

# Urban Energy Technical Note



## Energy and Cost Savings - EE Appliances

Did you know that there is a worldwide trend towards energy efficient appliances and building materials? And did you know that growing awareness and appreciation of the environment is set to increase the demand for green buildings. Current improvements in design and technology offer new opportunities to be competitive in the domestic and international market.

Green buildings generally offer a more comfortable, healthier and cost effective solution for living and working. To go green means to maintain a competitive edge in the market.

Energy efficient appliances and the latest energy saving technology is an important feature of green buildings. Switching to energy saving lighting, for instance, helps to reduce your overall electricity bills by up to 20%.

Compared to conventional lighting, compact fluorescent lamps or LED lamps emit the same amount of visible light, but save up to 88% of the electric power needed for lighting and also have an eight to fifteen times longer lifetime. Air conditioning systems today save as much as 50% of the electricity that earlier models from the 80s and 90s used to eat up. Ceiling and room fans are not a new technology, but are still a viable low energy alternative in many buildings, especially those featuring bioclimatic design. Electric water heaters are among the most power hungry consumers in any building (whether commercial, private or public). Today, solar water heating technology is affordable and will reduce electricity

consumption for hot water by as much as 80% compared to electrical resistance water heaters. Today, there are energy saving alternatives for literally all the appliances available for household and commercial use. It is also necessary to be aware of these new trends in order to comply with the legal requirements of integrated building design.

Energy savings mean cost savings, while the performance of an appliance is the same or better when compared to the baseline. The premium, if any, that we need to pay today for an energy saving alternative (or sometimes to replace a still functioning older piece of equipment) can be expected to be paid off in a time span that is significantly shorter than the life span of the new equipment itself. This means that investments in energy saving technology will soon turn into profits.

The appliances discussed here are “finished” products and are therefore distinguished from building materials or building components (to be discussed in an upcoming technical note). These appliances all have low environmental impact and high performance. They are designed to meet three basic criteria:

1. Effective and efficient use of materials,
2. Energy saving,
3. Low or no toxicity.

The list presented here includes product groups with typical state of the art technical specifications. The categories covered are lighting, air-conditioning and cooling, water heating, refrigeration, computers, and television sets.

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**Recommended**

**Not recommended**

**Lighting**

**Mirror ducts**

0 energy consumption



These systems bring daylight indoors. They are highly energy efficient due to the direct use of natural light, and the collection and diffusion of light without the consumption of kinetic energy as there are no moving parts such as sun tracking devices. Mirror ducts are low maintenance due to a simple, sealed structure that protects them from failure and deterioration.

**LED lamps**

**Energy savings:** Up to 88% compared to incandescent lamps for the same Lumen



**Life time:** 40,000 hours plus.  
**Baseline:** Incandescent lamps, 95% heat, 5% light generation; efficiency: 5%.  
**Life time:** ca. 1,000 hours.

**LED ceiling lights in combination with smart lighting (sensors and dimmers)**

**Energy savings:** Up to 67% compared to incandescent lamps. Up to 18% energy savings can be achieved through smart lighting alone compared to office lighting operated without sensors and dimmers



**Life time:** 60,000 hours plus. Sensors have a significantly longer lifetime than the corresponding lamps.  
**Baseline:** Incandescent lamps, 95% heat, 5% light generation; efficiency: 5%.  
**Life time:** ca. 1,000 hours; lighting operated in offices, private and public buildings.

**LED security lights**

**Energy savings:** Up to 70% compared to incandescent lamps.



**Life time:** 60,000 hours plus.  
**Baseline:** Incandescent lamps, 95% heat, 5% light generation; efficiency: 5%.  
**Life time:** ca. 1,000 hours

**Compact Fluorescent Lamps**

**Energy savings:** Up to 80% compared to incandescent lamps



**Life time:** 20,000 hours plus.  
**Baseline:** Incandescent lamps, 95% heat, 5% light generation; efficiency: 5%.  
**Life time:** ca. 1,000 hours.



