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sense and simplicity

LED in Office and Industry lighting
Simply enhancing life with light

Eran Gorgen, Philips Lighting

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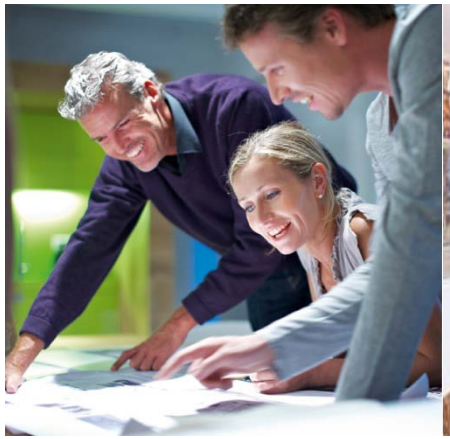
The lighting industry is undergoing a remarkable transformation

The only constant is change

Office Trends



Altering the way we work

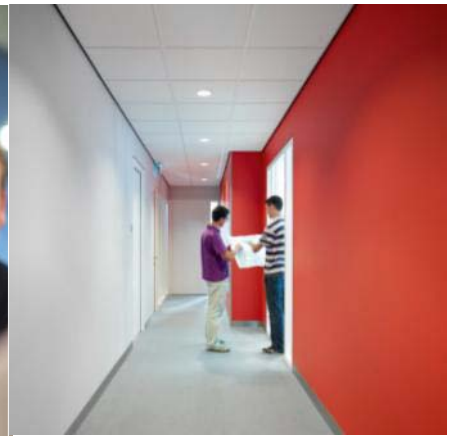
These days, only 50% of office space is allocated to personal work spaces.

Space expresses identity

Good design, management and use of space can improve an organization's performance by up to 15%.

Companies are experiencing economic pressure

Lighting accounts for about 35% of energy consumption in offices, making it one of the most attractive ways to save energy.



Transforming the way we consume energy

75% of all office lighting is based on outdated energy-inefficient lighting.

The only constant is change

Industry Trends

It’s good for business to be good to the environment

The best environmental, social and governance programs create financial value for a company.

Companies are experiencing economic pressure

Many manufacturing companies are currently in crisis. Energy-efficient (LED) solutions save costs and simplify maintenance.

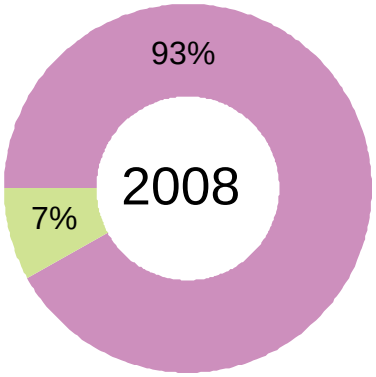
The developing world is rapidly industrializing

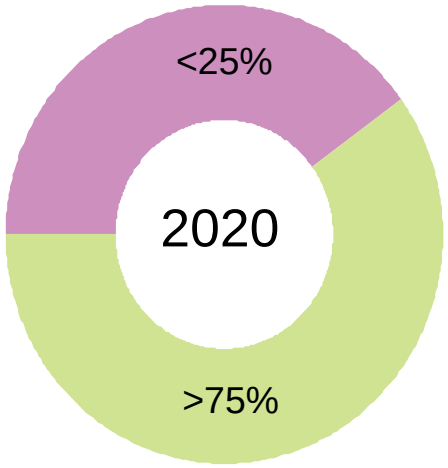
62% of all Fortune 500 companies originate from emerging markets.

Improved labor conditions drive up productivity

Pleasant, good-quality working conditions will lead to increased job satisfaction. Lighting is a key element for enhancing the physical workspace.

