# ENERGY EFFICIENCY

## BROCHURE FOR EMPLOYERS

*Serbian Association of Employers*


SERBIAN ASSOCIATION OF EMPLOYERS

BOSMIP 3 Bringing Business Together

BUSINESSEUROPE

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Belgrade, 2011

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# I INTRODUCTION

Serbia's road toward EU means EU standards and regulation are what awaits us in many arias of life as well in the aria of Energy Efficiency. Reducing energy consumption and eliminating energy wastage are among the main goals of the European Union (EU). There is significant potential for reducing consumption, especially in energy-intensive sectors such as construction, manufacturing, energy conversion and transport. At the end of 2006, the EU pledged to cut its annual consumption of primary energy by 20% by 2020. To achieve this goal, it is working to mobilize public opinion, decision-makers and market operators and to set minimum energy efficiency standards and rules on labeling for products, services and infrastructure.

Having all this in mind and adding to it the fact that energy is a running force of any economy, Serbia and its economy have long way to go. This time of increase energy consumption and rise of prices of traditional energy sources impels as to look for new more economical, efficient and green energy sources.

This brochure is made for YOUR COMPANY. Its main purpose is to give you basic information on energy efficiency terminology, legislation in EU and Serbia and to give you ideas on how to make your business more energy efficient. Among other information the brochure contains opinions given to us by the participants of the workshop "Energy Efficiency" healed earlier this year as a part of the Bosmip III project.

Creation of this brochure was facilitated by the BUSINESSEUROPE trough BOSMIP III (Business Organizations as Single Market Integration Players), program financially supported by the European Commission and managed by BUSINESSEUROPE. BOSMIP III strengthens horizontal business federations in the Western Balkans & Turkey. Know-how and experience about the efficient implementation of the acquis communautaire has been transferred to business federations through partnerships with the EU-27 member federations of BUSINESSEUROPE. BOSMIP III is a project that will follow up on the successful BOSMIP I and BOSMIP II projects and will consist of various acquis related workshops and mentoring projects.

What is energy efficiency? EU Commission definition of Energy Efficiency is

***THE REDUCTION OF PRIMARY ENERGY CONSUMPTION.***

Hire are some other definitions of Energy Efficiency:

- It refers to the programs aiming to reduce energy consumption by the end devices in a curtain system without any consequences to the service provided by the devices www.pplweb.com/glossary.htm
- Term refers to the products or systems designed for lower usage of the energy with same or better characteristics in comparison to the usual products. Energy efficient buildings are designed to use les energy than traditional buildings. www.mtpc.org/cleanenergy/energy/glossaryefficiency.htm

- Technologies and measures that reduce consumption of electricity and fuels necessary to carry out some work www.nrdc.org/reference/glossary/e.asp
- Any change in energy consumption that incises benefits per unite of energy consumed www.pce.govt.nz/reports/pce_reports_glossary.shtml
- Term refers to the products or systems designed for lower usage of the energy in order to carry out same or more work in comparison to the conventional devices. Energy efficiency saves energy, money and bills and it saves the environment. www.epa.gov/greenpower/whatis/glossary.htm

# II HOW TO USE ENERGY EFFICIENCY

Energy Efficiency is the main pillar for an affordable transition to a low-carbon economy. There is immense potential in Europe and in the world to increase energy efficiency, through behavioral changes and education or through cost-effective technologies, many of which are already available or being developed. In particular, the building sector has considerable untapped possibilities, which can generate significant CO2 emissions reductions. Furthermore, energy efficiency in the transport sector could be improved by cost-effective measures such as the development of co-modality or infrastructure investments.

## 1. Energy Efficiency in Industry

Industry uses a large amount of energy to power a diverse range of manufacturing and resource extraction processes. Many industrial processes require large amounts of heat and mechanical power, most of which is delivered as natural gas, petroleum fuels and as electricity. In addition some industries generate fuel from waste products that can be used to provide additional energy.

Because industrial processes are so diverse it is impossible to describe the multitude of possible opportunities for energy efficiency in industry. Many depend on the specific technologies and processes in use at each industrial facility. However there are a number of processes and energy services that are widely used in many industries. Here are some of the possible ways to save energy:

1. Various industries **generate steam and electricity** for subsequent use within their facilities. When electricity is generated, the heat that is produced as a by-product can be captured and used for process steam, heating or other industrial purposes. Conventional electricity generation is about 30 percent efficient, whereas combined heat and power (also called co-generation) converts up to 90 percent of the fuel into usable energy. Advanced boilers and furnaces can operate at higher temperatures while burning less fuel. These technologies are more efficient and produce fewer pollutants.

