EXECUTIVE SUMMARY REPORT ON THE INTERIM CONCLUSIONS OF THE

CONCERTED ACTION

SUPPORTING TRANSPOSITION AND IMPLEMENTATION OF THE DIRECTIVE 2002/91/EC

CA – EPBD (2007 – 2010)

27 Member States
Austria, Belgium, Bulgaria , Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary,
Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, UK

1 MS candidate
Croatia

1 EFTA Country
Norway

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Intelligent Energy Europe

Introduction

Reducing energy consumption and eliminating wastage are among the main goals of the European Union (EU). EU support for improving energy efficiency will prove decisive for competitiveness, security of supply and for meeting the commitments on climate change made under the Kyoto protocol. There is significant potential for reducing consumption. With 40% of our energy consumed in buildings, the EU has introduced legislation to ensure that they consume less energy.

A key part of this legislation is the Energy Performance of Buildings Directive (EPBD) which requires all EU countries to enhance their building regulations and to introduce energy certification schemes for buildings. All countries are also required to have inspections of boilers and air-conditioners.

The introduction of national laws meeting EU requirements is challenging, as the legislation has many advanced aspects. It is a great opportunity to mobilise energy efficiency in EU buildings, but also a formidable and continuing challenge for many EU countries.

To support EU countries in this task, the **Concerted Action (CA) EPBD** was launched by the European Commission to promote dialogue and exchange of best practice between them. An intensely active forum of national authorities from 29 countries, it focuses on finding common approaches to the most effective implementation of this EU legislation.

The multi-faceted format of the forum, with specialist workshops combined with high level discussions, allied to networking opportunities and web resources, has centred on sharing -and inspiring- smart solutions for the professional tools, skills and systems in all fields addressed by the legislation. These solutions are now being applied across the majority of EU countries.

- The **Concerted Action EPBD** is carried out under the coordination of ADENE, the Portuguese National Energy Agency
- The consortium is composed of organisations designated by all 27 EU Member States, plus Norway and Croatia
- The activities revolve around 6 meetings, each with over 100 participants, held over a 3-year period (December 2007 – November 2010)
- Working groups and networking take place between the meetings
- **Only national authorities implementing the Directive are involved, or those bodies appointed and entrusted by the national authorities to do so**
- Invited experts attend to give additional specialist viewpoints

The 100+ Members of the CA EPBD represent Europe's authorative, collective knowledge on practical implementation and operational experience of energy performance certification of buildings and inspection and testing of boilers and air-conditioning systems.

When initiated in 2005, most countries were still at the planning stage, but are now well advanced. After stimulating advancement and convergence across the EU, the CA approach was enhanced in 2007. The countries now share real operating experience and the Concerted Action provides ever increasing practical value and deeper learning to all participating authorities, playing its role in ensuring the success of this Directive as a vital instrument of EU energy efficiency policy.

The CA EPBD (2007 – 2010) is organized around 5 Core Themes (CTs): **Certification of Buildings**, **Inspections of Boilers and AC systems**, **Training of Experts**, **Procedures for Characterization of Energy Performance**, and **Information Campaigns**. Since its launch in December 2007 , it has organized four major meetings between Member States (MS) representatives, with intensive preparatory work in between. In addition to plenary sessions devoted to issues of general interest, it organised a total of 63 detailed technical sessions for discussing specific issues relating to one or more of the 5 CTs. The initial plan for CA2 included a long list of topics related to the various themes and additional topics have been identified since then by CA2 participants.

This report summarises the main outcomes of these sessions, including conclusions and recommendations, for each of the five main topics. Some topics have been dealt with by more than one CT and therefore reported in more than one section, but described in different perspectives.

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CT1 - Certification of buildings

MS must implement mandatory certification of new buildings, upon construction, and existing buildings, at the time of sale or rent, along with periodic certification of public buildings.

This concerns residential (including apartments) and non-residential buildings, as well as those with mixed use. The prevailing ownership structures and building systems (communal or individual) need to be taken into account, as do special concerns for rented buildings or apartments.

Different types of certification are possible – asset rating or operational rating (i.e. calculated versus metered) – whilst rating of buildings can be based on, inter alia, energy demand, primary energy consumption and/or on emissions, etc.

Certification of apartment blocks, or those with several units of mixed use, presents specific challenges. For such buildings it can be debated whether the certification shall be based on the whole building or on the individual part. There are also specific concerns in the relations between owner (landlord) and tenant (renter).

Energy Performance Certification aims to quantify the energy consumption of a building or a building unit (apartment or section of a building). It should also result in recommendations for improvements. These recommendations are an essential part of certification, with a view to making possible energy savings. As such, there is significant interest in identifying the most appropriate procedures and the way information is handled and presented, etc.

Since January 2006, certification has been gradually introduced in the MS for different types of buildings. Since January 2009, the majority of Member States have certification schemes in place and now have growing operational experience with those schemes. Specific experience of many MS were exchanged, and it was thus possible to see successes or problems in other MS and take corrective measures that will lead to a successful implementation, including administration systems, to give a robust effect to the EPBD. In so doing, many MS may decide to converge on similar solutions, whenever possible, thus allowing a more harmonious implementation of certification across the EU.

At the first four CA2 meetings, 19 sessions were devoted to certification, some of them in collaboration with other CTs. From the beginning of the first Concerted Action, Certification of Buildings has elicited great interest and it is the Core Theme with the most participants.

Main issues addressed in the Certification sessions

The following topics on certification of buildings address, when possible, three types of issues:

- Building certification in general;
- Administrative aspects of building certification;
- Implementation of energy performance certificates in the MS.

Certification of flats

It has been valuable and inspiring for the MS to learn about the different approaches for certification of flats and blocks of flats. Many different approaches are used in MS, from certification of individual apartments to certification of the whole block, depending on the certification methods (calculated or measured values), age of the building, the ownership, the type of the heating systems, etc.

The three sessions on Certification of flats and blocks of flats showed that different approaches are being adopted in the MS. Progress of the certification process also varies significantly.

It is difficult to have a simple certification method and at the same time provide individual certificates for each flat in a block of flats. There are both advantages and disadvantages with certifying each flat individually or certifying the entire block of flats as a whole. ***The optimum solution for certification of flats and blocks of flats may thus lie between the two approaches; to show both certificates***

to the occupant of each flat. This method will ensure that suggested energy saving measures that require intervention in the whole building to be effective or to be implemented can more easily be accepted by the renters or owners.

Certification of complex and mixed-use buildings

No special rules are available for certification of complex and mixed-use buildings. Some MS have introduced simplifications, e.g., the majority area is decisive for which type of certificate to issue. Some MS use measured rating and without proper sub-division of meter readings, this causes problems with assignment of recommendations in the different sections of the building.

Zoning or a reduced zone calculation model could be considered and simplifications may be possible since many mixed-use buildings are not so complicated and minor sections with a different use may be ignored. ***Guidelines for installation of meters and sub-meters are needed as well as guidelines for in-situ measurements. Providing benchmarks for a variety of uses is necessary*****,** including rules for creating benchmarks for buildings with mixed use (see also related topic under CT4).

For blocks of flats and mixed-use buildings, it is important that the same expert (or service provider) issues all needed energy performance certificates (EPC) in each building unit, otherwise, different energy saving recommendations could be given by different experts for the overall thermal envelope or for the common installations.

For large and complex buildings (e.g. hospitals), it seems appropriate to use measured energy performance values as it is very time consuming and therefore costly to set up a calculation model representing the building in all details.

Processes to make up recommendations

There are different levels of issuing energy saving recommendations in the EPC, ranging from a simple approach with automatic generation of energy performance and recommendations to detailed inspection of the building with calculation of profitable measures. Selection or even automatic generation of re-commendations from a standard list offers both advantages and disadvantages. Among the advantages; 1) it is easy to categorise the recommendations for later processing of collected data; 2) the method is cheap. Conversely: 1) these recommendations do not depend on the skills and preferences of the expert; and 2) the system is rigid and new measures must be approved before they can become part of the general list.

Recommendations given in the certificate should be directly targeted at the actual building being certified. This will increase the public's acceptance of the certificate and help persuade building owners to carry out the suggested energy saving measures.

The main focus of EPC schemes is on saving energy, but there should also be focus on encouraging good indoor environment. Thus a good and healthy indoor climate should not be neglected at the expense of energy saving. Experts must focus on these potential hazards to the indoor climate when making recommendations.

National standards for benchmarking using measured energy rating

Many benchmarking systems take final energy consumption into account and cover the overall result of the energy used for heating, hot water, cooling, ventilation and lightning. Often the energy consumption is treated by at least two numeric indicators, in some cases by one combined numeric indicator. A typical difference within MS is the number of different classes of energy performance of benchmarks that are taken into account. The numbers of classes range from less than 5 to more than 30. This is seen as necessary by some MS in order to cover their entire range of building stock types.

