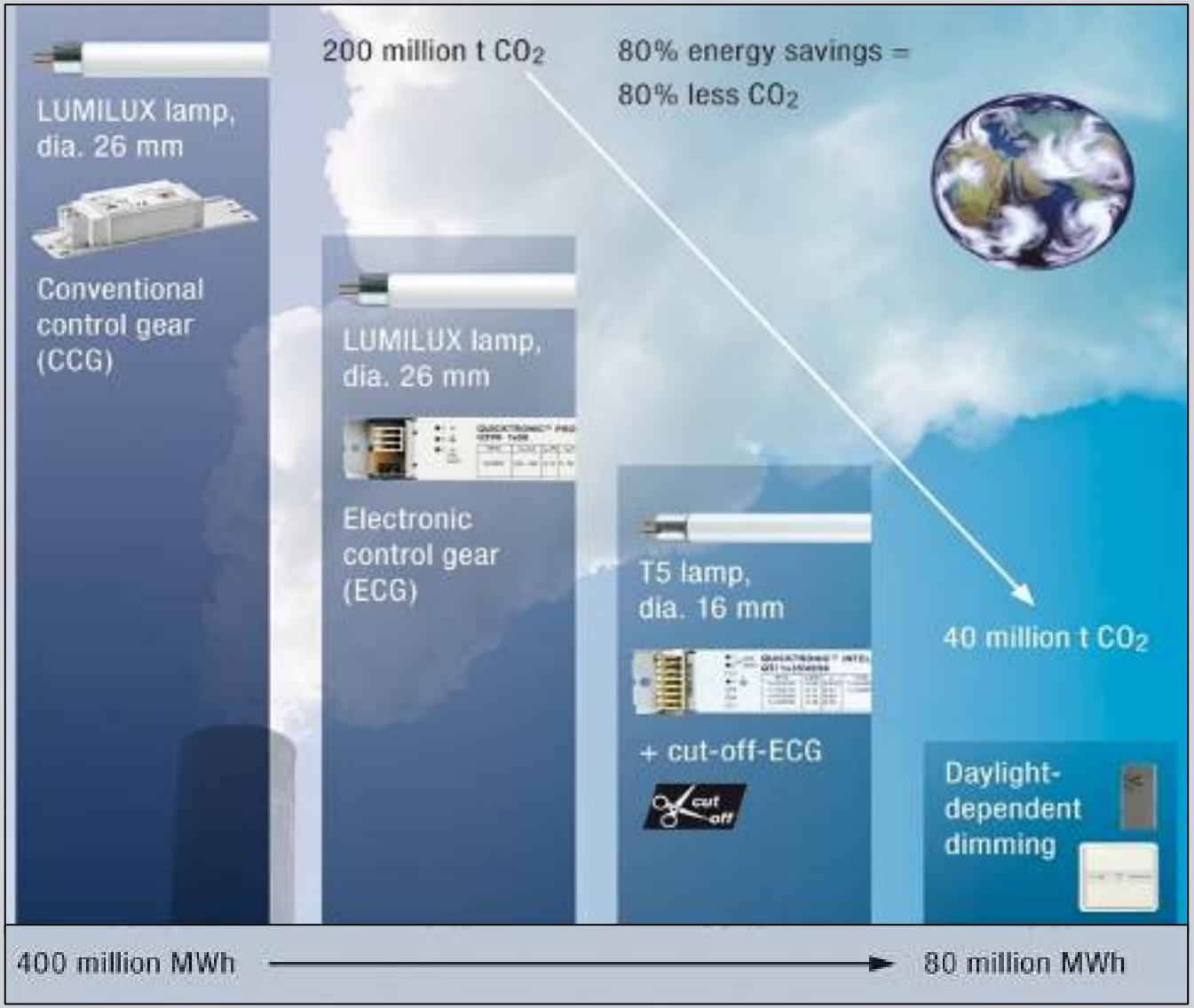
Basic steps for energy saving



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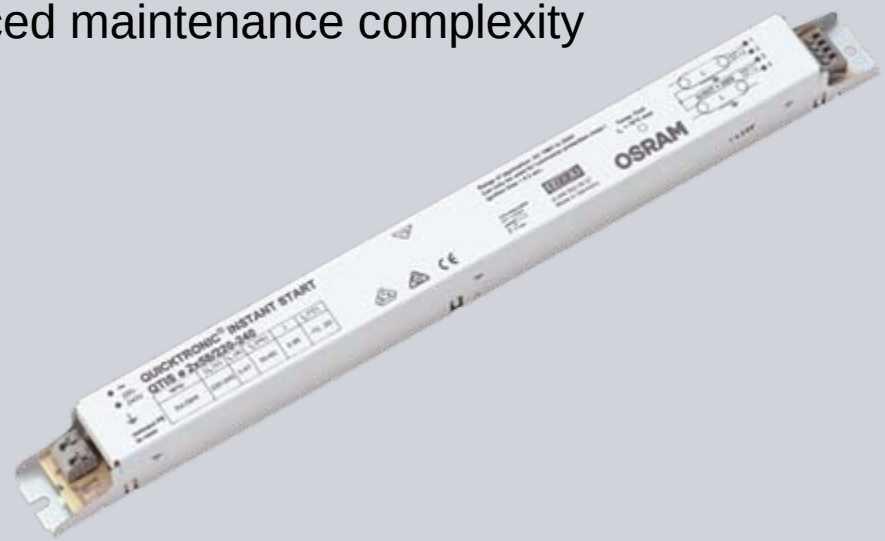
Intelligent electronic control gear

ENERGY SAVER

- Operates T5, T8 and CFL lamps
- DALI or 1…10V dimmable versions
- Intelligent lamp detection maximises energy savings
