



Annex 2: Inspections of Boilers and Air Conditioners *by Marcello Antinucci*

CONCERTED ACTION

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

21 Member States

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

1 EFTA Country

Norway

1 Accession Country

Bulgaria (MS from 2007)

6 Invited Participants

Lithuania, Romania, Malta, Luxembourg, Croatia, Czech Republic

Editors:

Eduardo Maldonado
Peter Wouters
Aleksander Panek

Core Theme Leaders:

Jens Laustsen (Certification)
Hans van Eck (Training)
Marcello Antinucci (Inspections)
Hans Erhorn (Procedures)

The Concerted Action supporting transposition and implementation of Directive 2002/91/EC of the European Parliament and of the Council (CA EPBD) was funded by the Intelligent Energy Europe Programme (2003-2006) of the European Union.

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Communities or any of the Member States. The European Commission is not responsible for any use that may be made of the information contained therein.

The CA EPBD was supported under the Intelligent Energy - Europe Programme of the European Commission. - The contract was established and managed by the Directorate-General for Energy and Transport.



Published 2008

Intelligent Energy  **Europe**

Table of contents

General information	3
1. THE PROGRAMME OF WORK FOR THE CONCERTED ACTION EPBD	3
1.1 The issues.....	5
1.1.1 Organization of Inspections of Boilers and Air-conditioners.....	5
1.1.2 Organisational aspects of boiler inspection	5
1.1.3 Field data reporting to national systems and national databases – boilers and air-conditioning inspections.....	6
1.1.4 The CEN Standard for Boiler inspections (prEN 15378)	6
1.1.5 Boilers and heating systems: equivalence of options A and B (Article 8)	7
1.1.6 Quality Assurance of Inspections	8
1.1.7 Inspection of air conditioning + CEN standard	8
1.1.8 How to interpret the 12 kW limit for AC inspections?	10
1.1.9 Independence of boiler and AC inspectors.....	10
1.2 Summary of conclusions.....	11
1.3 Advancement in implementation and efforts towards harmonisation of methods.....	12
2. SUMMARY OF INSPECTIONS TOPICS DISCUSSED DURING THE CA-EPBD	12
3. CONCLUSIONS AND RECOMMENDATIONS	13

General information

According to the EPBD, MS must implement mandatory inspections of boilers and air-conditioning systems, above certain threshold power levels, depending on 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 and public buildings, by the simple force of the very large numbers involved.

Within the CA, MS have caught the opportunity to discuss the logistics and the methodologies involved in these 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.

1. The Programme of Work for the Concerted Action EPBD

The main problems addressed by the Core Theme were grouped in two main areas, each one with several issues:

A) Methodologies for Inspections

- Regular inspection of boilers - large central systems

The EPBD introduces the obligation of regular inspection of boilers, addressing separately the large units over 100 kW. The regular inspection of large boilers is already practiced in Italy, Germany and Austria. These experiences were passed on to others with less experience. The new EN standard under approval at CEN was presented by the authors (Technical Committee CEN/TC 228 “Heating systems in buildings”), and analysed in detail.

- One-off inspection of heating systems at 15 years of age

The new CEN standard under final approval was studied and discussed in its flexible aspects. As the standard offers options and recommendations, MS discussed their preferences and practical ways to implement the standard and the ways to provide the additional advice that is mandatory (Article 8). The interaction with the energy certificate and with the regular maintenances performed by the service personnel was also considered.

The qualification and accreditation of the inspectors was examined in collaboration with the core theme Training.

The methodology developed in the Netherlands for the one-off inspection of boilers was translated in English, to help the other MS in adopting similar procedures.

The issue of how to enforce the one-off inspection was also discussed.

- Regular inspection of air-conditioners - smaller individual units

Every year, millions of new small air-conditioners are installed all over Europe, and units larger than 12 kW will have to undergo mandatory periodic inspections. Their inspection should provide the answer about its proper installation, and some guidelines for the end users about their management.

