



Baltic Sea Region  
Programme 2007-2013

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and European Neighbourhood and  
Partnership Instrument)

Co<sub>2</sub>olBricks

## WP5 Education and Economic Promotion

# Home energy saving devices, Energy saving light bulbs, Daylight controlled lighting

Educational product: New lecture material for training modules dealing with knowledge and skills how to apply suitable methods of energy efficient refurbishment of historic constructions and how innovation can be combined with cultural heritage



## Home energy saving devices, Energy saving light bulbs, Daylight controlled lighting

**Target group:** energy audit students

**Educational objectives:** To inform about different types of devices and show their importance in energy saving.

This measure can help to save up to 2% of total energy used in building

**Lecture course:** 2 academic hours

### **References:**

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## Technical devices for energy saving

Electrical components in buildings use significant amount of total used energy. Figure 1 shows the usage of energy for different purposes in buildings Europe and the potential to save energy.

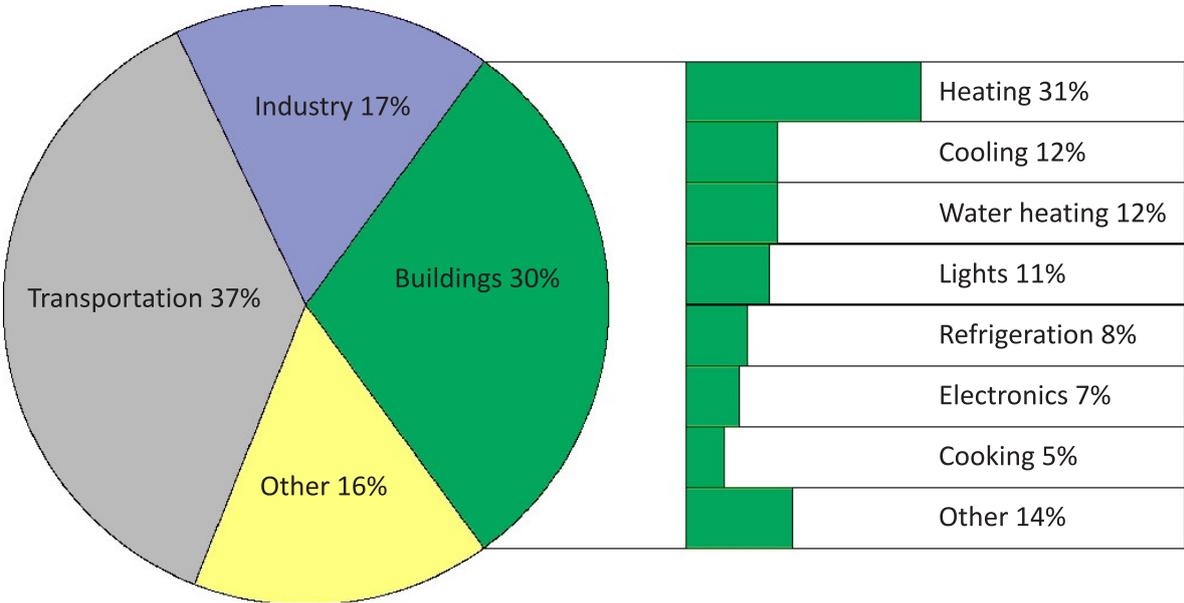


Fig. 1. Energy consumption in general and in buildings of European countries [22-24]

There are some typical ways to save energy in the buildings. Changes in habit influence energy use mostly, but energy can also be saved by using energy saving gadgets – battery chargers, LED lamps, multiple sockets, timers, demand controlled ventilation and lighting, home automation and smart applications.

## Battery Charger

Rechargeable batteries are more cost effective than throwaway batteries over the long term. They also reduce overall energy consumption and toxic landfill clutter, because fewer new batteries need to be manufactured and fewer old batteries are thrown out. Older battery chargers draw power even when they are not actively charging batteries, so unplug them when they are not in use. If you change from an old to a new charger, it uses about 35 percent less energy than the older one.