2. **Electric motors** usually run at a constant speed, but a variable speed drive allows the motor's energy output to match the required load. This achieves energy savings ranging from 3 to 60 percent, depending on how the motor is used. Motor coils made of superconducting materials can also reduce energy losses. Motors may also benefit from voltage optimization.

3. Industry uses a large number of **pumps and compressors** of all shapes and sizes and in a wide variety of applications. The efficiency of pumps and compressors depends on many factors but often improvements can be made by implementing better process control and better maintenance practices. Compressors are commonly used to provide compressed air which is used for sand blasting, painting, and other power tools.

## 2. Energy Efficiency in Building Designs

A building's location and surroundings play a key role in regulating its temperature and illumination. For example:

1. Trees, landscaping, and hills can provide shade and block wind. In cooler climates, designing buildings with a south facing windows increases the amount of sun (ultimately heat energy) entering the building, minimizing energy use, by maximizing passive solar heating. Tight building design, including energy-efficient windows, well-sealed doors, and additional thermal insulation of walls, basement slabs, and foundations can reduce heat loss by 25 to 50 percent.

2. **Dark roofs** may become up to 39 C° hotter than the most reflective white surfaces, and they transmit some of this additional heat inside the building. Lightly colored roofs use 40 percent less energy for cooling than buildings with darker roofs. White roof systems save more energy in sunnier areas. Advanced electronic heating and cooling systems can moderate energy consumption and improve the comfort of people in the building.

3. Proper placement of windows and skylights and use of architectural features that reflect light into a building, can reduce the need for artificial lighting. Increased use of natural and task lighting have been shown by one study to increase productivity in schools and offices. **Compact fluorescent lights** use two-thirds less energy and may last 6 to 10 times longer than incandescent light bulbs. Newer fluorescent lights produce a natural light, and in most applications they are cost effective, despite their higher initial cost, with payback periods as low as a few months.

4. Effective energy-efficient building design can include the use of **low cost Passive Infra Reds (PIRs)** to switch-off lighting when areas are unoccupied such as toilets, corridors or even office areas out-of-hours. In addition, lux levels can be monitored using daylight sensors linked to the building's lighting scheme to switch on/off or dim the lighting to pre-defined levels to take into account the natural light and thus reduce consumption. Building Management Systems (BMS) link all of this together in one centralized computer to control the whole building's lighting and power requirements.

The choice of which space heating or cooling technology to use in buildings can have a significant impact on energy use and efficiency. For example **ground source heat pumps** can be even more energy efficient and cost effective. These systems use pumps and compressors to move refrigerant fluid around a thermodynamic cycle in order to "pump" heat against its natural flow from hot to cold, for the purpose of transferring heat into a building from the large thermal reservoir contained within the nearby ground. The end result is that heat pumps typically use four times less electrical energy to deliver an equivalent amount of heat than a direct electrical heater does. Another advantage of a ground source heat pump is that it can be reversed in summertime and operate to cool the air by transferring heat from the building to the ground.

### 3. Energy Efficiency in Transportation

There are several ways to enhance a vehicle's energy efficiency.

1. More advanced tires, with decreased tire to road friction and rolling resistance, can save gasoline. Fuel economy can be improved by up to 3.3% by keeping tires inflated to the correct pressure.
2. Replacing a clogged air filter can improve a car’s fuel consumption by as much as 10 percent on older vehicles. On newer vehicles (1980's and up) with fuel-injected, computer-controlled engines, a clogged air filter has no effect on mpg but replacing it may improve acceleration by 6-11 percent.[21]

Energy-efficient vehicles may reach twice the fuel efficiency of the average automobile.

## RENEWABLE ENERGY SOURCES

in order to reduce energy consumption. All forms of energy are expensive, but as time progresses, renewable energy generally gets cheaper,] while fossil fuels generally get more expensive. Al Gore has explained that renewable energy technologies are declining in price for three main reasons:

First, once the renewable infrastructure is built, the fuel is free forever. Unlike carbon-based fuels, the wind and the sun and the earth itself provide fuel that is free, in amounts that are effectively limitless.

Second, while fossil fuel technologies are more mature, renewable energy technologies are being rapidly improved. So innovation and ingenuity give us the ability to constantly increase the efficiency of renewable energy and continually reduce its cost.

