

## **Goodnight light bulb**

### **The Swedish Energy Agency's guide to the new light**

#### **The world in a new light**

Perhaps you are sitting under one at this very moment. Most likely you have several in the room and on average, there are 42 of them in your home. I am of course talking about your light bulbs.

It is now, during the darkest time of year, that we need light the most. We use lamps to be able to see, to feel good and to create an atmosphere. But this lighting comes at a price; it uses a lot of electricity. And some lamps use more electricity than necessary. The old light bulb for one. Out of all the electricity it used, only 10 per cent generated light and the rest became heat. For this reason, all the EU countries have agreed, through the ecodesign directive, to disallow the selling of this light bulb. The ecodesign directive is, to put it simply, a way to get rid of the products that waste the most energy, and that includes the light bulb. These products are costly for the consumer and also bad for the climate.

The fact is that our lamps are closely linked to the climate. Lighting represents 20 per cent of the global electricity usage and the electricity used to power all the world's lamps is mainly produced by energy sources that raise the Earth's temperature. We need light, but we need it to be a new kind of light using modern technology, which also provides us with greater opportunities.

At the Swedish Energy Agency we strive to make us as a country use our energy more efficiently. We do this by supporting energy efficient technology and by cooperating with other countries and all the municipalities in Sweden. We give concrete advice on how to conserve energy to companies and private individuals like you.

In this magazine, we want to tell you about the incredibly exciting shift in technology that lighting is presently going through; how your kitchen lamp is

connected to the climate; and how inviting your home can become using new energy efficient lighting in creative ways.

And so we say: Goodnight light bulb - good morning new light

Anita Aspegren  
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## **Ecodesign will save three times Sweden's electricity use each year**

The light bulb requires an excessive amount of energy to do its job. It is not the only one. There are television sets that use too much, as well as chargers and ventilation fans. Since there are now better alternatives, the products wasting the most energy are forced off the market by the EU directive. Thus far, ecodesign requirements have been put on 13 product groups and more will follow.

These 13 product groups, for which the EU has set requirements for ecodesign and energy labelling, will help us conserve 383 TWh per year by 2020. This is close to the amount of electricity that Sweden uses each year times three\*. The decision to phase out the light bulb alone decreases the energy use by 39 TWh per year.

\* Sweden's electricity usage in 2010 was 132 TWh.

## **Our home should feel inviting**

Eva and Magnus Häll live on a farm in Ramstena outside Örebro, along with their two children and a cuddly cat. Inside the house, 3-year old Elsa is thrashing over the thresholds on a pink scooter while her older brother Olof is intently listening to the adults.

The Häll family home is warm and cosy, with antique furniture, candles and small lamps in the windows. Two experts advise the family on ways to conserve energy without affecting the nice atmosphere in their home.

The family gets a visit from Karin Fant from the Swedish Energy Agency and the light designer Natalie Bell, who reviews the lighting in the house and makes suggestions for improvements. The new technology obviously gives us new possibilities.

- It is now possible to choose a lamp with a cold or warm glow depending on your needs and mood and what atmosphere you wish to create in the room. The best thing is to try different ones, since the lamp shade also affects the light, says

Natalie Bell who teaches at the Lighting Laboratory, School of Technology and Health, at the KTH Royal Institute of Technology.

A tour of the house shows that Eva and Magnus already have made a lot of progress in reducing their energy costs for lighting. Eva loves antiques and many of the families electric fittings are really old. Despite this, most of them are fitted with low energy bulbs, well hidden by fabric shades with fringes and rounded glass shades. They have had no trouble making the new technology fit the old sockets. The only thing on their conscience seems to be that a few of the small lamps in the windows are lit all day long.

- I want the house to look inviting when I get home at night, says Eva, and is advised to put timers on the lamps. This proves an easy task as the couple already has a few timers which they use for the Christmas lights.

