



Industry analysis

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The future of lighting: who will win?

LED lighting will dramatically change the market dynamics for the big three. We foresee a fragmented LED chip supply market dominated by Asian players with luminaire manufacturers gaining ground.

- **LED lighting is here.** As shown by Q4 results, demand in the LED market has sharply accelerated and the industry is set for major mid-term growth (>40% p.a. over the next 5 years). This is attracting large (Asian) investments in the field of component manufacturing, as highlighted by strong order growth for MOCVD suppliers Veeco and Aixtron.
- **Lighting versus solar PV:** We compare the recent experience in the development of the solar PV market, where Chinese companies have rapidly expanded, causing cell prices to fall by >50% over the past year. Will overinvestment in LED chip capacity lead to the same result?
- **Philips pushing into applications:** Having acquired numerous companies in the application/fixtures field, Philips has more flexibility on the upstream supply of light sources given a) the ongoing fragmentation of this market and b) the attractive multiples of the peer group (c.f. Lumileds versus LED pure play Cree on 8x CY sales). Philips continually states the need to retain access to both technology and supply of LEDs.
- **Siemens sitting on the fence.** Having decided not to integrate Osram into Building Technologies, the company is trying to find the sweet spot in the new lighting market before committing to large strategic moves, such as the sale of the business or the entry into the luminaire market.
- **GE now committed to lighting:** Having failed to find a buyer for its lighting business, GE is now looking to catch up in the LED business and remains on the look-out for partners.
- **Mid-term margins below past levels:** LEDs will drive up midterm growth for Siemens and Philips, but we expect the *massive fragmentation* of the industry to push medium term margins below past peak levels, which reflected a lamp market dominated by three rational global players.

Recommendations

€	Price		TP
Siemens	67	Buy	75
Philips	23	Hold	23

Source: New Street Research estimates

Key players in lighting

Local currencies	Price	CY EV/ Sales
Acuity	41	1.2
Aixtron	23	4.7
Cooper	48	1.6
Cree	69	7.8
Epistar	94	4.4
Fagerhult	126	0.8
GE	16	3.4
Hubbell	48	1.3
Philips	23	0.9
Seoul Semi	38200	3.2
Siemens	67	0.9
Toyoda Gosei	2347	0.7
Veeco	36	1.8
Zumtobel	16	0.8

Source: Bloomberg

Cree - bullish investor sentiment towards LED market



Source: Bloomberg

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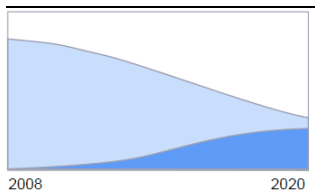
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The global lighting market

The ongoing phase-out of incandescent light bulbs in the EU, increased focus on energy efficiency, and the continued fall in costs is set to accelerate growth of the LED segment, leading to the greatest changes ever seen in the lighting market.

Massive changes ahead

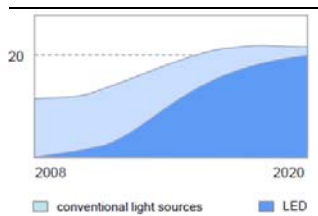
Number of lamps sold



Source: Philips

The big 3 lighting manufacturers, Philips, Siemens and GE, generate >90% of their lamp sales through replacement, as incandescent bulbs have a lifetime of around 1,500 hours. The shift to compact fluorescent lighting (CFL) has led to substantial costs to close* old and rebuild new capacity and this process may need to be repeated as LEDs replace CFL and FLT**. LEDs are now competitive for many commercial applications and with chip costs falling by 20-30% p.a., applications for the residential market are expected to be cost competitive by 2014. With an >5 year life expectancy, LEDs will sharply reduce replacement demand. Following strong growth of the LED market over the coming 5 years (>40% p.a.), the overall size of the lamp market in value terms will reach a plateau by the middle of this decade.

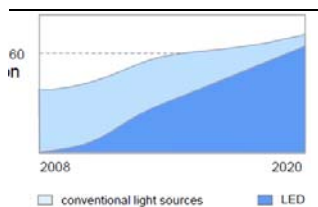
Lamps market value (€bn)



Source: Philips

LED component manufacturing is set to be dominated by Asian manufacturers and - following trends seen in other industries - is likely to become a low margin business over the medium term.

Growth in applications



Source: Philips

In applications (~70% of the €45-50bn lighting market), integrated LED lighting solutions will put pressure on many of the smaller luminaire players which will be unable to keep up with product development. This should drive increased consolidation in the luminaire segment, especially in Europe (~800 players), but overall we expect this to remain a fragmented market.

The jury is still out on who will be the real winners in the new world of lighting (apart from MOCVD manufacturers...), but we suspect that suppliers closest to the customers, able to offer tailored solutions - addressing lighting quality, reliability and energy efficiency - will be in a stronger position.

Potential value of Lumileds

Sales (2010E)	478
Potential EV	
Sales multiple (x)	4 1,914
	5 2,392
	6 2,870
	7 3,349

Source: New Street Research estimates

Philips versus Siemens: With 28% of sales and around 35% of (normalised) EBIT from lighting, Philips has a lot more to lose or gain than Siemens for which lighting represents ~5% of sales and 6% of EBIT. In light of the high multiples now being paid by the market for pure play LED component businesses, we believe a sale/IPO of Lumileds (see table) and the focus on LED applications - where it holds a strong IPR portfolio - would enable Philips to benefit from the growth in LEDs without being exposed to increased pricing pressure on the capital intensive chip side. Proceeds could be invested in building a complementary wiring device/low voltage business.

Siemens is in the process of trying to gauge where the lighting market is heading. Initial proposals to sell the business were rejected and synergies between lighting and Building Technologies were deemed insufficient to justify a merger of the two. At the same time, management is unwilling to follow Philips' move into LED applications (e.g. by acquiring Zumtobel). We believe that Siemens can do without lighting and should be using the current 'growth and higher margin phase' to sell the business (valued by NSR at €5bn). GE failed to find a buyer for its lighting business, probably because the restructuring and potential environmental costs linked to the incandescent business could not be offset by growth opportunities. Siemens is further advanced in reducing its legacy business exposure, especially in mature markets, and offers potential future owners a growth story in LEDs.

* Philips spent €500m on restructuring over the past 3 years, Siemens €200m over 2 years. ** Philips has outsourced most of its CFL production, but will incur costs to close fluorescent tube (FLT) production.

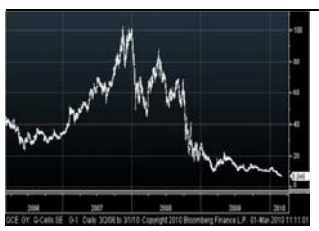
Parallels to solar PV industry?

The solar industry has witnessed strong growth over the past years. However, supply has outpaced demand, leading to a sharp drop in cell pricing over the past 12 months. The better placed players have generally been the systems integrators and installers as opposed to the cell manufacturers.

Dramatic pricing collapse in solar cells

The solar industry has seen strong growth over the past years, attracting substantial (Asian) capital into the industry.

QCells share price



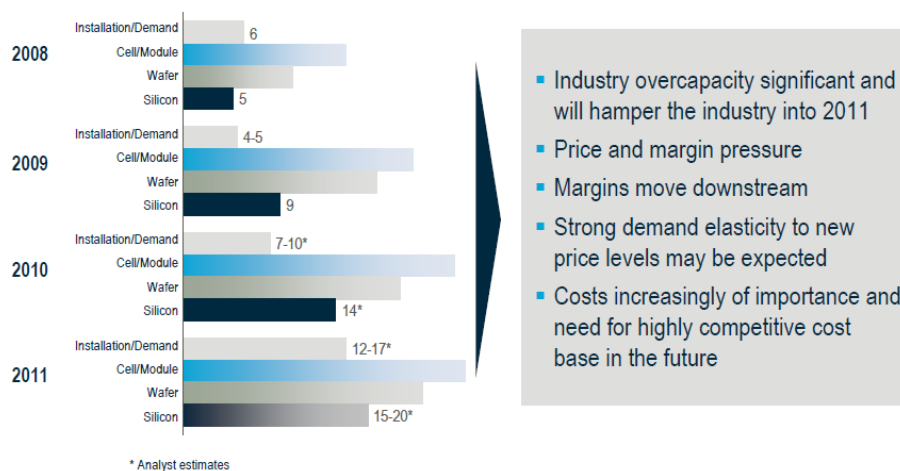
Source: Bloomberg

The reversal of fortunes at QCells may serve to be a warning of risks ahead. Management believed that the key to success in the solar market was scale. Ranked the top supplier of PV cells in 2007, the company achieved EBIT margins in excess of 20%. However, the increased availability of silicon, stagnating demand in 2009 (post a doubling of the market in 2008) and the strong increase in Chinese competition led to a 50-55% drop in cell prices. This eroded the company's competitive position, resulting in heavy losses in 2009 (loss on an EBIT level of €481m on sales of €801m, down from €1.25bn in 2008). The company was forced to sell its stake in REC and launch a convertible bond to stay afloat. From peak to trough, the company's share price is down over 90%. Management is now focused on moving downstream.

Overcapacity at all levels of the value chain

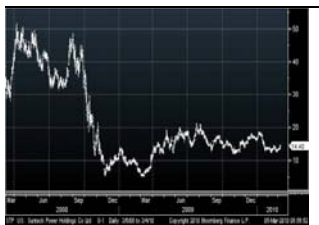
As highlighted by the company, there is now overcapacity at every level in the PV solar value chain.

Overcapacity in the solar PV industry (in GWp)



Source: QCells

Suntech share price



Source: Bloomberg

Estimated global PV system demand - 2009 first down year

GW	2008	2009E	2010E	2011E	2012E	CAGR %
World total	5.8	5.2-5.5	7.5	9.7	12.1	-35%

Source: First Solar

Global market leader now a Chinese company

China-based Suntech has now become the market leader for crystalline solar PV cells. This is all the more interesting given that global PV demand is still dominated by Europe (~70% of demand in 2009). In 2009, 74% of the company's sales were generated in Europe, thereof over half in Germany. While QCells had argued in the past that 'made in Germany' would provide protection from Asian imports, pricing for the *highly competitive* Suntech products in Germany is almost on a par with the level of German cells.

