ENERGY PERFORMANCE STANDARDISATION AND REGULATION IN EUROPE

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ABSTRACT

Energy Performance (EP) standardisation and regulation is by a growing number of countries considered as an attractive approach for achieving a more energy efficient built environment. Several countries have already enacted such EP based regulation (the Netherlands, France, Germany, ASHRAE approach in North America…), or are preparing one (Greece, the Flemish Region…).

The European Council and Parliament are drafting a directive on the Energy Performance of buildings, imposing the institution of such regulation in every member state.

This paper will give a general introduction to the issue of energy performance standardisation and regulation :

- A brief review of major developments during the last 3 decades;
- The general principle of energy performance standardisation and regulation and an indication of the various challenges;
- The need for European collaboration : a brief introduction to the SAVE project ENPER-TEBUC;
- A brief introduction to the European Directive on Energy Performance;
- Some reflections on the role of CEN and EOTA in relation to the issue of energy performance standardisation and regulation.

KEYWORDS

Standardization, regulation, energy performance, European Directive, indoor climate

INTRODUCTION

Energy Performance (EP) standardisation and regulation is by an increasing number of countries considered as an attractive approach for achieving a more energy efficient built environment. Several countries have already enacted such EP based regulation (the Netherlands, France, ASHRAE approach in North America…), or are preparing one (Germany, Greece, the Flemish Region…).
First of all, the paper discusses why energy performance standardisation and regulation is at present an important issue. Then, the proposal for a European Directive on Energy Performance of buildings is briefly discussed. This is followed by an overview of critical challenges for a successful implementation of an energy performance regulation. Finally, the ongoing SAVE-project ENPER-TEBUC is briefly presented.

WHY ENERGY PERFORMANCE REGULATION IN THE BEGINNING OF THE 21ST CENTURY?

There are clearly some remarkable trends in the expression of requirements which explain the interest in energy performance regulations in the beginning of the 21st century:

- In the seventies, eighties and the beginning of the nineties, many countries have set up standards and regulations concerning minimum requirements regarding the thermal insulation of buildings. Often, this was combined with requirements regarding the minimum efficiency of heating systems. This approach was quite logical since many buildings were poorly insulated (due to which transmission losses represented the bulk of the heating losses) and equipped with heating systems with a poor performance;
- In the eighties, several regulations included the so-called passive solar performances of buildings (use of free solar gains in winter time) whereby minimum requirements concerning the net heating demand were imposed;
- Due to the increased importance of summer comfort and cooling, the potential contribution of renewable energy sources, the relative and sometimes absolute increase in the energy use due to ventilation, there is since the beginning of the nineties a strong tendency for setting up requirements whereby attention is paid to the total energy use of buildings.

Energy Performance (EP) standardisation and legislation is in many member states considered to be an attractive tool for increasing the energy efficiency of new buildings and existing buildings. Several countries have already an Energy Performance Regulation (EPR) in place (Netherlands, France, Germany,…) or are preparing a new regulation (Belgium, …).

NEW PROPOSAL FOR EUROPEAN DIRECTIVE ON ENERGY PERFORMANCE

The recent proposal (May 2001) by the European Commission for a European Directive on Energy Efficiency is an important new action in relation to the energy performance assessment of buildings. The fact that the European Council of Energy Ministers and the European Parliament have approved this proposal in a first reading (including comments) seems to indicate that there is good chance to have in the near future such directive.

NO ENERGY PERFORMANCE WITHOUT ACCEPTABLE INDOOR CLIMATE

As far as the authors are concerned, an EP approach that does not pay attention to appropriate indoor climate conditions is not on the right track. Therefore, an EP approach must have as basic idea a correct assessment of the energy efficiency of a building for an agreed level of indoor climate conditions, whereby particular attention is given to thermal comfort in summer, indoor air quality and visual comfort (Figure 1).