- Flexible use of lamp systems
- Reduced luminaire complexity
- Reduced maintenance complexity



Intelligent lamp recognition

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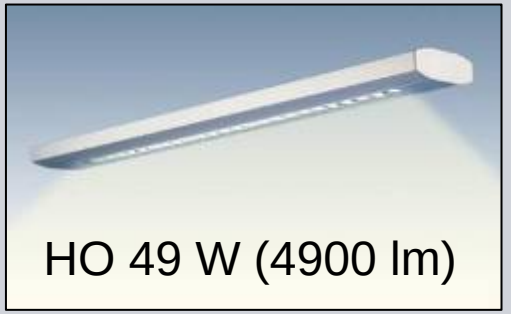
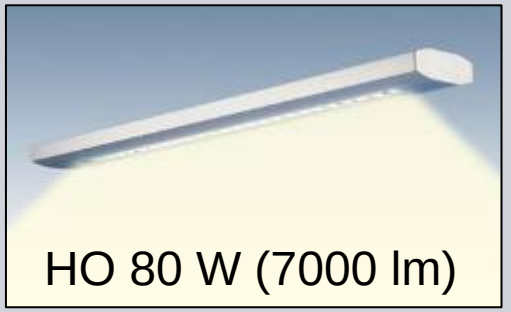
Just 1 luminaire type with QTi