First Solar, a US-based manufacturer of the more cost effective thin-film technology, estimates that the **12 other leading players in the solar industry now have a combined net debt position of US\$5bn**, reflecting overexpansion over the past 2 years.

In what was a challenging year, the solar market saw a move of margins downstream. **Systems integrators and installers** were less affected by the fall in cell pricing, with **local presence and brand recognition** proving a degree of downside protection.

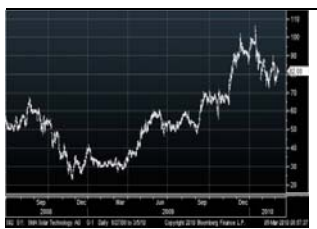
**Downstream player
 Solarworld has seen
 margins hold up
 better...**

Solarworld, for example - which has a stronger downstream position - achieved a 12% rise in 2009 sales and - while EBIT fell by 42% - still maintained a 15% margin. The strong link to the trade as well as final customers has (so far) provided a better competitive shield.

**...as has electronic
 equipment suppliers
 SMA**

With most of new capital moving into cell manufacturing, **SMA Solar Technology**, a German-based manufacturer of inverters for solar applications (global market share around 50%), recorded a 37% rise in 2009 sales to €934m with an EBIT margin of 29%. The company forecasts 2010 sales of €1.1-1.3bn with an EBIT margin of 20-23% (increased competition).

SMA Solar share price



Source: Bloomberg

We believe that solar cell manufacturing (a solar cell converts photons into electrons, whereas LED systems convert electrons into photons...) provides some parallels to the LED component business. It is a capital intensive, automated production process, which is attracting a lot of Asian capital. The PV systems integration/installation business offers similarities to the luminaire/fixtures market and has, so far, provided better downside protection as pricing in the upstream area comes under pressure.

Lighting and low voltage?

Rexel distribution partners



Source: Rexel

Could the move into LED-based total lighting solutions play into the hands of low voltage suppliers? Should Philips buy a low voltage/wiring devices supplier (Legrand?), which provides exposure to a business with strong branding, customer loyalty and solid pricing dynamics?

Achieving the optimum efficiency of a lighting system requires the use of controls (e.g. movement sensors, monitoring systems). As the lighting market moves from lamps (shelf space at retailers) towards integrated solutions, we believe that synergies between the two areas will increase.

So far, results from recent company moves have been less than conclusive. **Schneider** acquired Juno Lighting in 2005, but claims that the synergies to date have been disappointing. **Siemens** - which could have built the ultimate building automation, low voltage and lighting business housed within the **Building Technologies** division - has so far decided to leave Osram as a stand-alone business.

Many lighting and low voltage systems are *sold through the same distributors* (c.f. Rexel) and installed by the same electricians, leading us to believe that there are certain synergies. The increased development of fully integrated solutions lighting/building control systems to extract maximum energy efficiency would in our view tend to increase the benefits of a combined offer. In the US, **Cooper Industries** and **Hubbell** are active in both low voltage/wiring devices and lighting systems and have highlighted that the combination improves the ability to offer solutions and well as channel management.

On balance, we believe that it would make sense for Philips to consider a move into the low/voltage, wiring devices space.

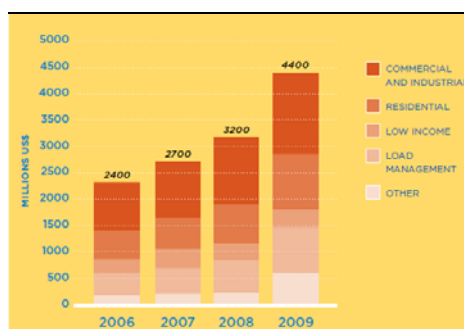
The quest for higher energy efficiency

LEDs consume up to 80% less energy than conventional incandescent lamps. Lighting represents around 19% of global electricity consumption (22% in the US and around 14% in Europe).

Sharp rise in US spending on energy efficiency in 2000

Momentum on energy efficiency investments is rising, even in the US, which consumes double the level of electricity per capita versus OECD Europe. The 'Center for Energy Efficiency' tracks investments and estimates an increase in US spending on energy efficiency measures from US\$3.2bn to US\$4.4bn in 2009. Key beneficiaries of this trend include electrical equipment suppliers such as Schneider, Eaton and Cooper Industries. Lighting controls, for example (occupancy and daylight sensors, timers) can yield energy savings of 20-40%.

US spending on electrical energy efficiency

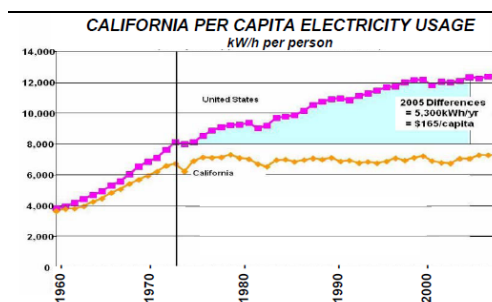


Source: CEE, February 2010

California has proven that regulation can cut energy consumption

While the US regulatory effort on energy efficiency has generally lagged the EU, California has been successful in maintaining electricity consumption at roughly 7,000 KWh/year over the past 30 years, whereas electricity consumption for the total US has continued to rise, as shown below.

Success of regulatory efforts



Source: Cooper

US consumes double the amount per capita as OECD Europe

This highlights the substantial potential in the rest of the US. As shown in the table below, US consumption is currently double the level of OECD Europe, which in turn is roughly 3x the level for China.

Annual per capita electricity consumption

KWh	
India	543
China	2,347
OECD Europe	6,239
US	13,616

Source: IEA

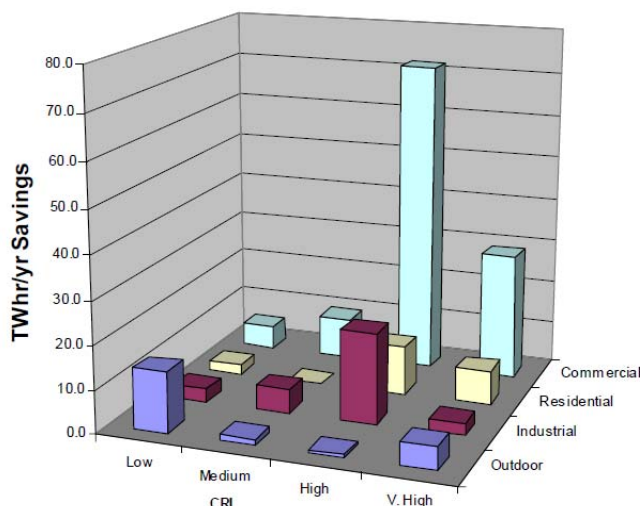
Lighting represents 22% of US electricity consumption

US\$120bn potential savings in US from LEDs over the next 20 years

Lighting, representing up to 22% of electricity consumption in the US (~40% in commercial buildings, 40% HVAC, 20% other), will be a major source for future savings. 80% of buildings have lighting systems installed pre 1986.

In February 2010, the US Department of Energy (DOE) released a report analysing the potential energy savings of broadly deployed solid-state lighting sources - predominantly LED- and OLED-based products (Energy Savings Potential of Solid-State Lighting in General Illumination Applications from 2010 to 2030). The DOE projects that between 2010 and 2030, solid-state lighting could save 1,488 terawatt-hours, representing a savings of US\$120bn at today's energy prices. The main savings are estimated to come from the displacement of fluorescent and halogen lamps in the commercial sector.

Electricity savings breakdown for the LED scenario in 2030



Source: DOE, February 2010

Low CRI (colour rendering index): mercury vapour, Medium CRI: T12 linear fluorescent, metal halide, High CRI: T8 linear fluorescent, Compact fluorescent lamps (CFL), Very High CRI: Incandescent, halogen

McKinsey (*Unlocking Energy Efficiency in the US Economy*, July 2009) estimate that a broad-based (non-transport) US energy efficiency programme could yield gross energy savings of US\$1.2 trillion by 2020, well above the US\$520bn upfront investment required, reducing end consumption by 23% and reducing greenhouse gas emissions by around 1.1 gigatons per year. Energy efficient lighting contributes a significant portion.

Philips estimate that in Europe, where 14% of electricity is used for lighting, a switch to energy efficient solutions should save the equivalent of 38 million tons of CO₂, 156 million barrels of oil and avoid the need for 52 power plants.

The LED market

LED penetration is set to grow from ~2% in 2009 to around 15% by 2013. Momentum has increased sharply over the past quarter, which is reflected in a strong increase in capex on the chip manufacturing side.

General lighting: still a small part of LED packaged LED demand...

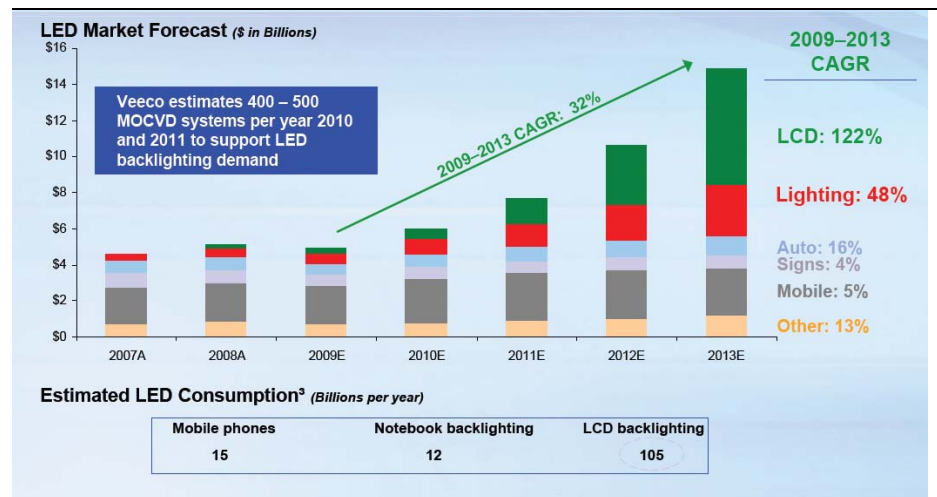
...but set for over 40% CAGR over the next 5 years

Over the past three years, LED component consumption was dominated by mobile phone and other backlighting as well as automotive applications. While the market for packaged LEDs was up 5% in 2009 - according to Strategies Unlimited - general lighting recorded with 24% the highest growth, albeit from a low base. This is in sharp contrast to the overall lighting market, which was down around 15% last year.

