DETAILED REPORT ON PROCEDURES FOR ENERGY PERFORMANCE CHARACTERISATION

CONCERTED ACTION

SUPPORTING TRANSPOSITION AND IMPLEMENTATION OF THE DIRECTIVE 2002/91/EC CA – EPBD (2005 – 2007)

21 Member States
Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, UK

1 EFTA Country
Norway

1 Accession Country
Bulgaria (MS from 2007)

6 Invited Participants
Lithuania, Romania, Malta, Luxembourg, Croatia, Czech Republic

Editors:
Eduardo Maldonado
Peter Wouters
Aleksander Panek

Core Theme Leaders:
Jens Laustsen (Certification)
Hans van Eck (Training)
Marcello Antinucci (Inspections)
Hans Erhorn (Procedures)

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Intelligent Energy Europe

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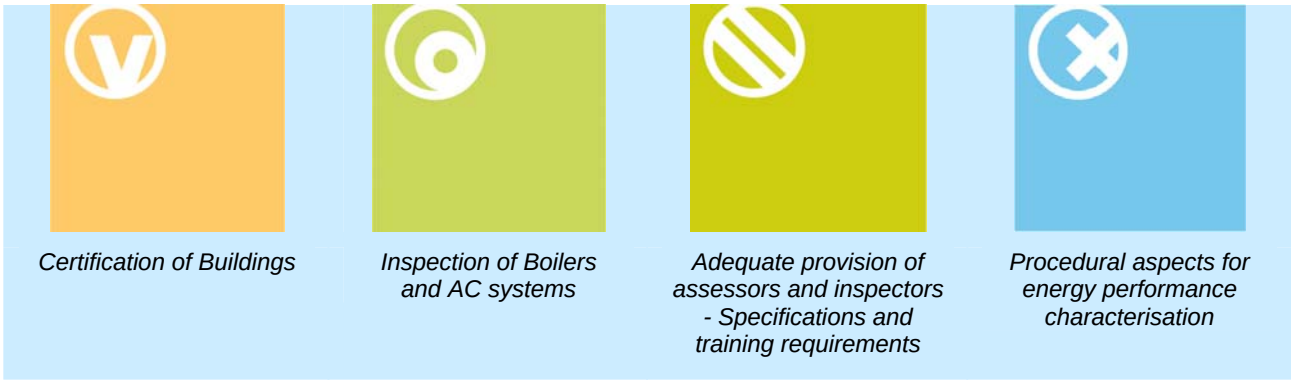


The four main themes of the EPBD

1. General Information

The Core Team Procedures has been very active in the Concerted Action project. Thirty-eight (38) sessions of 1.5 – 2 hours have been organized. Some of these have been organised in collaboration with some of the other core teams. Procedures for calculating the energy performance of buildings has been of high interest from the beginning of the CA.

All sessions have been highly participated – typically with 20 up to 65 participants. Typically, most countries or all countries have participated in the workshops and often countries have sent several delegates to this workshop, especially for the combined workshops.

The range of topics for the Core Team Procedures has been large. This concerns the types of buildings: residential buildings, non-residential buildings and especially public buildings which are covered by specific demands in the Directive. But also mixed buildings with multiple functions were analysed in detail. Similarly, there has been a need to cover new and existing buildings. Representatives of some countries explained the necessity for regional procedures.

CEN was preparing in parallel to the CA project a set of standards. These standards have established main specifications, but most of them leave many options for choice by MS as well as a need to define their national application conditions concerning, e.g., the climate or the building culture. Moreover, some topics, due to their complexity, are not addressed at all by CEN.

The CA has provided a convenient forum to discuss the practical implementation of the new standards in regulations and certification procedures in MS, namely by identification of common approaches to simplifications and alternatives, which pose common difficulties that are best solved together by the MS in frank discussions. Although it was not possible for CEN to find a common solution that fits all MS needs, the range of solutions has been discussed to find out whether they can be restricted to a few selected possibilities, allowing for a first level of convergence within the EU. A continuous experience exchange with experts from the relevant CEN committees and from running EIE SAVE projects (like ENPER-EXIST, EPA-NR and EP-LABEL) has been created by the Core Team Procedures.

2. The Programme of Work for the Concerted Action EPBD

The work in the Core Team Procedures has included many aspects from the development of procedures, their practical application and verification as well as the European activities on harmonisation. The following chapter will report on some topics that have been covered more deeply and continuously in the sessions:

- CEN standards and their practical use in the national procedures
- Which approach is most appropriate (holistic, simplified, tailored)
- Software developments and quality control procedures
- How are summer requirements covered in the MS procedures
- How to handle innovations in the procedures

CEN has prepared a set of standards, which are now under review in the Member States. These standards establish main specifications, but they still leave many options for choice by MS as well as a need to define their national application conditions (concerning e.g.: climate, procedures). Relevant discussion issues are:

- Which model could be implemented from the prEN standards?
- How to use CEN prEN standards for existing buildings?

Moreover, some topics, due to their complexity, are not addressed at all by CEN. Relevant discussion issues are:

- Building integrated renewable systems
- Combined daylighting and shading devices
- Cogeneration
- Hybrid ventilation

During 2006 and 2007, several MS presented actual draft versions of the software packages that are planned for adoption at national level. Besides providing inspiration for other MS, it also allowed for several cooperation agreements. Special sessions with several EIE-funded projects, e.g., EPLABEL and EPA-NR, demonstrated tools under development for non-residential buildings, based on either asset or operational rating methodologies. The discussion about the pros and cons of each approach helped MS to choose the right option adapted to their national needs.