## LED lamps

LED lamps offer long service life and high energy efficiency, but initial costs are higher than those of fluorescent and incandescent lamps. Chemical decomposition of LED chips reduces luminous flux over life cycle as with conventional lamps.

Commercial LED lighting products use semiconductor light-emitting diodes.

LED lamps can be made interchangeable with other types of lamps. Assemblies of high power light-emitting diodes can be used to replace incandescent or fluorescent lamps. Since the luminous efficacy (amount of visible light produced per unit of electrical power input) varies widely between LED and incandescent lamps, lamps are usefully marked with their lumen output to allow comparison with other types of lamps. LED lamps are sometimes marked to show the watt rating of an incandescent lamp with approximately the same lumen output, for consumer reference in purchasing a lamp that will provide a similar level of illumination. Efficiency of LED devices continues to improve, with some chips able to emit more than 100 lumens per watt. The efficiency of conversion from electric power to light is generally higher than for incandescent lamps. Since the light output of many types of light-emitting diodes is small compared to incandescent and compact fluorescent lamps, in most applications multiple diodes are assembled. LEDs are degraded or damaged by operating at high temperatures, so LED lamps typically include heat dissipation elements such as heat sinks and cooling fins.



- 11% of the home energy budget comes from lightning.
- LED light bulbs last up to 10 times as long as compact fluorescents, and far longer than incandescent light bulbs.
- LED light bulbs produce 3.4 btu's/hour, compared to 85 for incandescent bulbs.
- LED light bulbs use only 2-17 watts of electricity (1/3<sup>rd</sup> to 1/30<sup>th</sup> of Incandescent).

## Multiple socket

A multiple socket is receptacles assembled in one box. The power switch also gives a signal if the multiple sockets are loaded with voltage. To protect technical devices (such as TV etcetera), the multiple socket is supplied with over voltage protection. Because of the power switch, energy saving is possible.



## Timer

The timer blocks the equipment by a preset time, and so also increases the security. Another positive thing with the timer is the energy saving possibility.

A permanent timer which is common on public spaces is a motion controlled system. A motion controlled system works as a permanent timer, the technical devices only works when it's needed. Light only when needed, is a simple way to lower your energy bill by up to 60%. Stairwells, storage rooms, basements, attics and garages are usually places frequented only brief periods. Presence-lighting increases safety and comfort while saving energy and money. Energy efficient lighting is a long term investment with a short payback period.



## Demand-controlled ventilation

Demand-controlled ventilation (DCV) is a combination of two technologies: CO<sub>2</sub> sensors that monitor CO<sub>2</sub> levels in the air inside a building, and an air-handling system that uses data from the sensors to regulate the amount of ventilation air admitted. Given a predictable activity level, such as might occur in an office, people will exhale CO<sub>2</sub> at a predictable level.

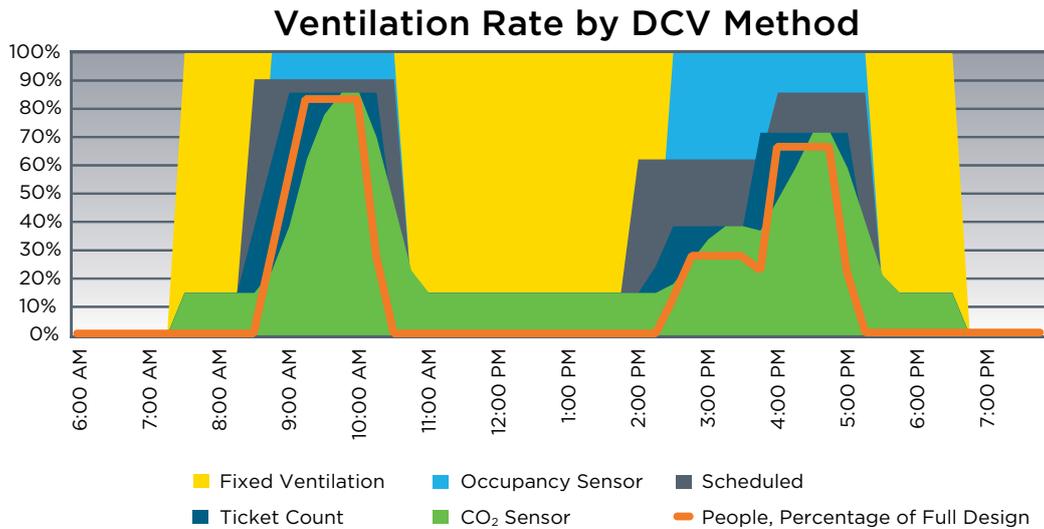
Therefore CO<sub>2</sub> production in the space will very closely track occupancy. The result is that ventilation rates can be measured and controlled to a specific area based on actual occupancy.