35/49/80 W





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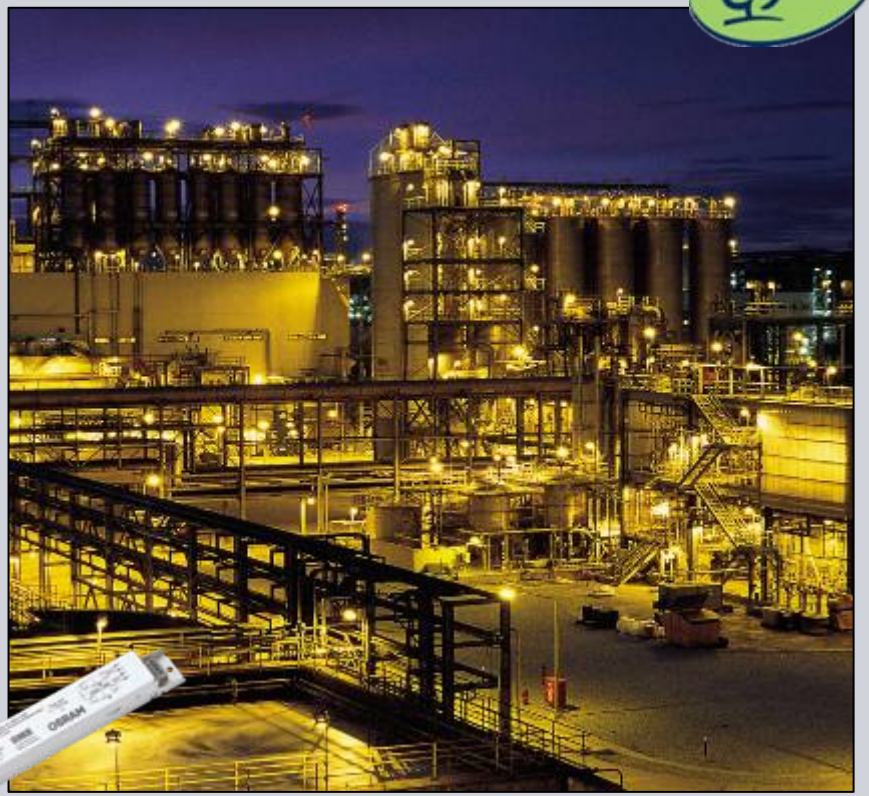
Electronic control gear for industry



BMW

> 150.000 OSRAM ECG since 1985

Bayer

> 150.000 OSRAM ECG since 1990

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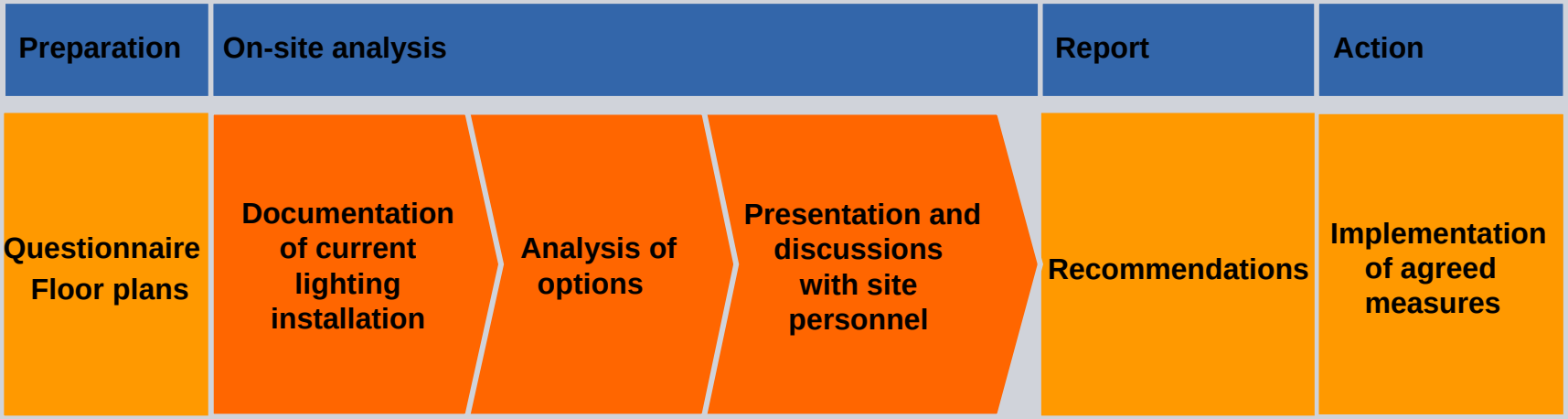
Energy audit in lighting process overview

Energy Audit in Lighting" is the optimisation of an existing lighting installation to achieve the following goals:

- Appropriate lighting in accordance to the relevant standards (DIN EN 12464)
- Energy saving
- CO_2 reduction
- Reduction of maintenance cost
- Reduction of thermal load and air conditioning



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High rack storage warehouse

21kW connected load

(400W Metal Halide)

