

# Implementation of Article 8 of the Energy Performance of Buildings Directive

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## **Executive Summary**

*Prepared for Alan Christie, Sustainable Energy Policy Division, DEFRA by BRE, Energy Division - 11 March 2004*

- This report sets out a matrix of implementation options to meet the requirements of Article 8 of the Energy Performance of Buildings Directive (EPBD). The work was carried out by a working group appointed by a consultation group convened by DEFRA.
- The options matrix tabulates implementation options against building types and the relevant Building Regulations in England and Wales. 13 options were identified and examined, of which 6 were intended for dwellings and 7 for commercial properties.
- Details of the implementation options are set out in Appendix C. They describe the actions required, possible implementation routes, and issues to be resolved. They include an informed opinion (not supported by a full study) of costs and effectiveness.
- The least-cost implementation is option N (simple advice) for dwellings, option T (simple advice) for commercial properties with boilers  $\leq 100\text{kW}$ , and option U (self-assessment by owner or energy manager) for commercial properties with boilers  $> 100\text{kW}$ . The least-cost implementation options will not necessarily be those ultimately recommended by the consultation group.
- The options have been presented, discussed, and accepted as comprehensive by the consultation group. The preliminary conclusions of the consultation group, and remaining issues for resolution, are noted.

## Introduction

*Prepared for Alan Christie, Sustainable Energy Policy Division, DEFRA by BRE, Energy Division - 11 March 2004*

European Council Directive 2002/91/EC, known as the Energy Performance of Buildings Directive (EPBD), lays down requirements for "*regular inspection of boilers and of air-conditioning systems in buildings and in addition an assessment of the heating installation in which the boilers are more than 15 years old*". The requirements are set out in Article 8 of the Directive, reproduced in Appendix B of this report.

However, Article 8 allows either *regular inspection* of boilers (Option (a)) or *provision of advice* (Option (b)) that may include boiler inspections but must achieve an overall impact equivalent to Option (a).

Neither of the options places any requirement on the owners of boilers and heating systems to react to the inspection report or advice. Although energy savings might be achievable by alterations to the heating plant (cleaning, servicing, adjustment of controls, etc) or replacement of it, owners are at liberty to ignore the report or advice they receive. Consequently the impact of Option (a) relative to Option (b) rests on an assessment of the extent to which installation-specific advice given in an inspection report is more persuasive than general advice.

DEFRA Sustainable Energy Policy Division has convened a consultation group to consider the options for implementation of Article 8 in the UK. The group held its first meeting on 28 October 2003, and appointed a working group to identify and enumerate the feasible options in sufficient detail to allow a preliminary view to be reached on those which should be recommended.

This report sets out a matrix of implementation options tabulated against building types and the relevant Building Regulations in England and Wales, the options details, the provisional ranking in order of cost-effectiveness, and the least-cost implementation route. These have been developed by the working group, and subsequently discussed and agreed by the consultation group at its second meeting. The preliminary conclusions and issues for further consideration are also listed.

## Description of the project

At the first meeting of the working group on 03 December 2003 the following steps were recommended :

1. Interpret the Directive carefully
2. Clarify what is obligatory as opposed to optional
3. Identify *minimum* action necessary to comply with the Directive
4. Are actions beyond the minimum cost-justified by additional savings?
5. Are they cost-effective compared with other energy saving investments?

The meeting proceeded to identify the most promising implementation options and the circumstances in which they would be suitable.

At the second meeting of the working group on 07 January 2004 the draft options matrix was presented, discussed, and refined.

At the second meeting of the consultation group on 20 January 2004 the final version of the options matrix was presented, and accepted by the group as comprehensive. A provisional ranking of the options in order of cost-effectiveness was agreed as indicative, in the absence of a fully detailed assessment. Recommendations on the least-cost implementation route were also presented, and accepted subject to minor changes. The consultation group concluded that a detailed cost/benefit assessment of the most promising options set out in this report should next be carried out, so that a final recommendation could be made to DEFRA.

The original brief for the project is given in Appendix A.

## Findings

### Requirements of Article 8 of the EPBD

Article 8 introduces a requirement either for *regular inspection* of boilers (**Option (a)**) or *provision of advice* (**Option (b)**) that may include boiler inspections but must achieve an overall impact equivalent to Option (a).

Table 1 sets out the boiler heating inspection regime as required by **Option (a)**. The columns show the separate requirements of Article 8 for each fuel and boiler power range; while the rows distinguish the likely building categories and regulations that would be used as routes to implementation in England and Wales (the regulatory position is different in Scotland and Northern Ireland). The implementation routes acknowledge that domestic boilers are often fitted in small commercial buildings, and commercial boilers in large dwellings.

Table 2 shows the implementation options that may be applied to give effect to Option (a).