The new CEN standard “prEN 15240 Inspection of air conditioners in buildings”, now under final approval¹, guides these inspections, but there remain many questions about how best to implement these inspections in

¹ Situation at the 30th of June 2007

the field. Participants have discussed ways to implement the standard, taking into account costs, qualification of experts, criteria for recommendations, etc. Similarly to inspection of small boilers, major issues will also be how to force the owners to have inspections ordered and how many such inspections will be needed.

- Regular inspection of air-conditioners
 - larger central air-conditioners with heating, cooling and ventilation

Large central air conditioners equipped with possibility of cooling and heating offer a big potential of savings and opportunity for implementation of advanced technological solutions. The number of different configurations and different types requires high qualification of inspectors and well described procedures. Adequate metering of the units for the assessment of the whole system may be an important asset.

Many MS already have some type of commissioning of central air-conditioning units, including heating, cooling, humidity control, filtration, ventilation and air distribution. Experience from them was passed on to others with less experience.

- Inspections or information campaigns?

Both approaches are acceptable in terms of the EPBD. Some participants, having their MS already decided to opt for one or the other, presented their approaches and, when available, their previous experiences. Other participants, having their MS postponed the implementation of art. 8, and in some cases even the selection of the option, had the possibility during the CA sessions to develop their opinion in view of the decision to come.

The consequent issue was the evaluation of effectiveness and costs of inspections and information campaigns. The comparison of the two approaches led to the presentation of possible methods to assess the impact of both approaches on the main final goal of the EPBD.

B) Organisation of inspection schemes

The organisation of an inspection schemes involves complicated issues, as the selection of inspectors, the costs of inspections, the registration of results, the identification of the boilers to inspect, the authority for quality assurance and control, and so on.

Actual work in the Certification team

The work of the group started with the selection of a list of priority issues at the first group sessions:

1. Organisation of boiler inspection
2. How to create a cadastre of systems.
3. Methodologies for inspection (analysis of the draft CEN standard).
4. Who is responsible for what: ruling, acting, controlling, storing information.
5. Who pays and how.
6. Training needs and quality assurance for experts in inspection (WG IN and TR together).
7. Differentiation of approaches: by size, by age, etc
8. Joining info and control approaches.
9. Inspection templates.
10. Inspections or information campaigns?

The first sessions allowed for establishing the approach and objectives, together with the presentation of the available experiences on inspection (Italy and Germany). Most MS tried to understand the consequences of selecting either option a or b.

The topic of air conditioners inspection was first addressed with the support of the SAVE project AUDITAC.

By the end of 2005, most countries were already in their way of deciding the main approaches, placing their position in respect to one of the three main identified alternatives:

- Systematic approach to an inspection and advice service to all end users, usually coupled to safety checks;
- The inspection as a tool to enforce the regular maintenance of boiler and AC systems, with inspections limited to critical cases;
- Option b: defined national programmes for information and advice.

The situation evolved since the end of 2005 to mid 2007, with some changes of orientation or improvement of strategies.

This convergence is accompanied by residual doubts and open questions, which were object of specific discussion: use of CEN standards, demonstrating equivalence of options b and a, AC procedures for inspection.

After one year of work from the start of the CA, the main remaining open questions concerned the way to obtain concrete effects on energy saving, using different policies or a mixtures of them, for example combining inspections (bigger boilers) and information and advice campaigns (smaller units). How to assess the effect caused by a governmental initiative remains a key problem. On AC inspection, the approach and methodology appears still open, requiring more discussion time and contributions from the available experiences, even if sometimes from contiguous fields.

1.1 The issues

1.1.1 Organization of Inspections of Boilers and Air-conditioners

The initial discussion was based on the following topics:

- Classification of systems
- More important role to inspectors (to advice, give info packages, ...)
- Define boundaries of systems (e.g. district heating networks)
- Hand out a report, rather than a printout.

A special concern, shared with WG Training, was devoted to the Quality Assurance (QA) aspects of the inspections.

The Italian regulation on boiler inspection (Law 10/1991) was presented in detail, followed by a summary presentation of the German system, based on chimney sweepers. Many questions on both experiences clarified their respective advantages and disadvantages.

Towards the end of the CA, a fundamental issue was also identified: how to best communicate the need and advantages of the inspections and advice initiatives to the citizens. MS need to handle this aspect very carefully.

