Towards a New Culture of Lighting

Wolfgang Gregor
CSO, OSRAM GmbH

OSRAM: The Lighting Company

A successful future built on 100 years of innovation

- OSRAM: one of the world's two leading lighting manufacturers (headquarters: Munich)
- Trademark registration: on April 17, 1906 at the then Imperial Patent Office in Berlin
- 100% subsidiary of the SIEMENS AG
- Represented in the US by OSRAM SYLVANIA

• Employees: More than 43,500	• Production: 46 factories in 17 countries	• Turnover: EUR 4.6 billion	• Group profit: EUR 401 million	• R&D: 6 % of sales

Long-term business strategy:
Innovation, global presence, cost leadership

Figures for FY 2008

OSRAM: The Lighting Company

Shaping the future of light - today

Opera in Oslo, Norway
Chandelier illuminated with LED

German President's Prize for
Technology and Innovation

German Sustainability Award 2008

High intensity
discharge lamp
with ceramic arc tube
Ideal for shoplighting

World Premiere: Table luminaire
with organic LEDs (OLEDs)

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OSRAM products have proven quality

Honors for quality and innovation

2008 ENERGY STAR® Award for Sustained Excellence byt the US Environmental Protection Agency (EPA) and the US Department of Energy (DOE).

80% of the OSRAM energy-saving lamps tested were rated "good" in the latest test by a **German consumer association**. This is a result that no other manufacturer has achieved.

German President's Prize for Technology and Innovation: Thinfilm chips are revolutionizing LED technology

OSRAM was awarded the **German Sustainability Prize 2008** for its large product portfolio of energy efficient products and its exceptional research and development performance in this field.

Commitment to social and environmental responsibility

Responsibility for sustainable development is part of our strategy

OSRAM CEO
Martin Goetzeler

"Global Care" represents our commitment to social and environmental responsibility worldwide. As a leader in innovative lighting solutions, we are dedicated to products and processes that contribute to solve global sustainability challenges, address economic needs and protect the environment for today and for the future.

Agenda

1. The Impact of Lighting on a Global Scale
2. Phasing Out Inefficient Lamps
3. Products for a New Culture of Lighting
4. Taking Responsibility Along the Life Cycle (Mercury & Recycling)
5. Sustainable Lighting - Going Beyond

The Impact of Lighting on a Global Scale

Lighting consumes a significant amount of energy

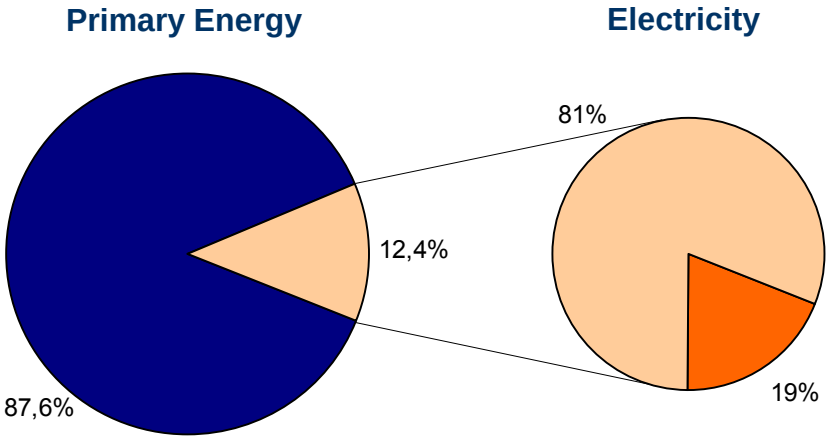
- Lighting accounts for 19% of the global electricity consumption

  → 2.4% of the world's entire *primary* energy consumption

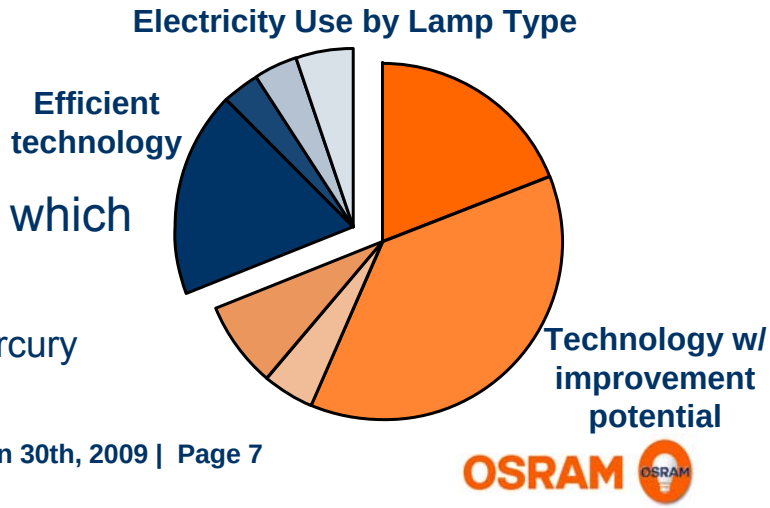
- 2 651 TWh were used globally for lighting in 2005 ~ 2/3 of the electricity consumption of the United States

- Nearly 70% of electricity is used by lamps for which a better alternative is available

  (Orange: e.g. T12 fluorescent, standard incandescent, mercury vapor lamps)



Lighting = 2651 TWh



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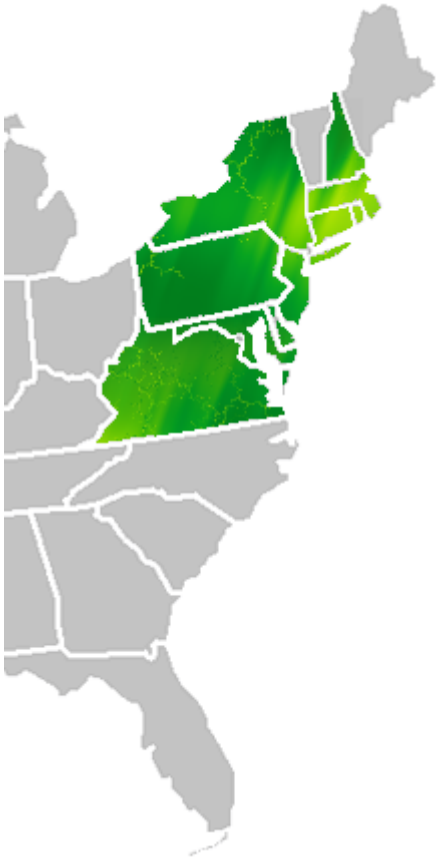
The Impact of Lighting on a Global Scale

The savings potential of efficient lighting is enormous

- It would be *technically* feasible to save ~ 50% of the electricity used for lighting
- Over 1/3 of the electricity for lighting could realistically be saved – nearly 900 billion kWh
- As a result, 450 million tons of CO_2 would not be emitted into the atmosphere* – an effect similar to planting a *new* forest the area of ten of the first thirteen US states