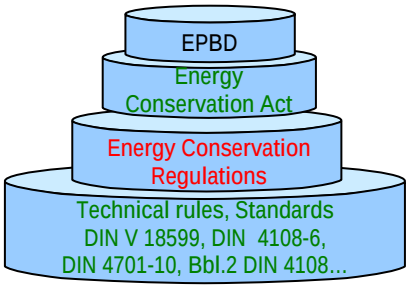
The Core Team Procedure was the smallest within the CA, due to its very specific nature and detailed technical content (calculation models, simulation software, etc.). However, much progress has been achieved, namely:

- Enhanced MS understanding of the scope and the diversification of EPBD CEN work.
- Exchange of general ideas for the integration of renewables in national methodologies.
- Information and analysis exchange forum for implementation of the standards in collaboration with relevant EIE projects.
- Mutual information about all the available national approaches, demonstration of all the available software packages, adopted simplifications and default values.

At the end of the Concerted Action, on June 30, 2007, many countries are still working on the development of national software. Much work is still needed before significant progress can be achieved, and the exchange of ideas and discussions about the difficult issues need to continue in the CA II project.

3. Actual work in the Training Core Team

The Core Team discussed a series of issues in the different sessions on the 8 meetings. Most of the points were in relation to article 3, 4 and 5 of the Directive. During the discussions in the Core Team sessions, it became clear that there was no common procedure in the implementation all over Europe. However, the discussion in the Core Team helped the procedure makers in the countries to get a better understanding of the different country philosophies of the developed procedures.



The implementation of the EPBD in Germany.

Comparing the implementation process, some countries like Germany, as illustrated left, use a 3 step procedure. The energy conservation act defines the legal base. The general procedures, requirements and exceptions are defined in energy conservation regulations, in which cross references are made to calculation standards.

Other countries, e. g., Portugal, fix all the information and rules in the energy conservation regulations or in the energy conservation act without using any supporting standard.

3.1 The planned national procedures

The Core Team discussed the planned approaches and procedures of the MS in different meetings. The initial overview showed that most of the MS plan national procedures on calculation base. In the procedures, most of the countries do not plan to use standards, but to publish the methods in an ordinance. This may make the implementation of CEN standards more difficult.

Only one third of the MS planned a full implementation of the CEN standards. Another 40 % of the MS planned at that stage to implement the CEN standards methodologies only partly or in a pragmatic way.

	procedures		building type					method			published as		use of CEN				status					
																	residential			non-residential		
	regional	national	new	existing	residential	non-residential	special non-residential	asset	benchmarking	operational	standard	ordiance	fully	partly	pragmatically	not yet	ready	draft	not yet ready	ready	draft	not yet ready
Austria	X		X	X	X	X		X			X			X				X				X
Belgium – Brussels	X		X		X		X	X				X			X				X			X
Belgium – Flanders	X		X		X		X	X		(X)		X			X		(X)		(X)	(X)		(X)
Belgium – Walloon	X		X	X	X		X	X	X	X		X				(X)			X			X
Bulgaria		X	X	X	X	X			X	X		X	X				X			X		
Cyprus		X	X	X	X	X		X				X			X				X			X
Estonia		X	X		X			X							X				X			X
Finland		X	X	X	X	X		X		(X)		X		X					X			X
France		X	X	X	X	X		X	X		X			X	(X)				X			X
Germany		X	X	X	X	X		X			X		X	(X)			X			X		
Greece		X	X	X	X	X		X		X		X			X			X			X	
Hungaria		X	X	X	X	X		X				X			X	(X)			X			X
Ireland		X	X	X	X	X		X			X		(X)					X				X
Italy	X	(X)	X	X	X	X		X				X		X					X			X
Latvia		X	X	X	X		X	X	X	X	X		X						X			X
Lithuania		X	X	X	X	X			X		X				X			X			X	
The Netherlands		X	X	X	X	X		X			X		X					X			X	
Norway		X	X	X	X	X		X				X			X			X			X	
Poland		X	X	X	X	X		X				X			X			X			X	
Portugal		X	X	X	X	X		X		X		X			X			X			X	
Slovakia		X	X	X	X	X		X		X		X	X					X				X
Spain		X	X	X	X	X			X	X	X				X			X			X	
Sweden		X	X	X	X	X		X	X			X		X					X			X
United Kingdom		X	X	X	X	X		X		(X)	X		X					X			X	
Denmark																						
Slovenia																						
Total	3	19	22	21	22	19	2	19	7	7	9	12	7	5	10	0	2	11	9	2	8	12

A survey later in the CA (end of 2006) showed, however, a different picture:

EPBD Concerted Action

The standards

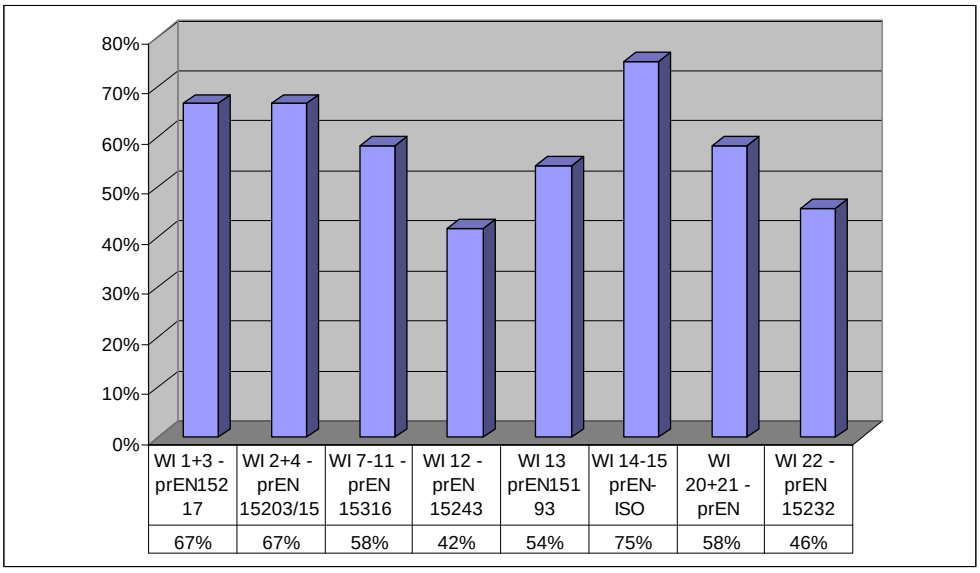
Article 3

WI 1+3 - prEN15217	Energy performance of buildings – Methods of expressing energy performance and for energy certification of buildings (merged with WI-3)
WI 2+4 - prEN 15203/ 15315	prEN 15203: Energy performance of buildings –Assessment of energy use and definition of ratings prEN15315:Energy performance of buildings – Overall energy use, primary energy and CO_2 emissions
WI 7-11 - prEN 15316 (Parts 1 to 4)	Heating systems in buildings - Method for calculation of system energy requirements and system efficiencies
WI 12 - prEN 15243	Ventilation for Buildings - Calculation of room temperatures and of load and energy for buildings with room conditioning systems
WI 13 prEN15193	Energy performance of buildings – Energy requirements for lighting – Part1: Lighting energy estimation
WI 14-15 prEN-ISO 13790	Energy performance of buildings – Calculation of energy use for space heating and cooling – (with extension of scope of EN ISO 13790; 2001)
WI 20+21 - prEN 15241	Ventilation for buildings – Calculation methods for energy requirements due to ventilation systems in buildings
WI 22 - prEN 15232	Calculation methods for energy efficiency improvements by the application of integrated building automation systems

EPBD Concerted Action

Article 3

Positive answers for implementation of the standards, %



The previous overview shows that most of the countries then intend to use the CEN/ISO 13790 as the basis for calculating the net energy demand for heating and cooling in their procedure. Also, two thirds of the countries are planning to implement most of the standards for the technical systems. Only the standards for calculating the final energy demand for cooling and the influences depending on automation systems are not yet well adopted in the MS procedures.

The change in the countries' view shows clearly the progress done in a year by exchanging experiences from other MS and also from the running EIE projects. The close cooperation between the Core Team Procedures and the EIE projects ENPER-EXIST, EPA-NR and EP-LABEL helped to transfer the gathered knowledge and discuss the gained experiences.

3.1.1 CEN standards and their applicability in existing buildings

The applicability of the CEN standards to existing buildings has been discussed in several sessions. Most of these sessions have been held in cooperation with the Core Team Certification. The outcome of these presentations and discussions was an overview of existing approaches in the MS for simplifying the collection of input data for the calculation procedures. Some of the countries have developed handbooks to assist the inspectors. In these handbooks, typical age-depended values for material properties of building components and efficiency factors of building systems are listed.

Besides the reports from the MS, there have been presentations from the EIE project EPA-NR on the tools for assessing the energy performance of non-residential buildings. One of the tools is an inspection protocol, which includes information from different MS on simplifications and default values. This report can be downloaded from the project website www.epa-nr.com.

The EIE project ENPER-EXIST reported in different sessions on their findings by checking the CEN standards for the use in existing buildings. In a report, a comparison of different available alternatives in the CEN standards is described. The project study shows that the range of the results can vary widely when using different alternatives. A huge influence is shown for the lighting calculation (simple and advanced approach). The potential influence between the different alternatives in the CEN/ISO 13790 is much smaller. Other identified gaps are that some CEN standards require too much detail (e.g., calculation of thermal bridges) during the data acquisition and the calculation, whereas other important influences like the ageing of products is not considered. The results can be downloaded from the project website www.enper.exist.com.

All this information and experiences may help the MS in creating their own supporting documents and national annexes to the CEN standards.

3.1.2 The future of CEN standards on European and international level

As the CEN standards are coming into force in 2007, the MS will get more and more experiences with the practical use of these documents and especially the interconnection of the different standards for calculating an overall performance indicator of existing buildings. The Core Team Procedures discussed the first experiences from the MS at the last CA meeting. The experiences from the IEE projects and first intercomparison calculations show that a next round of harmonisation is needed to bring all the standards on the same stage of details and to create a common set of definitions and symbols. Also the experiences from the implementation process of the MS have to be reviewed and some standards may have to be slightly adjusted.

The new IEE project CENSE will create a platform where the experiences will be collected and analysed. A close cooperation with the Core Team Procedure and the new project is planned for the next period of the CA.