1.1.2 Organisational aspects of boiler inspection

The boiler inspection method in Germany was examined in detail, provoking several questions: the type of education of the chimney sweepers, the role of the Master chimney sweeper, its exclusive responsibility in one district, the possibility of the chimney sweepers to intervene in the boiler maintenance (some adjustments, cleaning, etc., but no change of parts), the absence of recommendations from inspection, the main role for safety and flue gas emissions, not on energy efficiency.

A very important issue, derived from the two analysed methods, was about the possible interaction of energy efficiency, environmental and safety aspects in a single operation, in order to limit costs and avoid duplication of checks.

The UK presented the reasons for selecting option b, based on the claimed better cost-effectiveness of information & advice campaigns respect to inspections. The alternative b was presented as the "least-cost" alternative. For larger boilers, a regular inspection might be imposed.

Another approach on advice is that dealers should give advice. In other Member States the heat supplier (mostly district heating system owner) has a dominant role in the scheme, and is responsible for carrying out the inspection. Is the existing role of heat supplier in conflict with the EPBD? The cost of inspection, €60 – 80, is paid by heat supplier, but in principle included in fuel/heat cost to consumer.

1.1.3 Field data reporting to national systems and national databases – boilers and air-conditioning inspections

A large number of countries are planning for a national data base for inspection data. In most cases this will be linked to the register for buildings certification and some countries also to a national buildings register. The main arguments used for the registers are the need for monitoring and whether the inspections are actually accomplished. The register will also serve as a valuable source of information for statistics to serve policy making. A register is also referred to as a measure of cost efficiency as former data can be a valuable input for the next inspection or certification.

1.1.4 The CEN Standard for Boiler inspections (prEN 15378)

The draft CEN standard for inspection (Methods for inspection of boilers and heating systems) was thoroughly studied, with its 10 annexes. The standard should be regarded more as a guideline than as a standard, and no measurements should be necessary there for boilers below 100 kW. It is important to consider that:

- The connection with other standards has to be understood: prEN 15316 (calculation methods) and prEN 15603 (overall energy use, operational rating).
- Inspection classes can be used either for boiler identification or for choosing alternative methodologies.
- The method can also be used for boiler sizing, starting from some simple data.

The check of oversizing, introduced in the standard, was questioned because, for modulating and condensing boilers, oversizing is no longer much of a problem in terms of energy efficiency. Moreover, the check is complex and thus expensive, which makes MS concerned about training inspectors with a sufficient formal education.

The standard, and the use of it, should be covered in a short national technical regulation, due to the standard approach being more a guideline.

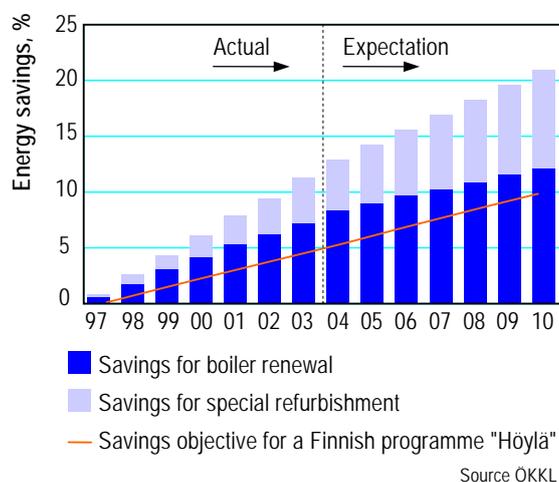
The position of the European Heating Industry (EHI) was presented to MS: "The value in an inspection is in the advice to the customer". A simpler inspecting method and tool box, with cost estimated at "€100 – 120" was proposed.

1.1.5 Boilers and heating systems: equivalence of options A and B (Article 8)

To demonstrate the equivalence of inspection and advice (option a or b of Article 8), the following assumptions were made in Finland:

- 30% of families do not maintain regularly (70% of boilers is below 25 kW).
- Saving potential is 7 €/y only per system, while the inspection costs is between €50 and 100.
- The extrapolation of the results of the national programme shows 20% saving in 2010, compared with 10% planned.

