



Electricity End-use

The Problem

- Electricity generation is one of the largest sources of carbon dioxide emissions in the world.
- The growth of electricity consumption remains higher than economic growth, therefore the electric intensity of the economy is growing. Electricity consumption in the EU-27 Member States and Candidate Countries has continued to grow in the last years at an average annual rate of 1.7 % between 1990 and 2005 (an absolute increase of 28.7 %).

Policy Relevance

- *Energy-using Products (EuP's)* : Directive 2000/55/EC on energy efficiency requirements for ballasts for fluorescent lighting; Directive 92/75/EEC framework directive on energy labelling of domestic household appliances; Directive 2005/32/EC framework for setting eco-design requirements for energy-using products
- *Energy distributors and retailers*: Directive 2006/32/EC on the promotion of end-use efficiency and energy services
- *Buildings Efficiency*: Directive 2002/91/EC on energy performance of buildings
- *Renewable energy sources*: Directive 2001/77/EC on promotion of electricity produced from renewable energy sources

Best Practice

- E-street: an EU project on energy savings on intelligent street lighting
- Topten: a web portal helping consumers to find the most energy efficient appliances and cars in Europe.
- Energy labelling of domestic appliances: a success story

Data and Indicators

Links and References



The Problem

Electricity generation is one of the largest sources of carbon dioxide emissions in the world.

The primary source for increased atmospheric concentrations of carbon dioxide since the pre-industrial period comes from fossil fuel use (IPCC, 2007). Electricity generation is therefore one of the largest sources of carbon dioxide emissions in the world since fossil fuels continue to dominate total energy consumption. Mainly as a result of improvements in the thermal efficiency of electricity and heat production and changes in the fossil fuel mix, from 1990 to 2005, emissions of carbon dioxide (CO₂), sulphur dioxide (SO₂) and nitrogen oxides (NO_x) fell despite a 27% increase in electricity and heat production. A significant part of this emissions decrease occurred at the beginning of the 1990s due to structural changes taking place in the economies of the EU-12 Member States. Some emissions have risen in recent years due to increased utilisation of existing coal plants with higher emissions per unit of output. Still, more than 80% of total greenhouse gas emissions in the EU-27 are caused by energy production, energy use by the industry, services and households, and transport.

Electricity consumption in the EU-27 Member States and Candidate Countries has continued to grow in the last years; in the period 1999-2004, in the EU-25, total electricity consumption has grown by 10.8% in the residential sector, by 15.6% in the tertiary sector and by 9.5% in the industrial sector.

Electricity consumption is of particular concern for the environment since it continued to grow in the period 1990-2005 at an average of around 1.7% a year (absolute increase of 28.7%). With its 450 million citizens, the EU represents the second energy market in the world and has a dependency on energy imports of over 50%. At present rates of consumption in the next 20 or 30 years, imports will cover about 70% of energy needs (90% with regard to oil products) of the EU.

Between 1990 and 2005 final household electricity consumption increased at a faster rate reaching an annual average of 2.1%. Similar trends are also observed in the tertiary sector and, to a lesser extent, in industry (*Electricity Consumption and Efficiency trends -status report 2006, IES*).

For a typical (average) European household, cooling (refrigerators and freezers) is the group of appliances requiring the largest share of electricity consumption within a household, representing about 25% of total electricity consumption. Lighting represents the second largest contributor with 18% of total electricity consumption. Washing clothes and drying represent about 16%, personal computers and accessories 12%, cooking 11% and televisions 9%. Air conditioning requires about 2% of household electricity consumption, while other appliances such as vacuum cleaners, radios and chargers represent about 4% (IEE project REMODECE).

On average the standby consumption measured was about 30 Watt and 169 kWh per household per year, which is about 6.3% of total annual energy per household. For most appliances, standby energy consumption is relatively low, between 0 and 2 percent of the total yearly consumption. However, for some appliances the standby energy share is much higher, from 93% for a printer, 89% for Wireless LAN, 68% for a charger, 66% for a DVD and 56% for a HIFI-radio.