Short maintenance interval

Uneven light distribution

No Light Management possible

ENERGY SAVER

~7kW connected load

(due to presence detection operation, 80W T5)

Long maintenance interval

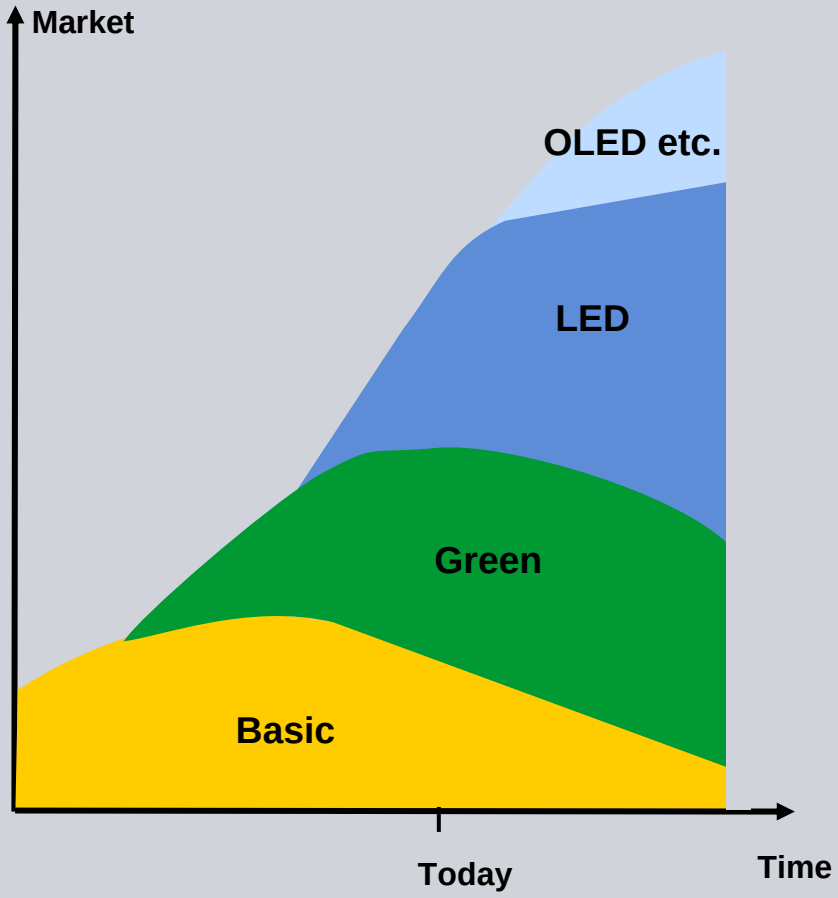
Even light distribution

Presence detection with High Bay Sensor

~70% Energy Saving

OSRAM is leading the technology transition

Classic versus SSL/LED**



- The overall lighting market had a size of EUR 22bn in 2008
- Increase in LED share from EUR 4.6bn in 2008 to EUR 12.6bn by 2012*