The Irish study calculates the cost effectiveness of inspections on maintenance quality and energy saving a spreadsheet was illustrated. The minimum seasonal efficiency is the parameter, considering its decline determined by the service interval. Difference between correct interval and jumped service is calculated. The conclusion is that the cost-effectiveness of inspection may be doubtful. The study was based on a theoretical determination of efficiency loss v/s fouling of the boiler, depending on hours of operation, justifying the 2.5% loss per year.



Annual energy savings resulting from refurbishment in oil heated one and two family houses.

The Swedish national info campaign for boiler replacement (by Heat Pumps or RES) is based on materials + training to advisors + adaptation to local conditions + press. The human resources are the 13 regional energy agencies and 290 local advisors + chimney sweepers and energy inspectors.

The objective is to reach 90% of target and change habit in 50% of them in two years. The overall cost is 1 M€ allocation in 5 years. The evaluation is foreseen after 5 y. The monitoring comes from the database of chimney sweepers, and will be based on the decrease of number of oil boilers, while to verify the increased awareness and expertise questionnaires will be necessary. This campaign is only on boilers.

A Dutch study shows the possibility to save energy through boiler inspection. The evaluation comprised the energy performance of 10 buildings. The main reasons for lower performance were:

- Building did not perform according to permit
- Installation did not perform according to product specification (heat pump in partial load, heating and cooling curves not optimal, ventilation runs too many hours).

The study reports a potential of 5 – 35% energy savings, in addition to improved comfort.

The present regime for boiler inspections in Austria, mostly is based on regional legislation. Since the introduction of new EU regulations in 1995, the chimney sweepers have been responsible for the inspection of energy efficiency aspects, in addition to the historic safety and emissions aspects.

The cleaning and inspection of all boilers, furnaces and chimneys is done 1 – 3 times a year, and at a cost of €40-60 for one boiler and chimney. If the inspector does all his measurements, it would take more than one hour.

Another typical scheme foresees option B for boilers < 100 kW, while a detailed inspection procedure is available for larger boilers. This inspection is expected to take 5 – 8 hours, including travel. This implies an average cost of €560 for medium and €680 for large installations. It is proposed to allow maintenance personnel to perform inspection, provided he has the necessary approval.

The discussions show that the MS are looking for good solutions not only for the customers but also “for the nation”, so the question who will do the inspections will be of special importance and equivalence of option B to option A will –in many cases - not be easy to prove.

The discussion showed a great effort in MS to find ways to improve the cost efficiency of the inspection schemes. Some countries have been able to combine the energy efficiency aspect with an existing inspection scheme by chimney sweepers. The combination of the new inspection with other tasks, e.g., safety, seems to be an important issue to consider. In practice, it is the same person that will take care of both safety and energy inspections, resulting in only one inspection. Even when all boilers are inspected, some countries prefer to store only very few parameters for each system, to simplify the data base management.

1.1.6 Quality Assurance of Inspections

A useful contribution of the WG TRAINING on Quality Assurance was expressed showing a chain from standards to physical inspections: National standards – Procedures – Tools/software – training material – training delivery – service delivery (market). An accompanying chain on QA is: Validation, accreditation and post-auditing. Many actors are involved: Experts, training providers, training developers, software developers, research developers, CEN/national standard developers, + accrediting bodies, professional bodies, scheme administrator. In between them all are the national authorities.

Pre-requirements for experts are not usually associated with being “an engineer” etc., but whether the job can be done in a proper way. In practice, for some schemes the expert will have to be an engineer. We can expect an interaction between certification of buildings and inspection of boilers and AC.

1.1.7 Inspection of air conditioning + CEN standard

MS benefited quite a lot from the cooperation with the EIE-SAVE project “AUDITAC”.

First, most MS agreed that the A/C system boundaries should be the heat/cold producing equipment, including the distribution system (ideally from air intake to air distributed in the rooms). The targets for inspection should be:

- a) to verify proper servicing and adjustment
- b) to assess proper functioning conditions
- c) to discover any mistake in design (they should be detected from symptoms, not by calculations)
- d) to give advice.