**Option (b)** allows for provision of advice on replacement of boilers and other heating system changes as an alternative to Option (a). Nevertheless the overall impact must be shown to be broadly equivalent to Option (a) in a report prepared for the Commission every two years. Table 3 shows a range of implementation options that may be applied to give effect to Option (b).

The implementation options in Tables 2 and 3 are designated by the letters N to Z and the key is given in Tables 4 and 5.

**Table 1: Article 8 (a): requirements for inspection**

EPBD Article 8 (a)							
Boiler / heating system inspection regime							
Building and boiler type	Boiler < 20kW	Boiler >= 20kW and <= 100kW			Boiler > 100kW		
		gas	oil	solid fuel	gas	oil	solid fuel
<b>Normal dwelling</b> <i>(subject to Bld Regs Part L1; has domestic boiler)</i>	No action required	<i>Optional</i> boiler inspection	Regular boiler inspection	Regular boiler inspection	Inapplicable	Inapplicable	Inapplicable
<b>Small non-domestic building</b> <i>(subject to Bld Regs Part L2; has domestic boiler)</i>	No action required	<i>Optional</i> boiler inspection	Regular boiler inspection	Regular boiler inspection	Inapplicable	Inapplicable	Inapplicable
<b>Large dwelling, or group of dwellings with communal heating</b> <i>(subject to Bld Regs Part L1; has non-domestic boiler)</i>	Inapplicable	<i>Optional</i> boiler inspection	Regular boiler inspection	Regular boiler inspection	Boiler inspection every 4 years	Boiler inspection every 2 years	Boiler inspection every 2 years
<b>Normal non-domestic building</b> <i>(subject to Bld Regs Part L2; has non-domestic boiler)</i>	Inapplicable	<i>Optional</i> boiler inspection	Regular boiler inspection	Regular boiler inspection	Boiler inspection every 4 years	Boiler inspection every 2 years	Boiler inspection every 2 years

**Table 2: Article 8 (a): implementation options**

<b>EPBD Article 8 (a)</b>							
<b>Boiler / heating system inspection regime: implementation options</b>							
Building and boiler type	Boiler < 20kW	Boiler >= 20kW and <= 100kW			Boiler > 100kW		
		gas	oil	solid fuel	gas	oil	solid fuel
<b>Normal dwelling</b> <i>(subject to Bld Regs Part L1; has domestic boiler)</i>	No action required	<b>Q</b>	<b>Q</b>	<b>Q</b>	Inapplicable	Inapplicable	Inapplicable
<b>Small non-domestic building</b> <i>(subject to Bld Regs Part L2; has domestic boiler)</i>	No action required	<b>Q</b>	<b>Q</b>	<b>Q</b>	Inapplicable	Inapplicable	Inapplicable
<b>Large dwelling, or group of dwellings with communal heating</b> <i>(subject to Bld Regs Part L1; has non-domestic boiler)</i>	Inapplicable	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>
<b>Normal non-domestic building</b> <i>(subject to Bld Regs Part L2; has non-domestic boiler)</i>	Inapplicable	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>	<b>W</b>

**Table 3: Article 8 (b): implementation options**

## EPBD Article 8 (b)

Provide advice to users about (i) boiler replacement, (ii) other changes to system, and (iii) alternative (may include inspection) to assess the efficiency and appropriate size of boiler, and demonstrate equipment compliance with Article 8(a).

Building and boiler type	Boiler < 20kW	Boiler >= 20kW and <= 100kW			Boiler > 100kW		
		gas	oil	solid fuel	gas	oil	solid fuel
	No advice	Optional advice	Advice	Advice	Advice	Advice	Advice
<b>Normal dwelling</b> <i>(subject to Bld Regs Part L1; has domestic boiler)</i>	No action required	<b>NOP</b>	<b>NOPQ</b>	<b>NOPQ</b>	Inapplicable	Inapplicable	Inapplicable
<b>Small non-domestic building</b> <i>(subject to Bld Regs Part L2; has domestic boiler)</i>	No action required	<b>NOP</b>	<b>NOPQ</b>	<b>NOPQ</b>	Inapplicable	Inapplicable	Inapplicable
<b>Large dwelling, or group of dwellings with communal heating</b> <i>(subject to Bld Regs Part L1; has non-domestic boiler)</i>	Inapplicable	<b>TUV</b>	<b>TUVW</b>	<b>TUVW</b>	<b>VWYZ</b>	<b>VWYZ</b>	<b>VWYZ</b>
<b>Normal non-domestic building</b> <i>(subject to Bld Regs Part L2; has non-domestic boiler)</i>	Inapplicable	<b>TUV</b>	<b>TUVW</b>	<b>TUVW</b>	<b>WXYZ</b>	<b>WXYZ</b>	<b>WXYZ</b>

### Implementation options

Tables 4 and 5 list the implementation options and a provisional cost-effectiveness ranking. Further details of the actions, methods, problems, and likely cost-effectiveness of each implementation option are given in Appendix C. The cost-effectiveness ranking (1 = best) is based on informed opinion, not yet substantiated by a detailed study of costs and benefits.

