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Applying the Energy Performance of Buildings Directive (EPBD) to Existing Buildings

Introduction

The Energy Performance of Buildings Directive (EPBD, European directive 2002/91/EC [1]) specifies a number of requirements specifically dedicated to existing buildings, which have to be met by EU member states. The main objective of the European ENPER-EXIST project (Applying the EPBD to Improve the Energy Performance Requirements to Existing Buildings) is to support the take-off of the EPBD in the field of existing buildings. This will be achieved by addressing the following three issues:

– Revision of CEN standards formerly elaborated with regard to EPBD for their applicability to the building stock;
– Examination of the impacts of the EPBD on economy, required experts, etc.;
– Analysis of the building stock knowledge.

In addition, a roadmap of possible strategies towards creating a more energy-efficient building stock, comprising both statutory and alternative measures, will be defined. Basically, this process relies on experience gained from projects conducted by the participating member states. To fulfill these tasks, the project utilizes an extensive network of existing national and international projects and research partnerships.

1. Analyzing the applicability of CEN standards to existing buildings

When assessing the energy consumption of existing buildings, bodies issuing energy performance certificates are confronted with special problems. Gathering the required input data often turns out to be quite different compared to new buildings. In addition to studying plans and building descriptions (if available) a detailed survey of the building during an on-site inspection is required. If construction plans or related information material are no longer available, gathering fundamental data for calculations becomes even more difficult. Similarly, it can also be very complicated to determine the efficiency factors of an old heating system, for instance.
To test the applicability of the CEN standards currently being developed and to propose subsequent measures concerning possible improvements, facilitations or required additional

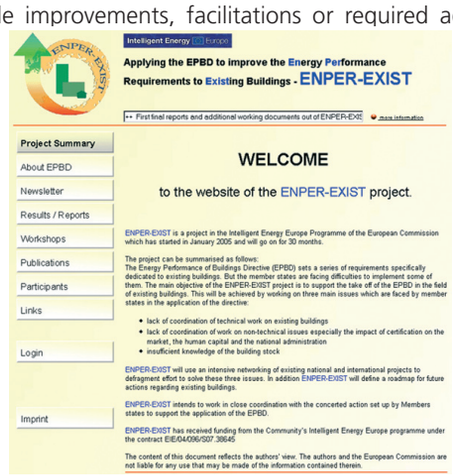

Fig. 1: Screenshot of the project's website www.enper-exist.com containing up-to-date project information [2].

information, four work steps were performed:

1. The respective CEN standards were analyzed and commented on.
2. On the basis of pilot projects it was examined whether the necessary input values can be determined on a site inspection in practice.
3. Simplified and detailed CEN methods of assessment were compared and the calculated deviations were compiled.
4. Alternative building stock analysis methods (used in different countries) were gathered.

The results of the work steps were specified in so-called Working Documents, which were summarized in the final report "Tools Application" [3]. The investigated CEN standards cover the fields of space heating, space cooling, domestic hot water, boiler plants and lighting. The results, technical commentaries and modification proposals submitted to the CEN Working Groups included

– the necessity to define default or standard values, respectively, as some input values were found to be difficult to determine in practice (e.g. values of internal heat sources, air change by infiltration and air change rates in general);

– the simplification of some aspects of calculation (concerning thermal bridges, sun spaces and solar shading, for instance);
– the addition of aspects of aging, as in the case of U-values for glazing;
– the development of simple tables to facilitate or replace complex calculations.

2. Non-technical effects of EPBD

The certification process for buildings according to EPBD specifications is a rather complex procedure, the structure of which is represented in a flow chart in **Fig. 2**. During the project, the direct costs for a performance certificate based on national information were estimated to range from € 100 to € 530 for residential buildings and from € 340 to € 5000 for non-residential buildings, depending on the issuing country. Additional indirect costs varied between € 1 and € 40 for residential buildings and between € 15 and € 40 for non-residential buildings. In Germany, special conditions prevail, as the accreditation of certification experts is not intended and quality assurance and surveillance will be subject to regulation by the federal states.

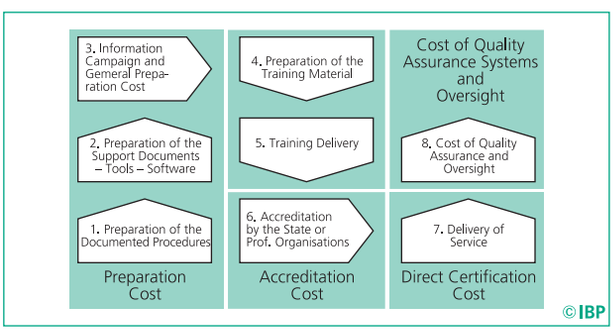

Fig. 2: Energy certification of buildings – process flow chart.

3. Knowledge of the stock of existing buildings

As a first step, the working group compiled a survey, stating what kind of building stock information was available in many EU member states. In addition, the group analyzed to which extent this information was relevant for issuing energy saving ordinances and how the energy performance certificates might help to extend respective knowledge within the scope of the EPBD implementation. An Excel file is available on the project website that contains the collected building stock information, illustrated by numerous diagrams. The data is based on both national statistics and on independent databases, partially resulting from EU projects or from national projects. The questionnaires inquired about the number of buildings, the surface areas contained, the age of the building stock, the quality of the building envelope, the type of heating system, lighting, ventilation, energy consumption etc., in each case for different types of buildings. In general, more information is available for residential buildings than for functional buildings. The bar chart in **Figure 3** analyzes the heating energy consumption of non-residential buildings.

A few countries (like Denmark) have a very detailed knowledge of their building stock. In Denmark, a mandatory energy performance certificate for residential buildings was introduced as early as in 1997.

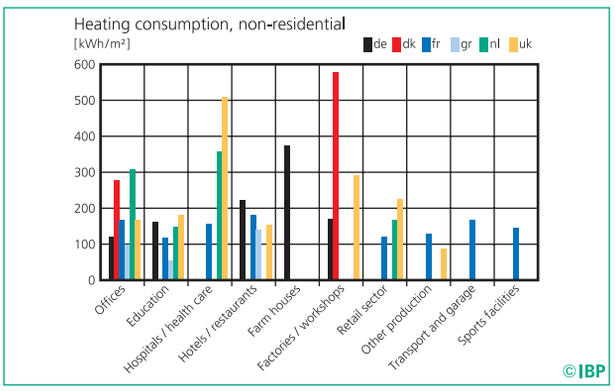

Fig. 3: Member states' specific knowledge of the energy consumption of non-residential buildings acc. to the ENPER-EXIST report "Building stock knowledge" [5].

Those member states who are in possession of a detailed knowledge of their building stock make use of their knowledge to predict the impacts of various (possibly large-scale) retrofit measures. Other countries that are lacking such detailed data pools have to act on a less well-documented empirical basis, on experience obtained from pilot studies. Germany, for instance, can rely on data obtained from the IKARUS study [4]. This study used a system of different type buildings to map the German building stock. The IKARUS study was conducted in cooperation with several research institutions, in order to procure a basis for predicting possible effects of intended modifications with respect to energy performance and associated economical implications. The ENPER-EXIST report entitled "Building stock knowledge" finally mentions that a detailed analysis of the characteristic data contained in the energy performance certificates is very important for enhancing the building stock knowledge and for predicting the impacts of energy efficient measures. The report contains a compilation of the characteristic data required.

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References

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