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

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General Service Incandescent (GSI) Phase-Out

OSRAM is proactively working to phase out inefficient lighting worldwide

- Strong **cooperation with the European Commission** to define the future Ecodesign requirements for Lighting in Europe (Street, Office & Industry and General Lighting)
- Development of **quality charters** and of further requirements on lighting products regarding hazardous substances (RoHS)
- **Support of Experts** of Governments worldwide in their efforts to develop legislation for phasing-out inefficient light sources (e.g. Argentina, Brazil, Australia, Russia)
- The phase-out of lamps with the lowest efficiency level (mostly GSI) will cause an increased demand for **alternative technologies**
- **Quality of light and consumer choice** must also be considered, so compact fluorescents can not be the only option
- Adjustment to the **changing demand of production capacities** accordingly, through acquisition and partnerships with suppliers worldwide, adaptation of existing production sites and installation of new production lines for sustainable products in various countries

GSI products
Consequences of EUP DIM

	Sep. 2009*	Sep. 2010	Sep. 2011	Sep. 2012	Sep. 2013	Sep. 2014	Sep. 2015	Sep. 2016
 Clear	15W 25W 40W 60W 75W 100W	15W 25W 40W 60W 75W 100W	15W 25W 40W 60W 75W 100W	15W 25W 40W 60W 75W 100W	Ban of all clear GLS			
 Non Clear	Non clear GLS lamps to be replaced by CFLi (A)							
 Directional	15W 25W 40W 60W 75W 100W	Implementation measure on directional light sources to be decided by end of 2009						
 Special	Special purpose lamps							

* All Lamps with Energy Class F&G banned starting Sept. 2009

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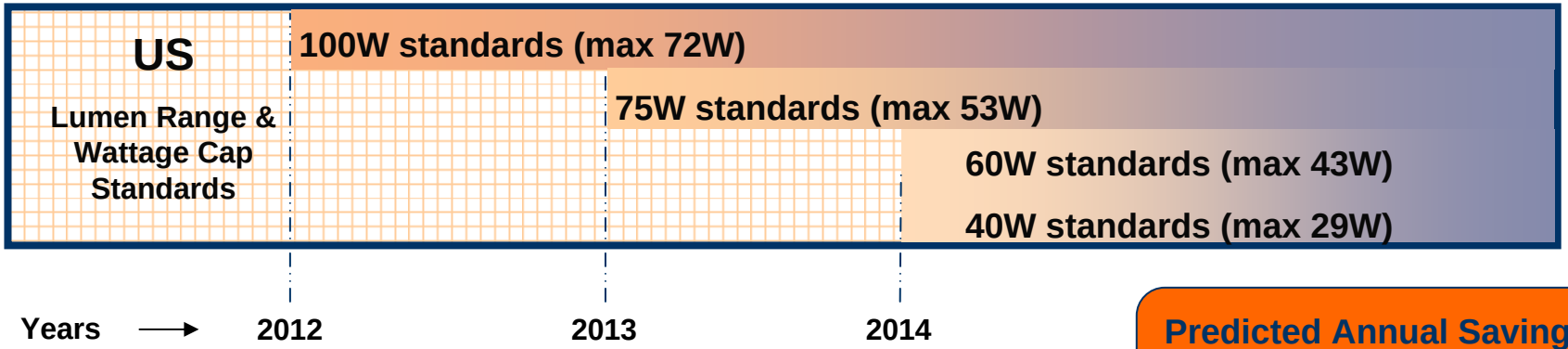
Phase-out of GSI in the US

Energy Independence & Security Act aims to phase-out inefficient GSI

Energy Independence and Security Act – 2007

- Covers incandescent or halogen medium screw base lamps for general service applications
- Does not cover special types like appliance lamps, bug lamps, reflector lamps, etc.
- Maximum wattages for 4 specific lumen ranges and minimum rated life (1000 hours) for standard GSI
- Phases out standard wattages, beginning January 2012
- Caps wattage of two decorative types



Predicted Annual Savings:
$13 billion for electricity
100 million tons of CO_2

Outcomes:

- Standard bulbs of 40W – 100W will disappear from U.S. store shelves (5 years from now)
- Compact Fluorescent Lamp (CFL) sales will continue to grow

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EU Legislation: Office, Industry and Street Lighting

Office & Industry Lighting (OIL) and Street Lighting Implementing Measure (SLIM)

EU-Members states are putting OIL into force

In 2009/2010*:
Phasing-out inefficient fluorescent lamp systems through minimum performance requirements for all fluorescent lamps

Mercury Vapor System

Halo-phosphate system T12/T10/T8 conventional magnetic ballast

EU-Members states are putting SLIM into force

1st Step 2010/2011*:
Phasing-out inefficient mercury vapor lamps by minimum efficacy levels for all street lighting lamps

2nd Step 2013/2014*:
Phasing-out less efficient high pressure sodium and metal halide lamps with minimum performance levels

* Date depending on speed of European and national implementation

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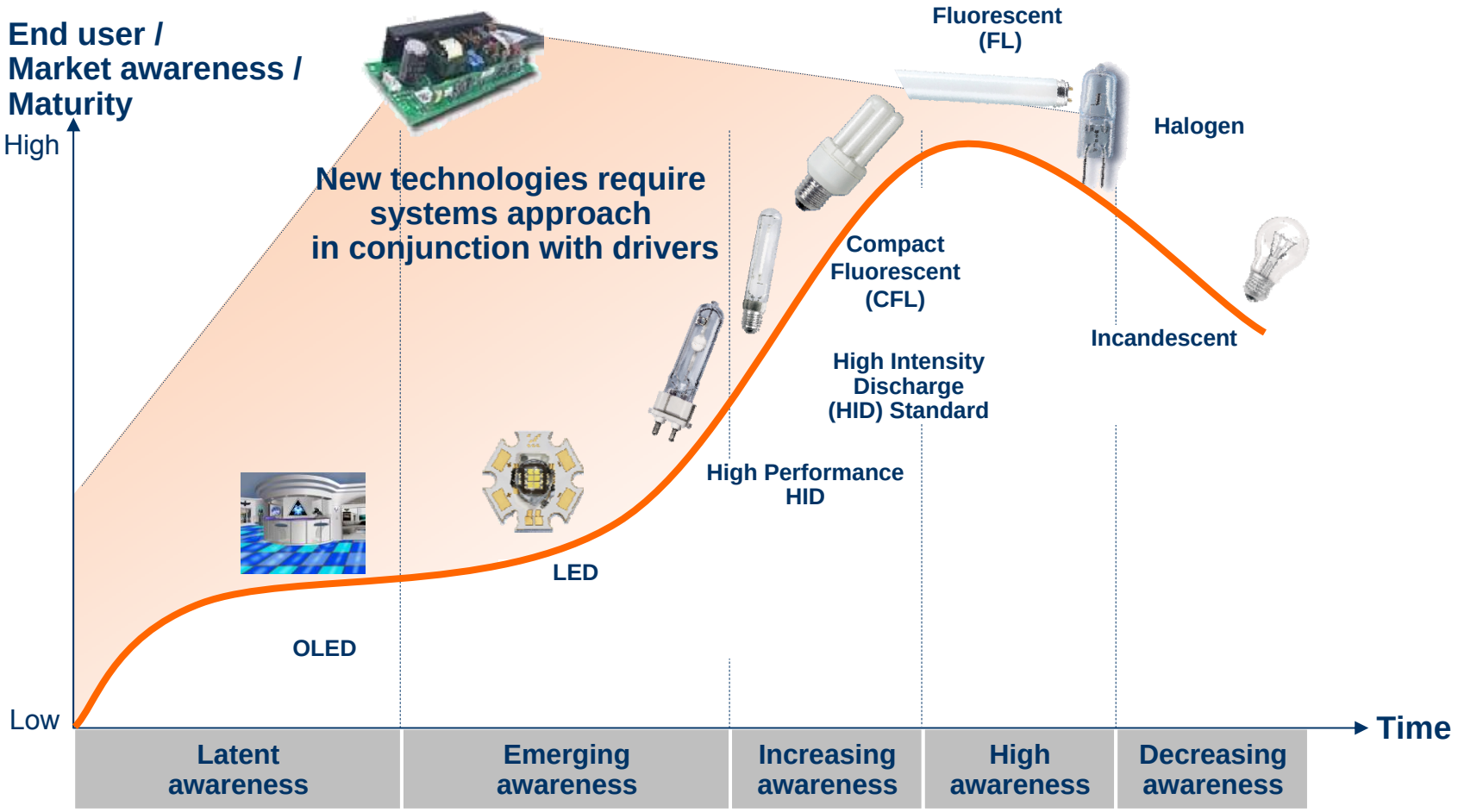
Products for a New Culture of Lighting