OPTION	DESCRIPTION	RANKING
N	Simple Advice	5
O	"Householder" self-assessment	4
P	Energy consumption assessment	3
Q	Competent person assessment (boiler only)	1
R	Competent person assessment (boiler and system)	2
S	Competent person assessment - with measurements	6

<b>Table 5: Implementation options for commercial boilers in large single dwellings and normal commercial installations</b>		
OPTION	DESCRIPTION	RANKING
T	Simple Advice	6
U	Owner/energy Manager self-assessment	5
V	Energy consumption assessment	4
W	Competent person assessment (boiler only)	1
X	Competent person assessment (boiler and system)	2
Y	Assessment by Audit Company/Energy Consultant	3
Z	Competent person assessment - with measurements	7

### ***Least cost implementation in the UK***

The working group and consultation group agreed that implementation of Article 8(b) offers greater flexibility at lower costs than 8(a), and that the three actions set out below would constitute a fair and reasonable *minimum* implementation of Article 8(b) of the Directive, though would not necessarily be the recommended solution.

#### **(1) For domestic boilers**

Adopt implementation option N; ie, send leaflet to householders on importance of efficiency, regular maintenance, and possible replacement of elderly systems. This should go to all owners of oil and solid fuel boilers (approx. 2M) and owners of gas boilers over 15 years old (approx. 5M). It need not go to owners of gas boilers less than 15 years old (approx. 17M). It could further be restricted to owners of boilers >20kW, though the difficulty of identifying them may outweigh the additional cost of sending to all.

The householder leaflet should follow the theme of Recitals (19) in the Directive; ie, inform recipients that regular maintenance improves performance and that if a heating system is more than 15 years old the cost effectiveness of replacing it should be considered. In addition the leaflet should speak with the authority and independence of government, explaining the regulatory context and the environmental impact of heating systems. It would emphasise that heating uses the most energy in typical homes, and possibly invite householders to categorise their own system by a simple method so as to estimate likely efficiency. It should also mention current grant and subsidy schemes (WarmFront, etc).

#### **(2) For non-domestic boilers <= 100 kW**

Adopt implementation option T; ie, send leaflet to owners on importance of efficiency, regular maintenance, and possible replacement of elderly systems.

The non-domestic boilers leaflet should be similar to the householder leaflet, but written for businesses. It should also refer to professional services, government support (especially for SMEs), ECAs, the Energy Technology List, etc.

#### **(3) For non-domestic boilers > 100 kW**

Adopt implementation option U; ie, send questionnaire every 2 or 4 years urging self-assessment of efficiency, reminding of ECAs, the Energy Technology List, etc

The non-domestic boilers questionnaire should be written for energy managers and similar, who might reasonably be expected to assume responsibility for efficient heating services on larger sites. It should emphasise the value of benchmarking, professional services, government support, ECAs, the Energy Technology List, etc.

During discussion of the above, it was observed by the consultation group that exclusion of gas (where optional) would result in an unbalanced treatment of the various fuel industries. Nevertheless, the commitment by ODPM to treat fuels equally in the Part L review did not extend to provisions for implementing the EPBD, which would be governed by cost and impact analysis.

***Comparing the effectiveness of Article 8(b) with Article 8(a)***

An impact assessment can estimate the effectiveness of 8(b) in July 2007, this being 18 months after introduction and 6 months before the first report to the Commission is due. A separate study can estimate the theoretical effectiveness of 8(a), if it had been chosen instead.

To reduce the risk that the effect of 8(b) is assessed as less than might reasonably have been expected from 8(a), consideration should be given to increasing the scope of 8(b) by a suitable safety margin. In the least cost implementation above, option O should be considered instead of N; option U instead of T; and option U with central assessment instead of with self-assessment.

**UK boiler population estimates**

A comprehensive impact assessment will be required to identify the likely costs and effectiveness of each option. This will require knowledge of the boiler population broken down in the same way as the matrix. At this stage the detailed information is not available, but estimated UK domestic and commercial boiler populations for 2006 are given in Table 6. Separate figures are given for boilers over 15 years old. Gas and oil boiler statistics are taken from the Boiler Energy Model maintained by BRE for the Market Transformation Programme, and the solid fuel figures are estimates from the Solid Fuel Association.

<b>Table 6: Estimated boiler population in the UK (000's) in year 2006</b>					
		GAS		OIL	SOLID FUEL
		Non-condensing	Condensing		
Domestic	Total	16,339	3,742	1,540	450
	> 15 years old	5,381	12	193	225
Commercial	Total	513		56	4
	> 15 years old	???		???	???