The interest from countries outside of the EU on the issues of energy performance calculation is growing fast. Therefore, several ISO standardisation committees started comparable activities. A set of new created work items in the technical committees TC 163 and TC 205 will work on worldwide applicable procedures. Although the European countries have useful procedures developed, they are not introduced in the fast

growing building market in Asia and Africa, but the US certification systems and calculation procedures entered already into these markets. To be prepared for the global market in energy certification and CO_2 trade, all these activities have also to be mirrored additionally in the next period of the CA project as well.

3.2 The integration of renewables in the energy performance calculation procedures of the MS

The Core Team Procedures analysed in a questionnaire the situation in the MS concerning the integration of different renewable energy systems in the calculation procedure. The questionnaire covered the following technologies: thermal solar collectors, PV collectors, daylighting, biomass heat and power generators, wind turbines, hydrothermal absorbers, passive cooling strategies, double skin constructions, absorption chillers, hybrid ventilation, district cooling, hydro power generators, ground coupled heat pump, etc.

The overview shows that most of the technologies are not yet covered by the national procedures. But CEN is not preparing standards for many of the listed technologies either. As all these technologies are pushed as innovations, the procedure on how to integrate them into the national calculation methodologies has to be developed by MS.

which renewable technology is planned to be integrated in your national EPBD-calculation procedure at the end of 2005?

Renewable Technology	Austria	Belgium (Flanders)	Belgium (Walloon)	Bulgaria	Cyprus	Denmark	Estonia	Finland	France	Germany	Greece	Hungaria	Ireland	Italy	Latvia	Lithuania	Netherlands (NEN - EPC)	Norway	Poland	Portugal	Slovakia	Slovenia	Spain	Sweden	United Kingdom
Solar thermal collector		n	n	i		i		n		i	i			N			N		I	mandatory		i	N		In simplified form
PV collector		n	n	-		(n)		-		-				-			N		-	Optional for non-residential buildings		-	N		In simplified form
Daylighting		n	n	-		i		n		i	i			N			NO		I	Optional for non-residential buildings		i	N		Basic to the calculation
Biomass heat/ power generator		- (1)	-	i		no		n		i				N			*		I	Optional for non-residential buildings		i	N		Via simulation option
Wind power generator		-	-	-		no		-		-				-			*		-	No		-	-		Via simulation option
Hydro thermal absorber		-	-	-		no		-		-				-			*		-	No		-	-		?
Double skin construction		-	-	-		(i)		-		n				N			**		-	Optional for non-residential buildings		-	-		Via simulation option
Passive cooling strategy		n(2)	n	-		n		n		n	i			N			NO		-	Mandatory(*)		-	N		In simplified form
Absorption chiller		n	-	-		no		-		n				N			***		-	No		-	-		Possible to include
Hybrid ventilation		-	-	i		(n)		-		-	i			-			***		-	No		-	N		?
District cooling		-	-	-		no		n		-				-			NO		-	Mandatory if available on site		-	-		Possible to include
Hydro power		-	-	-		no		-		-				-			*		-	No		-	-		
... (others)		-	-			-		n			i			N					-			-	N (Trombe wall; sunspaces)		

n: national standard approach i: international standard approach -: no standard approach planned

1) texts of procedure and software will allow easy extension to biomass boilers
2) already partly included (non-residential; as in NL). Texts of procedure foresees possible inclusion in residential buildings.

*as an agreed figure for the efficiency for installations outside the dwelling
**every (envelop/floor/roof) construction is possible; the r-value of the construction must be used
*** every technique is possible; some are worked out in the standard (the most traditional techniques).,If not, the proposer has to prove to use the right figures and calculation method