Disruptive technologies are changing the lighting market



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Energy Savings in Different Lighting Applications

Application in general lighting	Energy saving through innovative lamp technologies			~savings / lamp / year*
Street lighting	 Mercury vapor	**~40%**	High-pressure sodium lamp 	**220 kWh / 110 kg CO_2**
Office & Industry Lighting	 Fluorescent lp. w. halophosphate phosphor	**~65%**	New T5 fluorescent w/ electronic control & light management 	**180 kWh / 90 kg CO_2**
Shop lighting	 3 Standard Halogen lamps	**~80%**	New Ceramic metal halide lamps 	**500 kWh / 250 kg CO_2**
Hospitality Spotlighting	 Low voltage halogen reflector	**~30%**	Dichroic Halogen lamp with infrared coat technology 	**60 kWh / 30 kg CO_2**
Household lighting (private)	 Standard Incandescent	**~80%**	Compact fluorescent 	**50 kWh / 25 kg CO_2**
		~30%	Halogen Energy-Saver 	**18 kWh / 9 kg CO_2**
Lighting design	 Low voltage halogen reflector	**~50%**	White LED Module COINlight OSTAR 	**45 kWh / 22 kg CO_2**

* For typical usage / Energy-Mix 0,5 kg CO2/kWh

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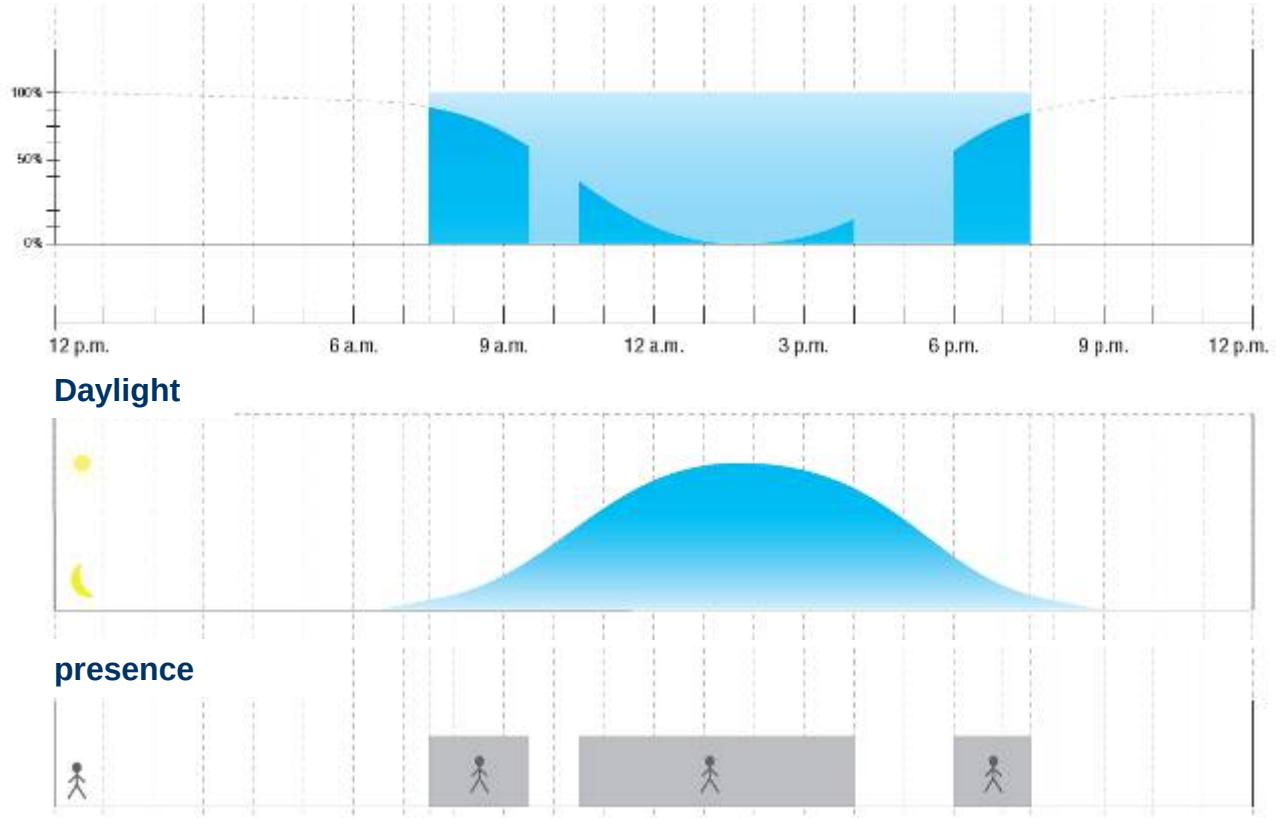
Energy Saving Potential with Light Management