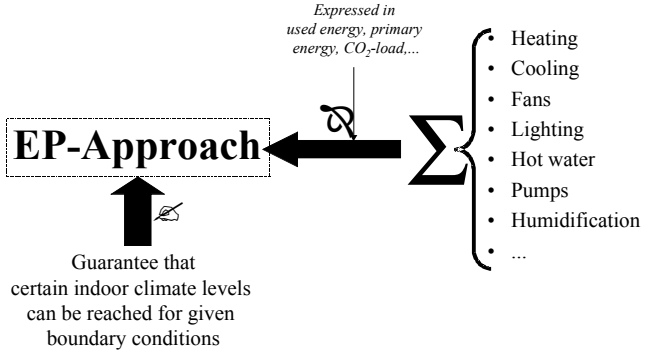

Figure 1: The EP level of a building includes all building related energy consumption (under normalised conditions) and assumes appropriate indoor climate conditions

It implies that a meaningful approach cannot only be based on a procedure that aims to limit the (normalised) energy use (❶) of a building. It should be accompanied by appropriate procedures that guarantee that acceptable indoor climate conditions (❷) can be achieved for given boundary conditions, such as climate, occupancy, etc.

CHALLENGES FOR AN ENERGY PERFORMANCE STANDARDISATION

In order to achieve an EP approach that really achieves environmental and societal quality, a whole range of challenges have to be dealt with (Figure 2):

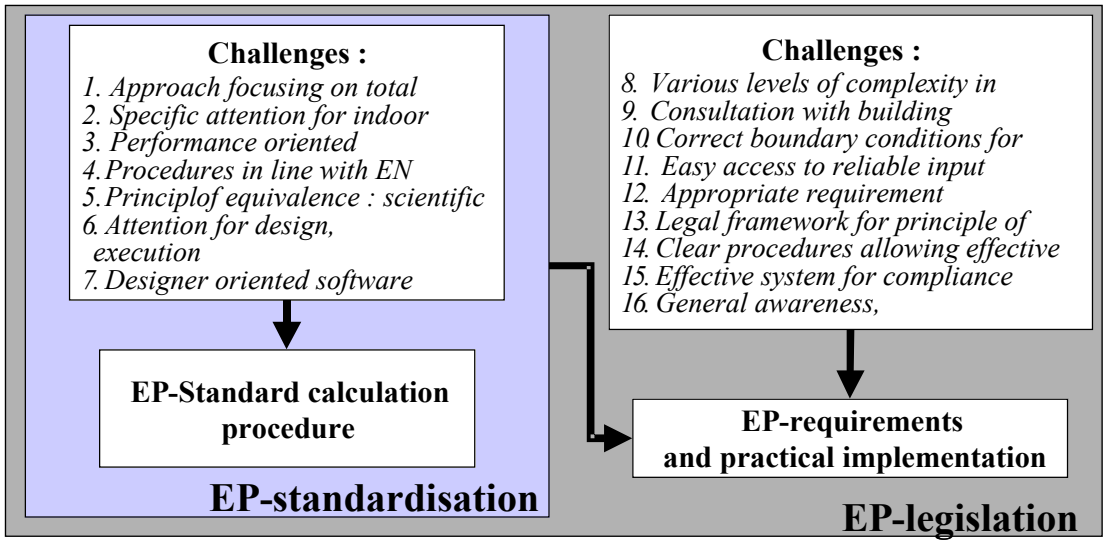

Figure 2: Challenges for and interaction between EP standardisation and legislation

1. *An EP approach must focus on the overall energy consumption*
   The total energy consumption of the building and its installed appliances has to be considered, whereby assumptions to be made for the various boundary conditions.
2. *Special attention to indoor climate*
   An EP approach must pay explicit attention to the indoor climate conditions. Of particular interest is the thermal comfort in summer and the indoor air quality (see §0).
3. *Performance oriented procedures*
   As much as possible, the whole EP approach must be based on a performance-oriented approach. This does not necessarily mean that the whole calculation procedure must be expressed in performance terms, but that the method is founded on a performance based philosophy. This is especially crucial for allowing the principle of equivalence.
4. *Procedures in line with CEN standards*
   It is clear that EP procedures should be based as much as possible on the CEN standards. A practical problem is that certain procedures are not yet approved as EN-standard.
5. *Open platform for innovation: coherent scientific philosophy with respect to the principle of equivalence*
   It is crucial that the EP philosophy takes from the beginning the principle of equivalence into consideration. It means in practice that one should have a correct philosophy for allowing in a later phase a correct assessment of the principle of equivalence.
6. *Attention for design, component and execution performances*
   It is important to have not only good component performances but also a good design and a correct execution. Therefore, an EP approach should pay attention to these 3 aspects. As far as legislation is concerned, the execution aspects can only be included in the assessment if proof of compliance is required after construction ('dossier as built').
7. *Support by means of designer oriented software*

