

# Energy and Buildings

## Renewable Energies and Energy Efficiency

### Energy consumption

About 37% of final energy consumption is taken by the building sector (households and services). A gradual shift over the last five years is observed from fossil fuels to renewable energy sources, such as solar energy, wind power and bio-energy. By means of Directives, Recommendations and Regulations the **European Commission** is giving direction to the future of sustainable energy use and supporting the low carbon energy policy.

Energy performance of buildings and efficient energy end-use are the important topics of interest. European standardisation facilitates exchange of goods, information and services to ensure a competition in a single European market.



The Energy Performance of Buildings Directive (EPBD 2010/31/EU) concerns the residential and the tertiary sector (offices, public buildings, etc.).

Member states must apply minimum requirements as regards the energy performance of new and existing buildings. A common calculation methodology should include all the aspects which determine the final and primary energy consumption of the building. This integrated approach should take into account aspects such as heating and cooling installations, lighting, the position and orientation of the building, heat recovery and the application of renewable energy. The member states are responsible for setting the minimum standards for buildings that are calculated on the basis of the above methodology.

The philosophy that supports the reduction of energy consumption in buildings is presented in three priority steps:

1. Energy saving (improve insulation),
2. Increase energy efficiency (building installations),
3. Use renewable energy resources (solar energy, etc.).

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**Energy performance** of buildings can be classified in three consumption categories:

#### **Building energy needs (savings)**

This is directly related to indoor (comfort level of temperature, air quality and light) and outdoor climate conditions (temperature, solar radiation and wind) for working and living in buildings. The heat transfer through the building envelopes and the ventilation define importantly the building energy needs. Minimum energy performance requirements are set for insulation levels of walls, roof, floor and windows, etc.

#### **Building systems energy (efficiency)**

The combined efficiency of the installations for heating, cooling, ventilation, hot water and electricity are the relevant factors in the end-use energy consumption. *Doing more with less* energy supports the overall reduction of primary energy consumption.

#### **Occupancy energy consumption (behavioural)**

The remaining use of energy depends on how the occupant makes use of the building. Household appliances, like washing machines refrigerators, etc. and entertainment apparatus such as TV and computers, consume mainly electricity that is converted for a great part into auxiliary heat. Occupancy behaviour is covering also variable aspects as the opening of windows, temperature setting, etc.

#### **Renewable energy**

It takes a more and more important share in the final energy supply. The 2010 data provided by the evaluation of the National Renewable Energy Action Plan reports give an estimated share of 11.6%, this corresponds to more than a doubling in 10 years whereas the 2020 target is an overall share in Europe of 20%.

Among other topics for **harmonisation** are:

- **Assessment** of solar yield for solar installations; energy produced by photovoltaic as well as solar thermal collectors;
- **Calculation** and simulation methods for low energy buildings, considering also passive and solar gain and the application of dynamic calculation methods.

Renewable energy in the building sector is covered mainly by solar energy, bio-energy and to a smaller extend by geo- and aero-thermal energy:

Solar energy can be distinguished in:

- **Passive solar** by means of building design (and orientation) for energy saving;
- **Solar electrical**: roof-top photovoltaic installations produce energy electricity;
- **Solar thermal**: solar collectors produce hot water for domestic use and space heating.

Biomass products, such as pellets are used as fuel for space heating installations. Geo- and aero-thermal energy; heat pumps are often used in buildings for ground coupled and air-to-air heat exchange. This conversion technology offers the possibility of efficient energy use both for space heating and cooling.



The JRC Institute for Energy and Transport is supporting the European legislation by assessing technical requirements for standardisation in relation to energy performance of buildings. Under review at present are the energy standards relevant for the EPBD 2010/31/EU; a holistic calculation method for final and primary energy consumption is under development at CEN. This process includes harmonisation of climate data and overall energy calculation methodology.



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