This is in contrast to the traditional method of ventilating at a fixed rate regardless of occupancy.

CO<sub>2</sub> sensors have been available for more than 10 years and the market is growing. There is a potential for millions of sensors to be used, since any building that has fresh air ventilation requirements might potentially benefit from the technology.

CO<sub>2</sub>-based DCV has the most energy savings potential in buildings where occupancy fluctuates during a 24-hour period, is unpredictable, and peaks at a high level—for example, office buildings, govern facilities, retail stores and shopping malls, movie theatres, auditoriums, schools, entertainment clubs and nightclubs.

DCV saves energy by avoiding the heating, cooling, and dehumidification of more ventilation air than is needed. In a survey on Norwegian schools, using CO<sub>2</sub> sensors, DCV was found to reduce energy consumption by 62% when compared with a constant air volume (CAV) ventilation system.



**Figure 1.** Ventilation rates provided with fixed ventilation and DCV alternatives

## Home automation and smart apps

Home automation refers to the use of computer and information technology to control home appliances and features. Elements of a home automation system include sensors (such as temperature, daylight), controllers (such as a general-purpose personal computer or a dedicated automation controller) and actuators, such as motorized valves, light switches, motors, and others. Home automation is adopted for reasons of ease, security and energy efficiency. By using home automation, technical devices aren't used if they don't have to be used.

One example of home automation is a moveable solar shading system. New building construction techniques in combination with an altered utilization of properties have made the provision of new demands for achieve an optimal indoor climate. Modern buildings have a very good insulation with the result that the need of cooling has increased significantly. Although the increased use glass facades provide increased cooling needs. Cooling increases linearly with the proportion of glass in the facade.

The cooling is costly. Experience values say it is five times as expensive to cool as to heat.