CHALLENGES FOR AN ENERGY PERFORMANCE LEGISLATION

An Energy Performance legislation specifies the minimum performance level, whereby the agreed Energy Performance standard has to be used as determination method or, if not fully covered by the standard, use can (partly) be made of the principle of equivalence. In order to have an effective approach, a whole range of requirements has to be met, e.g.:

8. *Various possibilities for proving compliance with required performance level, with specific attention for simplified procedures for simple projects.*
   Especially for small projects and/or projects with very classical techniques and/or in a market which makes little use of specific consultancy on building physics, there may be a need for a simpler procedure than the standard EP calculation. Such approach is in principle almost purely descriptive. The other extreme is the approach that is required for applying the principle of equivalence. It may require detailed calculations going far beyond the standard EP calculation and it is mainly performance based.
9. *The preparation procedure should include consultation with all stakeholders*
   Implementing an EP legislation should be preceded by consultation with the various partners: designers, industry, building contractors, consumer organisations…. This is important for various reasons: to inform, to obtain feedback ….
10. *Correct boundary conditions for various stakeholders*
    In order to achieve a successful implementation of an EP approach, it is important that the various stakeholders (architects, building contractors, investors, building owners, administration) have appropriate boundary conditions that motivate them to apply the regulations and/or to take actions to increase the probability for a correct application.
11. *Easy access to reliable product data*
    Reliable and well-defined product data are essential inputs for applying an EP procedure. This means that, first of all, there must be appropriate determination procedures. Moreover, industry must make these data available whereby easy access by the users is important. As far as possible, there should be default data for most products and systems, which should be an underestimation of the real performances.
12. *Requirement levels which are performance oriented and achievable by the market*
    An EP regulation can contribute to a better environmental and societal quality if the levels of requirement are on the one hand sufficiently severe for stimulating better building design, technology and execution and if on the other hand these levels are achievable by the market.

Therefore, an approach as presented in Figure 3 may be relevant:

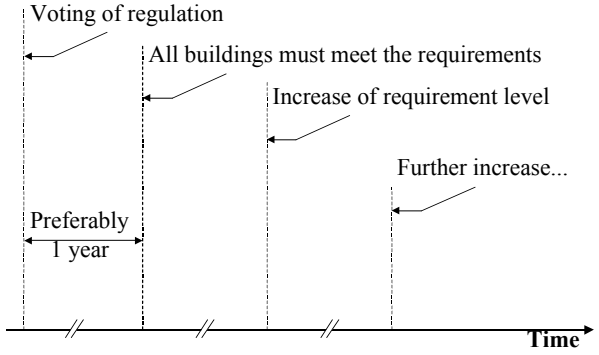

Figure 3: Gradual increase of the requirements

- In a first phase, the building sector must become familiar with the new approach.

- Later on, the requirements can/should be gradually increased. This has e.g. been done in the Netherlands where the required EP level (based on NEN 5128) was in the beginning 1.40 (1996), then it became 1.2 (1998) and since January 2000, it has become 1.0.

13. *Legal framework for the application of the principle of equivalence*
    Given the importance of the principle of equivalence as a measure for correctly assessing innovative approaches, a legal framework for proof of compliance is needed. The authors believe that it is not realistic to expect from a communal civil servant to correctly assess such approaches and, therefore, an assessment procedure at a higher level is required.
14. *Legal framework requiring proof of compliance after construction*
    Given the building practice in certain countries, it seems for most countries crucial to require proof of compliance with the regulation after construction (and not only when requesting a building permit) and this for the following reasons:
    - It allows to pay attention to the execution aspects;
    - The motivated architects are in a stronger position to impose the desired performance;
    - The motivated builders better know the building composition. They will have the possibility of checking the conformity between the dossier 'as built' and the reality;
    - The material producers and building contractors are in a stronger position;
    - As a result, the governmental officials will no longer be the only controllers, since motivated building owners, architects, material producers, building contractors and possible buyers of the building are becoming able to carry out control;
    - The risk of non-compliance with the regulations reduces and it will lead to more energy efficient buildings and a better environmental performance the building stock;
    - Finally, a dossier 'as built' is at the same time an ideal basis for energy certification.
15. *An effective system for checking compliance with the regulation*
    A legislation that is based on a proof of compliance after construction strongly enlarges the number and type of persons who can check the works. Nevertheless, there is still a major role for the administration to set up a framework for carrying out random controls and for taking appropriate measures in case of non-compliance.
16. *Actions in relation to creating general awareness, training…*
    It probably is in many cases important to pay sufficient attention to informing the market about the philosophy and advantages of an EP approach. Moreover, appropriate training programmes are crucial.