Efficient light sources are not the only concept for saving energy



100% power consumption with T5 & ECG

Savings with daylight harvesting

Additional savings with presence detection

Savings up to 70% with DALI multi 3

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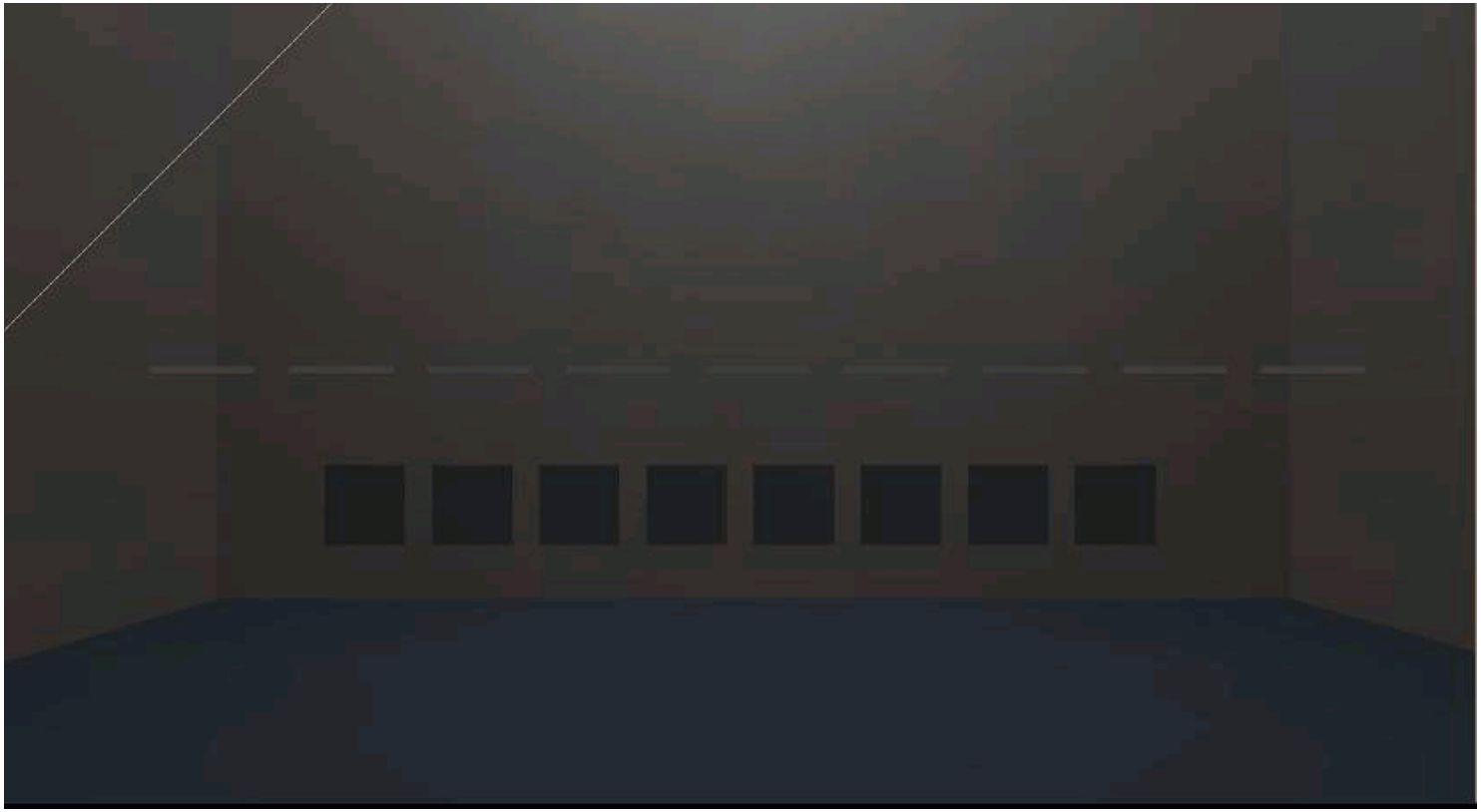
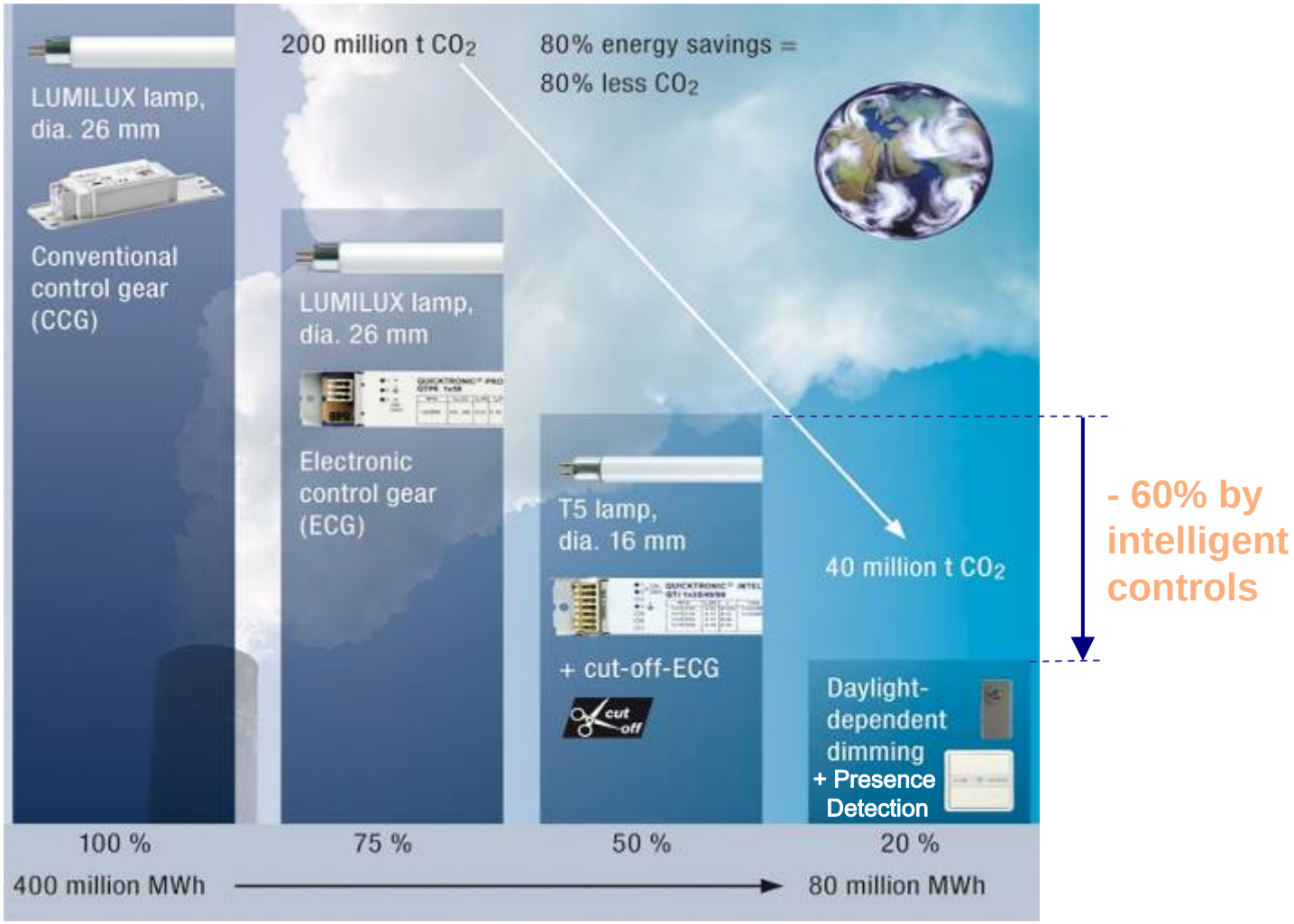
Additional savings by intelligent control technologies