Third, once the world makes a clear commitment to shifting toward renewable energy, the volume of production will itself sharply reduce the cost of each windmill and each solar panel, while adding yet more incentives for additional research and development to further speed up the innovation process.

**Wind power** - Airflows can be used to run wind turbines. Modern wind turbines range from around 600 kW to 5 MW of rated power, although turbines with rated output of 1.5–3 MW have become the most common for commercial use; the power output of a turbine is a function of the cube of the wind speed, so as wind speed increases, power output increases dramatically. Typical capacity factors are 20-40%, with values at the upper end of the range in particularly favorable sites

**Hydropower** - Energy in water can be harnessed and used. Since water is about 800 times denser than air even a slow flowing stream of water, or moderate sea swell, can yield considerable amounts of energy. There are many forms of water energy:

1. Hydroelectric energy is a term usually reserved for large-scale hydroelectric dams.
2. Micro hydro systems are hydroelectric power installations that typically produce up to 100 kW of power. They are often used in water rich areas.

3. Damless hydro systems derive kinetic energy from rivers without using a dam.

**Solar energy** - Solar energy is the energy derived from the sun through the form of solar radiation. Solar powered electrical generation relies on photovoltaic and heat engines. A partial list of other solar applications includes space heating and cooling through solar architecture, day lighting, solar hot water, solar cooking, and high temperature process heat for industrial purposes.

Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy. *Active solar techniques* include the use of photovoltaic panels and solar thermal collectors to harness the energy. *Passive solar techniques* include orienting a building to the sun, selecting materials with favorable thermal mass or light dispersing properties, and designing spaces that naturally circulate air.

**Biomass (plant material)** - renewable energy source because the energy it contains comes from the sun. Through the process of photosynthesis, plants capture the sun's energy. When the plants are burned, they release the sun's energy they contain. In this way, biomass functions as a sort of natural battery for storing solar energy. As long as biomass is produced sustainable, with only as much used as is grown, the battery will last indefinitely.

In general there are two main approaches to using plants for energy production: growing plants specifically for energy use, and using the residues from plants that are used for other things. The best approaches vary from region to region according to climate, soils and geography.

**Biofuel** - liquid biofuel is usually either bioalcohol such as bioethanol or oil such as biodiesel. Biofuels provided 1.8% of the world's transport fuel in 2008.

1. Bioethanol is an alcohol made by fermenting the sugar components of plant materials and it is made mostly from sugar and starch crops. With advanced technology being developed, cellulose biomass, such as trees and grasses, are also used as feedstock's for ethanol production. Ethanol can be used as a fuel for vehicles in its pure form, but it is usually used as a gasoline additive to increase octane and improve vehicle emissions.
2. Biodiesel is made from vegetable oils, animal fats or recycled greases. Biodiesel can be used as a fuel for vehicles in its pure form, but it is usually used as a diesel additive to reduce levels of particulates, carbon monoxide, and hydrocarbons from diesel-powered vehicles. Biodiesel is produced from oils or fats using transesterification and is the most common befoul in Europe.

**Geothermal energy** - energy obtained by tapping the heat of the earth itself, both from kilometers deep into the Earth's crust in some places of the globe or from some meters in geothermal heat pump in all the places of the planet . It is expensive to build a power station but operating costs are low resulting in low energy costs for suitable sites. Three types of power plants are used to generate power from geothermal energy: dry steam, flash, and binary. Where hot underground steam or water can be tapped and brought to the surface it

may be used to generate electricity. There is also the potential to generate geothermal energy from hot dry rocks.

**New and emerging renewable energy technologies** are still under development and include cellulose ethanol, hot-dry-rock geothermal power, and ocean energy. These technologies are not yet widely demonstrated or have limited commercialization. Many are on the horizon and may have potential comparable to other renewable energy technologies, but still depend on attracting sufficient attention and research, development and demonstration funding.

Solar power panels that use nanotechnology, which can create circuits out of individual silicon molecules, may cost half as much as traditional photovoltaic cells, according to executives and investors involved in developing the products.

## 5. Cogeneration

**Cogeneration** (combined heat and power - CHP) is the use of a heat engine or a power station to simultaneously generate both electricity and useful heat. Cogeneration is a thermodynamically efficient use of fuel. In separate production of electricity some energy must be rejected as waste heat, but in cogeneration this thermal energy is put to good use. All power plants must emit a certain amount of heat during of electricity generation. This can be into the natural environment through cooling towers, flue gas, or by other means. By contrast CHP captures some or all of the by-product heat for heating purposes, either very close to the plant, or hot water for district heating with temperatures ranging from approximately 80 to 130 ℃. This is also called Combined Heat and Power Dis trict Heating or CHPDH. Small CHP plants are an example of decentralized energy.

