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Thermal Rehabilitation Technology and the Nearly Zero-Energy Buildings. Romanian Representative Education Buildings-Case Study

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Abstract

Improving energy efficiency of the existing buildings is essential, not only for the achievement of the national objectives of energy efficiency in the medium term, but also to meet long-term objectives of the strategy on climate change and the transition to a competitive economy based on low carbon dioxide emission by 2050. Recognizing the diversity of traditions and current practices in the building sector, the climatic conditions and different methodologies of approach across the EU, EPBD [1] does not establish a uniform methodology for implementing nearly zero energy buildings (nZEB), determining each EU Member State to develop its own definition of nZEB. In addition to the new buildings construction, nZEBs and important energy savings in building sector also can be obtained by retrofitting the existing building stock. Until now, the thermal rehabilitation activity was particularly aimed at collective housing sector for which there are appropriate regulations and technologies. Public buildings, in general, are characterized by certain constructive and functional diversity, requiring a specific approach for each case. The aim of the paper is to study the potential of existing education buildings to become nZEBs, by applying current technologies based on improving the general level of thermal protection.

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1. The “Nearly Energy Zero Building” Concept

Today, due to population growth and a more advanced technology, the energy consumption is steadily increasing. At a time when environmental, economic and social concerns are becoming more important, being represented by the climatic changes or those who endanger energy security, resource depletion or the ability to pay the energy bills, reducing energy consumption in buildings is of strategic importance, both at national and international level. Reduced energy consumption and increased use of renewable energy also have an important role in promoting security of energy supply, technological developments and in providing opportunities for employment and regional development.

In addition to the efforts to build (design and construct) new buildings with low energy requirements from conventional sources of energy, it is essential to address the high levels of consumption of existing buildings. Buildings are a central element of EU Member States policy on energy efficiency, accounting for approximately 40% of final energy consumption (Figure 1) and 36% of emissions of greenhouse gases.

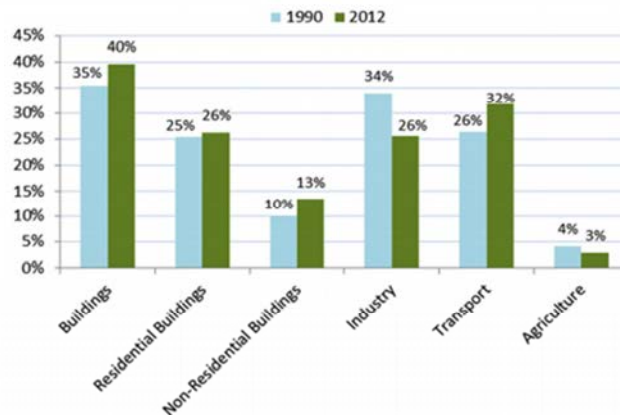


Fig. 1. Share of buildings in final energy consumption in EU-28 (Source: Eurostat)

Having a significant contribution to EU energy consumption, to the use of conventional energy resources and carbon dioxide emissions, the building sector is the subject of many policies, strategies and medium and long-term goals which seek reducing negative effects.

Wider objectives such as the protection of the environment were formulated in "20-20-20" target, which is a set of three key objectives for 2020:

- 20% reduction in emissions of greenhouse gases in the EU compared with 1999 levels;
- 20% increase in the share of energy produced from renewable sources in the EU;
- 20% improvement in energy efficiency in the EU.

In a longer perspective, the EU has set long-term targets for 2050.

Considering that more than a quarter of the building stock in 2050 to be built, much of these emissions are not considered at present. In order to achieve these ambitious EU objectives, energy consumption and associated CO₂ emissions of the buildings to be constructed will be nearly zero. This requires a definition or some guidelines into practice of "buildings with almost zero energy consumption" (nZEB).

Revision of the Directive on Energy Performance of Buildings (EPBD) introduced in Article 9, "Buildings with nearly zero energy consumption" (nZEB) as a future requirement to be implemented from 2019 to 2021 for public buildings and all new buildings. The directive defines buildings with nearly zero energy consumption as follows: "A building with nearly zero energy consumption is a high energy performance building with a reduced energy demand or nearly zero energy that should be covered largely from renewable sources, including energy produced on-site or nearby".

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