For 2010, Strategies Unlimited forecasts 32% growth in LED lighting with a 44% compound annual growth rate over the next five years. Veeco expects 48% compound annual growth through 2013.

By 2013 general lighting is expected to account for around 20-25% of total LED demand. The LED general lighting market could be worth over €10bn by 2012, up from around €4bn at present.

LED market forecast

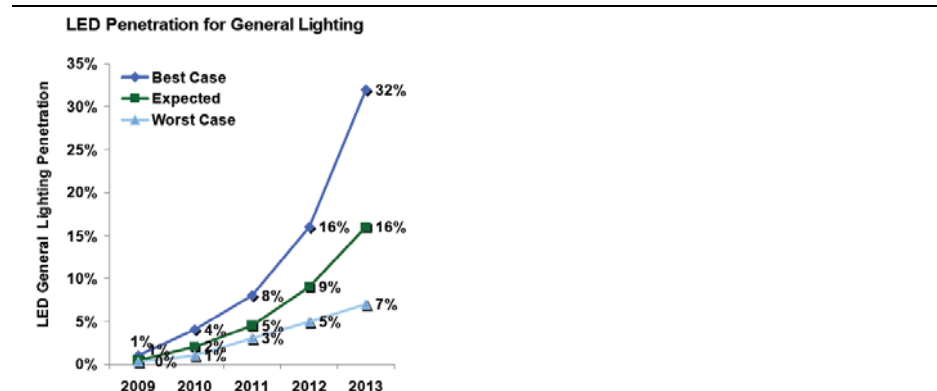


Source: Veeco

Penetration of over 30% by 2013?

Under the best case scenario, LED penetration in general lighting could reach 32% by 2013. This is being driven by commercial market, where LED applications can already offer paybacks as short as 1-2 years.

LED penetration in general lighting could reach over 30% by 2013

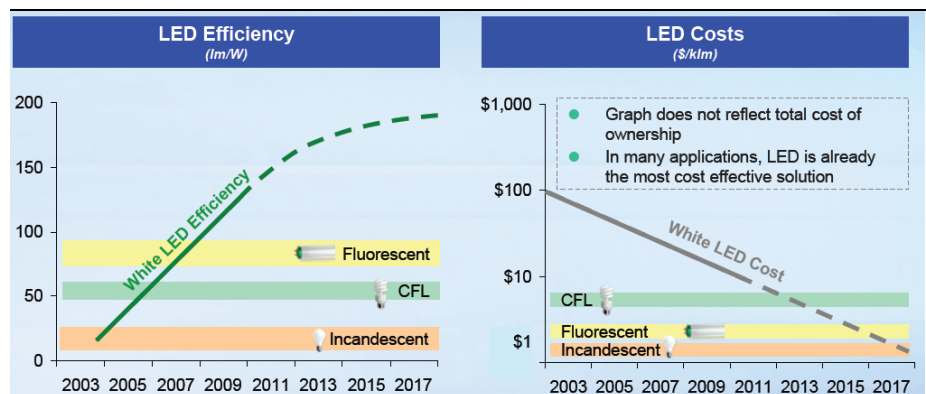


Source: Strategies Unlimited, Strategy Analytics, Freedonia, Philips, Veeco

With the ongoing phase-out of incandescent light bulbs in Europe which started in September 2009 (>= 100W bulbs), consumers are now increasingly forced to buy CFL lamps, which in many cases cannot match the light quality of incandescent bulbs, often cannot be dimmed and contain mercury. While the first retrofit LED lamps are starting to hit the retail channel, these are still priced at unattractive level (€25-50).

For commercial applications, however, LED is starting to make sense with a payback of between 1-2 years.

LED: cost competitive with CFL by 2012

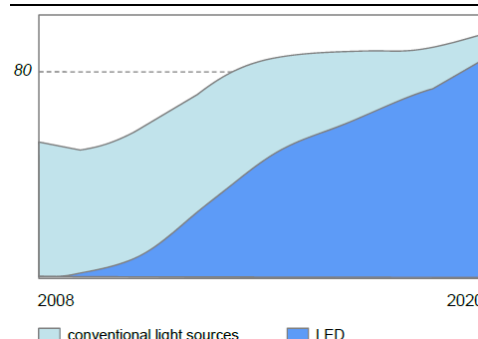


Source: Veeco

LED penetration of 80% by 2020

Philips estimates that LED penetration will reach 80% by 2020. The overall lighting market estimated at €45-50bn, is forecast to grow by 6% p.a. over the next 10 years. Applications/luminaires account for around 70% of the market and are expected to continue to grow as a percentage of the total.

Lighting market: total size €45-50bn in 2009, 10 CAGR through 2020: 6%



Source: Philips

Efficiency improvements and price declines

Better design key driver for further efficiency gains

Cree highlights that over past 20 years, lumens per wafer - which the company sees as a key measure of efficiency - have doubled every 18-24 months. This is a result of better design rather than scale, and will continue to be a major driver for reducing cost. According to Cree, this is not universally recognised in the industry where the main focus remains on scale.

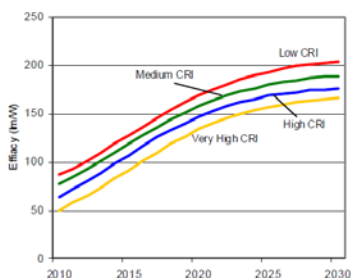
DOE projects substantial efficacy improvement

A DOE report on solid-state lighting published in February 2010 projects significant efficacy improvements.

In high CRI* (76-90) SSL lights, the DOE expects efficacy to go from 64 lumen/W today to 147 lumen/W in 2020 and to 176 lumen/W in 2030.

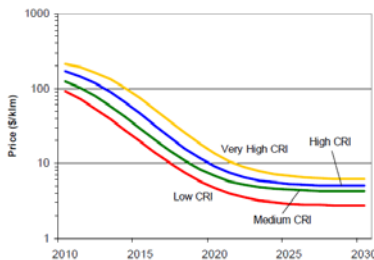
From a cost perspective, the DOE projects SSL to drop from US\$170 per klm today to US\$5 per klm by 2030 for high CRI products. The market response curve indicates that the residential sector is less willing to accept a longer-term payback than the commercial and industrial sectors. A 2 year payback would only lead to 20% adoption rate in residential.

Improvement in efficiency



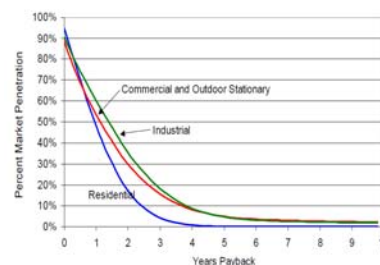
Source: DOE

LED price projection



Source: DOE

Market response curve



Source: DOE, Arthur D. Little

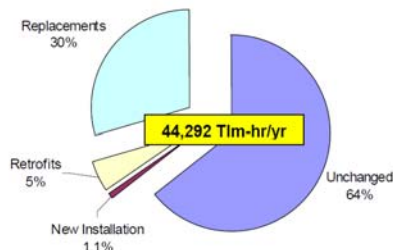
* CRI: colour rendering index - measure of light quality

DOE projects solid state lighting to displace all other technologies by 2030

The DOE expects SSL to completely displace all other technologies in commercial, residential, industrial and outdoor segments by 2030. The projected savings, however, come primarily from the replacement of fluorescent and halogen lamps in the commercial sector. As a result, greenhouse gas emissions could be reduced by 246 million metric tons of carbon over two decades.

As shown in the chart below, around 35% of the installed base in lamps is replaced on an annual basis. With the increased penetration of solid-state lighting, this percentage is set to decline considerably over the coming years.

US annual lumen-hour market turnover in 2010

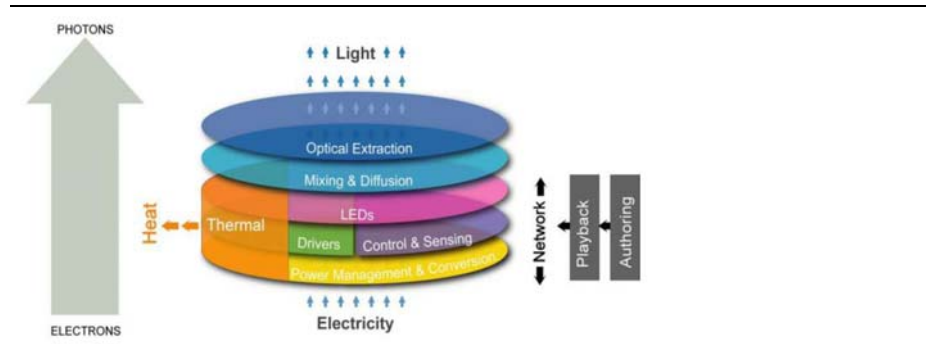


Source: DOE

The LED value chain

An LED system converts electrons into photons through a semiconductor. Compared to traditional lighting, LEDs require more precise current and heat management which drive the expected lifetime of a unit as well as the speed of light output degradation.

LED lighting systems



Source: Philips

The LED market by segment

LED
Level 1 - LED chip: Lumileds, Nichia, Cree, Osram, Toyoda Gosei, Epistar, Seoul Semiconductor
Level 2 - LED module: Electronics and controls (e.g. Color Kinetics)
Level 3 - Retrofit LED lamps: LED to fit traditional fixtures (Osram, Philips, GE, Lemnis)
Level 4 - Applications - e.g. lighting controls (e.g. Genlyte)
Level 5 - Solutions and services -luminaires, fixtures (e.g. Acuity, Zumtobel)

Source: Philips

Philips identifies 5 levels in the LED value chain.