LED lighting is transforming the entire landscape*





Traditional lighting

LED lighting

*Market estimate based on internal Philips study

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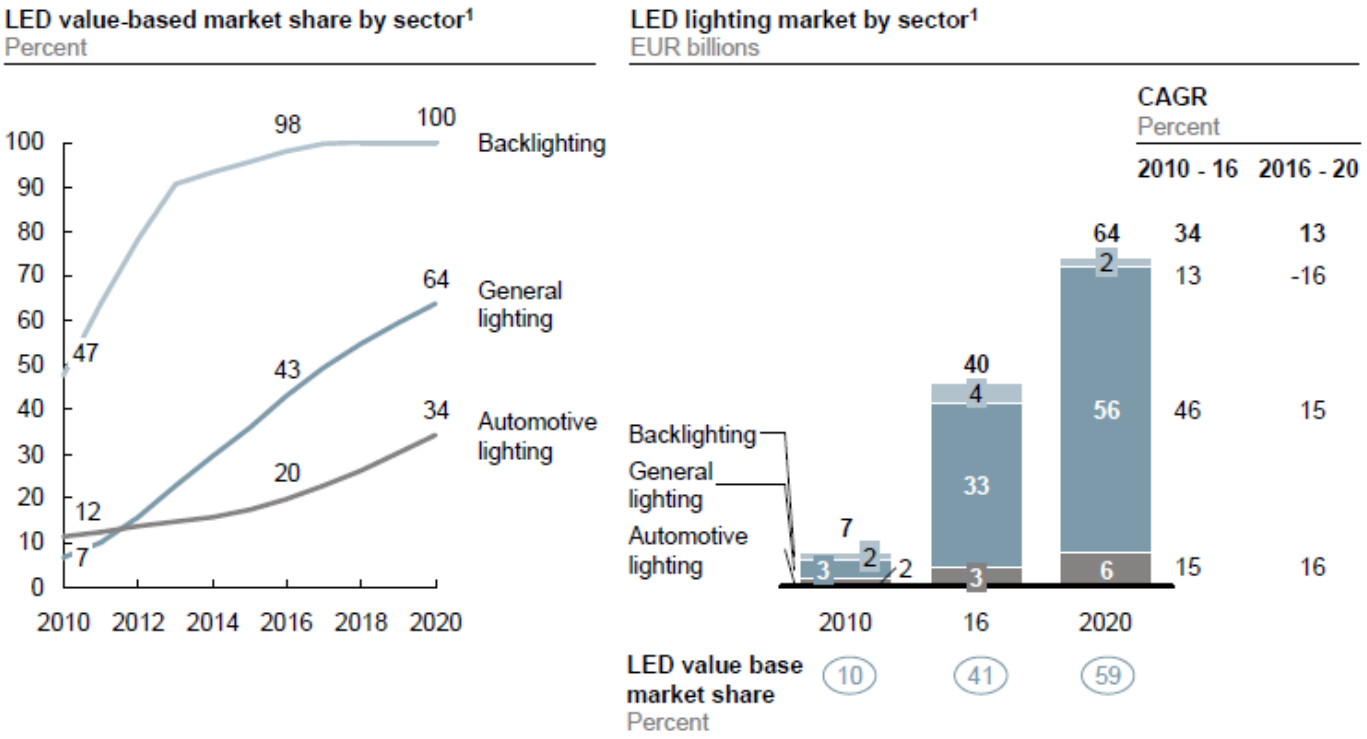
LED lighting market is expected to increase very rapidly in the coming 10 years



1 Total general lighting market (new fixture installation market with light sources and lighting system control components [full value chain] and light source replacement market), automotive lighting (new fixture installations and light source replacement), and backlighting (light source only: CCFL and LED package)

SOURCE: McKinsey Global Lighting Market Model; McKinsey Global Lighting Professionals & Consumer Survey

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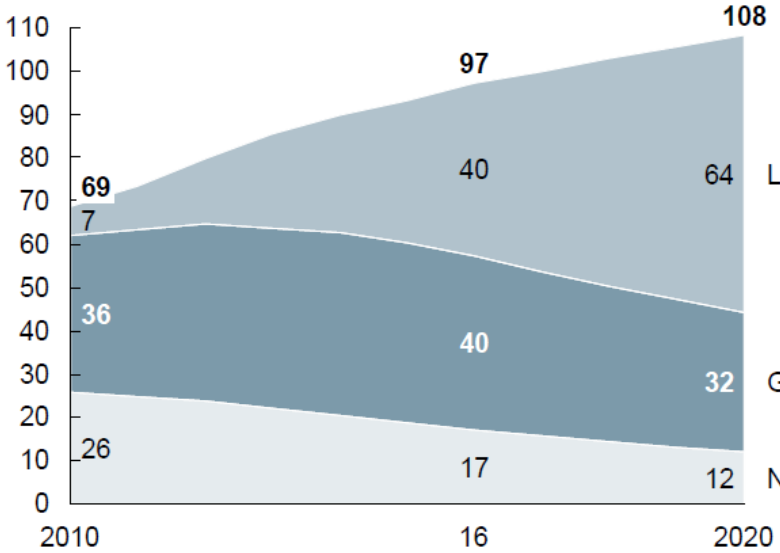
Energy-efficient traditional technologies will play a significant role before LED transition in 3 - 4 years

Global lighting product market trend[1] by energy-efficient products
EUR billions



	CAGR Percent 2010 - 16	2016 - 20
	6	3
LED	34	13
Green traditional[2]	2	-5
Non-green traditional	-6	-9

1 Total general lighting market (new fixture installations full value chain incl. lighting system control components, and light source replacements), automotive lighting (new fixture installations and light source replacement), and backlighting (light source only: CCFL and LED package)
2 Due to the broad range of different lighting products, green is defined per product group in line with typical energy efficiency standards within the industry, e.g., Energy Star for CFL light bulbs. At the minimum, all green products need to provide an 20% energy efficiency improvement vs. comparable non-green products.

SOURCE: McKinsey Global Lighting Market Model; McKinsey Global Lighting Professionals & Consumer Survey, Industry Experts

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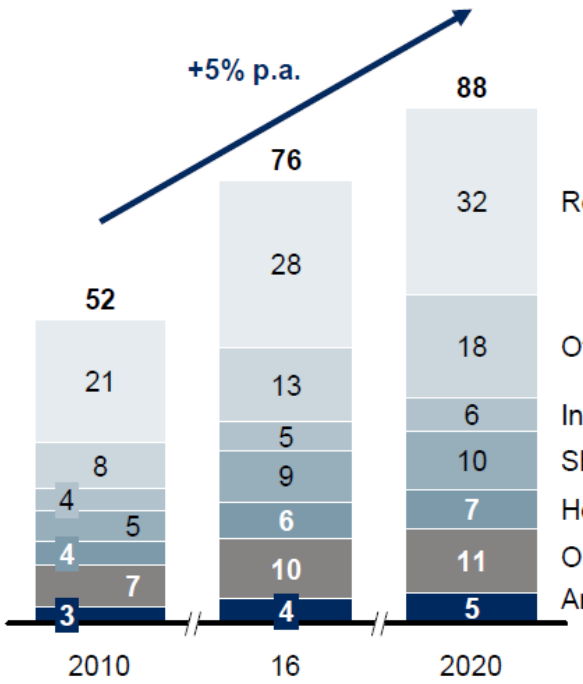
Residential is and will remain the largest market segment, followed by office and outdoor