Forecasts on need for experts and number of inspections have been carried out for some European countries. The forecast is model-based, with a lot of underlying assumptions. One of the assumptions is that future

growth of stock in the tertiary sector be based on historical US growth. Results showed that the stock of ACs will have a high growth rate in the years 2000 – 2015, with saturation after 2015. "Saving potential of inspection can be low. It must orient building owners towards audits." The numbers used for estimating the number of experts and inspection costs were objected by several participants, but the relevance of the topic was confirmed, and the need to further study on it.

Which professional figure is suitable for the inspections? The most suitable professional figure is not an engineer but a good and experienced technician.

The available draft standards do not address the challenge of different types and needs: there is danger of duplication of the same work, undertaken both at certification and under inspection scheme.

AC often needs a first thorough inspection of documentation and system (including dimensioning and needs). Subsequent inspections are much more rational /effective.

ACs have all kinds of configuration – a lot of different systems and solutions. This makes classification more complex than for boilers. There are no "official" guidelines and technicians and companies develop their own solutions. The situation is alarming – ACs are almost becoming "a necessity".

Small size air conditioners (DX) are served by a regular service contract only in the proportion of 30% to the total; the percentage becomes 90% for larger systems (Air Handling Units). This may suggest that the main purpose for air conditioners inspection is to improve the servicing of DX.

The suggestion of the HVAC industry is to encourage consumers to have a regular service and teach them to consider total lifecycle cost instead of purchase cost only when deciding on replacement. To this goal, a simple inspection, aimed at faults, including oversize, which could not lead to shut-downs, is suggested, but some effort in a methodology including per each defect its causes, energy impact, cost of repair, frequency, etc... should be useful. Considering the evolution of technology, where new appliances show efficiency improvement within time spans of 15 years, the advice suggesting a replacement should be considered only in long time intervals of this order. The new units have no problems if oversized (there are variable speed drives installed on compressors).

To determine the cost-effectiveness of AC inspections, AUDITAC proposes that the operating time is to be considered (250 to 1250 operating hours/year), so that the cost of running, passing from 10% saving to 20%, allows for a low and cost effective inspection fee (for systems below 100 kW).

Justifiable cost of Inspection of AC Installations. Inspection as % of potential: 20%.

System rating	Hours of full load operation p.a.				
kW _{cooling}	250	500	750	1 000	1 250
8	€2	€5	€7	€10	€12
20	€6	€12	€18	€24	€30
28	€8	€17	€25	€34	€42
100	€30	€60	€90	€120	€150
262	€79	€157	€236	€314	€393

There is no unanimous view on the periodicity. Views are country specific, with periods ranging from 3 to 10 years. MS in general agreed that there should be an initial detailed inspection, which could be used as a basis to simplify the subsequent ones. Such a procedure would lower inspection costs.

Regular inspections are already made for hygienic purpose, for fire safety (ducts). The art. 9 purpose (from explanatory statement 19) is regular maintenance and cost effective replacement. Therefore frequent inspection is suitable for operation, and long term for replacement (technical improvements).

There is a general agreement on the need for maintenance manual in installations. MS agreed that there should be regular maintenance and a log book. The inspector does visual inspection, checks the log book and gives advice on improvement.

The “success pathway” in AC operation is thought to be as follows:

- Documentation of the plant : usually the missing point for all further steps. MS should provide for a compulsory deposit of documentation at time of installation
- Controls and clocks management
- Awareness of consumption and expenditure
- Integration of inspection in life cycle
- Capacity to control the operator and maintainer and to lead him to continuous improvement
- Readiness to speak with a real professional when retrofit or improvement can be funded
- No liability issues between maintainer and inspector
- Not spending too much on inspection is essential
- A 5 years period for field inspection seems to be reasonable

1.1.8 How to interpret the 12 kW limit for AC inspections?

The interpretation of the 12 kW limit should be per building or per system?

Using the building criterion, there is risk of a multiplication of small units to avoid inspections.

Alternatively, the 12 kW limit could be applied to the final user/owner. It will be difficult to check the correct sizing and give advice about it when multiple units supply the same space or building. The common view was that sizing should be done roughly, based on rules of thumb. It should be done in greater detail at construction or transaction phases.

Many MS will adopt a different interpretation of this rule.