Light source

- Level 1: LED chip manufacturing is by far the most capital intensive. Cree, for example plans to spend 30% of sales on capex this year. According to a May 2009 report by IMS Research, Nichia held 24%, Osram Opto 10.5% and Philips Lumileds 6.5% of the packaged LED market. Seoul Semiconductors, one of the most aggressive companies in this area, ranked 4th. IMS' January 2010 report on the top HB LED companies by \$-based sales indicates a 2009 market share of 42% for Nichia, 11% for Cree, 8% for Showa Denko 7% for Epistar and 2% for Epivalley*.
- Level 2: Electronics and controls is mainly an assembly business.
- Level 3: Retrofit LED lamps - this business is similar to the traditional lamps business, involving assembly and sale through similar distribution channels.

Applications/solutions

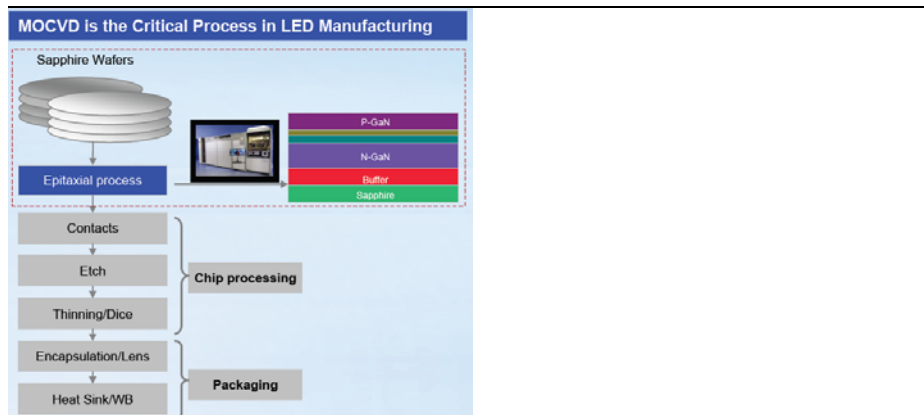
- Level 4: Applications
- Level 5: Solutions and services

* Korea-based company aiming to become a global top 5 in LED wafer and chips by 2013

LED chip manufacturing

LED chip manufacturing is closely linked to traditional semiconductor production, requiring highly automated and capital intensive plants. Metalorganic chemical vapour deposition (MOCVD) represents one of the key steps and - according to Veeco - over 50% of a fab's capital expenditure.

MOCVD represents over 50% of LED fab capital expenditure



Source: Veeco

Veeco and Aixtron have seen a major increase in MOCVD orders over the past quarter

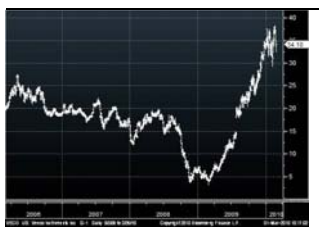
US-based Veeco and German-based Aixtron are the major two suppliers of MOCVD equipment alongside Nippon Sanso and Thomas Swan. Both companies have reported a sharp upturn in orders last year, which has not gone unnoticed by the market. Veeco and Aixtron are up seven and six-fold from their March low respectively. While part of this is due to the increased penetration of LEDs for flat screen TV backlighting, growth in general lighting is driving demand. According to IMS Research, there were 1,413 MOCVD reactors in operation at 75 manufacturers by the end of 2009 with 348 units expected to be added in 2010.

Veeco growth in LED and solar



Source: Veeco

Veeco share price



Source: Bloomberg

In Q4 2009, Veeco recorded a 200% rise in orders, of which 69% represented by the LED and solar markets. 16 LED manufacturers placed orders. The company has entered 2010 with 'unprecedented' momentum and a record backlog of US\$402m. Having shipped 40 units in Q4, Veeco plans to ship 120 units by the end of 2010.

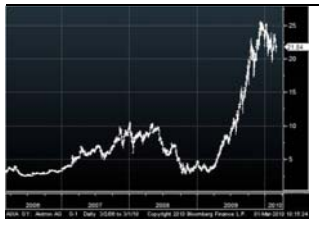
German-based Aixtron (~70% global market share for MOCVD chambers), recorded a joy and sequential doubling of orders in Q3. For the first 9 months of 2009, 78% of equipment orders were linked to LED contracts (Q4 figures will be released on 11 March). In Q4 2009, Aixtron booked one of its largest single orders out of China. Lattice Power, the customer, is expanding its LCD backlighting and LED general lighting business. The largest order out of China - booked in Q1 2009 - was from Hualei Optoelectronic Ltd, a company which is 'shifting out of heavy industry into high tech'.

Aixtron equipment orders (78% of 9m 2009 orders linked to LED)

	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3
€m	2007	2008	2008	2008	2008	2009	2009	2009
Equipment orders	87	86	73	52	41	31	58	118

Source: Aixtron

Aixtron share price



Source: Bloomberg

As shown in the chart below, Veeco has a broad-based customer group in the LED lighting market, the bulk of which are based in Asia. **Samsung LED** (a JV between Samsung Electronics and Samsung Electro-Mechanics) has recently ordered a large number of units and is aiming to raise monthly production from 300m LEDs/month to 5bn within 3 years.

Veeco LED customers



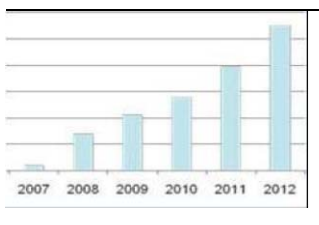
Source: Veeco

Patents/intellectual property rights

The patent situation for LED chips, components and applications is very complex and there are a growing number of cross-licensing agreements.

- Siemens/Osram holds important IPRs together with Nichia, licensed it to others, e.g. Cree. Nichia has the license for blue light for GaN LEDs whereas Siemens/Osram holds the license for the coatings to transform blue into white light.
- Osram claims to have the best IPR portfolio for high energy white LEDs.
- Cree holds 516 US patents with expiration dates extending to 2027.
- In 2008, Osram acquired special rights from Philips (Color Kinetics and TIR Systems) in return for granting some patents to Philips.
- Philips claim to hold 70% of all patents on LED applications (>225 patent families, >450 issued patents, 770 patents pending). Philips is licensing basic technology (LED control, Cosmopolis lamp, AlInGaP LED technology) in order to grow the market, but is retaining the differentiating technologies in house. Philips is charging royalties of 3% for single color luminaires, 4% for tunable white luminaires and 5% for color luminaires based on net revenues. Royalties on LED retrofit bulbs amount to 5% with a minimum of €0.25 per unit. No royalties are due if all LED light engine modules, all LED drivers and all components for lighting control are sourced from a qualified supplier (Philips, Zumtobel and Osram).
- As highlighted by Zumtobel, it is almost impossible to develop systems in the LED application field without infringing on Philips patents.

Philips LED license revenue



Source: Philips

The luminaire/fixture market

Philips believes that the key to future success in the LED market is to build a strong position in applications, such as luminaires and fixtures. Barriers to entry include the channel contacts to end customers/specifiers and the high level of customization. In certain aspects there are similarities to the low voltage market.

Europe (professional luminaires)

Europe still highly fragmented...

- Still fragmented with around 800 players. Many are family-owned, specialised regional players, generating sales of around €30-40m.
- Top 10 control >35% of the market - these include Philips, Zumtobel, Schreder, Trilux and Fagerhult.
- Philips and Zumtobel both claim a leadership position with a 10% market share each.

US (professional luminaires)

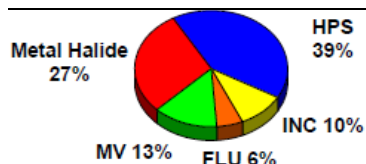
...whereas the top 4 control 50% of the US market

- The top 4 - consisting of Acuity, Philips, Cooper and Hubbell - control roughly 50% of the market.
- Acuity (using Philips patents) is the number 1 with a 17% market share.

As highlighted by Cooper Industries, there are 869m track and recessed lighting units in operation in US, of which 83% incandescent and 17% CFL. A 5% LED penetration would yield a US\$550m market opportunity.

There are around 137m outside lighting units currently in operation in US. Shifting to LED results in energy savings of 30-60% versus metal halide (27% of installed base) and increases the lifetime by a factor of 7. A 5% LED penetration provides a US\$1.6bn market opportunity.

Outdoor lighting in the US: 137m units in operation



Source: Cooper

According to Acuity, the US lighting market is worth around US\$10bn p.a., of which only 17% is represented by the residential sector. The largest sector is commercial indoor (34%), followed by outdoor (24%). The Department of Energy estimates the size of the installed base at US\$100bn.

US lighting market

	US\$bn	Acuity position
Commercial indoor	3.4	1
Outdoor	2.4	1
Residential	1.7	2-4
Industrial and special applications	1.2	1
Controls	0.8	2-4
Emergency	0.4	1
Modular wiring - lighting	0.1	1
Total (80% new construction)	10.0	1
Installed base	100.0	

Source: Acuity, Department of Energy

Electrical wholesalers remain the main channel to market

The main channel to market is electrical wholesalers, representing close to 70%. This is followed by home centres (10%).