## **Conclusion and recommendations**

### **General conclusions**

The Discussions at two working group meetings reached the general conclusions that:

1. Article 8 Option (b) is preferable to Option (a) since it allows more flexibility on implementation.
2. Straightforward advice in the form of leaflets that rely directly on the householder or boiler owner to take action are unlikely to be successful. The response rate to this type of request is very low. Even in cases where customers only contribute 50% of costs the uptake on energy efficiency measures is less than 1-2%.
3. Specific visits to undertake inspections or advice would be expensive to implement.
4. For economy, maximum use must be made of existing regular building visits for other reasons, where inspection or advice can be delivered at the same time. Examples are: annual boiler service, insurance inspections, Warmfront / EEC assessments, obligatory gas safety checks in rented homes, and surveys for property valuation and the forthcoming Home Condition Report.
5. It is preferable to target only buildings that have boiler installations (approximately only 80% of dwellings). But it may well be easier and cheaper to contact all building/dwelling owners than to identify only those with a boiler.
6. It is not necessary to adopt different approaches for different boiler types. Slightly different approaches are necessary for domestic and commercial boilers.
7. Measurement of the efficiency of installed boilers is not particularly informative, and corrective action is often not feasible. Simple visual inspection of boiler type and age may be more useful.
8. Consideration should be given to the use of actual annual energy consumption data to prioritise those boilers that need inspection. This would be most effective for large boilers which already require detailed energy consumption monitoring. However, consumption has to be related to building size and insulation characteristics, and varies substantially with individual occupancy. The EPBD defines energy performance of a building in terms of standardised usage.
9. A detailed impact assessment should be carried out to identify the numbers of boilers and likely costs and effectiveness of each option. The assessment should also consider alternative methods of improving energy efficiency where they can be shown to be more cost effective and would still qualify under the terms of the Directive (legal clarification required).
10. A key consideration will be the availability of suitably qualified staff to carry out the work, and training of them.

### **Outstanding questions for the consultation group**

1. Does the consultation group recommend adoption of Article 8 Option (b), or a combination of Option (a) and (b) based on boiler size?
2. Should any boilers below 20kW, and any gas boilers below 100kW, be included?
3. Should electric boilers be included? [They appear to be excluded by Article 2 of the EPBD, which defines 'boiler' as a boiler body and burner-unit designed to transmit to water the heat released from combustion.]
4. How should the cost effectiveness of actions to implement Article 8 be compared with other energy efficiency measures, and which other measures would be accepted as valid alternatives for the purposes of the Directive?

## Implementation of Article 8 of the Energy Performance of Buildings Directive

5. What visits to existing buildings/dwellings are made already, and could they be augmented to inspect or advise on the heating installation?
6. How are buildings with boiler systems to be identified, and is it necessary to create a database of all such installations and the names of their owners? How should the least efficient installations be discovered, so that they receive priority treatment?
7. Is the provision of simple advice an effective energy saving activity, and if not how can the requirements of the Directive be satisfied at least cost?
8. What level of training and qualifications will be required for "inspection" and "advice"?
9. Mandatory regular inspection of boilers is already adopted by a number of European countries (Austria, Belgium, Denmark and Germany). Should an assessment be made of the effectiveness of their schemes?

## Appendix A - Project brief

### A1.Aim

DEFRA Sustainable Energy Policy Division convened a consultation group to consider the options for implementation of Article 8 of the Energy Performance of Buildings Directive (EPBD). The following representatives were invited to form the consultation group:

Alan Christie	DEFRA
Ken Bromley	ODPM
Alan Silvester	BCEMA/BARMA
Chris Allen	BCEMA/BARMA
Malcolm Gunn	BCEMA/BARMA
John Beer	SBGI/HHIC
Roy Oxley	SBGI/HHIC
Richard Gales	OFTEC
Prof Bill Kay	HETAS
Mark Bugler	BRITISH GAS SERVICES
Mark Crowther	GASTEC
Bruce Young	BRE
Bob Pawsey	SBGI/HHIC
Chris Flynn	EST
Prof David Strong	BRE
Peter Iles	BRE

The aim of the consultation group is to reach a consensus on how Article 8 of EPBD may be implemented, such that carbon and cost savings are maximised in relation to costs.

After the first meeting of the group, held on 28 October 2003, DEFRA requested BRE to prepare a matrix of options that clearly identifies the relevant issues and alternative options to meet the requirements of EPBD Article 8. The options presented should be developed by a working group, and be consistent with the above aim and other priorities of the consultation group.

### A2.Tasks for this project

1. Invite individuals from the consultation group and other technical experts to form a working group to develop an options matrix. The working group should hold an initial "brainstorming" meeting.
2. Draft an options matrix document based on the brainstorming meeting to cover the range of boilers and fuels with all relevant issues and alternative options identified. Ask the working group to provide written comments and suggestions for improvement.
3. Hold a second working group meeting to discuss and identify revisions that are required, then produce a final document for submission to the full consultation group.