1.1.9 Independence of boiler and AC inspectors

One of the basic aims of inspections is to improve the operating conditions of systems by improving the maintenance process. Maintenance (service) personnel and inspectors are therefore, two different entities complementing each other. Besides, in many countries, inspectors have no (business) interest in maintaining systems.

EU countries follow different approaches regarding inspectors. Some prefer accrediting organisations while others prefer to accredit individuals (persons). Many countries will base their systems on chartered engineers. The code of conduct is expected to help with quality issues. Databases of inspectors will be created and results will be checked to determine possible inspection quality problems. Inspectors and inspections will be, in addition, checked randomly.

Countries will use existing mechanisms, such as, indemnity insurance, competent person's scheme, etc. to deal with inspection controls issue.

The sanctions issue is also under discussion and consideration. Some countries maintain that there should be no sanctions, but many others believe that purposely distorted results should lead to sanctions against the

inspectors. Sanctions should start from initial removal from the inspectors list and end up to the loss of professional status.

1.2 Summary of conclusions

Two main approaches were presented and compared in the first working group sessions. The Italian approach, developed in the last 10 years with frequent adjustments, sees the inspection as a tool to verify the correct and regular maintenance performed by the service personnel. Therefore, the inspections are performed in a random sample of the existing boilers, and will be extended to all boilers aged more than 15 years. This approach results more cost effective than a 100% inspection approach. In Germany, on the contrary, the existing organisation of chimney sweepers since a long time inspects all boilers for safety reasons. Their task has been gradually enlarged to energy efficiency checks, with a minimum extra-cost.

These two organisation schemes were considered by the participants and oriented some of them in either direction.

The problem of qualification and independence of the inspection personnel was also discussed, and two main orientations were identified: the creation of specific inspectors not involved in the HVAC business, or a quality assurance system allowing the performance of inspections by the same HVAC service personnel.

The average cost of a boiler inspection was identified in the range of €50-130, and the estimated number of inspectors per country ranging from less than one hundred to about one thousand. In some cases, there is a connection between inspectors and certification assessors.

The qualification and accreditation of inspectors was discussed jointly with the Core Theme “Training”. Most countries realised that a market-oriented system for inspector selection, with a proper quality assurance organisation, and a regulatory public body, could be the most suitable solution.

Another group of the participants is oriented toward the option b) foreseen in art. 8 of the Directive, namely information and advice campaigns having at least the same cost effectiveness of the inspections. According to the presented calculations, an inspection system extended to all boilers does not pay for the savings it can produce (the Italian and German approaches are actually attempts to reduce the inspection costs while reaching the same objective). Nordic countries were mostly oriented towards option b), and illustrated their information and advice national campaigns, with targets, already available results and organisation schemes (local energy agencies, incentives, auditing, etc...).

The situation of air conditioning inspection was found much harder to define, as for all countries this was a completely new item. The working group benefited of the AUDITAC project support, investigated on industrial standards for service and maintenance inspections, discussed preliminary proposals, but most participants agreed with the need of an extra-period to develop more concrete approaches.

The methodology aspects started with the study of the draft PrEN standards for regular inspection of boilers and regular inspection of air-conditioners. The ventilation systems standard was not considered at the present time, as ventilation systems, not connected to air conditioning, are out of scope of the inspections as foreseen in the Directive.

The CEN draft standards are actually offering a wide range of possible methods, to be selected by Member States according to their priority and approaches. In the next steps, an attempt will be afforded to connect these proposed standard methods with those adopted in the countries where inspections are already practiced or going to be introduced.

A one-off inspection methodology for heating systems at 15 years of age was presented by the Netherlands. It was found quite interesting by most countries, mostly because it outlines the importance of the advice and recommendations for boiler substitution and system improvement, facilitating the generation of standard suggestions.

1.3 Advancement in implementation and efforts towards harmonisation of methods

From the most recent summaries presented by the Core Theme participants, it appears that many Member States are still at an early stage in the definition of the details of their inspection approach.

A group of Member States adopted the use of inspection as an auditing scheme to check the correct and regular maintenance of boilers. Another group is oriented towards an inspection of 100% of the installed units, by chimney sweepers or other specialised independent personnel. There are also intermediate solutions, foreseeing a self-declaration of system efficiency by the owner for smaller units, or with inspection performed by the HVAC service personnel.