General lighting market trend[1] by application
EUR billions



	CAGR Percent	
	2010 - 16	2016 - 20
	7	4
Residential	5	3
Office	9	9
Industrial	4	4
Shop	9	3
Hospitality	7	1
Outdoor	7	2
Architectural	6	6

1 Total general lighting market: new fixture installation market with light source and lighting system control component (full value chain) and light source replacement market

NOTE: Numbers may not sum due to rounding

SOURCE: McKinsey Global Lighting Market Model; McKinsey Global Lighting Professionals & Consumer Survey

LEDs were initially focused on creating emotion

Transforming spaces into inspirational environments…

Outdoor Architectural

Avenue of the Arts
Philadelphia

Shops

Lacoste,
multiple US locations

Entertainment

Star Trek, the Tour
Long Beach, California

Hospitality

Grand Melia
Tenerife, Spain

Creating new application using coloured, dynamic lighting…

Now LED is accelerating efficient white light

…entering main stream applications

Street & Road

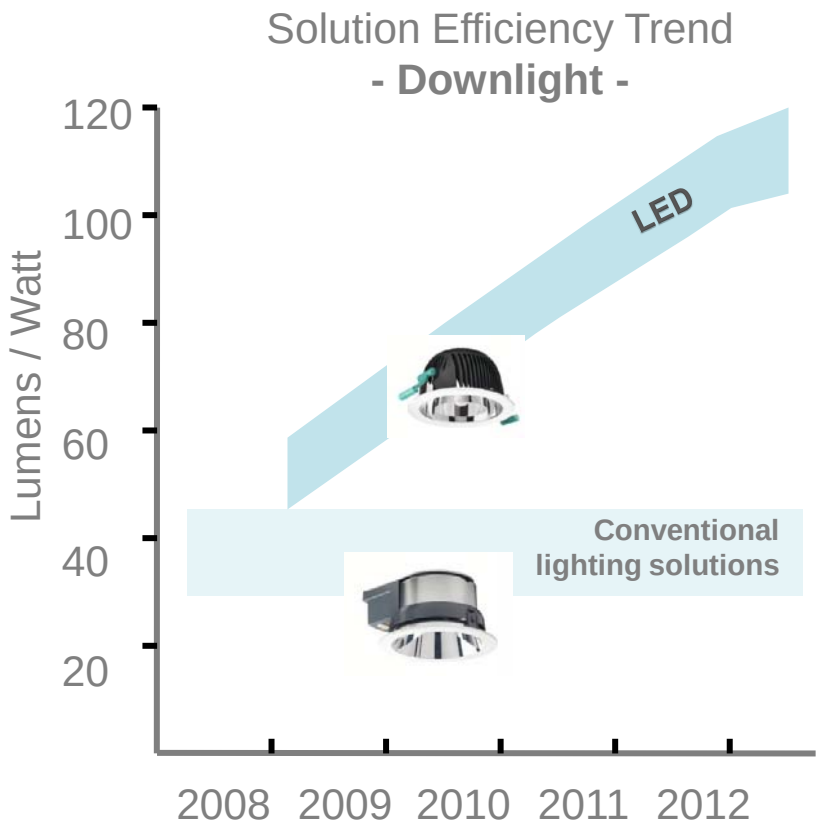
Architectural

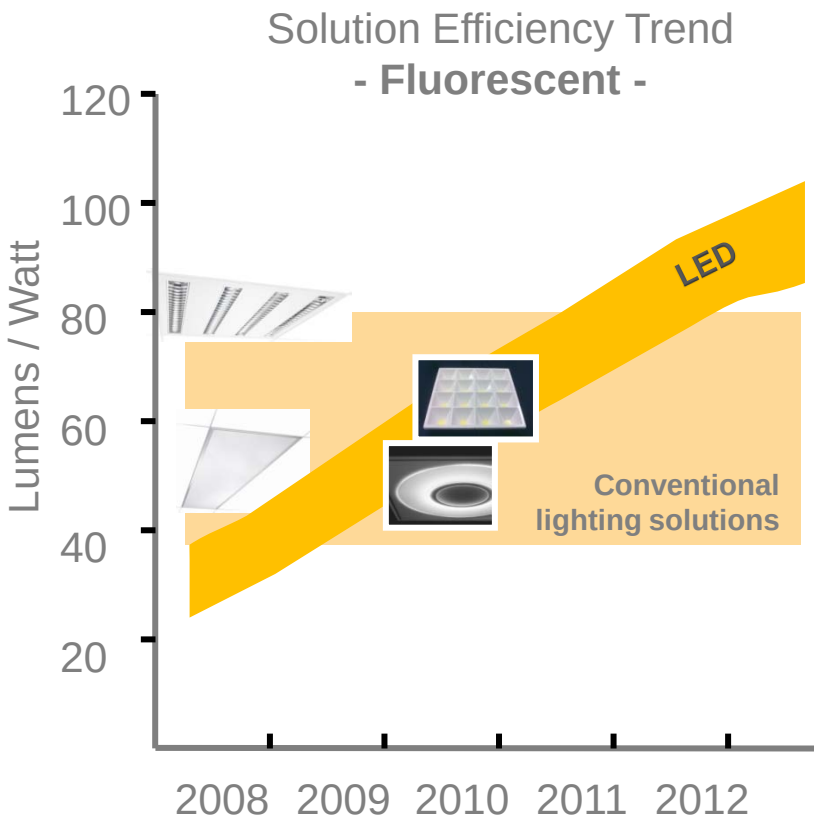
Accent lighting

General lighting

… making it suitable even for general lighting!