Magnus retrieves a few low energy bulbs from the storage room and Karin Fant points out a number of differences. On some of them, the folded fluorescent tube is fully visible and others have an outer glass casing that hides the bulb, making it look a lot like a regular light bulb.

- The casing gives a softer glow, but also removes some of the light. The visible tube is the most energy efficient, says Karin.

### **"It is now possible to choose a lamp with a cold or warm glow"**

- Read the information about the light bulb's properties on the packaging carefully, and then try a few different ones, Karin suggests.

She continues by saying that it is always an overall gain to switch the light bulbs. The low energy bulbs and the LED lights - Light Emitting Diodes - can seem expensive since the unit price is still fairly high. But this higher cost is counterbalanced by the fact that the modern lamps last for a significantly higher number of hours and use less energy.

- It is advisable to write the date on the socket with a marker, that way you know when it was put in, and always save the receipt. If a lamp does not live up to its promised standard, you can return it where you bought it, Karin says. Her advice is to talk to the municipal energy and climate advisor if you have any questions on energy efficient lighting. The purchasing is best done in a lamp store where you can see what the bulb looks like in a fitting.

- When it comes to low energy light bulbs or LED lights it pays off to buy good quality, says Natalie.

Of course, your own behaviour also affects how high the costs become. The traditional advice to turn off the lights when you leave a room and not keep them on at night still applies.

- I turn them on and you turn them off, Magnus says to Eva who laughs in recognition.

She likes it cosy and candlelit whereas he wants to be able to see what he is doing. On the other hand, he is better at turning off the lights in empty rooms. Later, during a coffee break on the newly built veranda, Eva sees an opportunity to ask the experts what kind of lighting would be suitable out there. Maybe a hanging ceiling light?

- Well no, when the light is directed downwards, it puts focus on the floor. It is nicer to be met with lamps that light up the walls around the door when you come home, says Natalie, and then talks about how the shape of the veranda could create beautiful shadows on the walls of the house.

Eva and Magnus get a lot of new ideas on the way light and shadows fall, and Natalie commends them on not routinely having all the lights on inside the house. Cosy lighting saves energy!

## **The experts' best advice:**

### **The kitchen**

Work surfaces such as the sink and stove require good lighting, preferably energy efficient fluorescent tubes, or a LED light strip that take up little space underneath the cupboards. The Häll family has separate switches for all light sources. This means that they can turn on the light in the place where they need it.

### **The living room**

Arrange your furniture as to take advantage of the natural light, for example by putting your reading chair next to a window. Soft lighting is more relaxing than sharp lighting, and cheaper as well. Small lamps at different levels highlight the space and depth of the room.

### **The wardrobe**

In this space it is a good idea to have automatic lighting that turns on and off as you go in and out. This type of lighting is also practical to have in the cellar and laundry room.

### **The bedroom**

If you try on clothes in the bedroom, you need lamps that provide good colour rendering. Look at the Ra label on the box. The closer to Ra 100, the more correctly you will see the colours of the clothes.

### **A child's room**

Consider what the child wants to see and light the room accordingly. A warm glow will create a safer feeling than a cold one. If you have a night light, put it at eye level at some distance from the bed. The child can then see the whole room and get orientated when waking up.

### **The garden**

Let the natural light guide the outside lighting. Go for light sensors or low energy lamps with twilight switches built into the socket for your existing fittings. The light sensors are the best option if you only need light as you pass by.

## **This is how much you save**

### **The halogen lamp**

**Saves 30 - 50 %**

The halogen lamp gets its name from the halogen-filled capsule that encloses the filament. Today you can find halogen lamps that look exactly like the light bulbs they replace, including chandelier bulbs. They have 2 – 3 times the life span of a regular light bulb.

### **The low energy lamp**

**Saves 75 - 80 %**

The low energy lamp could be described as a light bulb, folded several times, with or without a casing. On average it uses 75-80 per cent less electricity than a regular light bulb. It also lasts up to ten times longer.