One possible way to get a benchmark is to analyse the consumption of the building stock statistically. Typical problems are:

- finding a reliable source of high-quality data;
- finding a representative number of consumption data for each building type;

To handle these problems high-quality database management is needed.

There is a need to investigate the energy consumption in the existing building stock statistically to enable a valid set of benchmark criteria for mixed-use buildings.

Interaction between certification and inspections

The EPBD establishes requirements for both energy certification of buildings and regular inspections of heating and air-conditioning systems in order to promote the improvement of energy performance of buildings within the EU. Besides these requirements, the EPBD also indicates that regular maintenance of heating and air-conditioning systems by specialised personnel contributes to preserving correct adjustment in accordance with the product specification and ensuring optimal performance from an energy point of view. It is clear that there are several points where regular maintenance procedures and inspections between two audits could provide useful information for the expert/inspector.

It might be beneficial to evaluate the possibility for ***MS to combine maintenance, inspection and certification of existing buildings schemes***.

Cost of issuing certificates

A survey and a case study provided useful information for MS, particularly for those in the early stages of EPBD implementation, when reference values may be needed for passing the message to stakeholders and the general public. Identification of the factors that most influence the cost can help in the practical implementation of certification schemes. Aspects like the number of experts available, whether it is an existing or a new building, the complexity of the method for determining ratings, etc. should be examined by the MS when addressing this issue.

The cost for issuing an EPC differs significantly across Europe. The table below shows the number of MS within specified cost ranges (spring 2008) for issuing an EPC (not every MS provided data).

	< €100	€100-€200	€200-€300	€300-€400	€400-€500	> €500
Detached houses	4	5	6	5	5	0
Flats	3	5	4	1	0	0

In the case of new buildings, the tasks “performing calculations / use of software tools” and “analysing and collecting information” are the most time consuming activities of the expert’s work.

In existing buildings the tasks “site visit(s)” and “preparation of recommendation” together with “collection and analysis of information” are the most time consuming. The task “Calculations and use of software tools” drop in the scale of influence. These changes may be explained by the fact that simplified methodologies are often used in existing buildings and its results are strongly dependent on the quality of the information collected and used. Producing recommendations is one of the main objectives of certification in existing buildings, thus being one of the aspects where experts naturally invest more time.

MS are encouraged to establish a cost settlement system ensuring that users get a useful certificate with robust, value-added content that matches its cost.

Layout of certificates

Typically, the energy performance is indicated on coloured scales, so that the poor quality is emphasised with darker red whilst the low energy consumption and environmentally friendly quality is expressed using lighter colours, often green (to be associated with the “green building” concept).

Stepped labels are used in the majority of the MS as a graphic presentation. In the majority of cases their scale is linear, the length of the arrows are more or less proportionate to the specific value. Regarding the number of discrete categories a compromise should be found, since it is easier to shift from one class to another when the number of categories is higher. Division of the scale into many discrete classes increases the influence of uncertainties in the energy performance. Finally it should be remembered that the ***compulsory review of the requirements necessitates the introduction of new categories in the future***.

The linear scale can be expressed either as a yard-stick or a speedometer. In either case it is possible to place the energy performance of the actual building at its exact location along the scale, and improvements will thus always be followed by a shift in position along the scale. Each certificate

type has pros and contras worth discussing and ***it is not possible to say that one method is better than the other***.

The front page (or a main one) ***should be eye-catching, expressing clearly the energy quality*** for everybody, possibly using an expressive graphic presentation. As additional information, it should be clearly shown what will be achieved if the recommended actions will be carried out. ***Encouragement to carry out energy-saving measures can be done by placing the most cost-effective recommendations at the very first page of the certificate.***

Quality assessment of Certificates

A quality assessment (QA) scheme for certification is absolutely needed in order to get a good quality of certificates and it completes the upstream system (like accreditation and training of experts). Several MS have a running QA scheme that can be interesting for other MS to consider when starting up a scheme. Based on the experience that has been made so far, ***some key elements have been identified that are definitely worthwhile considering when starting up a QA scheme***:

- Define the QA scheme with processes and actors;
- Consider the use of a central database. ***A central database is a powerful tool*** that allows fast access to the information that has to be checked. Search functionalities trigger which certificates to check;
- Define the cost structure of the QA scheme;
- ***Built-in automated checks in local software or the central database can lower the amount of mistakes and can decrease the costs*** of a QA scheme;
- ***Develop a sanction system and use it***, although, to start with, it can be good to have a learning period in which the sanctions are not immediately applied.

It is too early at this moment to see whether some kind of QA scheme is more successful than another or to see the practical results of the QA schemes. However, it is evident that ***a sanction system is a valuable tool to ensure high quality work by the experts.***

Database management

There is general consensus that the presence of central databases to collect information gathered while issuing the energy performance certificates opens a world of possibilities for numerous analyses on all kinds of topics. Data from the EPCs can provide not only information about the number and quality of issued EPC, but can also be used for estimating the potential energy savings in the MS, regions or counties for the benefit of the authorities. A more widespread dissemination of statistical information from the EPC schemes will probably lead to a higher degree of acceptance by the public.

MS still need to address the issue of data confidentiality when discussing publication of information gained from the EPC schemes. MS must identify potentially sensible data and find ways to make it anonymous before publication. ***It is recommended that every MS (or region) should collect EPC data in a central register.***

Impact of certification

In practically all MS, implementation of EPBD was connected with issuing a new energy performance regulation (in some countries it has been already reviewed recently or there are plans to do this in the near future). However, as most MS only started certification in 2009, it is too early to quantitatively evaluate the impact of EPBD on the building stock, but preliminary data or/and qualitative observations are promising. One should remember that data from 2009 are strongly affected by the economic crisis.

Introduction of EPC schemes in MS has without doubt increased the public awareness of energy consumption in the existing building stock. It is difficult to quantify the impact on the energy consumption in this segment of the building stock, as there is no information to identify which energy saving measures have been implemented due to an EPC and which would have been implemented anyway.

Experiences gained from EPCs are still limited and further surveys of the topic are thus needed to be able to gain knowledge about the impact of certification and how owners/occupiers can best be stimu-

lated to take up measures. To be able to measure the impact of building certification in MS, it is necessary to:

- identify potentials of national energy saving in the sector;
- set up targets for energy savings (action plans at national level);
- raise interest for energy savings of owners, tenants, users, etc.;
- use technical knowledge in campaigns to influence the owners and users to improve their buildings.

To be able measure the impact of EPCs and to integrate data from all MS, it is an absolute necessity to identify and establish a commonly agreed approach in all MS to evaluating their impact.

Compliance and control of EP requirements and certification system

More than three years after the deadline for bringing the laws into force, regulations and administrative provisions necessary to comply with the EPBD, there are still many questions about the compliance and control of EP requirements and certification. The level of implementation (number of issued certificates, quality of certificates, changes in the building stock) seems to be correlated with the enforcement procedures. ***It can be concluded that regulation without enforcement leads to lack of compliance. The existence of penalties (for building owners, energy assessors and others) increases compliance with the regulations and the quality of the issued certificates.***

Although sometimes very time consuming in the case of complicated buildings, ***random checks allow authorities to sustain high quality of both certificates and independent experts***. It could be interesting to develop automatically working control mechanisms (e.g. in calculation interface or a database of certificates), as this reduces cost and minimises administrative burden.

Some countries supplement enforcement with systems of incentives and grants. This financial support to energy conservation investments and/or application of new technologies also increases the impact of EPBD but it is worth noting the high public acceptance. The concept to raise public awareness of energy savings via public access to the database of certificates is interesting, but some participants voiced concern related to the protection of sensitive private data of the building owners.

Main outcomes from the Certification sessions

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
Certification of flats and blocks of flats	It is difficult to have a simple certification method and at the same time provide individual certificates for each flat in a block of flats. The optimum solution for certification of flats and blocks of flats may be to show both certificates to the occupant of each flat.	MS have selected their solutions among a variety of options adapted to their specific conditions and possibilities.	Lessons learned need to be discussed when MS have gained further experience in the topic.
Complex and mixed use buildings	Solutions for mixed use have been found, though benchmarking of these buildings offers some challenges. The same goes for complex buildings that require special calculation procedures, carefully developed simplifications or use of measured EP data.	It has not been possible to recommend one universal method.	Large need for further discussions and analyses to search for better solutions.
Processes to produce recommendations	MS use different solutions, ranging from standard recommendations generated automatically to detailed calculations of the measures. Some MS use different solutions depending on building type and EPC method.	MS have selected their solutions among a set of options adapted to their specific conditions and possibilities.	Lessons learned need to be discussed in the future when more experience has been gained.
National standards for benchmarking using measured energy rating	Measured energy rating (MER) and benchmarking systems need further work. There is a need to investigate the energy consumption in the existing building stock statistically to enable a valid set of benchmark criteria for mixed-use and complex buildings.	Even though EN 15603 deals with a method for measured benchmarking, there are still many complications that need to be clarified.	Large need for further discussions to search for possibilities for use of measured certification and benchmarking.