Comparing lumen output shows that LED solutions are already better on Lm/Watt





LEDs have many advantages

compared to other lighting sources

Conventional lighting sources

- Incandescent

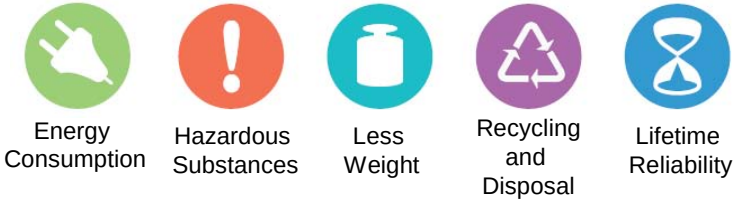
- Halogen

- Fluorescent

- Gas-discharge (example: neon)

Light Emitting Diode (LED)

- Advantages of LEDs
  - Long lasting and low maintenance
  - Energy efficient
  - Dynamic (digitally) color control
  - Small (design flexibility)
  - Directed light (= increased efficiency)
  - Robust and vibration proof
  - Turn on instantly
  - No IR and UV radiation in the beam
  - Cool beam of light
  - Low voltage
  - No mercury



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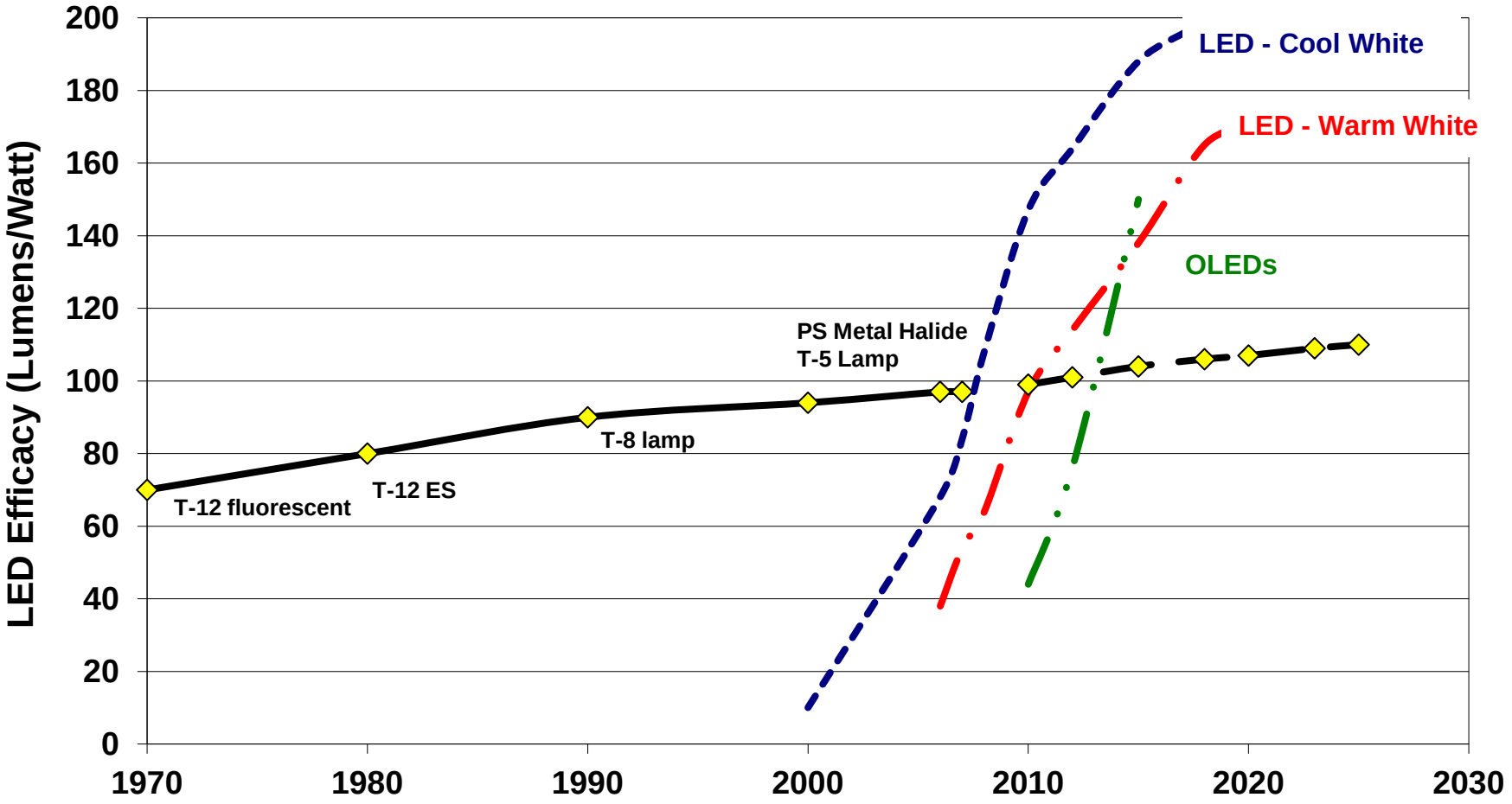
White Light Efficacy Projections