3.3 Software

3.3.1 Existing software tools in the MS

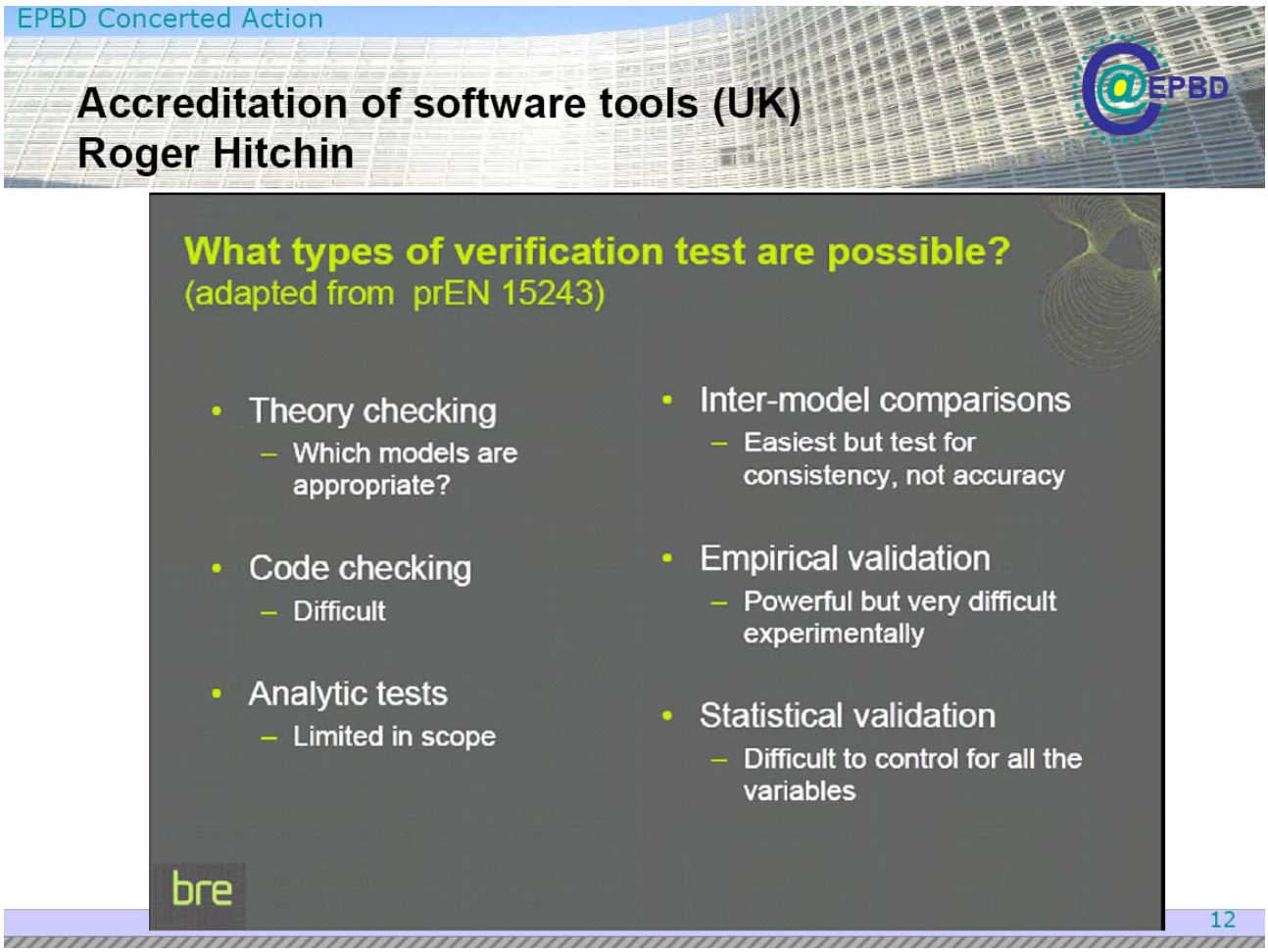
Information on the current situation concerning available software solutions in the MS was gathered in the Core Team Procedures at different meetings, addressing the topics such as accreditation, verification and validation. Some MS presented actual developments of national software tools for assessing the feasibility of alternative energy systems and of qualified software tools.

The presented software covers a wide range, starting from assessment tools for the feasibility of different technologies over simple calculation tools for the energy performance of dwellings up to complex tools for the energy performance of commercial buildings. An overview on the available products is organized by CEN and published by the buildings platform project.

At the end of the CA, most of the countries have software products in use for residential buildings, but only few for the non-residential buildings. Only 7 MS reported on existing solutions which mostly included lighting and air conditioning. 14 MS intended to develop software and the rest is looking for accredited commercial software, possibly from other MS or from the US. One offer comes from the IEE project EPA-NR for a kernel that can be applied in MS software interfaces.

3.3.2 Quality check for software developments and use

Quality aspects of the software have been discussed at several occasions. The types of verification have been analysed and the current situation in the countries discussed. Most of the countries used the intermodel comparison approach, which is easy to do and most cost efficient. But this test is not the most accurate possibility.



The undertaken MS overview report shows that 4 MS only allow one software tool for the official certification. Five other countries reported on the central development of calculation kernels, which can be used by the software enterprises for integration in their interfaces. This development has the advantage that all software products use the same basis for calculation, even when there is an error in the code. But the integration of the kernel in the interfaces has also to be validated. Twelve MS do not plan any limitations on the methods or tools, but some of them plan to develop an accreditation system for the applied tools.

