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Assessment of innovative systems in the context of EPBD regulations

As the Energy Performance of Buildings (EPB) regulations cannot cover all possible kind of new technologies, Member States have to develop "principle of equivalence" procedures, in order to allow the assessment of systems not covered by the standard calculation procedures. This information paper discusses the overall context and describes the approaches used in several countries.

1 > Introduction

The implementation of the European Energy Performance of Buildings Directive (EPBD) [1] requires all EU Member States to develop calculation procedures for the determination of the energy performance of buildings. The EPBD annex specifies the aspects which have to be included, i.e. thermal characteristics of the building, heating installation and hot water supply, ventilation, air-conditioning installation, passive solar systems and solar protection and indoor climatic conditions.

In practice, it is not possible to develop in the framework of energy performance regulations calculation methods that cover all possible kind of systems. Therefore, in order to prevent the EPB regulations to constitute barriers to innovation, it seems necessary that Member States include in their legislation the possibility of alternative ways to assess those systems not covered by the standard calculation procedures. This approach is usually called the "principle of equivalence". In some countries, the principle of equivalence is often relevant/necessary for systems with time variable properties, e.g. demand controlled ventilation, double ventilated façades, etc.

Experience in e.g. France, Germany and the Netherlands has shown that a proper handling of innovative systems in the national EPB regulation often leads to a market transformation (e.g. humidity controlled ventilation is widely spread in France, with more than 1.5 million dwellings equipped, whereas the in other EU countries, the market is marginal). Experience in the Netherlands also has shown that various difficulties can arise related to the principle of equivalence, illustrating that the way to handle equivalence is not so evident.

This paper first presents a discussion of the overall context, followed by a description of the approaches used in several countries. Then, a brief summary of related international projects is given.

Definitions

In the context of EPB regulations, and in particular in the context of ASIEPI WP6, *innovative systems* are defined as:

1. systems which most probably give a better performance in terms of the energy performance of buildings than the common systems and,
2. the performance of which cannot be assessed by the standard EPB calculation methods.

Note: according to this definition, some systems may be innovative in some countries and not in others.

In the context of EPB regulations, and in particular in the context of ASIEPI WP6, the *principle of equivalence* is defined as the procedure to assess the energy performance (in terms of the energy performance of buildings) of innovative systems.

Note: in some Member States, the principle of equivalence is not limited to EPB regulations.

The Energy Performance of Buildings Directive

The objective of this Directive is to promote the improvement of the energy performance of buildings, taking into account outdoor climatic and local conditions, as well as indoor climate requirements and cost-effectiveness.

This Directive lays down requirements as regards:

- > the general framework for a methodology of calculation of the integrated energy performance of buildings;
- > the application of minimum requirements on the energy performance of new buildings;
- > the application of minimum requirements on the energy performance of large existing buildings that are subject to major renovation;
- > energy certification of buildings; and
- > regular inspection of boilers and of air-conditioning systems in buildings and in addition an assessment of the heating installations in which the boilers are more than 15 years old.

2 > Assessment of innovative systems in France, The Netherlands, Belgium and Germany

2.1 > The Netherlands

The Netherlands have a long experience of the principle of equivalence; its application is foreseen in the Dutch Building Decree. Note that in The Netherlands the principle may be applied for all aspects related to construction work, and not only those related to EPB regulation.

The equivalence study has to be evaluated by the municipality where the construction work will take place. Of course, all municipalities do not have the same competences to evaluate such reports. Consequently, the same building with the same innovative system could possibly be accepted in one municipality and rejected in another one. Moreover, different approaches can be used for similar technologies. And in addition it happens that too optimistic evaluations of innovative products get approved by the municipalities. This is a direct consequence of the complexity of many of the equivalence studies and the fact that the procedure of the control of these studies does not contain a pool of experts somewhere in the process.

Anyone can make an analysis (as far as the report is accepted by the municipality).

The regulation does not specify anything about how an analysis must be carried out, and especially about the reliability of the assumptions that have to be made. Consequently, the principle of equivalence can be considered as a very open approach. Which in practice has been a huge stimulation for innovation, but also, as mentioned above, a source of confusion, misunderstanding and misuse. See also [2].

2.2 > France

For the assessment of the system not covered by regulation calculation (Th-CE), an application called Titre V for approval of the project with this system or for the calculation method concerning all buildings must be addressed to the Ministry for Ecology, Sustainable Development and Spatial Planning. It is accompanied by a case study and composed as described in annex V (Arrêté du 24 mai 2006). The technical study has to prove the respect of requirements.

2.3 > Belgium

In Belgium, the implementation of the EPBD is the responsibility of the three Regions (Flemish Region, Walloon Region, and Region of Brussels Capital).

In the three Regions, a Decree (or Ordinance), voted by the Parliament, gives the general framework for the EPBD implementation. The specific procedures, including the calculation methods and the requirements, have to be fixed by each regional government. The Decree (or Ordinance) also gives the government the possibility to define the procedure for the assessment of innovative systems.

This specific procedure is currently defined in the Flemish Region only. Firstly, the manufacturer of an innovative system has to apply for an "ATG-E", which can be seen as a specific Technical Approval limited to energetic aspects, to the *Belgian Union for the technical approval in the construction* (BUtgb/Ubatc). Secondly, the manufacturer must provide this ATG-E and a technical dossier to the Flemish Region, which decides how to make the link between the ATG-E and the regional EPB regulation. If this system is also followed by the two other Regions, it will allow the manufacturer to make only one principle of equivalence study for the three Regions.