By-product heat at moderate temperatures (100-180°C) can also be used in absorption chillers for cooling. A plant producing electricity, heat and cold is sometimes called trigeneration or more generally polygeneration plant.

Renewable energy is an increasingly important element of the EU energy mix. However, to achieve the renewable energy targets energy efficiency represents an indispensable factor. Therefore it is crucial to deploy actively all the energy efficient solutions offered by a wide range of technologies, including those to make fuel power generation more efficient. Policies instruments must be defined in a technology-neutral way and pursue a pragmatic sectoral and bottom-up approach.

Furthermore renewable energy support should be designed in such a way that it does not cause excessive increases of electricity prices. Otherwise, it would damage Europe’s competitiveness. In the short term, energy-intensive industries must be compensated for their increased energy costs to reduce the competitiveness risks due to the cumulative impact of energy policies. In the long term, and without prejudice to the prerogative given by the EU Treaty to Member States to choose their own energy mix, renewable energy support schemes must be harmonized to ensure investment in renewable energy where it is economically and environmentally most efficient, so that these energy sources eventually become commercially viable.

## III LEGISLATION

- ***EU legislation***

Reducing energy consumption and eliminating energy wastage are among the main goals of the European Union (EU). EU support for improving energy efficiency will prove decisive for competitiveness, security of supply and for meeting the commitments on climate change made under the Kyoto Protocol. There is significant potential for reducing consumption, especially in energy-intensive sectors such as construction, manufacturing, energy conversion and transport. At the end of 2006, the EU pledged to **cut its annual consumption of primary energy by 20% by 2020.**

There is wide-spread consensus that one of the most cost-effective way to face this challenge is to reduce our energy consumption. However, while we are on a good way to achieve the 2020 targets for emission reduction and renewable energy, we are seriously lagging behind as far as energy efficiency is concerned. By 2020 we will only reach half of the 20% target if we carry on at the current pace.

On March 8th the Commission will present an Energy Efficiency Plan proposing specific measures to boost energy efficiency. The Commission will then review the progress achieved with these measures by 2013 and will consider further measures-including proposing legally binding targets - if necessary. One element of the plan will be public procurements. With stringent standards in public procurement, the EU can give a real boost to energy efficiency. The European Council has also given new impetus to of energy efficiency.

Some of the main EU Directives on Energy Efficiency and Renewable Energy are:

- EU Directive 2010/31/EC on the energy performance of buildings
- EU Directive 2010/30/EU on the indication by labeling and standard product information of the consumption of energy and other resources by energy-related products
- EU Directive 2009/125/EC on establishing a framework for the setting of ecodesign requirements for energy-related product
- EU Directive 2006/32/EC on Energy end-use Efficiency and Energy Services and repealing Council Directive 93/76/EEC
- EU Directive 2004/8/ he promotion of cogeneration
  EU Directive 2003/66/EC with regard to energy labelling of household electric refrigerators, freezers and their combination
- EU Directive 2003/30/EC on the promotion of the use of biofuels EU Directive 2002/91/EC on the energy performance of buildings
  EU Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources
  EU Directive 2000/55/EC on energy efficiency requirements for ballasts for fluorescent lighting
- EU Directive 2002/91/EC on the energy performance of buildings

These are just some of Directives by the EU. Over all there are 24 dating form the 1982. You can fin them on http://ec.europa.eu/energy/efficiency/index_en.htm.

- ***Serbian legislation***

Ministry of Environment, Mining and Spatial Planning is en charge of energy efficiency in Serbia.

- Energy Law (Official Gazette RS no. 84/2004) – New Energy Low is in the process of being adopted
- Law on Environmental Protection (Official Gazette RS no. 135/2004, 36/2009, 72/2009)
- Law on Concessions (Official Gazette RS no. 55/2003)
- Law on Planning and Construction (Official Gazette RS no. 84/2004)
- Program for the realization of the Strategy for Energy Development in Serbia 2007-2012

Other related laws and relevant papers – strategy, recommendations, platforms etc you may find at the Energy Efficiency Agency web site at www.seea.gov.rs

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