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## Towards Pan-European Software for Building Energy Performance

Report from a workshop organized by CENSE on June 29,  
2009 in Brussels

A workshop on software for building energy performance was organized by the IEE - CENSE project in Brussels - CEN Meeting Centre, on June 29, 2009. The main objective of the event was to identify the interest of a unified European framework for building energy performance software and to discuss common actions to push forward the development and application of a European energy calculation methodology.

The subject of the workshop was considered to be of high priority. Participants from 17 countries attended the workshop. The majority of the participants were representing the main European software companies in this field. Energy experts, manufacturers, energy suppliers, standard writers and authorities (at the European, national, regional levels) were also participating.

During the workshop, the possibility for sustained cooperation on pan-European methodologies and software was identified. This information paper reports on the discussions and on the outcomes of the workshop.

### 1 > Context

The energy performance of buildings is a key energy policy concern for Europe (Commission, Member States), one that is addressed by several Directives, notably the Energy Performance of Buildings Directive (EPBD). Buildings are responsible for 1/3rd of the total energy used in Europe, and the long term potential exists to cut this by half.

To achieve the ambitious goals set up by the Commission, reliable calculation tools are needed to predict with a reasonable accuracy the performance of new and refurbished buildings and to provide recommendations for improvement.

The Directive defines the general requirements for these processes, but details of transpositions of the Directive - including calculation procedures - are left to the Member States' authorities. As a result, there is a patchwork of national methods and conventions. In consequence, difficulties in reaching the targets of the Directive are encountered because the multitude of different methods handicaps the dissemination of good practice and know-how, the circulation of products and services and the comparison of experiences.

Although it might take some time to achieve it, there would be many benefits in having a Europe-wide unified framework for such calculation methods [4]. Of course, each country would set up the level of requirements, national input data and boundary conditions, but it would be a great advantage if the methodology used was the same throughout Europe.

## 2 > The IEE-CENSE-project and the purpose of the workshop

The aim of the IEE-CENSE project [2] is to increase awareness and effective use of the European (CEN) standards related to the EPBD in the EU Member States. The main activities in the IEE-CENSE project are:

- > to communicate the role, status and content of these standards;
- > to collect comments and good practice examples from Member States;
- > to prepare recommendations to CEN.

Standards help to create common European market conditions. Software companies that are interested in developing software for the European Market would like it to be possible for the same version to be used within all national regulatory systems (e.g. verify compliance with energy performance requirement, calculate energy performance certificates) and for it to be linked to design tools. Standardisation could help to open up a huge market.

To explore the interest on consistent European calculation methods and software further, a software workshop for building energy performance was organised in Brussels at the CEN Meeting Centre:

- > to inform about the present legal situation and the use of such software in Europe;
- > to exchange views and opinions (on a common European method, on linking regulation and design);
- > to discuss and identify common actions to advance the development and application of a common European energy calculation methodology.

An additional aim of the meeting was to strengthen the cooperation between standard writers and software developers, which was considered to be highly essential. Influential standard writers who are active in the development of the CEN EPBD standard package participated, including:

- > Jaap Hogeling Chair CEN BT TC 371;
- > Johann Zirngibl Chair CEN TC 228/WG4 and ISO TC 205/WG9;
- > Dick van Dijk Chair ISO TC 163/WG3.

## 3 > The workshop's content

The meeting was chaired by Johann Zirngibl, and started with presentations, followed by a productive plenary discussion. The presentations can be downloaded at [www.epbd-s.eu](http://www.epbd-s.eu).

Gordon Sutherland, Project Officer from the Executive Agency for Competitiveness and Innovation (EACI), opened the meeting with a presentation entitled "Why support energy efficiency in buildings?".

Jaap Hogeling, Chair CEN BT TC 371, then gave an overview of the EPBD CEN standards, and Paul Davidson, Director, Sustainable Energy, at BRE, described the context of EPBD Energy Calculation Procedures and the UK experience. The final presenter, Laurent Socal, Edilclima, explained how to apply the CEN Package to building regulation and software. He outlined the difficulties encountered in the national version of the CEN package in Italy and presented some solutions.