2.4 > Germany

The German energy decree for the implementation of the EPBD from 2006 defines the two energy performance assessment methods that have to be used for calculating the EP certificate values. For the residential buildings the two applied standards (DIN 4108-6 and DIN 4701-10) are simpler than the one for the non-residential buildings. The new German energy performance assessment standard for non-residential buildings (DIN V 18599) is a detailed calculation method, which includes already calculation procedures for many systems such as double skin façades, combined heat and power systems, etc.

In the case where a planned building includes technologies or strategies for which the assessment using state-of-the-art methods is impossible, it is defined in paragraph 23 of the energy decree [3] that the systems have to be verified by alternative methods. The used method has to be accepted by the local authority. There are no requirements for the alternative methods defined: in practice, detailed simulation tools are then most often used to calculate the characteristic performance values.

The principle of using alternative methods is utilised in Germany since many years. It is for example also included in the energy saving decree of 1995.

3 > International research projects dealing with assessment of innovative systems

3.1 > IEA ECBCS Annex 35 Hybvent project

Annex 35 of the International Energy Agency's (IEA) Implementing Agreement on Energy Conservation in Buildings and Communities (ECBCS www.ecbcs.org) was entitled Hybvent - Hybrid ventilation in new and retrofitted office buildings (1998-2002). One of tasks dealt with the issue of assessing hybrid ventilation systems in the context of energy performance regulations. The final report [2] can be downloaded from <http://hybvent.civil.auc.dk>, or from the Buildings Platform website (www.buildingsplatform.eu).

3.2 > SAVE ENPER Project

The ENPER project (2001-2003) was a SAVE project in which various aspects of energy performance regulations were studied. One of the work

packages was the assessment of innovative systems. It built further on the work of the IEA Hybvent project. The final report [4] can be downloaded from www.enper.org, or from the Buildings Platform website (www.buildingsplatform.eu).

3.3 > EC RESHYVENT project

The RESHYVENT project (2002 - 2004) was an EC funded project part of the 5th Framework Programme and focused on the use of hybrid ventilation systems for residential buildings. In this project, the assessment of innovative systems was evaluated whereby a Monte-Carlo based analysis method has been worked out and implemented on a few theoretical cases. The final report [5] can be downloaded the buildingsplatform website (www.buildingsplatform.eu).

3.4 > SAVE ASIEPI project

The SAVE ASIEPI (ASsessment and Improvement of the EPBD Impact - www.asiepi.eu) project, submitted to the SAVE call 2006, has started in October 2007. One of the work packages is dedicated to innovative systems (WP6 - The EPBD as support for market uptake for innovative systems).

This work package is led by BBRI. Its first step is to make a "State-Of-The-Art analysis" of the current situation in the different Member States (MS) participating in the project (as partners or as subcontractors). Attention will also be given to knowledge exchange between MS which have experience with handling of innovations in the national EPB regulations, like France, Netherlands, Sweden and Norway, because the lessons learned from this subtask are interesting for all member states. In the ASIEPI project, the following points will be analysed:

- > What is the legal framework in each MS (if any)?
- > What kind of systems are considered as innovative (according the definition above) in each MS?
- > Who is allowed to make the performance assessment? Are there assessment and specific quality control schemes? Is there a role for organisations involved in technical approval of systems? What problems concerning performance assessment are found in practice? Can solutions be found in other countries? To what extent can results obtained in one country be relevant for other countries?
- > Financial aspects, e.g. who is paying the study?
- > How does it work in practice (good and bad experiences from industry)? How many studies have been carried out so far? What are the conditions for a successful implementation? Why do some barriers occur in one country and not in another, what lessons can MS learn from each other?
- > What is the impact of the procedure on the market for innovative systems?

Based on the information collected, a structuring of the various approaches will be made. Moreover, guidelines (with pro's and con's for the various approaches) will be made available allowing MS to accelerate the realisation of a qualitative environment for the assessment of innovative systems in EPBD context. These guidelines will cover legal and technical issues. However, it is not the intention to develop new methodologies to assess the performance of innovative systems, but limit the work on reporting interesting technical approaches.

The expected outcomes of this work package are:

- > Short-term outcome: create/increase awareness of policy makers and industry about the potential barriers that their EPB regulations could be for innovative systems, and providing them guidelines.
- > Mid-term outcome: clear away barriers for innovative systems, due to improved legal frameworks.
- > Long-term outcome (after the project): faster progress towards

improved energy efficiency in the building stock in the EU, healthier, fairer and more transparent market for the development of innovative technologies.

4 > Conclusions

It is expected that the implementation of the EPBD by the EU Member States will substantially contribute to the improvement of the energy efficiency of buildings. As such, it can also be a strong driver for the market uptake of innovative systems.

However, it requires the availability of an appropriate framework for the assessment of such innovative systems. This approach, often called the "principle of equivalence", will vary from country to country, from both a technical and an administrative point of view.

The SAVE ASIEPI project is expected to give support to the EU Member States regarding the setting up or improving of such a framework; which in turn might lead to more harmonisation.

5 > References

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Disclaimer: ASIEPI has received funding from the Community's Intelligent Energy Europe programme under the contract EIE/07/169/SI2.466278.

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The EPBD Buildings Platform has been launched by the European Commission in the frame of the Intelligent Energy - Europe, 2003-2006 programme. It is managed by INIVE EEIG (www.inive.org), on behalf of DG Energy and Transport.

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