ENERGY PERFORMANCE STANDARDISATION: AN OPEN PLATFORM FOR INNOVATION AND CREATIVITY

The availability of cost-effective innovation technologies with respect to indoor climate and energy efficiency is not a guarantee for its large-scale application by the building sector. Many users are not able to correctly assess the benefits of certain innovations. Moreover, creative solutions for improving the indoor climate and/or energy efficiency are not always understood by the decision makers. An EP approach has the potential to stimulate innovation and to promote creative solutions.

In Figure 4, various possible actions (all aiming to improve the energy efficiency of a building) are compared with respect to their investment and the energy savings (in EP terms). In principle, an EP approach must allow to assess all relevant technological improvements, therefore a situation as presented for 'measure' E should not occur. As far as the various measures have no other advantages, an EP approach will orient the market to those measures with the best 'investment-energy savings'-ratio, which corresponds in Figure 4 to those measures with the steepest slope. A major advantage for governments is that one can focus on a single global requirement; the market forces can determine the most attractive options.

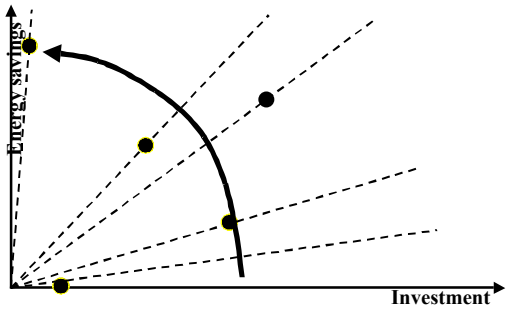

Figure 4: An EP approach stimulates the use of cost-effective measures

SAVE project ENPER-TEBUC

Since April 2001, the European SAVE project 'ENPER-TEBUC' (2001-2003) (www.enper.org) has started. It brings organisations from 15 European Union countries together around the topic of energy performance standardisation and regulation.
This SAVE project deals with the issue of harmonisation in European Building Codes integrating the project proposals 'ENPER' and 'TEBUC' into a single clustered project programme.
A first part of the study concerns the investigation of the possibilities to design harmonised building codes at the European level. Since within the time horizon of the Kyoto protocol (2008 – 2012), the existing building stock will be responsible of most of the CO_2-emissions, possible measures to foster energy efficiency in this field will be particularly scrutinised. The questions of checking the application and building certification will be investigated, so that this code can serve as a reliable and visible tool for ensuring building energy efficiency.
Whereas a whole range of European standards are prepared and/or adopted that cover several sub-domains of an EP standard, there are major differences in the overall approach used in the different countries for determining the EP level of a building. Setting up a platform for information exchange among the prominent national players, to systematically collect and summarise the different approaches and to develop suggestions for a European 'model code' is therefore another main goal of this project.

CONCLUSIONS

1. The authors believe that an Energy Performance standardisation and regulation is probably the most effective approach for at the same time improving the indoor climate in buildings (especially thermal comfort in summer and indoor air quality) and increasing the energy efficiency.
2. The proposed European Directive on Energy Performance will, if adopted, impose the member states to implement the concept of Energy Performance regulations.
3. A successful implementation requires that a whole range of conditions have to be met. Among these, the co-operation of the professional sectors involved is of paramount importance for the success of the regulation.
4. Several European countries are working in a similar way towards an overall Energy Performance regulation. The SAVE-project ENPER is expected to make a substantial contribution towards the development of a common European approach.