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
Interaction between certification and inspections	MS have not established an integrated approach for maintenance, inspection and certification of existing buildings processes and for most of these countries it is quite difficult to integrate these schemes, especially due to the high level of skills needed for professionals involved in the different tasks.	There is a benefit from interaction between inspection and maintenance of systems and inspection and energy certification of buildings.	MS should try to combine maintenance, inspection and certification of existing buildings schemes.
Cost of certification	The factors that influence the cost of certification have been identified and cost models discussed. Complexity of the method for determining the energy rating and market mechanisms, can influence the cost significantly.	MS have selected their solutions for settling costs among a set of options based on local conditions.	There is a need for continuous sharing of experiences on costs and on the value for money issue.
Layout of certificates	There are two main approaches for layout of certificates, the stepped scale and the continuous scale. Within the stepped scale there are differences in the layout and the number of steps among MS. They are both equally effective.	The front page should be eye-catching, expressing clearly the energy quality and recommendations.	Although improvements in content are possible, there is no need for further discussions about layout.
Quality assessment of certification	Key elements for a QA scheme were identified: central database, checks and penalties. It is too early to see which QA schemes are more successful than others.	A sanction system is a valuable tool to ensure high quality work by the experts.	More experiences need to be gained to be able to find optimum solutions for QA.
Database management	Collection of EPC data in a database is not required, but most MS do it anyway, though in very different levels of detail. Only a few MS have experiences with use of databases for purposes other than EPC registry.	It is recommended that all MS should collect EPC data in central (or regional) registers.	Possibilities for use of data need to be explored, but confidentiality issues need to be addressed.
Impact of certification	In most MS, implementation of EPBD was connected with issuing a new energy performance regulation. As most MS only started certification in 2009, it is too early to quantitatively evaluate the impact of EPBD on the building stock, but preliminary data or/and qualitative observations are promising.	To be able measure the impact of EPCs in all MS, it is essential to agree on one unique common methodology for all the MS.	Experiences gained from EPCs are still very limited and, to gain knowledge about the impact of certification. More work is needed.
Compliance and control of EP requirements and certification systems	The level of implementation (number of issued certificates, quality of certificates, changes in the building stock) seems to be correlated with the enforcement procedures. Financial support to energy conservation investments and/or application of new technologies also increases the impact of EPBD.	Regulation without enforcement leads to lack of compliance. Random checks allow high quality certificates and independent experts.	There is a need for continuous sharing of experiences.

Lessons learned and recommendations

Certification of buildings includes many, often interdependent, topics and covers all building types. Buildings are different and certification of different building types (uses) and ages call for different certification methods.

- For certification of blocks of flats and mixed-use buildings, it is important that the same expert (or service provider) issues all required certificates to ensure coherence in the recommendations.
- In large and complex buildings (e.g. hospitals) it seems appropriate to use measured energy performance values. The optimal solution would be to have both measured and calculated EPC, even though this is a very costly approach and not without problems. Good benchmarks need to be identified on the basis of statistical analysis of building surveys: the overall knowledge of the building stock remains low. EPCs are a means of collecting this data which facilitates the preparation of tailored accompanying measures.
- For complex and mixed use buildings the following set of recommendations apply:
  - Zoning or a reduced zone model could be considered when calculating these kinds of buildings.
  - Simplifications of the calculations may be possible in mixed-use buildings.
  - Installation of meters and sub-meters and in-situ measurements.
  - Guide for in-situ measurements is needed.
  - Providing benchmarks for a variety of uses are needed.
- Recommendations in EPCs should be directly tailored to the actual building being certified.
- EPC may benefit from information collected from inspection and maintenance schemes, e.g. boilers, ventilation, and air-conditioning. MS are encouraged to make formal links between certification and inspections.
- The front page of the EPC should be eye-catching, expressing clearly the energy quality and the most cost-effective recommendations. Encouragement to implement the energy saving recommendations from the EPC could be ensured in this manner.

– There is a need for regulation and without enforcement it will lead to lack of compliance. The existence of penalties increases compliance with the regulation as well as high quality experts and EPCs.
– When running a QA scheme, the follow-up mechanism regarding the quality of the certificates is the core of the whole scheme.
– It is recommended that MS establish a central database making it possible to perform a quality check of data and gain increased knowledge about the energy performance of the building stock.
– To be able to measure the impact of the EPC schemes, it is recommended to identify and establish a commonly agreed approach to measure the impact of EPCs in MS.

CT2 – Inspection of Boilers and AC Systems

According to the EPBD, MS must implement mandatory inspections of boilers and air-conditioning systems, above certain threshold power levels, depending on the type of equipment or fuel, as well as of heating systems when older than 15 years, and produce recommendations for upgrade or substitution in certain cases. With millions of such units everywhere in Europe, this is a task that might prove even more challenging than implementing certification of new, existing and public buildings, by the simple force of the very large numbers involved. For boilers, an alternative option is offered to implement, instead of inspections, information and advice campaigns having at least the same impact as inspections.

In the first four CA2 meetings, 15 sessions were devoted to Inspections, some of them in collaboration with other CTs, having normally between 20 and 30 participants, often representing all or most MS. There were more than 30 presentations, discussing specific issues or the implementation status in all MS.

Main issues addressed in the Inspections sessions

In the various sessions, MS took the opportunity to discuss the logistics and the methodologies involved in the required inspections, especially the organisational and financial solutions, the relative merits of inspections or informative campaigns, and how to assess their relative success, as well as the costs that consumers will have to pay for this service.

Experience with Inspections in MS

From the most recent summaries presented by the participants, it appears that many MS are still at an early stage in the implementation of their inspection approach, in relation to AC systems especially. According to a questionnaire proposed to MS in May 2009:

- 10 MS are currently (May 2009) implementing inspections on heating as well as Air Conditioning systems;
- 2 MS only on heating systems;
- 1 on air conditioning systems only, as for heating systems the Option B was adopted;
- 7 are not implementing any inspection scheme at all, even if some are “ready” at legislative level;
- The other participants did not wish to describe the running situation, meaning no inspections planned, most probably.

A gradual convergence has been achieved since the first CA started, considering that, in 2005, each country had different and confused ideas about how to implement this requirement of the Directive.

Some good practices are already coming out from the early on-field experience of MS with on-going inspection schemes. The countries having a tradition of chimney sweeper organisations, already accustomed to visit homes for boiler safety checks, have trained them to also verify boiler energy efficiency, obtaining a quite cheap cost for the final users, as the additional check has a minor marginal cost. However, as most chimney sweepers were not qualified for delivering recommendations on possible system improvements, additional more qualified personnel had to be appointed for this task. Another problem connected with chimney sweepers is that they had traditionally a monopoly in their district, but the free market rule requires an opening to competition, therefore the role of chimney sweepers and energy inspectors requires periodical open tenders.

In MS where inspectors are accredited as independent experts, the final user impact is generally positive. There have however been complaints that the inspectors were too severe for minor infringements of the safety or efficiency rules. The role of the inspector risks becoming more a "policeman" than an advisor, reducing the potential of inspections for obtaining an actual energy efficiency improvement. ***It is recommended to train the inspectors to act as advisors and to provide the most useful energy information to the users*.**

Training for inspectors

About 50% of the MS have established training procedures for inspectors, as part of an accreditation system for inspectors. Typical training courses take from 5 to 10 days, require a final examination, and the main topics are safety of gas boilers, inspection procedures, energy efficiency improvement opportunities and drafting of recommendations. The required qualifications for inspectors varies widely among MS, spanning from skilled workers (e.g., chimney sweepers) to thermal engineers, having a clear connection with the expected costs for the final users.

A harmonised profile for boiler inspectors will probably be feasible over a certain period of time, but it is certainly premature at this stage of development due to entrenched national practices that are difficult to harmonise, or because it is believed that few advantages may derive from doing so. ***Even if inspection is a new requirement in several countries, pairs of neighbouring countries with broadly similar systems and installation practices would benefit from collaboration, and skill shortages in some countries could actually be filled in by others*.** However, there is no sign at present that such a move will occur spontaneously. Similarly, harmonised training on the basic skills for inspectors is hindered by language differences, different practices, and different background qualification levels.

Advice-recommendation and interaction with energy certificates

Recommendations for heating/cooling system efficiency improvements are commonly suggested after an inspection. ***The more the recommendations are detailed and tailored, the higher the probability they are implemented*.**

As the EPBD also requires recommendations when an energy performance certificate (EPC) is issued, there is some potential overlapping with the issue of a building EPC and the inspection of heating and air conditioning systems. Thus, there is a large potential for savings to always ***perform an inspection when an in-situ visit is made to produce an EPC***, and to ***regularly make the inspection data available to the certification experts***. ***Certificates should only be issued with proof that a required inspection has taken place***.