*Data basis: Strategies Unlimited, September 2009

**schematic

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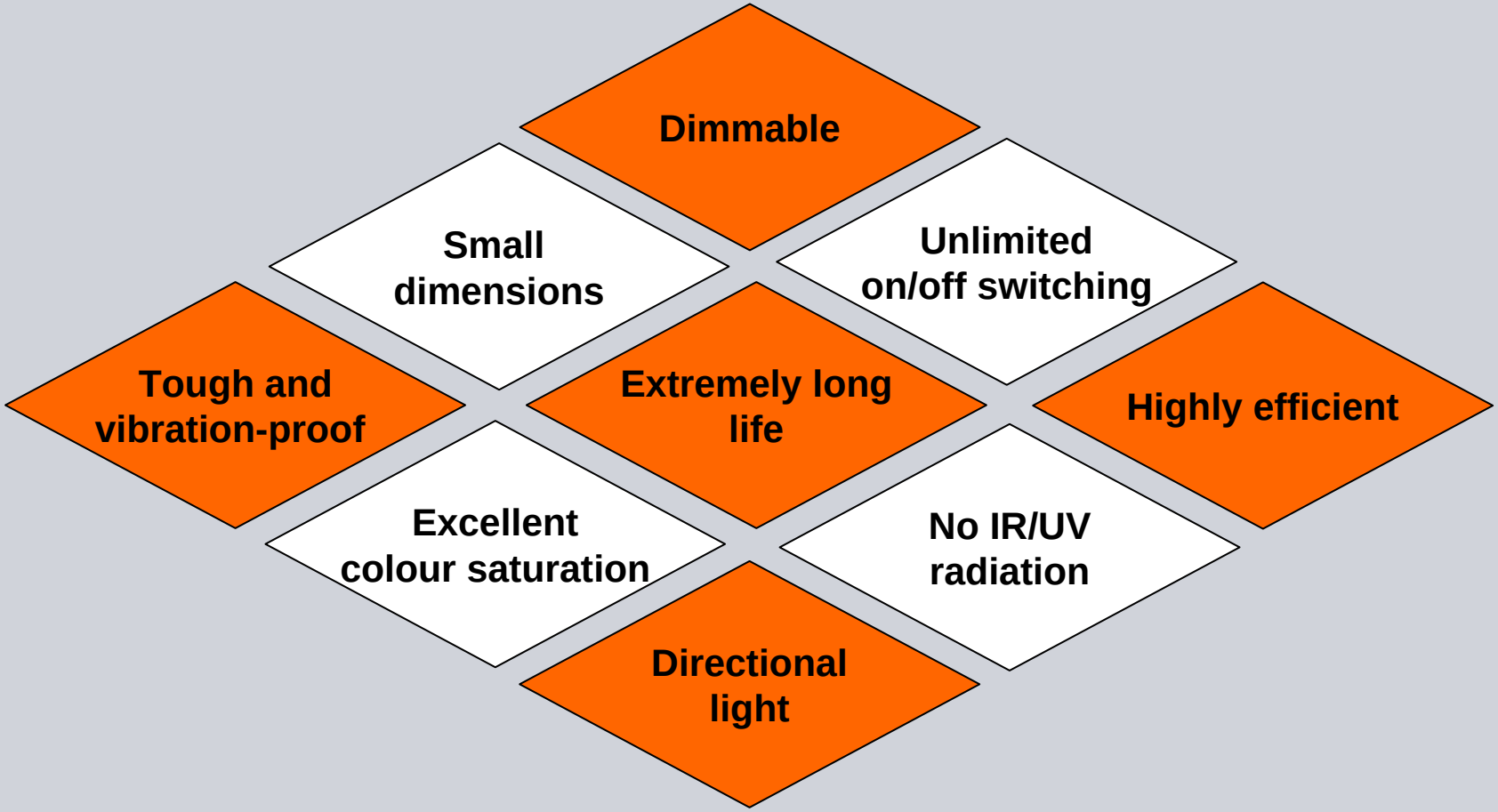
LED benefits



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OSRAM Solid State Segmentation

Discrete LED

Chip, package

Luminaire manufacturers, electronic industry, automotive industry

LED modules

Board, heat sink, optics, control software, power supply

Luminaire manufacturers, lighting designers

LED luminaires

Indoor, outdoor

Lighting designers, wholesalers, contractors, end users

LED retrofit lamps

Direct replacement of incandescent and halogen

Lighting designers, end users, consumers

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A lot more rugged than the average lamp…

They usually last longer than the application!

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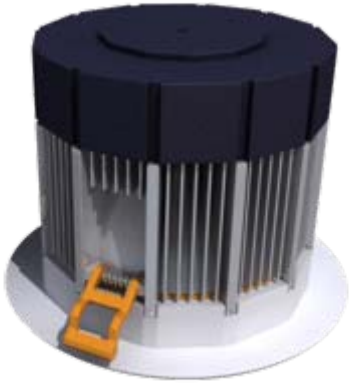
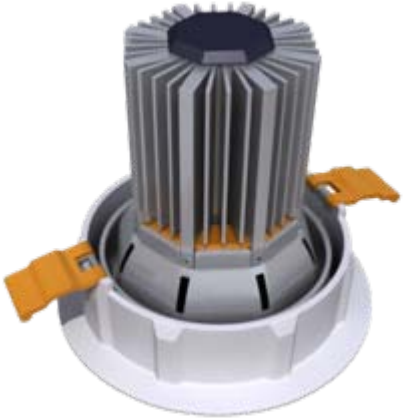
Upgrade luminaires