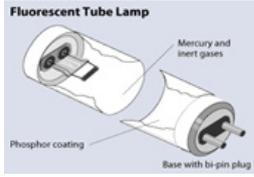
**Recommended**

**Not recommended**

**Lighting**

**Fluorescent Lamp Stabilisers**

**Energy savings:** Up to 30% compared to fluorescent lamps operated without stabilisers.



**Life time:** n/a, devices have a significantly longer lifetime than the corresponding lamps.  
**Baseline:** Fluorescent lamps/tubes, operated in offices and public buildings.



**Air Conditioning / Cooling**

**Room air conditioners (closed cycle system, refrigeration)**

**Energy savings:** Up to 50% compared to 80s or 90s vintage model ACs.



**Life time:** For reasons of energy efficiency and continuous technical advances, ACs should be replaced every 10 years.  
**Baseline:** ACs with an energy efficiency ratio of 5 (80s or 90s).

Today's AC achieve an EE ratio of cooling capacity (energy outtake per hour) over electricity input (per hour) of 10 and above.



**Central air conditioners (closed cycle system, refrigeration)**

**Energy savings:** 20-30% compared to central ACs of the 80s or 90s.



**Life time:** For reasons of energy efficiency and continuous technical advances, central ACs should be upgraded every 10 years.  
**Baseline:** Central ACs with an energy efficiency ratio of 7 or 8 (80s or 90s).



**Evaporative cooling (open cycle systems)**

**Energy savings:** up to 85 % compared to closed cycle air conditioners



**Life time:** Compared to closed cycle air conditioning systems, these evaporative coolers have a much longer lifetime. However, the cleaning demand of evaporative coolers is higher.  
**Baseline:** Closed cycle air conditioning systems (refrigeration technology)



**Room and ceiling fans**

**Energy savings:** They generally use less energy than air conditioning systems and can produce a satisfactory cooling effect without lowering room temperatures and humidity.



**Life time:** 5 years  
**Baseline:** Air conditioning systems using dead or open cycle systems

**Recommended** **Not recommended**

**Water Heating**

**Heat pump water heaters**

**Energy savings:**  
66% compared to conventional electric resistance water heaters.



**Life time:** 10-15 years.  
**Baseline:** Electric resistance water heaters with a lifetime of ca. 10-15 years and an annual energy consumption of 2,000 kWh.

**Solar water heater**

**Energy savings:**  
50-80% compared to conventional electric resistance water heaters.



**Life time:** 20 years plus for quality Solar Water Heaters.  
**Baseline:** Electric resistance water heaters with a lifetime of ca. 10-15 years and an annual energy consumption of 2,000 kWh.

**Refrigeration**

**Energy savings:** Up to 60% for state of the art energy efficient refrigerators and freezers (Euro A+, A++, A+++, or U.S. Energy Star \*\*\* rated).



**Life time:** For reasons of energy efficiency and continuous technical advances, refrigerators should be upgraded every 10 years.  
**Baseline:** Older models with an annual energy consumption of ca. 600 kWh or more (average size).

**Laptop computers and notebooks**

**Energy savings:** Ca. 75% savings in energy consumption



**Lifetime:** 3-5 years guaranteed, exceeding technological innovation time until outdated.  
**Baseline:** Desktop computers with ca. 120 W rating.  
Computers can run for as many as 2,000 hours per year in an office set-up.

**Televisions**

**Energy efficient LCD Television using LED back light system**

**Energy savings:** Ca. 29% savings in energy consumption compared to LCD TVs not using LED back lighting, and over 60% to cathode ray TV sets.



**Life time:** For reasons of energy efficiency and continuous technical advances, televisions should be upgraded every 10 years.  
**Baseline:** New technology, new approach, no baseline.



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The purpose of this Technical Note is to call reader's attention to new technical issues in the field of sustainable human settlements development. They are not meant to be final or exhaustive. For more information, contact the Urban Energy Unit. Prepared by Vincent Kitio, Sebastian Lange and Jerusha Ngungui