Channels to market in the US

% total	
Electrical wholesalers	68
Home centers	10
Lighting showrooms	4
Utilities	6
Direct accounts	6
ESCO	5
Other	1

Source: Acuity

Key players in LED lighting

	Y/E	Price	Mkt. cap (€bn)	EPS Historic	EPS Year 1	EPS % Chg	EPS Year 2	EPS % Chg	PE historic	PE Year 1	PE Year 2
Acuity Brands	Aug	40.4	1,287	2.4	2.1	-12%	2.6	26%	17.2	19.5	15.5
Aixtron	Dec	22.8	2,291	0.3	0.4	51%	0.8	106%	84.3	55.9	27.1
Cooper Industries	Dec	47.0	5,761	2.4	3.0	23%	3.4	14%	19.5	15.8	13.9
Cree	Jun	69.0	5,377	0.7	1.6	139%	2.0	30%	106.2	44.5	34.3
Epistar	Dec	90.8	1,603	0.5	2.0	299%	4.1	102%	178.0	44.6	22.0
Fagerhult	Dec	125.0	1,606	5.1	10.1	99%	12.9	28%	24.7	12.4	9.7
GE	Dec	15.9	124,496	1.0	1.0	0%	1.2	20%	15.9	16.0	13.3
Hubbell	Dec	48.2	2,100	3.1	3.2	5%	3.8	17%	15.7	15.0	12.8
Philips	Dec	22.3	21,656	0.7	1.3	80%	1.6	28%	31.8	17.7	13.8
Seoul Semiconductor	Dec	38200	1,426	762	1435	88%	2220	55%	50.1	26.6	17.2
Siemens	Sep	66.2	60,475	4.6	4.5	-2%	5.5	21%	14.4	14.7	12.1
Toyoda Gosei	Mar	2323.0	2,495	30.6	61.3	101%	118.0	93%	76.0	37.9	19.7
Veeco	Dec	35.8	1,050	0.7	2.1	228%	2.5	18%	55.1	16.8	14.3
Zumtobel	Apr	15.8	686	0.8	0.8	1%	1.1	43%	21.0	20.8	14.6

Source: Bloomberg consensus estimates

Key players

Philips Lighting - global leader

Broadest portfolio in the industry

With sales of €6.5bn in 2009 and 51,600 employees (-10% vs. 2008), Philips is the global market leader in lighting. The company manufactures around 80,000 products and holds number one positions in fluorescent, CFL-I (compact fluorescent lighting), HID (high-intensity discharge) and incandescent lighting. 2009 R&D spending (€351m) reached 5.4% of sales.

Philips market position



Source: Philips

Top three position across most industries

With the exception of consumer luminaires outside of Europe, Philips claims a top three position across all end markets in all geographies excluding Japan.

Multi brand access to market



Source: Philips

Philips Lighting sales by customer group

% total	2009
Homes	24
Offices	16
Outdoor	16
Industry	10
Retail	12
Hospitality	10
Automotive	7
Entertainment	3
Healthcare	3

Source: Philips

2.5% of sales spent on restructuring over the past 3 years

In order to adapt to the changes in the lighting market, Philips has booked restructuring charges of €494m (-2.5% of combined sales) over the past three years and we forecast further charges of €120m in 2010.

Philips Lighting - track record and NSR forecasts

€m	2006	2007	2008	2009	2010E	2011E	Management target
Sales	5,466	6,093	7,362	6,546	6,834	7,210	
EBITA	620	722	480	145	576	833	
% sales	11.3	11.8	6.5	2.2	8.4	11.6	12-14

Source: Philips and New Street Research estimates

LEDs generated >10% of Q4 sales, broad IPR portfolio

Total LED applications represented 8% of sales in 2009 and over 10% in Q4. This is forecast to rise to 50% by 2015 and 75% by 2010. The company claims **the broadest portfolio in the industry** from LED chips, modules, applications and controls through to designer luminaires. The ability **monetise the strong IPR portfolio**, especially for applications, could be a significant additional profit driver, but Philips indicates to us that its main focus is on expanding the size of the LED fixtures market.

Philips: broad product offer for the LED market

Light sources	Applications	Services
Lumileds (LEDs)	LTI (entertainment)	Bodine (emergency ballasts)
TIR (LED modules)	Dynalite (controls, energy management)	Genlyte (fixtures & controls)
	Teletrol (building automation systems)	PLI (home lighting solutions)
		ColorKinetics (LED applications)
		Selecon (entertainment solutions)
		lite Luce (architectural indoor solutions)

Source: Philips

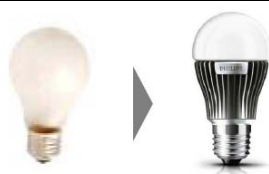
Philips and Agilent founded Lumileds as a JV in 1999 and Philips bought out its partner's share in 2005. This marked the beginning of a **€4bn acquisition spree in lighting**, focused mainly on LED downstream applications.

Philips: major acquisitions in lighting

€m		Net cash out	Net assets acquired	Other intangible assets	Goodwill	
Genlyte	2008	1,805	10	860	1,024	Lighting fixtures, controls and related products for residential and commercial applications
Color Kinetics	2007	515	(29)	187	357	Design and marketing of LED based lighting systems
PLI	2007	561	47	217	297	Home luminaires (acquired from CVC)
Lumileds	2005	788	(3)	268	523	LED components (50% acquired from Agilent)
Total		3,669	25	1,532	2,201	

Source: Philips

Retrofit LED light bulb



Source: Philips

Out of the ~€520m in LED-based lighting sales in 2009, 45% was represented by packaged LEDs (Lumileds*) and 55% by lamps and luminaires. Philips expects 2010 sales in the LED lamps and luminaire area to double in 2010.

The launch of a full range of retrofit LED light bulb in 2009 should enable the company to benefit from growth in the residential market. However with a 60 W incandescent equivalent bulb still retailing for around €50, this market will be slow to pick up.

Philips Lighting sales breakdown

% total	2008	2009
Lamps & lighting electronics	47	51
Professional luminaires	31	33
Consumer luminaires	6	6
LED components and modules (Lumileds)	4	3
Automotive/special applications	12	7
Total	100	100

Source: Philips

* Philips does not source all of its packaged LEDs from Lumileds. <50% of Lumileds sales go to Philips

Siemens/Osram: sitting on the fence

Number two in lighting behind Philips

Osram, a 100% owned subsidiary of Siemens, is the number two lighting supplier behind Philips. With FY2009 sales of €4.0bn (peak €4.7bn in FY2007), 39,000 employees (thereof 10,000 in China), 46 production facilities in 46 countries (as of 2008) the company sells its products in 150 countries. The company has been restructuring over the past years. 60% of manufacturing headcount, 40% of purchasing and 30% of R&D is now located in low cost countries.

Number two in LED chips

LED-based lighting represented over 14% of total divisional sales in the last quarter. Osram Opto Semiconductors claims the number two position in LED chip manufacturer behind Nichia and ahead of Cree. Siemens/Osram holds important IPRs together with Nichia, licensed it to others, e.g. Cree. Nichia has the license for blue light and Siemens holds the license for the coatings to transform blue into white light.

Management adopting a 'wait and see' approach to the LED market

Siemens is watching the development of the market before making any major moves, i.e. into the luminaire/fixture market. At the moment, management remains *skeptical about the mid-term margin opportunities in luminaires, given the risk of commoditization*. The company is also aware that increased Asian competition will push down margins on the semiconductor chip side over the medium term.

No plans to integrate Osram into Building Technologies

The plan to integrate Osram into Building Technologies (BT) has been put on ice. Management believes that there are more synergies between low voltage and BT than between lighting and BT (HVAC controls, fire safety and access control). Low Voltage was moved from Industrial Automation to Building Technologies at the beginning of the year.

Osram track record and NSR forecasts

€m	2006	2007	2008	2009	2010E	2011E	2012E	Management target
Sales	4,563	4,690	4,624	4,036	4,246	4,459	4,681	
EBIT	456	492	401	89	465	401	421	
% sales	10.0	10.5	8.7	2.2	11.0	9.0	9.0	10-12

Source: Siemens and New Street Research estimates

- Osram's EBIT margin has fallen from 10.5% in FY2007 to 2.2% in FY2009, which included charges of €58m (3.6% clean). The target margin range is 10-12%. 2008 sales were up 4% in 2008 and down 13% organic in 2009.
- Q1 FY2010 saw a recovery with sales up 6% organic and a margin of 13.5%. The division benefited from a) the recovery in autos (and the launch of new models) b) the strength in LEDs and c) a general market stabilization. The CFO has indicated that the division will see 'decent' margins in coming quarters, but not on the level of Q1.
- LED sales represented >14% of Osram's total sales in Q1. Given the high level of capital intensity, the company estimates a drop through level of around 80% on the strong volumes seen in Q1.
- LED demand is expected to remain strong for the next few quarters, but could start to slow down in Q4 2010. Following semiconductor business logic, the CFO believes that the industry may be benefiting from double ordering as customers want to secure supply.
- Around 50% of Osram's R&D budget (6% of sales) is spent on LED technology.
- Over the mid-term, Siemens expects the greatest market opportunity to be in retrofit bulbs (LED bulbs which fit into existing sockets). These are expected to drive the general shift into LEDs over the coming years.

- The latest generation of Osram LED lamps achieves a lifetime of 25,000 hours with a power input of 8 watts. 25 conventional 40-watt light bulbs would be needed to achieve the same burning life, each with an average lifetime of 1,000 hours.
- Over two thirds of Osram sales come from energy-efficient products, this will increase up to 80 percent within the next years.
- Management expect numerous new entrants to push margins down in the long-term; The more lighting moves to LED the more Asian, esp. Taiwanese or Korean companies will emerge.
- At the end of December, Osram set up a majority owned joint venture with Traxon Ltd (Hong Kong) to create and market integrated lighting solutions in the professional LED market.

Capacity expansion

Clean room in the Osram LED chip plant in Penang



Source: Siemens

In mid 2009, Osram inaugurated a 35,000-m² facility in Penang to manufacture 4-inch-wafer-based indium gallium nitride semiconductor chips. These chips form the basis for the blue, green and white LEDs primarily used in architecture and general lighting, for display backlighting and in mobile terminal devices. Osram Opto Semiconductors employs around 2,600 of its total worldwide workforce of 4,400 at the Malaysian facility. The new plant complements the main facility in Regensburg, Germany, which was expanded in 2008.