Implementation of the EPBD in the MS has not always exploited so far the full potential of inspections for energy efficiency improvement In these cases, inspections may be perceived by the users as just an additional administrative burden. ***Experience shows the importance of information campaigns about inspections***, which have proved essential in some MS.

Boilers: Option A (Inspections) or Option B (Campaigns)?

Discussions continue about whether advice-information campaigns (Option B in EPBD art. 8) are more cost-effective compared to inspections (Option A). The quota of MS having selected option B is around 20%, and 30% of MS adopted a combination of options A and B to some extent (inspections or pre-inspections are accompanied by user-targeted information campaign, or information/advice campaign are supplemented by voluntary inspection schemes). One national inquiry on the impact of a voluntary inspection campaign showed that the most known energy efficiency tool was the energy labelling of buildings (87% of the sample), while the awareness of the voluntary inspection was only 32%.

The trend is therefore moving from a rigid definition of the two approaches to a more flexible and mixed approach, ***using the most effective elements of the two options***, having in mind the overriding objective of improving the energy efficiency of the systems. A way to improve the impact of inspections was to include some relevant mandatory requirement, which should be implemented in the case, for example, of old boilers, or uninsulated pipe works, or lack of central climatic controls and thermostatic valves.

Another proposed option is to give the user a calculation of the seasonal energy efficiency of the whole system, and offer a benchmark corresponding to the most advanced technologies. This could provide a powerful motivation for renovation of the system and improvement of energy efficiency after an inspection.

Drivers to improve old heating systems

Economic reasons, system failure, inspections and private advice were identified as the most frequent motivations inducing users to improve or replace their old heating systems.

In view of identifying the most effective ways to obtain an improvement of old systems, a priority list was produced of the different solutions: program marketing, information provision to end-users, technical assistance in retrofit planning, training, awareness on performance standards and other regulatory tools, mandatory or voluntary inspections, financial incentives- as tax credits and contributions to investments, but also obligations for component renovation and support for low income users. The involvement of installing personnel is seen as a pre-condition to promote energy efficient heating systems.

A reported good practice in one MS shows 1,500 M€ of energy efficiency investments produced in little over one year by a tax credit of 55%, with an average expenditure of 13,000 € per application.

Combining EPBD requirements with safety and CFC environmental regulations

Most MS have agreed that the legislation on CFC gas has several points of contact with AC inspections. Therefore, a coordination of the two on-site checks is strongly recommended. Even when these inspection calendars cannot be unified, other elements can be commonly operated, e.g., data collection, expert training and accreditation, definition of inspection frequency, supply of information, management of the data base. Early experiences in one MS show an attempt of ***coordination of the non-technical parts of the two regulations*** (organisation, frequencies, etc), in another case a ***combination of EPBD art. 9 with existing parts of the legislation on air conditioning***. There are also experiences of common ***accreditation of gas inspectors***. In a few countries, an integration of ventilation control and EPBD inspections is in place. It was however acknowledged that differences in the required skill level of technicians may make a common training for both inspections somewhat difficult.

Discussion and Analysis of EN 15240

EN 15240 has been expressively written to leave a certain margin of national differentiation in A/C inspection methods, just as EPBD leaves freedom for a national adaptation in inspection frequency and extent. Thus, different interpretations of the standard by MS have been identified, and even some basic terms were interpreted differently.

Extensive discussions at the CA2 concluded that ***some points of this essential standard need to be revised, some basic terminology subject to misinterpretation needs to be clarified, and some classification of inspections should desirably be introduced to make this standard more effective for MS***. Few MS are able to use this standard in its current format, declaring they need better guidance, which would also be most useful for better harmonised inspection procedures in the MS.

Methodologies for air conditioning (A/C) inspections

There is a clear need for making A/C inspections more cost-effective. Previous discussions within CA1 indicated that "*while inspections of larger installations are clearly cost-effective, inspections of smaller units, especially in moderate climates (low heating or low air-conditioning loads), are clearly not cost-effective".* The SAVE project "HARMONAC - Harmonising air-conditioning inspection and audit procedures in the tertiary building sector" concludes that there is significant scope for energy savings in a/c inspections, but it may be not necessary to have detailed inspections and tests for all systems. It is thus necessary to set up ***effective a/c inspection schemes that allow identification of the systems which are consuming too much energy***.

There are a range of options which allow A/C inspections to be simple and not expensive, without losing the majority of the energy efficiency benefits. One of these options includes introducing a ***"graded or step-by-step" inspection scheme on Air Conditioning systems (pre-audit, inspec-***

tion, audit, advice). The main point of interest is the adoption of a ***pre-inspection, where analysis can be based on the consumption data*** provided by the owner through the service personnel, which could be upgraded with appropriate analysis tools, mainly software tools. A related condition is to have a dedicated electricity meter, measuring the energy absorbed by the A/C unit alone, and benchmarking values, coming from a wide and multinational sample of monitored systems. The main advantage of this approach is that ***the on-site inspections could be limited to those systems having a performance far lower than the benchmark***, therefore with a high energy saving potential. It is however controversial whether this simple analysis could lead to reliable advice and solutions. ***A good compromise could be represented by the adoption of pre-inspection schemes for simple buildings and detailed audits for complex ones*.**

Three technical sessions have addressed the topic of methodologies for air-conditioning inspections. The methodologies studied in field trials within the Intelligent Energy Europe supported project "HARMONAC - Harmonizing air-conditioning inspection and audit procedures in the tertiary building sector" have been core to all discussions to date. The debate is still open and needs to be continued after more data becomes available from field trials of these alternative methodologies.

Main outcomes from the Inspections sessions

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
Experience with Inspections in MS	Many MS are still at an early stage in the implementation of their inspection approach, in relation to AC systems especially.	Train the inspectors to act as advisors and to provide the most useful energy information to the users.	Increase the transfer of information on MS experiences, e.g. using exchanges of personnel.
Training of inspectors	Possible development of a harmonised profile for boiler inspectors and common training features.	Common schemes are still premature due to entrenched national practices.	The circulation of experts could be a reasonable option when inspection approaches become more similar,.
Advice-recommendation and interaction with energy certificates	There is some potential overlapping with the inspection of heating and air conditioning systems. Implementation of the EPBD in the MS has not always exploited so far the full potential of inspections for energy efficiency improvement In these cases, inspections may be perceived by the users as just an additional administrative burden.	Always perform an inspection during a visit to produce an EPC. Make inspection data available to EPC experts. Don't issue a certificate if an inspection is missing.	More effective information campaigns need to be initiated by MS.
Analysis of EN 15240	EN 15240 has been expressively written to leave a certain margin to national differentiation Thus, different interpretations of the standard by MS have been identified, and even some basic terms were interpreted differently.	Basic terminology subject to misinterpretation needs to be clarified. Introduce a better classification of inspections.	Revise EN 15240 to help MS define their inspection schemes.
Methodologies for AC inspections	There are a range of options which allow A/C inspections to be simple and not expensive, without losing the majority of the energy efficiency benefits. There is a clear need for making A/C inspections more cost-effective. While inspections of larger installations are clearly cost-effective, inspections of smaller units, especially in moderate climates (low heating or low air-conditioning loads), are clearly not cost-effective.	A good compromise could be represented by the adoption of pre-inspection schemes for simple buildings and detailed audits for complex ones.	A better analysis is needed to clarify the terms of real implementation. A stepped approach could be more cost-effective for AC inspections.
Boilers: Option A (Inspections) or Option B (Campaigns)?	Advice-information campaigns (Option B) have to be compared with proper inspections (Option A) on cost-effectiveness.	Combined solutions have been developed in more flexible and mixed-up approaches.	These combined solutions in the next future should be further studied.
Combining EPBD requirements with safety and CFC regulations	Most MS have agreed that the legislation on CFC gas has several points of contact with AC inspections. Therefore, a coordination of the two on-site checks is strongly recommended.	Several elements for coordination have been tested and referenced, with good indications.	These combined solutions in the next future should be further studied.
Drivers to improve old heating systems	MS have a multiple set of policies and programmes to improve old system substitution. They were analysed in terms of effectiveness and success.	Best drivers to improve or replace old AC/heating systems: system failure,, advice from inspections, incentives.	A further evaluation on the impact of implemented measures is needed.