ENERGY SAVER

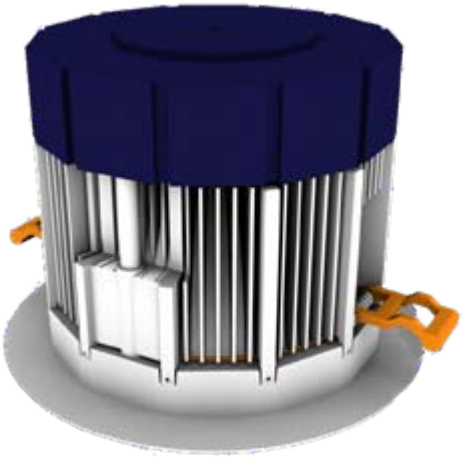
6.5W LED ~ 20W Halogen



18W LED ~ 1x18W/1x26W CFL



13.5W LED ~ 50W Halogen



32W LED ~ 2x18W/2x26W CFL

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Application: Signage

Eckerle Munich

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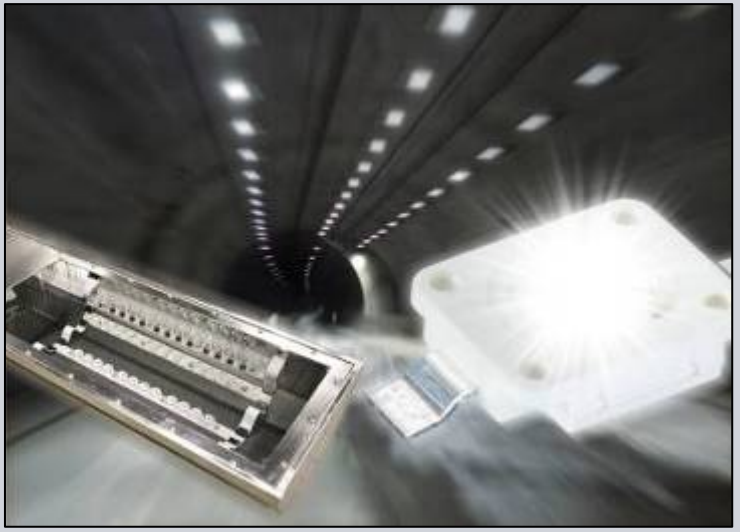
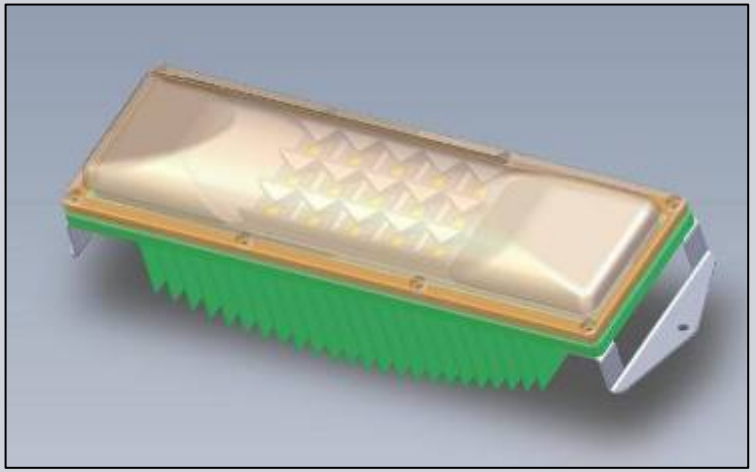
Application: Road & Tunnel





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Application: LED street lighting