Osram applications

Automotive

Osram argued that the use of LED also increases driver safety. The Ostar headlamp LEDs fitted in the A8 illuminate the road surface with perfect definition, without glare, and they produce a **light similar to daylight**, which enhances perceptions of contrast. In the peripheral field of vision especially, i.e. where pedestrians, animals or poorly lit vehicles may suddenly appear at night, it is easier to recognize objects with white LED light. But even potholes, obstructions and worn road markings are much more visible thanks to the attributes of LED lighting. Another benefit is that the **colour temperature is close to that of sunlight**, so a driver's eyes will not tire so quickly. This technology has the potential to prevent numerous accidents caused at night.

Audi A8 LED headlight



Source: Siemens

OLED for luminaires

In November 2009, Osram launched its first OLED* light source (Orbeos), which the company claims is the first product on the market for designer luminaires. Orbeos promises, thin, non-glare and warm white light, matching the quality of incandescent light. This surface-emitting panel is especially suited to applications in the premium segment such as architecture, hotels and catering, offices, private homes and shops.

The Orbeos OLED panel has a round lamp surface of 80mm diameter, is only 2.1mm thick and weighs 24g, allowing for different usage options. With an efficiency of 25lm/W, the panel beats that of conventional halogen lamps. The system can be switched on and off without delay and is continuously dimmable. **Unlike LEDs, its heat management is simple.** The panel contains no mercury and emits no UV or infrared radiation. Its brightness level is usually 1,000cd/m² with power input of less than a watt. In ideal operating conditions the company claims a lifespan of around 5,000 hours.

** Organic LED: LED with an electroluminescent layer composed of a film of organic compounds. Advantages: thinner, lighter, draws less power, simpler heat management; ideal for use in TV and cell phone screens and now being adopted for general lighting.*

First application for designer luminaires

Focus on internationalization and expansion of LEDs

GE Lighting - looking to catch up

Having failed to secure a buyer for its lighting business over the past years, GE took the decision last year to keep the business. Management is now looking to benefit from the growth opportunities offered by the LED market, as highlighted in an interview with the European head of GE Lighting in the Handelsblatt (1st March 2010). Whilst highlighting the growth opportunities, GE stated that it expects more competitors to enter the LED market, including semiconductor and consumer electronics suppliers out of Japan, Korea, Taiwan and China. The company is currently looking for cooperation partners.

- 2009 sales of US\$2.3bn (€1.7bn). The division is reported under the GE Consumer & Industrial division and does not disclose detailed figures.
- 60% of sales in the US, 25% in Europe and 15% in the rest of the world. Target 50:50 sales distribution between the US and the rest of the world by 2011.
- 4% of sales invested in R&D (vs. 5-6% for both Osram and Philips Lighting), over 50% (~US\$50m) being invested in LEDs and OLEDs.
- 6% of sales with LEDs in 2009.
- Retrofit LED bulbs launched in 2009.
- **GE Lighting Solutions** is being formed through the combination of its light-emitting diode (LED) systems operation, **Lumination**, based at GE Lighting's headquarters in Cleveland, and the commercial and industrial **fixture group**, **GE Lighting Systems** in North Carolina. The aim is to offer integrated LED-based solutions.
- The company is looking for further cooperation partners. There is an existing strategic cooperation with Nichia.
- Power Paper and GE Global Research (the technology development arm for the General Electric Company) signed an agreement in December 2009 to jointly develop self-powered **OLED lighting devices**. Using low-cost, high-volume manufacturing processes, these devices could be deployed in a wide variety of environments from military ships to night-time jogging vests. The collaboration is supported by an Israel-U.S. Binational Industrial Research and Development Foundation (BIRD Foundation) program.

Nichia - number 1 in LED chips

Key patent holder for high brightness blue LED

Founded in 1956, privately-held Japan-based Nichia (5,100 employees, 2007 sales of US\$2.3bn) has grown in the field of manufacturing and sales of fine chemicals, particularly inorganic luminescent materials (phosphors). The company succeeded in developing and commercializing the **super high brightness gallium nitride blue LED in 1993**. Since then, nitride-based LEDs in different colors ranging from ultraviolet to yellow have been contributing to the diversification of LED application fields.

In addition to LEDs, a lot of resources are now being focused on the development of bluish purple laser diodes, which will play a key role for the further expansion of the information media industry. Management believes that Nitride-based semiconductors will become one of the most exciting areas of the semiconductor industry in the near future.

The company remains majority owned by the founding Ogawa family.

Nichia continues to aggressively protect its intellectual property rights in LEDs and over the past years has filed lawsuits against Shenzhen Jiawei in

China, Everlight in Taiwan and Seoul Semiconductors in South Korea, which resulted in a cross licensing agreement.

Cree - US pure play on LED market

Primary focus on LED components

US-based Cree focuses on LED chips and components and entered the US fixtures market (through the acquisition of LED Lighting Fixtures for around US\$80m in 2008) *only as a means to accelerate the deployment of LED-based solutions*. The company is focused primarily on LED components, but management believe it is **crucial to control the chip and materials technology** and that this provides the **competitive edge to continue to improve LED efficiency**.

Strong growth in sales and earnings over the past 6 months

H1 sales to the end of December rose by 38% and the gross margin reached 46%. Operating profit was up 3.5-fold, boosting the margin to 19.7%, which highlights the operational leverage in the business.

The company's capex budget is US\$240-260m for this year, representing 30% of consensus sales FY2010 (+45%). Expansion plans include a new LED chip factory in China. The company targets to exit this fiscal year with 3x the production capacity for LED components it had at the beginning of the year.

Wal-Mart contract could accelerate deployment in commercial market

The company booked a watershed order during the last quarter to equip **650 Wal-Mart stores with its LRP-38 LED light bulbs**. Cree believe that this order validates the fact the LED is ready for mainstream commercial applications. Wal-Mart has calculated energy savings of 82% and several other national chains are now looking at LED conversions. Retailers are talking about pay-back periods of 1-2 years.

Products being launched for residential markets

While 75% of the lighting market is driven by commercial/industrial lighting, Cree is also working on **building up a presence in the residential market** with the launch of the **CR6 downlight**, which should be available to customers through DIY channels retailing at US\$50 net of rebates and incentives. On LED retrofit bulbs, the company expects a broad roll-out across big box retailers in the US to take place in 2012. Management expect the ban of incandescent light bulbs in the EU to accelerate the process of conversion given the disadvantages of compact fluorescent light bulbs.

LED street lighting



Source: Cree

Other applications the company is focusing on include **street lighting** using its XLamp LED family. Management highlights that Anchorage, Alaska, achieved 75% energy savings and is converting all of its 16,000 street lights to LED. Los Angeles is planning to convert the majority of its 140,000 street lights to LED and has reported energy savings of 40% on the test units. In December 2009, China-based **Lioayuan Lighting** demonstrated a street lamp with close to 100 lm/W using Cree's XP-G LEDs and announced plans to start volume production for the Chinese market.

Cree highlights that the **LED market lacks an industry approach** and is still driven by an individual company developments. Through the development of components and closer cooperation with fixtures suppliers, the company is looking to develop a more coordinated industry approach.

- **LED chips** - competitors - Nichia (Japan) - largest market share for nitride-based LEDs - other competitors for blue, green and white LED products are Epistar (Taiwan), Samsung LED (South Korea), Toyoda Gosei (Japan). Key competitive factors: performance vs. price and strength of intellectual property rights - pricing pressure generally significant, but currently less pronounced given strong demand.

- **LED components** (high power or lighting class LED components): key competitors: Philips Lumileds, Nichia and Osram. Cree sells its 'XLamp LED' components to compete in this market. Other vendors include Avago Technologies, Edison Opto, Kingbright and Seoul Semiconductor.
- **LED lighting (fixtures)**: competitors include Acuity Brands Lighting, Cooper Lighting and Philips.
- Launched strategic alliance with Zumtobel in 2009 to introduce technology to European market. Cree sells only at systems level in the US - its core market - and is moving into Europe through this cooperation agreement.
- The bulk of sales are generated through distributors. The two largest customers were Seoul Semiconductor (13% of total) and Arrow Electronics (11%) in 2009.
- 40% of the company's sales are generated in China, where Cree is seeing a faster adoption of LED than in North America.
- The company holds 516 US patents with expiration dates extending to 2027.

Strong growth in H1 FY2010

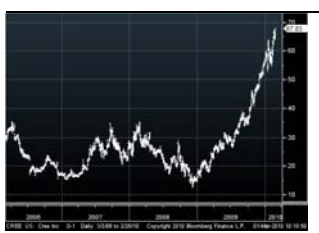
Cree key figures

US\$m, June year end	2007	2008	2009	2009 H1	2010 H1	% change
Sales	394.1	493.3	567.3	288.0	368.6	28
Gross profit	134.0	165.8	211.9	105.9	167.8	58
% sales	34.0	33.6	37.4	36.8	45.5	
R&D	58.8	58.8	71.4	35.7	39.5	11
% sales	14.9	11.9	12.6	12.4	10.7	
SG&A	58.5	94.9	109.9	54.0	55.66	
Operating profit	16.7	12.1	30.6	16.3	72.6	347
% sales	4.2	2.5	5.4	5.6	19.7	
Pre-tax profit	51.1	41.0	39.7	21.6	76.4	
Net profit (from continuing ops)	50.2	31.8	30.7	16.6	54.8	230

Source: Cree

- Consumer applications are starting to appear in big box retailers, but management believe that the first competitive products will not be available until 2012. Europe is moving quicker with the forced phase out of incandescent bulbs beginning in 2009. This will eventually leave the customer with only the choice between CFL (poor light quality, mercury content, often not dimmable) and LED bulbs, which offer most of the advantages of incandescent lighting. The company expects that the ban will accelerate the adoption of LED products even though the payback time is still at an unattractive level for many residential applications.
- The company's strong growth on both the top and bottom line has not gone unnoticed by the market. Based on current year estimated figures (June year end), the stock is trading on close to 8x sales and 34x EBIT.