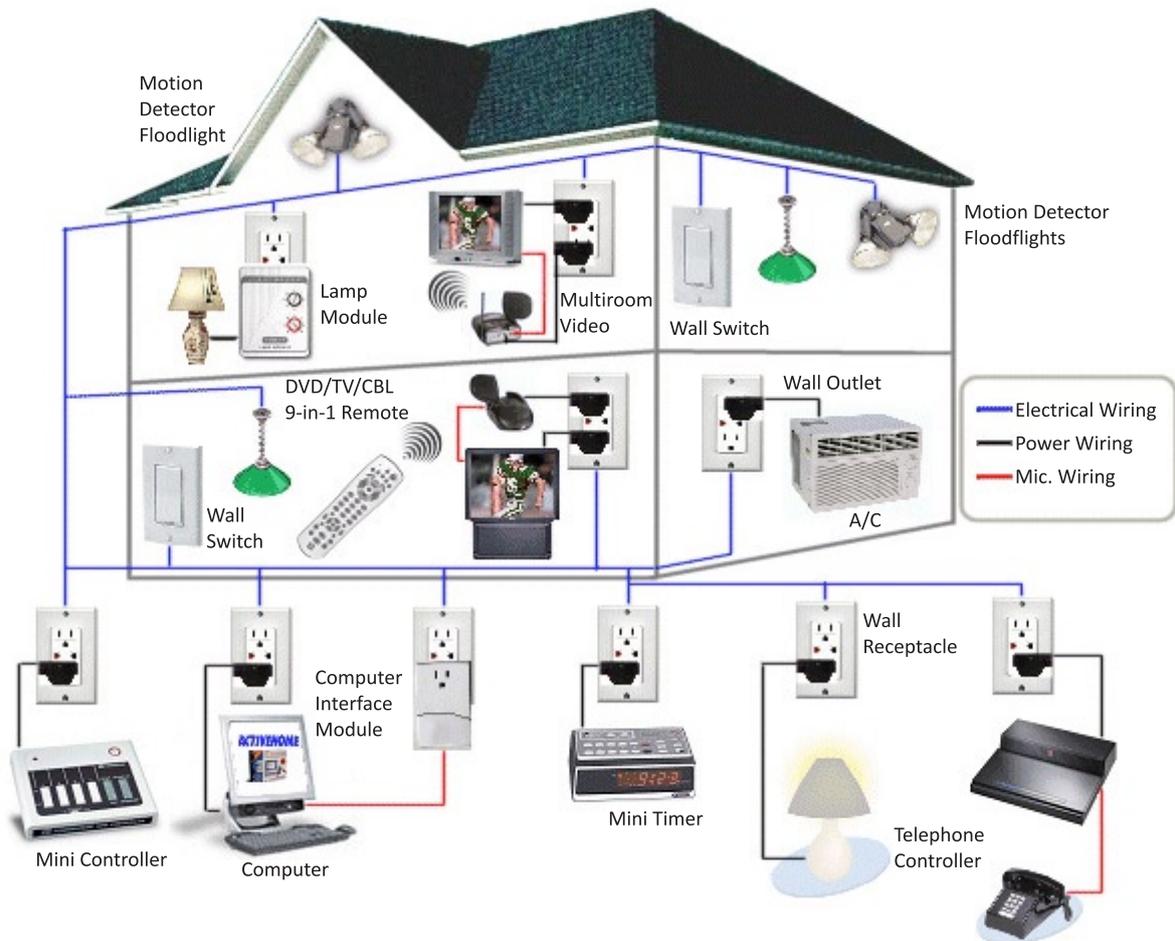
Solar shading has been found to have very good properties for both the reduction of cooling costs by optimizing light conditions and indoor climate. Energy consumption reduced by solar heat shielded admitted and that daylight is utilized, thereby reducing the need for artificial light. Some types of solar shading also have good insulation properties which can be used during winter to avoid heat leakage as unintended during nights.

The sun's rays containing large amounts of energy. Energy can't be consumed or lost, only transformed from one form to another. When solar rays against a plain clear glass so it can only take three routes:

- Some go right through the glass, radiation is transmitted, about 83%
- Some absorbed (trapped) in the glass and converted to heat, about 10%
- A portion is reflected back, about 7%.

In order to achieve maximum benefits of the sun shading requires that these can be adjusted in an optimal way. Automation of functions can be made in varying degree and is a prerequisite for achieving effective use. In manual control disappears much of the sun shading's advantage that energy saver and can mainly be seen as a light and glare protection. An advantage is also the automation of solar shading can communicate for example, the property's heating or cooling system, so that these are not undermined.

A smart app via your mobile phone could be one solution to control the home automation.





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<http://greenliving.nationalgeographic.com/electric-energysaving-devices-2295.html>

Picture: [http://gadgets.boingboing.net/gimages/b7fd\\_la\\_crosse\\_batt\\_charger.jpg](http://gadgets.boingboing.net/gimages/b7fd_la_crosse_batt_charger.jpg)

Source:

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Picture: <http://www.e360.es/blog/?p=579>

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