4. Attend the next consultation group meeting to present the draft report, finalise, and clarify the way forward.

### **A3.Activities of the working group**

The working group consisted of:

Alan Christie	DEFRA
Roy Oxley	SBGI/HHIC
Mark Bugler	BRITISH GAS SERVICES
Mark Crowther	GASTEC
Alan Shiret	BRE
Bruce Young	BRE
Prof David Strong	BRE

The working group held two meetings, on 03 December 2003 and 07 January 2004. The draft final report was presented to the 2nd consultation group meeting on 20 January 2004.

## **Appendix B - Article 8 of the Energy Performance of Buildings Directive**

*DIRECTIVE 2002/91/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL*

*of 16 December 2002*

*on the energy performance of buildings*

### Article 8

#### *Inspection of boilers*

*With regard to reducing energy consumption and limiting carbon dioxide emissions, Member States shall either:*

- (a) lay down the necessary measures to establish a regular inspection of boilers fired by non-renewable liquid or solid fuel of an effective rated output of 20 kW to 100 kW. Such inspection may also be applied to boilers using other fuels.*

*Boilers of an effective rated output of more than 100 kW shall be inspected at least every two years. For gas boilers, this period may be extended to four years.*

*For heating installations with boilers of an effective rated output of more than 20 kW which are older than 15 years, Member States shall lay down the necessary measures to establish a one-off inspection of the whole heating installation.*

*On the basis of this inspection, which shall include an assessment of the boiler efficiency and the boiler sizing compared to the heating requirements of the building, the experts shall provide advice to the users on the replacement of the boilers, other modifications to the heating system and on alternative solutions; or*

*(b) take steps to ensure the provision of advice to the users on the replacement of boilers, other modifications to the heating system and on alternative solutions which may include inspections to assess the efficiency and appropriate size of the boiler. The overall impact of this approach should be broadly equivalent to that arising from the provisions set out in (a). Member States that choose this option shall submit a report on the equivalence of their approach to the Commission every two years.*

Additional extracts from the Directive are reproduced below, with passages strongly relevant to Article 8 underlined:

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*Whereas:*

*(19) Regular maintenance of boilers and of air-conditioning systems by qualified personnel contributes to maintaining their correct adjustment in accordance with the product specification and in that way will ensure optimal performance from an environmental, safety and energy point of view. An independent assessment of the total heating installation is appropriate whenever replacement could be considered on the basis of cost-effectiveness.*

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Article 2

***Definitions***

*For the purpose of this Directive, the following definitions shall apply:*

2. *'energy performance of a building': the amount of energy actually consumed or estimated to meet the different needs associated with a standardised use of the building, which may include, inter alia, heating, hot water heating, cooling, ventilation and lighting. This amount shall be reflected in one or more numeric indicators which have been calculated, taking into account insulation, technical and installation characteristics, design and positioning in relation to climatic aspects, solar exposure and influence of neighbouring structures, own-energy generation and other factors, including indoor climate, that influence the energy demand;*
  
6. *'boiler': the combined boiler body and burner-unit designed to transmit to water the heat released from combustion;*

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Article 10

***Independent experts***

*Member States shall ensure that the certification of buildings, the drafting of the accompanying recommendations and the inspection of boilers and air-conditioning systems are carried out in an independent manner by qualified and/or accredited experts, whether operating as sole traders or employed by public or private enterprise bodies.*

## Appendix C - Details of the implementation options

<b>OPTION N</b>	<i>Simple Advice</i>
	<i>Applicable to: Domestic boilers in dwellings and small commercial installations.</i>
<b>ACTION</b>	
Letter/leaflet sent to all householders <i>with boilers</i> to indicate the potential benefits of having an efficient boiler and the potential savings possible from replacement with a condensing boiler. It would also confirm the potential benefits of servicing existing boilers to improve energy efficiency and safety.	
<b>IMPLEMENTATION ROUTES</b>	
<ul style="list-style-type: none"> <li>■ Direct mailshot</li> <li>■ Energy supplier "stuffer"</li> <li>■ Roadshow - promotion, etc.</li> </ul>	
<b>ISSUES</b>	
Only a limited number of householders are likely to read information. Very small number likely to take action using this method. How to target only those who have a boiler?	
<b>COSTS:</b> Low	
<b>EFFECTIVENESS:</b> Very poor	

<b>OPTION O</b>	<b><i>Householder self-assessment</i></b>
	<i>Applicable to: Domestic boilers in dwellings and small commercial installations.</i>
<b><i>ACTION</i></b>	
<p>Questionnaire sent to all householders so that they can undertake a simple self assessment of their boiler (and system?). Questionnaire would provide information on how to identify their present boiler (and energy efficiency features of the system?). Based on type and age, the estimated boiler efficiency can be indicated. The option would provide information to all householders of the benefits of having an efficient boiler and the potential savings possible from replacement by a gas or oil condensing boiler, or a wood-burning solid fuel boiler.</p>	
<b><i>IMPLEMENTATION ROUTES</i></b>	
<p>Self assessment - householder would be given some simple information on how to estimate the average efficiency of their boiler and the energy savings possible from replacement with a condensing boiler. Information would be based on a small number of typical dwelling and boiler types.</p> <p>"Central" Assessment - Householder would complete a form indicating boiler type and dwelling plus system features. Questionnaire would be sent to a central function for processing, then each householder would be sent a letter estimating potential savings from boiler replacement (and suggesting other improvements?).</p>	
<b><i>ISSUES</i></b>	
<p>A large proportion of householders are likely to ignore any request of this type. Many householders would not be able to identify the type and age of their boiler correctly.</p>	
<b><i>COSTS:</i></b> Low to mid-range	
<b><i>EFFECTIVENESS:</i></b> Poor	