Projections from US DOE 3/09



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Key elements for evaluating LED systems

Sustainability

+

Quality of Light

+

Value over lifetime

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Energy Efficiency

Sustainability

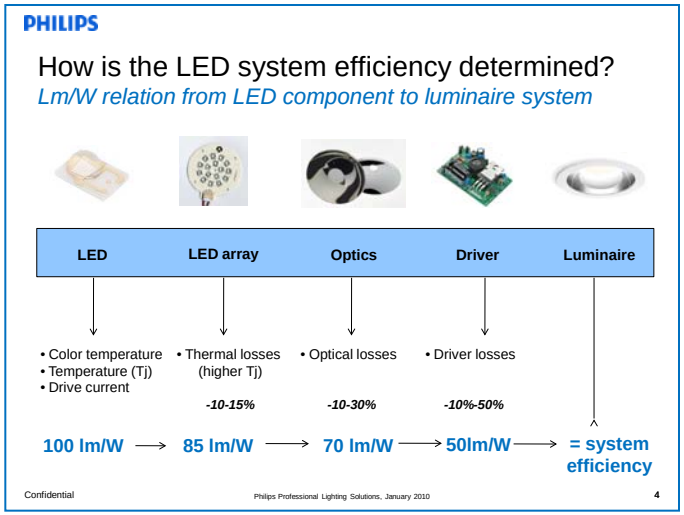
How to evaluate energy efficiency ?

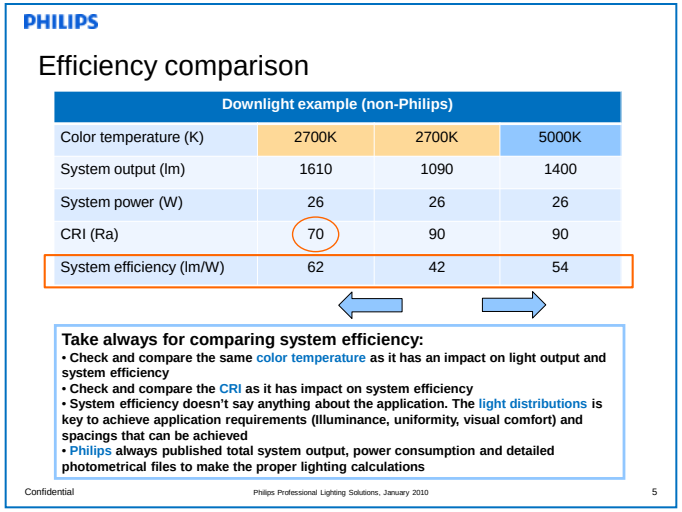
- Lumen / Watt differs per LED type, color temperature and CRI

- Lumen / Watt of the bare LED ≠ Lumen /Watt of the luminaire due to
  - Thermal losses
  - Optical losses
  - Driver losses

What is key to understand?

- Check the *color temperature* of the systems. Cool white LEDs are more efficient that warm white
- When comparing lm/W, make sure that the *total system output and system power* is taken into account





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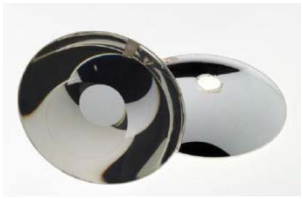
How is the LED system efficiency determined?

Lm/W relation from LED component to luminaire system





LED	LED array	Optics	Driver	Luminaire
• Color temperature • Temperature (Tj) • Drive current	• Thermal losses (higher Tj) ***-10-15%***	• Optical losses ***-10-30%***	• Driver losses ***-10%-50%***	
100 lm/W →	**85 lm/W** →	**70 lm/W** →	**50lm/W** →	**= system efficiency**

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Efficiency comparison, where to look for…

Downlight example (in the market)			
Color temperature (K)	2700K	2700K	5000K
System output (lm)	1610	1090	1400
System power (W)	26	26	26
CRI (Ra)	70	90	90
System efficiency (lm/W)	62	42	54

Take always for comparing system efficiency:

- **Check and compare the same color temperature as it has an impact on light output and system efficiency**
- **Check and compare the CRI as it has impact on system efficiency**
- **System efficiency doesn't say anything about the application. The light distribution is key to achieve application requirements (Illuminance, uniformity, visual comfort) and spacings that can be achieved**
- **Always ask from supplier about *total system output, power consumption and detailed photometrical files* to make the proper lighting calculations**