Cree share price



Source: Bloomberg

Cree: punchy valuation

x	2007	2008	2009	2010E	2011E
EV/sales	5.3	3.6	4.1	7.8	5.8
EV/EBIT	126	149	75	34	23

Source: NSR calculations based on Bloomberg consensus forecasts

Toyoda Gosei

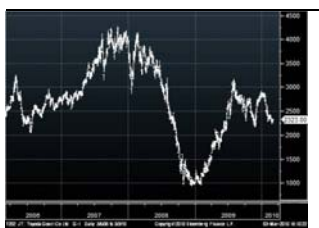
As a Toyota group auto parts supplier (42% owned by Toyota), Toyoda Gosei started developing gallium nitride (GaN) LEDs in 1986, working with Nagoya University and Toyota Central R&D Labs. Utilizing its macromolecule technologies, accumulated in the area of automobiles, the company developed blue LEDs (1991), green LEDs, purple LEDs and white LEDs, named "TG White Hi", which offer a high level of brightness.

In December 2009, Toyoda Gosei entered into a cross licensing agreement with Sharp for nitride based LEDs.

A cross-licensing agreement was signed with Osram in 2007 to get access to its broad patent portfolio covering technologies for industrial production of LEDs and laser based on Indium Gallium Nitride. Toyoda Gosei in turn provided access to a number of patents for blue LEDs. The company has signed other cross-licensing agreements over the past with Nichia, Tridonic, Cree and Lumileds.

Toyoda Gosei recently announced plans to boost LED production in the current financial year (through March) by 1.8x versus the FY09 level, reaching close to 3x the FY09 level by the next fiscal year.

Toyoda Gosei



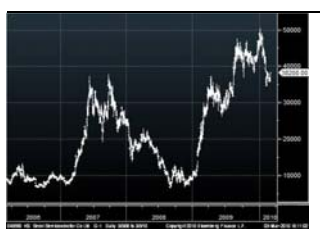
Source: Bloomberg

Seoul Semiconductor - growth driven

Founded in 1987, Seoul Semiconductor has generated annual sales growth of 18% p.a. since 2002 and aims to become one of the top three LED manufacturers. For 2008, IMS Research ranked the company fourth behind Nichia, Osram and Lumileds.

2009 sales reached US\$357m (2010 consensus forecast: US\$620m), EBIT US\$35m and capex amounted to, US\$16m. The main end market driver at present is TV backlighting.

Seoul Semiconductor



Source: Bloomberg

Strategic partnerships

- Cree - white LED license and long term chip supply agreement
- Toyoda Gosei - strategic business cooperation
- Osram - white LED and visible housing patent and white LED cross license agreement
- Nichia - cross-licence agreement

On 1 February, the company announced the launch of the first 100lm/W AC LED light source under the Acriche brand, which claims to offer 25% greater efficiency than current products. The company has spent US\$20m on development and marketing of the Acriche product range in the US so far.

Luminaire/fixtures suppliers

The growth in LED is attracting many new players to the luminaire market. The US Department of Energy's sponsored annual LED luminaire design competition in February this year saw 126 entries from **60 different companies**, many of which are small start-ups (incidentally, the four winners were Finelite, Specstite, GE Lighting and Philips).

Given rising R&D costs, Zumtobel (which has spent €100m on LED applications since 2001) expect the European market to consolidate. Below is a brief summary for some of the major players.

Acuity Brands - market leader in US

Acuity Brands: key figures

US\$m	2005	2006	2007	2008	2009
Sales	1,638	1,841	1,965	2,027	1,657
EBIT	67	152	222	261	154
% sales (target: >12%)	4.1	8.3	11.3	12.9	9.3

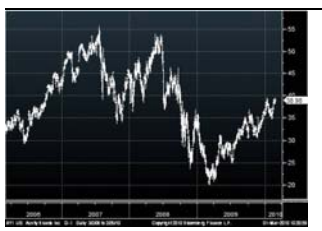
Source: Company

Acuity is the number 1 fixtures and controls supplier in the US with a claimed market share of around 17% in 2009. Management estimate that the top four (Acuity, Philips, Hubbell and Cooper) hold over 50% of the US lighting fixtures and controls market.

At the end of January, Acuity and Samsung LED Co. announced a collaboration in the field of LED lighting, designed to accelerate the adoption of LED lighting technologies. Samsung LED (established in April 2009) has been highly successful in backlighting for flat screen TVs and is now looking to expand into general lighting.

The company's largest customer was Home Depot (accounting for 11% of both 2009 and 2008 sales). 89% of the group's sales are in the US.

Acuity Brands share price



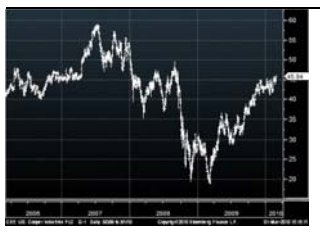
Source: Bloomberg

Acuity brand portfolio



Source: Acuity Brands

Cooper share price



Source: Bloomberg

Cooper Industries - diversified electrical supplier

Cooper Lighting generates annual sales of around US\$1.1bn, of which around 80% in the US. The company aims to globalise its business and benefit from energy efficiency upgrades where the company is focusing on growth opportunities in controls and LED.

Over 50% of sales are into the commercial sector, around 25% in residential (Halo: no 1 recessed lighting brand) and the remainder into industry and roadways, where the company claims the broadest LED offering in the industry. Cooper buys in the LEDs from Nichia, Lumileds and Cree and focuses on applications - thermal and optical controls - as well as design.

In 2009, Cooper increased the number of solutions from 10 to 200 for commercial applications.

The company does not break out sales and earnings for the Lighting, which is reported under the Electrical Products division and represents around 25% of its sales. In Q4, Electrical Products generated sales of US\$1.1bn with an operating margin of 15.5%.

Electrical Products consists of power systems (transformers, utility automation and reliability products), safety (e.g. emergency lighting), wiring devices and lighting.

Hubbell share price



Source: Bloomberg

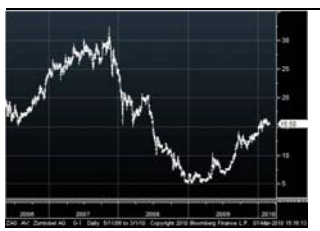
Hubbell - single source supplier across the electrical market

Similar to Cooper, Hubbell is active across various electrical end markets, including T&D, wiring devices and lighting. In Lighting the group offers a wide range of fixtures for commercial, industrial and residential applications with over 20 different specialised brands. The company is active in lighting controls and supplies through three separate brand (Bryant, Hubbell Building Automation and Hubbell Wiring Device-Kellems) dimmers, sensors and timers.

Lighting (figures not disclosed) forms part of the Electrical segment, which generated sales of US\$1.65bn in 2009 with a margin of 9.9%, down from 11.6% in 2008.

Diversification of product and market provides the company with the advantages of flexibility and the benefits of counter-cyclical markets and enables the group to provide its customers with a **single source of supply** for new construction, modernization, or rehabilitation.

Zumtobel share price



Source: Bloomberg

Zumtobel - number one/two in Europe

With a market share of around 10%, Austrian-based Zumtobel is the number one/two in Europe behind Philips. With sales of €1.2bn in FY09 (April year end), the company generates close to 80% of its sales in Europe.

The group's adjusted EBIT margin peaked in FY08 at 9.6% and fell to 6.7% in FY09. In H1 of the current year (the seasonally stronger half of the year), the margin reached to 8.2% on a clean basis, down from 9.4% in the prior year period. While H1 sales were down 7.8% organic, revenues of LED based products jumped by 58%.

Cross-licensing agreement with Philips

In May 2009, Zumtobel and Philips signed an extensive worldwide cross-licensing agreement covering in particular **driver and control technologies** for changing intensity and colour of conventional and solid state lighting systems. As a result of this agreement, Zumtobel has become a **qualified supplier under the Philips LED-based luminaires licensing programme** and customers of Zumtobel's OEM brands will be exempted from paying royalties

to Philips. Zumtobel was able to license some of its electronic ballast IP for conventional lighting to Philips (€7m one-off licensing revenue recognised in H1 FY10). According to management, this cash inflow should **offset all expected revenue-based payments to Philips over the coming 10 years.**

Intensified cooperation with Cree

In order to further expand the range of LED products, Zumtobel intensified the cooperation with Cree in 2009 that was started in spring 2008. The cooperation agreement allows Zumtobel to adapt a Cree downlight for the European market and to sell this product in Europe and selected export regions exclusively under the Zumtobel and Thorn brand names. Zumtobel will therefore be in a position to market LED luminaires with new and what the company believe to be unique technological properties.

Strategic partnership with Toyoda Gosei

The existing strategic cooperation with Cree provides Zumtobel with continued access to - in its view - the most efficient high-performance chips. This cooperation agreement complements the strategic partnership with Toyoda Gosei in the low and middle performance segment.

Pharox LED lamp



Source: Lemnis Lighting

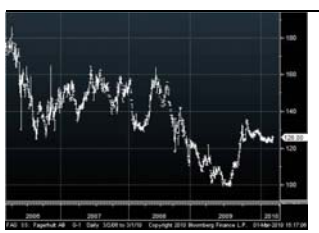
At the end of January 2010, Zumtobel announced that it is entering the LED lamp business with the founding of LEDON Lamp GmbH. The product range will focus on “retrofit” lamps, LED lamps designed to look like and replace all conventional incandescent light bulbs (e.g. with E14 or E27 screw caps). Sales of these high-tech LED lamps will be through retail outlets (e.g. DIY stores) and sales partners across Europe.

At the same time, the company concluded a development partnership agreement with Dutch-based Lemnis Lighting (*set up in 2005 by the two great grandsons of Anton Philips, the founder of Philips*), which specialises in LED-based lighting solutions and markets various LED retrofit lamps (25 and 45 W) under the Pharox brand name. In line with the agreement, Lemnis and LEDON will jointly develop a full-line portfolio of technologically advanced and high quality LED-based lamps (60, 100 W, dimmable) for residential and professional use. The current products retail for around €25-27. Zumtobel believe that for LED lamps to become really competitive with CFL lamps, the retail price will need to fall below €10. The company expects this to be the case by 2015.