<b>OPTION P</b>	<b><i>Energy Consumption assessment</i></b>
	<i>Applicable to: Domestic boilers in dwellings and small commercial installations.</i>
<b><i>ACTION</i></b>	
Energy supply company includes annual fuel consumption, dwelling floor area and categorises generic use (e.g. domestic heating and hot water, small shop, office etc).	
<b><i>IMPLEMENTATION ROUTES</i></b>	
Energy supply companies must obtain sufficient information to obtain representative annual energy consumption for dwelling/building. Dwelling/building area obtained from land registry or sellers packs. Criteria agreed for dwelling /building classification and trigger levels of consumption per square metre to have full inspection of boiler.	
<b><i>ISSUES</i></b>	
Does this approach meet the requirements of Article 8? Current frequency of actual meter readings are inadequate to obtain realistic annual consumption. Frequent changes of energy supplier may compound problem. How would accurate information on floor area and building usage be obtained? Energy performance under the EPBD is defined in terms of standardised usage (not a particular occupancy).	
<b><i>COSTS:</i></b> Low	
<b><i>EFFECTIVENESS:</i></b> Poor	

OPTION Q	<b>Competent person assessment (boiler only)</b>
	<i>Applicable to: Domestic boilers in dwellings and small commercial installations.</i>
<p><b>ACTION</b></p> <p>Competent person (CP) completes a standard questionnaire covering the householder's boiler to identify boiler type and age. In many cases CP would already visit the dwelling but implementation must cover all dwellings/boilers.</p>	
<p><b>IMPLEMENTATION ROUTES</b></p> <p>"Add-on" to annual service visit- CP completes questionnaire and provides advice on boiler replacement/improvement options. Recommendations could be added to log book as a record of advice.</p> <p>"Add-on" to annual service visit- CP completes questionnaire which is sent to central function for processing. Independent specific advice sent to householder (and CP?).</p> <p>Similar assessment completed as part of the Home Condition Report.</p> <p>Similar assessment completed as part of WarmFront, EEC, etc visits.</p> <p>Specific assessment visits targeted at those who do not have a regular service visit (ie; all except dwellings with private landlord, RSLs and LAs, British Gas or independent installer regular service contract, etc.)</p>	
<p><b>ISSUES</b></p> <p>CP will be qualified for annual boiler servicing by registration with CORGI (gas), OFTEC (oil), or HETAS (solid fuel). If CP provides advice there is a possible conflict of interest and consequent risk of inappropriate advice, leading to unnecessary boiler replacement/improvements. Nevertheless, installers may be keen to provide this "official" advice with mandatory backing to target all boiler owners. It will be hard to reach those who do not have a current service contract.</p>	
<p><b>COSTS:</b> Low (Mid-range for specific visit)</p> <p><b>EFFECTIVENESS:</b> Good but better to also cover system improvements during visit.</p>	

<b>OPTION R</b>	<b><i>Competent person assessment (boiler and system)</i></b>
	<i>Applicable to: Domestic boilers in dwellings and small commercial installations.</i>
<b><i>ACTION</i></b>	
Competent person (CP) completes a standard questionnaire covering the householder's boiler <b>and system</b> to identify energy saving features. In many cases an CP would already visit the dwelling but implementation must cover all dwellings/boilers.	
<b><i>IMPLEMENTATION ROUTES</i></b>	
<ul style="list-style-type: none"> <li>■ "Add-on" to annual service visit- CP completes questionnaire and provides advice on boiler replacement/improvement options. Recommendations could be added to log book as a record of advice.</li> <li>■ "Add-on" to annual service visit- CP completes questionnaire which is sent to central function for processing. Independent specific advice sent to householder (and CP?).</li> <li>■ Similar assessment completed as part of the Home Condition Report.</li> <li>■ Similar assessment completed as part of WarmFront, EEC, etc visits.</li> <li>■ Specific assessment visits targeted at those who do not have a regular service visit (i.e.; all except dwellings with private landlord, RSLs and LAs, British Gas or independent CP regular service contract, etc.)</li> </ul>	
<b><i>ISSUES</i></b>	
CP will be qualified for annual boiler servicing by registration with CORGI (gas), OFTEC (oil), or HETAS (solid fuel). If installer provides advice there is a possible conflict of interest and consequent risk of inappropriate advice, leading to unnecessary boiler replacement/improvements. Nevertheless, installers may be keen to provide this "official" advice with mandatory backing to target all boiler owners. It will be hard to reach those who do not have a current service contract.	
<b><i>COSTS:</i></b> Mid-range (but High for specific visit)	
<b><i>EFFECTIVENESS:</i></b> Good	