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In the discussions the following points were underlined:

- > different tools will provide different answers;
- > to several participants, the question of hourly or monthly method is a wrong debate, compared to the capacities of the calculation engines; other participants stress that it will be a major challenge to reach international agreement on the descriptions of a common hourly method, covering the building, the systems and the dynamic interactions;
- > the user interfaces are as important as the content;
- > each section of a standard should be a software model;
- > boundary conditions could be used to determine whether detailed or simplified models should be used;
- > low energy houses require better calculation models and software, but on the other hand the biggest uncertainty in the model is often in the input data [1].



The importance of the software developers, as the linking element between the standard writers and the standard users (designers, installers, certifiers) in the field of energy performance of buildings was recognized. The software developers will read the standards and apply them in the development of software tools for building professionals. The content of the standards should be "software friendly" and "software proof". Also, in order to achieve energy efficiency in buildings, reliable software tools will definitely be needed.

#### 4 > A unified framework for building energy performance

The following aspects were identified during the workshop's discussions:

The priorities are not the same across Europe (e.g. in warm climates, summer comfort has a higher priority than heating). Different users, such as designers, installers and certifiers, have different needs. Consequently, the overall structure of the unified framework [4] should allow different levels (simplified, detailed) and be modular. Given the power of calculation engines today the simplification could be achieved by the use of simplified input (default values, precalculation).

Common validation test cases need to be defined to ensure that results obtained at different levels are reproducible.

There is a need for designers to be able to use the same software for design and building code compliance, to avoid duplication of data input.

Although the small market size of some European countries would not seem to justify the development of national software tools, especially for complex buildings, most are in the process of doing so. The participants reported that they often have to struggle with low quality public software developed with limited budgets (incomplete tools, interactions between buildings and equipment not taken into account, an absence of user-friendly interfaces, etc).

A common methodology (see note 1, left) with a modular structure, would make it possible to reach higher quality workflows and avoid duplication of effort in international cooperation. It could also be tailored to individual country requirements by adding national annexes (i.e. national weather data). There should be enough flexibility to allow each country to respond and comply with the EPBD in their own way, in accordance with their existing custom and practices.



The use of CEN standards in Member State regulations is the goal. However, at this stage the use of existing CEN standards is difficult. There are still different options, the whole structure should be better defined and national annexes are missing.

Thus even if it appears to be the start of a long process, the work should proceed in this direction and now is the right time to start.

## 5 > Databases

The databases are often closely linked to the national calculation methods (e.g. UK, France). The result is a patchwork of databases corresponding to the patchwork of national methods. The proliferation of different databases (i.e. product characteristics, weather data) is a strong argument in favour of working towards a unified European framework.

If the national market is not so important, manufacturers will often be unwilling to make the effort to provide data. National databases sometimes require additional testing or precalculation. The results are new barriers for trade within Europe.

Reliable calculation tools for design and asset rating, especially for low energy houses where cooling and the interactions between the systems and the building are important, have to use the dynamic approach with hourly calculation steps. Detailed meteorological data are very expensive in some countries and do not even exist in others. Consequently, it is essential that a database of hourly weather data for all regions of Europe be made freely available to all who require it.

## 6 > Identification of common actions

In some countries the public authorities finance a "core" software or free software. In addition to these mainly simplified interfaces, there are "commercial" interfaces developed to facilitate the use of the software (e.g. graphical interfaces).

Therefore two domains could be distinguished for common actions: a "public" domain and a "private" domain.

### Public domain

The common European methodology should be in the public domain, where people can share experiences and collaborate to develop better procedures for energy efficient buildings. There should be no commercial interest, in order to allow public organisations (building authorities, institutes, universities) and private companies (industrials, energy suppliers, software companies) to work together.