Savings with energy efficient lighting technologies



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Case Study: Domestic Lighting

Lighting an apartment with 100 m² and saving 32,40 $ / year

Additional benefits:

- Longer lifetime

	kWh consumed 1 000 h/yr	Electricity Cost*	CO_2 Emissions*
10 x 60 W incandescent lamps	600 kWh	54.00 $	300 kg CO_2
		60% savings	
4 x 42 W Halogen ES lamps 6 x 12 W DULUX EL lamps	240 kWh	21,60 $	120 kg CO_2

* Electricity 0.10 $/kWh, energy-Mix 0.5 kg CO_2/kWh

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Case Study: Street Lighting

Lighting 1km street section with 33 lamp poles and saving 636 $ / year

Additional benefits:

- Longer lifetime = less maintenance
- Better light distribution would allow reducing the number of lamp poles to 29 to achieve the same lighting level

	Installed Power per pole	kWh consumed 4 000 h/yr	Electricity Cost*	CO_2 Emissions*
HQL 125W de Luxe mercury vapor lamps	137 W	18 084 kWh	1 620 $	9.0 to CO_2
			39% savings	
NAV-T 70W Super 4Y High Pressure Sodium lamps	83 W	10 984 kWh	984 $	5.5 to CO_2

* Electricity 0.10 $/kWh, energy-Mix 0.5 kg CO_2/kWh

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Case Study: Shop Lighting

Lighting a showroom with an area of 1000m² and saving 21 960 $ / year

Additional benefits:

- Longer lifetime = less maintenance
- Lower air conditioning costs

	Lamps required	Installed Power	kWh consumed 3 600 h/yr	Electricity Cost*	CO_2 Emissions*
50 W Standard Halogen lamps, magnetic ballast	1 460	87.6 kW	315 000 kWh	28 350 $	158 to CO_2
			78% savings		
HCI-T POWERBALL 35 W with electronic ballast	460	19.78 kW	71 000 kWh	6 390 $	36 to CO_2

* Electricity 0.10 $/kWh, energy-Mix 0.5 kg CO_2/kWh

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Other Case Studies

Open Plan Office

57% savings

Warehouse

20 % savings

Production Hall

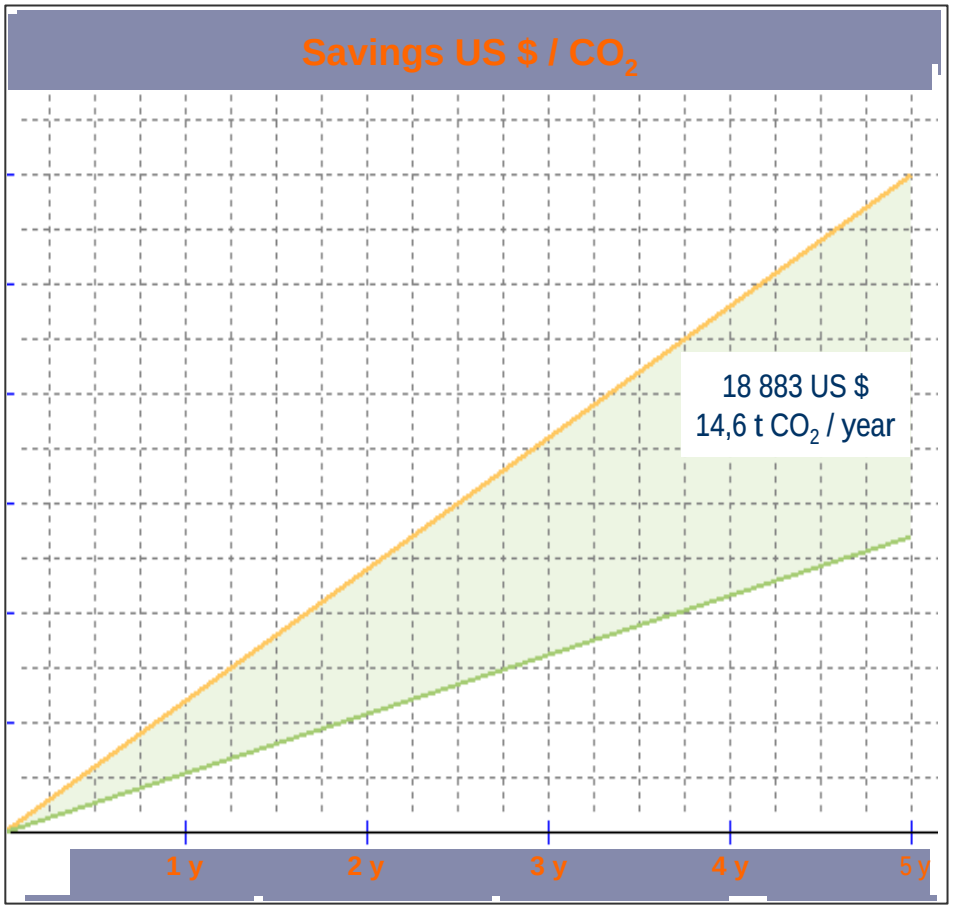
35 % savings

Providing solution-oriented tools

OSRAM offers tools to help customers optimize their lighting

OSRAM light@FM

- Facility Management for Lighting
- Provides cost transparency
- Calculates savings potential
- Automatically improves lights