<b>OPTION S</b>	<b><i>Competent person assessment - with measurements.</i></b>
	<i>Applicable to: Domestic boilers in dwellings and small commercial installations.</i>
<b><i>ACTION</i></b>	
Direct assessment of boiler efficiency using simple flue loss measurements.	
<b><i>IMPLEMENTATION ROUTES</i></b>	
<p>"Add-on" to annual service visit - competent person (CP) required to undertake flue loss measurements (where not already undertaken) and provide advice. CP completes questionnaire and provide advice on boiler replacement/improvement options. Could be added to log book as a record of advice.</p> <p>Specific "measurement" visits targeted at those who do not a regular service visit (i.e. except dwellings with private Landlord, RSL's and LA's, British Gas or independent CP regular service contract, etc.)</p>	
<b><i>ISSUES</i></b>	
<p>Flue loss efficiency only gives an indication of efficiency when the boiler is firing continuously. Under typical in-use cyclic operation, efficiency can deteriorate rapidly at part load and this is not detected by a flue loss measurement. Measurement of flue loss efficiency may show up poorly adjusted oil fired boilers but overall efficiency can possibly be estimated (based on boiler age/type) quite easily and accurately enough to show whether boiler requires replacing.</p>	
<p><b><i>COSTS:</i></b> Mid-range (High for specific visit)</p> <p><b><i>EFFECTIVENESS:</i></b> Poor. Extra measurements of flue loss efficiency are unlikely to lead to significantly more boiler replacements. The combustion performance of many gas boilers cannot be adjusted and where adjustments are made they usually have a small effect on overall efficiency. Measurements of the flue loss efficiency of solid fuel boilers are not usually effective.</p>	

<b>OPTION T</b>	<i>Simple Advice</i>
	<i>Applicable to: Commercial boilers in large single dwellings and normal commercial installations.</i>
<b><i>ACTION</i></b>	
<p>Leaflet sent to all Building Owners to indicate the potential benefits of having efficient boilers and the potential savings possible from new equipment including condensing boilers. It would also indicate the possible benefits of adjustment and servicing of existing boilers for both energy efficiency and safety.</p>	
<b><i>IMPLEMENTATION ROUTES</i></b>	
<p>Direct mailshot</p> <p>Energy supplier "stuffer"</p> <p>Roadshow - promotion, etc.</p>	
<b><i>ISSUES</i></b>	
<p>Sometimes difficult to target the appropriate person who takes responsibility for the energy bills. Very small number of recipients likely to take action using this method. How to target only those owners who have a boiler(s)?</p>	
<b><i>COSTS:</i></b> Low	
<b><i>EFFECTIVENESS:</i></b> Very poor	

<b>OPTION U</b>	<b><i>Owner /Energy Manager self-assessment</i></b>
	<i>Applicable to: Commercial boilers in large single dwellings and normal commercial installations.</i>
<b><i>ACTION</i></b>	
<p>Questionnaire sent to all sites for simple self assessment of the boilers installed. Questionnaire would provide information on how to identify their present boiler(s) (and energy efficiency features of the system). Information would be provided to emphasise the cost benefits/paybacks of boiler replacement and measures to reduce energy use.</p>	
<b><i>IMPLEMENTATION ROUTES</i></b>	
<p>Owner/Energy Manager assessment - would be given some simple information on how to estimate the average efficiency of their boiler(s) (must deal with boiler house) and the energy savings possible from replacements with a condensing boiler. Information would be based on a range of typical commercial installations and energy usage.</p> <p>Central Assessment - owner/energy manager would complete a form indicating boiler types, applications and current energy usage. Questionnaire would be sent to a central function for processing each owner/energy manager would be sent recommendations indicating potential savings from boiler replacement etc.</p>	
<b><i>ISSUES</i></b>	
<p>Owners may be unable to provide reliable information. Energy Managers are more likely to. Should link to Enhanced Capital Allowances where appropriate.</p>	
<b><i>COSTS:</i></b> Low to Mid range	
<b><i>EFFECTIVENESS:</i></b> Moderate	

<b>OPTION V</b>	<i>Energy Consumption assessment</i>
	<i>Applicable to: Commercial boilers in large commercial installations.</i>
<b>ACTION</b>	
Energy supply company includes annual fuel consumption, building floor area and categorises generic use (e.g. retail, office, school, etc).	
<b>IMPLEMENTATION ROUTES</b>	
Energy supply companies provide annual consumption based on regular monitoring of supply. Dwelling/building area obtained from land registry or sellers packs. Criteria agreed for building classification and trigger levels of consumption per square metre to have full inspection of boiler.	
<b>ISSUES</b>	
Does this approach meet the spirit of the requirements of Article 8?	
More practical where regular monitoring takes place (30 minute readings). How would accurate information on floor area and building usage be obtained? Possibility of data protection issues. How to set effective benchmarks. Should help to prioritise large energy users. Energy performance under the EPBD is defined in terms of standardised usage (not a particular occupancy).	
<b>COSTS:</b> Low	
<b>EFFECTIVENESS:</b> Good - but does it meet Article 8 requirements?	