Lessons learned and recommendations

- From the available experience on inspections, some improvement are needed:
  - FREQUENCY OF INSPECTIONS: some MS have linked the less frequent public inspection scheme with the regular periodical maintenance checks;
  - BETTER INFORMATION TO BUILDING OWNERS: several MS provide inspections combined with customised advice;
  - INSPECTION REPORT IMPROVEMENT: Those MS implementing good practice are taking efforts to make the report understandable to non-technical people (owners and tenants), and to propose advice mainly focused on low cost investments;
  - CONTROL SYSTEM ON INSPECTIONS: it is seen as vital by several MS to create a database on inspected boiler performance, to organise a quality control of inspectors.
- Inspections seem to go on a "third" way between options A and B, as many MS have opted for a combination of inspection and information to users.
- The content of the inspection report should be addressed more to the non-technical final recipient. Seasonal thermal efficiency and benchmarks are useful parameters to report. Low-cost improvements should have priority.
- An interaction with certification and other inspections (safety, CFC gases) seems practicable and a good opportunity for cost savings and improving cost-effectiveness of inspections.
- There are a range of options which allow A/C inspections to be simple and not expensive, without losing the majority of the energy efficiency benefits. A stepped approach, with inspection as the last step in a chain, expected to offer a higher level of cost-effectiveness, could be appropriate. Further analysis is needed to determine the terms of real implementation.
- A harmonised profile for boiler inspectors will be probably feasible in the future, but for now exchanges or visits between MS having mutual interests are more feasible.
- Differences among MS on inspection schemes, methodologies, type of systems (heating and AC ones), and training for inspectors are still relevant. The value of harmonisation in training for inspectors implies a harmonisation of the content of the inspection report and its recommendations, and the grades of inspection schemes (pre-audit, inspection, audit, advice).

CT3 – Specifications & Training requirements

As an integral part of implementation, MS must ensure that 'qualified and/or accredited experts' (Article 10) carry out the work of certification of buildings and inspection of boilers and air-conditioning buildings. Approaches in this regard vary between strict governmental/centralised controls with requirements of experts legislatively defined and limited training providers, to accreditation schemes where private companies assume operational responsibilities such as training, registration and quality assurance, to 'passive' acknowledgement of experts via prior experience & qualifications (e.g., membership of a professional architects/engineers chamber).

In the first four CA2 meetings, 14 sessions were devoted to Training requirements, two of these in collaboration with other CTs. The sessions were attended by an average of 25 persons. Collaboration has increased significantly in 2008/2009, as a result of the ground work of familiarisation and also as a consequence of more training/ acknowledgment schemes in MS going 'live'.

Main issues addressed in the Training sessions

There has been significant advancement in mutual understanding of MS approaches to acknowledging experts, enabling progress towards the mutual recognition of experts. There is also increased interest in tools and systems to effect standardizstion, as a 'laissez-faire' approach to qualifying experts tends towards a variable quality of certification, in turn negatively affecting the reputation of the implementation.

How many categories of experts?

During CA1, it was anticipated that up to seven categories of experts would be defined as a consequence of implementation. Three and a half years later, this has proved not to be the case, as ***the average across MS surveyed is four categories of experts***. However, the categorisation is highly idiosyncratic which in itself is a barrier to harmonisation. The most common approach is to differentiate between boiler inspections, AC inspections, and certification of buildings. Arising from this discussion, ***boiler inspection was identified as the category with the most potential for harmonisation***.

Training specifications and delivery

Training specifications and delivery are considered respectively as 'the rules of the game' and 'who plays it'. The rules and players in the systems of acknowledging experts are defined by government in each MS, and thus training delivery and specification is to some degree defined by national legislation. ***The majority of MS are delivering training through a combination of government and market actors***. There is a high degree of reliance on existing professional bodies, and less so, academic institutions.

Government/acting authority preparation of training materials has the effect of improving quality and consistency of training while simultaneously decreasing the costs of training. Normally training duration is between 3 and 10 days. For success, the following factors must be balanced: number of experts, quality of experts (competence and behaviour), effective system of quality assurance, and adequately specified training requirements. ***An increasing number of MS are directly administering a single national exam in order to maintain standards***, usually in combination with a market based training approach.

Requirements of experts and Qualifying exams

This topic probed more deeply into the specifications or requirements for experts set by the national authority in each MS. ***The diversity of requirements remains a barrier to harmonisation***. High entry requirements are a necessary but not sufficient condition to ensure high quality of experts (although this is contradicted by the experience of one MS). ***High entry requirements do not lessen the dependency on a robust and effective quality assurance scheme***. The recourse to market based training providers has resulted in a variance in the quality and standard of training in the marketplace, and therefore ***providing national examinations for expert is a strategy for standardising the qualification of experts***. Acknowledging experts individually (as opposed to companies or accreditation schemes) may prevent peer learning among experts.

Qualifying exams are one of the least harmonised topics of the EPBD implementation in MS. Differentiated approaches reflect divergent starting points, past national practice, and variant structure of national legislation. Nevertheless, the majority have introduced a qualifying examinations (or, is planning to in the near future), with varying degrees of rigour. Not all MS intend to keep the same system in the future, as some plans were undoubtedly 'last-minute'. ***Qualifying exams represent a significant aspect of quality assurance process, and as such key to the reputation of certification and inspcetion programs***. The only clear commonalities in qualifying exams across MS are surveying and EPBD.

Harmonised profile for boiler inspectors

Although ***EU harmonisation will be difficult to achieve for the analysis and certification of buildings***, there would seem to be a better prospect for plant inspection. Boilers, air-conditioning units, and other components of heating and cooling systems are made by large manufacturers for international markets, so greater similarities between the installations in different countries might be expected.

The CA searched for similarities between the inspection schemes being set up by MS who have chosen option A of Article 8, and identified what moves towards harmonisation were feasible and desirable. It was concluded that, ***although there were no insuperable barriers, moves to harmonisation were unlikely to occur spontaneously except, perhaps, between pairs of neighbouring countries with similar systems and traditions***. ***Language is a major barrier***. MS would need powerful advantages to induce harmonisation. These might emerge in time, when more experience from inspection schemes had been gained and there was a greater consciousness of their costs and

benefits. Otherwise, it appeared unlikely that EU-wide harmonisation would evolve in the foreseeable future, unless a Directive were to require it.

Codes of Conduct

This topic is concerned with the training delivery mechanism, as the way in which experts are acknowledged holds consequences for the implementation of the Services directive (2006/123/EC) and the recognitions directive (2005/36/EC). When defining national codes of conduct, it is important that the national code does not conflict with the interacting directives (services/recognitions//EPBD). Another consequence of the services and recognitions directives is that ***MS will have to address the threat from 'lowest common denominator' on entry criteria***.

The issue of independence of experts is a high priority among MS (independence mentioned explicitly in EPBD - Art. 10). Other conduct issues of high priority are liability insurance and prices on services.

Complaints and disciplinary procedures

Discussion on the issue of intensity on codes of conduct (i.e. enforcement) led to a discussion about complaints and disciplinary procedures. The key findings presented were that the ***majority (~70%) of complaints/errors are identified as a result of the quality assurance process***. Of these, ***a clear majority are minor errors*** – typos/clerical ***rather than deliberate falsification***. Not many complaints are received from the public: perhaps at this early stage the consumer is not well informed enough to know what to expect from the assessor, and hence is not in a position to complain. ***Sanctions are in place in most MS*** although these are used infrequently or not at all, probably due to the relatively early stage of implementation in many MS. There is convergence among MS in the approach to resolving complaints and applying disciplinary procedures although in most cases the systems are not yet fully matured.

Experiences in managing central registries

Effective management of central registers is key for the optimal implementation of EPBD and greatly facilitates core activities such as billing, quality assurance, communications, knowledge of national building stock and evidence base for policy.

Most MS are convergent on a structure of a single central register, administrated by the government or government agency. However, in many MS both the data captured and the functionality of the central register is quite limited, undermining the potential to apply automated (and therefore low-cost) quality assurance or provide accurate evidence to underpin building upgrade programmes. ***Up-front cost of effective data management systems is a key issue for many MS***, therefore it is intended to continue discussing this topic with particular focus on self-financing or revenue-neutral systems.