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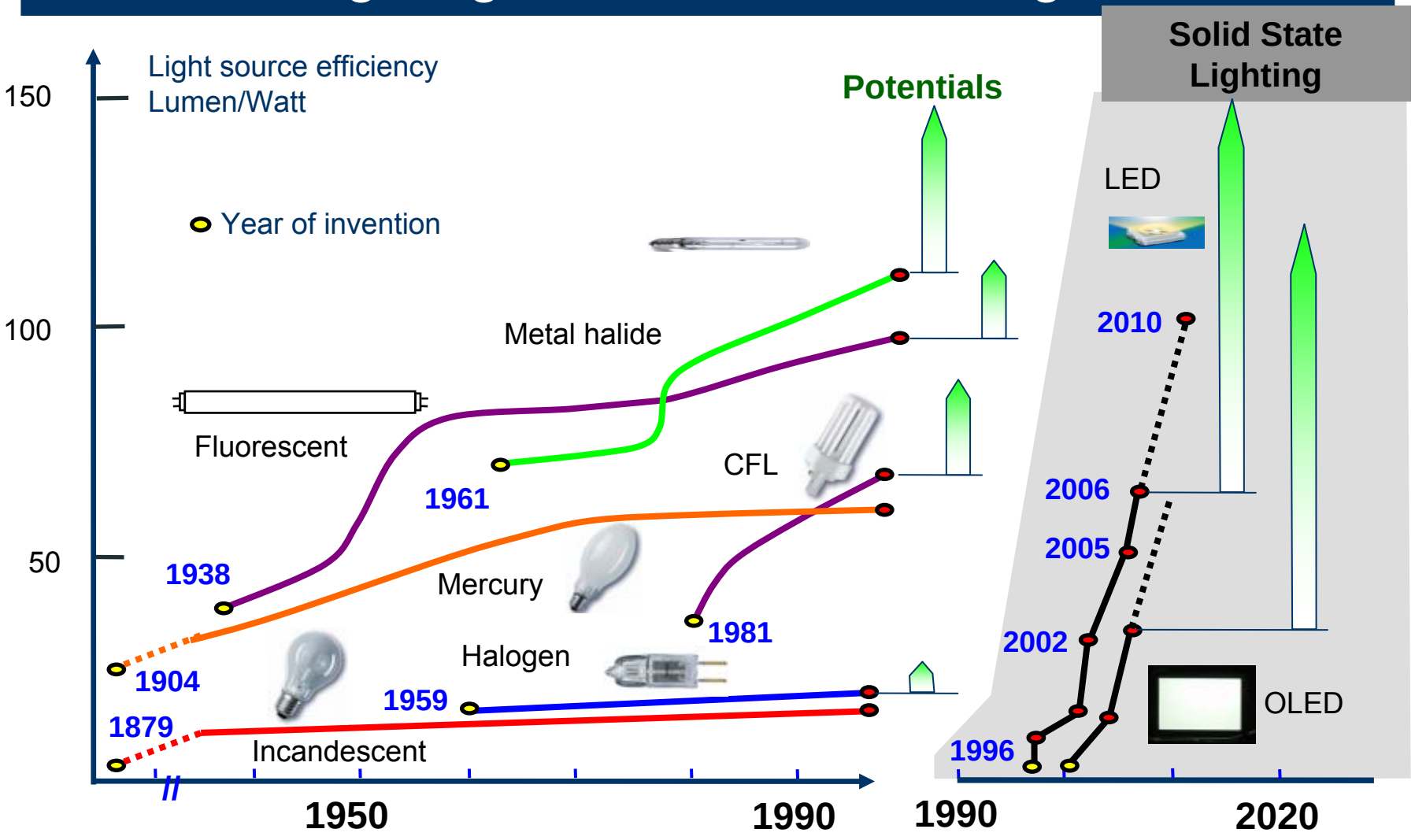
Shaping the future of light - LED

LED illuminated historical Stone Bridge Regensburg, 2004

Solid state lighting vs. classical technologies



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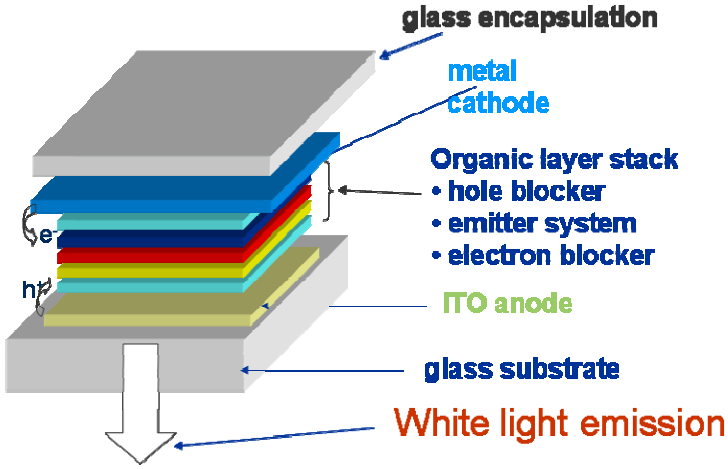
Why OLED Lighting ?

Innovative OLED lighting products and solutions will have the potential for attractive and unique features:

- Thin, flat and light weight
- Pleasant diffused light source (complementary to LED point light source)
- Transparent or mirror-like substrates
- Electronic color control
- High design flexibility: variable shape, bendable
- Instant-on feature
- Environmentally friendly (free of Hg)



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OLED Technology Demos

Cell design Ingo Maurer

Object & task light

High quality white
(high CRI & light output)

dimmable

Mood light

10 OLEDs

dimmable

Transparent technology

90 cm^2 , transparent

dimmable

Table luminaire

Accessoire „Light drop“

50 cm^2 , 1 OLED

OLED – Roadmap to the Light of the Future

Diffuse ceiling lighting

2016

General lighting
Transparent room separators

Decorative illumination

Flexible OLED
Lighting wallpaper and light curtains

Self illuminating traffic signs

Automotive interior lighting

Advertisement

Emergency and other signs

2008

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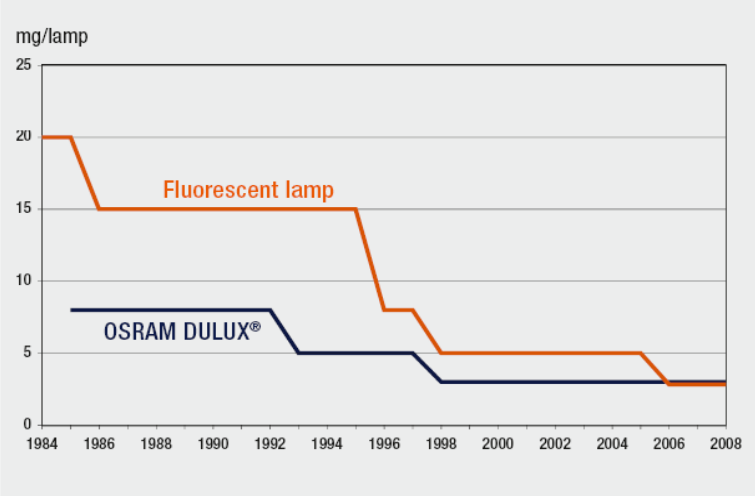
Our Responsibility:
Reducing Mercury - Increasing Recycling

OSRAM is continuously reducing the mercury content of its products



- We have constantly reduced the mercury content of our innovative lamps
- Today, the OSRAM DULUX® Longlife lamp contains less than 3 mg of mercury. With its long lifetime, it has an impressive ratio of hours of light per mg of mercury (Hg mileage)
- SYLVANIA markets the micro-mini, the lowest mercury CFL in US
- Our short-term goal for linear fluorescent lamps is 1.8 mg, for compact fluorescents it is 1.3 mg of mercury per lamp