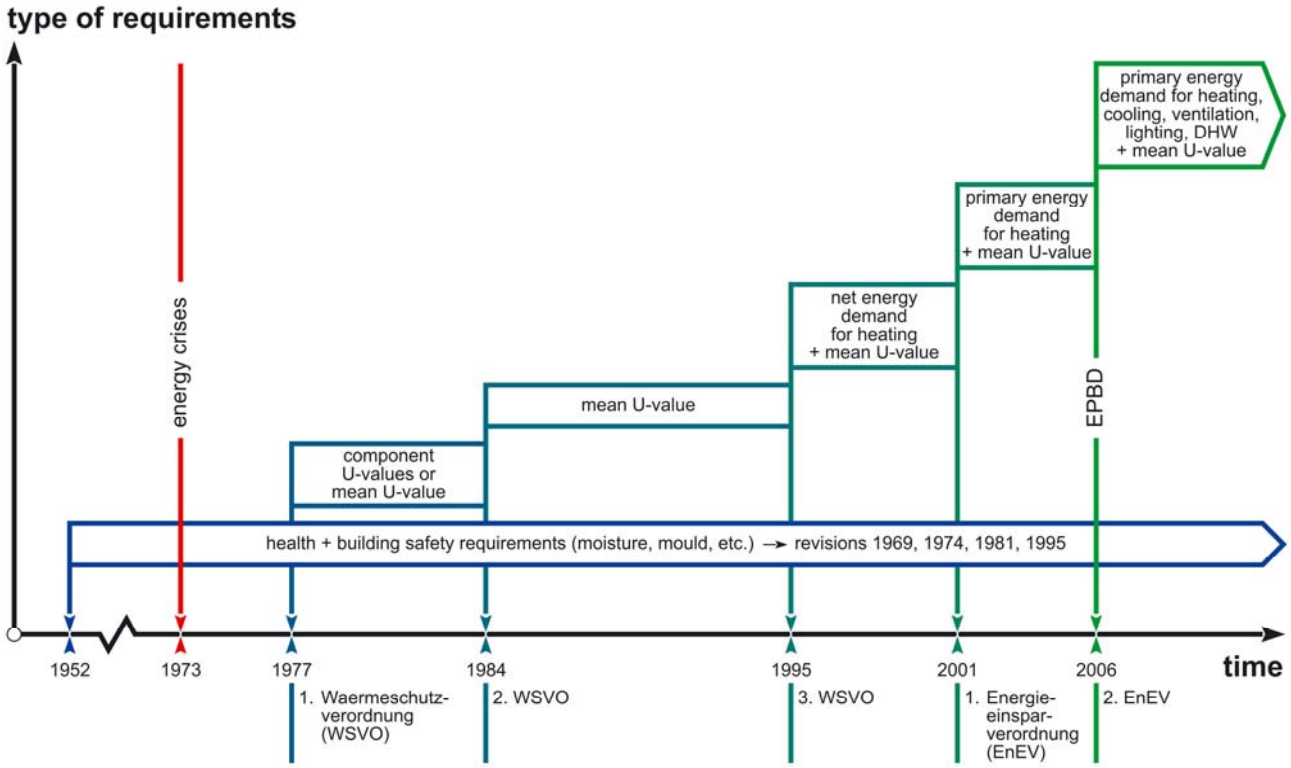
As an additional analysis, the current situation in the MS at the training and the accreditation process for software users is published. Most of the countries have developed formal training schemes for users, but only ¾ of them planned an accreditation or licensing system for the software users.

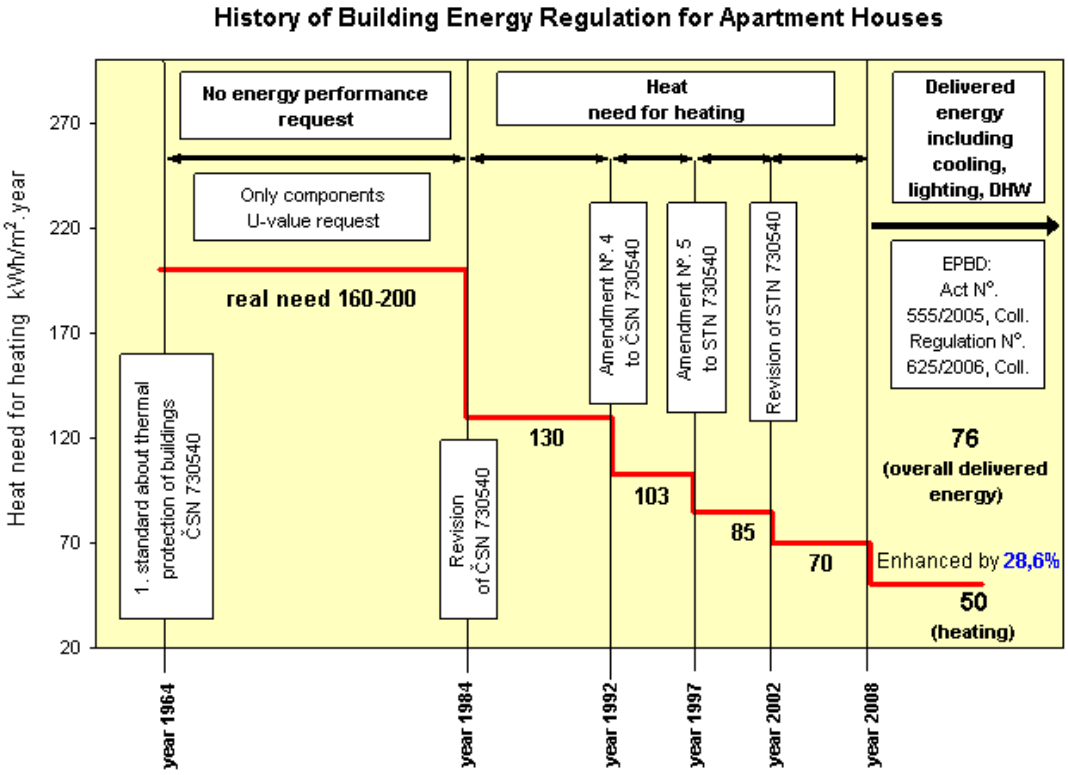
The produced report (an Annex in this report) is also published as an information paper by the buildings platform.