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Quality of Light

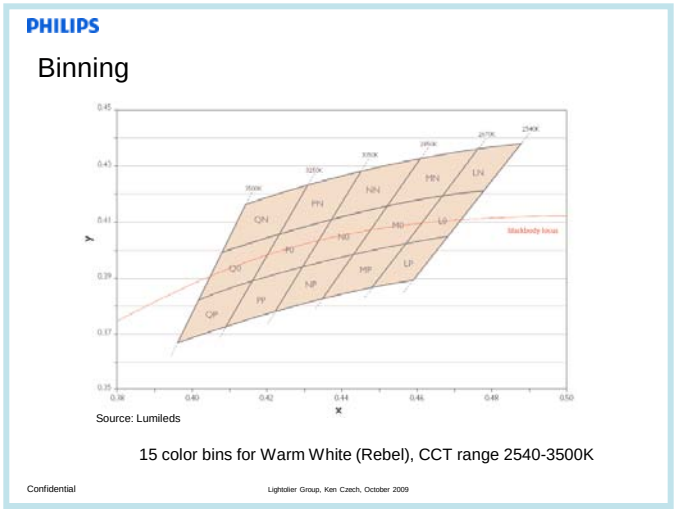
Quality of Light

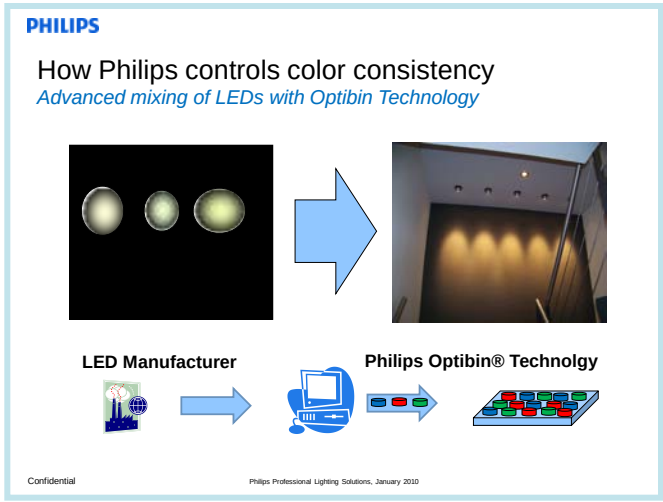
How to evaluate light quality

- Individual LEDs are never exactly the same, those with similar performance (color, output) are grouped together by manufacturers into *bins*

What is key to understand?

- To achieve *color consistency*, you need to mix the light from the different LEDs together using a mixing chamber and optic
- Check and compare the *variation of color temperature* (K+/-)





Choosing products is a balancing act

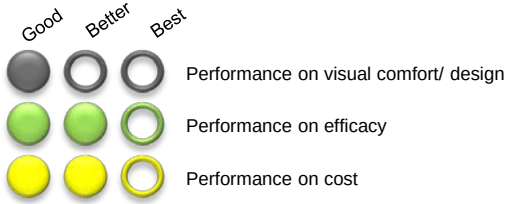
Making trade-offs between cost, efficacy and visual comfort/design

Efficacy

Visual comfort/ design

Cost

Performance grid (example)



Creating inspiring workspaces

A meaningful solution: Company on stage

MLC, Sydney, Australia

MLC is a life insurance and investment company in Australia. They wanted to create an inspiring, comfortable environment to enhance staff performance and encourage interaction and communication.

Philips Color Kinetics
in-ground LEDs bring the design concept to life with rich, saturated colors and dynamic wall-washing effects.

Enhance working life with LED

A meaningful solution: Healthy workplace

AB Group, Orzinuovi, Italy

The AB Group was looking for an advanced solution that ensured a level of comfort for people working in the office, as well as optimum management of energy resources.

Philips DayZone provides high-quality LED lighting with impressive visual comfort, and glare control and color consistency that are compliant with all office norms.

LuxSpace features the latest LED technology and delivers consistent light output and high color rendering.

Ensure a pleasant working environment

A meaningful solution: Healthy workplace

NAM Assen, Assen,
The Netherlands

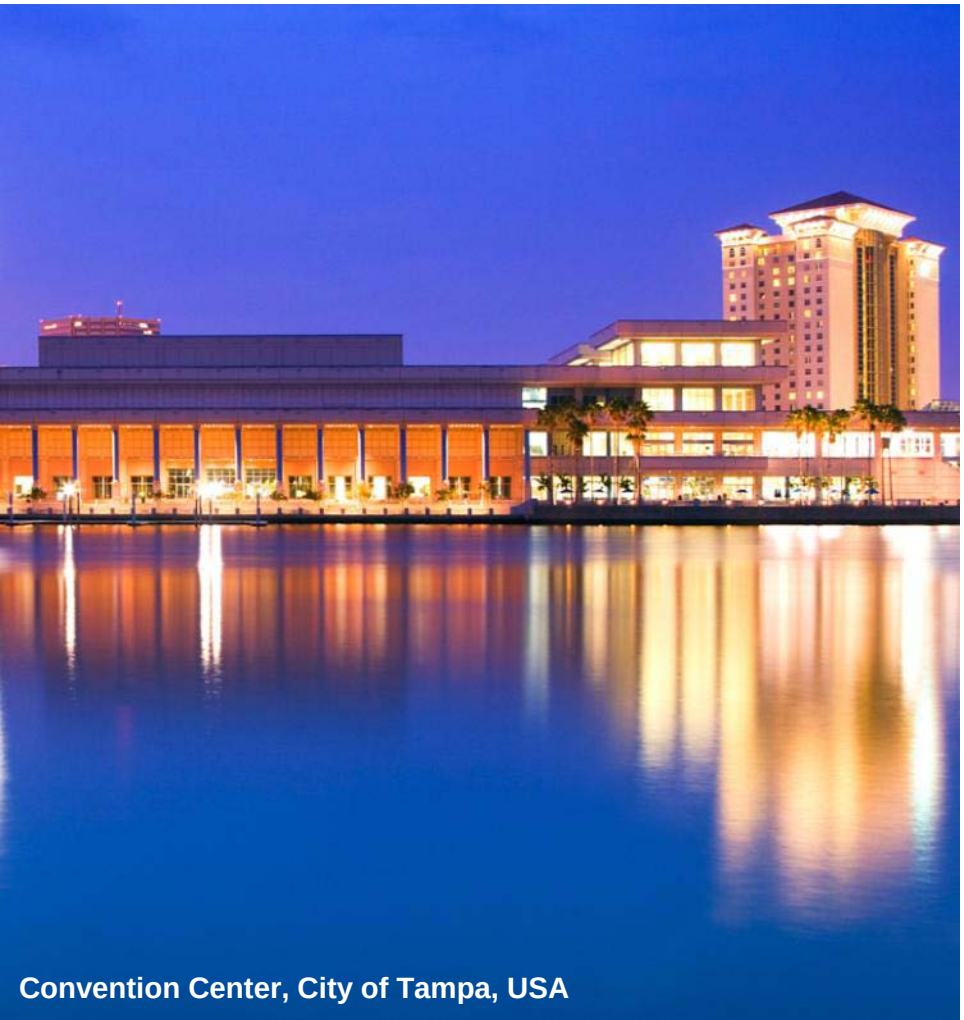
NAM, The Netherlands' largest producer of natural gas and oil, considers sustainability to be of great importance. They were looking for ways to light their office in Assen with high-quality lighting and luminaires.