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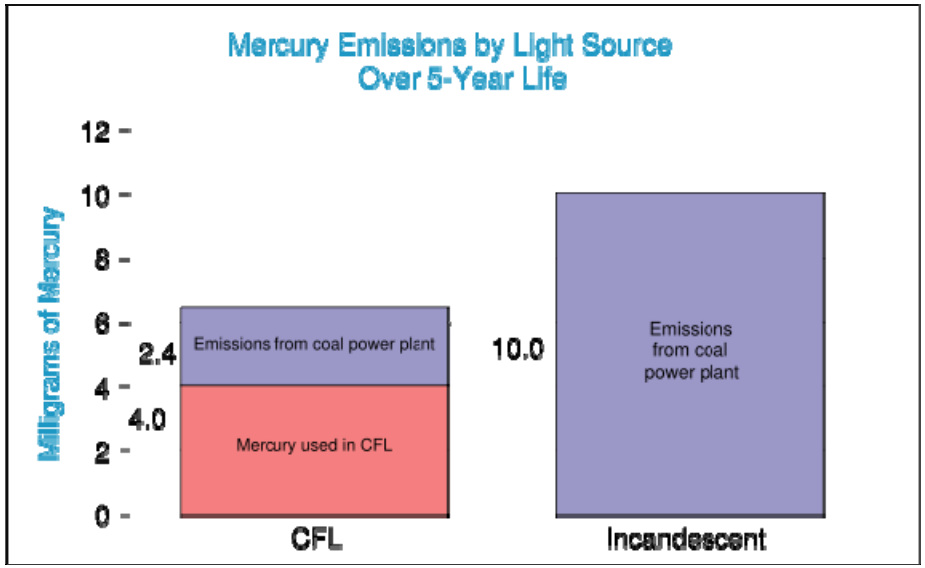
Our Responsibility:
Reducing Mercury - Increasing Recycling

Although CFLs contain mercury, they help keep it out of the environment



Mercury-paradoxon:

- Burning coal to generate the electricity releases mercury into the environment
- Generating additional electricity for powering an incandescent lamp for five years releases more mercury into the atmosphere than is contained in the CFL
- Mercury emitted by coal power plants is never recycled

Source: EPA

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Our Responsibility:
Reducing Mercury - Increasing Recycling

Recycling lamps reinforces their benefit for the environment

OSRAM supports the setup of industry systems that manage the environmental friendly and efficient retraction of lamps and initiates the dialogue with authorities to shape legislation facilitating this effort.

- OSRAM is the driving force in the lighting industry activities to develop, establish and continuously improve the sustainable and efficient producer retraction schemes in the **European Union** according to the WEEE* regulation
- OSRAM will proactively support authorities all over the world to define proper legislation for WEEE

Situation in the **United States**:

- The SYLVANIA recycling program was the first from a US manufacturer
- 35-40 recycling facilities nationwide
- Capacity exists to support recycling for the remaining 70% of commercial lamp recycling

*WEEE: Waste Electrical and Electronic Equipment

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CDM: A New Business Model Based on Sustainability

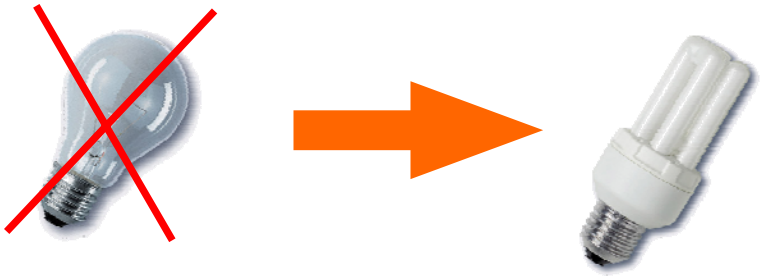
The Kyoto Protocol offers OSRAM new ways to business

Following the Clean Development Mechanism (CDM) set forth by the Kyoto protocol, OSRAM distributes CFLi lamps to replace standard incandescents in exchange for Certified Emission Reduction certificates (CERs).

- The partner country and its population profit from affordable quality lighting and reduced energy consumption (less stress on the grid)
- The global environment benefits from reduced CO_2 Emissions

The first project is under way in India, aiming to replace two million incandescent lamps.

Product Requirement:
DULUX EL Longlife (15.000 hrs)



Δ in kWh · (Grid Emission Factor in g CO_2/ kWh) · 10 years = CERs ($$)

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Details: The Project Area

- Geographical boundary of project area has to be clearly defined
- No other CDM project is registered in the project area
- All participating households must be registered customers of the utility company

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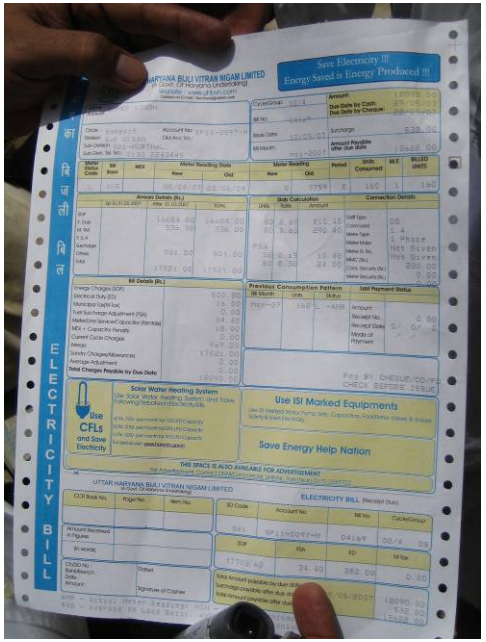
Why should households participate? (Example India)

Every household will reduce their electricity bill every month from the start

Sample Calculation India:

80W x 4h/day x 365days => 116,8 KWh x 4 INR (KWh) => **467 INR per year !**



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Details: Training

Detailed training of distribution team is mandatory

Lamp exchange simulations and Training material provide a practical and easy learning process

Bilingual Training ensures that contains have been fully understood.