Models indicate that by 2030, primary energy (electric and thermal) consumption is likely to increase by 10-26% compared to 2005 with fossil fuel maintaining a high share. It is only under scenarios involving more stringent policies for energy and climate change (based on the EU's objective of limiting global temperature rises to 2°C) that the absolute increase in primary energy consumption slows down and, actually starts to decline between 2020 and 2030, primarily due to greater improvements in energy efficiency.

Projections show that the tertiary sector will have the highest increase in final energy consumption because of increases in the use of "traditional" office equipment; consumption in the residential sector will have a growth of 30% in the period between 2000 and 2030 due to demographic growth and family lifestyle changes more oriented towards small houses and with high energy needs (a greater use of active cooling systems).



Policy Relevance and Policy References

Energy-using Products (EuP's)

The European Union has harmonised national measures relating to the publication of information on the consumption of energy and of other essential resources by household appliances, thereby allowing consumers to choose appliances on the basis of their energy efficiency. The response was to act in two complementary ways:

- **Minimum Efficiency Requirements:** through the Eco-design Directive 2005/32/EC that defines the framework for setting compulsory minimum efficiency requirements for household appliances to improve the product design with a view to lowering energy consumption with their use. It is estimated that over 80% of all product-related environmental impacts are determined during the design phase of a product. Energy-using products (EuP's) account for a huge consumption of natural resources and energy in the Community. The Directive's aims are to optimize the environmental performance of products, while maintaining their functional qualities, to achieve a sustainable development and a continuous improvement in the overall environmental impact. To reduce the environmental impact of products across the whole of their life cycle is the core of this Directive throughout the life-cycle by systematic integration of environmental aspects at a very early stage in the product design.
- **Energy Labelling of household appliances:** seeing that the market for household appliances such as washing machines, dishwashers, ovens, air-conditioning systems etc. are highly visible to the consumer, the intention of the energy labelling Directive 92/75/EEC was to increase consumer awareness on the real energy use of household appliances through reliable and clear labelling in their sales points. Using a scale from A to G, where A represents the best equipment that is widely available and G the worst, the label ranks the appliance into the proper energy class. In addition, the label provides basic performance data to help the consumer judge whether the product complies with his/her expectations. Currently there are defined energy labels for the following products: refrigerators and freezers, washing machines, washer dryers, tumble dryers, dishwashers, air conditioners, electric ovens.

In March, the Commission adopted two Eco-design Regulations to improve the energy efficiency of household lamps and office, street and industrial lighting products. The two regulations lay down energy efficiency requirements which will save close to 80TWh by 2020 (roughly the electricity consumption of Belgium, or of 23 million European households, or the equivalent of the yearly output of 20 power stations of 500 megawatts) and will lead to a reduction of about 32 million tons of CO₂ emission per year.

Inefficient incandescent light bulbs will progressively be replaced by improved alternatives starting in 2009 and finishing at the end of 2012. As a result of these regulations, 11 billion Euros are expected to be saved and re-injected every year into the European economy.

The 2000/55/EC Directive aims at reducing energy consumption for ballasts for fluorescent lighting by moving gradually away from the less efficient ballasts, and towards the more efficient ballasts which may also offer extensive energy-saving features.

On January 7 another eco-design regulation directly applicable in all Member States came into force for standby off-mode to ensure the lowest possible energy use for small and large household appliances and electronic products in passive standby and off modes.

Energy distributors and retailers

The Directive on energy end-use efficiency and energy services was tabled by the Prodi Commission in December 2003. The directive seeks to increase energy efficiency all along the supply chain right up to the retail stage when energy is sold to the end-user. No binding targets are set but Member States have to draw up national plans (every three years) in order to achieve at least 1% annual energy savings. Another key element of the directive is a supply-side obligation for energy distributors and retailers to offer efficiency improvement measures to their customers.

Buildings Efficiency

The EPBD Directive is the framework for EU member state legislation on building energy standards and energy labelling (in order to know more about it, see "Green Building" ([link alla scheda "Green Building"](#))).

Renewable energy sources



Renewable energy sources have a crucial role in reducing CO₂ emissions from electricity consumption. *Directive 2001/77/EC* sets targets and tries to remove barriers to encourage the growth in the share of electricity from renewable energy sources. This share rose from roughly 13% in 2001 to 16% in 2006 but under new directive 2009/28/EC this will probably need to be doubled, to over 30%, for the EU to reach its overall renewable energy target of 20% by 2020. Each member state has to reach national overall targets for the share of energy from renewable sources in gross.