A common methodology (description) is preferred over free core software in order to encourage commercial EPBD applications to be used. At the national level, this methodology has to be adapted to individual countries requirements (e.g. climate).

A unified framework, developed by sharing international knowledge and accessible to everybody, will be more easily accepted at a national level, by national authorities.

International standardisation turns out to be the most appropriate procedure for achieving this work in the public domain. Standards are well recognized, and can be referenced all over the world. The working procedures are transparent. At several stages of standard realisation, possibilities are given to provide input, to react and finally to vote on a proposal. In Europe, the transposition of European (CEN) standards into national standards is mandatory for the national CEN Member Bodies.

## Private domain

The public domain should be complemented by the private sector (competition, commercial interest). Private companies could develop software that is adapted to the needs of different users and sponsors, provide training, etc.

In conclusion, the 'private domain' is software, whereas the 'public domain' is a common European methodology. There is no need for European standard software.

## 7 > Roadmap towards a unified European frame on building energy performance - the European method as the reference for national methods

National methodologies are used in most European Member States today. CEN standards are taken into account in a "practical way", and are supplemented by national developments (see [3]).

As building professionals have been and are being trained to use these national methods, it is unlikely that national methods can be replaced immediately by a unified European methodology. But the use of a European methodology could be admitted as an option to fulfil the national building code requirements. This possibility is already given in some countries, despite the fact that the current first generation of CEN standards to support the EPBD contains many open ends that must be completed at national level.

If this possibility is made available, it is very likely that software will be developed more and more according to the unified European framework, as the market will be European rather than national. Building professionals will then be trained to use this methodology as it gives them the possibility to work throughout Europe.

It should not be a problem if two methodologies, e.g. national and European, yield two different results. This is already the case when using simplified and detailed methods, default values or real values etc. But coherence has to be established. For example, when energy consumption is determined by using a simplified method, the consumption obtained should be conservative - higher - than it would be if it had been determined by using a more detailed method. The effort of going into more details should be compensated.

An important step will be to restructure the European methods in such a way that it will be easier to identify where national choices must be made.

Formal validation, calibration and accreditation of the European method, and of existing national methods, will be necessary.

The European Commission has already announced such international calibration in the proposal for a recast of the Directive (the development of a European method for calibrating the minimum requirements in each Member State).

The unified European framework, developed to incorporate the experience of all European countries and approved by European Member States, should be used for international calibration of national software.

## 8 > Opportunities for pan-European software for building energy performance

The enquiry that was carried out before the workshop (see: [www.epbd-s.eu](http://www.epbd-s.eu) "Software enquiry results") indicated that software tools based on different methodologies, may be used within national regulatory systems (minimum requirements, certificate) in some countries. In these countries it is therefore already possible to propose software based on unified European methodology.

In some countries this software has to be accredited. National accreditation of software using a common methodology, based on standards, would facilitate accreditation across Europe.

Several countries are currently preparing to implement the EPBD in their national building regulations. They will face the same difficulties (many choices to be made at the national level, different time steps, loose ends in CEN standards) that other countries have already overcome. An exchange of experience between different countries can be very effective when related versions of software are being developed.

It is proposed that different countries should work together towards a common European structure. Each country could then focus on national specifications (like weather data). Building authorities will be able to reduce costs by adopting existing European standards instead of reinventing the wheel by developing separate national standards and software. Software companies will benefit from the creation of an open European market for services and software.

The proposed collaboration will be a big step towards a common European methodology and towards Pan-European software.

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### CENSE partners:

TNO (NL; coordinator), CSTB (FR), ISSO (NL), Fraunhofer-IBP (DE), DTU (DK), ESD (GB), FAMBSI (FI), EDC (IT)

### Associated partners:

HTA Luzern (CH), BRE (GB), Viessmann (DE), Roulet (CH), JRC IES (EC)

Link: [www.iee-cense.eu](http://www.iee-cense.eu)

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