## **The LED light**

### **Saves 85 %**

Light Emitting Diodes, more commonly known as LED lights, are developing rapidly. They are predicted to become the most energy efficient lighting alternative. They last up to 25 times longer than a regular light bulb. They do not contain any mercury.

## **Lighting around the country**

### **Energy efficient night lights become more and more common**

Did you know that 25 per cent of the municipality's costs for operation and maintenance is spent on street and park lighting? Due to this fact, Gästorp municipality decided to replace all the fittings on both street and park lights. There were of course quality requirements since the light contributes to the safety in parks, tunnels and crossings.

Using new and more precisely directed low energy lamps, they lowered the electricity cost by 62 per cent while the lighting in certain locations was even improved.

### **Sport facility lighting at the highest level**

It is possible to save up to 35 per cent of the energy usage for public pools, sports and combination facilities. This has been proved by Bengtsfors sports hall, which presently holds the title. In this location, there is an intelligent light control system which regulates the light level depending on what is going on in the hall. On a regular training night, the lights are a little bit lower compared to the lights at high-level games.

Using this intelligent control system, Bengtsfors sports hall ends up saving 60 per cent of their lighting costs.

### **New lights lead to double profit**

The lighting in a shop is not just for "brightening up". It should also make the customers feel comfortable at the same time as providing the merchandise an as selling exposure as possible. In connection to remodelling, a grocer's in south Stockholm made an investment for the future. Instead of fluorescent lights and spots, they went with modern fittings and a special type of high pressure sodium-vapour lamps for accentuation lighting.

The lighting is more comfortable but also more selling now, while the energy usage has decreased by 200,000 kWh/year – which when recalculated in terms of finances constitutes a saving of SEK 250,000 each year.

### **This is how your electricity is distributed at home:**

Lighting 26 %  
Home electronics 26 %  
Refrigerator and freezer 22 %  
Other 26 % (laundry, dish washing, cooking, etc.)

### **Venture a win-win weekend**

As you can gather from the previous paragraph, the lamps and electronics consume the most electricity in your home. The refrigerator and freezer come second. But you can easily decrease your electricity usage without complicating your everyday life. Devote one weekend and profit from it for years to come.

#### **Friday night**

As it becomes dark, check which ten lamps that you keep lit most often. If you switch ten of the light bulbs in your home for energy efficient lighting you can decrease your electricity cost by SEK 600 a year. One good tip is to always save your receipts for lamps. If a lamp does not meet the promised standard, take it back to the shop.

#### **Saturday**

TV, computers and home entertainment use a fourth of the household's electricity. A field study done by the Swedish Energy Agency shows that a lot of people leave their TV or computer on even when it is not being used. Just developing a habit of always turning off appliances at night would save a lot of energy. Energy labels show how much electricity is used by an appliance. Such labels can be found on major appliances and lamps and more recently also on television sets. When you need to buy a new product, the energy label can help you save a lot of money and energy in the future. The principal is simple. The greener, the more energy efficient. Red is the least efficient. It pays to compare. One TV might use more than twice as much electricity as another one with the same picture quality, according to tests made by the Swedish Energy Agency.

## Sunday

Start your energy trimming Sunday by putting a thermometer in the freezer. If it turns out to be colder than 18 degrees below, raise the temperature. Then place the thermometer in a glass of water in the refrigerator (the reading will be more accurate in the water). If it turns out to be colder than 5 degrees, raise the temperature. For each decrease by one degree, the freezer and refrigerator's electricity usage increases by 5 per cent.

## Remember

Light inventory  
Turn off at night  
Energy labelling  
Measurements refrigerator and freezer

## The right Christmas lights make a huge difference

An 11-armed candlestick with regular light bulbs will use 43 times more electricity than the same candlestick with LED lights. This is shown in a test conducted by the Swedish Energy Agency's test lab.