Main outcomes from the Training sessions

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
How many categories of experts	Most MS differentiate between boilers inspections, AC inspections, and certification of buildings. Less differentiation than anticipated.	Convergence of majority of MS on 4 categories.	Different categorization of experts is a barrier to harmonisation.
Training specifications	Wide variety of specifications, reliance on professional associations and academic bodies.	Standardisation of core materials lowers cost.	Map potential for mutual recognition of experts.
Requirements of experts	High entry level not a guarantee of high quality certification. No clear route to harmonisation at this stage.	National examinations is a strategy for standardising the qualification of experts.	Boiler inspections is the most likely category of experts for harmonisation

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
Qualifying examinations for experts	Primarily a tool for standardisation and QA. Necessary but not sufficient quality assurance mechanism.	Divergent starting points, past national practice, and variant structure of national legislation.	There is very limited scope for harmonisation.
Training delivery	MS recognise experts from 'automatic' based on pre-qualification, to examination/training of individual experts, to authorising companies or formalizing accreditation schemes.	The majority of MS are delivering training through a combination of government and market actors.	Training delivery defines the scope for the code of conduct.
Harmonised profile for boiler inspections	The category of experts with the most potential for harmonisation. Lack of political will among MS to advance. Language is a major barrier.	Pre-inspection scheme should be linked to certification and be adaptable to local conditions.	Harmonisation possible but unlikely unless required by legislation..
Codes of conduct	Defining scope of interaction between services, recognitions and EPB directives with regard to mode of training/qualification mechanism.	Major concerns with issue of 'lowest common denominator" in recognising experts from other MS.	Other conduct issues of high priority are liability insurance and prices on services.
Complaints & disciplinary procedures	Not yet underway in most MS. Clear consensus on how an idealised procedure should be defined.	Sanctions are in place in most MS, although these are used infrequently or not at all (too early yet?).	Likely procedures to follow national consumer legislation & professional association codes.
Quality assurance (certification)	Comprehensive documentation of developing QA schemes across MS.	QA is a vital reputational issue, and also costly.	More experiences need to be gained.
Managing central registers	Need for effective database management Up-front cost outlay a leading issue for many MS.	Central register key to efficient QA. Many MS still need tools, or improved tools.	Explore the issues of cost and functionality of central register.

Lessons learned and recommendations

- The role of experts and inspectors under the EPBD should be seen as a "top up" to the qualifications of existing professionals rather than the creation of a new profession.
- Specifications and training requirements for experts and inspectors are highly diverse across MS, even regionally within some MS. Requirements range from stringent (engineering degree + 5 years experience) to self-assessment. Standardisation is challenged by the variety of delivery mechanisms and qualification routes. Nonetheless, there is clear potential for groups (linked regionally / linguistically / common methodology) of MS to engage in mutual recognition of experts & inspectors, and it is strongly recommended that work towards formalising the mutual recognition process is commenced.
- In particular, examination as an entry condition is an effective mechanism towards enabling standardisation, and can offer significant opportunity to advance the harmonisation agenda.
- A market-based solution to training has in some instances resulted in a wide variance in the quality of the training offered by commercial training providers. Effective methods of carrying out quality assurance of training providers need to be established.
- The structural approach in MS to training delivery and qualifying of experts and inspectors defines the scope of interaction between the Services directive (2006/123/EC), the Recognitions directive (2005/36/EC) and the EPBD recast proposal. MS need to be aware of these requirements.
- However, irrespective of progress on such mutual recognition, there is clear benefit to EPBD implementation and reputation from the comprehensive codification of codes of practice/ conduct, including the codification of complaints, disciplinary and appeals procedures.
- Effective acquisition and management of the data (registers of experts/inspectors, certificates, training providers) generated by implementation is a current challenge facing many MS. Cost-effective / self-financing models must be presented to MS, in order to encourage development of administrative/ ICT infrastructure sufficient to facilitate the quality assurance and other requirements of the recast EPBD.

CT4 – Methods and procedural aspects for energy performance characterisation

MS shall apply a methodology, at national or regional level, of calculation of the energy performance of buildings. Based on this methodology, MS must set minimum energy performance requirements for new and existing buildings that undergo major renovation.

The EU Commission has given a mandate to CEN to develop a set of standards for assessing the energy performance of buildings. Due to the short time between the mandate start and the implementation deadline, CEN standards were then still in the development phase and most MS further developed and still use their own national standards. Therefore, the methodologies used in MS vary greatly, including the use of calculated and measured energy performance assessment. Thus national minimum requirements depending on the methodologies cannot easily be compared.

This CT "Procedures" has conducted 19 sessions, with an average of 39 participants, some of them in collaboration with other CTs. The topics discussed in the sessions cover articles 3 to 6 of the EPBD.

Main issues addressed in the Procedures sessions

High performance (near zero energy/emission) buildings

Definitions/ Occurrence/National roadmaps

High performance buildings constitute a growing part of the European building stock and 2/3 of the countries include them in national roadmaps as a goal for future new buildings. But 23 different terms for defining high performance buildings were identified across Europe. ***There is thus a strong need for harmonisation of terms and definitions***. These ***definitions should however not limit the technological options and innovation*** that can be used to meet performance requirements. Every country reports having one or more high performance building, of different typologies, in their country.

By comparing the MS definitions or calculation procedures for buildings, it also became clear that there is no valid definition for many terms and for many others the definitions differ between countries. Existing definitions are often not based on national calculation procedures and the buildings can therefore not easily be compared to the EPBD rating.

Parallel certification schemes result in market confusion and this needs to be absolutely avoided.

Comparison of national requirements

The CA participants discussed 6 different studies on the intercomparison of national energy performance requirements, mostly between neighbouring countries. All studies have been used as preparation for a tightening of the national requirements. These studies showed that the comparisons are influenced by many different parameters including the national calculation procedures and boundary conditions like user behaviour, climate, the used base case technologies, building types and building geometry and even simple issues like the definition of the reference floor area.

There is currently no robust, simple and fair method available to compare the different national requirements. The participants pointed out that the situation might get even more complicated if cost assessment is added to the comparison. Studies should include the potential impact of the various influence parameters.

Procedures State of the Art – Advances – Software application

Currently applied national procedures and the timing and content of further developments were described and compared. There was also a detailed discussion on if and how CEN standards are taken into account. ***There is no country that uses a one-to-one transfer of all CEN standards into their procedures, but many countries use a CEN compatible approach***, because:

- CEN standards were available too late for the countries;
- Some MS require national procedures to be available for free. Published CEN standards have a high cost;

- CEN standards include alternative paths. National procedures mostly fix one path;
- CEN requests to include the national boundary conditions as an annex. Countries prefer to have the boundary conditions integrated in the standard. Therefore a national standard is written that takes into account CEN elements but is no longer a CEN standard;
- Some CEN standards do not cover the whole challenge of the EPBD. An example for this is the lighting standard EN 15193, which is applicable for existing buildings but not for the building design phase. Countries needed to develop an own method for this.

Most national procedures are applied as software programs. The discussions concentrated on quality control and accreditation of the software and on the necessary level of input detail for assessing the summer performance, especially whether multiple zones are necessary. One-zone models can be crucial for summer comfort and cooling. Multi-zone models cause increased efforts and may need simplifications.

Measured energy performance rating - Procedures and Benchmarks

Several MS allow measured energy performance rating for existing buildings because there is a need for simplification of the certification procedures in order to save effort and money. ***The countries are mostly aware of the advantages of measured energy rating but are often not aware of all the risks arising from it. A common method for normalisation of the measured energy is missing, as well as a check of the data quality and ways of dividing the measured energy into different uses***.

There are different systems for the benchmarking of measured energy rating in the MS. To further develop their systems, ***some countries plan to add more benchmarks and/or more subcategories, whereas other countries plan to reduce them to facilitate the rating procedure***. Special attention should be given to:

- Requirements for the data quality used for measured energy rating and benchmarking;
- Normalisation procedures;
- Weather correction procedures;
- Division of measured energy into different usages and exclusion of the energy uses that are not part of the EPBD procedure;
- How to derive recommendations for improvements based on measured energy rating.

Feasibility analysis of alternative energy systems

The feasibility study requirement is transposed in various ways into the national legislation of the 27 EU MS. It is not yet clear how the quality of the feasibility study is guaranteed, and who is responsible for the control. Thus, it will be not be easy to have a European wide standardisation of the procedure and the compliance of the requirement.

The IEE project SENTRO has developed a handbook and supporting tools, notably checklists that shall help to standardise the process. Without a proper compliance system in place, the feasibility study requirement holds the risk that calculations/reports are made, but there will not be much impact in practice. ***The key factor in the whole process is the timing of the feasibility study: it has to be carried out in the pre-design phase when the strategic decisions are being made***.

Procedures for specific certification challenges

Recommendations – Complex buildings

MS establish recommendations for energy improvements of existing buildings in different ways. The differences include (see also related topic under CT1):

- the use of either calculated or measured energy rating;
- inclusion of energy and or cost data;
- standard recommendations to chose from or individual recommendations made by the issuer;
- national software that proposes recommendation automatically.

Certification of complex and mix/use buildings is problematic because of a difficult geometry, a lot of technical installations, poor documentation of building components, etc. A special challenge seems to

be quantification of recommendations when using measured energy rating. The following problems emerge with complex buildings:

- in the case of asset rating: availability of data sources, identification of technical systems, calculation procedures and zoning rules;
- in the case of operational rating: availability and assignment of meters, quality of reference values.

Thermal bridges – Infrared thermography

According to an analysis carried out by the IEE ASIEPI project, countries cover thermal bridges in many different ways in their national EPBD implementation. Relevant issues are:

- the energy impact, limits;
- good practice guidance;
- compliance checks in the design and realisation phase of a building.

Thermal bridges become even more important with high performance buildings as the relative impact of poorly designed component joints on the heating energy consumption can be significant.