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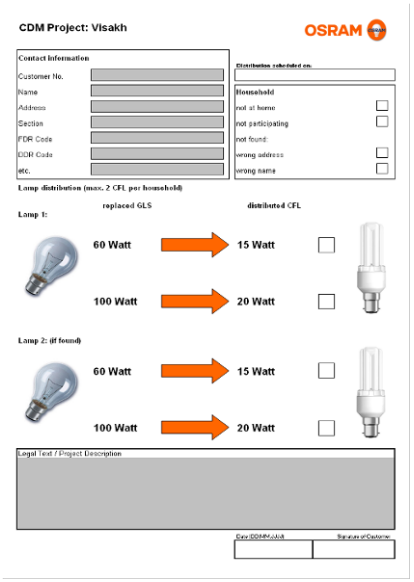
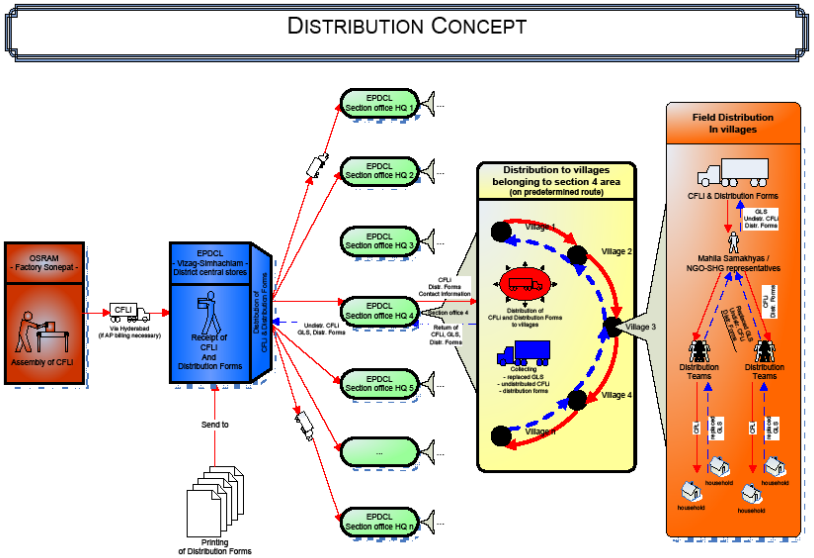
Details: Distribution of Lamps

The correct distribution & exchange of lamps is the key issue for a successful project :

- The distribution of the lamps will be done by the local utility company in collaboration with Self-Help-Groups in the urban as well as the rural areas
- OSRAM will intensively train all section leaders of the local utiliy as well as the NGOs
- OSRAM will temporarily hire additional staff to assure a qualified training & distribution





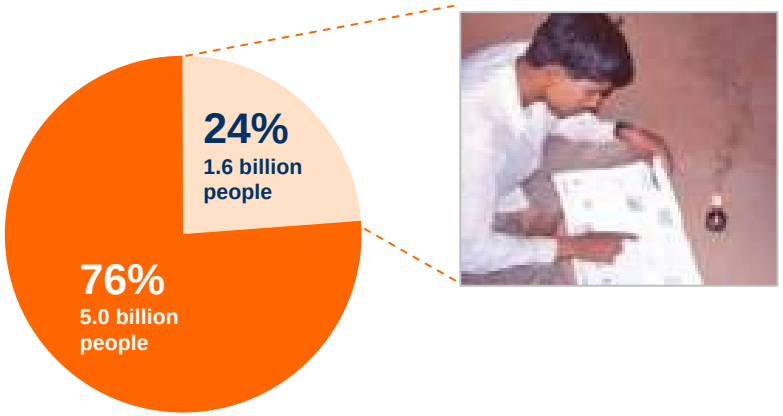
Details: Distribution of Lamps

Off Grid Lighting – The Lake Victoria Project

Off Grid Lighting

OSRAM is addressing 1.6 bn people dependant on “fuel-based lighting”

1/4 of the world's population relies on kerosene or candle light for illumination



These people account for a large share of kerosene consumption and CO_2 emission.

Annual fuel consumption for lighting:
About 20 billion gallons of kerosene

Annual emission of carbon dioxide:
About 190 million tons of CO_2

The present price for 20 billion gallons of kerosene amounts to:
>50 billion $

For its users, kerosene is dangerous, expensive and unhealthy while offering low quality light

BUT: it can be bought in small portions, and thus allows for low and irregular incomes

OSRAM has developed an innovative off-grid concept “beyond the product” where light can be bought in small portions, providing an inexpensive solution.

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Off Grid Lighting – The Lake Victoria Project

A pilot project with "Energy Hubs" on Lake Victoria has been started

The concept is simple – Lanterns and batteries are charged at a solar-powered "Energy Hub". An innovative financing ensures energy and lighting at affordable costs for the BoP

The first four energy hubs have been built on the shores on Lake Victoria. Providing Light without kerosene is especially important here:

- The fishermen spend up to 70% of their income for kerosene – they profit from the lower price of light, with the OSRAM solution up to 40%
- Kerosene spills are avoided, and much less CO_2 is emitted
- The pilot projects (OSRAM invests approx. 2Mio €) serve to test the viability of an exciting new business model.

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Off Grid Project – Press conference

Off Grid Lighting – The Lake Victoria Project

Off Grid Project - Mbita

Off Grid Lighting – The Lake Victoria Project

Off Grid Project – Technical Details

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Off Grid Lighting – The Lake Victoria Project

Market Transformation in Less Developed Countries

Initiative to create a PPP for efficient lighting in LDC with GEF and UNEP

GEF

Monique Barbut
Chief Executive Officer
and Chairperson

Mr. Wolfgang Gregor
OSRAM GmbH
Senior Vice President / C
Hellabrunner Strasse 1
81543 Munchen
Germany

Dear Mr. Gregor,

As you know
company, but also t
in partnership with

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Longlife Energy S
by ONE in excha

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OSRAM

Mme. Monique Barbut
CEO and Chairperson
Global Environment Facility
1776 G Street, NW
Washington, DC 20006
USA

cc: Achim Steiner / Executive Director UNEP
Bernard Jamet / UNEP DTIE

Ihre Zeichen/Nachricht vom:	Unsere Nachricht vom:	Unsere Zeichen	OSRAM GmbH
		GS/W. Gregor	20.01.2009

Global Market Transformation Project for Efficient Lighting

Dear Madame Barbut,

OSRAM is a leading global lighting company with a focus on transforming the global lighting market toward energy efficient products.

During the last months we have had intensive discussions with UNEP DTIE regarding the new lighting transformation project for Developing Countries based on a GEF PPP platform.

Following the discussions and the commonly agreed project details, OSRAM is prepared to join this PPP initiative and to support the above project as an industrial co-founding member. On the basis of the project documentation as submitted by UNEP DTIE we would outline our contribution in the following manner:

Our estimated in kind contribution over the first 4 - 5 years for the above PPP will likely be in excess of 6 million US$ subject to project and economic development. Our main contribution will be in the fields of:

- Off Grid lighting in developing countries
- Recycling activities
- Providing manpower and know-how
- DSM / CDM projects
- Participation in the project steering committees
- Others

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Geschäftsführung: Martin Goetzeler, Vorsitzender Johannes Närger
Registergericht: München HRB 4151
WEEE-Reg.-Nr. DE 71568000

We welcome this important initiative of GEF and UNEP at this present time. It is our firm commitment to support all developing countries in their efforts to phase out inefficient lamp technologies and to help our environment with energy-efficient, modern lighting technologies based on the principles of the Triple Bottom Line.

With best regards

OSRAM
Gesellschaft mit beschränkter Haftung

Martin Goetzeler
Chief Executive Officer

Wolfgang Gregor
Chief Sustainability Officer

2/2

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Further Saving Potential

There is further saving potential even with the most efficient lighting

When the music's over –

turn out the lights.