Philips had the best credentials to do this and saw an interesting opportunity for its 'LEDs innovate in offices', using DayZone, DaySign, LuxSpace and MASTER LEDspot.

With this solution costs and energy savings were considered and the design and very many color options of LED were on the agenda.

Partnering with customers to achieve great results

A meaningful solution: Increased energy efficiency



Convention Center, City of Tampa, USA

The City of Tampa needed a specific green lighting solution at their Convention Center to demonstrate a reduction in overall electricity costs.

Philips LED high-bay proved to be the right solution. With the switch to LED the city was able to reduce the overall wattage consumed. Light levels were improved and maintenance was reduced.

Philips partnered with the customer and exceeded the expected savings.

Philips has a complete set of LED solutions that will allow you to equip your office and industry with LED

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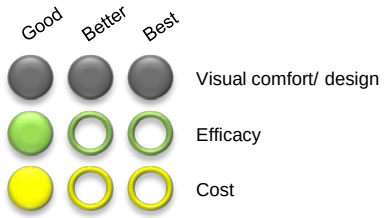
DayWave
“Designed to Inspire”



Key benefits:

- Inspiring organic design
- Daylight feeling through subtle variations of light level and tone
- Complies with office norms thanks to innovative optical system for LEDs

DayZone
“Innovative design meets sustainability”

Key benefits:

- Inspiring design and light effect
- High visual comfort (UGR: 19), fully dimmable
- Energy saving (52 lm/W; 300/500 LX concept)
- Additional energy saving up to 50% in combination with controls

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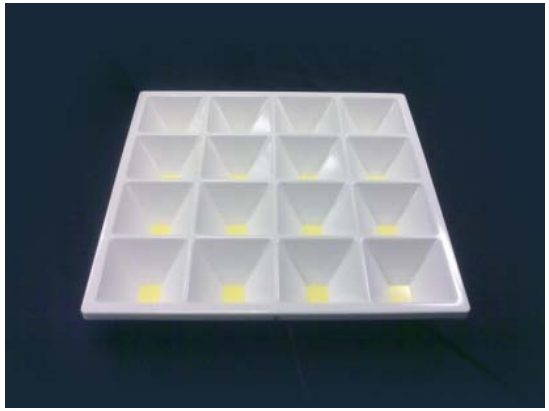
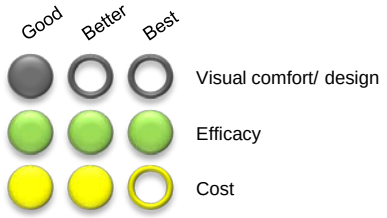
PowerBalance
“A smart choice”





Key benefits:

- Most energy-efficient solution (70 lm/W)
- Office compliant
- Save on operational costs
- Additional energy saving up to 50% in combination with controls

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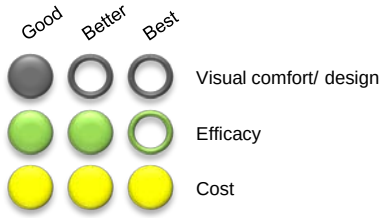
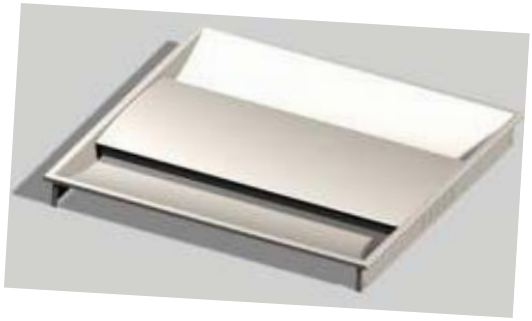


CoreView
“Simply sustainable”

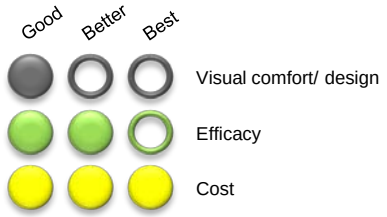


Key benefits:

- Very affordable LED solution
- Energy saving (60 lm/W)
- Save on operational costs
- Additional saving up to 30% in combination with OccuSwitch

CoreView panel

“Simply sustainable”



Key benefits:

- Very affordable LED solution delivering good enough light level & quality
- Energy saving (> 65 lm/w compared to TBS160 4x18W OR 2x36W HFP P @ ~70W / 45lm/W = 30% saving)
- Nicely shaped, uniform lit surface of light
- Minimal maintenance
- Additional saving up to 30% in combination with OccuSwitch