Fagerhult - leader in the Nordic region

Fagerhult is the largest lighting group in the Nordic region with sales of SEK2.4bn in 2009 and around 1,900 employees. The group aims to become ‘one of the largest players’ in the European lighting market through internal and external growth.

Fagerhult share price



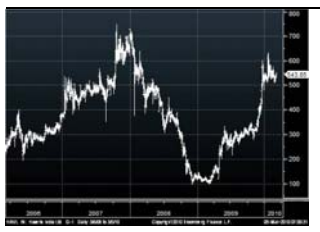
Source: New Street Research estimates

With sales down from SEK2.8bn in 2008 to SEK2.4bn in 2009, the EBIT margin fell from 9.8% (peak level) to 4.3% (5.7% clean), which included costs of SEK35m to close two European plants. Production is being relocated to existing plants in Europe and to the company’s plant in Suzhou, China.

Professional Lighting, representing around three quarters of group sales, saw a margin decline from 10.6% to 6.6% (7.7% clean). Retail Lighting (sales down 32%) fell from a margin of 10.9% in to a loss. Outdoor Lighting’s margin fell from 1.7% to break-even pre restructuring charges.

Havells India - diversified electrical supplier

Havells India Ltd



Source: Bloomberg

Founded in 1971, Havells manufactures a broad range of electrical equipment, such as lighting (lamps and luminaires), low voltage equipment, wiring devices, cables and wires. The group owns several well established brands, such as **Crabtree, Concord, Luminance, Linolite and SLI Lighting**. In 2007, the company acquired **Sylvania** from private equity owners for €200m (EV). The deal included brand rights for all markets excluding the US, Canada, Australia and New Zealand, which are owned by Siemens.

The Havells group generated sales of €843m in FY2009 (March), of which 42% from India, 42% from Europe (70% of Sylvania) and 16% from the Americas (27% of Sylvania). The company is targeting growth in China, the Asean region and Latin America. EBITDA margins for 2009 reached 5.0%, with Havells, the Indian operation, contributing 9.2% and Sylvania 2.3%.

Strong growth and margins in India...

In **India**, the company has generated compound annual sales growth of 40% p.a. over the past 10 years with an average ROCE of around 30%. The **Lighting and Fixtures** division (14% of sales) generates a contribution margin of 20%. In **lamps** the company has a market share of around 9% behind **Philips** and ahead of **Osram**. In **luminaires** the group ranks fourth with a market share of around 10% behind **Philips, Bajaj and Crompton Greaves**. Switchgear (domestic, industrial and wire accessories) contributes 29% to sales and generates a contribution margin of 37%. Havells ranks **first in domestic switchgear** with a market share of 20% ahead of **Legrand and Schneider**, fourth with a market share of 8% in industrial switchgear behind **L&T, Siemens and Schneider** and **second in wiring accessories with a market share of 11%** behind **Anchor Electricals (Panasonic)**.

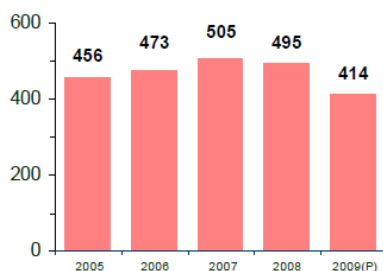
For the first 9 months through December 2009, sales and EBITDA for Havells Indian business grew by 9% and 68% respectively, raising the margin from 8.3% to 12.8%. This was driven by a reduction in the fixed cost base, better price realisation and lower raw material costs. Lighting sales were up 23% and Switchgear rose by 15%.

... but Sylvania loss-making and being restructured

Outside of India, Havells ranks 4th in the lamps business through **Sylvania**, which generated sales of €414m in calendar 2009. The business was loss-making (negative EBITDA of €36m in 2009) and, following a covenant breach in September 2008, a restructuring plan was agreed with lenders in August 2009. A long-term bank facility of €120m was made available through 2013.

The €22m restructuring programme aims to reduce the break-even level and includes the outsourcing of production to China and India. Management expect the full benefits in 2011 which should result in incremental gross margins in excess of 25%. The gross margin in 2009 was 21.1%, down from 23.4% in 2008.

Sylvania sales development (€m): 2009 sales down 18% from 2007 peak



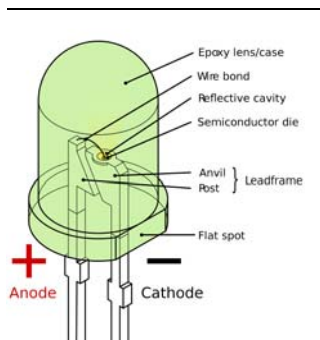
Source: Havells

The company's market capitalisation is around €500m. Based on the consensus forecasts for March 2011, the company is trading on a PE of 15x. The founding shareholders own 60% of the capital.

Appendix: LEDs Advantages/disadvantages

Advantages

LED



Source: Wikipedia

- **Efficiency:** LEDs produce more light per watt than incandescent lamps. **Energy consumption is reduced by up to 80%** versus an incandescent lamp and by around 50% versus a compact fluorescent lamp. Incandescent lamps convert only 5% of the electricity consumed into actual light, with most of the remaining 95% being turned into heat.
- **Lifetime:** LEDs can have a relatively long useful life, with estimates ranging from **35,000 to 50,000 hours of useful life**. Fluorescent tubes typically are rated at about 10,000 to 15,000 hours, depending partly on the conditions of use, and incandescent light bulbs at 1,000-2,000 hours.
- **Color:** LEDs can emit light of an intended color without the use of color filters that traditional lighting methods require. This is more efficient and can lower initial costs.
- **Size:** LEDs can be very small (smaller than 2 mm²) and are easily populated onto printed circuit boards.
- **On/Off time:** LEDs light up very quickly. A typical red indicator LED will achieve full brightness in LEDs used in communications devices can have even faster response times.

Cree LED LR4 downlight



The LR4 ships as three components — a housing, light engine and reflector.

Source: Cree

- **Cycling:** LEDs are ideal for use in applications that are subject to frequent on-off cycling, unlike fluorescent lamps that burn out more quickly when cycled frequently, or HID lamps that require a long time before restarting.
- **Dimming:** LEDs can very easily be dimmed either by Pulse-width modulation or lowering the forward current.
- **Cool light:** In contrast to most light sources, LEDs radiate very little heat in the form of IR that can cause damage to sensitive objects or fabrics. Wasted energy is dispersed as heat through the base of the LED.
- **Slow failure:** LEDs mostly fail by dimming over time, rather than the abrupt burn-out of incandescent bulbs.
- **Shock resistance:** LEDs, being solid state components, are difficult to damage with external shock, unlike fluorescent and incandescent bulbs which are fragile.

Philips retrofit LED lamp



Source: Philips

- **Focus:** The solid package of the LED can be designed to focus its light. Incandescent and fluorescent sources often require an external reflector to collect light and direct it in a usable manner.
- **Toxicity:** LEDs do not contain mercury, unlike fluorescent lamps.

Incandescent lights: 5,135 W*



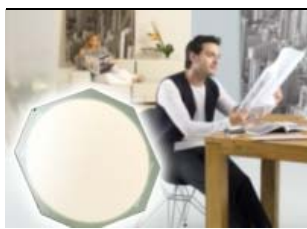
Source: Cree * total power in watt

LED lighting: 948 W



Source: Cree

Osram OLED lighting panel



Source: Siemens

Disadvantages

- **High initial price:** LEDs are currently more expensive, price per lumen, on an initial capital cost basis, than most conventional lighting technologies and (with the exception of LED retrofit lamps) the entire luminaire needs to be replaced. The additional expense partially stems from the relatively low lumen output and the **drive circuitry and power supplies needed**. Cree provides payback calculator on its website (www.creeledlighting.com) e.g. for the LR6 down-lighting system. For applications with high average daily hours of use (e.g. 14 hours), the payback can be less than two years. Using 6 average hours, the payback is currently still over four years, which for main consumers is still too long. For commercial applications, however, paybacks can be as short as 1-2 years.
- **Temperature dependence:** LED performance largely depends on the ambient temperature of the operating environment. 75 to 85% of the total energy running through the LED is converted into heat that needs to be conducted through a PCB (printed circuit board) and heat sink. Over-driving the LED in high ambient temperatures may result in overheating of the system, eventually leading to device failure. Adequate heat-sinking is required to maintain long life. This is especially important in automotive, medical and military applications where the device must operate over a large range of temperatures, and is required to have a low failure rate.
- **Voltage sensitivity:** LEDs must be supplied with the voltage above the threshold and a current below the rating. This can involve series resistors or current-regulated power supplies.

OLED

- **Organic LED:** LED with an electroluminescent layer composed of a film of organic compounds.
- **Advantages:** thinner, lighter, draws less power, simpler heat management; OLEDs can be printed onto any suitable substrate.
- **Disadvantages:** emits less light for a given area than LED, lower lifetime.
- **Ideal for use in TV and cell phone screens** and now being adopted for general lighting (c.f. Osram's new Orbeos OLED lighting panel).

Source: Wikipidia and companies

EU phase-out of high energy consuming lamps between September 2009 and the end of 2016

Phase	Lamps to be phased out
1st Sept 2009	- Non-clear incandescent and halogen lamps (opal, white, frosted etc...) - Compact fluorescent lamps in energy efficiency class B - Class F and G lamps - Clear incandescent lamps ≥ 100W - Halogen lamps ≥ 75W in classes D and E (excluding lamps with cap-base G9 and R7)
1st Sept 2010	- 75W clear incandescent lamps - 60W halogen lamps in classes D and E
1st Sept 2011	- 60W clear incandescent lamps - 40W halogen lamps in classes D and E
1st Sept 2012	- 25 and 40W clear incandescent lamps - 25W halogen lamps in classes D and E
1st Sept 2013	- Lamps with cap-bases S14, S15 and S19
1st Sept 2016	- Class C lamps (excluding lamps with capbases G9 and R7)

*This information is provided for reference purposes only and is subject to change

Source: Philips

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