Countries opting for an information and advice system, estimated it more cost effective than inspections. At the time of the last CA meetings, several other countries were still in discussion phase or had postponed the decision.

The situation can still evolve and change, as many countries are comparing their ideas with the new information obtained by the other countries' situations. A gradual convergence has been achieved during the Working Group activity, considering that, at the beginning of the CA, each country had different and confused ideas about how to implement this requirement of the Directive.

2. Summary of Inspections topics discussed during the CA-EPBD

Topic	Main discussions and outcomes	Conclusion of topic?	Future directions
Organisation of boiler inspection schemes	Starting with the presentation of the few available experiences, the MS were able to choose an inspection system or define an information campaign. Roles (<i>ruling, acting, controlling, storing info</i>) have been discussed and clarified.	The legislation and procedures have been defined in most MS.	Need to discuss results after monitoring implementation at MS level.
Who pays and how much?	Cost effectiveness has been discussed extensively, and different solutions proposed. <i>Cost-effectiveness of inspections of smaller units called into question.</i>	The legislation and procedures have been defined in most MS.	A comparison among the impact of the different choices is still useful.
Databases of systems to be inspected	MS have different opinions about the effective <i>usefulness or need for a database</i> of all boilers to be inspected.	Methods have been presented.	Need to discuss results after monitoring implementation at MS level.
Methodologies for inspections	The two <i>relevant CEN standards have been analysed</i> , experts invited, details discussed.	Most countries plan to use the boiler standard.	The AC inspection methods need still further clarification.
Training needs and quality assurance for inspectors	Common sessions with the Core Theme Training allowed clarification of the <i>required expertise and the methods for training inspectors</i> . Some countries have started training implementation. Others are still in preparation.	No, but most MS have selected solutions among a limited set of options.	A more detailed comparison is required.
Combining information campaigns and inspections	MS reached a <i>consensus on the need of informing and involving citizens</i> , explaining to them the advantages that can result from inspections.	No, but there is a good consensus about available options.	Need to continue sharing experiences and ideas.
Demonstration of equivalence of Options a and b (boiler inspections or campaigns)	<i>MS quickly understood the need of establishing common methods to assess the effects of inspections and information campaigns.</i> The topic turned out to be particularly challenging, and <i>no clear consensus emerged.</i>	No, it is a complex and difficult issue.	Large need for further discussions to search for useful solutions.

3. Conclusions and recommendations

During the CA, most MS have organised an inspection system following one of the main approaches: either as a proof of regular maintenance and site check, or as regular inspection. Other MS have opted for information, promotion and advice campaigns to accelerate the replacing of old boilers or to improve servicing. This issue is mostly resolved and now needs only follow-up to analyze the outcomes achieved in each country, reported from monitoring implementation results.

The inspection programmes in MS who had already implemented them produced an improvement of the regularity of the maintenance service and a more frequent replacement of old boilers. It is hoped that similar results may be achieved in all the other MS as a result of the adopted policies.

Conversely, other issues have not been concluded during the CA. Further discussions are still needed on the following issues:

- methods for AC inspections
- the equivalence of option a) and b) for boiler inspections
- software tools to simplify inspections and issue recommendations on old systems
- the connection of inspections and information campaigns with the development or stricter standards on new boilers

CEN standards for inspections of boilers and air-conditioners seem to need to be quickly revised and completed. Some technical options are not consensual among MS, and cost-effectiveness issues need to be better addressed. Most MS are having difficulties in implementing these two standards.

The rapid increase of installation of small air conditioning units in the residential sector requires a more effective action than an AC inspection, limited to units above 12 kW. Many Member States would prefer a more cost effective alternative, e.g. the development of information and advice campaigns, as allowed for boilers. Building regulations promoting better summer design and prevention of overheating may have a more important potential for producing energy savings than inspections of small units, of doubtful cost-effectiveness.

The CA EPBD was supported under the Intelligent Energy - Europe Programme of the European Commission. - The contract was established and managed by the Directorate-General for Energy and Transport.



Intelligent Energy  Europe