Another test shows that if one million households were to choose LED lights instead of regular light bulbs in one "advent star", one strand of fairy lights and one Christmas decoration each, we would save 41,000,000 kWh, which is equivalent to the electrical heating of 2,700 houses for an entire year\*.

If you want to learn more about the Swedish Energy Agency's tests, go to [energimyndigheten.se](http://energimyndigheten.se) where you will find close to 40 different tests, ranging from "advent stars" and low energy lamps to solar cells.

\*The calculation is based on the assumption that the lights are turned on around the clock for a month, and that a house uses 15,000 kilowatt hours of electricity in a year.

## The lighting guide

### Reading lights

Choose a low energy lamp or LED light, 430 – 1000 lm/2700 – 4000 K. If you have a fitting for a halogen reflector lamp, there are efficient options of halogen, LED and some low energy lamps that would fit.



**Dinner lighting**

Choose low energy lamps, 430 – 800 lm/2500 – 3000 K. choose 1000 lm for even stronger light. Should you want to be able to dim the lights for a romantic candlelit dinner, choose a halogen lamp. Some dimmable LED lamps with a high luminous flux would also work.

**General lighting**

Choose low energy lamps, 430 – 800 lm/2500 – 3000 K. If you have halogen spotlights in the ceiling, they can be replaced with efficient halogen lights. The LED technology is developing rapidly, so be on the lookout for new LED products.

**Work lighting**

Choose low energy lamps, LED lights or a compact fluorescent tube, 430 – 1000 lm/2500 – 4000 K.

**Bathroom lighting**

Choose low energy lamps, 430 – 800 lm/2500 – 3000 K. choose 1000 lm for even stronger light. In terms of make-up lighting, a halogen or LED lamp with a warm white or white glow is preferable (up to 4000 K). There are efficient halogen and LED options to replace halogen spotlights.

**Cooking lights**

Choose low energy lamps or fluorescent lights with good colour rendering, 750 – 1000 lm/2700 – 4000 K.

**Dimmer lights**

All halogen lights may be dimmed. Most LED lights are dimmable as well. A few types of low energy lamps can be dimmed, but the colour of the light will change when dimming it down.

**Mood lighting**

Choose low energy lamps or LED lights, 125 – 470 lm/2500 – 3000 K. most LED lights also work with a dimmer.

## Terms and concepts

### Lumen (lm) measures the luminous flux

Lumen (lm) measures the luminous flux of the lamp, i.e., the total amount of visible light emitted by the lamp.

### Watt (W) measures power output

The more watts, the more energy the lamp is using when lit. In a regular light bulb, only 10 per cent of the energy is converted into light whereas the remainder turns into heat. In efficient halogen lamps, low energy lamps and LED lights, more of the energy is converted into light. This means that you can replace a 60 W light bulb with a low energy lamp of 11-13 W and still get the same luminous flux.

### Kelvin (K) gives the colour temperature.

The colour temperature (colour of the light) is measured in kelvin (K). The most common colours of light are called warm white and white. A higher colour temperature is often perceived to create a better colour rendering and visual acuity. The higher the colour temperature, the colder the light.

### Ra gives colour rendering.

Ra (Rendering average) is the measurement for how well colours are rendered in the light from a certain lamp. The highest value possible for a lamp is Ra 100. All household lamps must presently have a value of at least Ra 80.

## From watt to lumen

Regular light bulb (W)	Low energy, halogen and LED*
15 W	120-135 lm
25 W	220-250 lm
40 W	410-470 lm
60 W	700-805 lm
75 W	920-1055 lm
100 W	1330-1520 lm
150 W	2140-2450 lm
200 W	3010-3450 lm

\* approximate values Not applicable to reflector lamps. The span is due to the fact that different types of lamps give slightly varying values. However, these variations cannot be seen by the naked eye.

## **Do you want to know more about how to make your home more energy efficient?**

Contact the energy and climate advisor available in all Swedish municipalities.

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