<b>OPTION W</b>	<i>Assessment by competent person (boiler only)</i>
	<i>Applicable to: Commercial boilers in large single dwellings and normal commercial installations.</i>
<b><i>ACTION</i></b>	
Competent person (CP) completes pro-forma indicating boiler type/age. Estimates annual efficiency. Makes recommendations to owner/energy manager for improvements.	
<b><i>IMPLEMENTATION ROUTES</i></b>	
"Add-on" to regular service visit- CP completes questionnaire and provides advice on boiler replacement/improvement options. Recommendations could be added to log book as a record of advice.	
"Add-on" to regular service visit- CP completes questionnaire which is sent to central function for processing. Independent specific advice sent to owner/energy manager and CP?).	
<b><i>ISSUES</i></b>	
The average CP unlikely to have the skills required to undertake this work effectively. Training and guidance information for the CP would be crucial to success.	
<b><i>COSTS:</i></b> Low	
<b><i>EFFECTIVENESS:</i></b> Poor, Depends on skill of CP.	

Implementation of Article 8 of the Energy Performance of Buildings Directive

<b>OPTION X</b>	<i>Assessment by competent person (boiler and system)</i>
	<i>Applicable to: Commercial boilers in large single dwellings and normal commercial installations.</i>
<b>ACTION</b>	
Competent person (CP) completes pro-forma indicating boiler types, applications and current energy usage. Makes recommendations to owner/energy manager for improvements.	
<b>IMPLEMENTATION ROUTES</b>	
"Add-on" to regular service visit- CP completes questionnaire and provides advice on boiler replacement/improvement options. Recommendations could be added to log book as a record of advice.	
"Add-on" to regular service visit- CP completes questionnaire which is sent to central function for processing. Independent specific advice sent to owner/energy manager and CP?).	
<b>ISSUES</b>	
The average CP unlikely to have the skills required to undertake this work effectively. Training and guidance information for the CP would be crucial to success.	
<b>COSTS:</b> Low	
<b>EFFECTIVENESS:</b> Poor, Depends on skill of engineer.	

<b>OPTION Y</b>	<i>Assessment by Audit Company/Energy Consultant</i>
	<i>Applicable to: Commercial boilers in large single dwellings and normal commercial installations.</i>
<b><i>ACTION</i></b>	
<p>Consultant completes report indicating boiler types (boiler house based), applications, loads and historical energy usage and compares with benchmarks. Makes recommendations to owner/energy manager for boiler, system and usage improvements.</p>	
<b><i>IMPLEMENTATION ROUTES</i></b>	
<p>Assessment but by Energy Consultant or Energy Audit Company.</p> <p>Assessment completed as part of Insurance visits (where applicable - limited?).</p> <p>Specific assessment visits targeted at those who do not a regular service visit (Consider changes to registration scheme to identify all commercial boiler installations - reduce current 5MW down to 100kW?)</p>	
<b><i>ISSUES</i></b>	
<p>Availability of current energy usage data (link to Article 7). Possible cost of visits due to emphasis required on whole system plus analysis of energy usage rather than boilers alone.</p>	
<b><i>COSTS:</i></b> High	
<b><i>EFFECTIVENESS:</i></b> Very good	

<b>OPTION Z</b>	<i>Assessment - with efficiency measurements.</i>
	<i>Applicable to: Commercial boilers in large single dwellings and normal commercial installations.</i>
<b>ACTION</b>	
Direct assessment of boiler efficiency using simple flue loss measurements for each boiler in boiler house.	
<b>IMPLEMENTATION ROUTES</b>	
"Add-on" to regular service visit (if not already undertaken) - Competent person (CP) undertakes test on each boiler and provides advice on boiler replacement/improvement options. Recommendations could be added to log book as a record of advice.	
As above but carried out by Energy Audit company or energy consultant.	
<b>ISSUES</b>	
Difficulties in undertaking effective measurements due to boiler firing periods and firing rates, accuracy of measurements. Can only be done under continuous firing operation: not part load where losses may be significant. Requires agreement with site owner for possible extra fuel use, variation in flue systems, etc. Need to consider the efficiency of each boiler relative to its use; e.g., standby boilers.	
<b>COSTS:</b> High	
<b>EFFECTIVENESS:</b> Poor	