The role of thermography for the identification of thermal conductivities of materials during building inspection, namely for assessing thermal bridging effects, was debated in a special CA CT4 session. It was concluded that:

- For assessing thermal conductivities, infrared thermography can only be taken as a qualitative process;
- Thermography is viewed as an expensive process for field measurements but it has some use for training purposes;
- Other simpler and/or more accurate methods for onsite measurements need to be discussed as viable alternatives for MS inspection/audit methodologies.

Issues remain on onsite measurements that still warrant further future discussions, and where thermography or other in/situ techniques may play a desirable role, include glazing system characterisation, and other methods which support energy performance identification.

Main Outcomes from the Procedures sessions

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
High performance (near zero energy/emission) buildings	Terms and definitions are used differently in the MS. 23 different terms for defining high performance buildings were identified across Europe. Most countries have national roadmaps that include high performance buildings as goal for future buildings.	There is a need for harmonisation of terms and definitions. Definitions should take into account national calculation methods.	Strong need for harmonisation of terms and definitions. These definitions should however not limit the technological options and hinder innovation.
Comparison of national requirements	There is currently no robust, simple and fair comparison method available. The situation might get even more complicated if cost assessment is added to the comparison.	Intercomparison studies are complex and cannot be simply reduced to U-value comparisons or energy consumptions in the MS.	Studies should include the potential impact of the various influencing parameters. Intercomparison will remain in the limelight in the future.
Use of CEN standards and Software	No country uses a one-to-one transfer of the CEN standards, but many countries use a CEN compatible approach. Quality control and accreditation of software and how to correctly model the summer performance is not completely solved.	Even though CEN standards are not directly implemented in the national energy performance procedures, many countries use CEN compatible approaches.	Some CEN standards should be extended to cover the whole field of application. Barriers for the use of the CEN standards have to be communicated to CEN.
Measured energy performance rating	Measured energy rating is used to save effort and money. Countries are often not aware of the risks arising from it. The existing systems for benchmarking of measured energy rating either need more benchmark data and/or subcategories or fewer subcategories in order to facilitate the rating.	A common method for normalisation of measured energy is missing, including ways for dividing the measured energy into different uses.	Information exchange on how to produce reliable benchmarks.

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
Feasibility analysis of alternative systems	Feasibility study requirement is transposed differently in the Member States. Main topics discussed were: Quality control of feasibility studies, qualification of consultants, costs, study for a single building or a larger development, and availability of suitable software tools. There is a handbook available that can support this process.	Quality control procedures are unclear and European wide standardisation is difficult. Feasibility study has to be carried when the strategic decisions are being made (early design phase).	Further experience is needed, exploring all available tools and information.
Special issues: Thermal bridges – Infrared thermography	Countries cover thermal bridges in different ways in their national EPBD implementation regarding the energy impact, limits, good practice guidance and compliance checks in the design and realisation phase of a building. Thermography can support the building inspection. Results are mostly qualitative only and needs a lot of experience.	Thermal bridges become even more important in high performing buildings. Thermography can be useful to train the building inspectors but is cost-intensive. On site use is limited.	A follow-up of the impact of thermal bridges on the cooling load is needed.

Lessons learned and recommendations

- High performance buildings are defined differently in the MS. Most of the available definitions do not take into account national calculation procedures. A common understanding and definition of near zero energy or emission buildings is needed. A comparison with national ratings is essential.
- Intercomparisons of national requirement levels are almost impossible to achieve. Technical and climate conditions have to be included along traditional building styles and user behaviour. Comparisons will become even more complicated if cost aspects are added.
- Weather normalisation is a crucial task, for measured data, but also for calculated data. Heating and cooling needs cannot be simply corrected by degree days.
- Assignment of meters, division into different uses, suitable benchmarks, normalisation and derivation of recommendations are some of the problems of measured energy rating. Guidelines and minimum requirements for a correct procedure for measured energy rating are missing.
- Calculated energy rating is influenced by complexity in zoning and accreditation of software. Simplifications for calculation methods have to be found whereas other methods need to be made more detailed in order to give reliable results with acceptable accuracy in specific situations.
- National procedures do not simply refer to CEN standards but, instead, the content is incorporated. Thus CEN standards should be further developed into general framework documents that fix general principles only and allow a maximum of flexibility for the countries' implementations.
- The information exchange with European projects (IEE and FP6) offered solutions for challenges to national procedures and proved to be useful contributions to the CA work.

CT5 –Information campaigns

Central issue in CT 5 is to discuss factors that will maximise the impact of the EPBD. Under Article 12, the MS are under an obligation to conduct national information campaigns, to raise public awareness and ensure acceptance of the Directive, as well as information on the added value of the EPBD. To be effective, such information campaigns will be directed at many actors, from construction and property professionals to the general public, and will need to use multiple communication channels and phased appropriately over time.

In the first four CA2 meetings, 8 sessions were devoted to Information Campaigns. One of them was organised in collaboration with CT1. After these sessions, CA participants have a better knowledge about the possibilities to strengthen the EPBD policy in their MS and the promotion measures that are possible.

Main issues addressed in the Information Campaign sessions

The essence of the core team information campaigns is to explore the comparative approaches across MS seeking to maximise the impact of the EPBD. At individual MS level, alliances between national or regional authorities and professional and other market actors are likely. Discussion of the most appropriate approaches and comparison of the experience of individual MS contributes significantly to speeding up take-off and increasing the degree of convergence and the impact leverage of the EPBD.

National information campaigns

Only 15 MS have some type of information campaign running by 2008. Only 50% of them monitor the results of the campaign. The ***key elements for a successful information campaign*** were:

- know your target groups - this will enable tailored campaigns. It is critical to identify the audience because this will shape the message and the media to be used for communicating the message;
- making a good strategic plan before you start - Make a Commitment from decision-makers to support the campaign. Campaigns require a firm commitment to be successful;
- the use of cross media;
- the use of 1 simple positive message;
- think before you act;
- monitoring the campaign helps to improve it;
- make use of a helpdesk to answer the public's questions;
- make use of free publicity through professionals;
- deliver the message personally (to the professionals);
- collaborate with the professionals/organisations in the building industry;
- be prepared for reactions (positive or negative) on the campaign.

Often overlooked by community organisations, ***word of mouth is essential for the success of any campaign***. It builds credibility and is typically more compelling and convincing. Word of mouth supersedes any fancy slogans and media blitzes.

***Free publicity could become the Best Tool*:** posting information through community calendars, bulletin boards and web sites, sending letters to the editor, participating in town forums, creating a word of mouth buzz, and using public service announcements could be instrumental in the success of any campaign.

Campaigns can benefit from ***using existing resources,*** networking with other agencies to share strategies, ideas, and lessons learned. Looking for opportunities to partner with other departments, community groups, and government agencies to spread the message is also key to success.

The role of professionals in maximising the impact of the EPBD

Professional parties that are in direct contact with the building owners are an important group of actors that has an influence on improving the energy performance of buildings and therefore on the impact of the EPBD. These parties are: Building industry, Media, Consumer organisations, NGOs, Legal parties (solicitors and lawyers), experts issuing certificates, Real Estate agents, Housing organisations, the energy sector, designers of buildings/ architects, financial parties, accreditation bodies, suppliers of new products and materials / R&D. Professional parties can advise the building owners on the possibilities of improving energy performance of buildings and see this as an added value to their daily work. It is desirable to make agreements with all professional parties and set goals of energy saving together with them. ***Success factors to maximise the impact of the EPBD are***:

- The ***spread of knowledge*** will make the purpose and the benefits of the EPBD clearer. This will encourage consumer organisations to communicate in a positive way about the EPBD.
- A ***simple and understandable method to determine the energy certificate*** will increase the support by consumer organisations for the energy certificate.
- Better ***training of parties in the building sector***. This will encourage the building sector to communicate about the EPBD in an understandable and positive way.
- ***Good examples of financial advantages of the EPBD***, e.g. better rating = higher value. This is an incentive for building companies to improve the energy quality of new and existing buildings.
- ***Linking of energy labelling to the rent system***. This means for housing corporations that the investments in improving the energy quality of dwellings can be paid back by higher rent. For tenants, linking of energy labelling to the rent system will create more transparency about the share of energy costs in the total living expenses.
- ***EPBD = added value of the energy company***. Energy companies can take their role in communication about the EPBD. Moreover, they can be active in supplying energy certificates.
- ***Education for real estate agents***. Knowing the advantages of a better energy class (e.g., higher value of the building or higher comfort levels) will encourage the real estate agents to use it.

- Introduction of ***revolving funds*** e.g. based on structural funds. These kinds of funds will encourage the investments in energy saving measurements by building owners.

How to deal with negative public reactions concerning the implementation of the EPBD in MS?