Best Practice

E-street: an Energy Intelligence for Europe (IEE) project on energy saving and intelligent outdoor street lighting

Over the years the efficiency of lamps has improved significantly. However new technology has been developed and implemented in multiple systems that can help to save even more energy. Tele-management, networking and automation technology allow for the adjustment of light to the exact level needed to keep the roads safe based on weather conditions, traffic density and other external factors. LED lighting also has great potential in helping save energy in outdoor lighting. However the technology is still in the development phase and there is relatively very little experience with it at the moment. The number of light points has been estimated based on luminaires market data available from various large companies in the industry.

According to project estimates, there is 1 light point on average for each 9 inhabitants. Accurate estimates highlight that Europe could achieve annual savings of 38TWh (out of 59.76 TWh, as much as 63.7 %) electricity consumption for street and highway lighting by introducing/retrofitting old installations with intelligent streetlights (adaptive lighting). website project: <http://www.e-streetlight.com/>

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Topten is a web portal helping consumers find the most energy efficient appliances and cars in Europe.

Topten is a consumer-oriented online search tool, which presents the best appliances in various product categories. The key criteria are energy efficiency, impact on the environment, health and quality. As a communications tool, it helps to show how our energy consumption causes climate change and what we can do personally to reduce our impact. It is also a powerful instrument for influencing manufacturers. Topten was launched in 2000 in Switzerland. Since then, twelve other national Topten sites have been established, and four countries are actually building up their own national Topten sites (Lithuania, Romania, Greece and Norway), thanks to the European IEE-projects Euro-Topten and Euro-Topten Plus. Topten reveals the best products in Europe: Topten is a web portal helping consumers find the most energy efficient appliances and cars in Europe. With a simple click, check the best products available in your country! Each national Topten website points consumers to the most energy efficient cars, TVs and appliances available in their country, and provides detailed information in local language(s) on product characteristics, including photos and manufacturer contact information. Topten website: <http://www.topten.info/>

Energy labelling of domestic appliances: a success story

Over the course of a decade, the household appliance industry has significantly improved the energy efficiency of its products – by as much as 40 per cent for the most relevant items, such as refrigerators or washing machines. Mandatory energy labelling has been the cornerstone of this success. In the process, the European labelling scheme has become the most successful of its kind in the world.

Such success does not come cheaply. Over the past decade most of the household appliance industry's €10 billion investment has been focused on eco-innovation. A first voluntary agreement on washing machine energy-efficiency was launched in 1997 and unilateral industry commitments have followed for refrigerators, freezers, dishwashers, wash-dryers, and electrical storage water heaters. The industry's achievements have been widely acknowledged as the most successful energy-efficiency programme in the EU and we are committed to continuing along this path.

Contact CECED (European Committee of Domestic Equipment Manufactures) Brussels office: Tel : +32-2-706.82.90 email secretariat@ceced.eu

Data and Indicators



- The total potential electricity saving per household by using efficient appliances ranges from 1.000 to 1.200 kWh/year depending on the country; In Europe, the total potential electricity saving (more than 150 million households) would be between 150 and 180 TWh/year, i.e. total Spanish electricity consumption (ECODROME, IEE Project).

Links and References

- Energy and environment report 2008, EEA Report No 6/2008
http://www.eea.europa.eu/publications/eea_report_2008_6
- Green Paper on Energy Efficiency ec.europa.eu/internal_market/copyright/docs/.../greenpaper_en.pdf
- European Commission website on Eco-design of Energy-using products
http://ec.europa.eu/energy/efficiency/ecodesign/eco_design_en.htm
- European Commission website on energy labelling :
http://ec.europa.eu/energy/efficiency/labelling/labelling_en.htm
- IEE website to know more about IEE projects: http://ec.europa.eu/energy/intelligent/projects/index_en.htm
- To know more about energy saving potentials for household appliances; Europe manufactures association web portal in <http://www.ceced.eu/>