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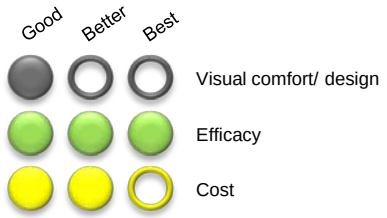

LuxSpace
“High efficiency sustainable solutions”

Key benefits:

- Highly efficient, dimmable downlight
- Compact form factor
- Wide range of options (size, lm output, form factor and accessories)
- Quality of light (3000K, 4000K, CRI>80 @ top efficacy)
- Additional saving up to 50% in combination with OccuPlus

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LumiStone

W1 2012

Key benefits:

- Saving energy with LED cups (over 80 lm/W)
- Office compliant for use in all office spaces
- Inspiring design with elliptical modules

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GentleSpace LED Highbay

LEDGINE

Key benefits:

- 1 on 1 replacement of **400W** and **250W** HID highbays
- 35% lower energy consumption than HID
- Dimmable (DALI) for even more energy savings
- Instant light

Maxos LED Trunking

Key benefits:

- Very low maintenance
- Long service life (>50.000 burning hours)
- No UV (ultraviolet radiation)
- No hazardous substances (no mercury, no lead)
- No performance decrease at low temperatures

Pacific Performer LED

Key benefits:

- Extremely comfortable light thanks to new optical system
- 20% energy saving compared with fluorescent solutions with electronic ballast
- Future-proof solution
- Low maintenance costs due to long lifetime of LEDs
- Light source is serviceable/upgradeable

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Increased energy efficiency

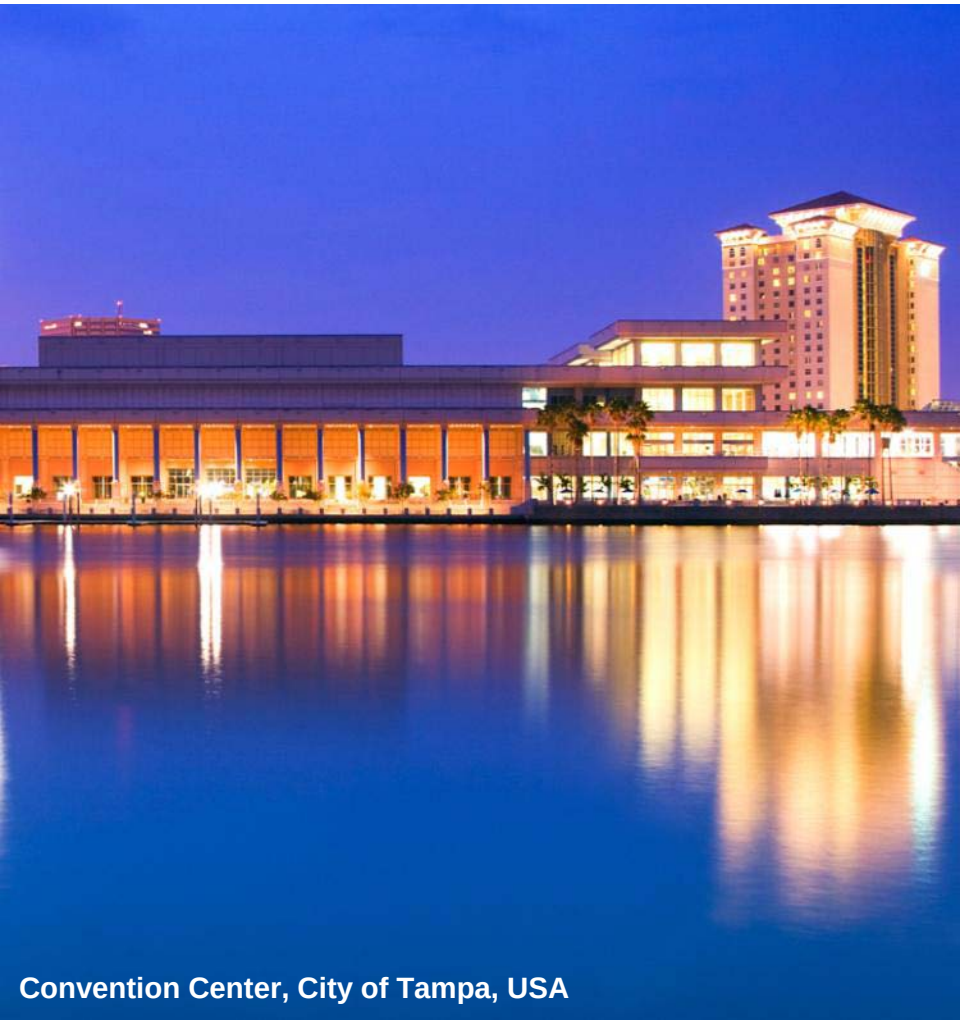
Save energy. Save cost.

Alternative energy systems help us make more efficient use of scarce resources. Flexible lighting that complements natural sources goes hand in hand with sustainable design.

Because green facilities aren’t just healthier for people and our planet. They’re better for business too.

Partnering with customers to achieve great results

A meaningful solution: Increased energy efficiency



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Safer lighting is better for everyone

A meaningful solution: Safer production

In the food industry, safety isn't just important, it's critical.

Philips waterproof luminaires protect lamps from moisture and shield food from dangerous glass particles.

With Secura/TuffGuard lamps inside they improve safety even more. Their long life also reduces the hassle and risk of changing lamps.

New introductions like LEDs will reduce the need for maintenance even further.


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