Good visibility with white LED lamp

High colour rendering

Higher avg. illuminance, but low visibility

Sodium lamps cause lare

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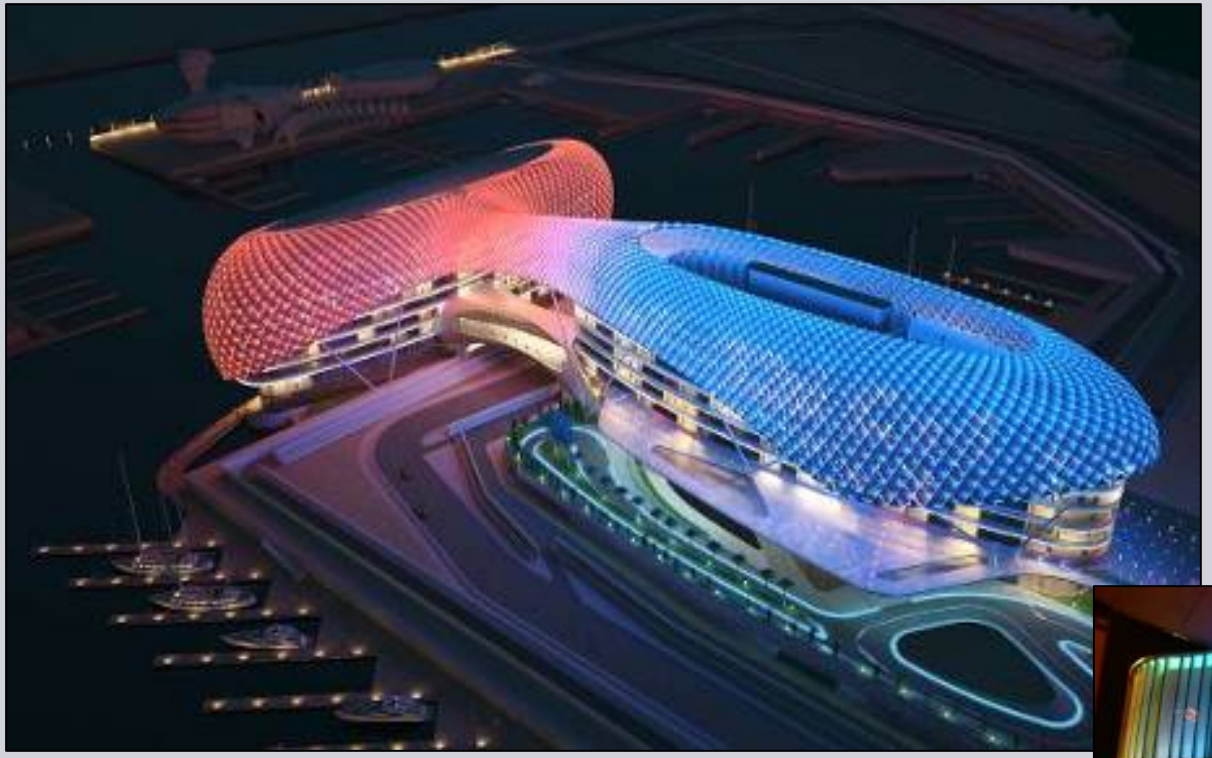
Application: Outdoor lighting



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Application: White light

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Application: Colour change/RGB

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Application: Communications

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The Future of Vehicle Lighting

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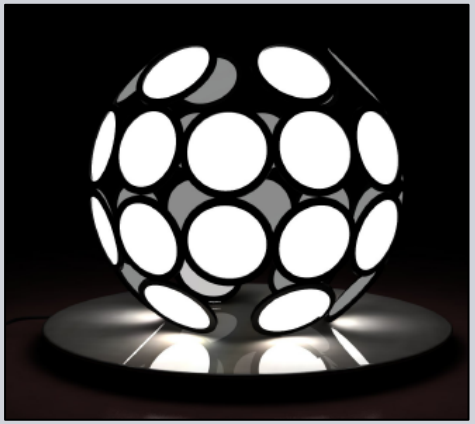
OLED lighting



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Durban Stadium, South Africa

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Thank You

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