For a successful implementation of the EPBD in MS, it is very important that building owners understand the meaning and goals of the EPBD, that the energy performance of buildings is improved and that building owners can see the advantages that improving energy efficiency has for them, e.g., higher comfort levels, less energy costs, higher value for their building etc.

As MS approach full implementation of the EPBD, ***it is certain that most MS will experience some negative reaction and comments from the media***. Two real examples:

- information given by some organisations was wrong because the details of legislation were not fully implemented yet.
- results in three different EPCs for the same house by three different assessors.

Solutions lie in listening to the criticism given and giving a quick and positive response, taking responsibility if applicable, announcing corrective measures or explaining how such errors can be avoided in the future. Knowing how to deal with negative publicity is very important. Many of the discussions are currently focused on energy certificates, but other parts of the EPBD are important as well.

First reactions from the General Public to the EPBD and the Energy Certificate

Consumers are more likely to invest in the Energy Certificate if the reactions of other consumers/ building owners are positive. Consumers are a vital link to in achieving the goals of the EPBD and the Kyoto Protocol. ***The reactions of consumers are likely to change into positive reactions when MS emphasise the added value of the EPBD and the Energy Certificate***. The quality of the Energy Certificate also plays an important role in this respect. The public reactions would be more positive if:

- the certificate was tested in practice before implementation;
- all the different parties were involved during the whole process;
- the certificate is of high quality and the experts well qualified;
- there are pertinent useful recommendations on the certificate;
- the certificate is clear to the target groups, not too technical;
- consumers can make a self assessment;
- the costs of the certificate are low;
- there was a lot of communication about the EPC and energy-saving measures to consumers and professional parties during the whole process;
- the certificate is connected to additional instruments;
- the certificate is changed as a result of negative reactions.

Financial instruments - maximising the impact of the EPBD

Financial instruments can play an important role in helping building owners decide on energy saving measures in their buildings. Financial instruments can have a positive influence on the uptake of recommendations and therefore on the impact of the EPBD.

There are many types of financial instruments. The most widely available and most effective are subsidies. In addition, soft loans, structural funds and tax reductions are also seen as effective instruments. By linking the financial instrument with the certificates, the EPBD will actually improve the energy performance of buildings. With this link, governments can give a positive signal to the certificate and for the real implementation of energy-saving measures. The ideal situation is:

- Financial instruments must be related to the improvement of the EPC class;
- Financial instruments must have high visibility to the public;
- Building owners and investors have insight into financing possibilities to improve the buildings by implementing energy-saving measures;
- The administrative burden and costs for all parties are low;

Main outcomes from the Information Campaigns sessions

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
National information campaigns	Success factors for a national information campaign: Know your target audience; Make a commitment; Word of mouth is irreplaceable; Make use of free publicity; Use existing resources.	MS should carry out information campaigns to maximise the impact of the EPBD.	MS should carry out campaigns and then evaluate results.
Role of professionals	Certain professional parties have a major influence on improving the energy performance of buildings: Building industry, Media, Consumer organisations, designers, real estate agents and financial parties, among others.	MS involving professionals into EPBD implementation got better results.	MS should make agreements with all professional parties and set goals for energy saving together with them.
How to deal with negative public reactions	As MS approach full implementation of the EPBD, it is certain that most MS will experience some negative reaction and comments from the media.	MS must listen to the criticism and give a quick response.	MS are learning from one other ways of dealing with negative publicity.
First reactions from the General Public	Consumers are more likely to invest in the Energy Certificate if the reactions of other consumers/ building owners are positive.	Consumer reactions are likely to be positive when MS emphasise the added value of the EPC.	MS must use campaigns to get Public support to Certificates.
Financial instruments	By linking the financial instrument to the certificate, the EPBD will improve the energy performance of buildings.	financial instruments must be effective and have a low administrative burden.	Governments can give a positive signal offering financial instruments.

Lessons learned and recommendations

- Involving professional parties and the general public during the whole process of implementation is very important to improve the social basis and the impact of the EPBD.
- MS can add financial instruments to the certificates to improve impact.
- Public acceptance of EPCs is higher if the certificate is of a high quality and gives good information.

Internal communication and external dissemination

Project Centre

To obtain an efficient information exchange between the members of the CA, the project centre (PC) launched in CA EPBD I is continued. All CA members (typically 3 per country) have full access to all the available information. Moreover, each MS, the EC and the EACI can indicate additional names of persons that should receive reader level, e.g., EDMC MS representatives. All presentations, detailed agendas of each session, summaries of the sessions and any other report or contributed file is placed in the PC.

Website (www.epbd-ca.eu)

The website of the CA2 contains mostly general information, with an update typically every 6 months. The public reports from the CA can be downloaded since March 2009. Since December 2007, the CA website has received some 40.000 visits. The number of visitors is rather stable. For more information, visitors are advised to visit the Buildings Platform website and, since June 2009, BUILD UP.

Book of country reports 2008

A major outcome of CA2 is the book of country reports. This book has been finalised in collaboration with the Buildings Platform in December 2008. More than 2000 books have been printed and distributed. It can be obtained in pdf-format from the CA website. More than 1000 downloads have been done.

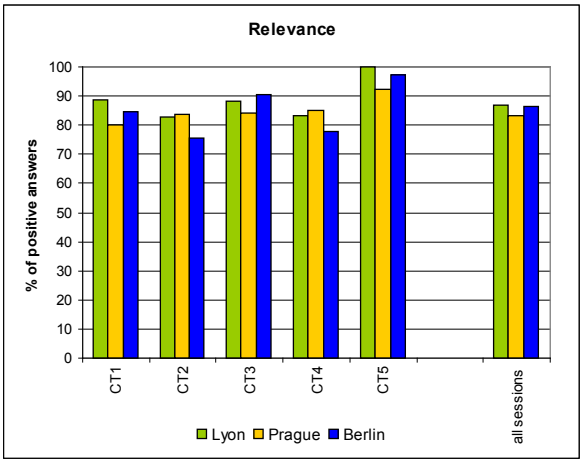
CA evaluation by MS participants

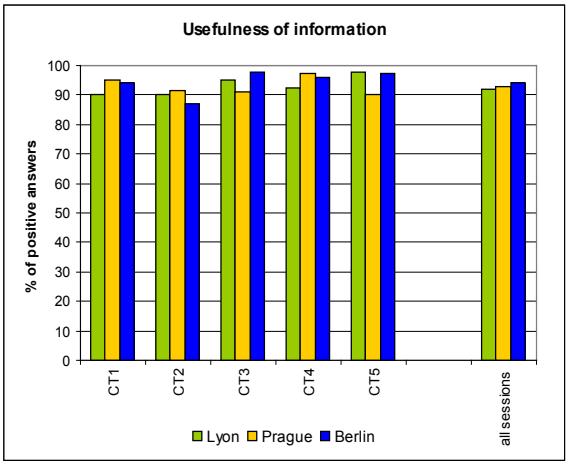
The CA Management Committee follows up the opinion of the MS participants using anonymous questionnaires to be filled and returned at the end of each meeting. The main purposes of the evaluation of the feedback are the following:

- to have an overview on the actual state of the implementation in MS,
- to check how the sessions promote the dissemination of best practice as well as the lessons learned from negative experience,
- to select the most relevant topics for the forthcoming meetings,
- to improve the organisation and the technical conditions of the work.

The questions encompass directly the above issues. Among them one can see, e.g., whether

- ***the topic is of high actual priority for a given country***, will have priority in the future or not actual anymore or irrelevant at all,
- the output of the ***discussion stimulated new ideas, usable in a country***, the MS representative is convinced that a given action of the implementation is going well (or not) in his/her country.





Further reading (to be completed)

This document is an executive summary of the following reports:

- Kirsten Englund Thomsen & Kim B Wittchen, **"Detailed Report on Certification (Interim)"**, CA EPBD (2007 – 2010) supporting transposition and implementation of the Directive 2002/91/EC, September 2009 (under final edit)
- Marcello Antinucci & Lisa Sentimenti, **"Detailed Report on Inspections (Interim)"**, CA EPBD (2007 – 2010) supporting transposition and implementation of the Directive 2002/91/EC, September 2009 (under final edit)
- Kevin O'Rourke & Clare Taylor, **"Detailed Report on Training (Interim)"**, CA EPBD (2007 – 2010) supporting transposition and implementation of the Directive 2002/91/EC, September 2009 (under final edit)
- Hans Erhorn & Heike Erhorn-Kluttig, **"Detailed Report on Procedures (Interim)"**, CA EPBD (2007 – 2010) Supporting transposition and implementation of the Directive 2002/91/EC, September 2009 (under final edit)
- Hans van Eck & Leanne van Diggelen, **"Detailed Report on Information Campaigns (Interim)"**, CA EPBD (2007 – 2010) supporting transposition and implementation of the Directive 2002/91/EC, September 2009 (under final edit)
- Other Interim Documents from CA EPBD (2007 – 2010) or published Information Papers.