3.4 Requirements in Building Regulations

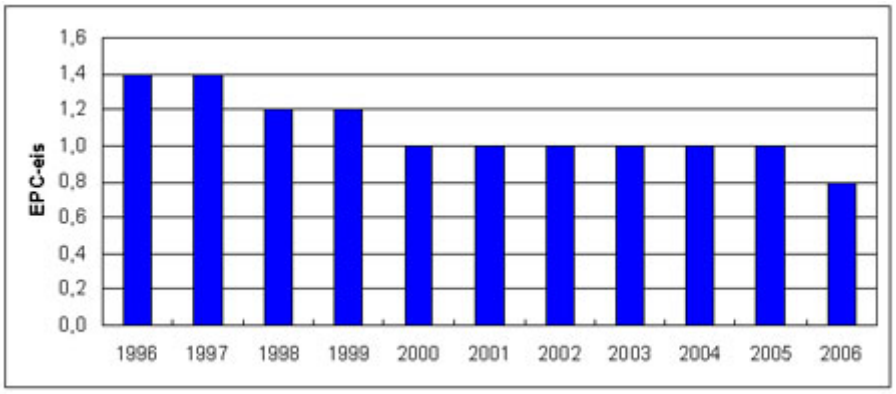
3.4.1 How do the procedures influence the minimum energy performance requirements in the MS

The Core Team Procedures produced a poster overview on the development of the energy performance requirements in the MS in the last 50 years. Most of the countries have shown a comparable development. The calculation procedures improved continuously the scopes. All countries started with requirements to building elements, extended them to net heating energy demand and some in the last years to final or primary energy demand for whole building. All these evolutions led to better performances. This was the driving force for innovations in several parts of the building envelope and the service systems. New buildings today need often less than ¼ of the energy compared to buildings built in the 70-ies. This development is still ongoing and it will be further supported by the implementation process of the EPBD in the countries.





The progress of building regulations in the Slovak Republic



The progress of building regulations in the Netherlands

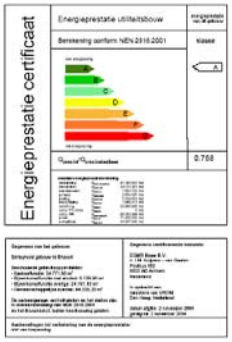
3.4.2 Inter-comparison studies on procedures and requirements in MS

The Core Team Procedures has not yet worked on inter-comparison studies intensively. The reason is that not all national procedures are finished. The Core Team has been engaged in the inter-comparison study of the energy performance of the Berlaymont Building.

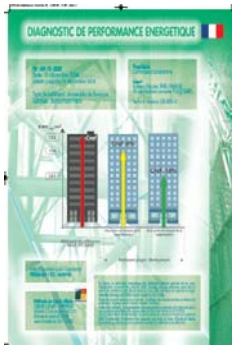
The Berlaymont comparison was done at a stage when the development of most of the national procedures had just started. Therefore, only 6 countries participated in this action and as the countries have used the national boundary conditions, huge differences between, e.g., Portugal and Germany results appeared. Under Portuguese weather conditions, the Berlaymont building is dominated by the cooling load while under the German conditions it is dominated by the heating load. But all certificates presented the Berlaymont building as very energy efficient. It is recommended to reorganise the inter-comparison in the CA 2 project to prepare certificates with all MS procedures and to allow to analyse the differences between the MS requirements and the MS procedures by using comparable boundary conditions.

AUSTRIA

NETHERLANDS

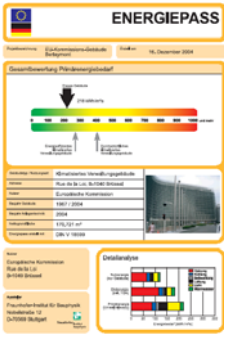


FRANCE

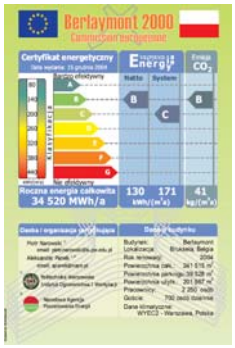


PORTUGAL

GERMANY



POLAND



3.4.3 Summer requirements in the MS building regulations

The Core Team Procedures worked out an overview report on the situation in the different MS concerning summer requirements for new and existing buildings. The analysis showed that most countries have some kind of calculation procedure or at least guidance for how to avoid overheating in the design process. The prepared report, published as a separate self-standing report, gives an overview on approaches for different building types, descriptive minimum requirements and energy performance based calculations (net energy need for cooling, overheating hours, etc.).

3.5 How are innovations handled in the energy performance calculation procedure of the MS

The integration of innovations – for most of which there is no standardised calculation procedure - has a huge influence of the different systems and technologies to the energy performance of a building. The non-integration of innovations in the calculation procedure is a huge barrier in motivating the industry to develop more efficient solutions.

The presentations have shown some approaches for specific elements in different MS. E.g., since in some countries thermal bridges have to be taken into account, new elements, like thermal breaks for balconies, window/wall connections, etc., enter easily the market. The same happens with air tightness products or with energy efficient pumps and vents.

From the discussion in the Core Team, a project proposal for an IEE project (ASIEPI) has been developed and succeeded, in which the different aspects will be studied and approaches for the implementation in the MS procedures developed. The work will be done in a very close cooperation with the Core Team in CA II.

3.6 Lessons learned

In the last CA meeting, the project and the produced results have been analysed, according to the usability in the implementation process in the MS. The Core Team members reported the following items as “Lessons learned” in the Core Team sessions:

- we left the initial sessions with more questions than we came in
- it is important to know other members have similar problems, hints are given
- not high thresholds, high confidentiality, great help as a meeting place

- big benefit to share problems and experiences with others
- found out every country is doing it easier than my country
- wider foundation for arguments
- it became easier to adjust the regulations because of a broader view
- central software kernel can help to reduce the software accreditation
- procedures are more complicated, less practical than other Core Teams

The Core Team members welcomed unanimously the support and hints which have been given in the various sessions from the colleagues in the MS that are working in the same area and have comparable items to solve. Nearly all members profited from experiences gained in the other MS and a lot of adjustments in the national procedures were caused by discussions in the CA sessions.

The experiences with the development of procedures in the MS and the parallel work on standards in CEN showed that a European wide harmonised procedure needs a step by step approach and not parallel working procedures. As most of the MS had to fix their procedures long before CEN could deliver any assisting document, MS developed their own approaches. Only very few MS reported that their procedures are fully based on the newly developed CEN standards. Most of them organised their procedures in a pragmatic way, by applying the CEN philosophy but by using national standards. Most of the Core Team members expect that the procedures in the MS will gain from the practical experiences and will be adjusted in the next years. This will give a chance to come to more harmonisation in the national procedures all over Europe. But, therefore, inter-comparisons have be to undertaken.

3.7 Open issues and work items for CA II

Besides the solved items concerning the Procedures, the Core Team members selected the following work items which are still in progress and need to be discussed in the next project phase (the 5 most interesting items are indicated in bold) or at another level (e.g., the CEN workgroup of the EDMC or SAVE IEE projects):

Procedures

- How is the procedure used in the design process (who is doing the calculation)?
- Development of a unified (reference) procedure
- **Approaches for innovations in the procedures**

  Overview and guidance for libraries, including minimum requirements

Requirements

- Consideration of passive and active renewables in the target values (minimum share envisaged in the EU Action Plan)
- **Target values and definitions for high performance buildings (carbon-free, zero energy, passive house, etc)**
- Rating of existing buildings

  Requirements for new buildings

Inter-comparison

- Berlaymont II (new set of certificates)
- **Comparison of procedures by using simple buildings (dwellings, offices, schools) in the MS**

  Comparison of summer requirements by using simple buildings

Sensitivity studies

- Influence of system parameters (control, pressure in the HVAC)

  Accuracy of reduced/simplified input values vs. saved inspection and calculation time

Standards

- Identification of necessary further product standards

Software

- Overview of existing software (cont.), especially for non-residential buildings
- Calculation of building service systems (lighting and cooling)
- Experiences with user support

  Software accreditation procedures

Supporting instruments

- Simplified data collection

  Practical air change rates (harmonised procedure, requirements)

4. Summary of Procedures topics discussed during the CA-EPBD

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
Advances on Calculation Methodologies and software	*Advancements in MS are faster for new residential buildings.* Simplified methods are greatly needed for existing buildings, most MS are struggling to establish methodologies for these buildings. *Few MS have decided on how to establish calculation methodologies for non-residential buildings*, using either measured or calculated (simulation) procedures.	No, but MS have selected or are ready to select solutions among a limited set of options.	Need to continue to share actual experiences on software development approaches. Rating methods for existing buildings need to be further discussed
Quality Control for Software	Validation of software tools is recognized as essential for credibility of certification systems, but *it is difficult to implement* CEN (or other) standards for this task.	Methods have been presented.	Need to share experiences and ideas.
Integration of difficult issues	The integration of several technical aspects of the EPBD annex is not described in a clear way in CEN standards. *Most MS experienced many difficulties in including these issues in the national regulations*. *CEN standards should offer more practical ways* to address these issues and help find simplified methodologies to allow implementation of the EPBD technical annex in a realistic and pragmatic manner.	No, it is a complex and difficult issue.	Large need for further discussions to search for useful solutions.
Requirements	First discussions on target values and definitions for *high-performance buildings* (carbon-free, passive house). The definitions are differing in the countries. Summer requirements are new to most MS. *Most MS have chosen to implement summer requirements in their new building regulations*.	MS became aware of the possible alternatives.	Definition of High-performance buildings requires discussion. Comparing the impact of the different choices for summer requirements is useful.
Integration of innovative systems	*Building regulations should not place limits on innovation*. Discussions showed how difficult it is to handle this issue. Only a very few MS had such provisions.	MS became aware of the possible alternatives.	Large need for further discussions to search for the best solutions.

5. Conclusions and recommendations

The Core Theme members welcomed unanimously the support and hints which have been given in the various sessions from the colleagues in the MS that are working in the same area and have comparable issues to solve. Nearly all members profited from experiences gained in the other MS and a lot of adjustments in the national procedures resulted from the discussions. At the end of the action, however, many countries are still working on the development of national software. Much work is still needed before significant progress can be achieved, and the exchange of ideas and discussions about the difficult issues needs to be continued.

The experiences with the development of procedures in the MS and the parallel work on standards in CEN showed that a European wide harmonised procedure needs a step by step approach and not parallel working procedures. As most of the MS had to fix their procedures long before CEN could deliver any assisting document, MS developed their own approaches. Only a very few MS reported that their procedures are fully based on the newly developed CEN standards.

Most of the difficult issues in the EPBD technical annex (e.g., integration of renewables, thermal bridges, natural ventilation, day-lighting, cogeneration, etc.) have been treated in a very simplified manner or ignored, due to lack of suitable available standards. It would be very welcome should CEN produce more detailed and more practical revised (or new) standards to address these issues and help find simplified methodologies to allow ***implementation of the EPBD technical annex in a realistic and pragmatic manner.***

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